GUARDRAIL TREATMENT

TYPE II
RAILING SYSTEM
BHS-007-08

STATE HIGHWAY ENGINEER

DIRECTOR DIVISION OF STRUCTURAL DESIGN

DEPARTMENT OF HIGHWAYS
KENTUCKY

STANDARD DRAWING NO.

MAINTENANCE NOTES:

HARDWARE.
ONLY USE FOR REPAIRING OR RESTORING EXISTING
NOT FOR NEW CONSTRUCTION.

BID ITEM NOTES

GUARDRAIL-STEEL "W" BEAM (SINGLE FACE A): The bid unit for this item is be linear feet. This item shall include the Railing System Type II that is to be installed on the bridge between the endmost posts attached to the bridge and all labor and incidentals necessary to properly install the railing system. For non-composite box beams, the railing system is attached to the beam prior to shipment.

GUARDRAIL-STEEL "W" BEAM (SINGLE FACE A): The bid unit for this item is be linear feet. This item includes the W-Beam guardrail (2 ply for extra strength), guardrail posts, offset blocks, hardware, and labor and incidentals necessary to properly install the approach guardrail within the 25' 0" limits at each corner of the structure. For guardrail components, refer to Standard Drawings RBR-001, RBR-005, and RBR-015.

25'-0" Steel "W" Beam Guardrail (Single Face) 2 Ply with extra Posts, Offset Blocks, Rail Elements for Double Strength

Installation

End of Bridge

3 Equal Spaces

3'-1/2" Post Spacing

Normal Guardrail Installation

Pay Limits For Steel "W" Beam Guardrail
(Single Face A)
Structures Bid Item

Pay Limits For Steel "W" Guardrail
(Single Face A)
Structures Bid Item

Pay Limits For Steel "W" Beam Guardrail
Roadway Bid Item

GUARDRAIL INSTALLATION

BID ITEM NOTES

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Pay Limits For Steel "W" Beam Guardrail
(Single Face BR)
Structures Bid Item

Pay Limits For Steel "W" Guardrail
(Single Face BR)
Structures Bid Item

Pay Limits For Steel "W" Beam Guardrail
Roadway Bid Item

MAINTENANCE NOTES:

HARDWARE.
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Pay Limits For Steel "W" Beam Guardrail
(Single Face BR)
Structures Bid Item

Pay Limits For Steel "W" Guardrail
(Single Face BR)
Structures Bid Item

Pay Limits For Steel "W" Beam Guardrail
Roadway Bid Item

MAINTENANCE NOTES:

HARDWARE.
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GUARDRAIL-STEEL "W" BEAM (SINGLE FACE A): The bid unit for this item is be linear feet. This item shall include the Railing System Type II that is to be installed on the bridge between the endmost posts attached to the bridge and all labor and incidentals necessary to properly install the railing system. For non-composite box beams, the railing system is attached to the beam prior to shipment.

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Pay Limits For Steel "W" Beam Guardrail
(Single Face BR)
Structures Bid Item

Pay Limits For Steel "W" Guardrail
(Single Face BR)
Structures Bid Item

Pay Limits For Steel "W" Beam Guardrail
Roadway Bid Item

MAINTENANCE NOTES:

HARDWARE.
ONLY USE FOR REPAIRING OR RESTORING EXISTING
NOT FOR NEW CONSTRUCTION.
11'-0" Barrier Transition (measured along outside face of barrier)

11'-4" to holes (measured along roadway face of barrier)

Form holes in barrier for guardrail and rub rail connections with 1" I.D. plastic pipe. Leave pipe in place and include the cost in the bid for rail system.

Top of slab

Note: Open joints are not required.

OPTIONAL WELDED WIRE REINFORCEMENT:

ELEVATION A-A

Note: Open joints are not required.

PLAN OF BARRIER TRANSITION

TYPICAL BARRIER SECTION

OBLIQUE VIEW

ELEVATION A-A

Note: Open joints are not required.

PLAN OF BARRIER TRANSITION

TYPICAL BARRIER SECTION

GENERAL NOTES

CONCRETE: Use Class "AA" Concrete throughout.

OPTIONAL WELDED WIRE REINFORCEMENT:

If the contractor's option, deformed welded wire reinforcement (WWR) in accordance with ASTM A497 and epoxy coated in accordance with ASTM A884 may be used in place of stirrup bars X2, X3, and X5 as well as the straight or longitudinal reinforcement attached to these stirrups. Use size D31 wire for both stirrups and straight reinforcement. Locate and space the wire reinforcement the same as the conventional reinforcement except lower the top straight bar at least 1/2" away from the bend in the stirrup. Use a minimum 2'-8" lap for the straight reinforcement between sheets of WWR.

MEASUREMENT: The linear foot bid for the barrier is measured along the roadway gutterline. Include all reinforcement shown and all concrete above the top of slab in the bid item for Rail System Type 3.

REINFORCEMENT: All reinforcement shown on this sheet is to be epoxy coated. Use stirrup bend diameters for all bent bars. Straight reinforcement is to be Size #5 and lapped 2'-2" when necessary.

MAINTENANCE NOTES:

PERMISSIBLE CONSTRUCTION JOINT: Permissible construction joint. Open joints are not required.

Mandatory roughened construction joint. Concrete above this joint is to be placed after slab has been properly cured and included in the bid for Rail System, Type 3.

Pay Limits (measured along gutterline)

End of slab

Top of slab

Note: X1 & X3 Bars at end of slab may be adjusted to maintain 2' minimum clearance on curved and skewed end bridges.
General Notes

This rail system has been structurally evaluated to be equivalent or greater in strength to other single slope railings which have been crash tested to MASH TL-4 criteria. This rail system can be used for speeds of 50 mph or greater when a TL-2 transition is used. When a TL-2 transition is used, this railing can only be used for 45 mph or less.

CONCRETE: Use Class "A" Concrete throughout.

SHOP DRAWINGS: Are not required for this rail.

OPTIONAL WELDED WIRE REINFORCEMENT: At the contractor’s option, deformed welded wire reinforcement (WWR) in accordance with ASTM A5064 and epoxy coated in accordance with ASTM A884 may be used in place of stirrup bars X1, X2, and X3 as well as the straight or longitudinal reinforcement attached to these stirrups. Use size D20 wire for both stirrups and straight reinforcement. Locate and space the wire reinforcement the same as the conventional reinforcement. Use a minimum 3’-11” lap for the straight reinforcement between sheets of WWR.

MEASUREMENT: The linear foot bid for the barrier is measured along the roadway gutter line. Include all reinforcement shown and all concrete above the top of slab in the bid item for Rail System, 36 Inch Single Slope.

REINFORCEMENT: All reinforcement shown on this sheet is to be epoxy coated Grade 60. Use stirrup bend diameters for all bent bars. Straight reinforcement is to be Size #4 and lapped 3’-11” when necessary. Average weight of rail is 412 lb/ft.

DEPARTMENT OF HIGHWAYS
KENTUCKY RAILING SYSTEM 36 INCH SINGLE SLOPE

TYPICAL 36" BARRIER SECTION ON RETAINING WALL

TYPICAL 36" BARRIER SECTION

OPTIONAL SIDE SLOT DRAIN DETAIL

"V-Groove" Rustication

OBLIQUE VIEW
SHOP DRAWINGS: DIRECTOR DIVISION OF STRUCTURAL DESIGN

Concrete above this joint is to be placed after slab has been properly cured and included in the bid for Rail System, 40 Inch Single Slope.

General Notes

This rail system has been structurally evaluated to be equivalent or greater in strength to other single slope railings which have been crash tested to MASH TL-4 Criteria. This rail system can be used for speeds of 55 mph or greater when a TL-3 rated transition is used. When a TL-2 transition is used, this railing can only be used for 45 mph or less.

CONCRETE: Use Class "AA" Concrete throughout.

OPTIONAL WELDED WIRE REINFORCEMENT: At the contractor's option, deformed welded wire reinforcement (WWR) in accordance with ASTM A1664 and epoxy coated in accordance with ASTM A884 may be used in place of stirrup bars X1, X2, and X3 as well as the straight or longitudinal reinforcement attached to these stirrups. Use size D20 wire for both stirrups and straight reinforcement. Locate and space the wire reinforcement the same as the conventional reinforcement. Use a minimum 1'-10" lap for the straight reinforcement between sheets of WWR.

MEASUREMENT: The linear foot bid for the barrier is measured along the roadway center line. Include all reinforcement shown and all concrete above the top of slab in the bid item for Rail System, 40 Inch Single Slope.

REINFORCEMENT: All reinforcement shown on this sheet is to be epoxy coated grade 60. Use stirrup bend diameters for all bent bars. Straight reinforcement is to be Size #4 and lapped 1'-11" when necessary. Average weight of rail is 474 lbs.

Note: Open joints are not required.
Contrary to Standard Drawings for Guardrail, place splices between posts off of bridge as shown.

Pay For Rail System from Post to Post on Bridge

25'-0" Nominal Rail Section - one 25'-0" W-Beam or two 12'-6" W-Beams (Typ.)

CONSTRUCTION NOTES:
Face of rail post must be plum unless otherwise approved by the Engineer.
Pole must be permeable to adjacent roadway grade. Use epoxy mortar with Type III binder conforming to Section 826 and ASTM C615 under post base plates if gaps larger than 0.5" exist. Fully anchored guardrail must be attached to each end of rail. Typical guardrail construction as indicated above.

MATERIAL NOTES:
Galvanized steel components. Anchor bolts for base plate must be 9/16" ASTM A325 or A449 bolts with one hardened washer and one regular lock washer placed under each head hex nut. Base plate shall be 10 gauge minimum. Anchor bolts must meet the requirements of Std. Dwg. AAB-001, i.e., except as modified in these plans. The contractor may furnish rail elements of 25'-0" or 12'-6" (Nominal) lengths. W-beam must have slotted holes at 3'-1" ± 1/8" by grinding. Stop drawings are not required.

GENERAL NOTES:
This railing has been successfully evaluated by full scale crash tests to meet MASH TL-3 criteria. This railing can be used for speeds 50 mph and greater. This railing is designed to deflect approximately 4'-0" - 4'-6" as it contains and redirects the errant vehicle. This rail may not be installed on risers or safety curbs that project above finished grade more than 5" of movement. In retaining walls, or on grade separations and interchanges. Repairs to impact damaged posts and base plate unit are not permitted. Replace all impacted damaged posts with a new post and base plate unit. Width of finishing with no overlay. 19 p/sf total.

TRANSITION AND END TREATMENT NOTES:
This traffic railing must be anchored by a minimum of 25 feet of guardrail. See roadway plans for layout.

W-BEAM ELEVATION

W-BEAM SPLICE ELEVATION

ALTERNATE ANCHORAGE

(For Concrete >11" Thick)

POE ELEVATION

KENTUCKY DEPARTMENT OF HIGHWAYS
RAILING SYSTEM
TYPE T631
DETAILS

STANDARD DRAWING NO. BHS-012
LIMITED

02-28-20

02-28-20
GENERAL NOTES

1. Use steel posts unless otherwise specified in the plans. The exact position of transitions shall be as shown in the plans or as directed by the Engineer.

2. Rail element shall meet the requirements of AASHTO M180 except as modified in the plans.

3. Button head "post" bolts (ASTM A325) shall be of sufficient length to extend through the full thickness of the nut and Type A, 1/8" O.D. washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A325) are 1/4" x 1 1/2" with 5/16 double recessed nuts (ASTM A563).

4. Bolts, nuts, and washers shall be galvanized in accordance with AASHTO M232. Hardware shall be incidental to Thrie-Beam Guardrail Transition TL-2.

5. If solid rock is encountered, see the standard specifications for the proper installation guidance.

6. Posts shall not be set in concrete, of any depth.

7. This railing has been successfully evaluated by full-scale crash test to meet MASH TL-2 criteria. This railing transition is to be used when speeds are 45 mph or less.

8. & Panel 1/4" Galvanized Hardware shall be incidental to Thrie-Beam Guardrail Transition. See Standard Drawings RBR-005, etc., for standard. All costs to install the curb shall be incidental to the lump sum price bid for Thrie-Beam Guardrail Transition, TL-2. As Guardrail is required if a Flume or Curb Box is not installed at the end of the bridge.

9. Method of measurement and basis of payment.

A. Thrie-Beam Guardrail Transition, TL-2 shall be paid at the contract unit price each and includes the Thrie-Beam terminal connection, Thrie-Beam element, non symmetrical transition, curb or curb and gutter, posts, standard header curb and gutter, hardware (See General Notes 4 and 6). All components necessary to complete the installation. This transition must be into W-Beam Guardrail, which is not included in this transition bid item.

B. Plastic pipe and cost of forming holes shall be included in the cost for the bridge railing.

TYPICAL PLAN VIEW

TYPICAL ELEVATION VIEW

THREE-BEAM TERMINAL CONNECTION

(See Terminal Connection Note)

THREE-BEAM (3'-6")

(10 GA.) ELEMENT SECTION

TRANSITION SECTION

NON-SYMMETRICAL (10 GA.)

STEEL POST & BLOCK

(Showing Standard Block, see Three-Beam Guardrail Transition, TL-2 for Thrie-Beam Block & Post Dimensions)
This document is a technical drawing and text related to the installation of a concrete bridge rail and traffic barriers system. The components include concrete standard header curbs, non-symmetrical transitions, and W-beam guardrail transitions. The drawing provides detailed specifications for installation, including the use of washers, nuts, and bolts. The text also includes general notes on the installation process, such as the requirement for washing and the use of standard header curbs. The project is associated with the Kentucky Department of Highways and involves the installation of guardrail transitions.
**General Notes**

**PIPE, RAILING & POSTS:** Structural Tube. Pipe and Bar shall be in accordance with ASTM B221 or ASTM D429, Alloy 6061-T6. For curved longitudinal alignments the top and bottom rails and handrails shall be shop bent to match the alignment radius.

**BASE PLATES:** Base Plates shall be in accordance with ASTM 0209, Alloy 6061-T6.

**COATINGS:** The aluminum railing shall be mill finish unless otherwise noted in the Contract Documents. All nuts, anchor bolts, and washers shall be hot-dip galvanized in accordance with AASHTO M232.

**ANCHOR BOLTS:** Anchor bolts shall be in accordance with ASTM F1554 Grade 36. Headless anchor bolts for Adhesive Anchors shall be threaded full length. Cutting of reinforcing steel is permitted for drilled hole installation. All anchor bolts shall have single self-locking hex nuts. Tack welding of the nut to the anchor bolt may be used in lieu of self-locking nuts. All nuts shall be in accordance with ASTM A563 or ASTM A194. Flat Washers shall be in accordance with ASTM F436. After the nuts have been snug tightened, the anchor bolt threads shall be distorted to prevent removal of the nuts. Distorted threads and tack welds shall be coated with a zinc rich paint. Mechanical anchors may be allowed. Submit calculations by a professional engineer and manufacture data for proposed mechanical anchor to the engineer for approval along with the shop drawings.

**RESILIENT AND NEOPRENE PADS:** Resilient and Neoprene pads shall be in accordance with Specification Section 932, except that testing of the finished pads shall not be required. Neoprene pads shall be durometer hardness 60 or 70.

**JOINTS:** All fixed joints are to be welded all around and ground smooth. Expansion Joints shall be spaced at a maximum of 20'-0". Field splices similar to the expansion joint detail may be approved by the Engineer to facilitate shipping and handling, but rails must be continuous across a minimum of two posts.

**WELDING:** All welding shall be in accordance with the American Welding Society Structural Welding Code (Aluminum) ANSI/AWS D1.1. (current edition). Filler metal shall be either ER5183, ER5356, or ER5556. Nondestructive testing of welds is not required.

**SHOP DRAWINGS:** Details addressing project specific geometry (line & grade) showing post and expansion joint locations must be submitted by the Contractor for the Engineer's approval prior to fabrication of the railing. Shop drawings shall be in accordance with the Specifications.

**PAYMENT:** Aluminum handrail shall be paid for under the contract unit price for Aluminum Handrail, LF. Payment for the handrail will be based on the quantity measured as the length along the center line of the top rail, and includes rails, posts, rail splice assembly, base plates, anchor bolts, nuts, washers, resilient or neoprene pads and all incidental materials and labor required to complete installation of the handrail.

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**RAILING MEMBER DIMENSIONS TABLE**

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>DESIGNATION</th>
<th>OUTSIDE DIMENSION</th>
<th>WALL THICKNESS</th>
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<tbody>
<tr>
<td>Posts and Rails</td>
<td>2&quot; NPS (Sch. 40)</td>
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<tr>
<td>Rail Joint/Splice Sleeves</td>
<td>1½&quot; NPS (Sch. 40)</td>
<td>1.900&quot;</td>
<td>0.145&quot;</td>
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**Kentucky Department of Highways**

**Aluminum Handrail**

**Standard Drawing No. BHS-015**

**CJP**

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**Typical Section**

**Expansion Joint**

*Note: Expansion joints shall be placed at bridge expansion joint locations and shall match Bridge Expansion Joint Size. This handrail shall not be used where bridge expansion and contraction will leave less than 6 inch overlap in handrail joint.*

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**Elevation**

**Base Plate Detail**

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**Drawing**

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**General Notes**

**PIPE RAILING & POSTS**: Pipe Rails and Posts shall be in accordance with ASTM A53 Grade B for standard weight pipe and ASTM A500 Grade B, C or D or ASTM A510 for structural tube. Rail curves and alignment of the top and bottom rails and handrails shall be shop bent to match the alignment radius.

**BASE PLATES**: Base Plates shall be in accordance with ASTM A36 or ASTM A709 Grade 36.

**COATINGS**: The railing shall be hot-dip galvanized after fabrication in accordance with AASHTO M111. All nuts, anchor bolts, and washers shall be hot-dip galvanized in accordance with AASHTO M323.

**ANCHOR BOLTS**: Anchor bolts shall be in accordance with ASTM F1554 Grade 36. Headless anchor bolts for Adhesive Anchors shall be threaded full length. Cutting of reinforcing steel is permitted for drilled hole installation. All anchor bolts shall have single self-locking hex nuts. Tack welding of the nut to the anchor bolt may be used in lieu of self-locking nuts. All nuts shall be in accordance with ASTM A563 or ASTM A194. Flat Washers shall be in accordance with ASTM F436. After the nuts have been snug tightened, the anchor bolt threads shall be disturbed to prevent removal of the nuts. Distorted threads and tack welds shall be coated with a zinc rich paint. Mechanical anchors may be allowed. Submit calculations by a professional engineer and manufacturer data for proposed mechanical anchor to the engineer for approval along with the shop drawings.

**RESILIENT AND NEOPRENE PADS**: Resilient and Neoprene pads shall be in accordance with Specification Section 932, except that testing of the finished pads shall not be required. Neoprene pads shall be diameter hardness 60 or 70.

**JOINTS**: All fixed joints are to be welded all around and plug welds ground smooth. Remove burs and weld splatter, additionally remove any sharp edges on rails to prevent injury. Expansion Joints shall be spaced at a maximum of 20'-0". Field splices similar to the expansion joint detail may be approved by the Engineer to facilitate shipping and handling, but rails must be continuous along a minimum of two posts.

**WELDING**: All welding shall be in accordance with the American Welding Society Structural Welding Code (Steel) AWS D1.1 (current edition). Weld metal shall be E60XX or E70XX. Nondestructive testing of welds is not required.

**SHOP DRAWINGS**: Details addressing project specific geometry (line & grade) showing post and expansion joint locations must be submitted by the Contractor for the Engineer's approval prior to fabrication of the railing. Shop drawings shall be in accordance with the Specifications.

**PAYMENT**: Steel handrail shall be paid for under the contract unit price for Steel Handrail, LF. Payment for the handrail will be plan quantity measured as the length along the center line of the top rail, and includes rails, posts, rail splice assembly, base plates, anchor bolts, nuts, washers, resilient or neoprene pads and any incidental materials and labor required to complete installation of the handrail.

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<tr>
<td>Handrail Joint/Splice Sleeves</td>
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<td>1.900</td>
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**KENTUCKY DEPARTMENT OF HIGHWAYS**

**STEEL HANDRAIL**

**STANDARD DRAWING NO. BHS-016**