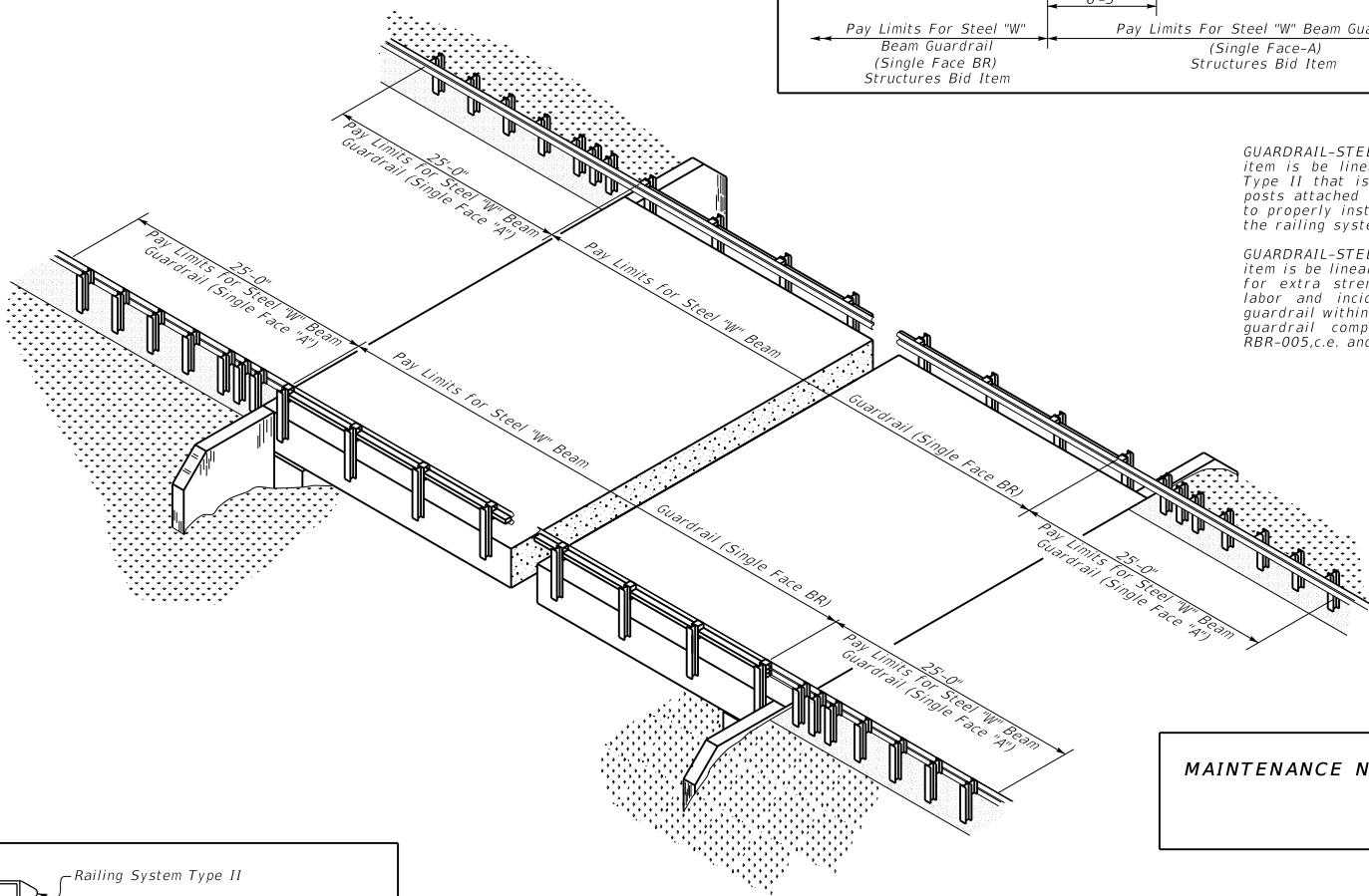


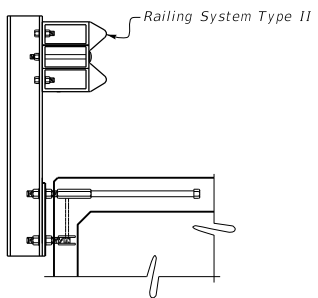
BID ITEM NOTES

GUARDRAIL-STEEL W BEAM (SINGLE FACE BR): 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.

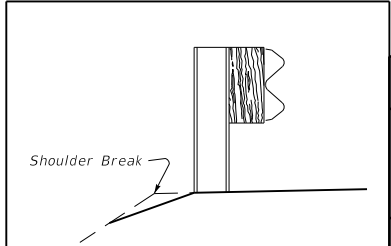
GUARDRAIL-STEEL W BEAM (SINGLE FACE A): The bid unit for this item is be linear feet. This item includes the W-Beam guardrail (2 ply for extra strength), guardrail posts, offset blocks, hardware, and labor and incidentals necessary to properly install the approach guardrail within the 25'-0" limits at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



MAINTENANCE NOTES:



BRIDGE GUARDRAIL INSTALLATION



ROADWAY SHOULDER G.R. INSTALLATION

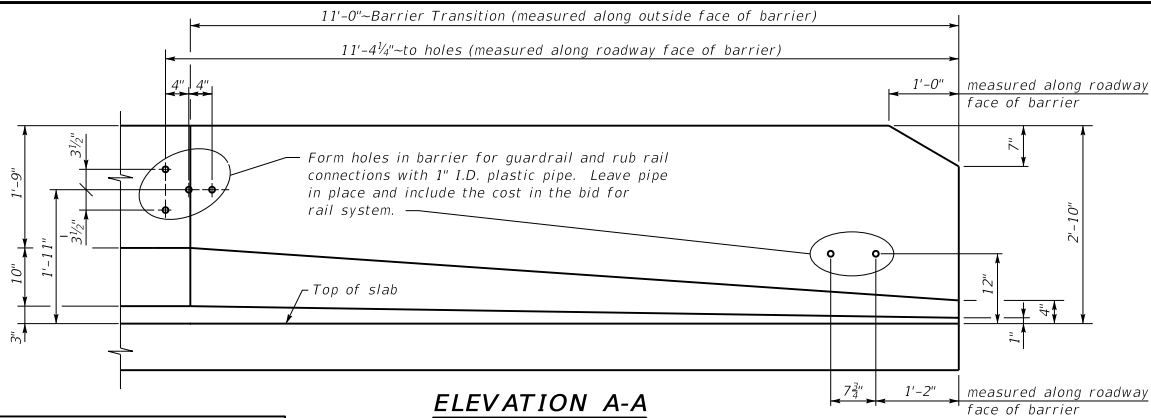
KENTUCKY
DEPARTMENT OF HIGHWAYS

RAILING SYSTEM
TYPE II
GUARDRAIL TREATMENT

STANDARD DRAWING NO. BHS-007-08

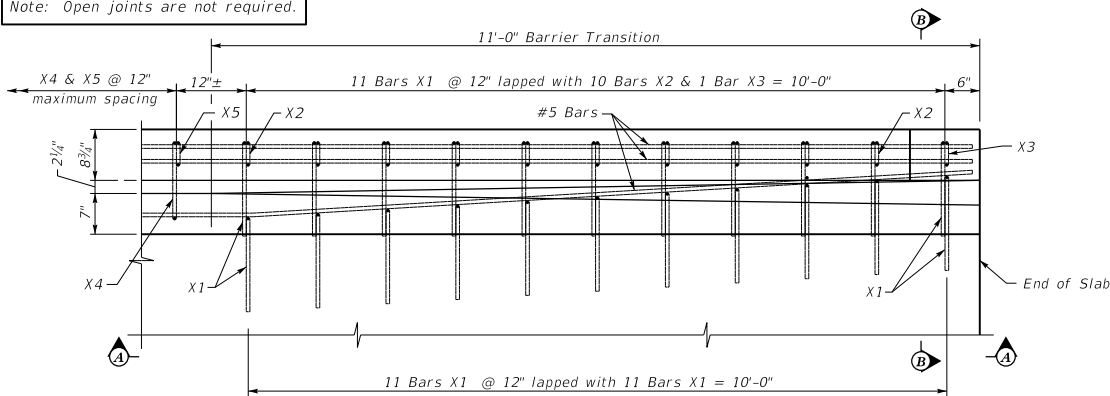
SUBMITTED: *Boyd Adams* 02-26-20
DIRECTOR DIVISION OF STRUCTURAL DESIGN DATE

APPROVED: *[Signature]* 02-26-20
STATE REGISTERED ENGINEER DATE

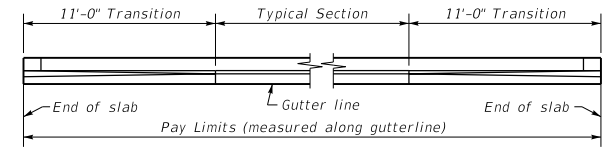


ELEVATION A-A

Note: Open joints are not required.

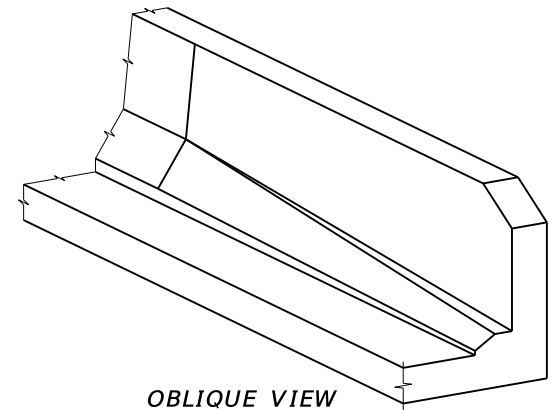


PLAN OF BARRIER TRANSITION



PLAN OF BARRIER

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



OBLIQUE VIEW

General Notes

CONCRETE: Use Class "AA" Concrete throughout.

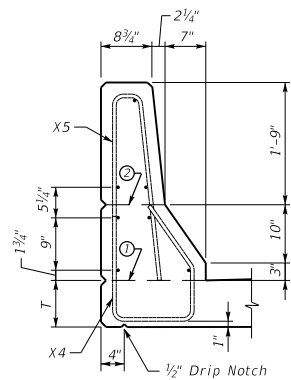
OPTIONAL WELDED WIRE REINFORCEMENT:

At 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 2 1/2" away from the bend in the stirrup. Use a minimum 2'-8" lap for the straight reinforcement between sheets of WWR.

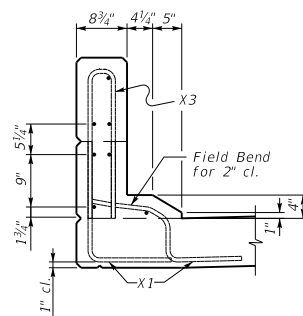
MEASUREMENT: The linear foot bid for the barrier is measured along the roadway gutterline. Include all reinforcement shown and all concrete above the top of slab in the bid item for Rail System Type 3.

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.

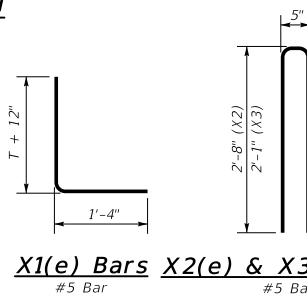
MAINTENANCE NOTES:



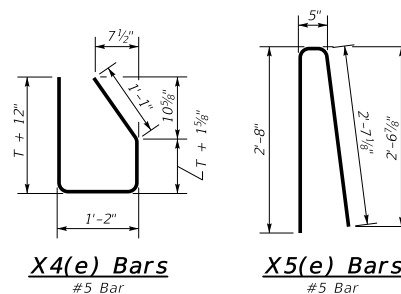
TYPICAL BARRIER SECTION



SECTION B-B



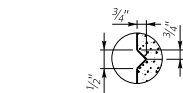
X1(e) Bars X2(e) & X3(e) Bars



X4(e) Bars

X5(e) Bars

- 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.
- Permissible construction joint. "V-Groove" rustication joint is required if construction joint is used. 1/4" Open Joints are not required.



"V-Groove" Rustication

KENTUCKY
 DEPARTMENT OF HIGHWAYS

RAIL SYSTEM TYPE 3

STANDARD DRAWING NO. BHS-008-03

SUBMITTED: *Bob Adams* 02-26-20
 DIRECTOR DIVISION OF STRUCTURAL DESIGN DATE
 APPROVED: *[Signature]* 02-26-20
 STATE ENGINEER DATE

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-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.

SHOP DRAWINGS: Are not required for this rail.

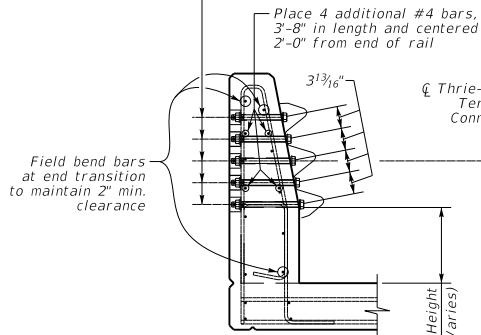
OPTIONAL WELDED WIRE REINFORCEMENT: At the contractor's option, deformed welded wire reinforcement (WWR) in accordance with ASTM A1064 and epoxy coated in accordance with ASTM A884 may be used in place of stirrup bars X1, X2, and X3 as well as the straight or longitudinal reinforcement attached to these 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'-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 1'-11" when necessary.

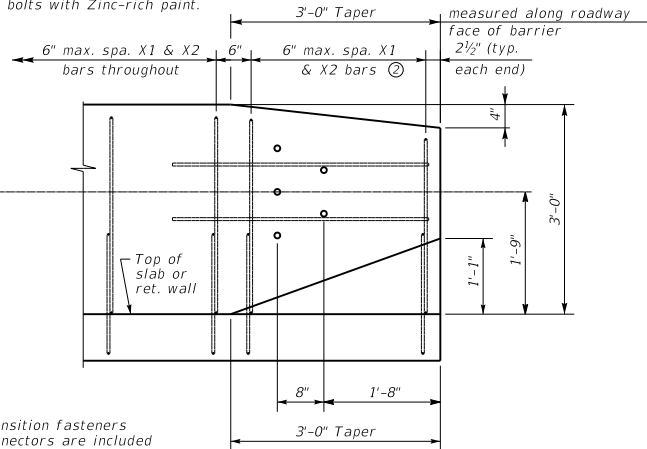
Average weight of rail is 412 lb/ft.

5 ~ 1" Dia holes and 2 1/2" Dia x 2" deep recesses. Form or core holes and recesses. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes and recesses. Bolt recesses are only required when pedestrian sidewalks are adjacent to back of rail. Tighten the 5 Terminal Connection Bolts in a well distributed pattern so to prevent damage or distortion of the Thrie-Beam Connector and the guardrail Transition. Cut bolts off after installation so as to extend no more than 3/4" beyond nut. Paint ends of cut-off bolts with Zinc-rich paint.

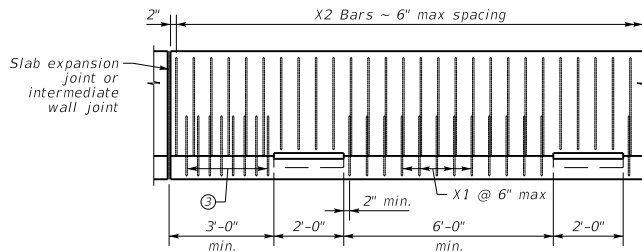


SECTION THROUGH TRANSITION

NOTE: All guardrail transition fasteners and terminal connectors are included in the lump sum price bid for the guardrail transition.



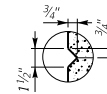
ELEVATION



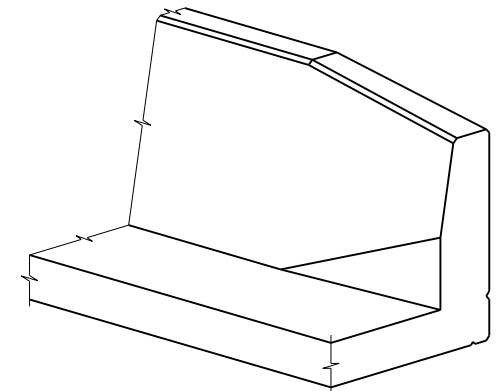
OPTIONAL SIDE SLOT DRAIN DETAIL

Note: Open joints are not required.

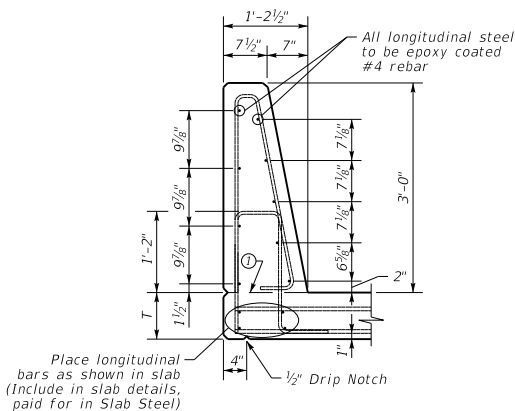
③ Space X1 @ 4" max. when end region of barrier is less than 6'-0" from joint to side slot. Space X1 @ 6" max. when end region is greater than 6'-0" from joint to edge of side slot.



"V-Groove" Rustication

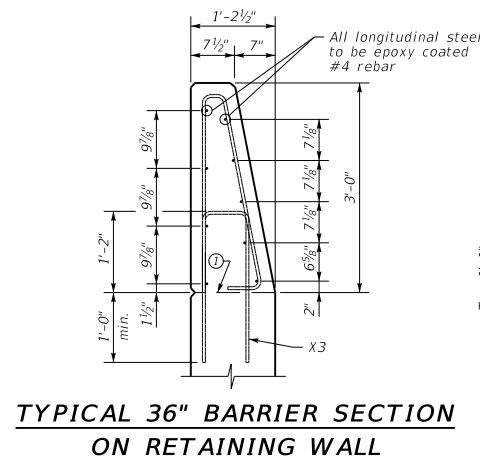


OBLIQUE VIEW

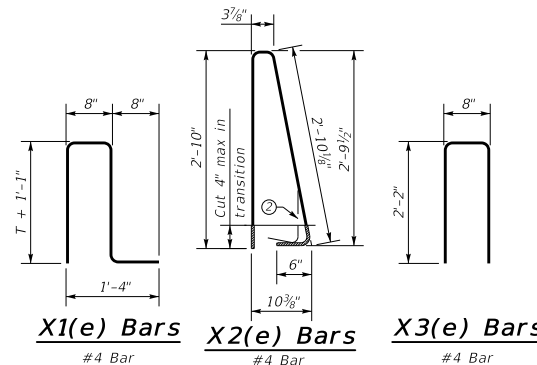


TYPICAL 36" BARRIER SECTION

① 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, 36 Inch Single Slope.



TYPICAL 36" BARRIER SECTION ON RETAINING WALL



X1(e) Bars
#4 Bar

X2(e) Bars
#4 Bar

X3(e) Bars
#4 Bar

② Bend and field cut X2 bar as necessary to maintain 2" min. clearance to sides of taper and 2" to top of barrier.

KENTUCKY
DEPARTMENT OF HIGHWAYS
RAILING SYSTEM
36 INCH
SINGLE SLOPE

STANDARD DRAWING NO. BHS-009
SUBMITTED: *B. J. Adams* 02-26-20
DIRECTOR DIVISION OF STRUCTURAL DESIGN DATE
APPROVED: *[Signature]* 02-26-20
STATE ENGINEER DATE

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-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.

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 A1064 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'-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, 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.

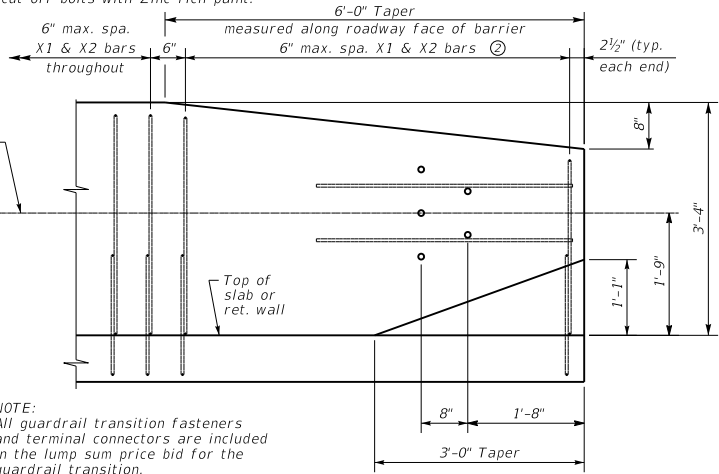
Average weight of rail is 474 lb/ft.

5 - 1" Dia holes and 2 1/2" Dia x 2" deep recesses. Form or core holes and recesses. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes and recesses. Bolt recesses are only required when pedestrian sidewalks are adjacent to back of rail. Tighten the 5 Terminal Connection Bolts in a well distributed pattern so to prevent damage or distortion of the Thrie-Beam Connection and the guardrail Transition. Cut bolts off after installation so as to extend no more than 3/4" beyond nut. Paint ends of cut-off bolts with Zinc-rich paint.

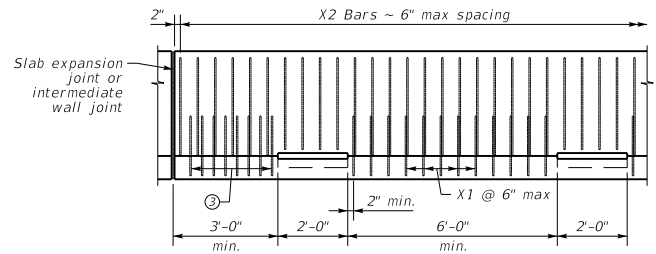
Place 4 additional #4 bars, 3'-8" in length and centered 2'-0" from end of rail

Field bend bars at end transition to maintain 2" min. clearance

SECTION THROUGH TRANSITION



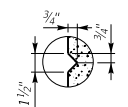
ELEVATION



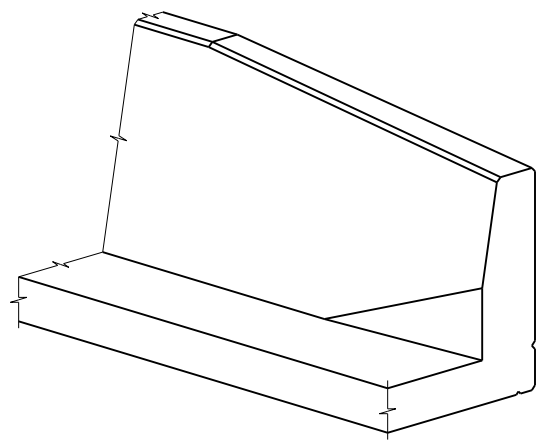
OPTIONAL SIDE SLOT DRAIN DETAIL

Note: Open joints are not required.

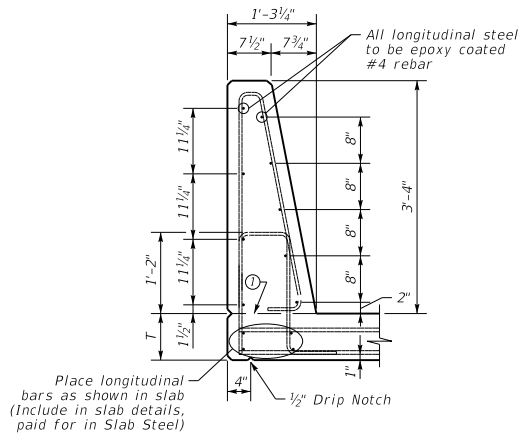
③ Space X1 @ 4" max. when end region of barrier is less than 6'-0" from joint to side slot. Space X1 @ 6" max. when end region is greater than 6'-0" from joint to edge of side slot.



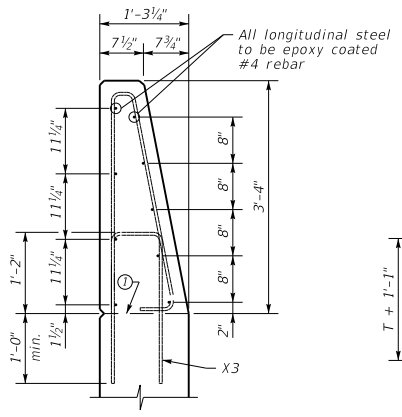
"V-Groove" Rustication



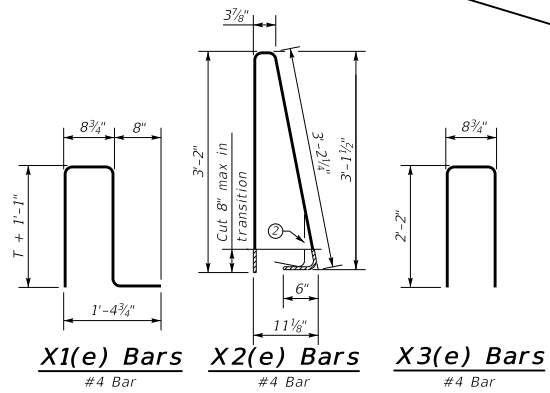
OBLIQUE VIEW



TYPICAL 40" BARRIER SECTION



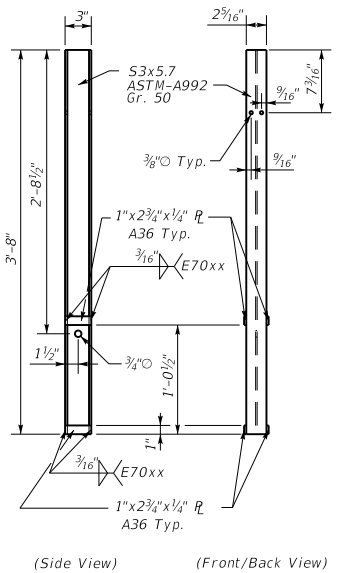
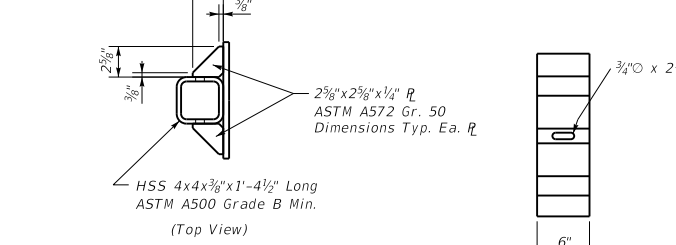
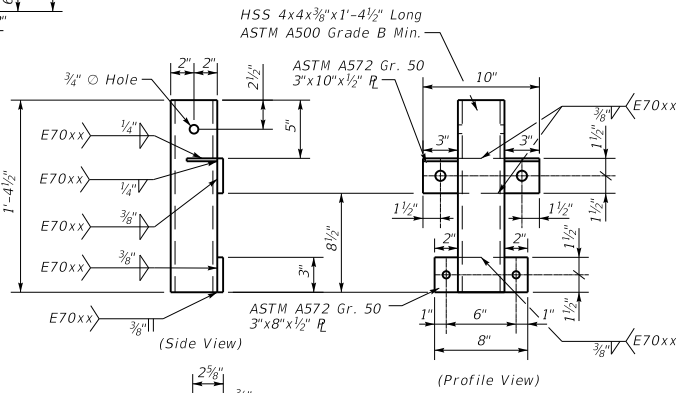
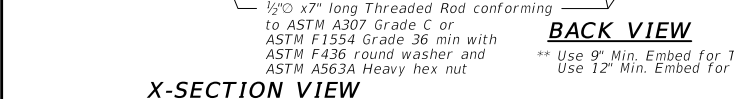
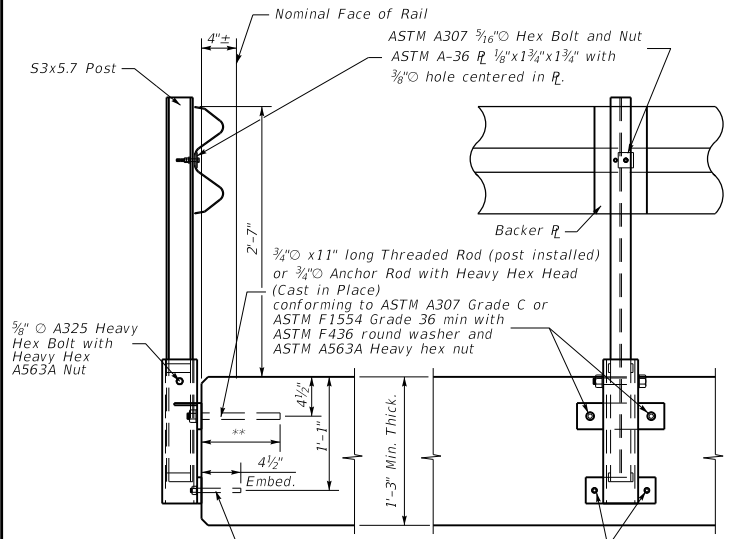
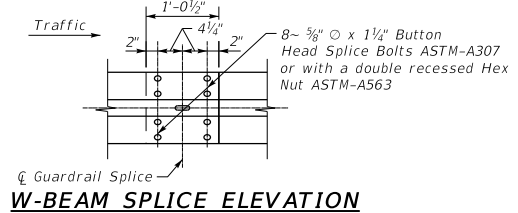
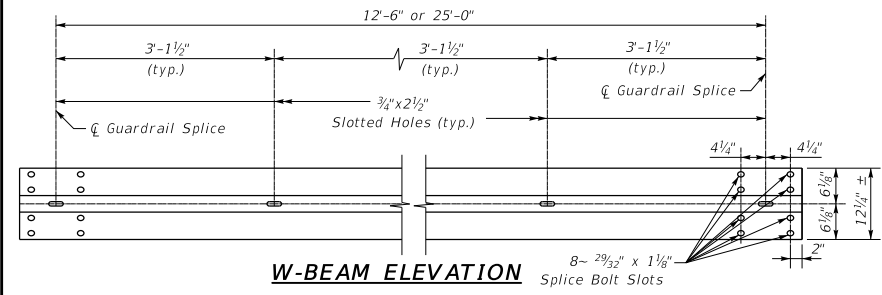
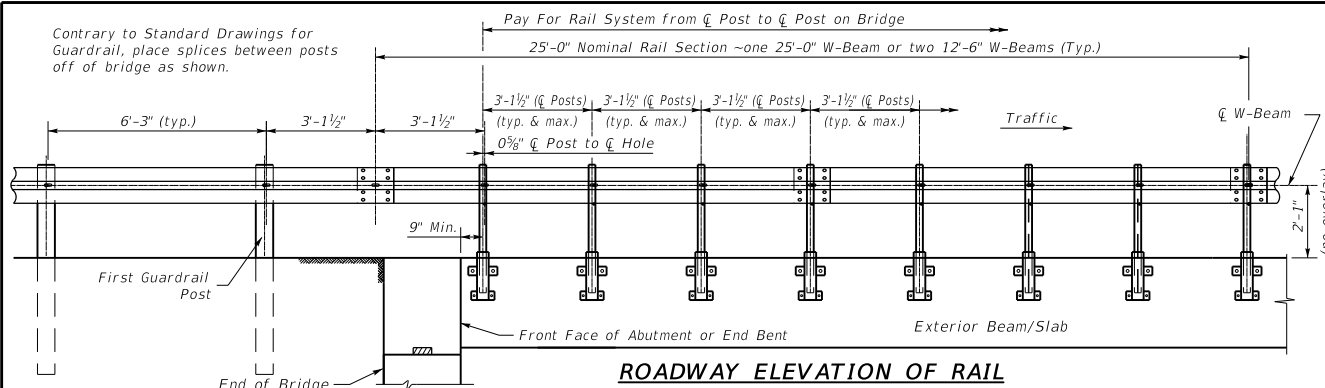
TYPICAL 40" BARRIER SECTION ON RETAINING WALL



① Mandatory roughened construction joint. Concrete above this joint is to be placed after slab has been properly cured and included in the bid or Rail System, 40 Inch Single Slope.

② Bend and field cut X2 bar as necessary to maintain 2" min. clearance to sides of taper and 2" to top of barrier.

KENTUCKY DEPARTMENT OF HIGHWAYS	
RAILING SYSTEM 40 INCH SINGLE SLOPE	
STANDARD DRAWING NO. BHS-010	
SUBMITTED	02-26-20
DIRECTOR DIVISION OF STRUCTURAL DESIGN	
APPROVED	02-26-20
STATE ENGINEER	



POST ELEVATION

KENTUCKY DEPARTMENT OF HIGHWAYS

RAILING SYSTEM

SIDE MOUNTED MGS

DETAILS

STANDARD DRAWING NO. BHS-011

SUBMITTED *Bob Adams* 02-26-20

DIRECTOR DIVISION OF STRUCTURAL DESIGN DATE

APPROVED *Bob Adams* 02-26-20

DATE

TRANSITION AND END TREATMENT NOTES:
This traffic railing must be anchored by a minimum of 25 feet of guardrail. This 25 feet at each corner of the bridge is to be paid with the roadway plans. See roadway plans for layout.

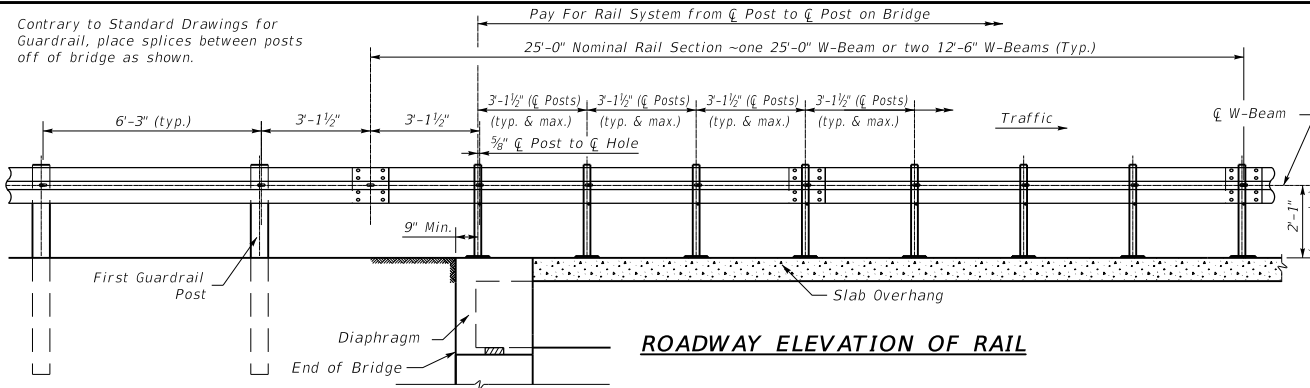
CONSTRUCTION NOTES:
Face of rail post must be plumb unless otherwise approved by the Engineer. Post must be perpendicular to adjacent roadway grade. Fully anchored guardrail must be attached to each end of rail. Typical guardrail construction as indicated above and not bridge rail transition or bridge end connector. It is recommended that the bridge plans show rail post locations. Round or chamfer exposed edges of rail posts and backer Plate to approximately 1/4" by grinding. Shop drawings are not required. Threaded rod may be cast in the beam/slab or may be drilled and epoxy grouted. Epoxy grout must conform to Section 826 and must have a minimum bond strength of 1,305 psi. Follow all manufacturers recommendations for installation.

MATERIAL NOTES:
All components must be supplied galvanized including fasteners, anchor rods, threaded rods, etc. Galvanize all steel components after fabrication in accordance with ASTM A123. W-beam must meet the requirements of Std. Dwg. RBR-001, c.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 1/2".

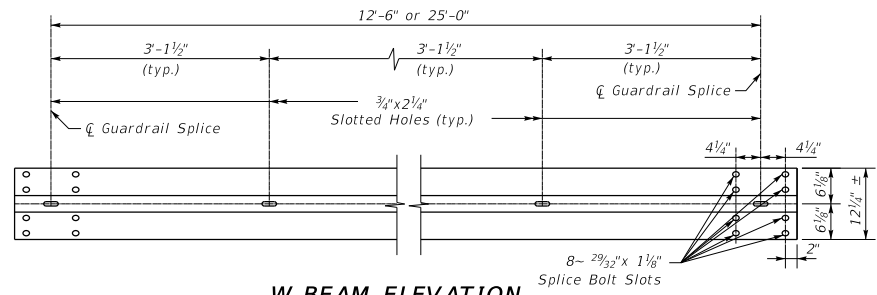
GENERAL NOTES:
This railing has been successfully evaluated by full scale crash test to meet MASH TL-3 criteria. This railing can be used for speeds 45 mph and greater. This rail is designed to deflect approximately 4'-0" - 4'-6" as it contains and redirects the errant vehicle. This rail may not be installed on top of or behind curbs that project above finished grade, on bridges with expansion joints providing more than 5" of movement, on retaining walls, or on grade separations and interchanges. Repairs to impact-damaged post and mounting bracket unit are not permitted. Replace all impact-damaged posts with a new post. If mounting bracket is visibly damaged, replace the bracket with a new one as well. Average weight of railing with no overlay: 19 plf total.

Note: Fabricator may elect to provide a 3/4" \bar{O} ASTM A563A heavy hex sleeve nut with a minimum length of 2 1/4" and minimum 1 1/4" across the flats along with threaded rod and the Anchor Rod. Maintain 12" minimum embedment with the 3/4" Anchor Rod behind the sleeve nut. The fabricator may elect to provide a 1/2" ferrule insert for the bottom anchors with a minimum length of 2 3/4" and a safe working load of 2000 lbs in tension and shear along with the threaded rod. Alternatively, the bottom anchors may also be supplied with a 1/2" \bar{O} ASTM A563A heavy hex sleeve nut with a minimum length of 1 1/2" and a minimum of 3/8" across the flats. Maintain 4 1/2" embedment behind the sleeve nut. All costs for sleeve nuts, threaded rods, anchor rods, etc. are incidental to the price bid for the Railing System Side Mounted MGS.

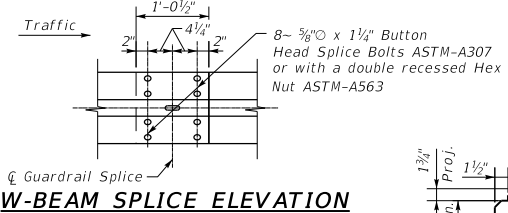
Contrary to Standard Drawings for Guardrail, place splices between posts off of bridge as shown.



ROADWAY ELEVATION OF RAIL

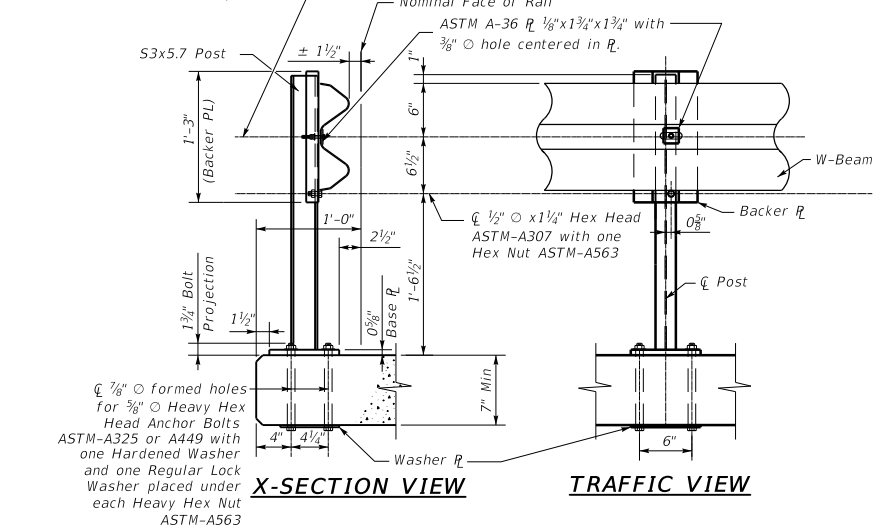


W-BEAM ELEVATION



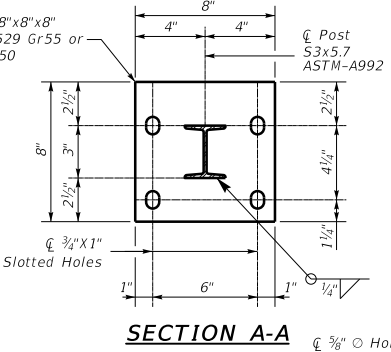
W-BEAM SPLICE ELEVATION

Use 5/16" x 2 1/2" Hex Head Bolt ASTM-A307 with one Regular Washer and one Regular Lock Washer placed under two Hex Nuts. (Tighten the first hex nut by hand until the top and bot. edges of the W-beam engage the backer plate snug against the post. Then tighten hex nut one revolution with wrench and secure with the 2nd hex nut.)

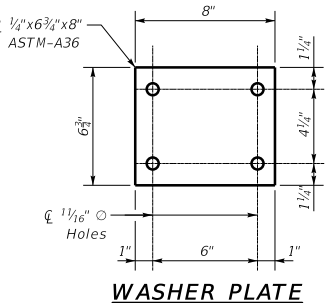


X-SECTION VIEW

TRAFFIC VIEW



SECTION A-A



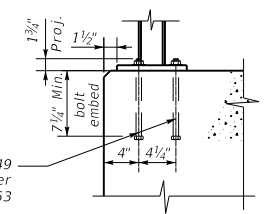
WASHER PLATE

TRANSITION AND END TREATMENT NOTES:
This traffic railing must be anchored by a minimum of 25 feet of guardrail. This 25 feet at each corner of the bridge is to be paid with the roadway plans. See roadway plans for layout.

CONSTRUCTION NOTES:
Face of rail post must be plumb unless otherwise approved by the Engineer. Post must be perpendicular to adjacent roadway grade. Use epoxy mortar with Type III binder conforming to Section 826 and ASTM C881 under post base plates if gaps larger than 1/8" exist. Fully anchored guardrail must be attached to each end of rail. Typical guardrail construction as indicated above and not bridge rail transition or bridge end connector. It is recommended that the bridge plans show rail post locations. Round or chamfer exposed edges of rail posts and backer plate to approximately 1/16" by grinding. Shop drawings are not required.

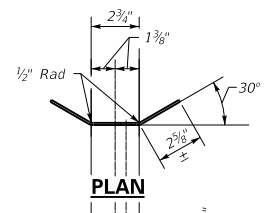
MATERIAL NOTES:
Galvanize all steel components. Anchor bolts for base plate must be 5/8" ASTM-A325 or A449 bolts with one hardened washer and one regular lock washer placed under each heavy hex nut. Nuts must conform to A563 requirements. W-beam must meet the requirements of Std. Dwg. RBR-001, c.e. except 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 1/2".

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

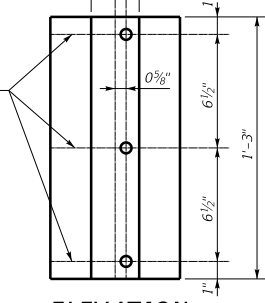


ALTERNATE ANCHORAGE

(For Concrete >11" Thick)

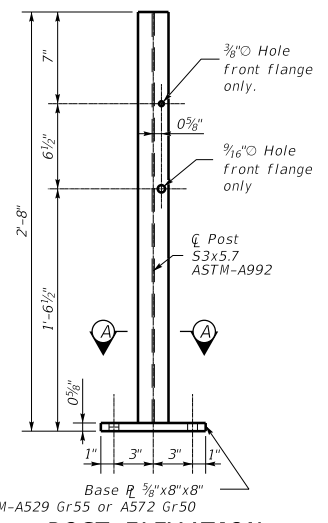


PLAN



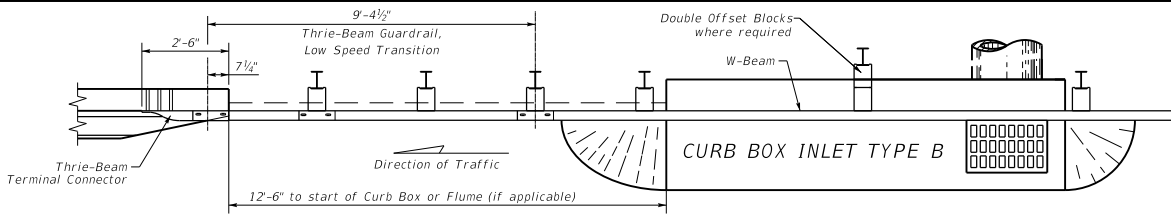
ELEVATION

(Bent Plate)
Backer R 1/8" x 8" x 1'-3"
ASTM-A1011 CS or SS Gr 33,
or A1008 CS or SS Gr 33
(11 Gage acceptable)

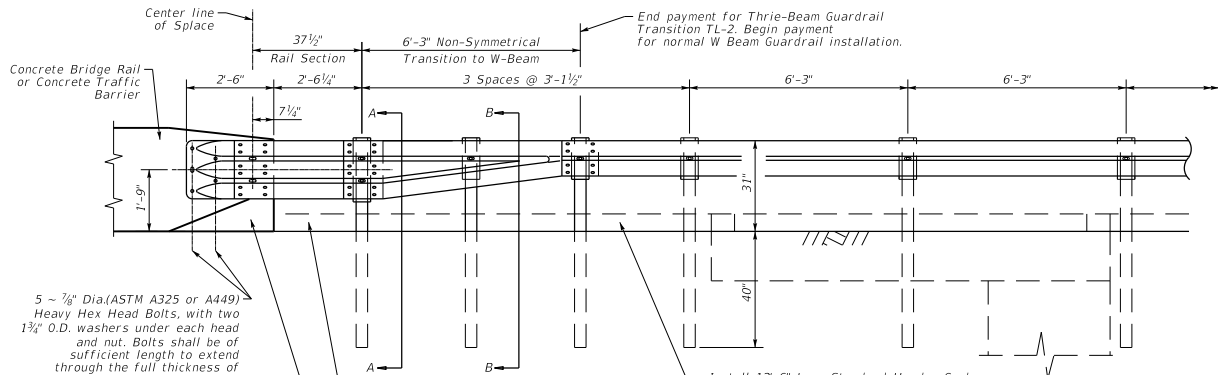


POST ELEVATION

KENTUCKY DEPARTMENT OF HIGHWAYS	
RAILING SYSTEM TYPE T631 DETAILS	
STANDARD DRAWING NO. BHS-012	
SUBMITTED	02-26-20 DATE
APPROVED	02-26-20 DATE



TYPICAL PLAN VIEW



TYPICAL ELEVATION VIEW

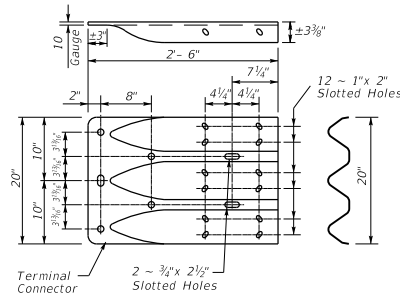
5 ~ 7/8" Dia. (ASTM A325 or A449) Heavy Hex Head Bolts, with two 1 1/4" O.D. washers under each head and nut. Bolts shall be of sufficient length to extend through the full thickness of the rail, washer, and nut. Install with bolt heads on traffic face.

Chamfer required on concrete rails that extend beyond the face of the guardrail transition.

Transition Curb to Barrier Shape within 4'-0" of end of Barrier.

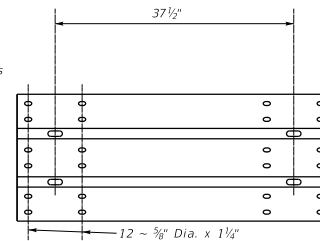
TERMINAL CONNECTION NOTE

To ensure a stable connection, (12) Rectangular Washers (See Std. Dwg. RBR-005, c.e.) are required under the recessed nuts at the Terminal Connection splice.

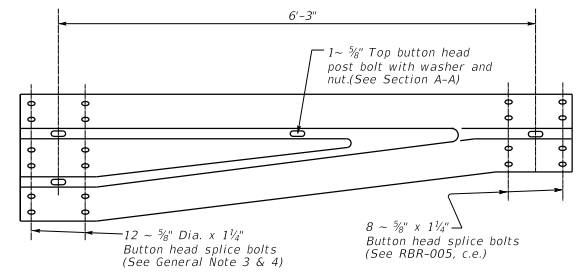


THRIE-BEAM TERMINAL CONNECTION

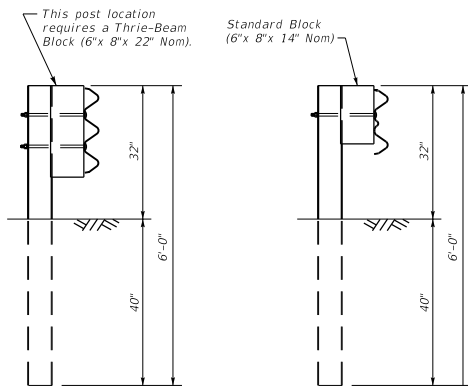
(See Terminal Connection Note)



THRIE-BEAM (3'-1 1/2") (10 GA.) ELEMENT SECTION

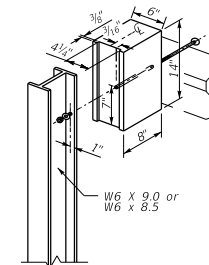


TRANSITION SECTION NON-SYMMETRICAL (10 GA.)



SECTION A-A

SECTION B-B



STEEL POST & BLOCK

(Showing Standard Block, see Thrie-Beam Guardrail Transition, TL-3 for Thrie-Beam Block & Post dimensions)

GENERAL NOTES

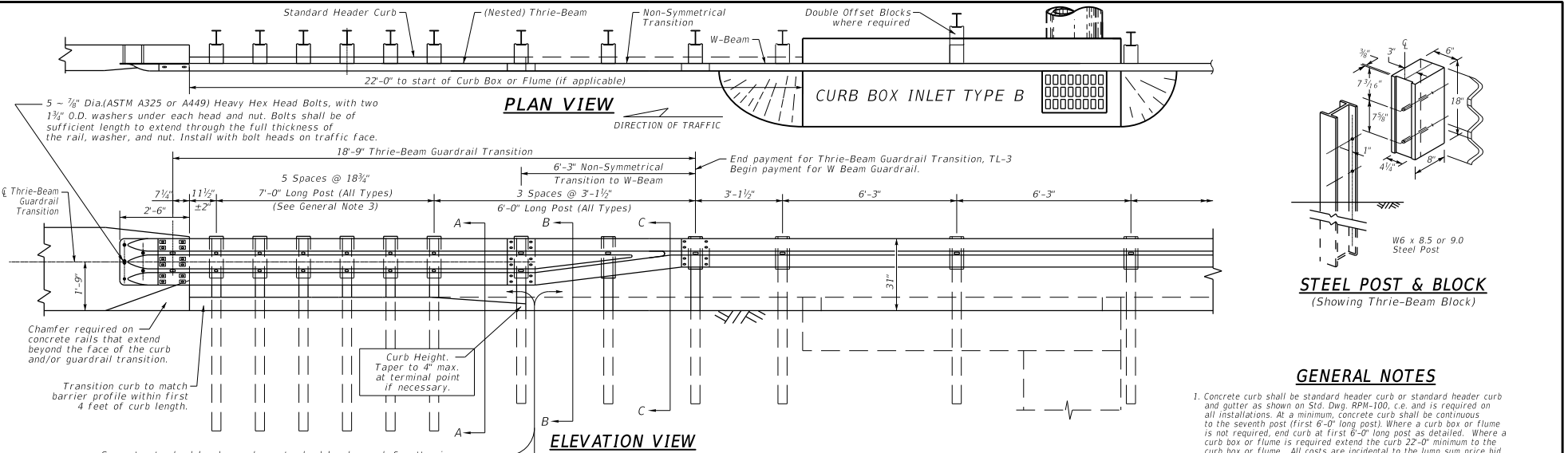
- Use steel posts unless otherwise indicated in the plans. The exact position of transitions shall be as shown in the plans or as directed by the Engineer.
- Rail element shall meet the requirements of AASHTO M180 except as modified in the plans.
- Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut and Type A 1 1/4" O.D. washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 3/8" x 1 1/4" with 3/8" double recessed nuts (ASTM A563).
- Bolts, nuts, and washers shall be galvanized in accordance with AASHTO M232. Hardware shall be incidental to Thrie-Beam Guardrail Transition TL-2.
- If solid rock is encountered. See the standard specifications for the proper installation guidance.
- Posts shall not be set in concrete, of any depth.
- 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.
- Install 12'-6" of Standard Header Curb or Standard Header Curb and Gutter if a Curb Box Inlet Type B or Flume is required at end of bridge. See Std. Dwg. RPM-100, c.e. for curb details. All costs to install the curb shall be incidental to the lump sum price bid for Thrie-Beam Guardrail Transition, TL-2. No curb is required if a flume or Curb box is not installed at the end of the bridge.
- Method of measurement and basis of payment.
 - 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, hardware and all other incidentals necessary to complete the installation. This transition must tie into W Beam Guardrail, which is not included in this transition bid item.
 - Plastic pipe and cost of forming holes shall be included in the cost for the bridge railing.

KENTUCKY
DEPARTMENT OF HIGHWAYS

THRIE-BEAM
GUARDRAIL TRANSITION
(TL-2)

STANDARD DRAWING NO. **BHS-013**

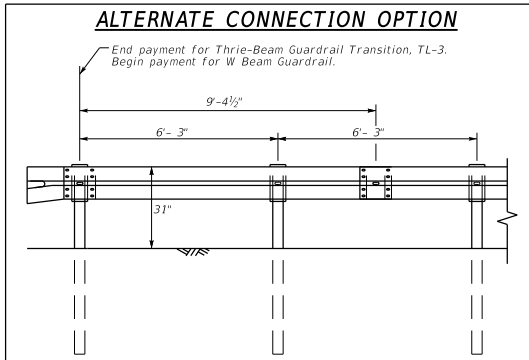
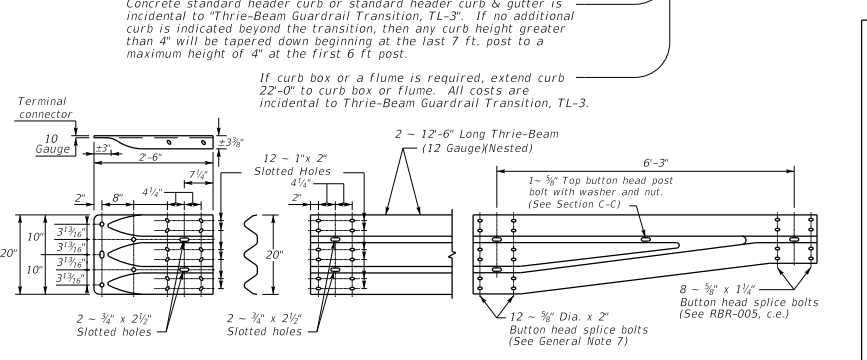
SUBMITTED *Boyd Adams* DIRECTOR DIVISION OF STRUCTURAL DESIGN DATE **02-26-20**
APPROVED *[Signature]* DATE **02-26-20**



STEEL POST & BLOCK
(Showing Thrie-Beam Block)

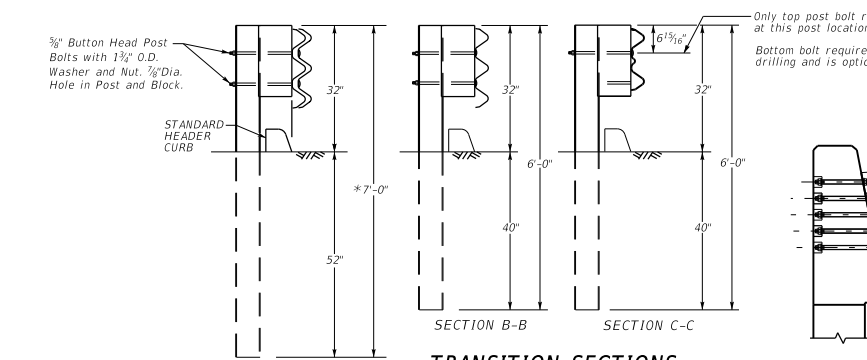
GENERAL NOTES

- Concrete curb shall be standard header curb or standard header curb and gutter as shown on Std. Dwg. RPM-100, c.e. and is required on all installations. At a minimum, concrete curb shall be continuous to the seventh post (first 6'-0" long post). Where a curb box or flume is not required, end curb at first 6'-0" long post as detailed. Where a curb box or flume is required extend the curb 22'-0" minimum to the curb box or flume. All costs are incidental to the lump sum price bid for Thrie-Beam Guardrail Transition, TL-3.
- Use steel posts as shown unless indicated otherwise in the plans.
- The post length shall be marked on all 7'-0" long posts by the Manufacturer. The mark shall be located within the top 1 ft. region of the post, at least 3/8" in height, and visible after installation. Steel posts shall be marked with a stencil before galvanizing.
- Rail element shall meet the requirements of AASHTO M180 except as modified on the plans. The thrie-beam terminal connector and the thrie-beam transition to w-beam shall be of the same material, but shall not be less than 10 gauge.
- Contractor shall verify that the locations of bolt holes match those in the thrie-beam terminal connector prior to ordering materials.
- Unless otherwise shown in the plans, transitions shall be placed with the block face in front of or directly above the curb face.
- Galvanized washers used with the 3/8" dia. post bolts shall be 1 1/2" O.D. washers. The (12) rectangular plate washers are required at the terminal connector splice.
- Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) 3/8" dia. x 2" (at triple rail splices) with 3/8" double recessed nuts.
- Bolts, nuts, and washers shall be galvanized in accordance with AASHTO M232. Hardware shall be incidental to the bid item.
- If solid rock is encountered, see the standard specifications for the proper installation guidance.
- Posts shall not be set in concrete.
- This railing has been successfully evaluated by full scale crash test to meet MASH TL-3 criteria. This railing transition is to be used when speeds are over 45 mph.
- Method of measurement and basis of payment.
 - Thrie-Beam Guardrail Transition, TL-3 shall be paid at the contract unit price. Each and includes the Thrie-beam terminal connector, nested Thrie-Beam elements, non symmetrical transition, posts, concrete standard header curb or standard header curb and gutter, hardware and all other incidentals necessary to complete the installation. This transition must tie into W-Beam Guardrail, which is not included in this transition bid item.
 - Plastic pipe and cost of forming holes shall be included in the cost for the bridge railing.



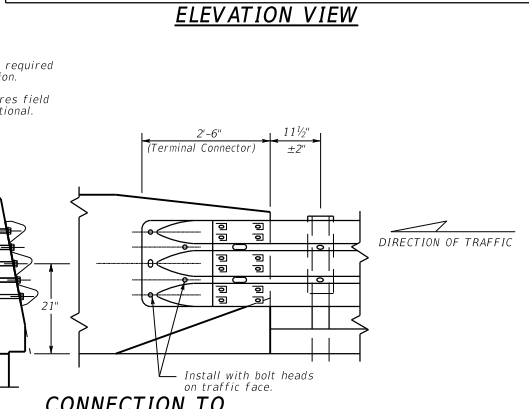
THRIE-BEAM TERMINAL CONNECTION
(See General Notes 6 & 7 for required hardware)

NON-SYMMETRICAL TRANSITION TO W-BEAM (10 Gauge)



SECTION A-A
* Note: (All post types)
(See General Note 3)

TRANSITION SECTIONS



CONNECTION TO CONCRETE BRIDGE RAIL AND TRAFFIC BARRIERS

(12) Galvanized rectangular washers (See Std. Dwg. RBR-005, c.e.) are required under the recessed nut at the terminal connector splice to nested thrie-beam. (See General Notes 6 & 7).

KENTUCKY DEPARTMENT OF HIGHWAYS	
THRIE-BEAM GUARDRAIL TRANSITION (TL-3)	
STANDARD DRAWING NO. BHS-014	
SUBMITTED	02-26-20
DIRECTOR DIVISION OF STRUCTURAL DESIGN	
APPROVED	02-26-20
STATE ENGINEER	

General Notes

PIPE RAILING & POSTS: Structural Tube, Pipe and Bar shall be in accordance with ASTM B221 or ASTM B429, 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 B209, 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.

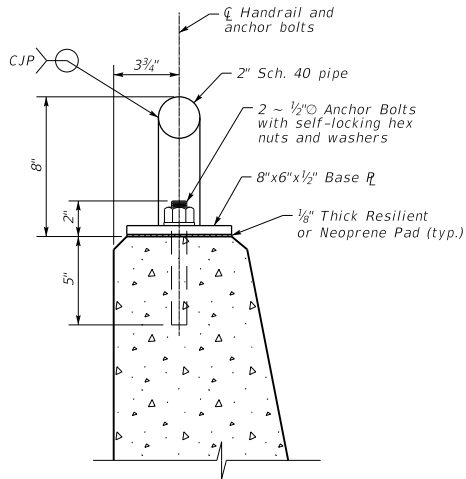
RESILIENT AND NEOPRENE PADS: Resilient and Neoprene pads shall be in accordance with Specification Section 932, except that testing of the finished pads shall not be required. Neoprene pads shall be durometer hardness 60 or 70.

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.

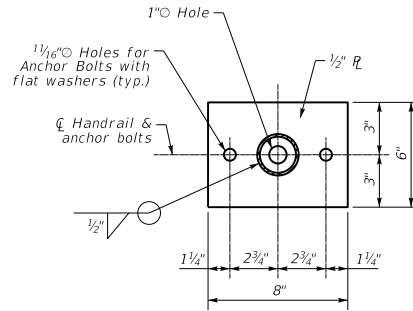
WELDING: All welding shall be in accordance with the American Welding Society Structural Welding Code (Aluminum) ANSI/AWS D1.2 (current edition). Filler metal shall be either ER5183, ER5356 or ER5556. Nondestructive testing of welds is not required.

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.

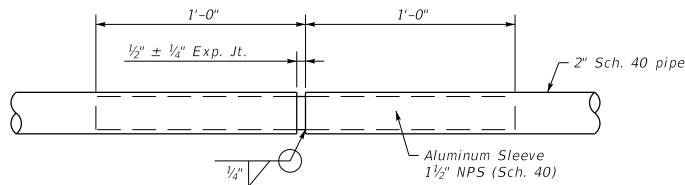
PAYMENT: Aluminum handrail shall be paid for under the contract unit price for Aluminum Handrail, LF. Payment for the handrail will be plan quantity measured as the length along the center line of the top rail, and includes rails, posts, rail splice assembly, base plates, anchor bolts, nuts, washers,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



TYPICAL SECTION



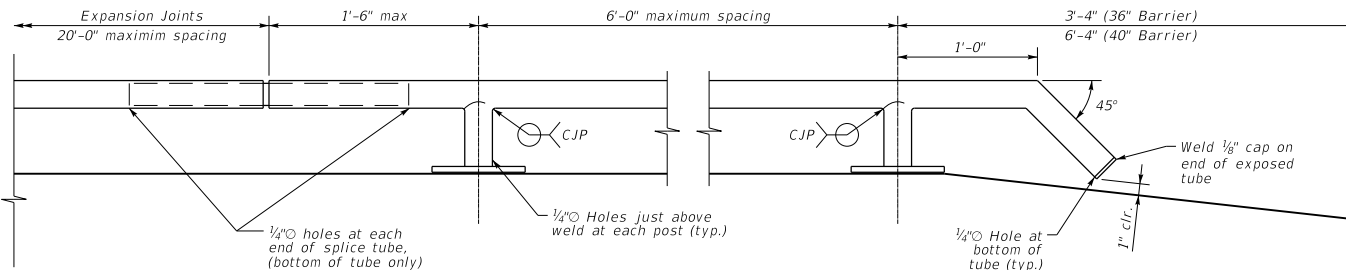
BASE PLATE DETAIL



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.

RAILING MEMBER DIMENSIONS TABLE			
MEMBER	DESIGNATION	OUTSIDE DIMENSION	WALL THICKNESS
Posts and Rails	2" NPS (Sch. 40)	2.375"	0.154"
Rail Joint/Splice Sleeves	1 1/2" NPS (Sch. 40)	1.900"	0.145"



ELEVATION

KENTUCKY DEPARTMENT OF HIGHWAYS	
ALUMINUM HANDRAIL	
STANDARD DRAWING NO. BHS-015	
SUBMITTED	02-26-20 DATE
DIRECTOR DIVISION OF STRUCTURAL DESIGN	
APPROVED	02-26-20 DATE
STATE PROFESSIONAL ENGINEER	

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 A501 for structural tube. 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 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 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.

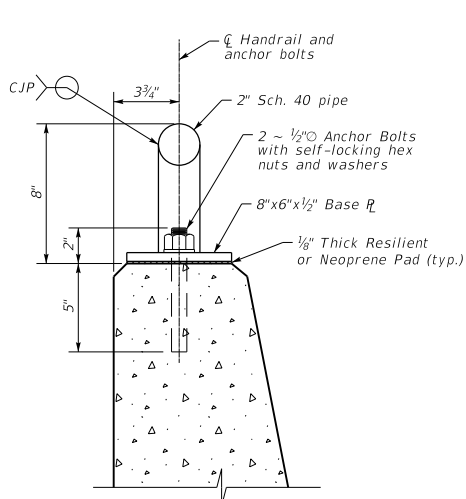
RESILIENT AND NEOPRENE PADS: Resilient and Neoprene pads shall be in accordance with Specification Section 932, except that testing of the finished pads shall not be required. Neoprene pads shall be durometer hardness 60 or 70.

JOINTS: All fixed joints are to be welded all around and 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 across a minimum of two posts.

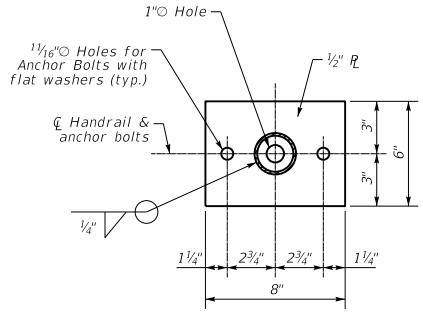
WELDING: All welding shall be in accordance with the American Welding Society Structural Welding Code (Steel) ANSI/AWS D1.1 (current edition). Weld metal shall be E60XX or E70XX. Nondestructive testing of welds is not required.

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.

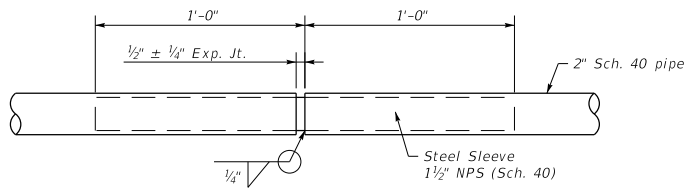
PAYMENT: Steel handrail shall be paid for under the contract unit price for Steel Handrail, LF. Payment for the handrail will be plan quantity measured as the length along the center line of the top rail, and includes rails, posts, rail splice assembly, base plates, anchor bolts, nuts, washers, resilient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



TYPICAL SECTION



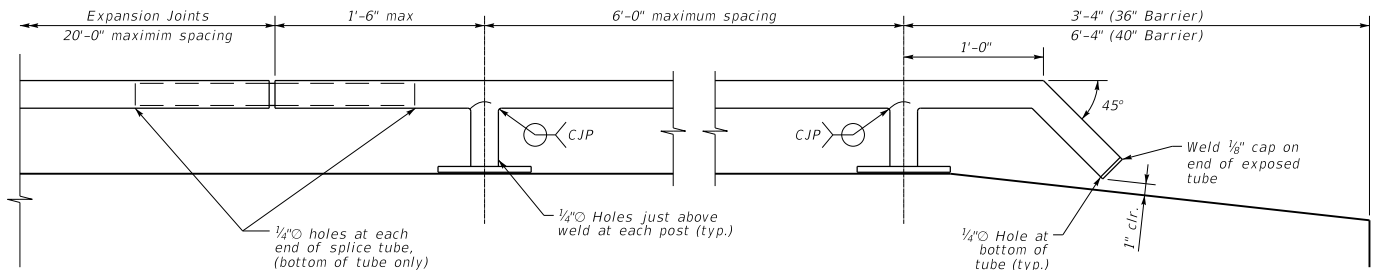
BASE PLATE DETAIL



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.

RAILING MEMBER DIMENSIONS TABLE			
MEMBER	DESIGNATION	OUTSIDE DIMENSION	WALL THICKNESS
Posts and Rails	2" NPS (Sch. 40)	2.375"	0.154"
Rail Joint/Splice Sleeves	1 1/2" NPS (Sch. 40)	1.900"	0.145"



ELEVATION

**KENTUCKY
DEPARTMENT OF HIGHWAYS**

**STEEL
HANDRAIL**

STANDARD DRAWING NO. **BHS-016**

SUBMITTED: *[Signature]* **02-26-20**
DIRECTOR DIVISION OF STRUCTURAL DESIGN DATE

APPROVED: *[Signature]* **02-26-20**
STATE PROFESSIONAL ENGINEER DATE