

**Figure 5-397.157(E)
Structural Tube Railing (Design T-1) and Concrete Parapet (Type P-2, TL-4)
Parapet Abutment with Guardrail Connection (Without Concrete Wearing Course)**

Approved, and signed, April 9, 2020.

Approved 04-09-2020

NEW STANDARD

This standard plan was adapted from previous standard plan 5-397.157 and has been expanded to 2 sheets and is specifically for use on parapet abutment bridges without a concrete wearing course.

SHEET 1 of 2

General:

- Changed the crash testing note from “Rail meets test level 4 requirements of NCHRP report 350” to “Parapet/Railing combination meets TL-4 requirements of NCHRP report 350 on bridge deck and TL-3 on approach panel.”

Under GENERAL NOTES:

- Moved the General Notes to sheet 2 of 2. Added “NOTE:” to the bottom right corner and included a few notes that only apply to sheet 1 of 2.

Added PLAN VIEW:

- Added a plan view in upper left corner showing details, geometry and reinforcement for the new tapered concrete block added to the top of the parapet adjacent to the end post.

Added ISOMETRIC VIEW:

- Added an isometric view in the upper right corner showing details for the new tapered concrete block, the end post guardrail connection geometry & chamfers and the concrete curb and brush curb transition geometry.

At INSIDE ELEVATION OF PARAPET/RAILING:

- Updated the reinforcement, guardrail connection plate, and end post geometry (including a tapered concrete block) and tapered brush curb for use with a Type 31.
- Added a designer note stating the minimum parapet length on an approach panel is 13’-4”.
- Reduced the maximum post spacing from 10’-0” to 8’-0” and added requirements for 20’-0” maximum railing length, 2 posts minimum and 3 posts maximum.
- Added “See Detail A” and “See Detail B”.
- Added circled note C regarding maximum railing cantilever lengths and circled note A referring to sheet 2 of 2 for additional details.
- Added other numerous updates to the reinforcement.
- Added curb off the end of the parapet (dashed line) and added note “Approach curb required (see approach panel plans).”

Added DETAIL A:

- Added this elevation view showing the geometry and reinforcement of the new tapered concrete block added to the top of the parapet adjacent to the end post.

At SECTION A-A:

- Updated old Section B-B to show the correct brush curb geometry and shape of bar R501E.
- Removed the concrete overlay.
- Added bar R514E.

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Added END VIEW B-B:

- Replaced old Section A-A with this detail showing updated reinforcement, end post geometry, and guardrail connection plate for use with a Type 31 guardrail.

Added SECTION E-E:

- Added this section showing the geometry and reinforcement of the new tapered concrete block added to the top of the parapet adjacent to the end post.

Added Designer Notes:

- Added 2 designer notes; one regarding changes needed for superelevated bridges, and one regarding minimum parapet length on approach panels, placement of dowels and reference to Memo to Designers #2020-1.

SHEET 2 of 2

General:

- Most of the structural steel details and guardrail connection details were moved to this new sheet, along with the general notes and bill of reinforcement.

Under GENERAL NOTES:

- Updated the concrete mix and weight per linear foot.
- Added “Refer to superstructure sheet for specific spacing information.” to the control joint note.
- Added note “Install rail posts normal to grade.”
- Throughout the notes changed “per spec.” to “in accordance with spec.”
- Changed note from “See special provisions for paint requirements.” to “See special provisions for coating to be applied to metal railing.”
- Eliminated old circle note ① regarding coping height.
- Changed old circled note ② to circled note ①.
- Changed old circled note ③ to circled note ②.
- Changed old circled note ④ to circled note ③.
- Eliminated old circled note ② regarding rail sleeve dimensions.
- Updated and replaced old circled note ⑤ with new circled note ④.
- Added new circled note ⑤ “Remove concrete from pipe ends after form removal.”
- Added new circled note ⑥ referenced in the “Structural Tube Rail Detail” that states “Center holes 1¼” from the top of tube.”

At RAIL END DETAIL:

- Removed weld size since minimum size governs.

At RAIL SLEEVE DETAIL:

- Replaced circled notes ② and ③ with circled notes ① and ② respectively.
- Changed the weld type.

At STRUCTURAL TUBE RAIL DETAIL:

- Changed several of the weld types and weld sizes.
- Added circled note ⑥ regarding location of the vent hole in the horizontal tube.
- Changed the vent hole size in the base plate from a 2” dia. round hole to a 6” x 4” rectangular hole.
- Changed the weld type.

At ANCHOR DETAIL:

- Added note “Ensure hex nut is in contact with the adjacent surface and torque to 80 ft-lbs.”
- Increased anchor rod length from 10” to 12” by changing anchor rod note from “7/8” x 10” anchor rods, MnDOT Spec. 3385 Type C, with two hex nuts and washers.” to “7/8” x 12” anchor rods, MnDOT Spec. 3385 Type C, with two hex nuts and washers.”

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- Changed several of the weld types and weld sizes.
- Replaced circled note ④ with circled note ③.

At BASE PLATE:

- Changed the size of the post to base plate weld from 3/8" to 5/16".
- Changed the vent hole size in the base plate from a 2" dia. round hole to a 6" x 4" rectangular hole.

Added DETAIL B AND SECTION H-H:

- Added this section and detail to show bars R513E and R514E that were added to strengthen the post anchorage to parapet connection.

Added SECTION F-F:

- Added a plan view showing the geometry & chamfers and the brush curb transition geometry at the end of the parapet.

At SECTION G-G:

- Added the hole size to the bar alternate and chamfered the outside corners on the plate alternate.

At GUARDRAIL CONNECTION DETAIL:

- Updated the plate dimensions, pipe holes and locations for use with a Type 31 guardrail connection.

At CONTROL JOINT DETAIL:

- Changed circled note ⑤ to circled note ④.
- Changed notes from "Typ. three sides" to "Typ. Top & sides".

Reinforcement Bend Details:

- Updated all of the reinforcement details and bends to match the updated design.

Bill of Reinforcement:

- Updated all of the reinforcement details and bends to match the updated design.

The remainder of this revision log includes the history of changes to figure 5-397.157 which was used as the basis to develop the 5-397.157(A) standard plan.

Figure 5-397.157

**Structural Tube Railing (Design T-1) And Concrete Parapet (Type P-2, T1-4)
(With Integral End Post)**

Archived on April 9, 2020.

Approved, and signed, March 30, 2010. Last date revised: April 17, 2013

Revised 04-17-2013

This standard was updated to convert reinforcing bar marks from metric to U.S. customary bar designations.

Re-Approved 03-30-2010

Under GENERAL NOTES:

- Changed 4th note (now 3rd note) *from*: Finish all edges of rail with 1/2" "VEE"..... *to*: Finish all edges of rail with 1/2" "CHAMFER".....
- Changed 5th note (now 4th note) *from*: Max. spacing of concrete DEFLECTION joints shall be 20 ft. *to*: Max. spacing of concrete CONTROL joints shall be 10 ft.
- Changed 7th note (now 5th note) : Added "SEE SPECIAL PROVISIONS." to the end of the note.

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- Changed 8th note (now 6th note) *from*: Structural steel per MnDOT spec. 3310..... *to*: Structural steel “AND PLATE WASHERS” per Mn/DOT spec. 3310.....
- Changed 12th note (now 10th note) : Replaced the words “RAILING CONCRETE” with “BARRIER CONCRETE” within the sentence.
- Changed numbered notes ② & ③: Replaced the words “DEFLECTION JOINTS” with “RAILING JOINTS” within the sentences.
- Added numbered note ⑤: See special provisions for joint sealing requirements.
- Removed note: “See superstructure sheet for joint spacing”.
- ALL OF THE GENERAL NOTES: Have been updated and rearranged to reflect the “Active Voice”.

At the “CONTROL JOINT” (previously called Deflection Joint)

- Changed the “DEFLECTION JOINT” to a “CONTROL JOINT” and removed the R1601E & R1602E reinforcement on each side of the control joint.
- Changed the note *from*: ⌄ “Deflection” Joint. *to*: ⌄ “Control Joint 10’-0” max. spacing.”
- Changed the note *from*: See “Deflection” Joint Details. *to*: See “Control” Joint Details.
- Added section D-D.

Throughout the sheet: Changed the structural steel tube designation *from*: “TS” *to*: “HSS”.

At the Base Plate detail:

- Changed the Base Plate dimensions *from*: 1’-2 ½” x 9 ½” *to*: 1’-4” x 9 ½”, keeping the post centered in the 1’-4” direction and no change in the 9 ½” direction.
- Changed the Base Plate holes *from*: 1 3/16” dia. *to*: 1 3/16” x 2” slotted holes with 2 ¼” dimension from the edge of the plate to the center of the slotted holes. (Slotted direction of the holes along length of railing).

At the Anchor detail:

- Changed the note *from*: “2” Thread Proj. (Typ.)” *to*: “2” Min. 2 ¼” Max. Thread Proj. (Typ.)”
- Added note: 3” Dia. x ¼” (15/16”ID) Circular Plate Washer Per Mn/DOT spec.3310.

At Section G-G:

- Rotated the section on the sheet for directional correctness to match the other details on the sheet and added “Anchor Bar Alternate” under the title.
- Added an additional Section G-G Detail to the sheet showing an optional “Anchor Plate Alternate”.

Replaced and relocated the “Deflection Joint Details” with “Control Joint Details” showing the vee joint details.

In the Bill of Reinforcement For Parapet:

- Changed the bar length *from*: 5’11” *to*: 6’-1” at the R1602E location correcting the total length.

Revised 10-22-2009

Under GENERAL NOTES:

- Added note: “THE METAL RAILING SHALL BE CONTINUOUSLY GROUNDED, SEE THE SPECIAL PROVISIONS. REFER TO THE ELECTRICAL PLANS AND ELECTRICAL SPECIAL PROVISIONS FOR DETAILS REGARDING BONDING MULTIPLE ELECTRICAL GROUNDING SYSTEMS.”

Re-Approved 10-09-2009

Under GENERAL NOTES:

- changed 8th note *from*: “STRUCTURAL STEEL PER Mn/DOT SPEC. 3309. STRUCTURAL TUBES ARE A.S.T.M. A500, GRADE B PER Mn/DOT SPEC. 3362” *to*: “STRUCTURAL STEEL PER Mn/DOT SPEC. 3310. STRUCTURAL TUBES ARE A.S.T.M. A500, GRADE B PER Mn/DOT SPEC. 3361”.

- Deleted numbered note ④ and added new note ④ reading: “SUBSTITUTION OF CHEMICAL ANCHOR RODS FOR CAST-IN-PLACE ANCHORAGE IS NOT PERMITTED”.

At Section B-B:

- Changed the dimension from the top of the concrete parapet to the top longitudinal reinforcement from 5” to 4”.

At Sections C-C and D-D:

- Enlarged the details for clarity.

Added Section G-G:

- Adding section G-G showing the ¼” x 1½” x 1’-2” anchorage bar assembly.

At “Anchor Detail”:

- Removed reference to chemical anchorages. Added the ¼” x 1½” x 1’-2” bar assembly to the detail with note 7/8” x 10” ANCHOR RODS, Mn/DOT SPEC. 3385 TYPE C, WITH TWO HEX NUTS AND WASHERS”. Added section arrows for section G-G.

At “Base Plate” Detail:

- Changed the size of the weld from 5/16 to 3/8 at the weld symbol.

Revised 06-14-2006

Changed standard title: STRUCTURAL TUBE RAILING (DESIGN T-1) AND CONCRETE PARAPET (TYPE P-2) (WITH INTEGRAL END POST) *to* STRUCTURAL TUBE RAILING (DESIGN T-1) AND CONCRETE PARAPET (TYPE P-2, TL-4) (WITH INTEGRAL END POST)

At INSIDE ELEVATION VIEW: changed drawing to show DEFLECTION JOINT is spaced 1'-0" (MIN.) from centerline of rail post.

At ANCHOR DETAILS: added anchor rod dimensions.

Under GENERAL NOTES:

- changed LENGTH OF "TYPE P-2 RAILING CONCRETE (3Y46 OR 3Y46A)" FOR PAYMENT SHALL BE MEASURED BETWEEN THE OUTSIDE FACES OF THE CONCRETE PARAPET. *to* LENGTH OF "TYPE P-2 (TL-4) RAILING CONCRETE (3Y46 OR 3Y46A)" FOR PAYMENT SHALL BE MEASURED BETWEEN THE OUTSIDE FACES OF THE CONCRETE PARAPET.
- changed LENGTH OF "STRUCTURAL TUBE RAILING, DESIGN T-1" FOR ... *to* LENGTH OF "STRUCTURE TUBE RAILING DESIGN T-1" FOR ...
- changed GUARDRAIL CONNECTION TO BE INCLUDED IN THE PRICE BID FOR OTHER ITEMS. *to* GUARDRAIL CONNECTION AND NAME PLATE TO BE CONSIDERED INCIDENTAL TO "TYPE P-2 (TL-4) RAILING CONCRETE (3Y46 OR 3Y46A)".
- changed PRICE BID FOR "STRUCTURAL TUBE RAILING, DESIGN T-1" INCLUDES ... *to* PRICE BID FOR "STRUCTURE TUBE RAILING DESIGN T-1" INCLUDES ...
- changed ALL MATERIAL IN THE CONCRETE PARAPET IS INCLUDED IN ... *to* ALL MATERIAL IN THE CONCRETE PARAPET IS LISTED IN ...

Revised 07-02-2004

At STRUCTURAL TUBE RAIL DETAIL

- Changed two weld symbols.

At RAIL SLEEVE DETAIL

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- Changed TS 9" x 3" x $\frac{1}{4}$ " (PLATE WITH $\frac{3}{16}$ " PLATE FOR $9\frac{3}{8}$ " x $3\frac{3}{8}$ " FINISHED SIZE). to TS 9" x 3" x $\frac{1}{4}$ ", PLATED TO $9\frac{3}{8}$ " x $3\frac{3}{8}$ " FINISHED SIZE – OR - FORMED TUBE $9\frac{3}{8}$ " x $3\frac{3}{8}$ " x $\frac{1}{4}$ "

At RAIL END DETAIL

- Changed weld symbol
- Changed $\frac{1}{4}$ " PLATE, BEVEL OUTSIDE EDGE to $\frac{1}{4}$ " PLATE
- Changed 2" to $\frac{3}{4}$ "
- Changed CL $\frac{1}{2}$ " DIA. WEEP HOLE AT UNDERSIDE CENTER (TYP.) to CL $\frac{1}{2}$ " DIA. WEEP HOLE ON UNDERSIDE AT $\frac{3}{4}$ " FROM BACK FACE OF TYBE (TYP.)

Approved, and signed, December 18, 2003