



**STATE OF TENNESSEE**  
**DEPARTMENT OF TRANSPORTATION**  
**ROADWAY DESIGN DIVISION**  
SUITE 1300 JAMES K. POLK BUILDING  
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(615) 741-2221

**JOHN C. SCHROER**  
COMMISSIONER

**BILL HASLAM**  
GOVERNOR

**INSTRUCTIONAL BULLETIN NO. 17-14**

**Regarding Revised, New, and Voided Standard Drawings**

**Effective March 23, 2018 letting (January 10, 2018 Turn-in)**, the following Standard Drawings have been revised or created. Also, Chapter 5 of the Roadway Design Guidelines has been revised to incorporate these changes.

**Revised Standard Drawings:**

<b>DRAWING NUMBER</b>	<b>CURRENT REVISION DATE</b>	<b>DESCRIPTION</b>
<sup>1</sup> D-PE-24A	07-05-17	24" CONCRETE ENDWALL CROSS DRAIN
<sup>2</sup> RP-S-7	07-05-17	DETAILS FOR CONCRETE SIDEWALKS
<sup>1</sup> S-BPR-1	07-05-17	BIKE/PEDESTRIAN SAFETY RAIL
<sup>1</sup> S-GRA-3	07-05-17	TYPE 13 GUARDRAIL ANCHOR
<sup>2</sup> S-GRA-4	07-05-17	IN-LINE GUARDRAIL ANCHOR
<sup>1,3,4</sup> S-GRS-2	07-05-17	SPECIAL CASE: GUARDRAIL ATTACHMENT TO CONCRETE DECKS
<sup>4</sup> S-GRT-2P	07-05-17	EARTH PAD FOR TYPE 38 AND TYPE 21 TERMINALS
<sup>4</sup> S-GRT-2R	07-05-17	EARTH PAD FOR TYPE 38 AND TYPE 21 TERMINALS (RETROFIT)

**Revised Standard Drawings (Continued):**

<b>DRAWING NUMBER</b>	<b>CURRENT REVISION DATE</b>	<b>DESCRIPTION</b>
<sup>1</sup> S-PL-6A	07-05-17	SAFETY PLAN SAFETY HARDWARE PLACEMENT IN MEDIAN
T-M-1	07-05-17	DETAILS OF PAVEMENT MARKINGS FOR CONVENTIONAL ROADS AND MARKING ABBREVIATIONS
T-M-2	07-05-17	DETAILS OF PAVEMENT MARKINGS FOR CONVENTIONAL ROADS

**New Standard Drawings:**

<b>DRAWING NUMBER</b>	<b>DESCRIPTION</b>
S-BPR-2	BARRIER BIKE/PEDESTRIAN MEDIAN RAIL
SD-MSE-1	SIDE DRAIN MITERED END SECTION

Note 1: Minor revisions, revised notes, and/or revised references to other standard drawings  
Note 2: Minor revisions, revised details  
Note 3: Minor revisions, revised pay item numbers  
Note 4: Add/remove details and/or tables, revised notes

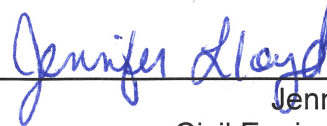
The revised standard drawings and revised Chapter 5 of the Roadway Design Guidelines are available online.

Standard Drawings:

<http://www.tn.gov/tdot/section/chief-engineer-design-standard-drawings-library>

Roadway Design Guidelines:

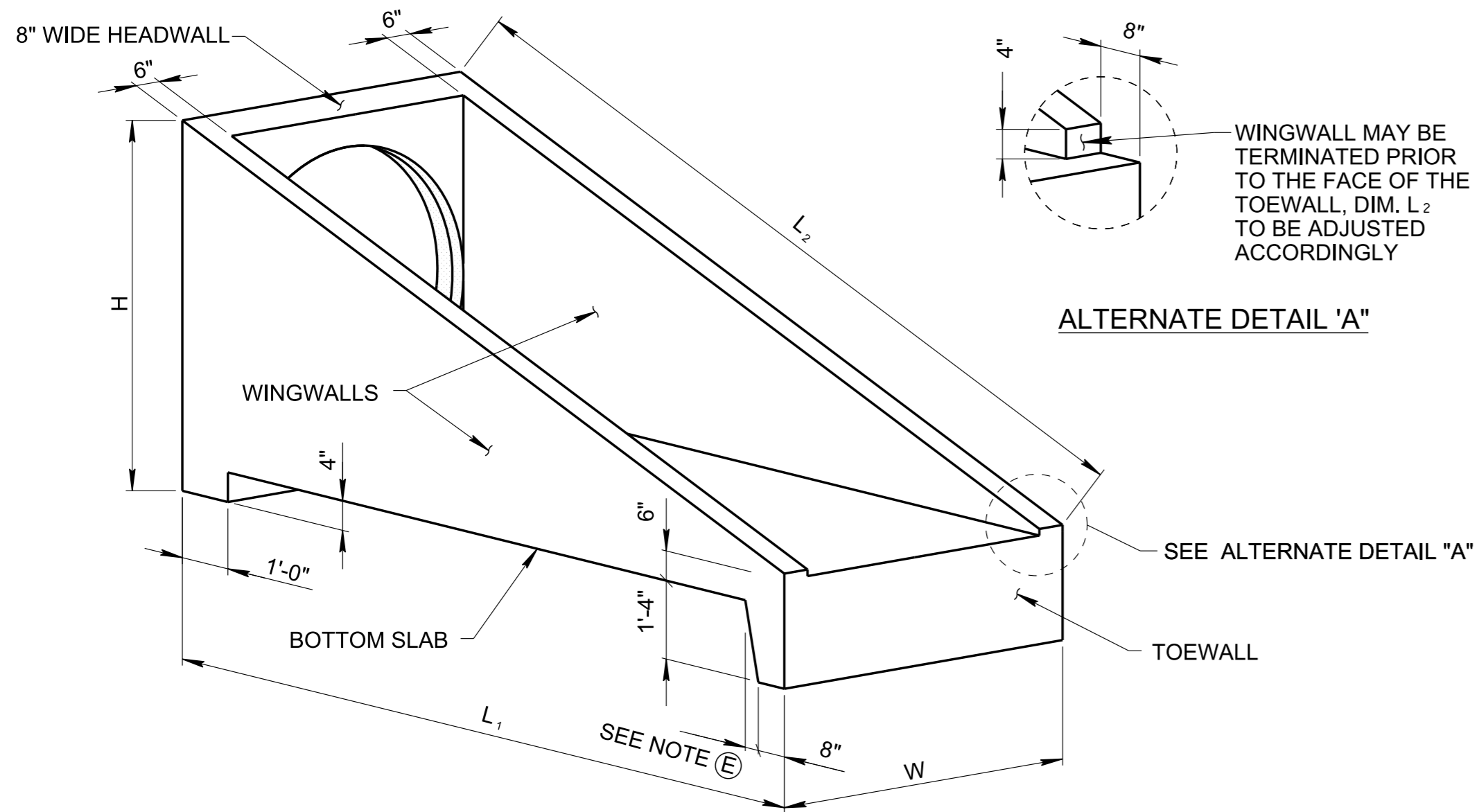
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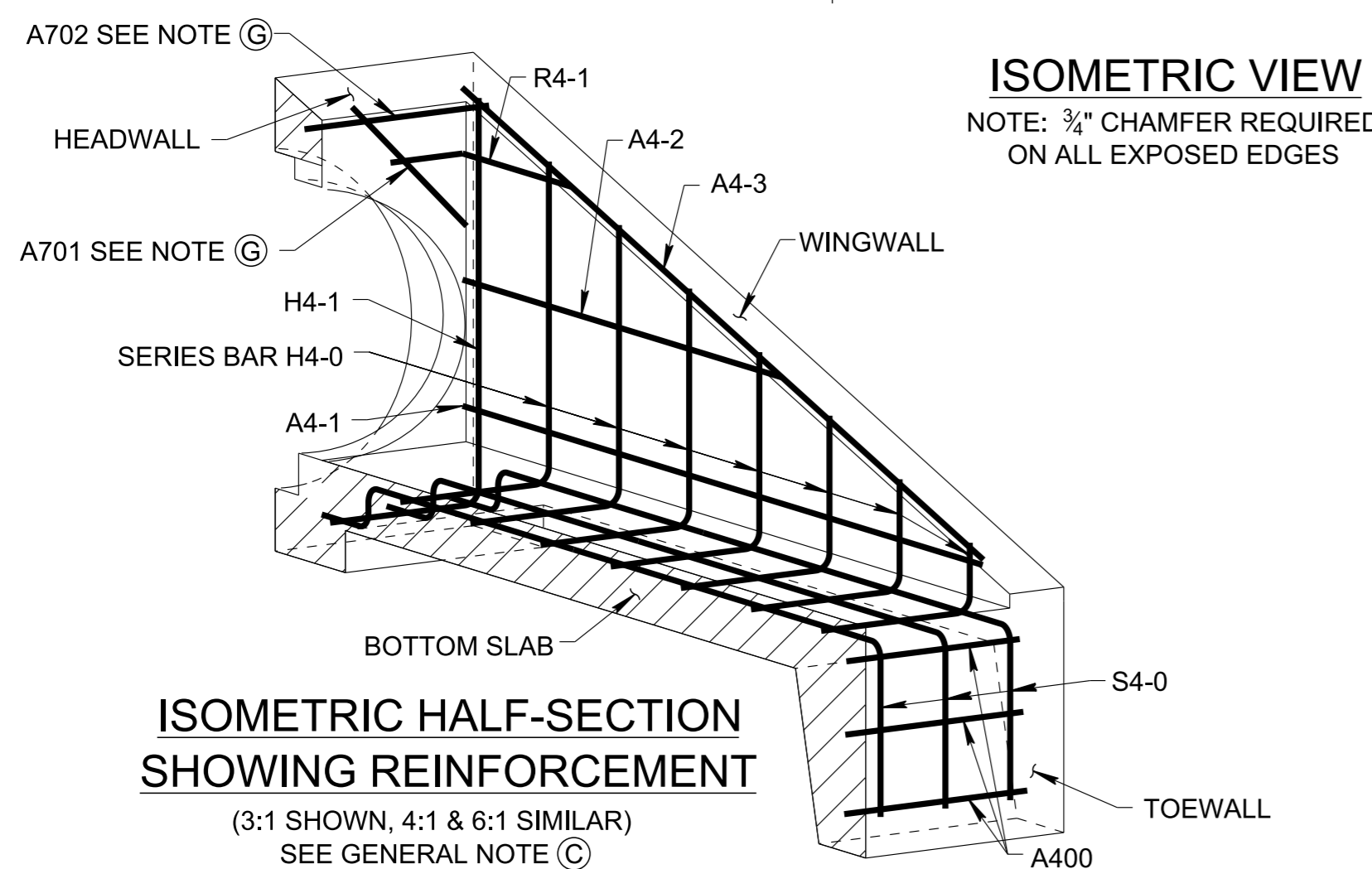
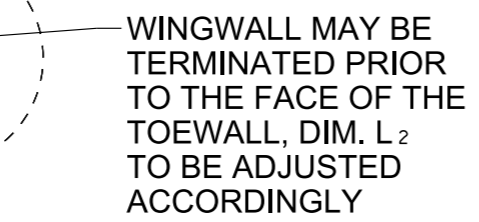
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Jennifer Lloyd, PE  
Civil Engineering Director  
Roadway Design Division

KJL:ARH:RBB:SSH  
November 9, 2017



ALTERNATE DETAIL 'A'

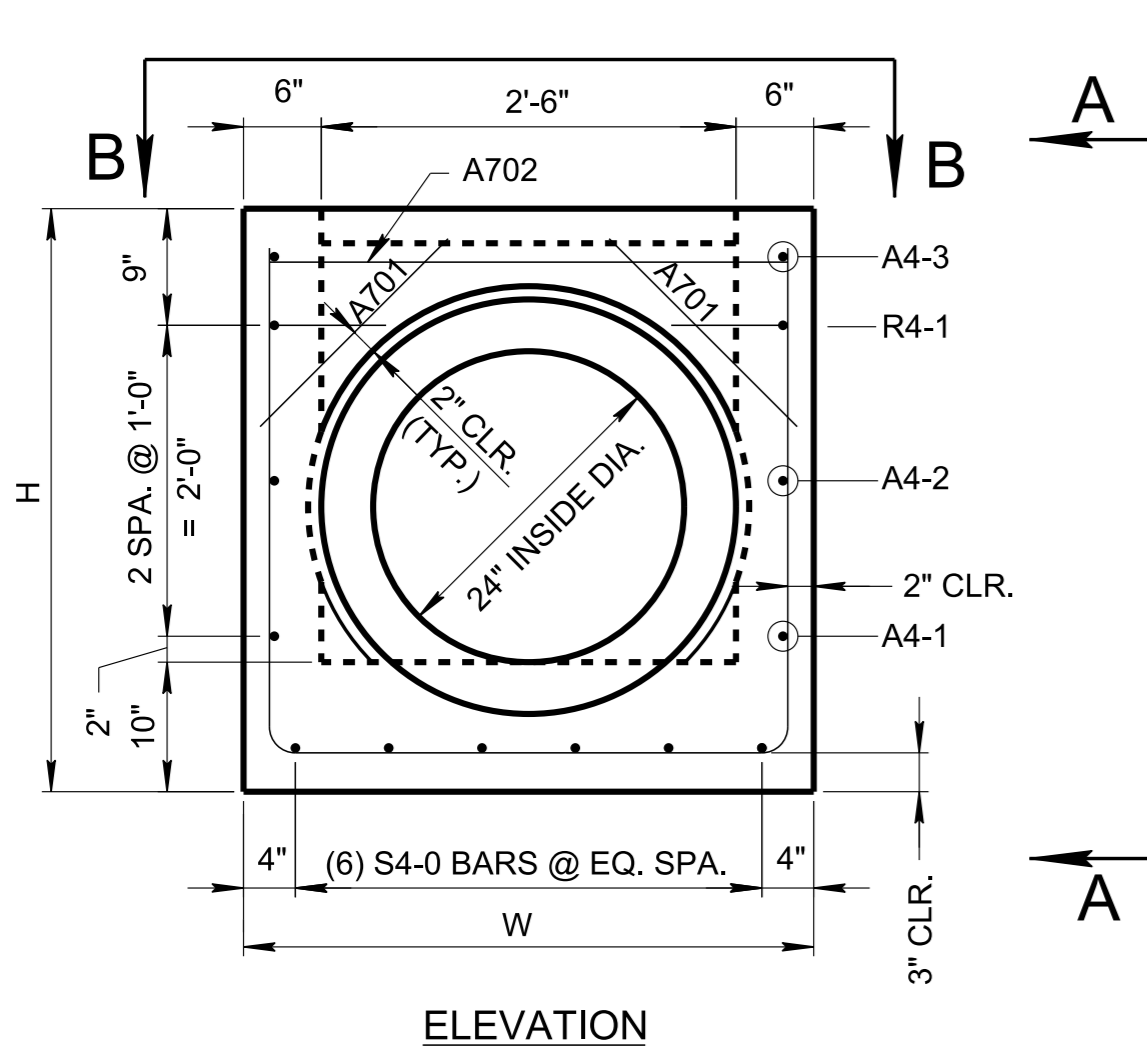


ISOMETRIC VIEW

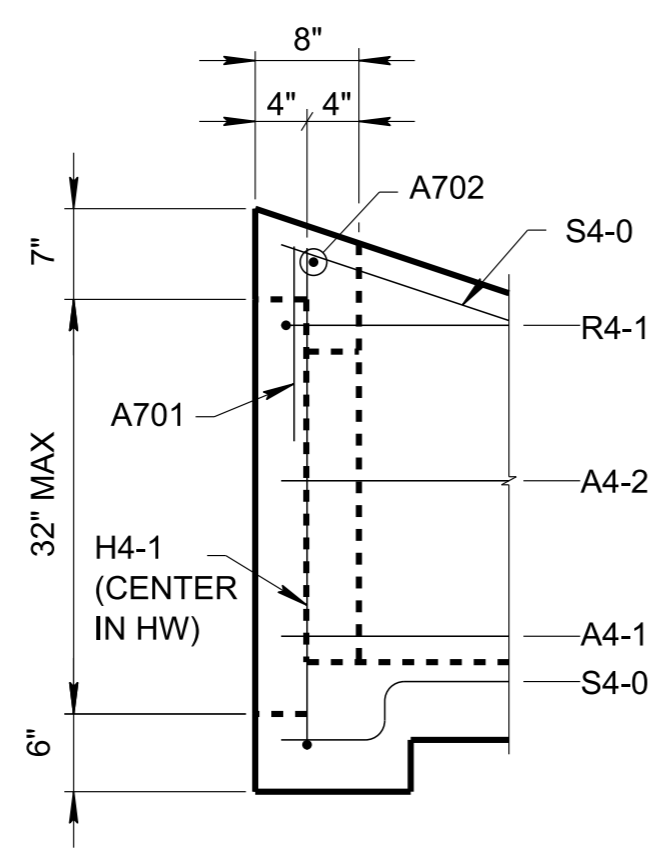
NOTE: 3/4" CHAMFER REQUIRED ON ALL EXPOSED EDGES

ISOMETRIC HALF-SECTION SHOWING REINFORCEMENT

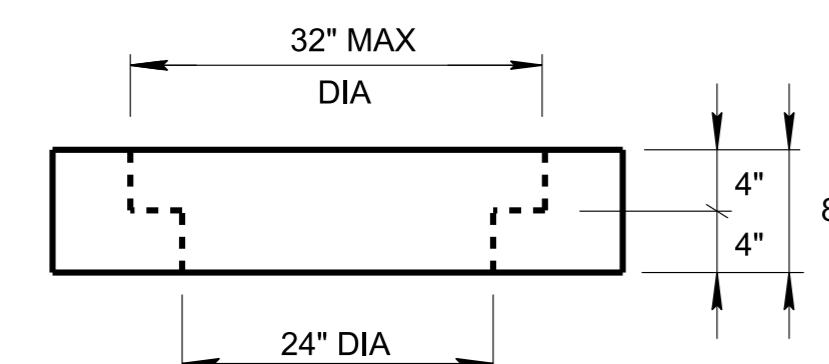
(3:1 SHOWN, 4:1 & 6:1 SIMILAR) SEE GENERAL NOTE (C)



ELEVATION



PARTIAL VIEW A-A

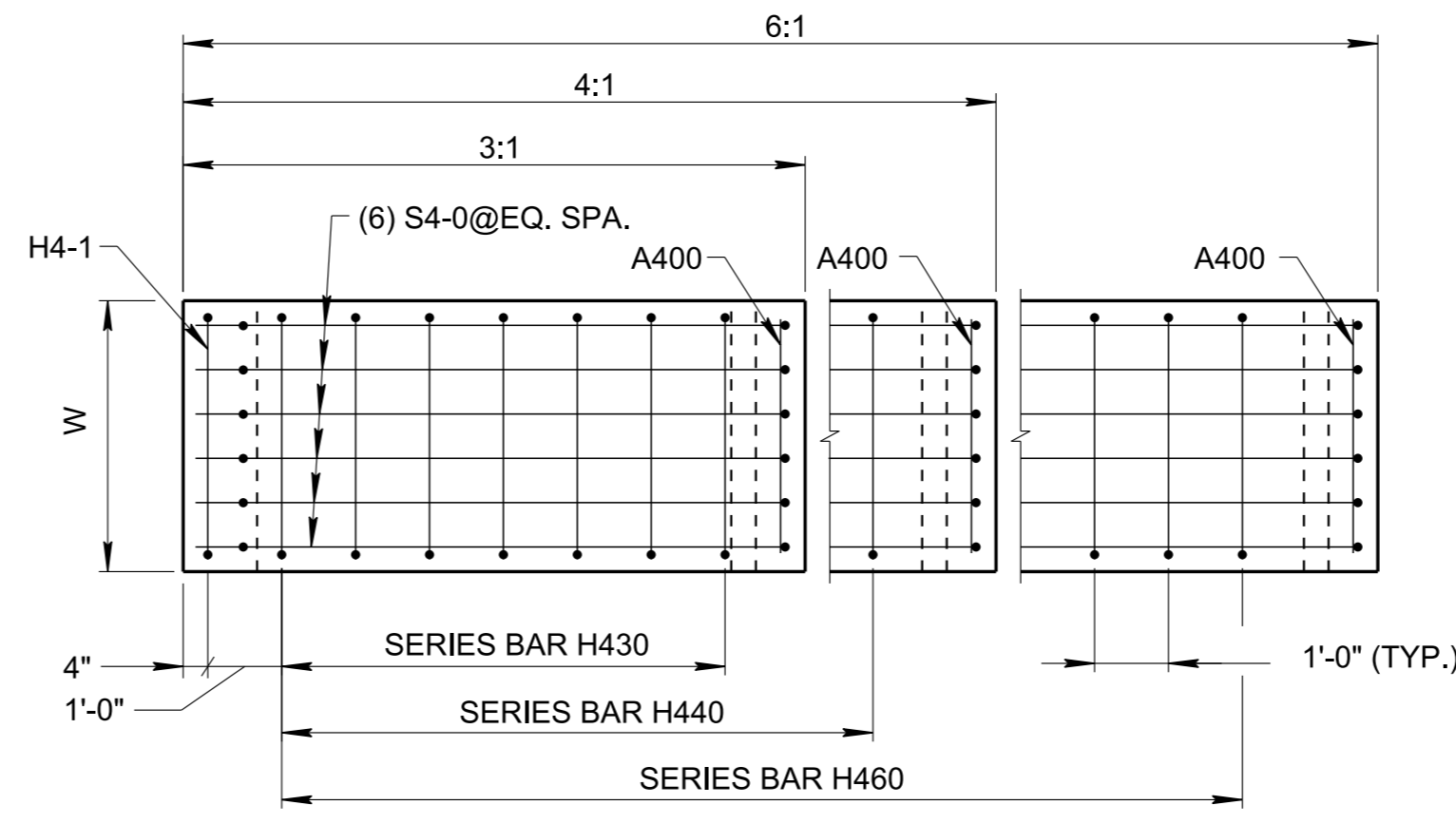


PARTIAL VIEW B-B

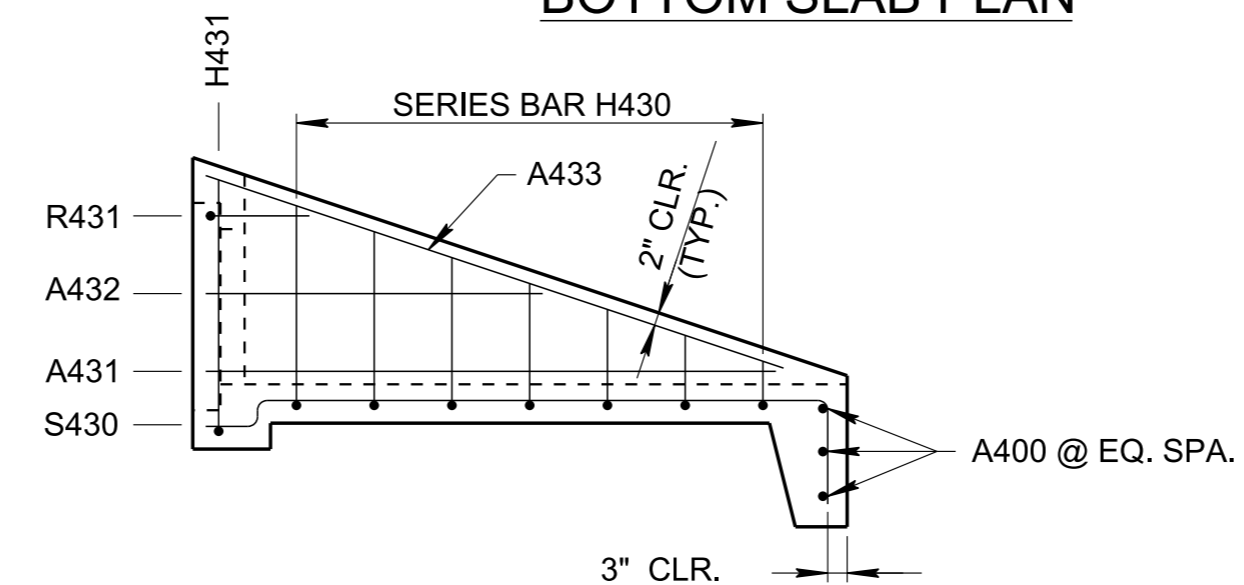
SEE NOTE (F)

HEADWALL DETAILS

NOTE: INSTALL BARS A701 AT 45° SEE GENERAL NOTES (C) & (F)

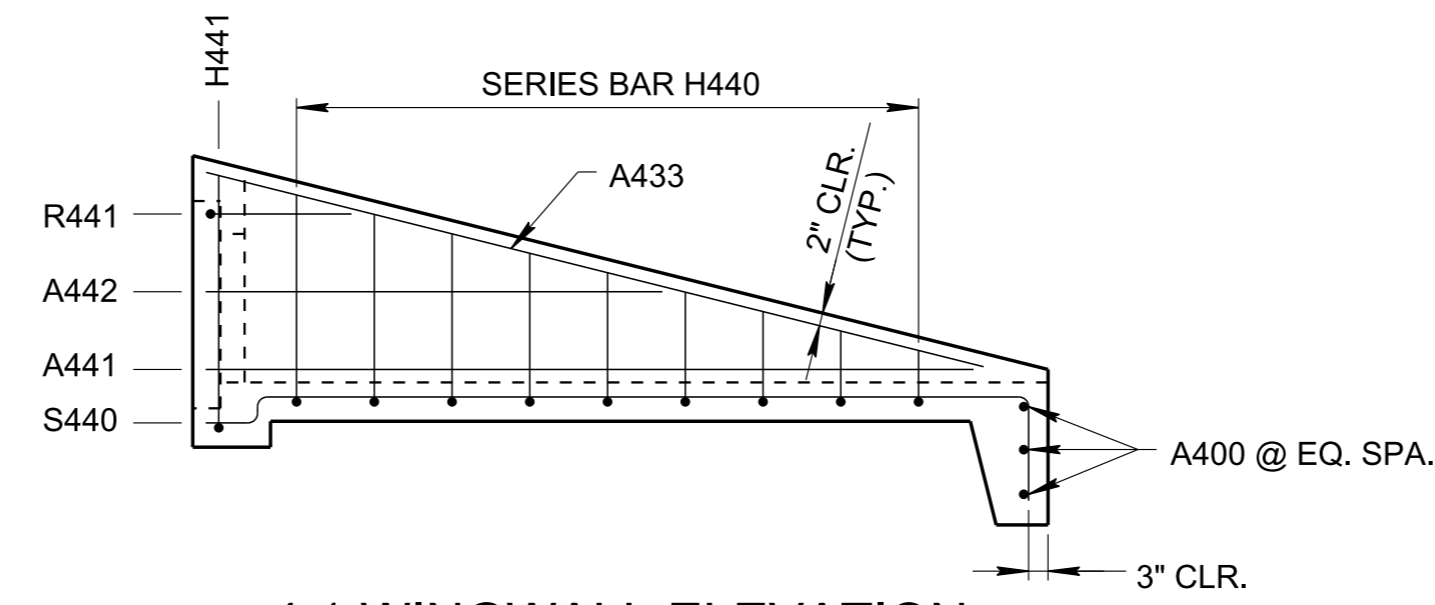


BOTTOM SLAB PLAN



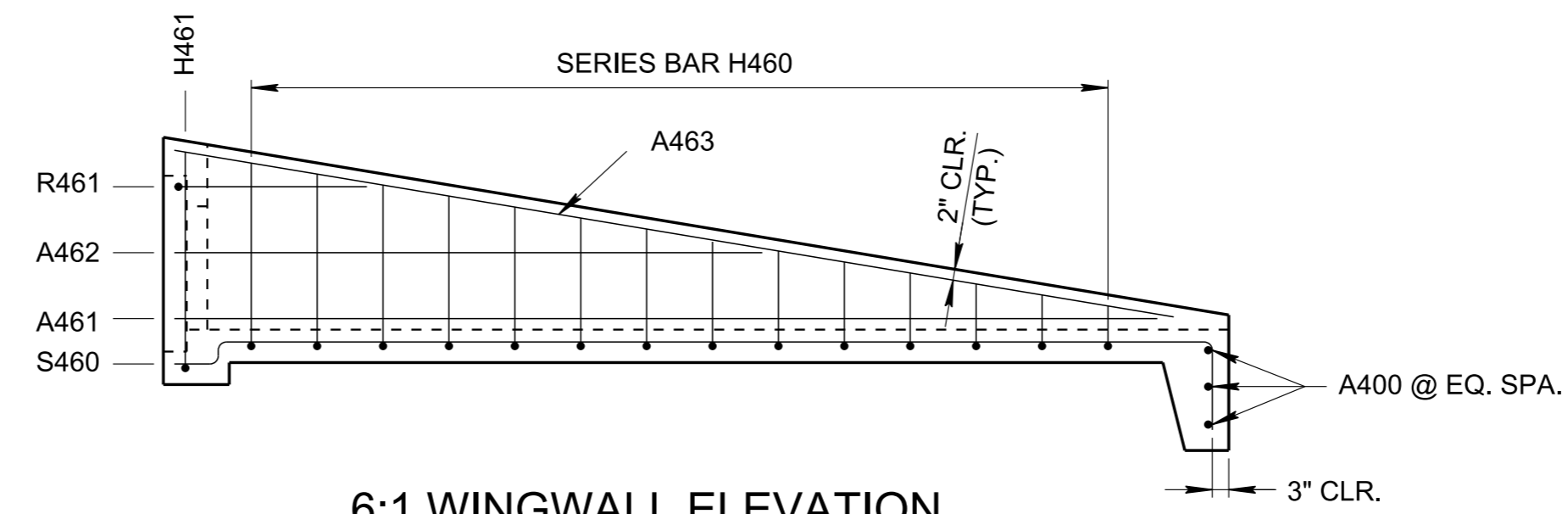
3:1 WINGWALL ELEVATION

NOTE: A-BARS IN HEADWALL NOT SHOWN FOR CLARITY.



4:1 WINGWALL ELEVATION

NOTE: A-BARS IN HEADWALL NOT SHOWN FOR CLARITY.



6:1 WINGWALL ELEVATION

NOTE: A-BARS IN HEADWALL NOT SHOWN FOR CLARITY.

DIMENSIONS AND QUANTITIES FOR ONE ENDWALL 24" PIPE						
SLOPE	CONCRETE ENDWALL DIMENSIONS				ESTIMATED QUANTITIES	
	H	L <sub>1</sub>	L <sub>2</sub>	W	CLASS "A" CONC. CU. YD.	STEEL BAR REINF. LB.
3:1		8'-5"	8'-10 1/2"		1.28	124
4:1	3'-9"	11'-0"	11'-4"	3'-6"	1.61	153
6:1		16'-2"	16'-4 5/8"		2.26	215

- REV. 6-14-13: REVISED NOTEG. ADDED NOTE (H) AND (L)
- REV. 1-6-15: REVISED HOLE OPENING SIZE. ADDED STEPPED HOLE DETAIL.
- REV. 1-21-16: REVISED GENERAL NOTE (B)
- REV. 7-5-17: MODIFIED GENERAL NOTES (C) AND (J)

GENERAL NOTES

- (A) DRAWING TO BE USED FOR ALL CAST-IN-PLACE AND ALL PRECAST 18" CONCRETE ENDWALLS (TYPE "U") FOR CROSS DRAINS ONLY. "U" ENDWALL TO BE PLACED AT 90° SKEW TO CENTERLINE. SEE STD. DWG. D-PE-99 FOR SKEWED CONNECTION DETAIL WHEN CROSS DRAIN IS NOT PERPENDICULAR TO CENTERLINE. CAST-IN-PLACE CONCRETE ENDWALL SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD SPECIFICATIONS, SECTION 611 AND/OR SPECIAL PROVISIONS.
- (B) SEE STD. DWG. D-PE-24B FOR BILL OF STEEL & PRECAST NOTES.
- (C) "X" IN BAR DESIGNATION REPRESENTS 3, 4 OR 6 FOR 3:1, 4:1 OR 6:1 SLOPES, RESPECTIVELY. SEE STD. DWG. D-PE-24B.
- (D) SPLICING OF REINFORCEMENT IS ACCEPTABLE PROVIDED THAT A MINIMUM 21" SPLICE LENGTH IS USED.
- (E) TOEWALL BACK SLOPE MAY BE CONSTRUCTED VARIABLE FROM VERTICAL UP TO 15°.
- (F) 90° STEPS ARE SHOWN ON THE STEPPED HOLE DETAIL, HOWEVER MINOR VARIATIONS OF THE TAPER ARE ACCEPTABLE.
- (G) OPTIONAL STEPPED HOLE OR HOLE FORMERS ARE ALLOWED PROVIDED THE AMOUNT OF COVER BETWEEN THE PIPE OPENING AND BARS A701 AND A702 IS THE SAME OR GREATER THAN SHOWN ON THIS DRAWING.
- (H) PAYMENT WILL BE MADE UNDER:
  - 611-07.57, 24" ENDWALL (CROSS DRAIN) 3:1 EACH
  - 611-07.58, 24" ENDWALL (CROSS DRAIN) 4:1 EACH
  - 611-07.59, 24" ENDWALL (CROSS DRAIN) 6:1 EACH
- (I) THE CONTRACTOR MAY BE ELECT TO SUBSTITUTE AN APPROVED ALTERNATIVE DESIGN.
- (J) DIMENSIONAL AND REINFORCING TOLERANCES WILL BE AS SHOWN IN STANDARD OPERATING PROCEDURE (SOP) 5-3.

□ MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

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TRANSPORTATION

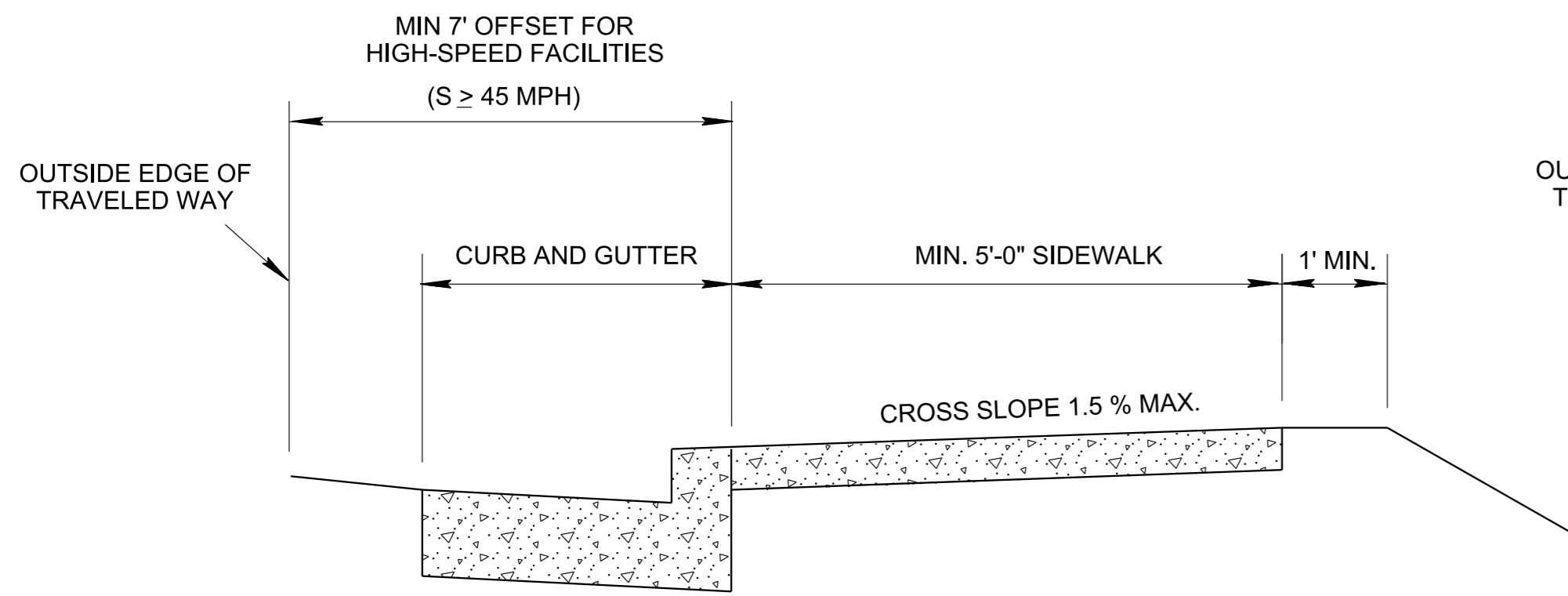
24"  
CONCRETE ENDWALL  
CROSS DRAIN

(FOR 3:1, 4:1 & 6:1 SLOPES)

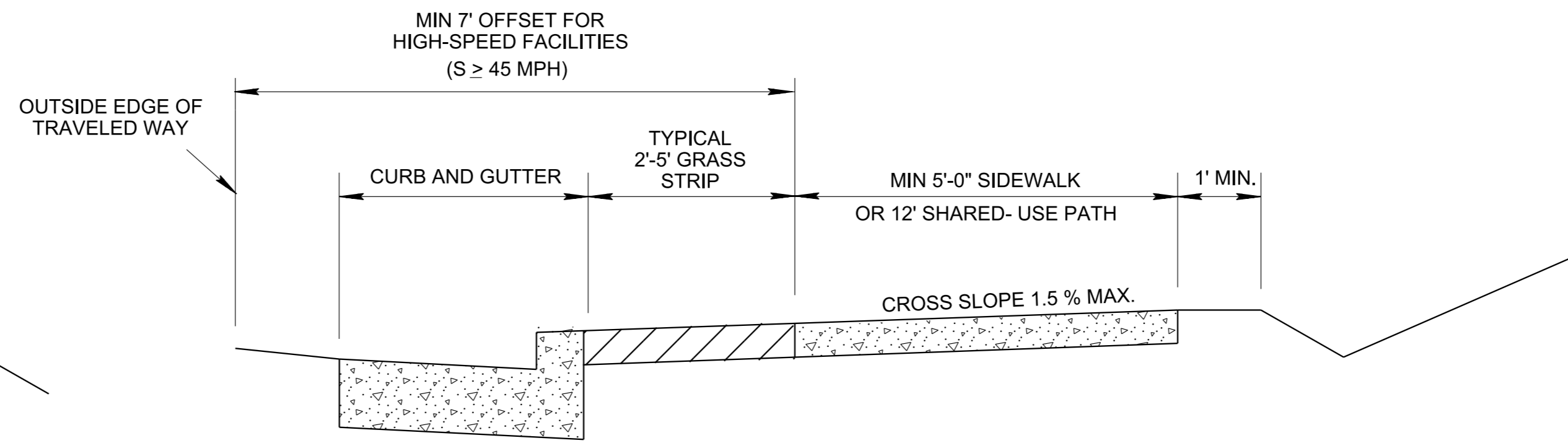
NOT TO SCALE

3-01-12

D-PE-24A

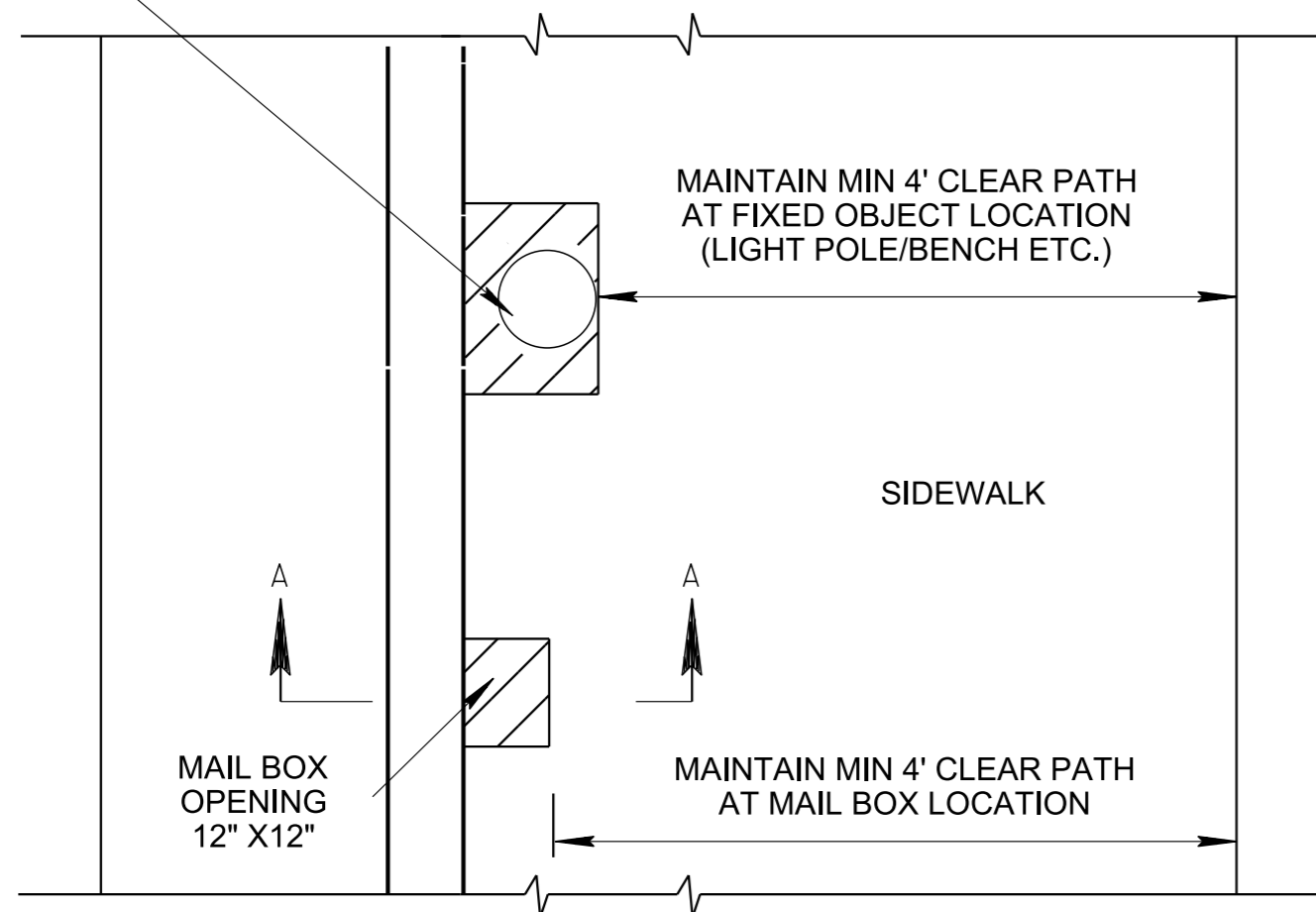


TYPICAL SIDEWALK CROSS SECTION

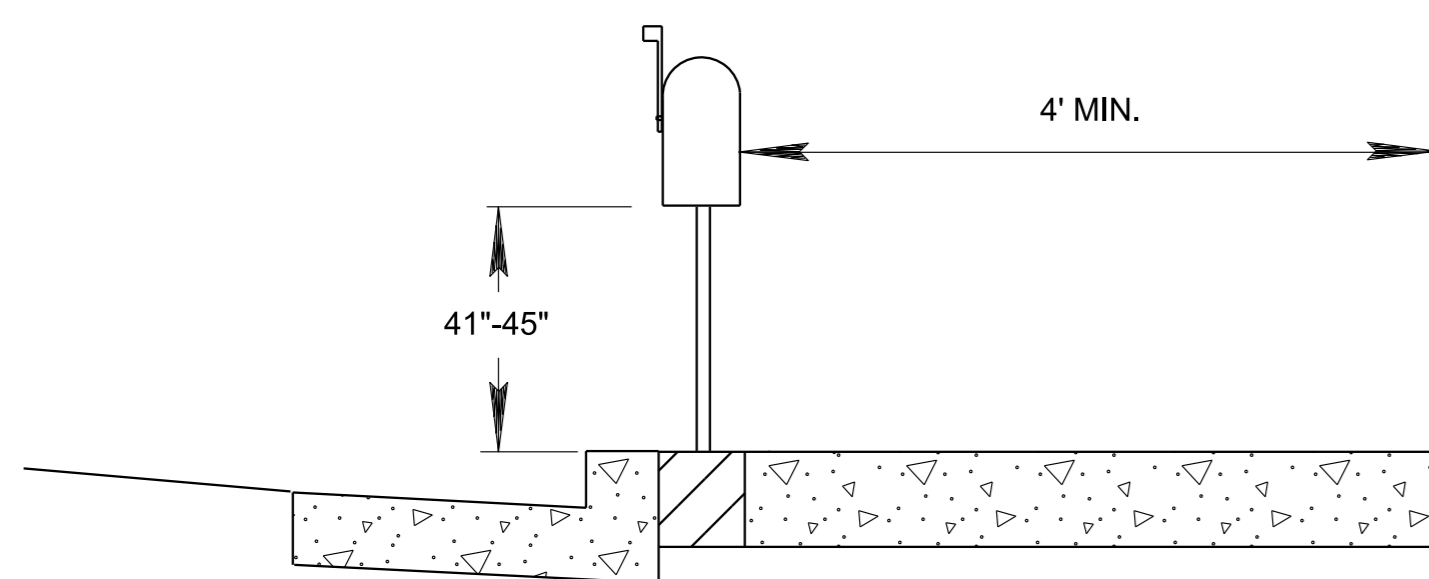


TYPICAL SIDEWALK CROSS SECTION WITH GRASS STRIP

LEAVE SQUARE OPENING IN SIDEWALK. THE LENGTH OF THE SIDE OF THE SQUARE OPENING SHOULD BE EQUAL TO THE DIAMETER OF THE FIXED OBJECT PLUS SIXTEEN INCHES, IT WILL BE BORDERED BY HALF INCH EXPANSION JOINT.

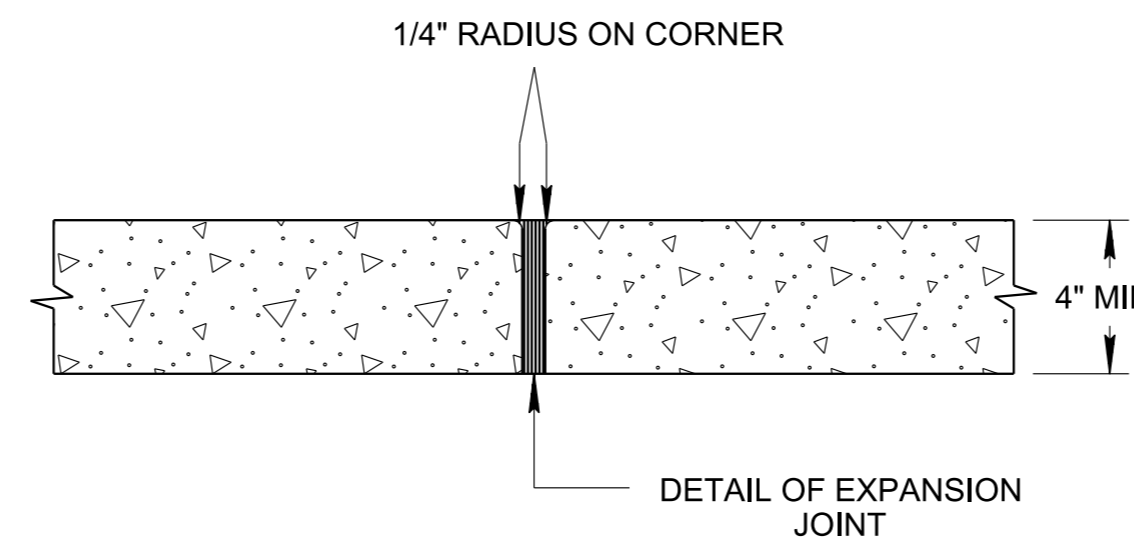


SIDEWALK CONSTRUCTION DETAILS PLAN VIEW



SECTION A-A MAIL BOX DETAIL

LEAVE 12"x12" OPENING IN SIDEWALK FOR MAIL BOX POST. ORIENT BOXES TO FACE THE DIRECTION OF ONCOMING TRAFFIC. EDGE OF MAIL BOX SHALL NOT OVERHANG BEYOND THE FACE OF THE CURB. NOR SHALL THE MAIL BOX OVERHANG THE SIDEWALK SUCH THAT THE USABLE WIDTH IS LESS THAN 4 FEET.



EXPANSION JOINT DETAIL

REFERENCED STANDARD DRAWINGS

- SEE T-M-4 FOR CROSS WALK MARKING
- SEE RP-H-SERIES FOR CURB RAMP DETAILS
- SEE S-BPR-1 FOR PEDESTRIAN RAIL REQUIREMENTS
- SEE RP-S-9 FOR ALTERNATNE PEDESTRIAN FACILITY DETAILS FOR REHABILITATION PROJECTS
- SEE RP-MC-1 OR 2 FOR CURB AND GUTTER DETAILS
- SEE RP-NMC-10 OR 11 FOR NON-MOUNTABLE CURB AND GUTTER DETAILS
- SEE T-M-10, 11, 12, 13, 14, FOR BIKE LANE/ROUTE PAVEMENT MARKINGS
- SEE RD01-TS-8 FOR SHARED USE PATH DETAILS
- SEE S-PL-6 FOR GUARDRAIL PLACEMENT

GENERAL NOTES

- (A) ALWAYS PLACE SIDEWALK AS FAR AS AWAY FROM THE TRAVELLED WAY WHEN POSSIBLE FOR SPECIFICATIONS SEE "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION" OF THE TENNESSEE DEPARTMENT OF TRANSPORTATION.
- (B) WHERE IT BECOMES NECESSARY TO REMOVE PARTS OF EXISTING CONCRETE SIDEWALKS OR RAMPS, THE RESULTING EDGES SHALL BE CUT TO A NEAT LINE, AND ANY OFFSETS IN SUCH LINES SHALL BE MADE OFFSETS IN SUCH LINES SHALL BE MADE AT RIGHT ANGLES.
- (C) SIDEWALK WIDTHS DO NOT INCLUDE THE SIX INCH CURB WIDTH OF PROPOSED TOP OF CURB.
- (D) DESIREABLE SIDEWALK CROSS SLOPE IS 1.5 %, ABSOLUTE MAXIMUM IS 2.0 %.

CONSTRUCTION NOTES

- (E) EXPANSION JOINTS ARE TO BE PLACED 25 TO 30 FEET APART DEPENDING ON TRANSVERSE JOINT MARKINGS AND NEED TO MATCH CURB EXPANSION JOINT WHERE SIDEWALK IS BUILT DIRECTLY AGAINST CURB, OR AS DIRECTED BY THE ENGINEER WHERE THE PROPOSED SIDEWALK IS IN CONTACT WITH THE STREET RETURNS, ON BUILDING LINES PRODUCED AT STREET INTERSECTIONS, WHERE WALKS LEAD TO HOUSE OR OTHER ENTRANCES AND ANY OTHER LOCATIONS WHERE STRESSES MAY DEVELOP, THE COST OF ALL EXPANSION JOINTS IS TO BE INCLUDED IN THE UNIT PRICE BID FOR THE PROPOSED SIDEWALK
- (F) CONCRETE JOINT MATERIAL TO BE FLUSH WITH THE SIDEWALK SURFACE, HALF INCH AND/OR ONE INCH PREMOLDED FIBER IN ACCORDANCE WITH SECTION 905 OF THE STANDARD SPECIFICATIONS
- (G) ONE INCH EXPANSION JOINTS ARE TO BE PLACED WHERE THE PROPOSED SIDEWALK IN CONTACT WITH CIRCULAR CURBS, BUILDINGS AND/OR RETAINING WALLS.
- (H) HALF INCH EXPANSION JOINTS ARE TO BE USED AT ALL OTHER LOCATIONS
- (I) LONGITUDINAL JOINT MARKINGS WILL NOT BE REQUIRED ON SIDEWALKS 5 FEET LESS IN WIDTH.
- (J) ONE LONGITUDINAL JOINT MARKING WILL BE REQUIRED ON SIDEWALKS OVER 5 FEET BUT LESS THAN 9 FEET IN WIDTH.
- (K) TWO LONGITUDINAL JOINT MARKINGS WILL BE REQUIRED ON SIDEWALKS OVER 9 FEET BUT LESS THAN 12 FEET IN WIDTH.
- (L) TRANSVERSE JOINT MARKINGS ARE TO BE MADE TO FORM BLOCKS AS NEARLY TO SQUARE AS PRACTICAL.

- REV. 7-1-72: CHANGED DEPARTMENT NAME.
- REV. 1-1-76: CHANGED DWG. NO. FROM P-S-7a(68) TO RP-S-7.
- REV. 5-14-87: ADDED EXPANSION JOINTS BETWEEN CURB AND SIDEWALK.
- REV. 4-15-91: REDREW, RENAMED AND REORGANIZED SHEET. MOVED INFORMATION REGARDING CONCRETE STEPS TO DWG. NO. RP-S-8.
- REV. 7-29-96: CHANGED GENERAL NOTE (C)
- REV. 5-7-13: ADDED MAIL BOX DETAIL.
- REV. 6-4-13: REVISED NOTES (C) AND (G) AND ADDED NOTE (L)
- REV. 11-25-13: REVISED NOTE (2)
- REV. 2-5-16: REDRAWN, REVISED NOTES.
- REV. 7-5-17: MODIFIED TYPICAL CROSS SECTION.

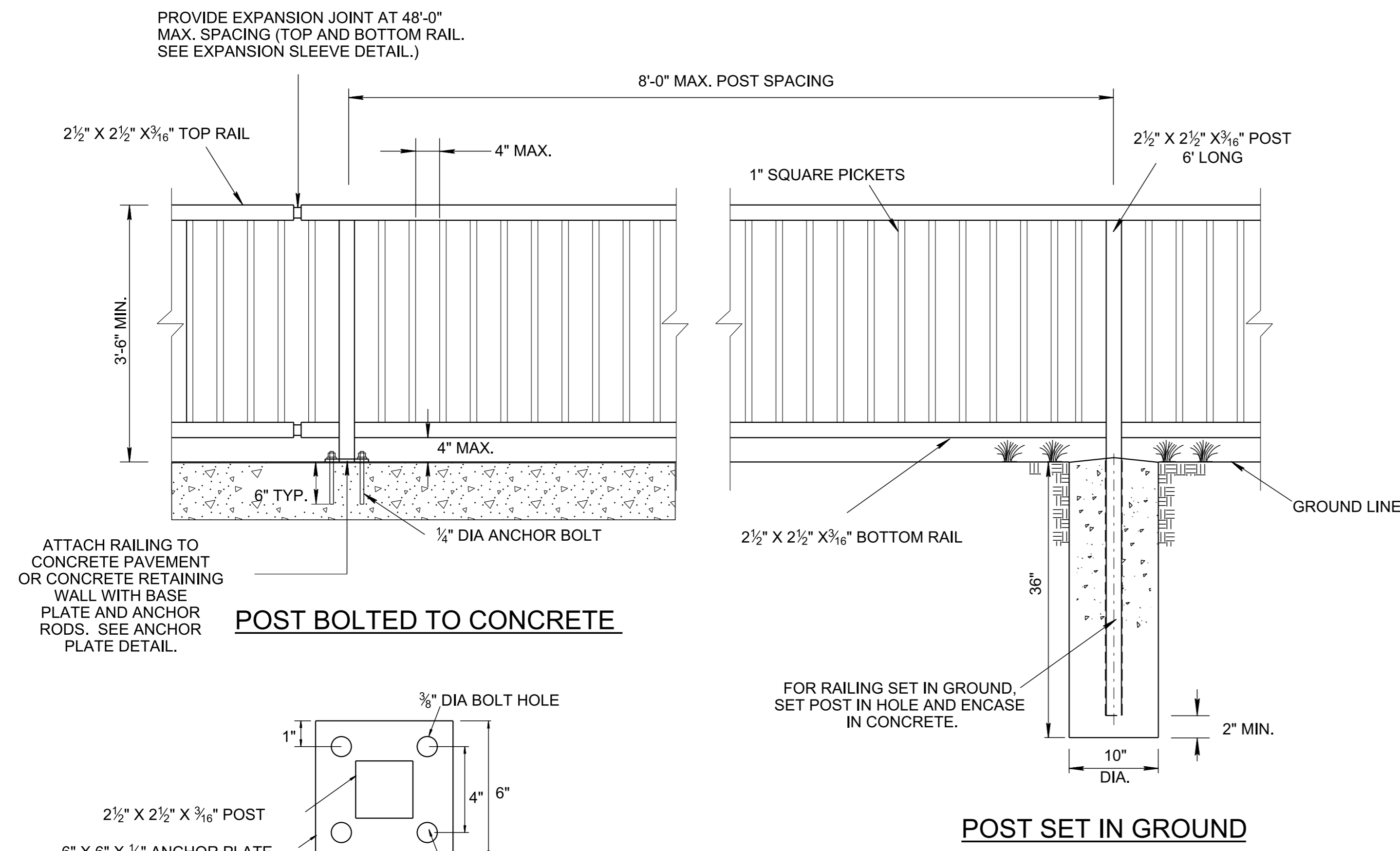
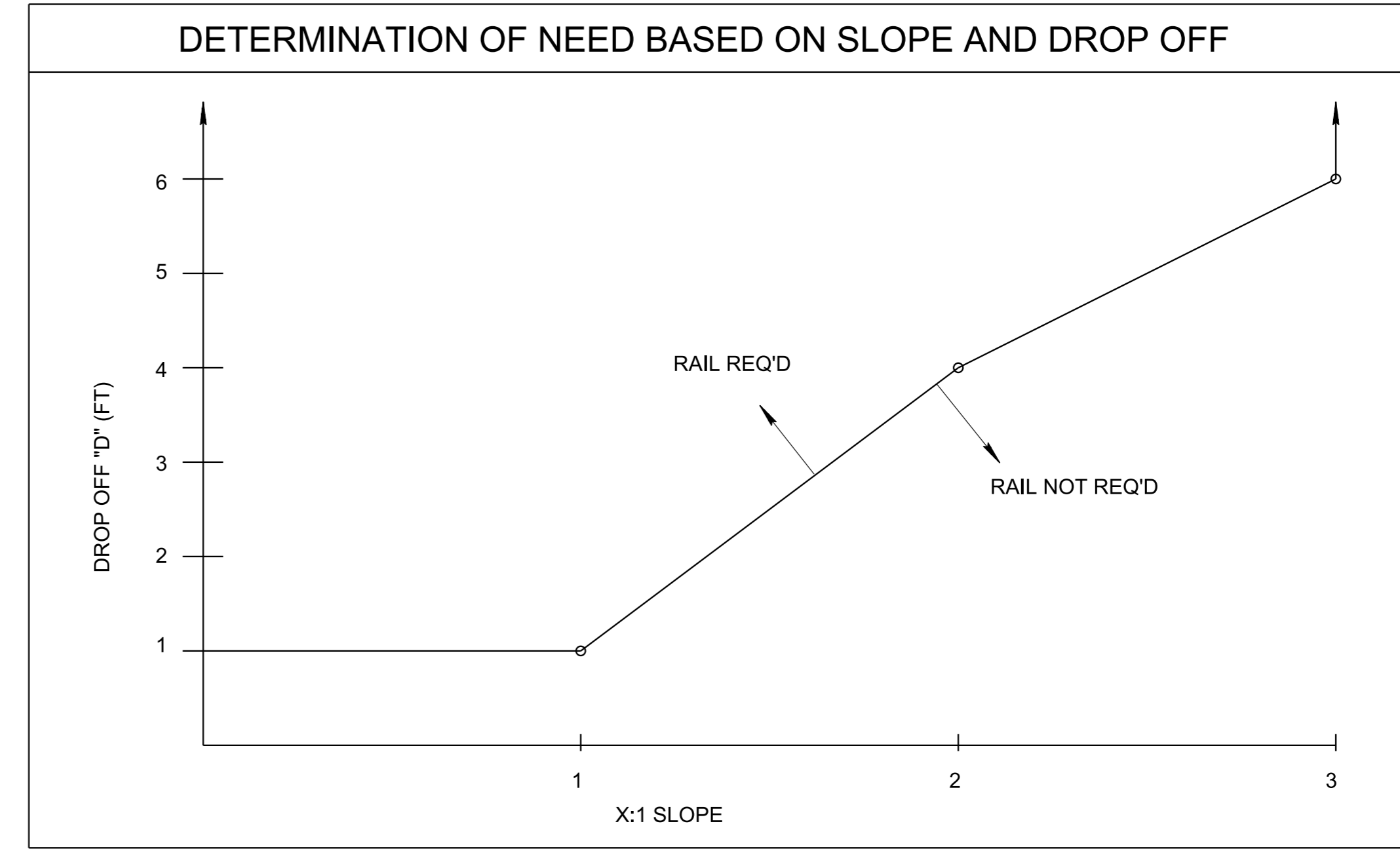
MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

STATE OF TENNESSEE DEPARTMENT OF TRANSPORTATION

DETAILS FOR CONCRETE SIDEWALKS

- REV. 6-4-14: CHANGED PAY ITEM NO.
- REV. 2-5-16: ADDED ALTERNATE INSTALL DETAIL.
- REV. 7-5-17: MODIFIED GENERAL NOTES. ADDED GENERAL NOTE ⑧.

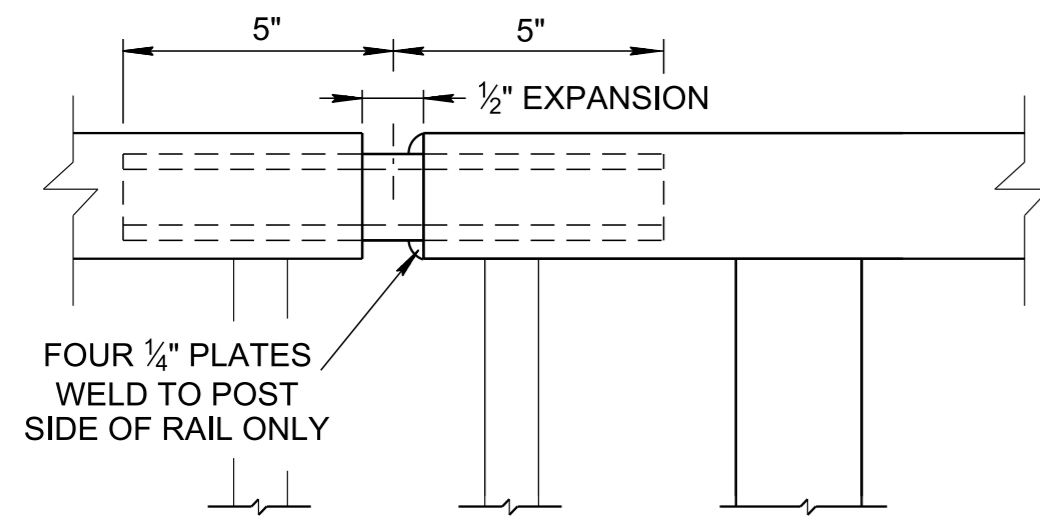
FIGURE (A)



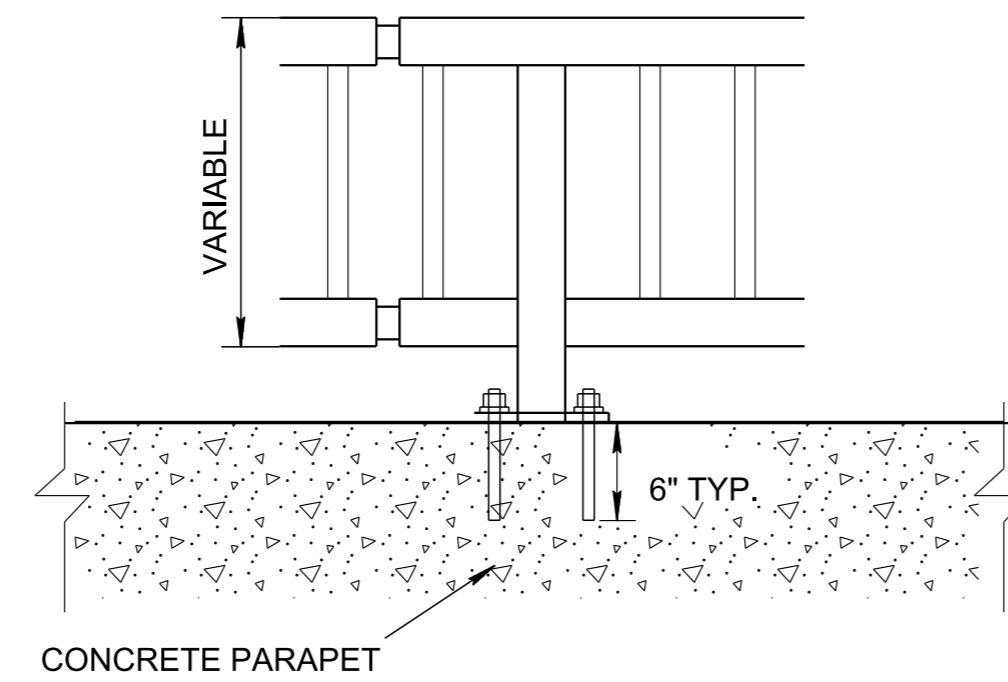
POST BOLTED TO CONCRETE

POST SET IN GROUND

ANCHOR PLATE DETAIL



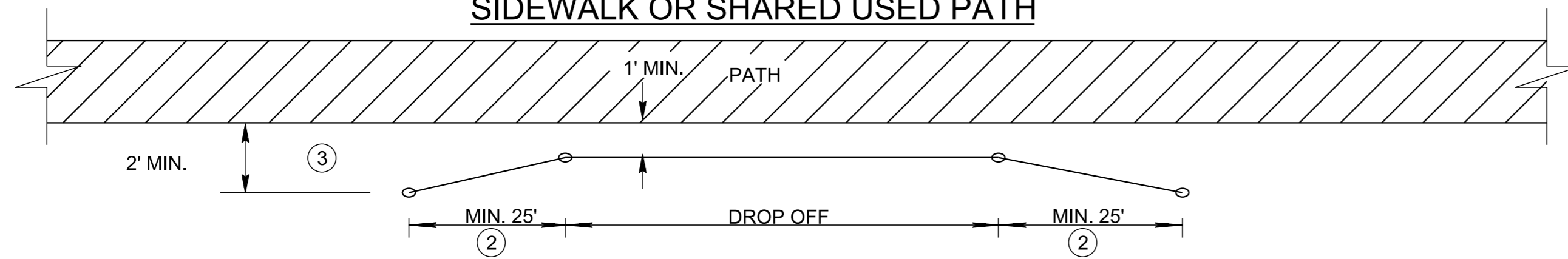
EXPANSION SLEEVE DETAIL ⑤



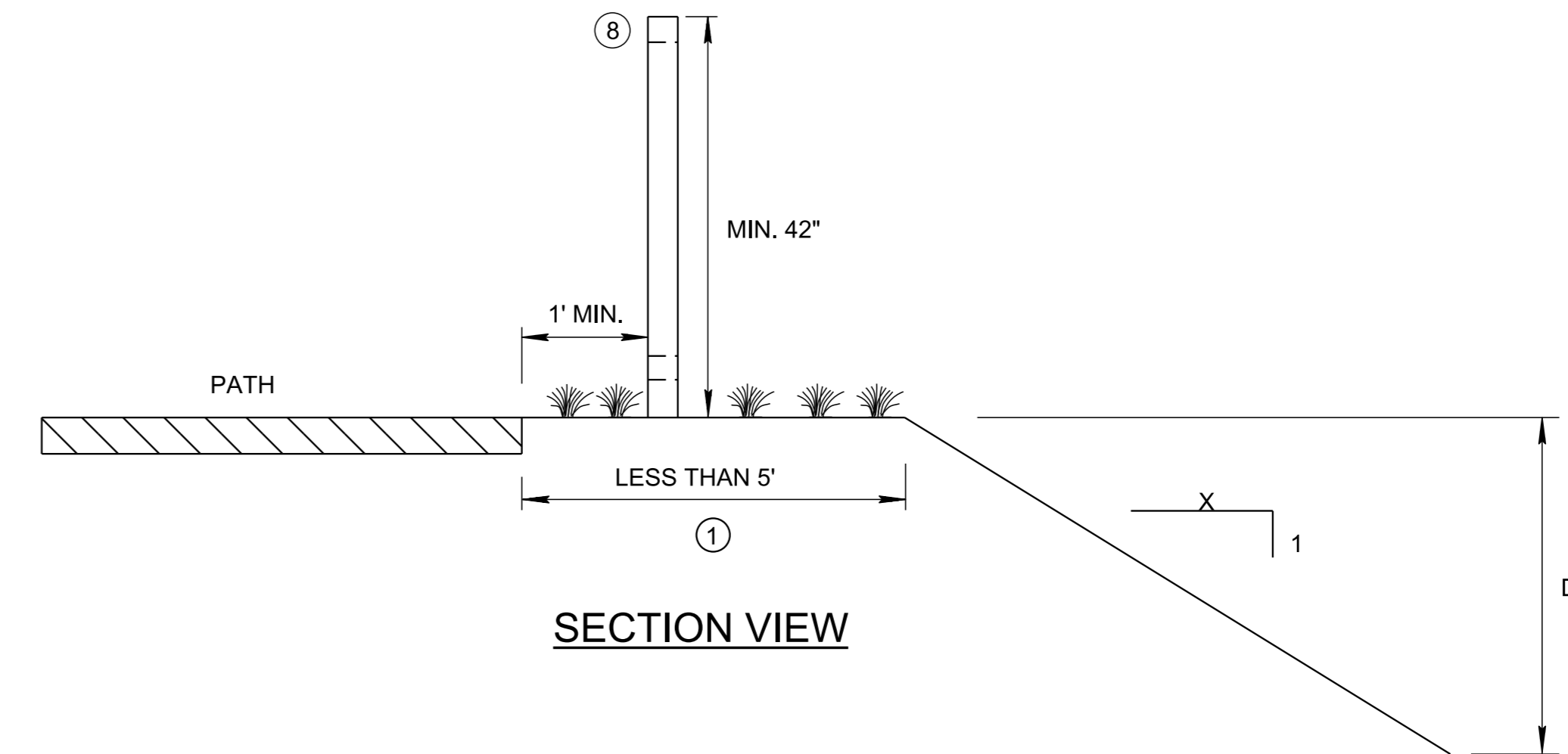
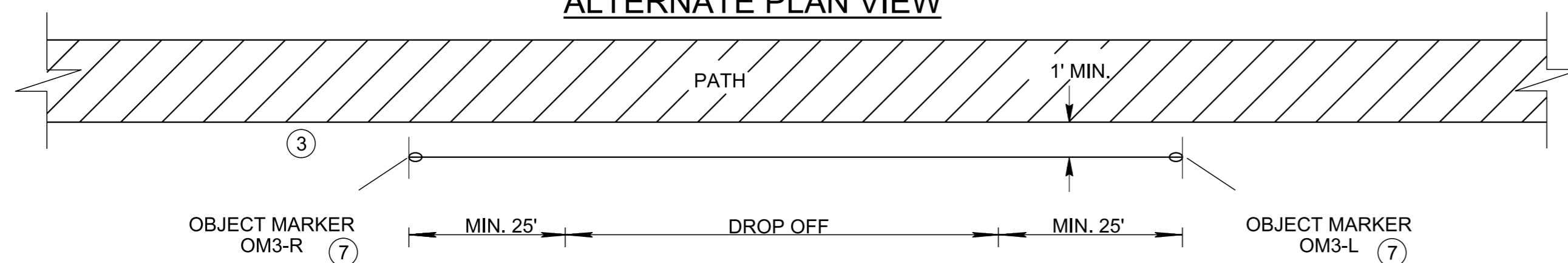
ALTERNATE INSTALLATION

RETROFITTING EXISTING CONCRETE BARRIER TO MEET MIN 42" HIGH PED/BIKE SAFE RAIL

TYPICAL PLAN VIEW  
SIDEWALK OR SHARED USED PATH



ALTERNATE PLAN VIEW



SECTION VIEW

GENERAL NOTES

- ① TO DETERMINE IF SAFETY RAIL IS REQUIRED, REFER TO FIGURE (A) WHEN SHARED USE PATH OR SIDEWALK EDGE DROP OFF IS WITHIN 5'. INFORMATION IS PROVIDED FOR GUIDANCE ONLY, SOME SITES MAY REQUIRE A RAIL PER ENGINEERING JUDGEMENT. IF SIDEWALK IS ALONG A ROADWAY, SEE STANDARD DRAWING S-PL-6 FOR SAFETY HARDWARE PLACEMENT.
- ② SAFETY RAIL SHALL BEGIN 25' BEFORE AND EXTEND 25' BEYOND AREA OF NEED.
- ③ SAFETY RAIL ENDS SHALL BE FLARED TO BEYOND 2' OF THE EDGE OF THE PATH OR MARKED WITH OBJECT MARKERS.
- ④ STEEL SHALL CONFORM TO ASTM A36. WELD ALL COMPONENTS USE 3#16" FILLET WELDS. GRIND WELDS AND CONNECTIONS AS REQUIRED TO PROVIDE A SMOOTH SURFACE, FREE OF BURRS.  
FIELD PAINT SAFETY RAIL AFTER INSTALLATION AS SPECIFIED IN THE CONTRACT DOCUMENTS.
- ⑤ DETAIL SHOWN IS FOR TOP RAIL. EXPANSION JOINT FOR BOTTOM RAIL IS SIMILAR.
- ⑥ SYSTEM REPLACEMENTS MAY BE ALLOWED PROVIDING THAT THE HEIGHT AND SPACING LIMITATIONS SHOWN ON THIS DRAWING ARE MET.
- ⑦ TO BE PAID FOR UNDER ITEM NO. 604-01.20 BOX TUBE SAFETY RAIL PER LINEAR FOOT. OBJECT MARKERS SHALL BE PAID FOR UNDER ITEM NO. 604-01.20 BOX TUBE SAFETY RAIL PER LINEAR FOOT.
- ⑧ STANDARD RIGHT-OF-WAY CHAIN LINK FENCE 4' IN HEIGHT MAY BE USED AS AN ALTERNATIVE TO THE BOX TUBE SAFETY RAIL AND IS TO BE PAID FOR UNDER ITEM NUMBERS:  

707-01.01	CHAIN-LINK FENCE (4-FOOT)	PER L.F.
707-01.02	END & CORNER POST ASSEMBLY(CHAIN-LINK FENCE 4')	PER EACH
707-01.04	GATE - CHAIN-LINK FENCE-4 FOOT (DESCRIPTION)	PER EACH

 SEE STANDARD DRAWING S-F-10B.

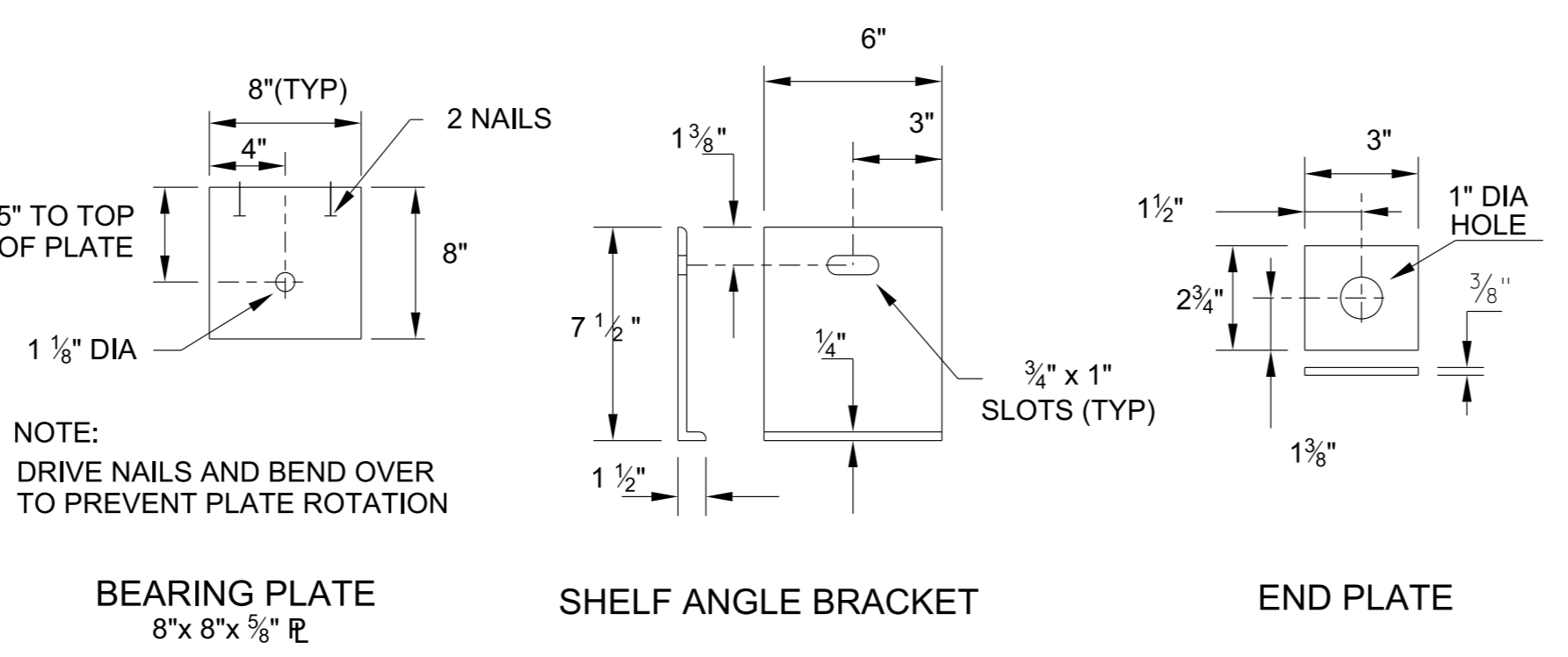
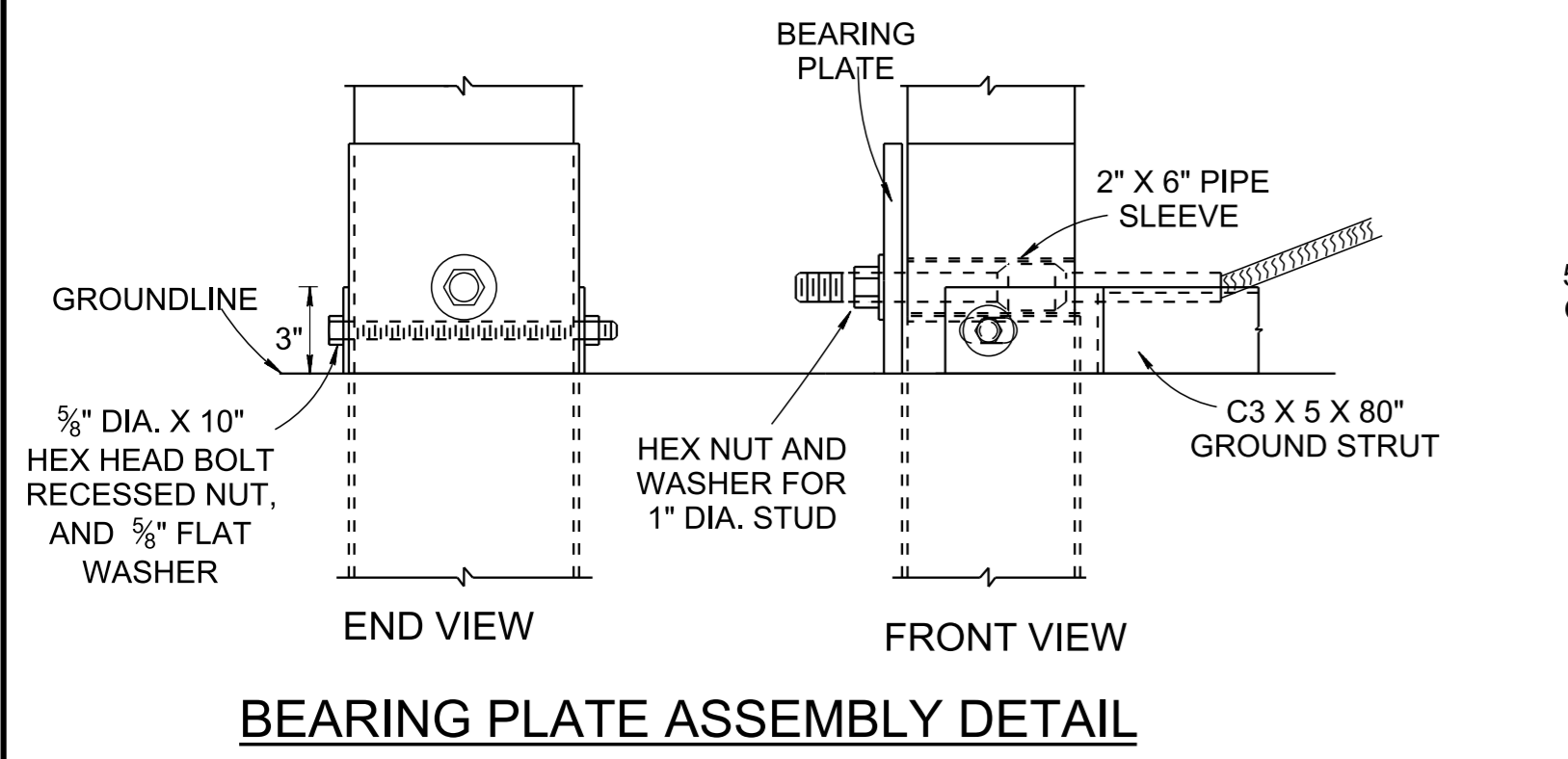
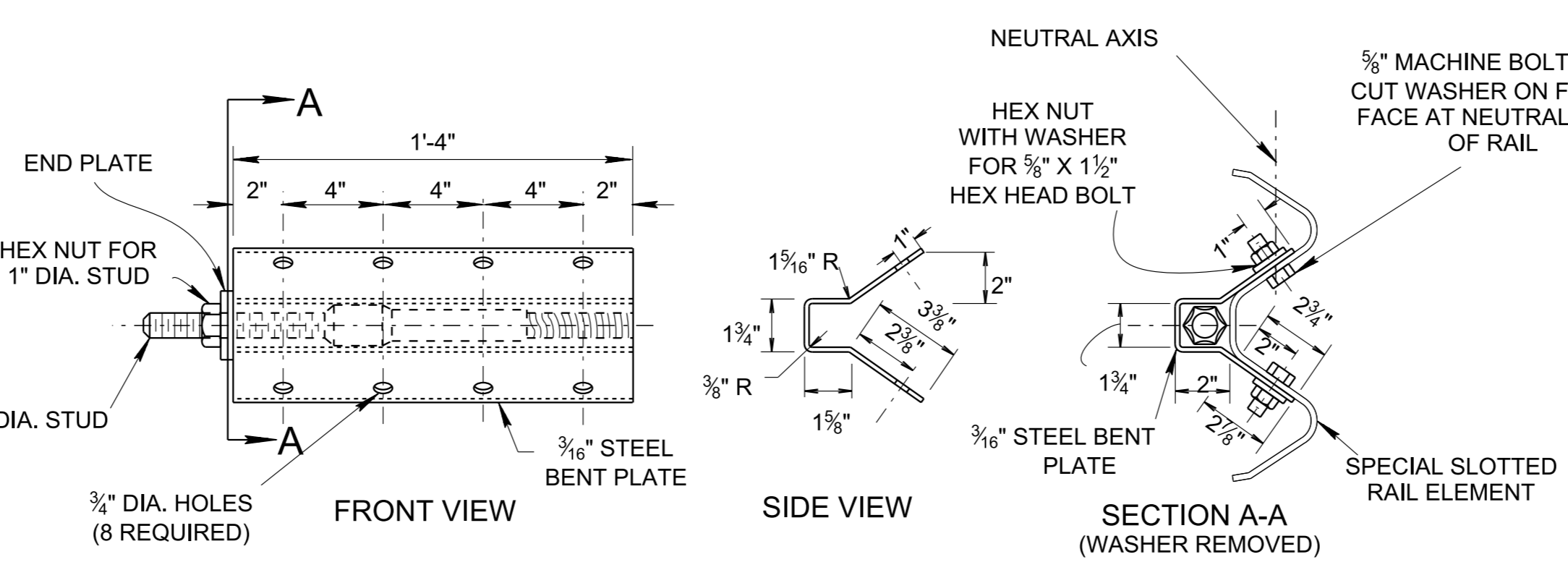
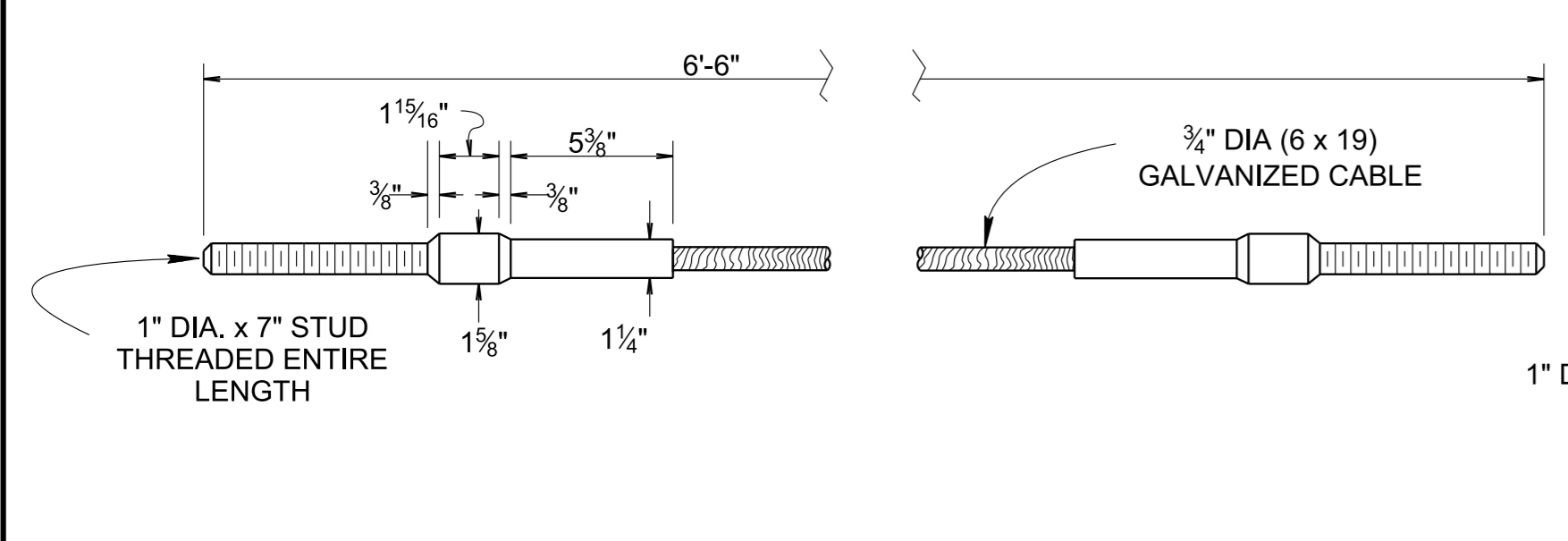
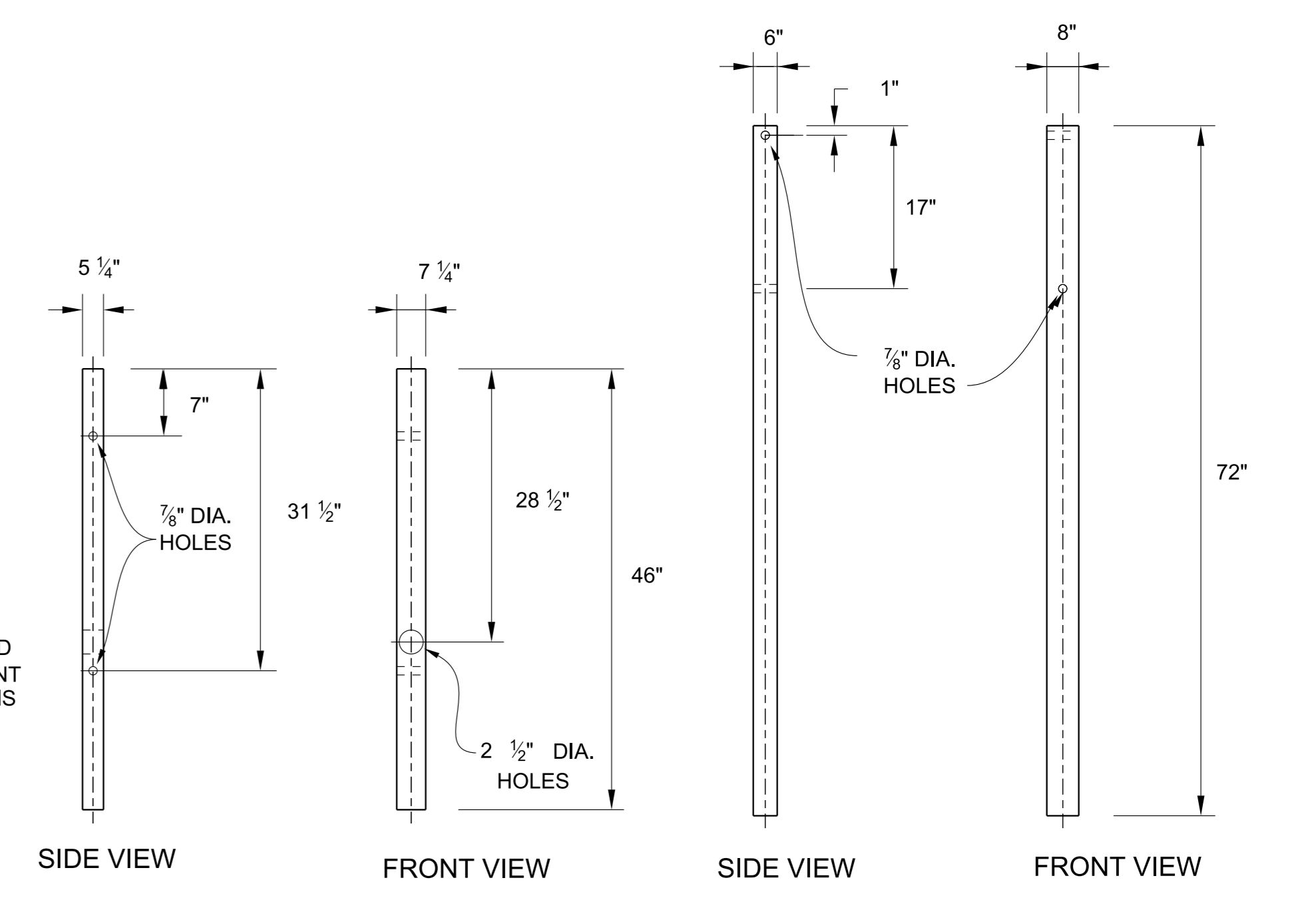
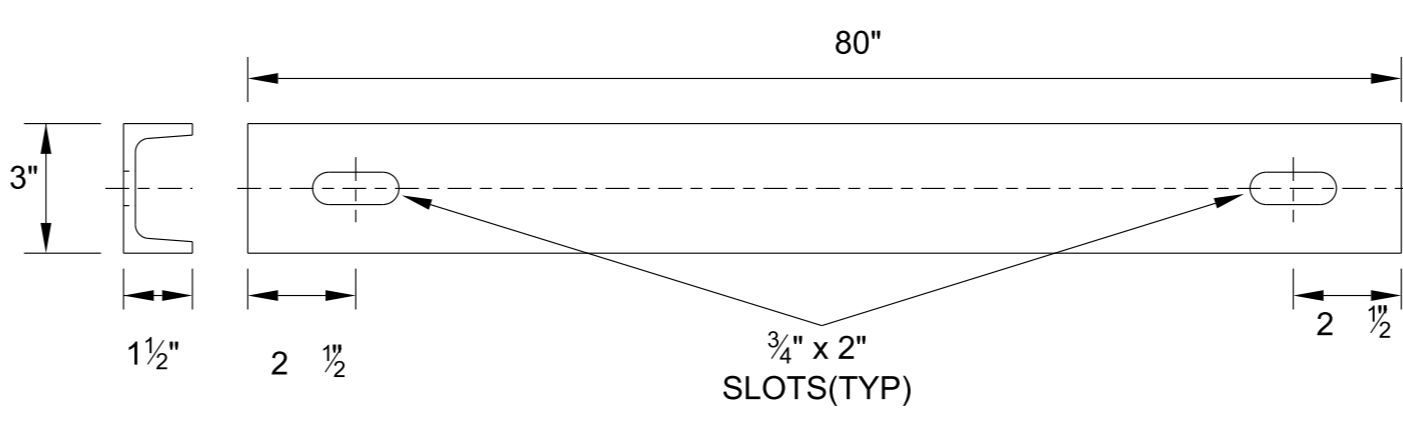
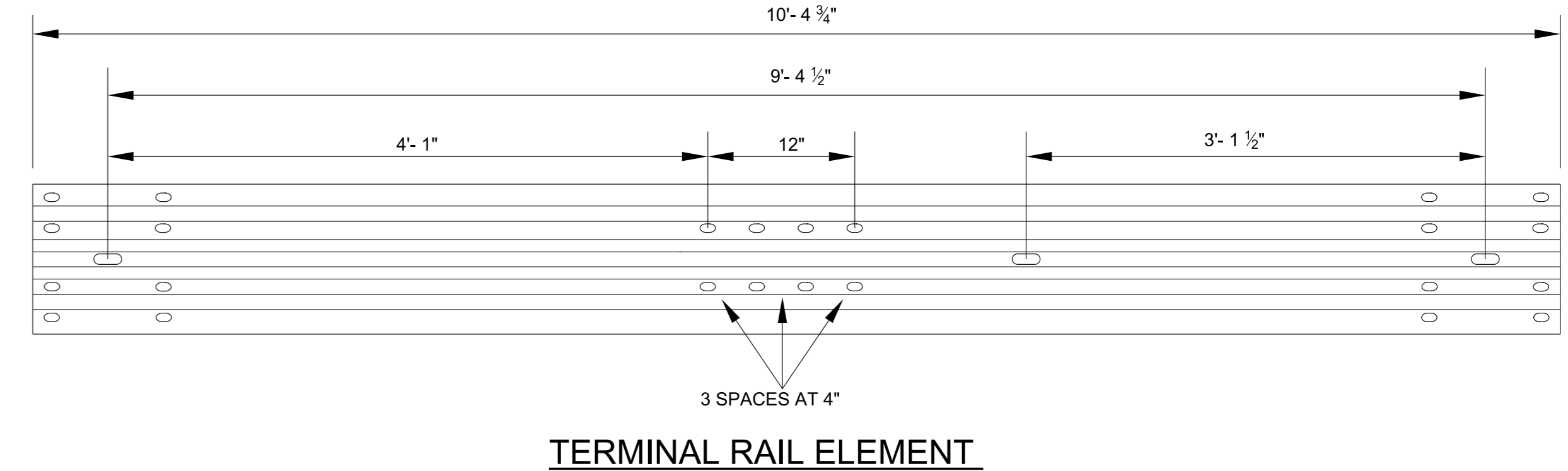
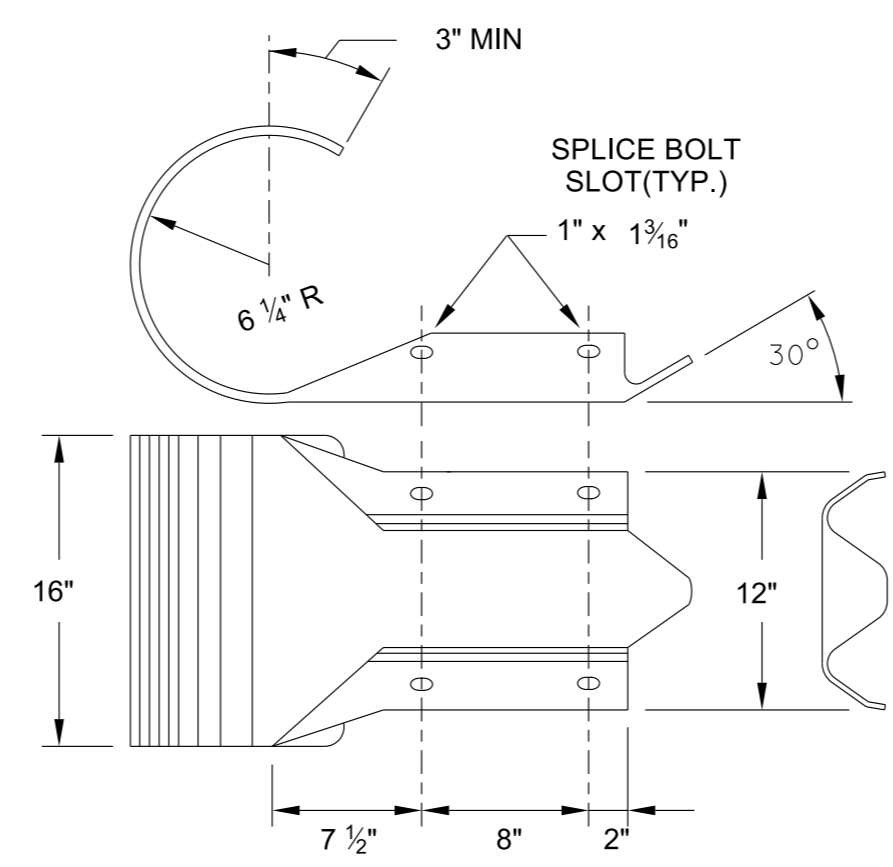
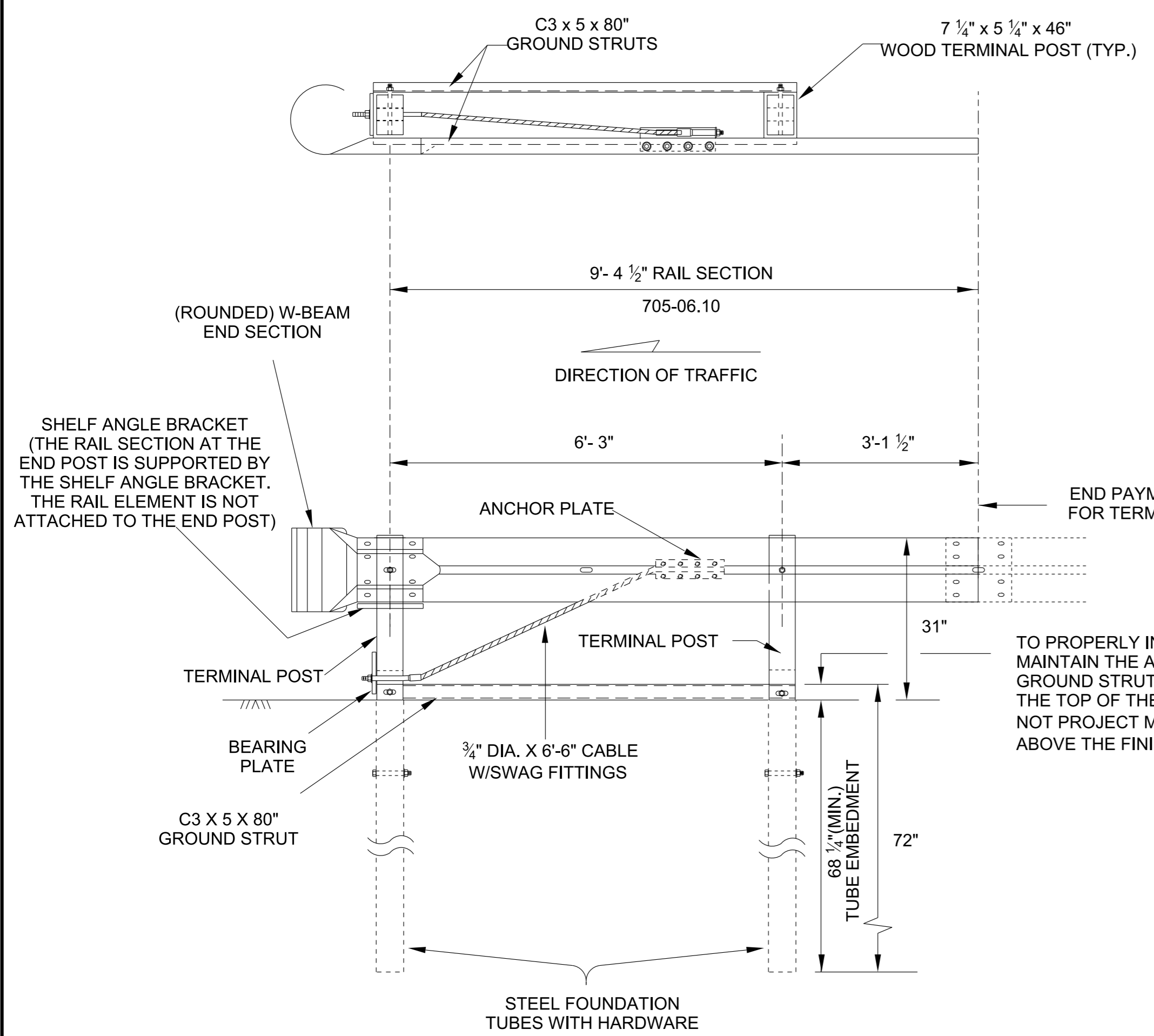
MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

STATE OF TENNESSEE  
DEPARTMENT OF  
TRANSPORTATION

BIKE/PEDESTRIAN  
SAFETY RAIL

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- REV. 3-28-17: CHANGED PAY ITEM NUMBER.
- REV. 7-5-17: REWORDED NOTE ON STRUT REQUIREMENTS IN THE DOWNSTREAM ANCHOR TERMINAL VIEW.
- REV. 5-1-15: REVISED NO.1 & 2 BREAK WAY POSTS WITH 5'-0" TUBE SLEEVE.
- REV. 5-27-16: REMOVED TYPE 21 AND IN-LINE FROM TITLE. UPDATED POST DETAIL, UPDATED STRUT DETAIL, ADDED RAIL DETAIL, AND UPDATED NOTES.



- GENERAL NOTES**
- (A) TYPE 13 GUARDRAIL TERMINAL SHALL ONLY BE INSTALLED AT TRAILING ENDS (DOWNSTREAM) WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC. SEE S-CZ-1.
  - (B) ALL HOLES IN WOOD POSTS ARE TO BE DRILLED BEFORE PRESERVATIVE TREATMENT IS APPLIED.
  - (C) ALL CUTTING, DRILLING, AND WELDING OF STEEL COMPONENTS SHALL BE DONE BEFORE GALVANIZING.
  - (D) THE FINISHED CABLE ASSEMBLY WILL NOT BE ACCEPTABLE UNLESS IT IS IN TENSION WITH NO SAG.
  - (E) OTHER ANCHOR CABLE ASSEMBLIES PROVIDING A MINIMUM BREAKING STRENGTH OF 40,000 POUNDS PER SQUARE INCH WILL BE ACCEPTABLE.
  - (F) TO BE PAID UNDER ITEM  
705-06.10 GR TERMINAL TRAILING END (TYPE 13) MASH TL3 PER EACH. (SEE S-PL-2)
  - (G) ALL HARDWARE SHALL CONFORM TO ASTM A307 UNLESS OTHERWISE SHOWN.
  - (H) DESIGN BASED ON AASHTO MASH TL-3, TTI REPORT 9-1002-6.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

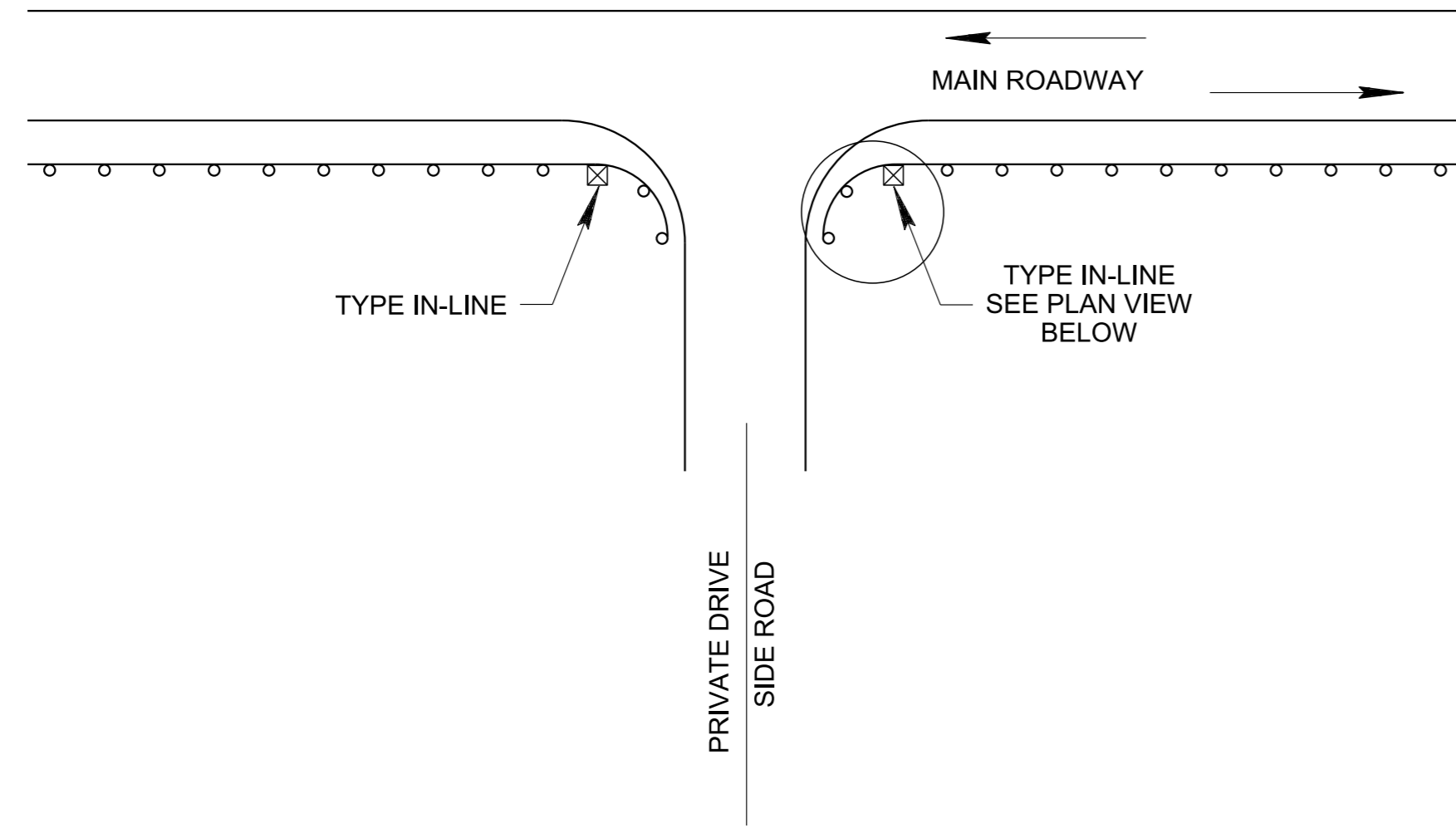
**STATE OF TENNESSEE  
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TRANSPORTATION**

**TYPE 13  
GUARDRAIL ANCHOR**

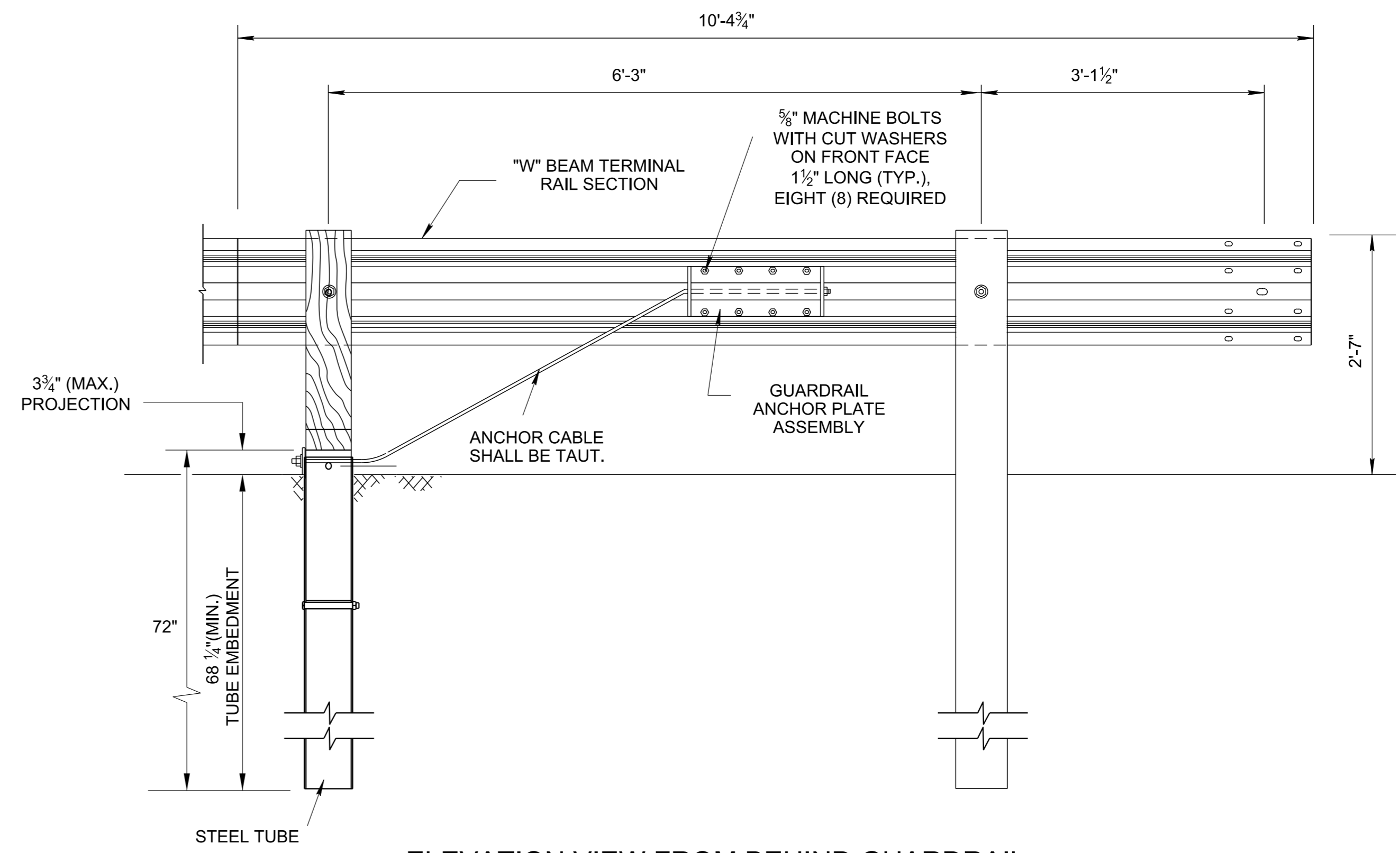
7-11-13 S-GRA-3



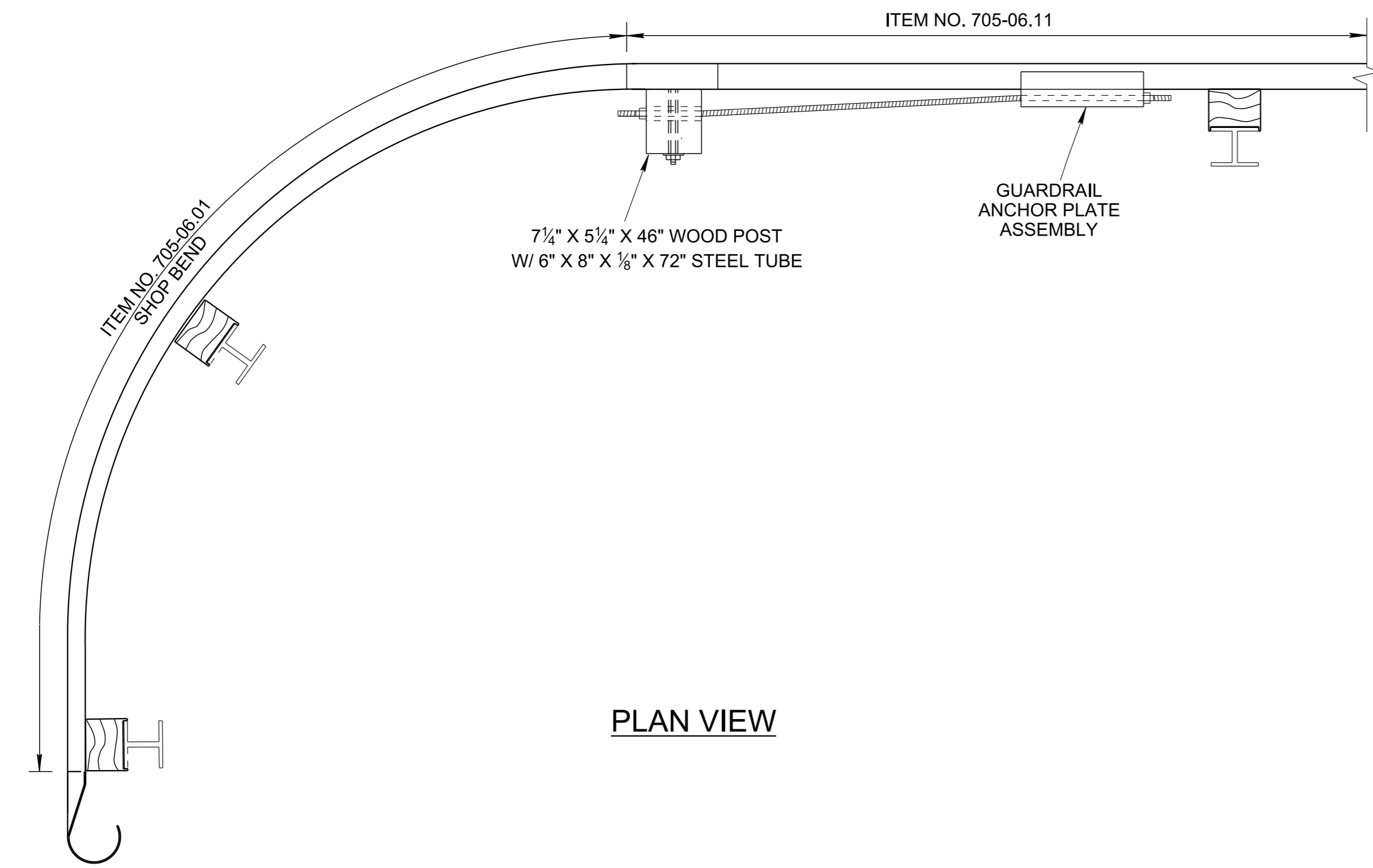
- REV. 5-27-16: REVISED POST SIZE IN PLAN VIEW. ADDED DIMENSIONS, REVISED DETAIL, REVISED NOTES.
- REV. 3-28-17: CHANGED PAY ITEM NUMBER.
- REV. 7-5-17: COMBINED THE TWO PLAN VIEWS. ADDED A DIMENSION TO THE ELEVATION VIEW.



**GUARDRAIL TERMINAL ANCHOR (TYPE IN-LINE) APPLICATION**



**ELEVATION VIEW FROM BEHIND GUARDRAIL**  
(SEE S-GRA-3 FOR HARDWARE DETAILS)



**PLAN VIEW**

**NOTE TO DESIGNER**

DO NOT USE ON NATIONAL HIGHWAY SYSTEM (NHS), USE S-PL-2 ON NHS  
DO NOT USE WITHOUT ALSO REFERENCING S-GRA-3 .

**GENERAL NOTES**

(A) THIS ANCHORAGE MAY ONLY BE USED ON THE TRAILING END OF A BARRIER WHICH IS NOT EXPOSED TO DIRECT VEHICULAR IMPACT OR IS OUTSIDE THE CLEAR ZONE (ONLY DIVIDED HIGHWAYS OR ROADS WITH ONE WAY TRAFFIC) USE S-PL-1 TO DETERMINE LENGTH OF NEED.

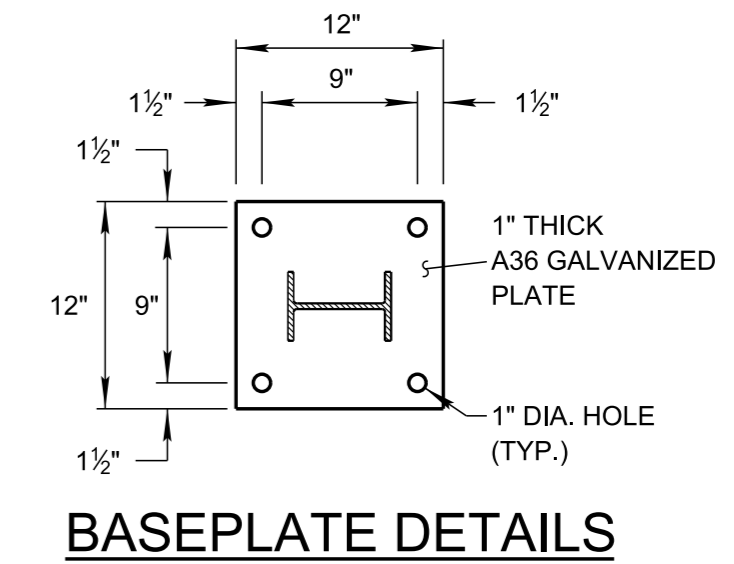
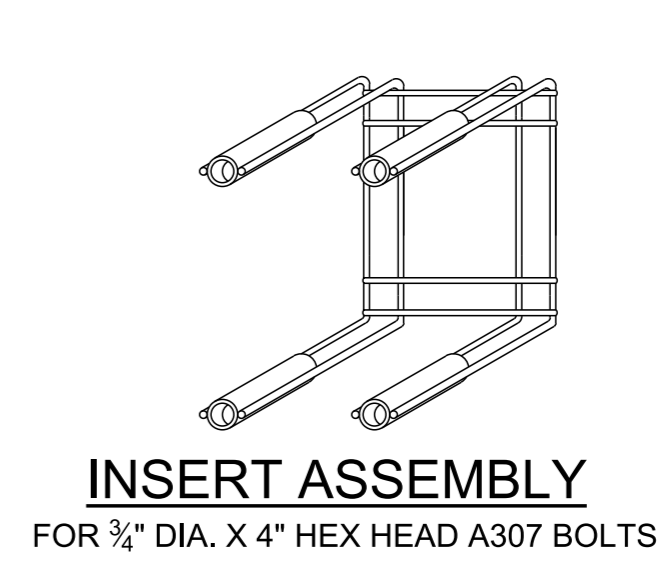
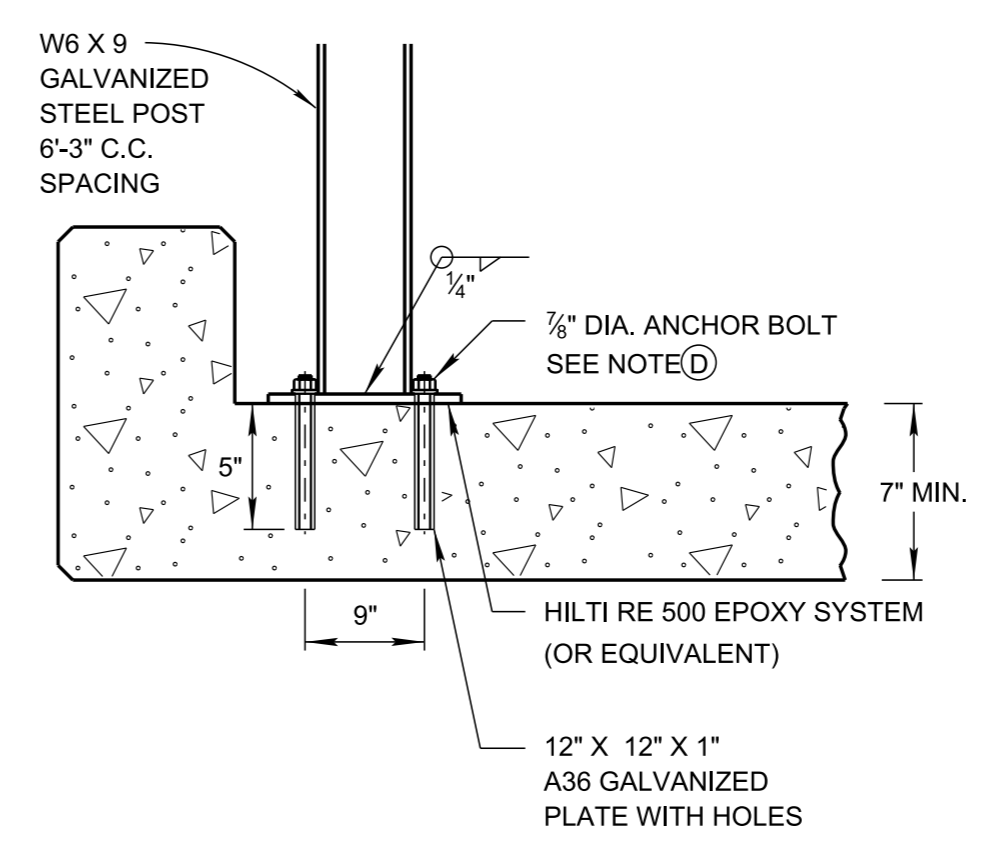
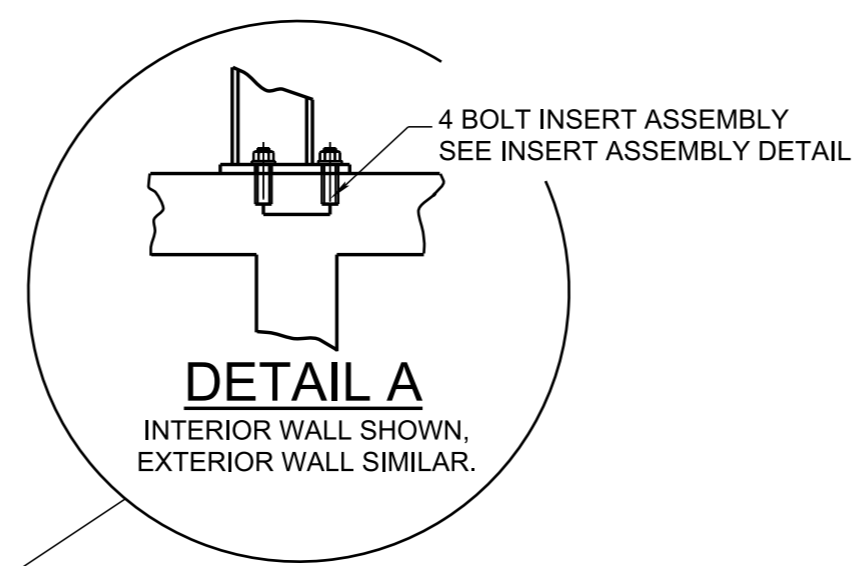
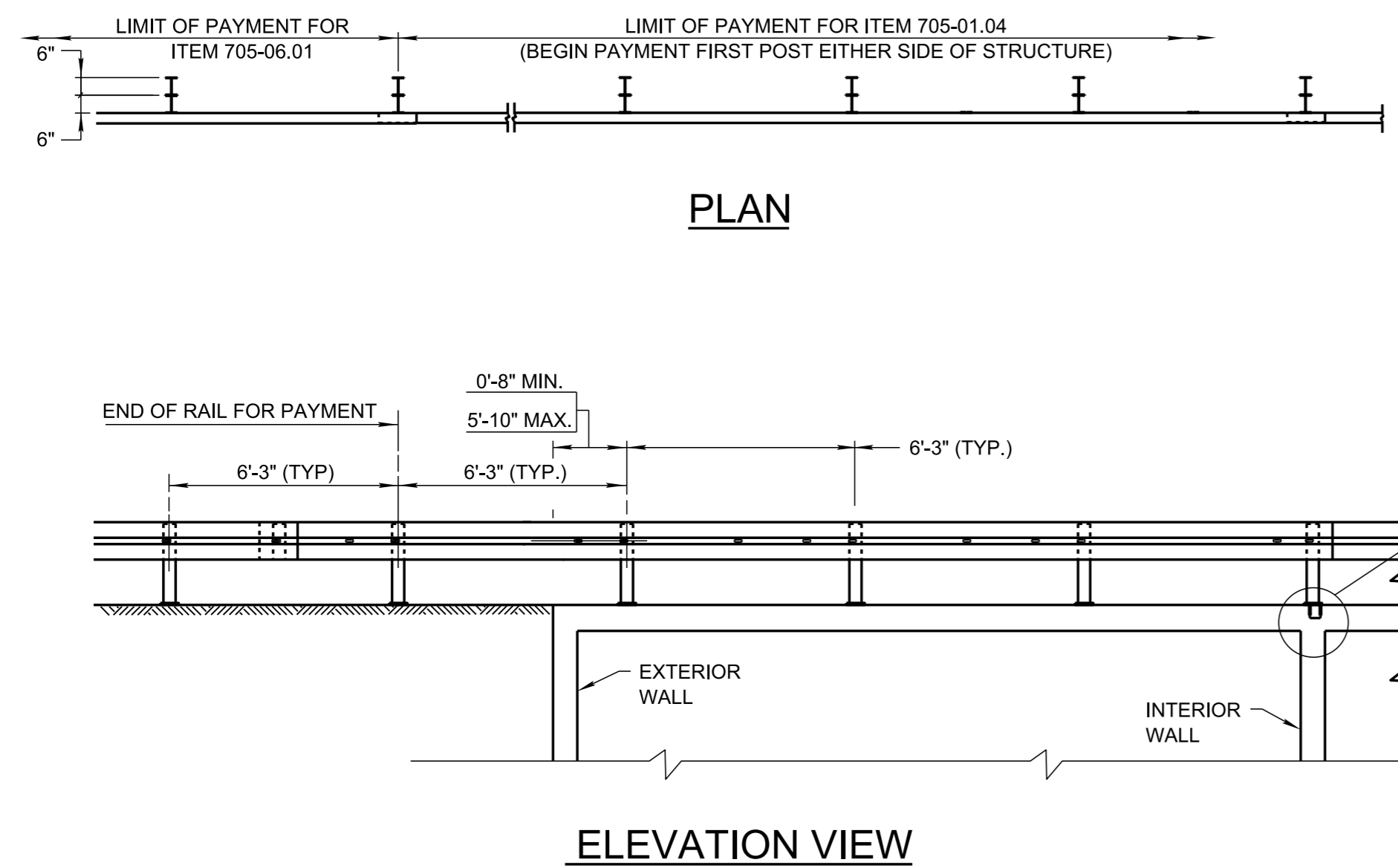
(B) IN-LINE GUARDRAIL TERMINAL TO BE PAID FOR UNDER ITEM NUMBER: PAY ITEM NO. 705-06.11 GR TERMINAL (IN-INLINE) MASH TL3 PER EACH COST TO INCLUDE WOOD POST, STEEL TUBE, ANCHOR CABLE, AND GUARDRAIL ANCHOR PLATE ASSEMBLY.

□ MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

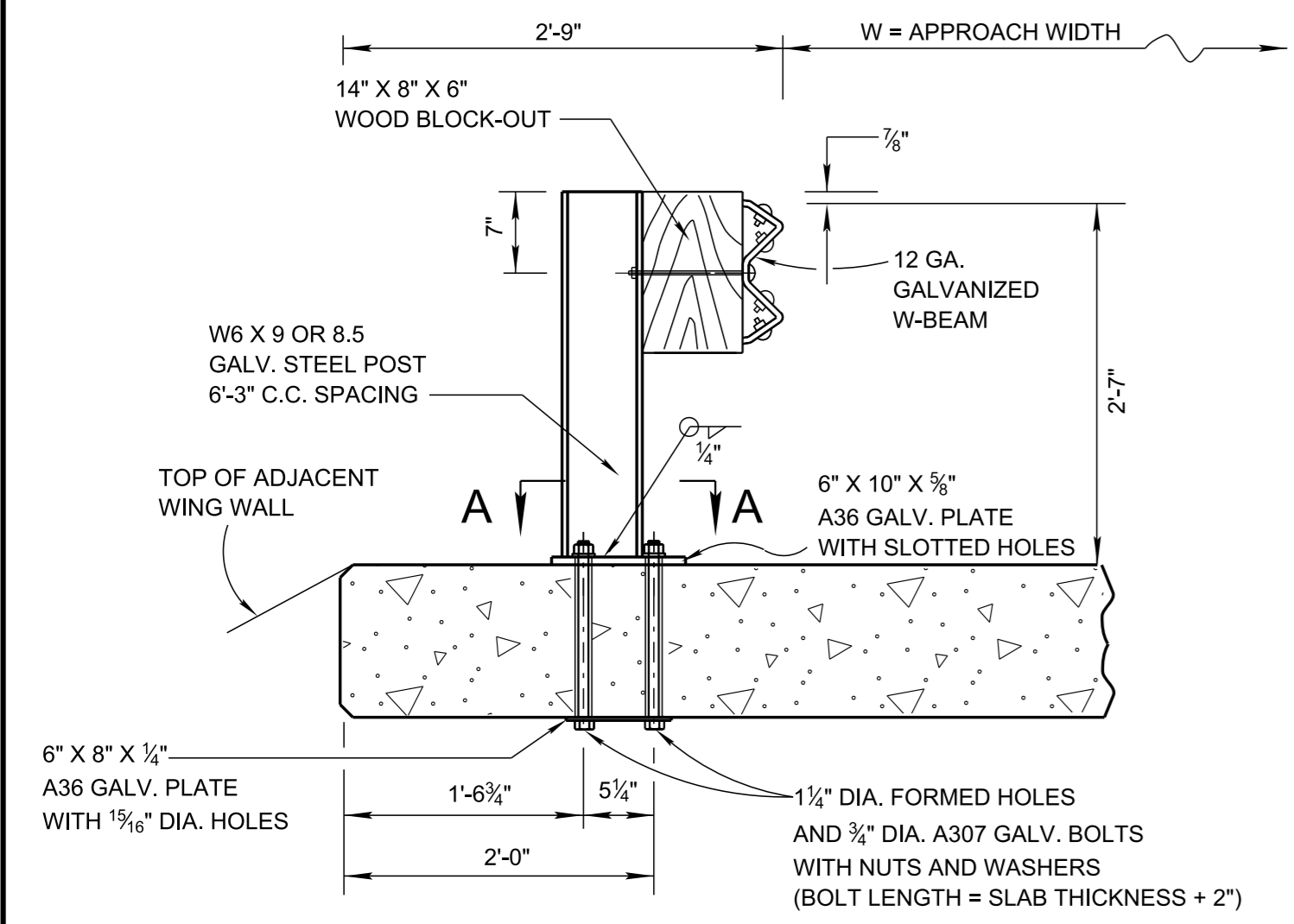
**STATE OF TENNESSEE  
DEPARTMENT OF  
TRANSPORTATION**

**IN-LINE  
GUARDRAIL  
ANCHOR**

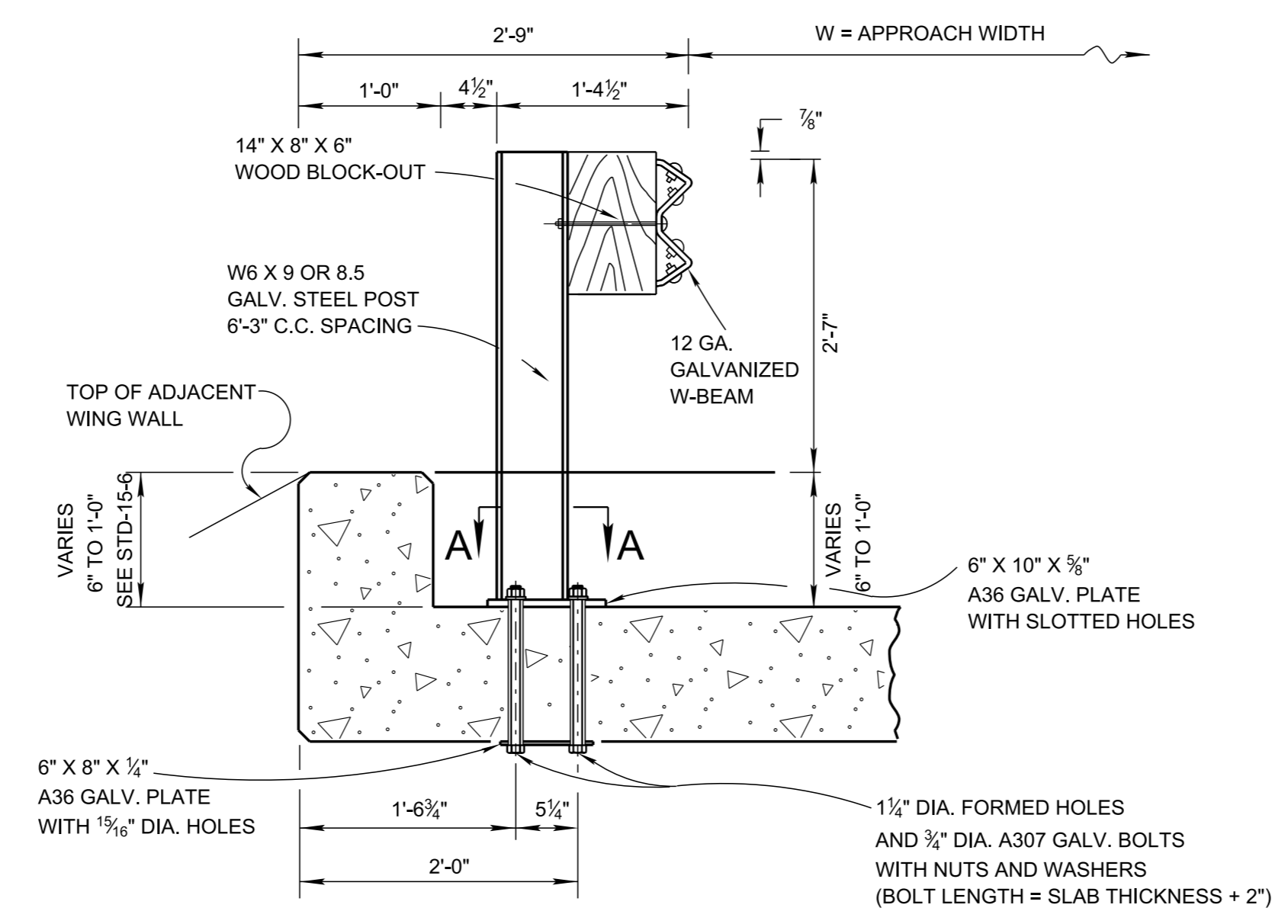




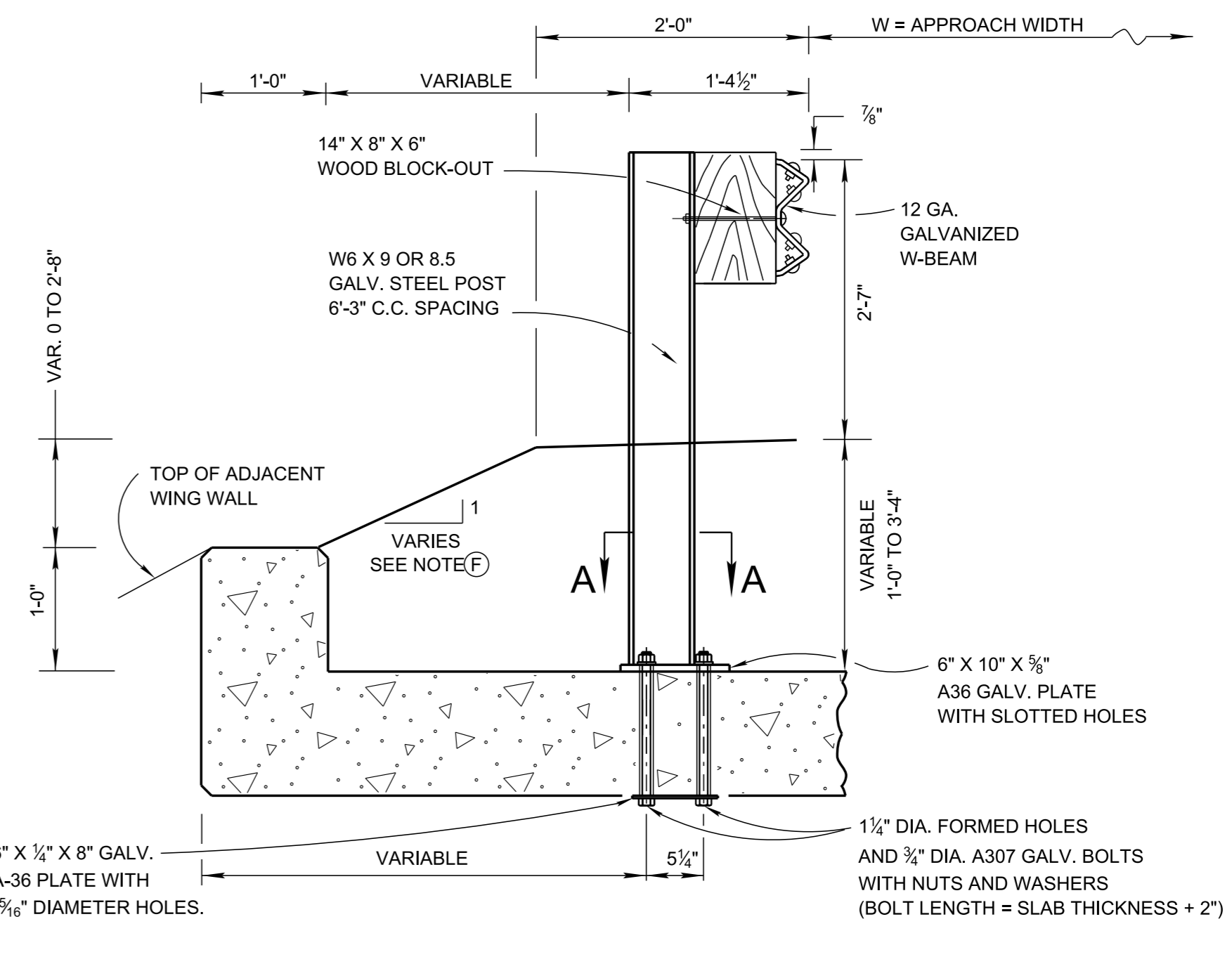
- REV. 5-25-16: CORRECTED WELD DETAIL.
- REV. 7-5-17: CORRECTED STD. DWG. NUMBERS ON GEN. NOTE (B). ADDED GENERAL NOTES (D), (E), AND (F). CHANGED PAY ITEM NUMBER IN DESIGN NOTE (1).



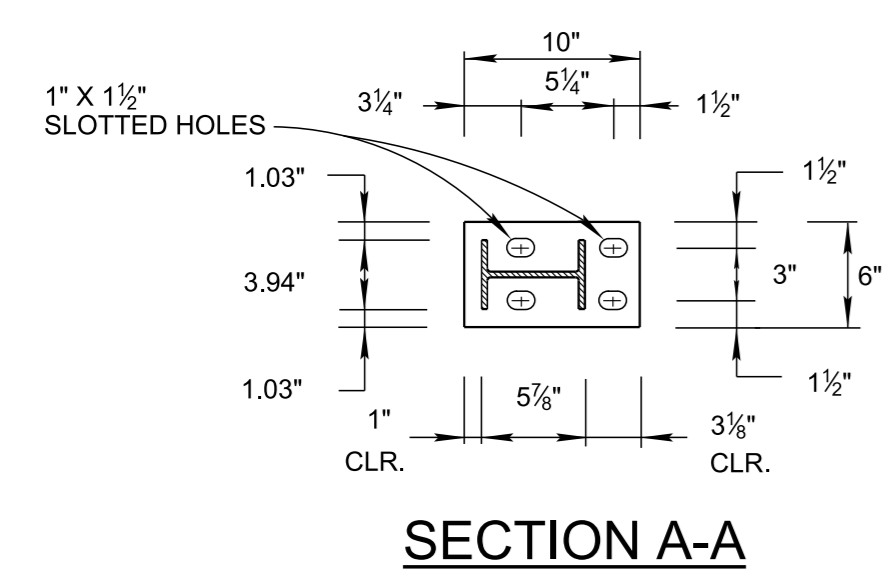
**DETAIL FOR CONCRETE DECK USED AS A RIDING SURFACE**



**DETAIL FOR CONCRETE DECK WITH 6" TO 1'-0" OF ROADWAY FILL COVER**



**DETAIL FOR CONCRETE DECK WITH 1'-0" TO 3'-4" OF ROADWAY FILL COVER**



**SECTION A-A**

- DESIGN NOTES**
- (1) WHEN DEPTH OF FILL AT FACE OF GUARDRAIL EXCEEDS 3'-4", USE ITEM NUMBER 705-06.01 AS SHOWN ON S-GR31-1.
  - (2) DO NOT USE ON PRECAST CONCRETE STRUCTURE WITHOUT PRIOR APPROVAL FROM MANUFACTURERS.
  - (3) THIS RAIL SYSTEM HAS BEEN TESTED AND PASSED BY THE CRITERIA SET FORTH BY AASHTO MASH TEST LEVEL 3, AS DOCUMENTED IN ROADSIDE SAFETY RESEARCH PROGRAM POOLED FUND STUDY NO. TPF-5(114) DATED NOV. 11, 2011.
  - (4) ANY REINFORCING STEEL THAT INTERFERES WITH THE 1 1/4" DIAMETER FORMED HOLES SHALL BE MOVED HORIZONTALLY TO PROVIDE A 1" MINIMUM CLEARANCE TO THE HOLE.

- GENERAL NOTES**
- (A) IN ORDER TO EXPEDITE INSTALLATION, GUARDRAIL POST MAY BE FIELD CUT TO ADJUST THE LENGTH REQUIRED. ALL CUT SURFACES MUST RECEIVE GALVANIZE COATING.
  - (B) FOR DIMENSIONS AND DETAILS NOT SHOWN SEE STANDARD STRUCTURES DRAWING NOS. STD-17-7 AND STD-17-8, AND STANDARD ROADWAY DRAWING S-GR31-1.
  - (C) TO BE PAID FOR UNDER ITEM NO: 705-01.04 METAL BEAM GUARD FENCE PER LF.
  - (D) ANCHOR BOLTS TO BE 3/8" DIA., ASTM A193, GRADE B7. NUTS AND WASHERS TO BE GALVANIZED.
  - (E) INSERT ASSEMBLY TO BE USED FOR CONNECTION OF POSTS OVER WALLS ONLY AND MAY NOT BE USED AS A SUBSTITUTE FOR PLATE ASSEMBLY ELSEWHERE.
  - (F) SLOPE TO MATCH ADJOINING ROADWAY SIDE SLOPE.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

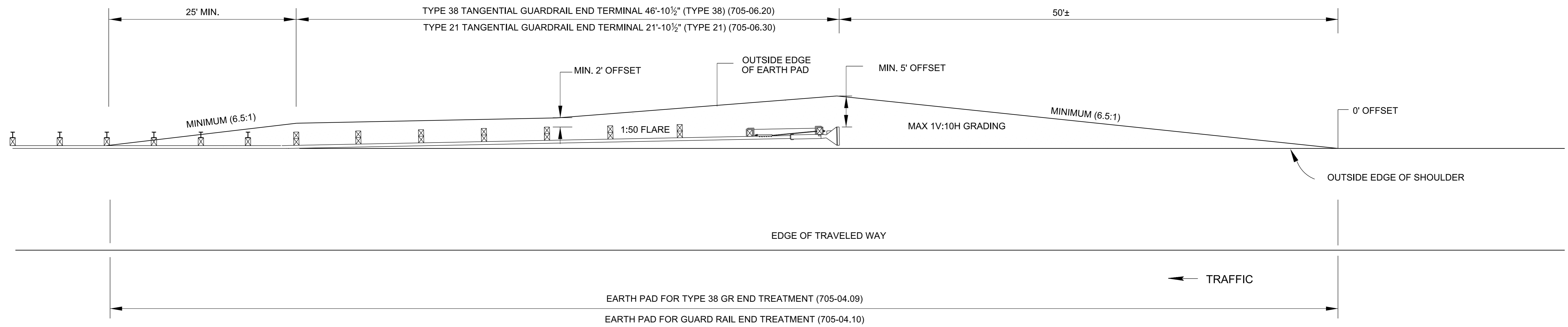
**STATE OF TENNESSEE  
DEPARTMENT OF  
TRANSPORTATION**

**SPECIAL CASE:  
GUARDRAIL  
ATTACHMENT  
TO CONCRETE  
DECKS**

7-11-13      S-GRS-2

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- REV. 5-26-16: CORRECTED PREFERRED TAPER RATE.
- REV. 7-5-16: UPDATED TITLE AND GENERAL NOTES TO INCLUDE TYPE 21 TERMINAL.
- REV. 7-5-17: ADDED ITEM NUMBERS TO THE PLAN VIEW.



**PLAN VIEW OF EARTH PAD CONSTRUCTION**

**GENERAL NOTES**

- (A) REFER TO RD01-S-SERIES FOR ROADSIDE SLOPE DEVELOPMENT AND ROADSIDE DITCH DETAILS.
- (B) TYPE 21 TERMINAL HAS 3 LESS SPANS THAN TYPE 38 TERMINAL. SEE S-GRT-2 FOR TYPE 38 TERMINAL DETAILS. SEE S-GRT-3 FOR TYPE 21 TERMINAL DETAILS. APPLICABLE FOR TANGENT INSTALLATIONS ONLY.
- (C) THE DESIGNER SHALL INCORPORATE AN EARTH PAD IN CONJUNCTION WITH ALL TYPE 38 AND TYPE 21 GUARDRAIL TERMINALS IN THE RIGHT-OF-WAY AND CONSTRUCTION PLANS AS WELL AS THE ROADWAY CROSS-SECTION SHEETS.
- (D) THE CONTRACTOR SHALL CONSTRUCT AN EARTH PAD AS PART OF THE INITIAL GRADING OPERATIONS AS SHOWN ON THIS STANDARD DRAWING AFTER FIELD VERIFICATION OF HAZARD LOCATION AND ENGINEER'S APPROVAL. THE OFFSETS SHOWN INDICATE THE MINIMUM OFFSETS REQUIRED BEHIND THE GUARDRAIL END TERMINAL, ACTUAL OFFSETS FROM THE OUTSIDE SHOULDER FOR THE GRADED PAD WILL DEPEND ON THE APPROVED TYPE 38 OR TYPE 21 GUARDRAIL END TERMINAL WHICH IS UTILIZED IN THE LOCATION.
- (E) ON ALL NEW GRADE AND DRAIN PROJECTS, THE EARTH PAD SHALL BE BUILT AS SHOWN ON THIS STANDARD DRAWING WITHOUT EXCEPTION AND PAID UNDER ROADWAY GRADING. RESURFACING, MAINTENANCE OR BRIDGE REPAIR PROJECTS MAY SUBSTITUTE RETROFIT STANDARD S-GRT-2R.
- (F) REFER TO S-PL-1 FOR LENGTH OF NEED AND CLEAR ZONE REQUIREMENTS.
- (G) ON PROJECTS OF LIMITED SCOPE OR WITH NO ADDITIONAL ROADWAY GRADING, THE EARTH PAD SHALL BE PAID UNDER THE ITEM NUMBER:

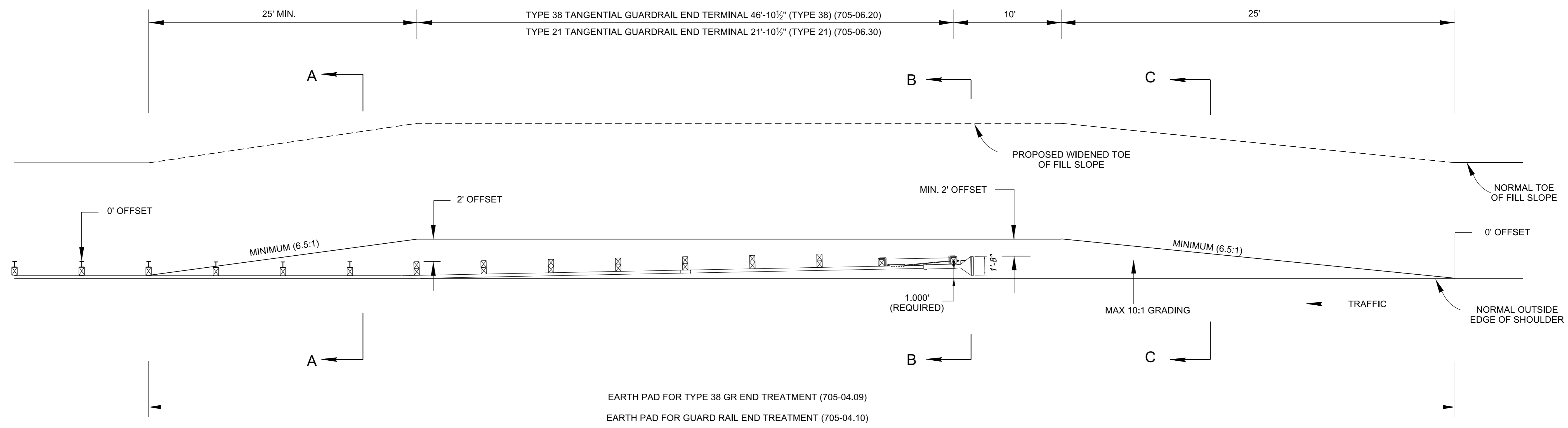
705-04.09 EARTH PAD FOR TYPE 38 GR END TREATMENT PER EACH  
 705-04.10 EARTH PAD FOR GUARD RAIL END TREATMENT PER EACH

□ MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

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 DEPARTMENT OF  
 TRANSPORTATION**

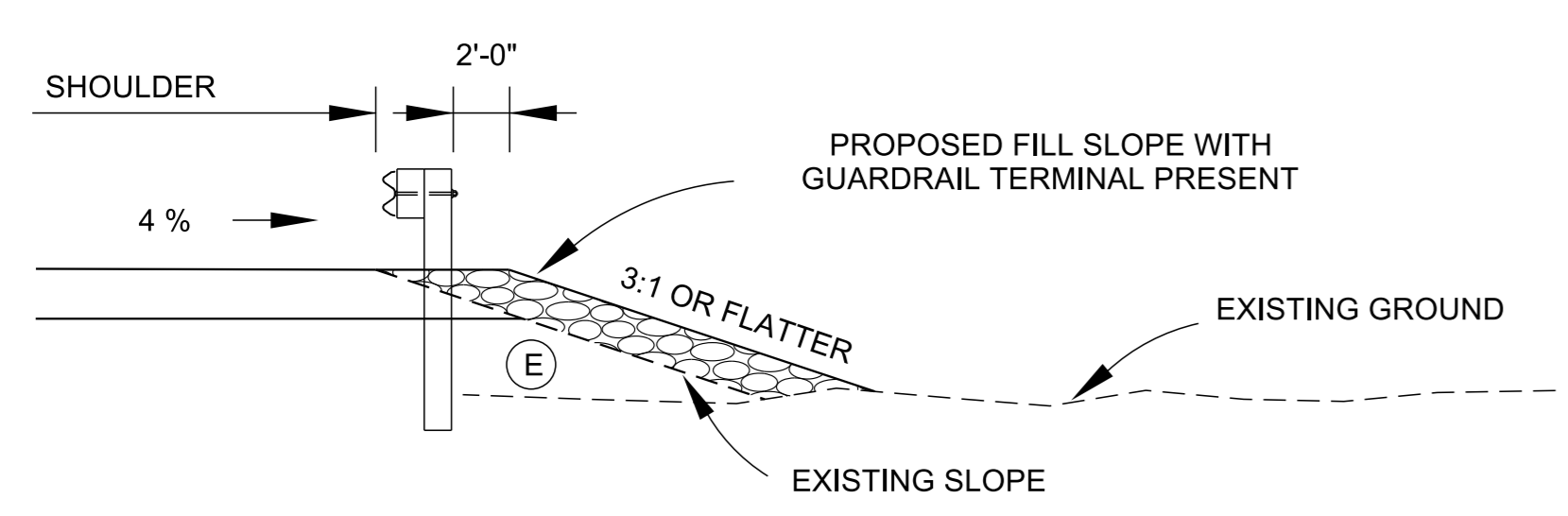
**EARTH PAD  
 FOR  
 TYPE 38 AND TYPE 21  
 TERMINALS**

REV. 10-10-16: UPDATED TITLE AND GENERAL NOTES TO INCLUDE TYPE 21 TERMINAL.  
 REV. 7-5-17: ADDED GENERAL NOTE (F) ADDED DIMENSIONS FOR THE TYPE 21 IN THE PLAN VIEW.

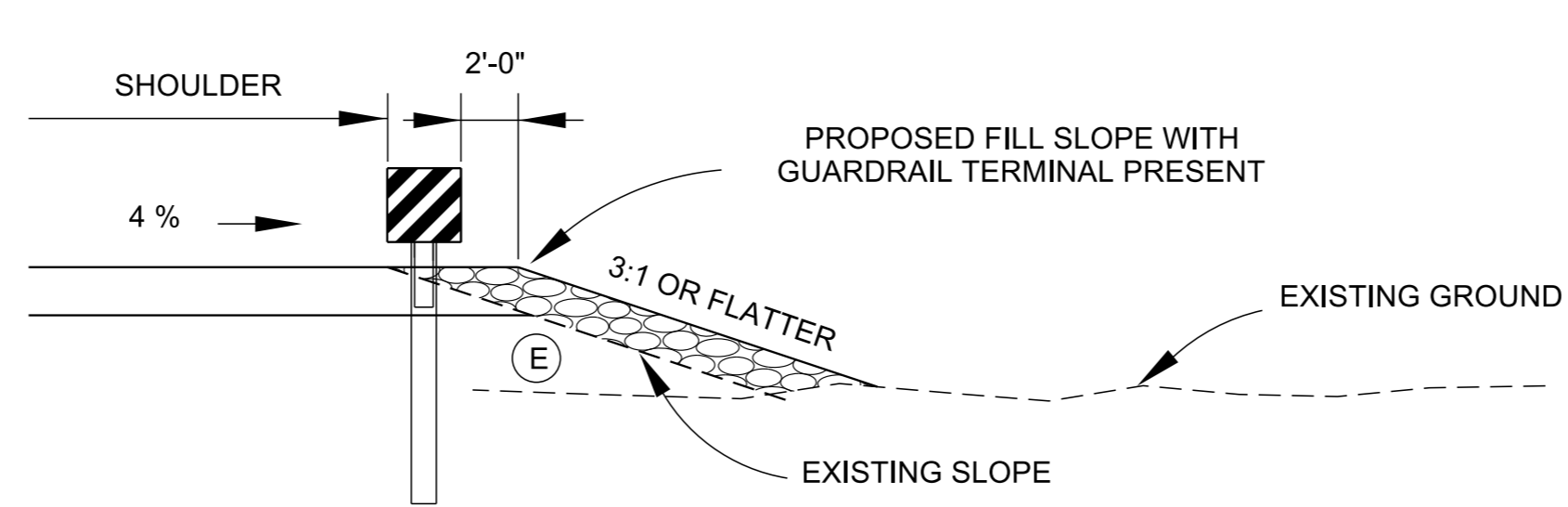


**PLAN VIEW OF PROPOSED CONSTRUCTION OF EARTH PAD FOR TYPE 38 AND TYPE 21 GUARDRAIL TERMINALS**

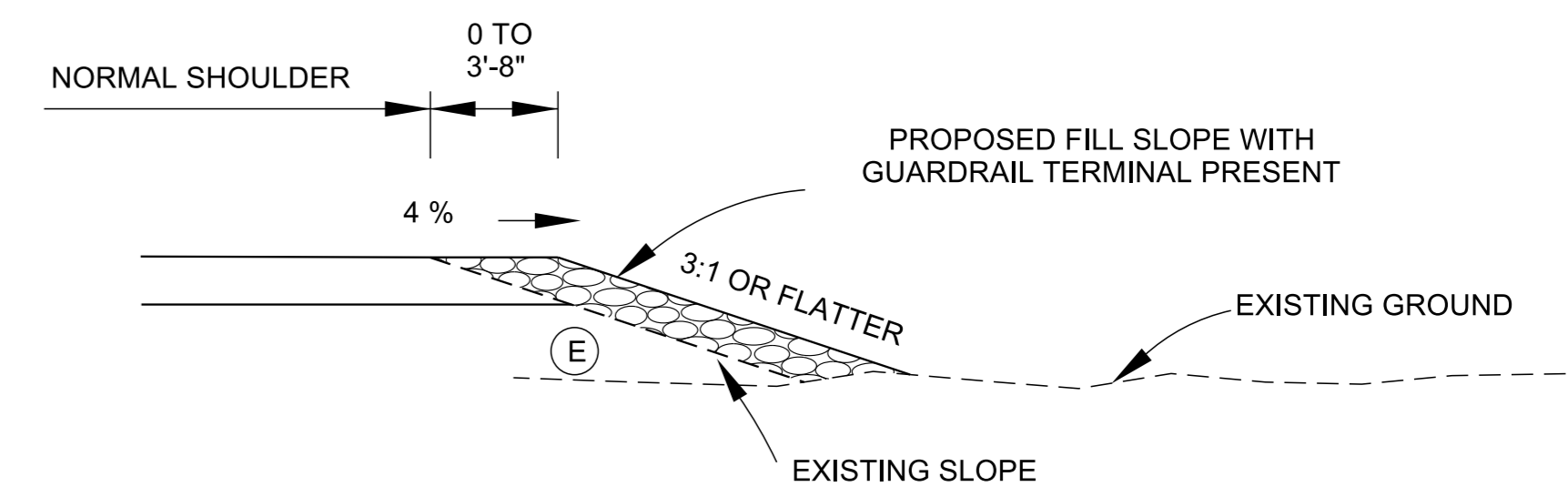
ALL OFFSET DISTANCES TAKEN FROM OUTSIDE EDGE OF SHOULDER



SECTION A-A



SECTION B-B



SECTION C-C

**NOTE TO DESIGNER**  
 THIS STANDARD DRAWING IS AN ALTERNATE TO THE PREFERRED STANDARD DRAWING S-GRT-2P TO BE USED ON MAINTENANCE, RESURFACING AND BRIDGE REPAIR PROJECTS.

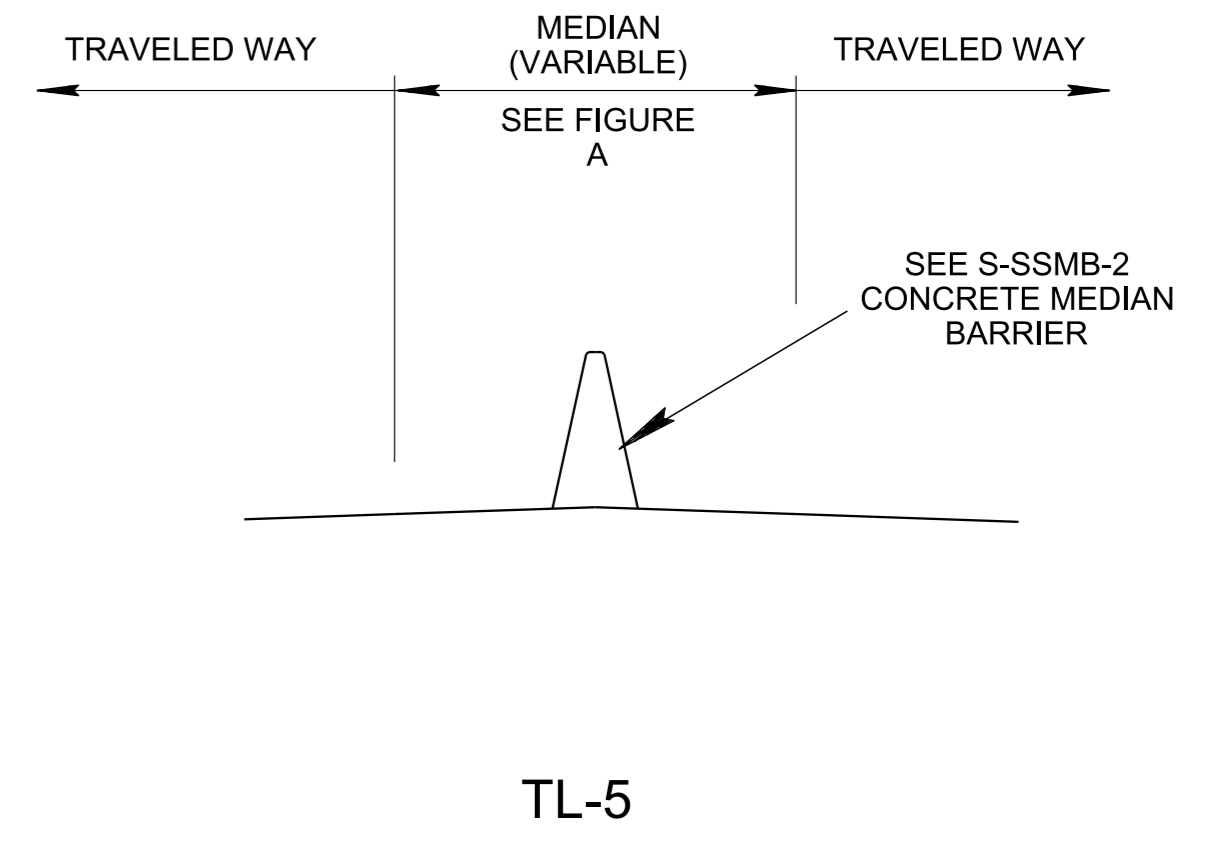
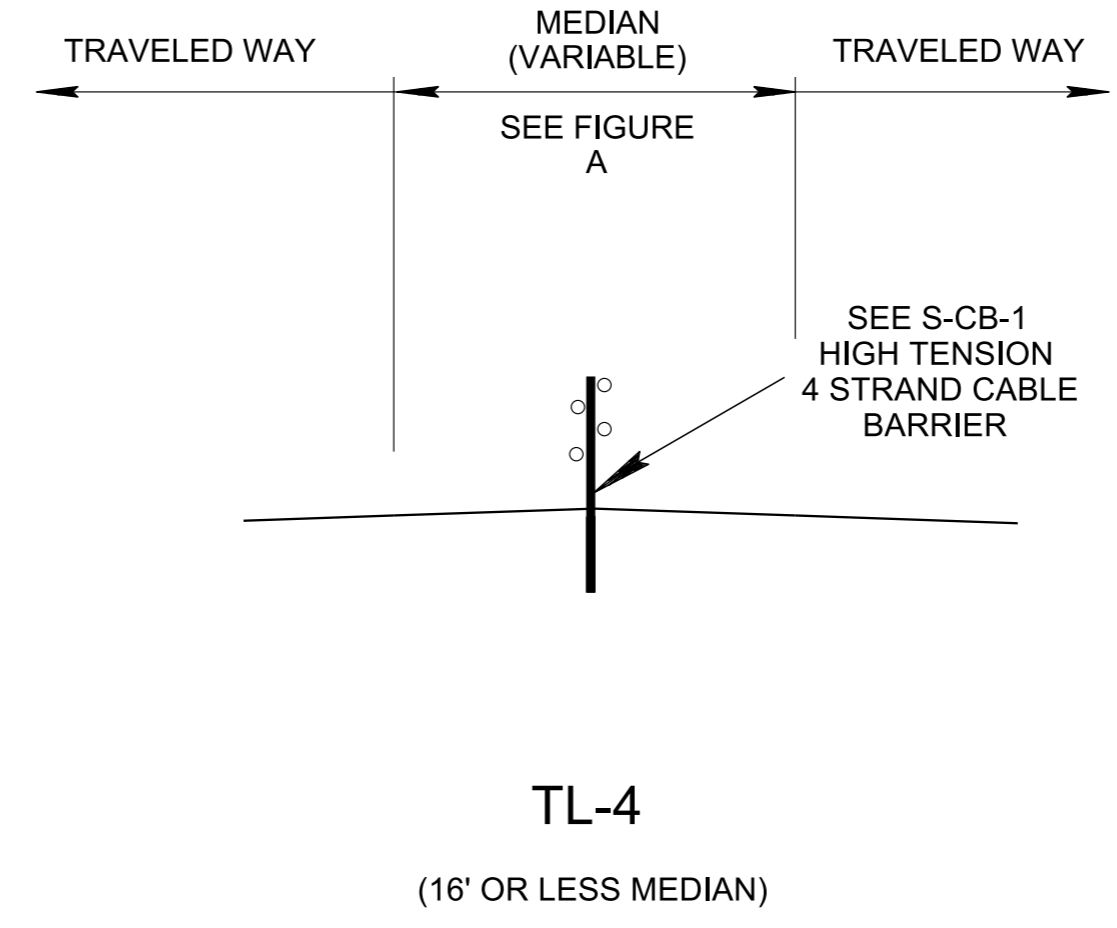
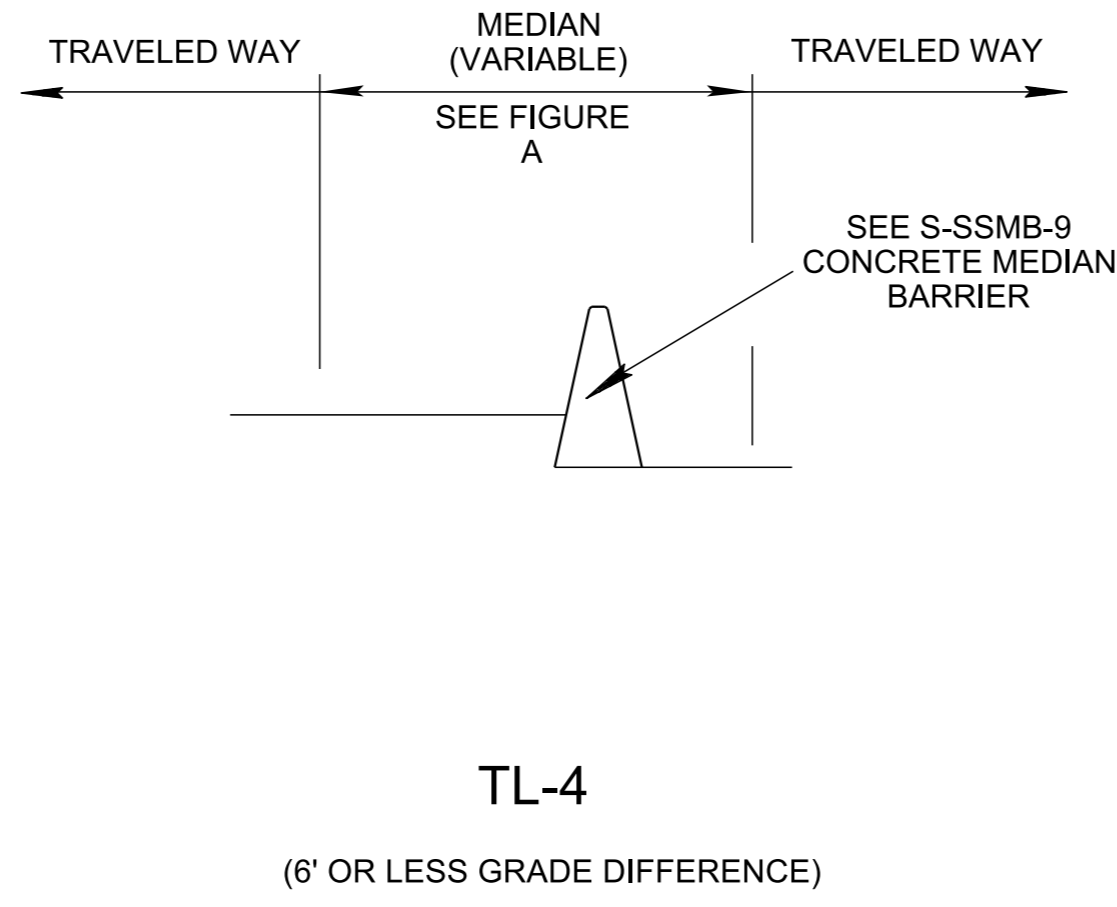
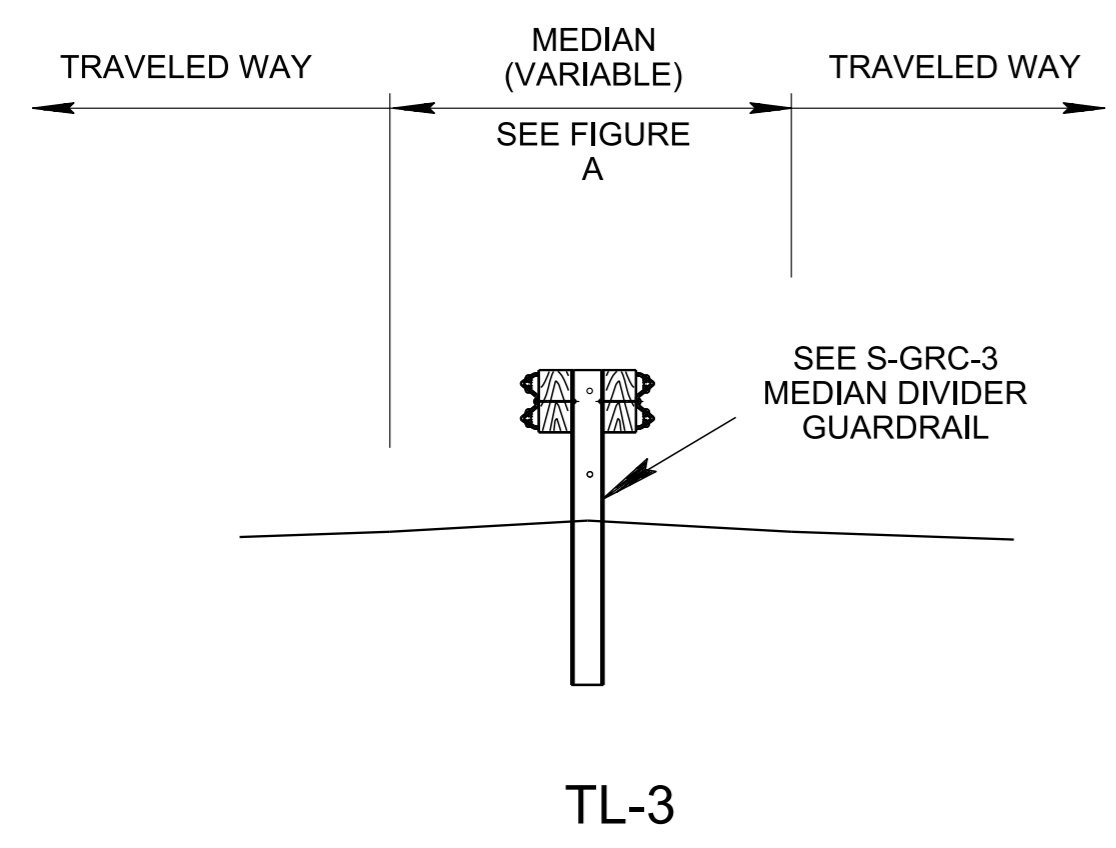
**GENERAL NOTES**

- (A) THIS STANDARD DRAWING MAY BE USED WHEN RIGHT-OF-WAY OR OTHER LIMITATIONS PROHIBIT THE USE OF S-GRT-2P.
- (B) EARTH PAD FOR TYPE 38 TERMINAL IS SHOWN. TYPE 21 TERMINAL HAS 3 LESS SPANS THAN TYPE 38 TERMINAL. SEE S-GRT-2 FOR TYPE 38 TERMINAL DETAILS. SEE S-GRT-3 FOR TYPE 21 TERMINAL DETAILS.
- (C) THE FORESLOPE MUST BE A 3:1 OR FLATTER. WHEN THE SLOPE IS STEEPER THAN 3:1 OR DRAINAGE DITCHES EXIST THAT DO NOT ALLOW THE USE OF THIS PAD DETAIL, THE GUARDRAIL MAY BE EXTENDED BEYOND THE MINIMUM LENGTH OF NEED AS SHOWN ON S-PL-1.
- (D) REFER TO S-PL-1 FOR LENGTH OF NEED REQUIREMENTS AND CLEAR AREAS AT GUARDRAIL TERMINALS.
- (E) EARTH PAD SHALL BE CONSTRUCTED OF AGGREGATE MEETING THE REQUIREMENTS OF STANDARD SPECIFICATION 903.05. THE AGGREGATE SHALL BE PLACED IN LAYERS AND COMPACTED.
- (F) PAYMENT:  
 705-04.09 EARTH PAD FOR TYPE 38 GR END TREATMENT PER EACH  
 705-04.10 EARTH PAD FOR GUARD RAIL END TREATMENT PER EACH (FOR TYPE 21)

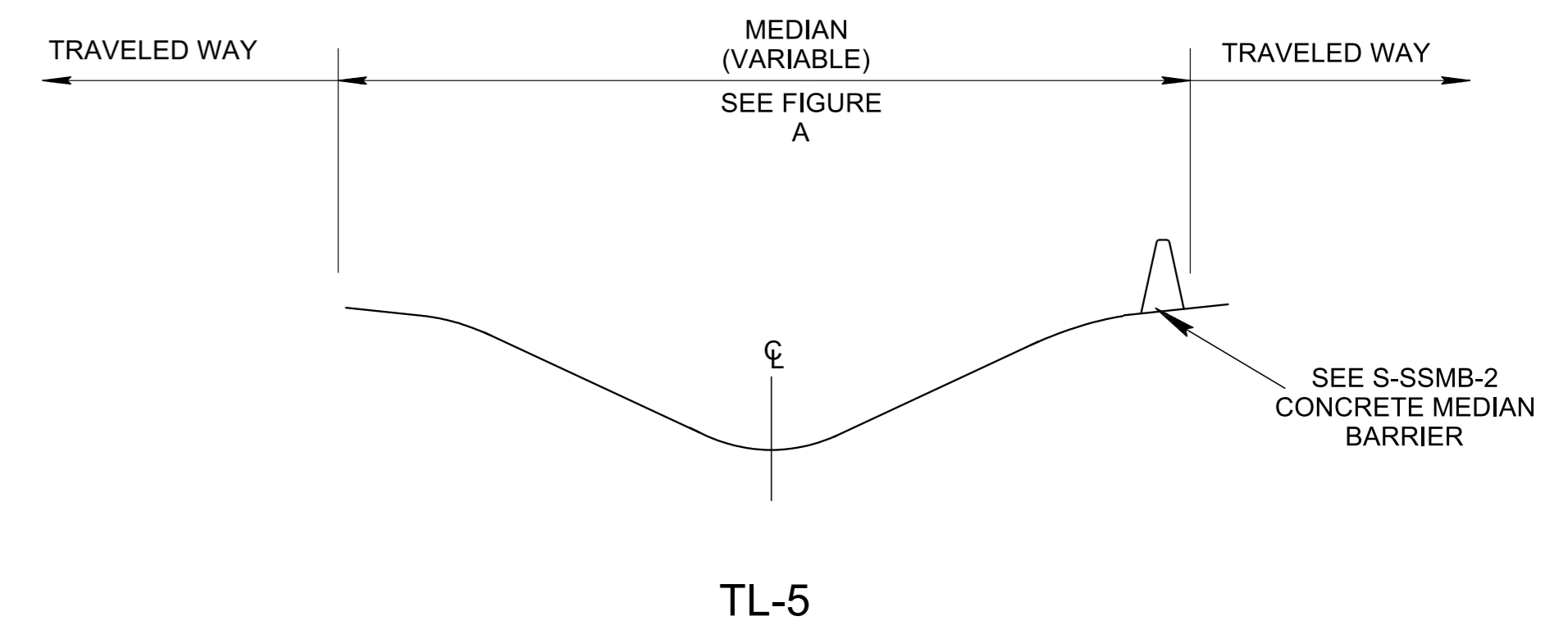
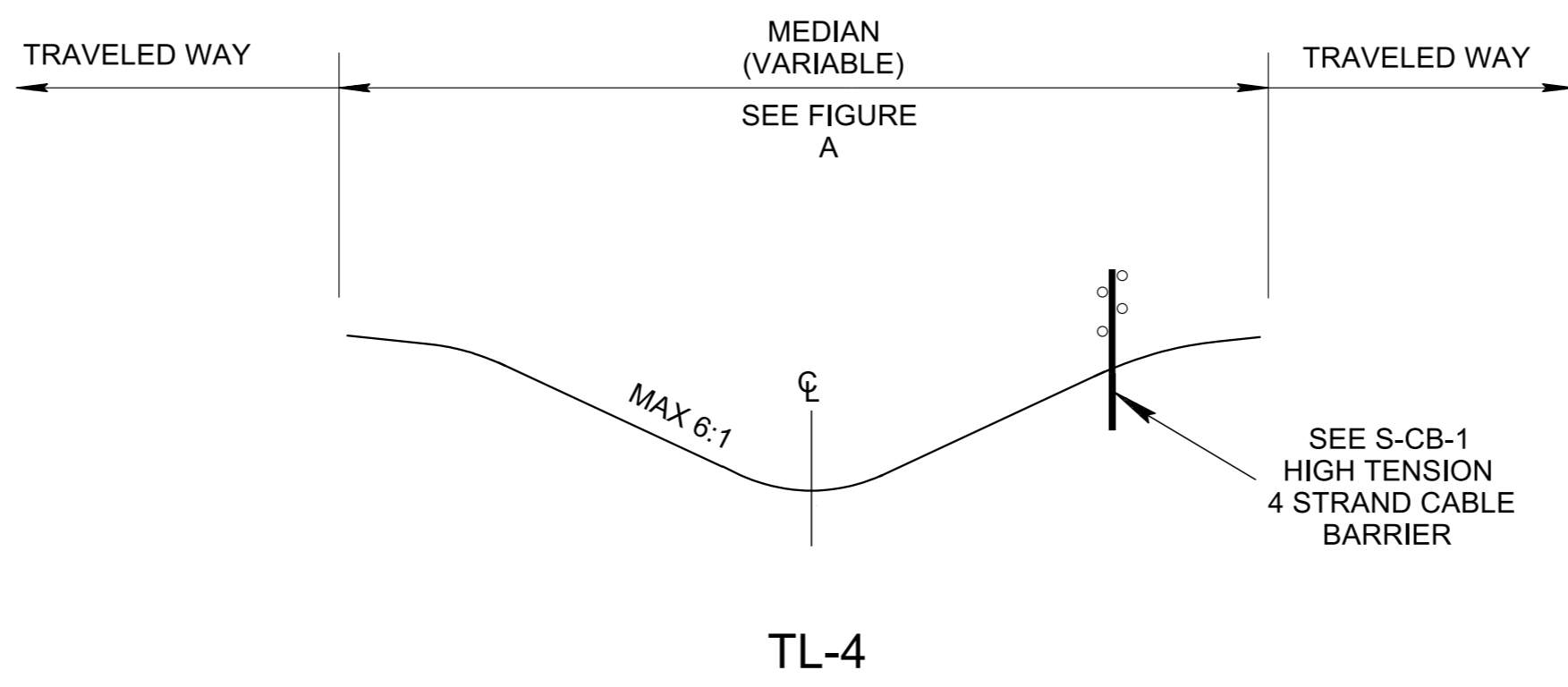
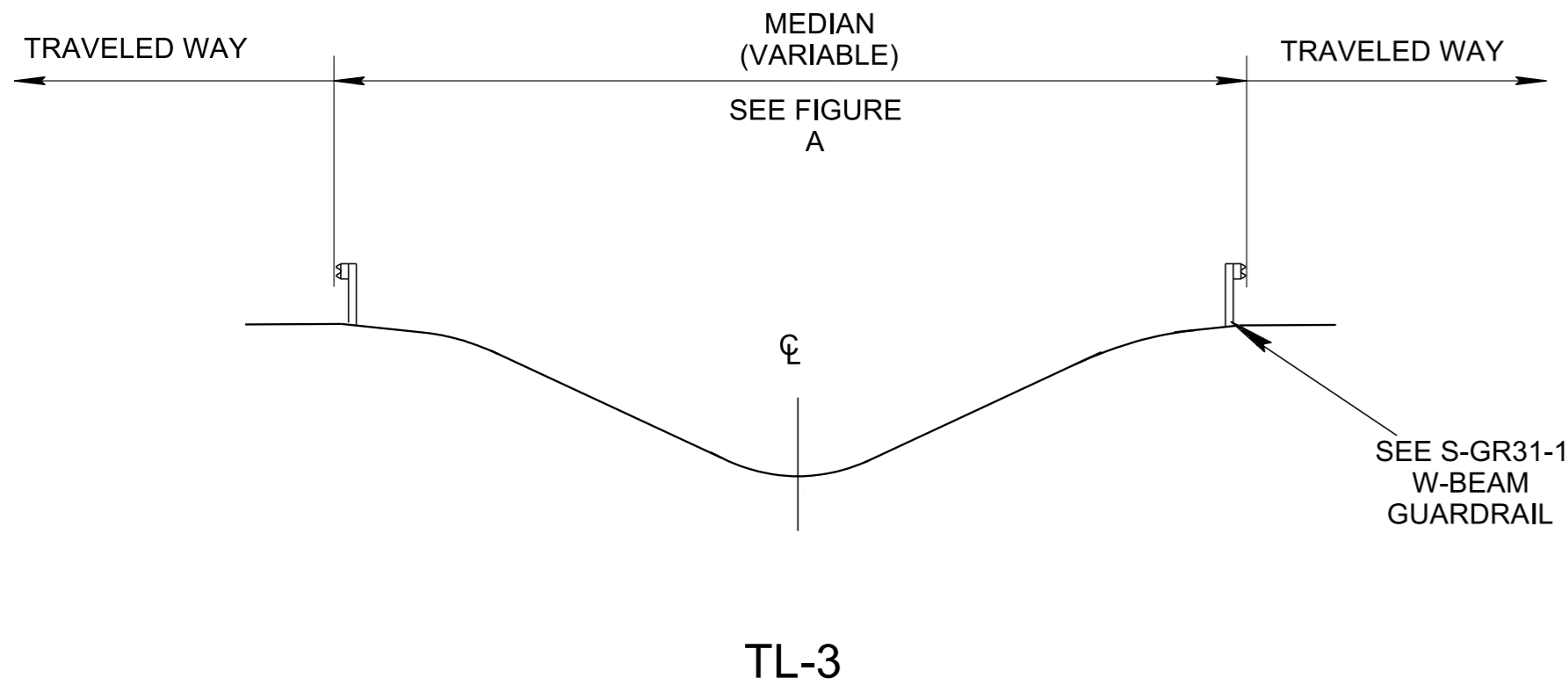
MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

**STATE OF TENNESSEE  
 DEPARTMENT OF  
 TRANSPORTATION**  
**EARTH PAD  
 FOR TYPE 38 AND  
 TYPE 21  
 TERMINALS  
 (RETROFIT)**  
 7-11-13 S-GRT-2R

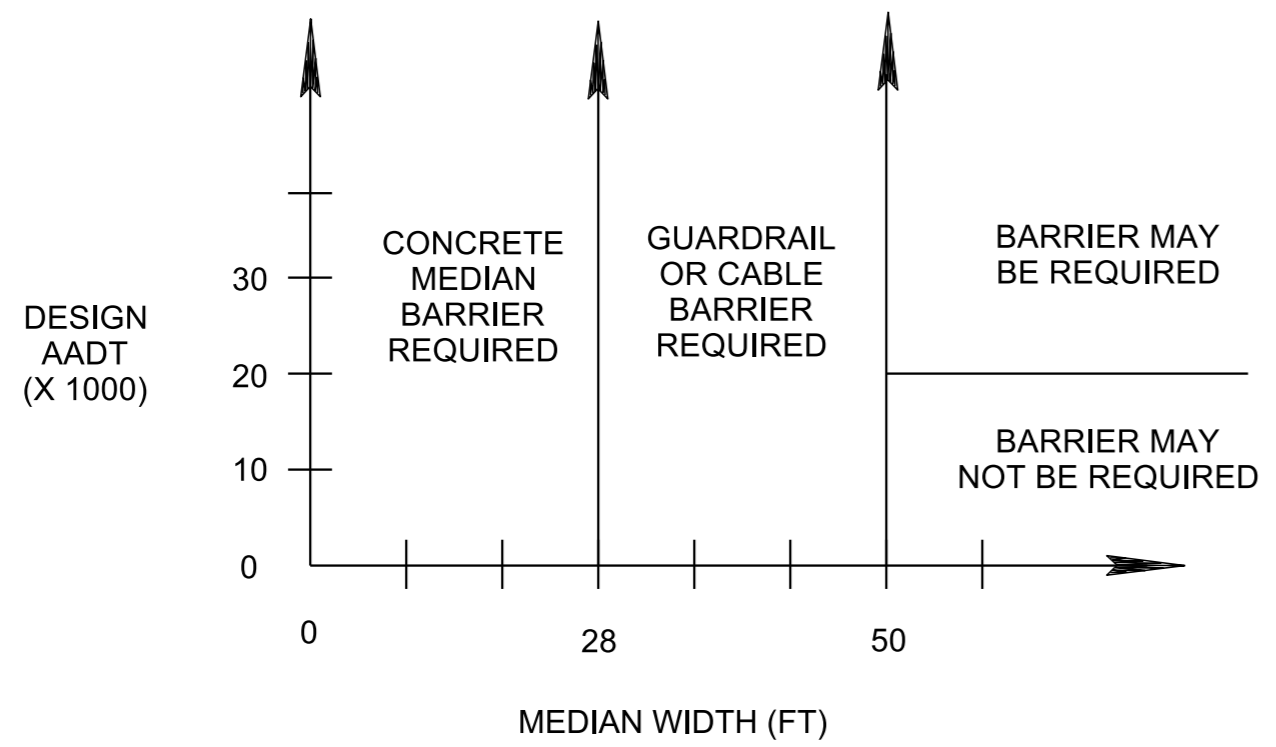
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**NARROW MEDIANS  
(28' OR LESS)**



**DEPRESSED MEDIANS  
(28' TO 64')**



**FIGURE A**  
THE NEED OF BARRIER DETERMINATION GUIDE  
FOR MEDIAN BARRIER INSTALLATION

FIGURE A IS TO BE USED AS A GUIDE, BUT IS NOT A SUBSTITUTE FOR GOOD ENGINEERING JUDGEMENT. OTHER CONSIDERATIONS, SUCH AS CRASH HISTORY, MAY BE USED TO JUSTIFY BARRIER INSTALLATION. THIS STANDARD DOES NOT APPLY TO FREEWAYS WITH INDEPENDENT ROADWAYS (SEE RD01-TS-5A)

- GENERAL NOTES FOR MEDIAN DIVIDER GUARDRAIL**
- (A) TO BE USED IN MEDIANS BETWEEN 10 TO 32' WIDE ONLY WHERE CONCRETE MEDIAN BARRIER CANNOT BE INSTALLED.
  - (B) SEE S-GR31-1 FOR DETAILS NOT SHOWN.
  - (C) THE POST SHALL NOT BE PLACED IN ASPHALT. IF NECESSARY PAVED MEDIAN ASPHALT SHALL BE REMOVED AT POST LOCATIONS.
  - (D) FOR CONNECTION TO CONCRETE MEDIAN BARRIER SEE S-GRC-3.
  - (E) THIS SYSTEM HAS BEEN EVALUATED AND DOCUMENTED ON THE TTL TEST REPORT 9-1002-12-8(2016).
  - (F) USE ONLY PRODUCTS LISTED ON THE TDOT QPL.
  - (G) REFER TO REFERENCED STANDARD DRAWINGS FOR PAY ITEMS.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

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DEPARTMENT OF  
TRANSPORTATION

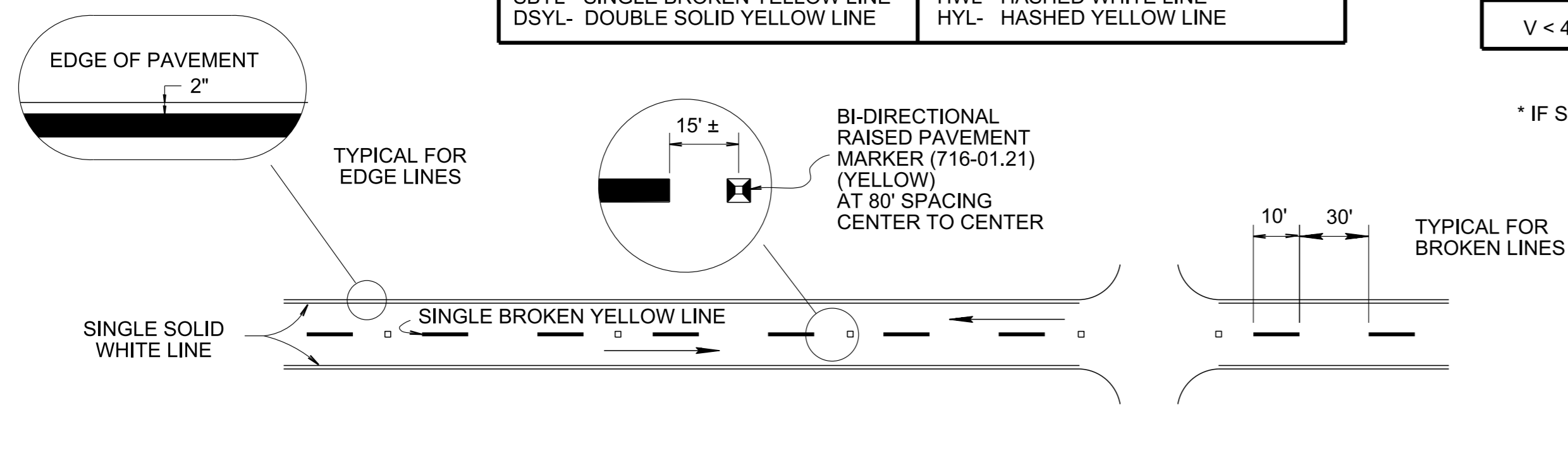
SAFETY PLAN  
SAFETY HARDWARE  
PLACEMENT  
IN MEDIAN

14-NOV-2017 10:43 \\AG03DCWF00008.net.ads.state.in.us\13\SHARED\StandDraw\DESIGN STANDARDS\Design CADD Standards & Downloads\17-14\SP\6A-20170705.dgn

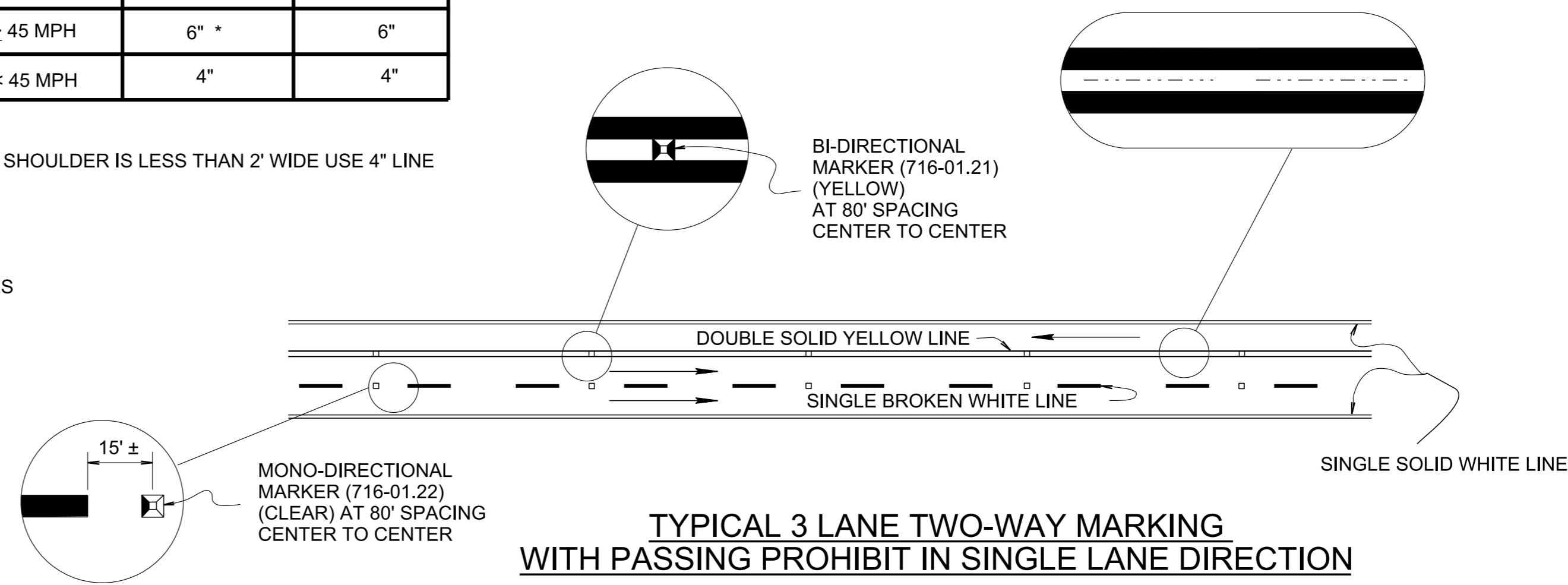
MARKING ABBREVIATIONS	
SSWL- SINGLE SOLID WHITE LINE	DBYL- DOUBLE BROKEN YELLOW LINE
SSYL- SINGLE SOLID YELLOW LINE	DWL- DOTTED WHITE LINE
SBWL- SINGLE BROKEN WHITE LINE	DYL- DOTTED YELLOW LINE
SBYL- SINGLE BROKEN YELLOW LINE	HWL- HASHED WHITE LINE
DSYL- DOUBLE SOLID YELLOW LINE	HYL- HASHED YELLOW LINE

PAVEMENT MARKING TABLE		
DESIGN SPEED	EDGE LINE	LANE LINE
V ≥ 45 MPH	6" *	6"
V < 45 MPH	4"	4"

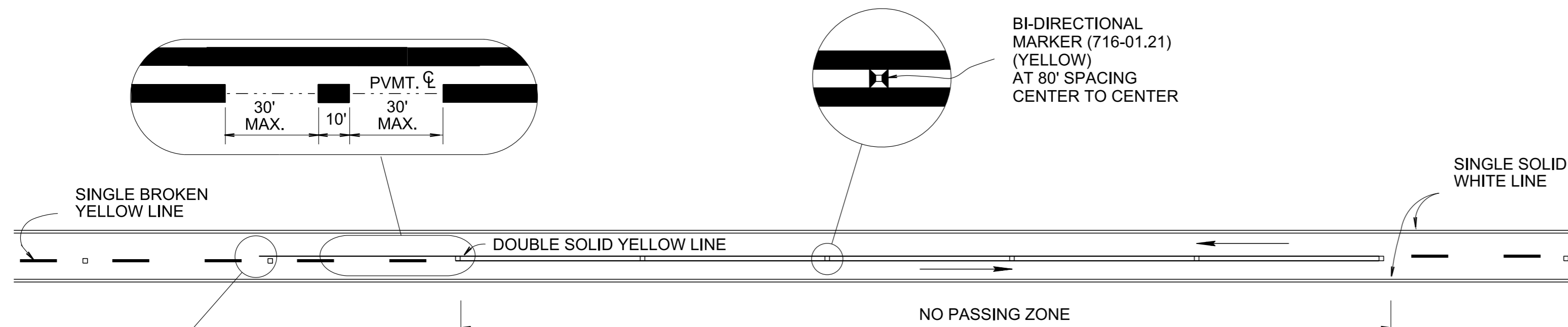
\* IF SHOULDER IS LESS THAN 2' WIDE USE 4" LINE



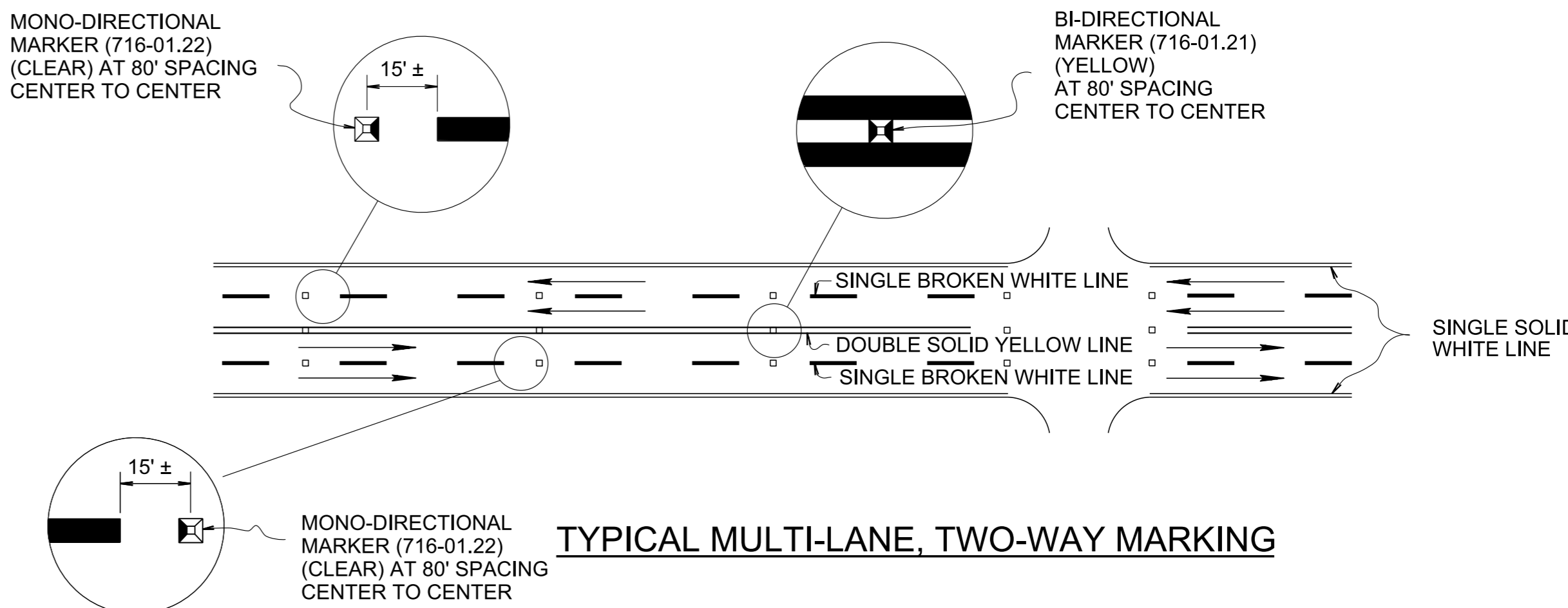
**TYPICAL TWO-LANE, TWO WAY MARKING WITH PASSING PERMITTED IN BOTH DIRECTIONS**



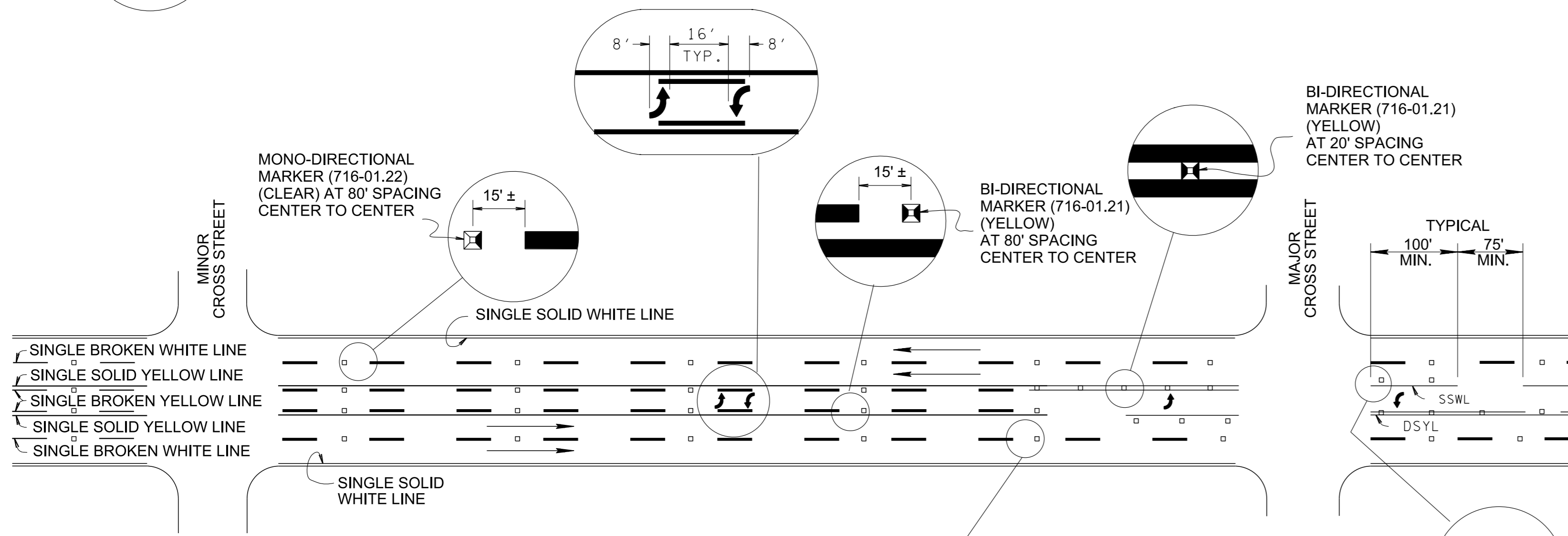
**TYPICAL 3 LANE TWO-WAY MARKING WITH PASSING PROHIBIT IN SINGLE LANE DIRECTION**



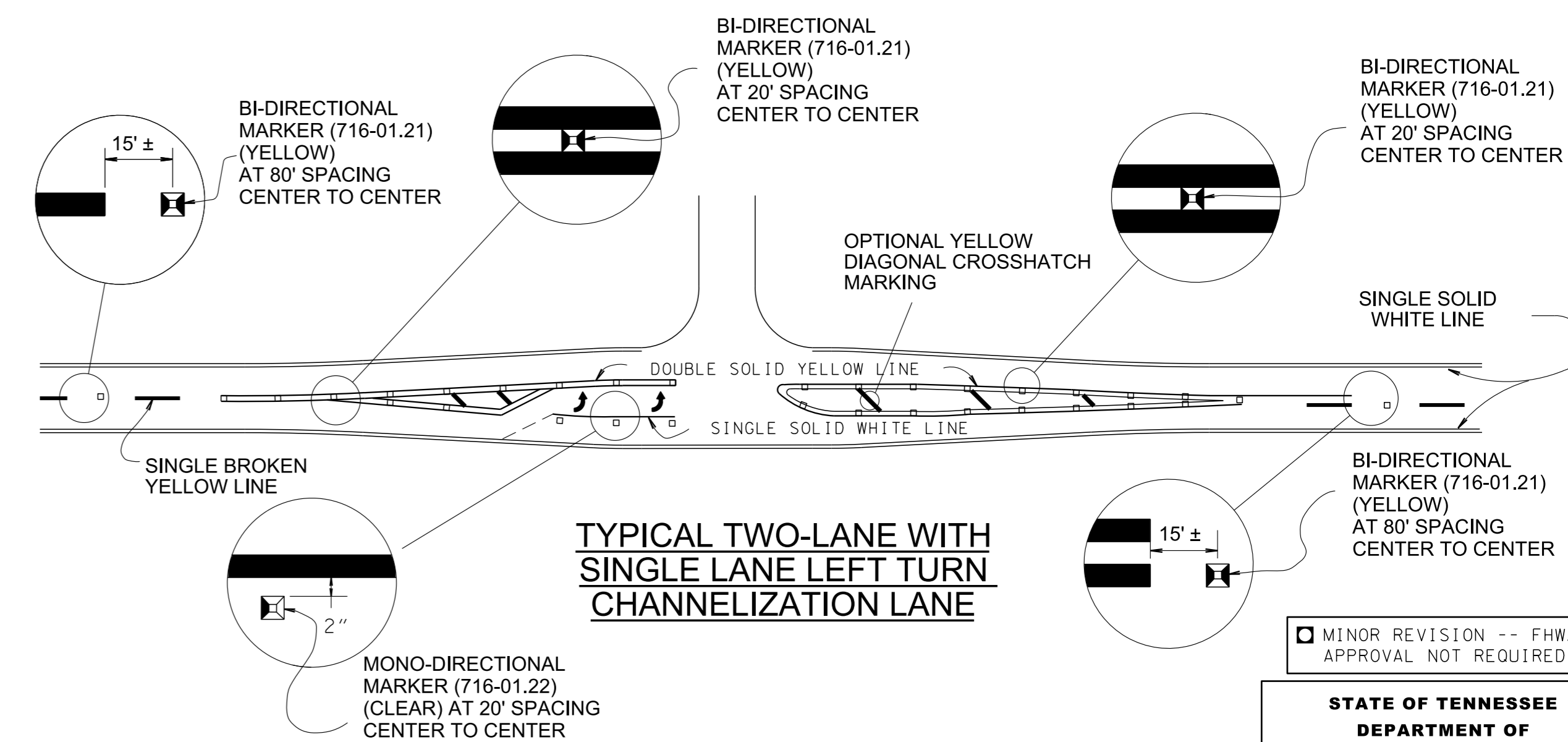
**TYPICAL TWO-LANE, TWO WAY MARKING WITH NO PASSING ZONES**



**TYPICAL MULTI-LANE, TWO-WAY MARKING**



**TYPICAL MULTI-LANE WITH TWO WAY LEFT TURN LANE**



**TYPICAL TWO-LANE WITH SINGLE LANE LEFT TURN CHANNELIZATION LANE**

**SPECIAL NOTE**  
 MAXIMUM SPACING BETWEEN DOUBLE ARROWS TO BE 1/2 MILE. DOUBLE ARROWS SHALL NOT BE LOCATED WITHIN 100' OF AN INTERSECTION.

- GENERAL NOTES**
- (A) EDGE LINES ARE NOT REQUIRED FOR PAVEMENT WIDTH LESS THAN 16 FEET NOR ON CURB AND GUTTER SECTIONS UNLESS SPECIFIED IN PLANS.
  - (B) SEE STANDARD DRAWING NOS. T-M-3 AND T-M-4 FOR CHANNELIZATION MARKING AND INTERSECTION MARKING DETAILS.
  - (C) PAVEMENT MARKERS ARE REQUIRED ONLY WHEN SPECIFIED IN THE PLANS.

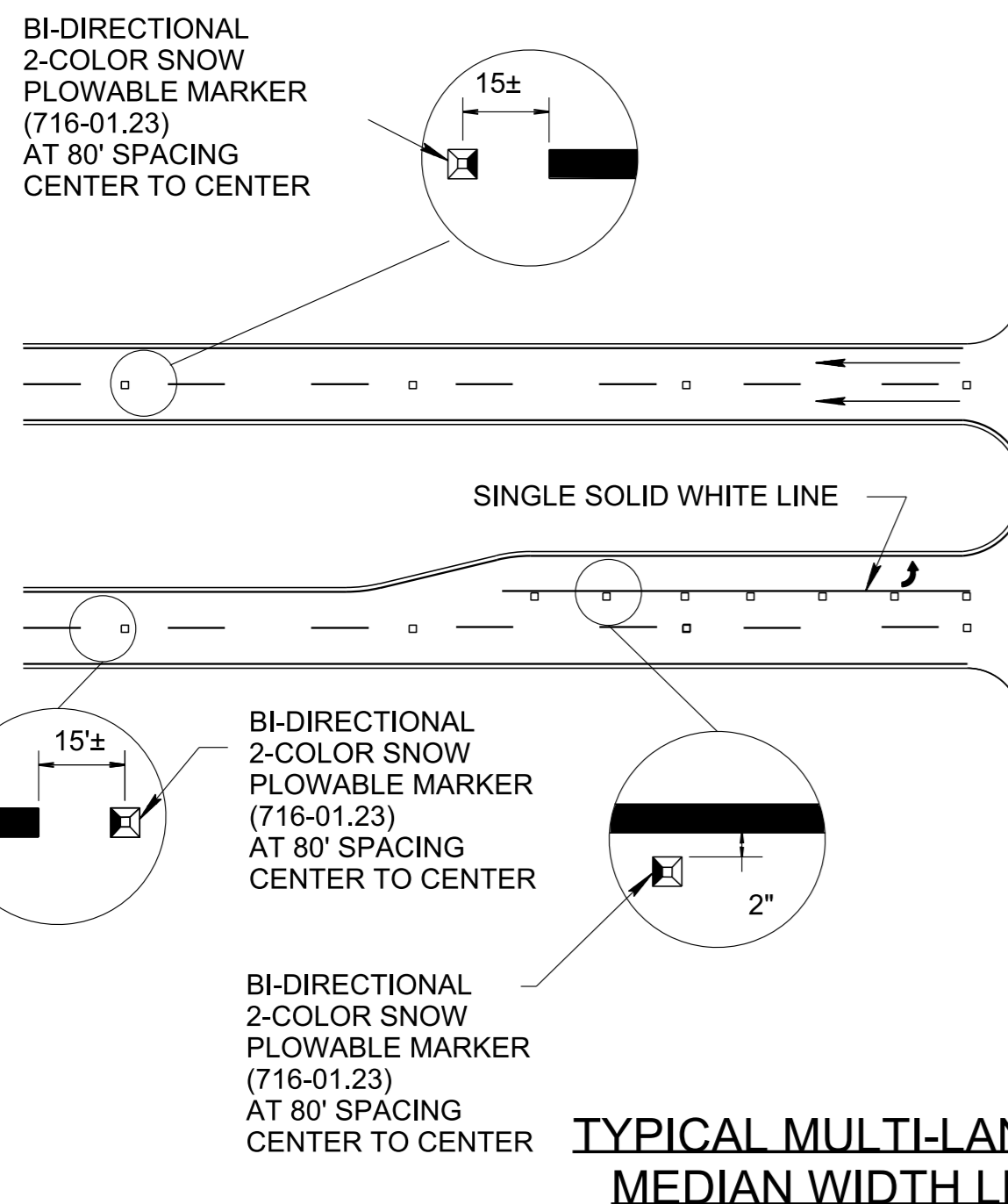
- REV. 2-22-88: ADDED EDGELINES, NOTES AND VARIOUS STRIPING AND MARKING DETAILS. CHANGED DWG. NO. FROM T-M-7 TO T-M-1. CHANGED SPACING & LOCATION OF VARIOUS RAISED PAVEMENT MARKERS. ADDED MARKING ABBREVIATIONS.
- REV. 3-20-91: REDREW SHEET. CHANGED TYPE 2 PAVEMENT MARKERS (CLEAR) TO MONO-DIRECTIONAL PAVEMENT MARKERS (CLEAR) AND CHANGED TYPE 1 PAVEMENT MARKERS (YELLOW) TO BI-DIRECTIONAL MARKERS (YELLOW).
- REV. 10-26-92: ADDED GENERAL NOTE ©
- REV. 7-29-98: REVISED DISTANCE BETWEEN EDGELINE PAVEMENT MARKING AND EDGELINE FROM 4" TO 2".
- REV. 4-15-04: CHANGED SPACING BETWEEN DOUBLE LEFT TURN ARROWS TO COMPLY WITH 2003 MUTCD.
- REV. 11-1-11: UPDATED TYPICAL DETAILS TO CONFORM WITH 2009 MUTCD STANDARD DETAILS.
- REV. 7-24-14: ADDED PAVEMENT MARKING TABLE.
- REV. 7-5-17: CORRECTED SSWL AND DSYL BLOW-UP DETAILS. ADDED ITEM NOS TO BLOW-UP DETAIL DESCRIPTIONS.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

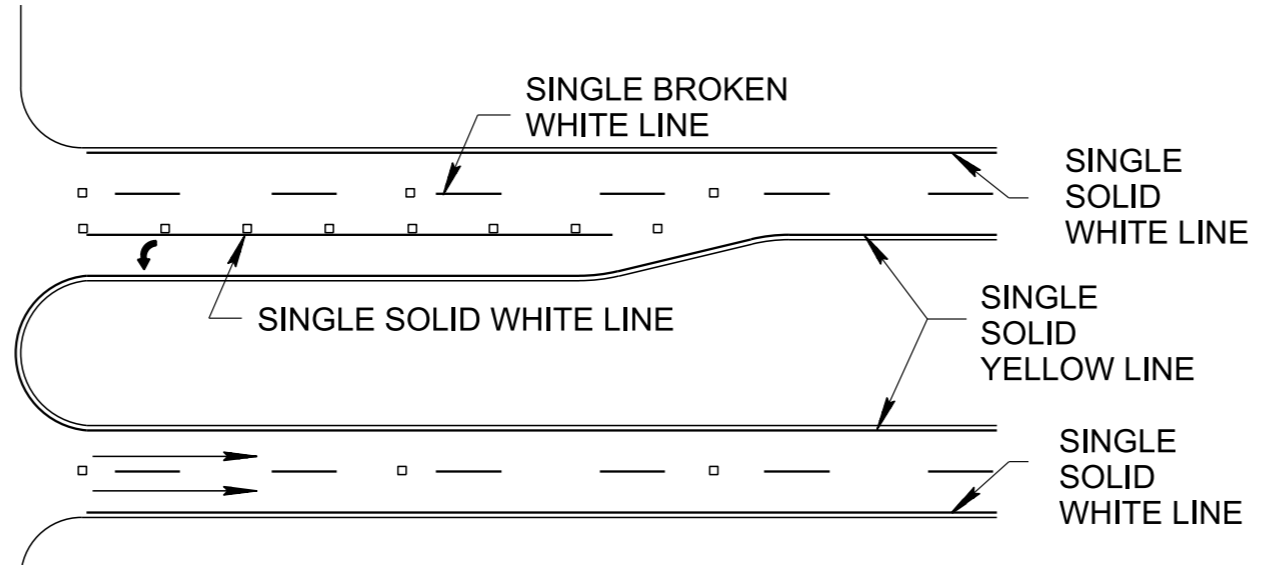
**STATE OF TENNESSEE DEPARTMENT OF TRANSPORTATION**  
 DETAILS OF PAVEMENT MARKINGS FOR CONVENTIONAL ROADS AND MARKING ABBREVIATIONS  
 T-M-1



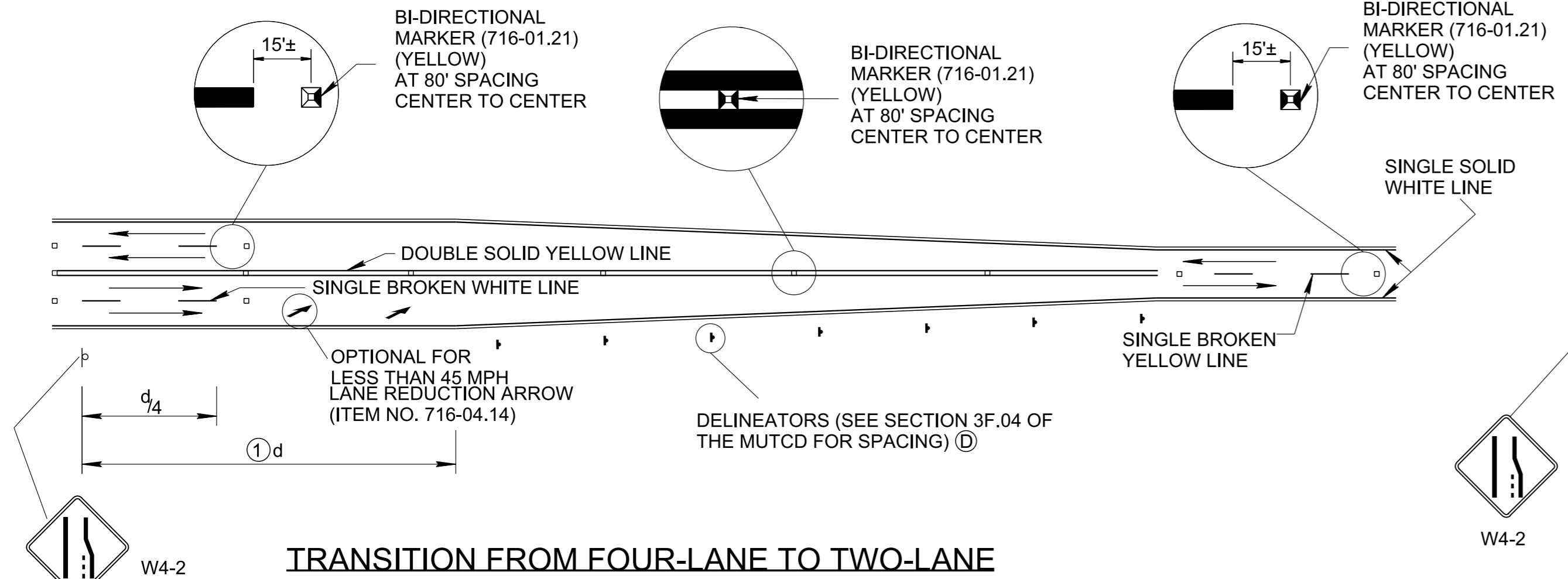
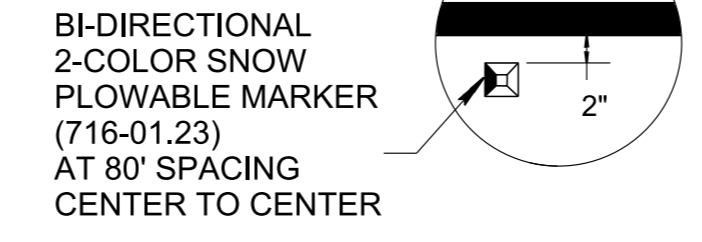
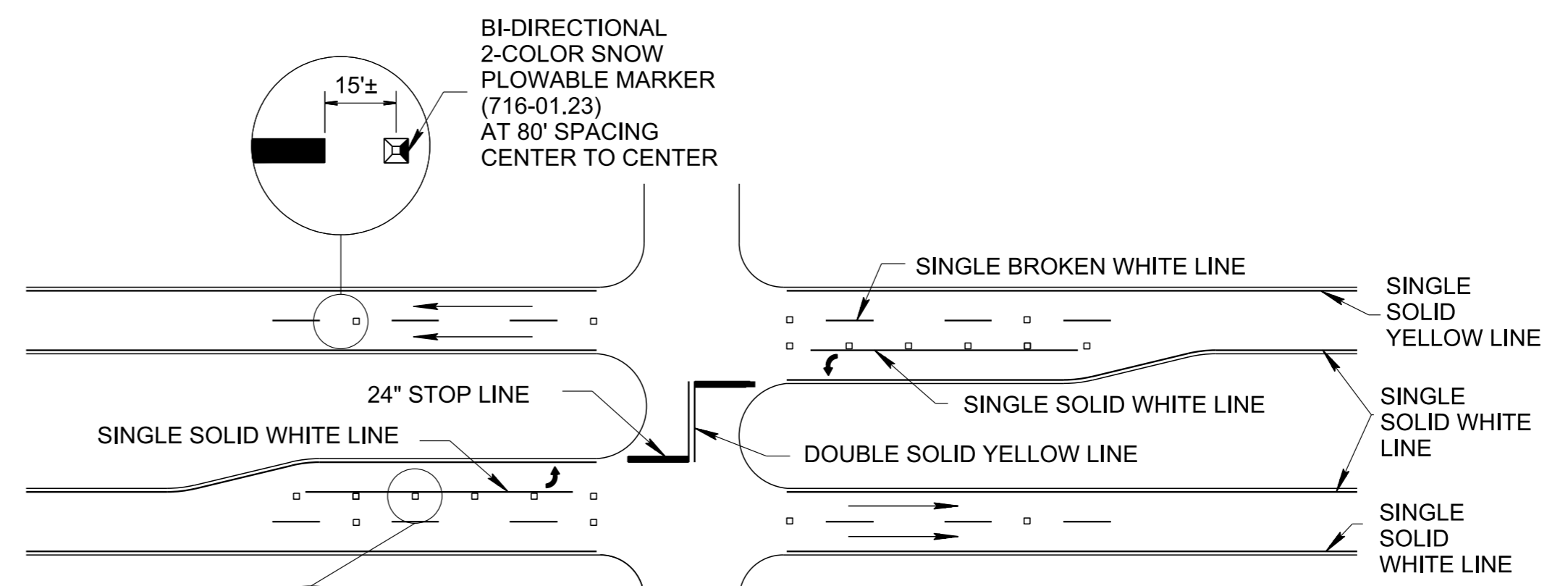
14-NOV-2017 10:43 \\AG03DCWF00008.net.ads.state.in.us\13\SHARED\StandDraw\DESIGN STANDARDS\Design CADD Standards & Downloads\17-14\TM2-20170705.dgn



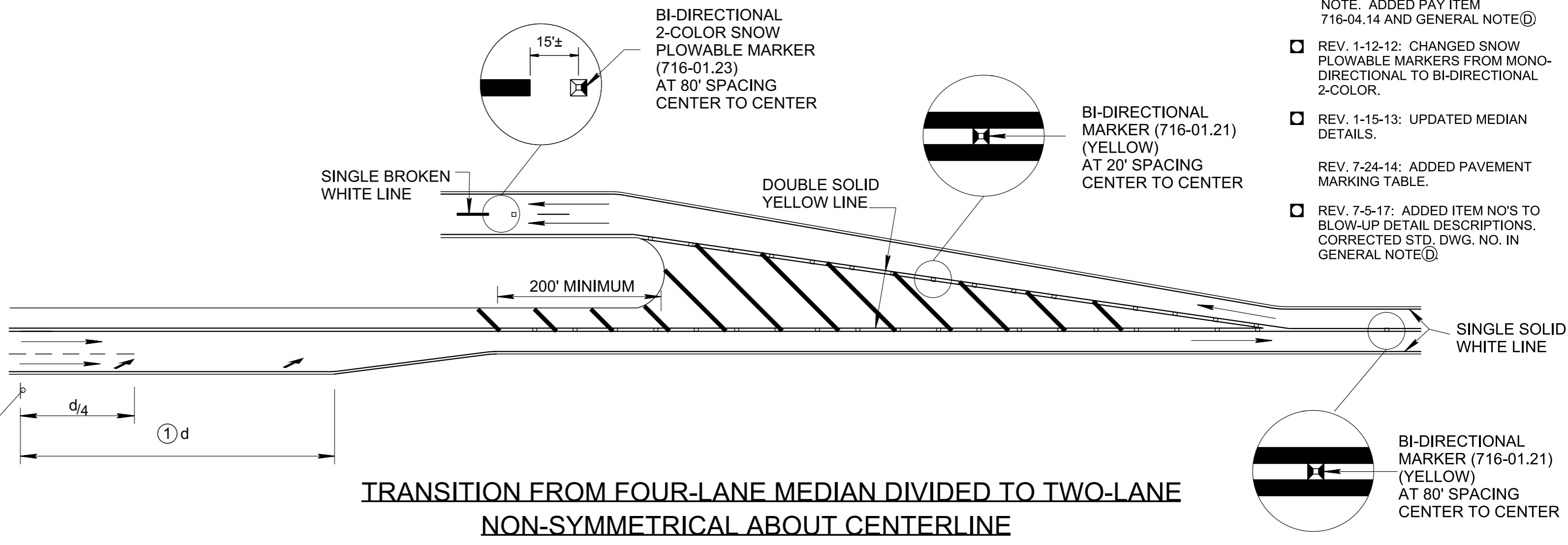
**TYPICAL MULTI-LANE WITH TURN LANE  
MEDIAN WIDTH LESS THAN 30 FEET**



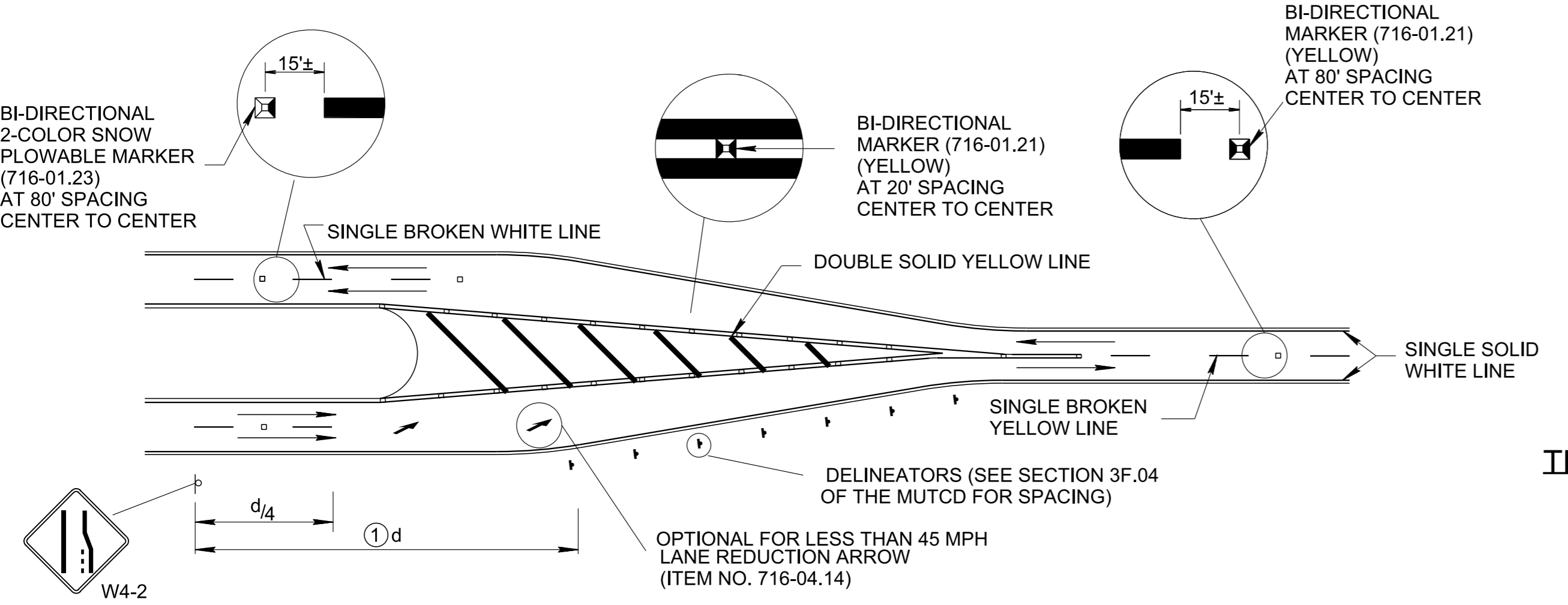
**TYPICAL MULTI-LANE WITH TURN LANE  
MEDIAN WIDTH EQUAL TO OR GREATER THAN 30 FEET**



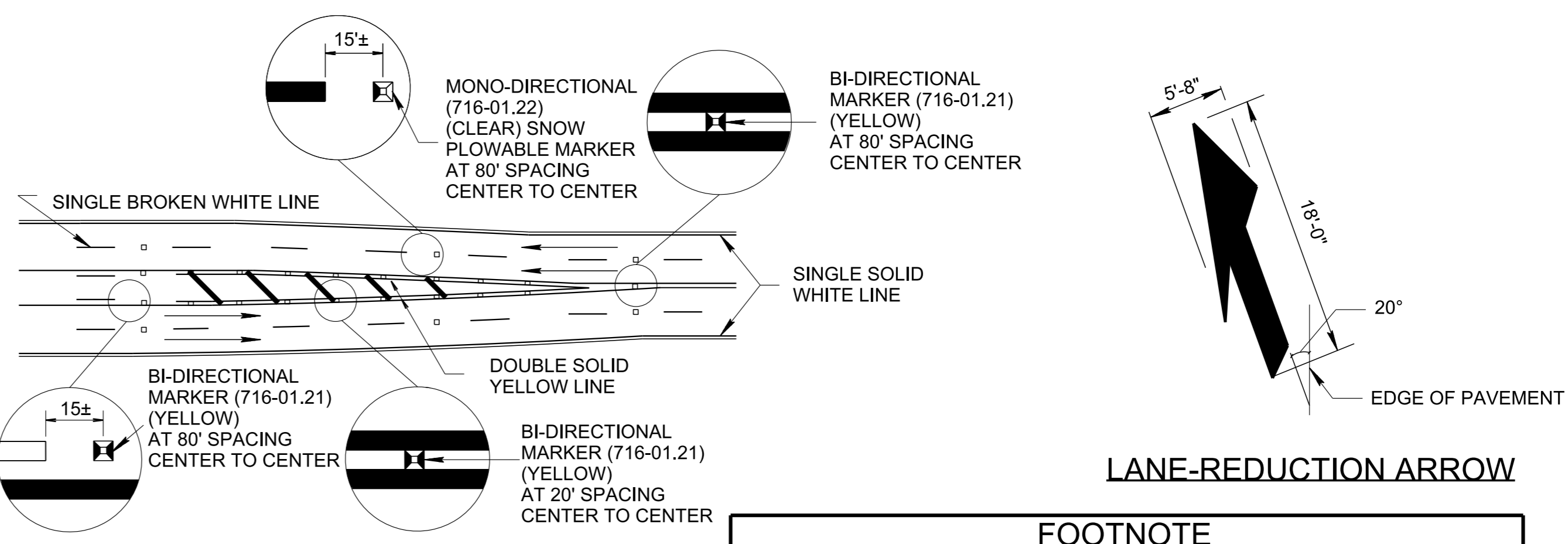
**TRANSITION FROM FOUR-LANE TO TWO-LANE**



**TRANSITION FROM FOUR-LANE MEDIAN DIVIDED TO TWO-LANE  
NON-SYMMETRICAL ABOUT CENTERLINE**



**TRANSITION FROM FOUR-LANE MEDIAN DIVIDED TO TWO-LANE  
SYMMETRICAL ABOUT CENTERLINE**  
SIMILAR FOR MULTI-LANE WITH TWO WAY LEFT TURN LANE TO TWO-LANE



**TRANSITION FROM MULTI-LANE WITH TWO WAY  
LEFT TURN LANE TO FOUR-LANE**

PAVEMENT MARKING TABLE		
DESIGN SPEED	EDGE LINE	LANE LINE
V > 45 MPH	6" *	6"
V < 45 MPH	4"	4"

\* IF SHOULDER IS LESS THAN 2' WIDE USE 4" LINE

**FOOTNOTE**  
① SEE TABLE 2C-4 OF PART 2 OF THE MANUAL ON UNIFORM TRAFFIC DEVICES (MUTCD) FOR GUIDELINES FOR ADVANCE PLACEMENT OF WARNING SIGNS DISTANCE d.

**GENERAL NOTES**  
 (A) EDGE LINES ARE NOT REQUIRED FOR PAVEMENT WIDTH LESS THAN 16 FEET OR ON CURB AND GUTTER SECTIONS UNLESS SPECIFIED IN PLANS.  
 (B) SEE STANDARD DRAWING NOS. T-M-3 AND T-M-4 FOR CHANNELIZATION MARKING AND INTERSECTION MARKING DETAILS.  
 (C) PAVEMENT MARKERS ARE REQUIRED ONLY WHEN SPECIFIED IN THE PLANS.  
 (D) SEE STD. DWG. T-S-11 FOR DETAILS OF DELINEATORS.

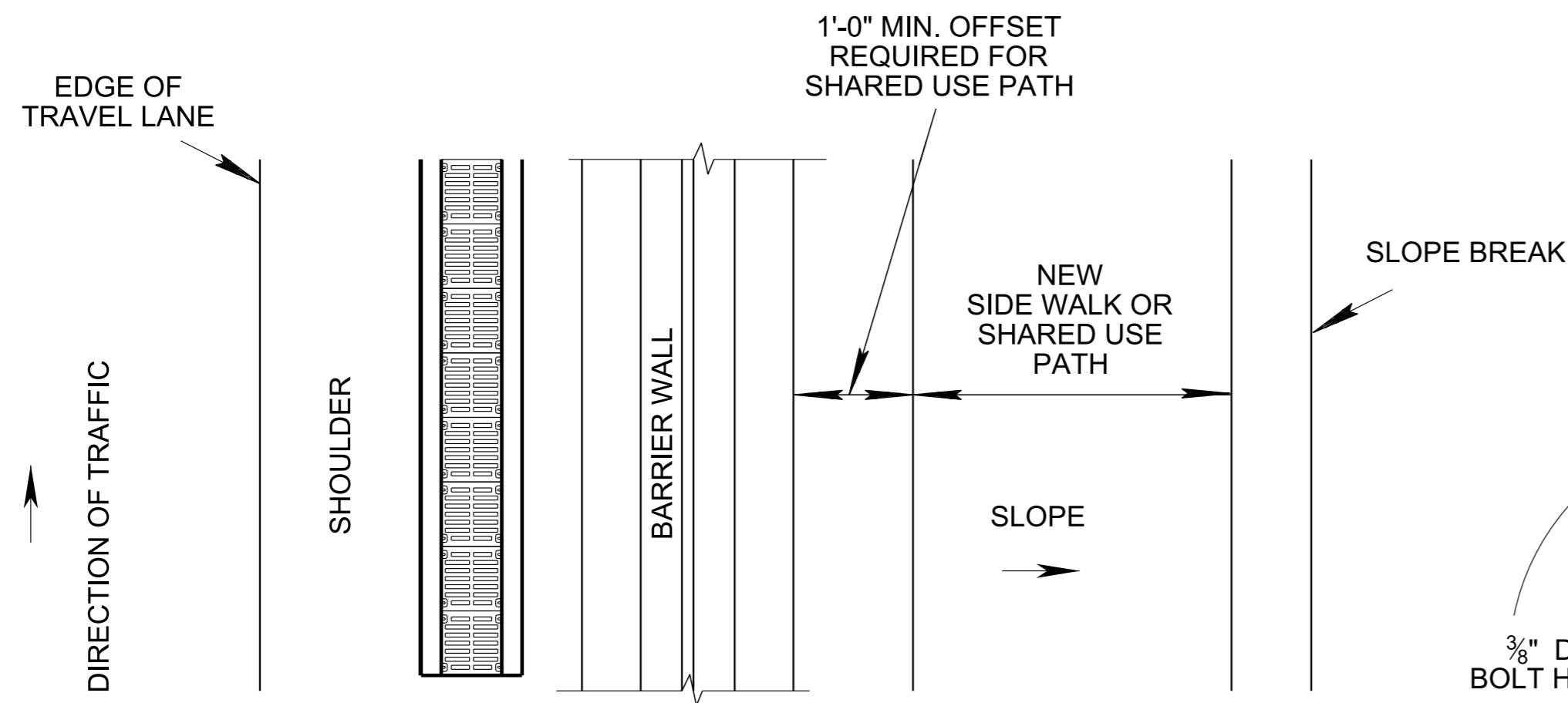
□ MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

**STATE OF TENNESSEE  
DEPARTMENT OF  
TRANSPORTATION**

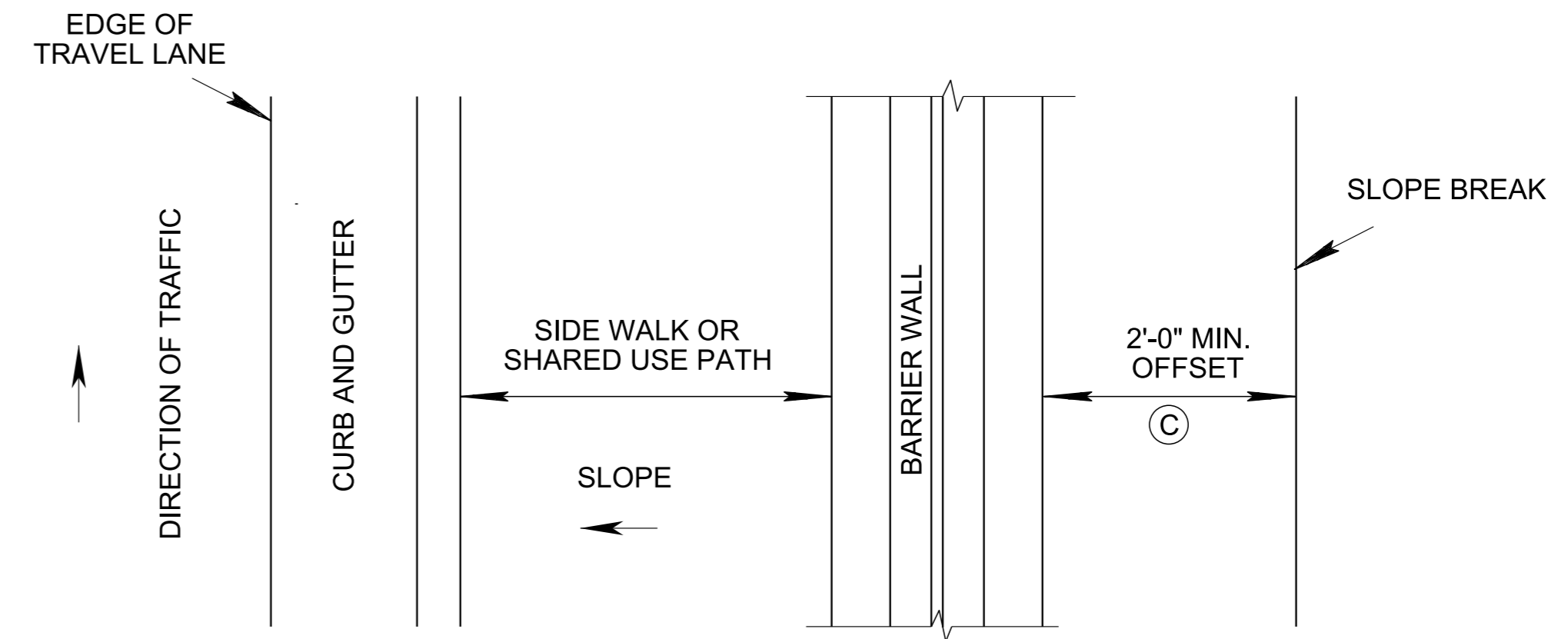
**DETAILS OF  
PAVEMENT  
MARKINGS FOR  
CONVENTIONAL  
ROADS**

T-M-2

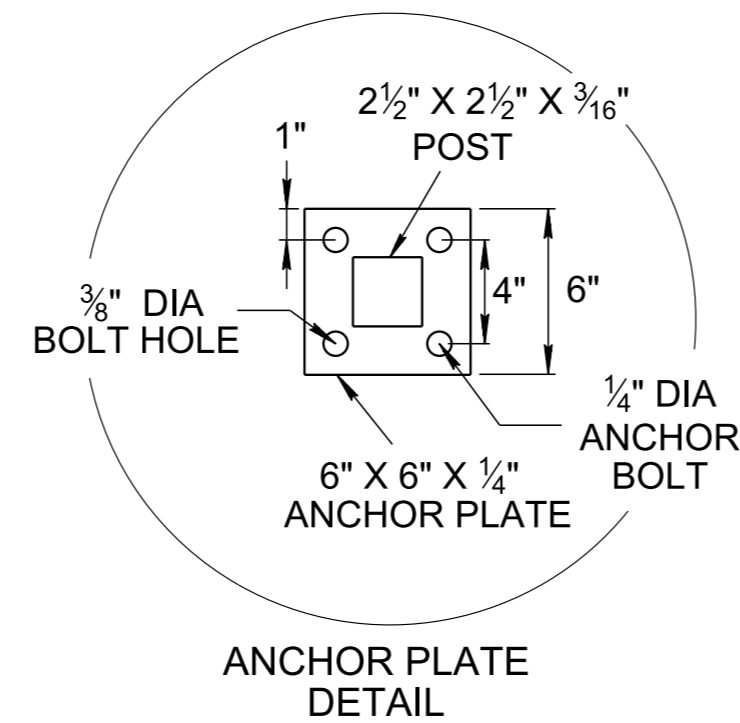
- REV. 2-22-88: ADDED EDGE-LINES, NOTES, AND DETAILS FOR TRANSITION MARKING. CHANGED SHEET TITLE AND DRAWING NO. FROM T-M-8 TO T-M-2. ADDED DETAILS ON RIGHT OF SHEET.
- REV. 3-20-91: REDREW SHEET. CHANGED TYPE 2 PAVEMENT MARKERS (CLEAR) TO MONO-DIRECTIONAL PAVEMENT MARKERS (CLEAR) AND TYPE 1 PAVEMENT MARKERS (YELLOW) TO BI-DIRECTIONAL MARKERS (YELLOW).
- REV. 10-26-92: ADDED GENERAL NOTE (C).
- REV. 12-18-93: ADDED EDGELINES INSIDE MEDIAN CROSSOVERS FOR MEDIAN WIDTHS LESS THAN 44 FEET.
- REV. 1-19-94: CHANGED WIDTH CRITERION FOR MEDIAN WIDTH FROM 44 FEET TO 64 FEET.
- REV. 1-19-96: CHANGED DETAIL ON LEFT BOTTOM OF SHEET.
- REV. 4-15-04: CHANGED W4-2 SIGNS AND FOOTNOTE (1) TO COMPLY WITH 2003 MUTCD.
- REV. 9-5-04: CHANGED FOOTNOTE (1) TO COMPLY WITH 2003 MUTCD.
- REV. 11-1-11: ADDED DELINEATORS WITH NOTE AND LANE REDUCTION ARROWS WITH NOTE. ADDED PAY ITEM 716-04.14 AND GENERAL NOTE (D).
- REV. 1-12-12: CHANGED SNOW PLOWABLE MARKERS FROM MONO-DIRECTIONAL TO BI-DIRECTIONAL 2-COLOR.
- REV. 1-15-13: UPDATED MEDIAN DETAILS.
- REV. 7-24-14: ADDED PAVEMENT MARKING TABLE.
- REV. 7-5-17: ADDED ITEM NO'S TO BLOW-UP DETAIL DESCRIPTIONS. CORRECTED STD. DWG. NO. IN GENERAL NOTE (D).



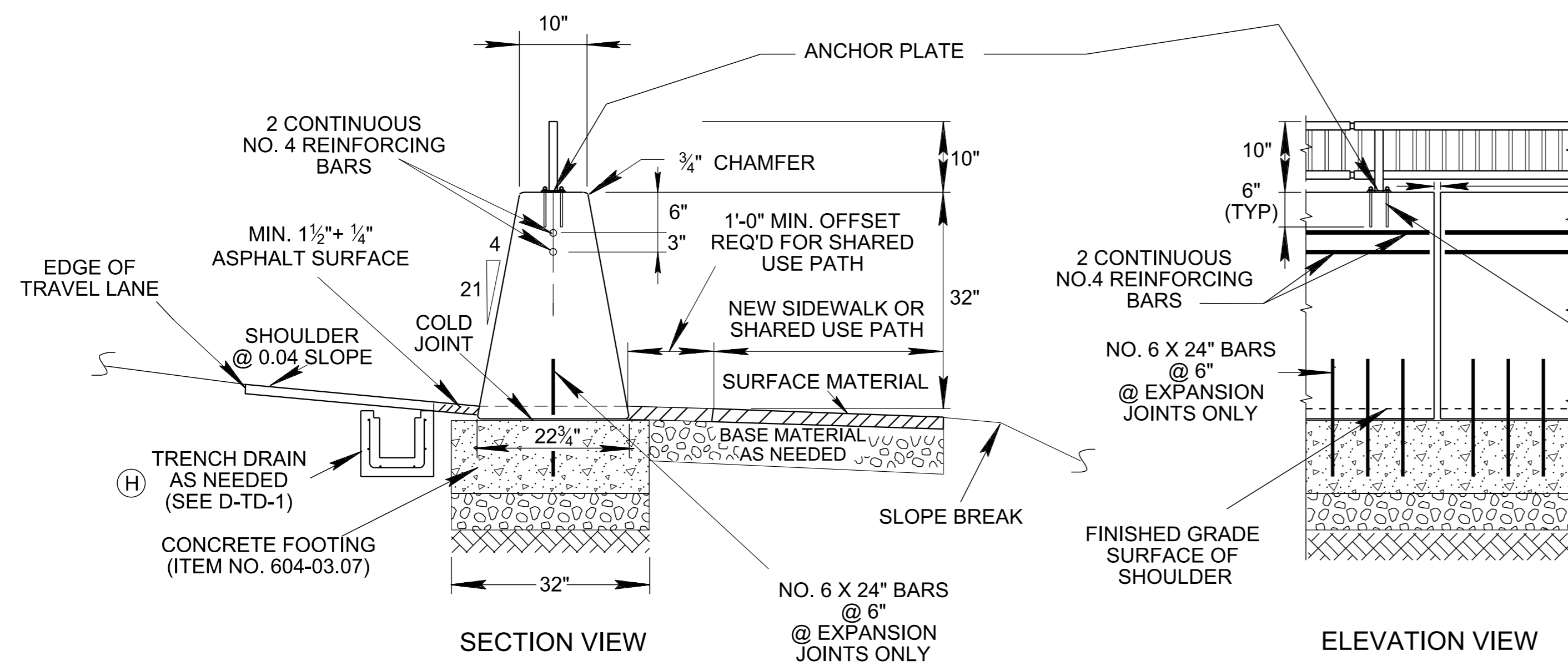
**HIGH SPEED TRAVEL LANE (SPEED > 45 MPH)**



**LOW SPEED TRAVEL LANE**

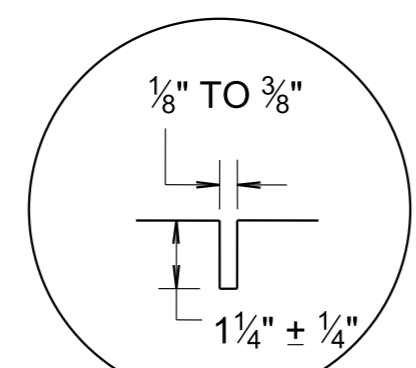


**ANCHOR PLATE  
DETAIL**

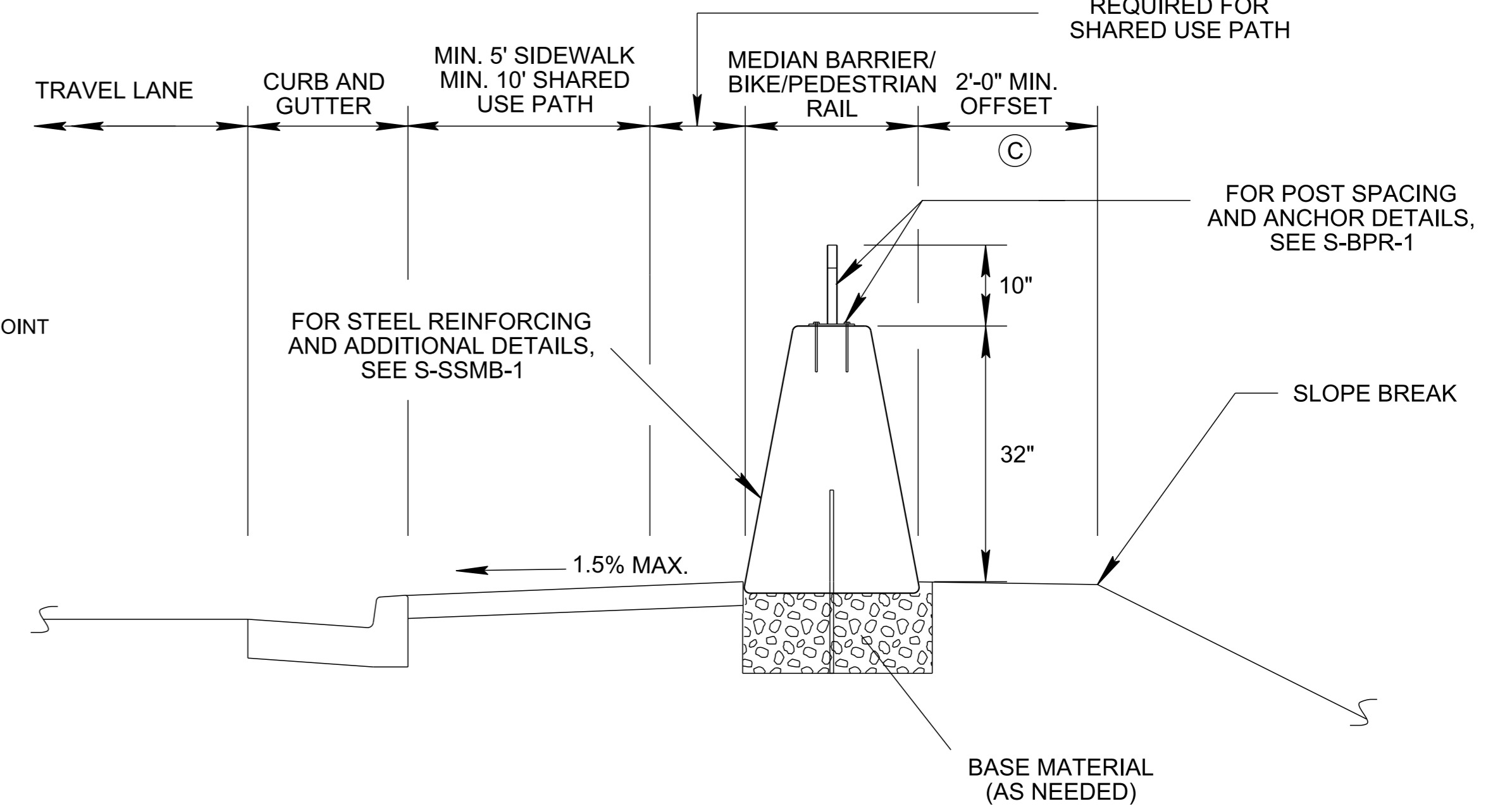


**TYPICAL CROSS-SECTION ⑤  
HIGH SPEED TRAVEL LANE (SPEED > 45 MPH)**

**BARRIER PLACEMENT TO PROTECT  
NON-MOTORIZED USERS**



**CONTRACTION JOINT  
DETAIL**



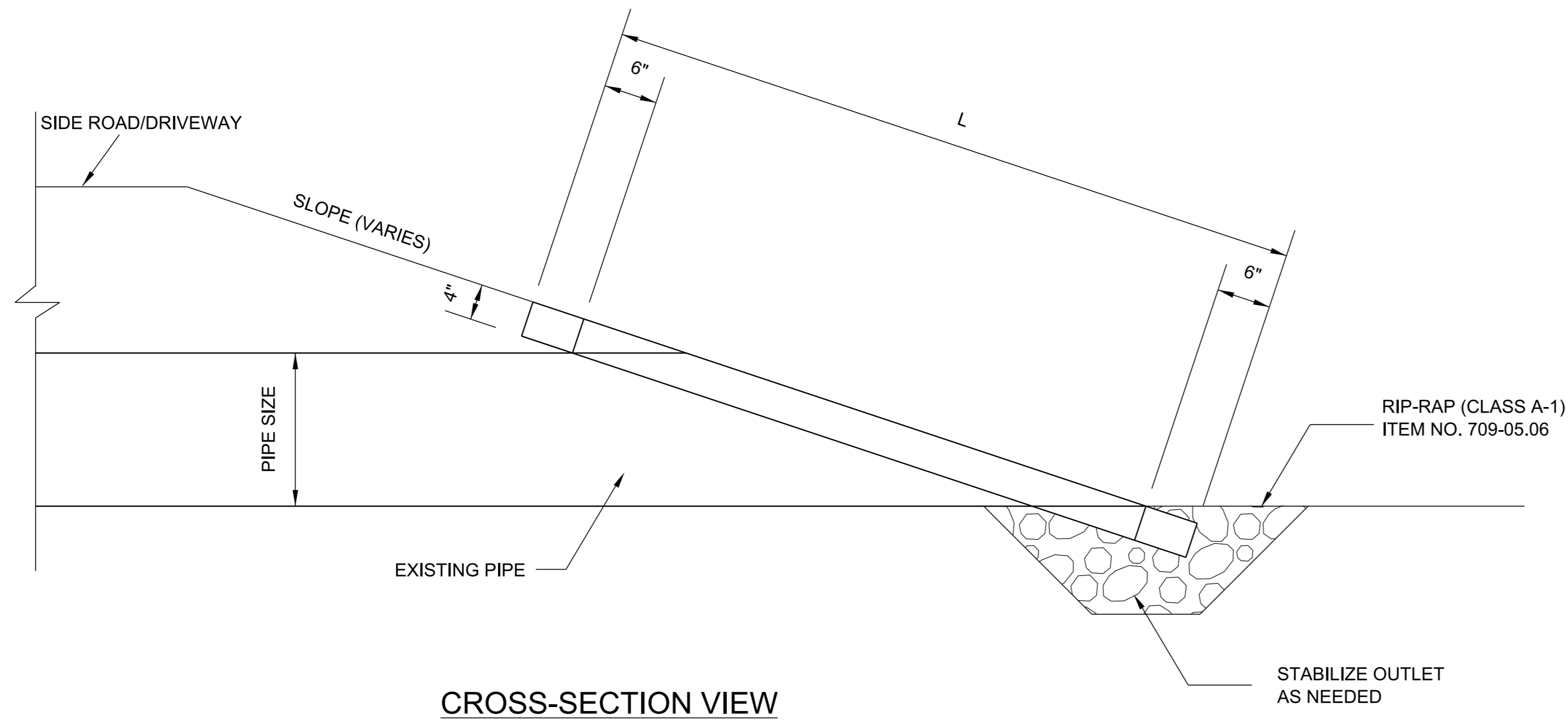
**TYPICAL CROSS-SECTION ④  
LOW SPEED TRAVEL LANE**

**BARRIER PLACEMENT TO PROTECT  
MOTORIZED AND NON-MOTORIZED USERS**

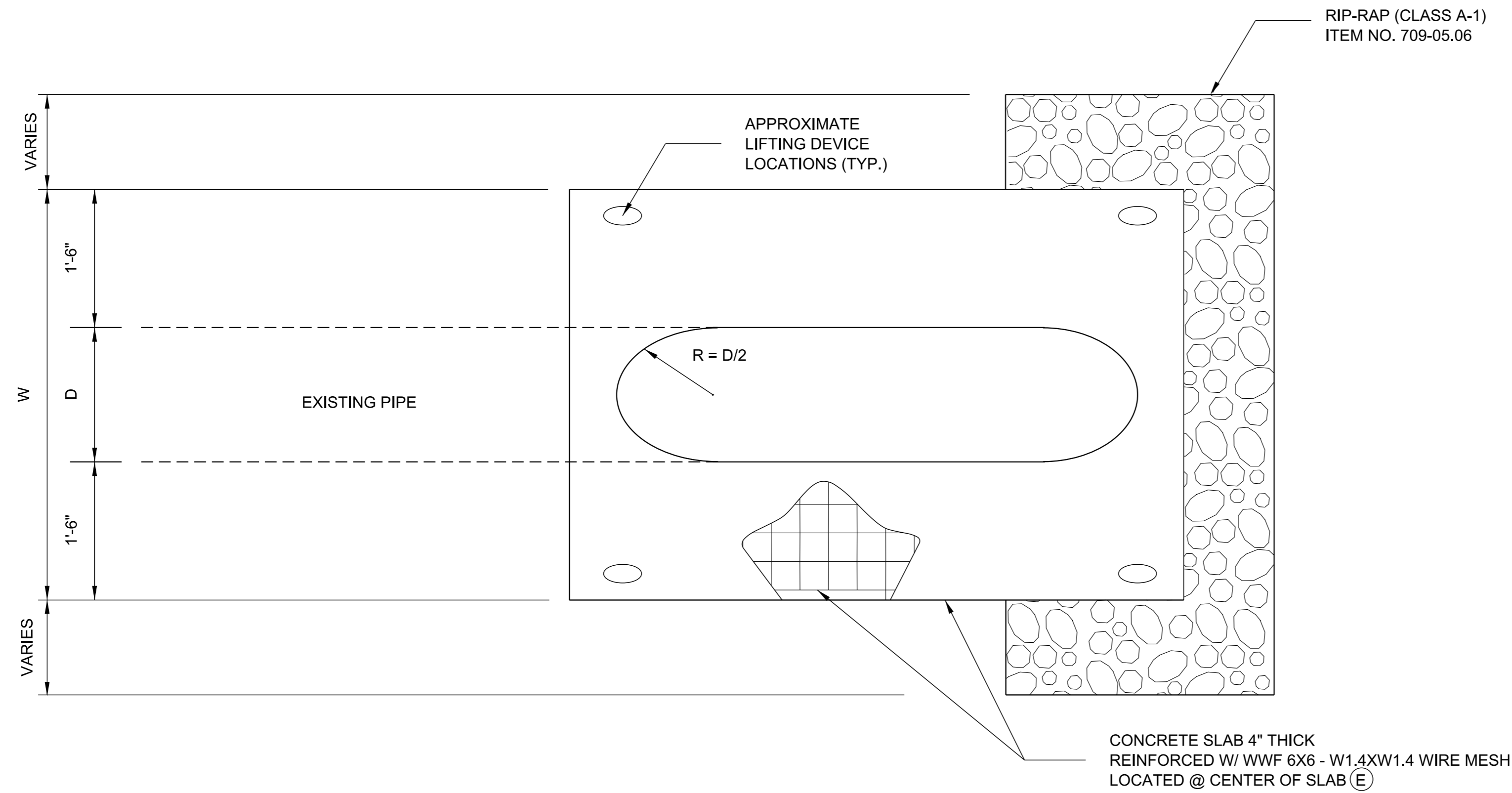
**GENERAL NOTES**

- (A) REFER TO RD01-TS-8 FOR ADDITIONAL DETAILS.
- (B) REFER TO RD01-TS-SERIES FOR MINIMUM SHOULDER WIDTH REQUIREMENTS DURING REHABILITATION PROJECTS.
- (C) IF CONCRETE BARRIER IS INSTALLED WITH FOUNDATION SHOWN IN SECTION A-A ON S-PL-4, MINIMUM OFFSET MAY BE REDUCED TO 0'.
- (D) THIS DETAIL SHOULD BE USED AT LOCATIONS WHERE DROP-OFF WOULD WARRANT GUARDRAIL.
- (E) THE INTENT OF THIS PLACEMENT IS TO PROVIDE POSITIVE PROTECTION FOR NON-MOTORIZED USERS.
- (F) THE BLUNT END OF THE BARRIER RAIL SHALL BE PROTECTED BY A CRASH CUSHION (SEE S-CC-1), OR BY AN END TERMINAL IF LOCATED WITHIN THE CLEAR ZONE.
- (G) PAYMENT FOR BARRIER MEDIAN RAIL WILL BE UNDER ITEM NO'S:  
604-01.20 BOX TUBE SAFETY RAIL PER LINEAR FOOT.  
711-05.70 32IN SINGLE SLOPE CONCRETE BARRIER WALL PER LINEAR FOOT.  
604-03.07 CLASS A CONCRETE (DESCRIPTION) PER C.Y.
- (H) REHABILITATION PROJECTS MAY REQUIRE DRAINAGE STRUCTURE LOCATIONS WHERE STORM DRAINAGE IS NOT EXISTING.





CROSS-SECTION VIEW



PLAN VIEW

APPROXIMATE QUANTITIES						
	3(H):1(V) SLOPE			2(H):1(V) SLOPE		
PIPE SIZE (IN)	15	18	24	15	18	24
L (IN)	78	88	107	58	65	79
D (IN)	17	20	26	17	20	26
W (IN)	53	56	62	53	56	62
CONCRETE (CY)	0.4	0.5	0.6	0.3	0.4	0.5
WIRE MESH (S.Y.)	4	4	5	3	3	4
RIP-RAP (TON)	1	1	1	1	1	1

GENERAL NOTES	
(A)	TO BE USED FOR MAINTENANCE ACTIVITIES ONLY. MITERED END SECTION IS INTENDED TO REHABILITATE THE EXISTING SIDE DRAIN PIPE ENDS DURING ROUTINE MAINTENANCE ACTIVITIES.
(B)	CONCRETE AND STEEL QUANTITIES ARE BASED ON A SOLID SLAB WITHOUT CUT-OUT.
(C)	PAYMENT WILL BE UNDER ITEM NUMBERS: 611-07.01 CLASS A CONCRETE (PIPE ENDWALLS) PER C.Y. 707-10.08 WIRE MESH (DESCRIPTION) PER S.Y. 709-05.06 MACHINED RIP-RAP (CLASS A-1) PER TON
(D)	ALL DIMENSIONS ARE NOMINAL.
(E)	DIMENSIONAL AND REINFORCING TOLERANCES WILL BE AS SHOWN IN STANDARD OPERATING PROCEDURE (SOP) 5-3.
(F)	PIPES ARE TO BE CUT TO MATCH THE SIDE SLOPE.