



**STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
DESIGN DIVISION**

NASHVILLE, TENNESSEE 37243-0348

**JOHN C. SCHROER**  
COMMISSIONER

**BILL HASLAM**  
GOVERNOR

**INSTRUCTIONAL BULLETIN NO. 13-08**


**Regarding New and Revised Standard Drawings**

**Effective for the July 12<sup>th</sup> letting (May 1<sup>st</sup> turn-in),** the following Standard Drawings are new or revised and Section V of the Design Guidelines is revised for this update.

<b><u>DRAWING NUMBER</u></b>	<b><u>CURRENT REVISION DATE</u></b>	<b><u>DESCRIPTION</u></b>
RD-L-7	05-24-12	LEGEND FOR EROSION PREVENTION AND SEDIMENT CONTROL
RD01-TS-8	06-15-12	SHARED USE PATH TYPICAL SECTIONS
RD01-TS-9	06-15-12	DESIGN STANDARDS FOR SINGLE LANE URBAN AND RURAL ROUNDABOUTS
RD01-TS-10	06-15-12	DESIGN STANDARDS FOR MULTI-LANE URBAN AND RURAL ROUNDABOUTS
D-SEW-1A	01-10-13	SIDE DRAIN CONCRETE ENDWALL WITH STEEL PIPE GRATE
S-F-1	05-24-12	HIGH VISIBILITY FENCE
S-GR-26	08-23-12	SLOTTED GUARDRAIL TERMINAL ANCHOR (TYPE 21)
S-GR-38	08-16-12	DETAILS FOR CONSTRUCTION OF EARTH PAD FOR TYPE 38 GUARDRAIL END TERMINAL
S-GR-47		ALTERNATE GUARDRAIL POST ATTACHMENT DETAIL
T-M-5	08-16-12	MARKING DETAILS FOR EXPRESSWAYS & FREEWAYS
T-M-6	06-22-12	MARKING DETAILS FOR EXPRESSWAY & FREEWAY INTERCHANGES
T-M-10	06-15-12	SIGN AND PAVEMENT MARKINGS FOR SHARED-USE PATHS
T-M-11	06-15-12	SIGNING AND PAVEMENT MARKING FOR BICYCLE ROUTES ON RURAL ROADS
T-M-17		PAVEMENT MARKING DETAILS FOR ROUNDABOUTS

IB 13-8

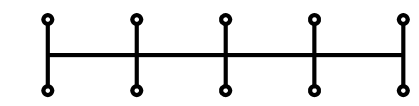
T-S-13	07-20-12	STANDARD STEEL GROUND MOUNTED SIGNS, BREAK-AWAY TYPE POST FOOTING DETAILS, I-BEAMS
T-S-14	08-17-12	STANDARD STEEL GROUND MOUNTED SIGNS, BREAK-AWAY TYPE POST FOOTING DETAILS, WF-BEAMS
T-S-21	07-11-12	DETAILS FOR SIGNS MOUNTED ON CONCRETE MEDIAN BARRIERS
T-S-22		SIGN LAYOUT FOR HOV LANES
EC-STR-18		SEDIMENT BASIN FLOATING OUTLET STRUCTURE

  
Carolyn Stonecipher, PE  
Civil Engineering Director  
Design Division

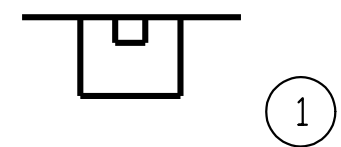
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Attachment

2/21/13

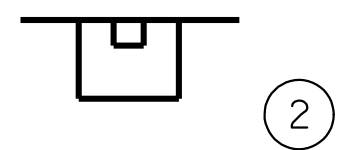
# STANDARD LEGEND



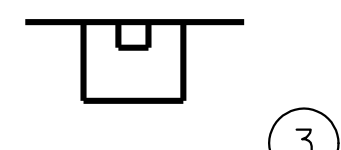
FLOATING TURBIDITY CURTAIN



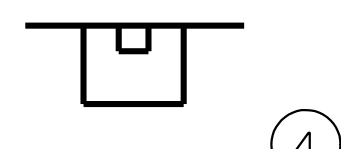
CURB INLET PROTECTION (TYPE 1)



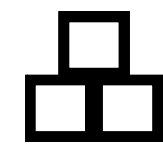
CURB INLET PROTECTION (TYPE 2)



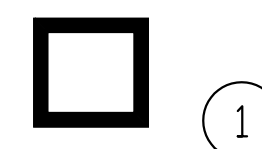
CURB INLET PROTECTION (TYPE 3)



CURB INLET PROTECTION (TYPE 4)



GABION CHECK DAM



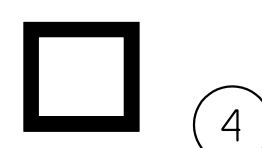
CATCH BASIN FILTER ASSEMBLY (TYPE 1)



CATCH BASIN FILTER ASSEMBLY (TYPE 2)



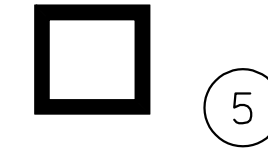
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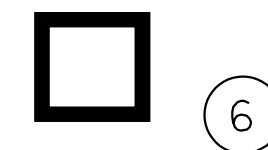
CATCH BASIN FILTER ASSEMBLY (TYPE 4)

\*HVF\*HVF\*

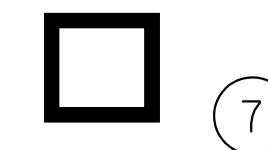
HIGH VISIBILITY FENCE



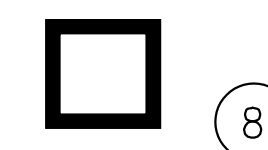
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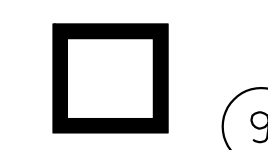
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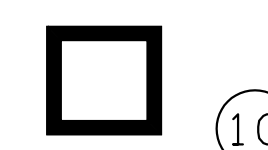
CATCH BASIN FILTER ASSEMBLY (TYPE 7)



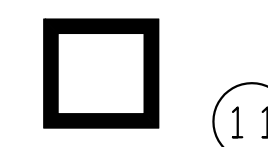
CATCH BASIN FILTER ASSEMBLY (TYPE 8)



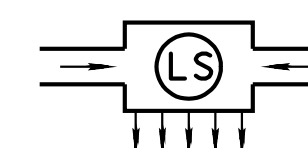
CATCH BASIN FILTER ASSEMBLY (TYPE 9)



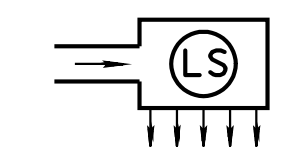
CATCH BASIN FILTER ASSEMBLY (TYPE 10)



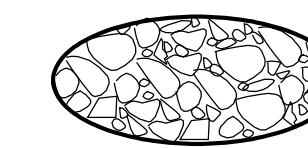
CATCH BASIN FILTER ASSEMBLY (TYPE 11)



LEVEL SPREADER (DUAL DIRECTION)



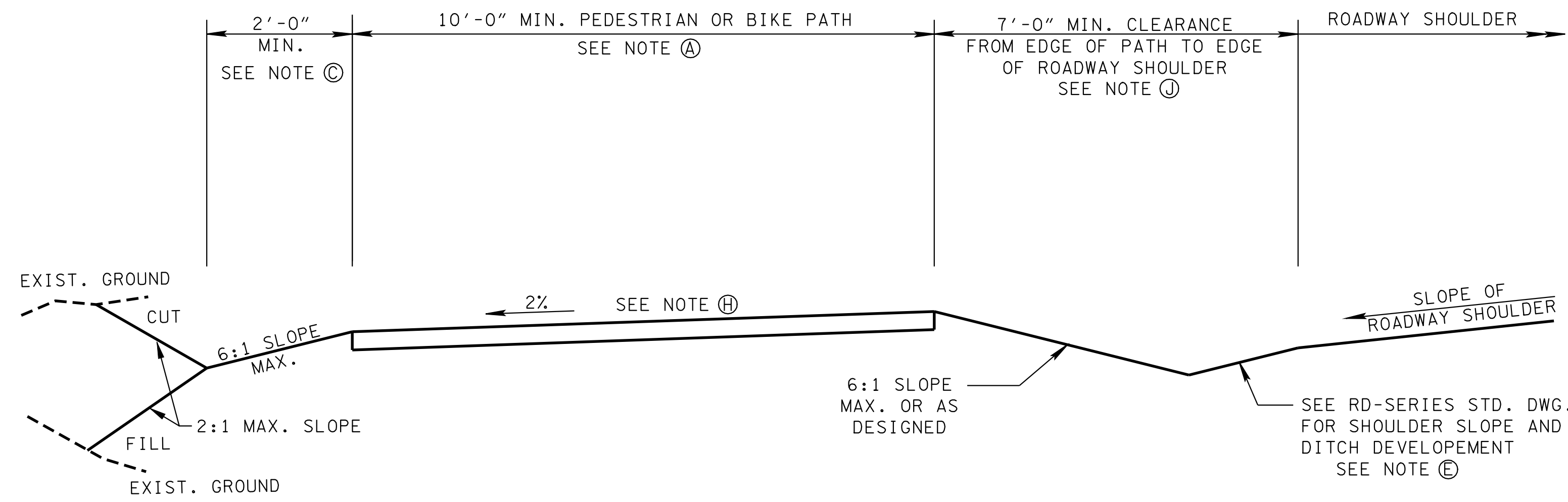
LEVEL SPREADER (SINGLE DIRECTION)



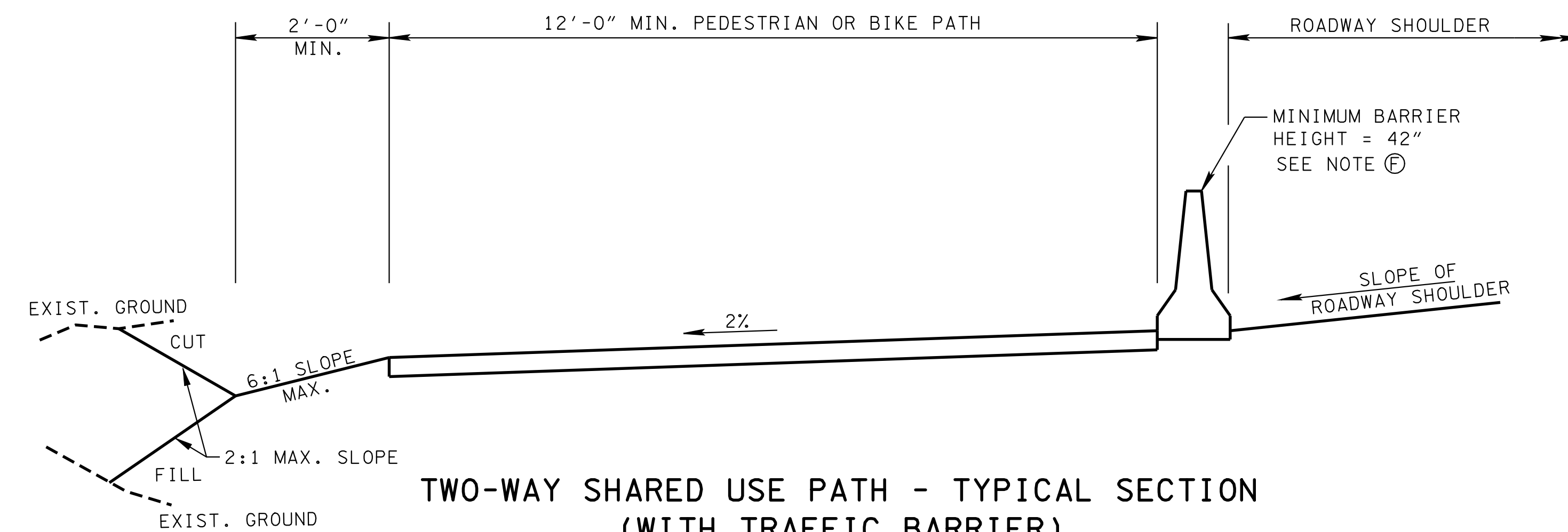
RIP-RAP



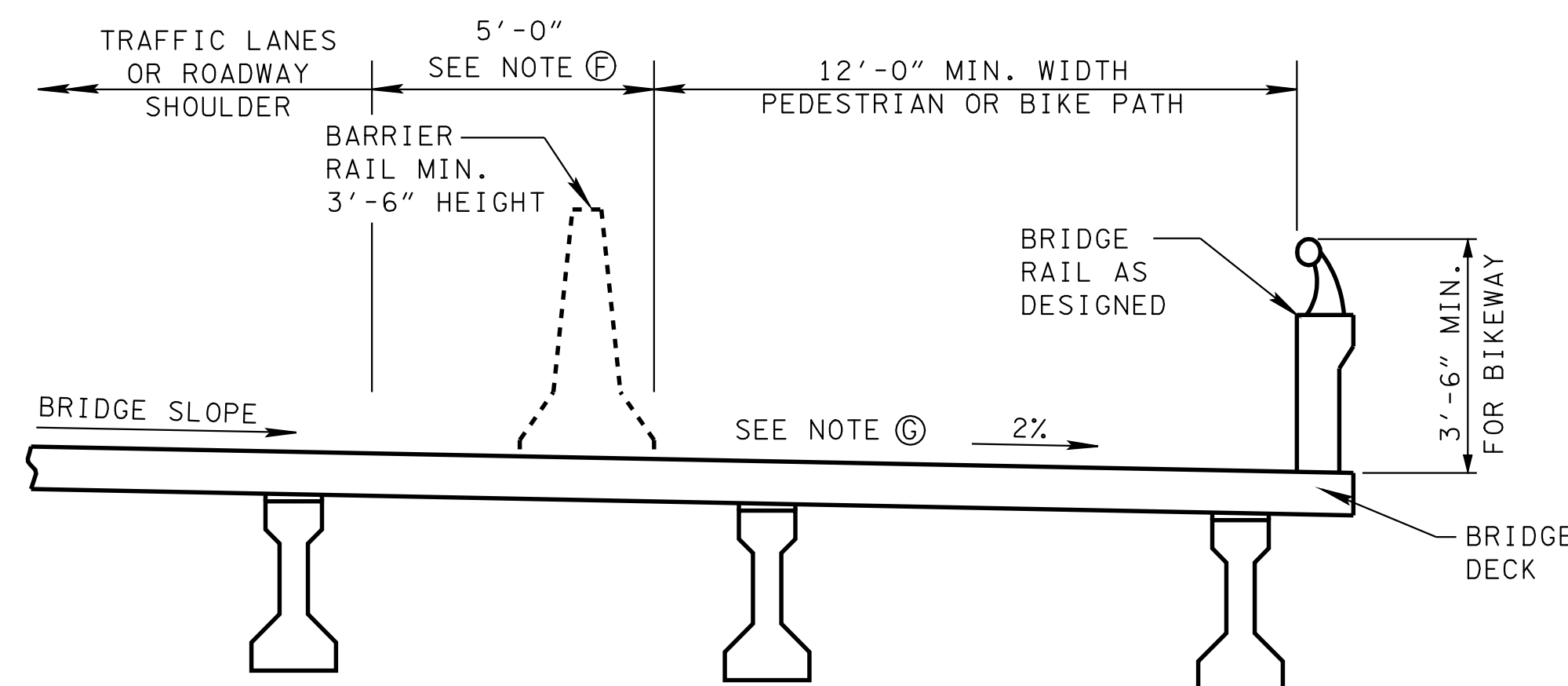
SAND BAG



**TWO-WAY SHARED USE PATH - TYPICAL SECTION  
(WITHOUT TRAFFIC BARRIER)**



**TWO-WAY SHARED USE PATH - TYPICAL SECTION  
(WITH TRAFFIC BARRIER)**



**SHARED USE PATH - BRIDGE SECTION  
DESIGN SPEED < 45 MPH**

NOTE: A MINIMUM DISTANCE OF 5'-0" FROM THE EDGE OF THE SHOULDER TO THE EDGE OF THE PEDESTRIAN OR BIKE PATH SHALL BE MAINTAINED.

**DESIGN NOTES**

- ① A MINIMUM DESIGN SPEED OF 20 MPH SHOULD BE USED. WHEN A DOWNGRADE EXCEEDS 4 PERCENT, OR WHERE STRONG PREVAILING TAILWINDS EXIST, A DESIGN SPEED OF 30 MPH OR MORE IS ADVISABLE.
- ② DESIRABLE MINIMUM RADII FOR PAVED SHARED USE PATHS
 

DESIGN SPEED (V)	BASED ON 15° LEAN ANGLE MINIMUM RADIUS (R)	BASED ON 2% SUPERELEVATION RATES AND 20° LEAN ANGLE MINIMUM RADIUS (R)
12	36	30
20	100	90
25	156	155
30	225	260
- ③ GRADES ON SHARED-USE PATHS GREATER THAN 5% ARE UNDESIRABLE. WHEN IT IS NECESSARY TO EXCEED THE 5% GRADE RECOMMENDATION, THE FOLLOWING GRADE RESTRICTIONS AND GRADE LENGTHS ARE SUGGESTED.
 

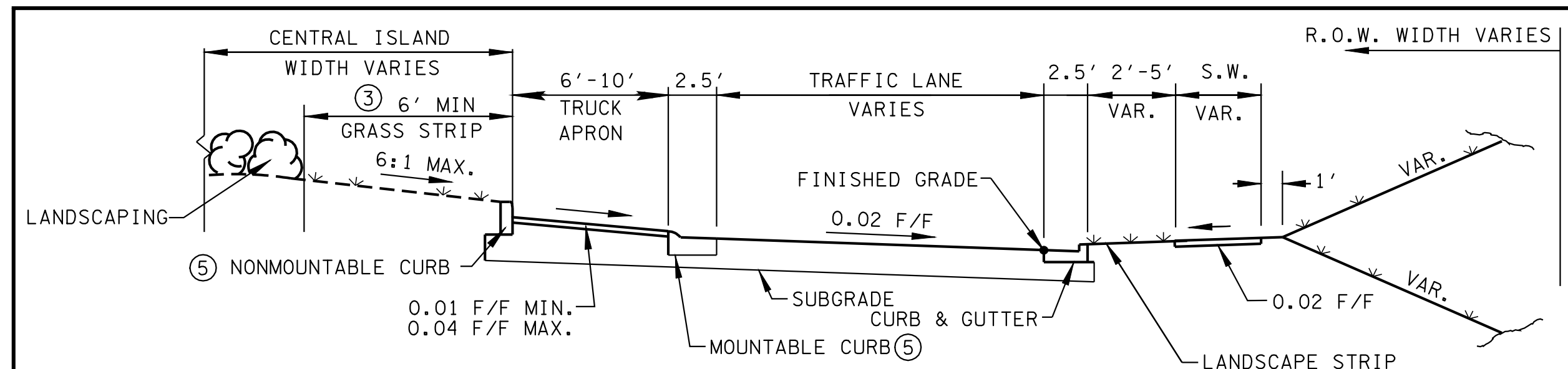
5-6% FOR UP TO 800'	9% FOR UP TO 200'
7% FOR UP TO 400'	10% FOR UP TO 100'
8% FOR UP TO 300'	11+% FOR UP TO 50'
- ④ MINIMUM STOPPING SIGHT DISTANCE VS. GRADES FOR VARIOUS DESIGN SPEEDS.
 
$$S = \frac{V^2}{30(f \pm G)} + 3.67V$$

WHERE : S = STOPPING SIGHT DISTANCE (ft)  
V = VELOCITY (mph)  
f = COEFFICIENT OF FRICTION (USE 0.25)  
G = GRADE (ft/ft) (RISE/RUN)
- ⑤ REFER TO AASHTO "GUIDE FOR THE DEVELOPMENT OF BICYCLE FACILITIES" FOR ADDITIONAL DESIGN REQUIREMENTS.

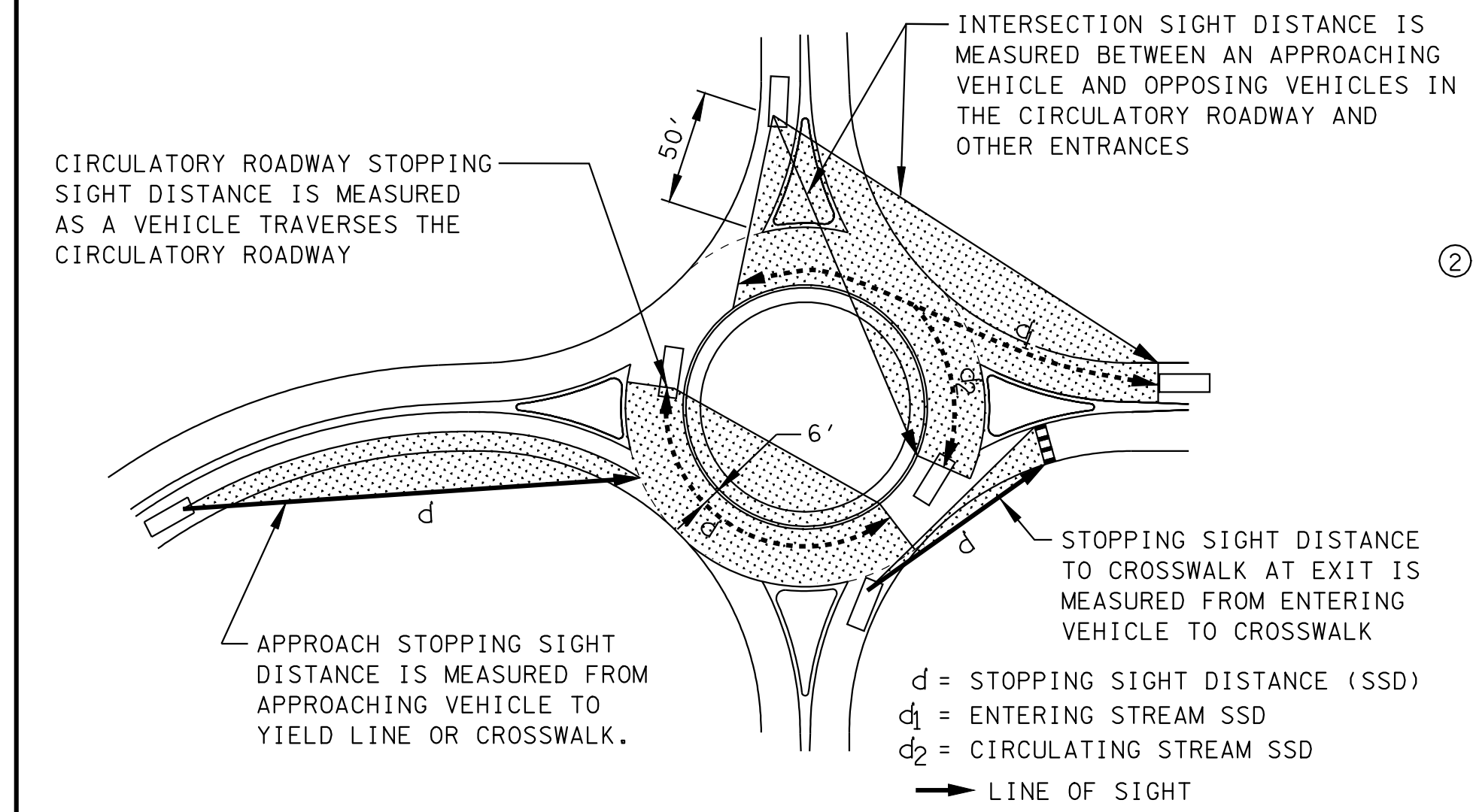
**GENERAL NOTES**

- Ⓐ UNDER CERTAIN CONDITIONS IT MAY BE NECESSARY OR DESIRABLE TO INCREASE THE WIDTH OF A SHARED USE PATH TO 12 FEET, OR EVEN 14 FEET, DUE TO SUBSTANTIAL USE BY BICYCLE, JOGGERS, SKATERS AND PEDESTRIANS, USE BY LARGE MAINTENANCE VEHICLES, AND/OR STEEP GRADES.
- Ⓑ THE MINIMUM WIDTH OF A ONE-DIRECTIONAL SHARED USE PATH IS 6 FEET.
- Ⓒ 3 FEET OR MORE IS DESIRABLE TO PROVIDE CLEARANCE FROM TREES, POLES, WALLS, FENCES, GUARDRAILS, OR OTHER LATERAL OBSTRUCTIONS. WHERE THE PATH IS ADJACENT TO CANALS, DITCHES OR SLOPES STEEPER THAN 3:1, A WIDER SEPARATION SHOULD BE CONSIDERED.
- Ⓓ THE VERTICAL CLEARANCE TO OBSTRUCTIONS SHOULD BE A MINIMUM OF 8 FEET. HOWEVER, VERTICAL CLEARANCE MAY NEED TO BE GREATER TO PERMIT PASSAGE OF MAINTENANCE AND EMERGENCY VEHICLES. IN UNDERCROSSINGS AND TUNNELS, 10 FEET IS DESIRABLE FOR ADEQUATE VERTICAL SHY DISTANCE.
- Ⓔ DITCH SHOULD BE LOCATED PROPERLY BETWEEN THE SHARED USE PATH AND ROADWAY TO INSURE THAT WATER DOES NOT FLOW ONTO THE ROADWAY OR SHOULDER. ALSO DITCH SHOULD BE SUFFICIENT ENOUGH TO REMOVE THE ADDITIONAL RUNOFF.
- Ⓕ WHEN THE DISTANCE BETWEEN THE EDGE OF SHOULDER AND THE SHARED USE PATH IS LESS THAN 7 FEET AND/OR THE ROADWAY DESIGN SPEED EXCEEDS 45 MILES PER HOUR, A BARRIER RAIL IS REQUIRED. BARRIER RAIL SHOULD BE CONSIDERED ON A CASE BY CASE BASIS IF THE DISTANCE IS GREATER THAN 5 FEET. BARRIER RAIL USED SHALL BE (NCHRP 350) TEST LEVEL III COMPLIANT.
- Ⓖ ON ALL BRIDGE DECKS, SPECIAL CARE SHALL BE TAKEN TO ENSURE THAT BICYCLE-SAFE EXPANSION JOINTS ARE USED AND DECKING MATERIALS THAT MAY BECOME SLIPPERY WHEN WET ARE AVOIDED.
- Ⓗ SEE ROADWAY PLANS FOR PAVEMENT DETAILS.
- Ⓘ SEE STD. DWG. T-M-10 FOR SIGNING AND PAVEMENT MARKINGS.
- Ⓙ CLEAR ZONE SHOULD BE MAINTAINED BETWEEN THE ROADWAY AND THE SHARED USE PATH. IF CLEAR ZONE CAN NOT BE ACHIEVED AN APPROPRIATE BARRIER SHOULD BE CONSIDERED FOR SPEED LESS THAN 45 MPH.

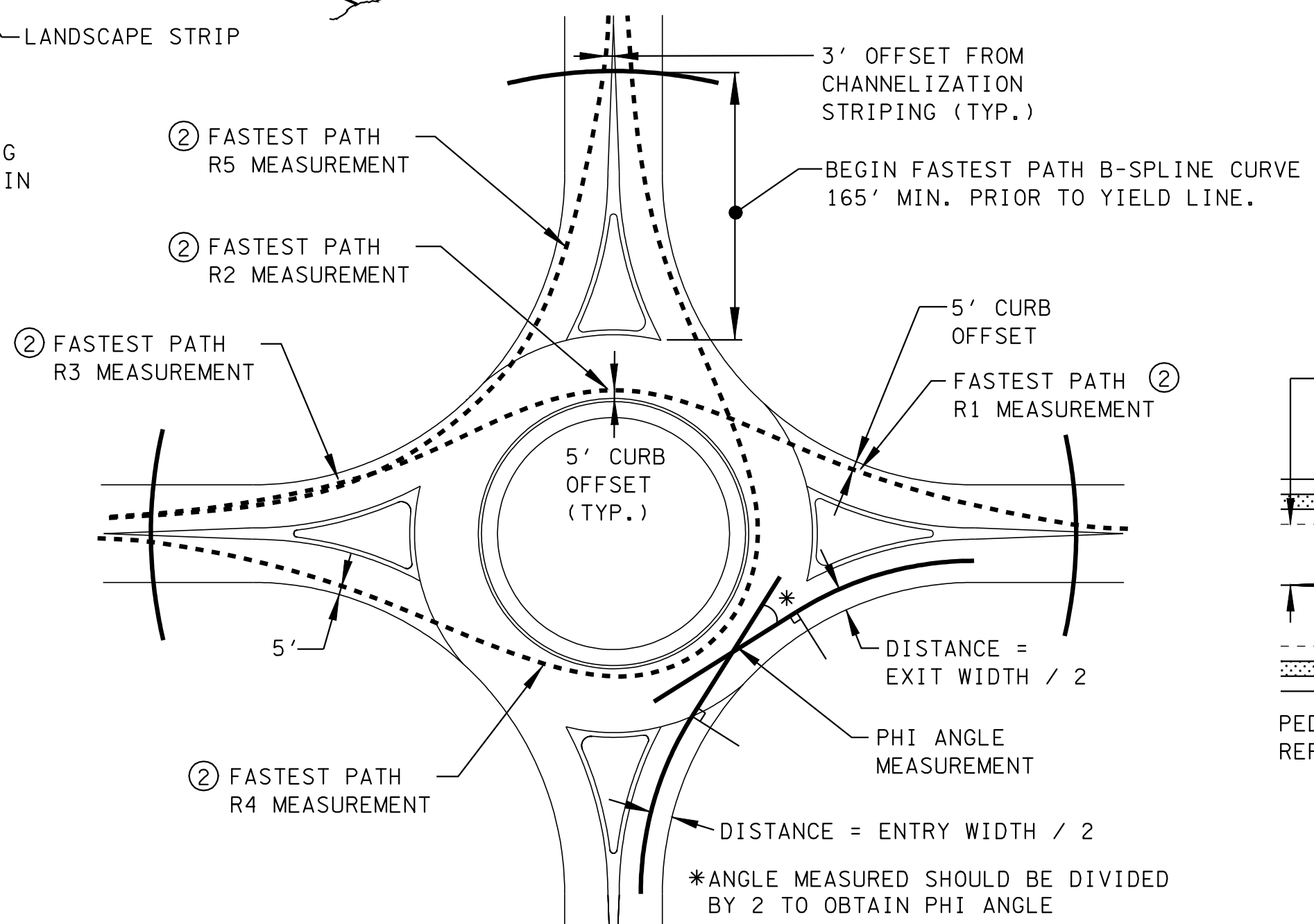
REV. 2-1-12: ADDED OPTIONAL PEDESTRIAN RAIL.  
 REV. 6-15-12: RENAMED SHEET FROM RD-TS-9. ADDED NOTE (M)



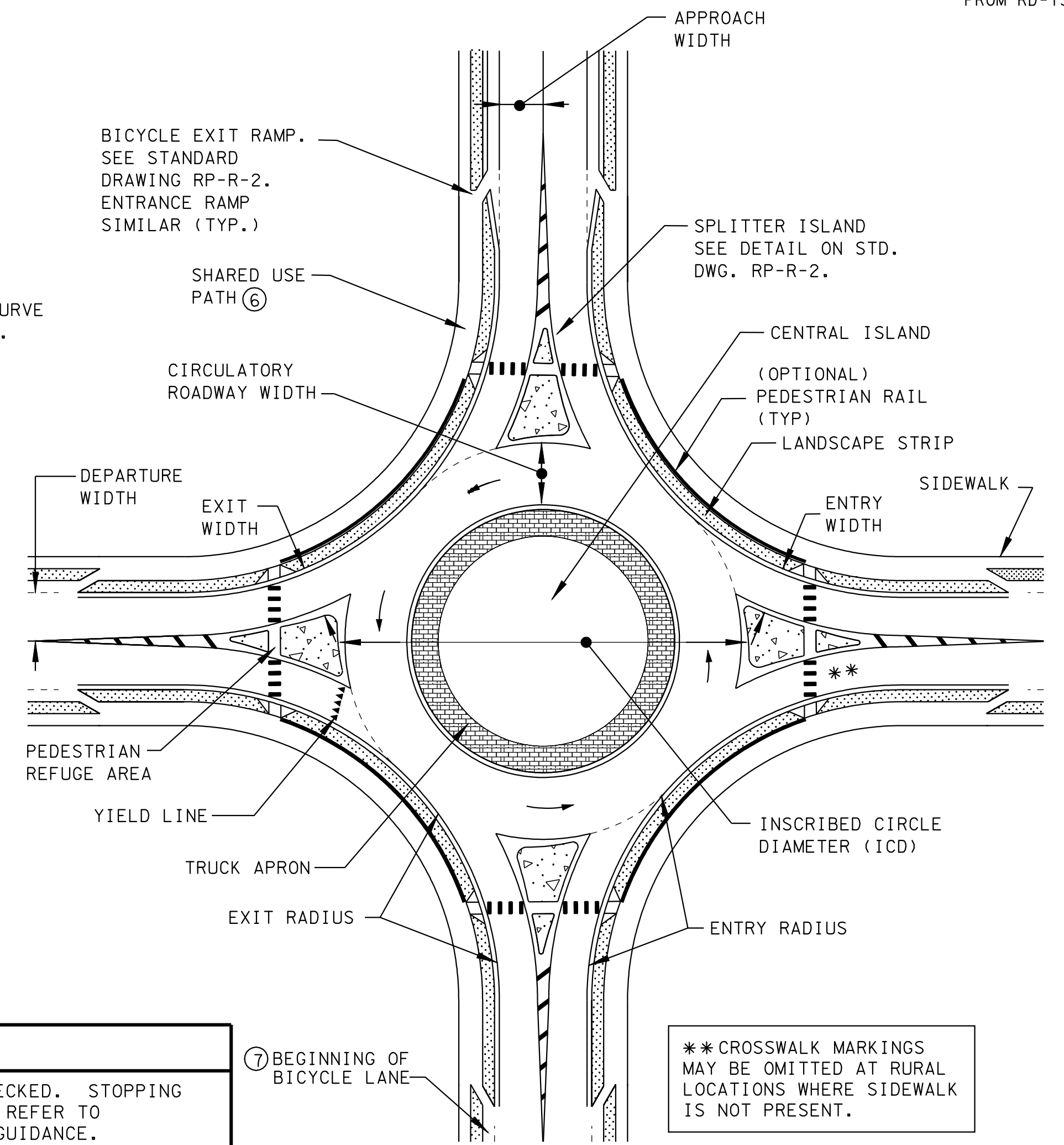
**ROUNDABOUT TYPICAL SECTION**



**ROUNDABOUT SIGHT DISTANCE ①**

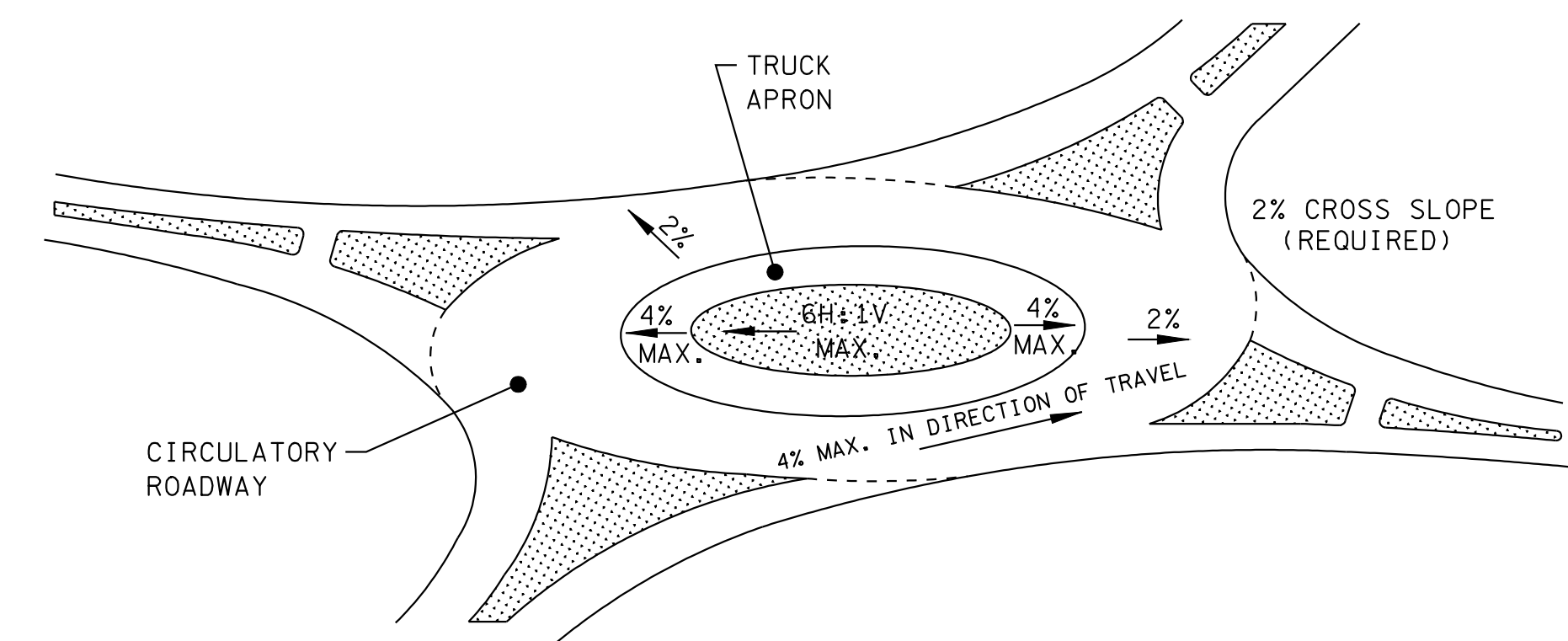


**ROUNDABOUT DESIGN CHECKS**



**TYPICAL PLAN VIEW OF ROUNDABOUT**

SEE GENERAL NOTE K



**CIRCULATORY ROADWAY SLOPES**

NOTE: TRUCK APRON CROSS SLOPE SHOULD MATCH CIRCULATORY ROADWAY CROSS SLOPE OR MAY BE INCREASED UP TO 4 PERCENT MAX.

**DESIGN STANDARDS FOR SINGLE LANE ROUNDABOUTS**

	URBAN	RURAL	NOTES
DESIGN SPEED	20 MPH	25 MPH	SEE FHWA EXHIBIT 6-4
INSCRIBED CIRCLE DIAMETER (8)	105' - 150'	130' - 150'	MEASURED FROM CURB FACE TO CURB FACE
CIRCULATORY ROADWAY WIDTH	1.0 - 1.2 TIMES THE MAXIMUM ENTRY WIDTH	1.0 - 1.2 TIMES THE MAXIMUM ENTRY WIDTH	---
ENTRY WIDTH	18' - 22'	18' - 22'	MEASURED FROM CURB FACE TO CURB FACE
ENTRY RADIUS	65' - 90'	65' - 90'	---
EXIT WIDTH	SAME AS ENTRY WIDTH	SAME AS ENTRY WIDTH	SAME AS ENTRY WIDTH
EXIT RADIUS	200' - 1000'	200' - 1000'	---
APPROACH/DEPARTURE WIDTH	WIDTH OF APPROACHING LANE	WIDTH OF APPROACHING LANE	DOES NOT INCLUDE BIKE LANE OR GUTTER
DAILY SERVICE VOLUME (WITH CAPACITY ANALYSIS) APPROXIMATELY 25,000 VEH/DAY			

**DESIGN NOTES**

- ① FASTEST PATH CHECKS SHOULD BE COMPLETED PRIOR TO INTERSECTION SIGHT DISTANCE BEING CHECKED. STOPPING SIGHT DISTANCE AND INTERSECTION SIGHT DISTANCE SHOULD BE CHECKED FOR ALL APPROACHES. REFER TO "ROUNDABOUTS; AN INFORMATIONAL GUIDE," FHWA, 2000 AND RD01-SD-1 THRU 7 FOR ADDITIONAL GUIDANCE.
- ② CONSTRUCT A B-SPLINE (SHOWN AS DASHED LINE) FOR THE THROUGH, LEFT TURN, AND RIGHT TURN MOVEMENTS. B-SPLINE SHOULD TOUCH THE 5' CURB OFFSETS AT THE POINTS INDICATED FOR THE R1, R2, R3, R4 AND R5 MEASUREMENTS. MEASURE THE RADIUS OF THE B-SPLINE AT EACH POINT. MEASUREMENT SHOULD BE BETWEEN 65' AND 85' LONG. FOR THE R1 MEASUREMENT, THE RADIUS SHOULD NOT BE MEASURED THROUGH THE YIELD LINE.
- ③ PROVIDE 6' MINIMUM UNOBSTRUCTED HORIZONTAL CLEARANCE FROM THE NON-MOUNTABLE CURB TO THE CENTRAL ISLAND LANDSCAPING TO ALLOW FOR CIRCULATORY ROADWAY SIGHT DISTANCE, ACTUAL DISTANCE MAY BE GREATER AND SHOULD BE DETERMINED AFTER SIGHT DISTANCE CHECKS ARE COMPLETE, BUT SHALL NOT BE LESS THAN 6 FEET.
- ④ SPLITTER ISLAND SHOULD BE A RAISED MEDIAN WITH CONCRETE HARDSCAPING (PREFERRED). SPLITTER ISLAND SHOULD EXTEND A MINIMUM OF 50' FROM THE YIELD LINE. SEE STANDARD DRAWING RP-H-6 FOR ADDITIONAL DETAILS.
- ⑤ FOR MOUNTABLE CURB BETWEEN CIRCULATORY ROADWAY AND TRUCK APRON, SEE STANDARD DRAWING RP-R-2. FOR NONMOUNTABLE CURB BETWEEN TRUCK APRON AND CENTRAL ISLAND, SEE STANDARD DRAWING RP-NMC-10.
- ⑥ SIDEWALK SHALL BE WIDENED TO ACCOMMODATE BICYCLES AND PEDESTRIANS AT ROUNDABOUT (SHARED USE PATH). SEE STANDARD DRAWING RD-TS-8 FOR ADDITIONAL DETAILS.
- ⑦ SEE STANDARD DRAWINGS T-M-10, 11 AND 12 FOR SIGNING AND PAVEMENT MARKINGS FOR SHARED USE PATHS AND BICYCLE LANES.
- ⑧ ASSUMES APPROXIMATELY 90-DEGREE ANGLES BETWEEN ENTRIES AND NO MORE THAN FOUR ENTRIES TO THE ROUNDABOUT.

**GENERAL NOTES**

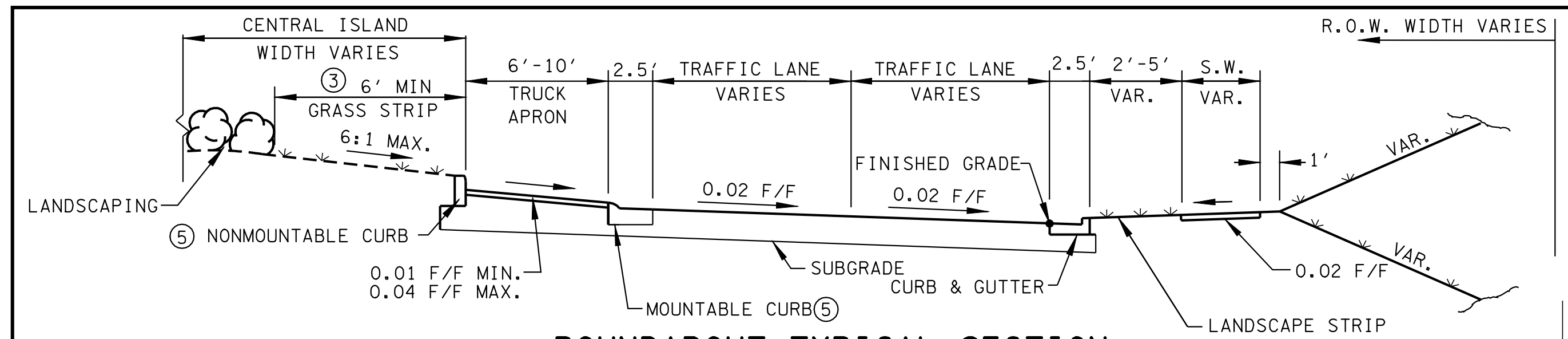
- |  |  |
|--|--|
| <p>(A) FOR SPECIFIC CONDITIONS NOT COVERED ON THIS SHEET, REFERENCE SHOULD BE MADE TO "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS", AASHTO, 2001.</p> <p>(B) REFERENCE SHOULD BE MADE TO "ROUNDABOUTS; AN INFORMATIONAL GUIDE", FHWA, 2000. REFERENCE SHOULD ALSO BE MADE TO THE "ROADSIDE DESIGN GUIDE", AASHTO, 2002.</p> <p>(C) THIS STANDARD DRAWING IS INTENDED TO BE USED AS GUIDANCE FOR THE DESIGN OF SINGLE LANE URBAN AND RURAL ROUNDABOUTS. FOR MULTI-LANE DESIGNS, SEE STANDARD DRAWING RD-TS-10.</p> <p>(D) TRUCK TURNING TEMPLATES SHOULD BE PERFORMED ON ALL TURNING MOVEMENTS WITHIN THE ROUNDABOUT. A WB-62 VEHICLE SHOULD BE USED WHERE APPROPRIATE.</p> <p>(E) STANDARD AASHTO GUIDELINES FOR ISLAND DESIGN SHOULD BE FOLLOWED FOR SPLITTER ISLAND DESIGNS, INCLUDING LARGER NOSE RADII AT APPROACH CORNERS AND OFFSETTING CURB LINES AT THE APPROACH ENDS OF THE SPLITTER ISLAND.</p> <p>(F) MAXIMUM LONGITUDINAL GRADE IN THE DIRECTION OF TRAVEL THROUGH THE CIRCULATORY ROADWAY SHALL BE 4 PERCENT.</p> | <p>(G) USE OF A RIGHT-TURN BYPASS LANE MAY BE WARRANTED FROM THE ROUNDABOUT TRAFFIC MODEL.</p> <p>(H) ROUNDABOUT APPROACHES WITH SPEEDS OF 45 MPH OR GREATER ARE CONSIDERED HIGH SPEED APPROACHES. REFER TO SECTION 6.5 OF THE "ROUNDABOUTS; AN INFORMATIONAL GUIDE", FHWA, 2000 FOR ADDITIONAL INFORMATION ON DESIGN OF ROUNDABOUTS WITH HIGH SPEED APPROACHES.</p> <p>(I) MINI ROUNDABOUTS, TRAFFIC CIRCLES, AND ROTARIES ARE NOT CONSIDERED ROUNDABOUTS AND SHOULD NOT BE DESIGNED TO THE STANDARDS ON THIS DRAWING.</p> <p>(J) ROADWAY SHOULDERS AND BICYCLE LANE SHALL END PRIOR TO THE CIRCULATORY ROADWAY.</p> <p>(K) FOR ROUNDABOUT CONSTRUCTION DETAILS, SEE STANDARD DRAWING RP-R-2.</p> <p>(L) OPTIONAL PEDESTRIAN RAIL SHALL NOT CAUSE A CONFLICT WITH INTERSECTION SIGHT DISTANCE.</p> <p>(M) SEE T-M-17 FOR MARKING DETAILS.</p> |
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STATE OF TENNESSEE  
 DEPARTMENT OF TRANSPORTATION

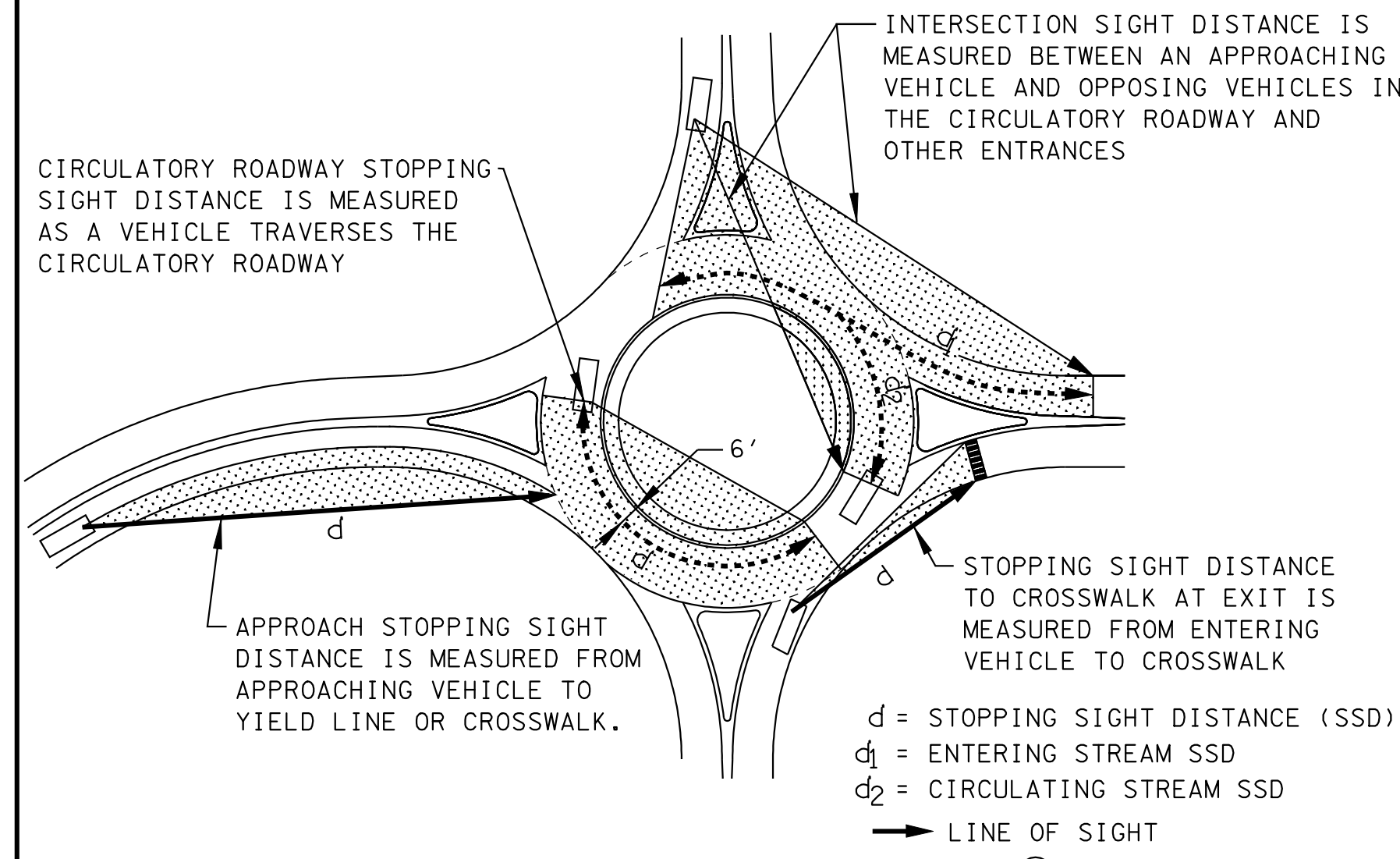
**DESIGN STANDARDS FOR SINGLE LANE URBAN AND RURAL ROUNDABOUTS**



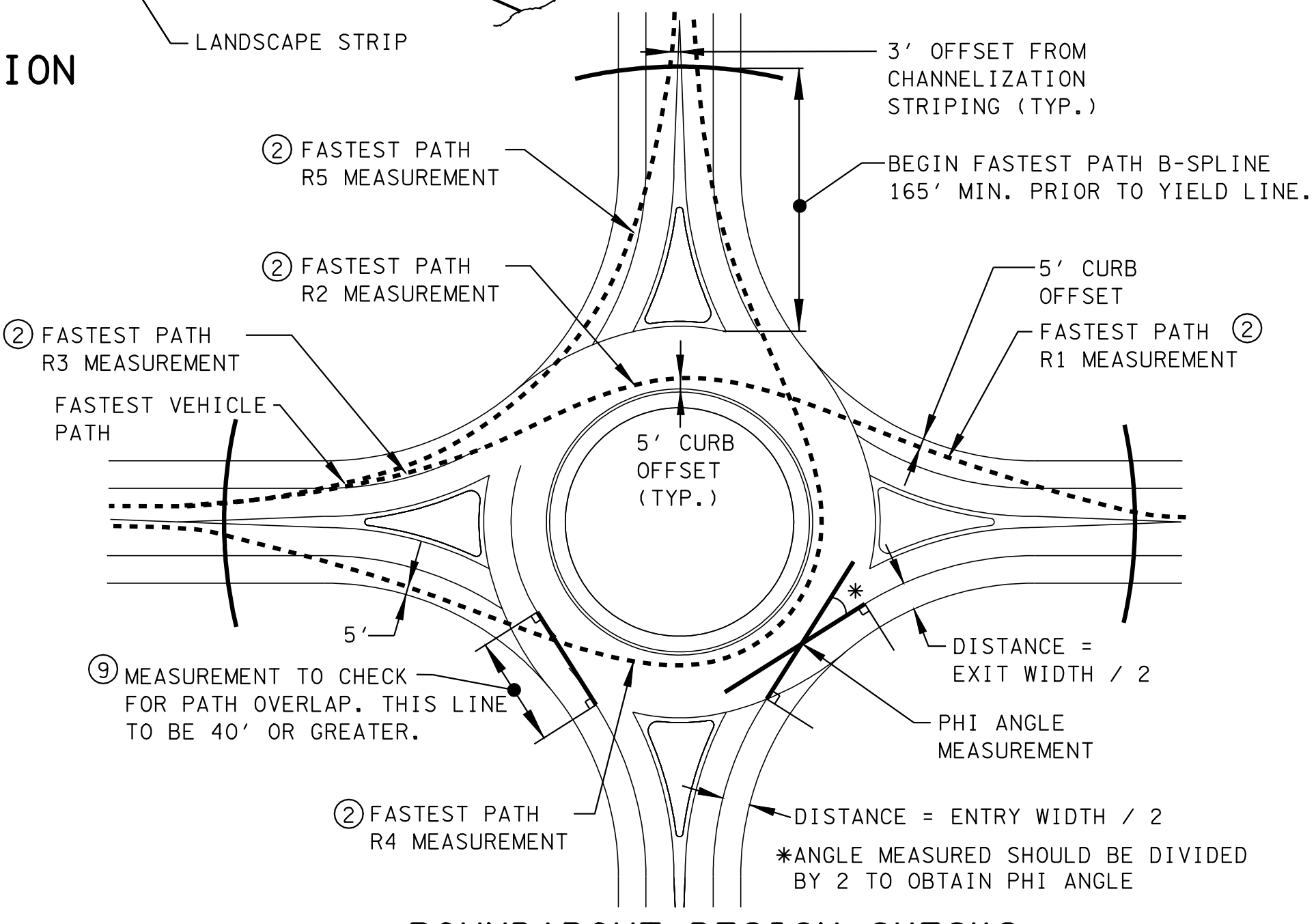
REV. 2-1-12: ADDED OPTIONAL PEDESTRIAN RAIL.  
 REV. 6-15-12: RENAMED SHEET FROM RD-TS-10. ADDED NOTE (M)



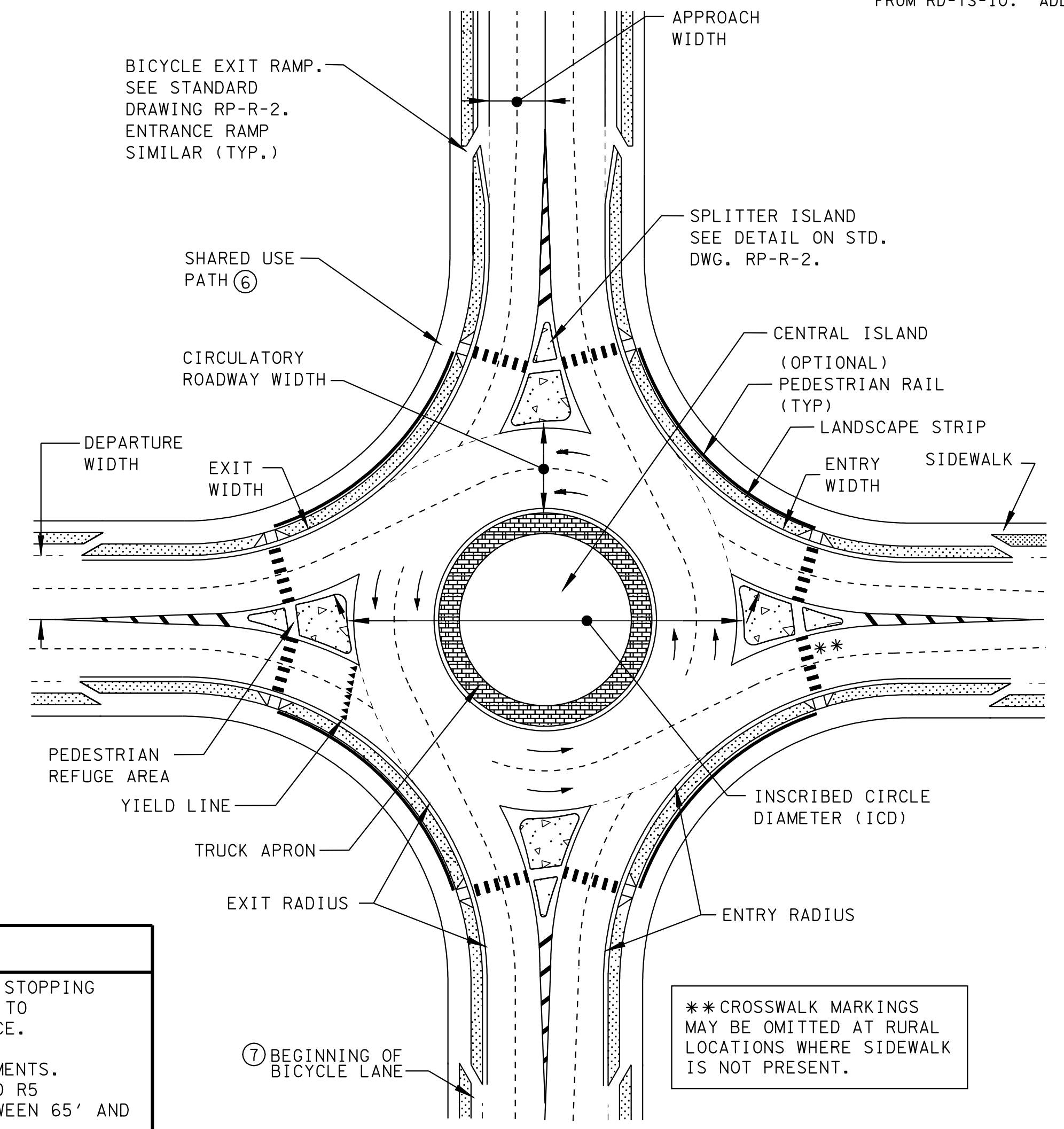
**ROUNDABOUT TYPICAL SECTION**



**ROUNDABOUT SIGHT DISTANCE ①**



**ROUNDABOUT DESIGN CHECKS**



**TYPICAL PLAN VIEW OF MULTI-LANE ROUNDABOUT**  
SEE GENERAL NOTE K

**DESIGN STANDARDS FOR MULTI-LANE ROUNDABOUTS**

	URBAN	RURAL	NOTES
DESIGN SPEED	25 MPH	30 MPH	SEE FHWA EXHIBIT 6-4
INSCRIBED CIRCLE DIAMETER (8)	150' - 220'	165' - 220'	MEASURED FROM CURB FACE TO CURB FACE
CIRCULATORY ROADWAY WIDTH	1.0 - 1.2 TIMES THE MAXIMUM ENTRY WIDTH	1.0 - 1.2 TIMES THE MAXIMUM ENTRY WIDTH	---
ENTRY WIDTH	24' - 28'	24' - 28'	MEASURED FROM CURB FACE TO CURB FACE
ENTRY RADIUS	65' - 100'	65' - 100'	---
EXIT WIDTH	SAME AS ENTRY WIDTH	SAME AS ENTRY WIDTH	SAME AS ENTRY WIDTH
EXIT RADIUS	200' - 1000'	200' - 1000'	---
APPROACH/DEPARTURE WIDTH	WIDTH OF APPROACHING LANE	WIDTH OF APPROACHING LANE	DOES NOT INCLUDE BIKE LANE OR GUTTER

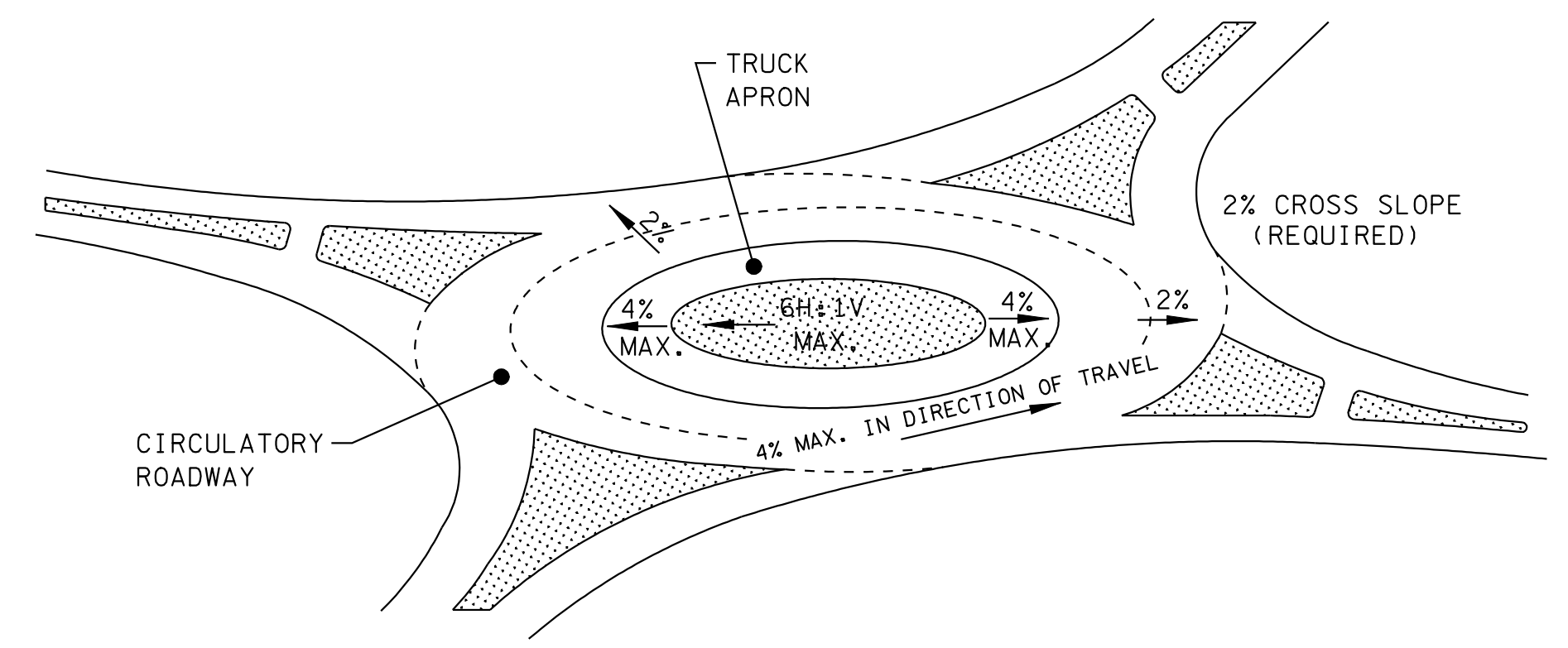
DAILY SERVICE VOLUME (WITHOUT CAPACITY ANALYSIS) APPROXIMATELY 45,000 VEH/DAY

**DESIGN NOTES**

- ① FASTEST PATH CHECKS SHOULD BE COMPLETED PRIOR TO INTERSECTION SIGHT DISTANCE BEING CHECKED. STOPPING SIGHT DISTANCE AND INTERSECTION SIGHT DISTANCE SHOULD BE CHECKED FOR ALL APPROACHES. REFER TO "ROUNDABOUTS; AN INFORMATIONAL GUIDE," FHWA, 2000 AND RD01-SD-1 THRU 7 FOR ADDITIONAL GUIDANCE.
- ② CONSTRUCT A B-SPLINE (SHOWN AS DASHED LINE) FOR THE THROUGH, LEFT TURN, AND RIGHT TURN MOVEMENTS. B-SPLINE SHOULD TOUCH THE 5' CURB OFFSETS AT THE POINTS INDICATED FOR THE R1, R2, R3, R4 AND R5 MEASUREMENTS. MEASURE THE RADIUS OF THE B-SPLINE AT EACH POINT. MEASUREMENT SHOULD BE BETWEEN 65' AND 85' LONG. FOR THE R1 MEASUREMENT, THE RADIUS SHOULD NOT BE MEASURED THROUGH THE YIELD LINE.
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- ④ SPLITTER ISLAND SHOULD BE A RAISED MEDIAN WITH CONCRETE HARDSCAPING (PREFERRED). SPLITTER ISLAND SHOULD EXTEND A MINIMUM OF 50' FROM THE YIELD LINE. SEE STANDARD DRAWING RP-H-6 FOR ADDITIONAL DETAILS.
- ⑤ FOR MOUNTABLE CURB BETWEEN CIRCULATORY ROADWAY AND TRUCK APRON, SEE STANDARD DRAWING RP-R-2. FOR NONMOUNTABLE CURB BETWEEN TRUCK APRON AND CENTRAL ISLAND, SEE STANDARD DRAWING RP-NMC-10.
- ⑥ SIDEWALK SHALL BE WIDENED TO ACCOMMODATE BICYCLES AND PEDESTRIANS AT ROUNDABOUT (SHARED USE PATH). SEE STANDARD DRAWING RD-TS-8 FOR ADDITIONAL DETAILS.
- ⑦ SEE STANDARD DRAWINGS T-M-10, 11 AND 12 FOR SIGNING AND MARKINGS FOR SHARED USE PATHS AND BICYCLE LANES.
- ⑧ ASSUMES APPROXIMATELY 90-DEGREE ANGLES BETWEEN ENTRIES AND NO MORE THAN FOUR ENTRIES TO THE ROUNDABOUT.
- ⑨ PATH OVERLAP SHOULD BE MEASURED AT THE ENTRANCE AND EXITS OF MULTI-LANE ROUNDABOUTS. LINE SHOULD BE DRAWN TANGENT TO THE CENTER OF THE ENTRANCE/EXIT AND CIRCULATORY ROADWAY.

**GENERAL NOTES**

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>(A) FOR SPECIFIC CONDITIONS NOT COVERED ON THIS SHEET, REFERENCE SHOULD BE MADE TO "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS", AASHTO, 2001.</li> <li>(B) REFERENCE SHOULD BE MADE TO "ROUNDABOUTS: AN INFORMATIONAL GUIDE", FHWA, 2000. REFERENCE SHOULD ALSO BE MADE TO THE "ROADSIDE DESIGN GUIDE", AASHTO, 2002.</li> <li>(C) THIS STANDARD DRAWING IS INTENDED TO BE USED AS GUIDANCE FOR THE DESIGN OF MULTI-LANE URBAN AND RURAL ROUNDABOUTS. FOR SINGLE LANE DESIGNS, SEE STANDARD DRAWING RD-TS-9.</li> <li>(D) TRUCK TURNING TEMPLATES SHOULD BE PERFORMED ON ALL TURNING MOVEMENTS WITHIN THE ROUNDABOUT. A WB-62 VEHICLE SHOULD BE USED WHERE APPROPRIATE.</li> <li>(E) STANDARD AASHTO GUIDELINES FOR ISLAND DESIGN SHOULD BE FOLLOWED FOR SPLITTER ISLAND DESIGNS, INCLUDING LARGER NOSE RADII AT APPROACH CORNERS AND OFFSETTING CURB LINES AT THE APPROACH ENDS OF THE SPLITTER ISLAND.</li> <li>(F) MAXIMUM LONGITUDINAL GRADE IN THE DIRECTION OF TRAVEL THROUGH THE CIRCULATORY ROADWAY SHALL BE 4 PERCENT.</li> </ul> | <ul style="list-style-type: none"> <li>(G) USE OF A RIGHT-TURN BYPASS LANE MAY BE WARRANTED FROM THE ROUNDABOUT TRAFFIC MODEL.</li> <li>(H) ROUNDABOUT APPROACHES WITH SPEEDS OF 45 MPH OR GREATER ARE CONSIDERED HIGH SPEED APPROACHES. REFER TO SECTION 6.5 OF THE "ROUNDABOUTS: AN INFORMATIONAL GUIDE", FHWA, 2000 FOR ADDITIONAL INFORMATION ON DESIGN OF ROUNDABOUTS WITH HIGH SPEED APPROACHES.</li> <li>(I) MINI ROUNDABOUTS, TRAFFIC CIRCLES, AND ROTARIES ARE NOT CONSIDERED ROUNDABOUTS AND SHOULD NOT BE DESIGNED TO THE STANDARDS ON THIS DRAWING.</li> <li>(J) ROADWAY SHOULDERS AND BICYCLE LANE SHOULD END PRIOR TO CIRCULATORY ROADWAY.</li> <li>(K) FOR ROUNDABOUT CONSTRUCTION DETAILS, SEE STANDARD DRAWING RP-R-2.</li> <li>(L) OPTIONAL PEDESTRIAN RAIL SHALL NOT CAUSE A CONFLICT WITH INTERSECTION SIGHT DISTANCE.</li> <li>(M) SEE T-M-17 FOR MARKING DETAILS.</li> </ul> |
|--|--|



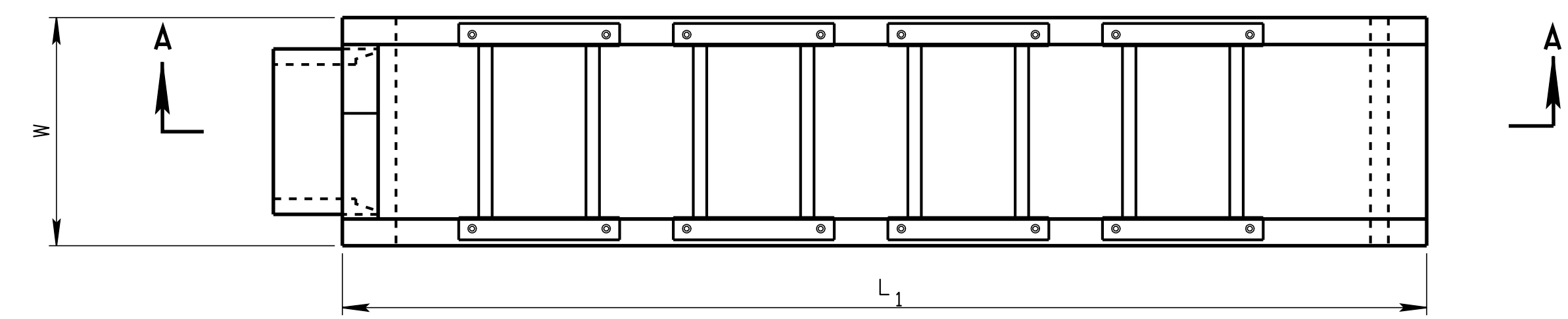
**CIRCULATORY ROADWAY SLOPES**

NOTE: TRUCK APRON CROSS SLOPE SHOULD MATCH CIRCULATORY ROADWAY CROSS SLOPE OR MAY BE INCREASED UP TO 4 PERCENT MAX.

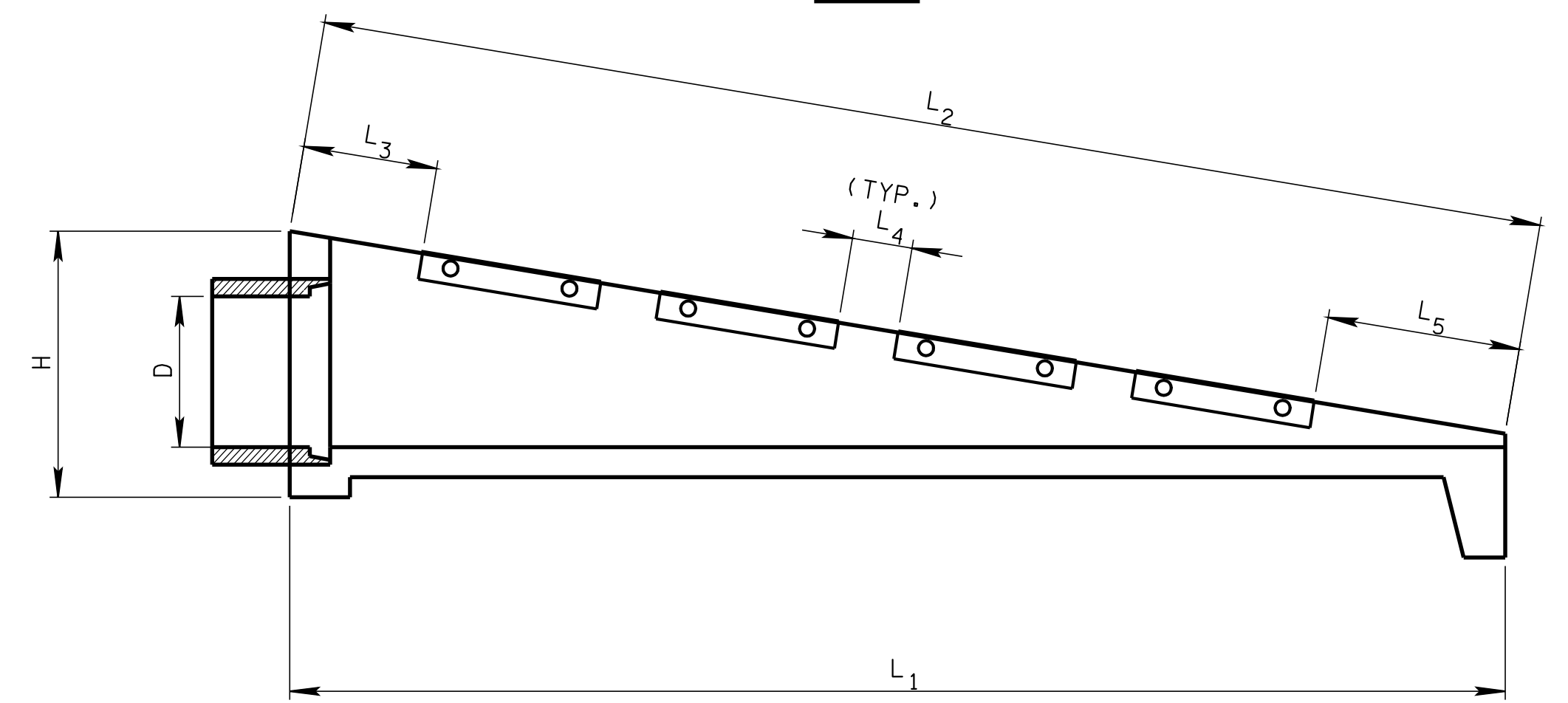
STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION

**DESIGN STANDARDS FOR MULTI-LANE URBAN AND RURAL ROUNDABOUTS**

- REV. 7-10-12: REVISED ALTERNATE ANCHORS FOR STRUCTURAL STEEL GRATES NOTE.
- REV1-10-13: CHANGED REQUIREMENT FOR GRATE ON ALL ENDWALLS.



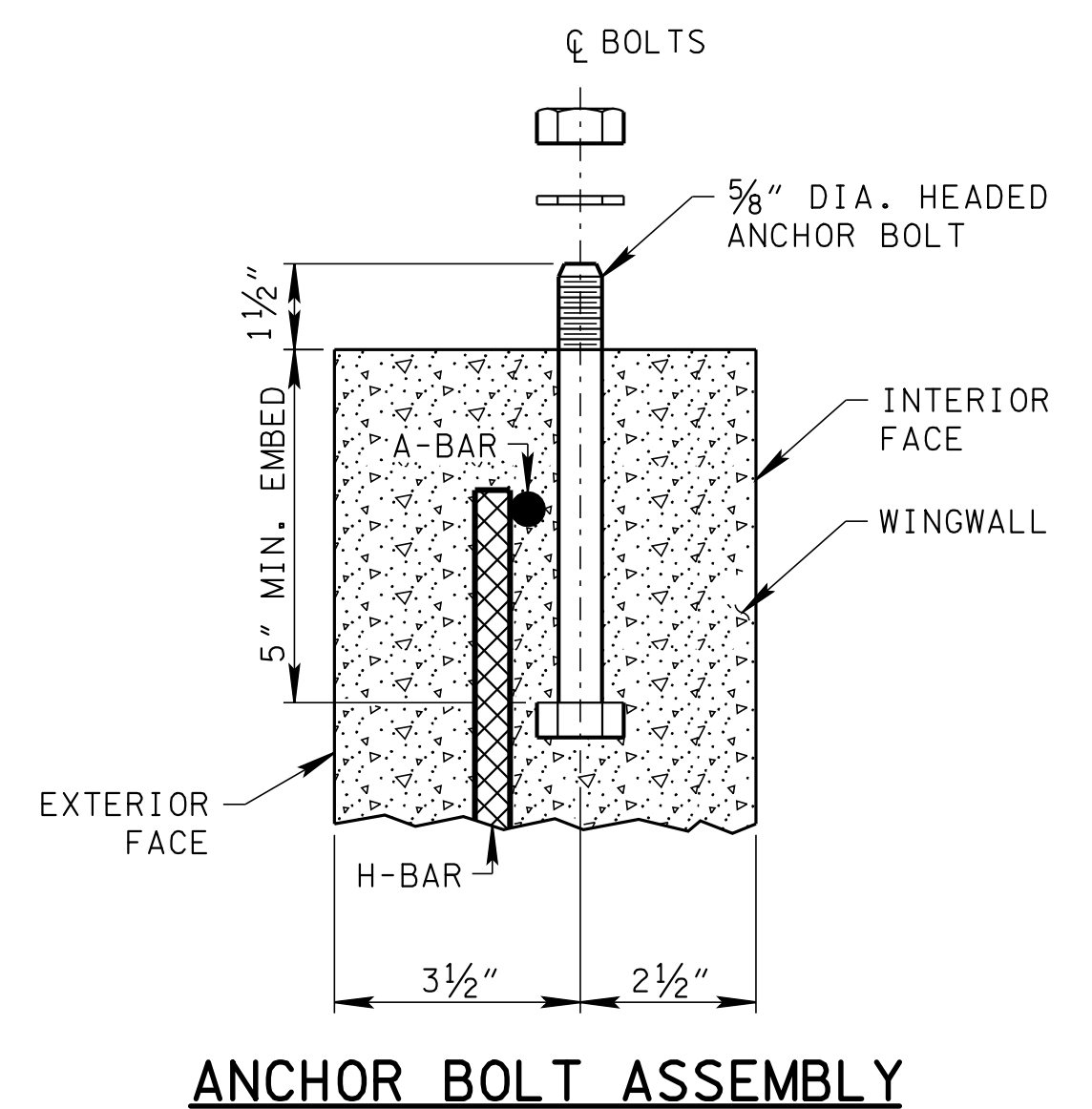
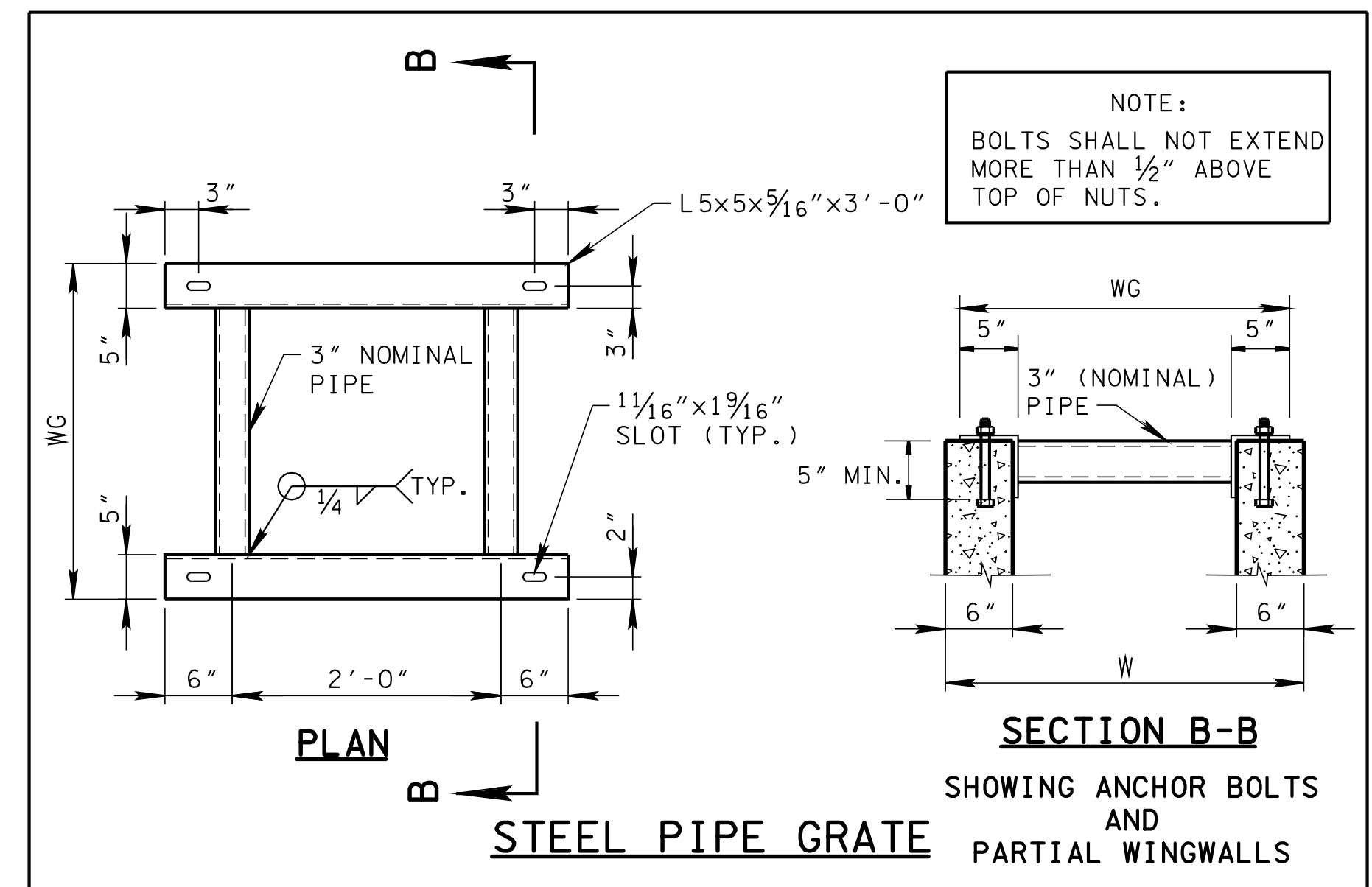
**PLAN**



**SECTION A-A**

**GENERAL NOTES**

- (A) DRAWING TO BE USED FOR ALL 15" THRU 48" SIDE DRAIN CONCRETE ENDWALLS. FOR ENDWALL CONSTRUCTION DIMENSIONS AND QUANTITIES, EXCEPT STEEL PIPE GRATES, SEE THE FOLLOWING STANDARD DRAWINGS:
- 15" ENDWALL - SEE D-PE-15A & D-PE-15B WITH 6:1 WINGWALL SLOPE
  - 18" ENDWALL - SEE D-PE-18A & D-PE-18B WITH 6:1 WINGWALL SLOPE
  - 24" ENDWALL - SEE D-PE-24A & D-PE-24B WITH 6:1 WINGWALL SLOPE
  - 30" ENDWALL - SEE D-PE-30A & D-PE-30B WITH 6:1 WINGWALL SLOPE
  - 36" ENDWALL - SEE D-PE-36A & D-PE-36B WITH 6:1 WINGWALL SLOPE
  - 42" ENDWALL - SEE D-PE-42A & D-PE-42B WITH 6:1 WINGWALL SLOPE
  - 48" ENDWALL - SEE D-PE-48A & D-PE-48B WITH 6:1 WINGWALL SLOPE
- NOTE: ALL SIDE DRAIN CONCRETE ENDWALLS REQUIRES STEEL PIPE GRATES SHOWN ON THIS DRAWING. FOR 30" THRU 48" THE CONTRACTOR SHALL OMIT THE CONCRETE BLOCKOUTS AS SHOWN ON THE ABOVE DRAWINGS, FOLLOWING REINFORCING BAR SUBSTITUTIONS ARE REQUIRED:
- 15" THRU 24" ENDWALLS - NO SUBSTITUTION IS REQUIRED
  - 30" ENDWALL - SUBSTITUTE A465 & A466 BY EXTENDING A464 TO 19'-5"
  - 36" ENDWALL - SUBSTITUTE A464 & A465 BY EXTENDING A463 TO 23'-0"
  - 42" ENDWALL - SUBSTITUTE A465 (2 BARS), A466 & A467 BY EXTENDING A464 TO 26'-0"
  - 48" ENDWALL - SUBSTITUTE A465 (2 BARS), A466 & A467 BY EXTENDING A464 TO 29'-7"
- (B) THE MATERIALS, WELDING AND PAINTING FOR STRUCTURAL STEEL GRATE SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS:
- ① ANGLES: ASTM A36
  - ② STEEL PIPE: ASTM A53, TYPE E, GRADE B, STANDARD WEIGHT (SW) FOR 15" THRU 24" DIAMETER PIPE CULVERT. ASTM A53, TYPE E, GRADE B, DOUBLE EXTRA STRONG WEIGHT (XXS) - FOR 30" THRU 48" DIAMETER PIPE CULVERT.
  - ③ WELDING: AASHTO/AWS D1.5M/D1.5 BRIDGE WELDING CODE (LATEST EDITION)
  - ④ THE GRATE SHALL BE PAINTED BLACK, FEDERAL SPECIFICATION TT-E-489J, AFTER FABRICATION.
- (C) THE MATERIAL AND GALVANIZING FOR BOLTS, NUTS AND WASHERS SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS:
- ① BOLTS, NUTS AND WASHERS: ASTM F1554 GRADE 36
  - ② GALVANIZING: ASTM A153
- (D) THE COST OF FURNISHING BOLTS, NUTS AND WASHERS, INCLUDING ALL MATERIALS, LABOR AND INCIDENTALS NECESSARY TO COMPLETE THE INSTALLATION, SHALL BE INCLUDED IN THE PRICE BID FOR STRUCTURAL STEEL.
- (E) PAYMENT WILL BE MADE UNDER:  
ITEM NUMBER 611-07.03, STRUCTURAL STEEL (PIPE ENDWALLS)----POUND.



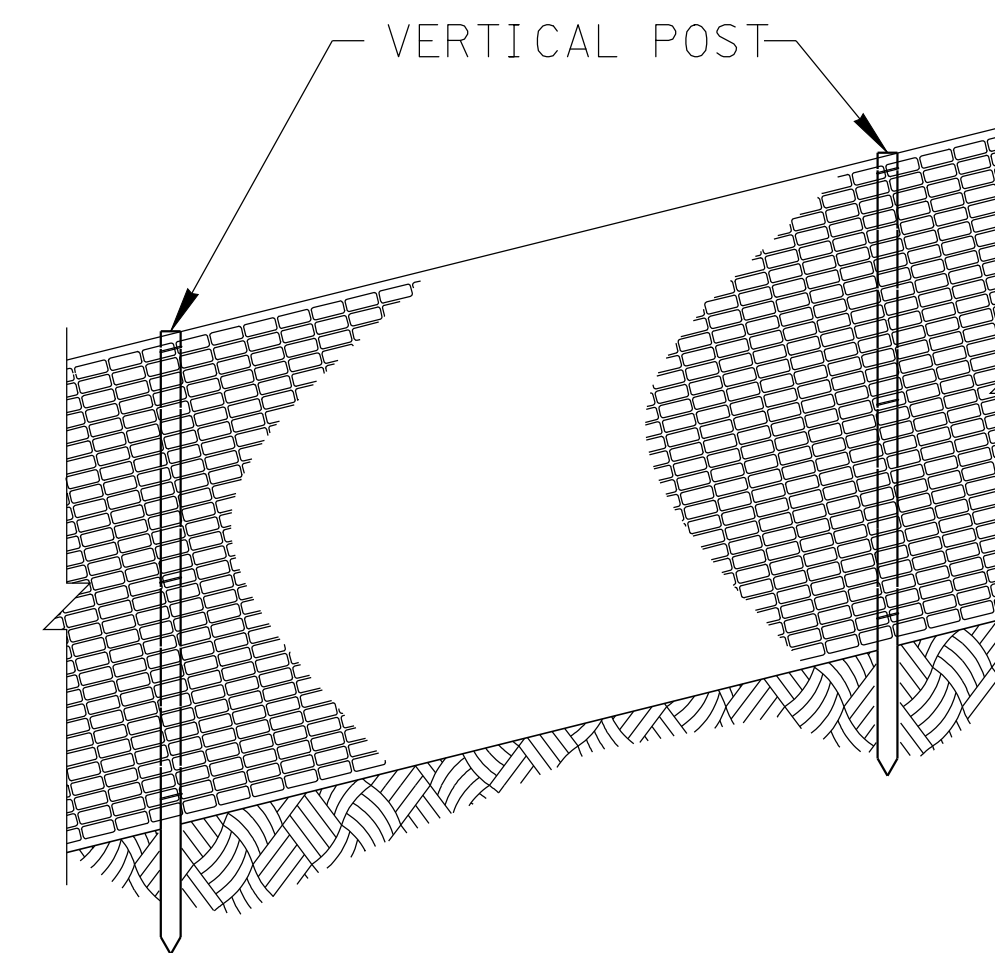
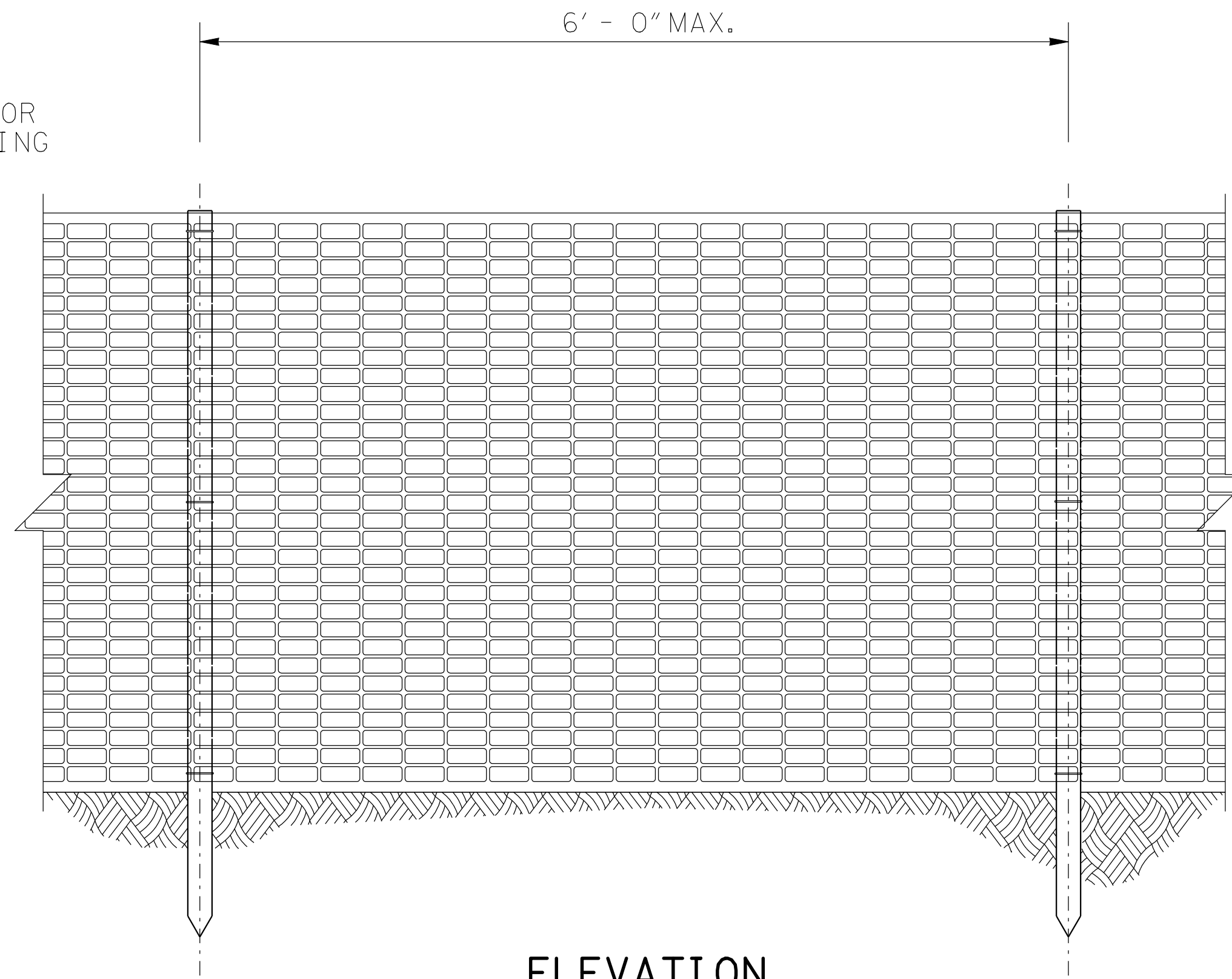
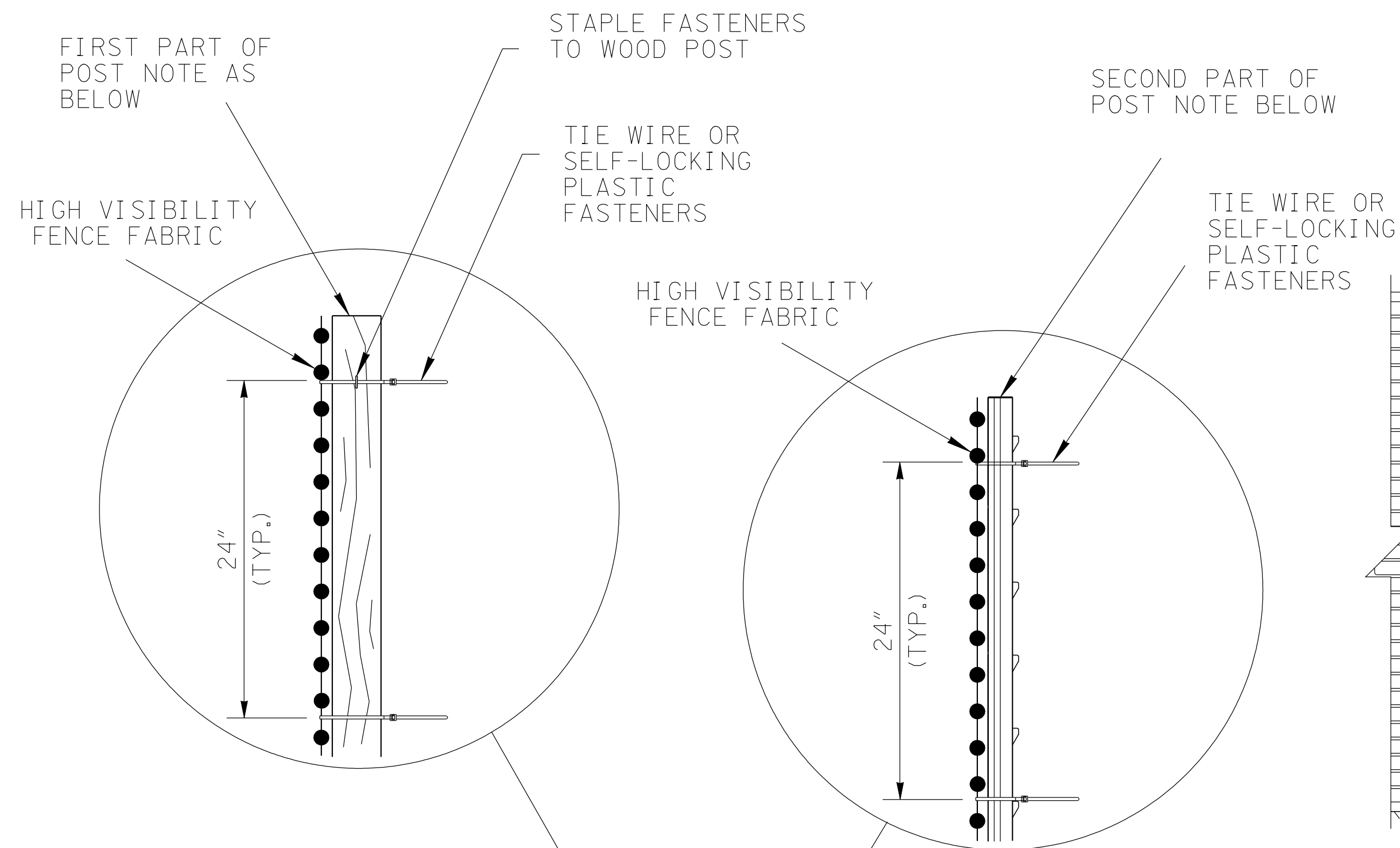
**ALTERNATE ANCHORS FOR STRUCTURAL STEEL GRATES**

CERTIFICATION:  
DRILLED-IN EPOXY ANCHORS OR CAST-IN THREADED INSERTS MAY BE UTILIZED IN LIEU OF CAST-IN HEADED ANCHOR BOLTS PROVIDED THAT THE CONTRACTOR FURNISHES CERTIFIED ANCHOR PULL OUT DATA FROM AN INDEPENDENT TESTING LABORATORY USING CLASS "A" CONCRETE AS PRESCRIBED BY TENNESSEE HIGHWAY SPECIFICATIONS. THE REQUIRED ULTIMATE LOAD FOR 5/8" DIAMETER ANCHORS IS 10,000 POUNDS.

SIDE DRAIN DIA. (D)	DIMENSIONS AND QUANTITIES FOR ONE ENDWALL									
	CONCRETE ENDWALL DIMENSIONS				GRATE PLACEMENT DIMENSIONS			STRUCTURAL STEEL GRATE DIMENSIONS AND QUANTITY		STRUCT. STEEL
	H	W	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>	WG	NO. REQ'D.	LB.
15"	SEE STD. DWG. D-PE-15A				1'-9 7/8"	1'-0"	2'-6"	2'-5"	2	172
18"	SEE STD. DWG. D-PE-18A				1'-2 1/8"	0'-9"	1'-2"	2'-8"	3	269
24"	SEE STD. DWG. D-PE-24A				2'-2"	1'-0"	3'-2 5/8"	3'-3"	3	296
30"	SEE STD. DWG. D-PE-30A				2'-2"	1'-0"	3'-3 3/8"	3'-10"	4	694
36"	SEE STD. DWG. D-PE-36A				2'-2"	1'-0"	2'-9 7/8"	4'-5"	5	975
42"	SEE STD. DWG. D-PE-42A				2'-2"	1'-0"	1'-10 3/8"	5'-0"	6	1,294
48"	SEE STD. DWG. D-PE-48A				2'-2"	1'-0"	1'-5"	5'-7"	7	1,669

□ MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

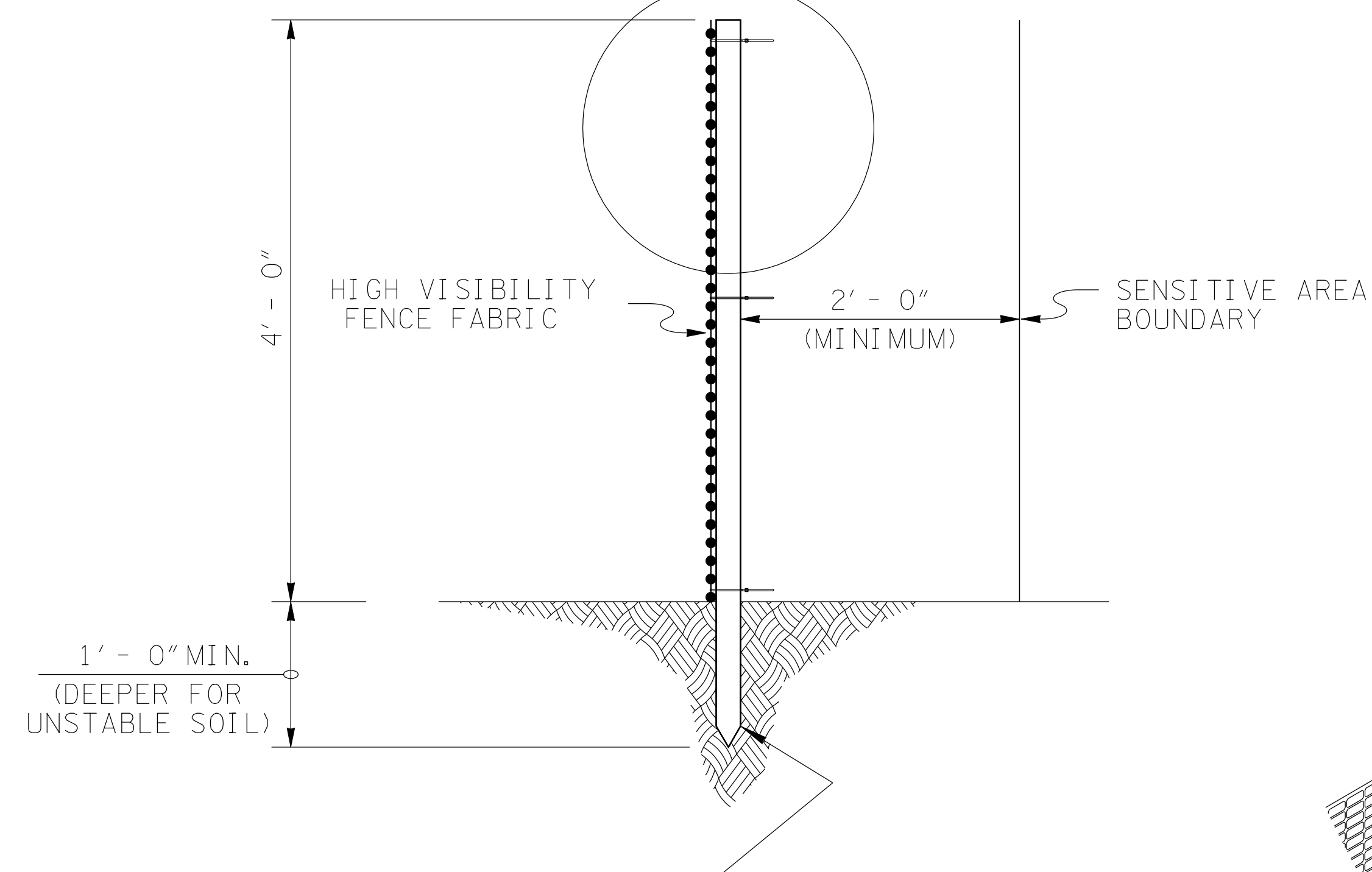
STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
**SIDE DRAIN CONCRETE ENDWALL WITH STEEL PIPE GRATE**  
FOR 15" THRU 48" PIPES - 6:1 SLOPE



ELEVATION

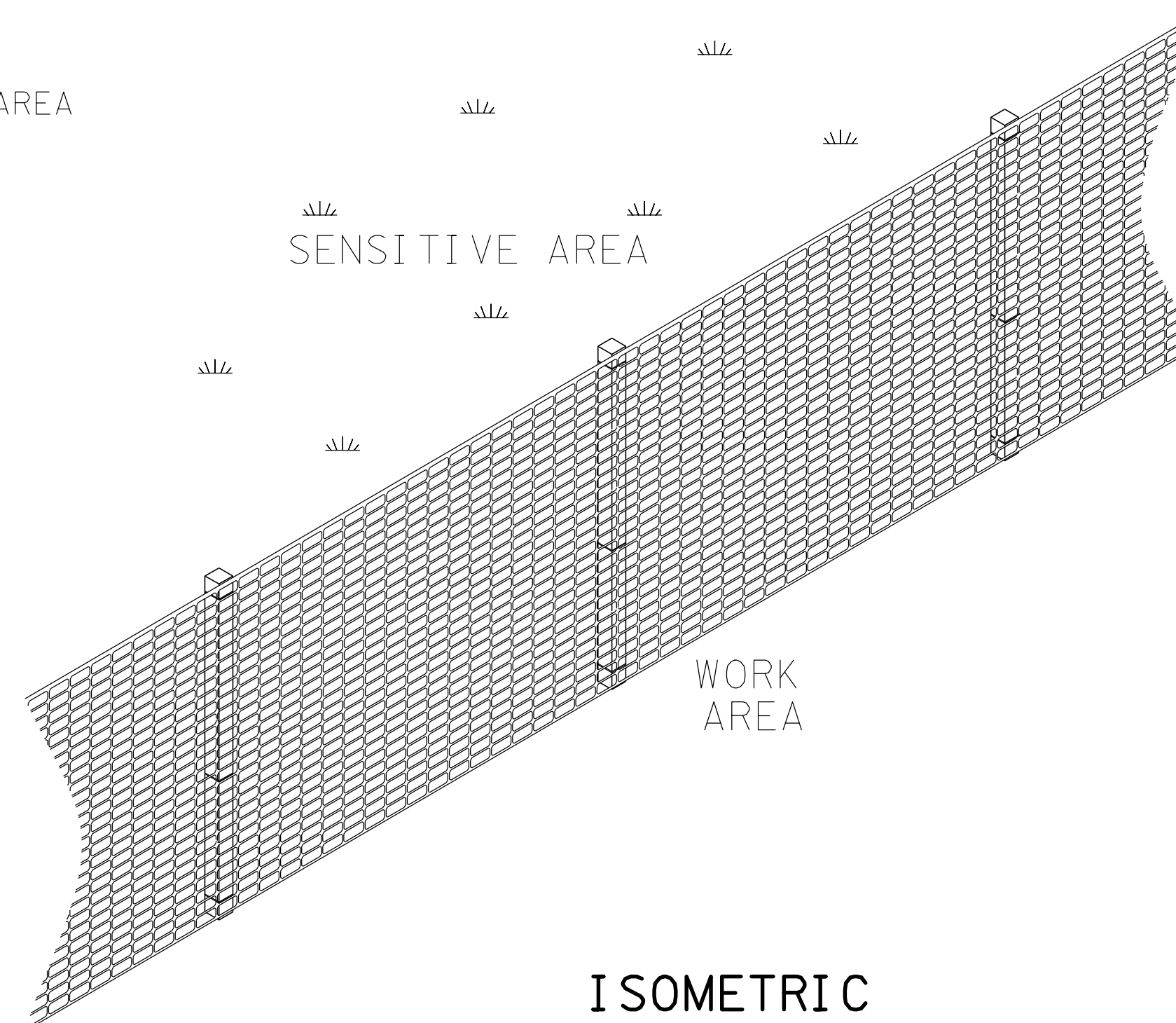
FENCE ON SLOPE

ELEVATION



MIN. 2.25" (NOMINAL) X 2.25' (NOMINAL)-(1.75" ACTUAL X 1.75" ACTUAL)  
 (3.06 SQ. IN.O HARDWOOD POST (OAK OR HICKORY) OR MIN. 1.25 LB/FT.  
 STEEL POST (STD "T" OR "U" SECTION) LENGTH 60"

TYPICAL SECTION



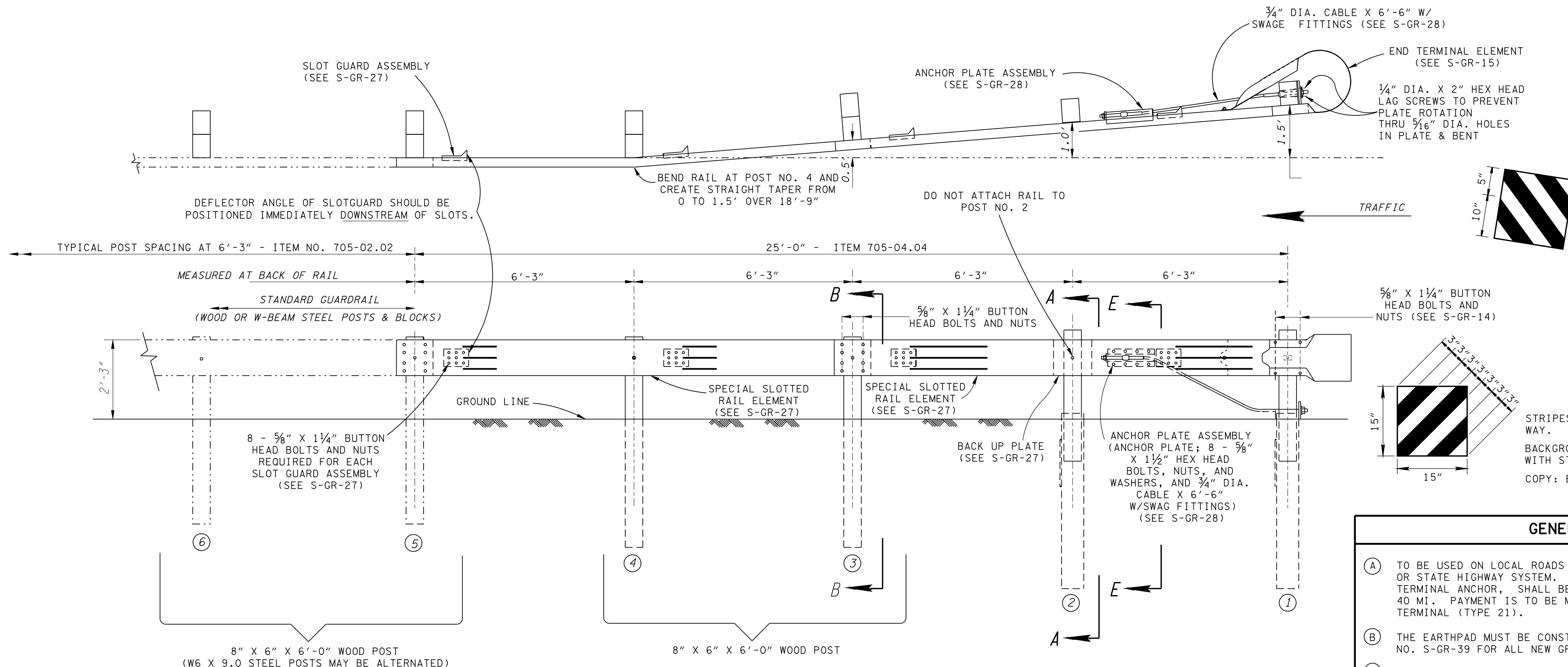
ISOMETRIC

**GENERAL NOTES**

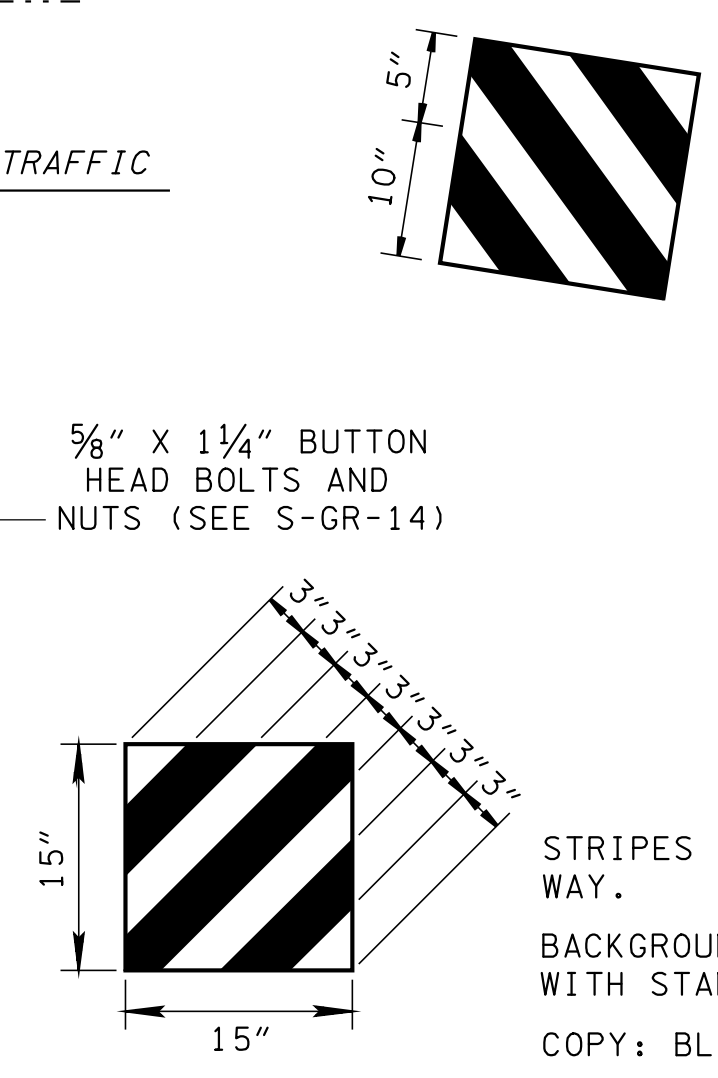
- (A) HIGH VISIBILITY FENCE IS INTENDED TO BE PLACED TO PREVENT DISTURBANCE OF SENSITIVE AREAS, THEIR BUFFERS, AND OTHER AREAS REQUIRED TO BE LEFT UNDISTURBED DURING CONSTRUCTION. IT MAY ALSO BE USED TO MARK APPROVED CLEARING LIMITS AND TO CONTROL VEHICLE ACCESS TO AND ON THE PROJECT SITE.
- (B) HIGH VISIBILITY FENCE FABRIC SHALL BE MACHINED PRODUCED ORANGE COLORED MESH MANUFACTURED FROM POLYPROPYLENE OR POLYETHYLENE. IT SHALL BE FULLY STABILIZED ULTRAVIOLET RESISTANT.
- (C) HIGH VISIBILITY FENCE FABRIC MAY BE MADE FROM RECYCLED MATERIALS. MATERIALS SHALL NOT CONTAIN BIODEGRADABLE FILLER MATERIALS THAT CAN DEGRADE THE PHYSICAL OR CHEMICAL CHARACTERISTICS OF THE FINISHED FABRIC.
- (D) HIGH VISIBILITY FENCE FABRIC SHALL HAVE A MINIMUM 4 FOOT WIDTH AND SHALL BE FURNISHED IN ONE CONTINUOUS WIDTH AND SHALL NOT BE SPLICED TO CONFORM TO THE SPECIFIED WIDTH DIMENSION.
- (E) STEEL POST SHALL BE ROLLED FROM HIGH CARBON STEEL AND SHALL HAVE A MINIMUM WEIGHT OF 1.25 LB/FT. POST SHALL BE HOT-DIPPED GALVANIZED OR PAINT. STEEL POST MAY BE EQUIPPED WITH AN ANCHOR PLATE HAVING A MINIMUM AREA OF 14 SQUARE INCHES. IF POSTS ANCHOR PLATES USED THEY SHALL CONFORM TO THE REQUIREMENTS OF ASTM A702.
- (F) HIGH VISIBILITY FENCE FABRIC SHALL BE FASTENED TO THE POST USING TIE WIRE OR SELF-LOCKING PLASTIC FASTENERS WITH A MAXIMUM FASTENERS SPACING OF 2 FEET. WHEN WOOD POSTS ARE USED THE FASTENERS SHALL BE STAPLED TO THE POST.
- (G) HIGH VISIBILITY FENCE THAT IS DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED OR REPLACED AT THE CONSTRCTORS EXPENSE ON THE SAME DAY THE DAMAGE OCCURS.
- (H) HIGH VISIBILITY FENCE SHALL BE PAID FOR UNDER THE FOLLOWING ITEM NUMBER:  
 707-08.11 HIGH VISIBILITY CONSTRUCTION FENCE, PER LF  
 PAYMENT SHALL INCLUDE ALL MATERIALS AND LABOR NECESSARY  
 FOR CONSTRUCTION MAINTENANCE, AND REMOVAL OF HIGH VISIBILITY  
 FENCE.

LEGEND: \*HVF\*HVF\*





- REV. 2-14-96: REMOVED GROUND STRUT DETAILS FROM SHEET AND MADE OTHER MINOR CHANGES.
- REV. 5-27-96: CHANGED DIAMETER OF HOLES IN 8" X 6" SLOTTED BEARING PLATE FROM 5/8" TO 3/4".
- REV. 5-27-98: REPLACED SHELF ANGLE WITH BACK UP PLATE ON POST NO. 2.
- REV. 12-18-98: MODIFIED OLD GENERAL NOTE (A) AND COMBINED IT WITH OLD GENERAL NOTE (A) TO MAKE NEW GENERAL NOTE (A).
- REV. 5-27-01: CHANGED PAY ITEM NO. 705-04.21 TO 705-04.04. ADDED SPECIAL GUARDRAIL INSTALLATION NOTE.
- REV. 7-1-01: CHANGED SPECIAL GUARDRAIL INSTALLATION NOTE.
- REV. 9-5-01: CHANGED HEADING FOR SPECIAL INSTALLATION NOTE.
- REV. 10-26-07: REMOVED SPECIAL INSTALLATION NOTE. ADDED GENERAL NOTE (E).
- REV. 3-15-08: RENAMED TITLE BLOCK.
- REV. 8-23-12: ADDED SPECIAL INSTALLATION NOTE.



- ### GENERAL NOTES
- (A) TO BE USED ON LOCAL ROADS ONLY. NOT TO BE USED ON INTERSTATE OR STATE HIGHWAY SYSTEM. THE SLOTTED RAIL TERMINAL (TYPE 21) TERMINAL ANCHOR, SHALL BE USED ONLY ON LOW SPEED ROADS < 40 MI. PAYMENT IS TO BE MADE UNDER ITEM 705-04.04 GUARDRAIL TERMINAL (TYPE 21).
  - (B) THE EARTH PAD MUST BE CONSTRUCTED PER STANDARD DRAWING NO. S-GR-39 FOR ALL NEW GRADE AND DRAIN PROJECTS.
  - (C) THE POST OFFSET DIMENSIONS ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE BLOCKOUTS, EXCEPT AT THE FIRST TWO POSTS, WHERE THE DIMENSION IS TO THE CENTER OF THE TRAFFIC FACE OF THE POST. OFFSET POINTS ARE TO BE LOCATED BY CHORD MEASUREMENTS AT THE BACK OF THE RAIL EQUAL TO THE NOMINAL POST SPACINGS SHOWN. POSTS ARE TO BE SET APPROXIMATELY RADIAL TO THE RAILINGS AT EACH POST LOCATION.
  - (D) OMIT THE RECTANGULAR WASHER BETWEEN BUTTON HEAD BOLT AND RAIL ON POST NOS. 2 THROUGH 6.
  - (E) SAFETY PERFORMANCE OF SLOTTED GUARDRAIL TERMINAL IS ACCEPTABLE ACCORDING TO THE TL-2 EVALUATION CRITERIA SPECIFIED IN NCHRP REPORT 350.

### SPECIAL INSTALLATION NOTE

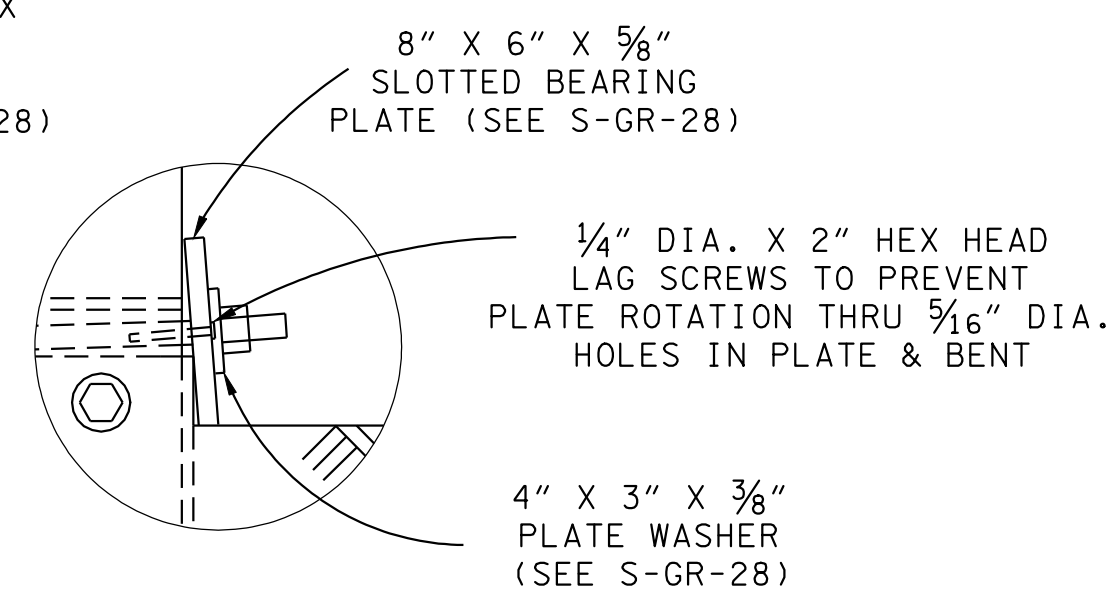
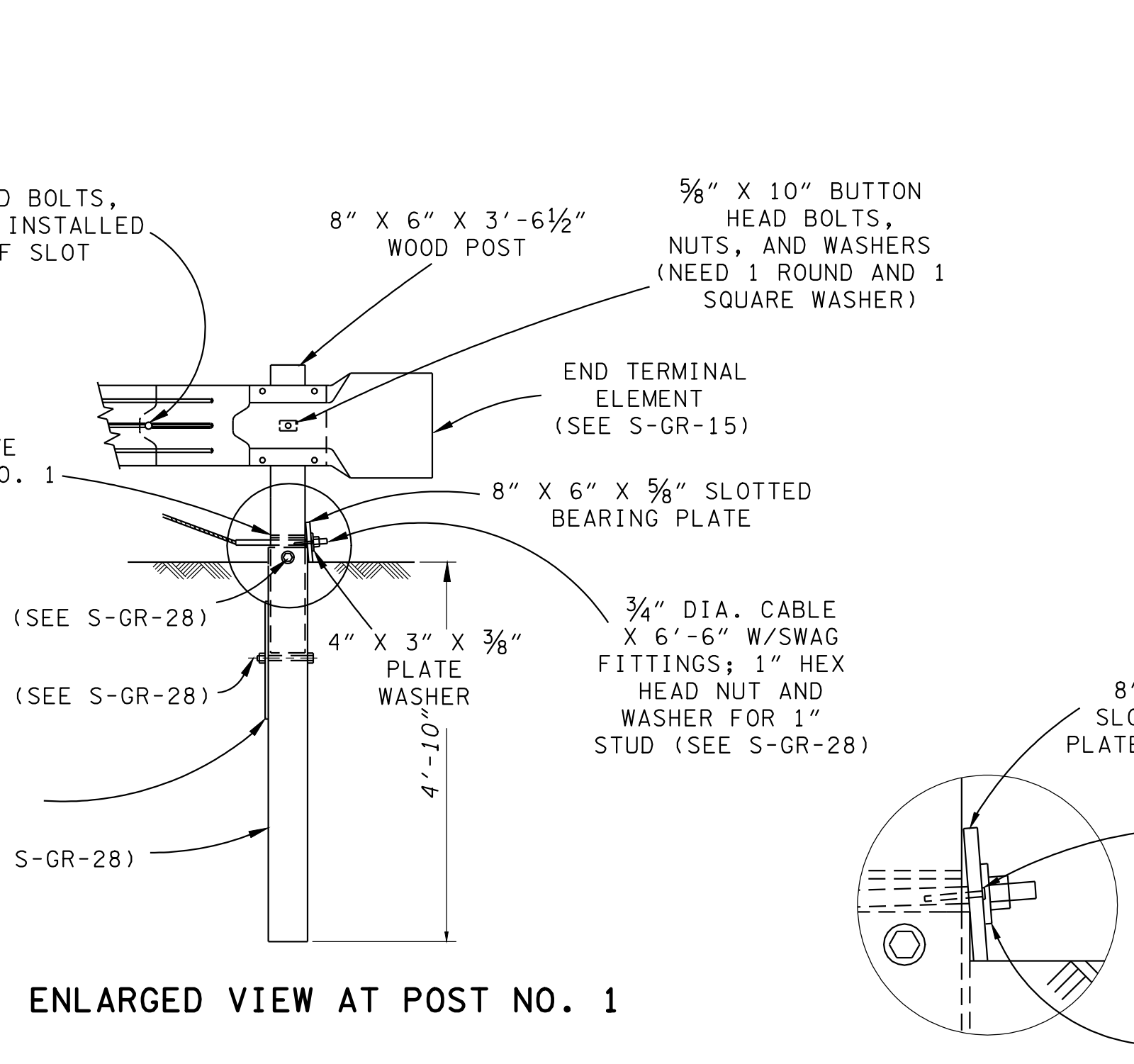
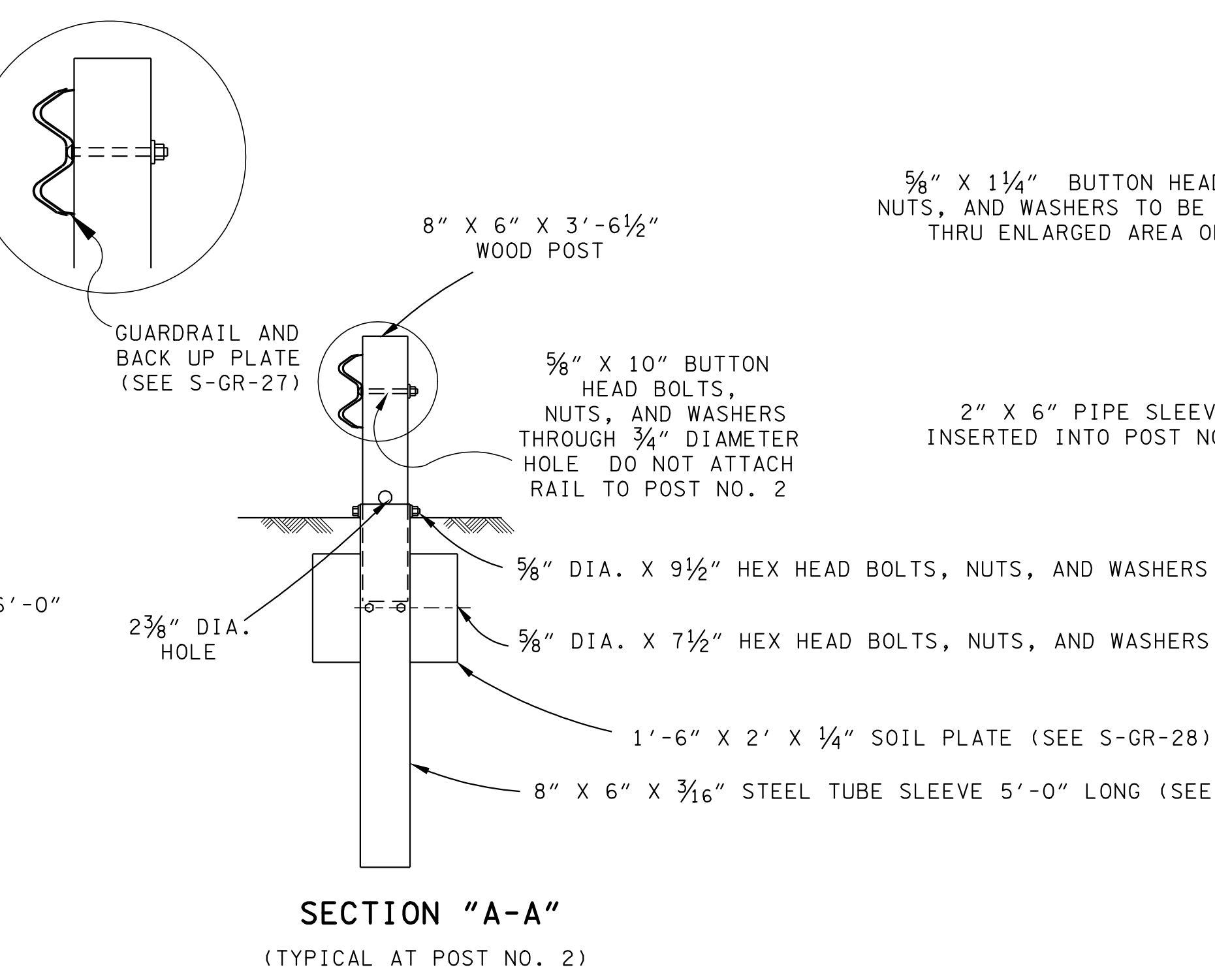
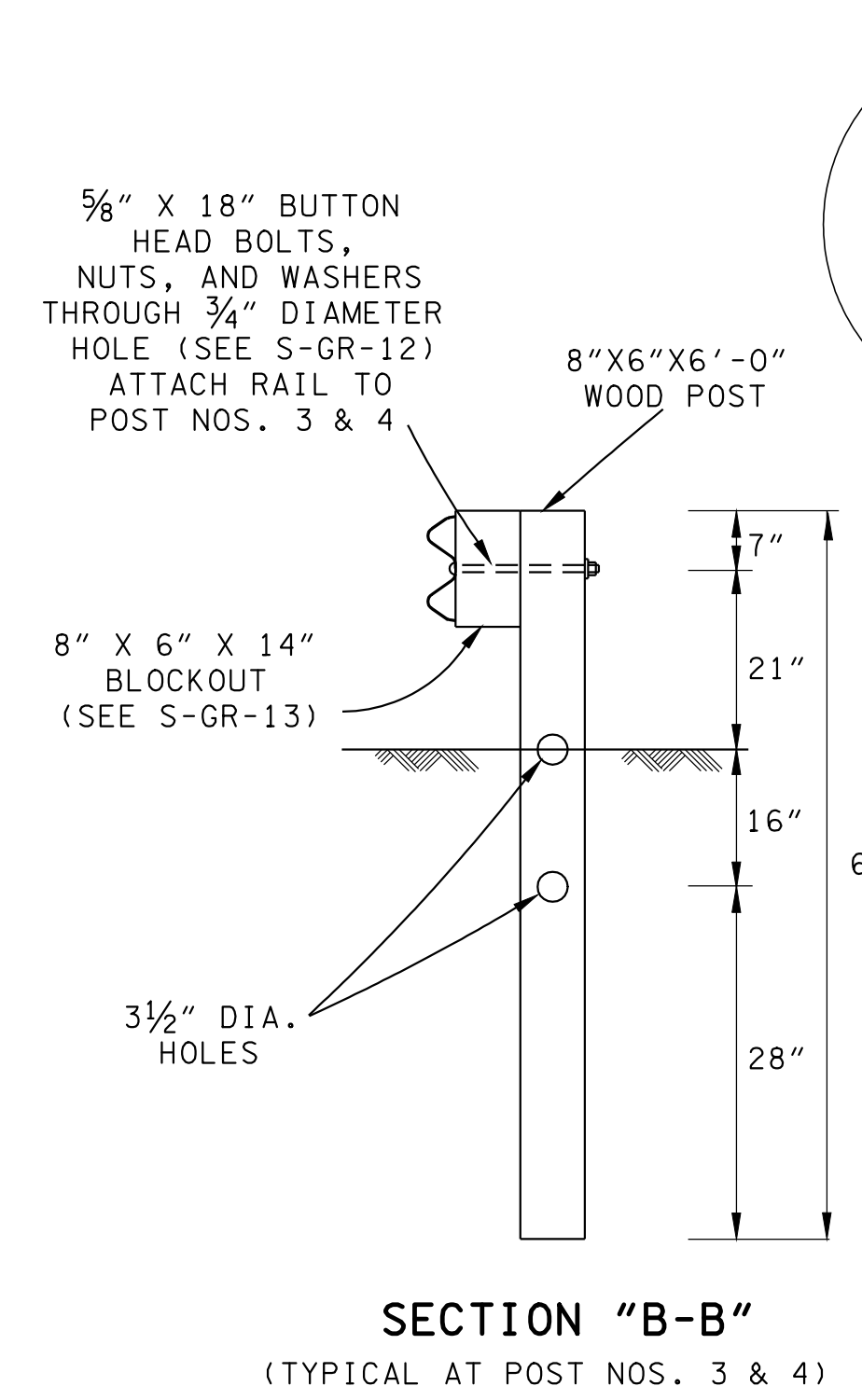
ANY NCHRP 350 COMPLIANT TL-3 TANGENTIAL END TERMINAL ON THE TDOT QUALIFIED PRODUCTS LIST MAY BE INSTALLED. MANUFACTURER'S SHOP DRAWINGS SHALL BE REQUIRED BEFORE ANY TANGENTIAL END TERMINAL INSTALLATIONS CAN BEGIN. THE CONTRACTOR SHALL HAVE ONE COMPLETE SET OF SHOP DRAWINGS ON SITE DURING INSTALLATION OR REPAIR OF ANY TANGENTIAL GUARDRAIL TERMINAL ANCHOR. THE CONTRACTOR SHALL ALSO PROVIDE THE CONSTRUCTION OR MAINTENANCE SUPERVISOR WITH ONE COMPLETE SET OF SHOP DRAWINGS.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

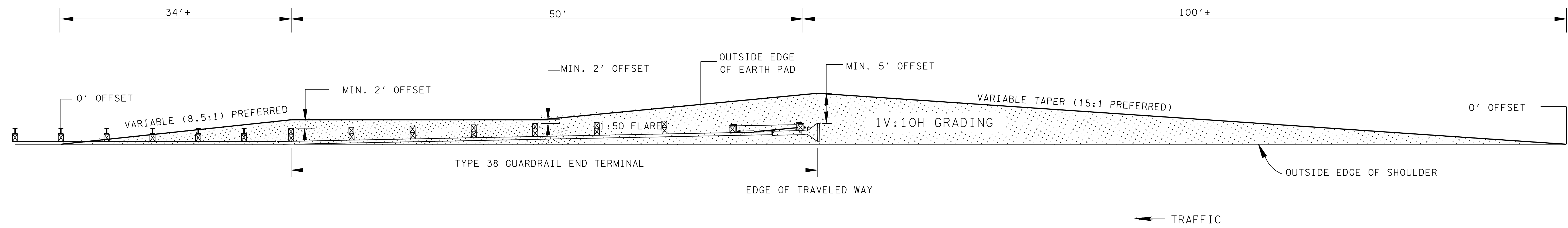
STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION

**SLOTTED GUARDRAIL TERMINAL ANCHOR (TYPE 21)**

7-29-95 S-GR-26



□ REV. 6-30-09: CHANGED GENERAL NOTE (D) AND ADDED (C). CHANGED PLAN VIEW.  
 REV. 8-16-12: REVISED GENERAL NOTE (C).  
 □ REV. 5-5-05: ADDED NEW GENERAL NOTE (F).  
 REV. 5-15-08: GENERAL MODIFICATIONS REMOVED DITCH DETAIL: S-GR-38A DELETED AND INCORPORATED, RENAMED.  
 REV. 12-18-98: CHANGED DRAWING NAME AND MODIFIED GENERAL NOTE (C).  
 □ REV. 5-27-01: CHANGED GENERAL NOTE (B).



PLAN VIEW OF EARTH PAD CONSTRUCTION

GENERAL NOTES

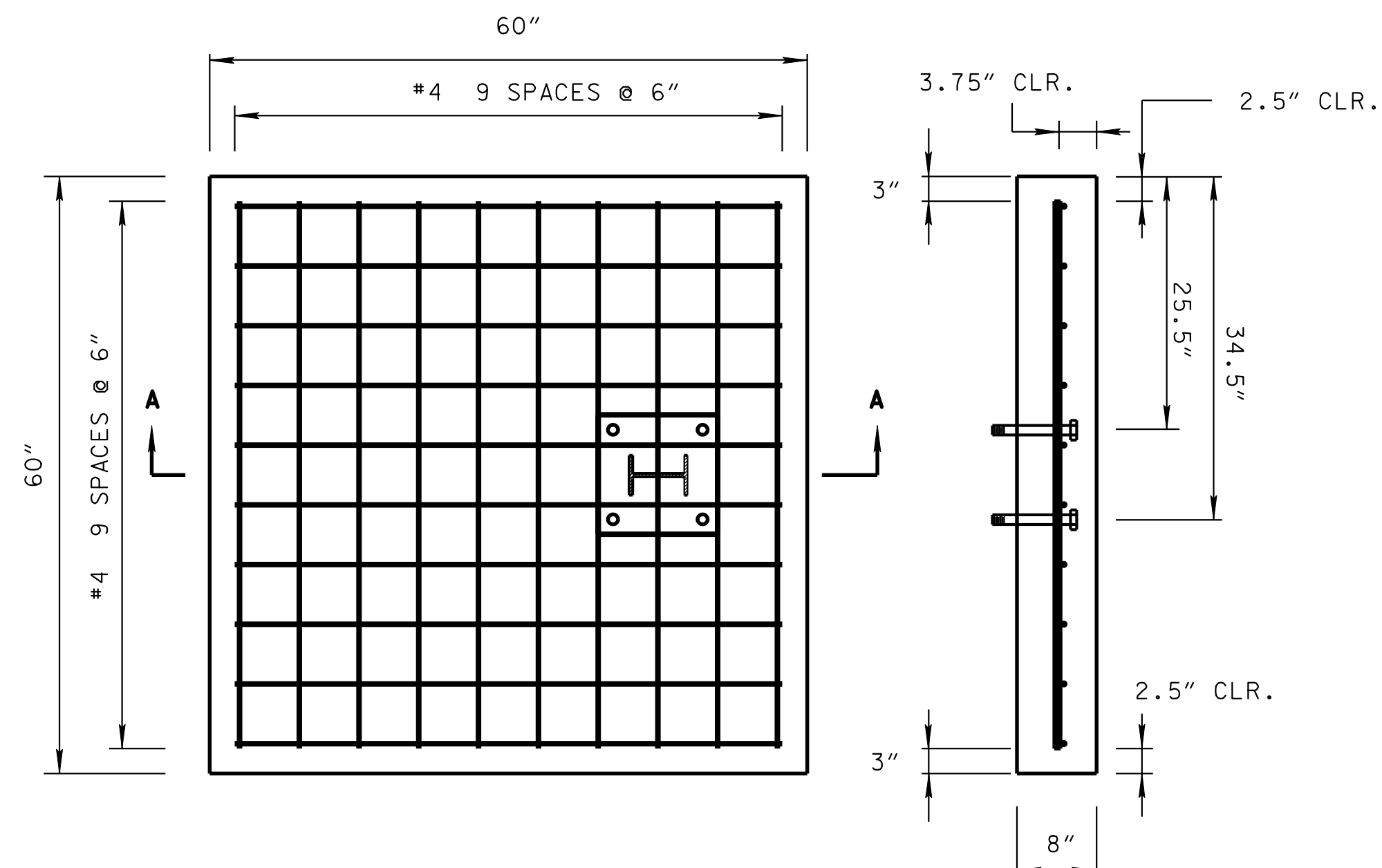
- (A) REFER TO RD01-S-SERIES FOR ROADSIDE SLOPE DEVELOPMENT AND ROADSIDE DITCH DETAILS.
- (B) FOR DETAILS NOT SHOWN SEE OTHER GUARDRAIL STANDARD DRAWINGS.
- (C) THE DESIGNER SHALL INCORPORATE THIS EARTH PAD IN CONJUNCTION WITH ALL TYPE 38 GUARDRAIL TERMINALS IN THE RIGHT-OF-WAY AND CONSTRUCTION PLANS AS WELL AS THE ROADWAY CROSS-SECTION SHEETS.
- (D) THE CONTRACTOR SHALL CONSTRUCT THIS EARTH PAD AS PART OF THE INITIAL GRADING OPERATIONS AS SHOWN ON THIS STANDARD DRAWING AFTER FIELD VERIFICATION OF HAZARD LOCATION AND ENGINEERS 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 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.
- (F) REFER TO STANDARD DRAWING S-GR-21 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 GUARDRAIL END TERMINAL.

□ MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

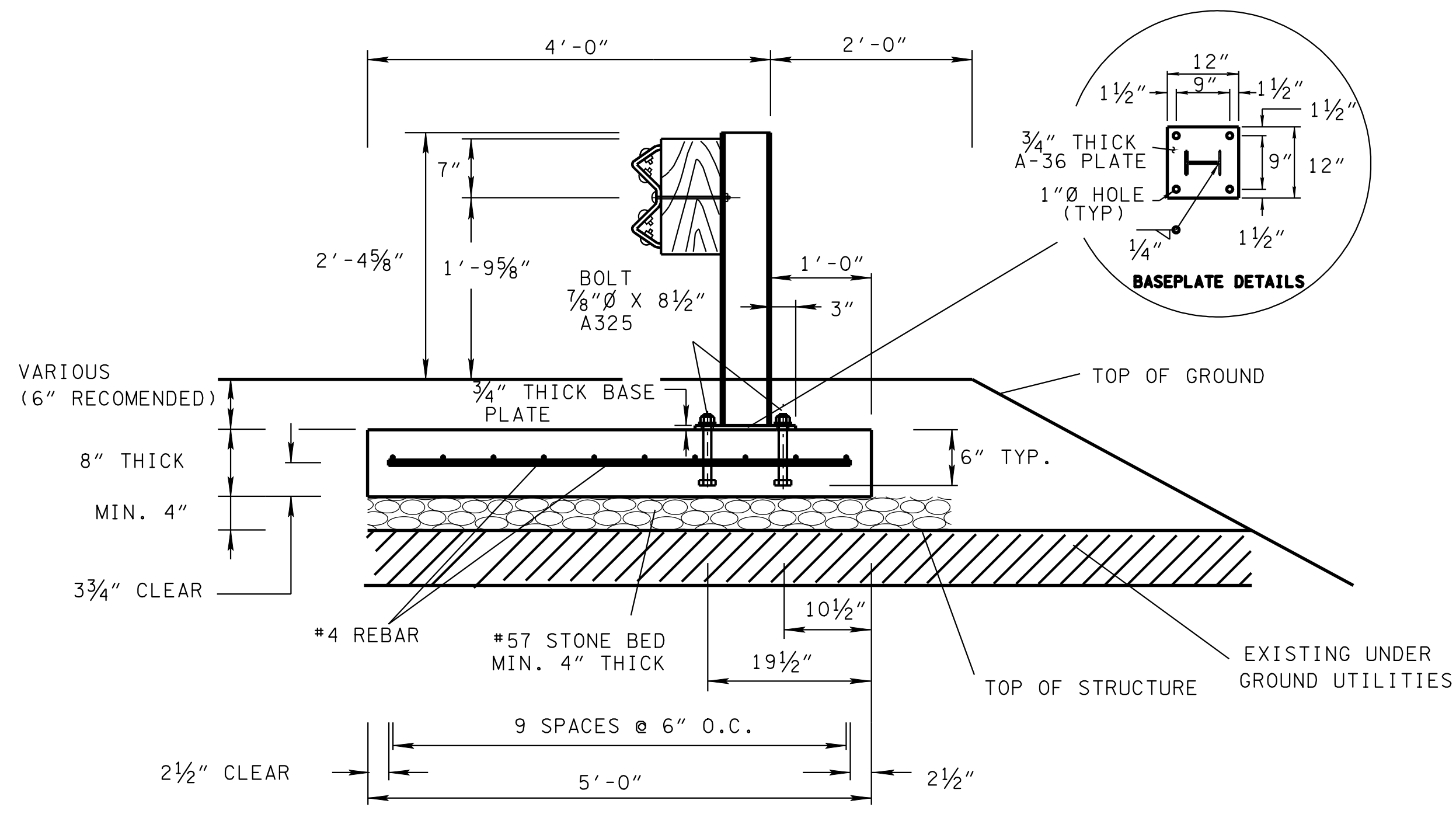
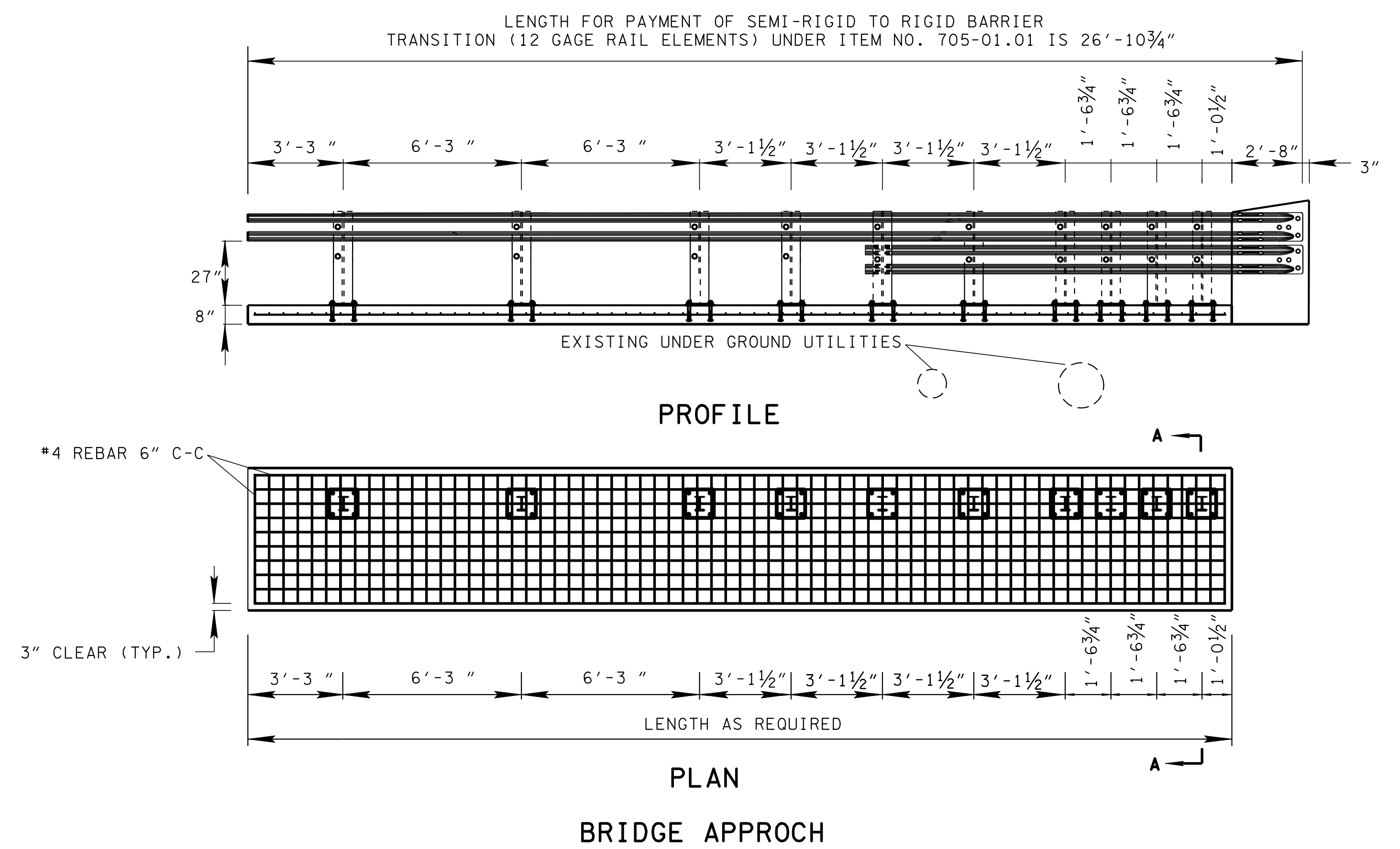
STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION

DETAILS FOR  
CONSTRUCTION OF  
EARTH PAD FOR  
TYPE 38 GUARDRAIL  
END TERMINAL

7-29-98 S-GR-38

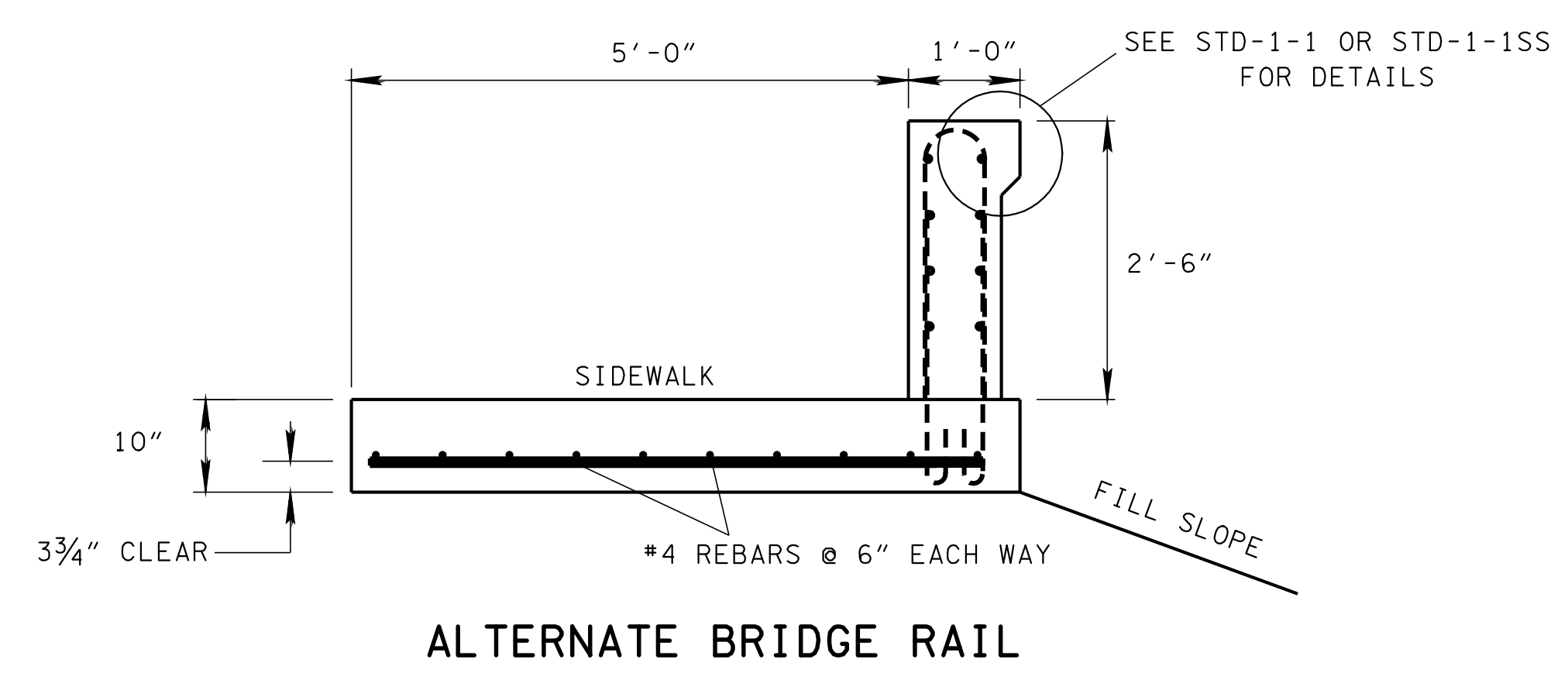
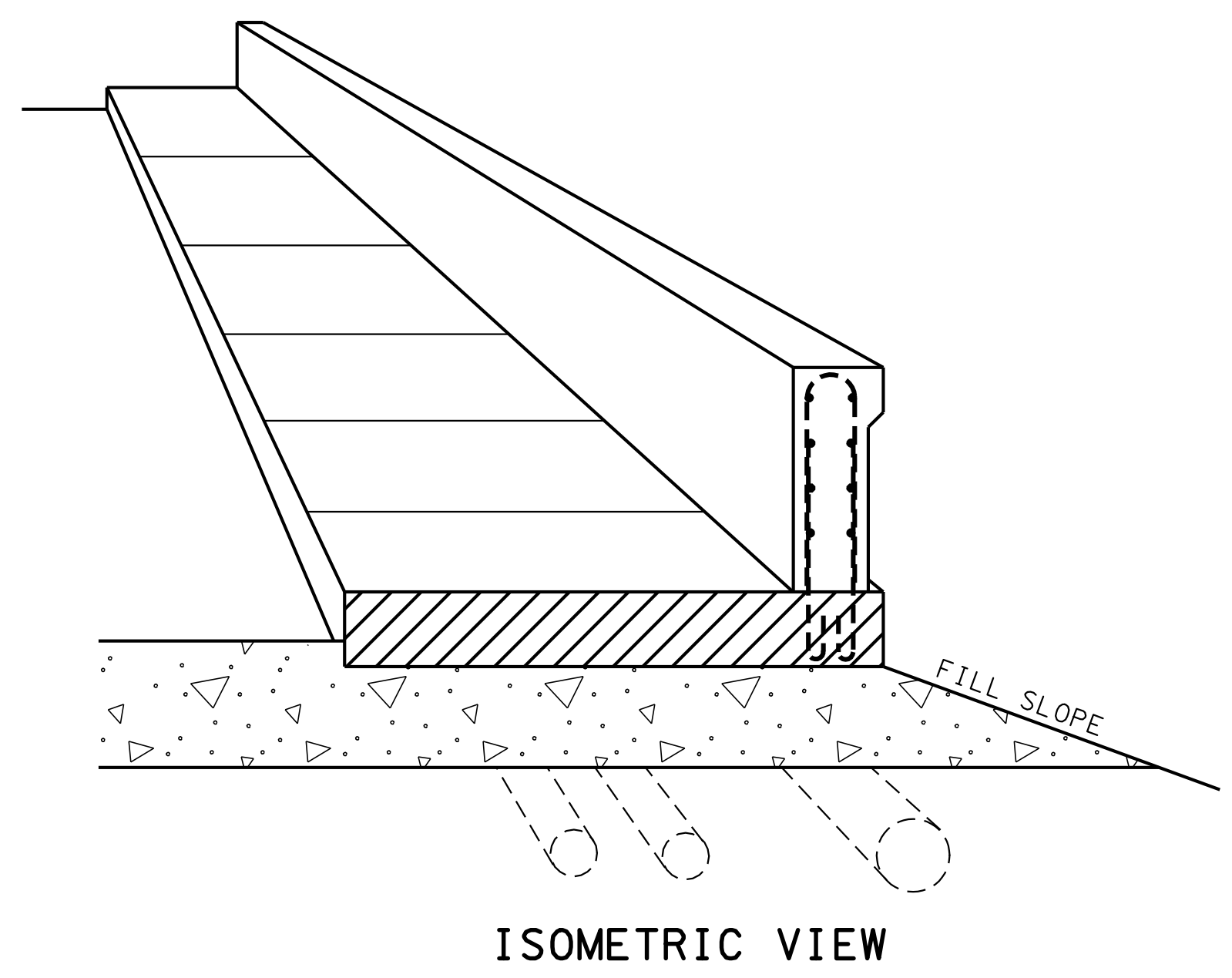


60"X60"X8" SINGLE POST SLAB DETAIL

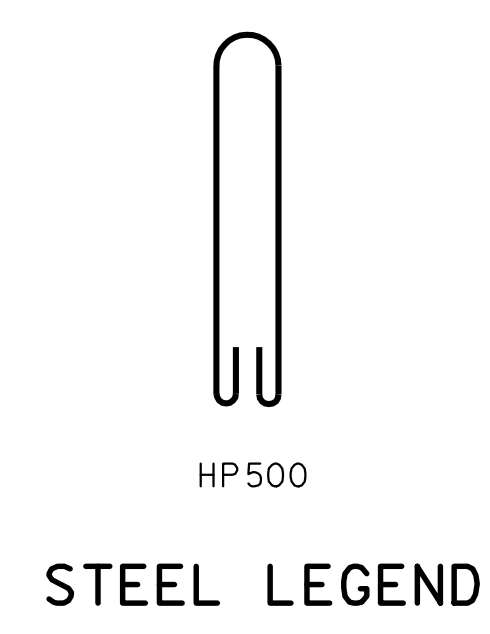


QUANTITIES ESTIMATE FOR CONCRETE PAD

	604-01.01 CLASS A CONCRETE CY/LF	602-01 STRUCTURAL STEEL LB/LF
5' WIDE	0.123	12.89
6' WIDE	0.184	15.36



- GENERAL NOTES
- THIS DRAWING TO BE USED WHERE AN UNDERGROUND UTILITY CONFLICT IS IDENTIFIED DURING DESIGN OR CONSTRUCTION WHERE STANDARD POST COULD NOT BE INSTALLED.
  - BASED ON TTI REPORT 405160-12 "STEEL POSTS OVER UNDERGROUND STRUCTURES".
  - CONCRETE PAD TO BE PAID FOR UNDER ITEMS 602-01 AND 604-01.01.

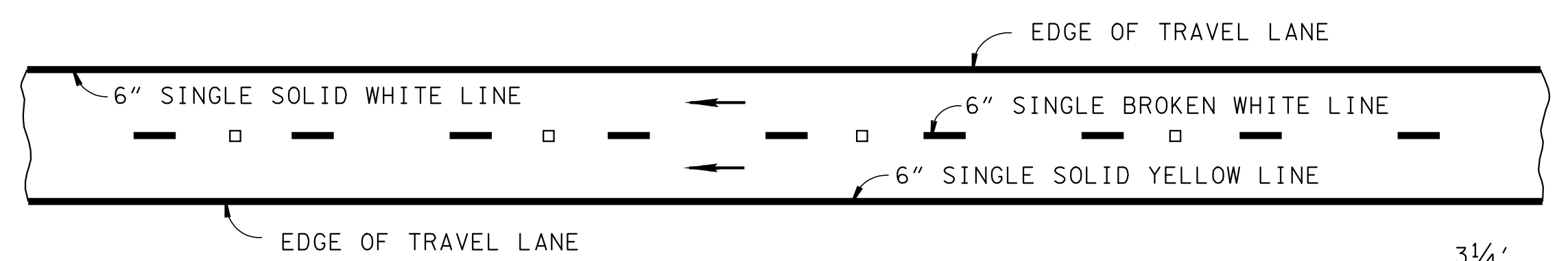


MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

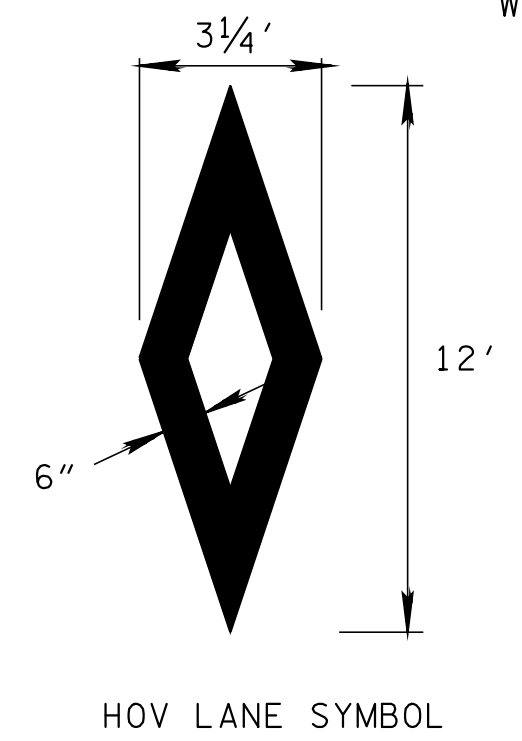
STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION

ALTERNATE  
GUARDRAIL  
POST  
ATTACHMENT  
DETAIL

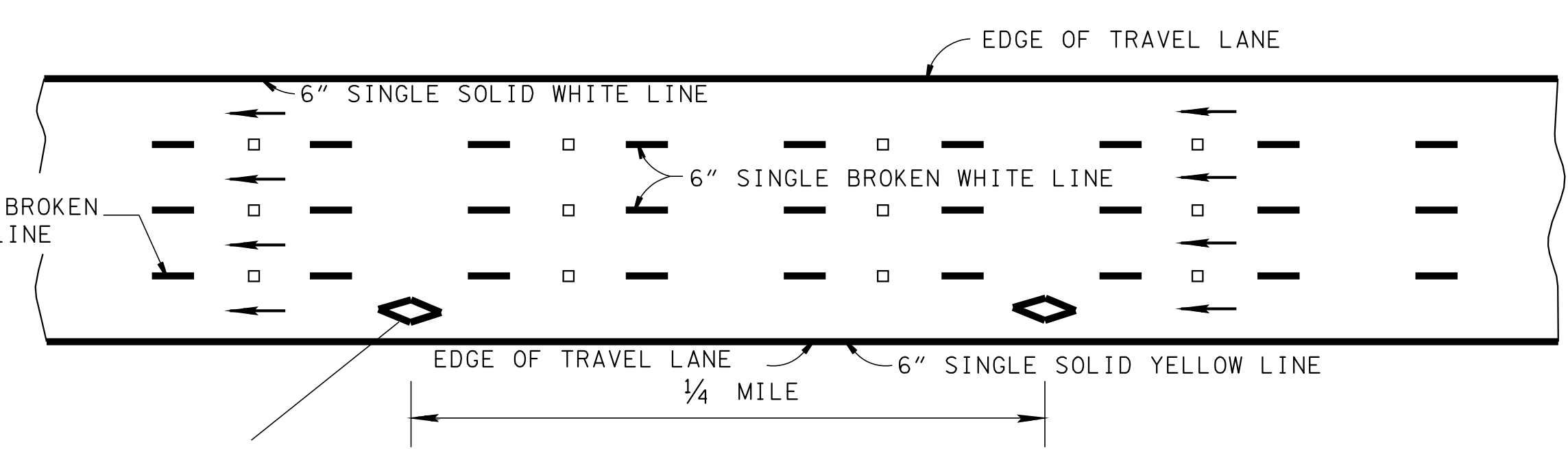
S-GR-47



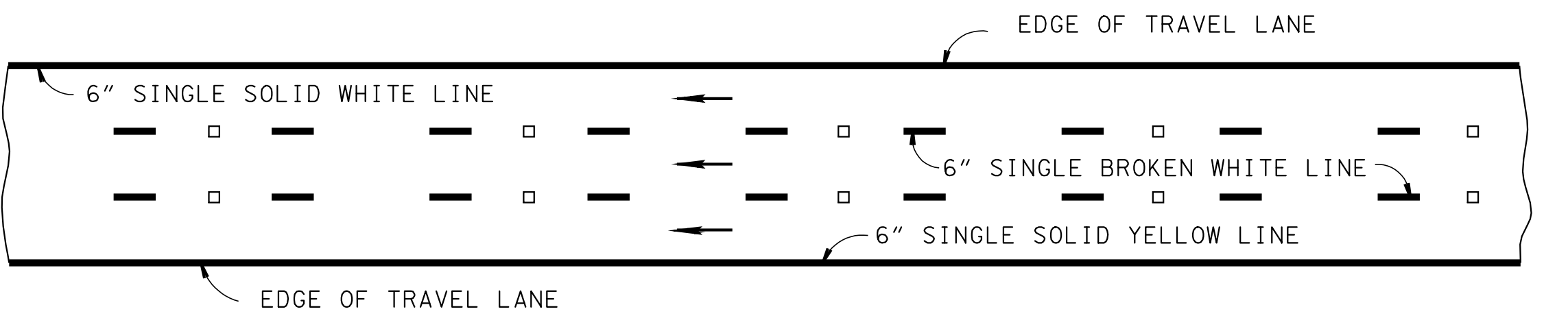
TYPICAL TWO LANE



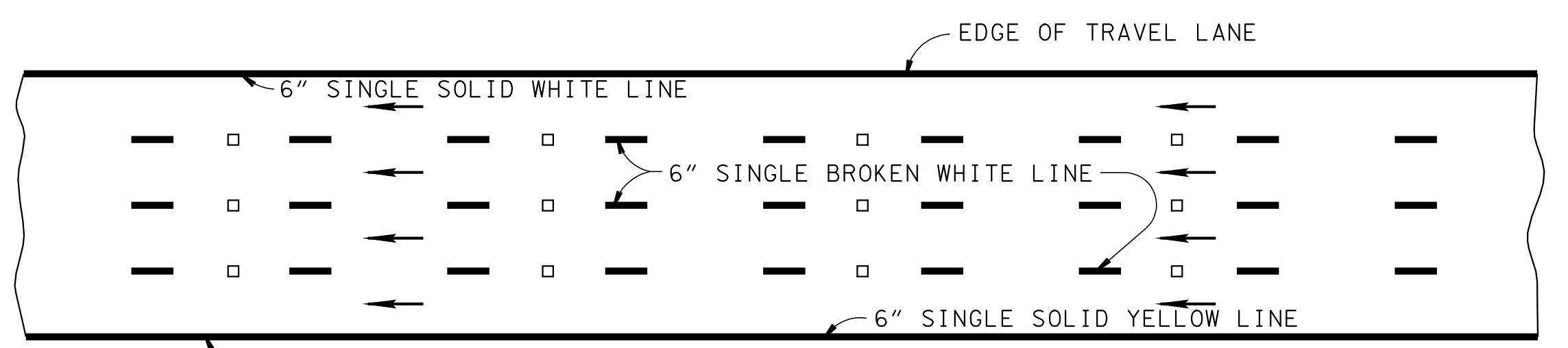
HOV LANE SYMBOL



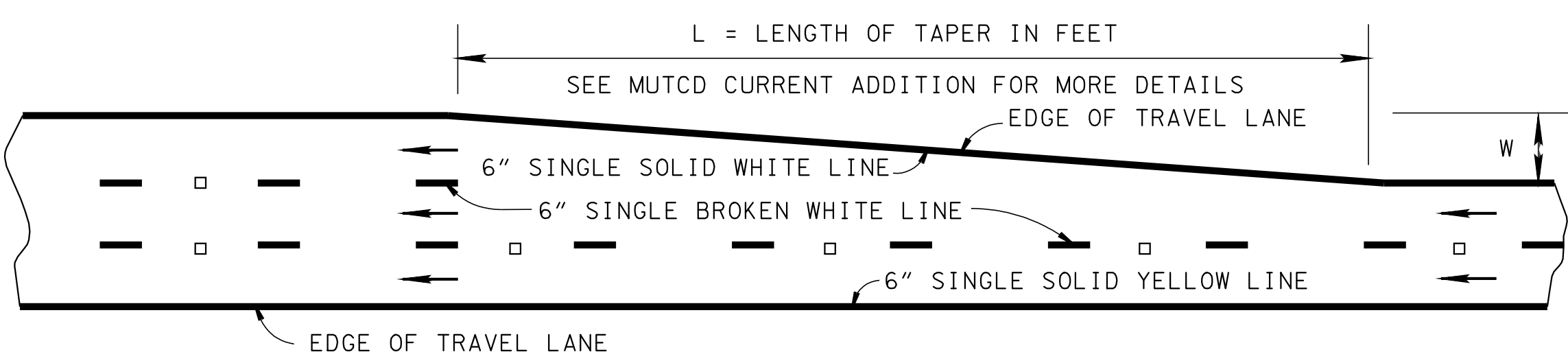
TYPICAL FOR HOV LANE  
(FOR MORE DETAILS SEE MUTCD CURRENT EDITION)  
SEE T-S-22 FOR SIGNING



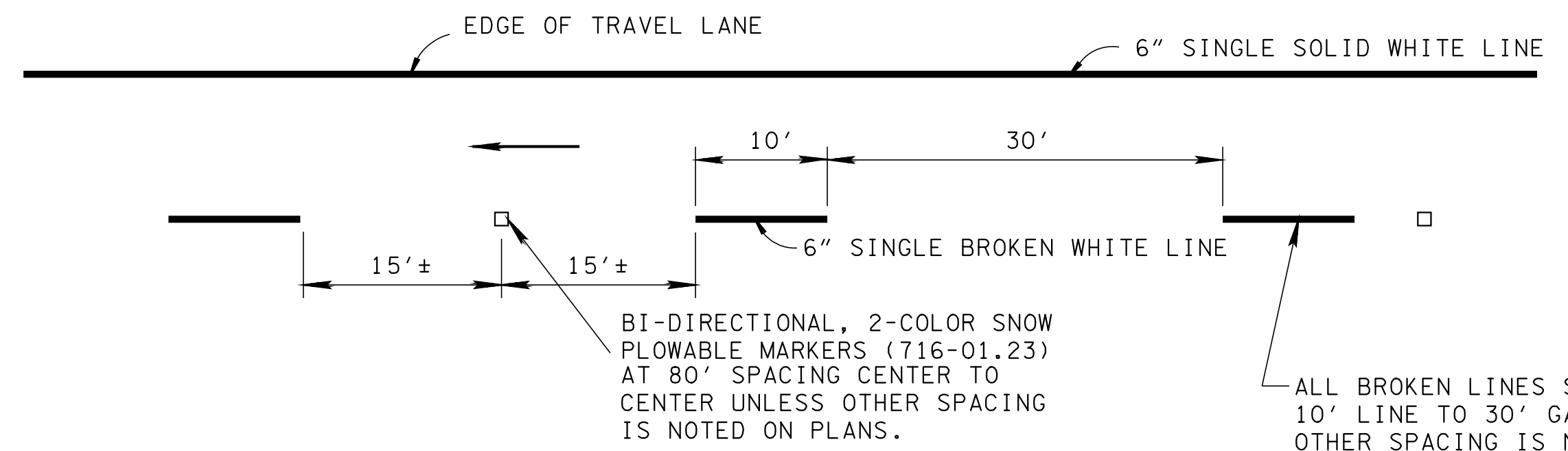
TYPICAL THREE LANE



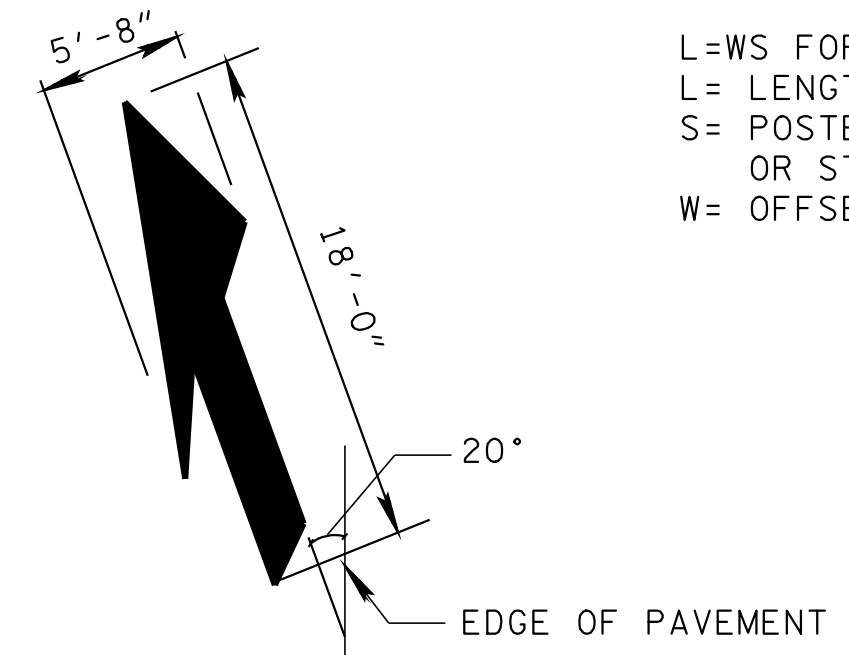
TYPICAL FOUR LANE



TYPICAL SHOWING  
BEGINNING OF ADDITIONAL LANE

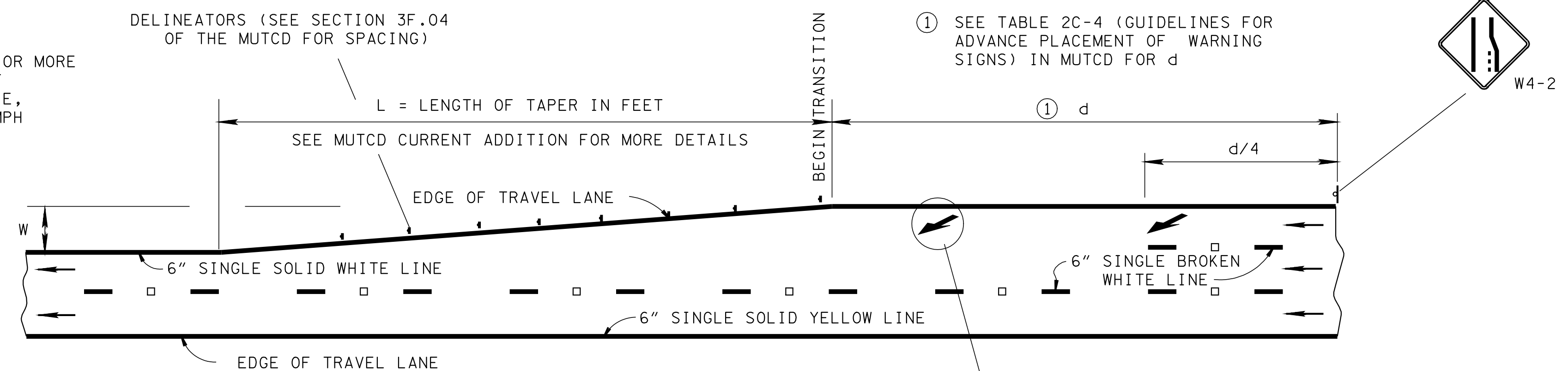


SPACING DETAILS



LANE-REDUCTION ARROW

L=WS FOR SPEEDS OF 45 MPH OR MORE  
L= LENGTH OF TAPER IN FEET  
S= POSTED, 85 TH-PERCENTILE,  
OR STATUTORY SPEED IN MPH  
W= OFFSET IN FEET



TYPICAL LANE REDUCTION TRANSITION

LANE REDUCTION ARROWS  
(ITEM NO. 716-04.14)

- REV. 2-22-88: REVISED TO SHOW RAISED REFLECTIVE PAVEMENT MARKERS CENTERED BETWEEN BROKEN LINES. CHANGED DRAWING NO. FROM T-M-2 TO T-M-5.
- REV. 3-20-91: REDREW SHEET. CHANGED TYPE 2 PAVEMENT MARKERS (CLEAR) TO MONO-DIRECTIONAL PAVEMENT MARKERS (CLEAR).
- REV. 10-26-92: ADDED GENERAL NOTE ①.
- REV. 7-29-98: CHANGED WIDTH OF CENTERLINES, EDGE LINES, AND DOTTED WHITE LANE LINES FROM 4 TO 6 INCHES.
- REV. 4-15-04: CHANGED W4-2 SIGNS AND TRANSITION NOTE IN LOWER RIGHT CORNER TO COMPLY WITH 2003 MUTCD.
- REV. 9-5-04: IN TYPICAL SHOWING ENDING OF ADDITIONAL LANE CHANGE NOTE ①.
- REV. 11-1-11: ADDED HOV SIGNS AND PAVEMENT MARKING DETAILS. ADDED LANE REDUCTION ARROWS WITH DETAILS, REVISED PAVEMENT MARKINGS TYPICAL DETAILS.
- REV. 1-12-12: CHANGED SNOW PLOWABLE MARKERS FROM MONO-DIRECTIONAL TO BI-DIRECTIONAL 2-COLOR.
- REV. 5-24-12: REMOVED BROKEN LINE FROM TRANSITION AREA ON BEGINNING OF ADDITIONAL LANE.
- REV. 8-16-12: REMOVED HOV SIGNS.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION

MARKING DETAILS  
FOR  
EXPRESSWAYS  
& FREEWAYS



REV. 2-22-88: ADDED DETAIL FOR "EXIT ONLY" AND FOR PARALLEL ACCELERATION LANE MARKING. CHANGED SHEET TITLE AND DWG. NO. FROM T-M-3 TO T-M-6. ADDED NOTES. ADDED DETAILS FOR TWO LANE EXIT AND PAVEMENT ARROWS. ADDED DOTTED LINES AT EXIT RAMP.

REV. 10-30-90: REDREW AND REORGANIZED SHEET, CHANGED WIDTH OF EXIT PAVEMENT ARROWS TO 12".

REV. 3-20-91: ADDED MONO-DIRECTIONAL PAVEMENT MARKERS (CLEAR) TO EXIT ONLY LANE DETAIL AND TWO LANE EXIT WITH OPTIONAL LANE DETAIL. CHANGED GENERAL NOTES. ON REMAINDER OF SHEET CHANGED TYPE 2 PAVEMENT MARKERS (CLEAR) TO MONO-DIRECTIONAL PAVEMENT MARKERS (CLEAR).

REV. 10-26-92: ADDED GENERAL NOTE (A).

REV. 12-18-92: MOVED MONO-DIRECTIONAL PAVEMENT MARKERS (CLEAR) FROM INSIDE OF CHANNELIZATION MARKING TO OUTSIDE OF CHANNELIZATION MARKING.

REV. 1-19-94: IN DETAIL FOR TWO LANE EXIT WITH OPTIONAL LANE, EXIT RAMP AND ADD PAVEMENT MARKERS.

REV. 7-29-98: CHANGED WIDTH OF CENTERLINES, EDGELINES AND DOTTED WHITE LANE LINES FROM 4" TO 6" INCHES. CHANGED USE OF DOTTED WHITE LANE LINES IN PARALLEL AND TAPERED ACCELERATION AND DECELERATION DETAILS.

REV. 9-1-09: ADDED 6" BROKEN WHITE LINE TO PARALLEL ACCELERATION LANE.

REV. 11-1-11: REVISED PAVEMENT MARKINGS FOR EXIT ONLY LANE DETAIL, EXIT ONLY WITH OPTIONAL LANE DETAIL, TAPERED ACCELERATION LANE DETAIL AND PARALLEL ACCELERATION LANE DETAIL. DELETED GENERAL NOTE (A).

REV. 1-12-12: CHANGED SNOW PLOWABLE MARKERS FROM MONO-DIRECTIONAL TO BI-DIRECTIONAL 2-COLOR.

REV. 5-24-12: REVISED PAVEMENT MARKINGS FOR TAPERED ENTRANCE AND EXIT AND PARALLEL ENTRANCE AND EXIT RAMP.

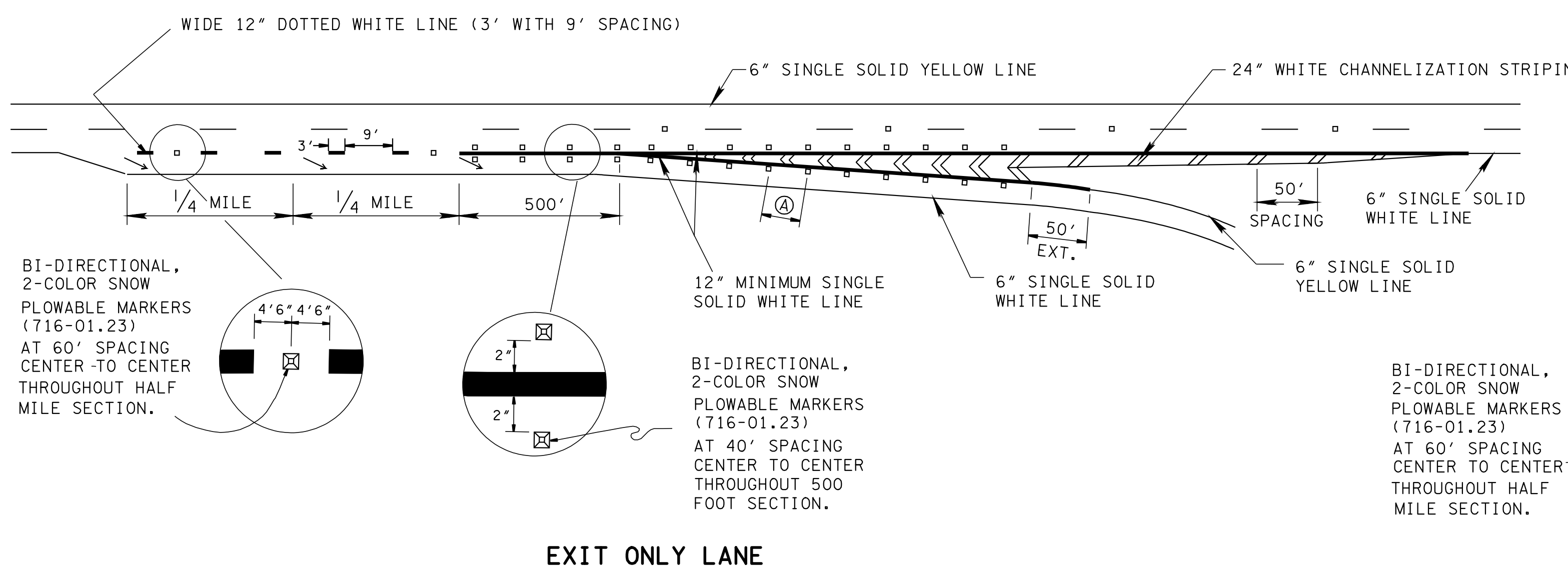
REV. 6-22-12: REVISED SPACING FOR SNOW PLOWABLE MARKINGS IN EXIT ONLY DETAILS.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

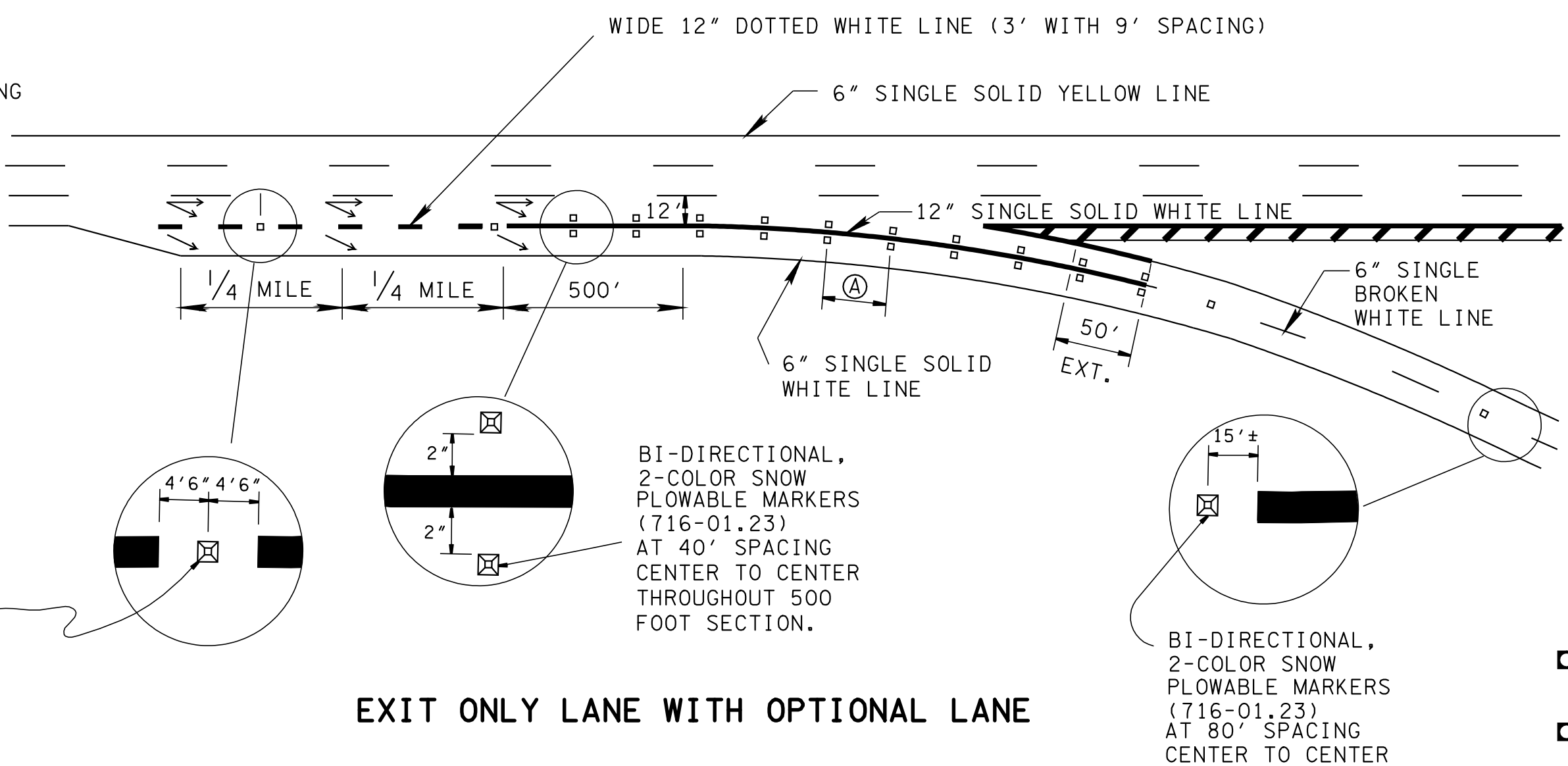
STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION

MARKING DETAIL  
FOR  
EXPRESSWAY & FREEWAY  
INTERCHANGES

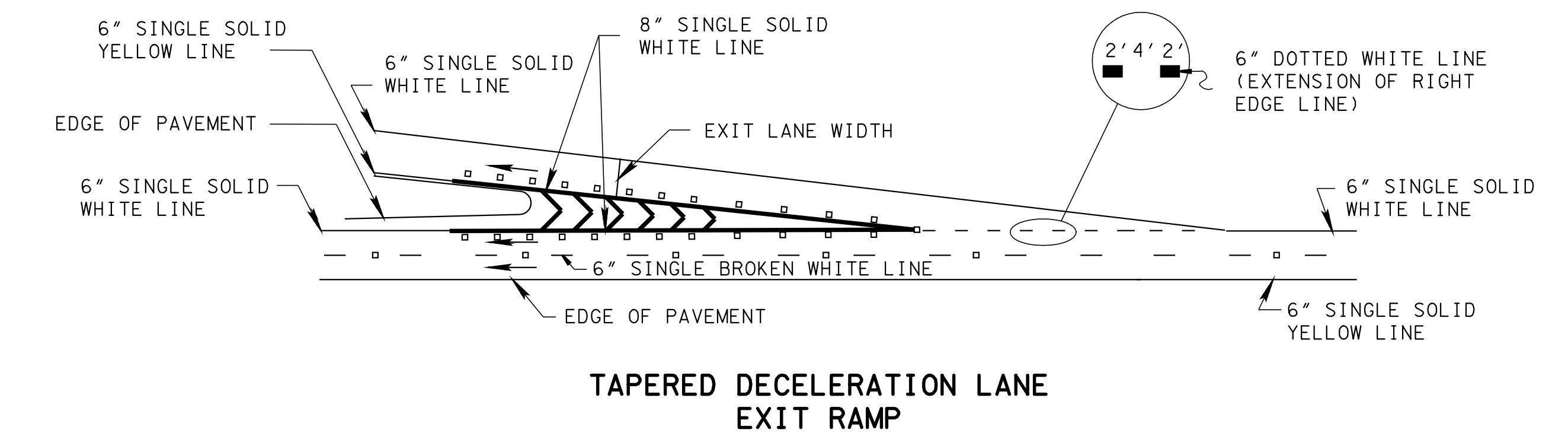
T-M-6



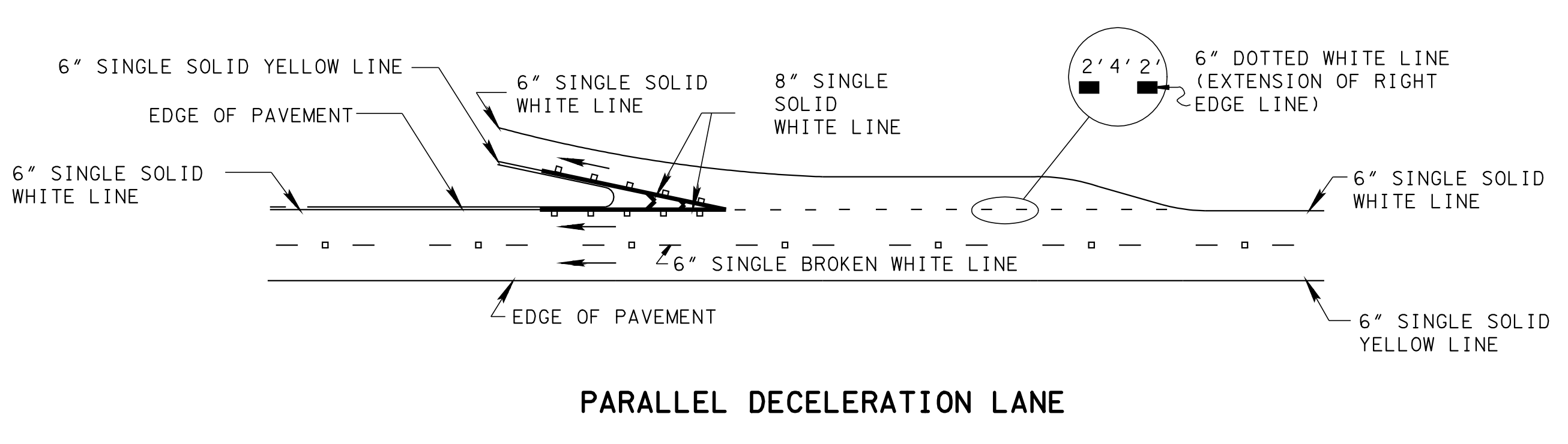
EXIT ONLY LANE



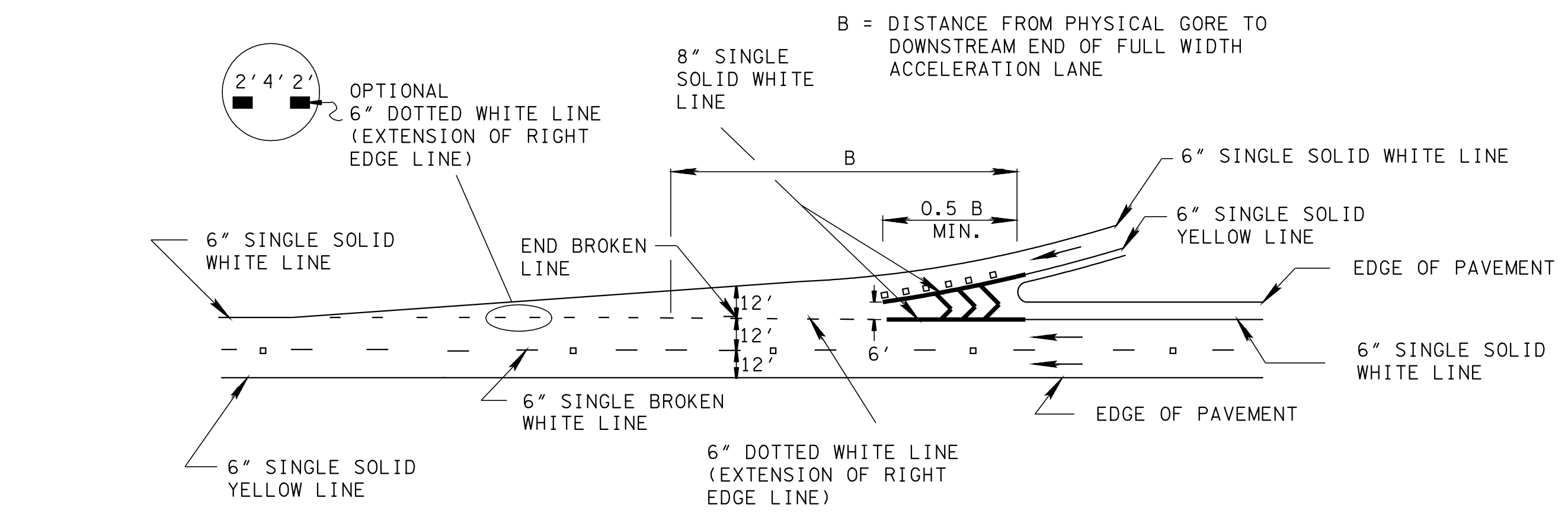
EXIT ONLY LANE WITH OPTIONAL LANE



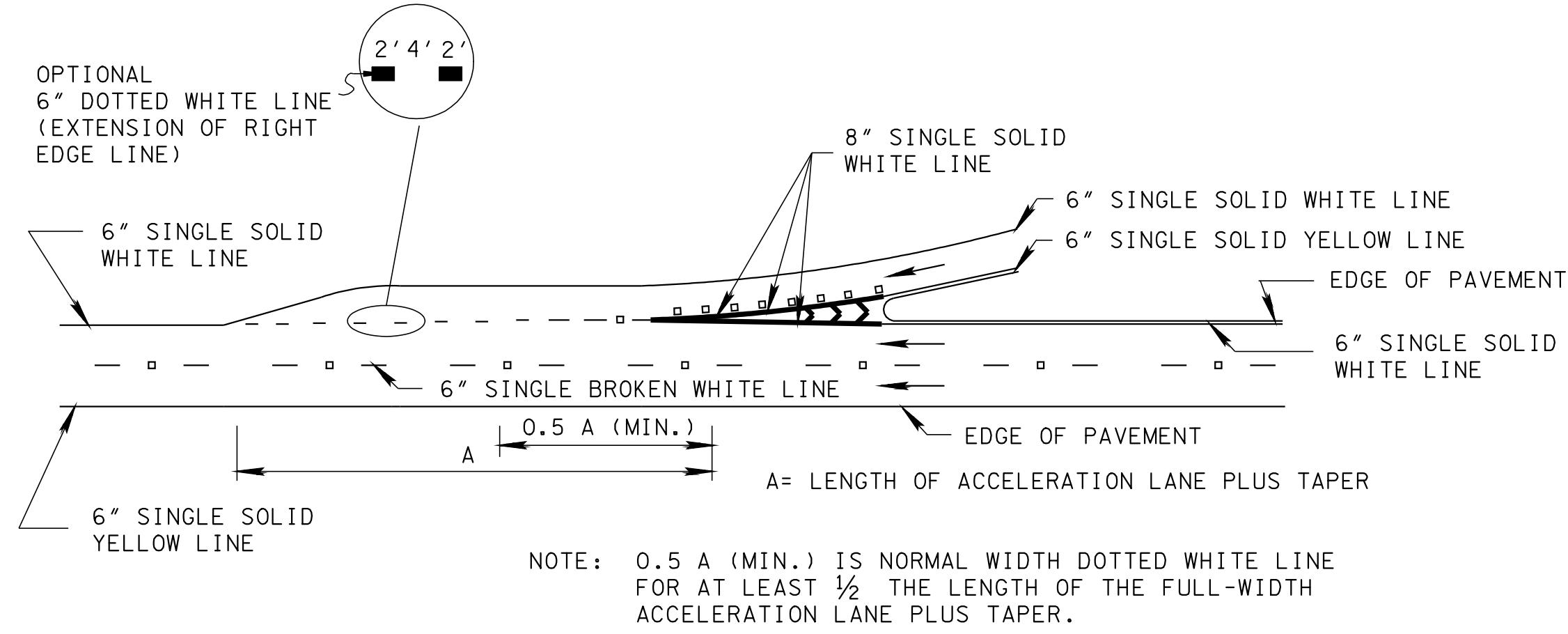
TAPERED DECELERATION LANE  
EXIT RAMP



PARALLEL DECELERATION LANE

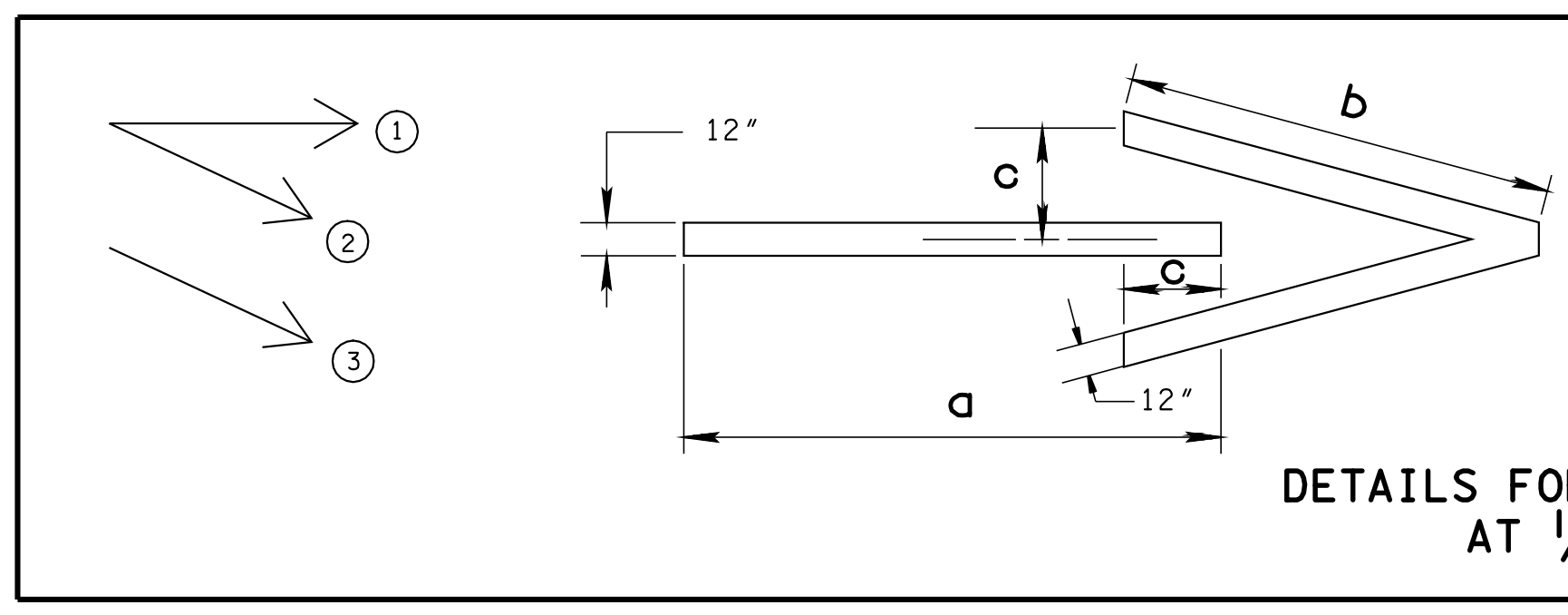


TAPERED ACCELERATION LANE  
ENTRANCE RAMP



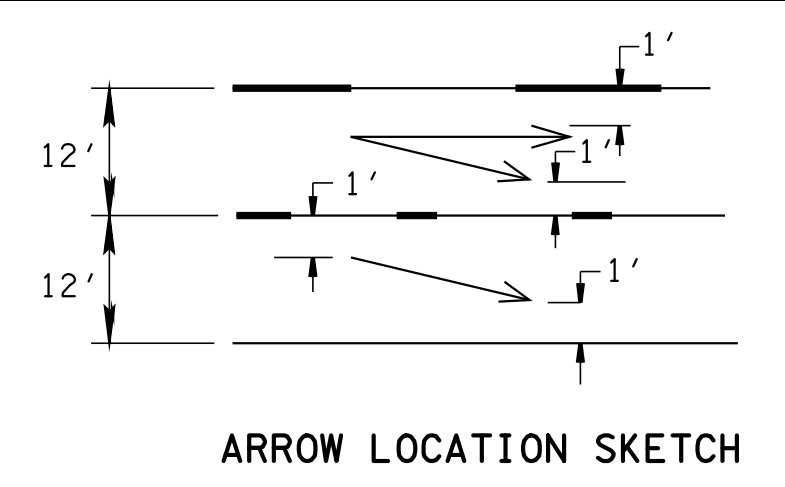
PARALLEL ACCELERATION LANE

NOTE: 0.5 A (MIN.) IS NORMAL WIDTH DOTTED WHITE LINE FOR AT LEAST 1/2 THE LENGTH OF THE FULL-WIDTH ACCELERATION LANE PLUS TAPER.



DIMENSIONS			
ARROW	a	b	c
①	14'-0"	8'-6"	2'-2"
②	10'-4"	8'-6"	2'-2"
③	16'-6"	10'-0"	2'-6"

DETAILS FOR EXIT PAVEMENT ARROWS  
AT 1/4 MILE SPACING

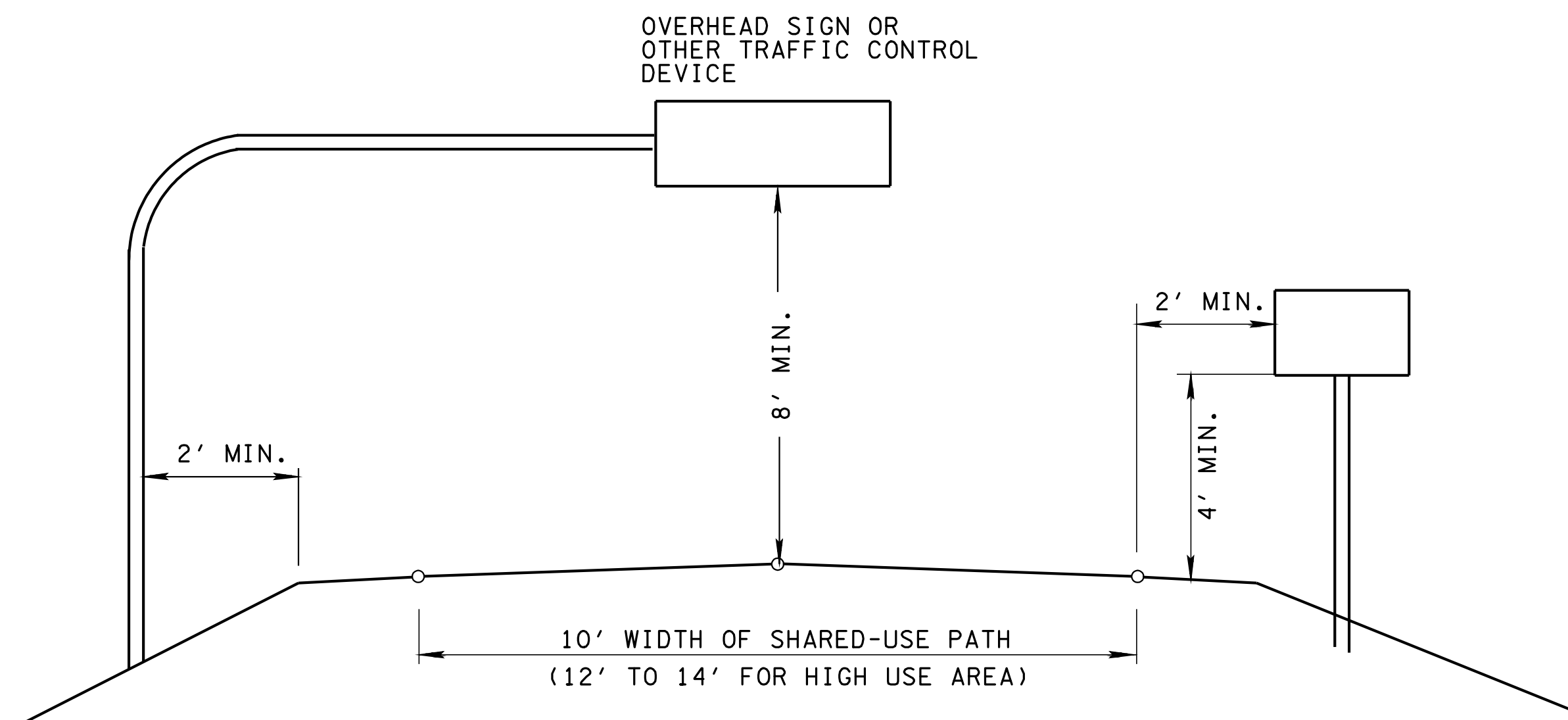


ARROW LOCATION SKETCH

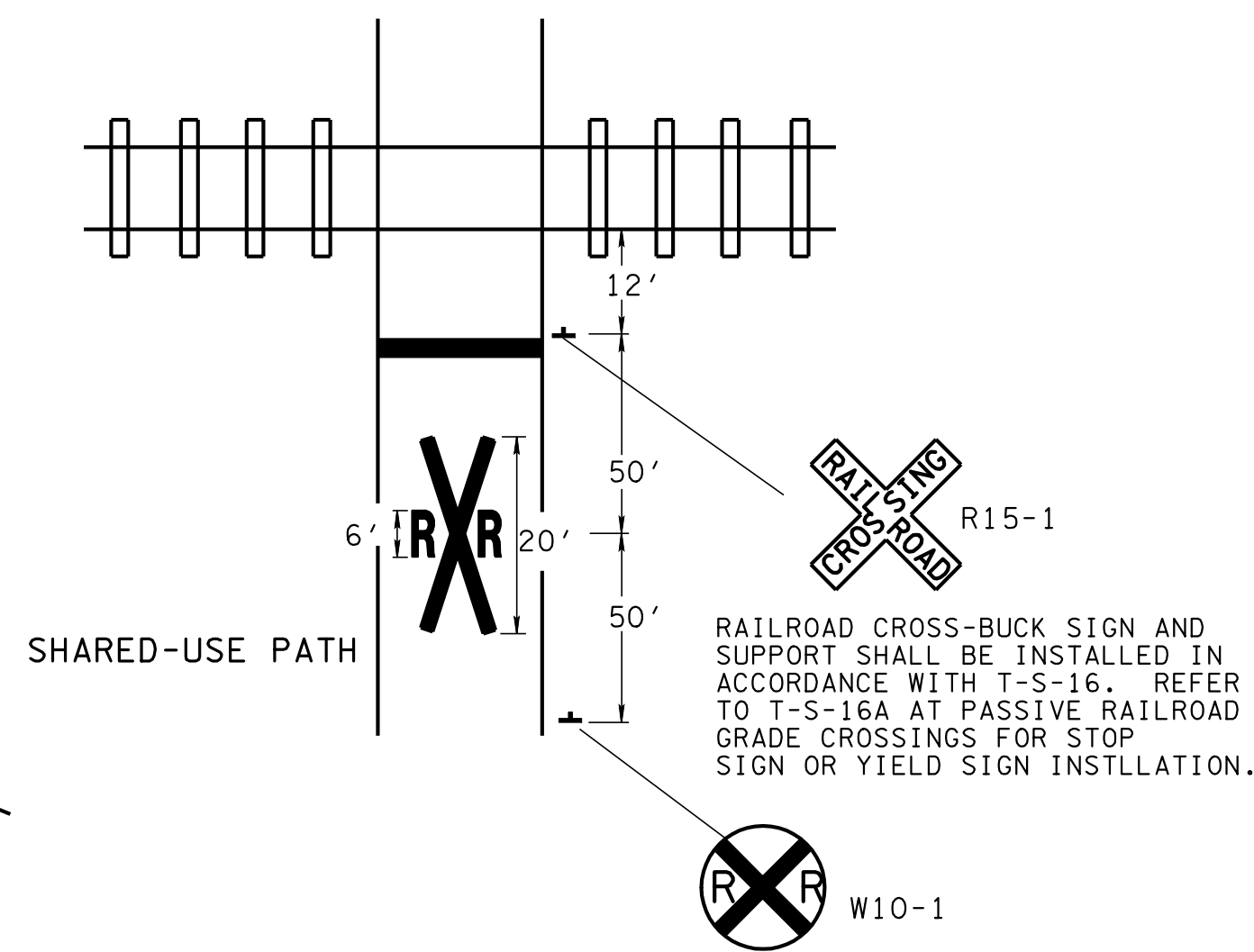
GENERAL NOTES  
(A) SEE STANDARD DRAWING NO. T-M-7 FOR GORE MARKING DETAILS.

REV. 11-1-11: REVISED OVERHEAD SIGN DETAIL. DELETED NOTE (C) REGARDING 4" SBYL ADDED SIGNS D11-1, M4-6, M6-1 AND M6-4. DELETED SIGNS M4-12 M7-1 AND M7-5. REASSIGNED NOTE (C) AND ADDED GENERAL NOTE (F).

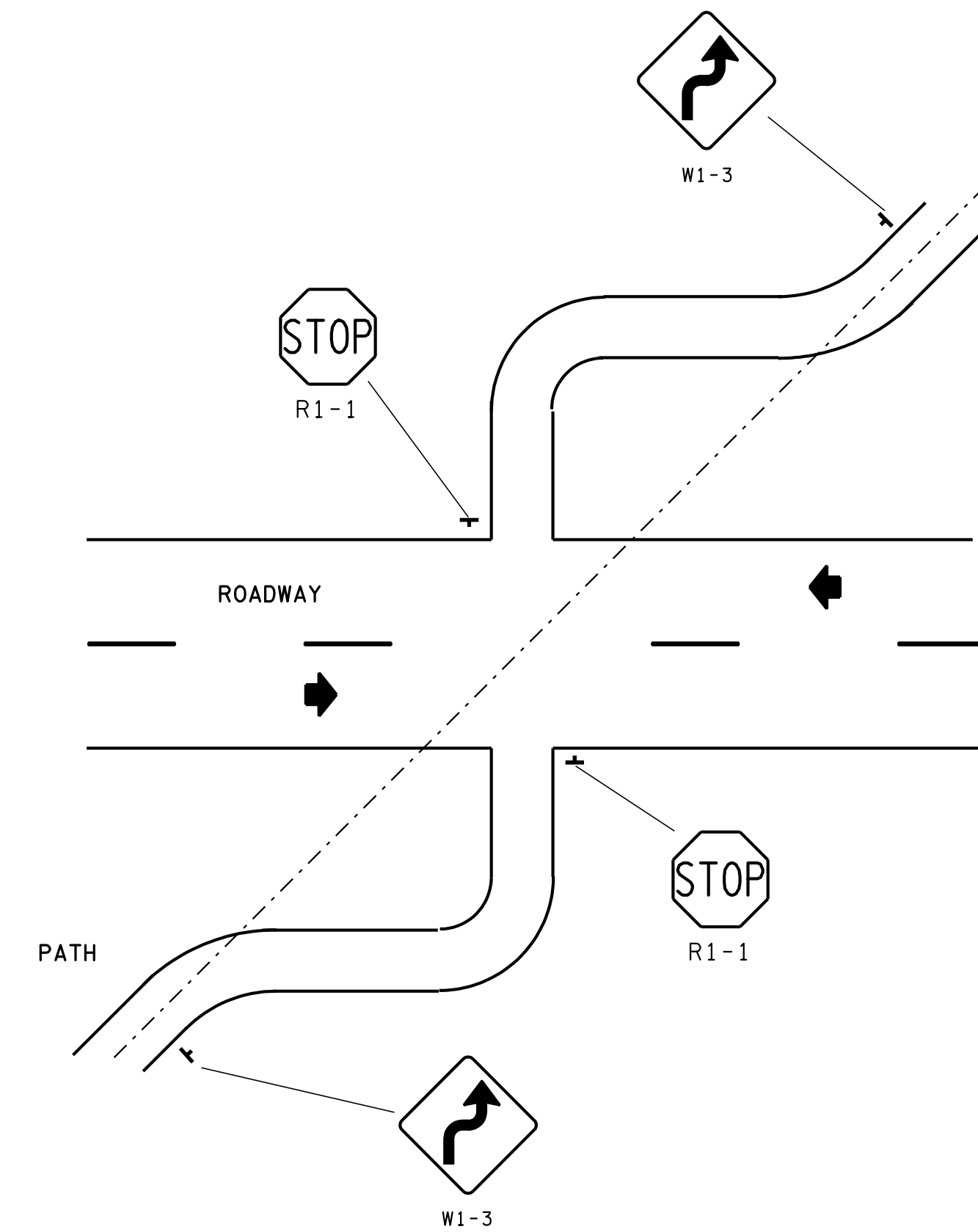
REV. 6-15-12: REVISED INTERSECTION SIGNING FOR 2012 EDITION OF GUIDE FOR THE DEVELOPMENT OF BICYCLE FACILITIES.



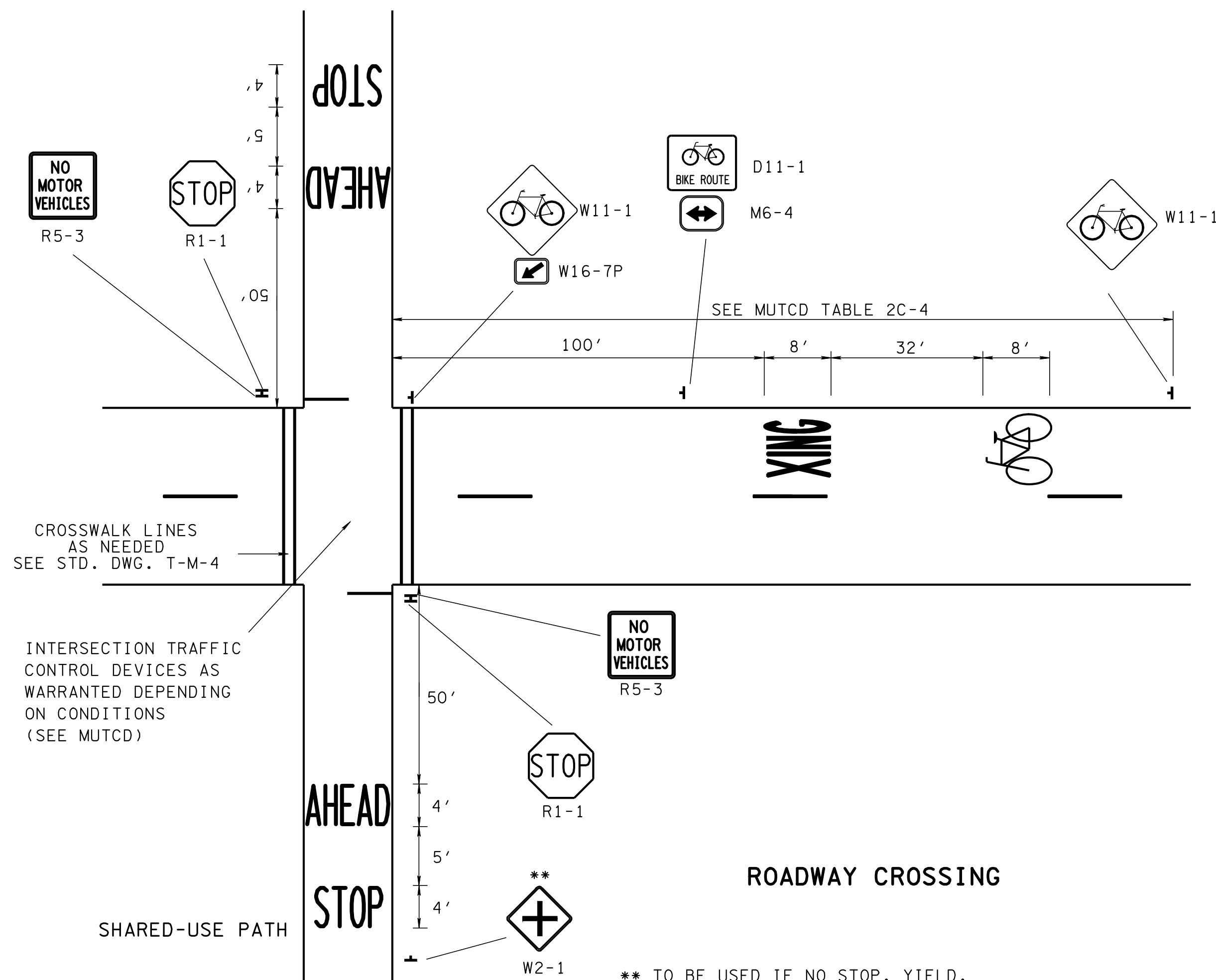
**SIGN PLACEMENT ON SHARED-USE PATHS**  
(SEE RD-TS-8 FOR TYPICAL CROSS SECTION DETAILS)



**RAILROAD CROSSING**

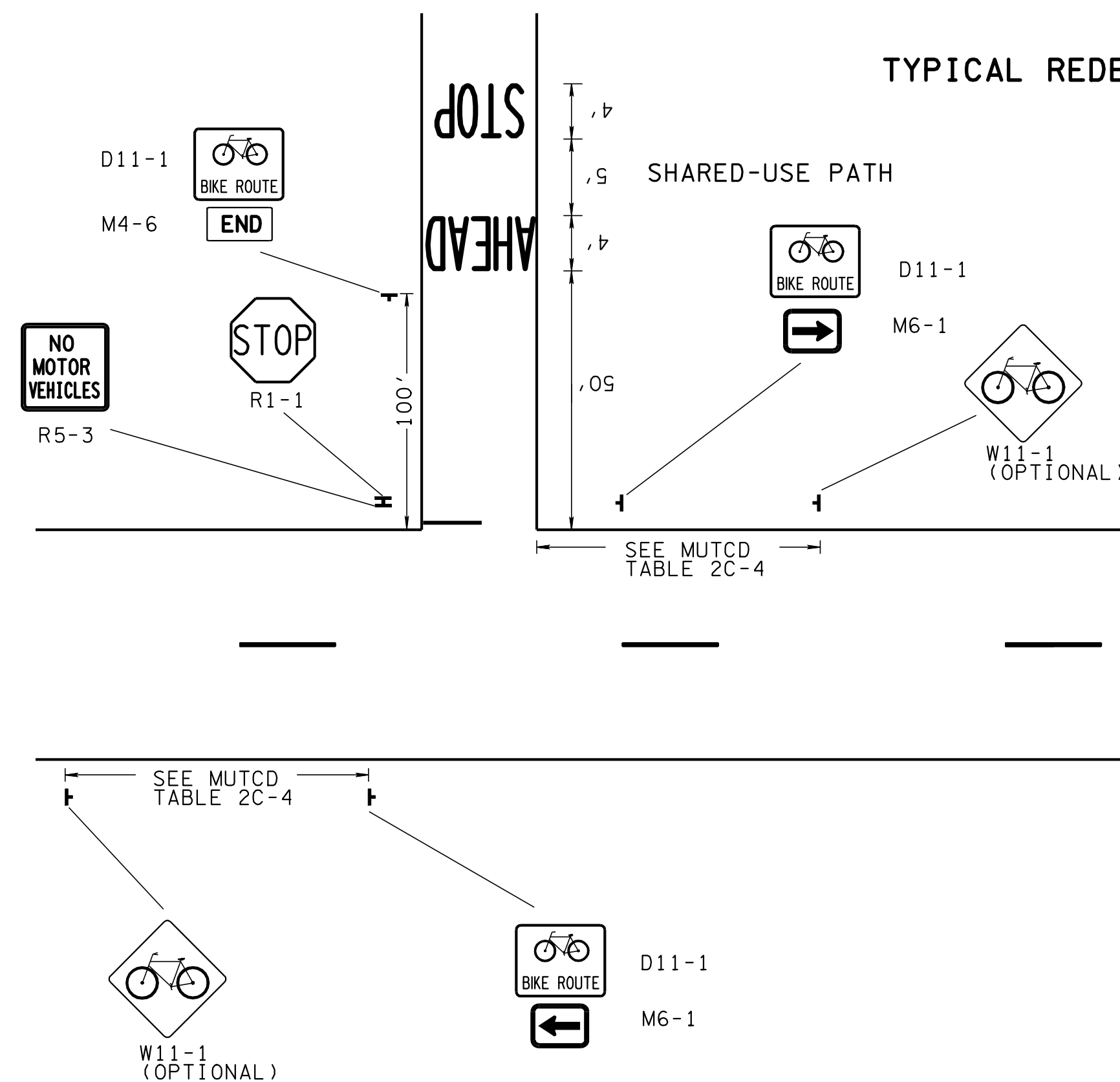


**TYPICAL REDESIGN OF A DIAGONAL ROAD CROSSING**



**ROADWAY CROSSING**

\*\* TO BE USED IF NO STOP, YIELD, OR SIGNAL CONTROL IS USED.



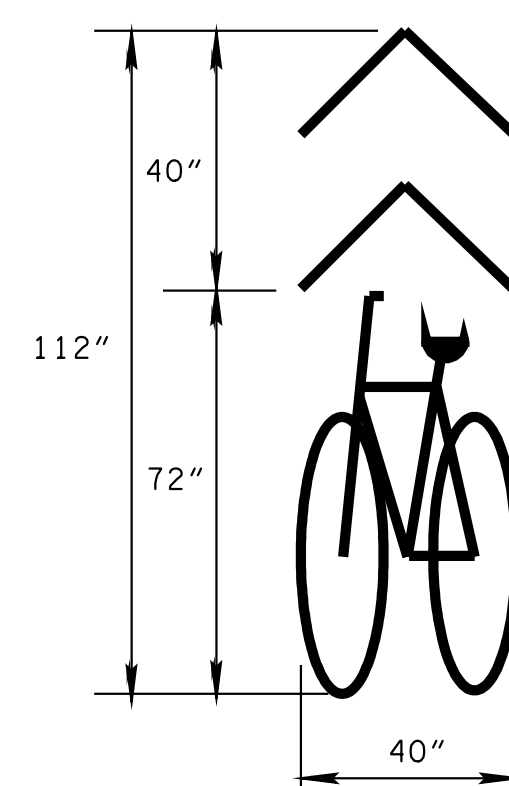
**BEGINNING AND END OF A DESIGNATED BICYCLE ROUTE ON A SHARED-USE PATH**

- GENERAL NOTES**
- (A) WHEN OVERHEAD SIGNS ARE USED ON SHARED-USE PATHS, THE CLEARANCE FROM THE BOTTOM EDGE OF THE SIGN TO THE PATH SURFACE DIRECTLY UNDER THE SIGN SHALL BE A MINIMUM OF 8 FEET.
  - (B) WHEN PLACEMENT OF STOP OR YIELD SIGNS IS CONSIDERED, PRIORITY AT A SHARED-USE PATHS/ROADWAY INTERSECTION SHOULD BE ASSIGNED WITH CONSIDERATION OF THE FOLLOWING:
    1. RELATIVE SPEEDS OF SHARED-USE PATH AND ROADWAY USERS;
    2. RELATIVE VOLUMES OF SHARED-USE PATH AND ROADWAY TRAFFIC; AND
    3. RELATIVE IMPORTANCE OF SHARED-USE PATH AND ROADWAY.
  - (C) WHEN ENGINEERING JUDGMENT DETERMINES THAT THE VISIBILITY OF THE INTERSECTION IS LIMITED ON THE SHARED-USE PATH APPROACH, INTERSECTION WARNING SIGNS SHOULD BE USED. INTERSECTION WARNING SIGNS SHOULD NOT BE USED WHERE THE SHARED-USE PATH APPROACH TO THE INTERSECTION IS CONTROLLED BY A STOP SIGN, YIELD SIGN, OR A TRAFFIC CONTROL SIGNAL.
  - (D) A SOLID WHITE LINE MAY BE USED ON SHARED-USE PATHS TO SEPARATE DIFFERENT TYPES OF USERS. THE R9-7 SIGN MAY BE USED TO SUPPLEMENT THE SOLID WHITE LINE. SMALLER SIZE LETTERS AND SYMBOLS MAY BE USED ON SHARED-USE PATHS. FIXED OBJECTS ADJACENT TO SHARED-USE PATHS MAY BE MARKED WITH OBJECT MARKERS.
  - (E) THE MINIMUM SIGN SIZES FOR SHARED-USE PATHS, SHALL BE THOSE SHOWN IN TABLE 9B-1 IN MUTCD, PART 9 AND SHALL BE USED ONLY FOR SIGNS INSTALLED SPECIFICALLY FOR BICYCLE TRAFFIC APPLICATIONS. THE MINIMUM SIGN SIZES FOR BICYCLE FACILITIES SHALL NOT BE USED FOR SIGNS THAT ARE PLACED IN A LOCATION THAT WOULD HAVE ANY APPLICATION TO OTHER VEHICLES.
  - (F) SEE T-M-12 FOR OTHER SIGNING AND PAVEMENT MARKINGS.

REV. 12-1-09: REMOVED RUMBLE DETAILS TO T-M-15 AND 15A.

REV. 11-1-11: REVISED GENERAL NOTE (B), ADDED GENERAL NOTE E AND (E), UPDATED PLAN VIEW, AND ADDED BIKE SYMBOL/ARROW SHARED LANE MARKING DETAIL.

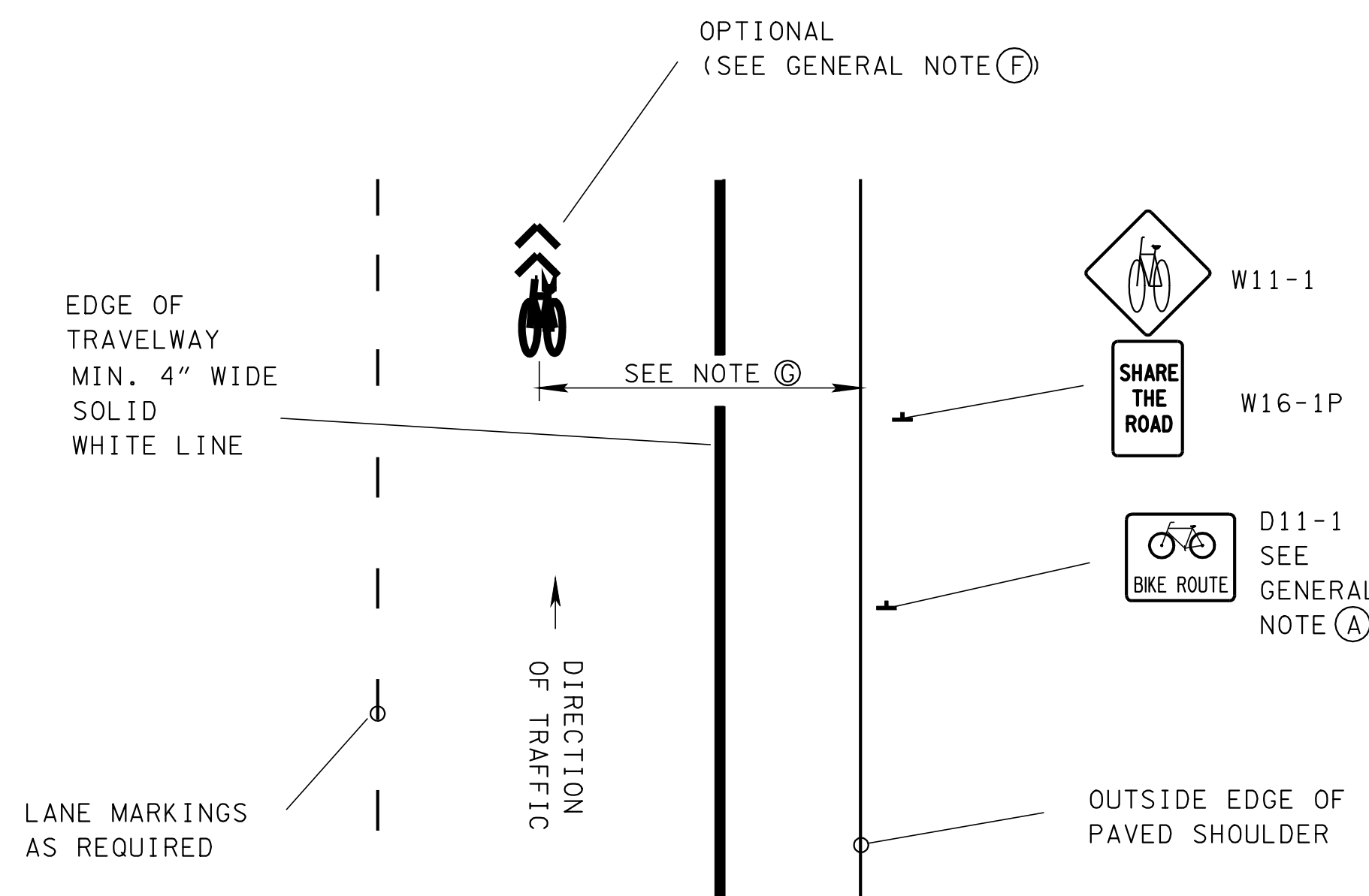
REV. 6-15-12: ADDED NOTE (C).



**BIKE SYMBOL/ARROW SHARED LANE MARKING**

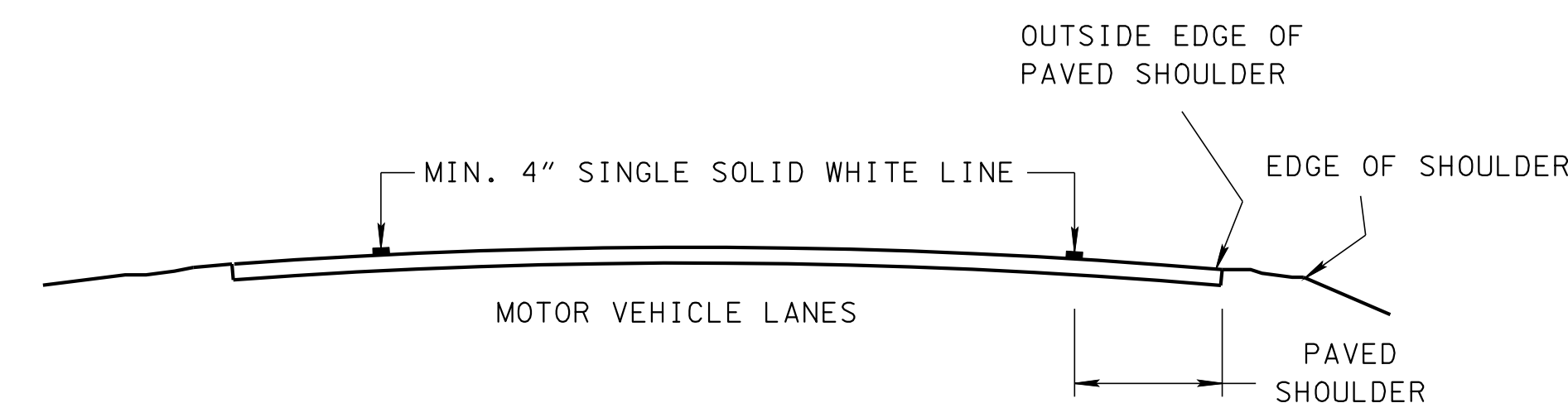
(ITEM NO. 716-04.15)

NOTE: TO BE PLACED IMMEDIATELY AFTER AN INTERSECTION AND SPACED AT INTERVALS NOT GREATER THAN 250 FEET.



**SHARED- LANE MARKING DETAIL**

**TYPICAL BIKE ROUTE CROSS SECTION FOR NON-ACCESS CONTROLLED RURAL ROUTES**



**GENERAL NOTES**

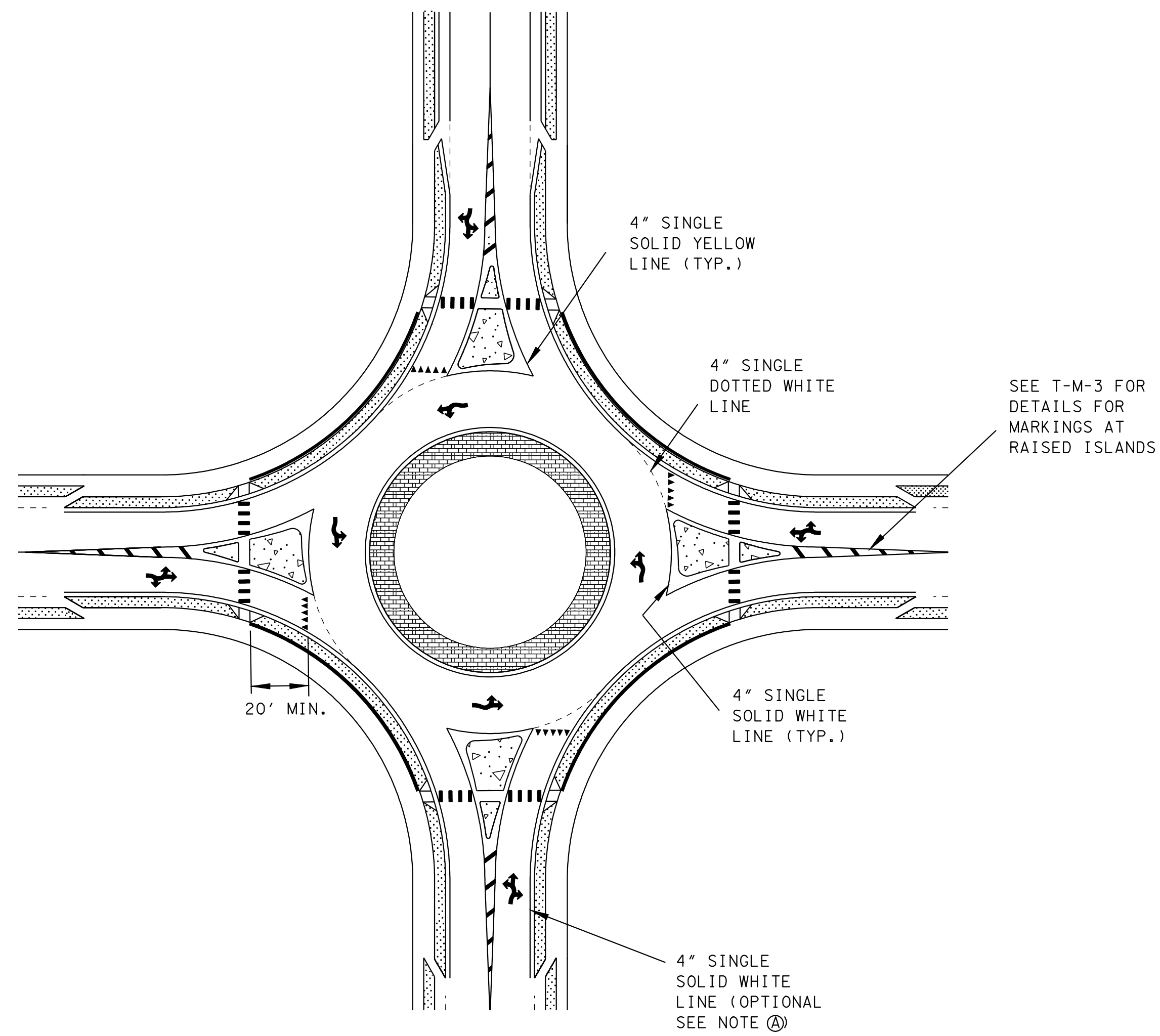
- (A) SIGNS SHOULD BE PLACED APPROXIMATELY EVERY 0.25 MILES, AT EVERY TURN, AND AT ALL SIGNALIZED INTERSECTIONS. SIGN SPACING SHOULD NOT EXCEED A MILE ON RURAL ROADS.
- (B) SEE STD. DWG. T-M-11A IF RUMBLE STRIP OR RUMBLE STRIPE IS PROPOSED IN CONJUNCTION WITH BIKE ROUTE.
- (C) BIKE LANES AND BIKE ROUTES ARE NOT PERMITTED ON ACCESS CONTROLLED FACILITIES.
- (D) IF BIKE LANE IS PROPOSED ON PAVED SHOULDER, RUMBLE STRIPS SHOULD NOT BE USED WHEN THEIR INSTALLATION WOULD LEAVE A CLEAR SHOULDER PATHWAY LESS THAN 4 FEET WIDE (OR LESS THAN 5 FEET WIDE IF THERE IS AN OBSTRUCTION SUCH AS A CURB OR GUARDRAIL) TO THE RIGHT OF THE RUMBLE STRIP FOR BICYCLE USE SEE T-M-15 FOR FURTHER INFORMATION.
- (E) SEE SECTIONS 9B.06, 9B.18, 9B.19, 9B.20, 9C.04, AND 9C.07 FOR ADDITIONAL SIGNING AND PAVEMENT MARKING INFORMATION IN THE MUTCD.
- (F) OPTIONAL, SHARED BIKE LANE MARKINGS SHOULD NOT BE PLACED ON ROADWAYS THAT HAVE A SPEED LIMIT ABOVE 35 MPH.
- (G) STREETS WHERE PARKING IS PERMITTED: 11 FEET MIN.  
STREETS WHERE PARKING PROHIBITED: 4 FEET MIN.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

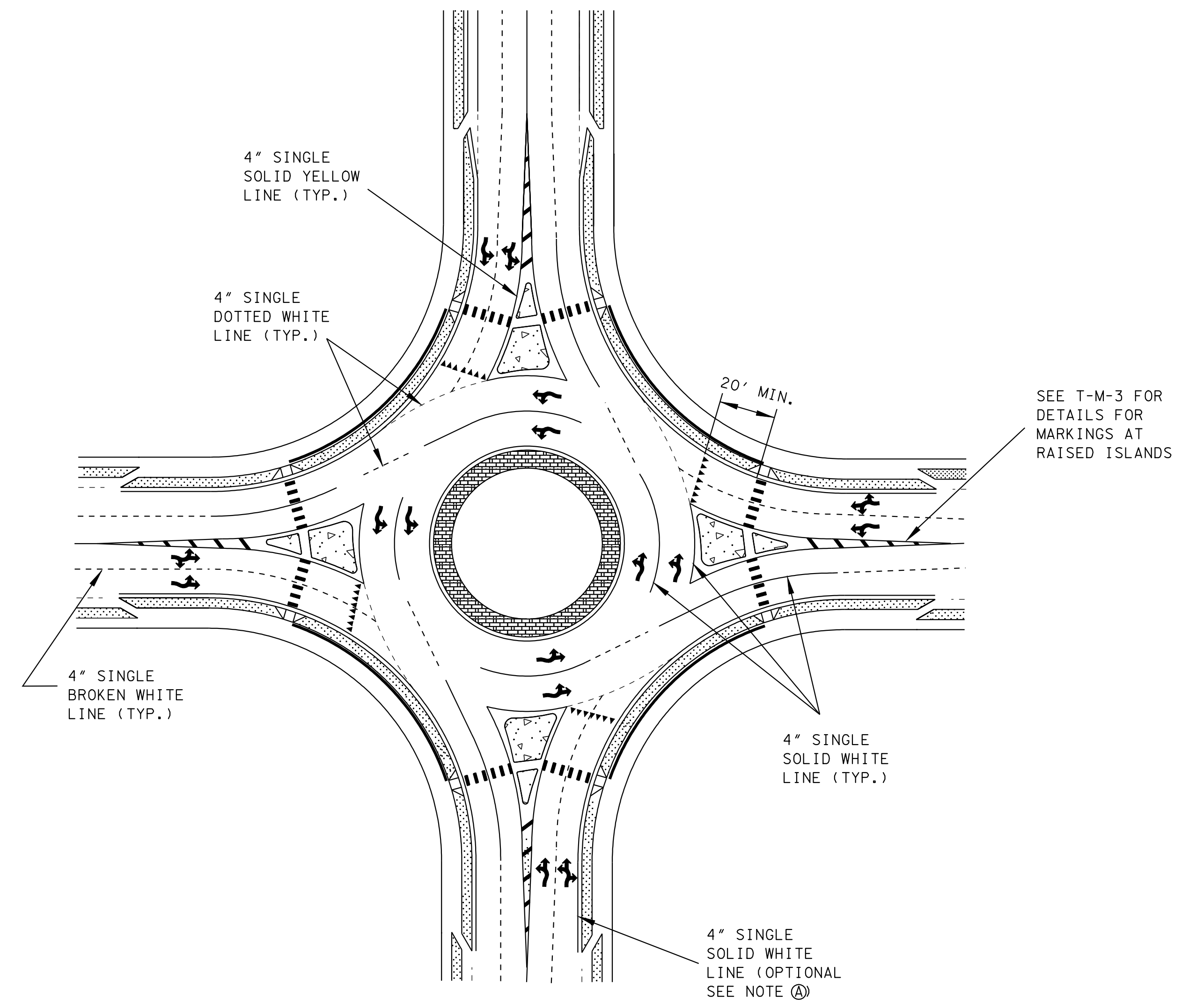
STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION

SIGNING AND PAVEMENT MARKINGS FOR BICYCLE ROUTES ON RURAL ROADS

5-1-07 T-M-11



TYPICAL MARKINGS FOR SINGLE LANE ROUNDABOUT



TYPICAL MARKINGS FOR MULTI-LANE ROUNDABOUT

GENERAL NOTES

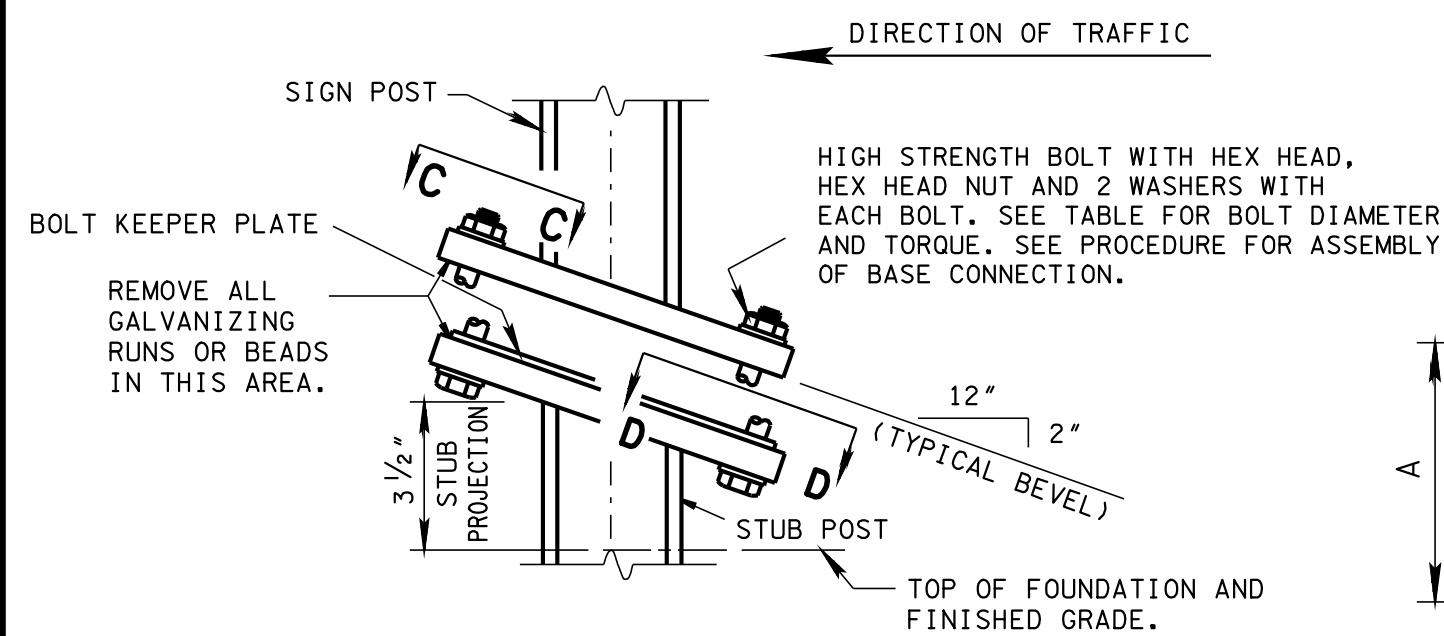
Ⓐ EDGE LINES ARE REQUIRED IF THE APPROACHING ROADWAY HAS EDGE LINES.



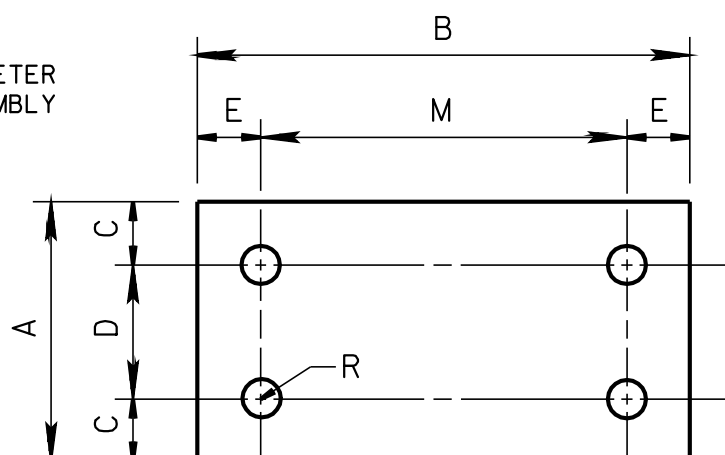
POST SIZE	BASE CONNECTION DIMENSIONS								FUSE PLATE DIMENSIONS										HINGE PLATE DIMENSIONS						FOUNDATION DIAMETER OF TYPE 5 FOOTING			
	BOLT SIZE & TORQUE	A	B	C	D	E	M	W	F	G	H	J	K	L	N	d <sub>1</sub>	t <sub>1</sub>	BOLT DIA.	S	U	V	X	Y	Z		d <sub>2</sub>	t <sub>4</sub>	BOLT DIA.
S3 X 5.7	1/2" Ø x 2 1/2" TORQUE=95 In. lbs. TO 142 In. lbs.	3"	6 1/2"	3/4"	1 1/2"	3/4"	5"	5/8"	3/16"	3 1/8"	1 1/2"	1 1/8"	2 5/8"	1 1/2"	3/16"	1/2"	3/16"	1/4"	1/2" Ø	3 3/4"	2 5/8"	1 1/8"	1 1/2"	1 1/2"	3/16"	3/16"	5/16"	1/2" Ø
S4 X 7.7	3/4" Ø x 2 1/2" TORQUE=142 In. lbs.	3"	7 1/2"	3/4"	1 1/2"	3/4"	6"	5/8"	3/16"	3 1/8"	1 1/2"	1 1/8"	2 5/8"	1 1/2"	3/16"	1/2"	3/16"	1/4"	1/2" Ø	3 3/4"	2 5/8"	1 1/8"	1 1/2"	1 1/2"	3/16"	3/16"	5/16"	1/2" Ø
S5 X 10.0	7/8" Ø x 2 1/2" TORQUE=226 In. lbs. TO 345 In. lbs.	3 1/2"	8 1/2"	3/4"	2"	3/4"	7"	3/4"	1/4"	3 5/8"	2"	1 1/8"	3"	1 3/4"	1/8"	1/2"	3/16"	1/4"	1/2" Ø	4 1/4"	3 3/4"	1 1/8"	2"	1 5/8"	7/8"	3/16"	5/16"	1/2" Ø
S6 X 12.5	1" Ø x 2 1/2" TORQUE=345 In. lbs.	4"	9 1/2"	3/4"	2 1/2"	3/4"	8"	3/4"	1/4"	3 3/4"	2"	1 1/8"	3 3/8"	1 5/8"	1/8"	1/2"	3/16"	1/4"	1/2" Ø	4 1/4"	3 3/4"	1 1/8"	2"	1 5/8"	7/8"	1/16"	5/16"	5/8" Ø

- ### GENERAL NOTES
- (A) THE DESIGN CONFORMS WITH THE AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS (CURRENT EDITION).
  - (B) THE MATERIALS AND FABRICATION SHALL CONFORM TO THE STANDARD SPECIFICATIONS OF THE TENNESSEE DEPARTMENT OF TRANSPORTATION.
  - (C) ALL STEEL SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH STANDARD SPECIFICATION ASTM-A123 FOR SIGN SUPPORTS.
  - (D) ALL HIGH STRENGTH BOLTS AND WASHERS SHALL CONFORM TO STANDARD SPECIFICATION ASTM-A325 OR SAE GRADE 5.
  - (E) ALL HIGH STRENGTH NUTS SHALL BE OF SUCH CAPACITY AS TO DEVELOP THE BOLT STRENGTH.
  - (F) TIGHTEN THE HIGH STRENGTH BOLTS IN THE BASE CONNECTION ONLY TO THE TORQUE SHOWN. CAUTION - DO NOT OVERTIGHTEN.
  - (G) ALL BOLT, NUTS AND WASHERS OTHER THAN LABELED HIGH STRENGTH SHALL CONFORM TO STANDARD SPECIFICATION ASTM-A307, CLASS A.
  - (H) THE WELDING SHALL BE DONE IN ACCORDANCE WITH THE AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS (CURRENT EDITION).
  - (I) ALL BOLTS AND NUTS SHALL BE COATED WITH A SUITABLE LUBRICANT.
  - (J) THE MATERIAL USED FOR STRUCTURAL SHAPES AND PLATES SHALL BE ASTM-A36 GRADE STEEL.
  - (K) ALL HIGH STRENGTH BOLTS, NUTS AND WASHERS MAY BE CADMIUM PLATED IN ACCORDANCE WITH STANDARD SPECIFICATION ASTM-A165 OR GALVANIZED IN ACCORDANCE WITH STANDARD SPECIFICATION ASTM-A153.
  - (L) FLANGE HOLES FOR HINGE AND FUSE PLATES SHALL BE DRILLED OR SUB-PUNCHED AND REAMED.
  - (M) CLASS "A" CONCRETE CONSTRUCTION AND MATERIALS SHALL MEET THE REQUIREMENTS OF THE "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION OF THE TENNESSEE DEPARTMENT OF TRANSPORTATION, SECTION 604".
  - (N) CLASS "A" CONCRETE AND REINFORCING STEEL USED IN CONJUNCTION WITH INSTALLATION OF THE SIGN SUPPORT POSTS IS TO BE PAID FOR UNDER ITEM NO. 713-01.01, CLASS "A" CONCRETE (FOUNDATION FOR SIGN SUPPORTS) PER CUBIC YARD, AND 713-01.02, STEEL BAR REINFORCEMENT (FOUNDATION FOR SIGN SUPPORTS) PER POUND.
  - (O) CLASS "A" CONCRETE FOOTING SHALL BE PLACED ONLY ON UNDISTURBED MATERIAL OR IN FILL MATERIAL PLACED BY CONTROLLED COMPACTION AT DEPTHS UNAFFECTED BY FROST.
  - (P) MATERIALS SURROUNDING FOOTING SHALL BE CAPABLE OF CARRYING A MINIMUM BEARING OF 2,500 POUNDS PER SQUARE FOOT. WHERE SOLID ROCK IS ENCOUNTERED, FOOTING SHALL BE LENGTH SHOWN ON THE SIGN SCHEDULE SHEET OR EXTEND A MINIMUM OF TWO FEET INTO THE ROCK.

- REV. 10-6-66: BOLT LENGTH AND NOTE.
- REV. 10-27-66: FOUNDATION BEARING REVISED.
- REV. 10-30-66: 3 1/2", 4" & 5" TUBES ELIMINATED.
- REV. 1-19-72: TORQUE FOR DETAIL "A".
- REV. 7-1-72: CHANGED DEPARTMENT NAME.
- REV. 5-1-73: REVISED SHIM NOTE.
- REV. 3-12-74: REVISED GENERAL NOTES.
- REV. 10-3-75: TORQUE ON BOLTS AND POST SIZE.
- REV. 1-1-76: CHANGED DWG. NO. FROM RD-S-13 TO T-S-13.
- REV. 7-29-76: NEW AASHTO SPECIFICATION.
- REV. 4-12-77: BOLTS AT FUSE PLATES & ADDED BOLT KEEPER PLATES.
- REV. 6-30-88: ADDED HINGE PLATE.
- REV. 3-14-90: CHANGED SLIP BASE TORQUE IN TABLE.
- REV. 12-7-90: REDREW AND RENAMED DRAWING. PLACED MATERIAL AND INFORMATION REGARDING STANDARD STEEL GROUND MOUNTED SIGNS WITH BREAK-AWAY TYPE FOOTINGS USING SQUARE TUBES ON DRAWING NO. T-S-12. ELIMINATED S7 x 15.3 SUPPORT POST SIZE FROM THE TABLE.
- REV. 10-26-96: CHANGED PAY ITEM NO. IN GENERAL NOTE (N).
- REV. 5-27-01: CHANGED NOTE UNDER SHIM DETAIL.
- REV. 7-20-12: REVISED DIMENSION K AND Y FOR S5X10.0.

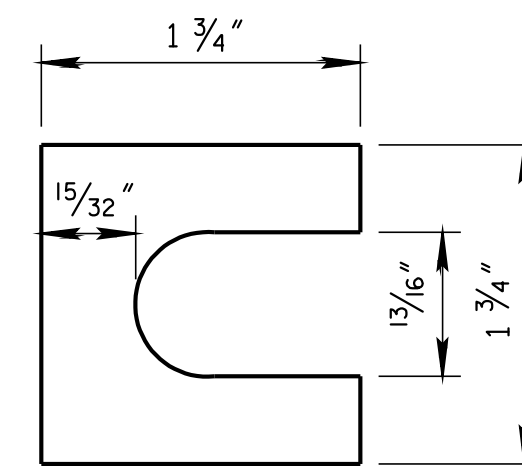


**SIGN POST AND STUB POST BASE CONNECTION DETAIL ELEVATION VIEW (FOR I-SHAPED SUPPORT POSTS)**



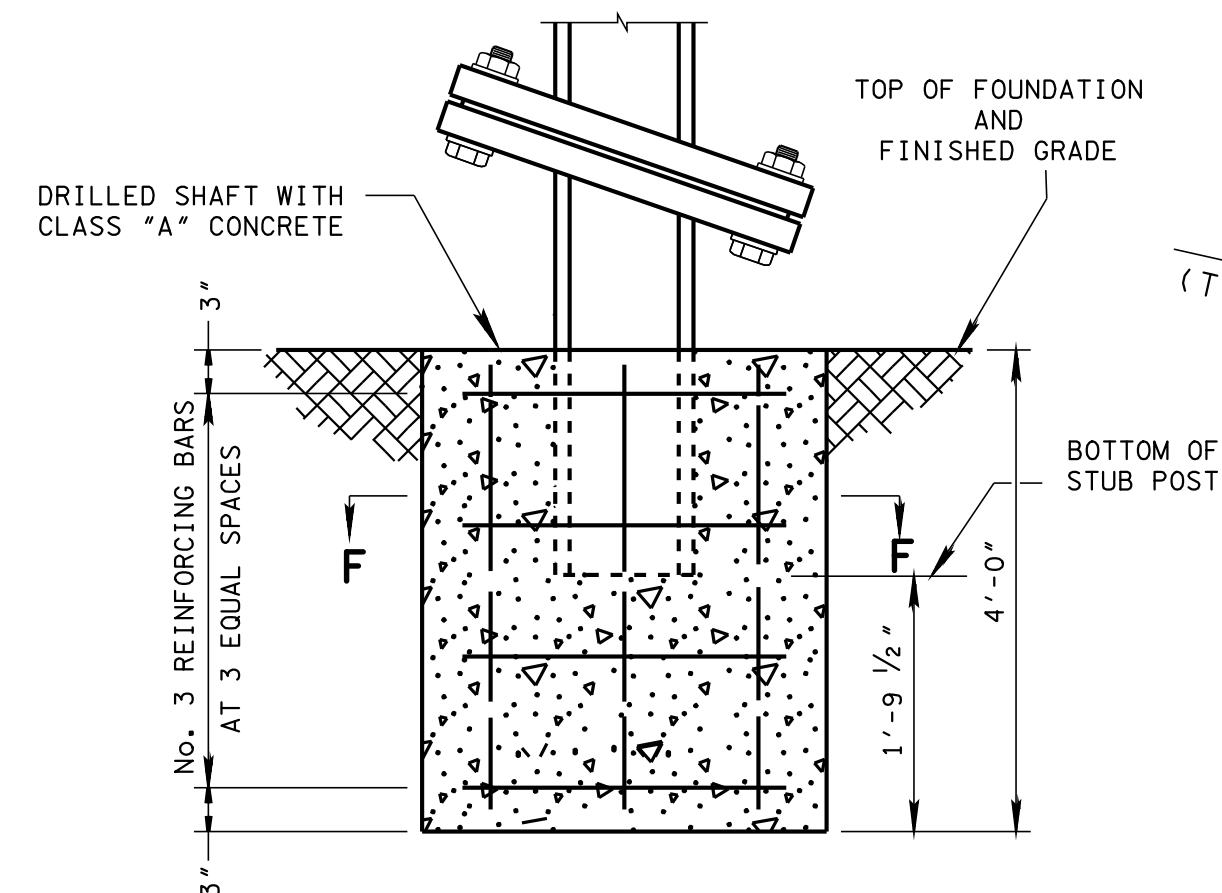
**BOLT KEEPER PLATE (28 GAUGE GALVANIZED STEEL)**

- ### PROCEDURE FOR ASSEMBLY OF BASE CONNECTION
- (1) ASSEMBLE POST TO STUB WITH BOLTS AND ONE BOLT KEEPER PLATE BETWEEN THEM.
  - (2) SHIM AS REQUIRED TO PLUMB POST.
  - (3) TIGHTEN ALL BOLTS THE MAXIMUM POSSIBLE WITH 12" TO 15" WRENCH TO BED WASHERS AND SHIMS AND TO CLEAN BOLT THREADS, THEN LOOSEN.
  - (4) RETIGHTEN BOLTS IN A SYSTEMATIC ORDER TO THE PRESCRIBED TORQUE (SEE TABLE).
  - (5) BURR THREADS AT JUNCTION WITH NUT USING A CENTER PUNCH TO PREVENT NUT LOOSENING.

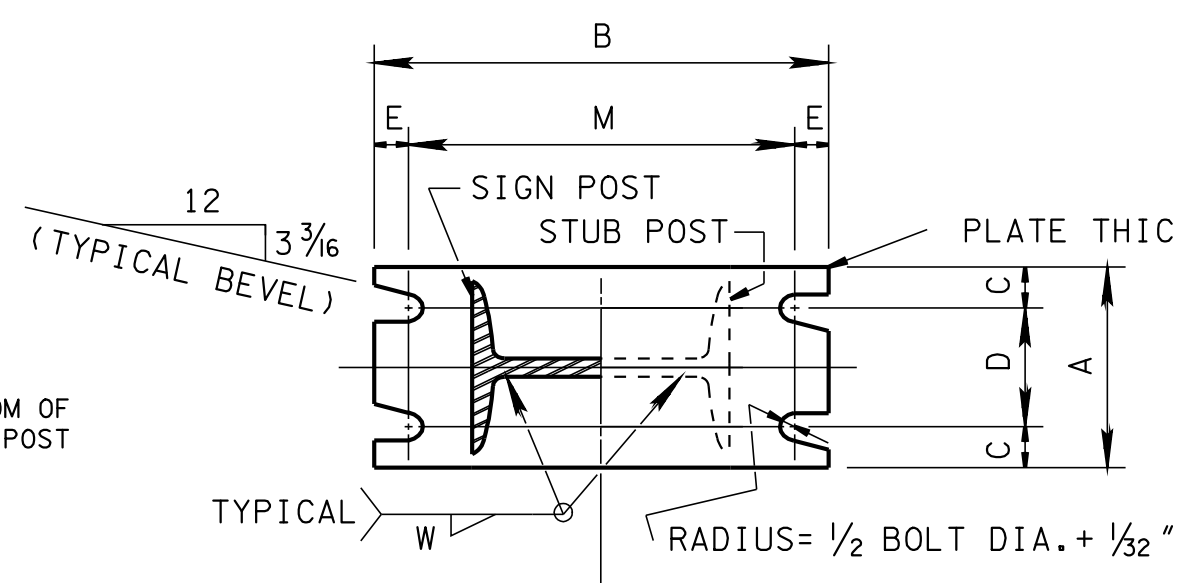


**SHIM DETAIL**

THE THICKNESS OF SHIMS SHALL NOT BE MORE THAN 0.032" NOR LESS THAN 0.012" AT ANY SINGLE BOLT. SHIMS SHALL BE FABRICATED FROM BRASS SHIM STOCK OR STRIP CONFORMING TO ASTM-B36.

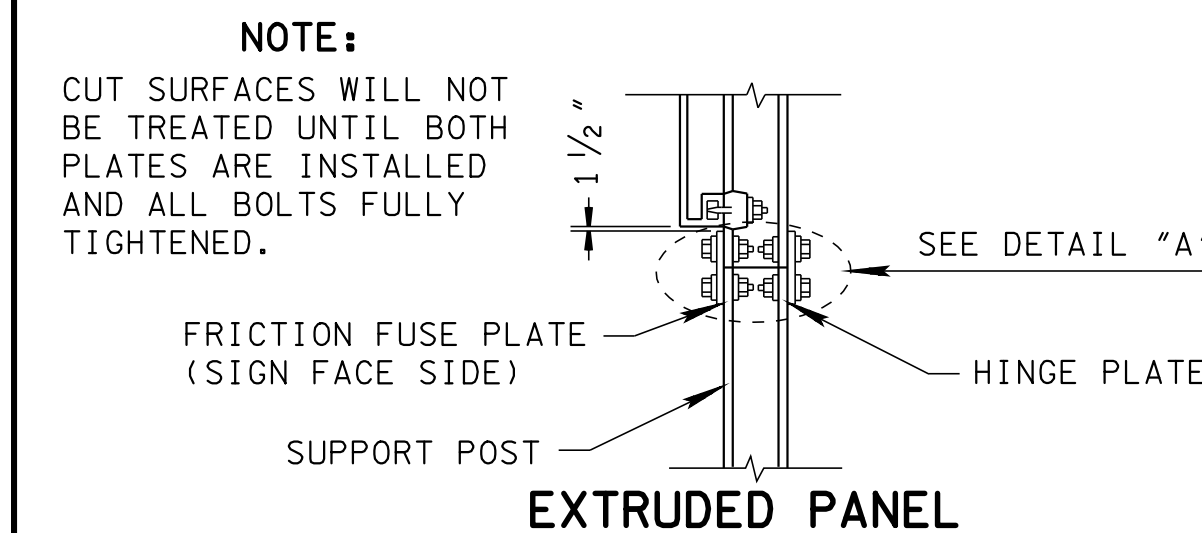


**FOUNDATION AND FOOTING ELEVATION DETAIL FOR I-BEAM POST SUPPORTS TYPE 5 FOOTING**

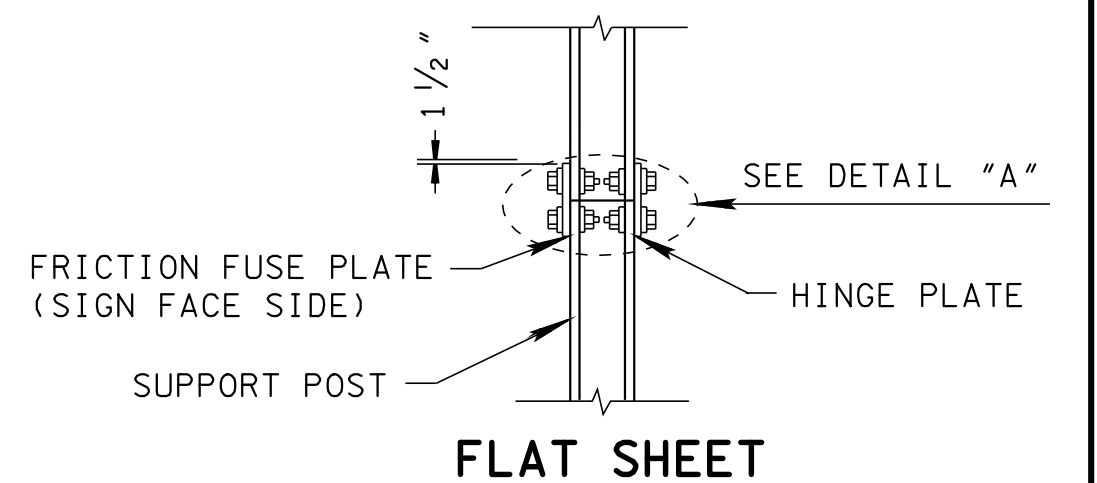


**SECTION C-C SECTION D-D (SEE TABLE FOR DIMENSIONS)**

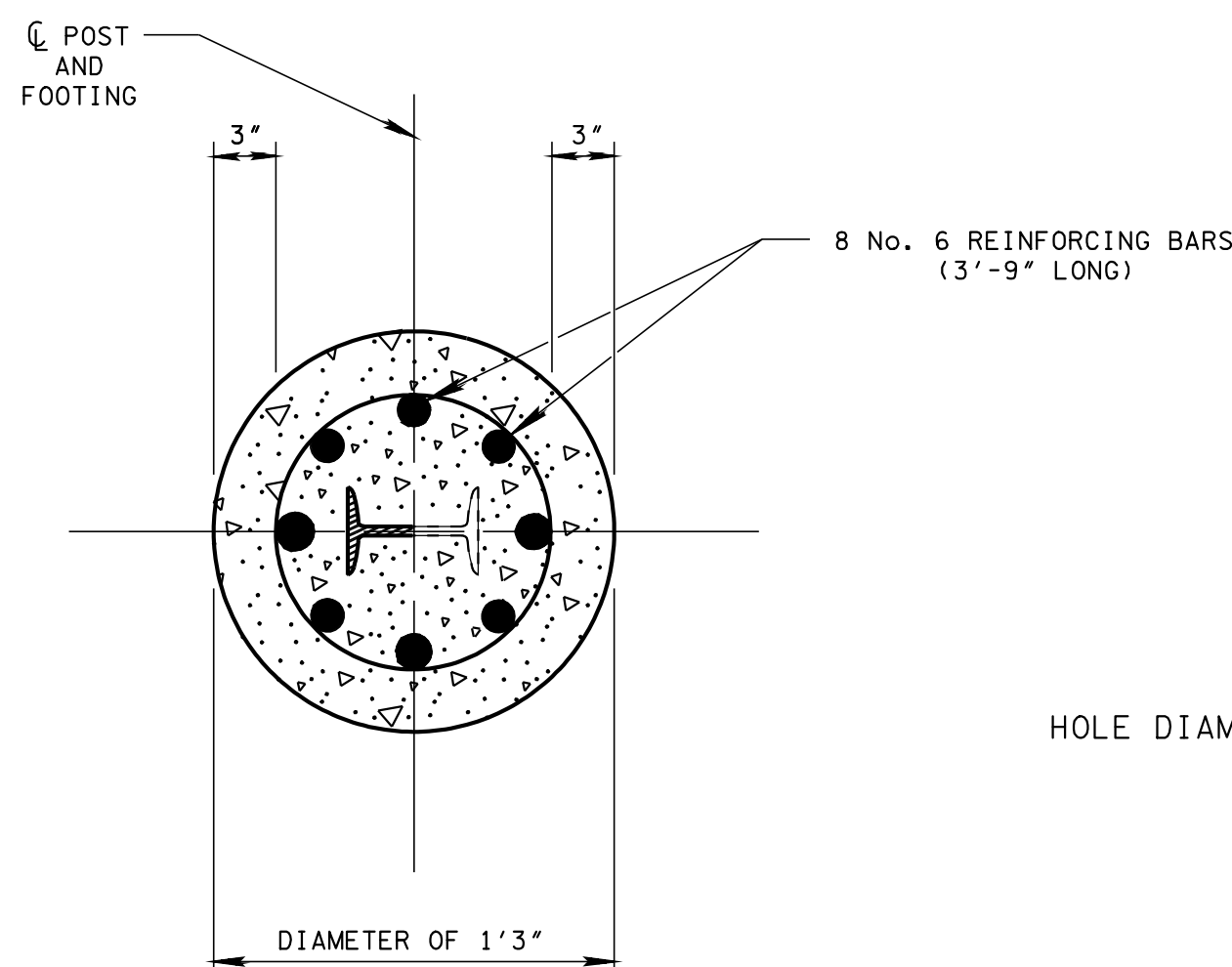
SECTIONS SHOWN ARE FOR INSTALLATIONS ON RIGHT SHOULDER AND IN GORE AREAS. PLATE SLOT BEVELS ARE OPPOSITE HAND FROM THAT SHOWN FOR INSTALLATIONS ON LEFT SHOULDER.



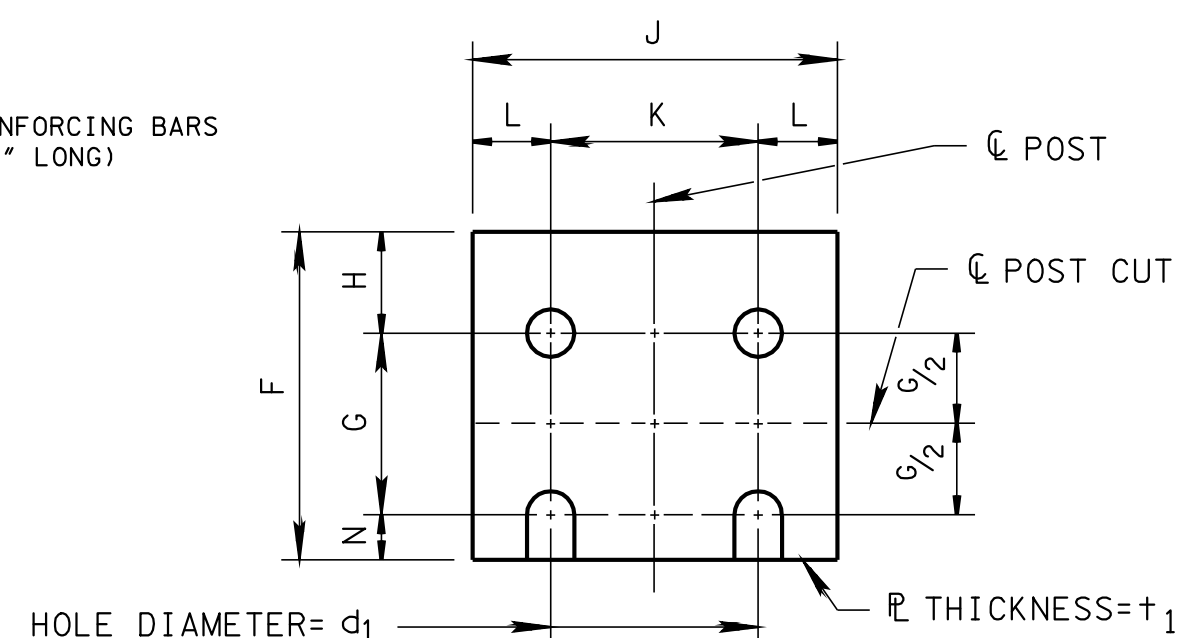
**-NOTES-**  
THE HOLES FOR THE HINGE AND FUSE PLATE SHALL BE DRILLED BEFORE THE SAW CUTTING AND GALVANIZING OF THE POST. THE POST SHALL BE SAW CUT COMPLETELY THRU BEFORE OR AFTER GALVANIZING. IF THE POST IS CUT AFTER GALVANIZING THEN THE CUT SURFACE SHALL BE TREATED WITH AN APPROVED ZINC SOLDER MEETING THE FEDERAL SPECIFICATION O-G-93 (STICK ONLY).  
USE HIGH STRENGTH BOLTS WITH HEX HEAD, HEX HEAD NUT AND ONE FLAT WASHER UNDER EACH BOLT HEAD AND BEVEL OR FLAT WASHER (WHERE REQUIRED) UNDER NUT.



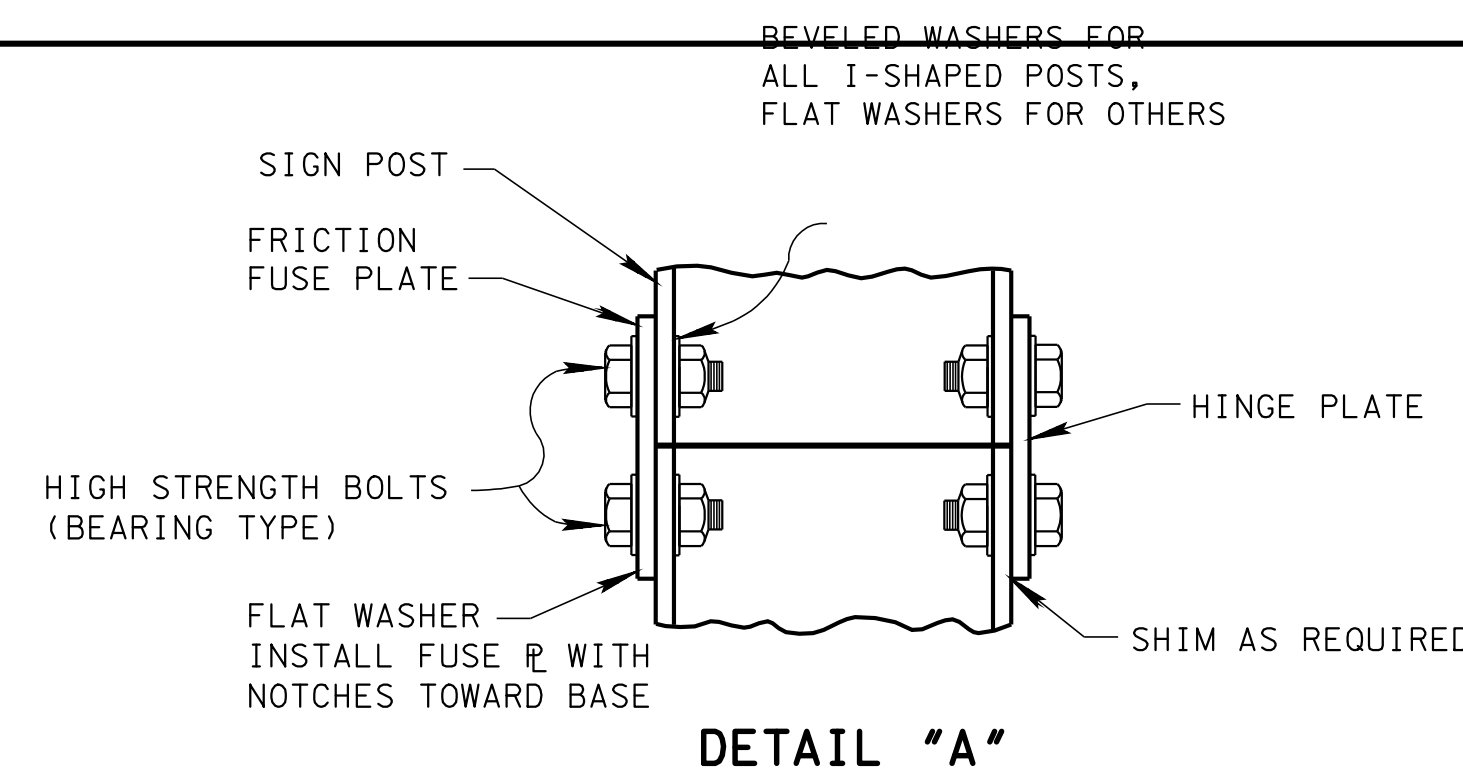
**TYPICAL SIDE VIEW**



**SECTION F-F TYPE 5 FOOTING**



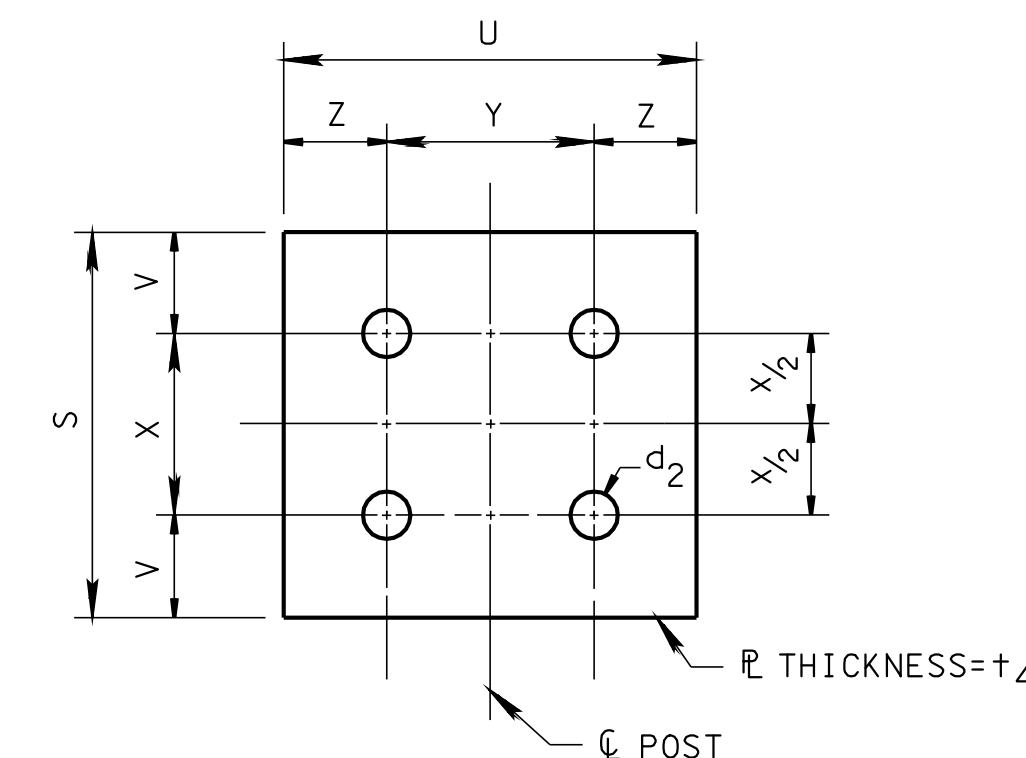
**FUSE PLATE DETAIL (SEE TABLE FOR DIMENSIONS)**



**DETAIL "A"**

**FABRICATOR NOTE: IMPORTANT-** ALL FRICTION FUSE AND HINGE BOLTS SHALL BE TIGHTENED IN THE SHOP FOLLOWING A METHOD APPROVED BY THE ENGINEER. TIGHTENING SHALL BE TO SUCH A DEGREE AS TO OBTAIN THE FOLLOWING MINIMUM RESIDUAL TENSION IN EACH BOLT:

BOLT SIZE	MIN. RESIDUAL BOLT TENSION
1/2" Ø	12,050 LBS.
3/8" Ø	19,200 LBS.
1/4" Ø	28,400 LBS.



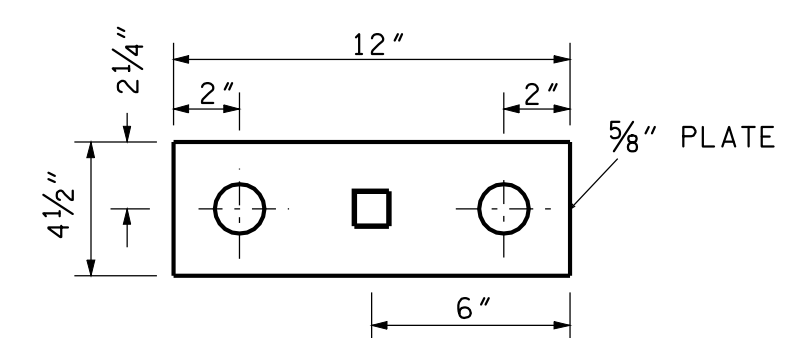
**HINGE PLATE DETAIL (SEE TABLE FOR DIMENSIONS)**

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

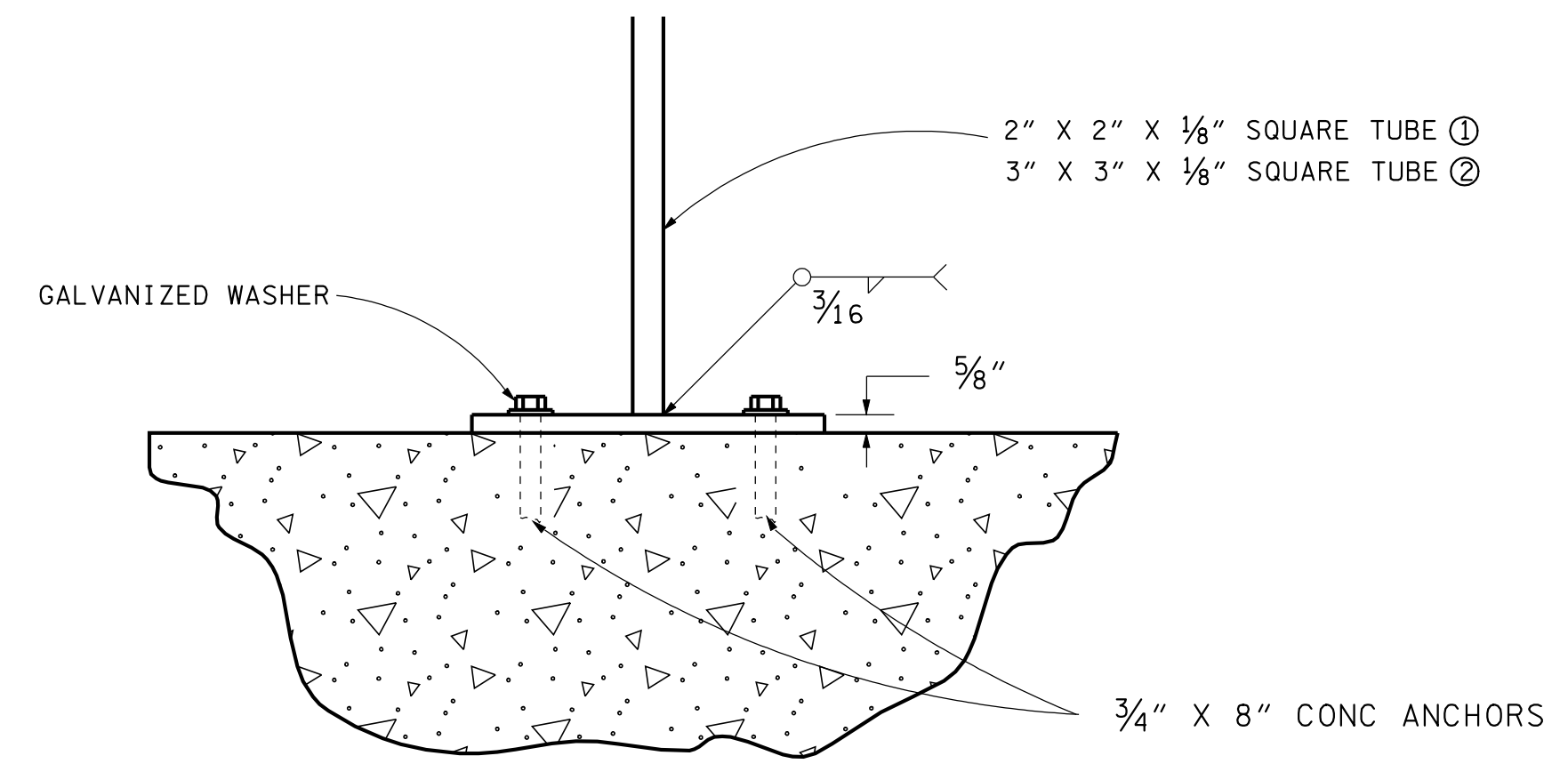
STATE OF TENNESSEE DEPARTMENT OF TRANSPORTATION

STANDARD STEEL GROUND MOUNTED SIGNS, BREAK-AWAY TYPE POST FOOTING DETAILS, I-BEAMS



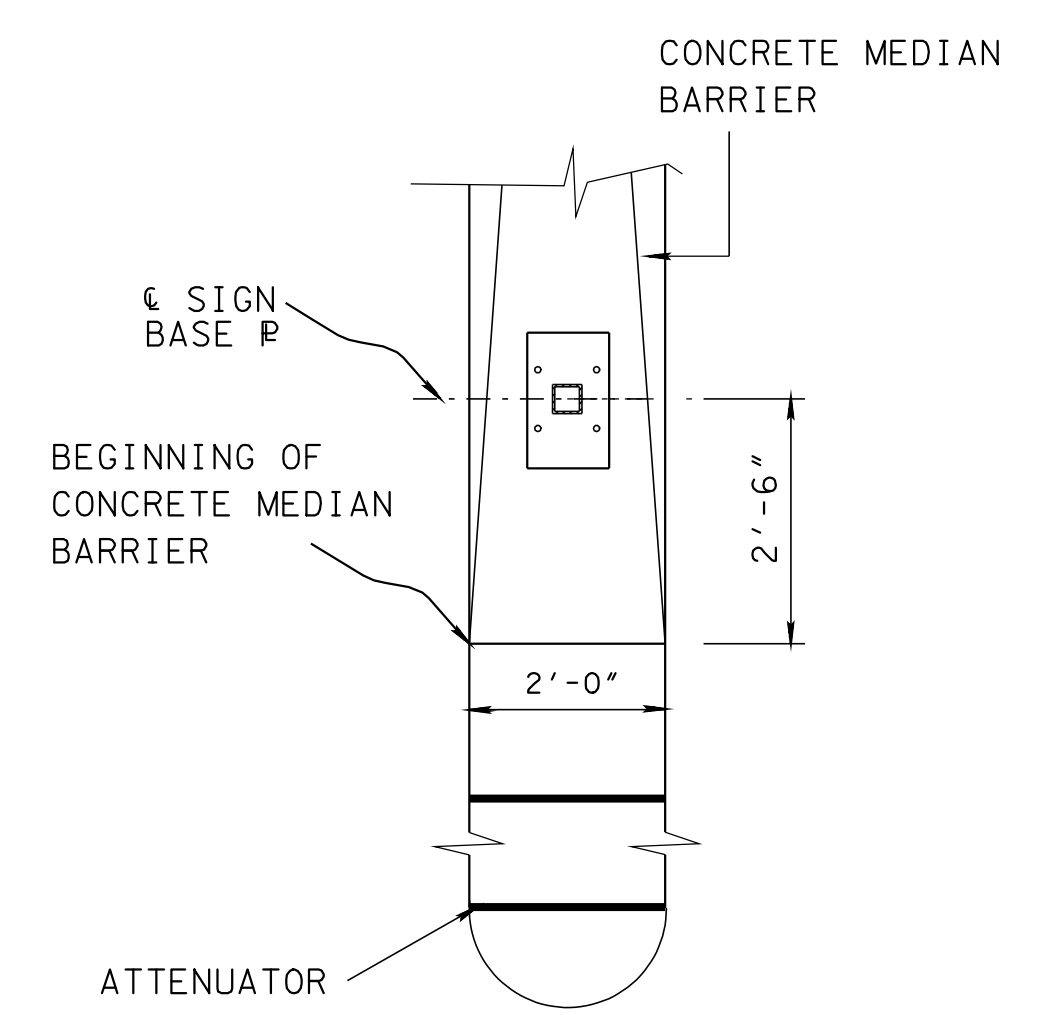


BASE PLATE DETAIL

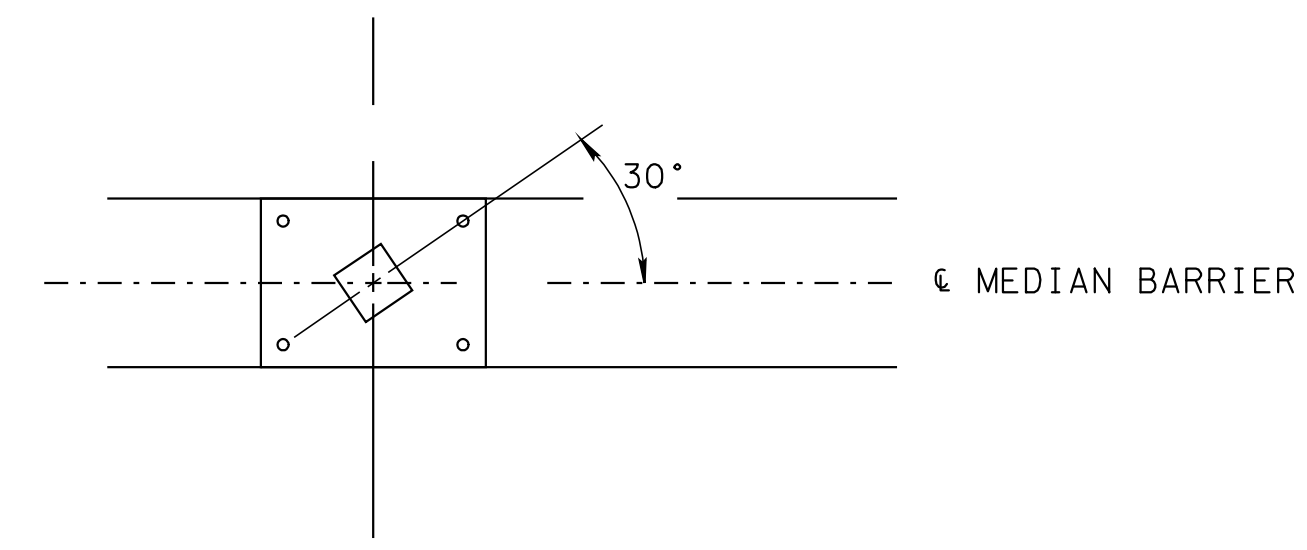


ELEVATION

DETAILS FOR MOUNTING SMALL AND REGULAR SIGNS ON CONCRETE MEDIAN BARRIERS ① ②  
(TO BE PAID FOR UNDER ITEM NO. 713-30.09)



LOCATION DETAIL FOR MOUNTING EXIT GORE SIGNS ON CONCRETE MEDIAN BARRIERS ③



SIGN ORIENTATION DETAIL FOR H.O.V. SIGNS MOUNTED ON CONCRETE MEDIAN BARRIERS ④

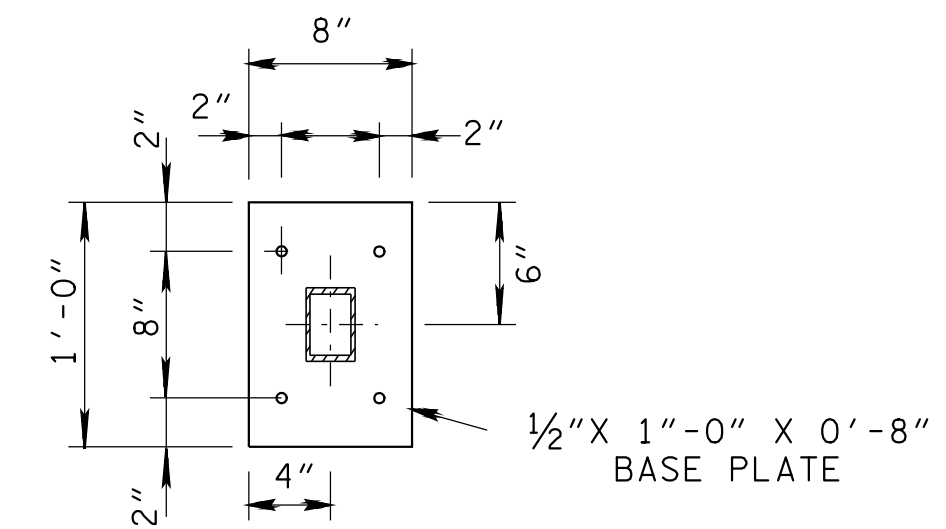
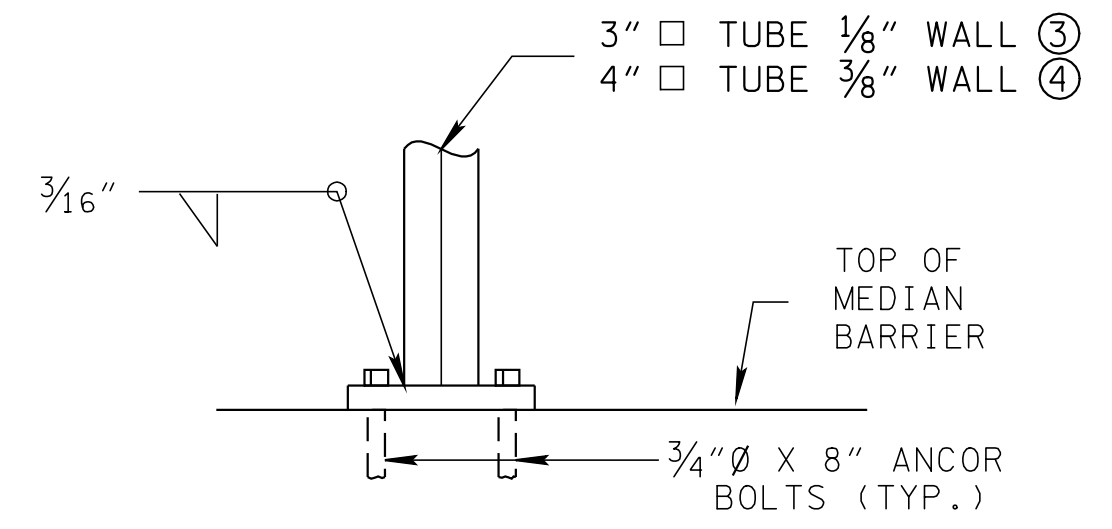
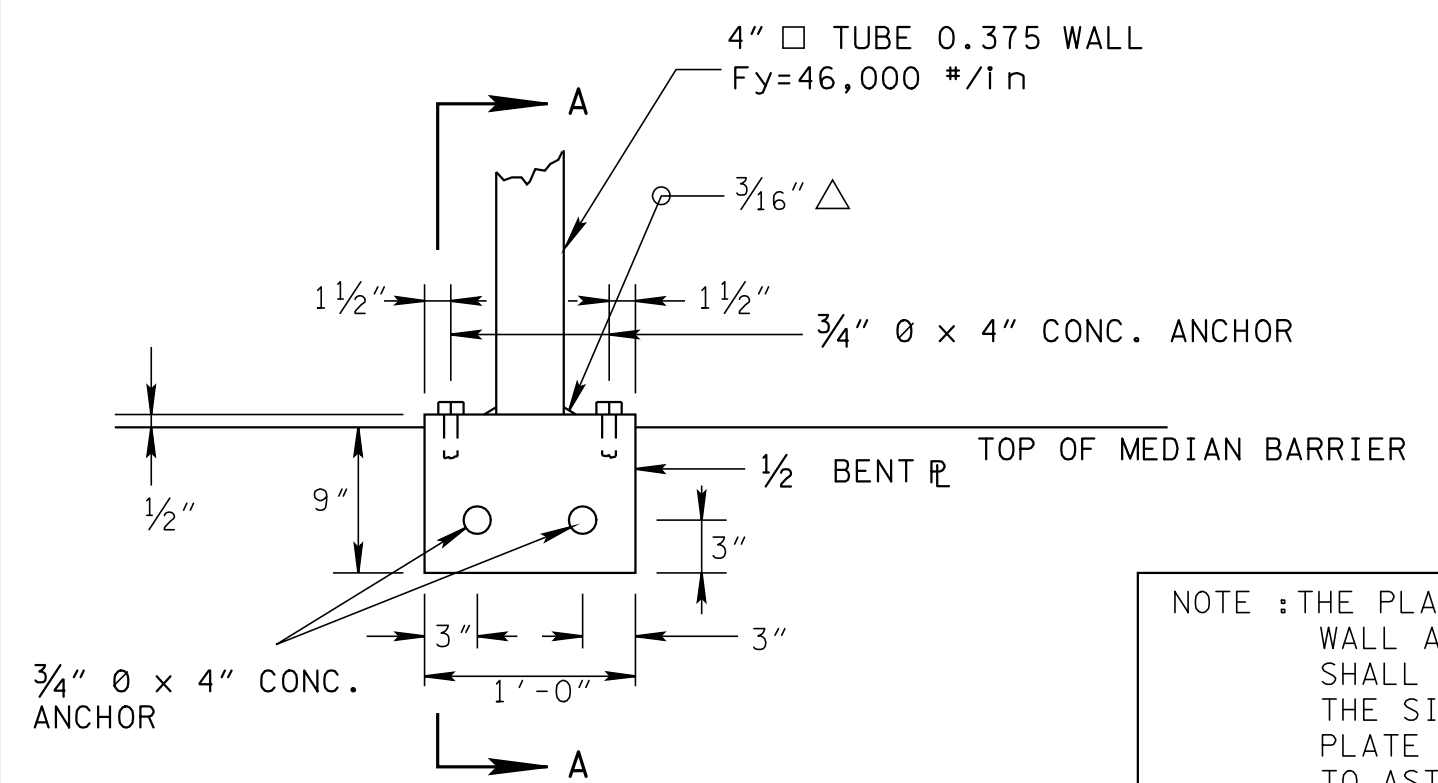


PLATE DETAIL

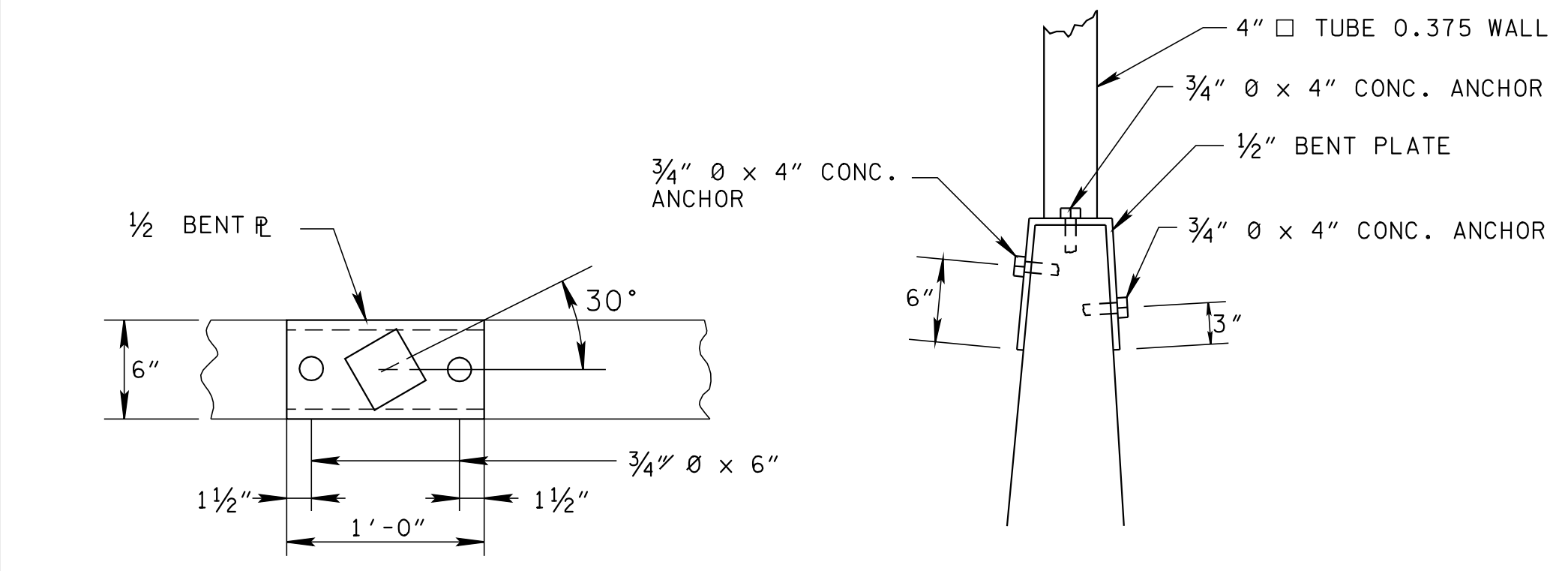


ELEVATION

DETAILS FOR MOUNTING LARGE SIGNS ON CONCRETE MEDIAN BARRIERS ③ ④  
(TO BE PAID FOR UNDER ITEM NO. 713-30.10)



NOTE: THE PLATE SHALL BE MOUNTED OVER THE WALL AS SHOWN. ANY DAMAGE TO THE WALL SHALL BE REPAIRED AT THE EXPENSE OF THE SIGNING CONTRACTOR. POST AND PLATE SHALL BE GALVANIZED ACCORDING TO ASTM-A123.



SECTION A-A

ATTACHMENT DETAIL FOR 6" WIDE WALL ⑤

(NOT INTENDED TO BE USED FOR NEW CONSTRUCTION)  
(TO BE PAID FOR UNDER ITEM NO. 713-30.05)

- GENERAL NOTES**
- (A) WELDING SHALL BE IN ACCORDANCE WITH AASHTO SPECIFICATIONS.
  - (B) ALL STEEL SHALL BE GALVANIZED AFTER FABRICATION AND CONFORMING TO THE REQUIREMENTS OF ASTM A123. DAMAGE TO THE COATING SHALL BE REPAIRED SUBSEQUENT TO ERECTION.
  - (C) MATERIAL FOR PLATES SHALL BE ASTM A36 STEEL.
  - (D) MATERIAL FOR TUBES TO BE ASTM A500 GRADE B STEEL.
  - (E) ALL BOLTS AND WASHERS SHALL BE MADE OF MATERIAL CONFORMING TO ASTM A307.
  - (E) MINIMUM CLEARANCE BETWEEN BOTTOM OF THE SIGN AND TOP OF BARRIER SHALL BE 48".
  - (G) PLATE TO BE CENTERED ON BARRIER CENTER LINE.

- DESIGN NOTES**
- ① FOR (18"X48") EMERGENCY MILE MARKER OR (12"X24", 12"X36" OR 12"X48") STANDARD MILE MARKERS.
  - ② FOR (36"X48") SPEED LIMIT, (48"X72" OR 48"X60") TRUCK RESTRICTION SIGNS (IF DIRECTED BY REGIONAL TRAFFIC ENGINEER) OR (36"X36") DIAMOND WARNING SIGNS.
  - ③ FOR EXIT GORE SIGNS (72" X 48" OR 90" X 48").
  - ④ FOR H.O.V. SIGNS (84" X 60").
  - ⑤ FOR ATTACHMENT TO EXISTING 6" WIDE CONCRETE BARRIER WALLS ONLY.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

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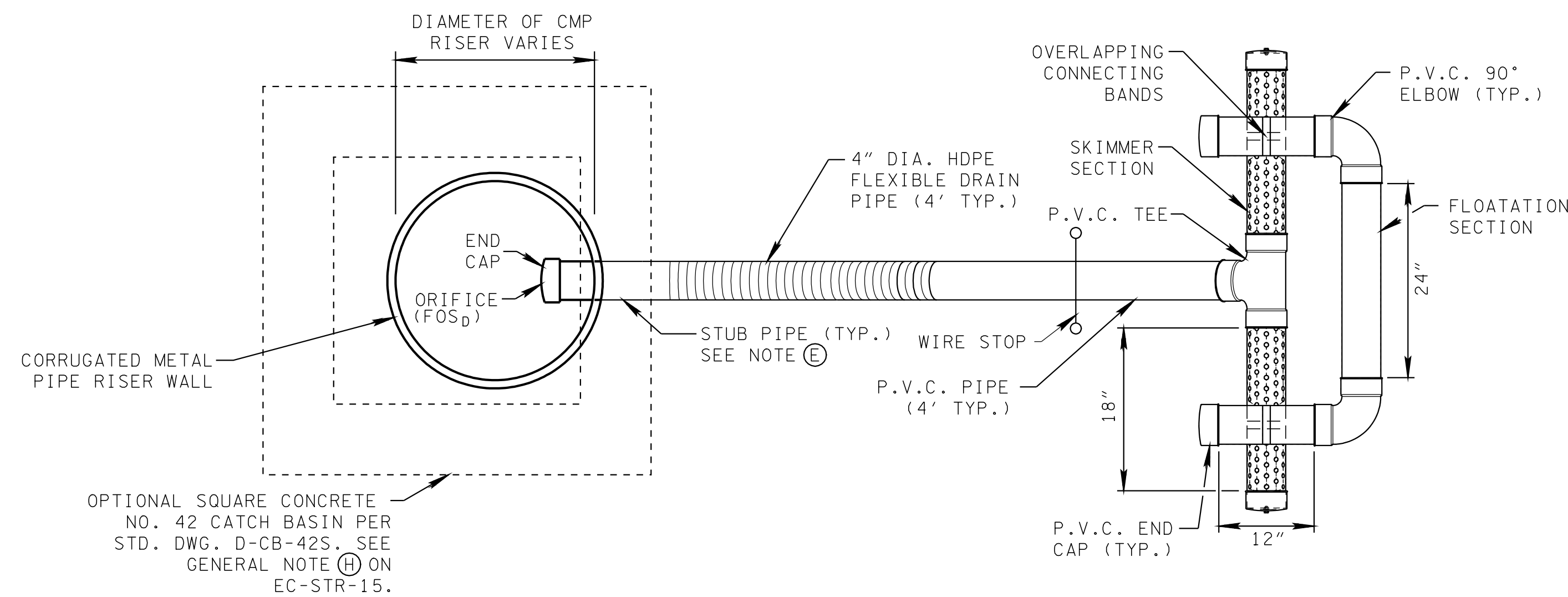
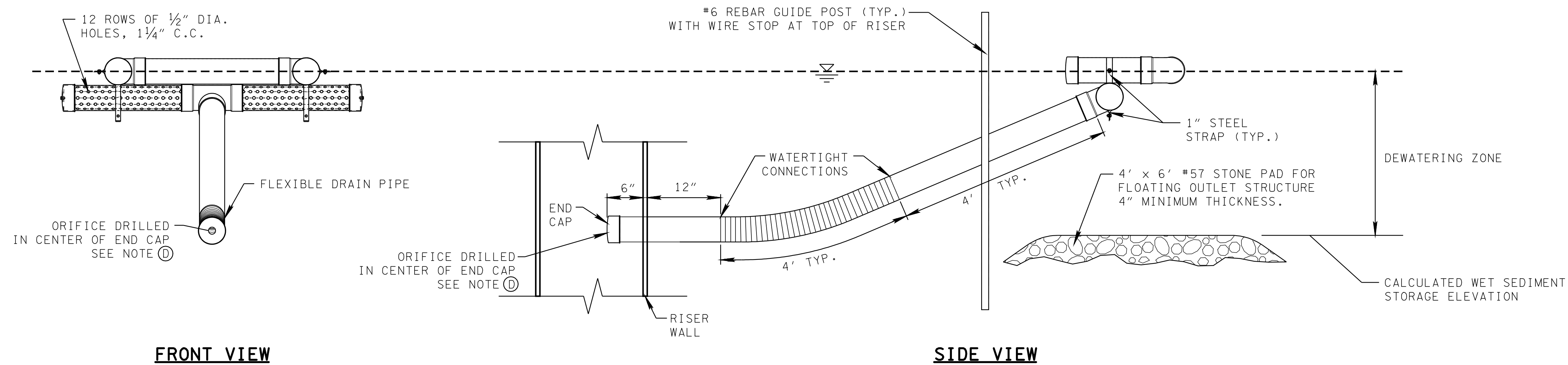
DETAILS FOR SIGNS MOUNTS ON CONCRETE MEDIAN BARRIERS

2-29-12 T-S-21

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**PLAN VIEW**

**FLOATING OUTLET STRUCTURE**

ORIFICE SIZE, FOS <sub>D</sub> (IN.)	DISCHARGE, Q (FT <sup>3</sup> /SEC)	EQUATIONS FOR MINIMUM AND MAXIMUM ORIFICE SIZE
1"	0.019	$Q_{MAX} = \frac{\text{DEWATERING ZONE VOLUME (FT}^3\text{)}}{259200}$
1.5"	0.041	
2"	0.074	$Q_{MIN} = \frac{\text{DEWATERING ZONE VOLUME (FT}^3\text{)}}{604800}$
2.5"	0.116	
3"	0.167	
3.5"	0.227	
4"	0.297	

**PROCEDURE FOR ORIFICE SELECTION**

- KNOWING THE SIZE AND SHAPE OF THE DEWATERING ZONE, CALCULATE THE VOLUME OF WATER (CUBIC FEET) FROM THE BOTTOM OF THE DEWATERING ZONE TO THE TOP OF THE DEWATERING ZONE.
- SOLVE FOR Q<sub>MAX</sub> AND Q<sub>MIN</sub> BASED ON THE VOLUME OF THE DEWATERING ZONE.
- SELECT AN ORIFICE SIZE (FOS<sub>D</sub>) THAT HAS A CORRESPONDING DISCHARGE BETWEEN Q<sub>MAX</sub> AND Q<sub>MIN</sub>.

**FLOATING OUTLET STRUCTURE GENERAL NOTES**

- ALL P.V.C. PIPES ARE TO BE 4" I.D. SCHEDULE 40.
- ALL JOINTS OF THE FLOATATION SECTION SHALL BE SOLVENT WELDED TO ENSURE AN AIRTIGHT ASSEMBLY. CONTRACTOR TO CONDUCT A TEST TO CHECK FOR LEAKS PRIOR TO INSTALLATION. JOINTS OF THE SKIMMER SECTION NEED NOT BE WATER-TIGHT.
- 4" HDPE FLEXIBLE DRAIN PIPE IS TO BE ATTACHED TO THE BASIN OUTLET STRUCTURE WITH WATER-TIGHT CONNECTIONS.
- ORIFICE IS TO BE SIZED ACCORDINGLY TO STORAGE VOLUME AND TO SLOWLY RELEASE RUNOFF. THE BASIN DEWATERING TIME SHOULD BE NO LESS THAN 3 DAYS.
- FOR CORRUGATED METAL RISER, STUB PIPE SHALL BE SCHEDULE 40 STEEL PIPE TACK WELDED TO CREATE A WATERTIGHT SEAL. FOR CONCRETE RISER, STUB PIPE SHALL BE SCHEDULE 40 P.V.C. PIPE GROUTED TO CREATE A WATERTIGHT SEAL.
- MATERIALS:**  
 SOLID PIPE - 4" SCHEDULE 40 P.V.C.  
 PERFORATED PIPE - 4" SCHEDULE 40 P.V.C.  
 90° TEE (1 EA.) - 4" SCHEDULE 40 P.V.C.  
 90° ELBOW (2 EA.) - 4" SCHEDULE 40 P.V.C.  
 CAP (4 EA.) - 4" SCHEDULE 40 P.V.C., SOLID  
 FLEXIBLE PIPE - 4" CORRUGATED HDPE (NON-PERFORATED)  
 MINERAL AGGREGATE - SIZE #57
- FLOATING OUTLET STRUCTURE SHALL BE PAID FOR UNDER THE FOLLOWING ITEM NUMBERS:  
 209-20.21 SEDIMENT BASIN OUTLET STRUCTURE (DESCRIPTION) L.S.  
  
 PAYMENT SHALL INCLUDE ALL MATERIALS AND LABOR NECESSARY FOR THE CONSTRUCTION, MAINTENANCE, AND REMOVAL OF THE FLOATING OUTLET STRUCTURE, INCLUDING REPLACEMENT OF THE STONE PAD AS NECESSARY.
- SEE THE OPL FOR APPROVED ALTERNATE FLOATING OUTLET STRUCTURES. THE ORIFICE SIZING PROCEDURE ON THIS SHEET IS NOT VALID FOR ALTERNATE FLOATING OUTLET STRUCTURES. ALTERNATE FLOATING OUTLET STRUCTURES SHALL BE DESIGNED TO ACHIEVE A SIMILAR DEWATERING TIME.
- SEE STANDARD DRAWINGS EC-STR-15, EC-STR-16 AND EC-STR-17 FOR ADDITIONAL DETAILS AND GENERAL NOTES NOT SHOWN ON THIS DRAWING.

NOT TO SCALE

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SEDIMENT BASIN  
FLOATING OUTLET  
STRUCTURE