



**STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION**

ROADWAY DESIGN DIVISION
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INSTRUCTIONAL BULLETIN NO. 15-13

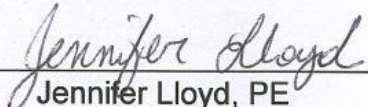
Regarding Revised Standard Drawings

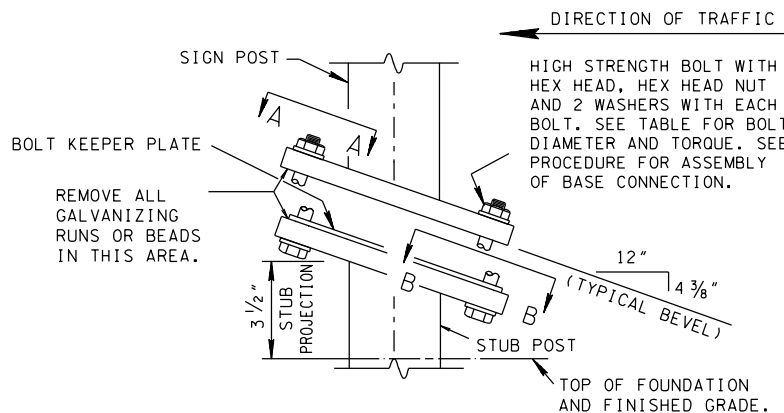
Effective Apr. 1, 2016 letting (Jan. 20, 2016 Turn-in), the following Standard Drawings have been revised. Section V of the Design Guidelines is revised to incorporate these changes.

DRAWING NUMBER	CURRENT REVISION DATE	DESCRIPTION
T-S-12	07-02-15	STANDARD STEEL GROUND MOUNTED SIGNS, BREAK-AWAY TYPE POST FOOTING DETAILS, SQUARE TUBES
T-S-16	07-02-15	GROUND MOUNTED ROADSIDE SIGN PLACEMENT DETAILS
T-S-16A	07-02-15	GROUND MOUNTED ROADSIDE SIGN PLACEMENT DETAILS
T-S-17	07-02-15	STANDARD GROUND MOUNTED SIGN USING PERFORATED/KNOCKOUT SQUARE TUBE
T-S-19	07-19-15	STANDARD STEEL SIGN SUPPORTS
T-S-21	07-02-15	DETAILS FOR SIGNS MOUNTED ON CONCRETE MEDIAN BARRIERS
T-S-23A	07-02-15	MULTI-DIRECTIONAL SLIP BASE BREAKAWAY P-POST SIGN SUPPORT
T-S-23C	07-02-15	BREAKAWAY POST SIGN SUPPORTS
S-CC-1	08-26-15	CRASH CUSHION

A copy of the revised standard drawings is attached.

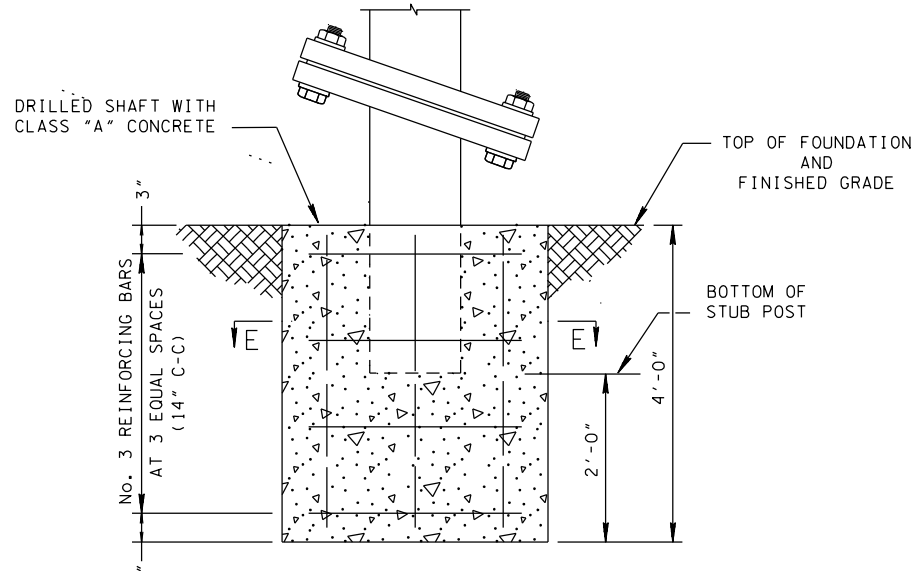
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10/7/2015


Jennifer Lloyd, PE
Civil Engineering Director
Roadway Design Division

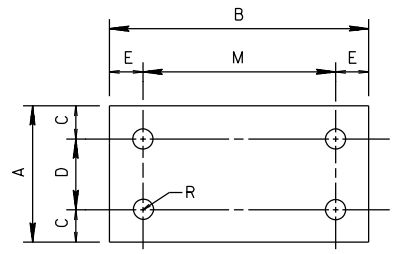
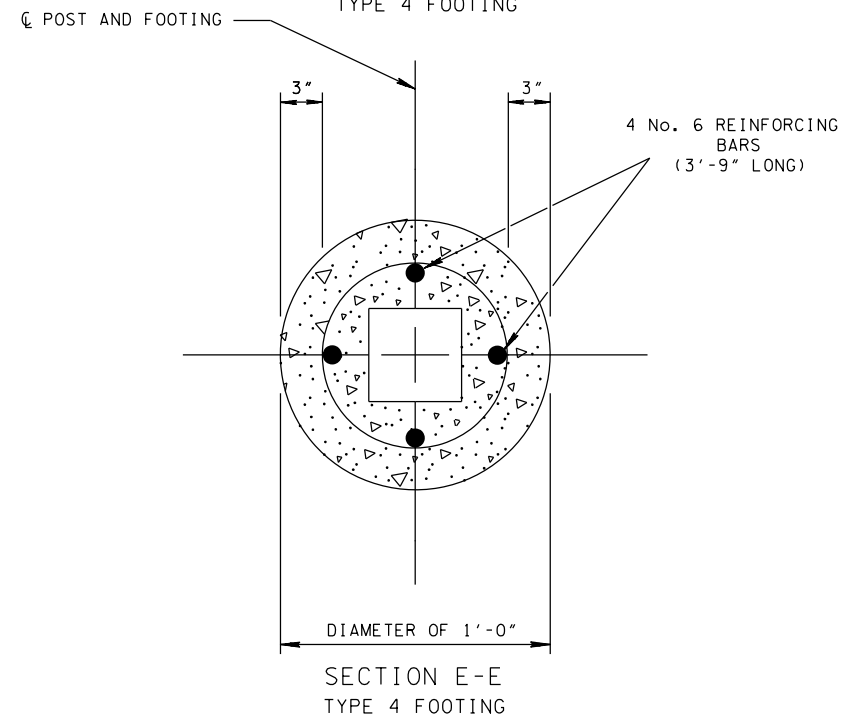


SIGN POST AND STUB POST BASE CONNECTION DETAIL
ELEVATION VIEW
(FOR SQUARE TUBE SUPPORT POSTS)

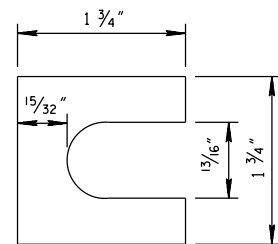
- PROCEDURE FOR ASSEMBLY OF BASE CONNECTION
- ASSEMBLE POST TO STUB WITH BOLTS AND ONE BOLT KEEPER PLATE BETWEEN THEM.
 - SHIM AS REQUIRED TO PLUMB POST.
 - TIGHTEN ALL BOLTS THE MAXIMUM POSSIBLE WITH 12" TO 15" WRENCH TO BED WASHERS AND SHIMS AND TO CLEAN BOLT THREADS, THEN LOOSEN.
 - RETIGHTEN BOLTS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



FOUNDATION AND FOOTING ELEVATION
DETAIL FOR SQUARE TUBES
TYPE 4 FOOTING

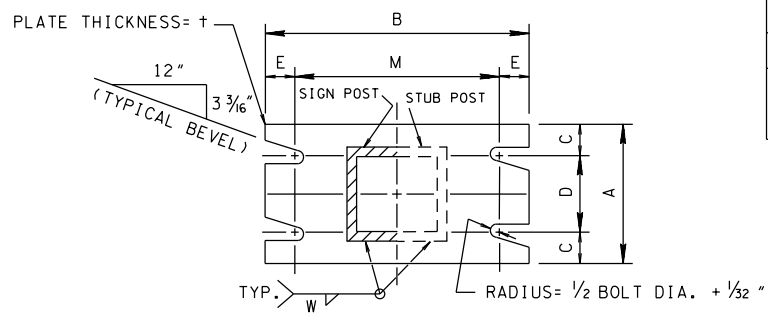


BOLT KEEPER PLATE
(28 GAUGE GALVANIZED STEEL)



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.



SECTION A-A SECTION B-B
SEE TABLE FOR DIMENSIONS

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

GENERAL NOTES

- THE DESIGN CONFORMS WITH THE AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS (CURRENT EDITION).
- THE MATERIALS AND FABRICATION SHALL CONFORM TO THE STANDARD SPECIFICATIONS OF THE TENNESSEE DEPARTMENT OF TRANSPORTATION.
- ALL STEEL SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH STANDARD SPECIFICATION ASTM-A123 FOR SIGN SUPPORTS.
- ALL HIGH STRENGTH BOLTS AND WASHERS SHALL CONFORM TO STANDARD SPECIFICATION ASTM-A325 OR SAE GRADE 5.
- ALL HIGH STRENGTH NUTS SHALL BE OF SUCH CAPACITY AS TO DEVELOP THE BOLT STRENGTH.
- TIGHTEN THE HIGH STRENGTH BOLTS IN THE BASE CONNECTION ONLY TO THE TORQUE SHOWN. CAUTION - DO NOT OVERTIGHTEN.
- ALL BOLT, NUTS AND WASHERS OTHER THAN LABELED HIGH STRENGTH SHALL CONFORM TO STANDARD SPECIFICATION ASTM-A307, CLASS A.
- THE WELDING SHALL BE DONE IN ACCORDANCE WITH THE AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS (CURRENT EDITION).
- ALL BOLTS AND NUTS SHALL BE COATED WITH A SUITABLE LUBRICANT.
- THE MATERIAL USED FOR STRUCTURAL SHAPES AND PLATES SHALL BE ASTM-A36 GRADE STEEL.
- 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.
- 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".
- CLASS "A" CONCRETE AND REINFORCING STEEL USED IN CONJUNCTION WITH INSTALLATION OF THE SIGN SUPPORT POSTS TO BE PAID FOR UNDER ITEM NOS. 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.
- CLASS "A" CONCRETE FOOTING SHALL BE PLACED ONLY ON UNDISTURBED MATERIAL OR IN FILL MATERIAL PLACED BY CONTROLLED COMPACTION AT DEPTHS UNAFFECTED BY FROST.
- 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.
- TO BE PAID FOR UNDER ITEM NO. 713-30.10 SQUARE TUBE SIGN SUPPORT LB.

TUBE SIZE	BOLT SIZE AND TORQUE	BASE CONNECTION DIMENSIONS								FOUNDATION
		A	B	C	D	E	M	t	W	DIAMETER OF TYPE 4 FOOTING
2" ϕ @ 3.12 #/FT	$\frac{1}{2}$ " ϕ x 2" TORQUE= 95 in. lbs.	4 1/2"	6 1/4"	1"	2 1/2"	3/4"	4 3/4"	1/2"	1/4"	1'-0"
2 1/2" ϕ @ 3.98 #/FT	$\frac{1}{2}$ " ϕ x 2 1/2" TORQUE= 95 in. lbs.	4 1/2"	7 1/4"	1"	2 1/2"	3/4"	5 3/4"	1/2"	5/16"	
3" ϕ @ 4.83 #/FT	$\frac{1}{2}$ " ϕ x 2 1/2" TORQUE= 95 in. lbs.	4 1/2"	8"	1"	2 1/2"	3/4"	6 1/2"	3/4"	5/16"	

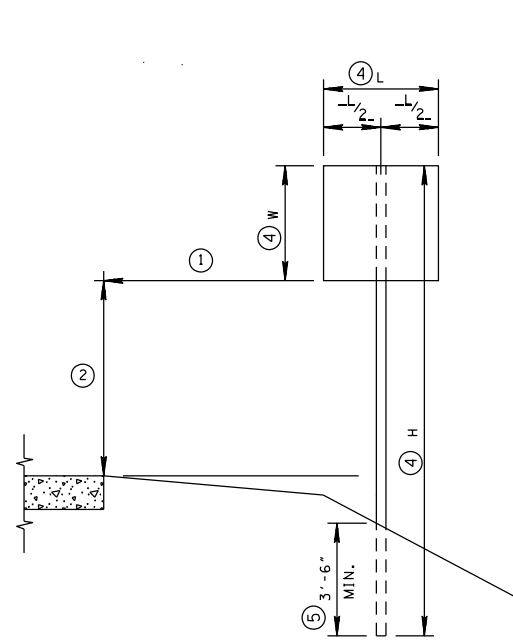
MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

STATE OF TENNESSEE
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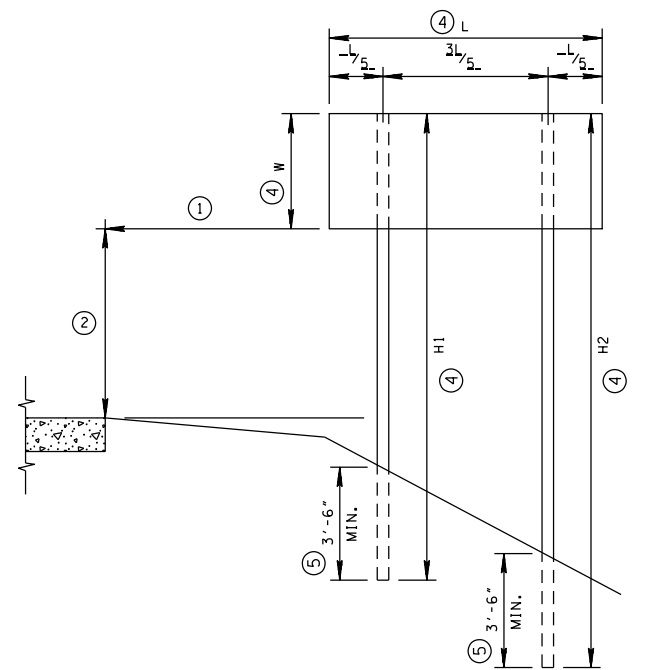
STANDARD STEEL
GROUND MOUNTED
SIGNS, BREAK-AWAY
TYPE POST FOOTING
DETAILS, SQUARE TUBES

T-S-12

- 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 BOLT 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: CHANGE SLIP BASE TORQUE IN TABLE.
- REV. 12-7-90: DREW NEW SHEET INCLUDING INFORMATION PREVIOUSLY ON DRAWING NUMBER T-S-13 REGARDING STANDARD STEEL GROUND MOUNTED SIGNS WITH BREAK-AWAY TYPE FOOTINGS USING SQUARE TUBE SUPPORTS.
- REV. 10-26-96: CHANGED PAY ITEM NO. IN GENERAL NOTE (M).
- REV. 5-27-01: CHANGED NOTE UNDER SHIM DETAIL.
- REV. 5-27-03: CORRECTED GENERAL NOTE (E).
- REV. 7-2-15: REVISED TUBE SIZE. ADDED GENERAL NOTE (P).



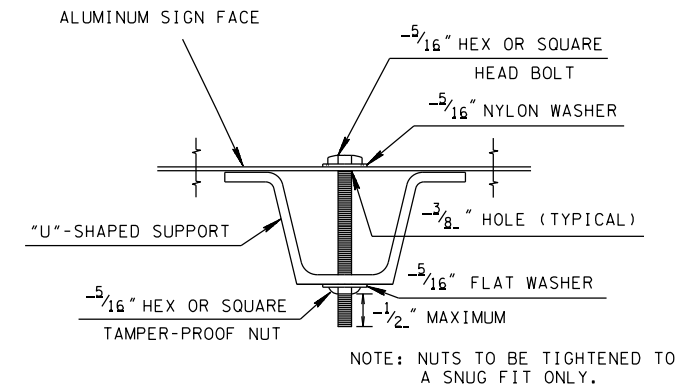
SHOULDER INSTALLATION FOR ONE "U" POST SUPPORT



SHOULDER INSTALLATION FOR TWO "U" POST SUPPORTS

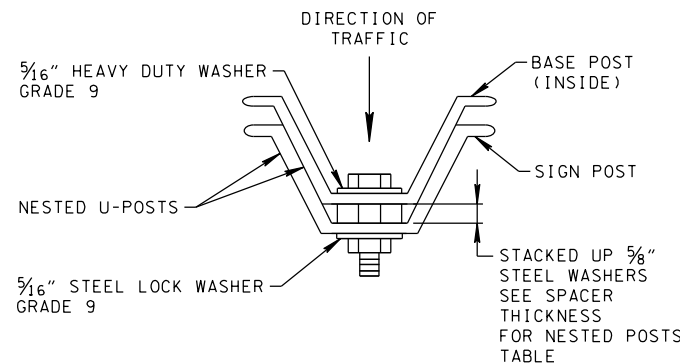
LEGEND	
W	HEIGHT OF SIGN FACE
L	LENGTH OF SIGN FACE
H	HEIGHT OF SIGN SUPPORT

FOOTNOTES	
①	FOR STANDARDIZATION OF LOCATION AND LATERAL CLEARANCE SEE SUBSECTIONS 2A-16 AND 2A-19 OF THE CURRENT EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
②	FOR HEIGHT SEE SUBSECTION 2A-18 OF THE CURRENT EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
③	FOR LATERAL CLEARANCE OF CROSSBUCK SIGN SEE SUBSECTION 2A-19 OF THE CURRENT EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
④	SEE SIGN SCHEDULE SHEET IN THE PLANS FOR DIMENSIONS L, H, H1, H2, H3 AND W.
⑤	IF ROCK IS ENCOUNTERED DURING THE INSTALLATION OF SUPPORT POSTS, THE HOLES FOR THE SUPPORTS SHALL BE DRILLED TO PROVIDE THE MINIMUM 3'-6" DEPTH IN GROUND.
⑥	SEE TDOT SPECIAL PROVISION 713A REGARDING SPECIFICATIONS FOR HIGH GRADE REFLECTIVE SHEETING.
⑦	TO BE PAID FOR UNDER ITEM NO. 713-16.20 THRU 39.



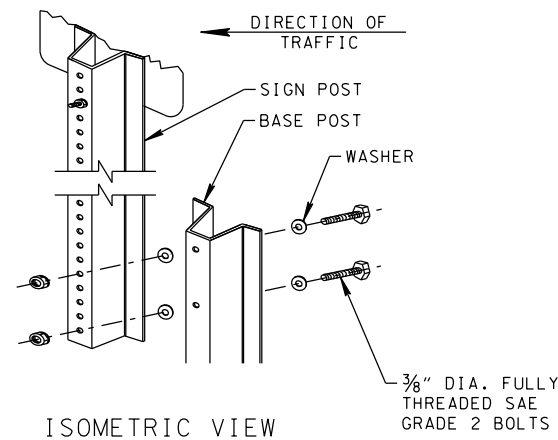
CONNECTION DETAIL FOR "U" POST

SINGLE-DIRECTIONAL BREAKAWAY LAP SPLICE[Ⓡ]

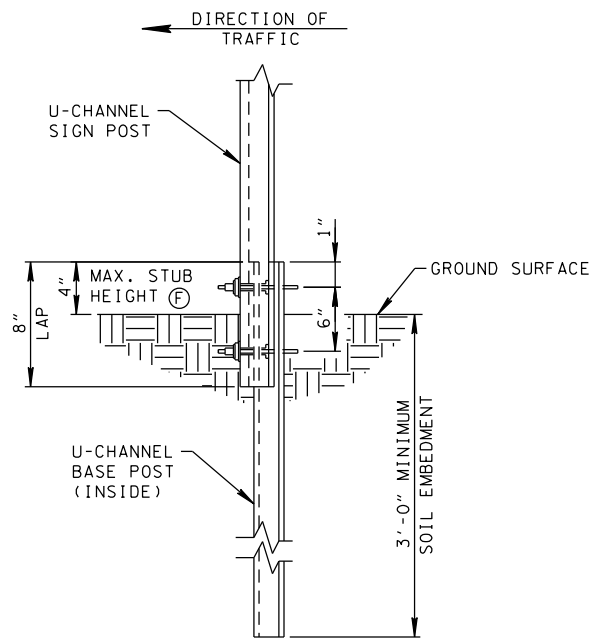


SECTION (THRU BREAKAWAY SPLICE)

SPACER THICKNESS FOR NESTED POSTS	
POST SIZE (LB/FT)	THICKNESS (INCHES)
2.00	3/8
2.50	5/16
2.75	1/4
3.00	3/8
4.00	1/2



ISOMETRIC VIEW



ELEVATION

- REV. 11-1-11: REVISED GENERAL NOTES (A) AND (D). ADDED GENERAL NOTE (E). CHANGED R-15-2 SIGNS TO R15-2P.
- REV. 6-5-14: COMBINED T-S-16 AND T-S-16A.
- REV. 7-2-15: ADDED SINGLE DIRECTIONAL BREAKAWAY LAP SPLICE. ADDED FOOTNOTES (E).
- REV. 7-1-72: CHANGED DEPARTMENT NAME.
- REV. 7-26-73: CORRECT VERTICAL AND LATERAL CLEARANCES AND RAILROAD CROSSBUCK SIGN TO AGREE WITH 1971 MUTCD. ELIMINATED USE OF WOOD POST SUPPORTS AND CHANGEABLE NUMERAL DETAIL.
- REV. 8-24-73: BREAKAWAY ADDED TO SQUARE TUBE POST DESCRIPTION. REFERENCE ARROWS ADDED FROM R15-2 TO THE APPROPRIATE SIGNS.
- REV. 2-21-74: PAY ITEM AND NOTE ADDED REGARDING RAILROAD CROSSBUCK SIGN AND SUPPORT.
- REV. 1-1-76: CHANGED DWG. NO. FROM RD-5-16 (68) TO T-S-16.
- REV. 3-15-76: DELETED REFERENCE TO OLD DWG. NO., SUBSTITUTED NEW DWG. NO.
- REV. 2-25-77: THE WORD "STEEL" ELIMINATED FROM U-POST.
- REV. 10-24-79: U-POST CONNECTION DETAIL REVISED.
- REV. 12-12-83: CONNECTION DETAIL U-POST CHANGED.
- REV. 5-28-84: CONNECTION DETAIL U-POST AND RAILROAD CROSSBUCK SIGN AND SUPPORT CHANGED.
- REV. 10-31-84: ADDED TAMPER PROOF NUT TO CONNECTION DETAIL U-POST.
- REV. 2-12-85: ADDED POP-RIVET ALTERNATE TO U-POST CONNECTION DETAIL.
- REV. 4-10-86: ADDED REFERENCE TO SECTION 2A-21 OF MUTCD.
- REV. 7-8-86: REDREW SHEET. DELETED POP-RIVET ALTERNATE. ADDED NOTES.
- REV. 10-15-90: REDREW AND REORGANIZED SHEET. CHANGED MINIMUM DEPTH OF "U" POST IN GROUND FROM 3'-0" TO 3'-6".
- REV. 1-16-91: ELIMINATED SHOULDER INSTALLATION USING THREE SUPPORTS.
- REV. 2-12-91: CORRECTED FOOTNOTE NUMBERS IN BOTH SHOULDER INSTALLATION DETAILS.
- REV. 7-29-92: CHANGED U7 POST TO P8 POST IN RAILROAD CROSSBUCK SIGN AND SUPPORT DETAIL.
- REV. 7-29-96: CHANGED MATERIAL ON CROSSBUCK AND TRACK NUMBER SIGN. ADDED WHITE RETROREFLECTIVE STRIP TO CROSSBUCK SUPPORT.
- REV. 1-19-99: ADDED FOOTNOTE (E).
- REV. 5-27-01: CHANGED DESCRIPTION IN ITEM NO. 713-16.05.
- REV. 7-29-04: IN RAILROAD CROSSBUCK SIGN AND SUPPORT DETAIL MOVED 18" DIMENSION LINE.
- REV. 10-23-06: ADDED GENERAL NOTE (E), (F) AND TRACK ID PLATE.
- REV. 11-1-11: ADDED RAILROAD ADVANCE WARNING SIGN DETAIL.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

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GROUND MOUNTED
ROADSIDE
SIGN PLACEMENT
DETAILS

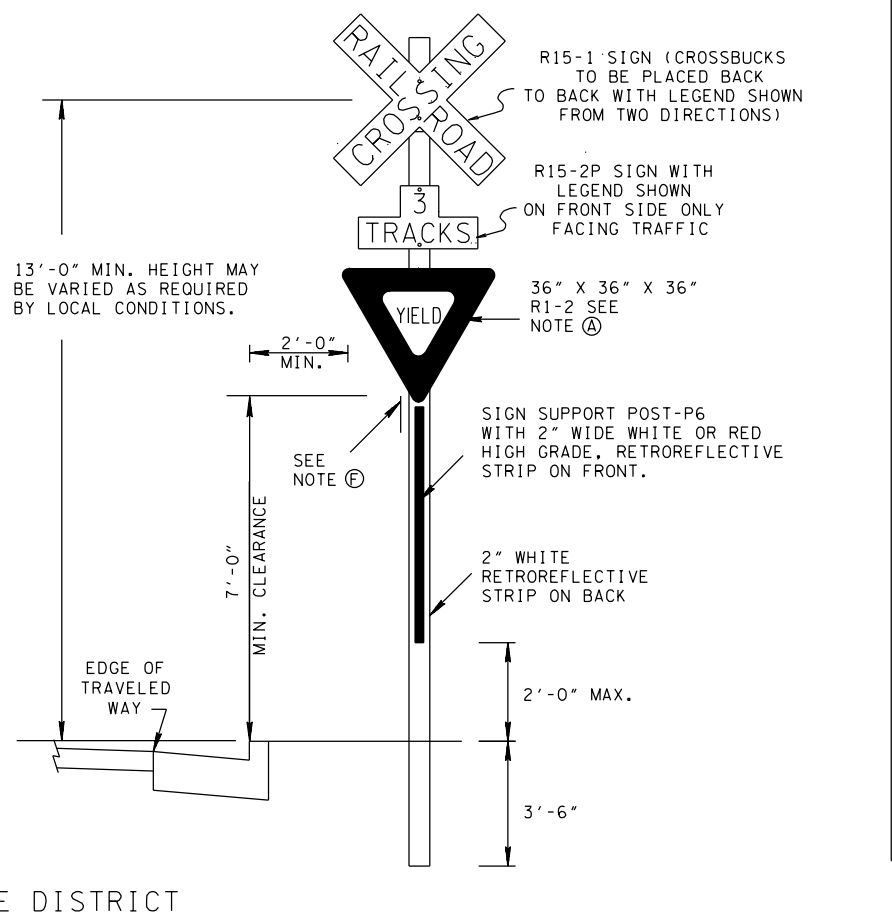
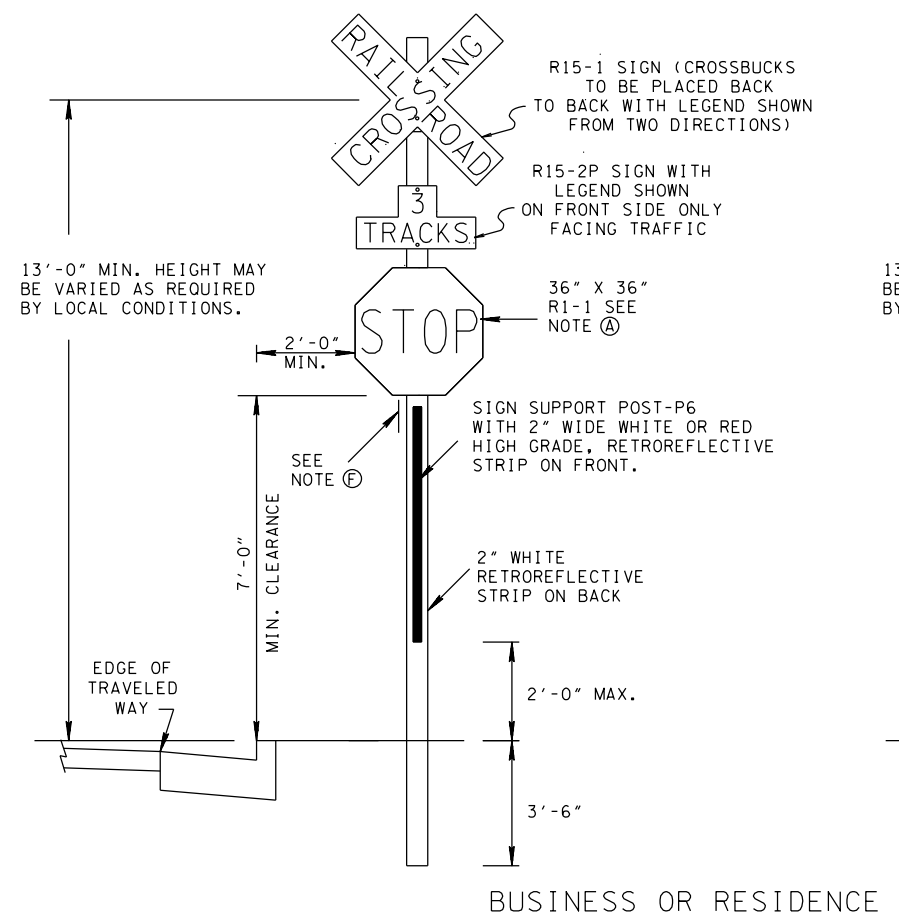
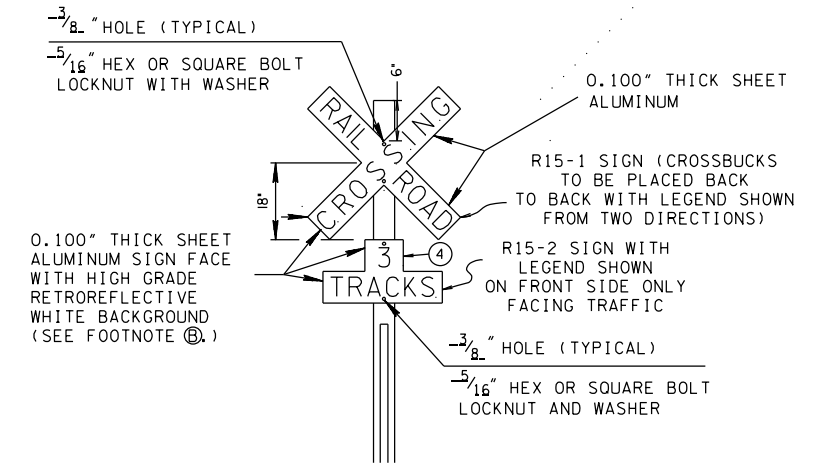
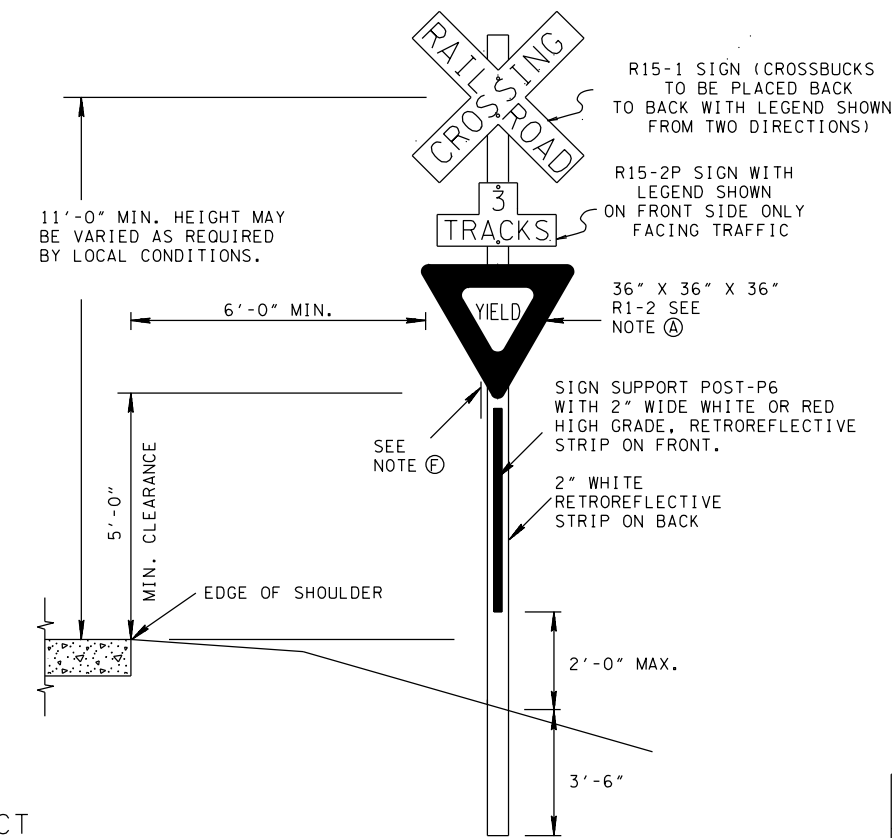
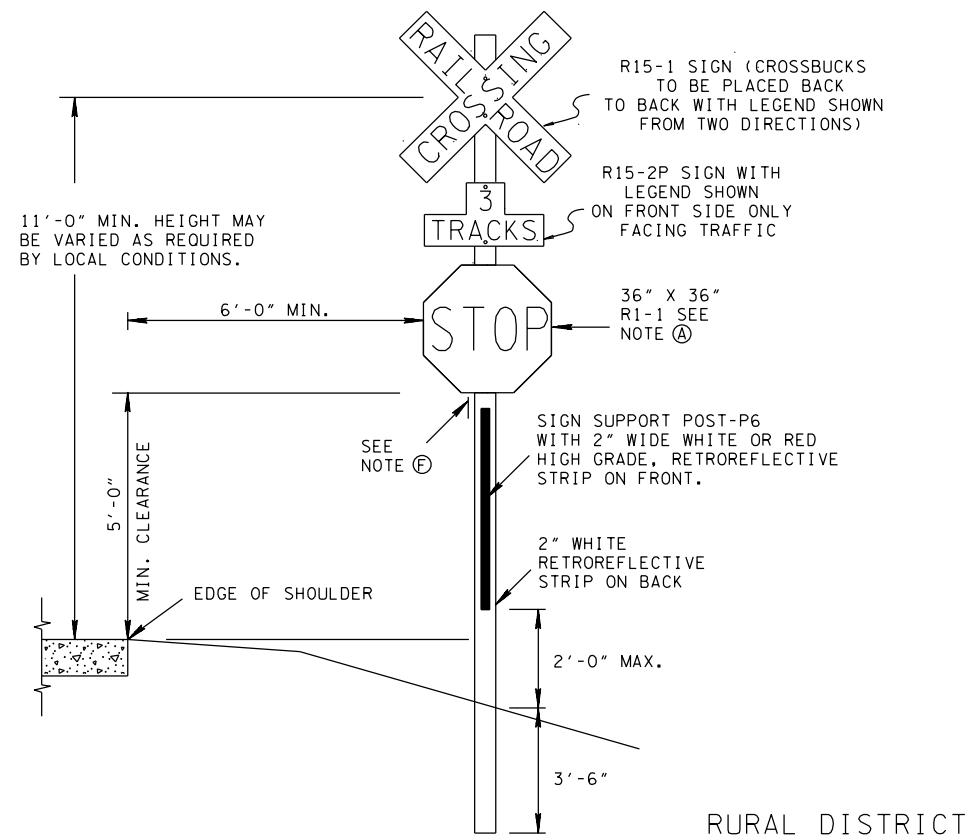
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STOP OR YIELD SIGN ON SAME POST WITH THE CROSSBUCK SIGN
AT PASSIVE HIGHWAY-RAIL GRADE CROSSINGS

REV. 11-1-11: REVISED GENERAL NOTES (A) AND (D). ADDED GENERAL NOTE (C). CHANGED R-15-2 SIGNS TO R15-2P.

REV. 7-2-15: ADDED DETAILS. ADDED GENERAL NOTES (H).



GENERAL NOTES

- (A) YIELD SIGNS SHALL BE THE DEFAULT SIGN AND SHALL BE USED UNLESS AN ENGINEERING STUDY DETERMINES THAT A STOP SIGN IS REQUIRED. IF A STOP SIGN IS REQUIRED, 36" X 36" STOP AHEAD (W3-1) SHALL BE PLACED IN ADVANCE OF THE RAILROAD SIGN (W10-1) ACCORDING TO SECTION 2C.05 AND TABLE 2C-4 IN THE MUTCD. FOR SINGLE LANE CONVENTIONAL ROADS USE 36"X36"X36" YIELD SIGN. FOR MULTI-LANE CONVENTIONAL ROADS USE 48"X48"X48" YIELD SIGN FOR ADDITIONAL INFORMATION FOR STOP AND YIELD SIGN SIZES, SEE TABLE 8B-1 OF THE MUTCD.
- (B) ONLY REFLECTIVE SHEETING ON THE QUALIFIED PRODUCT LIST (10A) SHALL BE USED.
- (C) RAILROAD CROSS-BUCK SIGN AND SUPPORT, YIELD/STOP SIGN, NUMBER OF TRACKS AUXILIARY SIGN, AND TRACK ID PLATE IS TO BE PAID FOR UNDER ITEM NO. 713-16.05, RAILROAD CROSS-BUCK SIGN AND SUPPORT PER EACH. THIS PAY ITEM SHALL INCLUDE THE FURNISHING AND INSTALLING OF THE SIGNS, SUPPORT AND HARDWARE.
- (D) LOCATION OF THE CROSSBUCK SIGN AND SUPPORT WITH RESPECT TO THE CENTERLINE OF THE NEAREST TRACK SHALL BE IN ACCORDANCE WITH THE TYPICAL LOCATION PLAN FOR FLASHING LIGHT SIGNAL LOCATIONS AS SHOWN ON FIGURE 8C-2 OF THE CURRENT EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD). SEE SECTION 8C.06 OF THE MUTCD FOR ADDITIONAL INFORMATION.
- (E) IF AN EXISTING CROSSBUCK SIGN AND SUPPORT IS TO BE REMOVED, THE CONTRACTOR SHALL REMOVE AND INSTALL THE EXISTING AAR NUMBER PLATE ON THE PROPOSED CROSSBUCK SIGN. ALL COST ARE TO BE INCLUDED IN THE PRICE BID FOR ITEM NO. 713-16.05.
- (F) TRACK ID PLATE TO BE MOUNTED ON LEFT SIDE FACING TRACK.
- (G) SEE FIGURE 8B-2 AND SECTION 8B.04 OF THE MUTCD FOR ADDITIONAL INFORMATION FOR PASSIVE GRADE CROSSINGS.
- (H) IF THERE ARE TWO OR MORE TRACKS, INCLUDING SIDINGS, THE NUMBER OF TRACKS SHALL BE INDICATED ON AN AUXILIARY SIGN OF INVERTED T-SHARE IS MOUNTED BELOW THE CROSSBUCK.
- (I) IF ROCK IS ENCOUNTERED DURING THE INSTALLATION OF SUPPORT POSTS, THE HOLES FOR THE SUPPORTS SHALL BE DRILLED TO PROVIDE THE MINIMUM 3'-6" DEPTH IN GROUND.
- (J) SEE T-S-16 FOR LAP SPLICE DETAILS.
- (K) TO BE PAID UNDER ITEM NO. 713-16.20 THRU 39.

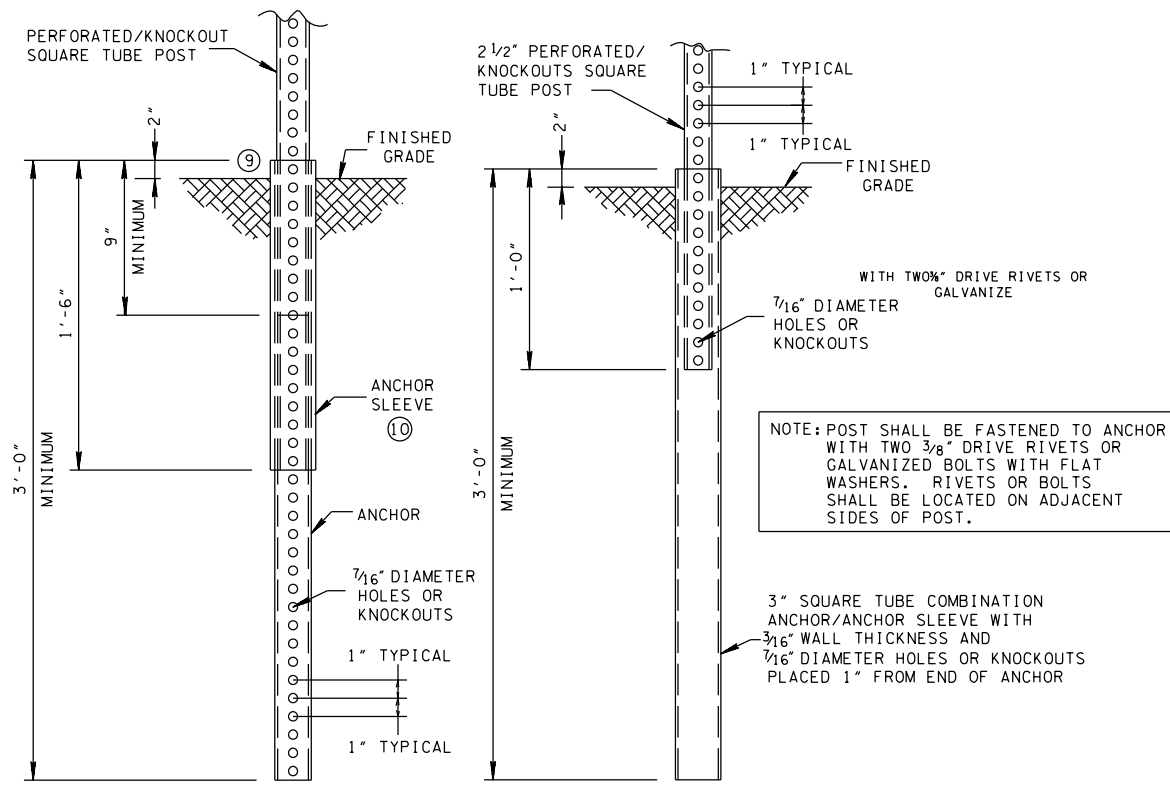
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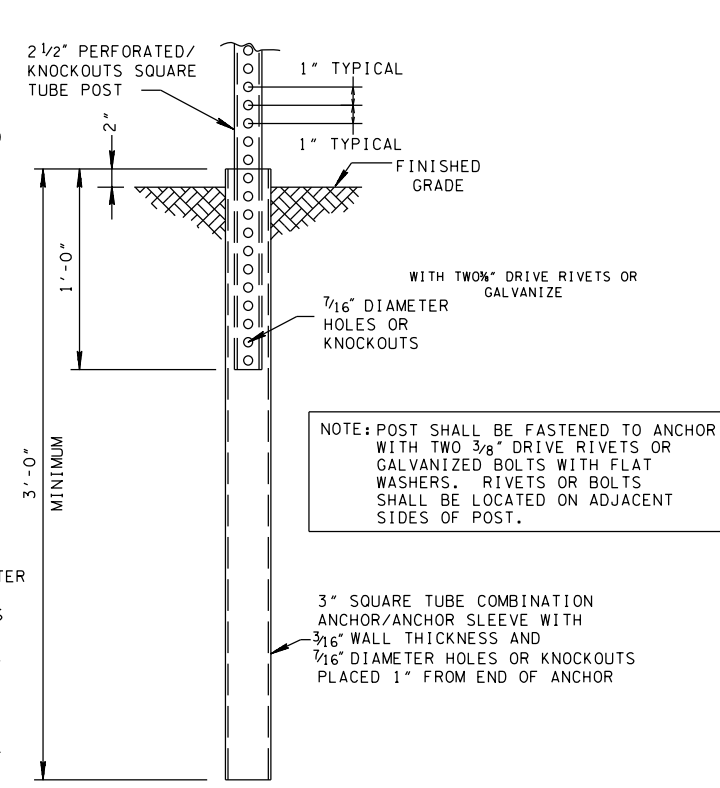
GROUND MOUNTED
ROADSIDE
SIGN PLACEMENT
DETAILS

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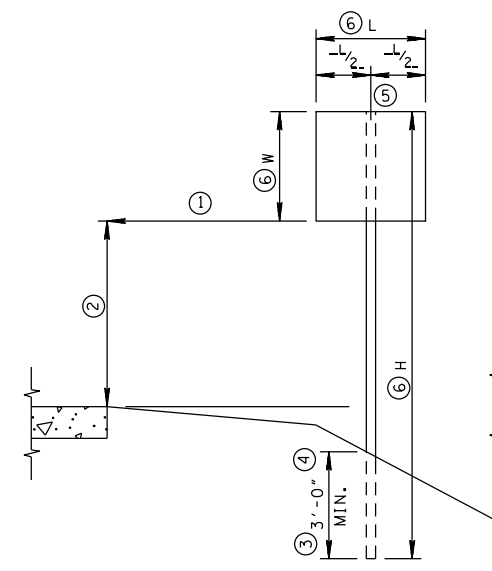
POST SLEEVE INSTALLATION DETAIL FOR 1 1/2, 1 3/4 AND 2" SUPPORT POSTS (SEE TABLE FOR SIZE OF ANCHOR/ANCHOR SLEEVE)



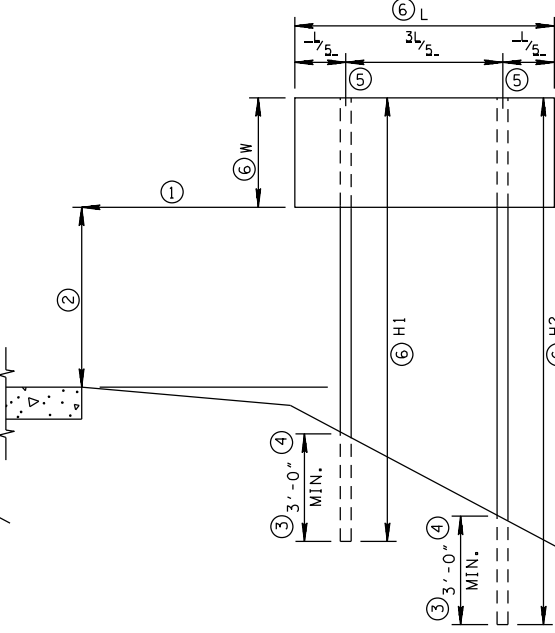
POST SLEEVE INSTALLATION DETAIL FOR 2 1/2" SUPPORT POST (SEE TABLE FOR SIZE OF COMBINATION ANCHOR/ANCHOR SLEEVE)

NOTE: POST SHALL BE FASTENED TO ANCHOR WITH TWO 3/8" DRIVE RIVETS OR GALVANIZED BOLTS WITH FLAT WASHERS. RIVETS OR BOLTS SHALL BE LOCATED ON ADJACENT SIDES OF POST.

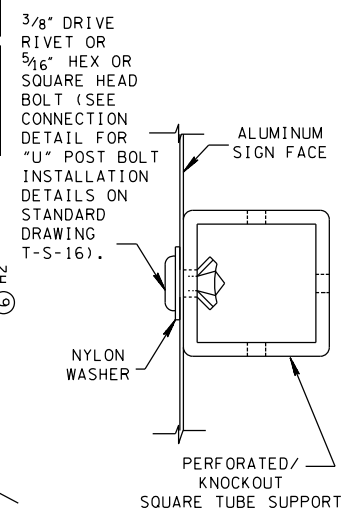
3" SQUARE TUBE COMBINATION ANCHOR/ANCHOR SLEEVE WITH 3/16" WALL THICKNESS AND 7/16" DIAMETER HOLES OR KNOCKOUTS PLACED 1" FROM END OF ANCHOR



SHOULDER INSTALLATION FOR ONE PERFORATED/KNOCKOUT SQUARE TUBE SUPPORT



SHOULDER INSTALLATION FOR TWO PERFORATED/KNOCKOUT SQUARE TUBE SUPPORTS

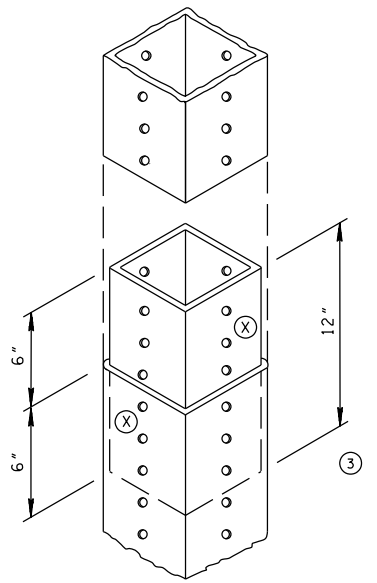


CONNECTION DETAIL FOR PERFORATED/KNOCKOUT SQUARE TUBE POST

LEGEND	
W	HEIGHT OF SIGN FACE
L	LENGTH OF SIGN FACE
H	HEIGHT OF SIGN SUPPORT

POST (SIZE AND WEIGHT)	ANCHOR (SIZE AND WEIGHT)	ANCHOR SLEEVE (SIZE AND WEIGHT)
1 1/2" SQUARE (1.702 LB/FT) 12 GAGE	1 3/4" SQUARE (2.060 LB/FT) 12 GAGE	2" SQUARE (2.416 LB/FT) 12 GAGE
1 3/4" SQUARE (2.060 LB/FT) 12 GAGE	2" SQUARE (2.416 LB/FT) 12 GAGE	2 1/4" SQUARE (2.773 LB/FT) 12 GAGE
1 3/4" SQUARE (1.882 LB/FT) 14 GAGE	2" SQUARE (2.416 LB/FT) 12 GAGE	
2" SQUARE (2.416 LB/FT) 12 GAGE	2 1/4" SQUARE (2.773 LB/FT) 12 GAGE	2 1/2" SQUARE (3.141 LB/FT) 12 GAGE
2" SQUARE (2.1639 LB/FT) 14 GAGE	2 1/4" SQUARE (2.773 LB/FT) 12 GAGE	

NOTE: ALL POSTS SHOWN IN ABOVE TABLE SHALL BE FABRICATED FROM 12 GAGE (OR WHERE DESIGNATED USS 14 GAGE) MATERIAL (60,000 POUNDS PER SQUARE INCH MINIMUM YIELD STRENGTH). ANCHORS AND ANCHOR SLEEVES (IF REQUIRED) SHALL BE FABRICATED FROM 12 GAGE MATERIAL OR GREATER. THE WEIGHT PER FOOT SHOWN IN THE TABLE ABOVE SHALL BE THE MINIMUM ACCEPTABLE.



PERMISSIBLE FIELD SPLICE

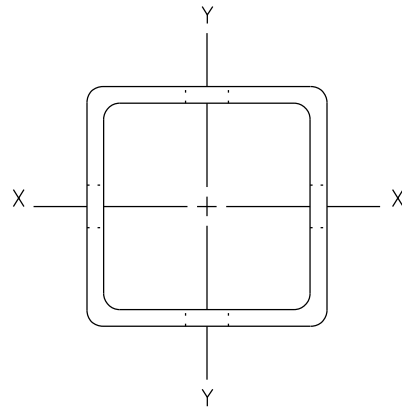
NOTE: A MAXIMUM OF ONE SPLICE IS ALLOWED PER POST. CONNECTION SHALL BE MADE WITH TWO 3/8" DRIVE RIVETS WITH FLAT WASHERS. DRIVE RIVETS TO BE LOCATED ON ADJACENT SIDES OF POST AS INDICATED BY (X) IN ORDER TO PROVIDE A TIGHT CONNECTION.

- FOOTNOTES
- FOR STANDARDIZATION OF LOCATION AND LATERAL CLEARANCE SEE SUBSECTIONS 2A-21 (PAGE 2A-8) AND 2A-24 (PAGE 2A-10 AND 2A-11) OF THE CURRENT EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
 - FOR HEIGHT SEE SUBSECTION 2A-23 (PAGE 2A-9 AND 2A-10) OF THE CURRENT EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
 - WHEN TYPE 4 FOOTING IS REQUIRED AS SHOWN ON SIGN SCHEDULE THE MINIMUM DEPTH OF SUPPORT POST WILL BE 2'-0". SEE T-S-12 FOR DETAILS.
 - IF ROCK IS ENCOUNTERED DURING THE INSTALLATION OF SUPPORT POSTS, THE HOLES FOR THE SUPPORTS SHALL BE DRILLED TO PROVIDE THE MINIMUM 3'-0" DEPTH IN GROUND.
 - THE SUPPORT POST SHALL BE EITHER FLUSH OR HALF-INCH DOWN FROM THE TOP OF THE SIGN FACE.
 - SEE SIGN SCHEDULE SHEET IN THE PLANS FOR DIMENSIONS L, H, H1, H2, AND W.
 - A 3" SQUARE TUBE COMBINATION ANCHOR/ANCHOR SLEEVE SHALL BE REQUIRED WHEN A 2 1/2" SUPPORT POST IS USED.
 - THE SUPPORT POST MUST BE PLACED 12" IN LIEU OF 6" INSIDE THE COMBINATION ANCHOR/ANCHOR SLEEVE WHEN 2 1/2" SUPPORT POST IS USED.
 - THE POST IS TO BE FASTENED TO THE ANCHOR/ANCHOR SLEEVE WITH ONE 1 1/2" CORNER BOLT LOCATED IN THE CORNER AWAY FROM THE DIRECTION OF TRAFFIC.
 - THE ANCHOR SLEEVE IS NOT REQUIRED WHEN USING A 14 GAGE POST. THE ANCHOR WILL SERVE AS A COMBINATION ANCHOR/ANCHOR SLEEVE.

- GENERAL NOTES
- PERFORATED/KNOCKOUT POSTS SHALL BE SQUARE TUBE FORMED FROM USS GAGE (12 GAGE) ASTM A-446 COLD ROLLED CARBON STEEL OR A-1011 HOT ROLLED CARBON SHEET STEEL. THE MINIMUM YIELD (Fy) IS TO BE 60,000 POUNDS PER SQUARE INCH. OR USS 14 GAGE HAVING A MINIMUM YIELD STRENGTH OF 60,000 POUNDS PER INCH. THE SQUARE TUBES SHALL BE WELDED DIRECTLY IN THE CORNERS BY HIGH FREQUENCY RESISTANCE WELDING OR EQUAL. THE SUPPORT POSTS ARE TO BE EXTERNALLY SCARFED TO AGREE WITH STANDARD CORNER RADIUS OF 3/32" ± 1/64".
 - PERFORATED/KNOCKOUT POSTS SHALL BE GALVANIZED TO CONFORM TO ASTM-525, DESIGNATION C-90 OR ITS CORROSION-RESISTANCE EQUIVALENT, WHEN TESTED IN ACCORDANCE WITH ASTM B-117 STANDARDS.
 - ALL HARDWARE SHALL CONFORM TO THE REQUIREMENTS OF ASTM A-307, CLASS A.
 - ALL HARDWARE SHALL BE GALVANIZED TO CONFORM TO THE REQUIREMENTS OF FEDERAL SPECIFICATION QQ-Z-325, TYPE I, CLASS 3 OR CADMIUM PLATED TO CONFORM TO THE REQUIREMENTS OF FEDERAL SPECIFICATION QQ-P-416, TYPE III, CLASS 3.
 - THE WEIGHT IN POUNDS OF THE POST, ANCHOR, ANCHOR SLEEVE AND COMBINATION ANCHOR/SLEEVE SHALL BE COMPUTED FOR PAYMENT UNDER ITEM NO. 713-11.02, PERFORATED/KNOCKOUT SQUARE TUBE POSTS. NO MEASUREMENT FOR PAYMENT WILL BE MADE FOR HARDWARE USED IN SIGN CONSTRUCTION. COST OF NECESSARY HARDWARE WILL BE INCLUDED IN THE PRICE BID FOR ITEM NO. 713-11.02.
 - THE SIGN FACE IS TO BE CONNECTED TO THE SUPPORT WITH 3/8" DRIVE RIVETS AND NYLON WASHER (SEE CONNECTION DETAIL FOR PERFORATED/KNOCKOUT SQUARE TUBE POST ON THIS SHEET). ALTERNATE CONNECTION WILL BE WITH 5/16" HEX OR SQUARE HEAD BOLT WITH NYLON WASHER, FLAT WASHER AND HEX OR SQUARE TAMPER-PROOF NUT (SEE CONNECTION DETAIL FOR "U" POST ON STANDARD DRAWING T-S-16).
 - 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."
 - 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.
 - CLASS "A" CONCRETE FOOTING SHALL BE PLACED ONLY ON UNDISTURBED MATERIAL OR IN FILL MATERIAL PLACED BY CONTROLLED COMPACTION AT DEPTHS UNAFFECTED BY FROST.
 - MATERIALS SURROUNDING FOOTING SHALL BE CAPABLE OF CARRYING A MINIMUM BEARING OF 2500 POUNDS PER SQUARE FOOT. WHERE SOLID ROCK IS ENCOUNTERED, FOOTING SHALL BE FOUR FEET AS SHOWN IN DETAILS OR EXTEND A MINIMUM OF TWO FEET INTO THE ROCK.
 - THE ANCHOR SHALL BE DRIVEN BEFORE THE ANCHOR SLEEVE OR THE ANCHOR/ANCHOR SLEEVE SHALL BE DRIVEN TOGETHER.
 - TO BE PAID UNDER ITEM NO. 713-16.20 THRU 39.

- REV. 6-12-74: CHANGED TYPE OF STEEL FOR PERFORATED POSTS FROM ASTM A-366 TO ASTM A-446.
- REV. 7-9-74: POST INSTALLATION DETAIL AND CONNECTION DETAIL ADDED. CORNER BOLT SIZE CHANGED.
- REV. 8-19-74: NOTE ADDED REGARDING POST INSTALLATION. FOOTING DETAILS ADDED.
- REV. 1-1-76: CHANGED DRAWING NO. FROM RD-S-17 TO T-S-17.
- REV. 7-29-76: HARDWARE FINISH, FIELD SPLICE AND MISCELLANEOUS.
- REV. 7-17-81: CHANGED ITEM NO. TO AGREE WITH NEW SPECIFICATION BOOK.
- REV. 3-1-88: KNOCKOUT ALTERNATE ADDED.
- REV. 11-22-90: REDREW AND REORGANIZED SHEET. ELIMINATED SHOULDER INSTALLATION USING THREE SUPPORTS.
- REV. 12-7-90: CHANGED CONNECTION DETAIL FOR PERFORATED/KNOCKOUT SQUARE TUBE POST AND GENERAL NOTE (F).
- REV. 7-29-91: CHANGED POST, ANCHOR AND ANCHOR SLEEVE TABLE. ADDED FOOTNOTE (I). CHANGED GENERAL NOTE (A).
- REV. 1-19-92: CHANGED POST, ANCHOR AND ANCHOR SLEEVE TABLE. MODIFIED VARIOUS NOTES ON DRAWING INCLUDING GENERAL NOTE (A).
- REV. 10-26-93: CHANGED WORDING OF GENERAL NOTE (E).
- REV. 2-14-96: CHANGED WORDING OF GENERAL NOTE (A).
- REV. 10-26-96: CHANGED PAY ITEM NO. IN GENERAL NOTE (H).
- REV. 7-19-13: REMOVED 2 1/2", 10 AND 12 GAUGE POST FY FOR 12GAUGE CHANGED TO 60 KSI. REMOVED TYPE 4 FOOTING.
- REV. 7-2-15: REVISED FOOTNOTES (3) ADDED GENERAL NOTES (L).

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.



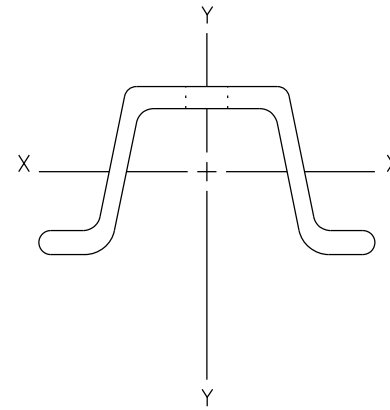
PERFORATED / KNOCKOUT SQUARE TUBE
 MATERIAL: ASTM A-446 (GRADE A) OR A-1011 GRADE 50
 $F_y = 60,000$ PSI MIN.

STEEL "U"-POST SHALL BE MANUFACTURED FROM STEEL CONFORMING TO THE MATERIAL REQUIREMENTS OF ASTM A-499 AND GALVANIZED CONFORMING TO ASTM A-123.

PERFORATED/KNOCKOUT POSTS SHALL BE SQUARE TUBE FORMED 10 OR 12 GAUGES, ASTM A1011 GRADE 50 STEEL. THE SQUARE TUBES SHALL BE WELDED DIRECTLY IN THE CORNER BY HIGH FREQUENCY RESISTANCE WELDING OR EQUAL. THE POSTS SHALL BE EXTERNALLY SCARFED TO AGREE WITH STANDARD CORNER RADII OF $\frac{3}{32} \pm \frac{1}{64}$ INCHES.

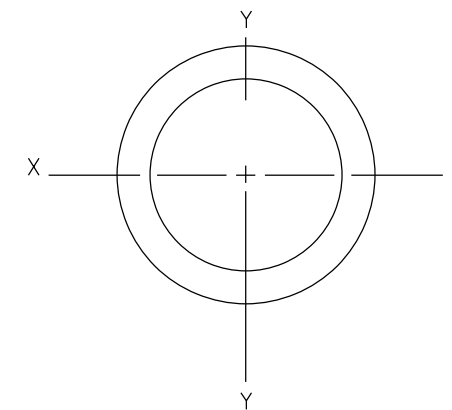
PERFORATED/KNOCKOUT POSTS SHALL BE SQUARE TUBE FORMED FROM USS GAGE (12 GAGE) ASTM A-446 COLD ROLLED CARBON STEEL OR A-1011 HOT ROLLED CARBON SHEET STEEL. THE MINIMUM YIELD (F_y) IS TO BE 60,000 POUNDS PER SQUARE INCH. OR USS 14 GAGE HAVING A MINIMUM YIELD STRENGTH OF 60,000 POUNDS PER INCH. THE SQUARE TUBES SHALL BE WELDED DIRECTLY IN THE CORNERS BY HIGH FREQUENCY RESISTANCE WELDING OR EQUAL. THE SUPPORT POSTS ARE TO BE EXTERNALLY SCARFED TO AGREE WITH STANDARD CORNER RADII OF $\frac{3}{32} \pm \frac{1}{64}$ ".

PERFORATED/KNOCKOUT POSTS SHALL BE GALVANIZED TO CONFORM TO ASTM-525, DESIGNATION C-90 OR ITS CORROSION-RESISTANCE EQUIVALENT, WHEN TESTED IN ACCORDANCE WITH ASTM B-117 STANDARDS.
 (TO BE PAID UNDER ITEM NO. 713-11.02)



U-POST

MATERIAL: ASTM A-499 GRADE 50
 $F_y = 50,000$ PSI MIN.
 (TO BE PAID UNDER ITEM NO. 713-11.01)



ROUND POST

MATERIAL: ASTM A-500 GRADE C
 $F_y = 50,000$ PSI MIN.
 SCHEDULE 80

ONLY SYSTEMS LISTED ON THE TDOT OPL SHALL BE USED.

BWG 10 SCHEDULE 80 PIPE SPECIFICATIONS (SIGN POST):
 2.875" OUTSIDE DIAMETER
 0.276" NOMINAL WALL THICKNESS
 STEEL TUBING PER ASTM A500 GRADE C
 OTHER SEAMLESS OR ELECTRIC-RESISTANCE WELDED STEEL TUBING OR PIPE WITH EQUIV. OUTSIDE DIA. AND WALL THICKNESS MAY BE USED IF THEY MEET THE FOLLOWING:
 46,000 PSI MINIMUM YIELD STRENGTH, 62,000 PSI MINIMUM TENSILE STRENGTH
 WALL THICKNESS (UNCOATED) SHALL BE WITHIN THE RANGE OF 0.248" TO 0.304"
 OUTSIDE DIAMETER (UNCOATED) SHALL BE WITHIN THE RANGE OF 2.855" TO 2.895"
 GALVANIZATION PER ASTM A123

(TO BE PAID UNDER ITEM NO. 713-11.03)

- REV. 06-01-76: ADDED WEIGHTS.
- REV. 08-13-76: REVISED WEIGHTS ALUMINUM.
- REV. 09-22-77: ADDED "MU"-POST; REVISED PROPERTIES OF RIBBED "U"-POST.
- REV. 07-01-78: REQUIREMENTS OF MATERIAL FOR STEEL "U"-POST.
- REV. 03-01-88: KNOCKOUT ALTERNATE ADDED.
- REV. 10-26-90: REDREW AND REORGANIZED SHEET. DELETED ALUMINUM "U"-POST AND "MU"-POST FROM SHEET. CHANGED SHEET NAME ACCORDINGLY. NUMBERED FOOTNOTES AND ADDED FOOTNOTE NO. ②.
- REV. 7-29-91: ADDED P7 AND P8 PERFORATED/KNOCKOUT TUBE POST. ADDED FOOTNOTE NOS. ⑤ AND ⑥.
- REV. 7-19-15: F_y FOR 12 GAUGE P POST CHANGED TO 60K PSI. ADDED P9 POST REVISED FOOTNOTES. CHANGE TITLE. ADDED ROUND POST INFORMATION.

MEMBER DESIGNATION	MINIMUM SECTION PROPERTIES	WT LBS/FT
P1	A = 0.380 IN. ² S _{xx} = 0.172 IN. ³ I _{xx} = 0.129 IN. ⁴	1.702 1 1/2" ∅
P2	A = 0.485 IN. ² S _{xx} = 0.264 IN. ³ I _{xx} = 0.231 IN. ⁴	2.060 1 3/4" ∅
P3	A = 0.590 IN. ² S _{xx} = 0.372 IN. ³ I _{xx} = 0.372 IN. ⁴	2.416 2" ∅
P4	A = 0.695 IN. ² S _{xx} = 0.499 IN. ³ I _{xx} = 0.561 IN. ⁴	2.773 2 1/4" ∅
P5	A = 0.803 IN. ² S _{xx} = 0.643 IN. ³ I _{xx} = 0.804 IN. ⁴	3.141 2 1/2" ∅
P6	A = 1.010 IN. ² S _{xx} = 0.783 IN. ³ I _{xx} = 0.979 IN. ⁴	4.006 2 1/2" ∅
P7	A = 0.392 IN. ² S _{xx} = 0.230 IN. ³ I _{xx} = 0.201 IN. ⁴	1.882 1 3/4" ∅
P8	A = 0.474 IN. ² S _{xx} = 0.296 IN. ³ I _{xx} = 0.296 IN. ⁴	2.164 2" ∅
P9	A = 0.841 IN. ² S _{xx} = 0.533 IN. ³ I _{xx} = 0.605 IN. ⁴	3.430 2 3/16" ∅

MEMBER DESIGNATION	MINIMUM SECTION PROPERTIES	WT LBS/FT
U1	A = 0.590 IN. ² S _{xx} = 0.225 IN. ³ I _{xx} = 0.179 IN. ⁴	2.00
U2	A = 0.645 IN. ² S _{xx} = 0.254 IN. ³ I _{xx} = 0.201 IN. ⁴	2.25
U3	A = 0.748 IN. ² S _{xx} = 0.289 IN. ³ I _{xx} = 0.233 IN. ⁴	2.50
U4	A = 0.819 IN. ² S _{xx} = 0.329 IN. ³ I _{xx} = 0.277 IN. ⁴	2.75
U5	A = 0.817 IN. ² S _{xx} = 0.363 IN. ³ I _{xx} = 0.331 IN. ⁴	2.75
U6	A = 0.918 IN. ² S _{xx} = 0.403 IN. ³ I _{xx} = 0.372 IN. ⁴	3.00
U7	A = 1.195 IN. ² S _{xx} = 0.511 IN. ³ I _{xx} = 0.460 IN. ⁴	4.00

MEMBER DESIGNATION	MINIMUM SECTION PROPERTIES	WT LBS/FT
R1 2 1/2" ∅	A = 1.154 IN. ² S _{xx} = 0.754 IN. ³ I _{xx} = 1.08 IN. ⁴	3.92

FOOTNOTES

- ① SEE GENERAL NOTES (A) AND (B) ON STANDARD DRAWING T-S-17 FOR MANUFACTURING REQUIREMENTS FOR STEEL AND GALVANIZING.
- ② STEEL "U"-POST SHALL BE MANUFACTURED FROM STEEL CONFORMING TO THE MATERIAL REQUIREMENTS OF ASTM A-499 AND GALVANIZED CONFORMING TO ASTM A-123.
- ③ P1 THRU P5 MEMBER DESIGNATIONS ARE TO BE 12 GAGE.
- ④ THE CONTRACTOR MAY SUBSTITUTE P2 FOR P7 AND P3 FOR P8. QUANTITIES ARE COMPUTED ON PLANS BASED ON USING P7 OR P8. NO INCREASE IN QUANTITIES WILL BE ALLOWED WHEN USING THE ABOVE SUBSTITUTIONS.
- ⑤ P7, P8 AND P9 MEMBER DESIGNATIONS ARE TO BE 14 GAGE.
- ⑥ P6 IS TO BE 10 GAUGE.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

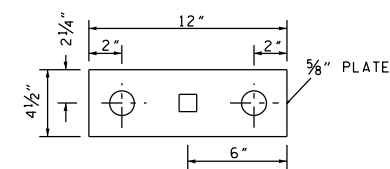
STATE OF TENNESSEE
 DEPARTMENT OF TRANSPORTATION

STANDARD STEEL
 SIGN
 SUPPORTS

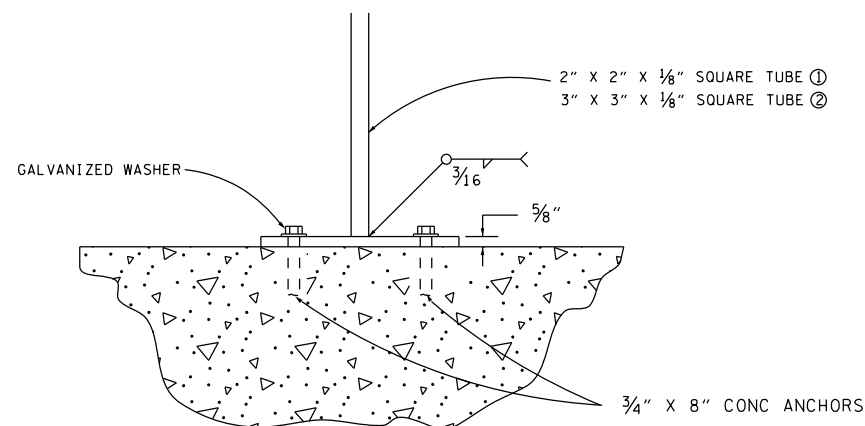
REV. 7-11-12: ADDED 6" WALL ATTACHMENT DETAIL AND NOTE ⑤

REV. 2-28-13: DELETED NOTE ① ADDED NOTE ⑥

REV. 7-2-15: REVISED GENERAL NOTE ⑥

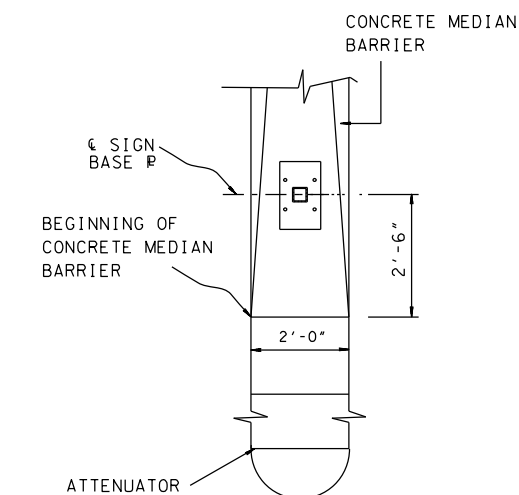


BASE PLATE DETAIL

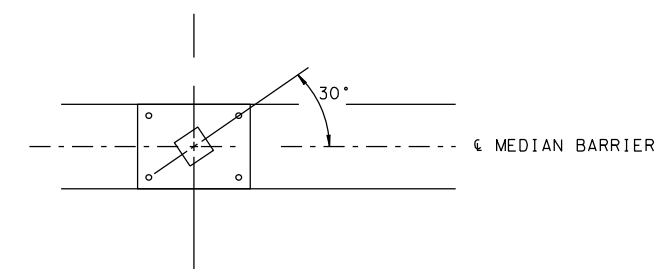


ELEVATION

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

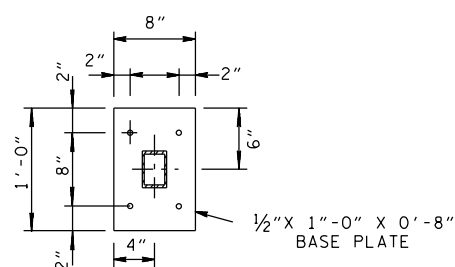
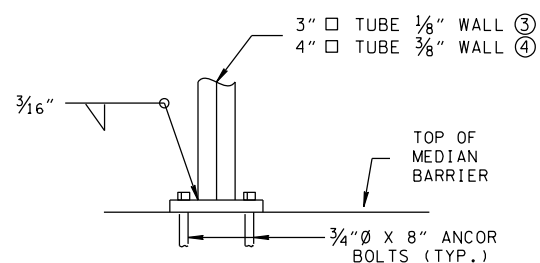
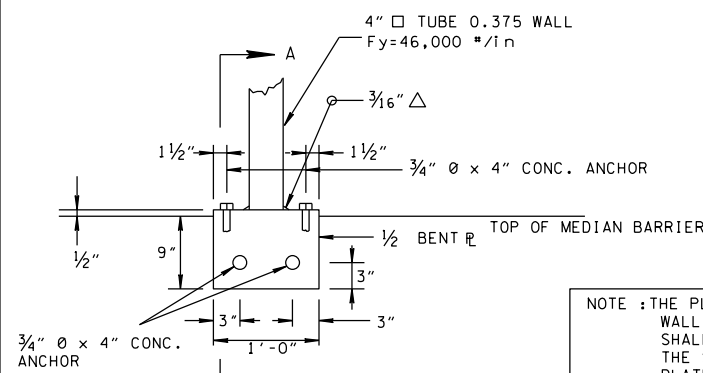


PLATE DETAIL

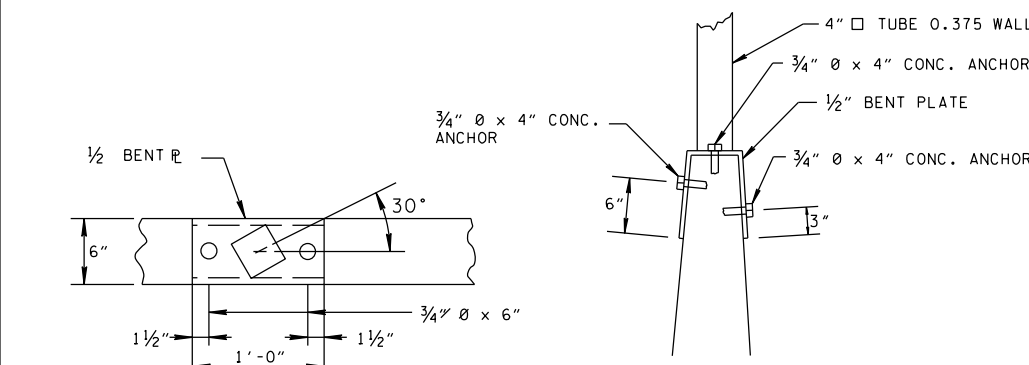


ELEVATION

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.



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

- ① WELDING SHALL BE IN ACCORDANCE WITH AASHTO SPECIFICATIONS.
- ② 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.
- ③ MATERIAL FOR PLATES SHALL BE ASTM A36 STEEL.
- ④ ALL BOLTS AND WASHERS SHALL BE MADE OF MATERIAL CONFORMING TO ASTM A307.
- ⑤ MINIMUM CLEARANCE BETWEEN BOTTOM OF THE SIGN AND TOP OF BARRIER SHALL BE 48".
- ⑥ PLATE TO BE CENTERED ON BARRIER CENTER LINE.
- ⑦ ITEM NO. 713-30.09 AND 713-30.10 INCLUDES BASE PLATE SIGN POST, ANCHOR BOLTS, AND WELDING.

DESIGN NOTES

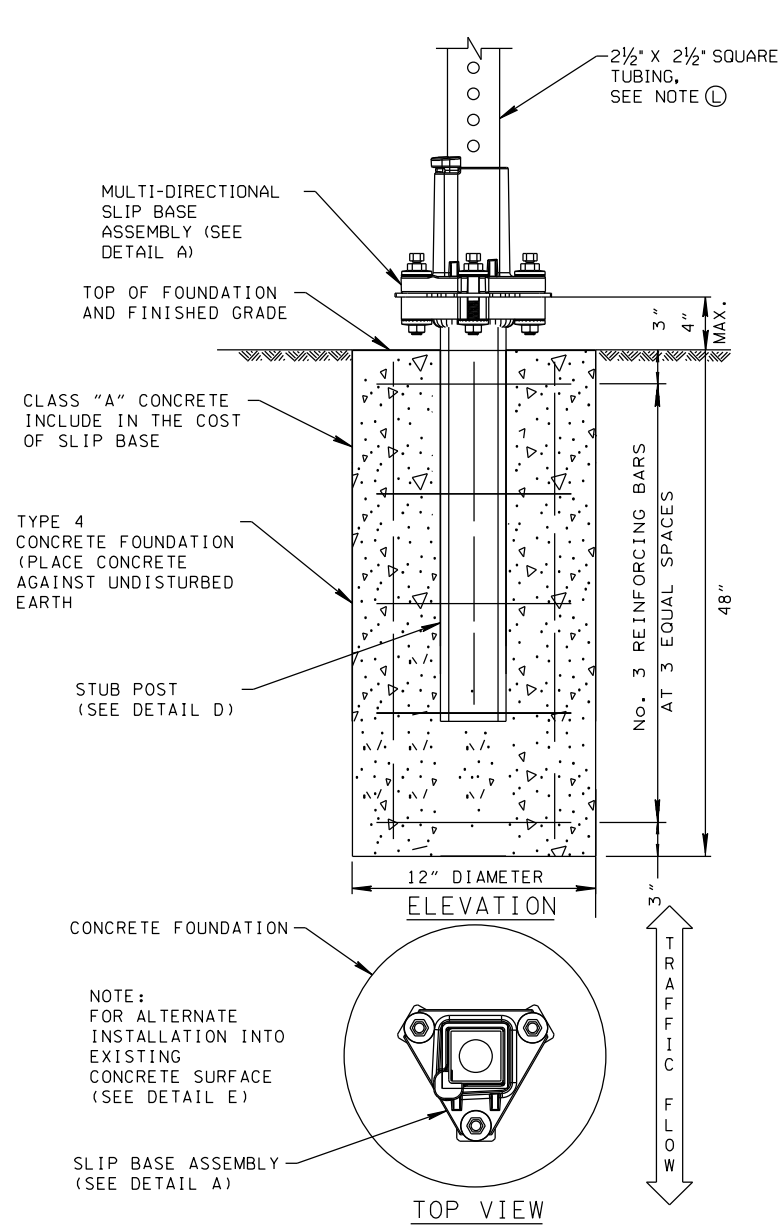
- ① FOR (18"x48") EMERGENCY MILE MARKER OR (12"x24", 12"x36" OR 12"x48") STANDARD MILE MARKERS.
- ② FOR (36"x48") SPEED LIMIT, (48"x72" OR 48"x60") TRUCK RESTRICTION SIGNS (IF DIRECTED BY REGIONAL TRAFFIC ENGINEER) OR (36"x36") DIAMOND WARNING SIGNS.
- ③ FOR EXIT GORE SIGNS (72" X 48" OR 90" X 48").
- 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.

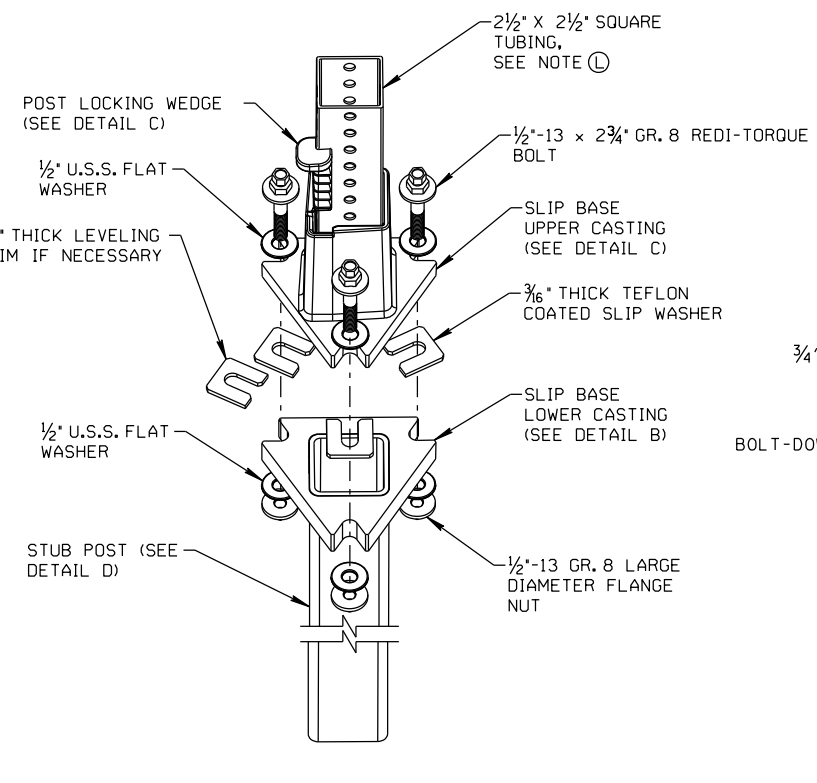
STATE OF TENNESSEE DEPARTMENT OF TRANSPORTATION

DETAILS FOR SIGNS MOUNTS ON CONCRETE MEDIAN BARRIERS

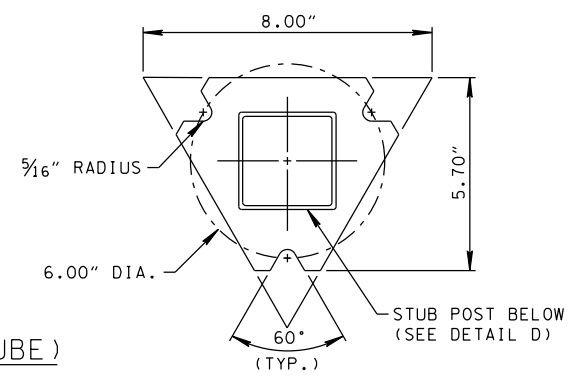
2-29-12 T-S-21



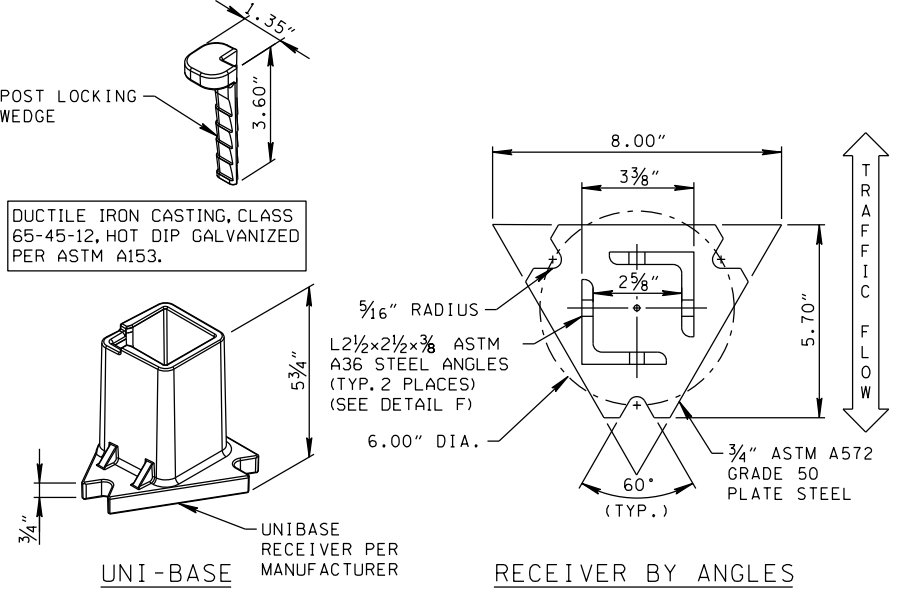
SLIP BASE SIGN SUPPORT FOR P-POST (SQUARE TUBE)



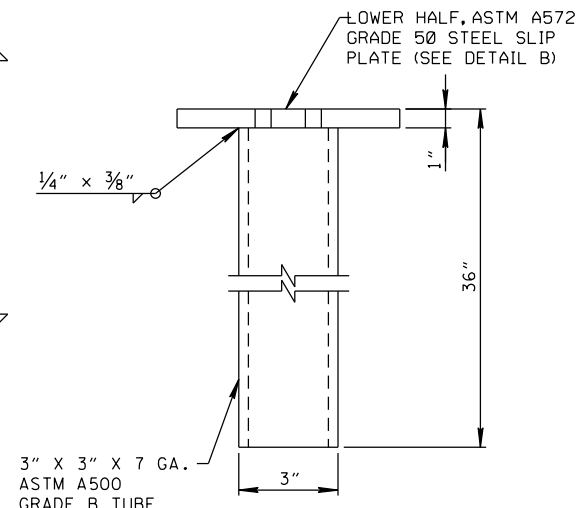
DETAIL A
TRIANGULAR SLIP BASE



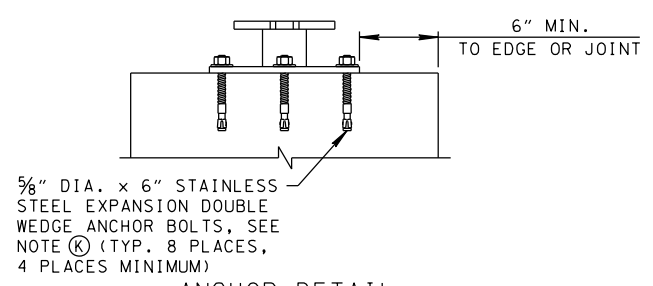
DETAIL B
SLIP BASE LOWER HALF



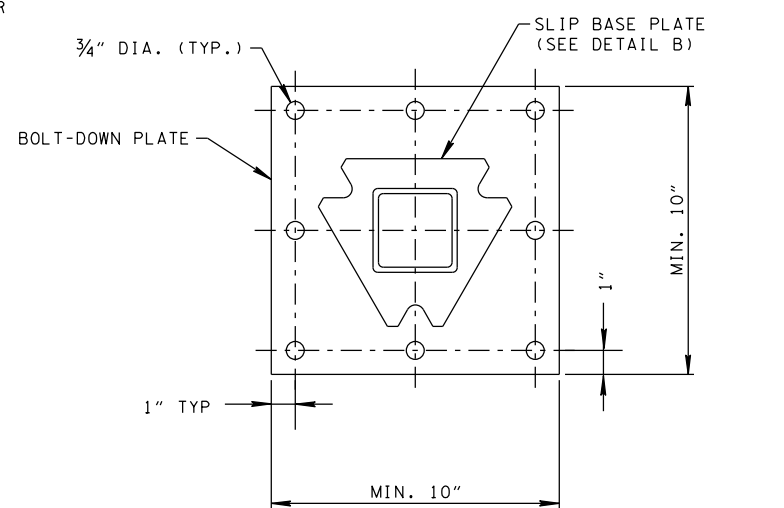
DETAIL C
SLIP BASE UPPER CASTING OPTIONS



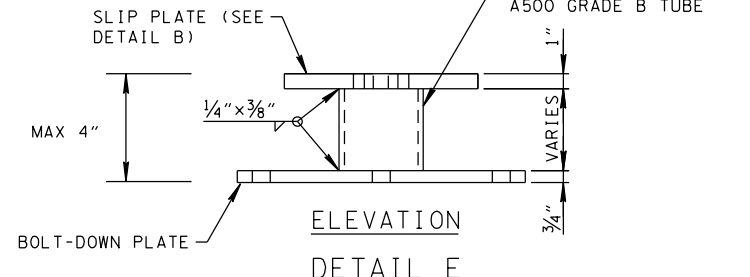
DETAIL D
SLIP BASE LOWER HALF



ANCHOR DETAIL

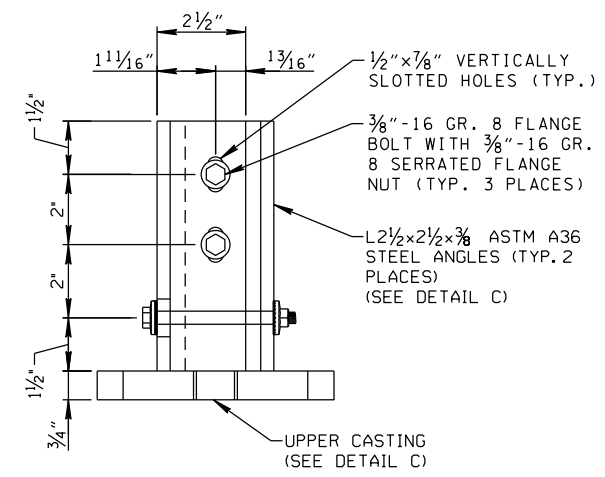


TOP VIEW



ELEVATION
DETAIL E

BOLT-DOWN ANCHOR INTO EXISTING CONCRETE



DETAIL F

GENERAL NOTES

- (A) MULTI DIRECTIONAL SLIP BASE BREAKAWAY SIGN SUPPORTS MAY BE USED ON ONLY HIGH SPEED HIGHWAYS AND ALL INTERSECTIONS LOCATED WITHIN THE CLEAR ZONE OF A ROADWAY AND NOT PROTECTED BY AN APPROVED BARRIER SYSTEM.
- (B) NO MORE THAN THREE MULTI-DIRECTIONAL SLIP BASES MAY BE INSTALLED WITHIN A SEVEN FOOT SPAN.
- (C) MULTI-DIRECTIONAL BREAKAWAY SLIP BASE SHALL BE USED AT LOCATIONS WHERE THE POSSIBILITY EXISTS OF THE SIGN BEING HIT FROM ANY DIRECTION. ALL SQUARE TUBE SIGNS LOCATED IN ISLANDS, AT INTERSECTIONS, OR LOCATED ALONG THE OUTSIDE OF A HORIZONTAL CURVE SHALL BE EQUIPPED WITH A BREAKAWAY SYSTEM, REGARDLESS OF THE NUMBER OF POSTS OR SPACING.
- (D) ALL SIGN PANELS PLACED PARALLEL TO THE DIRECTION OF TRAFFIC FLOW (SUCH AS ONE-WAY SIGNS ON A DIVIDED HIGHWAY) SHALL BE MOUNTED ON A MULTI-DIRECTIONAL BREAKAWAY SYSTEM.
- (E) BASE POST STUB HEIGHT SHALL BE 4 INCHES OR LESS ABOVE FINISHED GROUND SURFACE.
- (F) ALL FINISHED COMPONENTS OF THE SLIP BASE SYSTEM SHALL BE PERMANENTLY MARKED TO INDICATE THE MANUFACTURER. METHOD, DESIGN, AND LOCATION OF MARKING SHALL BE AS APPROVED BY THE ENGINEER.
- (G) INTERMIXING OF U-CHANNEL POSTS WITH PERFORATED SQUARE TUBE POSTS AT ANY SIGN INSTALLATION LOCATION WILL NOT BE ALLOWED.
- (H) ONLY SYSTEMS LISTED ON THE TDOT OPL SHALL BE USED.
- (I) ALL STEEL SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH SPECIFICATION ASTM-A123.
- (J) 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."
- (K) ANCHORS MAY BE EXPANSION TYPE AS SHOWN OR ADHESIVE TYPE LISTED ON THE OPL MEETING THE STRENGTH REQUIREMENTS. EXPANSION ANCHORS SHALL CONSIST OF 5/8 INCH DIAMETER STUD BOLT WITH UNC-SERIES BOLT THREADS ON THE UPPER END WITH HEAVY HEX NUT PER ASTM A563, AND HARDENED WASHER PER ASTM F436. THE STUD BOLT SHALL HAVE A MINIMUM YIELD STRENGTH OF 50 KSI AND ULTIMATE TENSILE STRENGTH OF 75 KSI.
- (L) SEE T-S-19 FOR P-POST DETAILS.
- (M) TO BE PAID FOR UNDER ITEM NO. 713-11.21 P POST SLIP BASE PER EACH (INCLUDES COST OF SLIP BASE AND STUB).

- REV. 7-19-13: ADDED NOTE (N). MINOR EDITS TO DRAWINGS. MODIFIED NOTE (M).
- REV. 8-25-14: REVISED NOTE (H).
- REV. 7-2-15: REVISED GENERAL NOTES AND FOUNDATION DETAILS.

□ MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

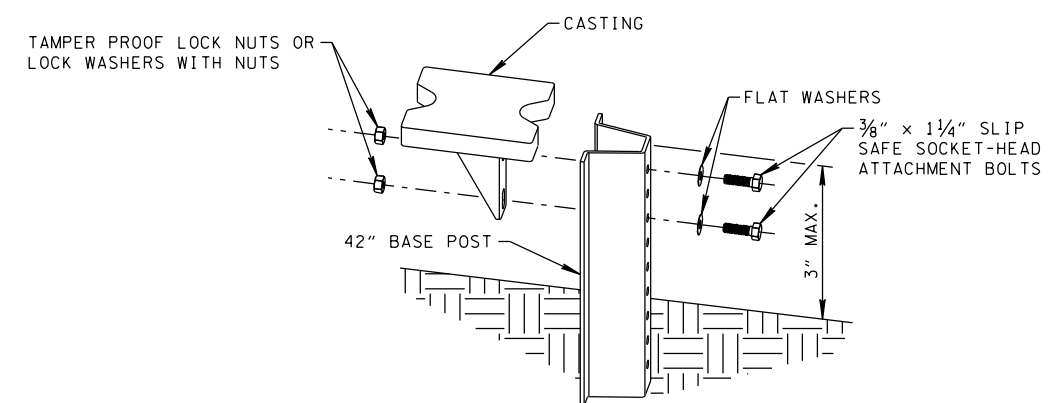
MULTI-DIRECTIONAL
SLIP BASE BREAKAWAY
P-POST
SIGN SUPPORT

09-01-12 T-S-23A

NOT TO SCALE

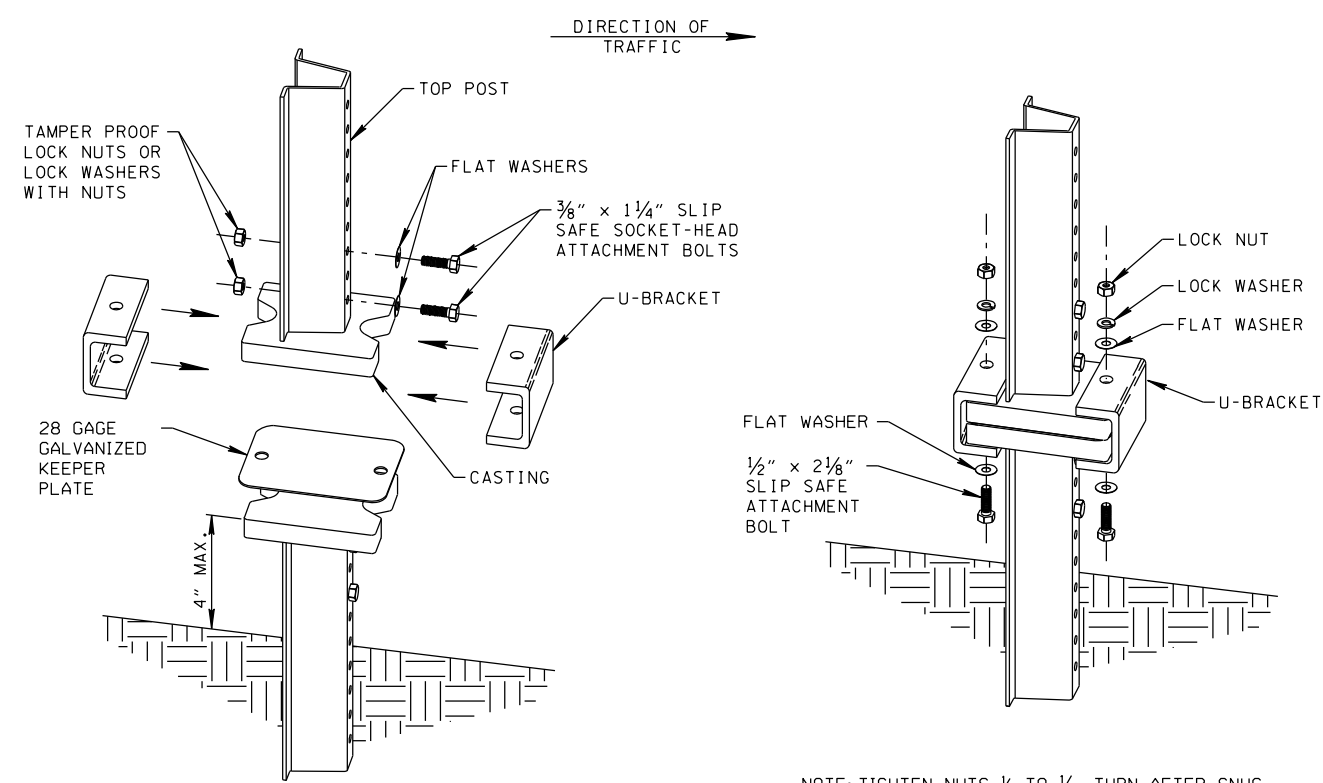
REV. 7-2-15: REVISED NOTE (L) AND ADDED NOTE (N) AND ADDED COUPLING DETAILS AND REVISED GENERAL NOTES. REV. 7-19-13: ADDED NOTE (M)

U-POST
MULTI-DIRECTIONAL BREAKAWAY SLIP BASE (D)(E)(K)



NOTE: BOLTS SHOULD BE TIGHTENED 1/2 TO 3/4 TURN AFTER SNUG.

STEP 1



NOTE: TIGHTEN NUTS 1/3 TO 1/2 TURN AFTER SNUG.

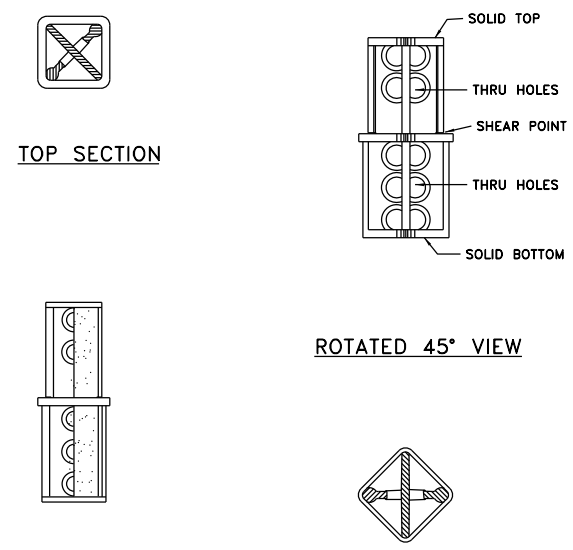
STEP 2

STEP 3

(TO BE PAID UNDER ITEM NO. 713-11.22)

NOT TO SCALE

P-POST
MULTI-DIRECTIONAL BREAKAWAY COUPLING
GROUND INSTALLATION



TOP SECTION

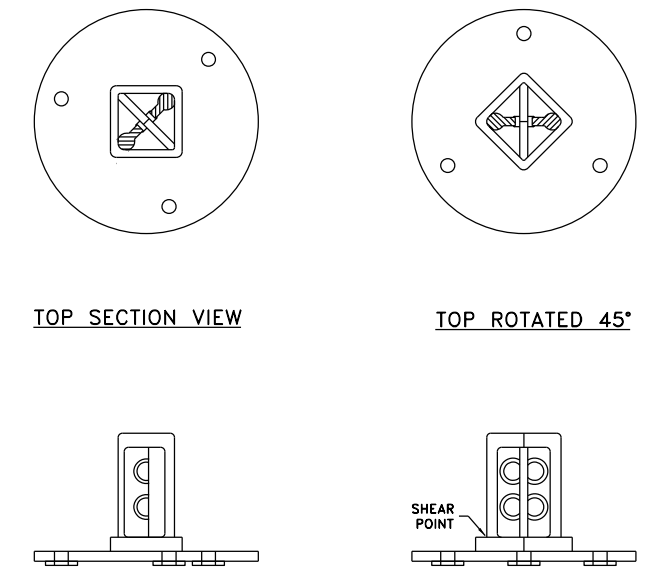
FRONT VIEW

ROTATED 45° VIEW

BOTTOM SECTION

(TO BE PAID UNDER ITEM NO. 713-11.04)

P-POST
MULTI-DIRECTIONAL BREAKAWAY COUPLING
CONCRETE FOOTING INSTALLATION



TOP SECTION VIEW

FRONT VIEW

TOP ROTATED 45°

FRONT ROTATED 45°

GENERAL NOTES

- (A) BREAKAWAY SIGN SUPPORTS SHALL BE USED ON ALL SIGN POSTS LOCATED WITHIN THE CLEAR ZONE OF A ROADWAY AND NOT PROTECTED BY AN APPROVED BARRIER SYSTEM.
- (B) SINGLE OR DOUBLE POSTS SIZED 3 LBS/FT OR SMALLER WITH A 7-FOOT CLEAR SPAN BETWEEN DOUBLE POSTS MAY BE DIRECT DRIVEN, AS THE POSTS ALONE ARE CONSIDERED BREAKAWAY PER FHWA. ALL TRIPLE U-POST INSTALLATIONS OF ANY SIZE POST, AND ALL 4 LBS/FT U-POST (MEMBER DESIGNATION U7 ON T-S-19) INSTALLATIONS OF ANY NUMBER OF POSTS, SHALL UTILIZE AN APPROVED BREAKAWAY SYSTEM. MULTI-DIRECTIONAL OR LAP-SPLICE SYSTEMS MAY BE USED, EXCEPT WHERE NOTED OTHERWISE, OR AS DIRECTED BY THE ENGINEER.
- (C) NO MORE THAN 2 SIGN POSTS OF ANY GAGE SHALL BE LOCATED WITHIN A 7-FOOT CIRCLE.
- (D) MULTI-DIRECTIONAL BREAKAWAY SLIP BASE SHALL BE USED AT LOCATIONS WHERE THE POSSIBILITY EXISTS OF THE SIGN BEING HIT FROM ANY DIRECTION. ALL U-POST SIGNS LOCATED IN ISLANDS, AT INTERSECTIONS, OR LOCATED ALONG THE OUTSIDE OF A HORIZONTAL CURVE SHALL BE EQUIPPED WITH A BREAKAWAY SYSTEM, REGARDLESS OF THE NUMBER OF POSTS OR SPACING.
- (E) ALL SIGN PANELS PLACED PARALLEL TO THE DIRECTION OF TRAFFIC FLOW (SUCH AS ONE-WAY SIGNS ON A DIVIDED HIGHWAY) SHALL BE MOUNTED ON A MULTI-DIRECTIONAL BREAKAWAY SYSTEM.
- (F) BREAKAWAY DEVICE IS OPTIONAL FOR POSTS WEIGHTING LESS THAN 3 LB/FT. BREAKAWAY DEVICE IS REQUIRED FOR HIGH SPEED (>45 MPH) FACILITIES.

SLIP BASE NOTES

- (G) BASE POST STUB HEIGHT SHALL BE 4 INCHES OR LESS ABOVE FINISHED GROUND SURFACE. WHEN DRIVING THE STUB POST, A DRIVE CAP OR OTHER ACCEPTABLE MEANS SHALL BE USED TO PROTECT THE TOP OF THE STUB POST FROM DAMAGE.
- (H) ALL FINISHED COMPONENTS OF THE SLIP BASE SYSTEM SHALL BE PERMANENTLY MARKED TO INDICATE THE MANUFACTURER. METHOD, DESIGN, AND LOCATION OF MARKING SHALL BE AS APPROVED BY THE ENGINEER.
- (I) THE STUB POST AND THE U-CHANNEL POST SHALL BE OF THE SAME SIZE (LB/FT) AND FROM THE SAME MANUFACTURER.
- (J) INTERMIXING OF U-CHANNEL POSTS WITH PERFORATED SQUARE TUBE POSTS AT ANY SIGN INSTALLATION LOCATION WILL NOT BE ALLOWED.
- (K) FOR BASE STUB AND U-POST MATERIAL PROPERTIES, SEE STANDARD DRAWING T-S-19. FOR DETAILS OF SIGN CONNECTION TO U-POST, SEE OTHER T-S-SERIES STANDARDS.
- (L) STEEL U-POSTS, BASE POSTS, SLIP BASES, AND HARDWARE SHALL BE SELECTED FROM THE OPL. ONLY SLIP BASE SYSTEMS ON OPL LIST 33 MAY BE USED.
- (M) TO BE PAID FOR UNDER ITEM NO. 713-11.22 U POST SLIP BASE PER EACH (INCLUDES COST OF SLIP BASE AND STUB)

COUPLING NOTES

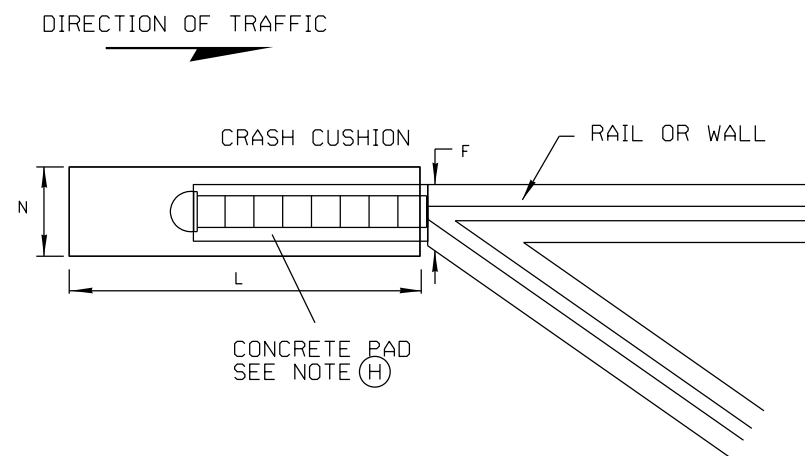
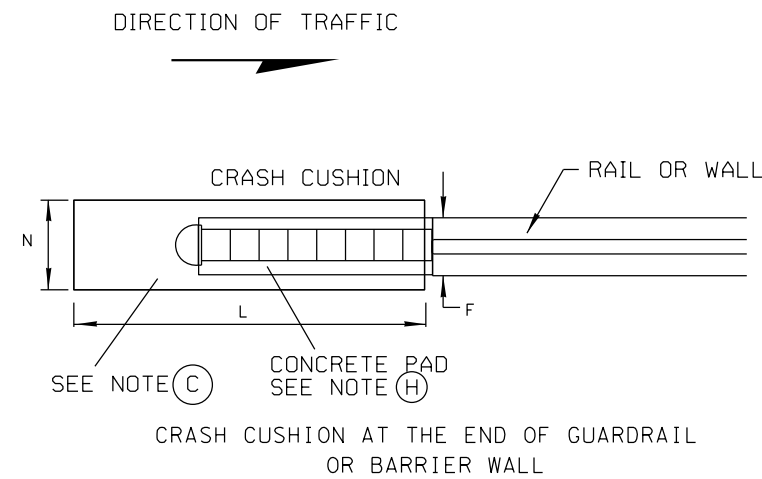
- (N) CONFIRM IF SIGN SUPPORT STRUCTURAL DESIGN CALCULATIONS WOULD ALLOW TO HAVE A COUPLING SYSTEM.
- (O) INSTALL MULTI-DIRECTIONAL BREAKAWAY COUPLING SYSTEMS AS DIRECTED BY MANUFACTURER.
- (P) ONLY COUPLING SYSTEMS ON OPL LIST 33 MAY BE USED.
- (Q) TO BE PAID FOR UNDER ITEM NO. 713-11.04 SURFACE MOUNT BREAKAWAY BASE FOR SIGN POST PER EACH.

MINOR REVISION -- FHWA APPROVAL NOT REQUIRED.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

BREAKAWAY
POST
SIGN SUPPORTS

09-01-12 T-S-23C



LEGEND

- N: APPROXIMATE WIDTH OF SPACE NECESSARY FOR THE PLACEMENT OF A CRASH CUSHION.
- L: APPROXIMATE LENGTH.
- F: WIDTH OF A FIXED OBJECT THAT WILL BE SHIELDED WITH A CRASH CUSHION.

MINIMUM CRASH CUSHION RESERVE AREA (FT)

DESIGN SPEED MPH (MAIN LINE)	MINIMUM DIMENSIONS (1)				DESIRABLE DIMENSIONS	
	RESTRICTED DIMENSIONS (2)		UNRESTRICTED DIMENSIONS			
	N	L	N	L	N	L
30	6	8	8	11	12	17
50	6	17	8	25	12	33
70	6	28	8	45	12	55

- (1) MINIMUM DIMENSIONS SHOULD ONLY BE USED AT LOCATIONS WHERE IT IS INFEASIBLE TO PROVIDE THE DESIRABLE AREA. IN CASES WHEN MORE THAN THE MINIMUM AREA CAN BE PROVIDED, AS MUCH SPACE AS POSSIBLE SHOULD BE PROVIDED.
- (2) RESTRICTED MINIMUM DIMENSIONS SHOULD ONLY BE USED IF THE MINIMUM UNRESTRICTED DIMENSIONS ARE UNATTAINABLE.

LEGEND: CRASH CUSHION

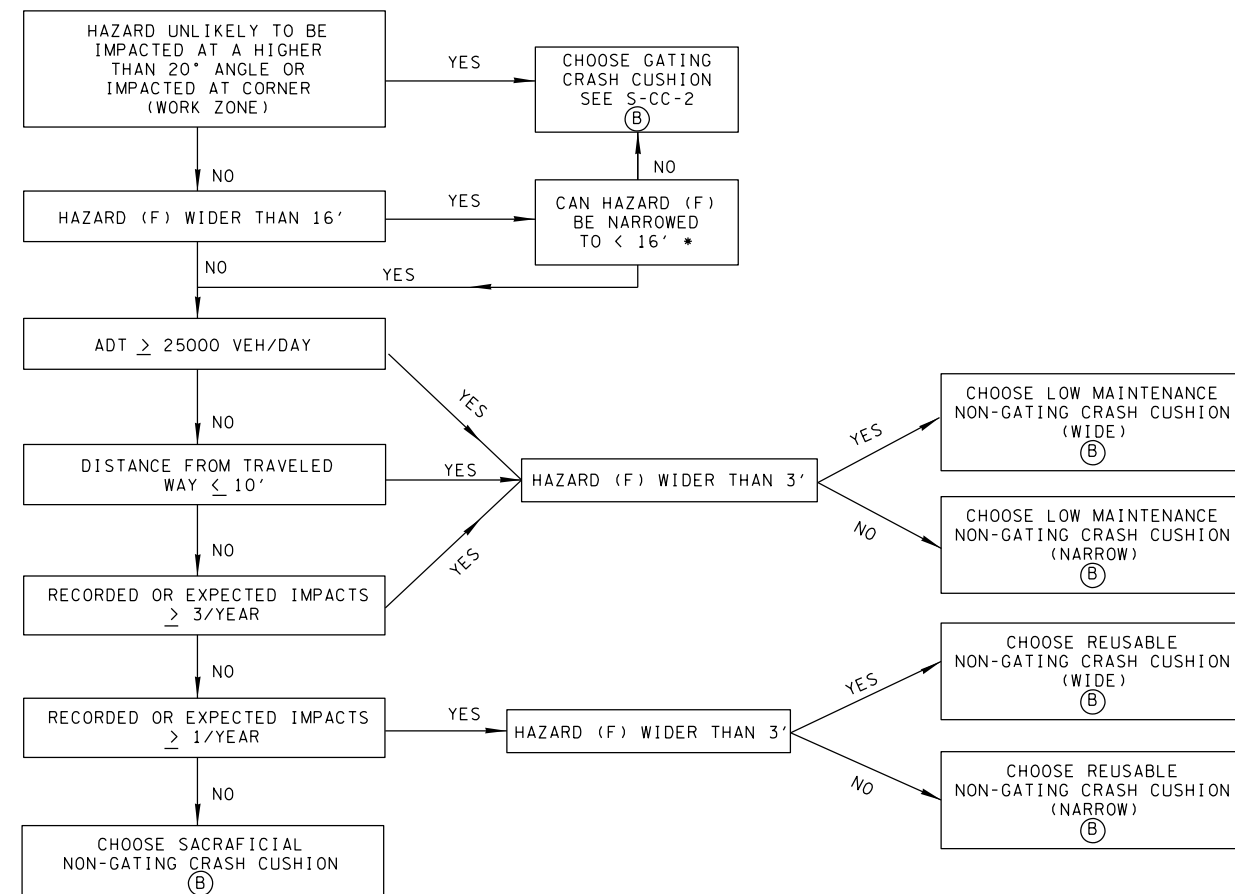
ATTENUATOR CLASSES DESCRIPTION

SACRIFICIAL: DEVICES DESIGNED FOR A SINGLE IMPACT SHOULD ONLY BE USED IF FREQUENT ATTENUATOR IMPACTS ARE NOT EXPECTED AT THE LOCATION.

REUSABLE: DEVICES FREQUENTLY DESIGNED THAT CAN BE REPAIRED BY SALVAGING MOST MAJOR COMPONENTS.

LOW-MAINTENANCE: DEVICES DESIGNED TO BE EASILY RESET AFTER IMPACT WITH MINIMAL REPAIR, USE IN AREAS WITH FREQUENT IMPACTS.

CRASH CUSHION SELECTION



* REDUCTION TO 16' CAN BE DONE BY MODIFYING BARRIER OR TRANSITION SECTION

GENERAL NOTES

- (A) CRASH CUSHIONS SHOULD ONLY BE USED IF LIMITED SPACE (SUCH AS A GORE AREA) PRECLUDES THE USE OF GUARDRAIL END TERMINALS OR AT OTHER LOCATIONS WHERE GUARDRAIL END TERMINAL WILL NOT FUNCTION.
- (B) CRASH CUSHIONS SHALL BE INSTALLED PER MANUFACTURERS SHOP DRAWINGS. SYSTEMS APPEARING ON THE QUALIFIED PRODUCT LIST 34 SECTION C ONLY MAY BE USED FOR THE SPECIFIED CATEGORY DETERMINED.
- (C) THE NOSE OR FIRST BARREL OF THE CRASH CUSHION SHALL BE MARKED WITH OBJECT MARKER STRIPING TYPE 3 INCLUDED IN THE COST OF THE SYSTEM.
- (D) SYSTEMS SHALL BE INSTALLED ON HARD, SMOOTH SURFACES WITH SLOPES LESS THAN 5% AND VARIATION OF CROSS SLOPE LESS THAN 2% CHANGE FOR THE LENGTH OF RESERVE AREA.
- (E) ONLY TL-3 CRASH CUSHION SHALL BE USED ON TDOT PROJECTS.
- (F) CURBS SHALL NOT BE INSTALLED IN AREAS NEAR CRASH CUSHIONS, EXISTING CURBS TO BE REMOVED UNLESS OTHERWISE SPECIFIED.
- (G) IF A CRASH CUSHION WOULD COMPROMISE SIGHT DISTANCE A SYSTEM WITH REDUCED HEIGHT (LESS THAN 36" HEIGHT) MAY BE SPECIFIED.
- (H) ALL PERMANENT INSTALLATIONS REQUIRE CONCRETE FOUNDATION AS SHOWN ON MANUFACTURERS SHOP DRAWINGS.
- (I) NON-GATING CRASH CUSHIONS (ATTENUATORS) SHALL BE PAID FOR:

PERMANENT		
705-17.94	ATTENUATOR (SACRIFICIAL)	EACH
705-17.95	ATTENUATOR (NARROW-REUSABLE)	EACH
705-17.96	ATTENUATOR (WIDE-REUSABLE)	EACH
705-17.97	ATTENUATOR (NARROW-LOW MAINTENANCE)	EACH
705-17.98	ATTENUATOR (WIDE-LOW MAINTENANCE)	EACH
THE PAYMENT OF ATTENUATOR INCLUDES CONCRETE FOUNDATION		
WORK ZONES		
705-08.51	PORTABLE IMPACT ATTENUATOR	EACH

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

CRASH CUSHION