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LEVELS DISPLAYED	56
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ESTIMATED CONCRETE RIPRAP QUANTITIES

D (Nominal Culvert I.D.)	Concrete (CY)
12"	0.8
15"	0.9
18"	1.0
21"	1.1
24"	1.2
27"	1.3
30"	1.4
33"	1.5
36"	1.6
42"	1.8
48"	2.0
54"	2.2
60"	2.4

CROSS PIPE LENGTHS & REQUIRED PIPE SIZES

D (Nominal Culvert I.D.)	Length of Cross Pipes	Cross Pipes Required	Cross Pipe Size
30" or Less	N/A	Not Required	N/A
36"	4'-5"	Always Required	4" Std
42"	4'-11"		
48"	5'-5"	Always Required	5" Std
54"	5'-11"		
60"	6'-5"		

PREFABRICATED END SECTION INFORMATION

D (Nominal) (Culvert I.D.)	H (6)	A (6)	W (6)	Gage (6)	STANDARD PIPE SIZES (1)
24" or less	6"	9"	D + 24"	16	3 1/2" STD 4.000"
30"	9"	12"	D + 32"	14	4" STD 4.500"
36"	9"	12"	D + 32"	14	5" STD 5.563"
42" or greater	12"	16"	D + 40"	12/10 (2)	

- Size and Lengths of Cross Pipes shall be as shown in the tables, except the first Cross Pipe from the bottom and the Saddle Pipe shall be 3 1/2".
- All 3-piece apron sections shall have 12 gage sides and 10 gage center panels.
- Match Cross Slope as shown elsewhere in the plans. All quantities, calculations, and dimensions shown herein are based on the 6:1 Slope. 6:1 slope or flatter is required for vehicle safety.
- Connection between Corrugated Metal Pipe Culvert and Galvanized Prefabricated End Section may be with strap and bolt as shown or other combinations of threaded rods and/or coupling bands.
- Reinforce upper edge of Prefabricated End Section with minimum 3/8" dia smooth or deformed bar (pre-galvanized).
- Values shown are minimum requirements.
- Riprap quantities shown are for one end of one culvert only. For multiple culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.
- Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, "Riprap".

GENERAL NOTES:

Cross Pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

The Safety End Treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Cross Pipes.

Steel Prefabricated End Section Toe Plate Extensions shall be required only when shown elsewhere in Plans.

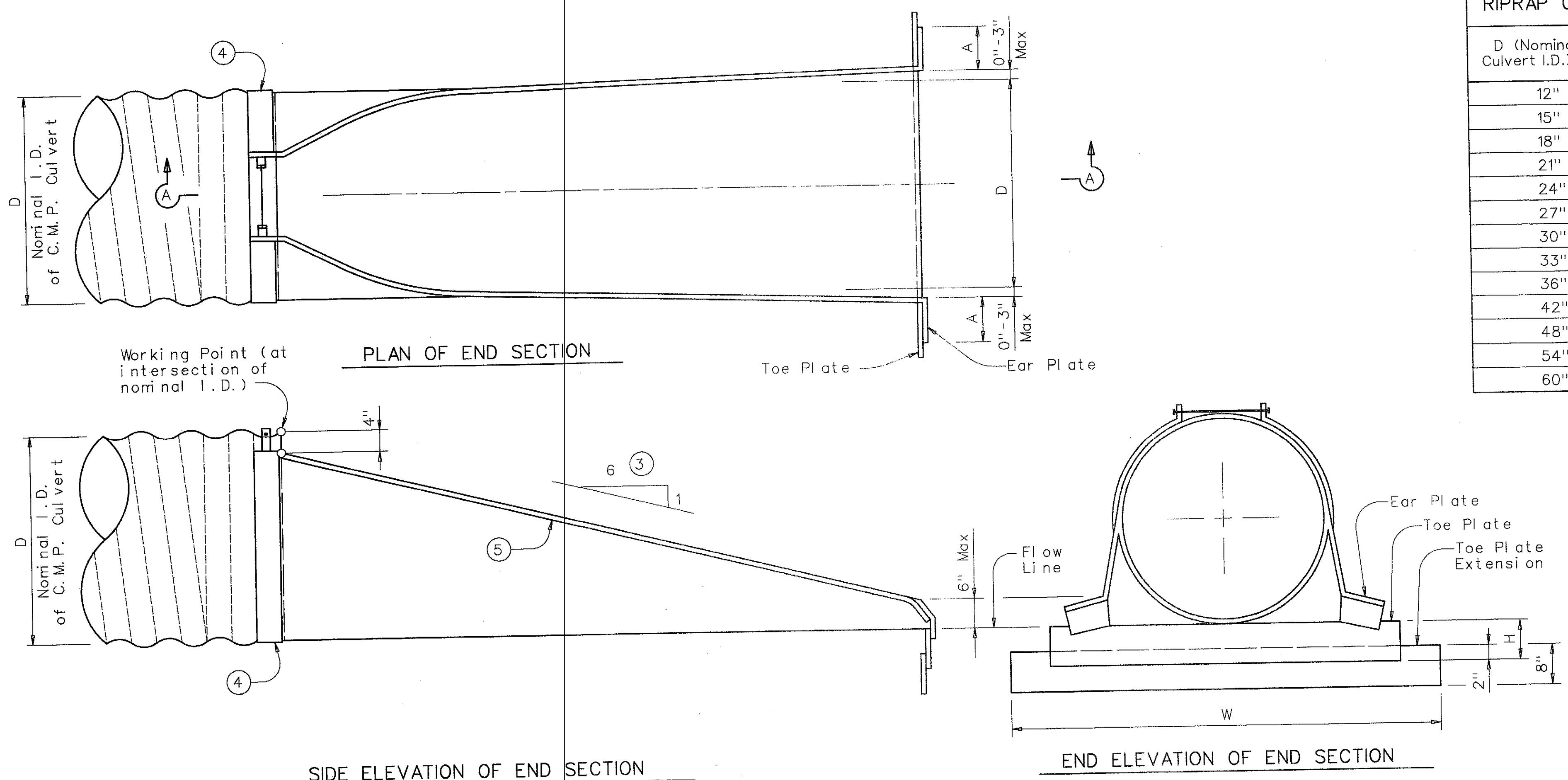
Riprap shall be Concrete Riprap in accordance with Item 432, "Riprap" and shall be required only when Cross Pipes are required, unless otherwise shown in Plans.

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

Cross Pipes and Saddle Pipes shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Bolts and nuts shall conform to ASTM A307.

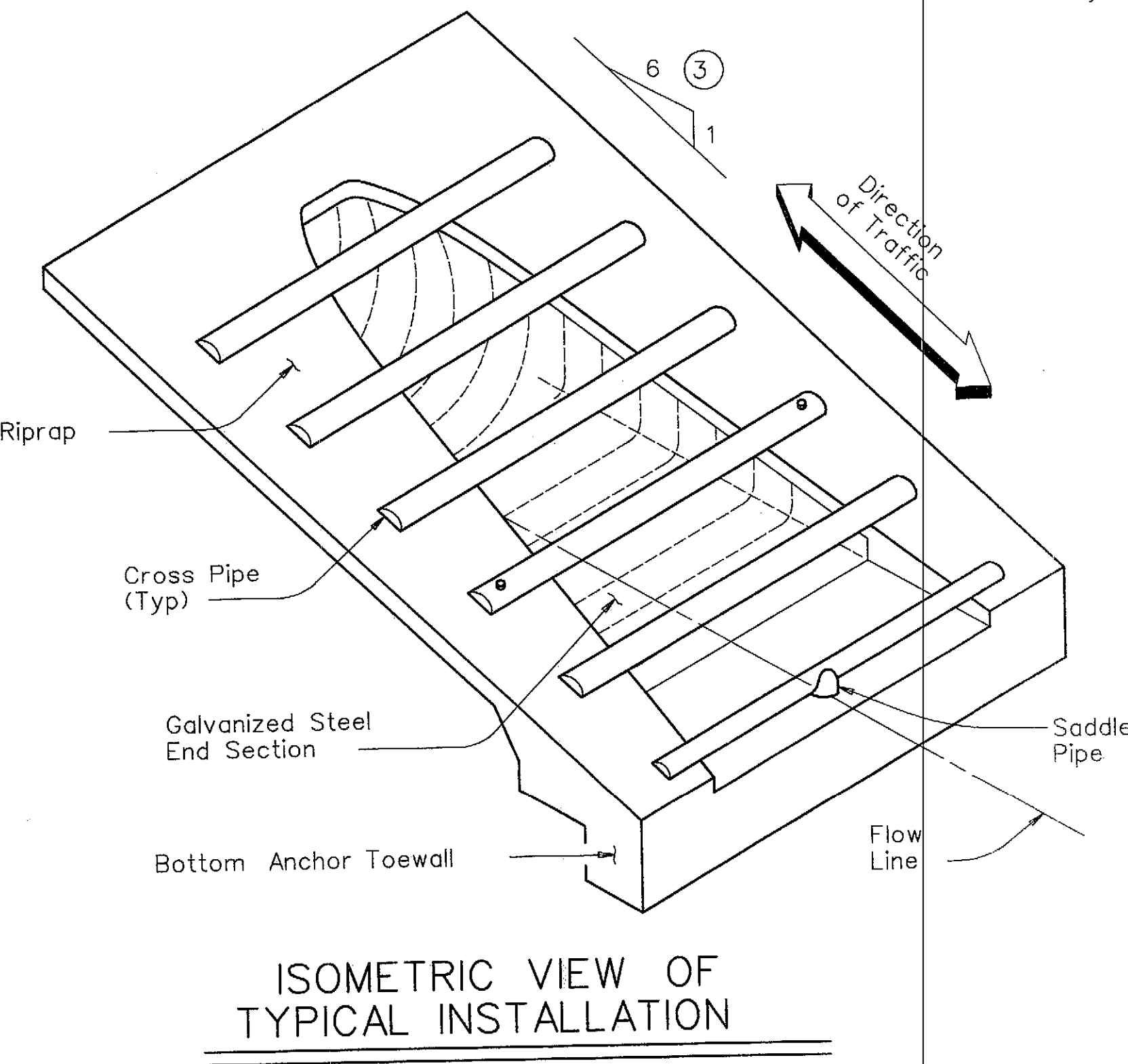
All steel components, except concrete reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.



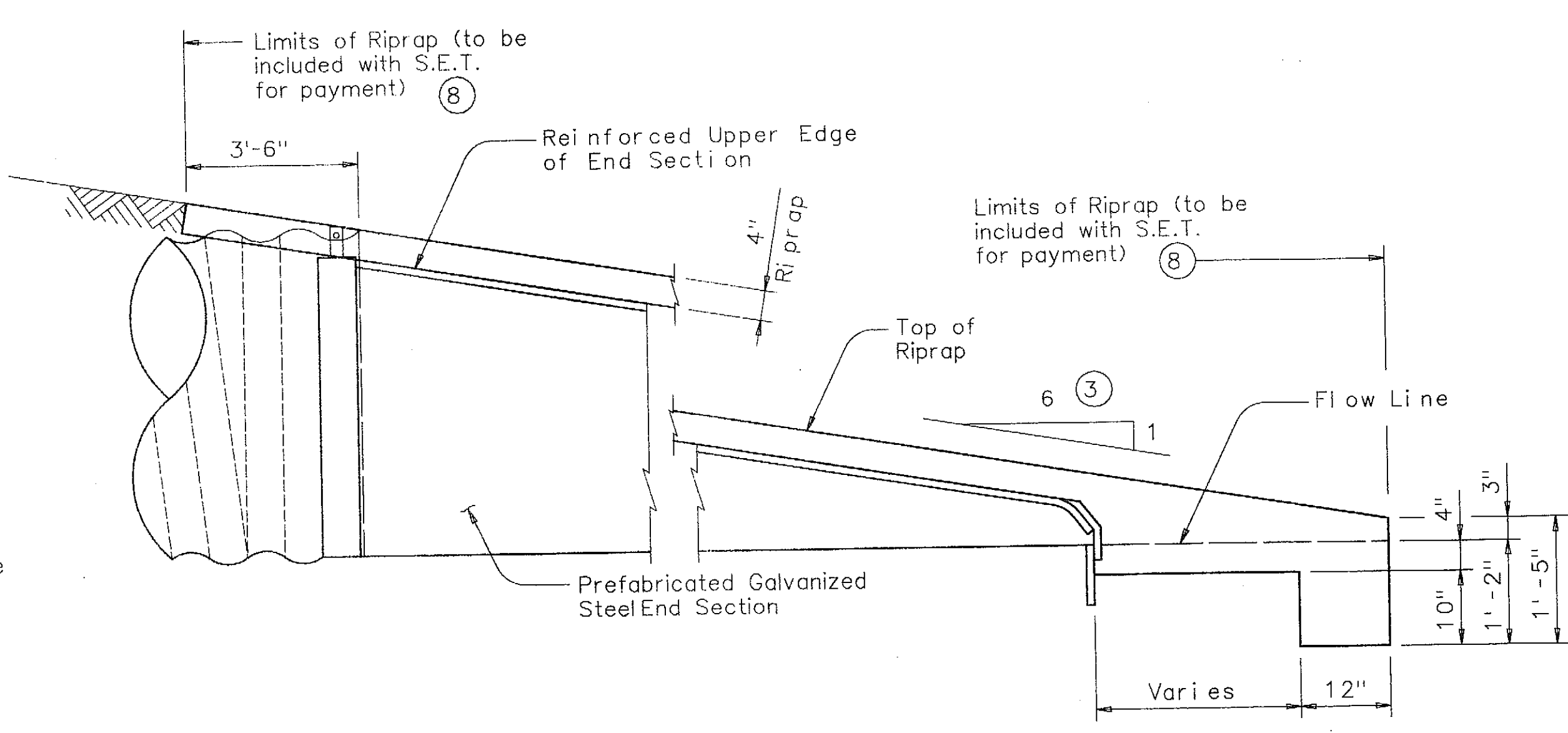
NOTE: All Cross Pipes, calculations, and dimensions are based on the Prefabricated Galvanized Steel End Section as shown in this detail. Alternate styles of End Sections will require that appropriate adjustments be made to the values presented on this standard.

PREFABRICATED GALVANIZED STEEL END SECTION DETAILS

(Safety End Treatment & Riprap not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Cross Pipes not shown for clarity)

Texas Department of Transportation
Bridge Division

PREFABRICATED GALVANIZED STEEL END SECTION SAFETY END TREATMENT

FOR 12" TO 60" DIA C.M.P. CULVERTS
TYPE II~ PARALLEL DRAINAGE

GS-ES-PD

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