DATE:
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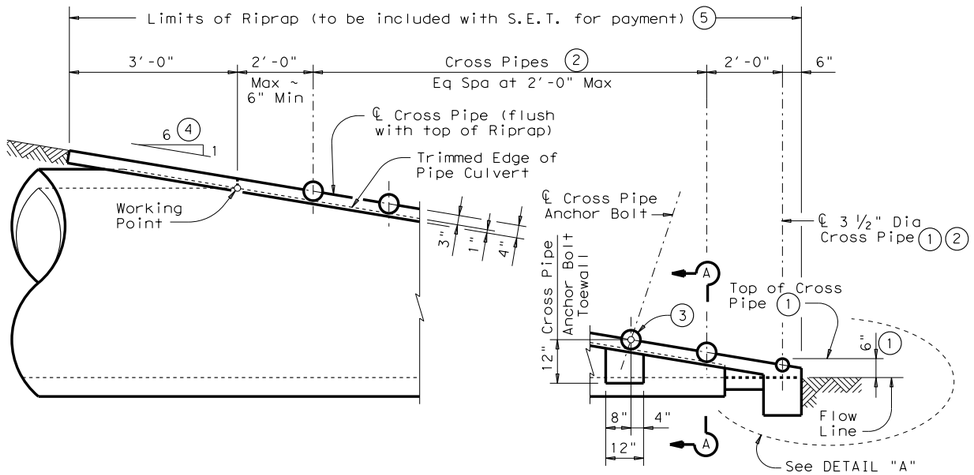



## SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing Concrete Pipe Culvert.)
(Details at Corrugated Metal Pipe Culvert are similar.)

### CROSS PIPE LENGTHS & REQUIRED PIPE SIZES (2)

#### CORRUGATED METAL PIPE CULVERTS

| Design | Conc Riprap (CY) (6) | Pipe Culvert Span | Pipe Culvert Rise | Pipe Culvert Spa ~ G | Single Barrel ~ Q1 | Multi-Barrel ~ Q1 | Q2 | Conditions for use of Cross Pipes | Cross Pipe Size |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.6 | 17" | 13" | 1'- 0" | N/A | 2'- 8" | 2'- 5" | 3 or more Pipe Culverts | 3" Std (3.500" O.D.) |
| 2 | 0.7 | 21" | 15" | 1'- 2" | N/A | 3'- 1" | 2'-11" | | |
| 3 | 0.9 | 28" | 20" | 1'- 5" | N/A | 3'- 9" | 3'- 9" | 3 or more Pipe Culverts | 3 ½" Std (4.000" O.D.) |
| 4 | 1.0 | 35" | 24" | 1'- 8" | 4'- 4" | 4'- 6" | 4'- 7" | All Pipe Culverts | 4" Std (4.500" O.D.) |
| 5 | 1.2 | 42" | 29" | 1'-11" | 4'-11" | 5'- 2" | 5'- 5" | | |
| 6 | 1.4 | 49" | 33" | 2'- 2" | 5'- 6" | 5'-11" | 6'- 3" | All Pipe Culverts | 5" Std (5.563" O.D.) |
| 7 | 1.6 | 57" | 38" | 2'- 5" | 6'- 2" | 6'- 8" | 7'- 2" | | |
| 8 | 1.8 | 64" | 43" | 2'-10" | 6'- 9" | 7'- 6" | 8'- 2" | | |
| 9 | 1.9 | 71" | 47" | 3'- 2" | 7'- 4" | 8'- 3" | 9'- 1" | | |

#### CONCRETE PIPE CULVERTS

| Design | Conc Riprap (CY) (6) | Pipe Culvert Span | Pipe Culvert Rise | Pipe Culvert Spa ~ G | Single Barrel ~ Q1 | Multi-Barrel ~ Q1 | Q2 | Conditions for use of Cross Pipes | Cross Pipe Size |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.6 | 22" | 13 ½" | 1'- 0" | N/A | 3'- 1" | 2'-10" | 3 or more Pipe Culverts | 3" Std (3.500" O.D.) |
| 2 | 0.7 | 26" | 15 ½" | 1'- 2" | N/A | 3'- 6" | 3'- 4" | | |
| 3 | 0.9 | 28 ½" | 18" | 1'- 5" | N/A | 3'-10" | 3'-9 ½" | 3 or more Pipe Culverts | 3 ½" Std (4.000" O.D.) |
| 4 | 1.0 | 36 ¼" | 22 ½" | 1'- 8" | 4'- 5" | 4'- 7" | 4'-8 ¼" | All Pipe Culverts | 4" Std (4.500" O.D.) |
| 5 | 1.2 | 43 ¾" | 26 ⅝" | 1'-11" | 5'- 1" | 5'- 4" | 5'-6 ¾" | | |
| 6 | 1.4 | 51 ⅛" | 31 ⅝" | 2'- 2" | 5'- 8" | 6'- 1" | 6'-5 ¼" | All Pipe Culverts | 5" Std (5.563" O.D.) |
| 7 | 1.6 | 58 ½" | 36" | 2'- 5" | 6'- 4" | 6'-10" | 7'-3 ½" | | |
| 8 | 1.8 | 65" | 40" | 2'-10" | 6'-10" | 7'- 7" | 8'- 3" | | |
| 9 | 1.9 | 73" | 45" | 3'- 2" | 7'- 6" | 8'- 5" | 9'- 3" | | |

(1) The proper installation of the first Cross Pipe is critical for vehicle safety. The top of the first Cross Pipe must be placed at no more than 6" above the flow line.

(2) Size of Cross Pipes, except the first bottom pipe, shall be as shown in the PIPE SIZE table. The first bottom pipe shall be 3 ½" Standard Pipe (4" O.D.).

(3) The third Cross Pipe from the bottom of the Culvert shall always be installed using a bolted connection. Care shall be taken to ensure that Riprap concrete does not flow into the Cross Pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, all other Cross Pipes may also be installed using the bolted connection details.

(4) Match Cross Slope as shown elsewhere in the plans. Cross Slope of 6:1 or flatter is required for vehicle safety.

(5) Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, "Riprap".

(6) Quantities shown are for one end of one Pipe Culvert. For multiple Pipe Culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

**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.

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.

Riprap and all necessary inverts shall be Concrete Riprap conforming to the requirements of Item 432, "Riprap".

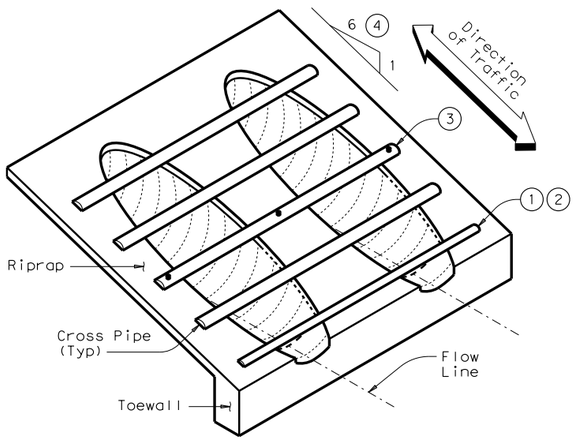
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

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

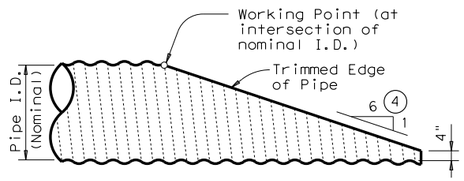
Cross Pipes shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

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.




## ISOMETRIC VIEW OF TYPICAL INSTALLATION




NOTE: All Cross Pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

## SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing Corrugated Metal Pipe Culvert.)
(Details at Concrete Pipe Culvert are similar.)



Texas Department of Transportation

Bridge Division Standard

# SAFETY END TREATMENT

FOR DESIGN 1 TO 9
ARCH PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

## SETP-PD-A

| FILE: setppase.dgn | DN: GAF | CK: TxDOT | DW: JRP | CK: GAF |
|---|---|---|---|---|
| ©TxDOT February 2010 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | | | | |
| 11-10: Add note for synthetic fibers. | DIST | COUNTY | | SHEET NO. |

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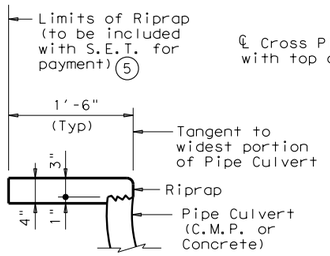
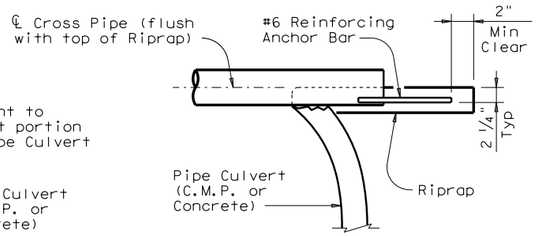
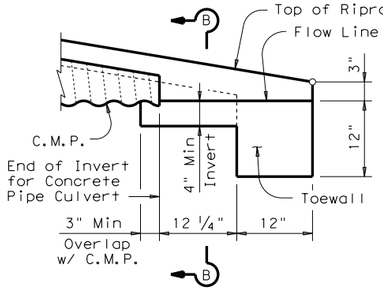



SHOWING TYPICAL PIPE CULVERT & RIPRAP

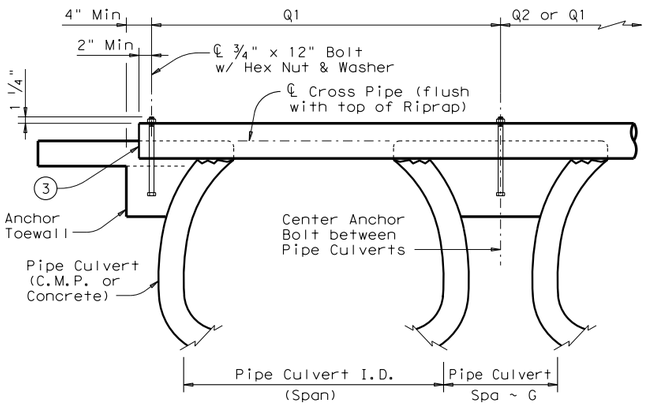



SHOWING CROSS PIPE WITH ANCHOR BAR



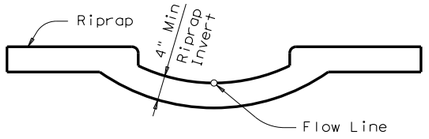

## DETAIL "A"

(Showing Invert with Corrugated Metal Pipe Culvert. Concrete Pipe Culvert details are similar. Cross Pipes not shown for clarity.)



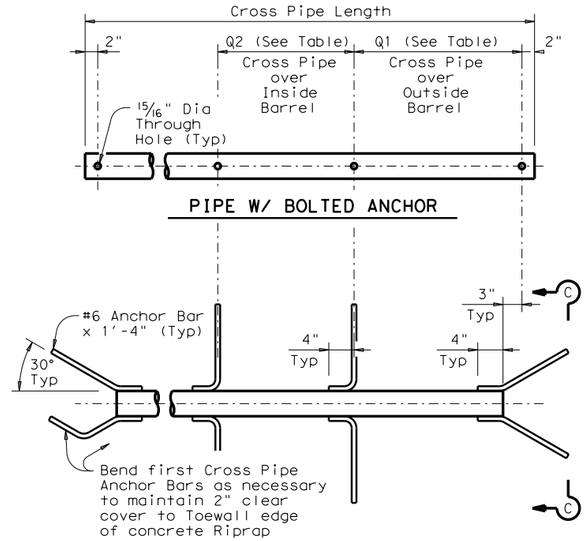

SHOWING CROSS PIPE WITH BOLTED ANCHOR

## SECTION A-A




## SECTION B-B

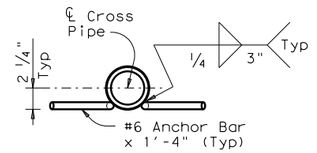
(Cross Pipes not shown for clarity.)




PIPE W/ BOLTED ANCHOR




PIPE W/ ANCHOR BARS




SECTION C-C

## CROSS PIPE DETAILS

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

# SAFETY END TREATMENT

FOR DESIGN 1 TO 9
ARCH PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

## SETP-PD-A

| FILE: setppase.dgn | DN: GAF | CK: TxDOT | DW: JRP | CK: GAF |
|---|---|---|---|---|
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| REVISIONS | | | | |
| 11-10: Add note for synthetic fibers. | DIST | COUNTY | | SHEET NO. |