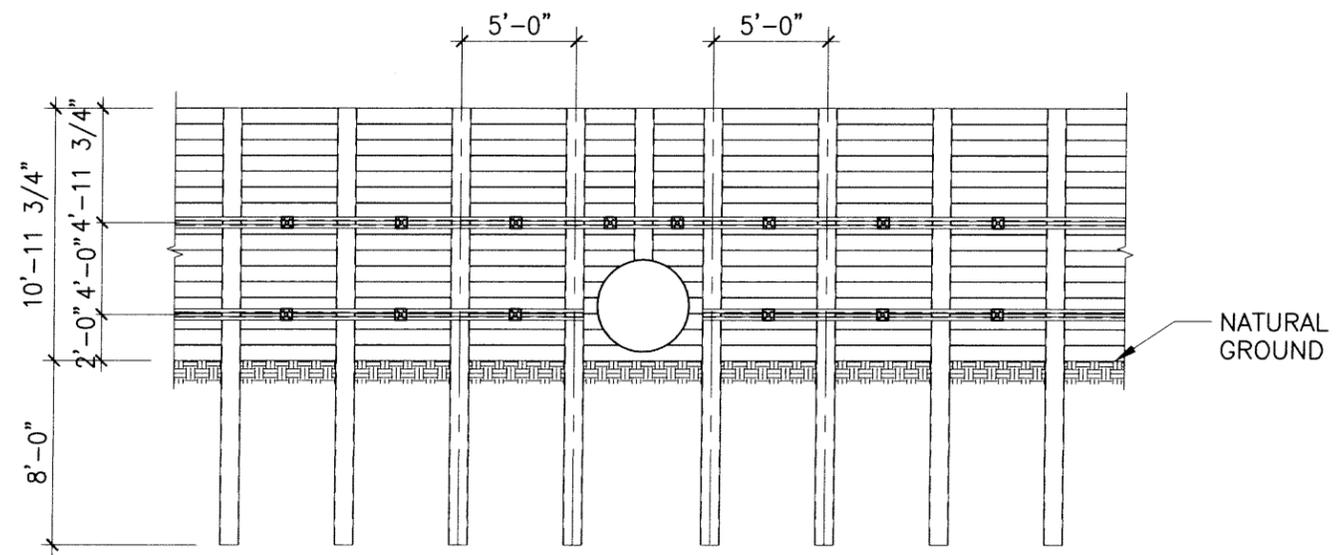
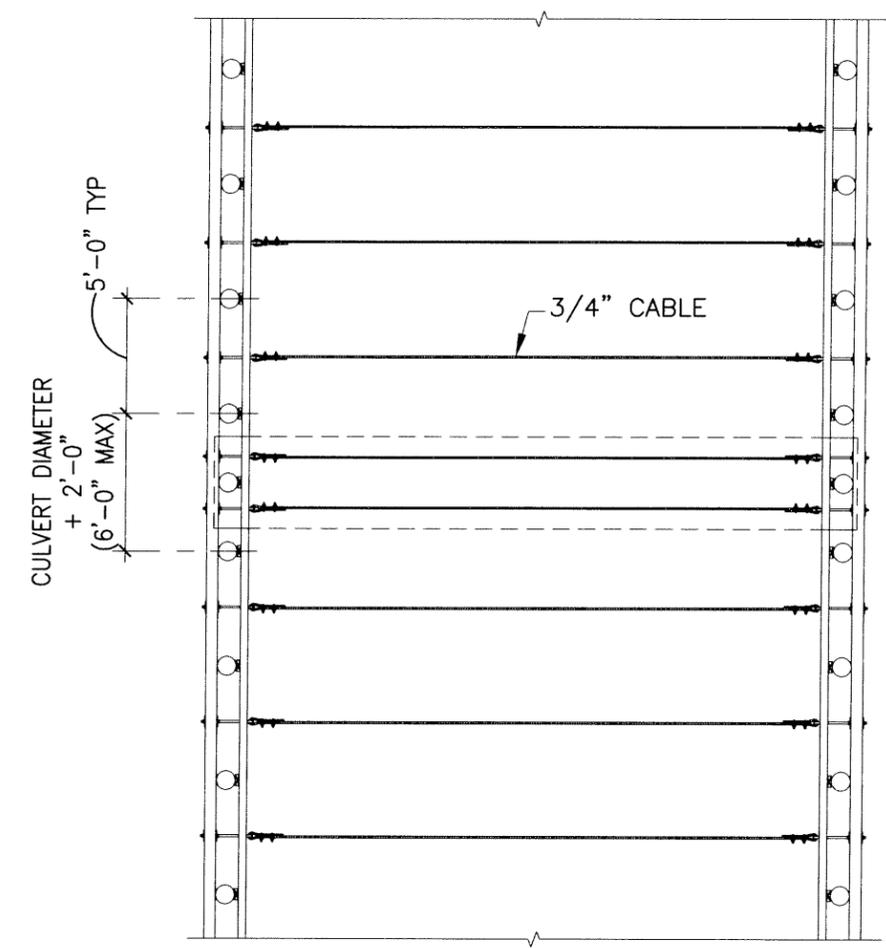


BILL OF MATERIALS					
Max 11' Headwall			HEIGHT =	ft	
	Quantity	UNIT	TOTAL QUANTITY	LENGTH =	ft
10" Pipe	0.518	lf			
4x8 Timbers	1.600	lf			
3/4" Cable	1.691	lf			
C7x9.8	0.364	lf			
1/2" Dia Bolts	0.145	ea			
10 GA Screws	1.000	ea			
Lock Washers	0.136	ea			
3/4" Dia Bolts	0.136	ea			
1/2" Plate	0.005	sf			
1"x30" Eye Bolts	0.018	ea			
Cable Clamps	0.036	ea			

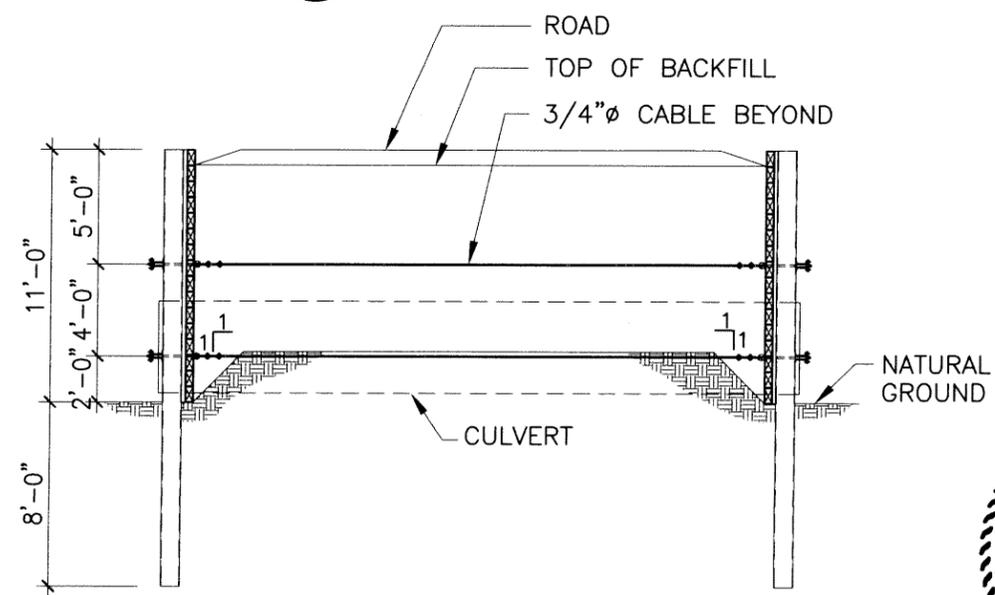
NOTE:  
 A. QUANTITIES ARE PER LINEAR FOOT OF WALL PER UNIT HEIGHT  
 B. TOTAL QUANTITY = QUANTITY x HEIGHT x LENGTH



**3 ELEVATION**  
 1/8"=1'-0"



**2 PLAN**  
 1/8"=1'-0"



**1 SECTION**  
 1/8"=1'-0"

STATE OF TEXAS  
 JOSEPH R. RAPIER  
 61147  
 PROFESSIONAL ENGINEER  
 12-21-06

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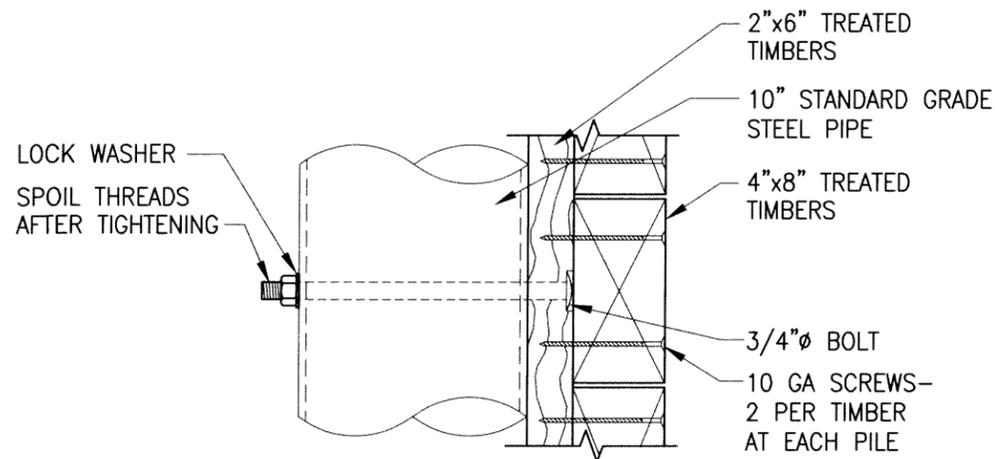
DESIGNED BY: MSJ  
 DRAWN BY: DLD  
 CHECKED BY: JRR  
 FILE NAME:  
 DATE PLOTTED: DEC 2006

HEADWALL WITH TIMBERS AND STEEL PIPE PILES 11 FOOT MAXIMUM HEIGHT

**NRCS**  
 Natural Resources Conservation Service  
 U.S. Department of Agriculture

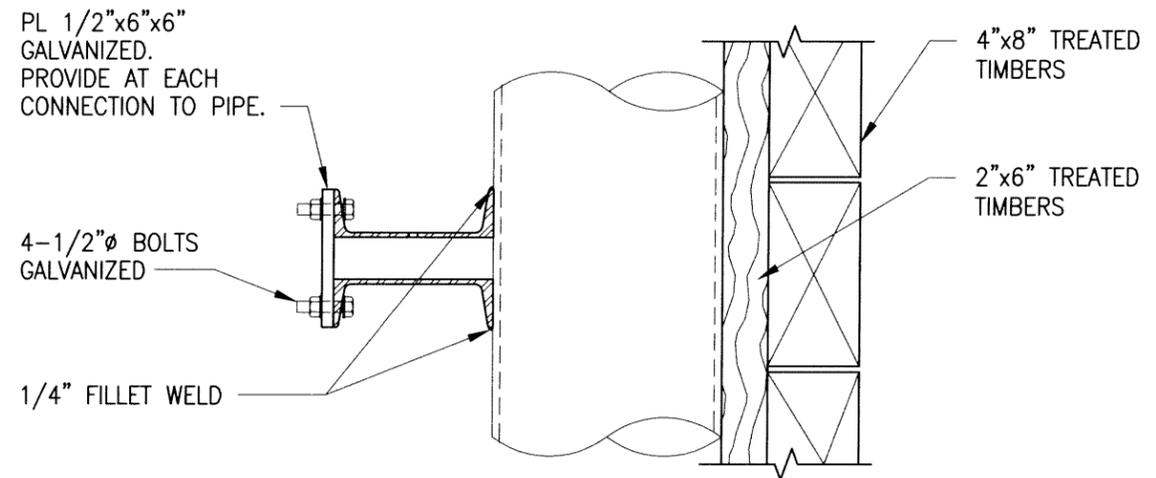
REVISIONS	DATE

DRAWING NO. TX-EN-0501  
 SHEET **1 of 5**



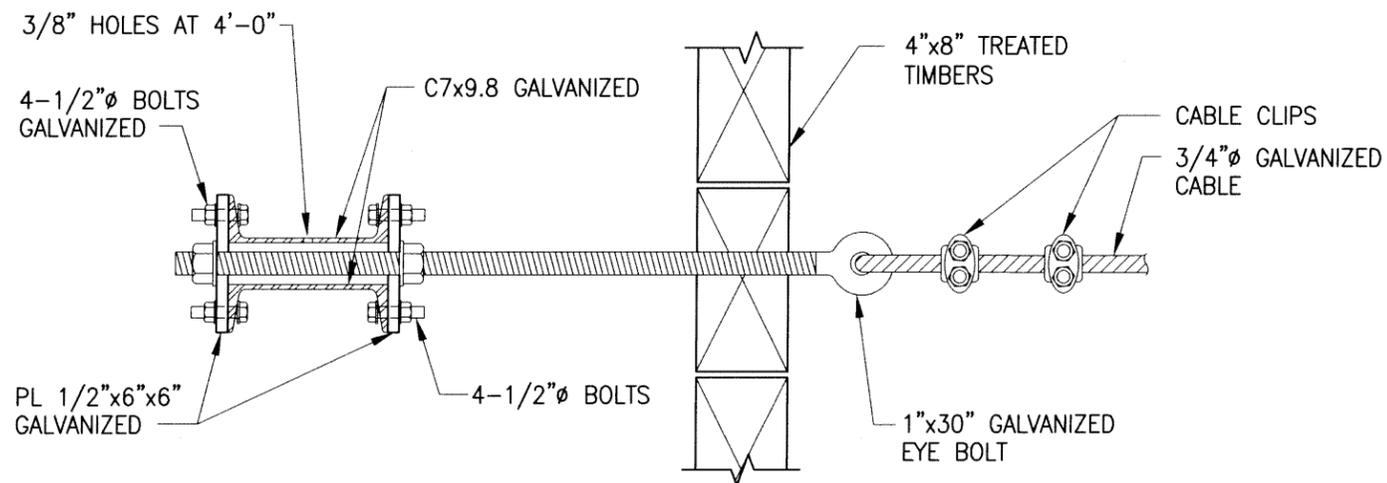
**1** TYPICAL LUMBER CONNECTION DETAIL

1 1/2"=1'-0"



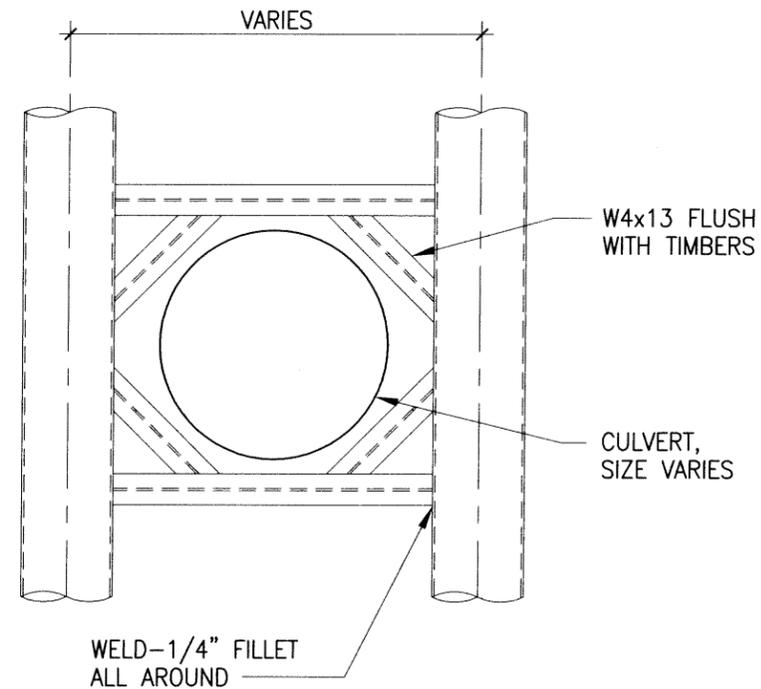
**3** TYPICAL WHALER CONNECTION DETAIL

1 1/2"=1'-0"



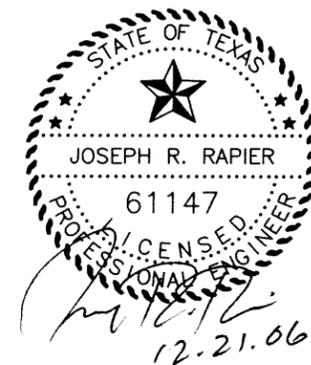
**2** TYPICAL EYEBOLT CONNECTION DETAIL

1 1/2"=1'-0"



**4** TYPICAL DETAIL AROUND CULVERT

1/2"=1'-0"



THIS DRAWING WAS PREPARED FOR NCRCS BY: **PSG**  
PARVALL SMITH & COOPER, INC.  
ENGINEERS - ARCHITECTS - PLANNERS

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DATE PLOTTED: DEC 2006

HEADWALL WITH TIMBERS AND STEEL PIPE PILES 11 FOOT MAXIMUM HEIGHT



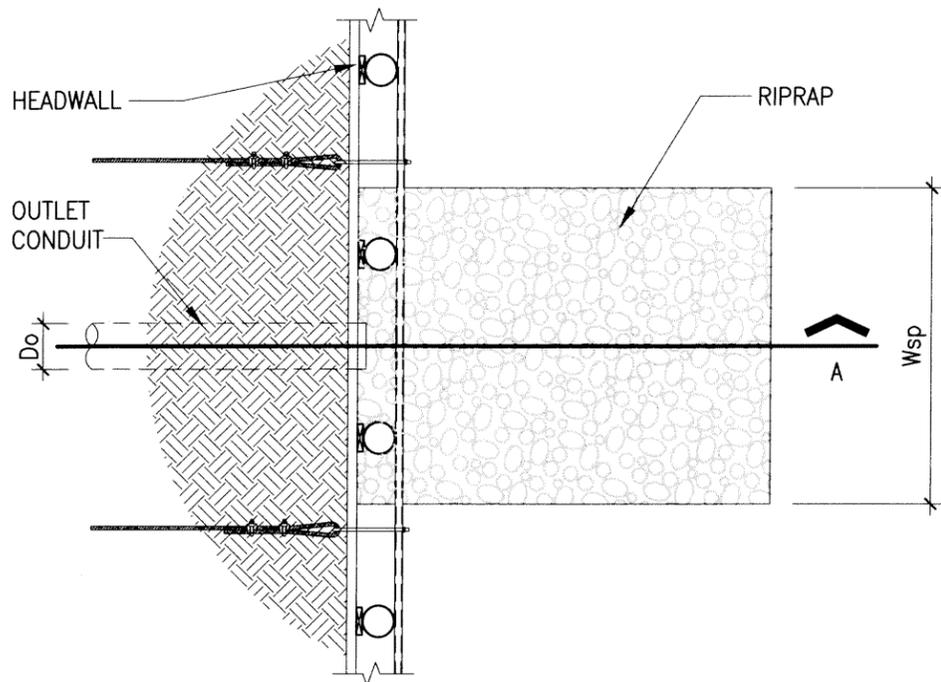
REVISIONS \_\_\_\_\_ DATE \_\_\_\_\_  
DRAWING NO. TX-EN-0501  
SHEET **2 of 5**

## GENERAL NOTES

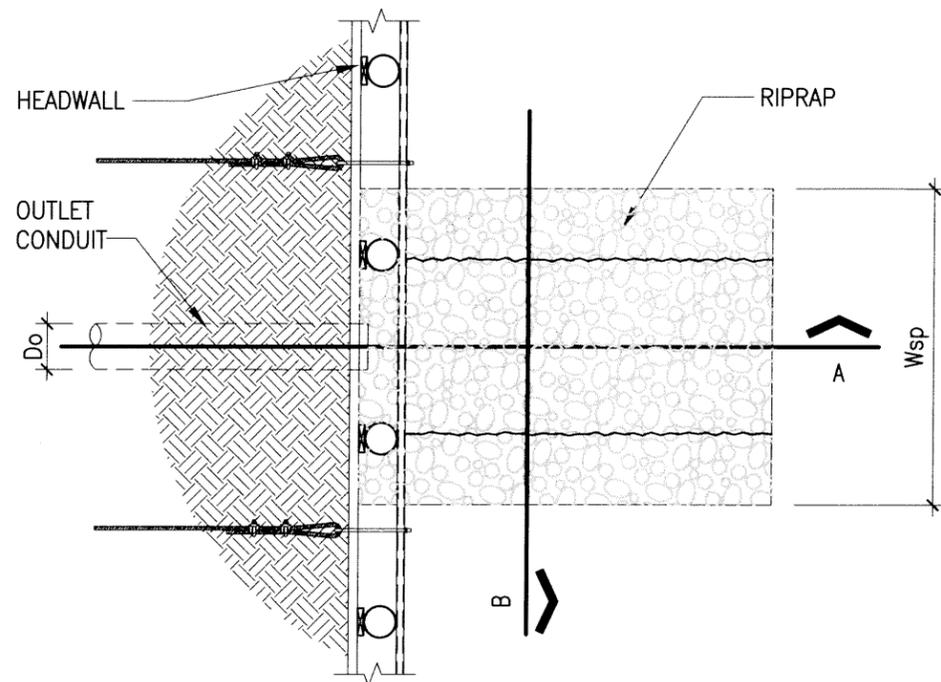
- A ALL LUMBER DIMENSIONS ARE NOMINAL DIMENSIONS. ALL LUMBER SHALL BE DOUGLAS FIR OR SOUTHERN PINE, NO. 2 GRADE. ALL LUMBER SHALL BE PRESSURE TREATED. ALL LUMBER SHALL BE PLACED ON THE INSIDE FACE OF THE STEEL PIPE PILES AS SHOWN.
- B ALL STEEL PIPE SHALL BE ASTM A501 GRADE STEEL. ALL STEEL PIPE DIMENSIONS ARE NOMINAL DIMENSIONS.
- C ALL STEEL PIPES SHALL HAVE A CAP PLATE WELDED WITH A CONTINUOUS 1/4" FILLET WELD. SPLICING OF STEEL MEMBERS IS PROHIBITED WITHOUT APPROVAL OF THE ENGINEER.
- D PILES MAY BE DRIVEN AND / OR EXCAVATED. IF EXCAVATION IS USED, USE A SATISFACTORY FILL, COMPACTED IN 6" MAXIMUM LOOSE LIFTS TO 95% OF MAXIMUM DENSITY PER ASTM D698-91.
- E ALL BOLTS SHALL BE ASTM A307.
- F THIS DRAWING DOES NOT PROVIDE PROVISIONS FOR TRENCH SAFETY OR THE SAFETY OF ANY WORKER IN OR AROUND THE EXCAVATION. THIS DRAWING DOES NOT INCLUDE CONFLICTS THAT MAY ARISE WITH UNDERGROUND OR OVERHEAD UTILITIES. THESE RESPONSIBILITIES SPECIFICALLY LIE WITH THE CONTRACTOR WHO IS RESPONSIBLE FOR METHODS AND MEANS OF CONSTRUCTION. THE CONTRACTOR WILL COMPLETE TX-EN-80, UTILITIES INVENTORY, PRIOR TO THE START OF ANY WORK AND PROVIDE A COPY TO THE APPORATE NRCS REPRESENTATIVE.
- G FOR HEADWALLS OF ALL HEIGHTS LOCATED IN HIGHLY PLASTIC SOILS (PI=25) GEOTECHNICAL TESTING AND ENGINEERING RECOMMENDATIONS ARE REQUIRED.
- H ALL PIPE SHALL BE SCHEDULE 40 UNLESS OTHERWISE NOTED.
- I GALVANIZED CABLE SHALL MEET ASTM A603.
- J EARTHFILL SHALL BE COMPACTED IN ACCORDANCE WITH CONSTRUCTION SPECIFICATIONS 23, EARTH-FILL, USING CLASS C COMPACTION AS PER THE ITEMS OF CONSTRUCTION DETAILS
- K DRAINFILL SHALL BE MATERIAL MEETING THE REQUIREMENTS OF METHOD OF CONSTRUCTION SPECIFICATIONS 24, DRAIN-FILL, AS PER THE ITEMS OF CONSTRUCTION DETAILS.
- L THE SITE SHALL BE ANALYZED TO DETERMINE IF RIPRAP OR OTHER EROSION CONTROL MEASURES ARE NECESSARY TO MINIMIZE EROSION ADJACENT TO THE STRUCTURE. AREAS TO BE PROTECTED SHALL BE SHOWN ON CURRENT SHEET 2 OF 3 AND DETAILED WITH NOTES TO ADEQUATELY DESCRIBE THE REQUIRED SIZE, EXTENT, THICKNESS, AND DEPTH. OPTIONAL ROCK RIPRAP OUTLET PROTECTION, SHEETS 4 OF 5 AND 5 OF 5 MAY BE USED.



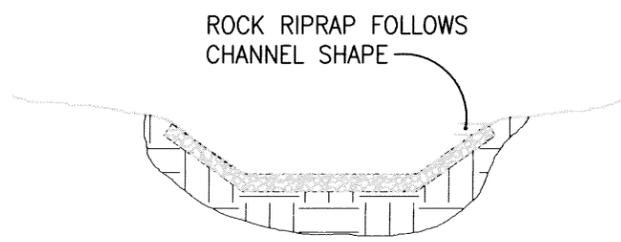
THIS DRAWING WAS PREPARED FOR NRCS BY: <div style="text-align: center;">                       PARKWELL SMITH &amp; COOPER, INC.                      ENGINEERS ARCHITECTS PLANNERS                 </div>	DESIGNED BY: MSL DRAWN BY: DLD CHECKED BY: JRR FILE NAME: DATE PLOTTED: DEC 2006
HEADWALL WITH TIMBERS AND STEEL PIPE PILES 11 FOOT MAXIMUM HEIGHT	
 <b>NRCS</b> Natural Resources Conservation Service U.S. Department of Agriculture	
REVISIONS	DATE
DRAWING NO. TX-EN-0501	
SHEET <b>3 of 5</b>	



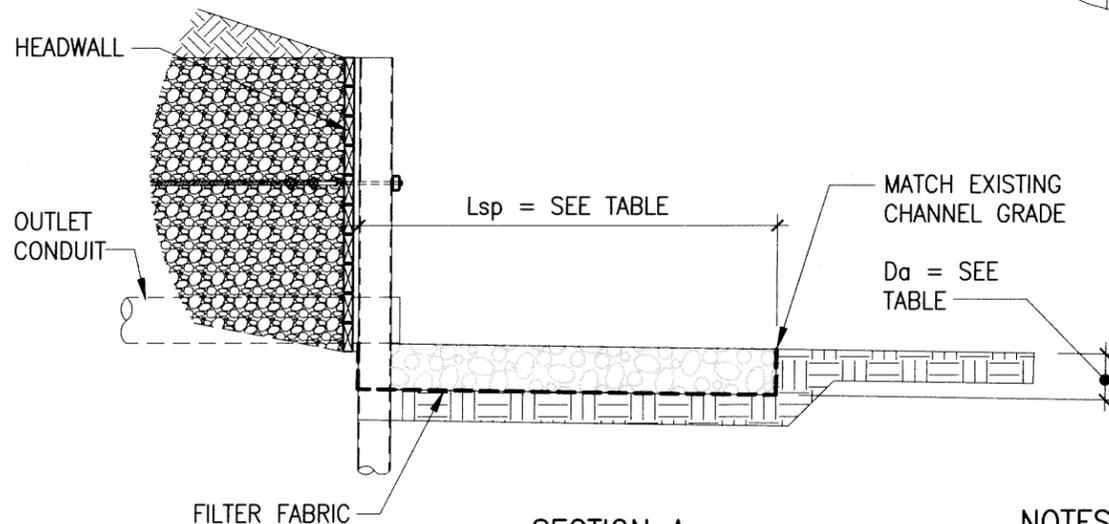
PLAN VIEW



PLAN VIEW

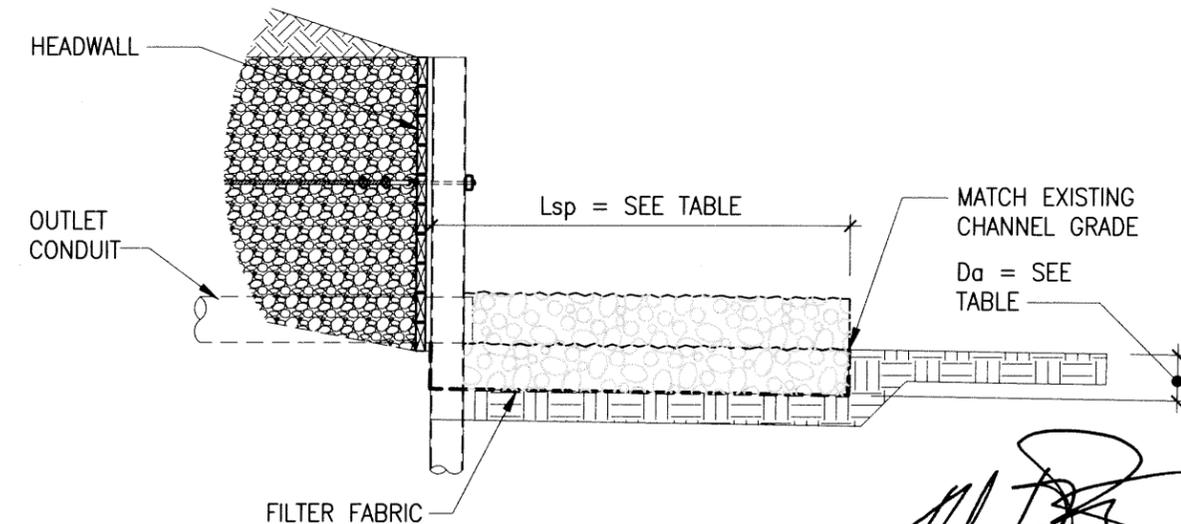


SECTION B



SECTION A

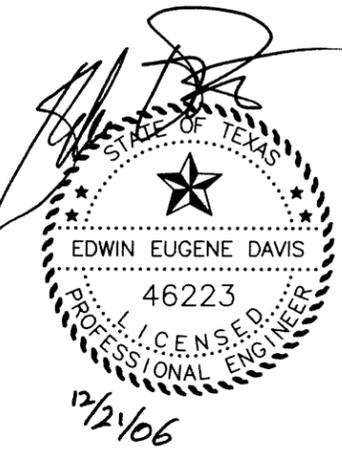
DOWNSTREAM CHANNEL NOT WELL DEFINED



SECTION A

DOWNSTREAM CHANNEL WELL DEFINED

- NOTES:
1.  $L_{sp}$  = LENGTH OF THE RIPRAP APRON. SEE TABLE
  2.  $D_a$  = DEPTH OF RIPRAP SEE TABLE
  3.  $W_{sp}$  = WIDTH OF RIPRAP SEE TABLE
  4. IN A WELL DEFINED CHANNEL FOLLOW CHANNEL SHAPE.
  5. FILTER FABRIC SHOULD BE INSTALLED BETWEEN THE RIPRAP AND SOIL FOUNDATON.



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 DRAWN BY: DLD  
 CHECKED BY: JRR  
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HEADWALL WITH TIMBERS AND STEEL PIPE PILES 11 FOOT MAXIMUM HEIGHT



REVISIONS DATE  
 DRAWING NO. TX-EN-0501  
 SHEET  
**4 of 5**

**OUTLET PROTECTION  
ROCK RIPRAP APRON**

PIPE DIAMETER	APRON DIMENSIONS				APRON QUANTITIES			
	LENGTH	WIDTH	ROCK SIZE	ROCK DEPTH	VOLUME	VOLUME	WEIGHT (165 lb/cf)	FILTER FABRIC AREA
	$L_{sp}$ (ft)	$W_{sp}$ (ft)	$D_{50}$ (inches)	$D_a$ (inches)	V (cf)	V (cy)	V (tons)	A (sy)
12	21	18	4	6	189	7	16	42
18	32	24	5	8	512	19	42	85
24	42	29	7	11	1,117	41	92	135
30	53	35	9	13	2,010	74	166	206
36	64	40	11	16	3,413	126	282	284
42	74	46	12	19	5,390	200	445	378
48	85	51	14	21	7,586	281	626	482
54	95	57	16	24	10,830	401	893	602
60	106	62	18	26	14,239	527	1175	730
66	116	68	19	29	19,063	706	1573	876
72	127	73	21	32	24,723	916	2040	1030

**CONSTRUCTION NOTES:**

1. THE MAXIMUM ROCK DIAMETER SHOULD BE  $1.5 \times d_{50}$ .  $d_{50}$  = THE MEDIAN ROCK SIZE IN A WELL GRADED APRON
2. THE ROCK SHALL CONSIST OF FIELD STONE OR ROUGH UNHEWN QUARRY STONE. THE STONE SHALL BE HARD AND ANGULAR AND OF A QUALITY THAT WILL NOT DISINTEGRATE ON EXPOSURE TO WATER OR WEATHERING.
3. GEOTEXTILE (FILTER FABRIC) SHALL BE PLACED BETWEEN THE APRON AND THE UNDERLYING SOIL TO PREVENT SOIL MOVEMENT INTO AND THROUGH THE RIPRAP.

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HEADWALL WITH TIMBERS AND STEEL PIPE PILES 11 FOOT MAXIMUM HEIGHT



REVISIONS      DATE  
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 \_\_\_\_\_  
 DRAWING NO.  
 TX-EN-0501  
 SHEET  
**5 of 5**