

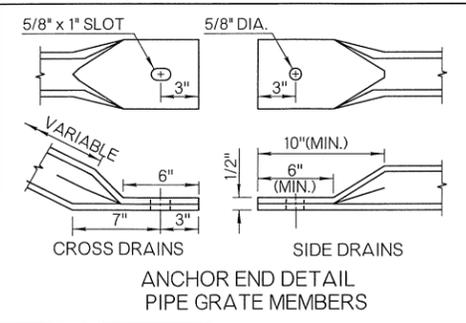
TABLE A - SCHEDULE OF PIPE SAFETY GRATES

CET TYPE	CULVERT TYPE				NO. OF GRATES	GRATE LENGTH L (SD)	NO. OF GRATES	GRATE LENGTH L (CD)	DIMENSION G
	REINF. CONC. STEEL OR ALUMINUM ROUND PIPE	REINF. CONC. ARCH PIPE	REINF. CONC. ELLIPTICAL PIPE (RISE x SPAN)	STEEL OR ALUMINUM ARCH PIPE					
AA4	18"			21" x 15"	2	5'-8"	NONE	12"	
		22" x 13"	14" x 23"	24" x 18"	2	6'-6"	NONE	12"	
					2	6'-8"	NONE	12"	
BB4	24"			28" x 20"	2	7'-8"	NONE	12"	
		28" x 18"	19" x 30"	35" x 24"	2	7'-8"	NONE	12"	
		36" x 22"	22" x 34"	49" x 33"	3	8'-6"	2	12'-0"	
			24" x 38"		3	8'-6"	2	12'-6"	
CC4	30"			42" x 29"	3	7'-10"	NONE	15"	
		43" x 26"		49" x 33"	3	10'-0"	2	13'-6"	
			29" x 45"		3	10'-0"	2	14'-3"	
		51" x 31"		64" x 43"	4	11'-8"	2	15'-3"	
			34" x 53"		4	11'-3"	2	15'-9"	
DD4	36"			57" x 38"	4	9'-8"	2	16'-6"	
	42"			64" x 43"	5	10'-4"	2	18'-9"	
		58" x 36"	38" x 60"		5	13'-4"	2	17'-3"	
EE4	48"			71" x 47"	5	14'-2"	4	19'-0"	
		73" x 45"	43" x 68"		5	14'-2"	4	19'-0"	
			48" x 76"		6	15'-0"	4	20'-6"	

TABLE B - SCHEDULE OF DIMENSIONS

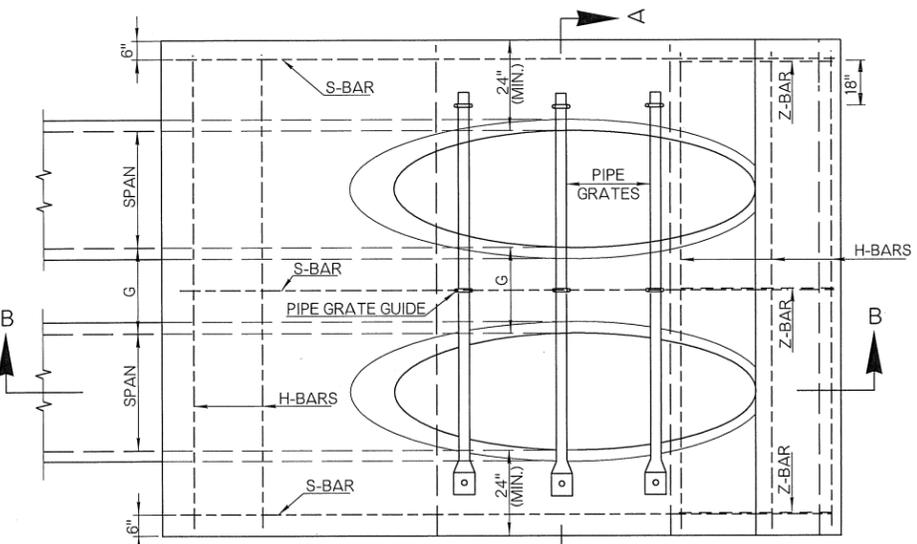
CET TYPE	LENGTH A	WIDTH BB	WIDTH BB	LENGTH C	HEIGHT H	HEIGHT K	CONC. CY	CONC. CY	STEEL LENGTH		
									H-BARS	H-BARS	S-BARS
AA4	10'-4"	8'-0"	9'-4"	5'-8"	21"	9"	2.45	2.90	7'-8"	9'-0"	12'-4"
BB4	12'-4"	9'-0"	11'-0"	6'-0"	22"	14"	2.95	3.75	8'-8"	10'-8"	15'-4"
CC4	15'-9"	10'-4"	14'-0"	7'-4"	26"	20"	4.45	5.75	10'-0"	13'-8"	19'-6"
DD4	19'-3"	12'-9"	16'-6"	8'-0"	28"	27"	6.00	8.00	12'-5"	16'-2"	21'-6"
EE4	20'-8"	14'-0"	18'-0"	8'-8"	30"	30"	7.35	9.30	13'-8"	17'-8"	23'-4"

(R) ROUND SHAPE CULVERT OPTIONS  
 (A) ARCH SHAPE CULVERT OPTIONS  
 (E) HORIZONTAL ELLIPSE SHAPE CULVERT OPTIONS  
 NOTE: FOR G DIMENSION, SEE TABLE A

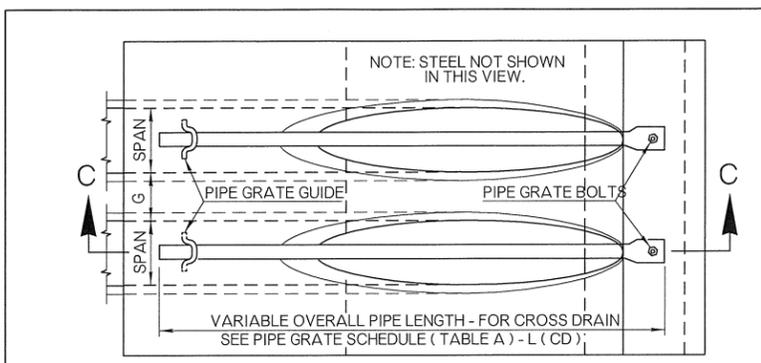


GENERAL NOTES

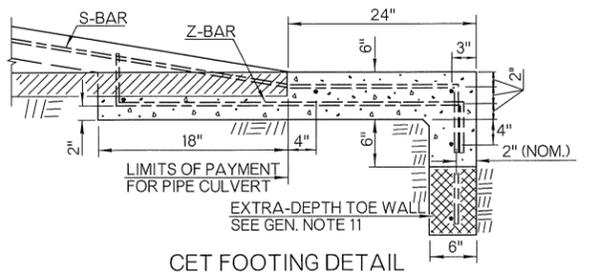
- ALL CONSTRUCTION AND MATERIAL REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE 2009 ODOT STANDARD SPECIFICATIONS.
- QUANTITIES SHOWN IN TABLE B ARE FOR ONE END ONLY. CLASS A CONCRETE SHALL CONFORM TO THE MINIMUM REQUIREMENTS OF SECTION 509 OF THE SPECIFICATIONS.
- TYPES AA4 THROUGH EE4 END SECTIONS, AS SHOWN IN TABLE B, MAY BE USED WITH ANY AASHTO DESIGNATED METAL, ALUMINUM & CONCRETE PIPE SIZES, AS SHOWN IN TABLE A. END SECTION QUANTITIES ARE BASED ON METAL PIPE DIMENSIONS, NO PIPE WALL THICKNESS AND SMALLEST LISTED ROUND OR ARCH CULVERT PIPE WITHIN TYPE.
- SLOPED END OF CULVERT PIPE SHALL BE SHOP CUT. TWO COATS OF COLD GALVANIZATION WILL BE APPLIED TO CUT EDGES OF STEEL CULVERT PIPE. COST OF CUTTING AND GALVANIZING IS INCLUDED IN THE PRICE BID FOR PIPE CULVERT.
- ALL SIZES OF CULVERT PIPE WILL BE CUT ON 1 TO 4 SLOPE.
- PIPE FOR SAFETY GRATES SHALL BE 3" x 7.58 LBS./FT. STANDARD WEIGHT STEEL PIPE, SCHEDULE 40. IT SHALL BE FURNISHED GALVANIZED, PLAIN END AND SHALL MEET THE MINIMUM REQUIREMENTS OF ASTM A53 (HYDROSTATIC TESTS MAY BE WAIVED) OR ASTM F1083. COST OF GRATES TO BE INCLUDED IN PRICE BID FOR THE CET.
- ANY GALVANIZED AREA(S) OF METAL PIPE DISTRESSED DURING THE POST FABRICATION AND/OR HANDLING PROCESS SHALL BE COATED WITH AN APPROVED ZINC RICH PAINT.
- REINFORCING STEEL AND PIPE GRATE GUIDES SHALL BE NO. 4 DEFORMED BARS. COST OF STEEL SHALL BE INCLUDED IN PRICE BID FOR THE CULV. END TREATMENT.
- CRITERIA FOR USE OF PIPE SAFETY GRATE MEMBERS:  
 (A) ALL SIDE DRAIN AND MULTIPLE PIPE INSTALLATIONS WITHIN THE CLEAR ZONE.  
 (B) ALL CROSS DRAIN INSTALLATIONS WITH A CULVERT SPAN OF 30" OR LARGER WITHIN THE CLEAR ZONE.  
 (C) ALL INSTALLATIONS OUTSIDE THE CLEAR ZONE WHERE HAZARD POTENTIAL IS HIGH BASED ON TRAFFIC DIRECTION, SPEED, VOLUME AND SIZE OF CULVERT. NOTE: ANALYZE HYDRAULIC PERFORMANCE AT VARYING DEGREES OF CLOGGING AND APPLY RISK ASSESSMENT BEFORE USING GRATES.
- ANCHOR END OF PIPE GRATE MEMBERS SHALL BE HELD IN PLACE WITH A 1/2" x 5/16" GALVANIZED BOLT, NUT AND WASHER, THREDS, 1 3/4" (NOM.) SHALL REMAIN EXPOSED FOR INSTALLING GRATE, WASHER AND NUT. ALL BOLTS, NUTS AND WASHERS SHALL CONFORM TO ASTM A307 WITH COST TO BE INCLUDED IN THE PRICE BID FOR THE CULVERT END TREATMENT.
- FOR TOTAL QUANTITY OF EXTRA DEPTH TOE WALL, MULTIPLY WIDTH BB TIMES 0.0185 FOR EACH FOOT OF DEPTH OF TOE WALL REQUIRED. PAYMENT TO BE INCLUDED IN PRICE BID FOR THE CULVERT END TREATMENT.



PLAN (SIDE DRAIN SHOWN)



SECTION C - C  
 INSTALLATION DETAIL  
 CROSS DRAIN WITH PIPE GRATE



CET FOOTING DETAIL

TYPICAL ABBREVIATIONS

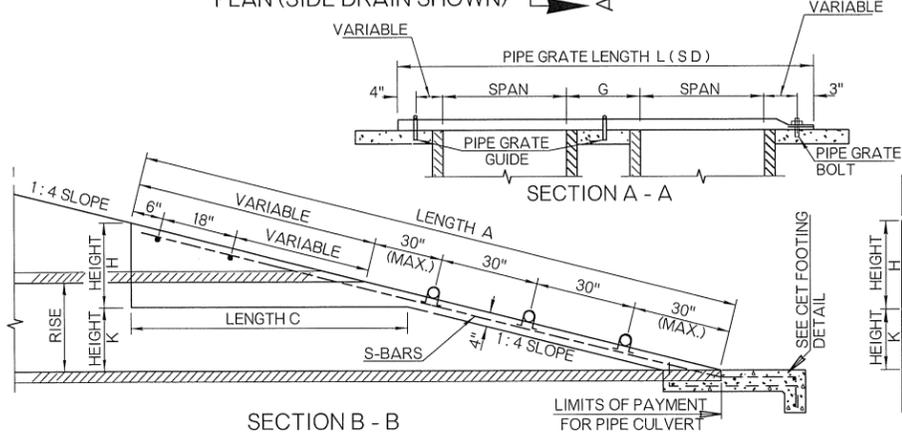
RS	ROUND SIDE DRAIN
RC	ROUND CROSS DRAIN
AS	ARCH SIDE DRAIN
AC	ARCH CROSS DRAIN
GR	GRATED
NG	NON-GRATED

PRECAST CULVERT END TREATMENTS OR OTHER ALTERNATIVE DESIGNS MAY BE USED IF APPROPRIATE DRAWINGS ARE SUBMITTED TO AND APPROVED BY THE ENGINEER.

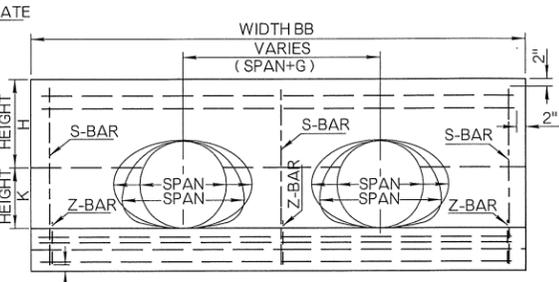
BASIS OF PAYMENT

ITEM NO.	ITEM	UNIT
613 (M)	CULVERT END TREATMENT	EA

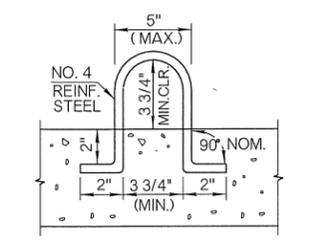
- SPECIFY TYPE OF END TREATMENT (EXAMPLE: TYPE BB4 CULVERT END TREATMENT)
- CET ORIENTATION AND SAFETY GRATE REQUIREMENTS SHALL BE SPECIFIED ON THE SUMMARY OF DRAINAGE STRUCTURES. (SEE TYPICAL ABBREVIATIONS)



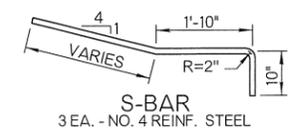
SECTION B - B



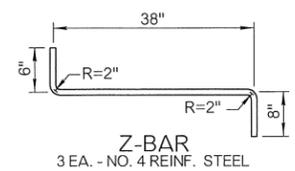
END VIEW  
 (PIPE GRATES NOT SHOWN THIS VIEW)



PIPE GRATE GUIDE (U-BOLT)



S-BAR  
 3 EA. - NO. 4 REINF. STEEL



Z-BAR  
 3 EA. - NO. 4 REINF. STEEL

APPROVED BY ROADWAY ENGINEER: *Caleb F. A.* DATE: 04/16/15  
 ROADWAY DESIGN DIVISION STANDARD  
**DOT**  
 CULVERT END TREATMENT  
 DOUBLE PIPE INSTALLATION  
 1 TO 4 SAFETY SLOPE  
 OKLAHOMA DEPARTMENT OF TRANSPORTATION  
 2009 SPECIFICATIONS

CET4D-3	2
	R-28