

TABLES OF DIMENSIONS & REINFORCEMENT - 75° SKEW - (ONE WALL)																														
OPENING		DIMENSIONS										REINFORCEMENT																		
		WALL					FOOTING & CUT-OFF WALL					BARS VS #4		BARS VS ₁ #4		BARS VS #5		BARS VS ₁ #5		BARS L _S #4		BARS D _S #4		BARS T _{S1} #4		BARS T _{S2} #4		BARS H _S #4		
PIPE SIZE [#]	AREA SQ. FT.	"L"	"H"	"VO"	"a"	"b"	"d"	"e"	"f"	"g"	"h"	"c"	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.
46"x46"	12.87	19'-6"	5'-8½"	4'-8½"	9'-9"	9'-9"	11½"	7"	9"	1'-2"	2'-6"	5'-0"	17	6'-9"	—	—	—	—	—	—	6	19'-0"	10	1'-6"	5	6'-6"	5	6'-6"	20	2'-0"
57"x57"	19.81	24'-0"	6'-10"	5'-10"	12'-0"	12'-0"	1'-0"	8½"	10"	1'-7½"	3'-2"	6'-0"	23	8'-3"	—	—	—	—	—	—	6	23'-6"	12	1'-6"	6	8'-6"	6	8'-6"	29	2'-9"
68"x68"	28.00	29'-6"	8'-2"	7'-2"	14'-9"	14'-9"	1'-0"	1'-0"	1'-0"	1'-10"	3'-10"	7'-0"	34	10'-0"	—	—	—	—	—	—	6	29'-0"	14	1'-6"	7	10'-0"	7	10'-0"	39	3'-3"
CATTLE PASS	—	27'-0"	8'-0"	7'-0"	13'-6"	13'-6"	1'-0"	1'-0"	1'-0"	1'-10"	3'-10"	—	33	9'-9"	—	—	—	—	—	—	6	26'-6"	—	—	7	10'-0"	7	10'-0"	36	3'-3"
80"x80"	38.90	33'-6"	9'-2"	8'-2"	16'-9"	16'-9"	1'-1"	1'-2"	1'-1½"	2'-2½"	4'-6"	7'-0"	50	11'-3"	—	—	—	—	—	—	6	33'-0"	14	1'-6"	8	12'-0"	8	11'-6"	50	4'-0"
91"x91"	50.40	37'-6"	10'-0½"	9'-0½"	18'-9"	18'-9"	1'-2½"	1'-4"	1'-3"	2'-5"	5'-0"	8'-0"	34	12'-9"	32	5'-9"	—	—	—	—	6	37'-0"	16	1'-6"	9	13'-6"	9	13'-0"	64	4'-6"
97"x97"	57.30	40'-0"	10'-8"	9'-8"	20'-0"	20'-0"	1'-4"	1'-6"	1'-4"	2'-8"	5'-6"	9'-0"	—	—	—	—	19	13'-9"	18	7'-0"	6	39'-6"	18	1'-6"	10	14'-3"	10	14'-3"	80	5'-0"

TABLES OF DIMENSIONS & REINFORCEMENT - 60° SKEW - (ONE WALL)																																
OPENING		DIMENSIONS										REINFORCEMENT																				
		WALL					FOOTING & CUT-OFF WALL					BARS VS #4		BARS VS ₁ #4		BARS VS #5		BARS VS ₁ #5		BARS LS #4		BARS DS #4		BARS TS ₁ #4		BARS TS ₂ #4		BARS HS #4				
PIPE SIZE [#]	AREA SQ.FT.	"L"	"H"	"VO"	"a"	"b"	"d"	"e"	"f"	"g"	"h"	"c"	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.
46"x46"	12.87	20'-9"	5'-8½"	4'-8½"	9'-9"	11'-0"	11½"	7"	9"	1'-2"	2'-6"	5'-6"	17	6'-9"	—	—	—	—	—	—	6	20'-3"	11	1'-6"	5	8'-0"	5	6'-6"	21	2'-0"		
57"x57"	19.81	25'-6"	6'-10"	5'-10"	12'-0"	13'-6"	1'-0"	8½"	10"	1'-7½"	3'-2"	6'-6"	24	8'-3"	—	—	—	—	—	—	6	25'-0"	13	1'-6"	6	10'-0"	6	7'-6"	31	2'-9"		
68"x68"	28.00	31'-3"	8'-2"	7'-2"	14'-9"	16'-6"	1'-0"	1'-0"	1'-0"	1'-10"	3'-10"	7'-6"	35	10'-0"	—	—	—	—	—	—	6	30'-9"	15	1'-6"	7	12'-0"	7	9'-3"	42	3'-3"		
CATTLE PASS	—	28'-6"	8'-0"	7'-0"	13'-6"	15'-0"	1'-0"	1'-0"	1'-0"	1'-10"	3'-10"	—	35	9'-9"	—	—	—	—	—	—	6	28'-0"	—	—	7	12'-0"	7	10'-0"	38	3'-3"		
80"x80"	38.90	35'-9"	9'-2"	8'-2"	17'-0"	18'-9"	1'-1"	1'-2"	1'-1½"	2'-2½"	4'-6"	7'-6"	51	11'-3"	—	—	—	—	—	—	6	35'-3"	15	1'-6"	8	13'-0"	8	11'-0"	54	4'-0"		
91"x91"	50.40	39'-9"	10'-0½"	9'-0½"	18'-9"	21'-0"	1'-2½"	1'-4"	1'-3"	2'-5"	5'-0"	8'-6"	37	12'-9"	34	5'-9"	—	—	—	—	6	39'-3"	17	1'-6"	9	15'-9"	9	12'-6"	67	4'-6"		
97"x97"	57.30	42'-3"	10'-8"	9'-8"	20'-0"	22'-3"	1'-4"	1'-6"	1'-4"	2'-8"	5'-6"	9'-6"	—	—	—	—	21	13'-9"	18	7'-0"	6	41'-9"	19	1'-6"	10	16'-9"	10	13'-6"	84	5'-0"		

TABLES OF DIMENSIONS & REINFORCEMENT - 45° SKEW - (ONE WALL)																																		
OPENING		DIMENSIONS										REINFORCEMENT																						
		WALL					FOOTING & CUT-OFF WALL					BARS VS #4		BARS VS ₁ #4		BARS VS #5		BARS VS ₁ #5		BARS LS #4		BARS DS #4		BARS TS ₁ #4		BARS TS ₂ #4		BARS HS #4						
PIPE SIZE [#]	AREA SO.FT.	"L"	"H"	"VO"	"a"	"b"	"d"	"e"	"f"	"g"	"h"	"c"	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.		
46"x46"	12.87	23'-9"	5'-8½"	4'-8½"	10'-6"	13'-3"	11½"	7"	9"	1'-2"	2'-6"	6'-0"	18	6'-9"	—	—	—	—	—	—	6	23'-3"	12	1'-6"	5	9'-0"	5	6'-0"	24	2'-0"	—	—		
57"x57"	19.81	29'-3"	6'-10"	5'-10"	12'-9"	16'-6"	1'-0"	8½"	10"	1'-7½"	3'-2"	7'-0"	27	8'-3"	—	—	—	—	—	—	6	28'-9"	14	1'-6"	6	12'-6"	6	7'-6"	35	2'-9"	—	—		
68"x68"	28.00	36'-0"	8'-2"	7'-2"	15'-9"	20'-3"	1'-0"	1'-0"	1'-0"	1'-10"	3'-10"	8'-0"	40	10'-0"	—	—	—	—	—	—	6	35'-6"	16	1'-6"	7	15'-3"	7	9'-3"	48	3'-3"	—	—		
CATTLE PASS	—	32'-6"	8'-0"	7'-0"	14'-0"	18'-6"	1'-0"	1'-0"	1'-0"	1'-10"	3'-10"	—	38	9'-9"	—	—	—	—	—	—	6	32'-0"	—	—	7	14'-9"	7	8'-6"	43	3'-3"	—	—		
80"x80"	38.90	40'-9"	9'-2"	8'-2"	18'-0"	22'-9"	1'-1"	1'-2"	1'-1½"	2'-2½"	4'-6"	8'-0"	60	11'-3"	—	—	—	—	—	—	6	40'-3"	16	1'-6"	8	17'-6"	8	11'-0"	61	4'-0"	—	—		
91"x91"	50.40	45'-6"	10'-0½"	9'-0½"	20'-0"	25'-6"	1'-2½"	1'-4"	1'-3"	2'-5"	5'-0"	9'-0"	40	12'-9"	38	5'-9"	—	—	—	—	6	45'-0"	18	1'-6"	9	19'-3"	9	12'-3"	78	4'-6"	—	—		
97"x97"	57.30	48'-6"	10'-8"	9'-8"	21'-3"	27'-3"	1'-4"	1'-6"	1'-4"	2'-8"	5'-6"	10'-0"	—	—	—	—	—	—	—	23	13'-9"	21	7'-0"	6	48'-0"	20	1'-6"	10	21'-0"	10	13'-3"	97	5'-0"	—

PIPE SIZE: DIMENSIONS SHOWN ARE INSIDE DIMENSIONS - SEE PIPE DETAIL SHEET.

ESTIMATED QUANTITIES (ONE WALL)									
PIPE SIZE	CONC.-TOT. CU.YDS.*			CONC. PER. FT. CU.YDS.	REINF.-TOTAL LBS.*			REINF. PER. FT. LBS.	
	SKEWS				SKEWS				
	75°	60°	45°		75°	60°	45°		
46"x46"	4.5	4.8	5.4	0.247	238	246	269	13.641	
57"x57"	7.0	7.4	8.4	0.318	355	374	424	16.884	
68"x68"	10.9	11.5	13.0	0.407	541	564	651	21.663	
CATTLE PASS	9.8	10.1	11.6	0.401	494	527	580	21.412	
80"x80"	15.1	16.0	18.0	0.501	784	815	947	28.475	
91"x91"	20.0	20.8	23.5	0.596	931	994	1112	30.092	
97"x97"	24.5	25.7	29.2	0.683	1039	1102	1249	30.405	

*INCLUDES CUT-OFF WALL

NOTE: CUT-OFF WALL PER FT. SAME FOR ALL SKEWS & PIPE SIZES - EQUALS 0.03 CU. YDS. CONC. & 1 LB. REINFORCING STEEL.

TABLE OF DIMENSION "X"					
PIPE SIZE	59'-46"	44'-36"	35'-26"	25'-15"	
	"X"	"X"	"X"	"X"	
46"x46"	1'-0"	1'-9"	3'-0"	6'-9"	
57"x57"	1'-3"	2'-0"	3'-9"	8'-3"	
68"x68"	1'-6"	2'-6"	4'-6"	10'-0"	
CATTLE PASS	1'-0"	1'-9"	3'-3"	7'-3"	
80"x80"	1'-9"	2'-9"	5'-0"	11'-6"	
91"x91"	2'-0"	3'-3"	5'-9"	13'-0"	
97"x97"	2'-0"	3'-9"	6'-3"	13'-9"	

GENERAL NOTES

- ① FORMULA FOR WALL LENGTH "L" FOR INTERMEDIATE SKEW ANGLES BETWEEN 75° & 60°:
- ① WALL LENGTH PORTION "a" REMAINS SAME AS SHOWN FOR 75° SKEW FOR RESPECTIVE PIPE SIZES.
- ② WALL LENGTH PORTION "b" EQUALS WALL LENGTH "a" (AS SHOWN FOR 75° SKEW FOR RESPECTIVE PIPE SIZES) DIVIDED BY SINE OF REQUIRED SKEW ANGLE,
- ③ OR, "L"="a"+"a"/SINE OF REQUIRED SKEW ANGLE.
- ② FOR INTERMEDIATE SKEW ANGLES LESS THAN 60°:
- ① WALL PORTION "a"="a" AS SHOWN IN ① ABOVE PLUS "X" AS SHOWN IN TABLE,
- ② WALL PORTION "b" SAME AS SHOWN IN ② ABOVE,
- ③ OR, "L"="a"+"X"+"a"/SINE OF REQUIRED SKEW ANGLE.
- ③ FOR WALL LENGTH FOR SKEWS 75°-85°, USE WALL LENGTHS AS SHOWN FOR 75° FOR RESPECTIVE PIPE SIZES.
- ④ FOR CUT-OFF WALL LENGTHS FOR SKEWS LESS THAN 75°, DIVIDE TWICE THE LENGTH OF "C" (SHOWN FOR 75° SKEW FOR RESPECTIVE PIPE SIZES) BY THE SINE OF THE REQUIRED SKEW ANGLE.

SHEET TO BE USED FOR
75°, 60° & 45° SKEWS

MINOR REVISION -- FHWA
APPROVAL NOT REQUIRED.

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION

STANDARD
STRAIGHT ENDWALLS
FLATBASE CONCRETE
PIPES

D-PE-7

PIPE SIZE	#4 BARS HS @ 12" C.C.- 19 SPA.	SKEW 75°
46"x46"	#4 BARS HS @ 12" C.C.- 20 SPA.	60°
46"x46"	#4 BARS HS @ 12" C.C.- 23 SPA.	45°
57"x57"	#4 BARS HS @ 10" C.C.- 28 SPA.	75°
57"x57"	#4 BARS HS @ 10" C.C.- 30 SPA.	60°
57"x57"	#4 BARS HS @ 10" C.C.- 34 SPA.	45°
68"x68"	#4 BARS HS @ 9" C.C.- 38 SPA.	75°
68"x68"	#4 BARS HS @ 9" C.C.- 41 SPA.	60°
68"x68"	#4 BARS HS @ 9" C.C.- 47 SPA.	45°
CATTLE PASS	#4 BARS HS @ 9" C.C.- 35 SPA.	75°
CATTLE PASS	#4 BARS HS @ 9" C.C.- 37 SPA.	60°
CATTLE PASS	#4 BARS HS @ 9" C.C.- 42 SPA.	45°
80"x80"	#4 BARS HS @ 8" C.C.- 49 SPA.	75°
80"x80"	#4 BARS HS @ 8" C.C.- 53 SPA.	60°
80"x80"	#4 BARS HS @ 8" C.C.- 60 SPA.	45°
91"x91"	#4 BARS HS @ 7" C.C.- 63 SPA.	75°
91"x91"	#4 BARS HS @ 7" C.C.- 66 SPA.	60°
91"x91"	#4 BARS HS @ 7" C.C.- 77 SPA.	45°
97"x97"	#4 BARS HS @ 6" C.C.- 79 SPA.	75°
97"x97"	#4 BARS HS @ 6" C.C.- 83 SPA.	60°
97"x97"	#4 BARS HS @ 6" C.C.- 96 SPA.	45°

PLAN-LEFT SKEW
SHOWING REINFORCING IN FOOTING

75° SKEW 4"	#4 BARS VS @ 8" C.C.-16 SPA.	68"x68" PIPE	#4 BARS VS @ 8" C.C.-15 SPA.	4"
60° SKEW 4"	#4 BARS VS @ 8" C.C.-18 SPA.	68"x68" PIPE	#4 BARS VS @ 8" C.C.-14 SPA.	4"
45° SKEW 4"	#4 BARS VS @ 8" C.C.-23 SPA.	68"x68" PIPE	#4 BARS VS @ 8" C.C.-14 SPA.	4"
75° SKEW 4"	#4 BARS VS @ 8" C.C.-15 SPA.	CATTLE PASS	#4 BARS VS @ 8" C.C.-15 SPA.	4"
60° SKEW 4"	#4 BARS VS @ 8" C.C.-18 SPA.	CATTLE PASS	#4 BARS VS @ 8" C.C.-15 SPA.	4"
45° SKEW 4"	#4 BARS VS @ 8" C.C.-22 SPA.	CATTLE PASS	#4 BARS VS @ 8" C.C.-13 SPA.	4"
75° SKEW 4"	#4 BARS VS @ 6" C.C.-24 SPA.	80"x80" PIPE	#4 BARS VS @ 6" C.C.-23 SPA.	4"
60° SKEW 4"	#4 BARS VS @ 6" C.C.-26 SPA.	80"x80" PIPE	#4 BARS VS @ 6" C.C.-22 SPA.	4"
45° SKEW 4"	#4 BARS VS @ 6" C.C.-35 SPA.	80"x80" PIPE	#4 BARS VS @ 6" C.C.-22 SPA.	4"

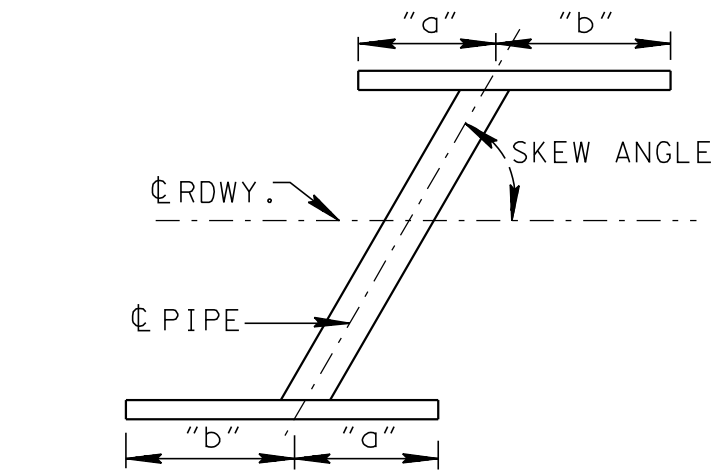
ELEVATION A-A

68" x 68" PIPE, CATTLE PASS, & 80" x 80" PIPE
NOTE: FOR CATTLE PASS OMIT CUT-OFF WALL.

75° SKEW 4"	#5 VS BARS @ 10" C.C.-17 SPA.	97"x97" PIPE	#5 VS BARS @ 10" C.C.-17 SPA.	4"
60° SKEW 4"	#5 VS BARS @ 10" C.C.-20 SPA.	97"x97" PIPE	#5 VS BARS @ 10" C.C.-16 SPA.	4"
45° SKEW 4"	#5 VS BARS @ 10" C.C.-25 SPA.	97"x97" PIPE	#5 VS BARS @ 10" C.C.-16 SPA.	4"

ELEVATION A-A

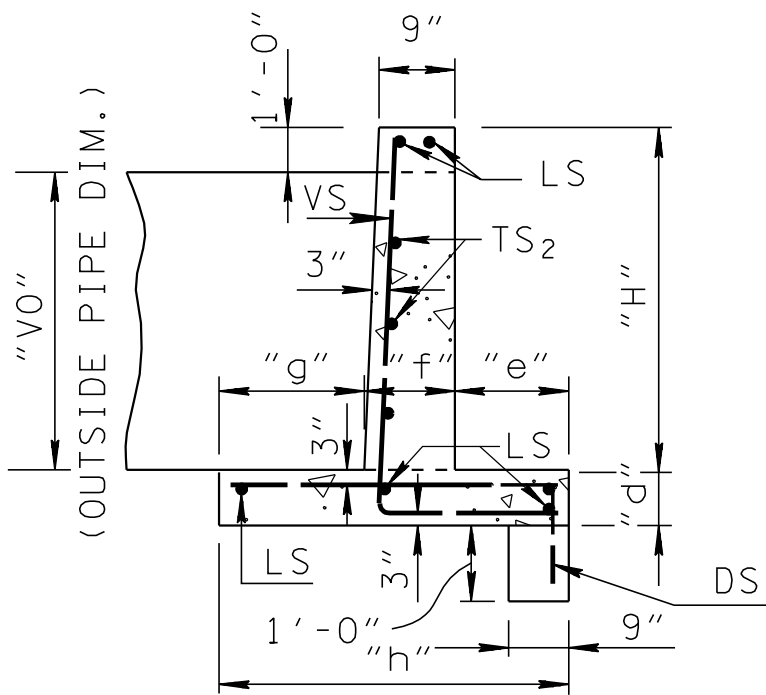
97" x 97" PIPE



SKETCH OF PIPE LAYOUT

LEFT SKEW

NOTE: RIGHT SKEW SAME BUT OPPOSITE HAND.



SECTION B-B

75° SKEW 4"	#4 VS BARS @ 5" C.C.-32 SPA.	91"x91" PIPE	#4 VS BARS @ 5" C.C.-31 SPA.	4"
60° SKEW 4"	#4 VS BARS @ 5" C.C.-38 SPA.	91"x91" PIPE	#4 VS BARS @ 5" C.C.-30 SPA.	4"
45° SKEW 4"	#4 VS BARS @ 5" C.C.-46 SPA.	91"x91" PIPE	#4 VS BARS @ 5" C.C.-29 SPA.	4"

ELEVATION A-A

91" x 91" PIPE

Technical drawing of a bridge deck cross-section showing reinforcement details. The drawing includes dimensions for width (b, a), height (1'-0"), and skew angle. Reinforcement includes #4 bars TS1 and TS2, #4 bars LS, #4 bars VS (BEND IN FIELD), and DOWEL BARS DS.

Skew Angle	Top Reinforcement (TS1)	Bottom Reinforcement (TS2)	Side Reinforcement (LS)	Vertical Reinforcement (VS)	Dowel Bars (DS)
75° SKEW 4"	#4 BARS VS @ 11" C.C.-7 SPA.	#4 BARS VS @ 11" C.C.-7 SPA.	#4 BARS VS @ 11" C.C.-7 SPA.	#4 BARS VS @ 11" C.C.-7 SPA.	46"x46" PIPE
60° SKEW 4"	#4 BARS VS @ 12" C.C.-8 SPA.	#4 BARS VS @ 12" C.C.-6 SPA.	#4 BARS VS @ 12" C.C.-6 SPA.	#4 BARS VS @ 12" C.C.-6 SPA.	46"x46" PIPE
45° SKEW 4"	#4 BARS VS @ 12" C.C.-9 SPA.	#4 BARS VS @ 12" C.C.-6 SPA.	#4 BARS VS @ 12" C.C.-6 SPA.	#4 BARS VS @ 12" C.C.-6 SPA.	46"x46" PIPE
75° SKEW 4"	#4 BARS VS @ 10" C.C.-10 SPA.	#4 BARS VS @ 10" C.C.-10 SPA.	#4 BARS VS @ 10" C.C.-10 SPA.	#4 BARS VS @ 10" C.C.-10 SPA.	57"x57" PIPE
60° SKEW 4"	#4 BARS VS @ 10" C.C.-12 SPA.	#4 BARS VS @ 10" C.C.-9 SPA.	#4 BARS VS @ 10" C.C.-9 SPA.	#4 BARS VS @ 10" C.C.-9 SPA.	57"x57" PIPE
45° SKEW 4"	#4 BARS VS @ 10" C.C.-15 SPA.	#4 BARS VS @ 10" C.C.-9 SPA.	#4 BARS VS @ 10" C.C.-9 SPA.	#4 BARS VS @ 10" C.C.-9 SPA.	57"x57" PIPE