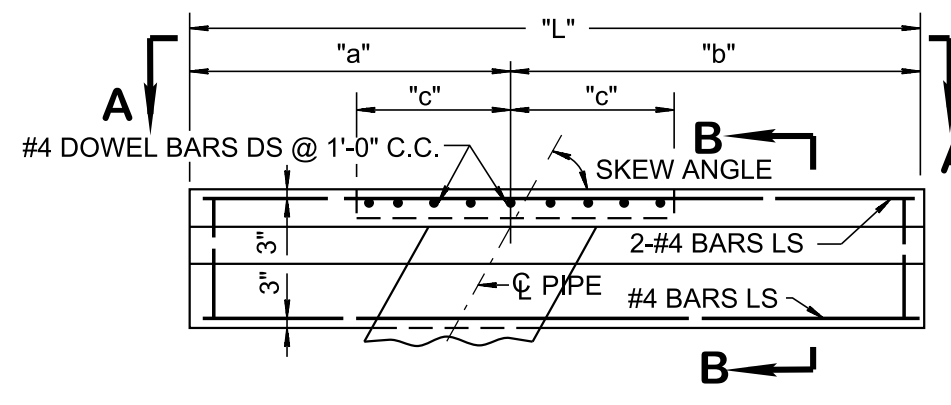


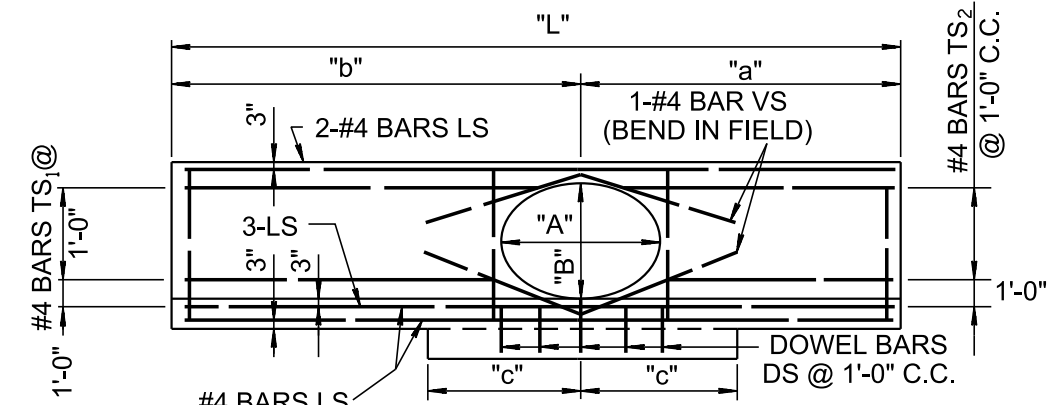
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REV. 7-1-76: CHANGED DEPARTMENT NAME.
 REV. 1-11-76: CHANGED DWG. FROM M-5-106 TO D-PE-5.
 REV. 5-27-01: REPLACED WITH CADD DRAWING.
 REV. 06-28-19: REVISED SHEET NAME AND REDREW SHEET.



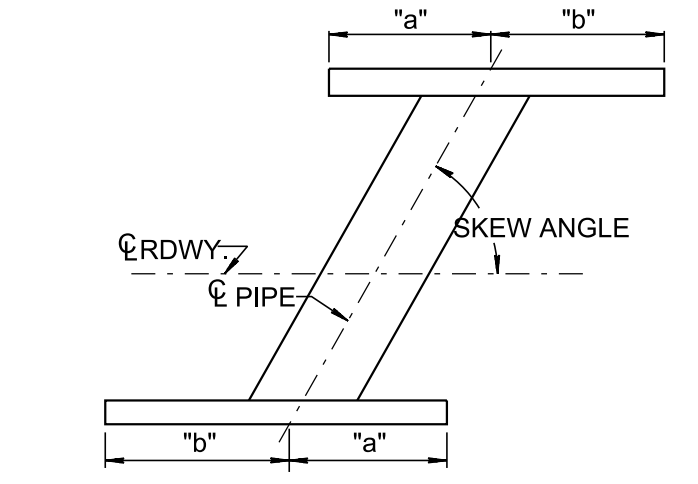
PIPE SIZE "A" "B"	#4 BARS HS @ 12" C.C.	SPA.	SKEW
23" 14"	7	SPA.	75°
23" 14"	7	SPA.	60°
23" 14"	9	SPA.	45°
30" 19"	9	SPA.	75°
30" 19"	10	SPA.	60°
30" 19"	11	SPA.	45°
34" 22"	10	SPA.	75°
34" 22"	11	SPA.	60°
34" 22"	13	SPA.	45°
38" 24"	11	SPA.	75°
38" 24"	12	SPA.	60°
38" 24"	14	SPA.	45°
45" 29"	14	SPA.	75°
45" 29"	15	SPA.	60°
45" 29"	17	SPA.	45°
53" 34"	16	SPA.	75°
53" 34"	17	SPA.	60°
53" 34"	20	SPA.	45°
60" 38"	18	SPA.	75°
60" 38"	19	SPA.	60°
60" 38"	23	SPA.	45°
68" 43"	20	SPA.	75°
68" 43"	22	SPA.	60°
68" 43"	25	SPA.	45°
76" 48"	23	SPA.	75°
76" 48"	24	SPA.	60°
76" 48"	28	SPA.	45°
83" 53"	30	SPA.	75°
83" 53"	32	SPA.	60°
83" 53"	37	SPA.	45°
91" 58"	33	SPA.	75°
91" 58"	35	SPA.	60°
91" 58"	41	SPA.	45°

PLAN - LEFT SKEW
 SHOWING REINFORCING IN FOOTING FOR ALL PIPE SIZES & ALL SKEWS EXCEPT 90° SEE PIPE LAYOUT SKETCH

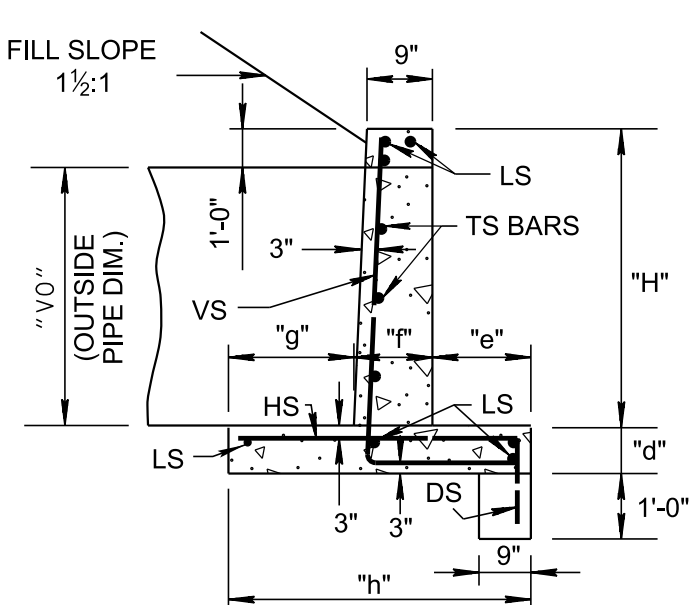


PIPE SIZE "A" "B"	#4 BARS VS @ 12" C.C.	SPA.	SKEW
23" 14"	2	SPA.	75°
23" 14"	2	SPA.	60°
23" 14"	3	SPA.	45°
30" 19"	3	SPA.	75°
30" 19"	3	SPA.	60°
30" 19"	4	SPA.	45°
34" 22"	3	SPA.	75°
34" 22"	4	SPA.	60°
34" 22"	5	SPA.	45°
38" 24"	3	SPA.	75°
38" 24"	4	SPA.	60°
38" 24"	5	SPA.	45°
45" 29"	4	SPA.	75°
45" 29"	5	SPA.	60°
45" 29"	7	SPA.	45°
53" 34"	5	SPA.	75°
53" 34"	6	SPA.	60°
53" 34"	8	SPA.	45°
60" 38"	6	SPA.	75°
60" 38"	7	SPA.	60°
60" 38"	9	SPA.	45°
68" 43"	7	SPA.	75°
68" 43"	8	SPA.	60°
68" 43"	10	SPA.	45°
76" 48"	7	SPA.	75°
76" 48"	9	SPA.	60°
76" 48"	11	SPA.	45°
83" 53"	8	SPA.	75°
83" 53"	11	SPA.	60°
83" 53"	12	SPA.	45°
91" 58"	9	SPA.	75°
91" 58"	12	SPA.	60°
91" 58"	15	SPA.	45°

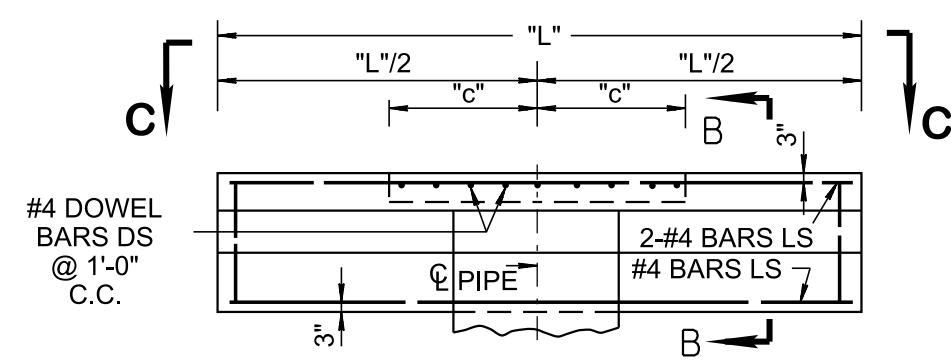
ELEVATION A-A
 NOTE: OMIT CUT-OFF WALL ON PIPE SIZES 23" x 14" & 30" x 19"



SKETCH OF PIPE LAYOUT LEFT SKEW
 NOTE: RIGHT SKEW SAME BUT OPPOSITE HAND.

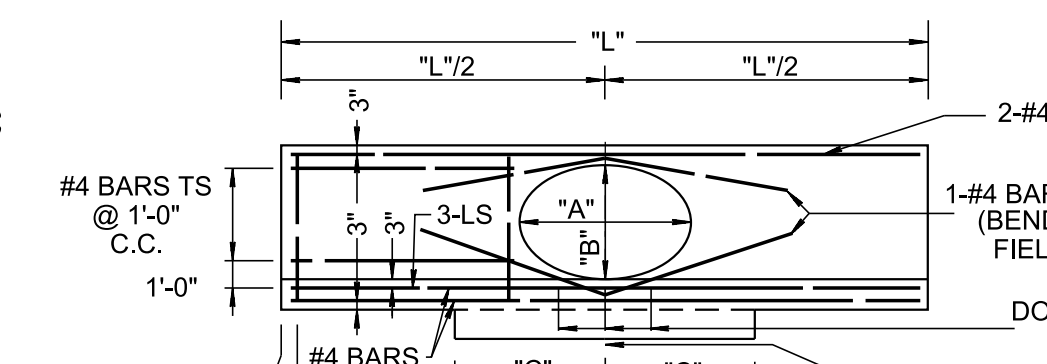


SECTION B-B
 TYPICAL FOR ALL SKEWS



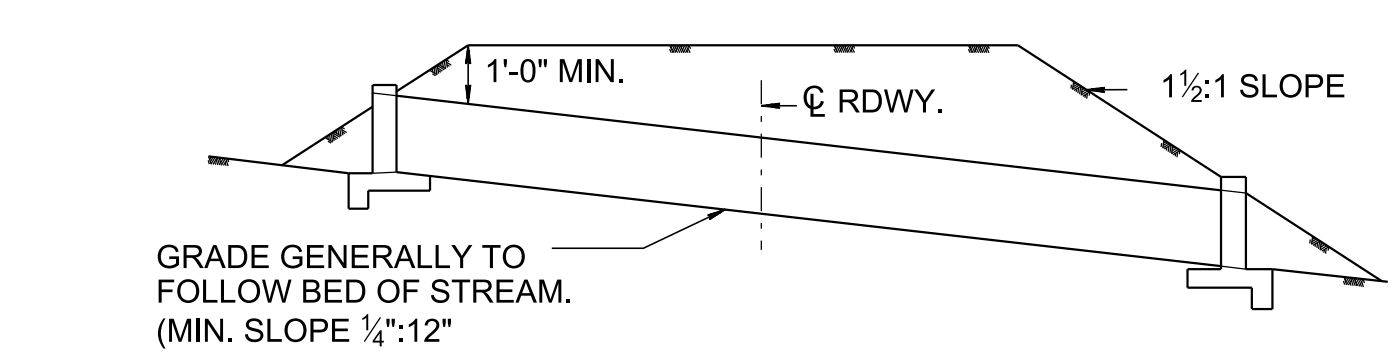
PIPE SIZE "A" "B"	#4 BARS HS @ 12" C.C.	SPA.
23" 14"	6	SPA.
30" 19"	9	SPA.
34" 22"	10	SPA.
38" 24"	11	SPA.
45" 29"	13	SPA.
53" 34"	16	SPA.
60" 38"	17	SPA.
68" 43"	20	SPA.
76" 48"	21	SPA.
83" 53"	24	SPA.
91" 58"	26	SPA.

PLAN - 90° SKEW
 SHOWING REINFORCING IN FOOTING



PIPE SIZE "A" "B"	#4 BARS VS @ 12" C.C.	SPA.
23" 14"	2	SPA.
30" 19"	2	SPA.
34" 22"	3	SPA.
38" 24"	3	SPA.
45" 29"	4	SPA.
53" 34"	5	SPA.
60" 38"	5	SPA.
68" 43"	6	SPA.
76" 48"	6	SPA.
83" 53"	9	SPA.
91" 58"	10	SPA.

ELEVATION C-C
 NOTE: OMIT CUT-OFF WALL ON PIPE SIZE 23" x 14" & 30" x 19"



SKETCH OF SECTION THRU ROADWAY
 SHOWING PIPE PLACEMENT

TABLE OF DIMENSION "X"						
PIPE SIZE	59"-46"	44"-36"	35"-26"	25"-15"		
"A" "B"	"X"	"X"	"X"	"X"		
23" 14"	6"	9"	1'-6"	3'-3"		
30" 19"	6"	1'-0"	2'-0"	4'-3"		
34" 22"	9"	1'-3"	2'-3"	5'-0"		
38" 24"	9"	1'-3"	2'-6"	5'-6"		
45" 29"	1'-0"	1'-6"	3'-0"	6'-6"		
53" 34"	1'-0"	1'-9"	3'-3"	7'-6"		
60" 38"	1'-3"	2'-0"	3'-9"	8'-6"		
68" 43"	1'-3"	2'-3"	4'-3"	9'-6"		
76" 48"	1'-6"	2'-6"	4'-9"	10'-6"		
83" 53"	1'-9"	2'-9"	5'-3"	11'-6"		
91" 58"	1'-9"	3'-0"	5'-9"	12'-6"		

ESTIMATED QUANTITIES - ONE WALL - ALL SKEWS												
PIPE SIZE	CONC.-TOTAL CU.YDS. ⁸				CONCRETE PER CU.YD.				REINF.-TOTAL LBS. ⁹			
	90°	75°	60°	45°	90°	75°	60°	45°	90°	75°	60°	45°
23" 14"	0.8	0.8	0.9	1.0	0.121	57	59	59	70	7.706		
30" 19"	1.1	1.1	1.3	1.5	0.135	73	81	82	93	8.041		
34" 22"	1.6	1.6	1.8	2.0	0.144	98	100	106	119	9.716		
38" 24"	1.8	1.8	2.0	2.2	0.149	107	108	118	133	9.883		
45" 29"	2.3	2.4	2.6	2.8	0.164	137	149	154	171	10.888		
53" 34"	2.9	3.0	3.2	3.6	0.185	169	172	180	205	11.391		
60" 38"	3.2	3.3	3.5	4.0	0.204	189	206	208	242	11.893		
68" 43"	4.0	4.1	4.3	4.9	0.225	235	246	258	295	13.233		
76" 48"	4.5	5.0	5.2	5.9	0.245	253	277	300	338	13.736		
83" 53"	5.8	6.0	6.3	7.2	0.268	337	364	377	428	16.547		
91" 58"	6.6	6.8	7.2	8.2	0.289	378	403	424	484	17.150		

⁸ INCLUDES CUT-OFF WALL
⁹ NOTE: CUT-OFF WALL PER FT. SAME FOR ALL SKEWS & PIPE SIZES EQUALS 0.03 CU. YDS. & 0.838 LB. REINFORCING STEEL.

TABLE OF DIMENSIONS & REINFORCEMENT - 90° SKEW - (ONE WALL)																							
OPENING		EQ. ROUND PIPE DIA.	DIMENSIONS							REINFORCEMENT													
PIPE SIZE	AREA SQ.FT.		WALL			FOOTING & CUT-OFF WALL				BARS VS #4	BARS LS #4	BARS DS #4	BARS TS #4	BARS HS #4									
"A" "B"		"L"	"H"	"VO"	"a"	"b"	"c"	"d"	"e"	"f"	"g"	"h"	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	
23" 14"	1.8	18"	7'-3"	2'-7 1/2"	1'-7 1/2"	3'-9"	3'-9"	---	9"	4"	9"	8"	1'-9"	8	3'-6"	6	6'-9"	---	---	4	2'-0"	7	1'-3"
30" 19"	3.3	24"	9'-6"	3'-1 1/2"	2'-1 1/2"	5'-0"	5'-0"	---	9"	4"	9"	8"	1'-9"	10	4'-0"	6	9'-6"	---	---	4	2'-9"	10	1'-3"
34" 22"	4.1	27"	10'-9"	3'-5"	2'-5"	5'-6"	5'-6"	---	9"	4"	9"	8"	1'-9"	10	4'-3"	6	10'-6"	---	---	6	3'-0"	11	1'-3"
38" 24"	5.1	30"	12'-0"	3'-7 1/2"	2'-7 1/2"	6'-0"	6'-0"	---	9"	4"	9"	8"	1'-9"	10	4'-6"	6	11'-6"	---	---	3	3'-6"	12	1'-3"
45" 29"	7.4	36"	15'-0"	4'-2"	3'-2"	7'-6"	7'-6"	---	9"	4"	9"	8"	1'-9"	14	5'-0"	6	14'-6"	---	---	4	4'-6"	15	1'-3"
53" 34"	10.2	42"	17'-0"	4'-8"	3'-8"	8'-6"	8'-6"	---	9"	5"	9"	10"	2'-0"	14	5'-6"	6	16'-6"	---	---	4	5'-3"	17	1'-6"
60" 38"	12.9	48"	19'-0"	5'-1"	4'-1"	9'-6"	9'-6"	---	9"	6"	9"	10"	2'-3"	17	6'-0"	6	18'-6"	---	---	4	6'-0"	19	1'-9"
68" 43"	16.6	54"	21'-0"	5'-7"	4'-7"	10'-6"	10'-6"	---	9"	7"	9"	1'-2"	2'-6"	18	6'-9"	6	20'-6"	---	---	5	6'-6"	21	2'-0"
76" 48"	20.5	60"	23'-6"	6'-1"	5'-1"	11'-9"	11'-9"	---	9"	8"	9"	1'-4"	2'-9"	18	7'-3"	6	23'-0"	---	---	5	7'-6"	24	2'-3"
83" 53"	24.8	66"	26'-0"	6'-7"	5'-7"	13'-0"	13'-0"	---	9"	9"	9"	1'-7"	3'-1"	24	8'-0"	6	25'-6"	---	---	6	8'-3"	31	2'-7"
91" 58"	29.5	72"	28'-0"	7'-1"	6'-1"	14'-0"	14'-0"	---	9"	10"	9"	1'-9"	3'-4"	26	8'-6"	6	27'-6"	---	---	6	9'-0"	34	2'-10"

TABLE OF DIMENSIONS & REINFORCEMENT - 75° SKEW - (ONE WALL)																							
OPENING		EQ. ROUND PIPE DIA.	DIMENSIONS							REINFORCEMENT													
PIPE SIZE	AREA SQ.FT.		WALL			FOOTING & CUT-OFF WALL				BARS VS #4	BARS LS #4	BARS DS #4	BARS TS #4	BARS HS #4									
"A" "B"		"L"	"H"	"VO"	"a"	"b"	"c"	"d"	"e"	"f"	"g"	"h"	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	
23" 14"	1.8	18"	7'-6"	2'-7 1/2"	1'-7 1/2"	3'-9"	3'-9"	---	9"	4"	9"	8"	1'-9"	8	3'-6"	6	7'-0"	---	---	2	2'-0"	2	1'-3"
30" 19"	3.3	24"	10'-0"	3'-1 1/2"	2'-1 1/2"	5'-0"	5'-0"	---	9"	4"	9"	8"	1'-9"	10	4'-0"	6	9'-6"	---	---	2	3'-0"	2	1'-3"
34" 22"	4.1	27"	11'-0"	3'-5"	2'-5"	5'-6"	5'-6"	---	9"	4"	9"	8"	1'-9"	10	4'-3"	6	10'-6"	---	---	3	3'-3"	3	1'-3"
38" 24"	5.1	30"	12'-0"	3'-7 1/2"	2'-7 1/2"	6'-0"	6'-0"	---	9"	4"	9"	8"	1'-9"	10	4'-6"	6	11'-6"	---	---	3	3'-6"	3	1'-3"
45" 29"	7.4	36"	15'-0"	4'-2"	3'-2"	7'-6"	7'-6"	---	9"	4"	9"	8"	1'-9"	14	5'-0"	6	14'-6"	---	---	4	4'-6"	4	1'-3"
53" 34"	10.2	42"	17'-0"	4'-8"	3'-8"	8'-6"	8'-6"	---	9"	5"	9"	10"	2'-0"	14	5'-6"	6	16'-6"	---	---	4	5'-3"	4	1'-6"
60" 38"	12.9	48"	19'-0"	5'-1"	4'-1"	9'-6"	9'-6"	---	9"	6"	9"	10"	2'-3"	17	6'-0"	6	18'-6"	---	---	4	6'-0"	19	1'-9"
68" 43"	16.6	54"	21'-0"	5'-7"	4'-7"	10'-6"	10'-6"	---	9"	7"	9"	1'-2"	2'-6"	18	6'-9"	6	20'-6"	---	---	5	6'-6"	21	2'-0"
76" 48"	20.5	60"	23'-6"	6'-1"	5'-1"	11'-9"	11'-9"	---	9"	8"	9"	1'-4"	2'-9"	18	7'-3"	6	23'-0"	---	---	5	7'-6"	24	2'-3"
83" 53"	24.8	66"	26'-0"	6'-7"	5'-7"	13'-0"	13'-0"	---	9"	9"	9"	1'-7"	3'-1"	24	8'-0"	6	25'-6"	---	---	6	8'-3"	31	2'-7"
91" 58"	29.5	72"	28'-0"	7'-1"	6'-1"	14'-0"	14'-0"	---	9"	10"	9"	1'-9"	3'-4"	26	8'-6"	6	27'-6"	---	---	6	9'-0"	34	2'-10"

TABLE OF DIMENSIONS & REINFORCEMENT - 60° SKEW - (ONE WALL)																			
OPENING		EQ. ROUND PIPE DIA.	DIMENSIONS							REINFORCEMENT									
PIPE SIZE	AREA SQ.FT.		WALL			FOOTING & CUT-OFF WALL				BARS VS #4	BARS LS #4	BARS DS #4	BARS TS #4	BARS HS #4					
"A" "B"		"L"	"H"	"VO"	"a"	"b"	"c"	"d"	"e"	"f"	"g"	"h"	NO.	LGTH.	NO.	LGTH.	NO.	LGTH.	