

1. Position is set by the intersection of the front slope and Point A where this intersection falls outside the clear zone.
2. Where the front slope and Point A intersects inside the clear zone, the endwall is positioned so the location reference point is at the clear zone limit. The front slope is transitioned to the endwall as shown in Index No. 280.

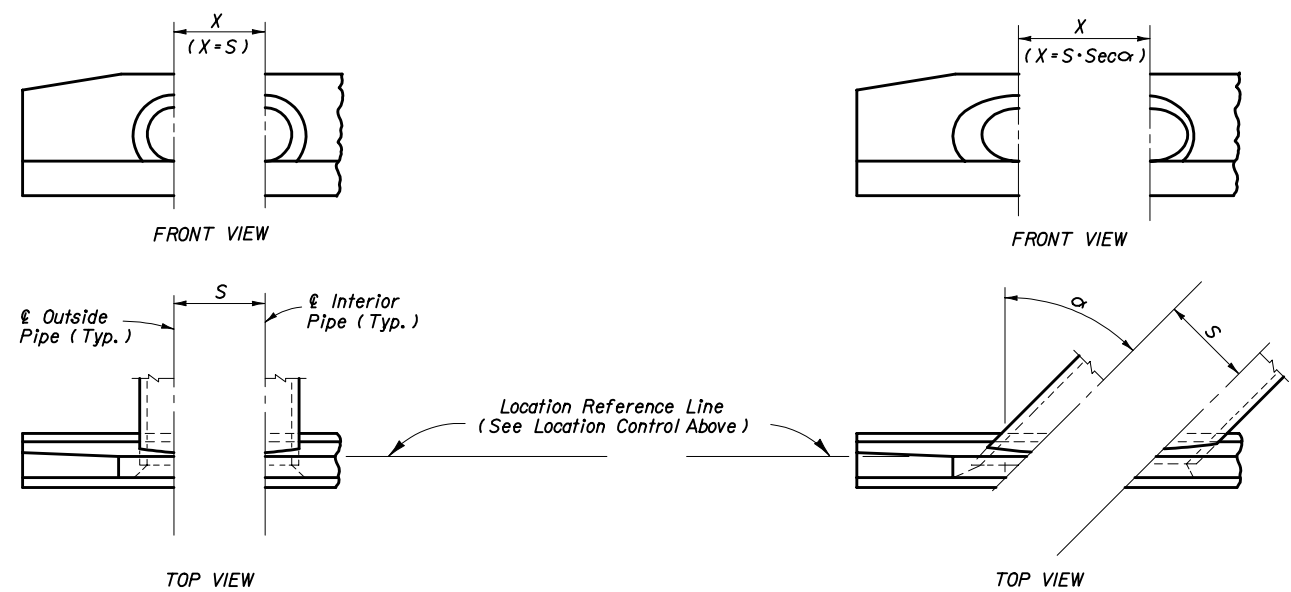
### STANDARD LOCATION CONTROL

### GENERAL NOTES

1. Endwall dimensions, locations and positions are for round and elliptical concrete pipe and for round and pipe-arch corrugated metal pipe. Round concrete pipe shown.
2. Front slope and ditch transitions shall be in accordance with Index No. 280.
3. Endwalls may be cast in place or precast concrete. Reinforcing steel shall be Grades 40 or 60. Additional reinforcement necessary for handling precast units shall be determined by the Contractor or the supplier. Cost of reinforcement shall be included in the contract unit price for concrete, (endwalls).
4. All exposed corners and edges of concrete are to be chamfered  $\frac{3}{4}$ ".
5. Concrete meeting the requirements of ASTM C478 (4000 psi) may be used in lieu of Class I concrete in precast items manufactured in plants which are under the Standard Operating Procedures for the inspection of precast drainage products.
6. On outfall ditches with side slopes flatter than 1:1 1/2 provide 20' transitions from the endwall to the flatter side slopes, right of way permitting.
7. For sodding around endwalls see Index No. 281.
8. Payment for concrete quantities for endwalls skewed to the pipe shall be made on the following basis:

Endwall Skew To Pipe	Use Tabulated Value
0° to 5°	0°
6° to 15°	15°
16° to 30°	30°
31° or over	45°
9. Pipe length plan quantities shall be based on the pipe end locations shown in the standard location control end view, or lengths based on special endwall locations called for in the plans.
10. Payment for pipe in pipe culverts shall be based on plan quantities, adjusted for endwall locations subsequently established by the Engineer.
11. Endwalls to be paid for under the contract unit price for Concrete Class I (Endwalls), CY.

### ENDWALL DIMENSIONS (EXCLUSIVE OF MULTIPLE PIPE SPACING)



NORMAL PIPE

SKewed PIPE

- LEGEND
- $\alpha$  Pipe Skew
  - S Center To Center Pipe Spacing
  - X Centerline To Centerline Dimension At Face Of Headwall

### ENDWALL POSITIONS FOR SINGLE AND MULTIPLE PIPE AND SPACING FOR MULTIPLE PIPE

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION				
<b>STRAIGHT CONCRETE ENDWALLS SINGLE AND MULTIPLE PIPE</b>				
Names	Dates	Approved By		
Designed By	HAB/EGR	73/83	State Drainage Engineer	
Drawn By	RWR/HSD	83	Revision	Sheet No.
Checked By	JBW/JVG	83	04	1 of 2
				Index No. <b>250</b>

**DATA AND ESTIMATED QUANTITIES FOR ONE ENDWALL**

**ROUND CONCRETE AND CORRUGATED METAL PIPE**

D	Opening Area (SF)				Dimensions										Class I Concrete (CY)																D													
															Number And Type Of Pipe And Skew Angle Of Pipe																													
	Number Of Pipes 1 2 3 4				Single		Double				Triple				Quadruple				Concrete	Metal	Concrete	Metal	Concrete	Metal	Concrete	Metal																		
					Concrete	Metal	Concrete		Metal		Concrete		Metal		Concrete		Metal																											
0°		0°		0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°													
15"	1.23	2.46	3.69	4.92	1'-11"	1'-2"	4'-0"	1'-10"	1'-2"	0'-6"	2'-7"	2'-7"	2'-8"	3'-0"	3'-8"	1.23	1.24	1.59	1.60	1.65	1.74	1.62	1.63	1.68	1.78	1.94	1.96	2.05	2.23	1.99	2.02	2.11	2.30	2.30	2.34	2.47	2.74	2.37	2.41	2.75	2.84	15"		
18"	1.77	3.54	5.31	7.08	2'-2"	1'-3"	4'-6"	1'-11"	1'-3"	1'-0"	2'-10"	2'-10"	2'-11"	3'-3"	4'-0"	1.56	1.59	1.99	2.01	2.06	2.17	2.04	2.06	2.11	2.23	2.43	2.46	2.56	2.79	2.51	2.54	2.65	2.89	2.86	2.91	3.06	3.40	2.96	3.01	3.17	3.53	18"		
21"	2.41	4.82	7.23	9.64	2'-5"	1'-4"	5'-0"	2'-0"	1'-4"	1'-6"	3'-2"	3'-2"	3'-3"	3'-8"	4'-6"	1.97																												21"
24"	3.14	6.28	9.42	12.56	2'-8"	1'-4"	5'-6"	2'-0"	1'-4"	2'-0"	3'-5"	3'-5"	3'-6"	3'-11"	4'-10"	2.24	2.29	2.82	2.84	2.91	3.06	2.91	2.93	3.01	3.17	3.39	3.43	3.57	3.87	3.52	3.56	3.71	4.03	3.97	4.03	4.24	4.69	4.14	4.20	4.43	4.91	24"		
27"	3.98	7.96	11.94	15.92	2'-11"	1'-5"	6'-0"	2'-1"	1'-5"	2'-6"	3'-10"	3'-10"	4'-0"	4'-5"	5'-5"	2.73																												27"
30"	4.91	9.82	14.73	19.64	3'-2"	1'-6"	6'-6"	2'-2"	1'-6"	3'-0"	4'-3"	4'-3"	4'-5"	4'-11"	6'-0"	3.26	3.34	4.13	4.16	4.26	4.49	4.28	4.31	4.43	4.67	4.98	5.04	5.25	5.69	5.20	5.27	5.49	5.97	5.84	5.93	6.24	6.91	6.13	6.23	6.56	7.29	30"		
36"	7.07	14.14	21.21	28.28	3'-8"	1'-8"	7'-6"	2'-4"	1'-8"	4'-0"	5'-1"	5'-1"	5'-3"	5'-10"	7'-2"	4.53	4.64	5.73	5.77	5.92	6.23	5.95	6.00	6.15	6.49	6.92	7.00	7.29	7.91	7.25	7.34	7.65	8.33	8.13	8.26	8.69	9.62	8.57	8.71	9.18	10.20	36"		
42"	9.62	19.24	28.86	38.48	4'-2"	1'-10"	8'-6"	2'-6"	2'-0"	5'-0"	6'-0"	6'-0"	6'-3"	6'-11"	8'-6"	6.33	6.49	8.11	8.17	8.39	8.85	8.43	8.50	8.73	9.23	9.90	10.02	10.45	11.38	10.38	10.52	10.98	11.99	11.68	11.87	12.51	13.89	12.32	12.52	13.22	14.73	42"		
48"	12.57	25.14	37.71	50.28	4'-8"	2'-1"	9'-6"	2'-9"	2'-0"	6'-0"	6'-9"	6'-9"	7'-0"	7'-10"	9'-7"	8.15	8.38	10.40	10.48	10.75	11.33	10.85	10.94	11.23	11.87	12.64	12.80	13.34	14.50	13.34	13.51	14.11	15.39	14.89	15.13	15.93	17.68	15.82	16.08	16.97	18.90	48"		
54"	15.90	31.80	47.70	63.60	5'-2"	2'-6"	10'-6"	3'-2"	2'-3"	7'-0"	7'-8"	7'-8"	7'-11"	8'-10"	10'-10"	11.71	11.77	15.23	15.35	15.78	16.69	15.35	15.48	15.90	16.83	18.77	19.02	19.86	21.69	18.93	19.18	20.04	21.89	22.29	22.66	23.93	26.67	22.51	22.89	24.17	26.96	54"		

**CORRUGATED METAL PIPE ARCH**

Span	Rise	Opening Area (SF)				Dimensions										Class I Concrete (CY)																Span	Rise	Approx. Equiv. Round Pipe
																Number Of Pipe And Skew Angle Of Pipe																		
		Number Of Pipes 1 2 3 4				Single		Double				Triple				Quadruple				Concrete	Metal	Concrete	Metal	Concrete	Metal	Concrete	Metal							
						0°	0°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°									0°	15°	30°	45°			
17"	13"	1.1	2.2	3.3	4.4	1'-9"	1'-2"	3'-10"	1'-10"	1'-2"	0'-4"	2'-6"	2'-6"	2'-7"	2'-11"	3'-6"	1.16	1.47	1.48	1.52	1.60	1.78	1.80	1.88	2.04	2.09	2.12	2.23	2.48	17"	13"	15"		
21"	15"	1.6	3.2	4.8	6.4	1'-11"	1'-2"	4'-3"	1'-10"	1'-2"	0'-9"	2'-10"	2'-10"	2'-11"	3'-3"	4'-0"	1.33	1.69	1.70	1.75	1.84	2.04	2.06	2.15	2.33	2.40	2.44	2.57	2.84	21"	15"	18"		
28"	20"	2.8	5.6	8.4	11.2	2'-4"	1'-3"	5'-2"	1'-11"	1'-3"	1'-8"	3'-5"	3'-5"	3'-6"	3'-11"	4'-10"	1.78	2.31	2.33	2.39	2.53	2.83	2.87	2.99	3.26	3.36	3.42	3.60	4.01	28"	20"	24"		
35"	24"	4.3	8.6	12.9	17.2	2'-8"	1'-4"	5'-11½"	2'-0"	1'-4"	2'-5½"	4'-0"	4'-0"	4'-2"	4'-7"	5'-8"	2.34	3.03	3.05	3.14	3.32	3.72	3.77	3.93	4.29	4.40	4.47	4.72	5.25	35"	24"	30"		
42"	29"	5.9	11.8	17.7	23.6	3'-1"	1'-5"	6'-10½"	2'-1"	1'-5"	3'-4½"	4'-9"	4'-9"	4'-11"	5'-6"	6'-9"	3.13	4.06	4.09	4.20	4.45	4.99	5.06	5.28	5.76	5.93	6.03	6.36	7.09	42"	29"	36"		
49"	33"	8.4	16.8	25.2	33.6	3'-5"	1'-6"	7'-8"	2'-2"	1'-6"	4'-2"	5'-6"	5'-6"	5'-8"	6'-4"	7'-9"	3.83	5.00	5.04	5.18	5.48	6.16	6.24	6.52	7.12	7.32	7.44	7.86	8.76	49"	33"	42"		
57"	38"	10.6	21.2	31.8	42.4	3'-10"	1'-7"	8'-7½"	2'-3"	1'-7"	5'-1½"	6'-4"	6'-4"	6'-7"	7'-4"	8'-11"	4.87	6.31	6.36	6.53	6.91	7.74	7.84	8.18	8.93	9.18	9.33	9.85	10.96	57"	38"	48"		
64"	43"	13.2	26.4	39.6	52.8	4'-3"	1'-8"	9'-6½"	2'-4"	1'-8"	6'-0½"	7'-1"	7'-1"	7'-4"	8'-2"	10'-0"	5.88	7.64	7.70	7.91	8.37	9.40	9.52	9.94	10.86	11.15	11.33	11.97	13.33	64"	43"	54"		
71"	47"	16.9	33.8	50.7	67.6	4'-7"	1'-10"	10'-4"	2'-6"	2'-0"	6'-10"	7'-10"	7'-10"	8'-1"	9'-1"	11'-1"	7.80	10.15	10.23	10.51	11.12	12.49	12.65	13.22	14.43	14.85	15.10	15.94	17.77	71"	47"	60"		


Note: Use the guidelines of General Note No. 8 for selecting tabular quantities.

**CONCRETE ELLIPTICAL PIPE**

Rise	Span	Opening Area (SF)				Dimensions										Class I Concrete (CY)																Rise	Span	Approx. Equiv. Round Pipe
																Number Of Pipe And Skew Angle Of Pipe																		
		Number Of Pipes 1 2 3 4				Single		Double				Triple				Quadruple				Concrete	Metal	Concrete	Metal	Concrete	Metal	Concrete	Metal							
						0°	0°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°									0°	15°	30°	45°			
12"	18"	1.3	2.6	3.9	5.2	1'-8"	1'-2"	3'-9"	1'-10"	1'-2"	0'-3"	2'-10"	2'-10"	2'-11"	3'-3"	4'-0"	1.09	1.45	1.46	1.51	1.60	1.80	1.82	1.91	2.09	2.16	2.20	2.33	2.60	12"	18"	15"		
14"	23"	1.8	3.6	5.4	7.2	1'-10"	1'-3"	4'-2½"	1'-11"	1'-3"	8½"	3'-5"	3'-5"	3'-6"	3'-11"	4'-10"	1.36	1.82	1.84	1.89	2.01	2.29	2.32	2.43	2.68	2.75	2.80	2.97	3.33	14"	23"	18"		
19"	30"	3.3	6.6	9.9	13.2	2'-3"	1'-4"	5'-1½"	2'-0"	1'-4"	1'-7½"	4'-2"	4'-2"	4'-4"	4'-10"	5'-11"	1.89	2.55	2.57	2.65	2.82	3.22	3.27	3.43	3.77	3.88	3.95	4.19	4.70	19"	30"	24"		
24"	38"	5.1	10.2	15.3	20.4	2'-8"	1'-5"	6'-3"	2'-1"	1'-5"	2'-9"	5'-2"	5'-2"	5'-4"	6'-0"	7'-4"	2.64	3.55	3.58	3.69	3.93	4.48	4.54	4.77	5.24	5.39	5.49	5.82	6.53	24"	38"	30"		
29"	45"	7.4	14.8	22.2	29.6	3'-1"	1'-6"	7'-0"	2'-2"	1'-6"	3'-6"	6'-0"	6'-0"	6'-3"	6'-11"	8'-6"	3.32	4.48	4.52	4.66	4.96	5.64	5.72	6.00	6.60	6.80	6.92	7.34	8.24	29"	45"	36"		
34"	53"	10.2	20.4	30.6	40.8	3'-6"	1'-7"	7'-11½"	2'-3"	1'-7"	4'-5½"	7'-1"	7'-1"	7'-4"	8'-2"	10'-0"	4.24	5.76	5.81	6.00	6.39	7.29	7.40	7.76	8.55	8.81	8.97	9.52	10.70	34"	53"	42"		
38"	60"	12.9	25.8	38.7	51.6	3'-10"	1'-8"	8'-9"	2'-4"	1'-8"	5'-3"	7'-11"	7'-11"	8'-2"	9'-2"	11'-2"	5.22	7.16	7.23	7.46	7.96	9.10	9.24	9.70	10.71	11.05	11.25	11.95	13.46	38"	60"	48"		
43"	68"	16.6	33.2	49.8	66.4	4'-3"	1'-10"	9'-8½"	2'-6"	1'-10"	6'-2½"	8'-10"	8'-10"	9'-2"	10'-2"	12'-6"	6.63	9.01	9.09	9.38	10.00	11.39	11.56	12.13	13.36	13.77	14.02	14.88	16.73	43"	68"	54"		
48"	76"	20.5	41.0	61.5	82.0	4'-8"	2'-1"	10'-8"	2'-9"	2'-0"	7'-2"	9'-9"	9'-9"	10'-1"	11'-3"	13'-9"	8.66	11.74	11.85	12.22	13.02	14.82	15.04	15.77	17.37	17.91	18.23	19.34	21.74	48"	76"	60"		
53"	83"	24.8	49.6	74.4	99.2	5'-1"	2'-6"	11'-7"	3'-2"	2'-6"	8'-1"	10'-7"	10'-7"	10'-11"	12'-3"	15'-0"	12.50	16.98	16.98	17.67	18.83	21.47	21.78	22.86	25.18	25.97	26.44	28.06	31.55	53"	83"	66"		
58"	91"	29.5	59.0	88.5	118.0	5'-6"	2'-10"	12'-6½"	3'-6"	2'-10"	9'-0½"	11'-4"	11'-4"	11'-9"	13'-1"	16'-0"	16.46	22.26	22.46	23.16	24.66	28.05	28.46	29.85	32.85	33.85	34.46	36.55	41.05	58"	91"	72"		

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

**STRAIGHT CONCRETE ENDWALLS  
SINGLE AND MULTIPLE PIPE**

Names	Data	Approved By		
Designed By	HAB/EGR 73/83		Revision	Sheet No.
Drawn By	RWR/HSD 83		04	2 of 2
Checked By	JBW/JVC 83	Index No.	250	