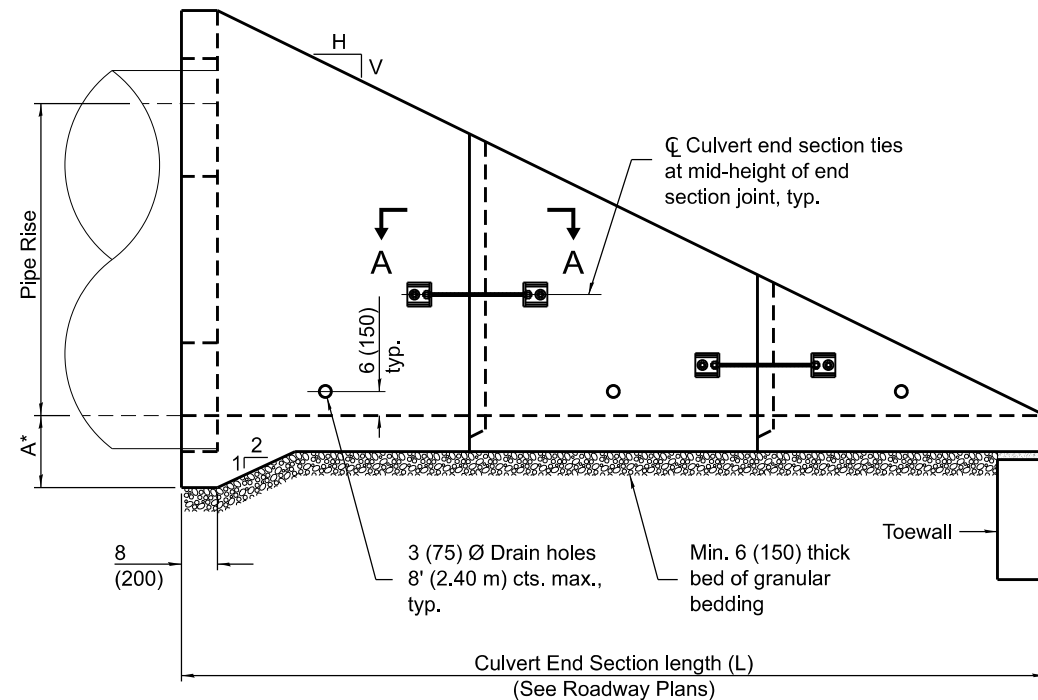
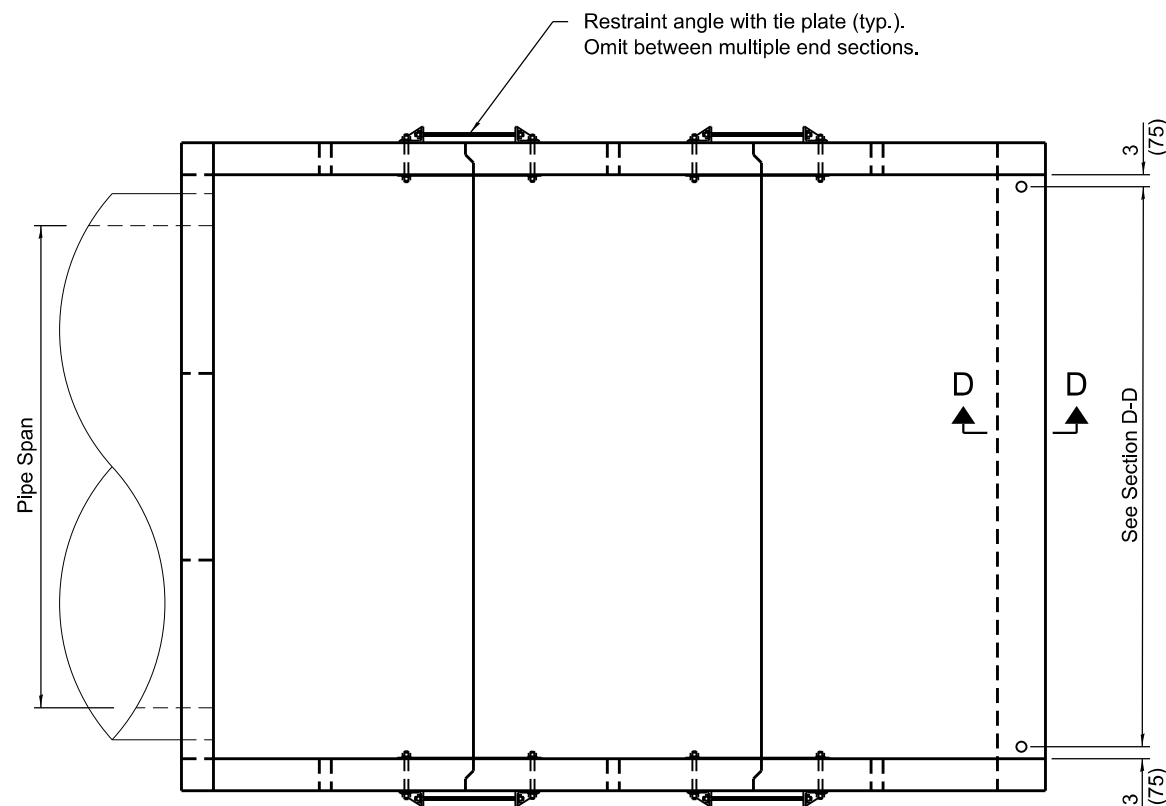




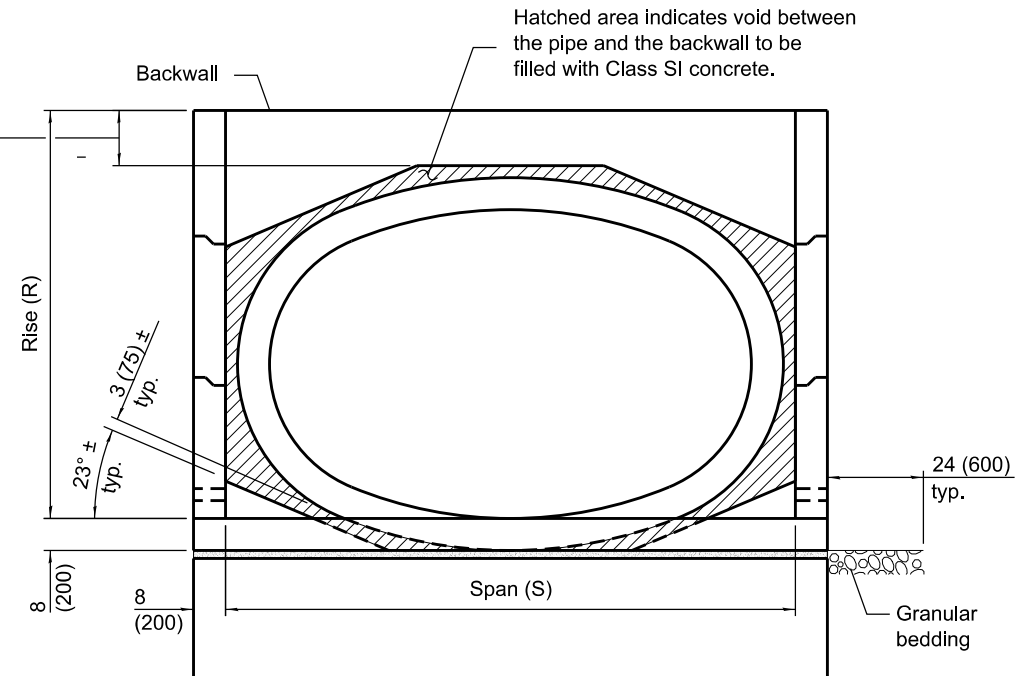
ELEVATION

* This dimension shall be increased by 1½ (38) for CIP field construction.



PLAN

8 (200) min. for EQRS < 21 (525)
12 (300) min. for EQRS ≥ 21 (525)



END VIEW

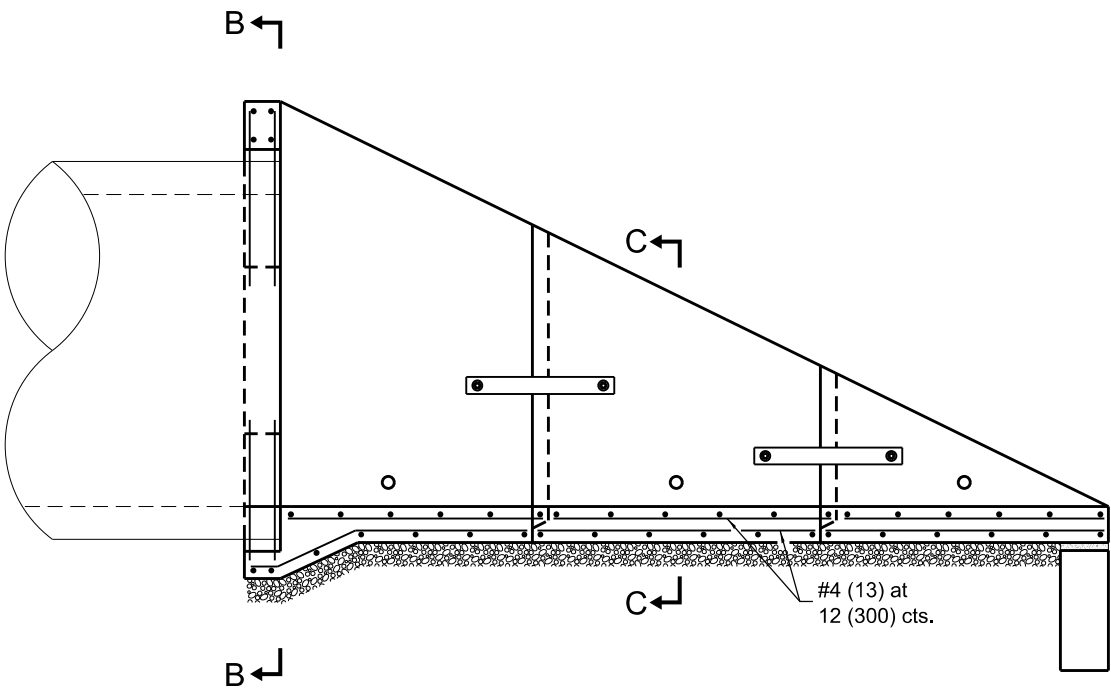
PIPE CULVERT END SECTION DIMENSIONS

Equivalent Round Size Pipe I.D.	Pipe Span	Pipe Rise	A	R	S	L			
						Slope of End Section			
						1:2	1:3	1:4	1:6
15 (375)	23 (575)	14 (350)	15 (375)	28 (711)	36 (914)	5'-4" (1.62 m)	7'-8" (2.34 m)	10'-0" (3.05 m)	14'-8" (4.47 m)
18 (450)	23 (575)	14 (350)	15 (375)	28 (711)	36 (914)	5'-4" (1.62 m)	7'-8" (2.34 m)	10'-0" (3.05 m)	14'-8" (4.47 m)
21 (525)	30 (750)	19 (475)	15 (375)	38 (365)	3'-8" (1.12 m)	7'-0" (2.14 m)	10'-2" (3.10 m)	13'-4" (4.07 m)	19'-8" (6.00 m)
24 (600)	30 (750)	19 (475)	15 (375)	38 (965)	3'-8" (1.12 m)	7'-0" (2.14 m)	10'-2" (3.10 m)	13'-4" (4.07 m)	19'-8" (6.00 m)
27 (675)	34 (850)	22 (550)	15 (375)	3'-5" (1.04 m)	4'-0" (1.22 m)	7'-6" (2.29 m)	10'-11" (3.33 m)	14'-4" (4.38 m)	21'-2" (6.46 m)
30 (750)	38 (950)	24 (600)	15 (375)	3'-7" (1.09 m)	4'-4" (1.32 m)	7'-10" (2.39 m)	11'-5" (3.48 m)	15'-0" (4.57 m)	22'-2" (6.75 m)
36 (900)	45 (1125)	29 (725)	16 (400)	4'-1" (1.24 m)	5'-0" (1.52 m)	8'-10" (2.69 m)	12'-11" (3.94 m)	17'-0" (5.18 m)	25'-2" (7.67 m)
42 (1050)	53 (1325)	34 (850)	16 (400)	4'-6" (1.37 m)	5'-10" (1.78 m)	9'-8" (2.95 m)	14'-2" (4.32 m)	18'-8" (5.69 m)	27'-8" (8.44 m)
48 (1200)	60 (1500)	38 (950)	17 (425)	4'-11" (1.50 m)	6'-6" (1.98 m)	10'-6" (3.20 m)	15'-5" (4.71 m)	20'-4" (6.21 m)	30'-2" (9.21 m)
54 (1350)	68 (1700)	43 (1075)	17 (425)	5'-4" (1.63 m)	7'-2" (2.18 m)	11'-4" (3.45 m)	16'-8" (5.08 m)	22'-0" (6.71 m)	32'-8" (9.96 m)
60 (1500)	76 (1900)	48 (1200)	18 (450)	5'-10" (1.78 m)	8'-0" (2.44 m)	12'-4" (3.76 m)	18'-2" (5.54 m)	24'-0" (7.32 m)	35'-8" (10.87 m)
66 (1650)	83 (2075)	53 (1325)	18 (450)	6'-3" (1.91 m)	8'-8" (2.64 m)	13'-2" (4.02 m)	19'-5" (5.92 m)	25'-8" (7.83 m)	38'-2" (11.64 m)
72 (1800)	91 (2275)	58 (1450)	19 (475)	6'-9" (2.06 m)	9'-4" (2.84 m)	14'-2" (4.32 m)	20'-11" (6.38 m)	27'-8" (8.44 m)	41'-2" (12.56 m)

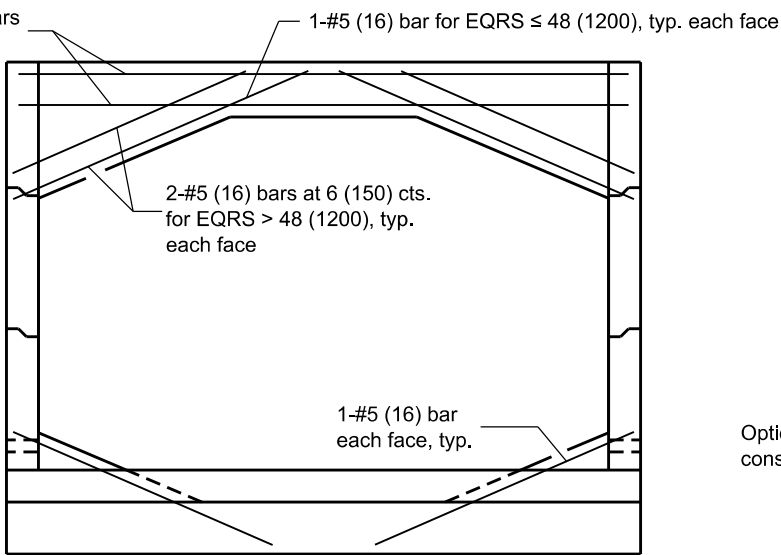
See Sheet 3 for GENERAL NOTES.

DATE	REVISIONS	CONCRETE END SECTIONS FOR ELLIPTICAL PIPE CULVERTS 15" (375 mm) THRU 72" (1800 mm) EQUIVALENT DIAMETER
4-15-16	Added general note for multiple end sections.	
4-1-16	Added note to omit restraint angle and tie plate for mult. end sections.	STANDARD 542011-02

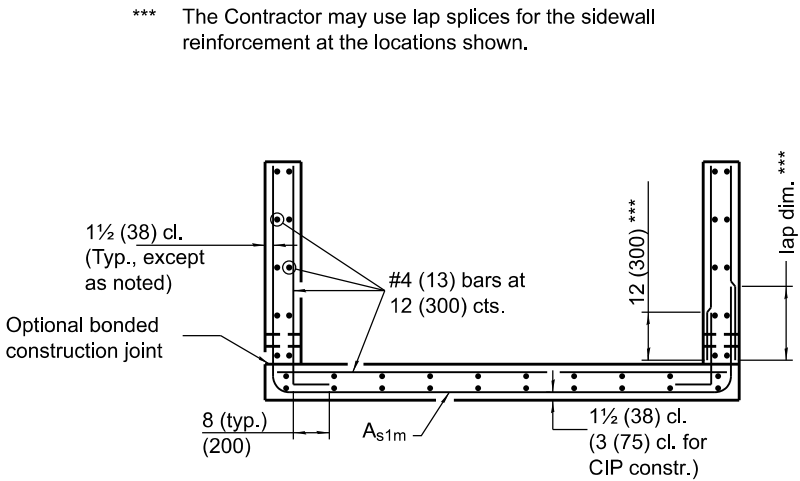
(Sheet 1 of 3)



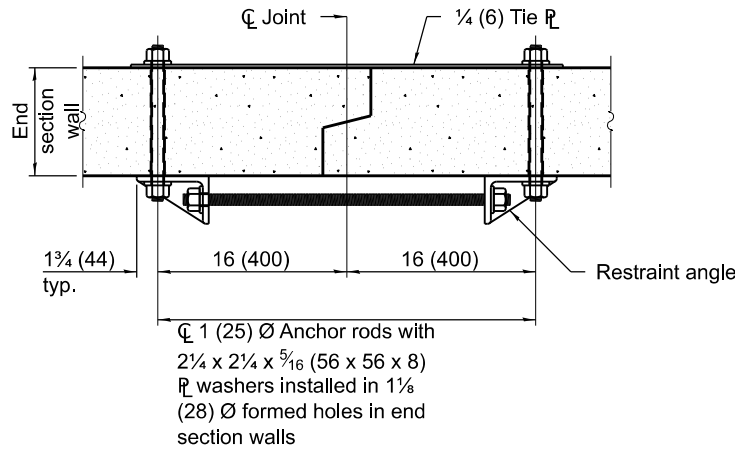
LONGITUDINAL SECTION
(Showing bottom slab and backwall reinforcement.)



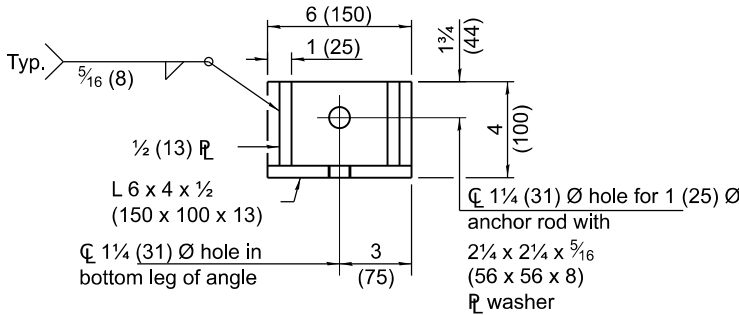
SECTION B-B
(Showing backwall reinforcement only.)
(Pipe omitted for clarity.)



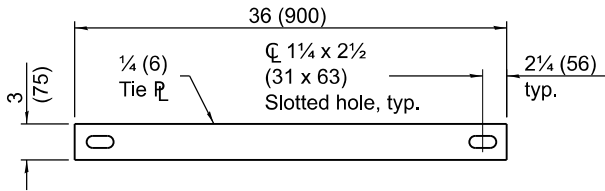
SECTION C-C



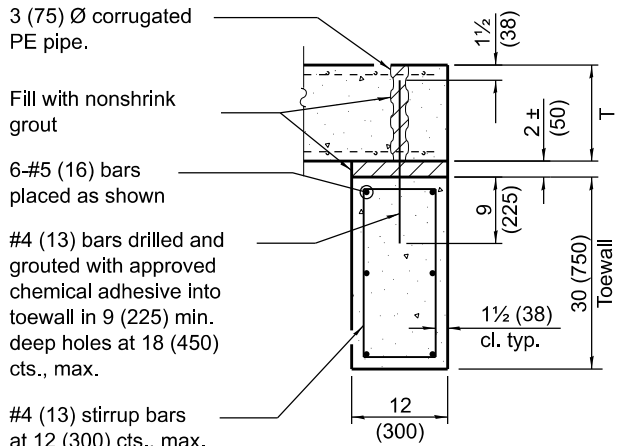
SECTION A-A
(Showing end section tie details)



RESTRAINT ANGLE DETAIL



TIE PLATE DETAIL



SECTION D-D

LAP DIMENSION

#4 (13) bar	= 17 (425)
#5 (16) bar	= 21 (525)
#6 (19) bar	= 25 (625)

*** The Contractor may use lap splices for the sidewall reinforcement at the locations shown.

REINFORCEMENT SCHEDULE

Equivalent Round Size Pipe I.D.	A _{s1m}	
	Bar Size	Bar Spacing
15 (375)	4 (13)	12 (300)
18 (450)	4 (13)	12 (300)
21 (525)	4 (13)	12 (300)
24 (600)	4 (13)	12 (300)
27 (700)	4 (13)	12 (300)
30 (750)	4 (13)	12 (300)
36 (900)	4 (13)	12 (300)
42 (1050)	4 (13)	12 (300)
48 (1200)	4 (13)	8 (200)
54 (1350)	4 (13)	8 (200)
60 (1500)	4 (13)	8 (200)
66 (1650)	5 (16)	8 (200)
72 (1800)	5 (16)	8 (200)

CONCRETE END SECTIONS FOR ELLIPTICAL PIPE CULVERTS 15" (375 mm) THRU 72" (1800 mm) EQUIVALENT DIAMETER
(Sheet 2 of 3)

STANDARD 542011-02

QUANTITIES

Equivalent Round Size Pipe I.D.	Concrete yd ³ (m ³) ①				Reinforcement Without Lap lbs. (kg)				Reinforcement With Lap lbs. (kg)			
	Slope of End Section				Slope of End Section				Slope of End Section			
	1:2	1:3	1:4	1:6	1:2	1:3	1:4	1:6	1:2	1:3	1:4	1:6
15	1.5	1.9	2.3	3.0	220	270	320	420	240	300	350	470
(375)	(1.1)	(1.6)	(1.8)	(2.3)	(120.8)	(148.3)	(172.9)	(228.5)	(132.3)	(164.3)	(192.8)	(257.4)
18	1.5	1.9	2.3	3.0	220	270	320	420	240	300	350	470
(450)	(1.3)	(1.6)	(1.8)	(2.3)	(120.8)	(148.3)	(172.9)	(228.5)	(132.3)	(164.3)	(192.8)	(257.4)
21	2.2	2.8	3.5	4.8	310	390	470	630	330	420	520	700
(525)	(1.7)	(2.1)	(2.7)	(3.7)	(167.2)	(172.9)	(211.5)	(285.2)	(181.8)	(189.3)	(232.9)	(316.3)
24	2.2	2.8	3.5	4.8	310	390	470	630	330	420	520	700
(600)	(1.7)	(2.1)	(2.7)	(3.7)	(167.2)	(172.9)	(211.5)	(285.2)	(181.8)	(189.3)	(232.9)	(316.3)
27	2.5	3.2	3.9	5.4	330	420	510	690	360	460	560	760
(700)	(1.9)	(2.4)	(3.0)	(4.1)	(181.7)	(190.1)	(231.4)	(310.5)	(197.0)	(208.0)	(254.3)	(343.1)
30	2.7	3.5	4.3	5.9	350	450	540	730	380	490	600	810
(750)	(2.1)	(2.7)	(3.3)	(4.5)	(193.1)	(201.9)	(244.9)	(331.3)	(209.5)	(220.4)	(268.7)	(365.3)
36	3.3	4.4	5.4	7.5	430	560	690	940	470	610	740	1020
(900)	(2.5)	(3.4)	(4.1)	(5.7)	(237.6)	(252.2)	(309.3)	(423.4)	(255.8)	(273.0)	(335.9)	(461.8)
42	4.0	5.3	6.6	9.2	510	660	820	1120	550	700	880	1220
(1050)	(3.1)	(4.1)	(5.0)	(7.0)	(279.8)	(295.6)	(369.1)	(508.5)	(299.8)	(317.9)	(398.7)	(551.3)
48	4.7	6.2	7.8	10.9	660	870	1070	1490	710	940	1160	1610
(1200)	(3.6)	(4.7)	(6.0)	(8.3)	(362.5)	(391.5)	(485.4)	(672.8)	(389.5)	(422.8)	(525.7)	(731.4)
54	5.3	7.2	9.0	12.6	730	960	1190	1670	780	1030	1290	1810
(1350)	(4.1)	(5.5)	(6.9)	(9.6)	(400.1)	(434.4)	(540.2)	(756.6)	(428.9)	(467.9)	(583.7)	(820.5)
60	6.3	8.5	10.7	15.1	830	1110	1390	1950	890	1180	1490	2100
(1500)	(4.8)	(6.5)	(8.2)	(11.5)	(458.1)	(500.0)	(629.0)	(882.2)	(488.7)	(535.9)	(676.2)	(951.4)
66	7.1	9.6	12.2	17.2	1080	1470	1840	2610	1180	1610	2030	2880
(1650)	(5.4)	(7.3)	(9.3)	(13.2)	(596.0)	(665.5)	(836.2)	(1185.3)	(650.1)	(729.0)	(918.3)	(1306.3)
72	8.2	11.1	14.0	19.8	1190	1620	2050	2930	1290	1770	2250	3220
(1800)	(6.3)	(8.5)	(10.7)	(14.9)	(653.9)	(734.2)	(931.6)	(1328.9)	(710.7)	(801.7)	(1019.9)	(1460.0)

① For cast-in-place construction, increase concrete volumes by approximately 13%.

GENERAL NOTES

This Standard is used with single pipe culverts and multi-pipe culvert installations. For multi-pipe culvert installations, place the end sections side-by-side leaving a 3 (75) space between adjacent end section walls and fill the space(s) with Class SI concrete.

The number of segments shown in elevation is for example only. The length and number of precast sections required to construct the end section shall be determined by the Contractor.

See roadway plans for slope (V:H) and pipe inside diameter.

End section may be installed up to ± 15 degrees skewed with roadway.

2¼ x 2¼ x ⅝ (56 x 56 x 8) plate washers shall be provided under each nut required for the anchor rods. Holes in the walls for the culvert tie assembly may be drilled using core bits in lieu of formed holes.

See Standard 542311 for end sections having traversable pipe grate.

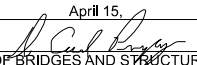
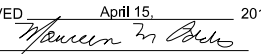
All slope ratios are expressed as units of vertical displacement to units of horizontal displacement (V:H).

All dimensions are in inches (millimeters) unless otherwise shown.

CONCRETE END SECTIONS FOR ELLIPTICAL
PIPE CULVERTS 15" (375 mm)
THRU 72" (1800 mm) EQUIVALENT DIAMETER
(Sheet 3 of 3)

STANDARD 542011-02

 Illinois Department of Transportation

APPROVED April 15, 2016

ENGINEER OF BRIDGES AND STRUCTURES
APPROVED April 15, 2016

ENGINEER OF DESIGN AND ENVIRONMENT

ISSUED 1-1-13