Dimens.		Ah & As3 Reinforcement				
Span S (FT)	Section Ht. H (FT)	Required Ah (IN²/FT)			Bottom Slab Thick. (IN) Required As3 (IN²/FT)	
6		15° Skew	30° Skew	45° Skew	8	10
	3	0.20	0.20	0.20	0.20	---
	4	0.20	0.20	0.20	0.20	---
	5	0.20	0.20	0.20	0.20	---
	6	0.20	0.20	0.20	0.20	---
	7	0.25	0.27	0.28	0.23	---
	8	0.37	0.40	0.42	0.31	---
8		15° Skew	30° Skew	45° Skew	8	10
	4	0.24	0.24	0.24	---	0.24
	5	0.24	0.24	0.24	---	0.24
	6	0.24	0.24	0.24	---	0.24
	7	0.24	0.24	0.24	---	0.24
	8	0.28	0.30	0.32	---	0.24
	9	0.42	0.45	0.48	---	0.29
	10	0.59	0.64	0.67	---	0.37
10		15° Skew	30° Skew	45° Skew	8	10
	4	0.24	0.24	0.24	---	0.24
	5	0.24	0.24	0.24	---	0.24
	6	0.24	0.24	0.24	---	0.24
	7	0.24	0.24	0.24	---	0.24
	8	0.26	0.28	0.30	---	0.24
	9	0.39	0.42	0.45	---	0.31
	10	0.56	0.60	0.64	---	0.40
	11	0.77	0.82	0.87	---	0.50
	12	1.02	1.09	1.16	---	0.62
12		15° Skew	30° Skew	45° Skew	8	10
	4	0.24	0.24	0.24	---	0.24
	5	0.24	0.24	0.24	---	0.24
	6	0.24	0.24	0.24	---	0.24
	7	0.24	0.24	0.24	---	0.24
	8	0.25	0.26	0.28	---	0.26
	9	0.37	0.40	0.42	---	0.34
	10	0.53	0.57	0.60	---	0.42
	11	0.73	0.78	0.83	---	0.53
	12	0.97	1.05	1.10	---	0.65

Note: "H" is the largest vertical dimension of the section.

Length L

Rise R (FT)	15° Skew	30° Skew	45° Skew
3	6'-1"	6'-6"	7'-11"
4	9'-3"	9'-11"	12'-2"
5	12'-4"	13'-5"	16'-5"
6	15'-5"	16'-10"	20'-8"
7	18'-6"	20'-4"	24'-11"
8	21'-8"	23'-9"	29'-1"
9	24'-9"	27'-3"	33'-4"
10	27'-10"	30'-9"	37'-7"
11	30'-11"	34'-2"	41'-10"
12	34'-1"	37'-8"	46'-1"

"L" - Based on 3:1 foreslope normal to ℄ of roadway.

Length LL

Span S (FT)	15° Skew	30° Skew	45° Skew
6	3'-6"	4'-7"	6'-6"
8	3'-9"	5'-2"	7'-6"
10	4'-0"	5'-9"	8'-6"
12	4'-3"	6'-4"	9'-6"

Length N

Span S (FT)	15° Skew	30° Skew	45° Skew
6	4'-3"	6'-4"	9'-6"
8	4'-10"	7'-6"	11'-6"
10	5'-4"	8'-8"	13'-6"
12	5'-11"	9'-10"	15'-6"

As4 Reinf. (IN²/FT)

Section Ht. H (FT)	15° Skew	30° Skew	45° Skew
10 or Less	0.20	0.20	0.20
11	0.20	0.21	0.22
12	0.25	0.27	0.29

Note:
As4 is inside face wall steel for the first section adjacent to the barrel only. "H" is the largest vertical dimension of the section. For all other sections, As4 = 0.20 IN²/FT

Length P

Span S (FT)	15° Skew	30° Skew	45° Skew
6	1'-0"	2'-1"	3'-8"
8	1'-3"	2'-8"	4'-8"
10	1'-6"	3'-3"	5'-8"
12	1'-9"	3'-10"	6'-8"

Note:
Dimensions shown in tables are rounded to the nearest whole inch.

Construction Notes:

Precast box culvert end sections shall be constructed in accordance with details and notes, as shown below:

Reinforcing for precast end sections & curtain walls shall be welded wire reinforcing (WWR) meeting the requirements of AASHTO LRFD Section 5. The concrete cover over the reinforcing steel shall not be less than 1.5 inches or greater than 2.0 inches.

Refer to sheets PRCB G1-20 & PRCB G2-20 for additional notes and details.

Refer to "Fabric Layer Detail" on sheet PRCB G2-20 for multiple WWR layers.

1. 8⅛" @ 15° ; 10⅝" @ 30° ; 1'-2" @ 45°
2. Culvert ties are to be 1 inch dia. rods.
3. For skew angles over 7°30' up to 22°30', use a 15° skew end section. For skew angles over 22°30' up to 37°30', use a 30° skew end section. For skew angles over 37°30' up to 45°, use a 45° skew end section.
4. Fill holes with grout. Grout shall consist of 1 part cement and 2 parts sand. Use air entrained portland cement. Grout mix shall have a maximum slump of 4 inches.
5. Floor thickness (Tb) shall be, Tb = 8 in. for 6 foot span and Tb = 10 in. for all other spans.
6. End of wall may be cut square as shown or follow the skew.
7. Joint "Option A": Provide joint in walls and floor. Terminate joint at haunch. See "Detail A" on PES 5-20-T3.
8. Joint "Option B": Provide continuous joint in walls, floor and haunch.
9. For the first section adjacent to the barrel, see As4 table.
10. Minimum longitudinal reinforcement shall be 0.06 sq. inches per peripheral foot on all faces of the end section, except in the tongue and groove area.
11. Use tongue on inlet end section and groove on outlet end section.
12. Lap splices shall be Class B and shall be designed according to the AASHTO LRFD Bridge Design Specifications, Section 5.
13. Optional eyebolts shall conform to ASTM A307. Eyebolts and nuts shall be galvanized in accordance with ASTM A153. The eye of the eyebolt shall be cast flush with the concrete surface.

Dowel Setting Note (Fence Anchor):

The 5fa bars or eyebolt may be set as dowels in drilled holes. Holes shall be drilled to the depth required to achieve bar embedment as shown in the "Elevation" or "Detail C". The dowels shall be installed in accordance with the Manufacturer's recommendations. Either of the following systems may be used as a bonding agent:

A. Polymer grout system shall be in accordance with Article 2301.03, E, of the Standard Specifications.
B. Hydraulic cement grout systems. Drilled holes are to be 2½ times the dowel diameter and are to be blown clean with compressed air immediately prior to placing grout. The hydraulic cement grout shall be one of those approved in Materials I.M. 491.13.

Note: See sheet PES 5-20-T3 for details used in conjunction with this sheet.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT Highway Division

Standard Design

Single Precast Reinforced Concrete Box Culverts

December, 2020

Type 3 End Section Details

For Skews of 7.5° to 45°; 6' - 12' Spans

PES 6-20-T3

Sheet 2 of 2