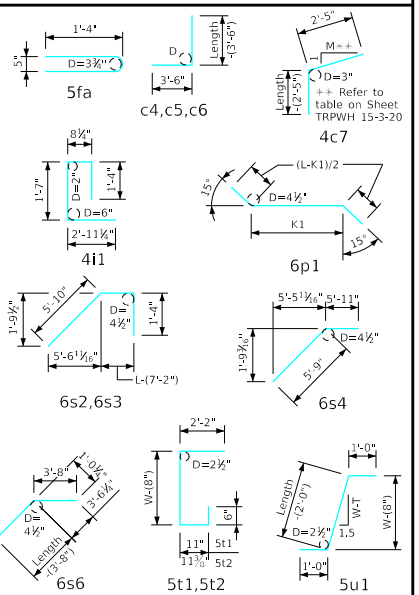
Bent Bar Details



Note: All dimensions are out to out
D = pin diameter
See table below for pin diameter "D" of c bars

c Bar Pin Diameter	
Bar Size	D
5	3¾"
6	4½"

Bill of Reinforcing for One Headwall 15° Skew Span x Culvert Height

Location	Shape	12' x 12'				12' x 11'				12' x 10'				12' x 9'				12' x 8'				12' x 7'			
		Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	41'-7	92	5b1	2	38'-6	80	5b1	2	35'-5	74	5b1	2	32'-4	67	5b1	2	29'-2	61	5b1	2	26'-1	54
Wingwall, F.F.H.		5b2	22 Var.	2 Each 9'-2 to 40'-2	571	5b2	20 Var.	2 Each 9'-2 to 37'-1	482	5b2	18 Var.	2 Each 9'-2 to 34'-0	405	5b2	16 Var.	2 Each 9'-2 to 30'-11	334	5b2	14 Var.	2 Each 9'-2 to 27'-9	270	5b2	12 Var.	2 Each 9'-2 to 24'-8	212
Wingwall, B.F.H.		4b3	2	41'-9	59	4b3	2	38'-8	52	4b3	2	35'-6	47	4b3	2	32'-5	43	4b3	2	29'-3	39	4b3	2	26'-2	35
Wingwall, B.F.H.		4b4	20 Var.	2 Each 12'-5 to 40'-4	356	4b4	18 Var.	2 Each 12'-5 to 37'-3	299	4b4	16 Var.	2 Each 12'-4 to 34'-1	248	4b4	14 Var.	2 Each 12'-4 to 31'-0	203	4b4	12 Var.	2 Each 12'-4 to 27'-11	161	4b4	10 Var.	2 Each 12'-4 to 24'-9	124
Interior Wall, Both F.H.		5b5	42 Var.	2 Each 6'-7 to 41'-2	1051	5b5	38 Var.	2 Each 6'-8 to 38'-1	887	5b5	34 Var.	2 Each 6'-8 to 35'-0	739	5b5	30 Var.	2 Each 6'-8 to 31'-10	602	5b5	26 Var.	2 Each 6'-9 to 28'-9	481	5b5	22 Var.	2 Each 6'-10 to 25'-7	372
Wingwall, F.F.V.		5c1	76 Var.	2 Each 2'-8 to 14'-7	684	5c1	70 Var.	2 Each 2'-8 to 13'-7	593	4c1	64 Var.	2 Each 2'-8 to 12'-8	328	4c1	58 Var.	2 Each 2'-8 to 11'-8	278	4c1	68 Var.	2 Each 2'-8 to 10'-8	303	4c1	60 Var.	2 Each 2'-8 to 9'-8	247
Wingwall, F.F.V.		5c2	36 Var.	2 Each 9'-3 to 14'-9	451	5c2	30 Var.	2 Each 9'-3 to 13'-9	360	4c2	24 Var.	2 Each 9'-3 to 12'-10	177	4c2	16 Var.	2 Each 9'-3 to 11'-6	111	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (O)		5c3	2	15'-1	31	5c3	2	14'-1	29	4c3	2	13'-1	17	4c3	2	12'-1	16	4c3	2	11'-1	15	4c3	2	10'-1	13
Wingwall, F.F.V. (A)		5c3	2	15'-1	31	5c3	2	14'-1	29	4c3	2	13'-1	17	4c3	2	12'-1	16	4c3	2	11'-1	15	4c3	2	10'-1	13
Wingwall, B.F.V.		6c4	76 Var.	2 Each 6'-4 to 18'-3	1403	5c4	70 Var.	2 Each 6'-4 to 17'-4	864	5c4	64 Var.	2 Each 6'-4 to 16'-4	757	5c4	58 Var.	2 Each 6'-4 to 15'-5	658	5c4	52 Var.	2 Each 6'-4 to 14'-5	563	5c4	46 Var.	2 Each 6'-4 to 13'-5	474
Wingwall, B.F.V. (O)		6c5	1	18'-7	28	5c5	1	17'-7	18	5c5	1	16'-7	17	5c5	1	15'-7	16	5c5	1	14'-7	15	5c5	1	13'-7	14
Wingwall, B.F.V. (A)		6c5	2	18'-7	56	5c5	2	17'-7	37	5c5	2	16'-7	35	5c5	2	15'-7	33	5c5	2	14'-7	30	5c5	2	13'-7	28
Wingwall, B.F.V.		6c6	50	8'-6	638	5c6	44	8'-6	390	5c6	38	8'-6	337	5c6	30	8'-6	266	5c6	24	8'-6	213	5c6	18	8'-6	160
Interior Wall, Both F.V		4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10	4c7	4	3'-10	10
Interior Wall, Both F.V		4c8	150 Var.	2 Each 1'-7 to 12'-3	693	4c8	136 Var.	2 Each 1'-7 to 11'-2	579	4c8	124 Var.	2 Each 1'-7 to 10'-2	487	4c8	112 Var.	2 Each 1'-7 to 9'-3	405	4c8	100 Var.	2 Each 1'-7 to 8'-3	328	4c8	88 Var.	2 Each 1'-7 to 7'-3	260
Interior Wall, Both F.V		4c9	4	12'-7	34	4c9	4	11'-7	31	4c9	4	10'-7	28	4c9	4	9'-7	26	4c9	4	8'-7	23	4c9	4	7'-7	20
Apron, Longit., Bott.		4d1	39	41'-7	1146	4d1	39	38'-5	1001	4d1	39	35'-4	921	4d1	39	32'-3	840	4d1	39	29'-2	760	4d1	39	26'-0	677
Apron, Longit., Top		6f1	39	41'-7	2577	6f1	39	38'-5	2250	6f1	39	35'-4	2070	6f1	39	32'-3	1889	6f1	39	29'-2	1709	6f1	39	26'-0	1523
Parapet, Vertical		4i1	77	6'-7	339	4i1	77	6'-7	339	4i1	75	6'-7	330	4i1	75	6'-7	330	4i1	75	6'-7	330	4i1	75	6'-7	330
Parapet, Horiz.		7j1	4	41'-0	355	7j1	4	41'-0	355	7j1	4	40'-4	350	7j1	4	40'-4	350	7j1	4	40'-4	350	7j1	4	40'-0	327
Apron, Trans., Top		5m1	45	40'-2	1999	5m1	41	40'-2	1821	5m1	37	39'-6	1524	5m1	33	39'-6	1360	5m1	29	39'-6	1195	5m1	25	39'-2	1021
Apron, Trans., Top		5m2	14 Var.	2'-7 to 39'-0	304	5m2	14 Var.	2'-3 to 38'-7	298	5m2	13 Var.	4'-4 to 37'-11	286	5m2	13 Var.	3'-11 to 37'-6	281	5m2	13 Var.	3'-6 to 37'-1	275	5m2	13 Var.	3'-0 to 36'-7	268
Apron, Trans., Bott.		5m3	73	38'-1	2900	5m3	67	38'-1	2661	6m3	31	38'-1	1773	5m3	28	37'-4	1090	5m3	25	37'-4	973	5m3	22	37'-0	849
Curtain, Horiz.		6p1	6	41'-6	396	6p1	6	41'-6	396	6p1	6	40'-10	390	6p1	6	40'-10	390	6p1	6	40'-10	390	6p1	5	40'-6	322
Wing Slope, Both F.		6s1	4	36'-8	220	6s1	4	33'-5	201	6s1	4	30'-2	181	6s1	4	26'-11	162	6s1	4	23'-8	142	6s1	4	20'-5	123
Wing Slope, Both F. (O)		6s2	2	7'-9	23	6s2	2	7'-9	23	6s2	2	7'-10	24	6s2	2	7'-10	24	6s2	2	7'-10	24	6s2	2	7'-10	24
Wing Slope, Both F. (A)		6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24
Wing Slope, F.F.		6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35
Wing Slope, F.F.		6s5	2	34'-2	103	6s5	2	30'-11	93	6s5	2	27'-8	83	6s5	2	24'-5	73	6s5	2	21'-2	64	6s5	2	17'-11	54
Interior Wall, Both F.		6s6	4	43'-1	273	6s6	4	39'-9	239	6s6	4	36'-7	220	6s6	4	33'-4	200	6s6	4	30'-1	181	6s6	4	26'-10	161
Curtain, Vert.		5t1	40	7'-11	330	5t1	40	7'-8	320	5t1	40	7'-5	309	5t1	40	7'-2	299	5t1	40	6'-11	289	5t1	39	6'-8	271
Curtain, Vert. Ends		5t2	4	7'-11	33	5t2	4	7'-8	32	5t2	4	7'-5	31	5t2	4	7'-2	30	5t2	4	6'-11	29	5t2	4	6'-8	28
Bracket, Vert.		5u1	4	6'-7	27	5u1	4	6'-5	27	5u1	4	6'-2	26	5u1	4	5'-11	25	5u1	4	5'-9	24	5u1	4	5'-6	23
Estimated Quantities One Headwall	Reinf. Steel			17,278 LB				14,861 LB				12,306 LB				10,492 LB				9327 LB				8102 LB	
	Concrete	Parapet Δ	3.9	124.1 CY		3.9	112.0 CY			3.7	94.0 CY			3.7	83.7 CY			3.7	73.8 CY			3.6	62.4 CY		
		Wingwalls	39.8			33.9				23.7				19.5				15.8				11.1			
		Apron ✳	80.4			74.2				66.6				60.5				54.3				47.7			

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

Δ Includes top of wingwall quantities.
✳ Assumes apron and floor are equal thickness, adjust concrete quantities for transition where apron and floor thickness are not equal.

(A) - Indicates bar located at acute corner.
(O) - Indicates bar located at obtuse corner.
Refer to Sheet TRPWH 15-1-20 for acute and obtuse corner locations.

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
2. The sides of the apron are to be formed to ensure correct line and grade.
3. All apron reinforcing steel is to be supported by bar chairs at intervals of not more than 3'-0" in either direction as outlined in the Standard Specifications.
4. Clear distance from face of concrete to near reinforcing bar is to be 2" unless otherwise noted or shown. Clearance to the bottom ends of vertical bars shall be 3 inches.
5. Concrete quantities are estimated from back of parapet.
6. Horizontal tails of bars "b" & "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "4d1" and "6f1" estimated to project into end section of barrel a minimum of 2'-5" beyond back of parapet. The "length" column reflects total number of feet necessary to meet these requirements.
7. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT Highway Division

Standard Design - Triple Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Quantity Tabulation
12'-0" Span
15° Skew

TRPWH
15-6-20
Sheet 1 of 2

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