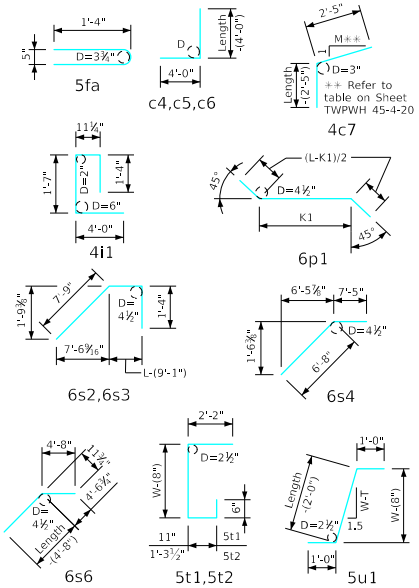
Bent Bar Details



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	3⅜"
6	4½"

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

Bill of Reinforcing for One Headwall 45° Skew Span x Culvert Height

Location	Shape	10' x 6' Bar	No.	Length	Wt.	10' x 5' Bar	No.	Length	Wt.	10' x 4' Bar	No.	Length	Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	30'-9	64	5b1	2	26'-6	55	5b1	2	22'-3	46
Wingwall, F.F.H.		5b2	10 Var.	2 Each 11'-9 to 28'-9	211	5b2	8 Var.	2 Each 11'-9 to 24'-6	151	5b2	6 Var.	2 Each 11'-9 to 20'-3	100
Wingwall, B.F.H.		4b3	2	31'-0	41	4b3	2	26'-9	36	4b3	2	22'-6	30
Wingwall, B.F.H.		4b4	8 Var.	2 Each 16'-4 to 29'-1	121	4b4	6 Var.	2 Each 16'-4 to 24'-10	82	4b4	4 Var.	2 Each 16'-4 to 20'-7	49
Interior Wall, Both F.H.		5b5	9 Var.	9'-0 to 29'-10	182	5b5	7 Var.	9'-2 to 25'-7	127	5b5	5 Var.	9'-6 to 21'-3	80
Wingwall, F.F.V.		4c1	72 Var.	2 Each 2'-7 to 8'-9	273	4c1	46 Var.	2 Each 2'-7 to 7'-9	159	4c1	36 Var.	2 Each 2'-7 to 6'-7	110
Wingwall, F.F.V.		c2	--	--	--	c2	--	--	–	c2	--	--	--
Wingwall, F.F.V. (O)		4c3	2	9'-0	12	4c3	2	8'-0	11	4c3	2	7'-0	9
Wingwall, F.F.V. (A)		4c3	3	9'-0	18	4c3	3	8'-0	16	4c3	3	7'-0	14
Wingwall, B.F.V.		5c4	54 Var.	2 Each 6'-9 to 12'-10	551	6c4	60 Var.	2 Each 6'-9 to 11'-10	837	6c4	48 Var.	2 Each 6'-9 to 10'-10	634
Wingwall, B.F.V. (O)		5c5	1	13'-0	14	6c5	1	12'-0	18	6c5	1	11'-0	17
Wingwall, B.F.V. (A)		5c5	4	13'-0	54	6c5	4	12'-0	72	6c5	4	11'-0	66
Wingwall, B.F.V.		5c6	16	9'-0	150	c6	--	9'-0	–	c6	--	9'-0	--
Interior Wall, Both F.V		4c7	2	3'-9	5	4c7	2	3'-9	5	4c7	2	3'-9	5
Interior Wall, Both F.V		4c8	51 Var.	1'-5 to 6'-2	129	4c8	42 Var.	1'-5 to 5'-2	92	4c8	34 Var.	1'-5 to 4'-2	63
Interior Wall, Both F.V		4c9	2	6'-6	9	4c9	2	5'-6	7	4c9	2	4'-6	6
Apron, Longit., Bott.		4d1	22	30'-6	448	4d1	22	26'-3	386	4d1	22	22'-0	323
Apron, Longit., Top		6f1	22	30'-6	1008	6f1	22	26'-3	867	6f1	22	22'-0	727
Parapet, Vertical		4i1	41	7'-10	215	4i1	41	7'-10	215	4i1	41	7'-10	215
Parapet, Horiz.		7j1	4	31'-0	253	7j1	4	31'-0	253	7j1	4	31'-0	253
Apron, Trans., Top		5m1	35	22'-5	818	5m1	27	22'-5	631	5m1	18	22'-5	421
Apron, Trans., Top		5m2	39 Var.	2'-5 to 21'-5	485	5m2	39 Var.	2'-2 to 21'-2	475	5m2	39 Var.	2'-5 to 21'-5	485
Apron, Trans., Bott.		5m3	19	27'-0	535	5m3	16	27'-0	451	5m3	13	27'-0	366
Curtain, Horiz.		6p1	5	31'-0	233	6p1	5	31'-0	233	6p1	5	31'-0	233
Wing Slope, Both F.		6s1	4	22'-2	133	6s1	4	17'-9	107	6s1	4	13'-5	81
Wing Slope, Both F. (O)		6s2	2	9'-8	29	6s2	2	9'-8	29	6s2	2	9'-8	29
Wing Slope, Both F. (A)		6s3	2	10'-5	31	6s3	2	10'-5	31	6s3	2	10'-5	31
Wing Slope, F.F.		6s4	2	14'-1	42	6s4	2	14'-1	42	6s4	2	14'-1	42
Wing Slope, F.F.		6s5	2	19'-8	59	6s5	2	15'-4	46	6s5	2	11'-0	33
Interior Wall, Both F.		6s6	2	31'-1	93	6s6	2	26'-8	80	6s6	2	22'-4	67
Curtain, Vert.		5t1	30	6'-5	201	5t1	30	6'-5	201	5t1	30	6'-5	201
Curtain, Vert. Ends		5t2	4	6'-10	29	5t2	4	6'-10	29	5t2	4	6'-10	29
Bracket, Vert.		5u1	4	5'-4	22	5u1	4	5'-4	22	5u1	4	5'-4	22
Estimated Quantities One Headwall	Reinf. Steel			6474 LB				5772 LB				4793 LB	
	Concrete	Parapet Δ	3.1	43.6 CY		3.1		37.0 CY		3.1		30.6 CY	
		Wingwalls	9.2			6.7				4.5			
		Apron *	31.3			27.2				23.0			

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 TWPWH 45-1-20 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 - Twin Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Quantity Tabulation
10'-0" Span
45° Skew

TWPWH
45-8-20
Sheet 2 of 2

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