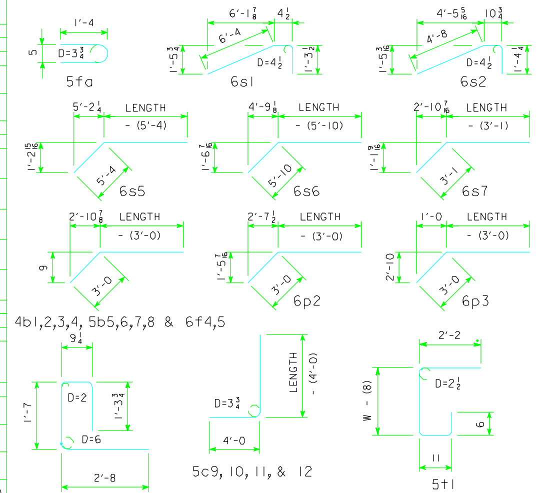
BILL OF REINFORCING FOR ONE TRIPLE HEADWALL 30° SKEW CULVERT SPAN x CULVERT HEIGHT

BAR	LOCATION	SHAPE	12'-0 x 12'-0			12'-0 x 10'-0			12'-0 x 8'-0			12'-0 x 6'-0			10'-0 x 12'-0			10'-0 x 10'-0			10'-0 x 8'-0			10'-0 x 6'-0			BAR
			NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	NO.	LENGTH	WEIGHT	
5fa	FENCE ANCHOR (GALV.)		2	3'-1	6	2	3'-1	6	2	3'-1	6	2	3'-1	6	2	3'-1	6	2	3'-1	6	2	3'-1	6	2	3'-1	6	5fa
4b1	WINGWALL, B.F.H. LONG		1	54'-3	37	1	45'-11	32	1	37'-7	25	1	29'-3	20	1	54'-3	37	1	45'-11	32	1	37'-7	25	1	29'-3	20	4b1
4b2	WINGWALL, B.F.H. SHORT		1	41'-3	29	1	35'-1	23	1	28'-10	19	1	22'-7	15	1	41'-3	29	1	35'-1	23	1	28'-10	19	1	22'-7	15	4b2
4b3	WINGWALL, B.F.H. LONG		10 VAR	14'-9: 52'-4	228	8 VAR	14'-9: 44'-0	158	6 VAR	14'-9: 35'-7	101	4 VAR	14'-9: 27'-4	56	10 VAR	14'-9: 52'-4	228	8 VAR	14'-9: 44'-0	158	6 VAR	14'-9: 35'-7	101	4 VAR	14'-9: 27'-4	56	4b3
4b4	WINGWALL, B.F.H. SHORT		10 VAR	11'-11: 39'-10	173	8 VAR	11'-11: 33'-8	122	6 VAR	11'-11: 27'-5	79	4 VAR	11'-11: 21'-2	44	10 VAR	11'-11: 39'-10	173	8 VAR	11'-11: 33'-8	122	6 VAR	11'-11: 27'-5	79	4 VAR	11'-11: 21'-2	44	4b4
5b5	WINGWALL, F.F.H. LONG		1	54'-3	59	1	45'-11	50	1	37'-7	39	1	29'-3	31	1	54'-3	59	1	45'-11	50	1	37'-7	39	1	29'-3	31	5b5
5b6	WINGWALL, F.F.H. SHORT		1	41'-3	45	1	35'-1	37	1	28'-10	30	1	22'-7	24	1	41'-3	45	1	35'-1	37	1	28'-10	30	1	22'-7	24	5b6
5b7	WINGWALL, F.F.H. LONG		11 VAR	10'-7: 52'-4	367	9 VAR	10'-7: 44'-0	258	7 VAR	10'-7: 35'-7	169	5 VAR	10'-7: 27'-4	99	11 VAR	10'-7: 52'-4	367	9 VAR	10'-7: 44'-0	258	7 VAR	10'-7: 35'-7	169	5 VAR	10'-7: 27'-4	99	5b7
5b8	WINGWALL, F.F.H. SHORT		11 VAR	8'-8: 39'-10	278	9 VAR	8'-8: 33'-8	199	7 VAR	8'-8: 27'-5	132	5 VAR	8'-8: 21'-2	78	11 VAR	8'-8: 39'-10	278	9 VAR	8'-8: 33'-8	199	7 VAR	8'-8: 27'-5	132	5 VAR	8'-8: 21'-2	78	5b8
5b9	CENTER WALLS, BOTH F.H.		42 VAR	5'-4: 30'-9	790	34 VAR	5'-4: 26'-2	559	26 VAR	5'-5: 21'-6	365	18 VAR	5'-6: 16'-11	210	42 VAR	5'-4: 30'-9	790	34 VAR	5'-4: 26'-2	559	26 VAR	5'-5: 21'-6	365	18 VAR	5'-6: 16'-11	210	5b9
4c1	WINGWALL, F.F.V. LONG		51 VAR	2'-10: 14'-10	301	43 VAR	2'-10: 12'-11	226	35 VAR	2'-10: 11'-0	162	26 VAR	2'-10: 8'-10	101	51 VAR	2'-9: 14'-9	298	43 VAR	2'-9: 12'-10	224	35 VAR	2'-9: 10'-11	160	26 VAR	2'-9: 8'-9	100	4c1
4c2	WINGWALL, F.F.V. SHORT		38 VAR	2'-11: 14'-9	224	32 VAR	2'-11: 12'-10	168	26 VAR	2'-11: 10'-11	120	20 VAR	2'-11: 9'-0	80	38 VAR	2'-10: 14'-8	222	32 VAR	2'-10: 12'-9	167	26 VAR	2'-10: 10'-10	119	20 VAR	2'-10: 8'-11	78	4c2
4c3	WINGWALL, F.F.V. LONG		2	13'-9	18	2	11'-9	16	1	9'-9	7	2	7'-9	10	2	13'-8	18	2	11'-8	16	1	9'-8	6	2	7'-8	10	4c3
4c3	WINGWALL, F.F.V. SHORT		2	13'-9	18	2	11'-9	16	1	9'-9	7	1	7'-9	5	2	13'-8	18	2	11'-8	16	1	9'-8	6	1	7'-8	5	4c3
4c4	CENTER WALLS, BOTH F.V.		4	1'-9	5	4	1'-9	5	4	1'-9	5	4	1'-9	5	4	1'-8	4	4	1'-8	4	4	1'-8	4	4	1'-8	4	4c4
4c5	CENTER WALLS, BOTH F.V.		108 VAR	1'-11: 12'-5	517	90 VAR	1'-11: 10'-5	371	72 VAR	1'-11: 8'-5	249	54 VAR	1'-11: 6'-6	152	108 VAR	1'-10: 12'-4	511	90 VAR	1'-10: 10'-4	366	72 VAR	1'-10: 8'-4	244	54 VAR	1'-10: 6'-5	149	4c5
4c6	CENTER WALLS, BOTH F.V.		4	12'-7	34	4	10'-7	28	4	8'-7	23	4	6'-7	18	4	12'-6	33	4	10'-6	28	4	8'-6	23	4	6'-6	17	4c6
5c7	WINGWALL, B.F.V. LONG		11 VAR	2'-10: 5'-2	46	11 VAR	2'-10: 5'-2	46	11 VAR	2'-10: 5'-2	46	11 VAR	2'-10: 5'-2	46	11 VAR	2'-9: 5'-1	45	11 VAR	2'-9: 5'-1	45	11 VAR	2'-9: 5'-1	45	11 VAR	2'-9: 5'-1	45	5c7
5c8	WINGWALL, B.F.V. SHORT		5 VAR	2'-11: 4'-2	18	5 VAR	2'-11: 4'-2	18	5 VAR	2'-11: 4'-2	18	5 VAR	2'-11: 4'-2	18	5 VAR	2'-10: 4'-1	18	5 VAR	2'-10: 4'-1	18	5 VAR	2'-10: 4'-1	18	5 VAR	2'-10: 4'-1	18	5c8
5c9	WINGWALL, B.F.V. LONG		40 VAR	9'-6: 18'-10	591	32 VAR	9'-6: 16'-11	441	24 VAR	9'-6: 15'-0	307	15 VAR	9'-6: 12'-10	175	40 VAR	9'-5: 18'-9	588	32 VAR	9'-5: 16'-10	438	24 VAR	9'-5: 14'-11	305	15 VAR	9'-5: 12'-9	173	5c9
5c10	WINGWALL, B.F.V. SHORT		33 VAR	8'-6: 18'-9	469	27 VAR	8'-6: 16'-10	357	21 VAR	8'-6: 14'-11	256	15 VAR	8'-6: 13'-0	168	33 VAR	8'-5: 18'-8	466	27 VAR	8'-5: 16'-9	354	21 VAR	8'-5: 14'-10	255	15 VAR	8'-5: 12'-11	167	5c10
5c11	WINGWALL, B.F.V. LONG		30	10'-6	329	22	10'-6	241	13	10'-6	142	—	—	—	30	10'-6	329	22	10'-6	241	13	10'-6	142	—	—	—	5c11
5c11	WINGWALL, B.F.V. SHORT		21	10'-6	230	15	10'-6	164	8	10'-6	88	—	—	—	21	10'-6	230	15	10'-6	164	8	10'-6	88	—	—	—	5c11
5c12	WINGWALL, B.F.V. LONG		2	17'-9	37	2	15'-9	33	1	13'-9	14	2	11'-9	25	2	17'-8	37	2	15'-8	33	1	13'-8	14	2	11'-8	24	5c12
5c12	WINGWALL, B.F.V. SHORT		2	17'-9	37	2	15'-9	33	1	13'-9	14	1	11'-9	12	2	17'-8	37	2	15'-8	33	1	13'-8	14	1	11'-8	12	5c12
4d1	APRON, LONGIT., BOTTOM		25	31'-3	522	25	26'-8	445	25	22'-1	369	25	17'-5	291	21	31'-3	438	21	26'-8	374	21	22'-1	310	21	17'-5	244	4d1
4d2	APRON, LONGIT., BOTT. LONG		3	48'-0	100	3	39'-7	79	3	31'-4	63	3	23'-1	47	3	48'-0	100	3	39'-7	79	3	31'-4	63	3	23'-1	47	4d2
4d3	APRON, LONGIT. BOTT. SHORT		3	36'-9	74	3	30'-8	61	3	24'-5	49	3	18'-4	37	3	36'-9	74	3	30'-8	61	3	24'-5	49	3	18'-4	37	4d3
6f1	APRON, LONGIT., TOP		37	31'-3	1737	37	26'-8	1482	37	22'-1	1227	37	17'-5	968	31	31'-3	1455	31	26'-8	1242	31	22'-1	1028	31	17'-5	811	6f1
6f2	APRON, LONGIT., TOP, LONG		11 VAR	5'-4: 28'-6	279	9 VAR	5'-4: 23'-10	197	7 VAR	5'-4: 19'-3	129	5 VAR	5'-3: 14'-7	74	11 VAR	5'-4: 28'-6	279	9 VAR	5'-4: 23'-10	197	7 VAR	5'-4: 19'-3	129	5 VAR	5'-3: 14'-7	74	6f2
6f3	APRON, LONGIT., TOP SHORT		8 VAR	7'-0: 28'-9	215	7 VAR	5'-5: 24'-1	155	5 VAR	6'-11: 19'-6	99	4 VAR	5'-5: 14'-10	61	8 VAR	7'-0: 28'-9	215	7 VAR	5'-5: 24'-1	155	5 VAR	6'-11: 19'-6	99	4 VAR	5'-5: 14'-10	61	6f3
6f4	APRON, LONGIT., TOP, LONG		1	54'-3	84	1	45'-11	72	1	37'-7	56	1	29'-3	44	1	54'-3	84	1	45'-11	72	1	37'-7	56	1	29'-3	44	6f4
6f5	APRON, LONGIT., TOP SHORT		1	41'-3	65	1	35'-1	53	1	28'-10	43	1	22'-7	34	1	41'-3	65	1	35'-1	53	1	28'-10	43	1	22'-7	34	6f5
4i1	PARAPET, VERTICAL		79	6'-4	334	77	6'-4	326	77	6'-4	326	77	6'-4	326	67	6'-4	283	65	6'-4	275	65	6'-4	275	65	6'-4	275	4i1
7j1	PARAPET, HORIZONTAL		4	45'-9	392	4	45'-0	386	4	45'-0	386	4	44'-7	382	4	38'-10	317	4	38'-1	311	4	38'-1	311	4	37'-8	308	7j1
6m1	APRON, TRANS., TOP		16 VAR	45'-6: 42'-8	1124	16 VAR	44'-10: 42'-0	1107	13 VAR	44'-3: 42'-0	894	7 VAR	42'-9: 41'-8	472	14 VAR	38'-8: 36'-3	788	14 VAR	38'-0: 35'-7	774	15 VAR	38'-2: 35'-7	831	9 VAR	36'-9: 35'-3	487	6m1
6m2	APRON, TRANS., TOP		9 VAR	48'-9: 45'-9	675	3 VAR	45'-10: 45'-1	217	3 VAR	37'-3: 34'-8	162	9 VAR	36'-11: 26'-6	429	13 VAR	43'-6: 39'-0	846	7 VAR	40'-7: 38'-4	423	24 VAR	32'-0: 6'-5	692	5 VAR	31'-4: 26'-1	216	6m2
6m3	APRON, TRANS., TOP		29 VAR	39'-9: 8'-8	1054	29 VAR	38'-1: 7'-0	982	25 VAR	33'-5: 6'-9	754	—	—	—	24 VAR	35'-0: 9'-5	801	24 VAR	33'-4: 7'-9	740	—	—	—	19 VAR	25'-0: 5'-0	428	6m3
6m5	APRON, TRANS., BOTTOM		24 VAR	54'-7: 38'-11	1757	20 VAR	51'-6: 38'-6	1407	16 VAR	48'-9: 38'-6	1091	12 VAR	45'-10: 38'-4	788	24 VAR	47'-8: 32'-0	1475	20 VAR	44'-7: 31'-7	1167	16 VAR	41'-10: 31'-7	892	12 VAR	38'-11: 31'-5	634	6m5
6p1	CURTAIN, HORIZONTAL		4	44'-0	280	4	43'-8	278	4	43'-7	278	4	43'-5	277	4	37'-1	223	4	36'-8	220	4	36'-8	220	4	36'-6	219	6p1
6p2	CURTAIN, HORIZ. LONG		4	28'-1	169	4	24'-0	144	4	20'-0	120	4	16'-0	96	4	28'-1	169	4	24'-0	144	4	20'-0	120	4	16'-0	96	6p2
6p3	CURTAIN, HORIZ. SHORT		4	16'-0	96	4	13'-11	84	4	11'-10	71	4	9'-9	59	4	16'-0	96	4	13'-11	84	4	11'-10	71	4	9'-9	59	6p3
6s1	WING SLOPE, BOTH F. LONG		2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	6s1
6s2	WING SLOPE, BOTH F. SHORT		2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	6s2
6s3	WING SLOPE, BOTH F. LONG		2	49'-4	154	2	40'-9	128	2	32'-2	97	2	23'-7	71	2	49'-4	154	2	40'-9	128	2	32'-2	97	2	23'-7	71	6s3
6s4	WING SLOPE, BOTH F. SHORT		2	38'-6	116	2	31'-11	96	2	25'-4	76	2	18'-10	57	2	38'-6	116	2	31'-11	96	2	25'-4	76	2	18'-10	57	6s4
6s5	WING SLOPE, F.F. LONG		1	54'-7	85	1	46'-0	72	1	37'-5	56	1	28'-10	43	1	54'-7	85	1	46'-0	72	1	37'-5	56	1	28'-10	43	6s5
6s6	WING SLOPE, F.F. SHORT		1	42'-8	67	1	36'-1	54	1	29'-6	44	1	23'-0	35	1	42'-8	67	1	36'-1	54	1	29'-6	44	1	23'-0	35	6s6
6s7	CENTER WALL, BOTH F.HOR.		4	32'-11	198	4	27'-11	168	4	22'-11	138	4	17'-11	108	4	32'-11	198	4	27'-11	168	4	22'-11	138	4	17'-11	108	6s7
5t1	CURTAIN, VERTICAL		60	7'-11	495	55	7'-5	425	50	6'-11	361	45	6'-5	301	54	7'-11	446	49	7'-5	379	44	6'-11	317	39	6'-5	261	5t1

ESTIMATED QUANTITIES ONE HEADWALL			12'-0 x 12'-0		12'-0 x 10'-0		12'-0 x 8'-0		12'-0 x 6'-0		10'-0 x 12'-0		10'-0 x 10'-0		10'-0 x 8'-0		10'-0 x 6'-0	
REINFORCING STEEL			15,003 LBS		12,070 LBS		9357 LBS		6443 LBS		13,685 LBS		10,904 LBS		8370 LBS		6079 LBS	
CONC.	PARAPET Δ		4.3	133.2 CU. YD.	4.1	98.9 CU. YD.	4.1	75.5 CU. YD.	4.0	53.4 CU. YD.	3.8	119.9 CU. YD.	3.6	87.7 CU. YD.	3.6	66.5 CU. YD.	3.5	46.4 CU. YD.
	WINGWALLS		39.6		23.7		15.9		8.6		39.6		23.7		15.9		8.6	
	FOOTING ΔΔ		89.3		71.1		55.5		40.8		76.5		60.4		47.0		34.3	

BENT BAR DETAILS



NOTE: ALL DIMENSIONS ARE OUT TO OUT. D = PIN DIAMETER

"SHORT" DENOTES SHORT WINGWALL

"LONG" DENOTES LONG WINGWALL

VARIABLE LENGTH BARS DENOTED BY X:Y

WEIGHT OF BARS OVER 40'-0 LONG INCLUDES AN ALLOWANCE FOR LAP (2'-8 FOR TOP APRON "m" BARS AND 2'-2 ALL OTHER BARS).
LENGTHS SHOWN FOR BARS OVER 40'-0 LONG DO NOT INCLUDE LAP (2'-8 FOR TOP APRON "m" BARS AND 2'-2 ALL OTHER).

Δ NOTE: INCLUDES TOP OF WINGWALL QUANTITIES.

ΔΔ ASSUMES APRON AND FLOOR ARE EQUAL THICKNESS, ADJUST CONCRETE QUANTITIES FOR TRANSITION WHERE APRON AND FLOOR THICKNESS ARE NOT EQUAL.

HEADWALL NOTES:

SEE SHEET TRRCB-GI-01 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.

THIS HEADWALL IS BASED ON A 3:1 SLOPE NORMAL TO CENTERLINE OF ROADWAY.

THE SIDES OF THE FOOTING ARE TO BE FORMED TO INSURE CORRECT LINE AND GRADE.

ALL EXPOSED CORNERS OF 90° OR SHARPER ARE TO BE FILLETED WITH A ¾" DRESSED AND BEVELED STRIP.

ALL REINFORCING IS TO BE SECURELY WIRED IN PLACE BEFORE THE CONCRETE IS POURED. ALL SLAB AND FLOOR 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.

CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR IS TO BE 2" UNLESS OTHERWISE NOTED OR SHOWN.

CONCRETE QUANTITIES ARE ESTIMATED FROM BACK OF PARAPET.

HORIZONTAL TAILS OF BARS "b" & "s" ESTIMATED TO EXTEND 2'-0 BEYOND BACK OF PARAPET (INTO END OF BARREL). LONGITUDINAL BARS "d", "6f1", "6f4", AND "6f5" ESTIMATED TO PROJECT INTO END SECTION OF BARREL A MINIMUM OF 2'-0 BEYOND BACK OF PARAPET.

THE "LENGTH" COLUMN REFLECTS TOTAL NUMBER OF FEET NECESSARY TO MEET THESE REQUIREMENTS.

LATEST REVISION DATE :

APPROVED BY :

STANDARD DESIGN

FLARED WING HEADWALLS

FOR

TRIPLE REINFORCED CONCRETE BOX CULVERTS

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION

SEPT., 2001

TRH 30-5-01

REVISED 06-02 - 4i1 BARS NUMBER CHANGED.
TRH305.S01 - 09-01 THIS SHEET ISSUED.

XXXXXXXXXXSYSTEMTIME XXXXXXXUSERNAME XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXDGNSPEC