

BILL OF REINFORCING FOR ONE HEADWALL 15° SKEW CULVERT SPAN x CULVERT HEIGHT

| LOCATION | SHAPE | 12' x 12' | | | | 12' x 11' | | | | 12' x 10' | | | | 12' x 9' | | | | 12' x 8' | | | | 12' x 7' | | | | 12' x 6' | | | | 12' x 5' | | | | 12' x 4' | | | |
|-------------------------|-------|-----------|----------------------|------|-----|-----------|----------------------|------|-----|-----------|----------------------|------|-----|----------|----------------------|-----|-----|----------|-----------------------|-----|-----|----------|----------------------|-----|-----|----------|----------------------|-----|-----|----------|----------------------|-----|-----|----------|----------------------|-----|--|
| | | BAR NO. | LENGTH | WT. | | BAR NO. | LENGTH | WT. | | BAR NO. | LENGTH | WT. | | 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 | 3'-1 | 6 | 5fa | 2 | 3'-1 | 6 | 5fa | 2 | 3'-1 | 6 | 5fa | 2 | 3'-1 | 6 | 5fa | 2 | 3'-1 | 6 | 5fa | 2 | 3'-1 | 6 | 5fa | 2 | 3'-1 | 6 | 5fa | 2 | 3'-1 | 6 | 5fa | 2 | 3'-1 | 6 | |
| WINGWALL, F.F.H. | 5b1 | 2 | 41'-3 | 90 | 5b1 | 2 | 38'-2 | 80 | 5b1 | 2 | 35'-0 | 73 | 5b1 | 2 | 31'-11 | 67 | 5b1 | 2 | 28'-10 | 60 | 5b1 | 2 | 25'-8 | 54 | 5b1 | 2 | 22'-7 | 47 | 5b1 | 2 | 19'-6 | 41 | 5b1 | 2 | 16'-5 | 34 | |
| WINGWALL, F.F.H. | 5b2 | 22 VAR | 2 EACH 9'-240'-2 | 570 | 5b2 | 20 VAR | 2 EACH 9'-237'-1 | 482 | 5b2 | 18 VAR | 2 EACH 9'-234'-0 | 405 | 5b2 | 16 VAR | 2 EACH 9'-230'-11 | 334 | 5b2 | 14 VAR | 2 EACH 9'-227'-9 | 270 | 5b2 | 12 VAR | 2 EACH 9'-224'-8 | 212 | 5b2 | 10 VAR | 2 EACH 9'-221'-7 | 160 | 5b2 | 8 VAR | 2 EACH 9'-218'-5 | 115 | 5b2 | 6 VAR | 2 EACH 9'-215'-4 | 77 | |
| WINGWALL, B.F.H. | 4b3 | 2 | 41'-5 | 58 | 4b3 | 2 | 38'-3 | 51 | 4b3 | 2 | 35'-1 | 47 | 4b3 | 2 | 32'-0 | 43 | 4b3 | 2 | 28'-11 | 39 | 4b3 | 2 | 25'-9 | 34 | 4b3 | 2 | 22'-8 | 30 | 4b3 | 2 | 19'-7 | 26 | 4b3 | 2 | 16'-6 | 22 | |
| WINGWALL, B.F.H. | 4b4 | 20 VAR | 2 EACH 12'-540'-4 | 355 | 4b4 | 18 VAR | 2 EACH 12'-537'-3 | 299 | 4b4 | 16 VAR | 2 EACH 12'-534'-1 | 248 | 4b4 | 14 VAR | 2 EACH 12'-531'-0 | 203 | 4b4 | 12 VAR | 2 EACH 12'-527'-11 | 161 | 4b4 | 10 VAR | 2 EACH 12'-524'-9 | 124 | 4b4 | 8 VAR | 2 EACH 12'-521'-8 | 91 | 4b4 | 6 VAR | 2 EACH 12'-518'-6 | 62 | 4b4 | 4 VAR | 2 EACH 12'-515'-5 | 37 | |
| WINGWALL, F.F.V. | 5c1 | 152 VAR | 2 EACH 2'-941'-10 | 1394 | 6c1 | 70 VAR | 2 EACH 2'-941'-8 | 863 | 6c1 | 64 VAR | 2 EACH 2'-941'-9 | 745 | 5c1 | 58 VAR | 2 EACH 2'-941'-9 | 439 | 5c1 | 52 VAR | 2 EACH 2'-941'-10 | 368 | 4c1 | 46 VAR | 2 EACH 2'-941'-10 | 193 | 4c1 | 40 VAR | 2 EACH 2'-941'-10 | 155 | 4c1 | 34 VAR | 2 EACH 2'-941'-11 | 121 | 4c1 | 26 VAR | 2 EACH 2'-941'-7 | 81 | |
| WINGWALL, F.F.V. (O) | 5c2 | 2 | 15'-0 | 31 | 6c2 | 2 | 14'-0 | 42 | 6c2 | 2 | 13'-0 | 39 | 5c2 | 2 | 12'-0 | 25 | 5c2 | 2 | 11'-0 | 23 | 4c2 | 2 | 10'-0 | 13 | 4c2 | 2 | 9'-0 | 12 | 4c2 | 2 | 8'-0 | 11 | 4c2 | 2 | 7'-0 | 9 | |
| WINGWALL, F.F.V. (A) | 5c2 | 2 | 15'-0 | 31 | 6c2 | 2 | 14'-0 | 42 | 6c2 | 2 | 13'-0 | 39 | 5c2 | 2 | 12'-0 | 25 | 5c2 | 2 | 11'-0 | 23 | 4c2 | 2 | 10'-0 | 13 | 4c2 | 2 | 9'-0 | 12 | 4c2 | 2 | 8'-0 | 11 | 4c2 | 2 | 7'-0 | 9 | |
| WINGWALL, B.F.V. | 6c3 | 76 VAR | 2 EACH 6'-4418'-3 | 1403 | 6c3 | 70 VAR | 2 EACH 6'-4417'-3 | 1240 | 6c3 | 64 VAR | 2 EACH 6'-4416'-4 | 1089 | 5c3 | 58 VAR | 2 EACH 6'-4415'-4 | 655 | 5c3 | 52 VAR | 2 EACH 6'-4414'-5 | 563 | 5c3 | 46 VAR | 2 EACH 6'-4413'-5 | 474 | 5c3 | 40 VAR | 2 EACH 6'-4412'-5 | 391 | 5c3 | 34 VAR | 2 EACH 6'-4411'-6 | 316 | 6c3 | 26 VAR | 2 EACH 6'-4410'-2 | 322 | |
| WINGWALL, B.F.V. (O) | 6c4 | 1 | 18'-6 | 28 | 6c4 | 1 | 17'-6 | 26 | 6c4 | 2 | 16'-6 | 50 | 5c4 | 2 | 15'-6 | 32 | 5c4 | 2 | 14'-6 | 30 | 5c4 | 2 | 13'-6 | 28 | 5c4 | 2 | 12'-6 | 26 | 5c4 | 2 | 11'-6 | 24 | 6c4 | 2 | 10'-6 | 32 | |
| WINGWALL, B.F.V. (A) | 6c4 | 2 | 18'-6 | 56 | 6c4 | 2 | 17'-6 | 53 | 6c4 | 2 | 16'-6 | 50 | 5c4 | 2 | 15'-6 | 32 | 5c4 | 2 | 14'-6 | 30 | 5c4 | 2 | 13'-6 | 28 | 5c4 | 2 | 12'-6 | 26 | 5c4 | 2 | 11'-6 | 24 | 6c4 | 2 | 10'-6 | 32 | |
| WINGWALL, B.F.V. | 6c5 | 50 | 8'-6 | 638 | 6c5 | 46 | 8'-6 | 587 | 6c5 | 42 | 8'-6 | 536 | 5c5 | 36 | 8'-6 | 319 | 5c5 | 34 | 8'-6 | 301 | 5c5 | 30 | 8'-6 | 266 | 5c5 | 26 | 8'-6 | 231 | 5c5 | 22 | 8'-2 | 187 | c5 | - | - | | |
| APRON, LONGIT., BOT. | 4d1 | 11 | 41'-2 | 317 | 4d1 | 11 | 38'-1 | 280 | 4d1 | 11 | 35'-0 | 257 | 4d1 | 11 | 31'-10 | 234 | 4d1 | 11 | 28'-9 | 211 | 4d1 | 11 | 25'-8 | 189 | 4d1 | 11 | 22'-6 | 165 | 4d1 | 11 | 19'-5 | 143 | 4d1 | 11 | 16'-4 | 120 | |
| APRON, LONGIT., TOP | 6f1 | 13 | 41'-2 | 843 | 6f1 | 13 | 38'-1 | 744 | 6f1 | 13 | 35'-0 | 683 | 6f1 | 13 | 31'-10 | 622 | 6f1 | 13 | 28'-9 | 561 | 6f1 | 13 | 25'-8 | 501 | 6f1 | 13 | 22'-6 | 439 | 6f1 | 13 | 19'-5 | 379 | 6f1 | 13 | 16'-4 | 319 | |
| PARAPET, VERTICAL | 4i1 | 25 | 6'-7 | 110 | 4i1 | 25 | 6'-7 | 110 | 4i1 | 25 | 6'-7 | 110 | 4i1 | 25 | 6'-7 | 110 | 4i1 | 25 | 6'-7 | 110 | 4i1 | 25 | 6'-7 | 110 | 4i1 | 25 | 6'-7 | 110 | 4i1 | 25 | 6'-7 | 110 | 4i1 | 25 | 6'-7 | 110 | |
| PARAPET, HORIZ. | 7j1 | 4 | 14'-2 | 116 | 7j1 | 4 | 14'-2 | 116 | 7j1 | 4 | 13'-10 | 113 | 7j1 | 4 | 13'-10 | 113 | 7j1 | 4 | 13'-10 | 113 | 7j1 | 4 | 13'-8 | 112 | 7j1 | 4 | 13'-8 | 112 | 7j1 | 4 | 13'-8 | 112 | 7j1 | 4 | 13'-8 | 112 | |
| APRON, TRANS., TOP | 6m1 | 50 | 14'-2 | 1064 | 6m1 | 46 | 14'-2 | 979 | 6m1 | 42 | 13'-10 | 873 | 6m1 | 38 | 13'-10 | 790 | 6m1 | 34 | 13'-10 | 706 | 6m1 | 30 | 13'-8 | 616 | 6m1 | 26 | 13'-8 | 534 | 6m1 | 21 | 13'-8 | 431 | 6m1 | 17 | 13'-8 | 349 | |
| APRON, TRANS., TOP | 6m2 | 4 VAR | 4'-212'-6 | 50 | 6m2 | 4 VAR | 3'-912'-2 | 48 | 6m2 | 4 VAR | 3'-211'-7 | 44 | 6m2 | 4 VAR | 2'-1011'-2 | 42 | 6m2 | 4 VAR | 2'-510'-10 | 40 | 6m2 | 3 VAR | 4'-910'-4 | 34 | 6m2 | 3 VAR | 4'-49'-11 | 32 | 6m2 | 4 VAR | 3'-1112'-4 | 49 | 6m2 | 4 VAR | 3'-611'-11 | 46 | |
| APRON, TRANS., BOT. | 5m3 | 73 | 11'-5 | 869 | 6m3 | 34 | 12'-3 | 626 | 6m3 | 31 | 11'-11 | 555 | 5m3 | 28 | 11'-1 | 324 | 4m3 | 25 | 10'-2 | 170 | 4m3 | 22 | 10'-0 | 147 | 4m3 | 19 | 10'-0 | 127 | 4m3 | 16 | 10'-0 | 107 | 4m3 | 13 | 10'-0 | 87 | |
| CURTAIN, HORIZ. | 6p1 | 6 | 14'-7 | 131 | 6p1 | 6 | 14'-7 | 131 | 6p1 | 6 | 14'-3 | 128 | 6p1 | 6 | 14'-3 | 128 | 6p1 | 6 | 14'-3 | 128 | 6p1 | 5 | 14'-1 | 106 | 6p1 | 5 | 14'-1 | 106 | 6p1 | 5 | 14'-1 | 106 | 6p1 | 5 | 14'-1 | 106 | |
| WING SLOPE, BOTH F. | 6s1 | 4 | 36'-9 | 221 | 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 | 6s1 | 4 | 17'-2 | 103 | 6s1 | 4 | 13'-11 | 84 | 6s1 | 4 | 10'-7 | 64 | |
| WING SLOPE, BOTH F. (O) | 6s2 | 2 | 7'-10 | 24 | 6s2 | 2 | 7'-10 | 24 | 6s2 | 2 | 7'-11 | 24 | 6s2 | 2 | 7'-11 | 24 | 6s2 | 2 | 7'-11 | 24 | 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'-1 | 24 | 6s3 | 2 | 8'-1 | 24 | 6s3 | 2 | 8'-1 | 24 | 6s3 | 2 | 8'-1 | 24 | 6s3 | 2 | 8'-1 | 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'-3 | 34 | 6s4 | 2 | 11'-3 | 34 | 6s4 | 2 | 11'-3 | 34 | 6s4 | 2 | 11'-3 | 34 | 6s4 | 2 | 11'-3 | 34 | 6s4 | 2 | 11'-3 | 34 | 6s4 | 2 | 11'-3 | 34 | 6s4 | 2 | 11'-3 | 34 | 6s4 | 2 | 11'-3 | 34 | |
| WING SLOPE, F. F. (O) | 6s5 | 2 | 34'-5 | 103 | 6s5 | 2 | 31'-2 | 94 | 6s5 | 2 | 27'-11 | 84 | 6s5 | 2 | 24'-8 | 74 | 6s5 | 2 | 21'-5 | 64 | 6s5 | 2 | 18'-1 | 54 | 6s5 | 2 | 14'-10 | 45 | 6s5 | 2 | 11'-7 | 35 | 6s5 | 2 | 8'-4 | 25 | |
| CURTAIN, VERT. | 5t1 | 13 | 7'-11 | 107 | 5t1 | 13 | 7'-8 | 104 | 5t1 | 13 | 7'-5 | 101 | 5t1 | 13 | 7'-2 | 97 | 5t1 | 13 | 6'-11 | 94 | 5t1 | 13 | 6'-8 | 90 | 5t1 | 13 | 6'-5 | 87 | 5t1 | 13 | 6'-5 | 87 | 5t1 | 13 | 6'-5 | 87 | |
| 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 | 5t2 | 4 | 6'-5 | 27 | 5t2 | 4 | 6'-5 | 27 | 5t2 | 4 | 6'-5 | 27 | |
| BRACKET, VERT. | 5u1 | 4 | 6'-8 | 28 | 5u1 | 4 | 6'-5 | 27 | 5u1 | 4 | 6'-2 | 26 | 5u1 | 4 | 6'-0 | 25 | 5u1 | 4 | 5'-9 | 24 | 5u1 | 4 | 5'-7 | 23 | 5u1 | 4 | 5'-4 | 22 | 5u1 | 4 | 5'-4 | 22 | 5u1 | 4 | 5'-4 | 22 | |

| ESTIMATED QUANTITIES ONE HEADWALL | REINF. STEEL | 8734 LBS. | | 7345 LBS. | | 6595 LBS. | | 5013 LBS. | | 4348 LBS. | | 3660 LBS. | | 3178 LBS. | | 2718 LBS. | | 2217 LBS. | |
|-----------------------------------|--------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
| | | CONCRETE | CU.YD. | CONCRETE | CU.YD. | CONCRETE | CU.YD. | CONCRETE | CU.YD. | CONCRETE | CU.YD. | CONCRETE | CU.YD. | CONCRETE | CU.YD. | CONCRETE | CU.YD. | CONCRETE | CU.YD. |
| PARAPET | 1.7 | 53.4 | 1.7 | 47.9 | 1.6 | 39.2 | 1.6 | 34.8 | 1.6 | 30.5 | 1.5 | 25.4 | 1.5 | 21.6 | 1.5 | 18.3 | 1.5 | 15.1 | |
| WINGWALLS | 22.5 | | 19.3 | | 13.6 | | 11.4 | | 9.3 | | 6.7 | | 5.1 | | 3.8 | | 2.6 | | |
| APRON | 29.2 | | 26.9 | | 24.0 | | 21.8 | | 19.6 | | 17.2 | | 15.0 | | 13.0 | | 11.0 | | |

Δ INCLUDES TOP OF WINGWALL QUANTITIES.
 (A) - INDICATES BAR LOCATED AT ACUTE CORNER.
 (O) - INDICATES BAR LOCATED AT OBTUSE CORNER.
 NOTE: WEIGHT OF BARS OVER 40'-0 LONG INCLUDE AN ALLOWANCE OF 2'-0 FOR LAP.
 REFER TO SHEET PWH 15-1-12 FOR ACUTE AND OBTUSE CORNER LOCATIONS.

HEADWALL NOTES:

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 3" DRESSED AND BEVELED STRIP.

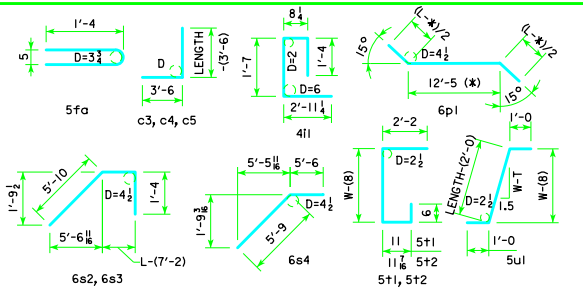
ALL REINFORCING IS TO BE SECURELY WIRED IN PLACE BEFORE THE CONCRETE IS POURED. ALL SLAB AND FLOOR REINFORCING STEEL IS TO BE SUPPORTED BY BAR CHAIRS AT INTERVALS OF NOT MORE THAN 3'-0 IN EITHER DIRECTION AS OUTLINED IN THE STANDARD SPECIFICATIONS.

CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR IS TO BE 2" UNLESS OTHERWISE NOTED OR SHOWN. CLEARANCE TO THE BOTTOM ENDS OF VERTICAL BARS SHALL BE 3 INCHES.

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 "4d1" AND "6f1" 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.

BENT BAR DETAILS



| c BAR PIN DIAMETER | |
|--------------------|-------|
| BAR SIZE | D |
| 4 | 3 |
| 5 | 3 1/2 |
| 6 | 4 1/2 |

NOTE: ALL DIMENSIONS ARE OUT TO OUT
 D = PIN DIAMETER
 SEE TABLE AT RIGHT FOR PIN DIAMETER "D" OF c BARS