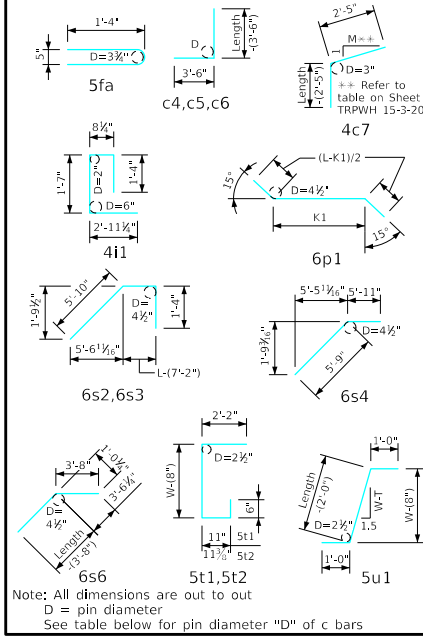


ENGLISHLRFDDESIGNEDTRIPLECULVERTS.DGN - TRPWH 15-7-20 S1 - THIS SHEET ISSUED 07-2020.

Bent Bar Details



| c Bar Pin Diameter | |
|--------------------|--------|
| Bar Size | D |
| 5 | 3 3/4" |
| 6 | 4 1/2" |

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

| Location | Shape | 10' x 12' | | | | 10' x 11' | | | | 10' x 10' | | | | 10' x 9' | | | | 10' x 8' | | | | 10' 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'-7 to 14'-6 | 677 | 5c1 | 70 Var. | 2 Each 2'-7 to 13'-6 | 587 | 4c1 | 64 Var. | 2 Each 2'-7 to 12'-7 | 324 | 4c1 | 58 Var. | 2 Each 2'-7 to 11'-7 | 274 | 4c1 | 68 Var. | 2 Each 2'-7 to 10'-7 | 299 | 4c1 | 60 Var. | 2 Each 2'-7 to 9'-7 | 244 | |
| Wingwall, F.F.V. | 5c2 | 36 Var. | 2 Each 9'-2 to 14'-8 | 447 | 5c2 | 30 Var. | 2 Each 9'-2 to 13'-8 | 357 | 4c2 | 24 Var. | 2 Each 9'-2 to 12'-9 | 176 | 4c2 | 16 Var. | 2 Each 9'-2 to 11'-5 | 110 | c2 | -- | -- | -- | c2 | -- | -- | -- | |
| Wingwall, F.F.V. (O) | 5c3 | 2 | 15'-0" | 31 | 5c3 | 2 | 14'-0" | 29 | 4c3 | 2 | 13'-0" | 17 | 4c3 | 2 | 12'-0" | 16 | 4c3 | 2 | 11'-0" | 15 | 4c3 | 2 | 10'-0" | 13 | |
| Wingwall, F.F.V. (A) | 5c3 | 2 | 15'-0" | 31 | 5c3 | 2 | 14'-0" | 29 | 4c3 | 2 | 13'-0" | 17 | 4c3 | 2 | 12'-0" | 16 | 4c3 | 2 | 11'-0" | 15 | 4c3 | 2 | 10'-0" | 13 | |
| Wingwall, B.F.V. | 6c4 | 76 Var. | 2 Each 6'-3 to 18'-2 | 1394 | 5c4 | 70 Var. | 2 Each 6'-3 to 17'-3 | 858 | 5c4 | 64 Var. | 2 Each 6'-3 to 16'-3 | 751 | 5c4 | 58 Var. | 2 Each 6'-3 to 15'-4 | 653 | 5c4 | 52 Var. | 2 Each 6'-3 to 14'-4 | 558 | 5c4 | 46 Var. | 2 Each 6'-3 to 13'-4 | 470 | |
| Wingwall, B.F.V. (O) | 6c5 | 1 | 18'-6" | 28 | 5c5 | 1 | 17'-6" | 18 | 5c5 | 1 | 16'-6" | 17 | 5c5 | 1 | 15'-6" | 16 | 5c5 | 1 | 14'-6" | 15 | 5c5 | 1 | 13'-6" | 14 | |
| Wingwall, B.F.V. (A) | 6c5 | 2 | 18'-6" | 56 | 5c5 | 2 | 17'-6" | 37 | 5c5 | 2 | 16'-6" | 34 | 5c5 | 2 | 14'-6" | 30 | 5c5 | 2 | 14'-6" | 30 | 5c5 | 2 | 13'-6" | 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'-9" | 10 | 4c7 | 4 | 3'-9" | 10 | 4c7 | 4 | 3'-9" | 10 | 4c7 | 4 | 3'-9" | 10 | 4c7 | 4 | 3'-9" | 10 | 4c7 | 4 | 3'-9" | 10 | |
| Interior Wall, Both F.V | 4c8 | 150 Var. | 2 Each 1'-6 to 12'-2 | 685 | 4c8 | 136 Var. | 2 Each 1'-6 to 11'-1 | 572 | 4c8 | 124 Var. | 2 Each 1'-6 to 10'-1 | 480 | 4c8 | 112 Var. | 2 Each 1'-6 to 9'-2 | 399 | 4c8 | 100 Var. | 2 Each 1'-6 to 8'-2 | 323 | 4c8 | 88 Var. | 2 Each 1'-6 to 7'-2 | 255 | |
| Interior Wall, Both F.V | 4c9 | 4 | 12'-6" | 33 | 4c9 | 4 | 11'-6" | 31 | 4c9 | 4 | 10'-6" | 28 | 4c9 | 4 | 9'-6" | 25 | 4c9 | 4 | 8'-6" | 23 | 4c9 | 4 | 7'-6" | 20 | |
| Apron, Longit., Bott. | 4d1 | 33 | 41'-7" | 970 | 4d1 | 33 | 38'-5" | 847 | 4d1 | 33 | 35'-4" | 779 | 4d1 | 33 | 32'-3" | 711 | 4d1 | 33 | 29'-2" | 643 | 4d1 | 33 | 26'-0" | 573 | |
| Apron, Longit., Top | 6f1 | 33 | 41'-7" | 2181 | 6f1 | 33 | 38'-5" | 1904 | 6f1 | 33 | 35'-4" | 1751 | 6f1 | 33 | 32'-3" | 1599 | 6f1 | 33 | 29'-2" | 1446 | 6f1 | 33 | 26'-0" | 1289 | |
| Parapet, Vertical | 4i1 | 65 | 6'-7" | 286 | 4i1 | 65 | 6'-7" | 286 | 4i1 | 63 | 6'-7" | 277 | 4i1 | 63 | 6'-7" | 277 | 4i1 | 63 | 6'-7" | 277 | 4i1 | 63 | 6'-7" | 277 | |
| Parapet, Horiz. | 7j1 | 4 | 34'-10" | 285 | 7j1 | 4 | 34'-10" | 285 | 7j1 | 4 | 34'-2" | 279 | 7j1 | 4 | 34'-2" | 279 | 7j1 | 4 | 34'-2" | 279 | 7j1 | 4 | 33'-9" | 276 | |
| Apron, Trans., Top | 5m1 | 46 | 34'-2" | 1639 | 5m1 | 42 | 34'-2" | 1497 | 5m1 | 38 | 33'-6" | 1328 | 5m1 | 34 | 33'-6" | 1188 | 5m1 | 30 | 33'-6" | 1048 | 5m1 | 26 | 33'-2" | 899 | |
| Apron, Trans., Top | 5m2 | 12 Var. | 2'-5 to 33'-2 | 223 | 5m2 | 11 Var. | 2'-5 to 32'-10 | 216 | 5m2 | 11 Var. | 2'-5 to 32'-1 | 207 | 5m2 | 11 Var. | 2'-5 to 31'-8 | 203 | 5m2 | 11 Var. | 2'-5 to 31'-4 | 199 | 5m2 | 11 Var. | 2'-9 to 30'-9 | 192 | |
| Apron, Trans., Bott. | 6m3 | 73 | 32'-8" | 3582 | 5m3 | 67 | 31'-10" | 2225 | 6m3 | 31 | 31'-11" | 1486 | 5m3 | 37 | 31'-2" | 1203 | 5m3 | 25 | 31'-2" | 813 | 5m3 | 22 | 30'-10" | 708 | |
| Curtain, Horiz. | 6p1 | 6 | 35'-3" | 318 | 6p1 | 6 | 35'-3" | 318 | 6p1 | 6 | 34'-7" | 312 | 6p1 | 6 | 34'-7" | 312 | 6p1 | 6 | 34'-7" | 312 | 6p1 | 5 | 34'-3" | 257 | |
| 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 | 34 | 7'-11" | 281 | 5t1 | 34 | 7'-8" | 272 | 5t1 | 33 | 7'-5" | 255 | 5t1 | 33 | 7'-2" | 247 | 5t1 | 33 | 6'-11" | 238 | 5t1 | 33 | 6'-8" | 229 | |
| 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'-4" | 26 | 5u1 | 4 | 6'-2" | 26 | 5u1 | 4 | 5'-11" | 25 | 5u1 | 4 | 5'-8" | 24 | 5u1 | 4 | 5'-6" | 23 | |
| Estimated Quantities One Headwall | Reinf. Steel | 16,668 LB | | | | 13,247 LB | | | | 11,008 LB | | | | 9,664 LB | | | | 8,297 LB | | | | 7,202 LB | | | |
| | Concrete | 108.3 CY | | | | 97.4 CY | | | | 80.6 CY | | | | 71.5 CY | | | | 62.9 CY | | | | 52.7 CY | | | |

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap. Δ Includes top of wingwall quantities. (A) - Indicates bar located at acute corner. * Assumes apron and floor are equal thickness, adjust concrete quantities for transition where apron and floor thickness are not equal. (O) - Indicates bar located at obtuse corner. Refer to Sheet TRPWH 15-1-20 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 apron are to be formed to ensure correct line and grade.
- 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.
- 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'-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.
- Dimensions are in feet and inches unless otherwise noted.

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| LATEST REVISION DATE | APPROVED BY BRIDGE ENGINEER | |
| | | Standard Design - Triple Reinforced Concrete Box Culverts |
| | | Parallel Wing Headwalls |
| | | July, 2020 |
| Quantity Tabulation | | TRPWH |
| 10'-0" Span | | 15-7-20 |
| 15° Skew | | Sheet 1 of 2 |