# VARIABLE DIMENSIONS AND QUANTITIES FOR BARREL SECTIONS

BAR LIST

| FILL | a1 SIZE | a1 SP | a1 LENGTH | a2 SIZE | a2 SP | a2 LENGTH | b1 SIZE | b1 SP | b1 NO. | b2 SIZE | b2 SP | b2 NO. | e1 SIZE | e1 SP | e1 NO. | e2 SIZE | e2 SP | e2 NO. | f1 SIZE | f1 SP | f1 NO. | f2 SIZE | f2 SP | f2 NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 5 | 12 | 11'-8 | 6 | 7.5 | 11'-8 | 4 | 9 | 28 | 4 | 9 | 15 | 5 | 12 | 18 | 4 | 18 | 16 | 4 | 12 | 22 | 4 | 18 | 16 |
| 1 | 4 | 6 | 11'-9 | 6 | 7.5 | 11'-9 | 4 | 9 | 28 | 4 | 9 | 15 | 5 | 12 | 18 | 4 | 18 | 16 | 4 | 12 | 22 | 4 | 18 | 16 |
| 2 | 4 | 9 | 11'-5 | 6 | 7.5 | 11'-5 | 4 | 9 | 28 | 4 | 9 | 15 | 5 | 12 | 18 | 4 | 18 | 16 | 4 | 12 | 22 | 4 | 18 | 16 |
| 3 | 4 | 12 | 11'-5 | 5 | 6 | 11'-5 | 4 | 9 | 28 | 4 | 9 | 15 | 5 | 12 | 18 | 4 | 18 | 16 | 4 | 12 | 22 | 4 | 18 | 16 |
| 4 | 4 | 12 | 11'-5 | 5 | 6 | 11'-5 | 4 | 9 | 28 | 4 | 9 | 15 | 5 | 12 | 18 | 4 | 18 | 16 | 4 | 12 | 22 | 4 | 18 | 16 |
| 5-7 | 5 | 12 | 11'-5 | 5 | 6 | 11'-5 | 4 | 9 | 28 | 4 | 9 | 15 | 5 | 12 | 18 | 4 | 18 | 16 | 4 | 12 | 22 | 4 | 18 | 16 |
| 8-10 | 6 | 9 | 11'-6 | 5 | 6 | 11'-6 | 4 | 9 | 28 | 4 | 9 | 15 | 5 | 12 | 18 | 4 | 18 | 16 | 4 | 12 | 22 | 4 | 18 | 16 |
| 11-13 | 4 | 9 | 11'-9 | 5 | 6 | 11'-9 | 4 | 9 | 28 | 4 | 9 | 15 | 5 | 12 | 18 | 4 | 18 | 16 | 4 | 12 | 22 | 4 | 18 | 16 |
| 14-16 | 4 | 9 | 11'-11 | 5 | 6 | 11'-11 | 4 | 9 | 28 | 4 | 9 | 15 | 5 | 12 | 18 | 4 | 18 | 16 | 4 | 12 | 22 | 4 | 18 | 16 |
| 17-19 | 4 | 6 | 12'-2 | 5 | 6 | 12'-2 | 4 | 9 | 28 | 4 | 9 | 15 | 5 | 12 | 18 | 4 | 18 | 16 | 4 | 12 | 22 | 4 | 18 | 16 |
| 20-22 | 4 | 6 | 12'-4 | 5 | 6 | 12'-4 | 4 | 9 | 28 | 4 | 9 | 15 | 5 | 12 | 18 | 4 | 18 | 16 | 4 | 12 | 22 | 4 | 18 | 16 |
| 23-25 | 4 | 6 | 12'-7 | 5 | 6 | 12'-7 | 4 | 9 | 28 | 4 | 9 | 15 | 5 | 12 | 18 | 4 | 18 | 16 | 4 | 12 | 22 | 4 | 18 | 16 |

| FILL | k1 SIZE | k1 SP | k1 LENGTH | k2 SIZE | k2 SP | k2 LENGTH | k4 SIZE | k4 SP | k4 LENGTH | k4 h | k4 v | k5 SIZE | k5 SP | k5 LENGTH | k5 h | k5 v |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 5 | 12 | 22'-2 | 5 | 12 | 8'-2 | 4 | 12 | 4'-11 | 1'-9 | 3'-2 | 5 | 12 | 4'-11 | 1'-9 | 3'-2 |
| 1 | 5 | 12 | 22'-2 | 5 | 12 | 8'-1 | 4 | 12 | 4'-11 | 1'-9 | 3'-2 | 5 | 12 | 4'-11 | 1'-9 | 3'-2 |
| 2 | 5 | 9 | 22'-2 | 5 | 9 | 7'-2 | 4 | 9 | 5'-6 | 2'-3 | 3'-3 | 5 | 9 | 5'-4 | 2'-1 | 3'-3 |
| 3 | 5 | 12 | 22'-2 | 5 | 12 | 6'-6 | 5 | 12 | 5'-3 | 2'-4 | 2'-11 | 5 | 12 | 4'-9 | 1'-10 | 2'-11 |
| 4 | 4 | 12 | 22'-2 | 5 | 12 | 7'-2 | 5 | 12 | 5'-2 | 2'-3 | 2'-11 | 5 | 12 | 4'-9 | 1'-10 | 2'-11 |
| 5-7 | 4 | 12 | 22'-2 | 5 | 12 | 7'-1 | 5 | 12 | 5'-2 | 2'-3 | 2'-11 | 5 | 12 | 4'-9 | 1'-10 | 2'-11 |
| 8-10 | 5 | 12 | 22'-2 | 5 | 12 | 6'-4 | 4 | 9 | 4'-10 | 1'-10 | 3'-0 | 4 | 9 | 4'-10 | 1'-10 | 3'-0 |
| 11-13 | 5 | 12 | 22'-2 | 5 | 12 | 6'-6 | 5 | 12 | 5'-1 | 1'-10 | 3'-3 | 6 | 12 | 5'-2 | 1'-11 | 3'-3 |
| 14-16 | 5 | 12 | 22'-2 | 5 | 12 | 6'-8 | 5 | 12 | 5'-1 | 1'-9 | 3'-4 | 6 | 12 | 5'-3 | 1'-11 | 3'-4 |
| 17-19 | 5 | 12 | 22'-2 | 5 | 12 | 6'-10 | 5 | 12 | 5'-4 | 1'-10 | 3'-6 | 6 | 12 | 5'-4 | 1'-10 | 3'-6 |
| 20-22 | 5 | 12 | 22'-2 | 5 | 12 | 7'-1 | 5 | 12 | 5'-6 | 1'-11 | 3'-7 | 6 | 12 | 5'-5 | 1'-10 | 3'-7 |
| 23-25 | 4 | 9 | 22'-2 | 5 | 9 | 7'-9 | 5 | 9 | 6'-2 | 2'-5 | 3'-9 | 5 | 9 | 6'-2 | 2'-5 | 3'-9 |

| FILL | k6 SIZE | k6 SP | k6 LENGTH | k7 SIZE | k7 SP | k7 LENGTH | k9 SIZE | k9 SP* | k9 LENGTH | m1 SIZE | m1 SP | m1 LENGTH | m2 SIZE | m2 SP | m2 LENGTH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 4 | 12 | 22'-2 | 4 | 12 | 5'-0 | 4 | 4.5 | 22'-2 | 4 | 12 | 22'-8 | 5 | 12 | 6'-11 |
| 1 | 5 | 15 | 22'-2 | 5 | 15 | 4'-8 | 5 | 7.5 | 22'-2 | 4 | 12 | 22'-8 | 5 | 12 | 7'-1 |
| 2 | 5 | 12 | 17'-1 | 6 | 12 | 5'-6 | 5 | 4.5 | 22'-2 | 4 | 9 | 22'-8 | 5 | 9 | 7'-1 |
| 3 | 5 | 12 | 15'-5 | 5 | 12 | 4'-7 | 5 | 4.5 | 22'-2 | 4 | 12 | 22'-8 | 5 | 12 | 7'-2 |
| 4 | 5 | 12 | 15'-0 | 5 | 12 | 4'-6 | 5 | 4.5 | 22'-2 | 4 | 12 | 22'-8 | 5 | 12 | 7'-1 |
| 5-7 | 5 | 12 | 14'-9 | 6 | 12 | 5'-0 | 5 | 4.5 | 22'-2 | 5 | 12 | 22'-8 | 5 | 12 | 6'-3 |
| 8-10 | 6 | 12 | 14'-8 | 6 | 12 | 4'-7 | 6 | 4.5 | 22'-2 | 5 | 12 | 22'-8 | 5 | 12 | 6'-6 |
| 11-13 | 6 | 12 | 14'-8 | 6 | 12 | 4'-8 | 6 | 4.5 | 22'-2 | 4 | 9 | 22'-8 | 5 | 9 | 7'-1 |
| 14-16 | 7 | 15 | 14'-10 | 7 | 15 | 4'-11 | 7 | 7.5 | 22'-2 | 4 | 9 | 22'-8 | 5 | 9 | 7'-2 |
| 17-19 | 7 | 15 | 14'-10 | 7 | 15 | 4'-11 | 7 | 7.5 | 22'-2 | 4 | 9 | 22'-8 | 5 | 9 | 7'-4 |
| 20-22 | 5 | 9 | 14'-8 | 6 | 9 | 5'-0 | 5 | 4.5 | 22'-2 | 4 | 9 | 22'-8 | 5 | 9 | 7'-7 |
| 23-25 | 5 | 9 | 14'-9 | 6 | 9 | 5'-3 | 5 | 4.5 | 22'-2 | 4 | 9 | 22'-8 | 5 | 9 | 7'-10 |

| FILL | m4 SIZE | m4 SP | m4 LENGTH | m4 h | m4 v | m5 SIZE | m5 SP | m5 LENGTH | m5 h | m5 v | m6 SIZE | m6 SP | m6 LENGTH | m7 SIZE | m7 SP | m7 LENGTH | m9 SIZE | m9 SP* | m9 LENGTH | FILL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 5 | 12 | 11'-10 | 1'-8 | 10'-2 | 5 | 12 | 11'-10 | 1'-8 | 10'-2 | 5 | 12 | 22'-8 | 5 | 12 | 3'-11 | 5 | 4.5 | 22'-8 | 0 |
| 1 | 5 | 12 | 11'-11 | 1'-8 | 10'-3 | 5 | 12 | 11'-11 | 1'-8 | 10'-3 | 5 | 12 | 22'-8 | 5 | 12 | 3'-11 | 5 | 4.5 | 22'-8 | 1 |
| 2 | 4 | 9 | 12'-2 | 1'-10 | 10'-4 | 5 | 9 | 12'-3 | 1'-11 | 10'-4 | 5 | 9 | 15'-8 | 5 | 9 | 4'-2 | 5 | 4.5 | 22'-8 | 2 |
| 3 | 5 | 12 | 12'-5 | 2'-4 | 10'-1 | 5 | 12 | 11'-9 | 1'-8 | 10'-1 | 4 | 9 | 15'-1 | 5 | 9 | 4'-8 | 4 | 4.5 | 22'-8 | 3 |
| 4 | 5 | 12 | 12'-4 | 2'-3 | 10'-1 | 5 | 12 | 11'-9 | 1'-8 | 10'-1 | 4 | 9 | 14'-11 | 5 | 9 | 4'-8 | 4 | 4.5 | 22'-8 | 4 |
| 5-7 | 5 | 12 | 12'-2 | 2'-1 | 10'-1 | 5 | 12 | 11'-9 | 1'-8 | 10'-1 | 5 | 9 | 14'-9 | 5 | 9 | 4'-1 | 5 | 4.5 | 22'-8 | 5-7 |
| 8-10 | 4 | 9 | 12'-0 | 1'-10 | 10'-2 | 4 | 9 | 11'-10 | 1'-8 | 10'-2 | 6 | 12 | 14'-11 | 6 | 12 | 4'-6 | 6 | 4.5 | 22'-8 | 8-10 |
| 11-13 | 5 | 12 | 12'-3 | 1'-10 | 10'-5 | 6 | 12 | 12'-3 | 1'-10 | 10'-5 | 7 | 15 | 15'-1 | 7 | 15 | 4'-9 | 7 | 7.5 | 22'-8 | 11-13 |
| 14-16 | 5 | 12 | 12'-4 | 1'-9 | 10'-7 | 6 | 12 | 12'-5 | 1'-10 | 10'-7 | 7 | 15 | 15'-1 | 7 | 15 | 4'-10 | 7 | 7.5 | 22'-8 | 14-16 |
| 17-19 | 5 | 12 | 12'-7 | 1'-11 | 10'-8 | 6 | 12 | 12'-6 | 1'-10 | 10'-8 | 5 | 9 | 14'-11 | 6 | 9 | 4'-11 | 5 | 4.5 | 22'-8 | 17-19 |
| 20-22 | 5 | 12 | 12'-7 | 1'-10 | 10'-9 | 6 | 12 | 12'-7 | 1'-10 | 10'-9 | 7 | 15 | 15'-1 | 7 | 15 | 4'-11 | 7 | 7.5 | 22'-8 | 20-22 |
| 23-25 | 5 | 9 | 12'-11 | 2'-0 | 10'-11 | 5 | 9 | 12'-10 | 1'-11 | 10'-11 | 5 | 9 | 15'-1 | 6 | 9 | 5'-4 | 5 | 4.5 | 22'-8 | 23-25 |

| FILL | DIMENSIONS S | H | A | B | C | D* | E* | F* | G* | J* | U | V | W | X | Y | Z | QUANTITIES CONCRETE YD³/FT SLAB | FLOOR | WALLS | TOTAL | STEEL LBS/FT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 10 | 10 | 10.5 | 10.5 | 10 | 9 | 4.5 | 9 | 12 | 12 | 1'-9 | 11'-1 | 2'-6 | 2'-5 | 11'-4 | 1'-11 | .791 | .805 | .889 | 2.485 | 320.45 |
| 1 | 10 | 10 | 11 | 11.5 | 10 | 6 | 4.5 | 9 | 18 | 12 | 1'-10 | 11'-1 | 2'-4 | 2'-5 | 11'-4 | 1'-11 | .826 | .876 | .889 | 2.591 | 332.11 |
| 2 | 10 | 10 | 8.5 | 10 | 10 | 9 | 4.5 | 4.5 | 12 | 12 | 2'-2 | 6'-0 | 2'-9 | 2'-4 | 4'-4 | 2'-1 | .652 | .770 | .889 | 2.311 | 357.76 |
| 3 | 10 | 10 | 8 | 10 | 10 | 9 | 4.5 | 9 | 12 | 12 | 2'-6 | 4'-4 | 2'-4 | 2'-3 | 3'-9 | 2'-4 | .617 | .770 | .889 | 2.276 | 304.08 |
| 4 | 10 | 10 | 8 | 10 | 10 | 9 | 4.5 | 9 | 12 | 12 | 2'-3 | 3'-11 | 2'-3 | 2'-4 | 3'-7 | 2'-4 | .617 | .770 | .889 | 2.276 | 295.24 |
| 5-7 | 10 | 10 | 8 | 10 | 10 | 9 | 4.5 | 9 | 12 | 12 | 2'-4 | 3'-8 | 2'-6 | 2'-9 | 3'-5 | 2'-1 | .617 | .770 | .889 | 2.276 | 320.58 |
| 8-10 | 10 | 10 | 8.5 | 11 | 10 | 9 | 4.5 | 4.5 | 12 | 12 | 2'-10 | 3'-7 | 2'-4 | 2'-10 | 3'-7 | 2'-3 | .652 | .841 | .889 | 2.382 | 351.47 |
| 11-13 | 10 | 10 | 10 | 12 | 10 | 9 | 4.5 | 9 | 12 | 18 | 2'-11 | 3'-7 | 2'-4 | 2'-7 | 3'-9 | 2'-5 | .756 | .912 | .889 | 2.557 | 359.55 |
| 14-16 | 10 | 10 | 11 | 13.5 | 10 | 9 | 4.5 | 9 | 18 | 18 | 2'-11 | 3'-9 | 2'-5 | 2'-8 | 3'-9 | 2'-5 | .826 | 1.018 | .889 | 2.733 | 365.45 |
| 17-19 | 10 | 10 | 12.5 | 14.5 | 10 | 6 | 4.5 | 9 | 18 | 12 | 2'-11 | 3'-9 | 2'-6 | 2'-7 | 3'-7 | 2'-6 | .930 | 1.089 | .889 | 2.908 | 375.63 |
| 20-22 | 10 | 10 | 13.5 | 16 | 10 | 6 | 4.5 | 9 | 12 | 18 | 2'-9 | 3'-7 | 2'-6 | 2'-7 | 3'-9 | 2'-6 | .999 | 1.196 | .889 | 3.084 | 378.66 |
| 23-25 | 10 | 10 | 15 | 17 | 10 | 6 | 4.5 | 4.5 | 12 | 12 | 2'-6 | 3'-8 | 2'-7 | 2'-6 | 3'-9 | 2'-8 | 1.103 | 1.267 | .889 | 3.259 | 395.92 |

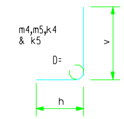
* THESE DIMENSIONS ARE CORRECT FOR 38' LONG STANDARD SECTIONS ONLY. DIMENSIONS MUST BE RECALCULATED FOR ALL OTHER SECTION LENGTHS.

NOTES:

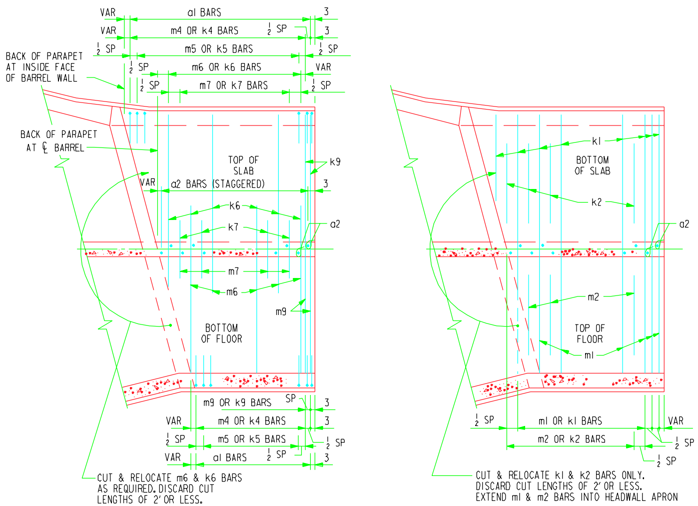
1. SEE DRAWING TWRCB-GI-87 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.

## BENT BAR DETAIL

| BARS | D |
|---|---|
| 4 | 3 |
| 5 | 3¾ |
| 6 | 4½ |
| 7 | 5¼ |



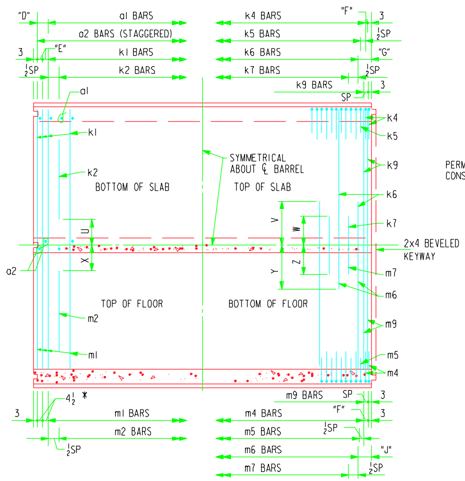

NOTE:
ALL DIMENSIONS ARE OUT TO OUT.
D = PIN DIAMETER.




## END SECTION - PLAN VIEW (KEYWAY NOT SHOWN)

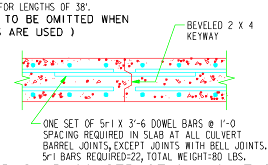
NOTE: END SECTION DETAILS SHOWN ARE FOR A 15° SKEW BARREL. USE FOR SKEWS OF 30° & 45° BY INCREASING THE NUMBER OF TRANSVERSE REINFORCING BARS REQUIRED TO BE CUT & RELOCATED.

NOTE: ALL LONGITUDINAL BARREL STEEL SHALL EXTEND AT LEAST TO THE BACKFACE OF PARAPET.

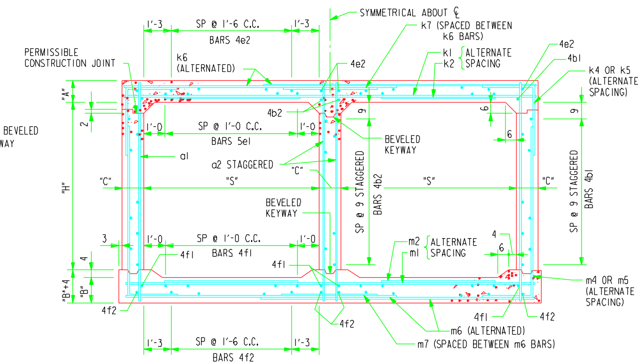



## STANDARD SECTION PLAN VIEW

NOTE: TYPICAL FOR LENGTHS OF 38'.
**( KEYWAY IS TO BE OMITTED WHEN BELL JOINTS ARE USED )**




## TOP SLAB CONSTRUCTION JOINT DETAIL




## BARREL SECTION

STANDARD DESIGN

# CULVERT BARREL DETAILS

FOR

TWIN REINFORCED CONCRETE BOX CULVERTS

HIGHWAY DIVISION
IOWA DEPARTMENT OF TRANSPORTATION

JULY, 1987

LATEST REVISION DATE: 12-5-96

APPROVED BY: [signature]

TWRCB 10-10-87

REVISED: 8/89; KEYWAY NOTE & DETAIL ADDED, LONGITUDINAL BARREL STEEL NOTE ADDED.
REVISED: 12/96 ; KEYWAY NOTATION CHANGED, DOWEL BAR LENGTH CHANGED.
TWB1010.S01

XXXXXXXXXXSYSTEMTIME XXXXXXXUSERNAME XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXDGNSPEC