

Estimate of Quantities - Flume Basin

| Bill of Reinforcing Steel |                               | 16' x 4' |      |     |               | 16' x 5' |      |     |               | 16' x 6' |      |     |               | 16' x 7' |      |     |               | 16' x 8' |      |     |               | 16' x 9' |      |     |               | 16' x 10' |      |     |              | 16' x 11' |      |     |              | 16' x 12' |    |    |                |      |
|---------------------------|-------------------------------|----------|------|-----|---------------|----------|------|-----|---------------|----------|------|-----|---------------|----------|------|-----|---------------|----------|------|-----|---------------|----------|------|-----|---------------|-----------|------|-----|--------------|-----------|------|-----|--------------|-----------|----|----|----------------|------|
| Bar                       | Location                      | Shape    | Size | No. | Length        | Weight   | Size | No. | Length        | Weight   | Size | No. | Length        | Weight   | Size | No. | Length        | Weight   | Size | No. | Length        | Weight   | Size | No. | Length        | Weight    | Size | No. | Length       | Weight    | Size | No. | Length       | Weight    |    |    |                |      |
| 5a1                       | Walls - Vert. - F.F.          | U        | 5    | 30  | 2'-8"6'-2"    | 138      | 5    | 32  | 3'-5"7'-2"    | 177      | 5    | 34  | 4'-3"8'-2"    | 220      | 5    | 36  | 5'-0"9'-3"    | 268      | 5    | 38  | 5'-9"10'-3"   | 317      | 5    | 40  | 6'-6"11'-3"   | 370       | 5    | 42  | 7'-4"12'-3"  | 429       | 5    | 44  | 8'-1"13'-4"  | 491       | 5  | 46 | 8'-10"14'-4"   | 556  |
| 5b1                       | Walls - Longit. - F.F. & B.F. | U        | 5    | 12  | 16'-5"        | 205      | 5    | 16  | 17'-6"        | 292      | 5    | 20  | 18'-7"        | 388      | 5    | 20  | 19'-7"        | 409      | 5    | 24  | 20'-8"        | 517      | 5    | 28  | 21'-9"        | 635       | 5    | 32  | 22'-9"       | 759       | 5    | 32  | 23'-10"      | 795       | 5  | 36 | 24'-11"        | 936  |
| 5b2                       | Walls - Longit. - F.F. & B.F. | U        | 5    | 4   | 13'-1"        | 63       | 5    | 4   | 16'-1"        | 67       | 5    | 4   | 17'-5"        | 73       | 5    | 8   | 19'-5"        | 154      | 5    | 8   | 19'-5"        | 154      | 5    | 8   | 20'-6"        | 171       | 5    | 8   | 21'-6"       | 179       | 5    | 12  | 22'-7"       | 283       | 5  | 12 | 23'-7"         | 295  |
| c1                        | Walls - Vert. - B.F.          | U        | 5    | 27  | 29'-3"29'-6"  | 827      | 5    | 21  | 31'-3"31-7"   | 688      | 5    | 15  | 33'-5"33-8"   | 525      | 5    | 9   | 35'-5"35-8"   | 334      | 5    | 3   | 37'-7"37-10"  | 118      | --   | --  | --            | --        | --   | --  | --           | --        | --   | --  | --           | --        | -- | -- | --             |      |
| c2                        | Walls - Vert. - B.F.          | U        | 5    | 2   | 23'-7"23'-10" | 49       | 5    | 10  | 23'-7"23'-10" | 258      | 5    | 18  | 23'-7"23'-10" | 463      | 5    | 26  | 23'-7"23'-10" | 724      | 5    | 34  | 23'-7"23'-10" | 989      | 5    | 39  | 23'-9"23'-3"  | 1150      | 6    | 41  | 24'-7"24-7"  | 1822      | 7    | 43  | 25'-7"26-1"  | 2710      | 7  | 45 | 25'-0"26-0"    | 2874 |
| c3                        | Walls - Vert. - B.F.          | U        | 5    | 4   | 4'-10"5'-0"   | 21       | 5    | 20  | 4'-10"5'-0"   | 113      | 5    | 36  | 4'-11"5'-0"   | 224      | 5    | 52  | 4'-11"5'-1"   | 353      | 5    | 68  | 4'-11"5'-1"   | 496      | 5    | 78  | 5'-4"10'-1"   | 627       | 6    | 82  | 6'-2"11'-1"  | 1062      | 7    | 86  | 6'-11"12'-2" | 1677      | 7  | 90 | 7'-8"13'-2"    | 1916 |
| 6f1                       | Floor - Longit. - Top         | U        | 6    | 24  | 14'-8"        | 529      | 6    | 25  | 15'-8"        | 588      | 6    | 25  | 16'-11"       | 635      | 6    | 26  | 17'-11"       | 700      | 6    | 26  | 18'-11"       | 739      | 6    | 27  | 19'-11"       | 806       | 6    | 27  | 20'-11"      | 848       | 6    | 28  | 21'-11"      | 922       | 6  | 28 | 22'-11"        | 964  |
| 5f2                       | Floor - Longit. - Bott.       | U        | 5    | 24  | 14'-8"        | 367      | 5    | 25  | 15'-8"        | 409      | 5    | 25  | 16'-11"       | 441      | 5    | 26  | 17'-11"       | 486      | 5    | 26  | 18'-11"       | 513      | 5    | 27  | 19'-11"       | 561       | 5    | 27  | 20'-11"      | 589       | 5    | 28  | 21'-11"      | 640       | 5  | 28 | 22'-11"        | 669  |
| 5g1                       | Curtain Bracket - Vert.       | U        | 5    | 4   | 5'-6"         | 23       | 5    | 4   | 5'-6"         | 23       | 5    | 4   | 5'-9"         | 24       | 5    | 4   | 6'-0"         | 25       | 5    | 4   | 6'-3"         | 26       | 5    | 4   | 6'-5"         | 27        | 5    | 4   | 6'-8"        | 28        | 5    | 4   | 6'-11"       | 29        | 5  | 4  | 7'-2"          | 30   |
| 5h1                       | Basin Backwall - Vert.        | U        | 5    | 18  | 7'-10"        | 147      | 5    | 18  | 8'-4"         | 156      | 5    | 18  | 9'-1"         | 171      | 5    | 18  | 9'-7"         | 180      | 5    | 18  | 10'-1"        | 189      | 5    | 18  | 10'-7"        | 199       | 5    | 18  | 11'-1"       | 208       | 5    | 18  | 11'-7"       | 217       | 5  | 19 | 12'-1"         | 239  |
| 6m1                       | Floor Trans. - Top            | U        | 6    | 29  | 17'-5"24'-5"  | 911      | 6    | 31  | 17'-5"24'-11" | 986      | 6    | 33  | 17'-5"25'-5"  | 1062     | 6    | 35  | 17'-5"25'-11" | 1139     | 6    | 37  | 17'-5"26'-7"  | 1227     | 6    | 39  | 17'-5"27'-1"  | 1308      | 6    | 41  | 17'-7"27'-7" | 1391      | 6    | 43  | 17'-9"28'-3" | 1485      | 6  | 45 | 17'-11"28'-11" | 1583 |
| 6p1                       | Curtain - Trans.              | U        | 6    | 2   | 24'-4"24'-6"  | 73       | 6    | 2   | 24'-10"25'-0" | 75       | 6    | 2   | 25'-3"25'-6"  | 76       | 6    | 2   | 25'-9"26'-0"  | 78       | 6    | 2   | 26'-5"26'-8"  | 80       | 6    | 2   | 26'-11"27'-2" | 81        | 6    | 2   | 27'-5"27'-8" | 83        | 6    | 2   | 28'-1"28'-4" | 85        | 6  | 2  | 28'-9"29'-0"   | 87   |
| 6s1                       | Wall - Top Slope              | U        | 6    | 4   | 16'-8"        | 100      | 6    | 4   | 17'-9"        | 107      | 6    | 4   | 18'-10"       | 113      | 6    | 4   | 19'-10"       | 119      | 6    | 4   | 20'-11"       | 126      | 6    | 4   | 22'-0"        | 132       | 6    | 4   | 23'-0"       | 138       | 6    | 4   | 24'-1"       | 145       | 6  | 4  | 25'-2"         | 151  |
| 5t1                       | Curtain - Vert.               | U        | 5    | 19  | 6'-4"         | 126      | 5    | 20  | 6'-4"         | 132      | 5    | 20  | 6'-7"         | 137      | 5    | 21  | 6'-10"        | 150      | 5    | 21  | 7'-1"         | 155      | 5    | 21  | 7'-4"         | 161       | 5    | 22  | 7'-7"        | 174       | 5    | 22  | 7'-10"       | 180       | 5  | 23 | 8'-1"          | 194  |
| Total Weight (LB)         |                               |          |      |     |               | 3579     |      |     |               | 4071     |      |     |               | 4572     |      |     |               | 5119     |      |     |               | 5654     |      |     |               | 6239      |      |     |              | 7710      |      |     |              | 9659      |    |    | 10,494         |      |
| Concrete (CY)             |                               |          |      |     |               |          |      |     |               |          |      |     |               |          |      |     |               |          |      |     |               |          |      |     |               |           |      |     |              |           |      |     |              |           |    |    |                |      |
|                           |                               | Footing  |      |     |               | 17.0     |      |     |               | 18.2     |      |     |               | 20.2     |      |     |               | 22.0     |      |     |               | 23.6     |      |     |               | 25.2      |      |     |              | 26.9      |      |     |              | 28.8      |    |    | 30.8           |      |
|                           |                               | Walls    |      |     |               | 2.6      |      |     |               | 3.6      |      |     |               | 4.7      |      |     |               | 5.7      |      |     |               | 7.9      |      |     |               | 9.4       |      |     |              | 11.0      |      |     |              | 14.1      |    |    | 17.6           |      |
|                           |                               | Total    |      |     |               | 19.6     |      |     |               | 21.8     |      |     |               | 24.9     |      |     |               | 27.7     |      |     |               | 31.5     |      |     |               | 34.6      |      |     |              | 37.9      |      |     |              | 42.9      |    |    | 48.4           |      |

Estimate of Quantities - Flume Basin

| Bill of Reinforcing Steel |                               | 16' x 13' |      |     |               | 16' x 14' |      |     |               |        |
|---------------------------|-------------------------------|-----------|------|-----|---------------|-----------|------|-----|---------------|--------|
| Bar                       | Location                      | Shape     | Size | No. | Length        | Weight    | Size | No. | Length        | Weight |
| 5a1                       | Walls - Vert. - F.F.          | U         | 5    | 48  | 9'-8"15'-4"   | 626       | 5    | 50  | 10'-6"16'-5"  | 702    |
| 5b1                       | Walls - Longit. - F.F. & B.F. | U         | 5    | 40  | 26'-0"        | 1085      | 5    | 44  | 27'-0"        | 1239   |
| 5b2                       | Walls - Longit. - F.F. & B.F. | U         | 5    | 12  | 24'-7"        | 308       | 5    | 12  | 25'-8"        | 321    |
| c1                        | Walls - Vert. - B.F.          | U         | --   | --  | --            | --        | --   | --  | --            | --     |
| c2                        | Walls - Vert. - B.F.          | U         | 8    | 47  | 26'-5"37'-11" | 4037      | 8    | 49  | 26'-9"38'-9"  | 4285   |
| c3                        | Walls - Vert. - B.F.          | U         | 8    | 94  | 8'-6"14'-2"   | 2844      | 8    | 98  | 9'-3"15'-2"   | 3194   |
| 6f1                       | Floor - Longit. - Top         | U         | 6    | 29  | 23'-11"       | 1042      | 6    | 29  | 24'-11"       | 1085   |
| 5f2                       | Floor - Longit. - Bott.       | U         | 5    | 29  | 23'-11"       | 723       | 5    | 29  | 24'-11"       | 754    |
| 5g1                       | Curtain Bracket - Vert.       | U         | 5    | 4   | 7'-4"         | 31        | 5    | 4   | 7'-7"         | 32     |
| 5h1                       | Basin Backwall - Vert.        | U         | 5    | 19  | 12'-7"        | 249       | 5    | 19  | 13'-0"        | 258    |
| 6m1                       | Floor Trans. - Top            | U         | 6    | 47  | 17'-11"29'-5" | 1671      | 6    | 49  | 18'-1"30'-1"  | 1772   |
| 6p1                       | Curtain - Trans.              | U         | 6    | 2   | 29'-3"29'-6"  | 88        | 6    | 2   | 29'-11"30'-3" | 90     |
| 6s1                       | Wall - Top Slope              | U         | 6    | 4   | 26'-3"        | 158       | 6    | 4   | 27'-3"        | 164    |
| 5t1                       | Curtain - Vert.               | U         | 5    | 23  | 8'-4"         | 200       | 5    | 24  | 8'-7"         | 215    |
| Total Weight (LB)         |                               |           |      |     |               | 13,062    |      |     |               | 14,111 |
| Concrete (CY)             |                               |           |      |     |               |           |      |     |               |        |
|                           |                               | Footing   |      |     |               | 32.6      |      |     |               | 36.5   |
|                           |                               | Walls     |      |     |               | 20.0      |      |     |               | 24.4   |
|                           |                               | Total     |      |     |               | 52.6      |      |     |               | 60.9   |

Variable Dimensions

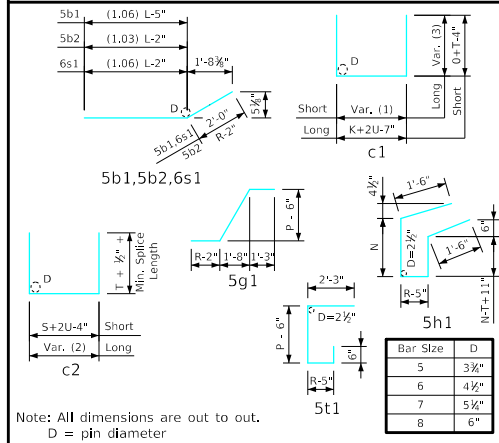
|              |  |
|--------------|--|
| Variable (1) | K+2U-4" (K-S) (No. of c1 - 1)<br>No. of c1 + c2 - 1  |
| Variable (2) | S+2U-4" (K-S) (No. of c2 - 1)<br>No. of c1 + c2 - 1  |
| Variable (3) | O+T-4" (N+V-O) (No. of c1 - 1)<br>No. of c1 + c2 - 1 |

Table of Flume Basin Dimensions

| S x H     | K      | L      | M      | N     | O      | P     | R     | T     | U   | V          |
|-----------|--------|--------|--------|-------|--------|-------|-------|-------|-----|------------|
| 16' x 4'  | 23'-0" | 14'-0" | 3'-0"  | 2'-3" | 1'-10" | 3'-6" | 1'-0" | 1'-2" | 9"  | 3'-1 1/2"  |
| 16' x 5'  | 23'-6" | 15'-0" | 3'-9"  | 2'-6" | 2'-7"  | 3'-6" | 1'-0" | 1'-2" | 9"  | 3'-10 3/8" |
| 16' x 6'  | 24'-0" | 16'-0" | 4'-6"  | 2'-9" | 3'-5"  | 3'-6" | 1'-3" | 1'-2" | 9"  | 4'-7 3/8"  |
| 16' x 7'  | 24'-6" | 17'-0" | 5'-3"  | 3'-0" | 4'-2"  | 3'-9" | 1'-3" | 1'-2" | 9"  | 5'-5"      |
| 16' x 8'  | 25'-0" | 18'-0" | 6'-0"  | 3'-3" | 4'-11" | 4'-0" | 1'-3" | 1'-2" | 10" | 6'-2 1/2"  |
| 16' x 9'  | 25'-6" | 19'-0" | 6'-9"  | 3'-6" | 5'-8"  | 4'-3" | 1'-3" | 1'-2" | 10" | 6'-11 1/2" |
| 16' x 10' | 26'-0" | 20'-0" | 7'-6"  | 3'-9" | 6'-6"  | 4'-6" | 1'-3" | 1'-2" | 10" | 7'-8 3/8"  |
| 16' x 11' | 26'-6" | 21'-0" | 8'-3"  | 4'-0" | 7'-3"  | 4'-9" | 1'-3" | 1'-2" | 11" | 8'-6"      |
| 16' x 12' | 27'-0" | 22'-0" | 9'-0"  | 4'-3" | 8'-0"  | 5'-0" | 1'-3" | 1'-2" | 11" | 9'-3 3/8"  |
| 16' x 13' | 27'-6" | 23'-0" | 9'-9"  | 4'-6" | 8'-10" | 5'-3" | 1'-3" | 1'-2" | 11" | 10'-0 3/8" |
| 16' x 14' | 28'-0" | 24'-0" | 10'-6" | 4'-9" | 9'-7"  | 5'-6" | 1'-3" | 1'-3" | 11" | 10'-9 3/8" |

S = Culvert Span  
H = Culvert Height

Bent Bar Details



Note:  
See Sheet RCFB 11-20 for flume basin details and notes.

|                      |   |                                       |            |
|----------------------|---|---------------------------------------|------------|
| LATEST REVISION DATE | <br>Standard Design<br>Single Reinforced Concrete<br>Box Culverts<br>December, 2020 | Flume Basin<br>Details<br>16'-0" Span | RCFB 10-20 |
|                      |   | APPROVED BY BRIDGE ENGINEER<br>       |            |
|                      |   | IOWA DOT Highway Division             |            |