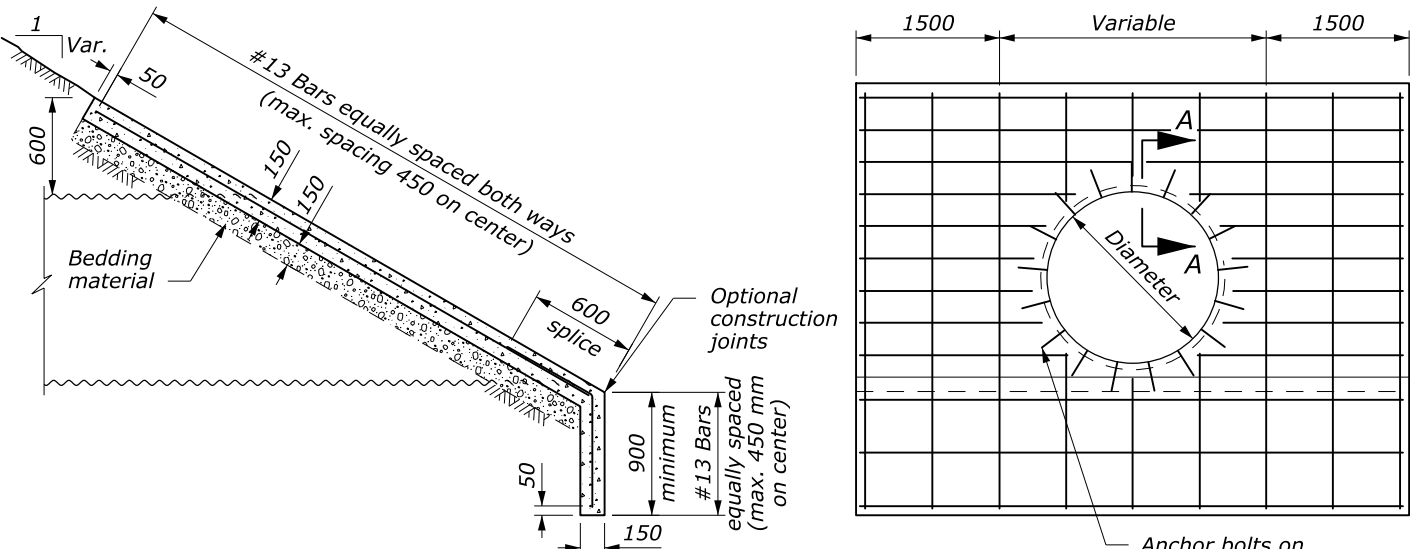
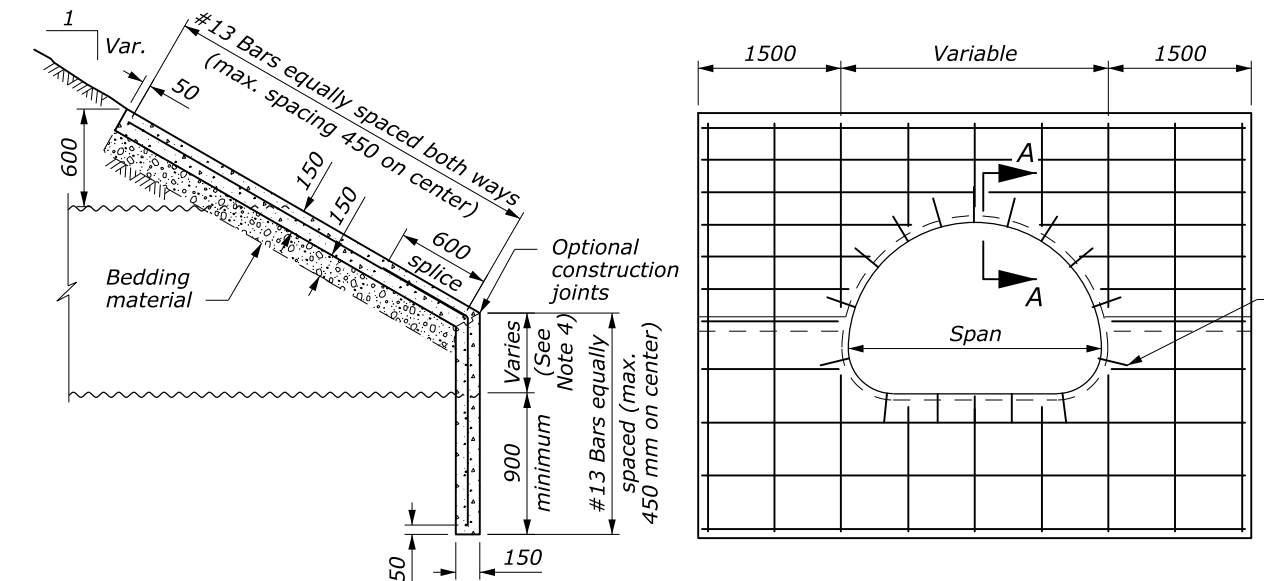


**TYPE A STEP BEVEL FOR ROUND PIPE**



**TYPE B FULL BEVEL FOR ROUND PIPE**

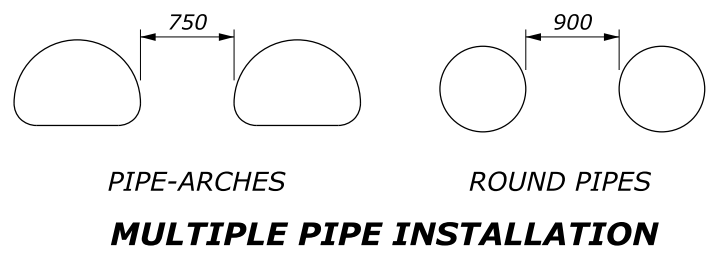
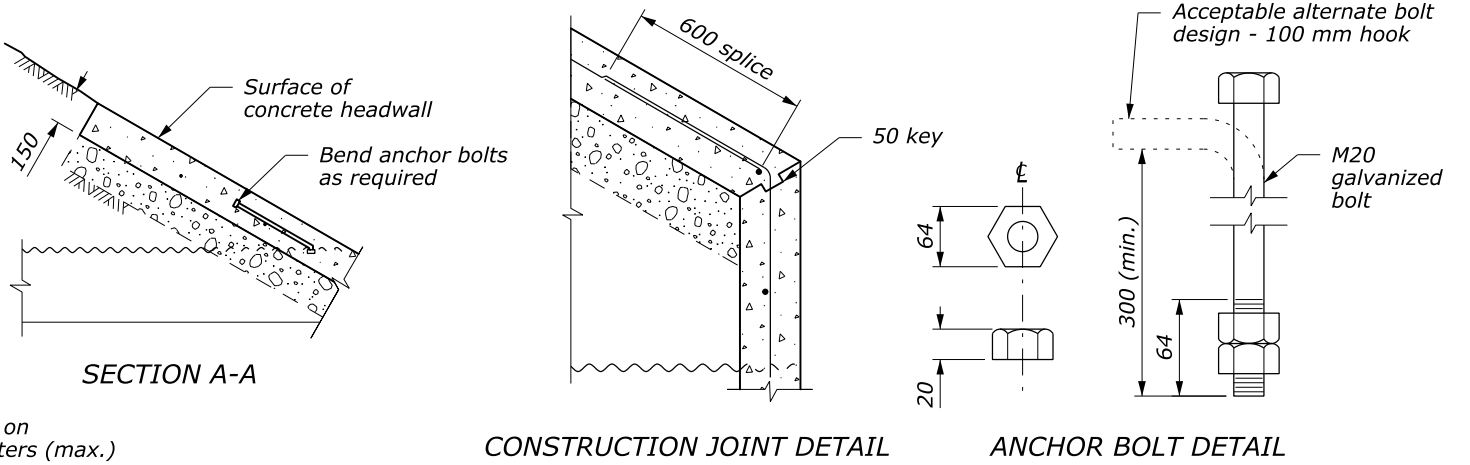


**STEP BEVEL FOR PIPE ARCH CULVERT**

| REINFORCED CONCRETE HEADWALL  |               |     |     |     |
|-------------------------------|---------------|-----|-----|-----|
| STEP BEVEL PIPE ARCH CULVERT  |               |     |     |     |
| PIPE ARCH SIZE<br>Span x rise | CONCRETE (m3) |     |     |     |
|                               | Skew Angle    |     |     |     |
|                               | 0°            | 15° | 30° | 45° |
| 1855 x 1400                   | 2.4           | 2.6 | 2.8 | 3.5 |
| 2060 x 1500                   | 2.7           | 2.8 | 3.1 | 3.8 |
| 2415 x 1700                   | 3.1           | 3.2 | 3.3 | 4.4 |
| 2845 x 1905                   | 3.4           | 3.5 | 3.9 | 4.7 |
| 3480 x 2210                   | 3.8           | 4.0 | 4.4 | 5.4 |
| 3910 x 2540                   | 4.5           | 4.6 | 5.1 | 6.3 |
| 4240 x 2615                   | 4.7           | 4.9 | 5.4 | 6.7 |
| 4675 x 3150                   | 5.0           | 5.2 | 5.8 | 7.1 |
| 4955 x 3300                   | 5.6           | 5.7 | 6.3 | 7.3 |

| REINFORCED CONCRETE HEADWALL |                   |     |     |     |                   |     |     |     |
|------------------------------|-------------------|-----|-----|-----|-------------------|-----|-----|-----|
| ROUND PIPE CULVERT           |                   |     |     |     |                   |     |     |     |
| PIPE SIZE<br>Diameter        | CONCRETE (m3)     |     |     |     |                   |     |     |     |
|                              | TYPE A STEP BEVEL |     |     |     | TYPE B FULL BEVEL |     |     |     |
|                              | Skew Angle        |     |     |     | Skew Angle        |     |     |     |
|                              | 0°                | 15° | 30° | 45° | 0°                | 15° | 30° | 45° |
| 1200                         | 2.5               | 2.5 | 2.6 | 2.8 | 2.2               | 2.4 | 2.7 | 2.7 |
| 1500                         | 2.8               | 2.8 | 2.9 | 3.1 | 2.8               | 2.8 | 2.9 | 3.1 |
| 1800                         | 3.1               | 3.1 | 3.2 | 3.4 | 3.2               | 3.3 | 3.4 | 3.5 |
| 2100                         | 3.4               | 3.5 | 3.6 | 3.8 | 3.7               | 3.7 | 3.8 | 4.1 |
| 2400                         | 3.9               | 4.0 | 4.1 | 4.4 | 4.1               | 4.1 | 4.3 | 4.5 |
| 2700                         | 4.3               | 4.4 | 4.5 | 4.8 | 4.5               | 4.6 | 4.7 | 5.1 |
| 3000                         | 4.6               | 4.7 | 4.8 | 5.2 | 5.0               | 5.0 | 5.2 | 5.6 |
| 3300                         | 5.3               | 5.4 | 5.6 | 6.0 | 5.4               | 5.5 | 5.7 | 6.1 |
| 3600                         | 5.7               | 5.7 | 6.0 | 6.5 | 5.9               | 6.0 | 6.2 | 6.7 |
| 3900                         | 6.0               | 6.1 | 6.3 | 7.0 | 6.4               | 6.5 | 6.7 | 7.3 |
| 4200                         | 6.6               | 6.7 | 7.0 | 7.6 | 6.9               | 7.0 | 7.3 | 8.0 |
| 4500                         | 6.8               | 7.0 | 7.2 | 7.8 | 7.4               | 7.5 | 7.8 | 8.5 |

- NOTE:**
1. CONCRETE: Chamfer all exposed edges 20 mm.
  2. REINFORCING STEEL: Grade 420 (ASTM A615M or A996M) deformed billet steel bars conforming to AASHTO M 31. The minimum concrete cover to the face of any bar is 50 mm unless otherwise shown.
  3. HEADWALL TYPE: Use type A Step Bevel headwalls for round pipe unless otherwise specified in the Special Contract Requirements.
  4. STEP BEVEL: The variable dimension indicated for the height or step conform to manufacturer's recommendations unless otherwise specified in the Special Contract Requirements.
  5. CUTOFF WALLS: The minimum depth shown may be reduced in solid rock, provided wall is keyed into the rock at least 300 mm.
  6. ANCHOR BOLTS: Conform to ASTM A307-04. Galvanize in accordance with ASTM A153M.
  7. BEDDING: Construct a firm and uniform foundation before placing the bedding. Use clean 10 mm sandy material for bedding unless otherwise specified in the Special Contract Requirements.
  8. ESTIMATED QUANTITIES: The concrete quantities are based on a 900 mm cut-off wall and 1:1.5 fill slopes for each of the skew angles. Interpolate concrete quantities for headwalls not shown. Reinforcing steel is estimated at 32 kg/m3 of concrete excluding the weight of the anchor bolts.
  9. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are unavailable.
  10. Dimensions without units are millimeters.



NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION  
WESTERN FEDERAL LANDS HIGHWAY DIVISION

METRIC DETAIL

**REINFORCED CONCRETE HEADWALL**

DETAIL APPROVED FOR USE 11/2006

REVISID: \_\_\_\_\_

DETAIL WM601-10