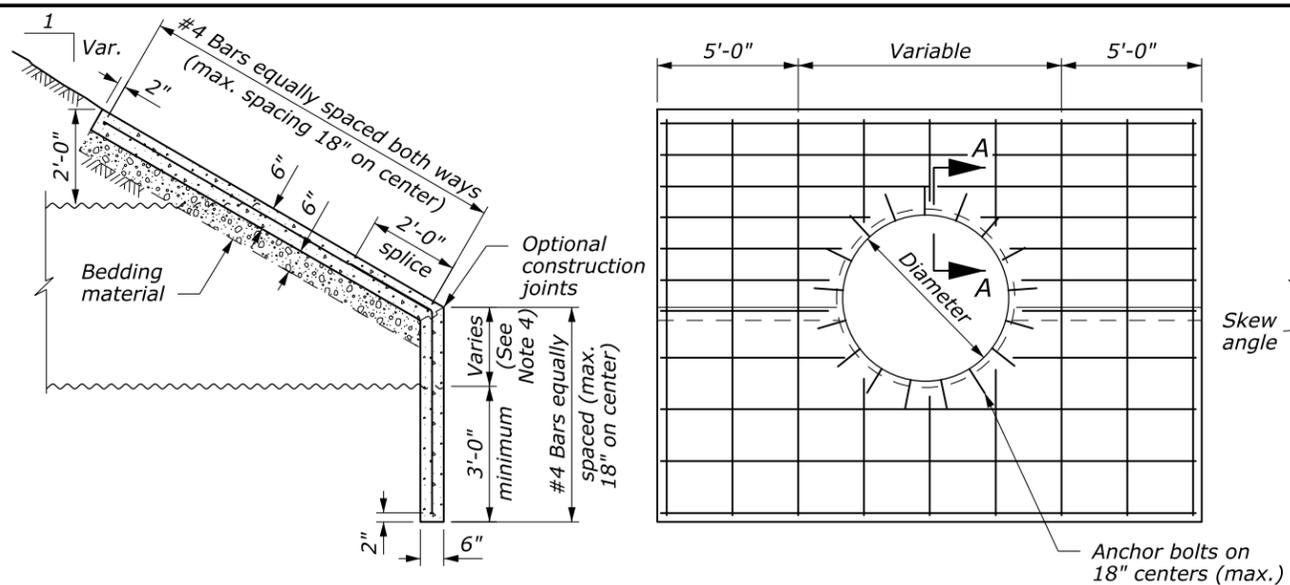


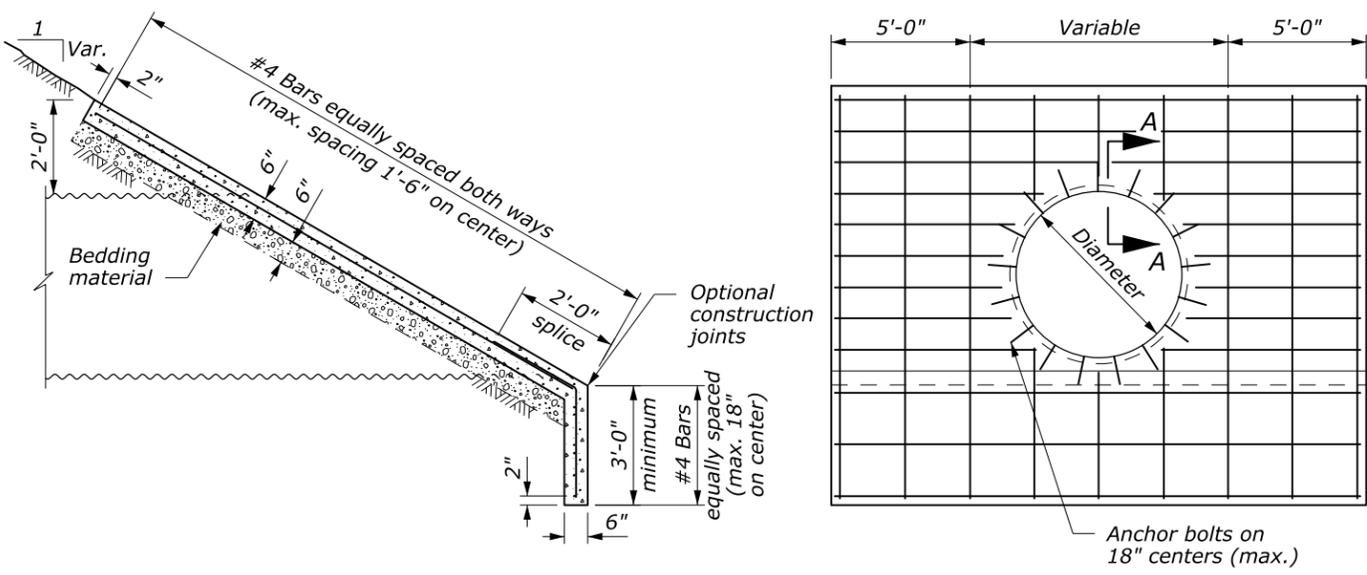
### REINFORCED CONCRETE HEADWALL

| STEP BEVEL PIPE ARCH CULVERT  |                  |     |     |     |
|-------------------------------|------------------|-----|-----|-----|
| PIPE ARCH SIZE<br>Span x rise | CONCRETE (cu yd) |     |     |     |
|                               | Skew Angle       |     |     |     |
|                               | 0°               | 15° | 30° | 45° |
| 6'-1" x 4'-7"                 | 3.2              | 3.4 | 3.7 | 4.6 |
| 7'-0" x 5'-1"                 | 3.5              | 3.7 | 4.1 | 5.0 |
| 8'-2" x 5'-9"                 | 4.0              | 4.2 | 4.7 | 5.7 |
| 9'-6" x 6'-5"                 | 4.4              | 4.6 | 5.1 | 6.2 |
| 11'-5" x 7'-3"                | 5.0              | 5.2 | 5.8 | 7.1 |
| 12'-10" x 8'-4"               | 5.8              | 6.0 | 6.7 | 8.2 |
| 13'-11" x 8'-7"               | 6.2              | 6.4 | 7.1 | 8.7 |
| 15'-4" x 10'-4"               | 6.6              | 6.8 | 7.6 | 9.3 |
| 16'-3" x 10'-10"              | 7.3              | 7.5 | 8.3 | 9.5 |

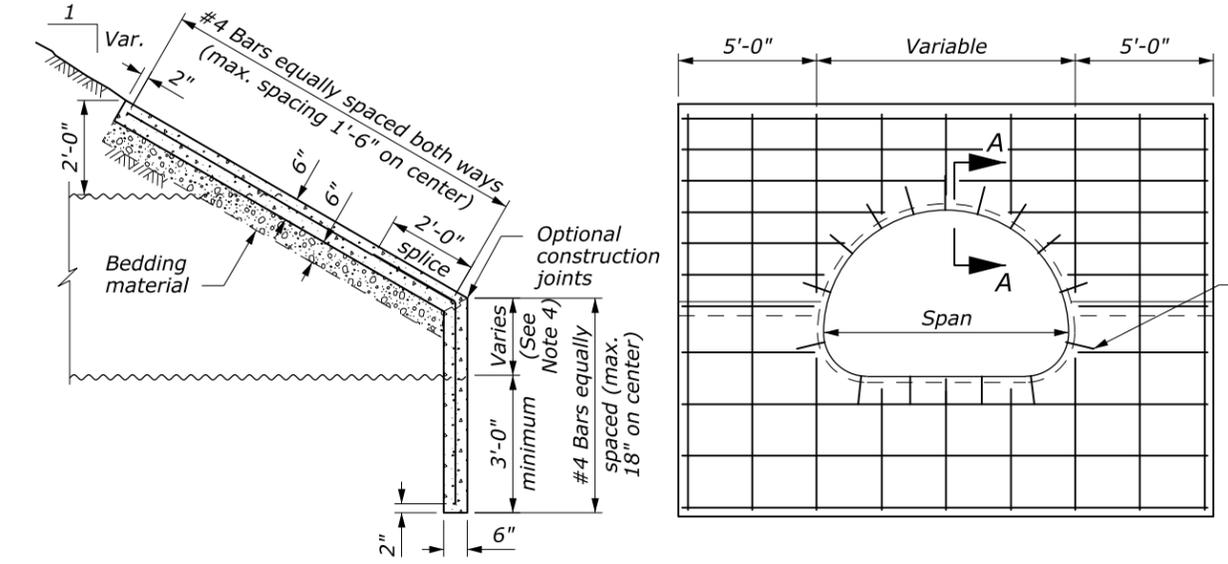
- NOTE:**
1. CONCRETE: Chamfer all exposed edges  $\frac{3}{4}$  inch.
  2. REINFORCING STEEL: Grade 60 (ASTM A615 or A996) deformed billet steel bars conforming to AASHTO M 31. The minimum concrete cover to the face of any bar is 2 inches unless otherwise shown.
  3. HEADWALL TYPE: Use type A Step Bevel 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 12".
  6. ANCHOR BOLTS: Conform to ASTM A307-04. Galvanize in accordance with ASTM A153.
  7. BEDDING: Construct a firm and uniform foundation before placing the bedding. Use clean  $\frac{3}{8}$  inch sandy material for bedding unless otherwise specified in the Special Contract Requirements.
  8. ESTIMATED QUANTITIES: The concrete quantities are based on a 3 foot 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 68 lb/cuyd of concrete excluding the weight of the anchor bolts.



**TYPE A STEP BEVEL FOR ROUND PIPE**



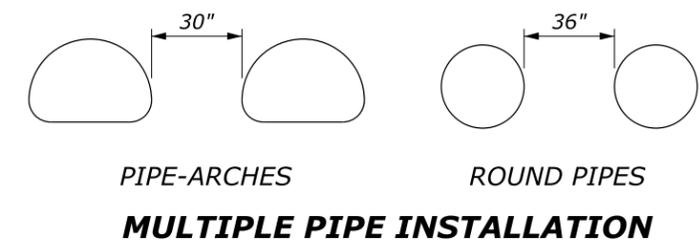
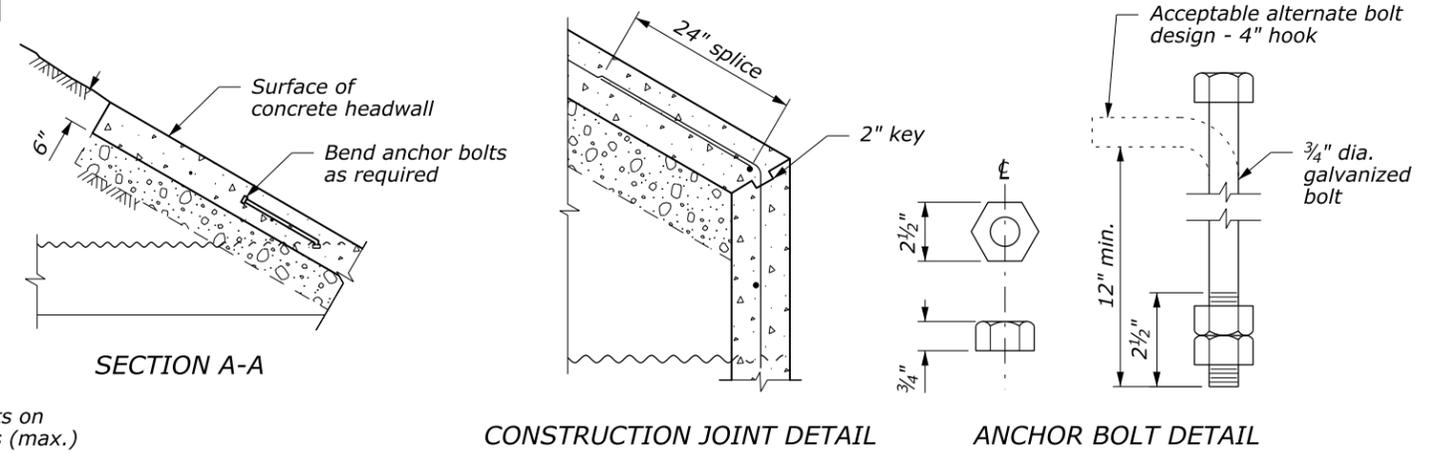
**TYPE B FULL BEVEL FOR ROUND PIPE**



**STEP BEVEL FOR PIPE ARCH CULVERT**

### REINFORCED CONCRETE HEADWALL

| ROUND PIPE CULVERT    |                   |     |     |      |                   |     |      |      |
|-----------------------|-------------------|-----|-----|------|-------------------|-----|------|------|
| PIPE SIZE<br>Diameter | CONCRETE (cu yd)  |     |     |      |                   |     |      |      |
|                       | TYPE A STEP BEVEL |     |     |      | TYPE B FULL BEVEL |     |      |      |
|                       | Skew Angle        |     |     |      |                   |     |      |      |
|                       | 0°                | 15° | 30° | 45°  | 0°                | 15° | 30°  | 45°  |
| 48"                   | 3.2               | 3.2 | 3.3 | 3.5  | 2.7               | 3.0 | 3.4  | 3.4  |
| 60"                   | 3.6               | 3.7 | 3.8 | 4.0  | 3.7               | 3.7 | 3.8  | 4.0  |
| 72"                   | 4.1               | 4.1 | 4.2 | 4.5  | 4.2               | 4.3 | 4.4  | 4.6  |
| 84"                   | 4.5               | 4.6 | 4.7 | 5.0  | 4.8               | 4.8 | 5.0  | 5.3  |
| 96"                   | 5.1               | 5.2 | 5.3 | 5.7  | 5.3               | 5.4 | 5.6  | 5.9  |
| 108"                  | 5.6               | 5.7 | 5.9 | 6.3  | 5.9               | 6.0 | 6.2  | 6.7  |
| 120"                  | 6.0               | 6.1 | 6.3 | 6.8  | 6.5               | 6.6 | 6.8  | 7.3  |
| 132"                  | 6.9               | 7.0 | 7.3 | 7.9  | 7.1               | 7.2 | 7.5  | 8.0  |
| 144"                  | 7.4               | 7.5 | 7.8 | 8.5  | 7.7               | 7.9 | 8.1  | 8.8  |
| 156"                  | 7.9               | 8.0 | 8.3 | 9.1  | 8.4               | 8.5 | 8.8  | 9.5  |
| 168"                  | 8.6               | 8.8 | 9.2 | 10.0 | 9.0               | 9.2 | 9.5  | 10.4 |
| 180"                  | 8.9               | 9.1 | 9.4 | 10.3 | 9.7               | 9.8 | 10.2 | 11.1 |



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

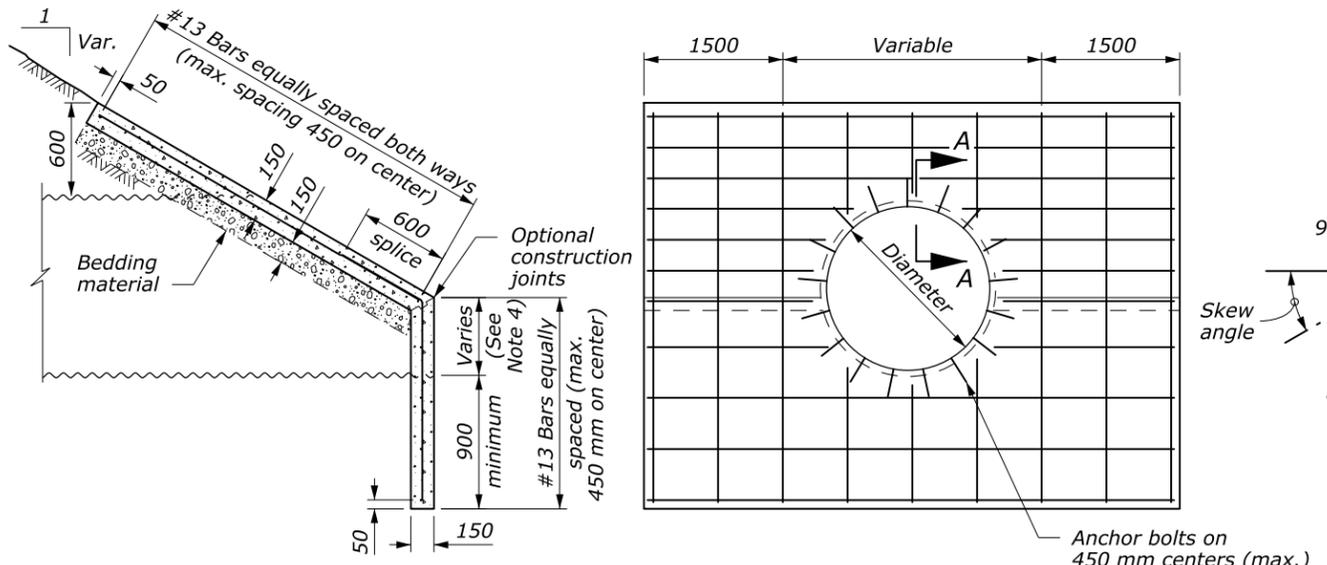
U.S. CUSTOMARY DETAIL

### REINFORCED CONCRETE HEADWALL

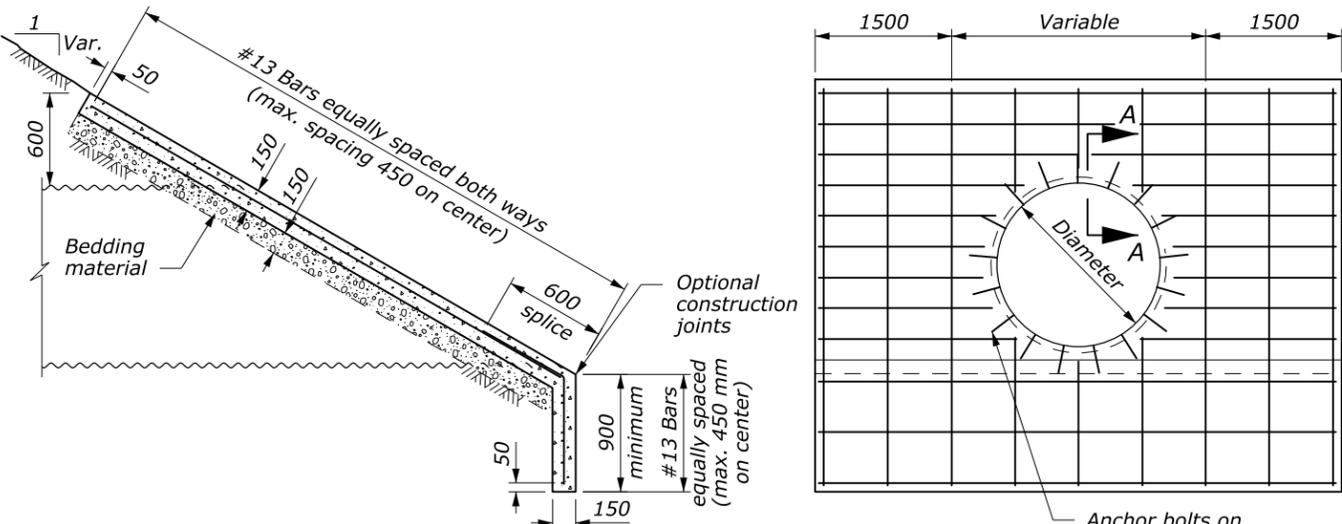
DETAIL APPROVED FOR USE 11/2006  
REVISIONS: \_\_\_\_\_

DETAIL  
W601-10

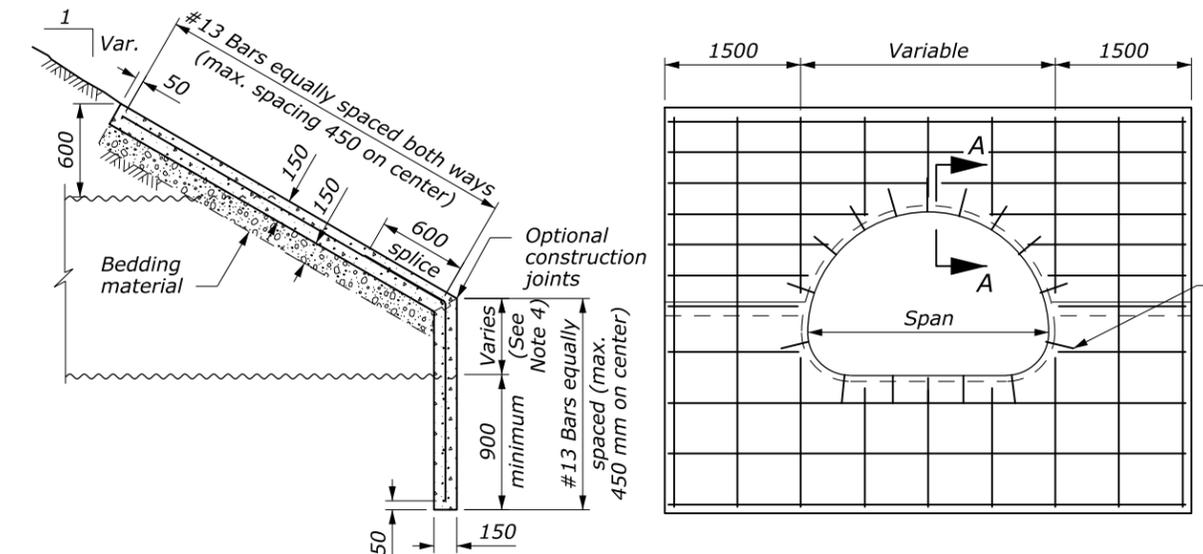
17 November 2014 2:16 PM c:\myfiles\pw\_production\dmms4392\Det.W601-10.dgn [USC]



**TYPE A STEP BEVEL FOR ROUND PIPE**



**TYPE B FULL BEVEL FOR ROUND PIPE**

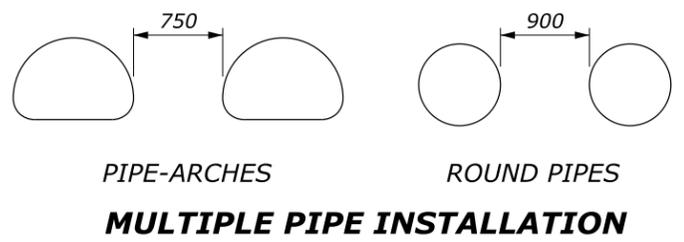
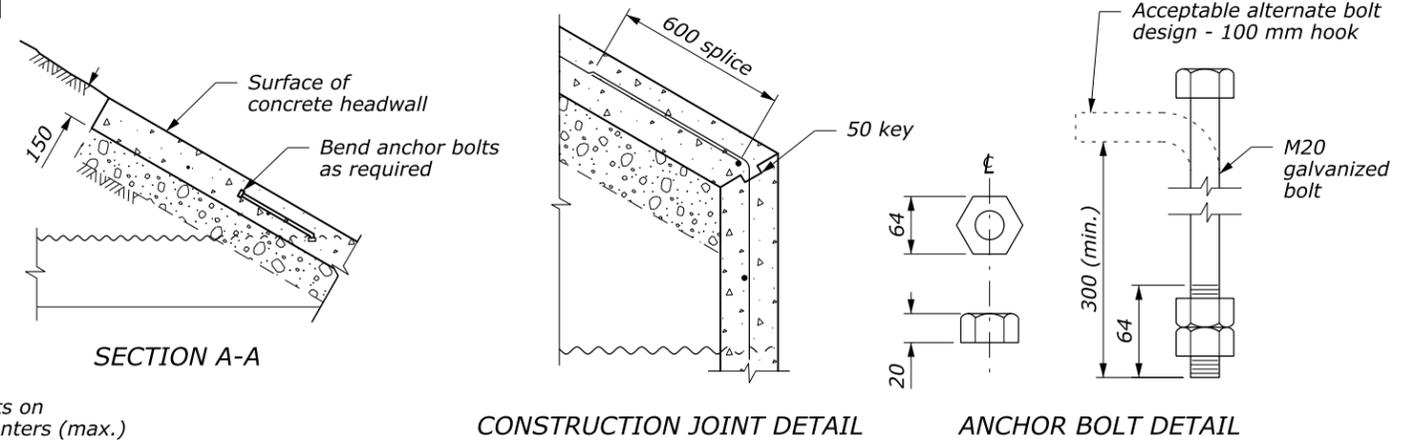


**STEP BEVEL FOR PIPE ARCH CULVERT**

| 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 |

- 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/m<sup>3</sup> 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.

| 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 |



NO SCALE

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

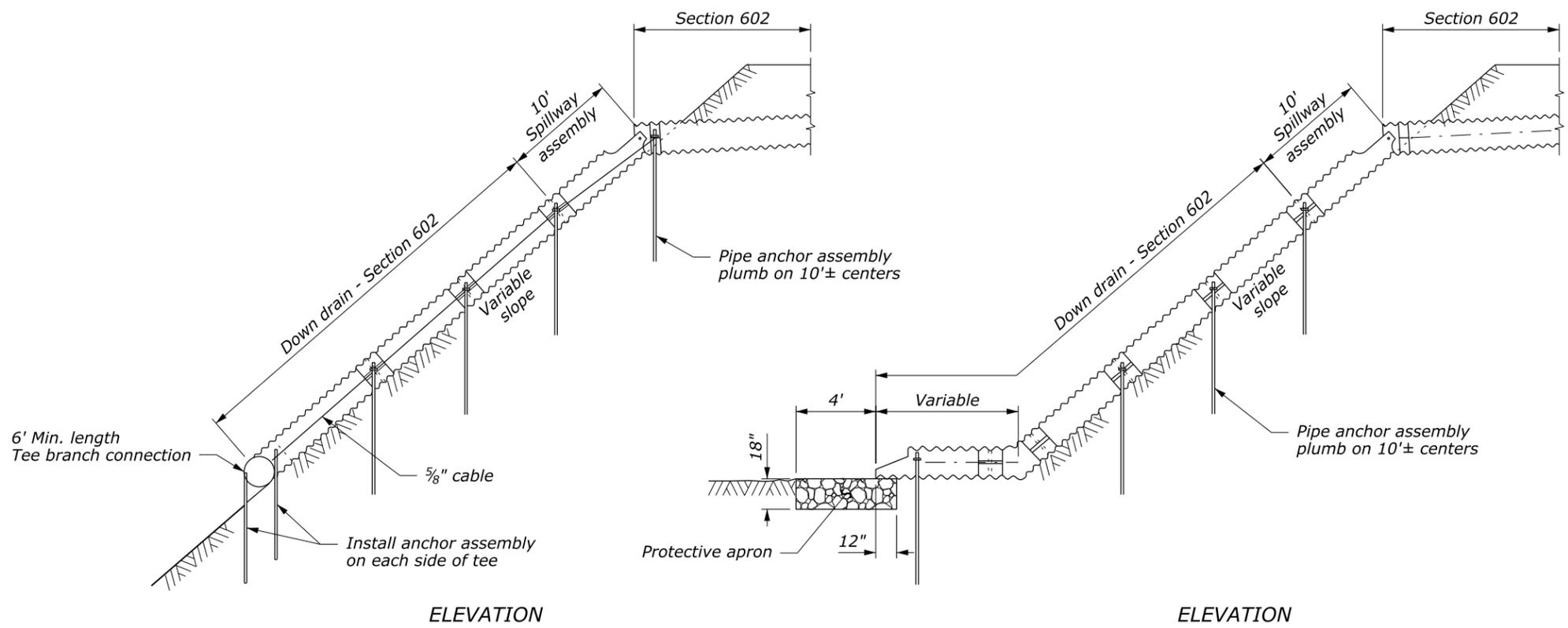
METRIC DETAIL

**REINFORCED CONCRETE HEADWALL**

DETAIL APPROVED FOR USE 11/2006  
REVISID:

DETAIL  
WM601-10

|       |         |              |
|-------|---------|--------------|
| STATE | PROJECT | SHEET NUMBER |
|       |         |              |

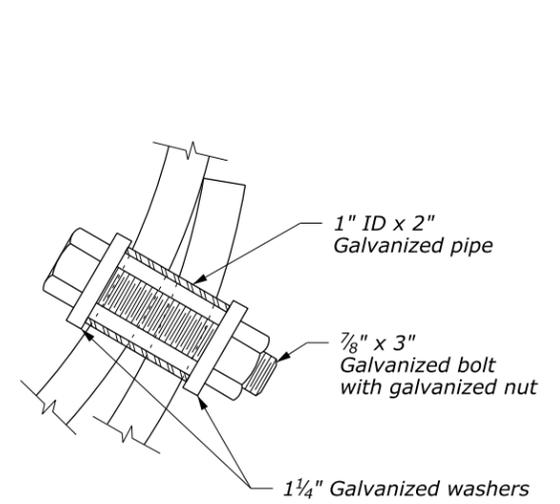


**SPILLWAY ASSEMBLY WITH DOWN DRAIN OUTLET ON NON-ERODIBLE MATERIAL**

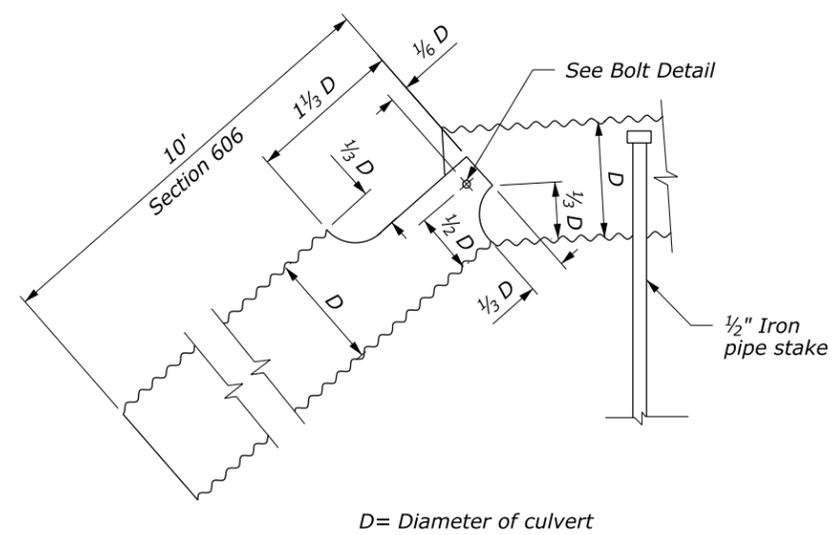
**SPILLWAY ASSEMBLY WITH DOWN DRAIN OUTLET ON ERODIBLE MATERIAL**

**NOTE:**

1. Fabricate spillway assembly from annular corrugated pipe, or from helically corrugated pipe with factory annular or reformed ends. Use 0.064 inch galvanized steel or 0.060 inch aluminum.
2. Make all banded connections water tight by placing  $\frac{3}{16}$  inch bead of approved caulking under each half of the band before tightening.
3. Payment for Tee Branch connection under Section 602 is included in the linear measurement for culvert pipe for the applicable sizes. Measure Tee Branch connections along the top of the Tee.
4. Place class 2 riprap conforming to Section 251 for protective apron.
5. Approved alternate designs may be used.
6. See Detail W606-14 for Pipe Anchor Assembly Detail.

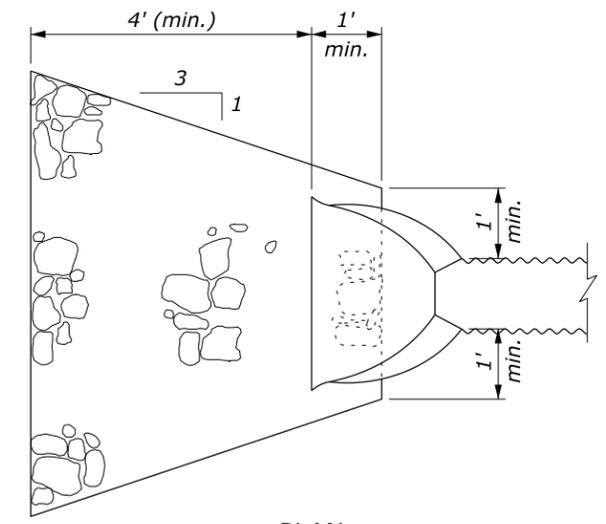


**BOLT DETAIL**



**SPILLWAY ASSEMBLY**

D= Diameter of culvert



**PROTECTIVE APRON**

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

U.S. CUSTOMARY DETAIL

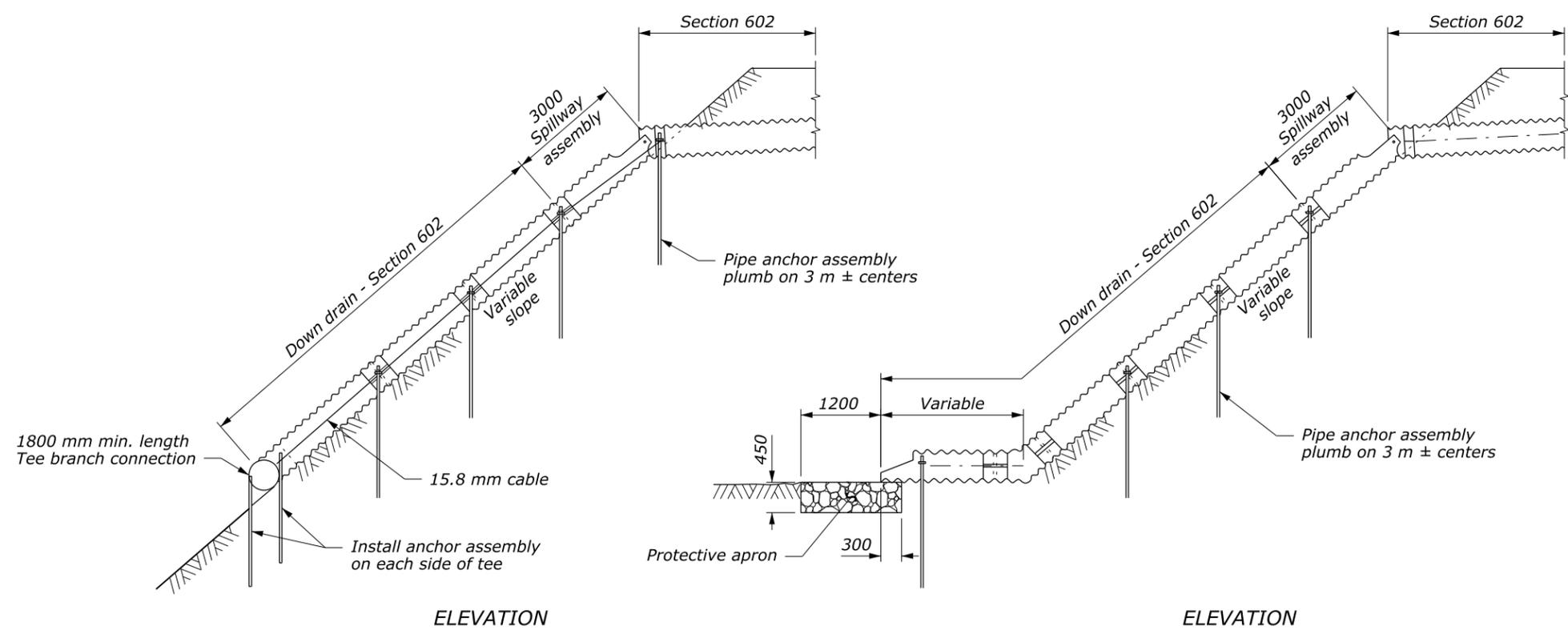
**SPILLWAY ASSEMBLY WITH DOWN DRAIN**

DETAIL APPROVED FOR USE 4/2009  
 REVISIONS: 9/2011

DETAIL  
 W606-10

NO SCALE

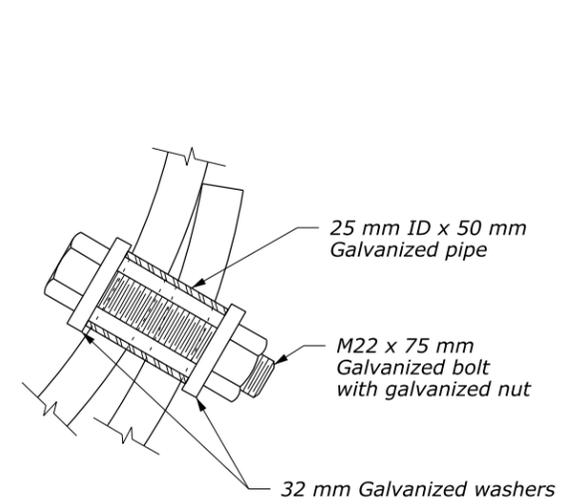
18 November 2014 9:28 AM c:\myfiles\pw\_production\dms00747\Det.W606-10.dgn [USC]



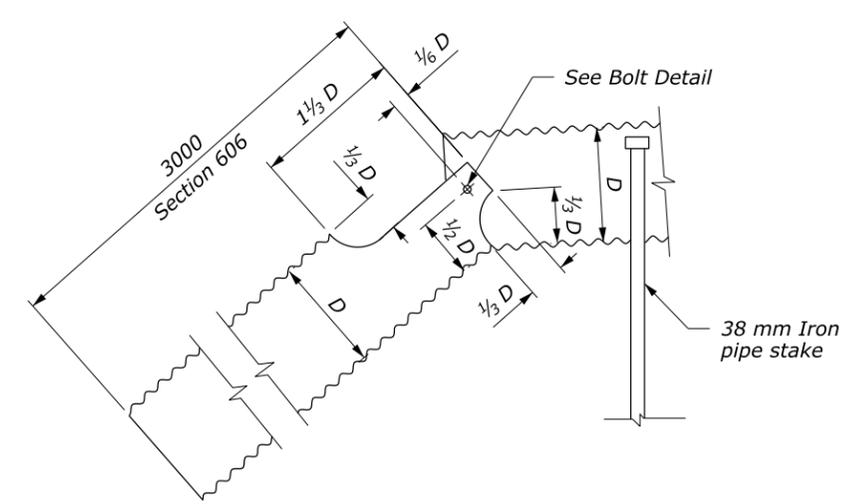
**SPILLWAY ASSEMBLY WITH DOWN DRAIN  
OUTLET ON NON-ERODIBLE MATERIAL**

**SPILLWAY ASSEMBLY WITH DOWN DRAIN  
OUTLET ON ERODIBLE MATERIAL**

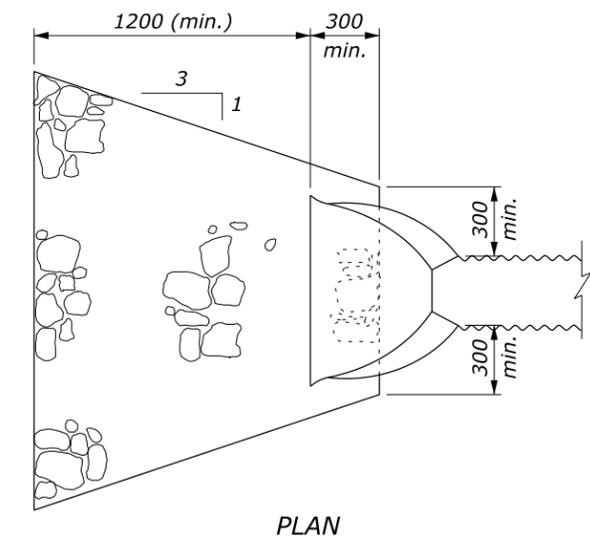
- NOTE:**
1. Fabricate spillway assembly from annular corrugated pipe, or from helically corrugated pipe with factory annular or reformed ends. Use 1.6 mm galvanized steel or 1.5 mm aluminum.
  2. Make all banded connections water tight by placing 5 mm bead of approved caulking under each half of the band before tightening.
  3. Payment for Tee Branch connection under Section 602 is included in the linear measurement for culvert pipe for the applicable sizes. Measure Tee Branch connections along the top of the Tee.
  4. Place class 2 riprap conforming to Section 251 for protective apron.
  5. Approved alternate designs may be used.
  6. See Detail WM606-14 for Pipe Anchor Assembly Detail.
  7. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are unavailable.
  8. Dimensions without units are millimeters.



**BOLT DETAIL**



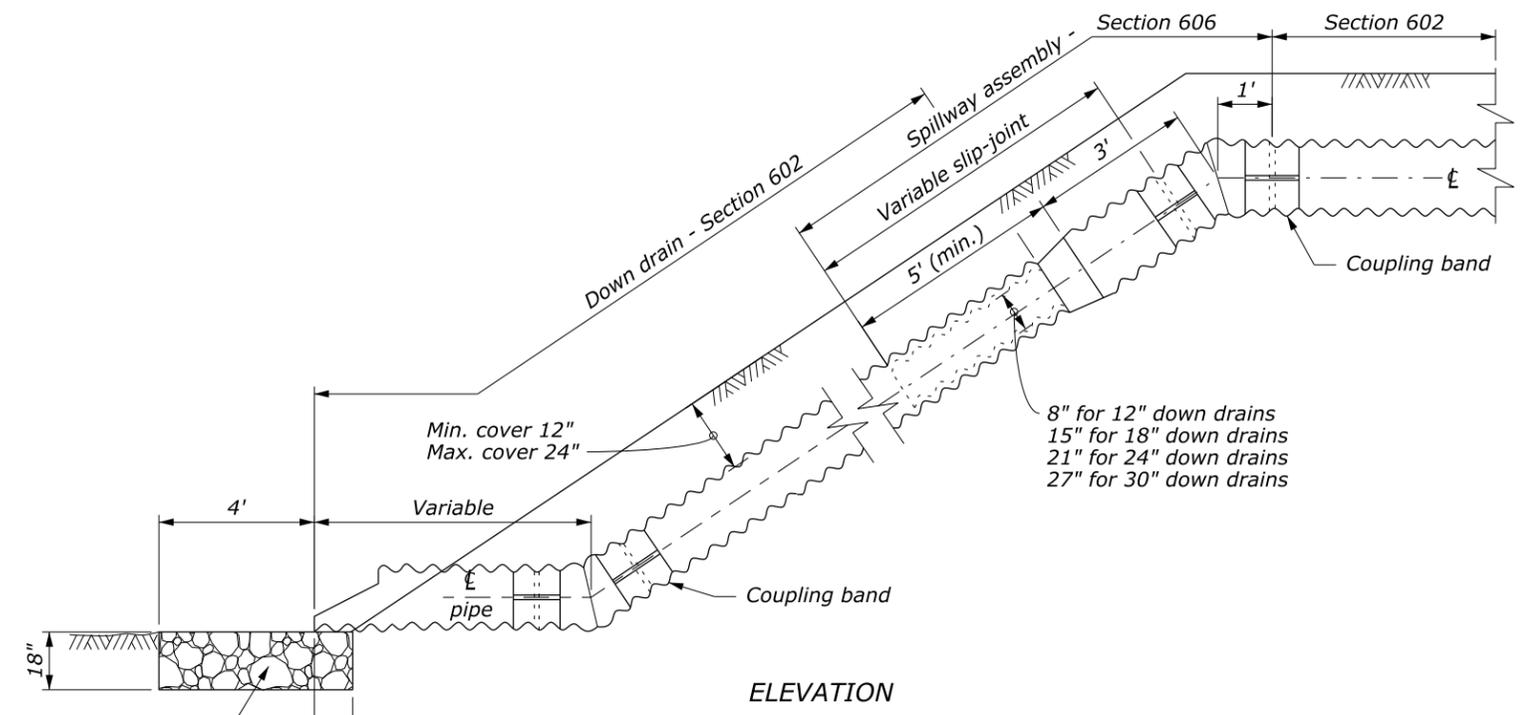
**SPILLWAY ASSEMBLY**



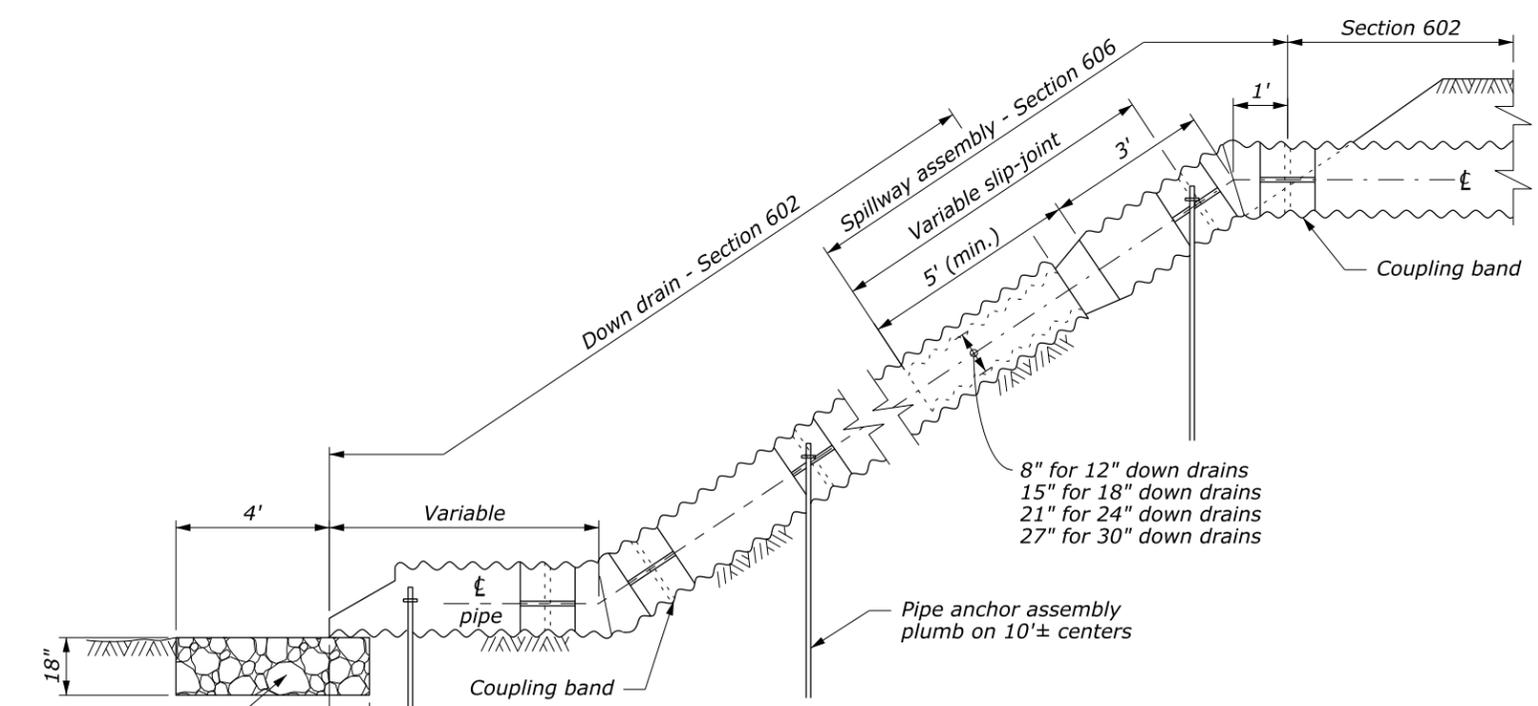
**PROTECTIVE APRON**

|   |          |
|---|----------|
| U.S. DEPARTMENT OF TRANSPORTATION<br>FEDERAL HIGHWAY ADMINISTRATION<br>WESTERN FEDERAL LANDS HIGHWAY DIVISION |          |
| METRIC DETAIL   |          |
| <b>SPILLWAY ASSEMBLY<br/>WITH DOWN DRAIN</b>  |          |
| DETAIL APPROVED FOR USE 4/2009  | DETAIL   |
| REVISED: 9/2011   | WM606-10 |

NO SCALE



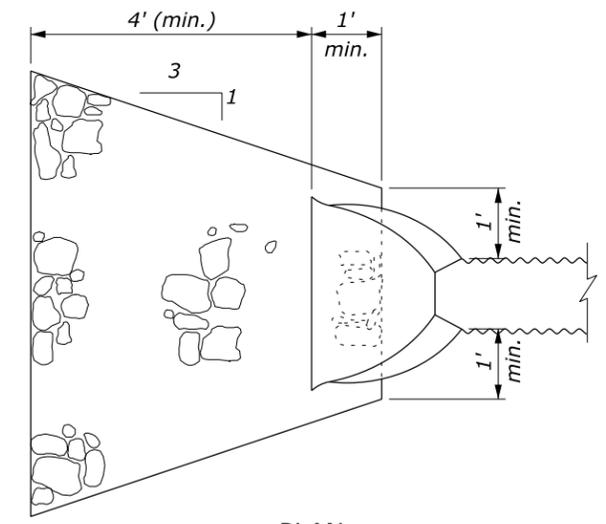
**ELEVATION**  
**SPILLWAY ASSEMBLY WITH BURIED DOWN DRAIN**



**ELEVATION**  
**SPILLWAY ASSEMBLY WITH SURFACE DOWN DRAIN**

**NOTE:**

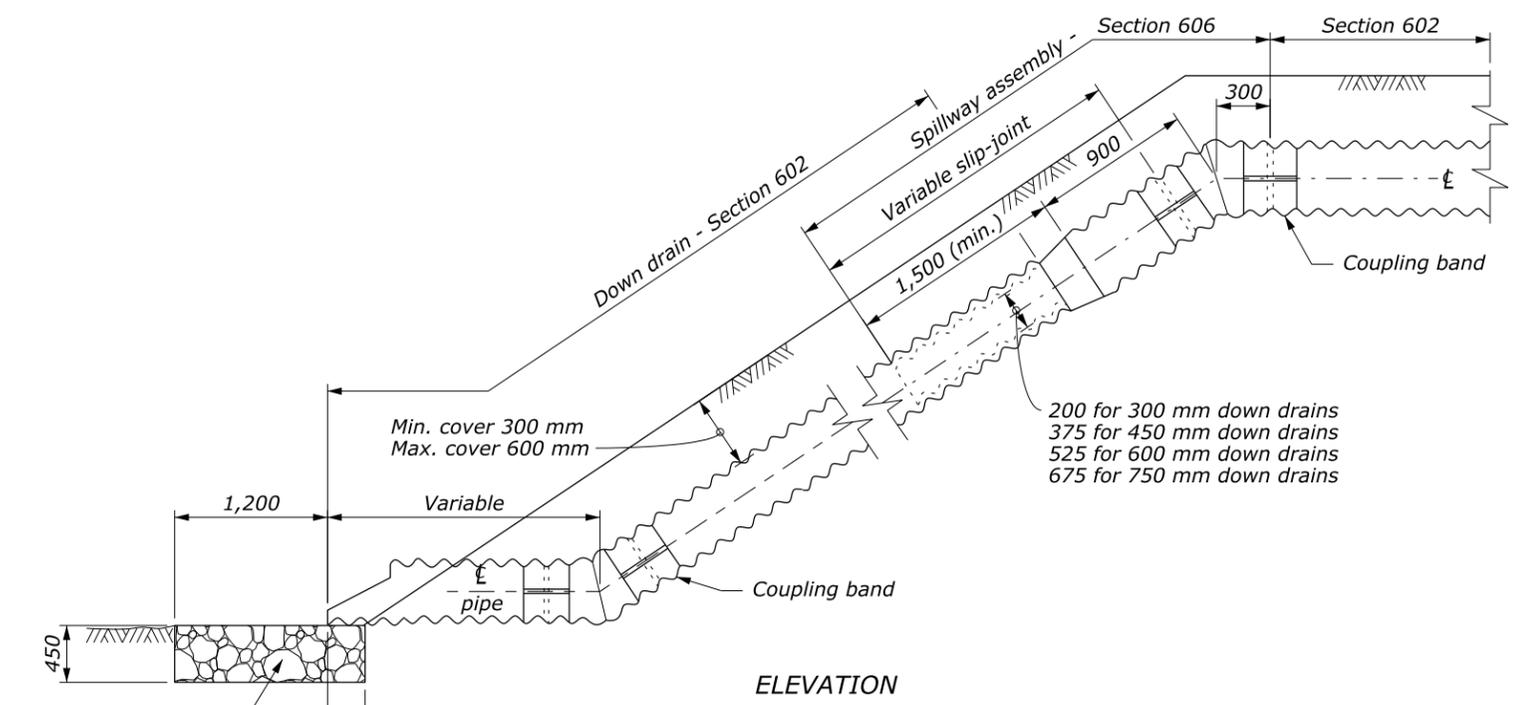
1. Fabricate spillway assembly from annular corrugated pipe, or from helically corrugated pipe with factory annular or reformed ends. Use 0.064 inch galvanized steel or 0.060 inch aluminum.
2. Make all coupling band connections water tight by placing  $\frac{3}{16}$  inch bead of approved caulking under each half of the band before tightening.
3. Place class 2 riprap conforming to Section 251 for protective apron.
4. Approved alternate designs may be used.
5. See Detail W606-14 for Pipe Anchor Assembly Detail.



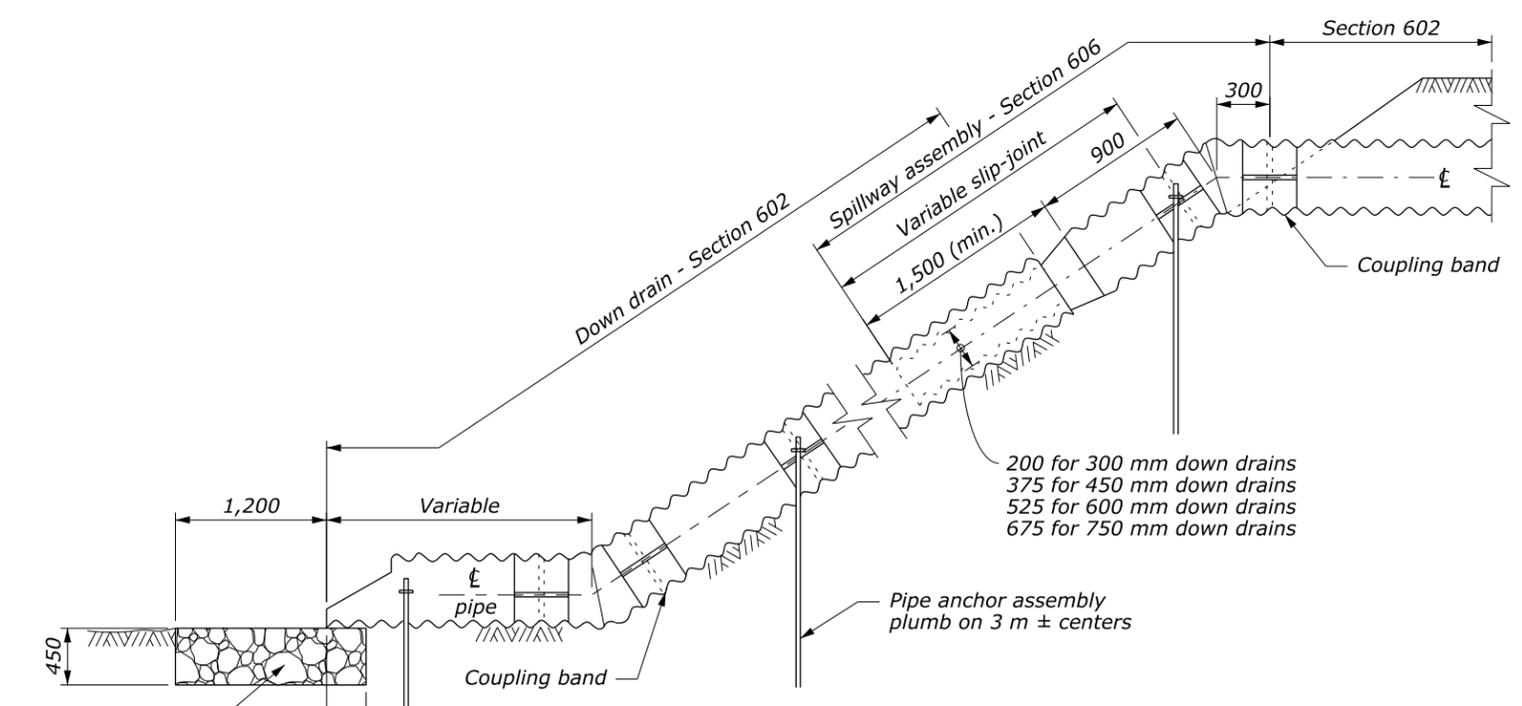
**PLAN**  
**PROTECTIVE APRON**

|   |         |
|---|---------|
| U.S. DEPARTMENT OF TRANSPORTATION<br>FEDERAL HIGHWAY ADMINISTRATION<br>WESTERN FEDERAL LANDS HIGHWAY DIVISION |         |
| U.S. CUSTOMARY DETAIL   |         |
| <b>SPILLWAY ASSEMBLY WITH<br/>DOWN DRAIN AND SLIP-JOINT</b>   |         |
| DETAIL APPROVED FOR USE 9/2009  | DETAIL  |
| REVISED: 9/2011   | W606-11 |

NO SCALE



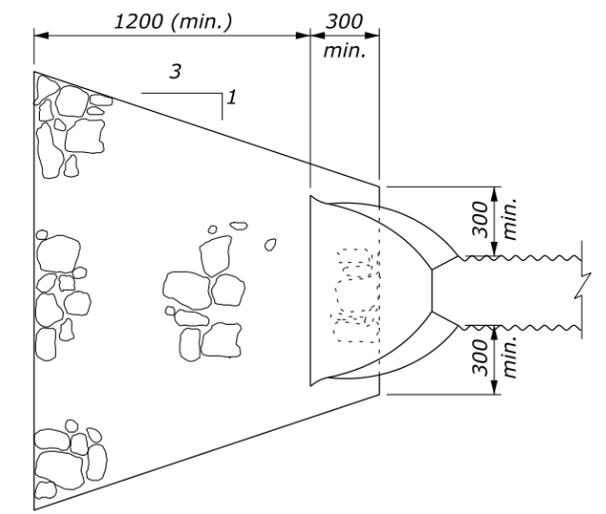
**SPILLWAY ASSEMBLY WITH BURIED DOWN DRAIN**



**SPILLWAY ASSEMBLY WITH SURFACE DOWN DRAIN**

**NOTE:**

1. Fabricate spillway assembly from annular corrugated pipe, or from helically corrugated pipe with factory annular or reformed ends. Use 1.6 mm galvanized steel or 1.5 mm aluminum.
2. Make all coupling band connections water tight by placing 5 mm bead of approved caulking under each half of the band before tightening.
3. Place class 2 riprap conforming to Section 251 for protective apron.
4. Approved alternate designs may be used.
5. See Detail WM606-14 for Pipe Anchor Assembly Detail.
6. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are unavailable.
7. Dimensions without units are millimeters.

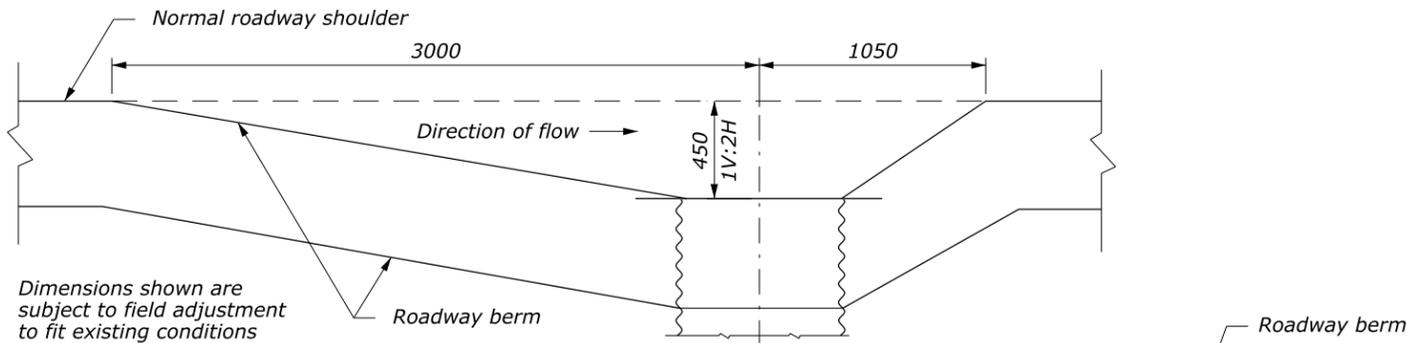


**PROTECTIVE APRON**

|   |          |
|---|----------|
| U.S. DEPARTMENT OF TRANSPORTATION<br>FEDERAL HIGHWAY ADMINISTRATION<br>WESTERN FEDERAL LANDS HIGHWAY DIVISION |          |
| METRIC DETAIL   |          |
| <b>SPILLWAY ASSEMBLY WITH<br/>DOWN DRAIN AND SLIP-JOINT</b>   |          |
| DETAIL APPROVED FOR USE 9/2009  | DETAIL   |
| REVISED: 9/2011   | WM606-11 |

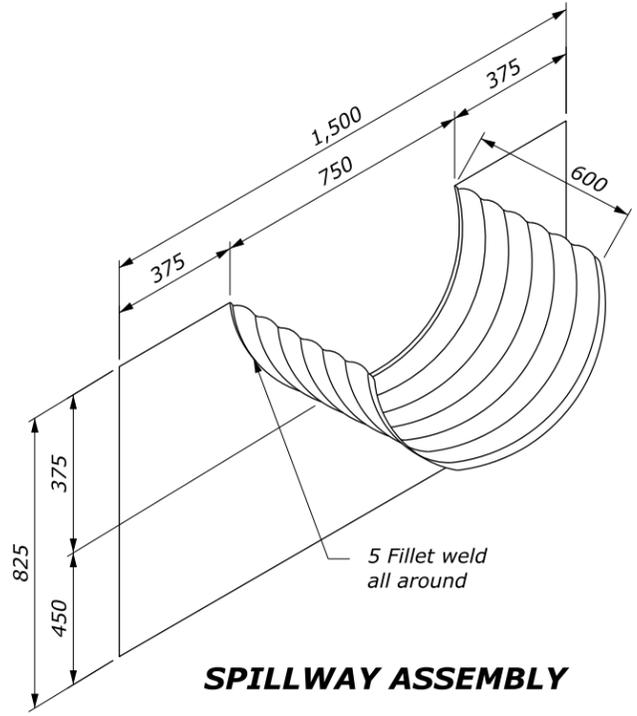
NO SCALE





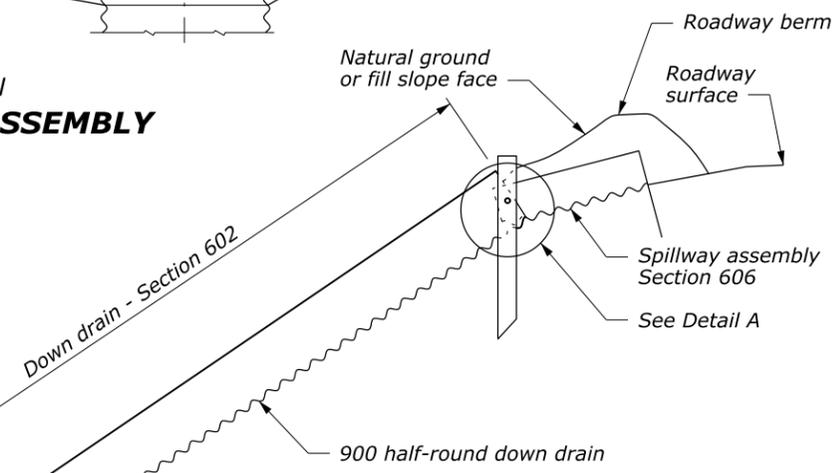
PLAN  
**SPILLWAY ASSEMBLY**

Dimensions shown are subject to field adjustment to fit existing conditions

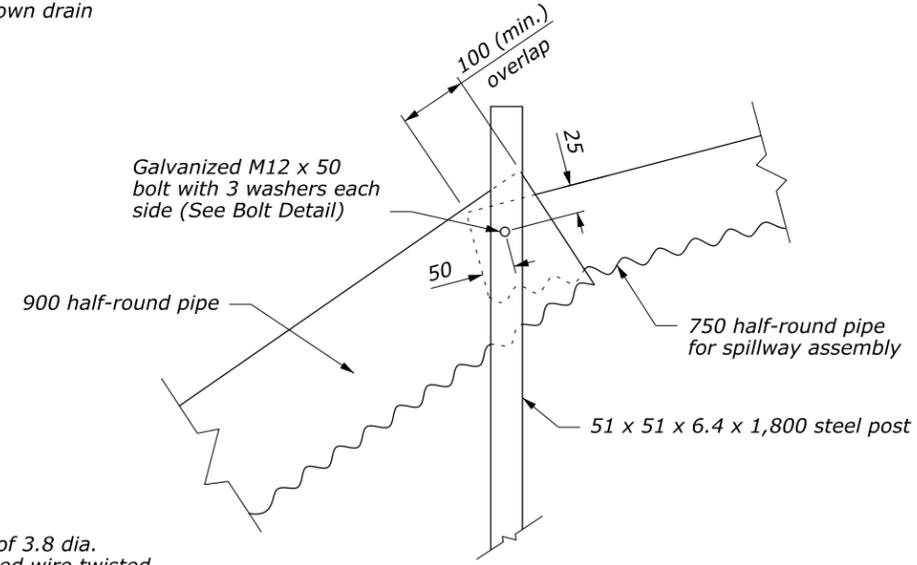
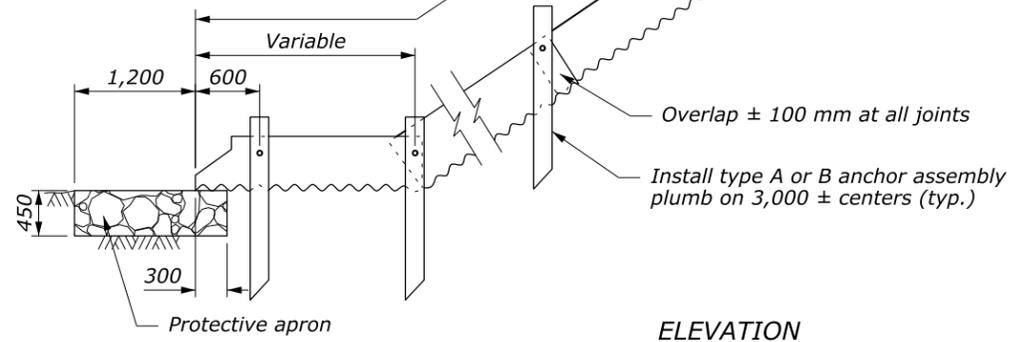


**SPILLWAY ASSEMBLY**

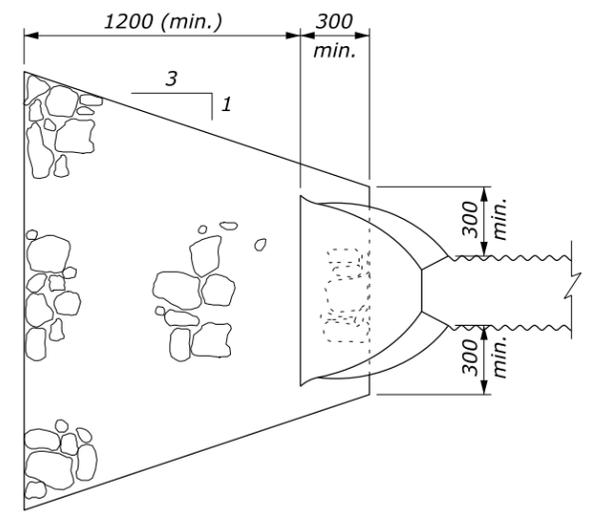
- NOTE:**
1. Fabricate spillway assembly from 1.6 mm thick galvanized steel or 1.5 mm aluminum.
  2. Place Class 2 riprap conforming to Section 251 for protective apron.
  3. Construct down drain from annular corrugated pipe, or from helically corrugated pipe with factory annular or flanged reformed ends.
  4. Approved alternate designs may be used.
  5. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are not available.
  6. Dimensions without units are millimeters.



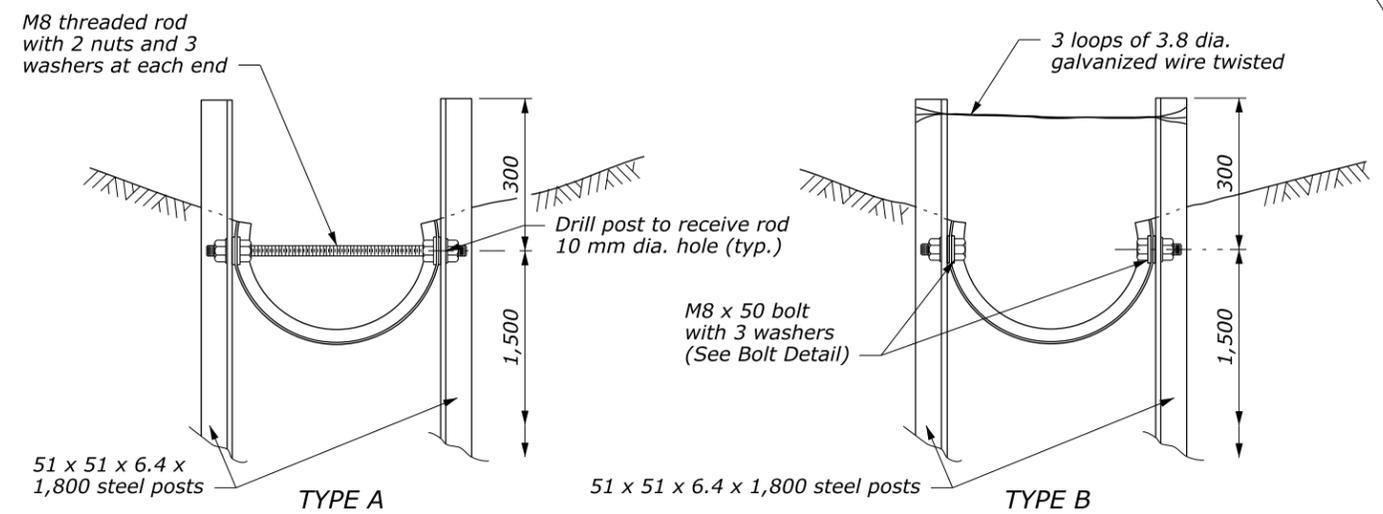
ELEVATION  
**SPILLWAY ASSEMBLY AND DOWN DRAIN**



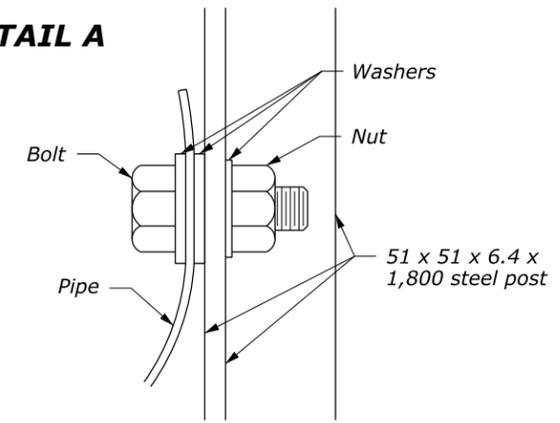
**DETAIL A**



PLAN  
**PROTECTIVE APRON**



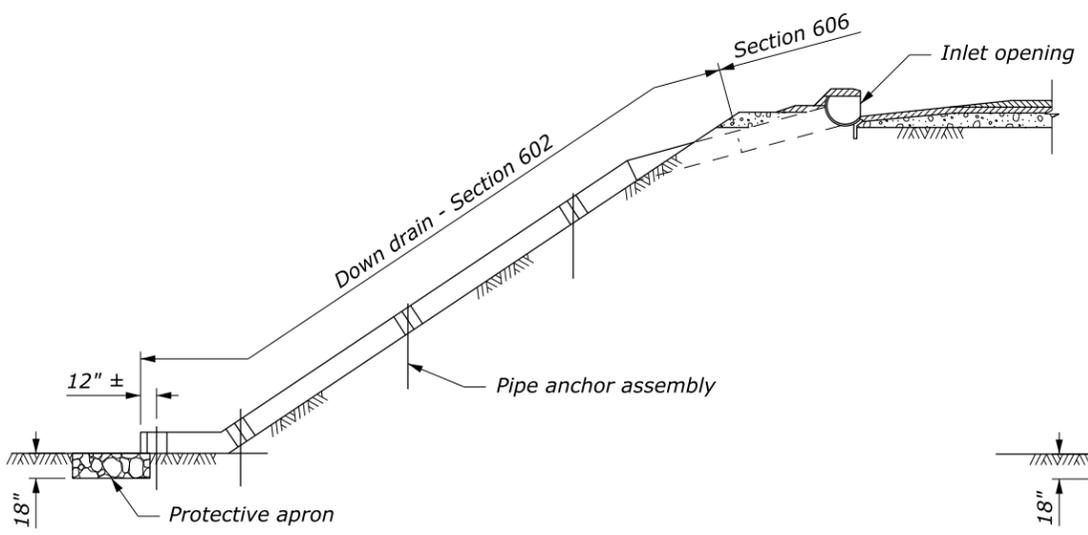
**ANCHOR ASSEMBLY**



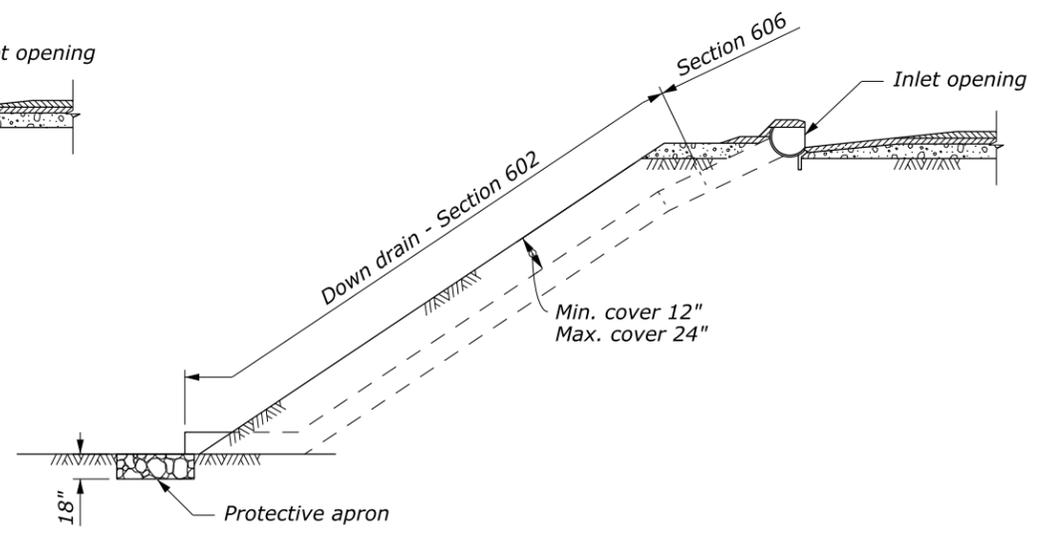
**BOLT DETAIL**

NO SCALE

|   |          |
|---|----------|
| U.S. DEPARTMENT OF TRANSPORTATION<br>FEDERAL HIGHWAY ADMINISTRATION<br>WESTERN FEDERAL LANDS HIGHWAY DIVISION |          |
| METRIC DETAIL   |          |
| <b>SPILLWAY ASSEMBLY WITH<br/>HALF-ROUND DOWN DRAIN</b>   |          |
| DETAIL APPROVED FOR USE 10/2009   | DETAIL   |
| REVISED:  | WM606-12 |



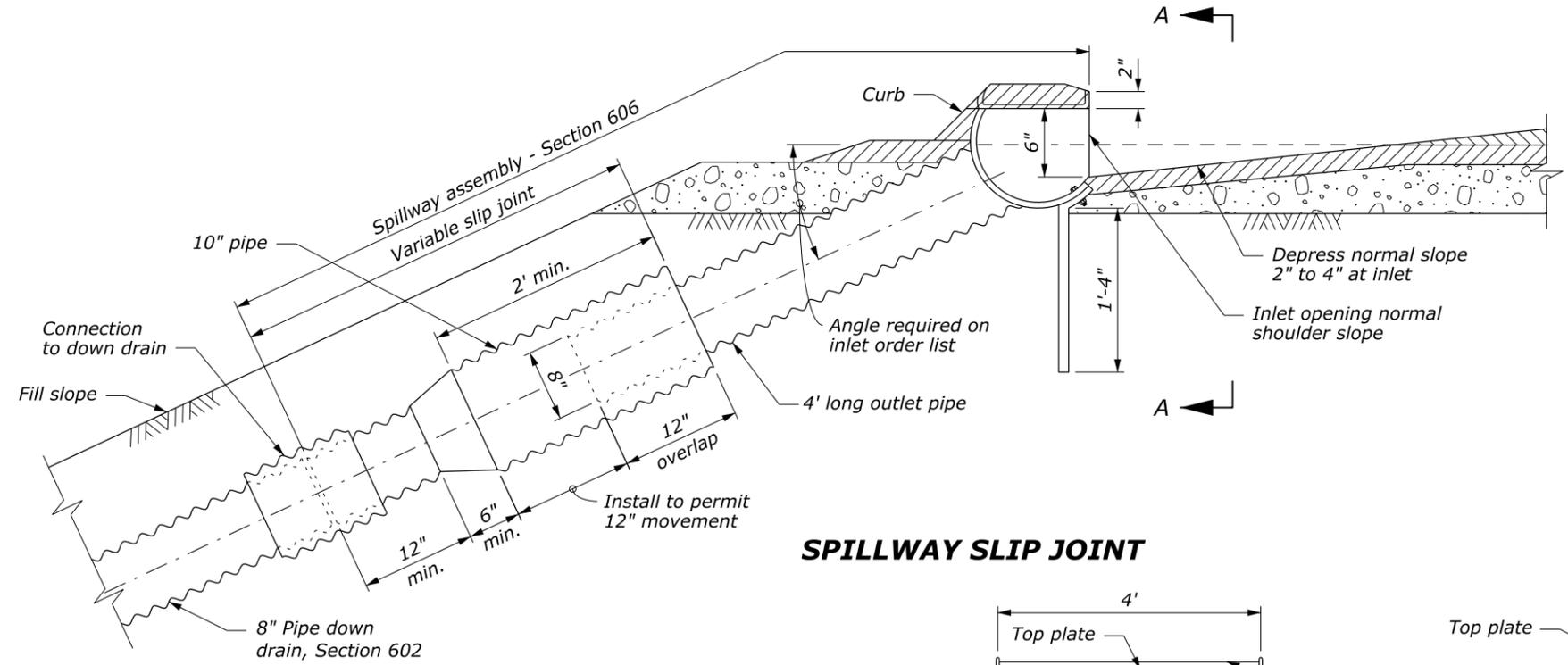
**SPILLWAY ASSEMBLY WITH SURFACE DOWN DRAIN**



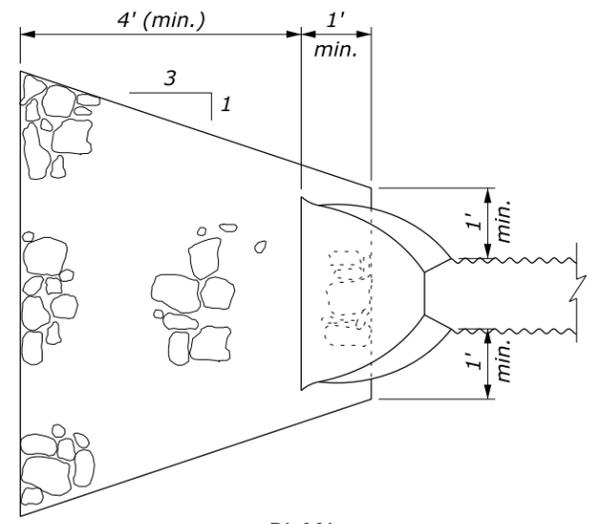
**SPILLWAY ASSEMBLY WITH BURIED DOWN DRAIN**

**NOTE:**

1. Fabricate half-round pipe, outlet pipe, and curtain wall for spillway assembly from 0.64 inch galvanized steel or 0.60 inch aluminum. Fabricate top plate and end plate from 0.18 inch flat steel or 0.20 inch aluminum plate.
2. Make all coupling band connections watertight by placing a  $\frac{3}{16}$  inch bead of approved caulking under each half of the band before tightening.
3. Install pipe anchor assemblies at 10 feet  $\pm$  spacing on down drain installed above ground.
4. Use type 2 spillway assembly inlets where profile grades are greater than 2%. Use type 1 on grades 2% or flatter.
5. Place class 2 riprap conforming to Section 251 for protective apron.
6. Approved alternate designs may be used.
7. See Detail W606-14 for Pipe Anchor Assembly Detail.

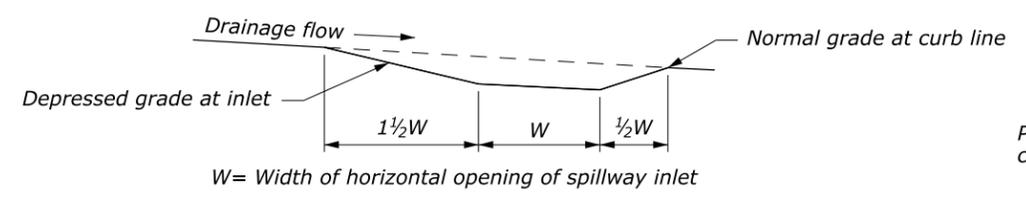


**SPILLWAY SLIP JOINT**

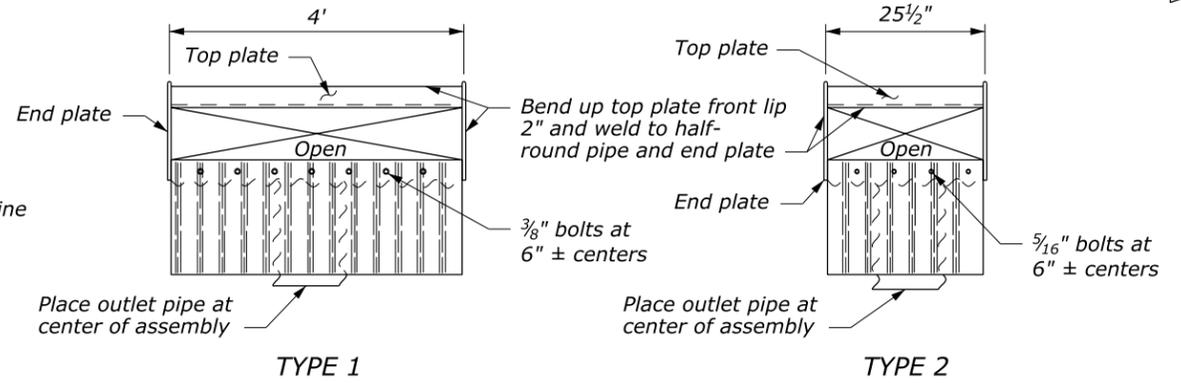


PLAN

**PROTECTIVE APRON**



**SCHEMATIC PROFILE OF INLET BASIN**



TYPE 1

TYPE 2

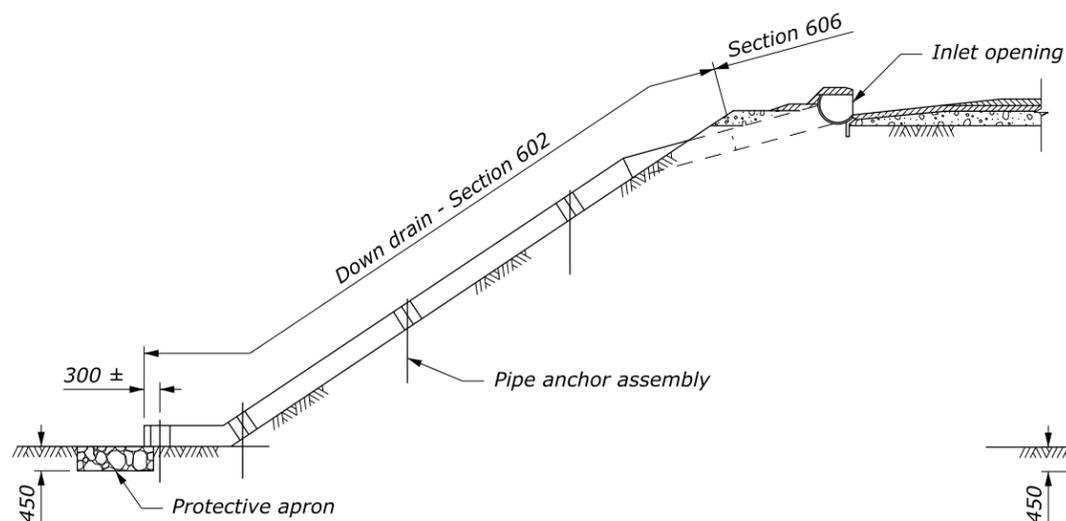
SECTION A-A

**SPILLWAY ASSEMBLY INLETS**

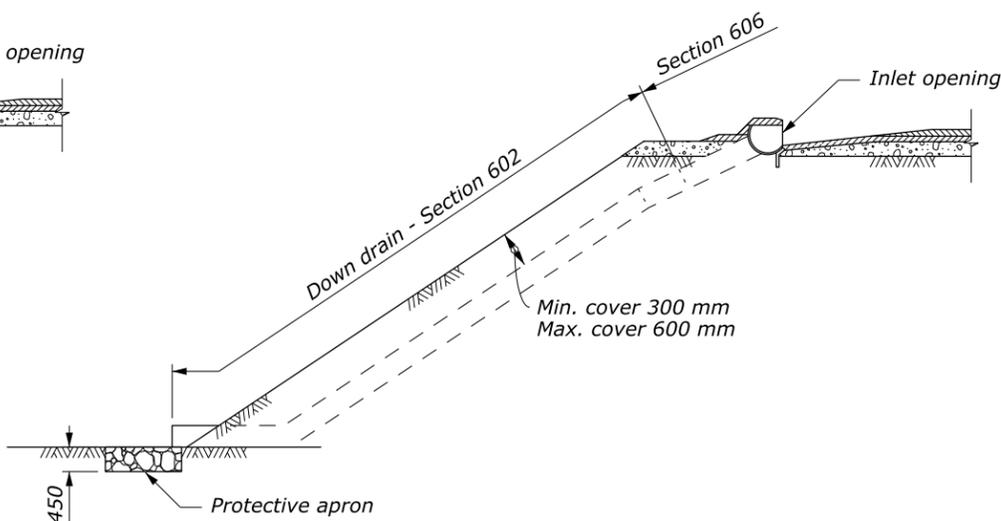
NO SCALE

|   |         |
|---|---------|
| U.S. DEPARTMENT OF TRANSPORTATION<br>FEDERAL HIGHWAY ADMINISTRATION<br>WESTERN FEDERAL LANDS HIGHWAY DIVISION |         |
| U.S. CUSTOMARY DETAIL   |         |
| <b>CORRUGATED METAL SPILLWAYS AND INLETS</b>  |         |
| DETAIL APPROVED FOR USE 10/2009   | DETAIL  |
| REVISED:  | W606-13 |

18 November 2014 1:19 PM c:\myfiles\pw\_production\dms00747\Det.W606-13.dgn [USC]



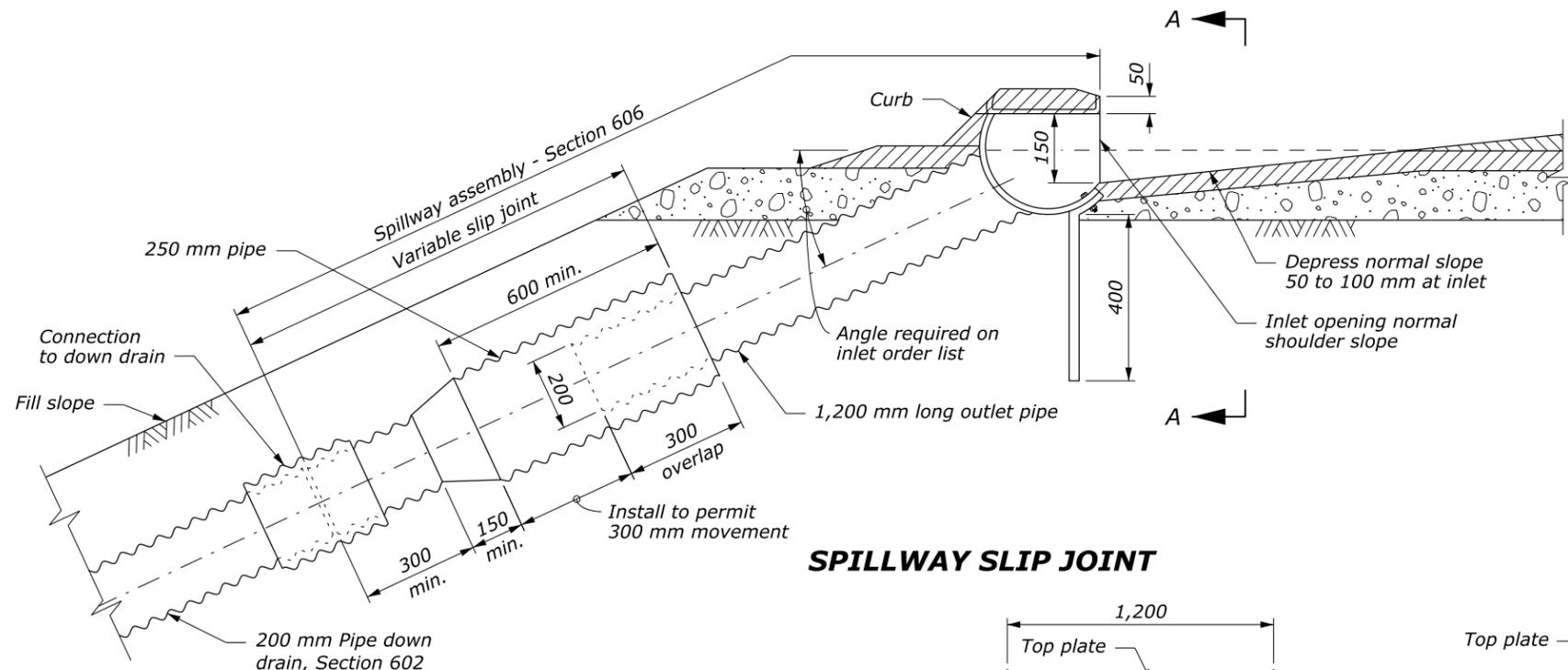
**SPILLWAY ASSEMBLY WITH SURFACE DOWN DRAIN**



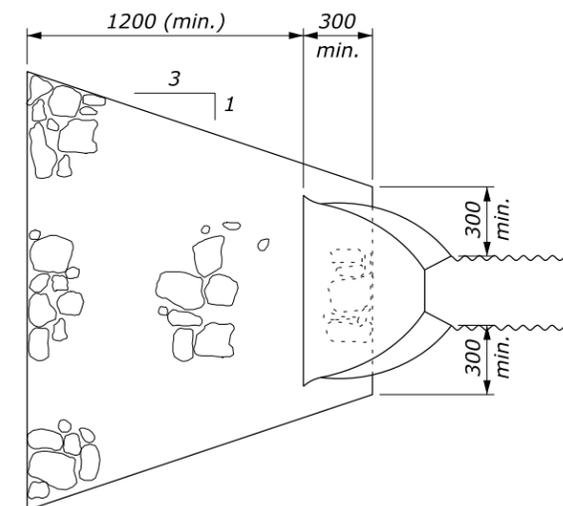
**SPILLWAY ASSEMBLY WITH BURIED DOWN DRAIN**

**NOTE:**

1. Fabricate half-round pipe, outlet pipe, and curtain wall for spillway assembly from 1.6 mm galvanized steel or 1.5 mm aluminum. Fabricate top plate and end plate from 4.6 mm flat steel or 5.0 mm aluminum plate.
2. Make all coupling band connections watertight by placing a 5 mm bead of approved caulking under each half of the band before tightening.
3. Install pipe anchor assemblies at 3,000 mm ± spacing on down drain installed above ground.
4. Use type 2 spillway assembly inlets where profile grades are greater than 2%. Use type 1 on grades 2% or flatter.
5. Place class 2 riprap conforming to Section 251 for protective apron.
6. Approved alternate designs may be used.
7. See Detail WM606-14 for Pipe Anchor Assembly Detail.
8. Furnish hardware in the metric sizes shown. Equivalent US Customary sizes may be used when metric sizes are not available.
9. Dimensions without units are millimeters.

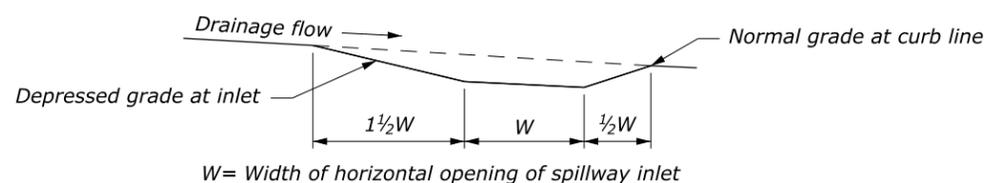


**SPILLWAY SLIP JOINT**

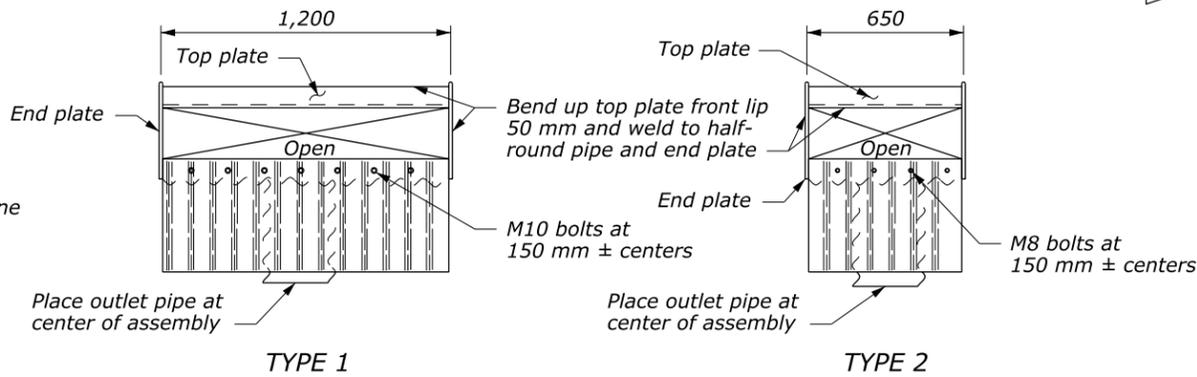


**PLAN**

**PROTECTIVE APRON**



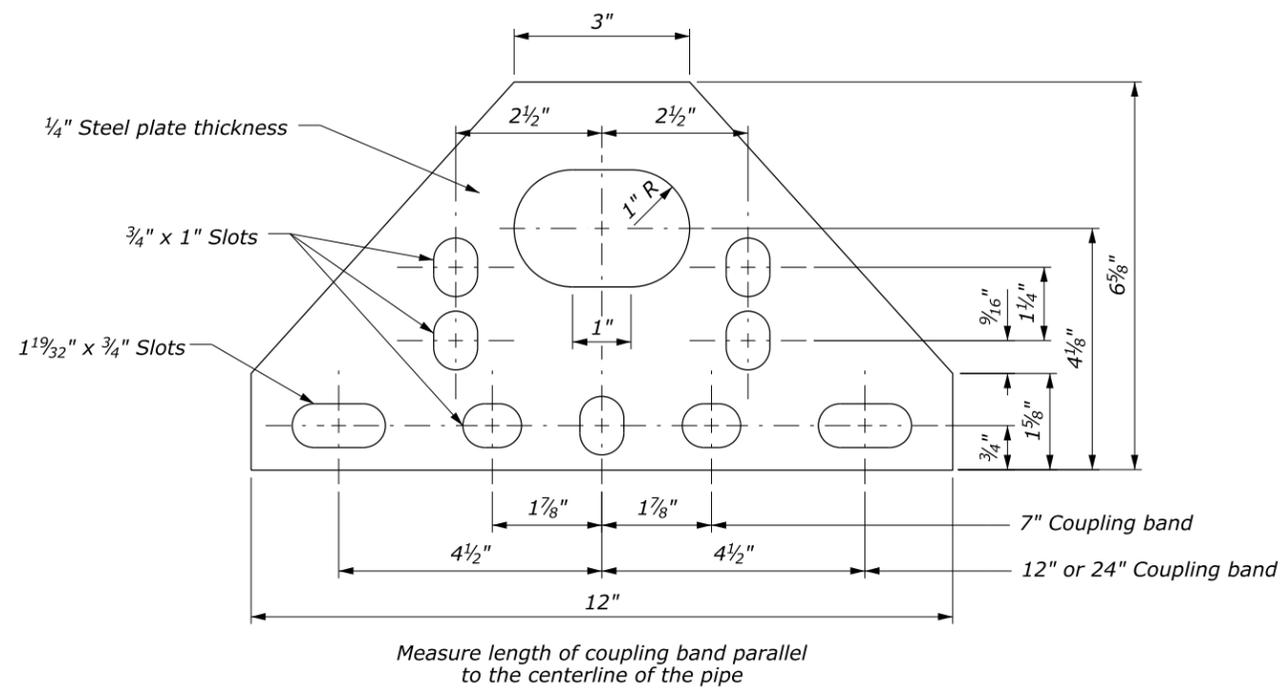
**SCHEMATIC PROFILE OF INLET BASIN**



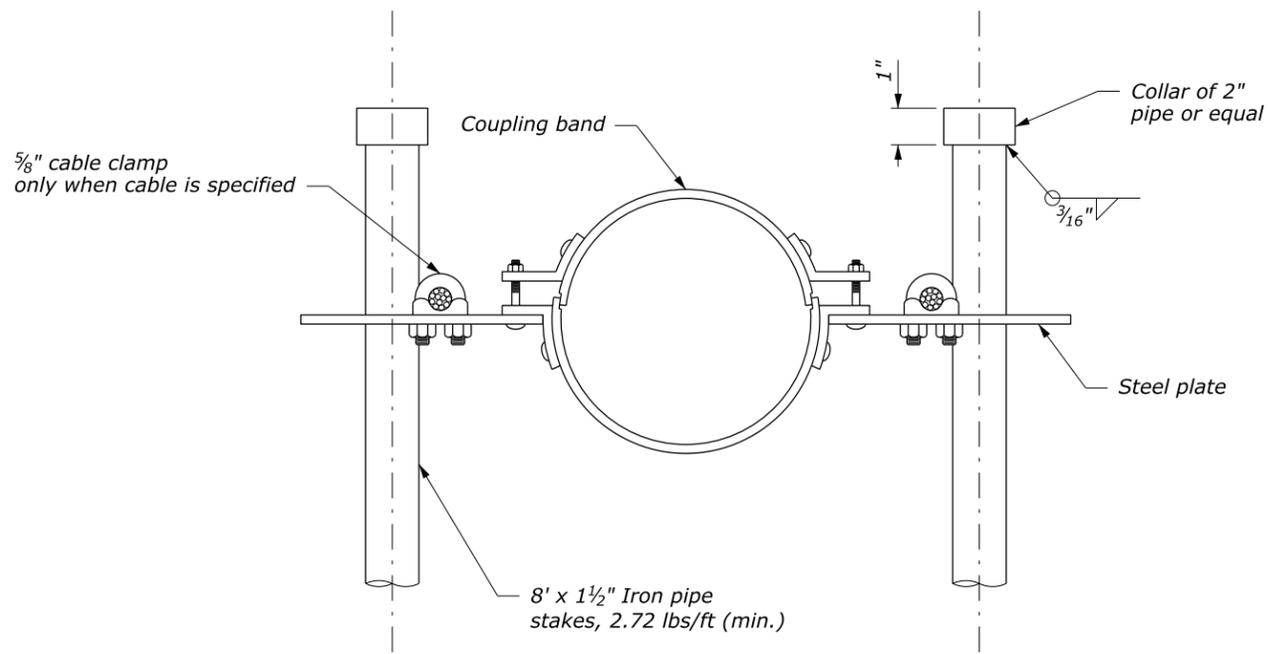
**SECTION A-A  
SPILLWAY ASSEMBLY INLETS**

NO SCALE

|   |          |
|---|----------|
| U.S. DEPARTMENT OF TRANSPORTATION<br>FEDERAL HIGHWAY ADMINISTRATION<br>WESTERN FEDERAL LANDS HIGHWAY DIVISION |          |
| METRIC DETAIL   |          |
| <b>CORRUGATED METAL<br/>SPILLWAYS AND INLETS</b>  |          |
| DETAIL APPROVED FOR USE 10/2009   | DETAIL   |
| REVISED:  | WM606-13 |



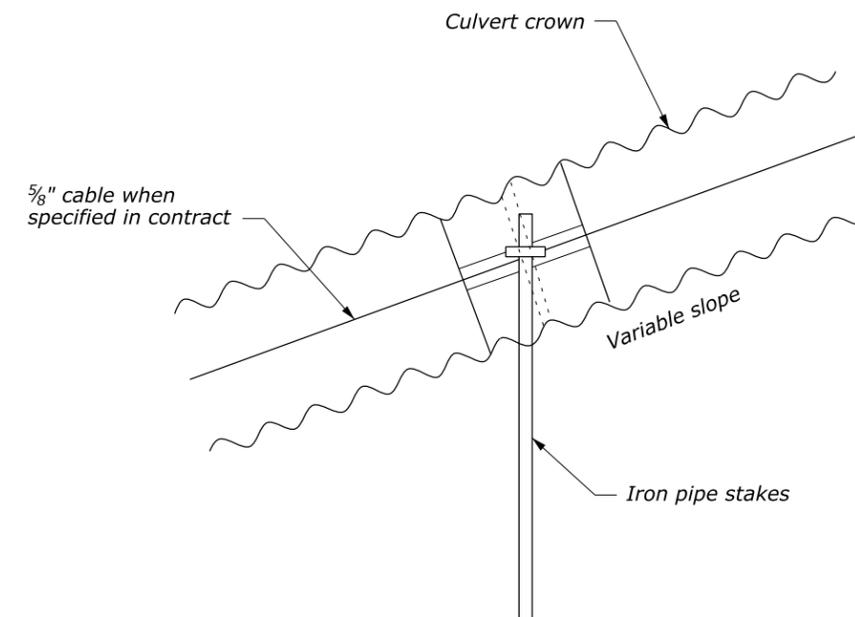
**STEEL PLATE**



**ANCHOR ASSEMBLY**

**NOTE:**

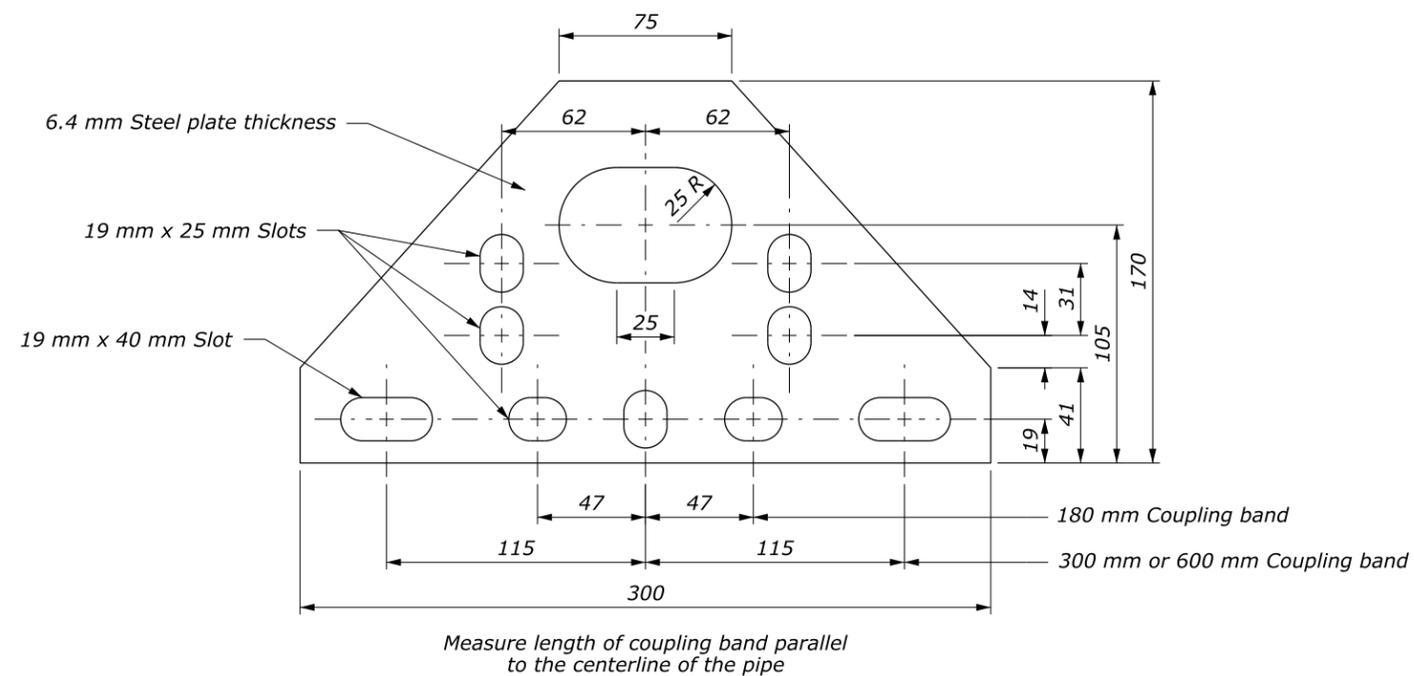
1. All pipe stakes and hardware to be galvanized after fabrication.
2. Approved alternative pipe anchor assemblies may be used.
3. Place slope anchor assemblies on 20' max. centers on slopes 20% or greater.
4. Plate material to be ASTM A36. Galvanize after fabrication.



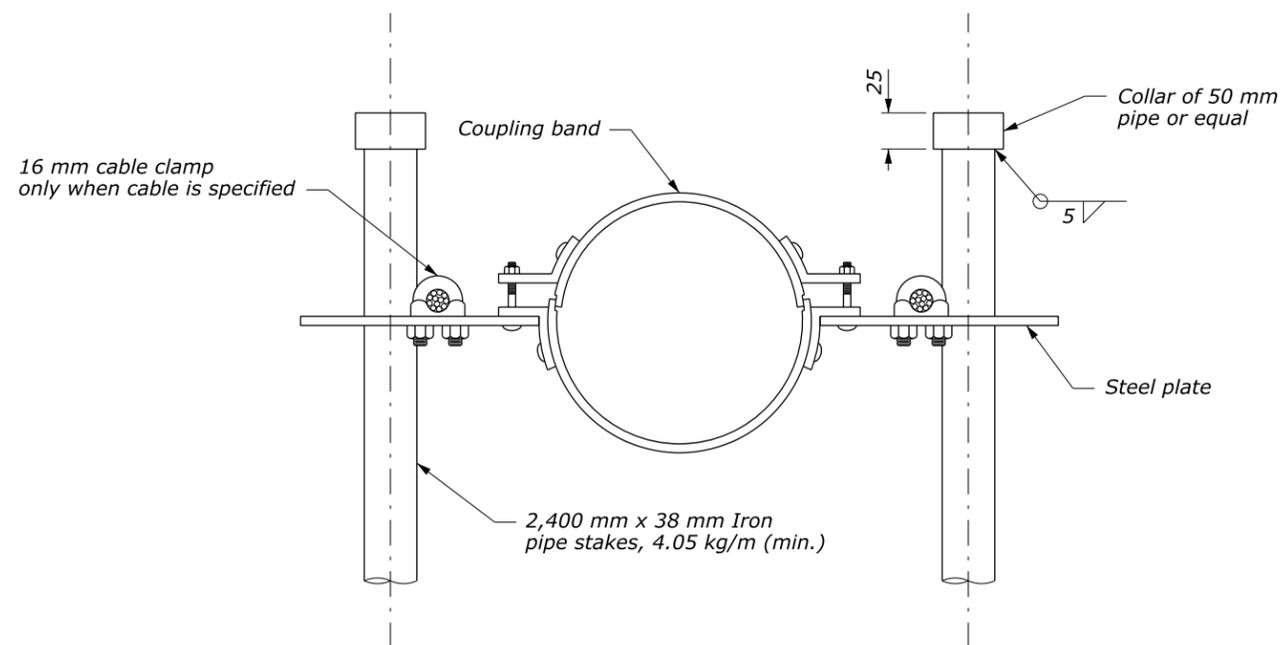
**METAL PIPE ASSEMBLY**

|   |         |
|---|---------|
| U.S. DEPARTMENT OF TRANSPORTATION<br>FEDERAL HIGHWAY ADMINISTRATION<br>WESTERN FEDERAL LANDS HIGHWAY DIVISION |         |
| U.S. CUSTOMARY DETAIL   |         |
| <b>PIPE ANCHOR ASSEMBLY</b>   |         |
| DETAIL APPROVED FOR USE 4/2009  | DETAIL  |
| REVISED: 9/2009   | W606-14 |

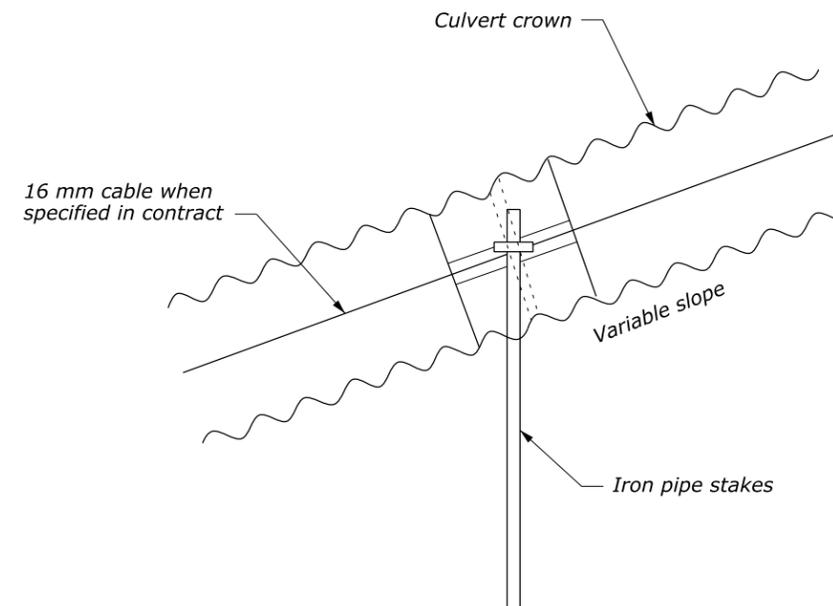
NO SCALE



**STEEL PLATE**



**ANCHOR ASSEMBLY**



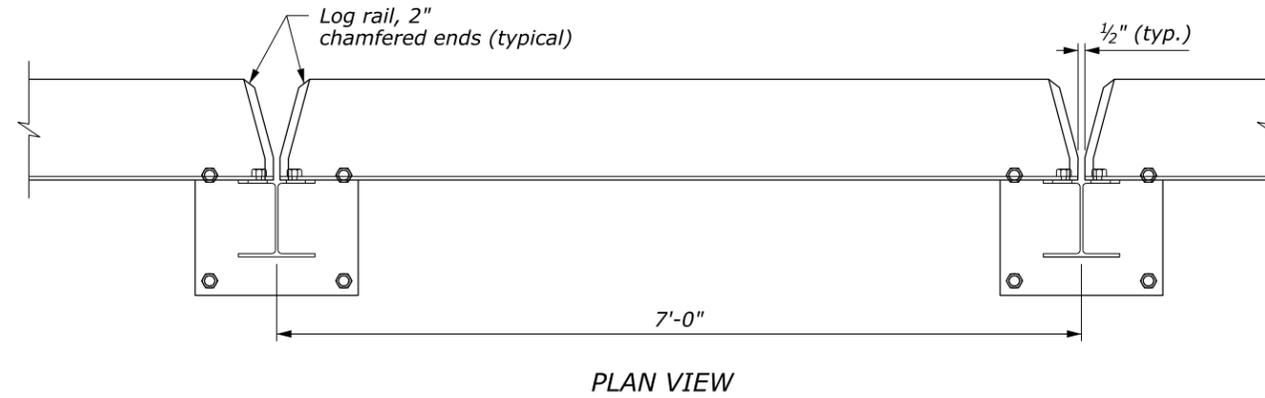
**METAL PIPE ASSEMBLY**

**NOTE:**

1. All pipe stakes and hardware to be galvanized after fabrication.
2. Approved alternative pipe anchor assemblies may be used.
3. Place slope anchor assemblies on 6 m max. centers on slopes 20% or greater.
4. Plate material to be ASTM A36. Galvanize after fabrication.
5. Dimensions without units are millimeters.

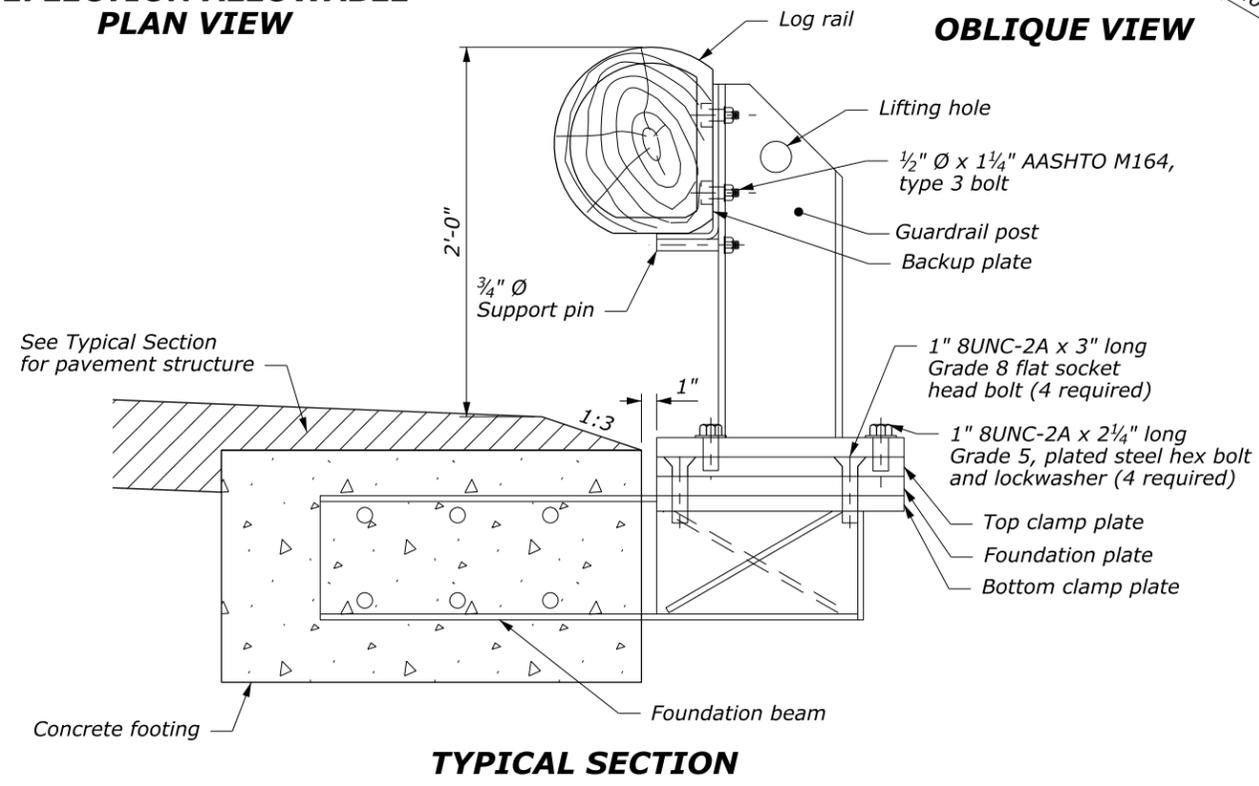
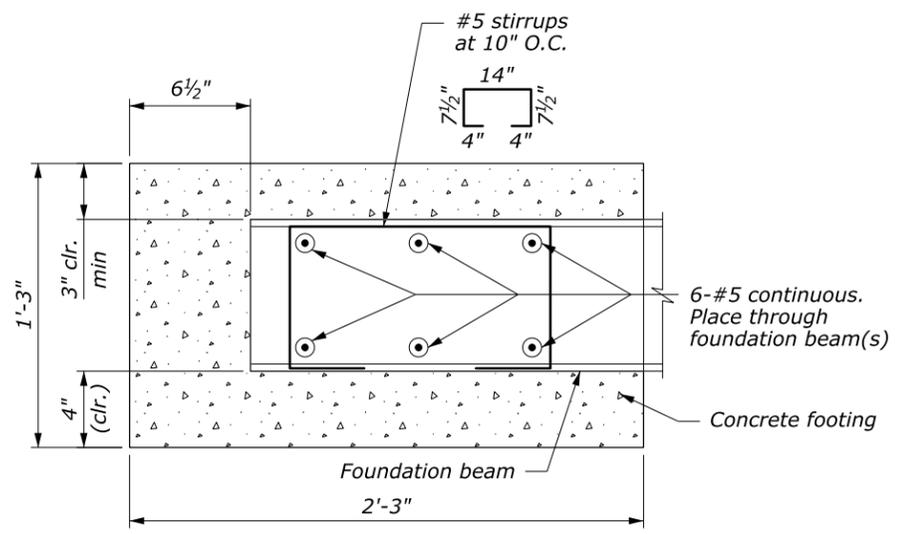
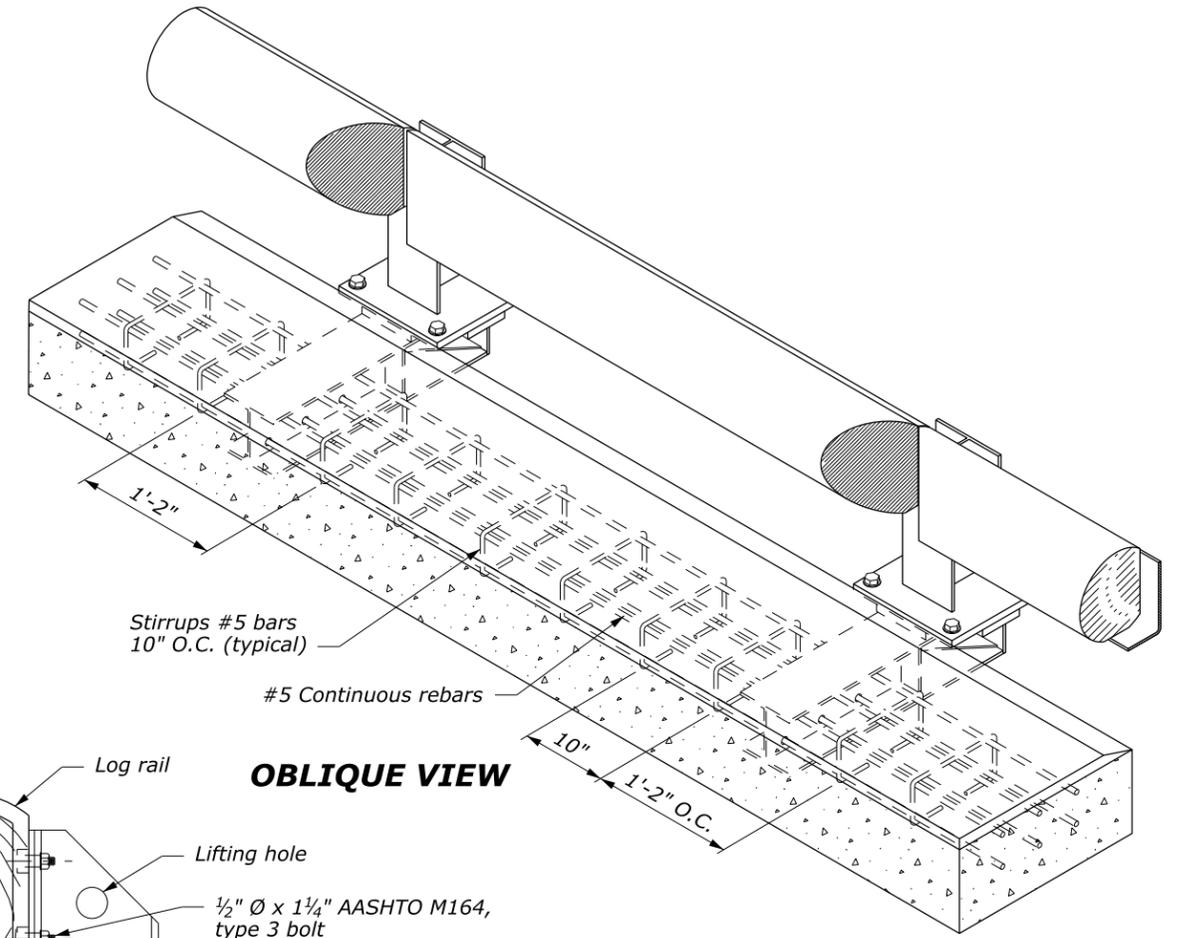
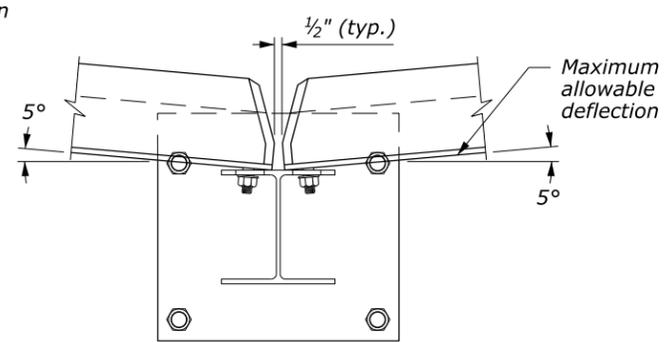
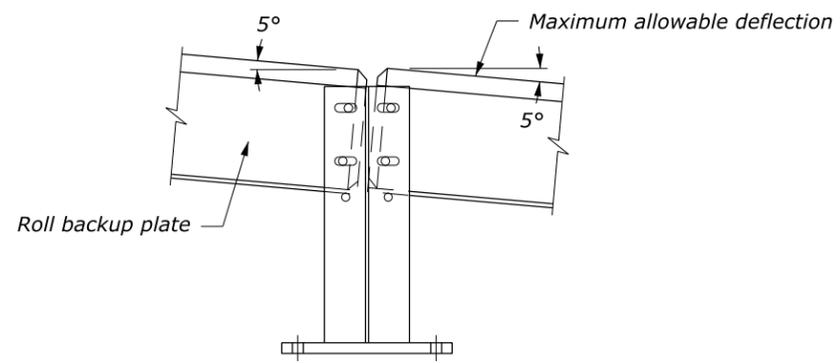
NO SCALE

|   |          |
|---|----------|
| U.S. DEPARTMENT OF TRANSPORTATION<br>FEDERAL HIGHWAY ADMINISTRATION<br>WESTERN FEDERAL LANDS HIGHWAY DIVISION |          |
| METRIC DETAIL   |          |
| <b>PIPE ANCHOR ASSEMBLY</b>   |          |
| DETAIL APPROVED FOR USE 4/2009  | DETAIL   |
| REVISED: 9/2009   | WM606-14 |



**NOTE:**

1. Steel is ASTM A242 or A588, Grade 50.
2. Concrete: minimum  $f_c' = 3500$  psi.



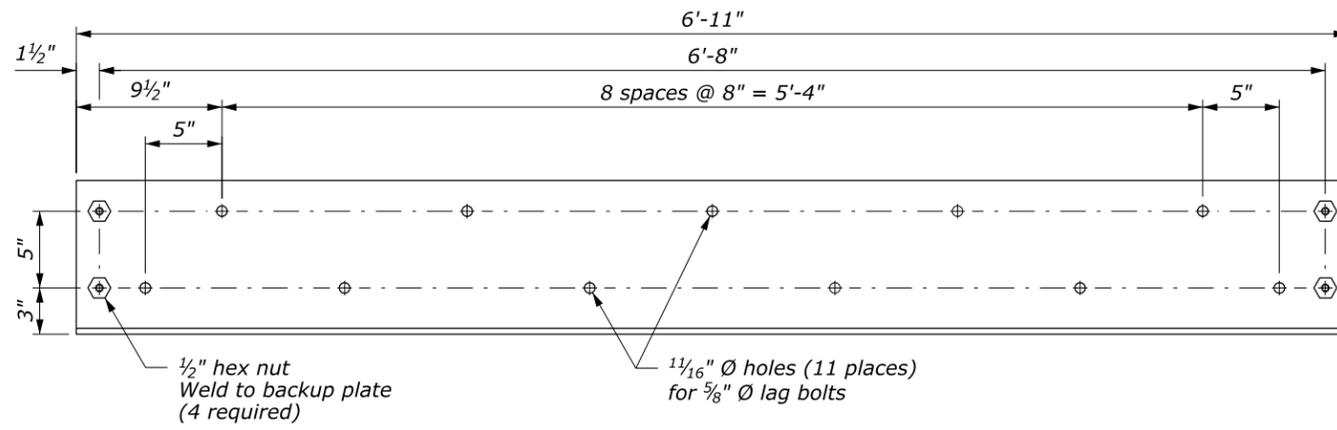
U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION  
WESTERN FEDERAL LANDS HIGHWAY DIVISION

U.S. CUSTOMARY DETAIL  
**REMOVABLE  
STEEL-BACKED LOG RAIL**  
Sheet 1 of 3

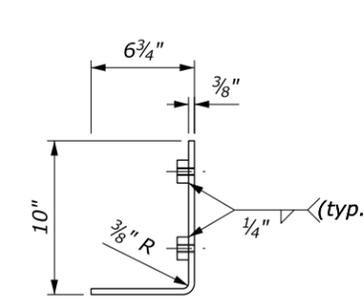
|                                |         |
|--------------------------------|---------|
| DETAIL APPROVED FOR USE 3/2009 | DETAIL  |
| REVISED:                       | W617-83 |

NO SCALE

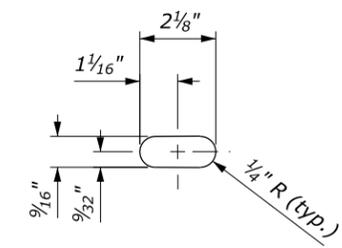
18 November 2014 8:42 AM c:\myfiles\pw\_production\dms43646\Det.W617-83.dgn [USC]



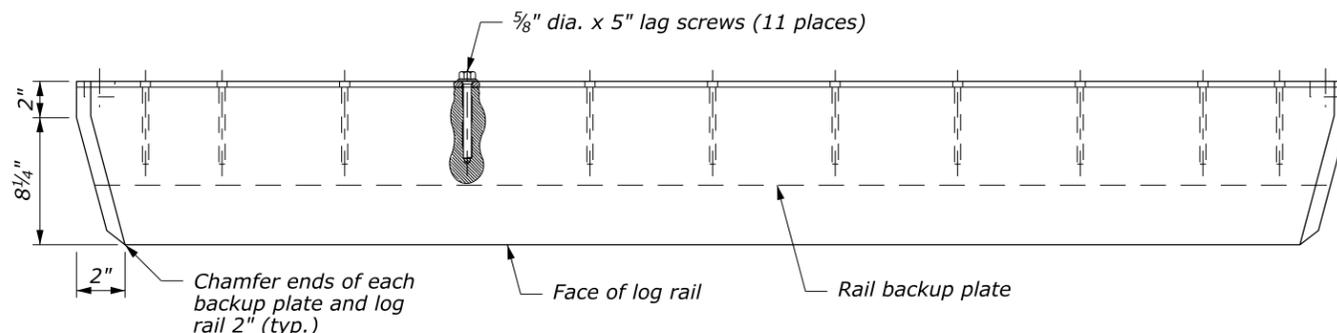
**RAIL BACKUP PLATE  
ELEVATION VIEW**



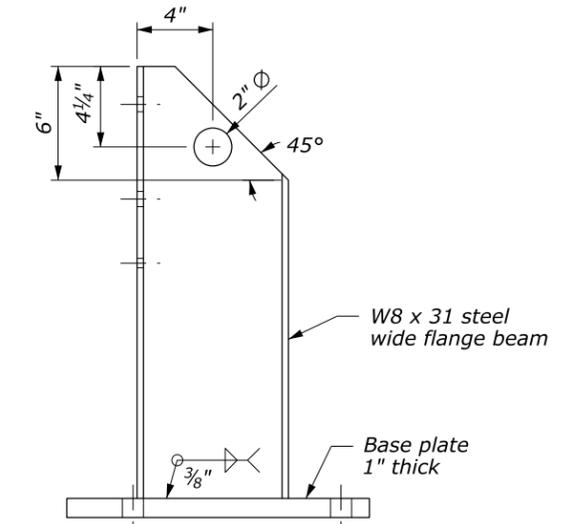
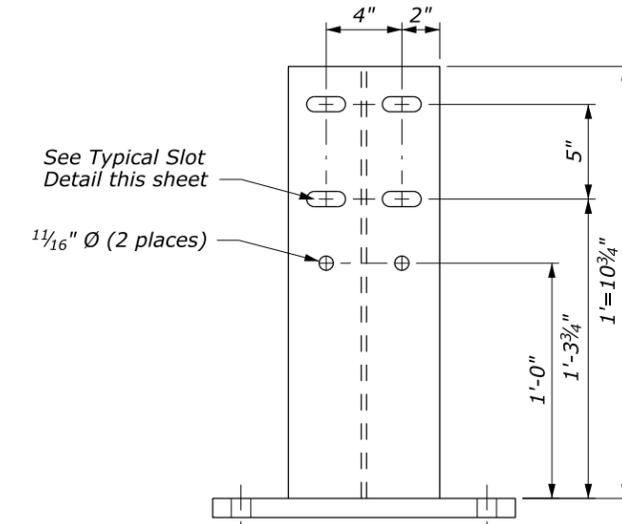
**RAIL BACKUP PLATE  
SECTION VIEW**



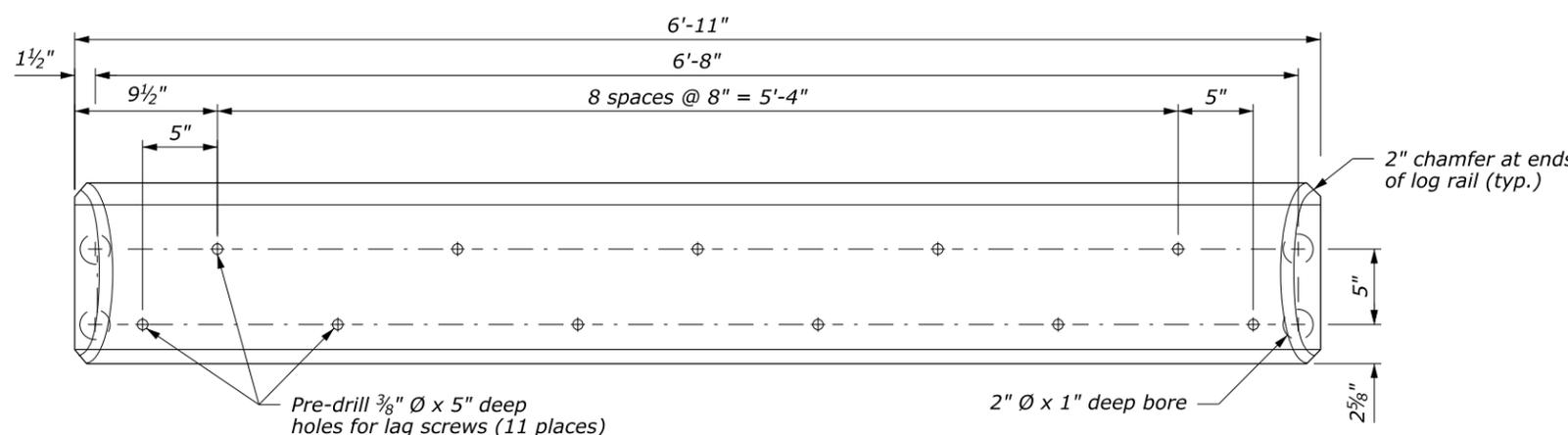
**TYPICAL SLOT DETAIL**



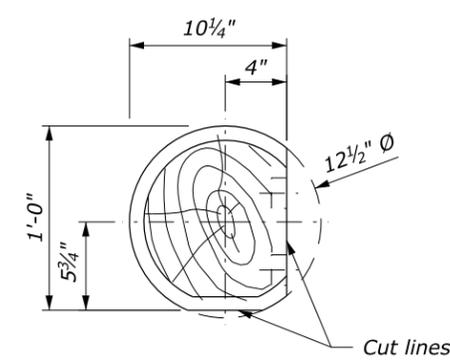
**LOG RAIL & RAIL BACKUP PLATE  
PLAN VIEW**



**GUARDRAIL POST**



**LOG RAIL  
ELEVATION VIEW**

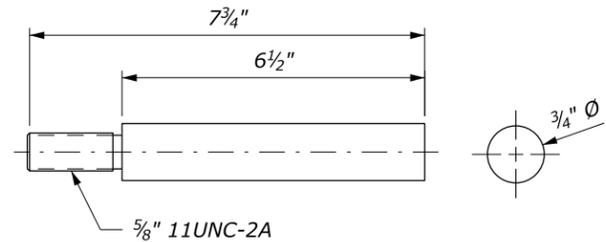


**LOG RAIL  
SECTION VIEW**

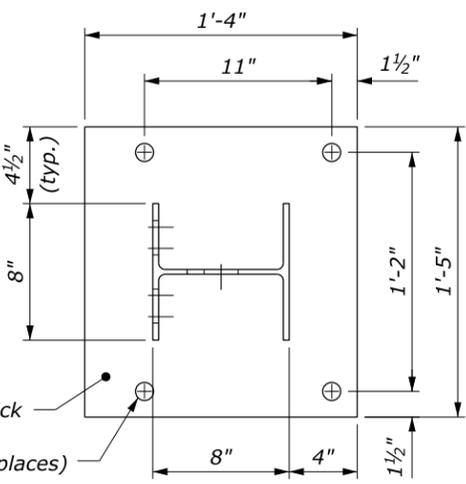
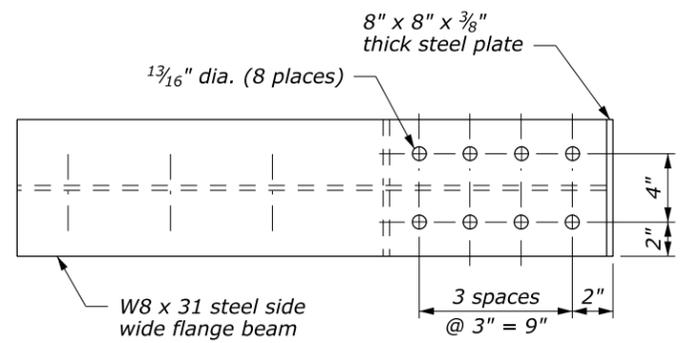
NO SCALE

|   |         |
|---|---------|
| U.S. DEPARTMENT OF TRANSPORTATION<br>FEDERAL HIGHWAY ADMINISTRATION<br>WESTERN FEDERAL LANDS HIGHWAY DIVISION |         |
| U.S. CUSTOMARY DETAIL<br><b>REMOVABLE<br/>STEEL-BACKED LOG RAIL</b><br>Sheet 2 of 3                           |         |
| DETAIL APPROVED FOR USE 3/2009  | DETAIL  |
| REVISED:  | W617-83 |

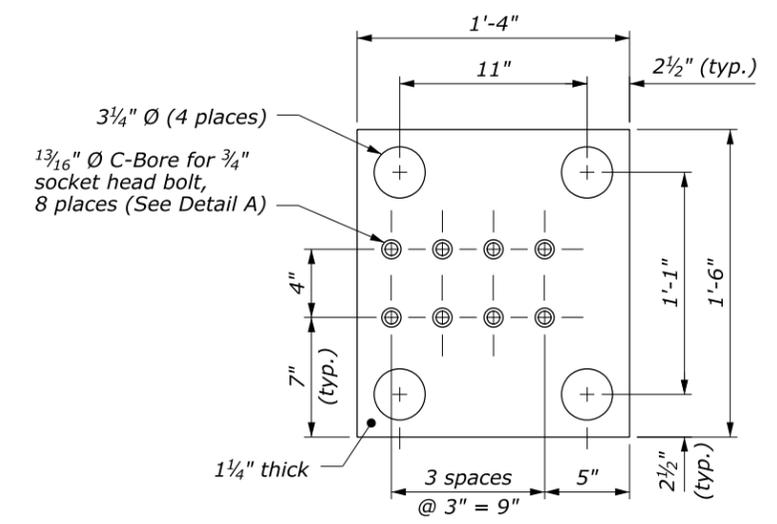
18 November 2014 8:42 AM c:\myfiles\pw\_production\dms43646\Det.W617-83.dgn [USC]



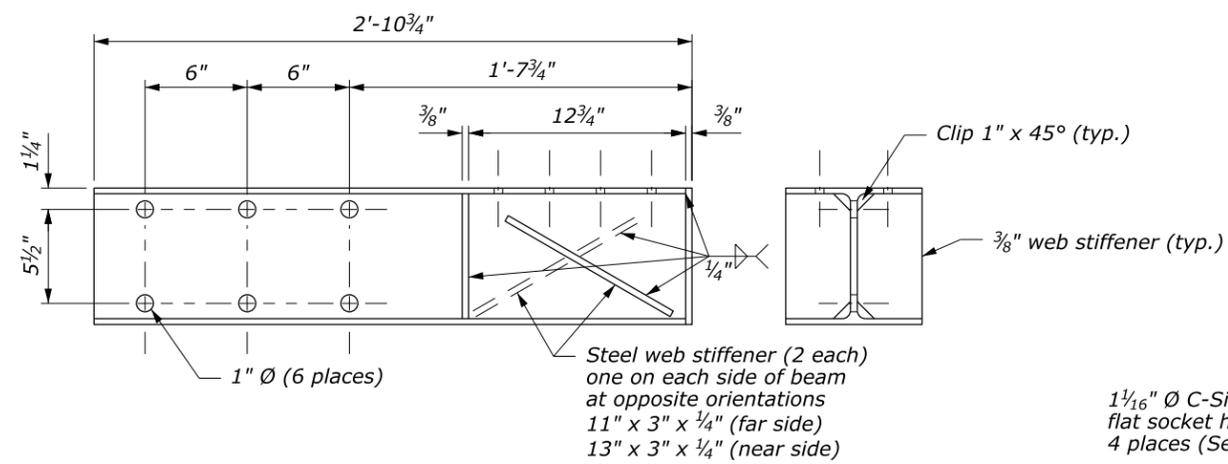
**SUPPORT PIN**



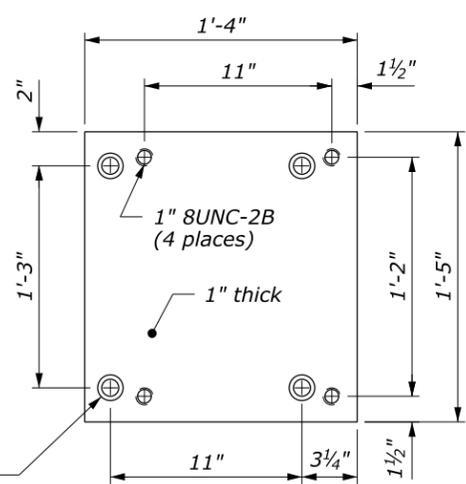
**RAIL POST BASE PLATE**



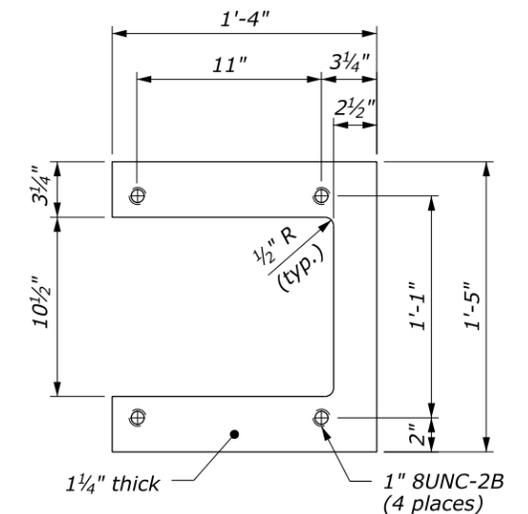
**FOUNDATION PLATE**



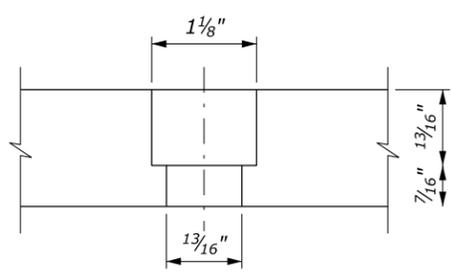
**FOUNDATION BEAM**



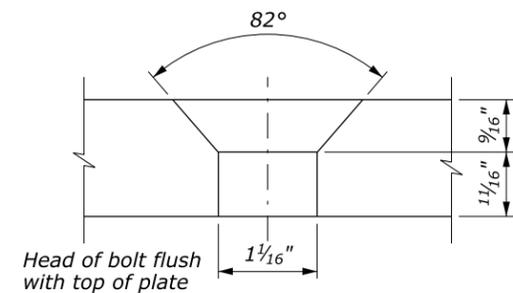
**TOP CLAMP PLATE**



**BOTTOM CLAMP PLATE**



**DETAIL A**



**DETAIL B**

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

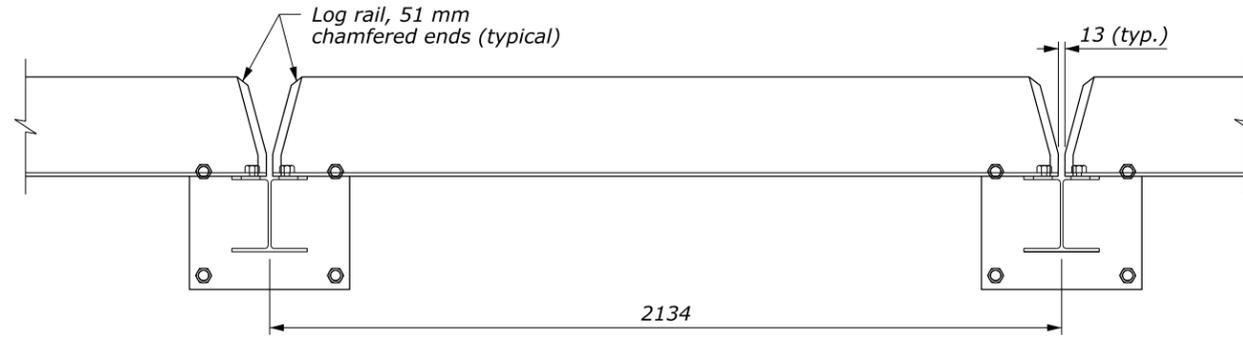
U.S. CUSTOMARY DETAIL  
**REMOVABLE  
 STEEL-BACKED LOG RAIL**  
 Sheet 3 of 3

DETAIL APPROVED FOR USE 3/2009  
 REVISIONS: \_\_\_\_\_

DETAIL  
 W617-83

NO SCALE

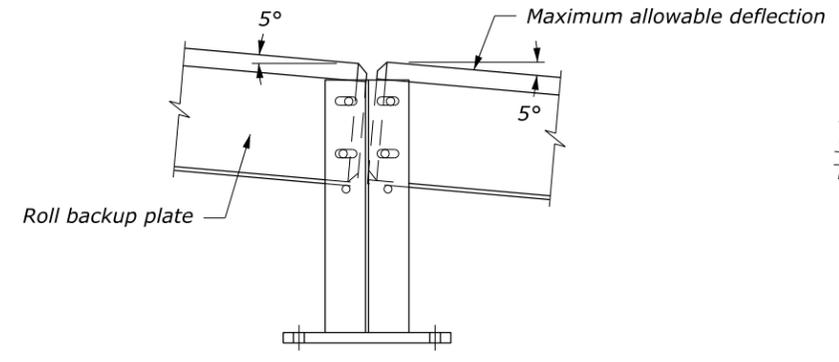
18 November 2014 8:42 AM c:\myfiles\pw\_production\dms43646\Det-W617-83.dgn [USC]



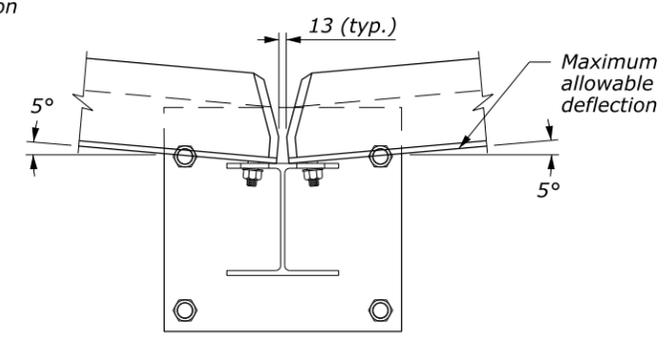
PLAN VIEW

**NOTE:**

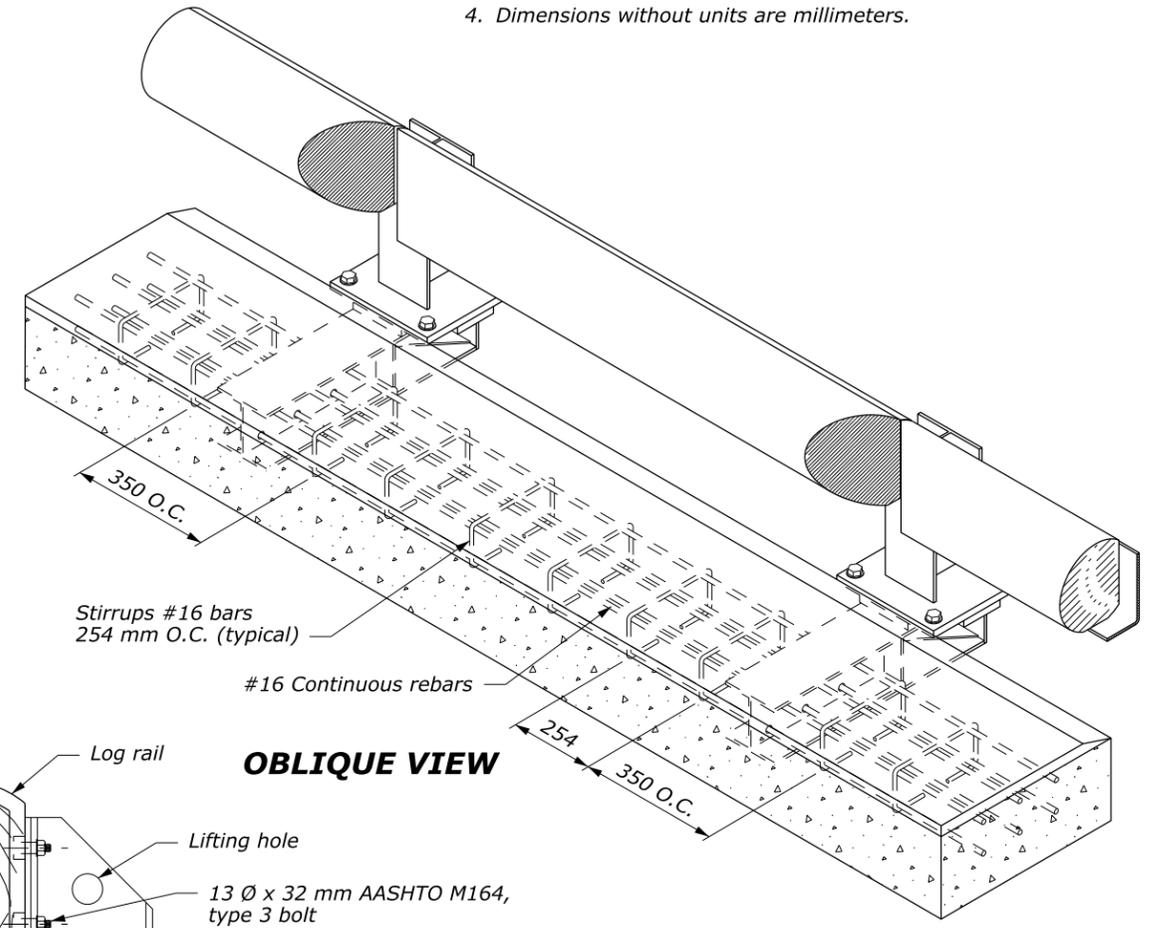
1. Steel is ASTM A242 or A588, Grade 50.
2. Concrete: minimum  $f'_c = 24$  MPa.
3. Furnish hardware in equivalent U.S. Customary sizes.
4. Dimensions without units are millimeters.



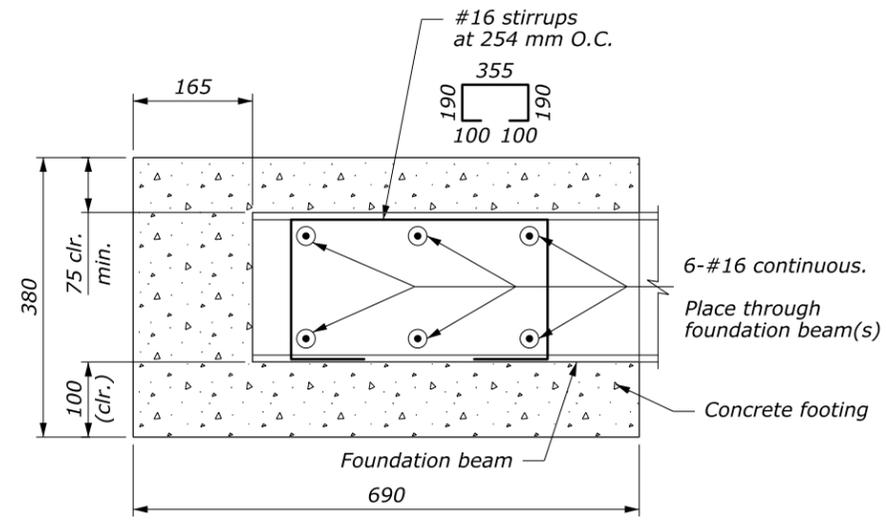
**ENDS OF RAILS AT POST:  
MAXIMUM VERTICAL  
DEFLECTION ALLOWABLE  
ELEVATION**



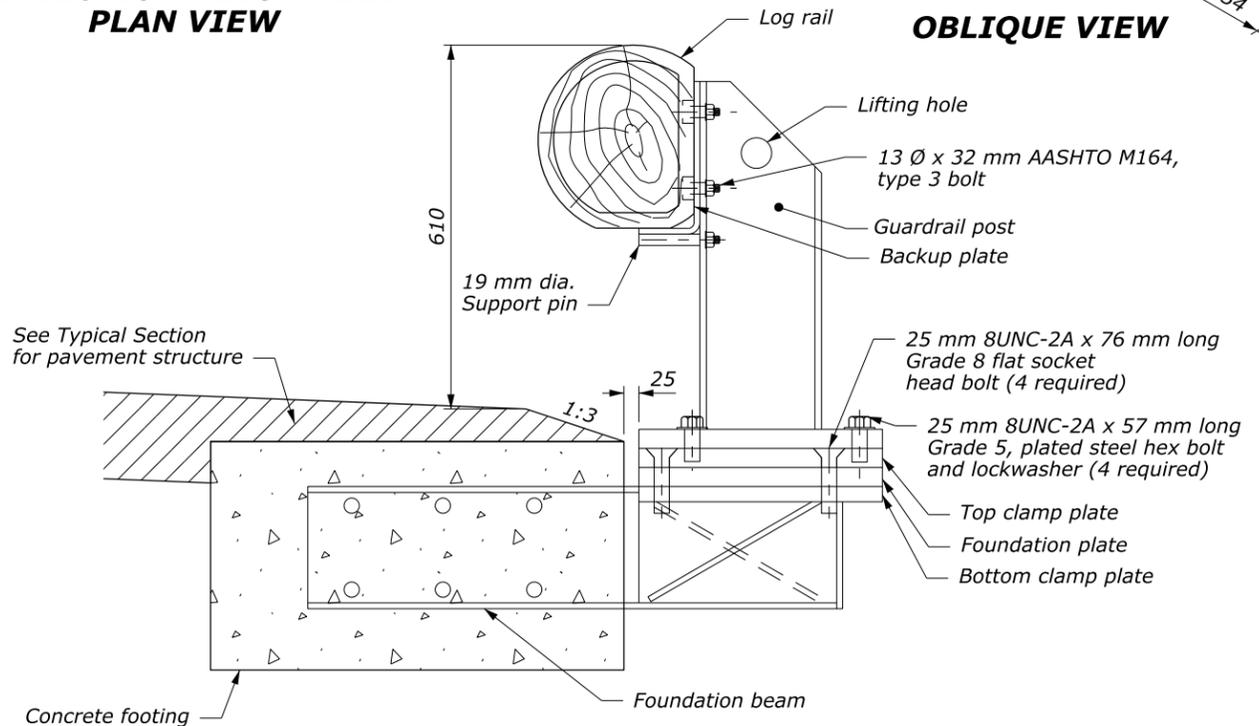
**MAXIMUM HORIZONTAL  
DEFLECTION ALLOWABLE  
PLAN VIEW**



**OBLIQUE VIEW**



**FOOTING DETAIL  
TYPICAL SECTION**

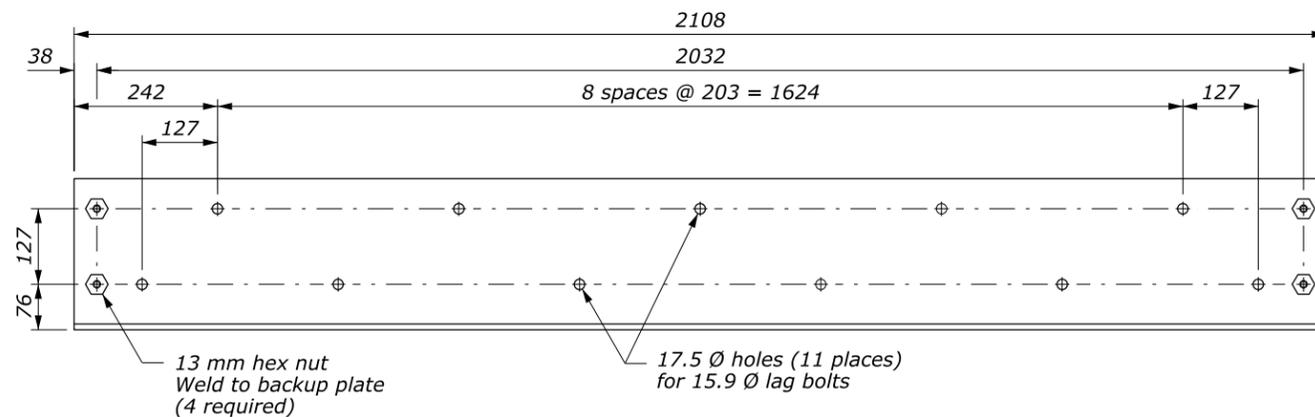


**TYPICAL SECTION**

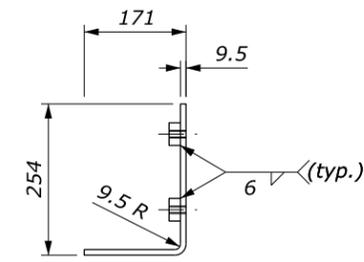
|   |          |
|---|----------|
| U.S. DEPARTMENT OF TRANSPORTATION<br>FEDERAL HIGHWAY ADMINISTRATION<br>WESTERN FEDERAL LANDS HIGHWAY DIVISION |          |
| METRIC DETAIL<br><b>REMOVABLE<br/>STEEL-BACKED LOG RAIL</b><br>Sheet 1 of 3                                   |          |
| DETAIL APPROVED FOR USE 3/2009  | DETAIL   |
| REVISED:  | WM617-83 |

NO SCALE

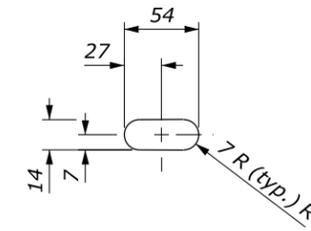
18 November 2014 8:43 AM c:\myfiles\pw\_production\dms43646\Det.W617-83.dgn [Metric]



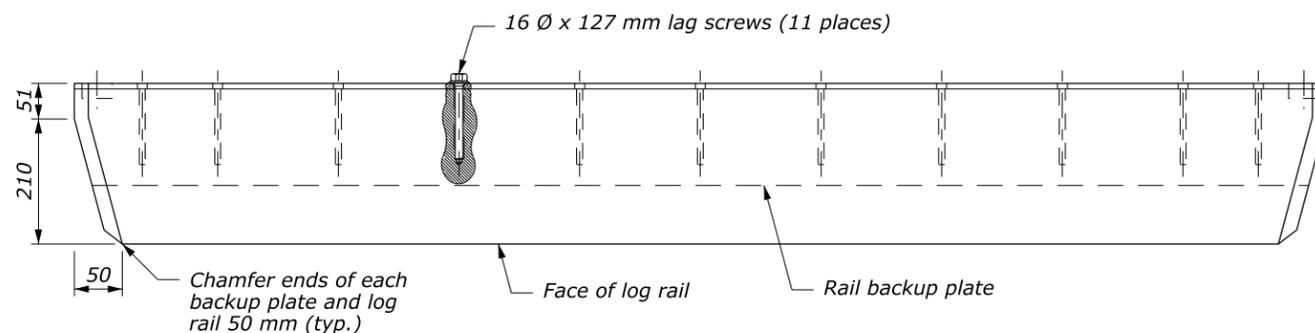
**RAIL BACKUP PLATE  
ELEVATION VIEW**



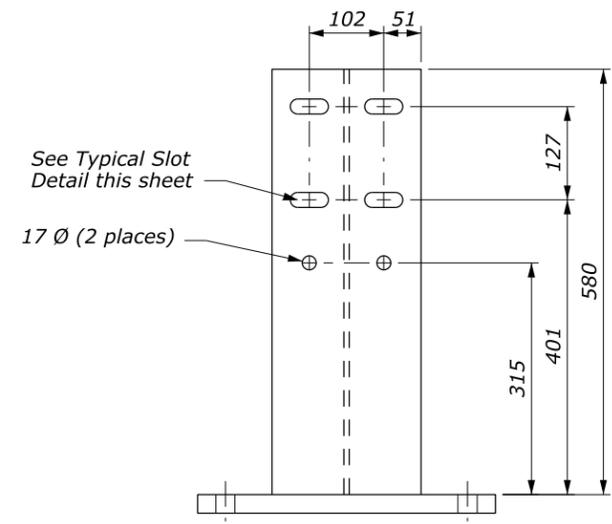
**RAIL BACKUP PLATE  
SECTION VIEW**



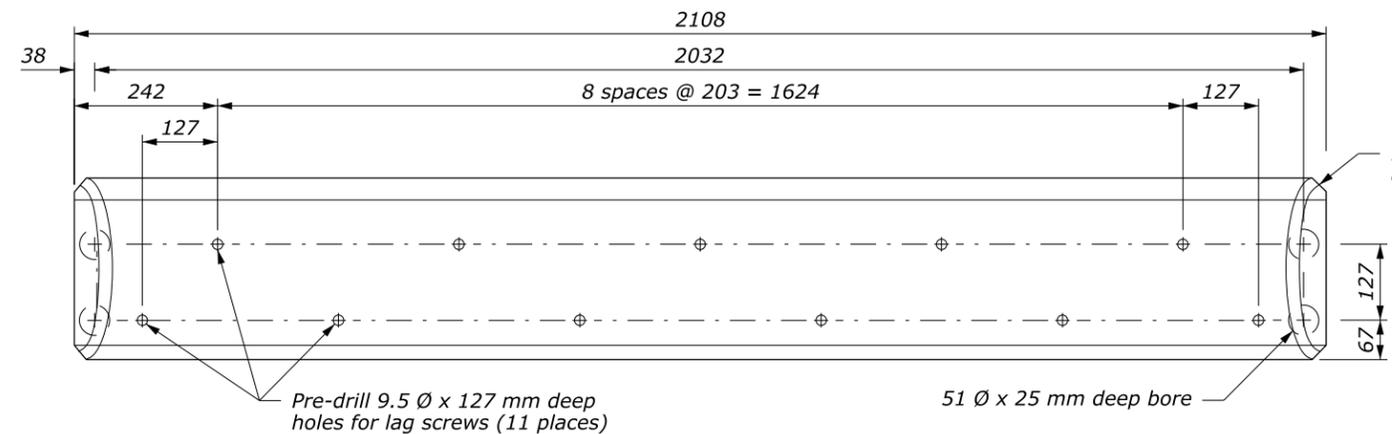
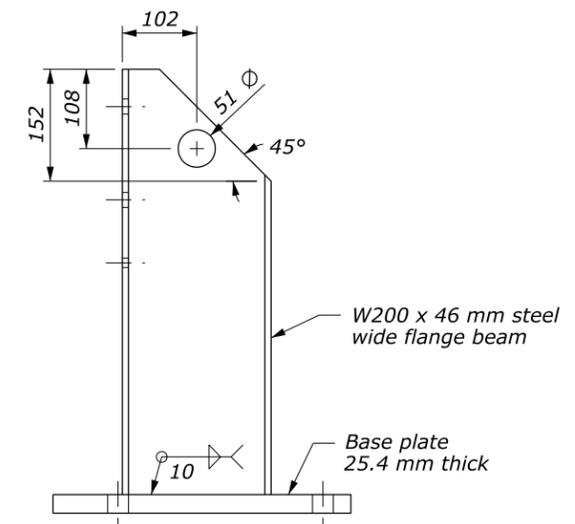
**TYPICAL SLOT DETAIL**



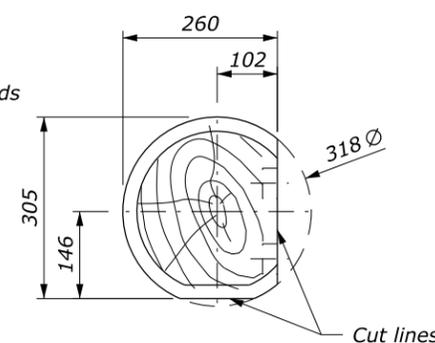
**LOG RAIL & RAIL BACKUP PLATE  
PLAN VIEW**



**GUARDRAIL POST**



**LOG RAIL  
ELEVATION VIEW**

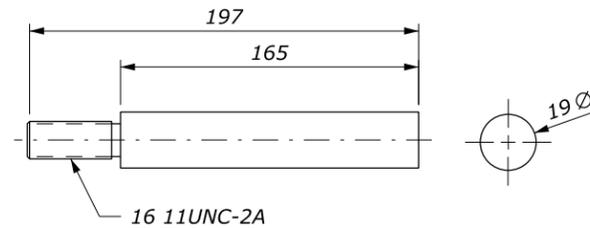


**LOG RAIL  
SECTION VIEW**

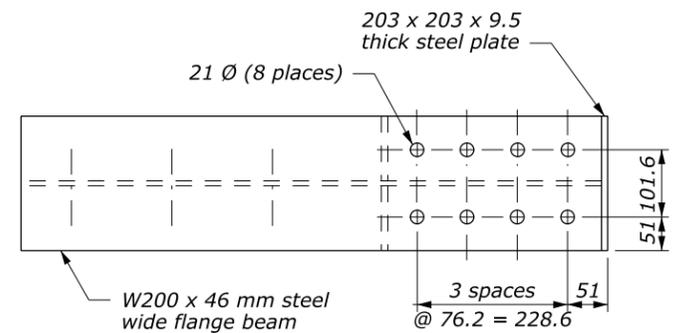
|   |          |
|---|----------|
| U.S. DEPARTMENT OF TRANSPORTATION<br>FEDERAL HIGHWAY ADMINISTRATION<br>WESTERN FEDERAL LANDS HIGHWAY DIVISION |          |
| METRIC DETAIL   |          |
| <b>REMOVABLE<br/>STEEL-BACKED LOG RAIL</b>  |          |
| Sheet 2 of 3  |          |
| DETAIL APPROVED FOR USE 3/2009  | DETAIL   |
| REVISED:  | WM617-83 |

NO SCALE

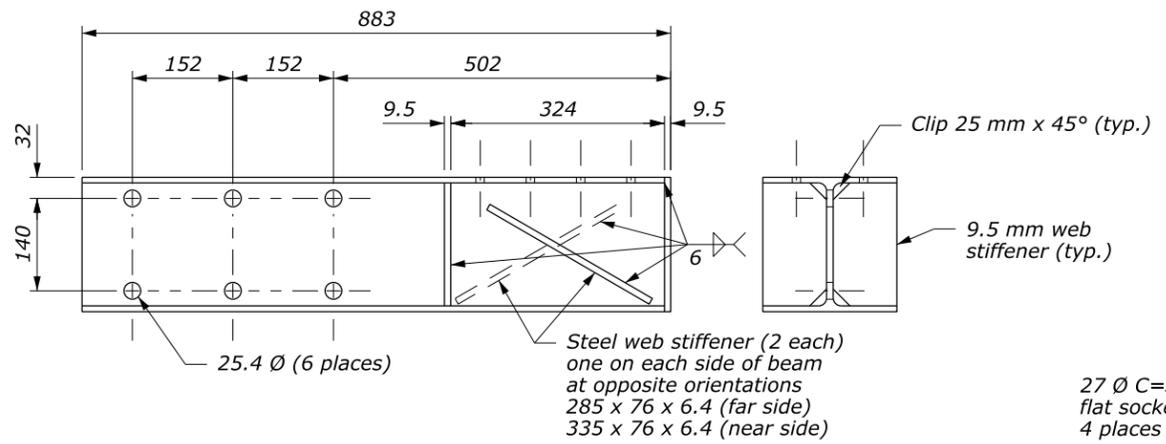
18 November 2014 8:43 AM c:\myfiles\pw\_production\dms43646\Det.W617-83.dgn [Metric]



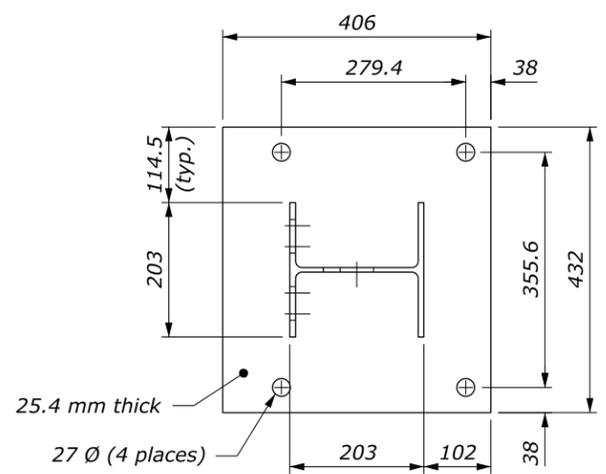
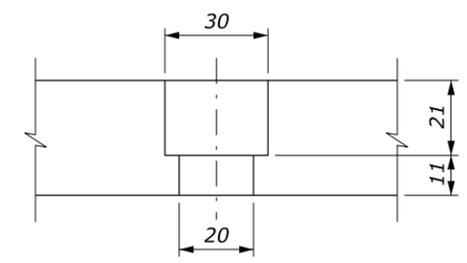
**SUPPORT PIN**



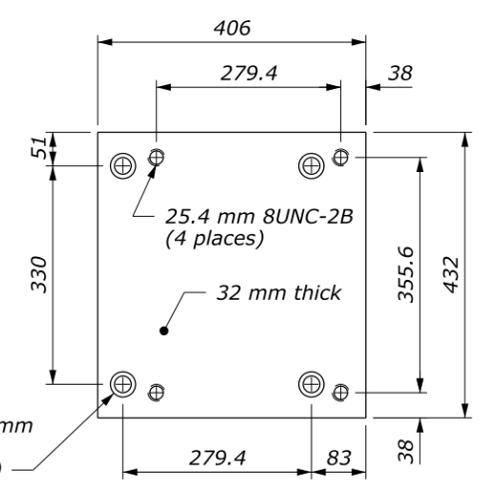
**FOUNDATION BEAM**



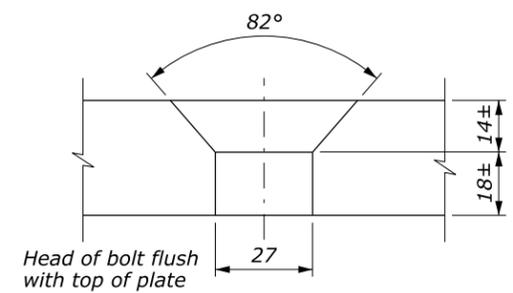
**DETAIL A**



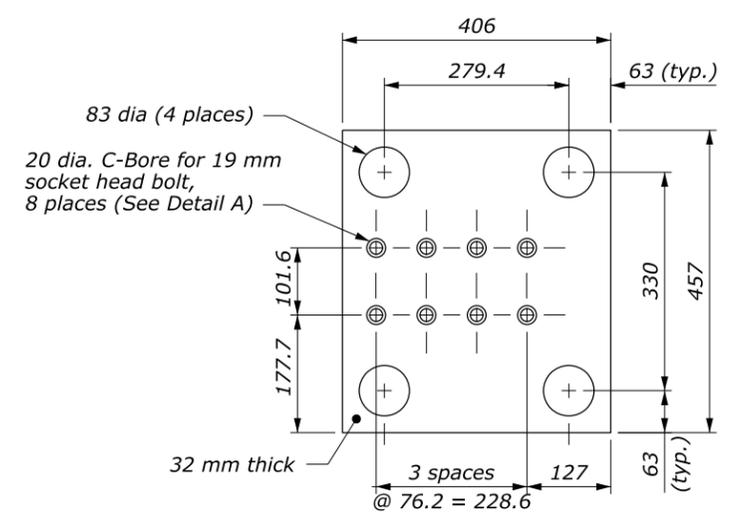
**RAIL POST BASE PLATE**



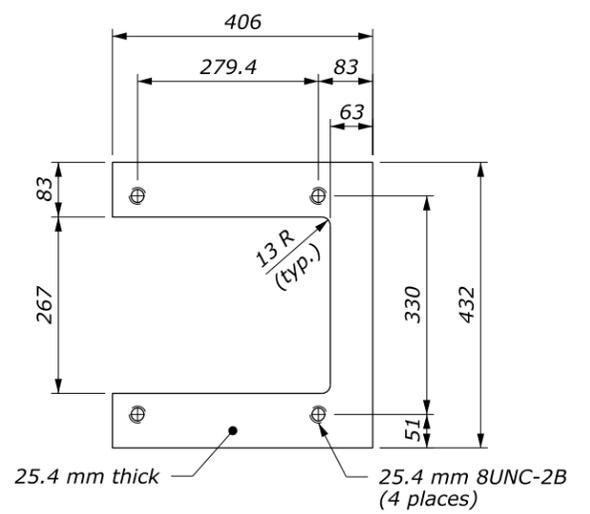
**TOP CLAMP PLATE**



**DETAIL B**



**FOUNDATION PLATE**



**BOTTOM CLAMP PLATE**

|   |          |
|---|----------|
| U.S. DEPARTMENT OF TRANSPORTATION<br>FEDERAL HIGHWAY ADMINISTRATION<br>WESTERN FEDERAL LANDS HIGHWAY DIVISION |          |
| METRIC DETAIL   |          |
| <b>REMOVABLE<br/>STEEL-BACKED LOG RAIL</b>  |          |
| Sheet 3 of 3  |          |
| DETAIL APPROVED FOR USE 3/2009  | DETAIL   |
| REVISED:  | WM617-83 |

NO SCALE