

**OHIO DEPARTMENT OF TRANSPORTATION**

**STANDARD ROADWAY CONSTRUCTION DRAWINGS**

**OFFICE OF ROADWAY ENGINEERING**

**ROADWAY STANDARD DRAWINGS**

<table>
<thead>
<tr>
<th>No.</th>
<th>Shts.</th>
<th>Drawing Title</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP-1.1</td>
<td>1</td>
<td>Concrete Pavement Reinforcing</td>
<td>7-29-2000</td>
</tr>
<tr>
<td>BP-2.1</td>
<td>2</td>
<td>Longitudinal Pavement Joints</td>
<td>7-17-2015</td>
</tr>
<tr>
<td>BP-2.2</td>
<td>2</td>
<td>Transverse Pavement Joints</td>
<td>7-18-2008</td>
</tr>
<tr>
<td>BP-2.3</td>
<td>3</td>
<td>Pressure Relief Joint Type A</td>
<td>7-19-2014</td>
</tr>
<tr>
<td>BP-2.4</td>
<td>1</td>
<td>Pressure Relief Joint Types B, C, &amp; D</td>
<td>7-19-2013</td>
</tr>
<tr>
<td>BP-2.5</td>
<td>1</td>
<td>Rigid Replacement</td>
<td>7-19-2013</td>
</tr>
<tr>
<td>BP-2.6</td>
<td>2</td>
<td>Load Transfer Retrofit</td>
<td>7-15-2016</td>
</tr>
<tr>
<td>BP-3.1</td>
<td>2</td>
<td>Asphalt Pavement</td>
<td>7-28-2014</td>
</tr>
<tr>
<td>BP-3.2</td>
<td>1</td>
<td>Asphalt Safety Edge</td>
<td>7-18-2019</td>
</tr>
<tr>
<td>BP-4.1</td>
<td>1</td>
<td>Driveways</td>
<td>7-19-2013</td>
</tr>
<tr>
<td>BP-5.1</td>
<td>1</td>
<td>Concrete Curb and Combined Curb &amp; Gutter</td>
<td>7-18-2013</td>
</tr>
<tr>
<td>BP-6.1</td>
<td>2</td>
<td>Pavement Joints at Ramp Terminals</td>
<td>7-19-2013</td>
</tr>
<tr>
<td>BT-1</td>
<td>3</td>
<td>New Curb Ramps</td>
<td>7-20-2018</td>
</tr>
<tr>
<td>BT-0.1</td>
<td>1</td>
<td>Retrofit Concrete Shoulder</td>
<td>7-20-2018</td>
</tr>
<tr>
<td>BT-0.2</td>
<td>1</td>
<td>Concrete Safety Edge</td>
<td>7-18-2019</td>
</tr>
<tr>
<td>BT-0.3</td>
<td>1</td>
<td>Shoulder Rumble Strips</td>
<td>7-18-2019</td>
</tr>
</tbody>
</table>

**PAVEMENT DESIGN FEATURES**

**Base Pavement**

- F-1.1 1 | Chain Link Fence | 7-19-2013 |
- F-2.1 1 | Woven Wire Fence | 7-20-2010 |
- F-3.1 1 | Fence Details at Bridges | 7-19-2013 |
- F-3.2 1 | Walk Gates | 7-18-2014 |
- F-3.3 1 | Fence Terminals | 7-19-2013 |
- F-3.4 2 | Fence Details | 7-19-2013 |

**Guardrail**

- MGS-1.1 3 | MGS Guardrail Details | 7-19-2013 |
- MGS-2.3 2 | Standard Type MGS | 7-18-2018 |
- MGS-2.4 1 | MGS 25' Long-Span Guardrail | 7-18-2014 |
- MGS-2.5 2 | Socketed Weak Post Attached to Headwall | 7-19-2019 |
- MGS-3.1 2 | MGS Bridge Terminal Assembly, Type 1 | 7-19-2018 |
- MGS-3.2 1 | MGS Bridge Terminal Assembly, Type 2 | 7-18-2013 |
- MGS-4.1 1 | MGS Type A Anchor Assembly | 7-20-2017 |
- MGS-4.2 1 | MGS Type B Anchor Assembly | 7-19-2013 |
- MGS-4.3 1 | MGS Guardrail Transitions | 7-19-2013 |
- MGS-4.5 3 | MGS Type B Buried in Backslope | 7-18-2018 |
- MGS-5.1 1 | MGS Introduction of Guardrail Runs | 7-15-2016 |
- MGS-5.2 1 | MGS Introduction of Guardrail Runs | 7-19-2016 |
- MGS-6.1 2 | MGS Guardrail at Bridges | 7-19-2018 |
- MGS-6.2 1 | MGS Median Guardrail at Piers | 7-19-2019 |
- GR-6.3 1 | Thle Beam Bullnose at Bridge Piers | 7-20-2017 |

**Roadway Miscellaneous**

- RM-1.1 2 | Roadway Monuments | 7-19-2013 |
- RM-2.1 1 | Concrete Steps | 7-19-2013 |
- RM-3.1 1 | Traffic Dividers | 7-20-2018 |
- RM-4.1 4 | 30" Portable Concrete Barrier | 7-29-2017 |
- RM-4.2 2 | 32" Portable Concrete Barrier | 10-24-2019 |
- RM-4.3 2 | Single Slope Barrier (Types A, B, C) | 7-18-2014 |
- RM-4.4 1 | Single Slope Barrier Transitions | 7-19-2015 |
- RM-4.5 2 | Single Slope Barrier, Type D | 7-21-2017 |
- RM-4.6 3 | Concrete Barrier End Sections (Types A, B, D) | 7-19-2013 |
- RM-5.1 2 | Steel Bollards | 7-18-2014 |
- RM-5.2 1 | Bikeway Railings | 7-18-2015 |
- RM-6.1 1 | Concrete Parking Block Detail | 7-18-2014 |
- RM-7.1 1 | Drilled Water Well Abandoned | 7-18-2014 |
- RM-7.2 1 | Plugging and venting Gas and/or Oil Well | 7-15-2005 |

**ROADSIDE DEVELOPMENT**

**Landscaping**

- LA-1.1 1 | Tree Wells and Pruning | 10-15-2016 |
- LA-1.2 1 | Planting and Braiding | 1-06-2009 |
**NOTES**

**STEEL REINFORCING:** In normal or wider lane widths, reinforcing may consist of two units with an approved longitudinal hinge. The hinge preferably of #4 or #6 steel wire connecting the two units such that the longitudinal members on either side of the hinge will be properly spaced when the reinforcing is in the final position. Reinforcing steel in final position shall not touch either the dowels or tie bars.
NOTES

GENERAL: Longitudinal joints shall be used when specified on the typical section and shall be constructed as shown on this drawing in Items 451 and 452 Pavement and Item 305 Base. The joint shall be on the centerline of the pavement unless otherwise shown on the plans. Where the pavement width exceeds 16', an additional longitudinal joint shall be introduced into the jointing details as directed by the Engineer.

The joint shall be cut normally to the road surface except where a tangent is intersected, and the joint shall be cut to the center of the road.

Tie bars shall be #5 deformed bars. A satisfactory device shall be used to hold the tie bars in proper positions or they may be installed by a mechanical installing device. Tie bars shall be centered on the longitudinal joint as nearly as practical.

BUTT JOINT: The longitudinal joint between adjoining slabs poured in separate operations shall be butt joint with hook bolts or tie bars, unless otherwise shown on the plans. Bent tie bars shall not be permitted.

TYPE D (DRILLED TIED LONGITUDINAL) JOINT: Type D joints shall be constructed in accordance with CMS 255.05. The joint shall be deep enough to accommodate the tie bars. A satisfactory device shall be used to hold the tie bars in proper positions or they may be installed by a mechanical installing device. Tie bars shall be centered on the longitudinal joint as nearly as practical.

The use of self-drilling expansion shield anchors, #5, shall not be permitted.

See sheet 2/2 for additional details.
**LONGITUDINAL PAVEMENT JOINTS**

**STANDARD ROADWAY CONSTRUCTION DRAWING**

**ENGINEER**

**SCD NUMBER**

**BP-2.1**

**ENGINEERING DEPARTMENT**

**Pavement Office of**

**OF TRANSPORTATION ADMINISTRATOR**

**STATE OF OHIO DEPARTMENT OF**

**7-17-2015**

David J. Humphrey

D. Miller

This drawing replaces BP-2.1 dated 7-19-13.

**TABLE A**

<table>
<thead>
<tr>
<th>Transverse Joint spacing</th>
<th>Number of Tie Bars per Slab</th>
<th>Max. spacing between Tie Bars</th>
<th>Minimum Offset to Transverse Joint</th>
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<tbody>
<tr>
<td>15&quot;</td>
<td>6</td>
<td>30&quot;</td>
<td>15&quot;</td>
</tr>
<tr>
<td>21&quot;</td>
<td>8</td>
<td>30&quot;</td>
<td>21&quot;</td>
</tr>
</tbody>
</table>

**EDGING:** Edge joints with a thin metal edge having a radius of 1/2". Finish the free edges of the pavement with a thin metal edge having a radius of 1/2". Any impression left in the surface of the pavement by the flat part of the edging tool shall be eliminated.

**HOOK BOLTS:** Threaded hook bolts and alternates shall be turned to a tight fit when installed in couplings. Ensure the coupling is located on the same side of the joint as the shorter 6" +/−1/2" hook bolt.

**METAL STRENGTH:** Tie bars, hook bolts assemblies, and the hook bolt alternate shall have a minimum yield strength of 40,000 psi.

**SPACING:** Tie bars shall not be located within 15" of any transverse joint.

**TIE BAR OR HOOK BOLT SPACING**
### CONTRACTION JOINTS

**ITEM 451, 452 & 305**

For shoulders, alleys, driveways, etc.

### EXPANSION JOINTS

**LEGEND**

- **Item 705.03 Joint Seal**
- **Item 705.04 Joint Seal**
- **Joint filler**

### NOTES

**GENERAL**

Notes and details shown on this drawing shall be considered in conjunction with and supplemental to the pertinent specifications for Portland cement concrete pavement and bases, and related incidental items.

**J O I N T  C O M P O N E N T S**

This drawing is intended for use with uniform depth pavement. When the project involves the placing of variable depth pavement, the joint components shall be held in place in accordance with the method shown in the plans or as approved by the Engineer.

**CONTRACTION JOINTS**

Contraction joints in Items 451 and 305 shall not be dowelled in alleys, private drives, or commercial drives.

Contraction joints of the type specified shall be spaced in accordance with the CONTRACTION JOINT SPACING Table.

### CONTRACTION JOINT SPACING

<table>
<thead>
<tr>
<th>Types of Pavement or Base</th>
<th>Maximum Spacing Between Joints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 451 Reinforced Concrete Pavement</td>
<td>2'</td>
</tr>
<tr>
<td>Item 452 Non-Reinforced Concrete Pavement</td>
<td>1'</td>
</tr>
<tr>
<td>Item 305 Concrete Base</td>
<td>1'</td>
</tr>
</tbody>
</table>

**SIDE ELEVATION OF EXP. JOINT**

(Through Concrete Pavement or Base)

**SECTION THROUGH EXP. JOINT**

**SECTION THROUGH CONSTRUCTION JOINT**
**NOTES**

Refer to OMS 451.08 and 709.13 for dowel specifications.

1. Wire sizes shown are minimum required.
2. All wire intersections are to be welded.
3. Stakes typically applied at working ends of dowel.
4. TOLERANCES
5. All +1/4" per foot unless otherwise specified.
6. Centerline of individual dowels shall be parallel to each other, the surface and the centerline of the slab.
7. Dowels should be placed at mid-depth of slab.
8. U-Leg or U-Leg to be installed on inside or outside of subframe.

**SECTION A-A**

- 8" epoxy coated dowel
- Weld alternate edges of dowels
- Prepared Surface

**SECTION B-B**

- Paving lane
- 8x6 or as specified
- 6" dowels on 12" centers

---

**J-LEG DETAIL**

- Dowel dia. + 1/2" to 3/4"
- Use of 10-306" dia. #1/0 wire

**U-LEG DETAIL**

- Dowel dia. + 1/2" to 3/4"
- Use of 10-306" dia. #1/0 wire
PLAN VIEW
PRESSURE RELIEF JOINT - TYPE A
AT NEW APPROACH SLAB
(Concrete Shoulders shown)

SECTION A-A AT NEW APPROACH SLAB

REINFORCING STEEL LIST

<table>
<thead>
<tr>
<th>Mark</th>
<th>Shape</th>
<th>Number</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>R501</td>
<td>Straight</td>
<td>8</td>
<td>S - 0.5'</td>
</tr>
<tr>
<td>R502</td>
<td>Straight</td>
<td>8 x 5'</td>
<td>8'</td>
</tr>
</tbody>
</table>

S = Length of sleeper slab in feet

R501 bars may be furnished in segments with a 1'-7" bar lap between segments.
REINFORCING STEEL LIST

<table>
<thead>
<tr>
<th>Mark</th>
<th>Shape</th>
<th>Number</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>R501</td>
<td>Straight</td>
<td>6</td>
<td>5 + 0.5'</td>
</tr>
<tr>
<td>R502</td>
<td>Straight</td>
<td>N = \frac{3}{8} \times \frac{5}{\cos \theta}</td>
<td></td>
</tr>
</tbody>
</table>

5 = Length of sleeper slab in feet

- RS02 bars may be furnished in segments with a 1'-7" lap between segments.

PLAN VIEW
PRESSURE RELIEF JOINT - TYPE A
AT EXISTING APPROACH SLAB

 SECTION A-A AT EXISTING APPROACH SLAB
**NOTES**

**APPROACH SLAB PRESSURE RELIEF JOINTS** Relief joints are to be provided regardless of abutment design at all bridge approaches where approach pavement is rigid, or composite consisting of a rigid base.

**ASPHALT CONCRETE** Compact the asphalt concrete in equal lifts not exceeding 3" with compaction equipment as approved by the Engineer, using Item 441 Asphalt Concrete Intermediate Course, Type 2 (448), Item 442 Asphalt Concrete Intermediate Course, 19 mm (448), or Item 443 Asphalt Concrete Intermediate Course, 12.5 mm (448).

**ITEM 305 BASE** Shall be constructed in accordance with SCD BP-2.1 & BP-2.2. Longitudinal joints shall be placed in the same location and in the same alignment as the longitudinal joints in the existing pavement.

**BOND BREAKER** A bond breaker consisting of two 4’ sheets of clear or opaque polyethylene film, Item 705.06, shall be centered above the joint between the subbase and the sleeper slab. Care shall be taken in the area beneath the polyethylene film to ensure the surface of the subbase is finished smooth and is flush with or slightly higher than the surface of the sleeper slab. The film shall have a nominal thickness of 4 mils.

**UNDERDRAIN** A perforated underdrain shall be placed as shown, it shall extend from edge to edge of the sleeper slab and be outletted as shown on the plan, to a longitudinal underdrain, a catch basin, or through the embankment or ditch foreslope. For additional information, see SCD DM-1.2.

**PAYMENT** Measurement of the pressure relief joint for payment purposes shall be along the centerline of the Sleeper Slab (I) between the outside edges of concrete shoulders, (2) between the back of curb, and (3) between the edges of the traveled way when asphalt shoulders are used. Payment shall be per Linear Foot of Item Special - Pressure Relief Joint, Type A and shall include saw cutting & removal of existing pavement, Item 305 or 441. Use equipment as approved by the Engineer. Use Item 705.06, shall be centered above the joint between the subbase and the sleeper slab. Care shall be taken in the area beneath the polyethylene film to ensure the surface of the subbase is finished smooth and is flush with or slightly higher than the surface of the sleeper slab. The film shall have a nominal thickness of 4 mils.

**BOND BREAKER** A bond breaker consisting of two 4’ sheets of clear or opaque polyethylene film, Item 705.06, shall be centered above the joint between the subbase and the sleeper slab. Care shall be taken in the area beneath the polyethylene film to ensure the surface of the subbase is finished smooth and is flush with or slightly higher than the surface of the sleeper slab. The film shall have a nominal thickness of 4 mils.

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**PAYMENT** Measurement of the pressure relief joint for payment purposes shall be along the centerline of the Sleeper Slab (1) between the outside edges of concrete shoulders, (2) between the back of curb, and (3) between the edges of the traveled way when asphalt shoulders are used. Payment shall be per Linear Foot of Item Special - Pressure Relief Joint, Type A and shall include saw cutting & removal of existing pavement, Item 305 or 441. Use equipment as approved by the Engineer. Use Item 705.06, shall be centered above the joint between the subbase and the sleeper slab. Care shall be taken in the area beneath the polyethylene film to ensure the surface of the subbase is finished smooth and is flush with or slightly higher than the surface of the sleeper slab. The film shall have a nominal thickness of 4 mils.

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GENERAL: All joints shall be constructed normal to the centerline of the pavement lane unless otherwise specified in the plans. All dowel holes shall be drilled by a mechanical device that will allow independent adjustment of all drill shafts in the horizontal and vertical direction. The device shall be capable of drilling a minimum of three holes at a time. All smooth dowels shall be coated with a bond-breaking material conforming to SCD BP-2.5. After they have been installed in the existing pavement and just prior to placing the patch, all dowels shall be placed parallel to the pavement surface and the centerline of the pavement lane.

This standard drawing is intended for use in repairing both concrete and composite pavements. For clarity, asphalt overlays are not shown. When Prefabricated Edge Drains are used, they shall be placed after joint repairs are completed.

TYPE N JOINTS: Joints referred to as Type N joints on the plan shall be constructed as contraction joints per SCD BP-2.1.

ADDITIONAL PAVEMENT REMOVAL: If, after the sawing and removal of the pavement from the area to be repaired, the face of the remaining pavement is spalled or deteriorated for a height greater than one-fourth the thickness of the rigid pavement, an additional saw cut shall be made as shown and as directed by the Engineer. This additional work shall be measured for additional payment for full depth pavement sawing, rigid pavement removal and replacement.

LONGITUDINAL JOINT: For patches 10' or greater in length, the longitudinal joint shall be constructed per SCD BP-2.3. The tie bars or hook bolts shall be spaced according to SCD BP-2.3.

HOLE DRILLING DETAILS

BAR PLACEMENT

- Bars shall be placed 2' from all tied longitudinal joints and continue across with 1' spacing to the edge of pavement or on an untied longitudinal joint. Where lane widths are between two tied longitudinal joints, begin bars 2' from each tied longitudinal joint and continue across with 1' spacing.

- Reinforcement will be required for all repairs greater than 10' in length or for Class F5 repairs that will be opened to traffic within 24 hours of placement. The bars shall consist of #8, 10, 12, or 14 longitudinal wires spaced 3" c/c and #4 or #6 transverse wires spaced 12" c/c. The clearance from the end of the wire fabric to the edge of pavement or new transverse joint shall be 4" to 12".

- Nylon or plastic grout retention discs shall be clear or opaque white in color.
Transverse Crack

As Needed for Dowel Placement

Section A-A

Retrofit Dowel Bar Spacing

Elevation

Notes

Cracks to be retrofitted will be marked on the pavement by the Engineer.

Prefabricated chair as approved by the Engineer.

1/2" x 18" Retrofit Dowel Bar

Asphalt Thickness: 2 2/3"
**RETROFIT DEFORMED BAR SPACING**

**NOTES**

Cracks to be retrofitted will be marked on the pavement by the Engineer.

Prefabricated chair as approved by the Engineer.
Existing Pavement Edge
Preleveling
Pavement or Top of Existing

Construct the lift shown approximately 1/4" above the top of the existing pavement or preleveling. Place the preleveling prior to excavation of the widening trench.

Surface Course
Intermediate Course
Asphalt Concrete Base, Intermediate or Surface Course, As Specified
Base Course
Subbase Course

LEGEND

The extended width (X) of a base or subbase lift shall be equal to the depth (Y) of the overlaying lift or 6", whichever is greater, or as shown on the plans.

The extended width shall be equal to the combined thickness of the surface and intermediate courses, or 4", whichever is greater.

Permissible removal and replacement

CENTER LINE OR EDGE OF TRAFFIC LANE

Lapping Longitudinal Joints

PLAN

MERGING EDGE OF PAVEMENT WIDENING WITH EDGE OF EXISTING PAVEMENT

SECTION A-A

COURSE DETAIL FOR WIDENING

WIN. LENGTH = 15" PER INCH OF "d"
FOR SPEEDS 55 MPH OR GREATER, USE 35" PER INCH OF "d"

Win. Length = 30" per inch of "t"
For Speeds 50 MPH or Greater, Use 45" per inch of "t"

Win. Length = 15" per inch of "t"

Min. Length = 15' per Inch of "d"
Use 35' per Inch of "d"
For Speeds 50 MPH or Greater,

FEATHERING AT STRUCTURES

Butt Joint Type

Taper Edge Type

NOTES: Butt Joint is required unless the taper edge is specified on the plans or approved by the Engineer.
Using Concrete or Mortar

Using Metal Adjusting Rings

Metal adjusting rings shall:
1. Attach securely to the existing frame by welding or mechanical devices.
2. Consist either of cast metal having an integral rim and seat, or be fabricated metal with a sturdy connection between the seat and ring and provide an even seat for the manhole cover.

In addition, the adjusting ring type shall be a design acceptable to the local governmental agency responsible for street and sewer maintenance. Any installation unacceptable to the Engineer shall be replaced by the Contractor at his expense.

(a) Attach securely to the existing frame by welding or mechanical devices.
(b) Consist either of cast metal having an integral rim and seat, or be fabricated metal with a sturdy connection between the seat and ring and provide an even seat for the manhole cover.
(c) Provide an even seat for the manhole cover.

In addition, the adjusting ring type shall be a design acceptable to the local governmental agency responsible for street and sewer maintenance. Any installation unacceptable to the Engineer shall be replaced by the Contractor at his expense.

Special care shall be taken during construction to obtain maximum compaction of concrete in gutters.

Aggregate drains to be placed where and as directed by Engineer. Provide filter fabric when specified as a separate pay item.
1) General: Safety edges are required at the outside edges of the paved roadway (edge of travel) lane or edge of paved shoulders, where the full thickness of material placed as part of the contract is greater than 1.5", except where indicated in the plans.

2) Construct the safety edge at an angle of approximately 30 degrees (40 degrees max.) measured from the pavement surface.

3) Do not construct safety edge at intersections, paved drives, or other obstructions.

4) Other items of work, such as tack coat, are omitted for clarity.

Legend:
- Construct the safety edge to the full thickness of the surface and intermediate courses, or 4", whichever is less. Construct a near vertical face below the safety edge.
- Construct the safety edge to a 4" depth, or the full thickness of the overlay, whichever is less. Construct a near vertical face below the safety edge.
- Asphalt concrete overlay may be one or more courses.

Notes:
- Shoulder pavement, aggregate shoulder
- Asphalt overlay
- Pavement
- Existing pavement
- Half section new construction
- Half section asphalt overlay paved shoulder
- Two course overlay detail
- Item 209 - preparing subgrade for shoulder paving

Embankment, aggregate or other material as shown in the plans.

NOTES

BP - 3.2

1-18 - 2019

CRAIG.

LA N D E D
NOTES

GENERAL: This drawing shows alternate types of curb that may be used on various types of pavement. The typical section of the project shows the type to be used, also the thickness of the edge of the pavement or the edge of the curb and gutter section.

JOINTS: 1" expansion joints shall extend up to the top of the curb and shall be constructed in the curb and gutter section in such a manner that the joint seal will extend the full width of the gutter and into the curb face a sufficient distance to seal the joint to an elevation of at least 2" above the flow line of the gutter. Dowel bars shall be used in the curb and gutter section of expansion joints and to the surface of the pavement.

Transverse expansion joint material shall meet the requirements of Item 705.03.

GUTTER PLATE THICKNESS: Thickness of gutter plate "T" shall be 9" unless otherwise shown on the plans.

TOLERANCES: Dimensional tolerances are as follows:

- Gutter: 0 to +1/8".
- Curbs: 0 to +1/8".

LEGEND

- Expansion joint material and joint sealer are not required for the portion of the curb that is adjacent to a flexible pavement type. Both materials are required, as detailed, for the full height of rigid pavement and concrete bases.

- Butt joints shall be provided between combined curb-and-gutter and new or existing rigid pavements, with tie bars or hook bolts provided at intervals of 5'. See SCD BP-2.1 for details of tie bars and hook bolts.

- If the combined curb-and-gutter adopts a new rigid base or an existing rigid base or pavement that is to be surfaced with asphalt concrete, a butt joint shall also be provided. However, tie bars or hook bolts shall be omitted when the vertical overlap "X" in detail below between the curb-and-gutter and rigid pavement is less than X.

TOLERANCES:

- Dimensional tolerances are as follows:
  - Combined curb-and-gutter: 0 to +1/8".
  - Curbs: 0 to +1/8".
  - Pavement: 0 to +1/8".
  - Earth: 0 to +1/8".
  - Preformed joint material: Item 705.03.
  - Joint sealer: Item 705.03.
  - Approach slab: 0 to +1/8".
  - Earth: 0 to +1/8".
  - Rigid pavement: 0 to +1/8".

- Approach slab: 0 to +1/8".
- Earth: 0 to +1/8".
- Rigid pavement: 0 to +1/8".
- Preformed joint material: Item 705.03.
- Joint sealer: Item 705.03.
- Approach slab: 0 to +1/8".
- Earth: 0 to +1/8".
- Rigid pavement: 0 to +1/8".
- Preformed joint material: Item 705.03.
- Joint sealer: Item 705.03.
- Approach slab: 0 to +1/8".
- Earth: 0 to +1/8".
- Rigid pavement: 0 to +1/8".
- Transverse expansion joint material: Item 705.03.

- Expansion joint material and joint sealer are not required for the portion of the curb that is adjacent to a flexible pavement type. Both materials are required, as detailed, for the full height of rigid pavement and concrete bases.

- Butt joints shall be provided between combined curb-and-gutter and new or existing rigid pavements, with tie bars or hook bolts provided at intervals of 5'. See SCD BP-2.1 for details of tie bars and hook bolts.

- If the combined curb-and-gutter adopts a new rigid base or an existing rigid base or pavement that is to be surfaced with asphalt concrete, a butt joint shall also be provided. However, tie bars or hook bolts shall be omitted when the vertical overlap "X" in detail below between the curb-and-gutter and rigid pavement is less than X.

TOLERANCES:

- Dimensional tolerances are as follows:
  - Combined curb-and-gutter: 0 to +1/8".
  - Curbs: 0 to +1/8".
  - Pavement: 0 to +1/8".
  - Earth: 0 to +1/8".
  - Preformed joint material: Item 705.03.
  - Joint sealer: Item 705.03.
  - Approach slab: 0 to +1/8".
  - Earth: 0 to +1/8".
  - Rigid pavement: 0 to +1/8".
  - Preformed joint material: Item 705.03.
  - Joint sealer: Item 705.03.
  - Approach slab: 0 to +1/8".
  - Earth: 0 to +1/8".
  - Rigid pavement: 0 to +1/8".
  - Transverse expansion joint material: Item 705.03.

- Expansion joint material and joint sealer are not required for the portion of the curb that is adjacent to a flexible pavement type. Both materials are required, as detailed, for the full height of rigid pavement and concrete bases.

- Butt joints shall be provided between combined curb-and-gutter and new or existing rigid pavements, with tie bars or hook bolts provided at intervals of 5'. See SCD BP-2.1 for details of tie bars and hook bolts.

- If the combined curb-and-gutter adopts a new rigid base or an existing rigid base or pavement that is to be surfaced with asphalt concrete, a butt joint shall also be provided. However, tie bars or hook bolts shall be omitted when the vertical overlap "X" in detail below between the curb-and-gutter and rigid pavement is less than X.

TOLERANCES:

- Dimensional tolerances are as follows:
  - Combined curb-and-gutter: 0 to +1/8".
  - Curbs: 0 to +1/8".
  - Pavement: 0 to +1/8".
  - Earth: 0 to +1/8".
  - Preformed joint material: Item 705.03.
  - Joint sealer: Item 705.03.
  - Approach slab: 0 to +1/8".
  - Earth: 0 to +1/8".
  - Rigid pavement: 0 to +1/8".
  - Preformed joint material: Item 705.03.
  - Joint sealer: Item 705.03.
  - Approach slab: 0 to +1/8".
  - Earth: 0 to +1/8".
  - Rigid pavement: 0 to +1/8".
  - Transverse expansion joint material: Item 705.03.
NOTES

1. This joint treatment is applicable for mainline and speed change lane pavement constructed of either Reinforced Concrete Pavement or Non-Reinforced Concrete Pavement when both the mainline and speed change lane pavement have adjoining tied concrete shoulders.

2. While specific locations of transverse joints required by the terminal geometrics are shown, intervening transverse joints are required in accordance with SCD BP-2.2. Unless otherwise required, all transverse joints in the speed change lanes are to be continuous in a straight line through the speed change lanes and mainline pavement. The required expansion joint is to be constructed normal to the mainline pavement and radii or normal to the ramp pavement as shown with the break located at the untied longitudinal joint. Where the speed change lanes are separated from the mainline by an untied longitudinal joint, transverse joints in the speed change lane are to be constructed radii or normal to the ramp.

3. On pavement with more than 3 lanes, the joint types and locations shall be as shown for the terminals on 3 lane pavements with no additional untied joints.

4. Divide the deceleration lane into 8' and 4' wide slabs at the point of the ramp where the total width begins to exceed 12'.

5. The longitudinal joint between the ramp and the inside narrow shoulder may be eliminated if the full length of the ramp and shoulder can be constructed to the proper cross slopes without the joint. The joints in the center of the ramp and between the ramp and the outside (wide) shoulder are required.

6. For Exit Terminals, see Sheet 2 of 2.
NOTES
For Entrance Terminals and Notes see sheet 1 of 2
Curb ramp types are shown on Sheet 2 and include Perpendicular, Parallel, and Combined types as specified to be constructed in the locations shown on the project plans.

Curb ramps added to an existing intersection or walk should be individually detailed on the project plans to ensure that the design is appropriate for site constraints and all items can be constructed to ADA standards. The contractor may adjust the placement of curb ramps if existing field conditions warrant with the approval of the Engineer.

PAYMENT: Measure and pay for the ramp area within the shaded limits of this drawing as Type A1 Curb Ramp, Square Foot. This includes the cost of any curb or curb ramp and gutter, detectable warnings, casting, installation, grading, forming, and finishing required within the shaded area.

NOTES
GENERAL: This drawing shows curb ramp types details and placement examples for curb ramp construction, including the installation of detectable warnings.

For at-grade crossing locations where only detectable warnings are required in order to achieve ADA compliance, measure and pay for the work of detectable warnings as Item 608 Detectable Warning, Square Foot. The work to cast the tiles in place will also require removal of existing pavement (Item 202) to the nearest joint, or if no joint exists, a minimum of 4 feet.

Remove all existing curb, walk or existing curb ramps are paid under Item 202.

For at-grade crossing locations where only detectable warnings are required in order to achieve ADA compliance, measure and pay for the work of detectable warnings as Item 608 Detectable Warning, Square Foot. The work to cast the tiles in place will also require removal of existing pavement (Item 202) to the nearest joint, or if no joint exists, a minimum of 4 feet.

Use this design only for existing walks, and when site constraints prohibit other designs. The diagonal Type D ramp may be constructed as either a Perpendicular, Parallel or Combination curb ramp type. Avoid using Type D where radius is less than 20'-0".

Acceptable design on corners with wide turning radius where user is able to maneuver within crosswalk limits so as not to encroach into adjacent traveled lanes.

Acceptable design for retrofit only where utilities prevent using a preferred layout.

Acceptable design on corners with wide turning radius where user is able to maneuver within crosswalk limits so as not to encroach into adjacent traveled lanes.

This drawing shows curb ramp types details and placement examples for curb ramp construction, including the installation of detectable warnings.

PAYMENT: Measure and pay for the ramp area within the shaded limits of this drawing as Type A1 Curb Ramp, Square Foot. This includes the cost of any curb or curb ramp and gutter, detectable warnings, casting, installation, grading, forming, and finishing required within the shaded area.

NOTE: Details on Sheet 2.
Type A2 (Perpendicular with returned curb)  
**PERPENDICULAR CURB RAMP DETAILS**

Type B1 (Single sided Parallel)  
**PARALLEL CURB RAMP DETAILS**

Type C1 (Combined with flared sides)  
**COMBINED CURB RAMP DETAILS**

Type A1 (Perpendicular with flared sides)  

Type B2 (Double sided Parallel)  

Type C2 (Combined with returned curb)  

5'-0" min.
50:1 max.
10:1 max.

5'-0" pref.

Landing

4'-0" min.
3'-0" pref.

4'-0" min.
3'-0" pref.

4'-0" min.
3'-0" pref.

Type B3 (Single sided Parallel)  

NOTES CONTINUED

The running slope of the curb ramp shall be a 50:1 maximum or flatter. In existing sidewalks, where the maximum ramp slope is not feasible due to site constraints (e.g. utility poles or vaults, right-of-way limits) it may be reduced as follows:

- A) 50:1 for a max. rise of 6',
- B) 4:1 for a max. rise of 3',
- C) 6:1 for a max. run of 12' for historic areas where a flatter slope is not feasible.

To prevent choking the grade indefinitely, the transition from existing sidewalk to the shaded curb ramp area is not required to exceed 5 feet in length.

While ramps may be skewed to the crosswalk, the entire lower landing area must fall within the cross walk that the ramp serves and cannot be located in the traveled lane of opposing traffic.

The counter slope of the gutter or street at the foot of a curb ramp, landing, or blended transitions shall be 50:1 or flatter.

The bottom edge of the ramp shall change planes perpendicular to the landing.

The edge of the curb shall be flush with the edge of the adjacent pavement and gutter and surface slopes that meet grade breaks shall also be flush. Ramp landings shall be 4' min. x 4' min. with a 50:1 or flatter cross slope and running slope.

**DETECTABLE WARNINGS:** Install detectable warnings on each curb ramp with approved materials, as shown on Sheet 3. Install these proprietary products as per manufacturer's written instructions.

**JOINTS:** Provide expansion joints in the curb ramp as extensions of walk joints and consistent with Item 608.03 requirements for a new concrete walk. Provide a 5' max. expansion joint every 30', 6' max. run length and 2' max. rise. Provide expansion joint filler around the edge of ramps built in historic areas where a flatter slope is not feasible.

To prevent chasing the grade indefinitely, the transition from existing sidewalk to the shaded curb ramp area is not required to exceed 5 feet in length.

**SURFACE TEXTURE:** Texture concrete surfaces by coarse brooming transverse to the ramp slopes to be rougher than the adjacent walk.

**DRAINAGE:** Contractor is to ensure the base of each constructed curb ramp is approved materials, as shown on Sheet 3. Install these proprietary products as per manufacturer's written instructions.

**NOTES CONTINUED**

To prevent chasing the grade indefinitely, the transition from existing sidewalk to the shaded curb ramp area is not required to exceed 5 feet in length.

**SURFACE TEXTURE:** Texture concrete surfaces by coarse brooming transverse to the ramp slopes to be rougher than the adjacent walk.

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**NOTES CONTINUED**

To prevent chasing the grade indefinitely, the transition from existing sidewalk to the shaded curb ramp area is not required to exceed 5 feet in length.

**SURFACE TEXTURE:** Texture concrete surfaces by coarse brooming transverse to the ramp slopes to be rougher than the adjacent walk.

**DRAINAGE:** Contractor is to ensure the base of each constructed curb ramp is approved materials, as shown on Sheet 3. Install these proprietary products as per manufacturer's written instructions.

**NOTES CONTINUED**

To prevent chasing the grade indefinitely, the transition from existing sidewalk to the shaded curb ramp area is not required to exceed 5 feet in length.

**SURFACE TEXTURE:** Texture concrete surfaces by coarse brooming transverse to the ramp slopes to be rougher than the adjacent walk.

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**NOTES CONTINUED**

To prevent chasing the grade indefinitely, the transition from existing sidewalk to the shaded curb ramp area is not required to exceed 5 feet in length.

**SURFACE TEXTURE:** Texture concrete surfaces by coarse brooming transverse to the ramp slopes to be rougher than the adjacent walk.

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**NOTES CONTINUED**

To prevent chasing the grade indefinitely, the transition from existing sidewalk to the shaded curb ramp area is not required to exceed 5 feet in length.

**SURFACE TEXTURE:** Texture concrete surfaces by coarse brooming transverse to the ramp slopes to be rougher than the adjacent walk.

**DRAINAGE:** Contractor is to ensure the base of each constructed curb ramp is approved materials, as shown on Sheet 3. Install these proprietary products as per manufacturer's written instructions.
DETECTABLE WARNINGS NOTES

GENERAL: Detectable Warnings are a distinctive surface pattern of truncated domes which are detectable by cane or underfoot to alert people with visual impairments of their approach to streets and hazardous drop-offs.

PLACEMENT: Detectable警告 shall be installed at any location where pedestrians might cross paths with vehicular traffic lanes, such as the base of curb ramp or blended curbs. A 2'-6" strip of domes is to be installed for the full width of the ramp or walk. Typical street corner placement locations are shown on Sheet 1.

The depth of concrete underneath detectable warning products shall be a minimum of 4". See DETAIL A.

ALIGNMENT: Truncated domes should be aligned with the primary direction of the ramp or as shown on the DETECTABLE WARNING ALIGNMENT Detail. Normally truncated domes should be aligned parallel to the primary direction of approach. For non-standard skewed conditions see DETECTABLE WARNING ALIGNMENT Detail. For non-standard layouts, detectable warning materials may have to be mitered and placed segmentally.

PRODUCTS & COLORS: Color of the detectable warning should contrast with surrounding concrete walk and ramp. Black is not an acceptable color. Approved products and guidance on color may be found on the Office of Roadway Engineering Service's Detectable Warnings Approved List. Install products as per manufacturer's printed instructions.

DETAIL A

SECTION A-A
NORMAL DETAIL
See Sheet 2.

SECTION A-A
EXISTING WALK DETAIL
See Sheet 2.

SECTION B-B
See Sheet 2.

SECTION C-C
See Sheet 2.

SECTION D-D
See Sheet 2.

NEW GUTTER SHOWN.

**Where possible, pour ramp area integral with the curb, otherwise use 6" thick walk.

DETECTABLE WARNINGS NOTES

GENERAL: Detectable Warnings are a distinctive surface pattern of truncated domes which are detectable by cane or underfoot to alert people with visual impairments of their approach to streets and hazardous drop-offs.

PLACEMENT: Detectable warnings are to be installed at any location where pedestrians might cross paths with vehicular traffic lanes, such as the base of curb ramp or blended curbs. A 2'-6" strip of domes is to be installed for the full width of the ramp or walk. Typical street corner placement locations are shown on Sheet 1.

The depth of concrete underneath detectable warning products shall be a minimum of 4". See DETAIL A.

ALIGNMENT: Truncated domes should be aligned with the primary direction of the ramp or as shown on the DETECTABLE WARNING ALIGNMENT Detail. Normally truncated domes should be aligned parallel to the primary direction of approach. For non-standard skewed conditions see DETECTABLE WARNING ALIGNMENT Detail. For non-standard layouts, detectable warning materials may have to be mitered and placed segmentally.

PRODUCTS & COLORS: Color of the detectable warning should contrast with surrounding concrete walk and ramp. Black is not an acceptable color. Approved products and guidance on color may be found on the Office of Roadway Engineering Service's Detectable Warnings Approved List. Install products as per manufacturer's printed instructions.
FOR CLARITY, TRANSVERSE JOINTS HAVE BEEN SHOWN NORMAL TO THE CENTERLINE. WHEN PLACED NEXT TO MAINLINE PAVEMENT WITH SKewed JOINTS, THE JOINTS IN THE SHOULDER SHALL BE SKewed TO MATCH THE SKew OF THE MAINLINE JOINTS.

CARE SHALL BE TAKEN TO MAKE THE EXPANSION, PRESSURE RELIEF OR CONTRACTION JOINTS IN THE SHOULDER A STRAIGHT LINE CONTINUATION OF THE NEW OR EXISTING EXPANSION, PRESSURE RELIEF OR CONTRACTION JOINTS.

SHOULDER: SHALL HAVE THE SAME JOINT SPACING, SAWING, AND SEALING REQUIREMENTS AS THE MAINLINE PAVEMENT.

EXPANSION, PRESSURE RELIEF AND CONTRACTION JOINTS:
Core shall be taken to make the expansion, pressure relief or contraction joints in the shoulder a straight line continuation of the new or existing expansion, pressure relief or contraction joints.

For clarity, transverse joints have been shown normal to the centerline. When placed next to mainline pavement with skewed joints, the joints in the shoulder shall be skewed to match the skew of the mainline joints.

TIE BAR SPACING: SHALL BE PER TABLE A ON SCD BP-2.1 AND SHALL BE BASED ON THE THICKNESS OF THE CONCRETE SHOULDER WHERE IT MEETS THE EXISTING CONCRETE PAVEMENT. THE NUMBER OF TIE BARS PER SLAB SHALL VARY DEPENDING ON THE EXISTING JOINT SPACING, BUT THE MAXIMUM SPACING BETWEEN TIE BARS SHALL NOT BE EXCEEDED.

NOTES
NOTES

GENERAL: SAFETY EDGES ARE REQUIRED AT THE OUTSIDE EDGES OF THE PAVED ROADWAY (EDGE OF TRAVEL LANE OR EDGE OF PAVED SHOULDERS), EXCEPT WHERE INDICATED IN THE PLANS.

CONSTRUCT THE SAFETY EDGE INTEGRAL WITH THE ADJACENT PAVEMENT, OR SHOULDER, AT AN ANGLE OF APPROXIMATELY 30 DEGREES (40 DEGREES MAX.) MEASURED FROM THE SURFACE.

DO NOT CONSTRUCT SAFETY EDGE AT INTERSECTIONS, PAVED DRIVES, OR OTHER OBSTRUCTIONS. SAFETY EDGE MAY BE INITIALLY CONSTRUCTED AT THESE LOCATIONS AND THEN REMOVED BY SAW CUTTING.

LONGITUDINAL JOINTS: LONGITUDINAL JOINTS, AS SHOWN IN THE TYPICAL SECTIONS, ARE OMITTED FOR CLARITY.

MEASUREMENT AND PAYMENT: SAFETY EDGE IS NOT MEASURED FOR PAYMENT. THE COST OF THE SAFETY EDGE IS INCIDENTAL TO THE CONCRETE PAVEMENT OR SHOULDER.
NOTES

GENERAL: Install rumble strips on new or existing asphalt or concrete shoulders. The pattern is designed so that it can be milled or ground into the shoulder material. See specifications for details. See PLACEMENT NOTES Location of Rumble Strips.

SHOULDER OFFSET: On median shoulders 12 feet or wider, where the shoulders have been designed for maintaining the shoulder land (see table below), offsets for egress. The purpose for this is to maintain traffic on the median shoulder during the phase 1 traffic maintenance sequence and to maintain the pattern. Phase 2 traffic can be maintained on the newly-paved outside shoulder prior to placement of new rumble strip pattern. See table, below.

In built-up residential areas where noise may be objectionable, the median shoulder dimension may be increased, but should not exceed 24'. See table, below.

PAYMENT: Rumble Strips are to be paid under Item 618 - Rumble Strips, (Asphalt, Concrete) Lineal Feet (Miles).

SHOULDER OFFSET: In concrete shoulders 4 feet or wider, the shoulder dimension may be increased, but should not exceed 24'.
TYPE CLT FENCE

INTERMEDIATE ANCHOR POST ASSEMBLY
For Type CLT Fence

DRIVE ANCHOR DETAIL
For Terminal Posts

TYPICAL POST ENCASEMENT

NOTES

FENCING: For information not covered in this drawing, see CMS 607.

POST ENCASEMENT: Line posts shall normally be driven to an embedment depth of 48". Where soil or other conditions do not permit driving to this depth, post holes shall be dug or bored and the posts encased in concrete. Fences on unconsolidated fills or other loose soils, in ditches or other depressions in the ground surface, or installed with fabric exceeding 60" in height shall also be encased in concrete.

All Terminal Posts, end, corner and pull panel posts shall be encased in concrete, if these posts cannot by encased, steel drive anchors may be used as shown in the DRIVE ANCHOR DETAIL.

FRAMEWORK AND FABRIC: Materials may be any type permitted by CMS 710.03.

TENSION WIRE: Wire shall be used instead of the top rail when specified on the plans as Item 607 - Fence, Type CLT. The wire shall be stretched taut and fastened to or passed through the top fitting, the fence shall be fastened to the tension wire with fabric ties consisting of hog rings every 24" or less.

GATE: Each gate shall be equipped with an approved padlock with a double locking bolt, a five-pin tumbler, a laminated steel case, and a brass cylinder, and shall be rust-proof. Where companion gates are installed on opposite sides of the highway, tumblers shall be identical in such locks so that the same key will open each lock. Two keys shall be furnished with each padlock; the cost of the padlock and keys shall be included in the cost of the gate.

STREAM CROSSINGS: Where chain link fence is to be constructed continuously across streams, and stream crossing closures are required by the plans, the closure shall be constructed in accordance with the details shown on SCD F-3.4, modified as necessary to conform to chain link fence dimensions and details.

FENCE GROUNDING: When needed for overhead electrical lines, grounding is to be in accordance with the SCD M-60.11.
**TYPE 47 FENCE**

- **Fabric:** 12” typ.
- **Ties:** 6” take-up

**TYPE 47RA FENCE**

- **Fabric:** 12” typ.
- **Ties:** 6” take-up

**NOTES**

- **Braces:** Wood braces shall be set in notches in the posts and fastened with 16d nails.
- **Posts:** Concrete encasement and tamped earth or aggregate shall be omitted when wood posts are driven to grade, except for line posts in a dip section. Posts set or driven to within 1” of grade need not be trimmed.
- **Fence:** Other methods for splicing wire fence may be used in lieu of the method shown, when approved by the Engineer.

**TYPE 47RA FENCE:** Type 47RA shall be used to fence rest areas. Where Types 47 and 47RA intersect at a corner, the corner assembly shall have all wood braces. Fence shall be paid for as Item 607 – Fence, Type 47RA.
Fence Details at Bridges

**General**
Details shown herein shall be used with SCD F-1.1 and SCD F-2.1.

**Abutment Connection**
The cost of furnishing and installing connecting rods, eyebolts, and anchors shall be included in the unit price bid per linear foot of fence. Where needed to clear deck projections or irregularities, the shaft length of the eyebolt may vary.

**Anchors**
Self-drilling anchors shall conform to CMS 712.01. Threaded steel inserts may be cast-in-place when the structure is constructed instead of using self-drilling anchors.

**Eyebolts**
The steel shall be in accordance with ASTM A-489, except that the bend test is waived.

**Clearance**
On embankments approaching bridges, the clearance of the lower fence wires may vary from 0" to 6".

**Notes**

<table>
<thead>
<tr>
<th>Fence Arrangement at Freeway Overpass</th>
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</thead>
<tbody>
<tr>
<td>Fence Arrangement Cross Road on Original Profile</td>
</tr>
<tr>
<td>Fence Arrangement Cross Road on High Fill</td>
</tr>
</tbody>
</table>

**Drawings**

- Chain Link Fence
- Woven Wire Fence
- Abutment Connection
- Fence Arrangement at Freeway Overpass
- Fence Arrangement Cross Road on Original Profile
- Fence Arrangement Cross Road on High Fill
GATES: Each gate shall be equipped with an approved padlock with a double locking bolt, a five-pin tumbler, a laminated steel case, and a brass cylinder, and shall be rust-proof. Where companion gates are installed on opposite sides of the highway, tumblers shall be identically set in each lock so that the same key will open each padlock. The cost of the padlock and key shall be included in the cost of the gate.

Gate width is either 4', 6', or 8' as specified on the plans, or by the Engineer.

TRUSS RODS: Rods may be omitted from gate frames if welded joints are furnished.

TYPE 47 WALK GATE: Walk gate and end post assemblies at gate openings shall conform to CMS 607, except as shown otherwise on this drawing.
FENCE TERMINALS

PLANS

W 1.5 galv. wire

Post

Terminal

ENDWALLS & CRADLES

48", 54" & 60" diameters

TYPE A

ENDWALLS & CRADLES

56" diameter and larger

TYPE B

WALL CONNECTION

h = length of connecting rod

1/2" steel rod

3/8" steel connecting rod (galv.)

1/2" eyebolt (galv.)

EYEBOLT: The steel shall be in accordance with ASTM A 489, except that the bend test is waived. The eyebolt shall be galvanized in accordance with ASTM A 153.

ANCHORS: Self-drilling anchors shall conform to CMS 712.01. Threaded steel inserts may be cast-in-place when the structure is constructed, instead of using self-drilling anchors.

EYEBOLTS: The steel shall be in accordance with ASTM A 489, except that the bend test is waived. The eyebolt shall be galvanized in accordance with ASTM A 153.

NOTES

FENCE TYPES: Fence terminals shown on this drawing apply to Type 47 fence. Differences between these designs are due to differences in fence height, height of post, length of post, or any other variance that would affect the terminal design. Fences shall be constructed, instead of using self-drilling anchors.

ANCHORS: Self-drilling anchors shall conform to CMS 712.01. Threaded steel inserts may be cast-in-place when the structure is constructed, instead of using self-drilling anchors.

EYEBOLTS: The steel shall be in accordance with ASTM A 489, except that the bend test is waived. The eyebolt shall be galvanized in accordance with ASTM A 153.

The construction of all types of fence if modified for differences in basic design such as anchor assembly, height of fence, length of panel, or any other variance that would affect the terminal design.

Cost of furnishing and installing connecting rods, eyebolts, and anchors for wall connections shall be included in the unit price bid per foot of fence.

7-19-2013

Michael Bingle

Transportation Administrator

State of Ohio

Department of Transportation

THIS DRAWING REPLACES F-3.3 DATED 7-28-00.
**CROSSING TYPE 1**

- Type 47 Fence
- Line Post
- 6" Bedding
- Barbed Wire

**CROSSING TYPE 2**

- Type 47 Fence
- Line Post
- 6" Bedding
- Barbed Wire

**CROSSING TYPE 3**

- Type 47 Fence
- Line Post
- 6" Bedding
- Barbed Wire

**CROSSING TYPE 4**

- Type 47 Fence
- Line Post
- 6" Bedding
- Barbed Wire

---

*Extra length posts shall be 2½" dia. Steel Pipe or 3½" x ½" Angle, galvanized and set in Concrete.*

---

**Note:**

- Item 601 Rock Channel Protection, Type B, w/ Filter (See Notes, Sheet 2 of 2)
- Protection, Type B, w/ Filter (See Note, Sheet 2 of 2)
- Item 601 Concrete Paved Gutter

---

**Protection, Type B, w/ Filter (See Note, Sheet 2 of 2)**

<table>
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<tr>
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<th>Width (max)</th>
<th>Height (max)</th>
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<tr>
<td>Item 601 Rock Channel</td>
<td>16'-0&quot;</td>
<td>18&quot;</td>
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<tr>
<td>Item 601 Concrete Paved Gutter</td>
<td>16'-0&quot;</td>
<td>12&quot;</td>
</tr>
</tbody>
</table>

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**Schedule 40 Pipe**

- 17'-0" max.
- 3½" O.D. by ½" Wall
- Galvanized or Galv. Nails

---

**Steel Pipe or 3" x 3" x ½" Angle**

*Extra length posts shall be 2½" dia. Steel Pipe or 3½" x ½" Angle, galvanized and set in Concrete.*

---

**Horizontal Members**

- 1" x 8"

**Vertical Members**

- 2" x 4"
HANGER DETAIL
See CROSSING TYPE 4 Detail, Sheet 1 of 2

NOTES

FENCE DETAILS: Details shown on this drawing apply to standard Type 47 fence as detailed; however, the same design may be used in the construction of all types of fence if modified for differences in basic design, such as anchor assembly, height of fence, length of panel, or other variances that would affect the design.

CROSSINGS: Types 1, 2, or 3, shall be provided at earth side ditches and streams served by culverts smaller than 48" in rise. A Type 4 crossing shall be furnished for each stream channel that is over 6 ft deep. For Crossing Types, see Sheet 1 of 2.

TYPE 2 CROSSINGS: This Type Sheet 1 of 2 is shown crossing a live stream, but it may also be used for intermittent flow channels. For a live stream crossing, the barbed wire may be deleted or its spacing varied, when directed by the Engineer, to prevent or reduce the collection of debris.

ROCK CHANNEL PROTECTION: Rock shall consist of Item 601 - Rock Channel Protection, Type C, with filter, unless otherwise shown on the plans or determined by the Engineer. It shall be placed 8" wide x 12" deep of the fence and 4' inside the fence, and shall be placed for an Item 601 - Rock Channel Protection, Type C, w/ Filter.

CONCRETE ENCASEMENT: When no rock channel protection is required, the concrete encasement shall be measured from the bottom of the channel.

MAINTENANCE OPENING: Barbed wire and fence fabric in the opening shall be separate from the approach wire fabric and shall be installed after the wire and fabric have been stretched and fastened on both approaches.
NOTES

GENERAL: Components shown on this drawing are used in a variety of guardrail systems. See individual guardrail drawing for specific applications.

See CMS 606 for guardrail specifications not covered on these drawings.

RAIL ELEMENTS: Unless otherwise specified, W-Beam Rail is 12 gauge steel with an effective length of 12'-6" or 25'-0", with 1½" x 1¾" splice bolt slots, and ½" x 2½" post bolt slots on 3'-1½" centers. Lap the flared end sections in the direction of traffic. Standard Splice Slots (typ.) are permitted when two nested 12 gauge steel beams are specified in perimeter both W-Beam and Thrie-Beam.

RAIL SPLICES: Lap splices between two rail elements or between a rail and terminal connector in the direction of traffic. Lap the flared end sections in the direction of traffic.

REFERENCES: See CMS 606 for guardrail specifications not covered on these drawings. See individual guardrail drawing for specific applications.

ASSEMBLY: Components shown on this drawing are used in a variety of guardrail systems. Refer to AASHTO M 180 for dimensional details of W-beam and Thrie-beam rail elements, related buffer, end, and sections, beam splices, post and splice bolts, nuts, and Type 1 Guardrail Bolt (For Post and Splice Bolts)...

GUARDRAIL BOLT (For Post and Splice Bolts)

<table>
<thead>
<tr>
<th>Type</th>
<th>Bolt Use</th>
<th>T</th>
<th>L</th>
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<tbody>
<tr>
<td>ASTM A307</td>
<td>Type MGS SP/WB, PB</td>
<td>4</td>
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<tr>
<td></td>
<td>Splice Bolt</td>
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<td>Steel Post</td>
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<td>Plastic Blockout</td>
<td>8</td>
<td>8&quot;</td>
</tr>
</tbody>
</table>

W = Wood Post
W = Wood Blockout
P = Plastic Blockout

Larger Bolt may be needed for round Wood Post larger than 8" dia.
GUARDRAIL HEIGHT: For initial installation, construct the guardrail within a 1' of the standard 31" height to the top of W-beam rail. When subsequent projects, such as resurfacing, affect the height of existing guardrail, adjustment is not required if the finished height is within 1" of the standard height.

POSTS: The Standard Post Length is 6'-0" (+3", -0" tolerance). Wood Posts are permitted instead of Standard Steel Posts per CMS 710.11. STEEL BEAM POSTS

<table>
<thead>
<tr>
<th>Size</th>
<th>Beam depth</th>
<th>Flange width</th>
<th>Flange thickness</th>
<th>Web thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rolled W6x8</td>
<td>5.8&quot;</td>
<td>1.54&quot;</td>
<td>0.093&quot;</td>
<td>0.105&quot;</td>
</tr>
<tr>
<td>Rolled W6x9</td>
<td>5.9&quot;</td>
<td>1.54&quot;</td>
<td>0.105&quot;</td>
<td>0.118&quot;</td>
</tr>
<tr>
<td>Rolled W6x10</td>
<td>6.0&quot;</td>
<td>1.54&quot;</td>
<td>0.118&quot;</td>
<td>0.130&quot;</td>
</tr>
</tbody>
</table>

Guards with worn flange or to 2:1 slopes are steeper than 6:1

FRONT

Types 1 & 2 Breakaway CRT Post

Flange thickness

Type 1 Breakaway CRT Post

When subsequent projects, such as resurfacing, affect the height of existing guardrail, adjustment is not required if the finished height is within 1" of the standard height.

POST EMBEDMENT DEPTH: Standard embedment depth is 3'-4" minimum. Embedment depth shall be 37" when using the round wooden post option. Do not drive posts located over a culvert with less than 6'-3" of cover, instead set in drilled or dug holes. Where site constraints prohibit the post from being placed at least one foot in front of the slope break point, use longer posts as shown in the Guardrail Post Length and Position Detail. The face of the rail may not be beyond the slope break point.

SPECIAL POST MOUNTINGS: Install posts located over a drainage inlet or structure with a cover of less than 3'-4" as shown in the FOOTING ANCHOR DETAIL. ANY WOOD POSTS USED IN THE GUARDRAIL STRUCTURE SHALL BE TREATED AFTER INSTALLATION USING THE STANDARD TREATMENT PROCESS. ANCHORS: Holes shall comply with CMS 530. Use non-shrink, nonmetallic grout per CMS 105.20.

PROTECTIVE COATING: In lieu of the complying with CMS 700.05, cost expansion shields, anchors and concrete insert anchor assemblies embedded in concrete in accordance with ASTM A 153 or be of stainless steel. Any bolts screwed into these devices shall meet CMS 710.06.

Footings shall be 3'-4" minimum embedment

Footing anchor detail

Steel Post

Foundation Ground Tube

1" dia. (Typ.)

Steel Plate Washer (Typ.)

3/16"

Reinforced Concrete

3/8" long 3/8" dia. X 3/8" thick with all-threaded rod with washer and nut. 6" min. embedment
**Guardrail System Details**

**Standard Guardrail System Construction Drawing**

**SCD Number**
- MG S-1.1

**Rail Components**
- Standard Swaged Fitting and Stud Cable Anchor
- Anchor Bracket Assembly Details
- End Plate
- Strut
- Bearing Plate
- Yoke

**Description**
- Rail shown in position
- Neutral Axis
- Eight each 3/4" dia. holes, nuts, and washers
- Strut and Yoke Assembly
- Channel legs shown down. For opposite hand, install channel legs up.

**Additional Details**
- Grade 5 (or equivalent) 1" dia. stud, threaded entire length
- Bent Plate
- 35° Neutral Axis
- Plate
- Symmetric about centerline
- Swaged and Washer

**Revision Date**
- 1-19-2018

**Transportation Administrator State of Ohio Department of**

David L. Holstein
D. Fisher
ENGINEERING OFFICE OF MIDWEST GUARDRAIL SYSTEM, STANDARD TYPE MGS

STANDARD POST SPACING

MGS POST SPACING 6'-3"

HALF POST SPACING 3'-0"

QUARTER POST SPACING 1'-6"

Notes:

RAIL: Use W-Beam rail meeting AASHTO M 210-12 Type II, Class A, as specified in CMS 606. Either 13'-6" long (12'-6" between splices) or 26'-0" long (25'-0" between splices) rail sections may be used.

POSTS: Posts may be constructed of wood or steel. Use the same type of post throughout the length of the project unless otherwise specified in the plans or permitted by the Engineer.

WOOD POSTS shall be fabricated and pressure-treated for approved species per CMS 710.14. Bore bolt holes and, if required, trim the tops of posts after the posts are set. See SCD MGS-1.1 for Standard Steel Posts.

All rectangular posts are 6'-0" long (+3", -0 tolerance) unless otherwise in the Contract Document. Posts may be drilled or may be driven to grade. Embedment depth shall be 37" when using the round wooden post option.

BLOCKOUTS: Blockout dimensions are dependent on post used. Wood blockouts are to be pressure treated as specified in CMS 710.14. Bore bolt holes. Approved alternate blockouts may be used in lieu of the wood blockouts shown. The Engineer's approved list is maintained by the Office of Roadway Engineering.

WHEN TERMINATING DOUBLE-SIDED BARRIER GUARDRAIL WITH AN IMPACT ATTENUATOR, USE REDUCED 8" DEEP BLOCKOUTS ON THE LAST # POSTS ON THE BARRIER DESIGN TO ACCOMMODATE THE IMPACT ATTENUATOR. USE THE SAME TYPE OF POST THROUGHOUT THE LENeth of the attenuator.

WOOD POSTS shall be fabricated and pressure-treated for approved species per CMS 710.14. Bore bolt holes and, if required, trim the tops of posts after the posts are set. See SCD MGS-1.1 for Standard Steel Posts.

For Barrier Reflectors see CMS 626.

MISCELLANEOUS: For other guardrail details, see SCD MGS-1.1.

PAYMENT: Guardrail is paid in feet per:

ITEM 606 - Guardrail, Type MGS
HALF POST SPACING

ITEM 607 - Guardian, Type MGS
QUARTER POST SPACING

ITEM 806 - Guardian, Type MGS Half Post Spacing

ITEM 807 - Guardian, Type MGS Quarter Post Spacing
**SECTION A-A**

**ELEVATION**

25'-0" (max.) GUARDRAIL SPAN

**NOTES**

**APPLICATION:** This drawing details the 25'-0" maximum Long-Span Guardrail across a culvert option, which meets the requirements of MASH Test Level 3.

A minimum length of 62.5' of Standard MGS guardrail is required before Post 1 and after Post 6 to maintain stability in the system. Normal grading with a minimum length of 62.5' of Standard MGS guardrail is required before Post 1 and after Post 6 to maintain stability in the system. Normal grading with a point the guardrail may flare at a maximum taper rate of 7:1.

**FLARED ENDS:** For locations where a guardrail flare is desired, the system should be offset 8' from the fixed object.

**POSTS:** Use Type 1 Breakaway CRT Wood Post for Posts No. 1-6.

**LATERAL OFFSET:** When the headwall is flush with the grade, the back of the post can be aligned with the near side of the headwall. But if the headwall continues above grade, the system should be offset 8' from the fixed object.

**MATERIALS:** All posts, blockouts, rails, and hardware shall comply with SCD MGS-2.1, except as noted. For other details not shown, see SCD MGS-2.1. Item 606 - Guardrail, Type MGS as detailed on SCD MGS-2.1 except as noted. For other details not shown, see SCD MGS-2.1.

**PAYMENT:** Item 606 - Guardrail, Type MGS, Long-Span is paid for in Feet across a culvert option, which meets the requirements of MASH Test Level 3.

For other details not shown, see Item 203 Embankment, Cu. Yd.
MIDWEST GUARDRAIL SYSTEM

SOCKETED WEAK POST ATTACHED TO HEADWALL

07-19-2019

STANDARD ROADWAY CONSTRUCTION DRAWING

ENGINEER
STDS.

ADMINISTRATOR
D. FISHER

SCD NUMBER
MGS-2.4

Rail Components

NOTES

Elevation

POST SOCKET ATTACHED TO HEADWALL

Item 606 - Guardrail, Type MGS With Socketed Posts

PAYMENT: The Socketed Post Connections shall be paid in
feet as Item 606 - Guardrail, Type MGS With Socketed Posts.

^SBS Post

(12 gauge)

MECHANICAL SPLICES shall comply with CMS 509.

ANCHORS: Holes shall comply with CMS 510. Use non-shrink,
nonmetallic grout according to CMS 705.20.

GENERAL: See Sheet 2 for rebar bending diagrams and for detailed
Guardrail components. All guardrail parts are galvanized steel.
Plates and Gussets are ASTM A572 Grade 50, Bolts are ASTM 307,
and the S3x5.7 Posts are ASTM A992.

BACKUP PLATE: The S3x5.7 Posts utilize a 12" wide W-Beam backup
plate instead of a blockout.

AND/OR: Holes shall comply with CMS 809.

PAYMENT: The Socketed Post Connections shall be paid in
feet as Item 606 - Guardrail, Type MGS With Socketed Posts.
The #6 90° hook bars shall be paid for with the culvert.
All headwall reinforcement shall be paid for with the headwall.

DESIGNER NOTE: Post/Socket location should be detailed in the
plans to coordinate with the rebar spacing in the headwall.

1/2

DESIGNER

PHOTO OF W-Beam Reinforcementaste of W-Beam Reinforcement

HEADWALL Reinforced Concrete Headwall

REINFORCED CULVERT Headwall

1'-3" (MIN.)

REINFORCED CULVERT Headwall

Plates and Gussets are ASTM A572 Grade 50, Bolts are ASTM 307,
and the S3x5.7 Posts are ASTM A992.

Plates and Gussets are ASTM A572 Grade 50, Bolts are ASTM 307,
and the S3x5.7 Posts are ASTM A992.

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Plates and Gussets are ASTM A572 Grade 50, Bolts are ASTM 307,
MIDWEST GUARDRAIL SYSTEM

POST SOCKET ATTACHED TO HEADWALL

A. SQUARE TUBE

B. TOP MOUNTING PLATE

C. BOTTOM MOUNTING PLATE

D. TOP PLATE GUSSET

E. TOP MOUNTING PLATE

F. TOP PLATE GUSSET

G. TOP MOUNTING PLATE

H. POST STANDOFF

SIDE VIEW

TOP VIEW

FRONT VIEW

POST SOCKET ATTACHED TO HEADWALL

BENDING DIAGRAMS

FORGED THREADED SPLINTER

#6 90° Hook Bar with one end threaded

#6 Stirrup

#6 180° Hook Bar with one end threaded

R = 2"
Thrie Beam Terminal Connectors connect to generate barrier end section by five (on each side) 3" washers and nuts, or thru-bolted where specified. Barrier end section includes athering bolts for connection with Twin Steel Tube Bridge Railing (SCD TST-1-99), Parapet Type Bridge Railing (SCD SBR-1-13, BR-1-13, TST-1-99) and for runs to the concrete barrier or parapet, but shall not extend past Post No. 13. Curb is paid separately under Item 609 - Curb, Type 4__, in feet. ** Where curb must extend upstream of Post No. 11 for drainage purposes, an extra 2'-6" panel of 12 gauge steel must be nested prior to the transition upstream of Post No. 11. This added component shall be included as incidental to the cost of the BTA.

For barrier guardrail details see SCD MGS-2.1. For additional rail details, see SCD MGS-1.1. POSTS: Use standard steel or 6"x8"x3" wood posts per SCD MGS-1. For Posts No. 1-12, Posts may be set in drilled or backfill grades. Posts No. 13 are 6"x4"x34" wood. Use the same post material throughout the length of the Transition unless otherwise specified in the posts or SCD MGS-2.1. ** Where curb must extend upstream of Post No. 11 for drainage purposes, an extra 12'-6" panel of 12 guage w-beam must be nested prior to the transition upstream of Post No. 11. This added component shall be included as incidental to the cost of the BTA. Standard MGS 6"x12"x14" blockout is used at Posts No. 1-6 are 6'-6" W6x9 steel or 7'-0" wood.

Curb: Type 4, 4A, 4B or 4C Curb per SCD BP-6.1 is required under the Thrie-beam portion of this transition when connecting to concrete barrier or parapet, but shall not extend past Post No. 13. Curb is not required when connecting to Thrie beam rail. ** Where curb must extend upstream of Post No. 11 for drainage purposes, an extra 2'-6" panel of 12 gauge steel must be nested prior to the transition upstream of Post No. 11. This added component shall be included as incidental to the cost of the BTA. See Sheet 2 of 2.

NOTES
1. The first post of the MGS 3'-1" past the BTA, extend past Post No. 11. Curb is NOT required when connecting to concrete barrier or parapet, but shall not extend past Post No. 13. Curb is not required when connecting to Thrie beam rail. ** Where curb must extend upstream of Post No. 11 for drainage purposes, an extra 2'-6" panel of 12 gauge steel must be nested prior to the transition upstream of Post No. 11. This added component shall be included as incidental to the cost of the BTA.

** 2. Thrie beam panel shall be 10 gauge. Thrie beam transition panel shall be 10 gauge. Thrie beam transition panel shall be 10 gauge. Thrie beam transition panel shall be 10 gauge. Thrie beam transition panel shall be 10 gauge.
**Standard MGS Post**

**Standard MGS Blockout**

**Rail splice** (lap in the direction of travel)

**Face of Guardrail**

**PLAN**

(Steel Posts shown, see POSTS Note.)

**ELEVATION**

**Bearing Plate (see detail)**

\[\frac{3}{4}"\] dia. ASTM A325 or A449 through bolts (length to be determined in field in accordance with Parapet width) into Bearing Plate with standard washers and hex nuts

**Connection with Concrete**

Parapet (SCD SBR-1-99) or Concrete Barrier (SCD RM-4.6) Shown.

**NOTES**

**GENERAL**: For additional rail and post details, see SCD MGS-1.1.

**APPLICATION**: Use Type 2 MGS Bridge Terminal Assembly to connect guardrail runs to the trailing end of Parapets or Concrete Barriers (see SCD RM-4.6 for Concrete Barrier) on one-directional Roadways. Do not use if located within clear zone of opposing traffic.

**POST**: See SCD MGS-2.1 for standard post details.

**BLOCKOUTS**: See SCD MGS-2.1 for standard blockout details.

**FLARED GUARDRAIL**: Keep the first panel of guardrail adjacent to the transition tangential to the roadway before applying standard guardrail flares.

**PAYMENT**: Item 606 - MGS Bridge Terminal Assembly, Type 2. Each includes the cost of all components, including the terminal end shoe, connector, bearing plate, bolts, washers, nuts, and any other hardware needed to attach the guardrail to the trailing end of the concrete wall or parapet.
Item 606 - Guardrail, Type MGS

Item 606 - Anchor Assembly, Type A

Item 606 - Anchor Assembly, Barrier Design, Type A

Type MGS, Barrier Design

Item 606 - Guardrail, Type MGS

Item 606 - Anchor Assembly, Type A

NOTES

APPLICATION: On Non-NHS roadways it may be used in the clear zone with restrictions. See Section 603, Location & Design Manual, Volume 1.

GENERAL: For details not shown, see SCD MGS-1.1 and other drawings pertaining to specific guardrail type. Coordinate all steel parts.

OFFSET: The 18" flare offset from normal face of rail, shown in the plan view (for single rail installations) will be utilized only where shoulder is insufficient for providing standard flares.

POSTS: Steel posts W6x9 are shown, but W6x8.5 posts are also permitted. See SCD MGS-1.1 for additional embedment details.

SPACERS: Post B Spacers shall be made of 3/8" Steel Plate as specified in CMS 710.3 or two sections of W6x9 or W6x8 cut out in the web (see dashed line on POST B Details) and welded together on both sides.

All steel spacers and posts may be provided with additional bolt holes so that these items will not be required to be made right and left handed.

Spacers shall be fastened to Posts with two 5/8" hex head bolts and nuts with standard washers on both sides.

WASHERS: All washers indicated on this drawing are standard galvanized steel of the appropriate size.

CONCRETE ANCHOR: Form top 4" of anchor and slope the top to conform to slope of the adjacent ground. The 36" diameter anchor may be replaced by a 2'-6" square anchor at the contractor's option.

PAYMENT: Include all materials and labor for the 25'-0" Single Rail, MGS Type A Anchor Assembly in the unit bid price for Item 606 - Anchor Assembly, MGS Type A, Each. Pay for all materials and labor for the 25'-0" Barrier Rail in the unit bid price Item 606 - Anchor Assembly, Barrier Design, MGS Type A, Each.

CONCRETE ANCHOR: Form top 4" of anchor and slope the top to conform to slope of the adjacent ground. The 36" diameter anchor may be replaced by a 2'-6" square anchor at the contractor's option.

PAYMENT: Include all materials and labor for the 25'-0" Single Rail, MGS Type A Anchor Assembly in the unit bid price for Item 606 - Anchor Assembly, MGS Type A, Each. Pay for all materials and labor for the 25'-0" Barrier Rail in the unit bid price Item 606 - Anchor Assembly, Barrier Design, MGS Type A, Each.

CONCRETE ANCHOR DETAIL

SECTION A-A

SECTION B-B

Concrete Anchor, showing reinforcement. See detail.

18" diameter

Concrete Anchor

Concrete Anchor, showing reinforcement. See detail.

NOTE:

1. Reinforcing Steel:
   - Slight crown (typ.)
   - Reinforcing steel of the appropriate size.
   - Reinforcing steel per CMS 710.15 or two sections of W6x9 or W8x10 cut in the web (see dashed line on POST B Detail) and welded together on both sides.

2. Bolt and Spacers:
   - Spacers shall be made of 3/8" Steel Plate as specified in CMS 710.3 or two sections of W6x9 or W6x8 cut out in the web (see dashed line on POST B Detail) and welded together on both sides.
   - All steel spacers and posts may be provided with additional bolt holes so that these items will not be required to be made right and left handed.
   - Spacers shall be fastened to Posts with two 5/8" hex head bolts and nuts with standard washers on both sides.

3. WASHERS:
   - All washers indicated on this drawing are standard galvanized steel of the appropriate size.

4. COMBINED POST B SPACER & BACKUP PLATE:
   - Combined Post B Spacers shall be made of 3/8" Steel Plate as specified in CMS 710.3 or two sections of W6x9 or W6x8 cut out in the web (see dashed line on POST B Detail) and welded together on both sides.
   - All steel spacers and posts may be provided with additional bolt holes so that these items will not be required to be made right and left handed.
   - Spacers shall be fastened to Posts with two 5/8" hex head bolts and nuts with standard washers on both sides.

5. CONCRETE ANCHOR:
   - Form top 4" of anchor and slope the top to conform to slope of the adjacent ground. The 36" diameter anchor may be replaced by a 2'-6" square anchor at the contractor's option.
   - Reinforcing steel per CMS 710.15 or two sections of W6x9 or W8x10 cut in the web (see dashed line on POST B Detail) and welded together on both sides.

6. WASHERS:
   - All washers indicated on this drawing are standard galvanized steel of the appropriate size.

7. POSTS:
   - Steel posts W6x9 are shown, but W6x8.5 posts are also permitted. See SCD MGS-1.1 for additional embedment details.
   - Reinforcing steel per CMS 710.15 or two sections of W6x9 or W8x10 cut in the web (see dashed line on POST B Detail) and welded together on both sides.

8. OFFSET:
   - The 18" flare offset from normal face of rail, shown in the plan view (for single rail installations) will be utilized only where shoulder is insufficient for providing standard flares.

9. POSTS:
   - Steel posts W6x9 are shown, but W6x8.5 posts are also permitted. See SCD MGS-1.1 for additional embedment details.

10. WASHERS:
    - All washers indicated on this drawing are standard galvanized steel of the appropriate size.

11. GENERAL:
    - For details not shown, see SCD MGS-1.1 and other drawings pertaining to specific guardrail type. Coordinate all steel parts.

12. OFFSET:
    - The 18" flare offset from normal face of rail, shown in the plan view (for single rail installations) will be utilized only where shoulder is insufficient for providing standard flares.

13. POSTS:
    - Steel posts W6x9 are shown, but W6x8.5 posts are also permitted. See SCD MGS-1.1 for additional embedment details.

14. WASHERS:
    - All washers indicated on this drawing are standard galvanized steel of the appropriate size.

15. GENERAL:
    - For details not shown, see SCD MGS-1.1 and other drawings pertaining to specific guardrail type. Coordinate all steel parts.

16. OFFSET:
    - The 18" flare offset from normal face of rail, shown in the plan view (for single rail installations) will be utilized only where shoulder is insufficient for providing standard flares.

17. POSTS:
    - Steel posts W6x9 are shown, but W6x8.5 posts are also permitted. See SCD MGS-1.1 for additional embedment details.

18. WASHERS:
    - All washers indicated on this drawing are standard galvanized steel of the appropriate size.

19. GENERAL:
    - For details not shown, see SCD MGS-1.1 and other drawings pertaining to specific guardrail type. Coordinate all steel parts.

20. OFFSET:
    - The 18" flare offset from normal face of rail, shown in the plan view (for single rail installations) will be utilized only where shoulder is insufficient for providing standard flares.

21. POSTS:
    - Steel posts W6x9 are shown, but W6x8.5 posts are also permitted. See SCD MGS-1.1 for additional embedment details.

22. WASHERS:
    - All washers indicated on this drawing are standard galvanized steel of the appropriate size.

23. GENERAL:
    - For details not shown, see SCD MGS-1.1 and other drawings pertaining to specific guardrail type. Coordinate all steel parts.

24. OFFSET:
    - The 18" flare offset from normal face of rail, shown in the plan view (for single rail installations) will be utilized only where shoulder is insufficient for providing standard flares.

25. POSTS:
    - Steel posts W6x9 are shown, but W6x8.5 posts are also permitted. See SCD MGS-1.1 for additional embedment details.

26. WASHERS:
    - All washers indicated on this drawing are standard galvanized steel of the appropriate size.

27. GENERAL:
    - For details not shown, see SCD MGS-1.1 and other drawings pertaining to specific guardrail type. Coordinate all steel parts.

28. OFFSET:
    - The 18" flare offset from normal face of rail, shown in the plan view (for single rail installations) will be utilized only where shoulder is insufficient for providing standard flares.

29. POSTS:
    - Steel posts W6x9 are shown, but W6x8.5 posts are also permitted. See SCD MGS-1.1 for additional embedment details.

30. WASHERS:
    - All washers indicated on this drawing are standard galvanized steel of the appropriate size.

31. GENERAL:
    - For details not shown, see SCD MGS-1.1 and other drawings pertaining to specific guardrail type. Coordinate all steel parts.

32. OFFSET:
    - The 18" flare offset from normal face of rail, shown in the plan view (for single rail installations) will be utilized only where shoulder is insufficient for providing standard flares.
NOTES

APPLICATION: Use Type T anchor assemblies on the trailing end of guardrail runs, located outside of the clear zone of opposing traffic. The assembly is 12'-6" long, none of which can be considered the length of need for the guardrail run.

For termination requirements of driveways, and side road approaches and terminations of structures, see Location & Design Manual, Volume 1, Figure 603-3.

MATERIALS: See SCD MGS-4.2 for parts used on this anchor, including the Type 2 BCT Breakaway Posts, Steel Ground Foundation Tube, Bearing Plate, Cable Anchor, Bracket Assembly, and Rounded W-Beam Section.

Bearing Plate is ASTM A307 Grade A. Steel Ground Foundation Tube shall be ASTM A500, Grade B, and meet CMS 710.01. All angles, channels and plates shall meet CMS 710.01. All structural steel shall be galvanized as specified in CMS 710.03. All bolt washers indicated are standard galvanized steel of the appropriate size.

For components on this anchor that are not detailed on SCD MGS-1.1, see part descriptions in the AASHTO/AGC/ARTBA Standardized Hardware Guide.

PAYMENT: All equipment, labor and materials, including the W-Beam Rounded End Section and the W-Beam Terminal Rail for the 12'-6" anchor assembly shall be included in the unit price bid for Item 606 - Anchor Assembly, MGS Type 1, Each.

DETAIL A

See SCD MGS-1.1 for parts used on this anchor, including the Type 2 BCT Breakaway Posts, Steel Ground Foundation Tube, Bearing Plate, Cable Anchor, Bracket Assembly, and Rounded W-Beam Section.

For specific embedment of 90° posts, see SCD MGS-4.2

See SCD MGS-4.2 for parts used on this anchor, including the Type 2 BCT Breakaway Posts, Steel Foundation Ground Tube, Bearing Plate, Cable Anchor, and Bracket Assembly details.

For termination requirements of driveways, and side road approaches and terminations of structures, see Location & Design Manual, Volume 1, Figure 603-3.

PAYMENT: All equipment, labor and materials, including the W-Beam Rounded End Section and the W-Beam Terminal Rail for the 12'-6" anchor assembly shall be included in the unit price bid for Item 606 - Anchor Assembly, MGS Type 1, Each.

DETAIL A

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For specific embedment of 90° posts, see SCD MGS-4.2

See SCD MGS-4.2 for parts used on this anchor, including the Type 2 BCT Breakaway Posts, Steel Foundation Ground Tube, Bearing Plate, Cable Anchor, and Bracket Assembly details.

For termination requirements of driveways, and side road approaches and terminations of structures, see Location & Design Manual, Volume 1, Figure 603-3.

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For specific embedment of 90° posts, see SCD MGS-4.2

See SCD MGS-4.2 for parts used on this anchor, including the Type 2 BCT Breakaway Posts, Steel Foundation Ground Tube, Bearing Plate, Cable Anchor, and Bracket Assembly details.

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DETAIL A

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For termination requirements of driveways, and side road approaches and terminations of structures, see Location & Design Manual, Volume 1, Figure 603-3.

PAYMENT: All equipment, labor and materials, including the W-Beam Rounded End Section and the W-Beam Terminal Rail for the 12'-6" anchor assembly shall be included in the unit price bid for Item 606 - Anchor Assembly, MGS Type 1, Each.
TRANSITION BETWEEN TYPE 5 GUARDRAIL AND TYPE MGS GUARDRAIL

NOTES

APPLICATION: Use Curved W-Beam Guardrail installations only at at phar roadway intersections and driveways adjacent to structures where Length of Need cannot be achieved per L&D Vol. 1 Section 602. Also see L&D Vol. 1 Figure 603-3 for alternative configurations.

MATERIALS: See SCD MGS-4.2 for Type T anchor assembly, and SCD MGS-1.1 for all guardrail parts.

Bridge Terminal Assembly | Type T Anchor

Anchor Assembly Per

Driveway or Side Road Opening Adjacent to Structures
These offsets may be adjusted to provide the appropriate amount of cover over the end anchor. The adjusted offsets shall not result in a taper rate for the given section that is flatter than the taper rate for the adjacent downstream section.

For 10:1 or flatter foreslopes, the rubrail can be omitted. Payment shall be for Item 606 - Guardrail, Type MGS.

For Sections see Sheet 2.

Item 606

Payment Limits for Item 606 Guardrail, Type 8-MGS

**PLAN VIEW**

Height of guardrail is parallel to edge of pavement until the distance between the bottom of the lower rail and the finished grade reaches 1'-4". At this point, taper both rails to maintain 1'-4" maximum clearance to finished grade. (See Section C-C on Sheet 2.)

Height of guardrail tapers to end anchor.

**ELEVATION VIEW (Profile Along Rail)**

Post End Anchor shown (see Detail on Sheet 3). For alternate End Anchor see Sheet 3.

---

**NOTES**

**POSTS & BLOCKOUTS:** Shall comply with MGS Guardrail (See SCD MGS-2.1.)

- Steel Post spacing
- 3'-0"
- 5'-0" (max.)
- 8'-0" (max.)

**MISCELLANEOUS:** For details not shown see SCD MGS-2.1.

**PAYMENT:** Item 606 - MGS Guardrail, Type 8, shall be in Feet for the length specified in the plans and shall include rails, 8'-0" posts, grading, excavation, embankment and all other hardware, materials and labor required to construct the guardrail as shown except for the End Anchor. Payment for Item 606 - Post End Anchor (or Concrete Block End Anchor), Each, shall include the extra cost of concrete blocks or steel posts and all other hardware, materials and labor required to construct the End Anchor.

**END ANCHORS:** A Post End Anchor is the preferred and treatment. A Concrete Block End Anchor may be installed in any location that does not permit the installation of posts. Concrete Blocks may be either pre-cast or cast-in-place and shall meet the requirements of CMS 606.02. The guardrail panel in the end anchors shall be pre-drilled and then galvanized per CMS 606.02. The finished ground line over the end anchor should be smooth and consistent with the surrounding topography, i.e., embankment shall not be mounded over the end anchor to achieve the proper amount of cover.
WASHER DETAIL
3/8" THICK SQUARE WASHER

PLATE DETAIL
1/2" THICK STEEL PLATE

Plan detail showing:
- Steel Post (Typ.)
- Plate (Typ.)
- Connector
- Terminal
- W-Beam Guardrail

Elevation detail showing:
- 1" dia. Hole drilled through W-Beam and Post Flange, attached to plate with 3/8"x2" Hex Bolt, Square Washer and Nut.
- Plate
- Steel Post

- Plate Detail
- Plan
- Elevation

CONCRETE BLOCK END ANCHOR

Posts 1 and 2 are not used in concrete option.

The 1/2" Steel Plate may be welded or bolted to the Post. If the Plate is bolted to the Post use four 8"x5/8" long hex head bolts with nuts. If the Plate is welded to the Post do not drill 1/2" holes in the Plate or the Post Flanges.

Bolts shall be either mechanical or set in epoxy adhesive per CMS 705.20. Length of bolt and size of hole to be determined by manufacturer's recommendation.
FLARED ANCHOR ASSEMBLIES

APPLICATION: Utilize details shown here only where approach foreslopes are 6:1 or flatter.

SLOPES: Slopes designated by * are 6:1 or flatter. Construct slopes labeled "A" or "B" as specified in the plans.

DISTANCE: The length of need (LON) represents the distance from the control point to the beginning of the end treatment. "D" is the lateral offset of the flare.

The control point shown designates the extent of the hazard being shielded and is shown for design use only. See Location & Design Manual, Volume 1, Section 602 for more information.

GRADING: The Anchor Assembly shown requires proper grading to function properly. See GRADING PLAN FOR FLARED ANCHOR ASSEMBLIES for more information.

ANCHOR ASSEMBLY: Install MGS Type B Anchor Assemblies according to the Manufacturer's instructions. Products are installed either on a curved flare or straight flare.

ANCHOR ASSEMBLY: Install MGS Type B Anchor Assemblies for more information.

GRADING: The Anchor Assembly shown requires proper grading to function properly. See GRADING PLAN FOR FLARED ANCHOR ASSEMBLIES for more information.

ANCHOR ASSEMBLY: Install MGS Type B Anchor Assemblies according to the Manufacturer's instructions. Products are installed either on a curved flare or straight flare.

ANCHOR ASSEMBLY: Install MGS Type B Anchor Assemblies for more information.

NOTES

Application: Utilize details shown here only where approach foreslopes are 6:1 or flatter.

Slopes designated by * are 6:1 or flatter. Construct slopes labeled "A" or "B" as specified in the plans.

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Grading: The Anchor Assembly shown requires proper grading to function properly. See GRADING PLAN FOR FLARED ANCHOR ASSEMBLIES for more information.

Anchor Assembly: Install MGS Type B Anchor Assemblies according to the Manufacturer's instructions. Products are installed either on a curved flare or straight flare.

Anchor Assembly: Install MGS Type B Anchor Assemblies for more information.

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ANCHOR ASSEMBLY: Install MGS Type B Anchor Assemblies for more information.
INTRODUCTION OF GUARDRAIL RUNS

STANDARD ROADWAY CONSTRUCTION DRAWING

SCD NUMBER
MGS-5.3

Fore slopes steeper than 6:1

ENGINEER STDS.

REVISION DATE
7-15-2016

TRANSPORTATION ADMINISTRATOR
STATE OF OHIO DEPARTMENT OF TRANSPORTATION

Flowline of Ditch

* * *

Notes

APPLICATION: Utilize details shown here only where approach foreslopes are steeper than 6:1, but not steeper than 3:1.

SLOPES: Slopes designated by A shall be 3:1 or flatter. Slopes labeled "A" and "B" shall be constructed as specified in the plans.

"LON" DISTANCE: The length of need, LON, represents the distance from the control point to the beginning of the guardrail installation.

OFFSET DESIGN: The design shown may be specified on the plans where it is deemed detrimental to lose effective shoulder width due to the dimensions of the MGS Type E Anchor Assembly. The Type E Anchor Assembly shall be MGS Type E Anchor Assemblies unless otherwise specified in the plans.

OBSTRUCTION INSTALLATION: Use this installation for one-directional roadways only.

LOCATION & DESIGN MANUAL, VOLUME 1, SECTION 602.

APPLICATION: Utilize details shown here only where approach foreslopes are steeper than 6:1, but not steeper than 3:1.

NOTES

OFFSET DESIGN: The design shown may be specified on the plans where it is deemed detrimental to lose effective shoulder width due to the dimensions of the MGS Type E Anchor Assembly. The Type E Anchor Assembly shall be MGS Type E Anchor Assemblies unless otherwise specified in the plans.

REFERENCES: See Location & Design Manual, Volume 1, Section 602.

OFFSET DESIGN (Plan View)

SECTION A-A

NOTES

APPLICATION: Utilize details shown here only where approach foreslopes are steeper than 6:1, but not steeper than 3:1.

SLOPES: Slopes designated by A shall be 3:1 or flatter. Slopes labeled "A" and "B" shall be constructed as specified in the plans.

"LON" DISTANCE: The length of need, LON, represents the distance from the control point to the beginning of the guardrail installation.

OFFSET DESIGN: The design shown may be specified on the plans where it is deemed detrimental to lose effective shoulder width due to the dimensions of the MGS Type E Anchor Assembly. The Type E Anchor Assembly shall be MGS Type E Anchor Assemblies unless otherwise specified in the plans.

OBSTRUCTION INSTALLATION: Use this installation for one-directional roadways only.

OFFSET DESIGN: The design shown may be specified on the plans where it is deemed detrimental to lose effective shoulder width due to the dimensions of the MGS Type E Anchor Assembly. The Type E Anchor Assembly shall be MGS Type E Anchor Assemblies unless otherwise specified in the plans.

LOCATION & DESIGN MANUAL, VOLUME 1, SECTION 602.

APPLICATION: Utilize details shown here only where approach foreslopes are steeper than 6:1, but not steeper than 3:1.

NOTES

OFFSET DESIGN: The design shown may be specified on the plans where it is deemed detrimental to lose effective shoulder width due to the dimensions of the MGS Type E Anchor Assembly. The Type E Anchor Assembly shall be MGS Type E Anchor Assemblies unless otherwise specified in the plans.

REFERENCES: See Location & Design Manual, Volume 1, Section 602.

OFFSET DESIGN (Plan View)

SECTION A-A

NOTES

APPLICATION: Utilize details shown here only where approach foreslopes are steeper than 6:1, but not steeper than 3:1.

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LOCATION & DESIGN MANUAL, VOLUME 1, SECTION 602.

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OFFSET DESIGN: The design shown may be specified on the plans where it is deemed detrimental to lose effective shoulder width due to the dimensions of the MGS Type E Anchor Assembly. The Type E Anchor Assembly shall be MGS Type E Anchor Assemblies unless otherwise specified in the plans.

REFERENCES: See Location & Design Manual, Volume 1, Section 602.

OFFSET DESIGN (Plan View)

SECTION A-A

NOTES

APPLICATION: Utilize details shown here only where approach foreslopes are steeper than 6:1, but not steeper than 3:1.

SLOPES: Slopes designated by A shall be 3:1 or flatter. Slopes labeled "A" and "B" shall be constructed as specified in the plans.

"LON" DISTANCE: The length of need, LON, represents the distance from the control point to the beginning of the guardrail installation.

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OBSTRUCTION INSTALLATION: Use this installation for one-directional roadways only.

OFFSET DESIGN: The design shown may be specified on the plans where it is deemed detrimental to lose effective shoulder width due to the dimensions of the MGS Type E Anchor Assembly. The Type E Anchor Assembly shall be MGS Type E Anchor Assemblies unless otherwise specified in the plans.

LOCATION & DESIGN MANUAL, VOLUME 1, SECTION 602.

APPLICATION: Utilize details shown here only where approach foreslopes are steeper than 6:1, but not steeper than 3:1.

NOTES

OFFSET DESIGN: The design shown may be specified on the plans where it is deemed detrimental to lose effective shoulder width due to the dimensions of the MGS Type E Anchor Assembly. The Type E Anchor Assembly shall be MGS Type E Anchor Assemblies unless otherwise specified in the plans.

REFERENCES: See Location & Design Manual, Volume 1, Section 602.

OFFSET DESIGN (Plan View)
1) The length of guardrail needed shall be determined according to methods contained in the Location and Design Manual, Volume 1, Section 602. Quantities shown on this sheet are based on these methods, using a lateral offset of 10' for the area of concern, a length of 90' and a guardrail taper/flare rate of 10:1 maximum.

2) Use DESIGN "A" in narrow medians where the end of the guardrail run extends into the clear zone of the opposite side traffic. In medians where the guardrail run would otherwise extend beyond the centerline of the median, turn the guardrail run to follow the centerline using a standard flare arc (shown on Sheet 2). The plans shall clearly indicate which portion of the flared guardrail run is to be constructed using barrier guardrail.

3) Use DESIGN "B" where the guardrail run lies outside of the clear zone of the opposite side traffic. In this case, the design of the guardrail flare in the median would be similar to that of the guardrail approaches on the outside shoulder. Estimated quantities are provided in the box below.

4) Provide 8:1 maximum cross-slopes in front of guardrail and in the median.

---

### Table: Recommended Lengths for Guardrail Flares at Bridge Approaches (FT.)

<table>
<thead>
<tr>
<th>Guardrail flare and taper at median</th>
<th>Taper Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>62.5</td>
</tr>
<tr>
<td>6</td>
<td>60.5</td>
</tr>
<tr>
<td>8</td>
<td>50</td>
</tr>
<tr>
<td>10</td>
<td>37.5</td>
</tr>
<tr>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>14</td>
<td>12.5</td>
</tr>
<tr>
<td>16</td>
<td>12.5</td>
</tr>
</tbody>
</table>

---

### Design Notes:

1. Including the 25'-0" Standard Flare Arc coming off the Bridge, but excluding the Anchor Assembly/Attenuator device.
2. For use with a DESIGN "A" medium or on the outside shoulder approach to the Bridge.
3. Lengths are based on using whole numbers of guardrail panels (12'-6" long).
4. For the Type A Anchor Assembly, 25' may be deducted from the guardrail Length of Need.
Bridge Terminal Assembly
(Type 1 shown)

Paved Shoulder

Face of Parapet or Face of Pavement shown on Typical Sections

SECTION A-A

GUARDRAIL FLARE ARC DETAIL

GUARDRAIL OFFSET TRANSITION

RECOMMENDED LENGTHS FOR GUARDRAIL OFFSET TRANSITIONS

<table>
<thead>
<tr>
<th>Difference in Offset (ft)</th>
<th>Total Length (ft)</th>
<th>Taper Length on Flares (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>75</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>87.5</td>
<td>12.5</td>
</tr>
<tr>
<td>6</td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>8</td>
<td>122.5</td>
<td>37.5</td>
</tr>
<tr>
<td>10</td>
<td>125</td>
<td>50</td>
</tr>
</tbody>
</table>

Flare Arc

25' tangent (See detail)

GUARDRAIL AT BRIDGES

25'-0" (ft)

Normal position of Post A

Taper Line

Guardrail

Taper Length

Normal position of Post A

Edge of Traveled Way

Paved Shoulder

Edge of Traveled Way
NOTES

1) The length of guardrail needed shall be determined according to methods contained in the Location & Design Manual, Volume 1, Section 602.

2) Use DESIGN "A" where the end of the guardrail run extends into the clear zone of the opposite side of traffic.

3) Use DESIGN "B" where the end of the guardrail run lying outside the clear zone of the opposite side of traffic.

4) Provide 10:1 Max or flatter cross-slopes in front of guardrail. Other slopes are shown in the median to suggest a grading and drainage plan, however for complete details see the construction plans.

5) Install Type T Anchor Assemblies (see SCD MGS-4.2) on the trailing ends of the guardrail beyond the bridge piers downstream from traffic flow.

6) The "HIGH SIDE" and the "LOW SIDE" designations are shown in the reference to the drainage design and are dependent upon the longitudinal slope in the median.

* Provide 25' Guardrail Flare Arc (7:1 Max).

LOCATION & DESIGN Manual, Volume 1, Section 602.

The "HIGH SIDE" and the "LOW SIDE" designations are shown in the reference to the drainage design and are dependent upon the longitudinal slope in the median.

* Provide 25' Guardrail Flare Arc (7:1 Max).
THREE BEAM BULLNOSE AT BRIDGE PIERS

THREE BEAM RAIL NO. 1

SLOTTED THREE BEAM RAIL NO. 1

SLOTTED THREE BEAM RAIL, DIMENSIONS SHOWN ARE BEFORE BENDING TO THE RADIUS SHOWN.

SLOT DETAILS

SLOT A

SLOT B

SLOT C

SLOT D

SLOT E

SLOT F

SLOT G

SLOT H

SLOT I

SLOT J

SLOT K

SLOT L

SLOT M

SLOT N

SLOT O

SLOT P

SLOT Q

SLOT R

SLOT S

SLOT T

SLOT U

SLOT V

SLOT W

SLOT X

SLOT Y

SLOT Z

SLOT AA

SLOT AB

SLOT AC

SLOT AD

SLOT AE

SLOT AF

SLOT AG

SLOT AH

SLOT AI

SLOT AJ

SLOT AK

SLOT AL

SLOT AM

SLOT AN

SLOT AO

SLOT AP

SLOT AQ

SLOT AR

SLOT AS

SLOT AT

SLOT AU

SLOT AV

SLOT AW

SLOT AX

SLOT AY

SLOT AZ

THREE BEAM BCT POSTS

STEEL FOUNDATION TUBE

THREE-BEAM BCT POSTS

THREE-BEAM CRT WOOD POSTS

THREE-BEAM WOOD POSTS

TAPERED WOOD BLOCK

UNBENT STANDARD THREE BEAM RAIL NO. 4

SIDE VIEW
FRONT VIEW

STANDARD WOOD BLOCK

SIDE VIEW
FRONT VIEW

THREE-BEAM WOOD POSTS
**CAP DESIGN**

- **DESIGN 1**
- **DESIGN 2**
- **DESIGN 3**
- **DESIGN 4**
- **DESIGN 5**
- **DESIGN 6**

*Furnish a positional mark after monument is constructed. Ensure positional mark is either a Punch Mark or a Chisled X.*

**MONUMENT TYPE**

- **TYPE A**
  - 1" min. dia. Aluminum Cap
  - **APPLICATION**
    - Right-of-Way Monuments
    - E Parcels & Non-Right-of-Way
  - **CAP DESIGN**
    - A
    - B
    - C
  - **PAY ITEM**
    - 623

- **TYPE B**
  - **APPLICATION**
    - Reference Monuments
  - **CAP DESIGN**
    - A
    - C
  - **PAY ITEM**
    - 623

**NOTES**

- Monument Types 4 & 6 are typically set outside pavement areas.
- Monument Type C is typically set in pavement areas.
- Cap Designs 3 and 4 are to be installed when the Right-of-Way Monuments are disturbed, destroyed, and/or damaged by construction activities and are to be reset.
- Right-of-Way Monuments are typically set prior to construction and are expected to be protected during construction unless otherwise specified in the plans.
MONUMENT TYPE C

**SECTION A-A**
- **Adjustment Frame**
- **Cover**
- **Steel Rod 1" min.**
  - Dia., x 36" long, square cut end and ground smooth
- **Concrete Sand Compacted by Flooding**
- **Class C Concrete 2" thick**

**SECTION C-C**
- **Concrete Sand Compacted by Flooding**
- **Class C Concrete 2" thick**

**SIDE VIEW**
- **Recessed Letter**
- **Adjustment Frame**
- **Steel Rod 1" min.**
  - Dia., x 36" long, square cut end and ground smooth
- **Concrete Sand Compacted by Flooding**
- **Class C Concrete 2" thick**

**SECTION B-B**
- **Recessed Letter**
- **Bolt Pad**
- **Concrete Sand Compacted by Flooding**
- **Class C Concrete 2" thick**

---

Reynaldo Stargell
M. Rupp

This drawing replaces RM-1.1 dated 1-18-2013.
NOTES

GENERAL: Locate the top of the integral wall 1" to 3" above ground line.

TYPE A: Fabricate hand railing and stair posts from nominal size 1½ diameter 0.014" wall thickness steel pipe meeting the requirements of the Specification for Welded and Seamless Steel Pipe ASTM A 53 Standard Weight, Schedule Number 40, or aluminium pipe meeting the requirements of the Specification for Aluminium Alloy Pipe ASTM B 241, 6063 T6 4SA, Schedule Number 40.

Galvanize steel handrails and stair posts after fabrication, as specified in ASTM A 93. Paint weld splices for steel railing. Re-galvanize areas in which the spelter coating has been damaged, as specified in AASHTO M 36, Section 24. Metalizing process or repair under the direction of the Engineer with stick-form galvanizing repair compound meeting Federal Specification G-S-533.

Install a single handrail on the right side of the stairs, facing up, unless otherwise shown on the plans.

For stair widths greater than 41", a handrail is required on both sides of the stairs. Install hand railings on both sides of stairs that are less than 43" wide, when required by the plans.

Provide splices for aluminum railing with internal sleeves, and after welding, be smooth and water tight.

Cast-in-place or set stair posts in sockets filled with 1:3 proportioned cement mortar. Provide a heavy coating of asphalt varnish or coal-tar pitch paint (both inside and outside) to the portion of aluminum stair posts set into concrete or mortar. Embed the stair posts a minimum depth 4".

Install stair posts and handrails free of burrs, or sharp projections.

LEGEND

H = 34" min., 58" max.
W = 4" min., 7" max.
T = 1½" min., 3½" max.

1' = Equal interior panel lengths equal. The upper and lower panel lengths may vary. Panel lengths are not to exceed 3'-6".

Unless shown otherwise on the plans.

Measurable tread per CMS 608.08

SECTION B-B

See NOSING DETAIL

TYPE B (Less than 3 Risers)

SECTION A-A

See NOSING DETAIL

TYPE A

(For 3 Risers or more)

NOSING DETAIL

All risers shall be of equal height and all treads shall be of equal depth on any set of stairs.

GENERAL: Locate the top of the integral wall 1" to 3" above ground line.
**NOTES**

**CONCRETE MEDIANS & TRAFFIC ISLANDS:** Construct as specified in CMS 609.

**ANCHORS AND GROUT:** For median widths of 6' or less, use one line of #3 rebars at 3'-0" on center spacing.

**SHOULDER WIDTH:** See Location and Design Manual Volume 1 for shoulder width if not specified in the plans.

**CONCRETE MEDIAN THICKNESS:** Thickness of the median/nose "T" shall be 4" unless otherwise specified in the plans.

**DISTANCE TO BREAK:** The Distance To Break "W" shall be 2'-6" unless otherwise specified in the plans.

**BASE:** Thickness of the base shall be 4" and the same material as an adjacent roadway unless otherwise specified in the plans.

**LEGEND**

- Concrete Median
- Base Material
- Subgrade

**MEDIAN NOSE RAMPING AT APPROACH END OF MEDIAN OR CORNER**
NOTES

GENERAL See CMS 622 for additional information. The minimum design strength of the concrete is 4,000 psi, and will meet the requirements of CMS 499.

PORTABLE CONCRETE BARRIER (PCB) As shown is not to be used on bridge deck edges, or similar drop-offs, the only suitable barrier in this situation is a 32" PCB as detailed on Structural Engineering's Standard Drawing PCB-91 or approved alternatives as posted on the Office of Roadway Engineering's website.

50" TRANSITION SECTION Only segments shown on SCD RM-4.2, or approved Impact Attenuators, may be attached to the 50" side of a 50" transition section. Do not connect an impact attenuator to a 50" barrier end.

HINGE AND REINFORCING BARS The ⅜" hinge bars may be ASTM A 36. Reinforcing steel shall meet the requirements of CMS 509 (ASTM A 615 Grade 60). Wire mesh shall meet CMS 709.30. Black steel is permitted.

CONNECTING HARDWARE Galvanize bolts, washers and hex nuts after fabrication per CMS 711.02 and meeting the requirements of CMS 110.9, except that the Rotational Capacity test specified in ASTM A 325 shall be waived.

HANDLING DEVICES Such devices may be used in lieu of the lifting slot for moving the barrier. They may be of any design sufficient to handle the weight of the section being lifted. No handling devices shall protrude from the surface of the barrier when in place.

MARKING All barrier segments are to be marked as shown, where XX indicates the year cast. Permanently impress these marking on the barrier using a minimum of 2 inch high lettering.

On the top of each barrier segment, including the transition section, permanently mark a unique identification as to the manufacturer. And somewhere on the barrier, permanently mark the day and month the barrier was manufactured.

REFLECTORIZATION Install barrier reflectors in accordance with Traffic Engineering Standard Drawing MT-101.70, when specified in the plans.

PAYMENT: This barrier is paid for in feet as ITEM 622 - Portable Barrier, 50". Approved Drawing MT-101.70, when specified in the plans.

GENERAL: See CMS 622 for additional information. The minimum design strength of the concrete is 4,000 psi, and will meet the requirements of CMS 499.

PORTABLE CONCRETE BARRIER (PCB) As shown is not to be used on bridge deck edges, or similar drop-offs, the only suitable barrier in this situation is a 32" PCB as detailed on Structural Engineering's Standard Drawing PCB-91 or approved alternatives as posted on the Office of Roadway Engineering's website.

50" TRANSITION SECTION Only segments shown on SCD RM-4.2, or approved Impact Attenuators, may be attached to the 50" side of a 50" transition section. Do not connect an impact attenuator to a 50" barrier end.

HINGE AND REINFORCING BARS The ⅜" hinge bars may be ASTM A 36. Reinforcing steel shall meet the requirements of CMS 509 (ASTM A 615 Grade 60). Wire mesh shall meet CMS 709.30. Black steel is permitted.

CONNECTING HARDWARE Galvanize bolts, washers and hex nuts after fabrication per CMS 711.02 and meeting the requirements of CMS 110.9, except that the Rotational Capacity test specified in ASTM A 325 shall be waived.

HANDLING DEVICES Such devices may be used in lieu of the lifting slot for moving the barrier. They may be of any design sufficient to handle the weight of the section being lifted. No handling devices shall protrude from the surface of the barrier when in place.

MARKING All barrier segments are to be marked as shown, where XX indicates the year cast. Permanently impress these marking on the barrier using a minimum of 2 inch high lettering.

On the top of each barrier segment, including the transition section, permanently mark a unique identification as to the manufacturer. And somewhere on the barrier, permanently mark the day and month the barrier was manufactured.

REFLECTORIZATION Install barrier reflectors in accordance with Traffic Engineering Standard Drawing MT-101.70, when specified in the plans.

PAYMENT: This barrier is paid for in feet as ITEM 622 - Portable Barrier, 50". Approved Drawing MT-101.70, when specified in the plans.

GENERAL: See CMS 622 for additional information. The minimum design strength of the concrete is 4,000 psi, and will meet the requirements of CMS 499.
Hinge Bar Type A
\(\frac{3}{8}\) in. x 81.3", Four per segment.

Hinge Bar Type B
\(\frac{3}{8}\) in. x 86.4", Four per segment.

Connecting Pin is a \(\frac{3}{8}\)" diameter by \(\frac{3}{4}\)" Grade 5 galvanized high strength steel bolt, with 3" of threads. Each bolt passes through eight hinge bar loops - four on each segment.

The assembly requires two F436 \(\frac{3}{16}\)" flat washer with an ID of \(\frac{5}{16}\)" and an OD of 2.5". The thickness is 0.156". The flat washer is hot dipped galvanized.

The assembly also requires one \(\frac{3}{8}\)" hex nut. The nut is hot dipped galvanized and waxed and is categorized 2H/DH.

Connecting Pin Assembly

Welded Wire Fabric, 6 x 6 x 2.9 x 2.9

WWF Elevation
Showing mesh before bending

REINFORCING BAR LIST

<table>
<thead>
<tr>
<th>Mark</th>
<th>Bar</th>
<th>Bar Length</th>
<th>Shape</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>BARRIER SECTION reinforced</td>
<td>X001</td>
<td>(\frac{3}{8})&quot; to 13-4&quot;</td>
<td>Str.</td>
<td>5</td>
</tr>
<tr>
<td>50° TAPERED END</td>
<td>X002</td>
<td>5-4&quot;</td>
<td>Str.</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>X003</td>
<td>5-4&quot;</td>
<td>Str.</td>
<td>2</td>
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</table>

SECTION A-A
CLOSING JOINT
Barriers shall initially be placed close together so that bolts can be easily inserted through hinge bar loop.

SECTION A-A
OPEN JOINT
NORMAL OPERATION
Barrier joints shall be fully open before the nut is tightened onto bolt.

Joint Connection Detail
NOTES

GENERAL: See CMS 622 for additional information. The minimum design strength of the concrete is 4,000 psi, and will meet the requirements of CMS 499.

PORTABLE CONCRETE BARRIER (PCB): As shown is not to be used on bridge deck edges, or similar dropoff. The only suitable barrier in this situation is a 50" PCB as detailed on Structural Engineering's Standard Drawing PCB-91 or approved alternatives as posted on the Office of Roadway Engineering's website.

50° TRANSITION SECTION: Only segments shown on SCD RM-4.1, or approved Impact Attenuators, may be attached to the 32" side of a 50° transition section. Do not connect an impact attenuator to a 50° barrier end.

HINGE AND REINFORCING BARS: The 3/16" hinge bars may be ASTM A-36. Reinforcing steel shall meet the requirements of CMS 509 (ASTM A 615 Grade 60). Wire mesh shall meet CMS 709.10. Black steel is permitted.

CONNECTING HARDWARE: Galvanize bolts, washers and hex nuts after fabrication per CMS T-99.02 and meeting the requirements of CMS T-99.09, except that the Rotational Capacity test specified in ASTM A 522 shall be waived.

HANDLING DEVICES: Such devices may be used in lieu of the lifting slot for moving the barrier. They may be of any design sufficient to handle the weight of the section being lifted. No handling device shall protrude from the surface of the barrier when in place.

MARKING: All barrier segments are to be marked as shown, where XX indicates the year cast. Permanently impress these marking on the barrier using a minimum of 2 inch high lettering. On the top of each barrier segment, including the transition section, permanently mark a unique identification as to its manufacturer. And somewhere on the barrier, permanently mark the day and month the barrier was manufactured.

REFLECTORIZING: Install barrier reflectors in accordance with Traffic Engineering Standard Drawing MT-02.70, when specified in the plans.

PAYMENT: This barrier is paid for in feet as ITEM 622 - Portable Barrier, 50". Approved Drawing MT-101.70, when specified in the plans.

REFERENCES: See MARKINGS NOTE for X502 and X503 details (Sheet 2).

PORTABLE CONCRETE BARRIER (PCB): As shown is not to be used on bridge deck edges, or similar dropoff. The only suitable barrier in this situation is a 50" PCB as detailed on Structural Engineering's Standard Drawing PCB-91 or approved alternatives as posted on the Office of Roadway Engineering's website.

50° TRANSITION SECTION: Only segments shown on SCD RM-4.1, or approved Impact Attenuators, may be attached to the 32" side of a 50° transition section. Do not connect an impact attenuator to a 50° barrier end.

HINGE AND REINFORCING BARS: The 3/16" hinge bars may be ASTM A-36. Reinforcing steel shall meet the requirements of CMS 509 (ASTM A 615 Grade 60). Wire mesh shall meet CMS 709.10. Black steel is permitted.

CONNECTING HARDWARE: Galvanize bolts, washers and hex nuts after fabrication per CMS T-99.02 and meeting the requirements of CMS T-99.09, except that the Rotational Capacity test specified in ASTM A 522 shall be waived.

HANDLING DEVICES: Such devices may be used in lieu of the lifting slot for moving the barrier. They may be of any design sufficient to handle the weight of the section being lifted. No handling device shall protrude from the surface of the barrier when in place.

MARKING: All barrier segments are to be marked as shown, where XX indicates the year cast. Permanently impress these marking on the barrier using a minimum of 2 inch high lettering. On the top of each barrier segment, including the transition section, permanently mark a unique identification as to its manufacturer. And somewhere on the barrier, permanently mark the day and month the barrier was manufactured.

REFLECTORIZING: Install barrier reflectors in accordance with Traffic Engineering Standard Drawing MT-02.70, when specified in the plans.

PAYMENT: This barrier is paid for in feet as ITEM 622 - Portable Barrier, 50". Approved Drawing MT-101.70, when specified in the plans.

REFERENCES: See MARKINGS NOTE for X502 and X503 details (Sheet 2).
### Hinge Bar Details

**Hinge Bar Type A**
- \( \frac{5}{8} \) dia. x 61.3”
- Four per segment.

**Hinge Bar Type B**
- \( \frac{3}{8} \) dia. x 86.4”
- Four per segment.

### REINFORCING BAR LIST

<table>
<thead>
<tr>
<th>Mark</th>
<th>Bar</th>
<th>Bar Length</th>
<th>Shape</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>X500</td>
<td>45</td>
<td>9'-6&quot;</td>
<td>Str.</td>
<td>5</td>
</tr>
<tr>
<td>X502</td>
<td>45</td>
<td>5'-4&quot;</td>
<td>Str.</td>
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</tr>
<tr>
<td>X503</td>
<td>45</td>
<td>6'-8&quot;</td>
<td>Str.</td>
<td>2</td>
</tr>
</tbody>
</table>

### Section A-A

**Closed Joint**
- Barriers shall initially be placed close together so that bolts can be easily inserted through hinge bar loops.

**Open Joint**
- Section A-A
- Normal Operation
- Barrier joints shall be fully open before the nut is tightened onto bolt.

### Joint Connection Detail

- Connecting Pin is a 11/4" diameter by 43" Grade 5 galvanized high strength steel bolt, with 3" of threads. Each bolt passes through eight hinge bar loops - four on each segment.
- The assembly requires two F436 11/4" flat washer with an ID of 1 1/8" and an OD of 2 5/8". The thickness is 0.056". The flat washer is hot dipped galvanized.
- The assembly also requires one 11/4" -7 heavy hex nut. The nut is hot dipped galvanized and waxed and is intergrated with bolt.
**NOTES (NEW JERSEY SHAPE)**

**GENERAL** This barrier may be manufactured with reinforcing steel or with welded wire fabric as shown in the ELEVATION and SECTION A-A details. See CMS 622 for additional information. The minimum design strength of the concrete is 4,000 psi and meets the requirements of CMS 499.

**Barrier Types** New Jersey Shape and F-Shape in the same run shall not be mixed.

**PORTABLE CONCRETE BARRIER** PCB does not use the PB Detailed here on bridge deck edges, or similar design. The PB, Bridge Mounted, shown in Structural Engineering's Standard Drawing PCB-91, or approved alternative products as shown on the Office of Roadway Engineering's website, shall be used at those locations in accordance with that office's PCBDD Design Data Sheet.

**HINGE AND REINFORCING BARS** Use ASTM A 36 for the 3/8" hinge bars. Use rebars meeting the requirements of CMS 509 ASTM A 505 Grade 60. Wire mesh shall meet CMS 709.10. Black Steel is permitted.

**CONNECTING HARDWARE** Bolts, washers and hex nuts are to be galvanized after fabrication per CMS 711.02 and meet the requirements of CMS 711.09 except that the rotational capacity test specified in ASTM A 520 shall be waived.

**ALTERNATE BARRIER** Approved Alternate Portable Barrier can be found on the Office of Roadway Engineering's Website.

**HANDLING DEVICES** Such devices may be used in lieu of the lifting slot for moving the barrier. They may be of any design sufficient to safely handle the weight of the section being lifted. No handling devices shall protrude from the surface of the barrier when in place.

**MARKINGS** All barrier segments are to be marked on the top, as shown, where XX indicates the year cast. If the barrier is cast using welded wire fabric instead of the rebar, and WWF to the end of the notation. Permanently impress these markings in the barrier using a minimum of 2" high lettering. The tapered end section is not required to be marked.

On the top of each barrier segment, including tapered end sections, permanently mark a unique identification as to its manufacturer, and somewhere on the barrier, permanently mark the day and month the barrier was manufactured.

**REFLECTORIZATION** Install barrier reflectors in accordance with Roadway Engineering Standard Drawing MB-2010, when specified in the plans.

**PAYMENT** This barrier is paid for in feet as ITEM 622 - Portable Barrier, 32". Approved alternatives to the barrier shown on this drawing (and SCD PCB-91) can be found on the Office of Roadway Engineering's website.

**Barrier Sections** Meeting this standard and cast before January 1, 2020, may continue to be used until December 31, 2029, provided the barrier section remains in conformance with the quality standards for temporary traffic control devices and acceptable delineation methods for vehicles.

**General** This barrier may be manufactured with reinforcing steel or with welded wire fabric as shown in the ELEVATION and SECTION A-A details. See CMS 622 for additional information. The minimum design strength of the concrete is 4,000 psi and meets the requirements of CMS 499.

**Barrier Types** New Jersey Shape and F-Shape in the same run shall not be mixed.

**PORTABLE CONCRETE BARRIER** PCB does not use the PB Detailed here on bridge deck edges, or similar design. The PB, Bridge Mounted, shown in Structural Engineering's Standard Drawing PCB-91, or approved alternative products as shown on the Office of Roadway Engineering's website, shall be used at those locations in accordance with that office's PCBDD Design Data Sheet.

**HINGE AND REINFORCING BARS** Use ASTM A 36 for the 3/8" hinge bars. Use rebars meeting the requirements of CMS 509 ASTM A 505 Grade 60. Wire mesh shall meet CMS 709.10. Black Steel is permitted.

**CONNECTING HARDWARE** Bolts, washers and hex nuts are to be galvanized after fabrication per CMS 711.02 and meet the requirements of CMS 711.09 except that the rotational capacity test specified in ASTM A 520 shall be waived.

**ALTERNATE BARRIER** Approved Alternate Portable Barrier can be found on the Office of Roadway Engineering's Website.

**HANDLING DEVICES** Such devices may be used in lieu of the lifting slot for moving the barrier. They may be of any design sufficient to safely handle the weight of the section being lifted. No handling devices shall protrude from the surface of the barrier when in place.

**MARKINGS** All barrier segments are to be marked on the top, as shown, where XX indicates the year cast. If the barrier is cast using welded wire fabric instead of the rebar, and WWF to the end of the notation. Permanently impress these markings in the barrier using a minimum of 2" high lettering. The tapered end section is not required to be marked.

On the top of each barrier segment, including tapered end sections, permanently mark a unique identification as to its manufacturer, and somewhere on the barrier, permanently mark the day and month the barrier was manufactured.

**REFLECTORIZATION** Install barrier reflectors in accordance with Roadway Engineering Standard Drawing MB-2010, when specified in the plans.

**PAYMENT** This barrier is paid for in feet as ITEM 622 - Portable Barrier, 32". Approved alternatives to the barrier shown on this drawing (and SCD PCB-91) can be found on the Office of Roadway Engineering's website.

**Barrier Sections** Meeting this standard and cast before January 1, 2020, may continue to be used until December 31, 2029, provided the barrier section remains in conformance with the quality standards for temporary traffic control devices and acceptable delineation methods for vehicles.
**SECTION BARRIER END**

**32" TAPERED END**

**WITH PIN & LOOP CONNECTION**

**ELEVATION**

**PLAN**

**SECTION C-C**

**CLOSED JOINT**

Barriers shall initially be placed close together so that bolts can be easily inserted through hinge loop.

**OPEN JOINT**

Barrier joints shall be fully open before the nut is tightened onto bolt.

**JOINT CONNECTION DETAILS**

**PIN & LOOP**

**DETAIL AT HINGED CONNECTION**

Shown with reinforcing.

**REINFORCING BAR LIST**

<table>
<thead>
<tr>
<th>Bar</th>
<th>Bar Length</th>
<th>Quantity per typ. length</th>
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<tbody>
<tr>
<td>X501</td>
<td>5'-5&quot;</td>
<td>Str. 9'-4&quot;</td>
</tr>
<tr>
<td>Y301</td>
<td>9'-4&quot;</td>
<td>Str. 11'-4&quot;</td>
</tr>
<tr>
<td>X502</td>
<td>9'-6&quot;</td>
<td>Str. 19'-4&quot;</td>
</tr>
</tbody>
</table>

**BENDING DIAGRAM**

Connecting Pin Assembly: 1 1/4" dia. High Strength Bolt with Plate Washers (2) and High Strength Heavy Hex Nut, Fully Threaded.
GENERAL: This barrier may be manufactured with reinforcing steel or with welded wire fabric as shown in the ELEVATION and SECTION A-A details. See CMS Item 622 for additional information. Provide class 509 concrete with a minimum compressive strength of 5,000 psi and permeability of 2,000 cfs. Provide uncoated reinforcing steel or welded wire fabric in accordance with CMS Item 509.

Barrier Types: New Jersey Shape and F-Shape in the same run shall not be mixed. Welded Wire Fabric with the same bar sizes as shown may be used instead of Rebar.

HINGE AND REINFORCING BARS: Use ASTM A 36 for the \(""\) hinge bar. Use rebars meeting the requirements of CMS 509 ASTM A 414 Grade 60. Wire mesh shall meet CMS 109.40. Black Steel is permitted.

CONNECTING HARDWARE: Bolts and washers are to be galvanized after fabrication per CMS 710.02 and meet the requirements of CMS 109.09 except that the Rotational Capacity test specified in ASTM A 325 shall be waived.

ALTERNATE BARRIERS: Approved Alternate Portable Barrier can be found on the Office of Roadway Engineering's Website. Drainage/Lifting Slot

HANDELING DEVICES: Such devices may be used in lieu of the lifting slot for moving the barrier. They may be of any design sufficient to safely handle the weight of the section being lifted. No handling devices shall protrude from the surface of the barrier when in place.

MARKINGS: All barrier segments are to be marked on the top, PCB-XX-MASH-TL3, where XX indicates the year the barrier was manufactured. And somewhere on the barrier, permanently mark the day and month the barrier was manufactured. On the top of each barrier segment, including tapered end sections, permanently mark a unique identification as to its manufacturer. And somewhere on the barrier, permanently mark the day and month the barrier was manufactured. See CMS Item 622 for transitions.

INSTALLATION: Install barrier reflectors in accordance with Roadway Engineering Standard Drawing DM-0510, when specified in the plans.

PAYMENT: This barrier is paid for in feet as Item 622 = Portable Barrier, 32' Approved alternative to the barrier shown on this drawing can be found on the Office of Roadway Engineering's Website.
NOTES (F-SHAPE)

1. Use this standard for the anchoring of precast concrete barrier on asphalt or portland cement concrete pavement including bridge decks.

2. After removing anchoring pins, clean the pin holes and fill them with non-shrink mortar conforming to CMS 705.22.

3. Refer to the plans for locations of anchored barrier.

---

**PLATE WASHER DETAIL**

- Add washer detail

**CONNECTING PIN ASSEMBLY DETAIL**

- Add pin assembly detail

**SECTION B-B**

- Add section detail
TOE Detail (Typ.) See ALTERNATE TOE Detail on Sheet 2

See ADJOINING PAVEMENT Note.

When the barrier is constructed in conjunction with new concrete pavement and dowels are shown as in DOWEL DETAILS (see Sheet 2). When pavement is to be constructed on one side of the barrier only, then compacted soil on the opposite side must be placed against the barrier at a minimum height of 3".

SEALING JOINTS: Use a butt longitudinal joint between the barrier and adjoining concrete pavement sealed with CMS 705.04 joint sealer. See details shown on Sheet 2, will be made at the unit price bid per Each.

STATION MARKINGS: Provide a 4" clearance to barrier surfaces and to any raceways. Shown on the RACEWAY and DOWEL BAR PLACEMENT detail on this sheet. Provide a 4" clearance to barrier surfaces and to my raceways.

CONTRACTION JOINTS: Maximum allowable spacing of unsealed joints is 20' throughout the run of the barrier. Construct joints by using metal inserts inside the forms, preferred full width joint filler, a grooving tool, or by sawing, bitsing, troweled, or speed joints will have a 3" depth. Construct all joints for the full height of the barrier. SECTION JOINTS: Joint bar to barrier at any construction joint as required, 20' throughout the run of the barrier. SECTION JOINTS: Joint bar to barrier at any construction joint as required, 20' throughout the run of the barrier.

MATERIALS: Construct the surface course directly against the barrier. Set barrier placed on existing pavement with a continuous edge of surface material tapering from a minimum thickness of the toe of the barrier to zero. For subfractional installations construct the edge on both sides of the barrier, for subfractional installations, construct the edge on the travel way side and the width may be reduced to 0.5 milmin. The barrier is to be constructed in conjunction with concrete pavement, place it directly on the base material. Construct the concrete pavement side against the barrier. The barrier may be placed on top of existing concrete pavement and dowels as shown in DOWEL DETAILS (see Sheet 2). When pavement is to be constructed on one side of the barrier only, then compacted soil on the opposite side must be placed against the barrier at a minimum height of 3".

STATION MARKINGS: Use markings on the green concrete on both sides of the top of the barrier. The cost isincidental to the unit cost bid for this barrier.

RACEWAY: Locate on as shown in RACEWAY PLACEMENT detail, unless otherwise directed by the engineer. Ensure that the electrical raceway is clear of obstructions. Cost of the 4" polyethylene raceway is included where shown on the plans. The cost for all further installations and No. 10 AWG copper cable or aluminum wire is also included where shown on the plans for future installation of circuits.

PAYMENT: shall be made at the unit price bid per Foot for:

- Item 622 - Concrete Barrier, Single Slope, Type ______. Include all materials, labor, equipment, overheads, markups and other incidental necessary to construct the barrier, except as follows:

Item 622 Barrier Median Inlet 20 ft.
Item 625 Light Pole Foundation or Pullbox 8 ft.
Item 630 Rigid Overhead Sign Support Foundation Each

Payment for any reinforced anchors, as shown on the END ANCHORAGE detail shown on Sheet 2, will be made at the unit price bid per Each for Item 622 - Concrete Barrier, End Anchorage, Reinforced. It includes all materials, labor, and other incidental necessary to construct this barrier.
Dimensions for Y401 (English)

<table>
<thead>
<tr>
<th>Barrier Type</th>
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<th>y</th>
<th>z</th>
<th>Length</th>
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</thead>
<tbody>
<tr>
<td>B</td>
<td>3&quot;</td>
<td>24&quot;</td>
<td>8&quot;</td>
<td>10'-10&quot;</td>
</tr>
<tr>
<td>Bi</td>
<td>5&quot;</td>
<td>24&quot;</td>
<td>8&quot;</td>
<td>13'-2&quot;</td>
</tr>
</tbody>
</table>

Provide a 12" overlap.

Concrete Pavement (Shown with New Asphalt Pavement)

Steel dimensions for Types C and C1 barriers are not shown.

At expansion joints, construct an End Anchorage on both sides of the joint, with a maximum gap of 2" for the open joint. The maximum expansion joint spacing shall be 800'.

When barrier does not abut another barrier run, construct barrier runs and at interruptions in barrier caused by expansion joints. When barrier does not abut another barrier run, construct the last 15' using the END ANCHORAGE Detail as shown here.

Staggered Dowels

Contraction Joint

Concrete Pavement

Concrete Pavement

Concrete Pavement

Concrete Pavement

Concrete Pavement

Concrete Pavement

Concrete Pavement

Concrete Pavement

Concrete Pavement

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TYPICAL INSTALLATIONS CONCRETE BARRIER AT OBSTRUCTIONS

GENERAL: Single Slope Concrete Barrier, Type D, may be cast-in-place or slip-formed. See SCD RM-4.5 for other standard barrier types and any details not shown, including materials, adjoining pavement, and dowel joints. Longitudinal steel is not required when top width of barrier is 12" or greater.

CONTRACTION JOINTS: Maximum allowable spacing of unsealed joints is 20' throughout the run of the barrier. Construct joints by using metal inserts inside the forms, performed full with joint filler, a grooving tool, or by sawing. Inserted, formed or sawed joints will have a 3" minimum depth.

Construct all joints for the full height of the barrier. Saw as soon as curing will allow to prevent spalling. When used in conjunction with concrete pavement, match joints to those in the concrete pavement but not exceeding the maximum allowable spacing.

ADJOINING PAYMENT: When the barrier is constructed in conjunction with new asphalt pavement, place it directly on the intermediate course. Construct the surface course directly against the barrier. See SCD RM-4.6 for Type D End Section details.

END SECTIONS: End Sections are used when barrier connects to Bridge Terminal Assembly, Type 1. See SCD RM-4.6 for details.

RACEWAYS: Raceways on Type D barriers are typically not embedded. Dowel bars as per CMS 622.02. Bars are to be placed as shown on the DOWEL BAR PLACEMENT detail on Sheet 2.

CONSTRUCTION JOINTS: Barrier runs with abutting vertical surfaces at either required or permissible construction joints are to be doweled to each other by use of 3/8" dia. by 18" long epoxy coated deformed dowel bars as per CMS 622.02. Bars to be placed as shown on the DOWEL BAR PLACEMENT detail on Sheet 2.

CONTRACTION JOINTS: Maximum allowable spacing of unsealed joints is 20' throughout the run of the barrier. Construct joints by using metal inserts inside the forms, performed full with joint filler, a grooving tool, or by sawing. Inserted, formed or sawed joints will have a 3" minimum depth.

For Bridge Terminal Assembly, Type 1, details and connections, see SCD RM-4.5. Barrier installations that cannot be constructed of the normal guardrail offset and are to be connected to the approach or trailing guardrail runs shall have a 25' longitudinal taper to meet the existing or normal guardrail offset.

Installations that are not to be connected to the approach or trailing guardrail runs must include the standard guardrail flare as per CMS 622.02. Barriers are to be placed as shown on the DOWEL BAR PLACEMENT detail on Sheet 2.

GENERAL: Single Slope Concrete Barrier, Type D, may be cast-in-place or slip-formed. See SCD RM-4.5 for other standard barrier types and any details not shown, including materials, adjoining pavement, and dowel joints. Longitudinal steel is not required when top width of barrier is 12" or greater.

CONTRACTION JOINTS: Maximum allowable spacing of unsealed joints is 20' throughout the run of the barrier. Construct joints by using metal inserts inside the forms, performed full with joint filler, a grooving tool, or by sawing. Inserted, formed or sawed joints will have a 3" minimum depth.

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CONTRACTION JOINTS: Maximum allowable spacing of unsealed joints is 20' throughout the run of the barrier. Construct joints by using metal inserts inside the forms, performed full with joint filler, a grooving tool, or by sawing. Inserted, formed or sawed joints will have a 3" minimum depth.

Construct all joints for the full height of the barrier. Saw as soon as curing will allow to prevent spalling. When used in conjunction with concrete pavement, match joints to those in the concrete pavement but not exceeding the maximum allowable spacing.

ADJOINING PAYMENT: When the barrier is constructed in conjunction with new asphalt pavement, place it directly on the intermediate course. Construct the surface course directly against the barrier. See SCD RM-4.6 for Type D End Section details.

END SECTIONS: End Sections are used when barrier connects to Bridge Terminal Assembly, Type 1. See SCD RM-4.6 for details.

RACEWAYS: Raceways on Type D barriers are typically not embedded. Dowel bars as per CMS 622.02. Bars are to be placed as shown on the DOWEL BAR PLACEMENT detail on Sheet 2.

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CONTRACTION JOINTS: Maximum allowable spacing of unsealed joints is 20' throughout the run of the barrier. Construct joints by using metal inserts inside the forms, performed full with joint filler, a grooving tool, or by sawing. Inserted, formed or sawed joints will have a 3" minimum depth.

For Bridge Terminal Assembly, Type 1, details and connections, see SCD RM-4.5. Barrier installations that cannot be constructed of the normal guardrail offset and are to be connected to the approach or trailing guardrail runs shall have a 25' longitudinal taper to meet the existing or normal guardrail offset.

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END SECTIONS: End Sections are used when barrier connects to Bridge Terminal Assembly, Type 1. See SCD RM-4.6 for details.

RACEWAYS: Raceways on Type D barriers are typically not embedded. Dowel bars as per CMS 622.02. Bars are to be placed as shown on the DOWEL BAR PLACEMENT detail on Sheet 2.

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For Bridge Terminal Assembly, Type 1, details and connections, see SCD RM-4.5. Barrier installations that cannot be constructed of the normal guardrail offset and are to be connected to the approach or trailing guardrail runs shall have a 25' longitudinal taper to meet the existing or normal guardrail offset.

Installations that are not to be connected to the approach or trailing guardrail runs must include the standard guardrail flare as per CMS 622.02. Barriers are to be placed as shown on the DOWEL BAR PLACEMENT detail on Sheet 2.
INCORPORATED INSTALLATIONS: For barrier installations that cannot be constructed at the normal guardrail offset, the incorporated installations shown on Sheet 3 may be installed at vertical walls, piers or other similar obstructions.

For barrier-incorporated installations that contractor may use the optional treatment, forming the back flange of the Single Slope Barrier, Type D, at the location shown between piers only, with any additional cost being included in the cost of Item 622.

REINFORCED END ANCHORAGES are required at the ends of concrete barrier runs and at interruptions in barrier caused by expansion joints. When barrier does not abut another barrier run, construct the last 15' using the END ANCHORAGE Detail as shown here.

At expansion joints, construct on End Anchorage on both sides of joint, with a maximum gap of 2" for the open joint. The maximum expansion joint spacing shall be 800'. This anchorage is not needed at construction joints, provide dowel bar connections instead. See CONSTRUCTION JOINT Note.

END ANCHORAGE
See Notes on Sheet 1.

DOWELING DETAILS

See ALIGNING PAVEMENT Notes on Sheet 1.
Section A-A

Section B-B

Section C-C

Section D-D

Section E-E

**BARRIER END SECTION TYPE B**

**ELEVATION**

**PLAN**

**NOTES**

**GENERAL**
This end section is to be used in median applications when traffic is on both sides and attaches to a Single Slope Concrete Barrier, Type B. See SCD RM-4.3 for Single Slope Barrier details and materials. Provide 2" concrete cover over rebars, except as noted.

**GUARDRAIL**
For Bridge Terminal Assembly and attachment details see GUARDRAIL Note Concerning Connection. Information on Impact Attenuators is found in the Location and Design Manual, Volume I, Section 603.

**BARRIER FACE TRANSITIONS**
To prevent vehicle snagging, smooth transitions from vertical faces to the single slope faces are made over a 10' distance.

**PCJ**
Permissible Construction Joint. In the unreinforced base section, barrier may be placed on top of concrete base if dowelled as shown on SCD RM-4.3.

**PAYMENT**
Payment for the Concrete End Section shall be made at the unit price for Item 622 - Concrete Barrier End Section, Type B, each, and shall include all materials, labor, and reinforcing steel required to construct the barrier end section as shown.

**TYPE B STEEL LIST**

<table>
<thead>
<tr>
<th>Mark</th>
<th>Bar</th>
<th>Shape</th>
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<td>3'-6&quot;</td>
</tr>
<tr>
<td>X502</td>
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<td>Bent</td>
<td>4</td>
<td>1'-0&quot;</td>
</tr>
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<td>1'-0&quot;</td>
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<tr>
<td>X601</td>
<td>#6</td>
<td>Bent</td>
<td>10</td>
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<tr>
<td>X602</td>
<td>#6</td>
<td>Bent</td>
<td>6</td>
<td>1'-0&quot;</td>
</tr>
</tbody>
</table>

**PAYMENT:** PCJ: Permissible Construction Joint. In the unreinforced base section, barrier may be placed on top of concrete base if dowelled as shown on SCD RM-4.3.

**GENERAL:** This End Section is to be used in median applications when traffic is on both sides and attaches to a Single Slope Concrete Barrier, Type B. See SCD RM-4.3 for Single Slope Barrier details and materials. Provide 2" concrete cover over rebars, except as noted.

**GUARDRAIL**
For Bridge Terminal Assembly and attachment details see GUARDRAIL Note Concerning Connection. Information on Impact Attenuators is found in the Location and Design Manual, Volume I, Section 603.

**BARRIER FACE TRANSITIONS**
To prevent vehicle snagging, smooth transitions from vertical faces to the single slope faces are made over a 10' distance.

**PCJ**
Permissible Construction Joint. In the unreinforced base section, barrier may be placed on top of concrete base if dowelled as shown on SCD RM-4.3.

**PAYMENT**
Payment for the Concrete End Section shall be made at the unit price for Item 622 - Concrete Barrier End Section, Type B, each, and shall include all materials, labor, and reinforcing steel required to construct the barrier end section as shown.

**TYPE B STEEL LIST**

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<tr>
<td>X501</td>
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</tr>
<tr>
<td>X503</td>
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<td>Straight</td>
<td>10</td>
<td>1'-0&quot;</td>
</tr>
<tr>
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<td>#6</td>
<td>Bent</td>
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</table>

**PAYMENT:** PCJ: Permissible Construction Joint. In the unreinforced base section, barrier may be placed on top of concrete base if dowelled as shown on SCD RM-4.3.

**GENERAL:** This End Section is to be used in median applications when traffic is on both sides and attaches to a Single Slope Concrete Barrier, Type B. See SCD RM-4.3 for Single Slope Barrier details and materials. Provide 2" concrete cover over rebars, except as noted.

**GUARDRAIL**
For Bridge Terminal Assembly and attachment details see GUARDRAIL Note Concerning Connection. Information on Impact Attenuators is found in the Location and Design Manual, Volume I, Section 603.

**BARRIER FACE TRANSITIONS**
To prevent vehicle snagging, smooth transitions from vertical faces to the single slope faces are made over a 10' distance.

**PCJ**
Permissible Construction Joint. In the unreinforced base section, barrier may be placed on top of concrete base if dowelled as shown on SCD RM-4.3.

**PAYMENT**
Payment for the Concrete End Section shall be made at the unit price for Item 622 - Concrete Barrier End Section, Type B, each, and shall include all materials, labor, and reinforcing steel required to construct the barrier end section as shown.

**TYPE B STEEL LIST**

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<tr>
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</table>
**GENERAL:** This end section is to be used in median applications when traffic is on both sides and attaches to a Single Slope Concrete Barrier, Type B1. See SCD RM-4.3 for Single Slope Barrier details and materials. Provide 3" concrete cover over rebars, except as noted. For Bridge Terminal Assembly and attachment details see SCD MGS-1.1 (SCD GR-3.5 if connecting to Type 5 Guardrail). Information on Impact Attenuators is found in the Location and Design Manual, Volume 1, Section 603.

**GUARDRAIL:** Permissible Construction Joint. In the unreinforced base section, barrier may be placed on top of concrete barrier if dowelled as shown on SCD RM-4.3.

**PAYMENT:** Payment for the Concrete End Section shall be made at the unit price for Item 622 - Concrete Barrier End Section, Type B1, Each, and shall include all materials, labor, and reinforcing steel required to construct the barrier end section as shown.

**BARRIER FACE TRANSITIONS:** To prevent vehicle snagging, smooth transitions from vertical faces to the single slope faces are made over a 10' distance.
GENERAL: This End Section is to be used in roadway applications when traffic is only on one side. This section attaches to a Single Slope Concrete Barrier - Type D as shown in SCD RM-4.5. See SCD RM-4.3 for Single Slope Barrier materials and other details. Provide 2" concrete over rebar, except as noted.

GUARDRAIL: See GUARDRAIL Note Concerning Connection.

BARRIER FACE TRANSITIONS: To prevent vehicle snagging, a smooth transition from vertical face to single slope barrier faces is made over a 10' distance.

PCJ Permissible Construction Joint.

PAYMENT: Payment for the Concrete End Section shall be made at the unit price for Item 622 - Concrete Barrier End Section, Type D. Each, and shall include all materials, labor, and terms of steel required to construct the barrier end section as shown.

NOTES

FACE OF CURB

1. Item 622 - Concrete Barrier End Section, Location and Design Manual, Volume 1, Section 603.

2. General Information on Impact Attenuators is found in the Location and Design Manual, Volume 1, Section 603.

3. Single Slopw Concrete Barrier, Type D as shown in SCD RM-4.5.

4. Transition from vertical face to single slope barrier faces is made over a 10' distance.

---

**MARKS**

- X521
- X522
- X523
- X524
- Y621
- Y622
- Y623

**STEEL LIST**

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---

**BENDING DIAGRAMS**

---

**PLAN**

- Reinforcing not shown

---

**ELEVATION**

- Face of Curb
- Face of Rail

---

**SECTION M-M**

- Four X523 bars spaced evenly both sides

---

**SECTION N-N**

- See GUARDRAIL Note Concerning Connection

---

**SECTION O-O**

- See GUARDRAIL Note Concerning Connection

---

**SECTION P-P**

- See GUARDRAIL Note Concerning Connection

---

**NOTES**

1. Construction joint. See NOTES on SCD RM-4.3. Provide rebar cover of 5/".

2. Construct 5/" bolt hole pattern as shown on the Bridge Terminal Assembly Standard Drawing.

---

**TERMINAL ASSEMBLY**

- Item 606 - Bridge (4:1 taper)
- Concrete End Flare

---

**PAYMENT**

- Payment for the Concrete End Section shall be made at the unit price for Item 622 - Concrete Barrier End Section, Type D. Each, and shall include all materials, labor, and terms of steel required to construct the barrier end section as shown.

---

**G E N E R A L**

- Item 622 - Concrete Barrier, Type D as shown in SCD RM-4.5.
- Reinforcing not shown
NOTES:

GENERAL: Mount all bollard sleeves flush with the bikeway pavement.

CONCRETE ENCASEMENT: Sleeve encasement shall be square as shown, in concrete pavement, but may be square or round in flexible pavement. Round encasement should be 1'-0" diameter.

PREFORMED EXPANSION JOINT FILLER: Shall meet the provisions of CMS 705.11, and is required when bollards are set in concrete pavement.

STEEL PIPE: ASTM A 53 Schedule 40.

CONCRETE: Use Class C concrete as specified in CMS 499 and CMS 511.

REFLECTIVE SHEETING: Shall meet the provisions of CMS 150.19.

GALVANIZING: After fabricating, hot-dip galvanize all steel parts, including steel pipe, as specified in ASTM A 123.

ALUMINUM: All steel components may be replaced by aluminum components meeting the following ASTM Specifications: B 209 (plates), B 210 or B 241 (known seamless tubes & plates), B 211 (rods), and F 901 (bolts).

PERMANENT BOLLARDS: Permanent Bollards shall be the same as Removable Bollards, except that the steel plates, sleeves and lifting handles shall be omitted. Encase posts directly in concrete.

GENERAL:

NOTES:
**NOTES:**

MATERIALS: In order to ensure that the bollard stays plumb and in place, make the fittings as tight as possible. If made of wood, construct the bollard using CCA pressure treated Southern Yellow Pine. Pressure treat as specified in CMS 712.06. Hot-dip galvanize any hardware and steel used for the bollard.

PAYMENT: Payment for the bollard shall be Item Special - Bollard, Misc., Hinged.

**PAYMENT:**

**MATERIALS:**

In order to ensure that the bollard stays plumb and in place, make the fittings as tight as possible. If made of wood, construct the bollard using CCA pressure treated Southern Yellow Pine. Pressure treat as specified in CMS 712.06. Hot-dip galvanize any hardware and steel used for the bollard.

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**NOTES:**

**PAYMENT:**

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**PAYMENT:** Payment for the bollard shall be Item Special - Bollard, Misc., Hinged.
NOTES

1) Treat all wood as specified in CMS 712.05.
2) Galvanize all bolts, washers, and nuts as specified in CMS 711.01 and 711.03. Countersink face of rails to provide flush bolt heads.
3) Provide a wood railing that is smooth and splinter free.
4) Where less than 1'-0" of graded shoulder width (10:1 or flatter) extends beyond the edge of the face rail, use longer posts so that a minimum 5'-0" embedment depth is provided.
5) The bottom end of the 6"x6" posts may be cut to a 45° point.
6) Stagger butt ends of the top rail and the lower face rail on alternate posts. Center all butt end joints on the posts.
7) Include the cost of furnishing and placing all posts, rails, and hardware in the unit price bid for Item 607 - Fence, Misc.: Wood Fence.
NOTES:
1. All materials used to manufacture the concrete parking block shall be in accordance with CMS 499 QC 1.
2. The material requirements for the anchor pin shall be in accordance with CMS 509.
3. All #4 reinforcing bars shall be epoxy coated as per CMS 509.
4. Reinforcing steel shall be placed 2" clear min. from the surface of the concrete.
5. Payment will be made as Item Special, Concrete Parking Block, Each and includes reinforcing steel and anchor pins.

LEGEND

#4 is the normal setback distance from a pavement edge.

In a remove and reset operation, the block would go on new or resurfaced pavement. However, it may be necessary on some projects to place new blocks on existing pavement.

Item Special, Concrete Parking Block, Each and includes reinforcing steel and anchor pins.
ITEM SPECIAL - DRILLED WATER WELL ABANDONED

The contractor may weld a cap on the casing or other approved method in lieu of using the concrete cap as shown.

NOTES:

The contract unit price for Item Special, Drilled Water Well Abandoned, shall include payment for all labor, tools, materials and incidentals necessary to complete this item.

Follow rules set forth per OAC chapter 3701-28-071 regarding drilled water well abandonment. In addition to the OAC, the State of Ohio Technical Guidance for sealing unused wells by the State Department of Natural Resources on groundwater, dated 1996, is available for reference.

Remove and dispose of the existing concrete or stone slab, well cover, pumping equipment and any other obstructions. Rip perforate the well casing. Disinfect the well to prevent bacterial contamination of the groundwater. Cut off the casing at least 3' below the proposed finish grade outside proposed subgrade elevation. Fill the well from the bottom to the proposed finish grade with bentonite slurry, pellets, chips, or concrete meeting ASTM C150 Type I Portland Cement with no air entrainment, and then cap in accordance with the detail shown on this drawing.

Registration as private water systems contractor with the Ohio Department of Natural Resources (ODNR) is required by the Ohio Revised Code. If only sealing one well, a Well Log is not required in addition to the Water Well Sealing Report. Any additional materials required by ODNR shall be considered incidental. ODNR's address is as follows:

Ohio Department of Natural Resources
Division of Water
2045 Morse Road, Building B-2
Columbus, Ohio 43229-6605
Telephone: (614) 265-6739
Fax: (614) 265-6767

The contract unit price for Item Special, Drilled Water Well Abandoned, shall include payment for all labor, tools, materials and incidentals necessary to complete this item.
PLUGGING AND VENTING GAS AND/OR OIL WELL

If the vent pipe is within 20' (6 m) of a building, the pipe should extend 14' (4.2 m) above the ground line or 10' (3 m) above the building, whichever is greater, and be located 12' (3.7 m) away from the building. The vent pipe shall extend 3' (0.9 m) above the ground line. The vent pipe opening shall be protected with a wire screen.

DETAIL

The oil or gas well casing shall be cut off a minimum of 5'-2" (1.5 m) below finish grade or bottom or subbase.

SECTION A-A

Notes:

ITEM SPECIAL - PLUGGING AND VENTING GAS AND/OR OIL WELL

Plug and/or vent all oil and gas wells located within the City of the Right-of-Way before any other construction is started in the vicinity of the wells. Plug and/or vent the wells in accordance with the requirements of the State of Ohio, Department of Natural Resources (ODNR), Division of Gas and Oil. Perform all work under the supervision of a representative of the Division of Natural Resources. Any additional materials required by ODNR shall be considered incidental. ODNR's address is as follows:

Ohio Department of Natural Resources
Division of Mineral Resources Management
2045 Morse Road, Building H-3
Columbus, Ohio 43229-6693
Telephone: (614) 265-6833
Fax: (614) 265-7999

A County issued plugging permit may also be required.

All oil and gas wells located within the Right-of-Way, whether previously plugged to the satisfaction of the ODNR or have been plugged on part of this project, require venting as detailed per this sheet.

Modification of this detail will be required for fills greater than 75' (22.9 m) or where settlement of the existing ground of more than 15" (375 mm) is anticipated.

Payment for this work shall be made at the contract unit price for Item Special, Plugging and Venting Gas and/or Oil Well, which price and payment shall constitute full compensation for furnishing all materials, labor, tools and equipment, and all incidental costs necessary to complete this item.
PLANTING DETAILS: The types and quantities of fertilizer, water, mulch and backfill vary with different soil and weather conditions. The costs for these items shall be included in the unit price bid for the planting items per CMS.

Pit diameter and depth shall vary with the type and size of the plant, the soil type and other site conditions.

Backfill unless otherwise specified, shall be in accordance with CMS 661.1.1. Circumventing roots of container plants shall be cut or removed prior to planting and backfilling.

Walls of planting holes dug with a tree spade shall be roughened before backfilling.

Circling roots of container plants shall be cut or removed prior to planting.

Backfill unless otherwise specified, shall be in accordance with CMS 661.1.1. The costs for these items shall be included in the unit price bid for the planting items per CMS 661.17.

Provide a minimum 4" [100] space between the tree trunk and the rootball.

Top of hole shall be minimum of 2 x Width of root ball.