Standard Plans
For Road, Bridge, and Municipal Construction

M 21-01
English

Washington State Department of Transportation

American Public Works Association
Washington State Chapter
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This *Standard Plans Manual* contains engineering drawings that are used for road, bridge, and municipal construction. These drawings have been prepared under the direct supervision of a professional engineer, licensed in the state of Washington, who is knowledgeable in the specialized field of civil engineering depicted in that drawing. This manual standardizes fabrication, installation and construction methods for specific items of work and complements the contract documents and the English version of the *Standard Specifications for Road, Bridge, and Municipal Construction*.

Updating the manual is a continuous process and revisions are issued periodically. Questions, comments, and recommendations for changes are welcome. The *Comment Request Form* on the reverse side of this page is provided to encourage comments and assure their prompt delivery. Use copies of the form to send any attachments, such as marked copies of specific standard plans. Your comments should be sent to *Design Standards*, Transportation Building, Olympia, WA 98504-7329.

Bentley MicroStation DGN CAD files, Adobe PDF files and some AutoCAD DWG CAD files can be downloaded from the Design Standards website at:

http://www.wsdot.wa.gov/eesc/design/designstandards

Contact the *Design Standards Office* at (360) 705-7540 if you have questions about the technical content of this manual.

Additional copies of this manual can be ordered from the *Engineering Publications Office* (360) 705-7430.

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*Harold Peterfeso*

State Design Engineer
**Comments**

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<td>Sidewalk Ramp Types 1A, 1B, 1C &amp; 1D</td>
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<td>Sidewalk Ramp Types 2A &amp; 2B</td>
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<td>F-3c</td>
<td>Sidewalk Ramp Types 3A, 3B, 3C &amp; 3D</td>
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<td>G-7</td>
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<td>G-8b</td>
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<td>Overhead Sign Mounting Details</td>
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<td>Pavement Marking Details</td>
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<td>I-3</td>
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- I-2 Crest Gage 4/23/99
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<td>Road Closure With Off Site Detour</td>
<td>12/20/02</td>
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<td>K-4</td>
<td>Alternating One Way Traffic, Temporary Signal Controlled</td>
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<td>Lane Closure With Temporary Concrete Barrier</td>
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<td>K-8</td>
<td>Paving Operations Non-Working Hours</td>
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<td>Right Lane Closure With Lane Shift, Five Lane Roadway</td>
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<td>12/20/02</td>
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<td>Surveying Along Centerline Of Low Volume Road</td>
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<td>Left Lane Closure on Far Side Of Intersection</td>
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## Section K

**Work Zone Traffic Control Plans**  
(Not for use on projects administered by WSDOT)

## Section L

**Fence and Glare Screen**

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<th>Date</th>
<th>Sheets</th>
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<td>Chain Link Fence</td>
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<td>L-5a</td>
<td>Glare Screen Type 2</td>
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<td>L-6</td>
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CASE 3
ASPHALT CONCRETE PAVEMENT
(L-Type Abutment)

CASE 4
ASPHALT CONCRETE PAVEMENT

CASE 5
ASPHALT CONCRETE PAVEMENT
(ACP was on bridge and/or roadway grade slopes up from bridge)

NOTES

1. Plane a taper into the existing pavement and shoulders (if paved). Depth shall taper from 0" at the beginning of pavement, to 1" at end of taper. Does not apply when existing pavement has been planed.

2. Before placing overlay, remove top 2" of existing joint filler, or 3" if existing joint is fiberboard, and block out the joint. After overlay, install new premolded joint filler. Top of joint filler shall be between 3/4" and 3/8" below overlay. When a compression seal is in place, see Bridge Plans.

3. Before placing overlay, block out the joint. After overlay, install premolded joint filler or rubberized asphalt filler. Top of joint filler shall be between 3/4" and 3/8" below overlay.

4. Full depth sawed grooves between 1/4" and 1/4" wide shall be placed directly over the existing sawed grooves in the cement concrete pavement and cement concrete shoulders.


LEGEND

Concrete Overlay
Asphalt Concrete Overlay
NOTES

1. Curb shall be Extruded Curb Type 1, 2, 4, 4a, 5, or 5a, as specified in the contract.

2. Catch basin or grate inlet shall be located between guardrail posts.
UNDIVIDED HIGHWAY
(TWO WAY TRAFFIC)
DOWEL BAR RETROFIT
FOR EACH LANE

SECTION C

SECTION D

EXTRACT TRANSVERSE
CONTRACTION JOINT
(SEE DETAIL PLAN A-1)

DOWEL BAR (Typ)
EXISTING CONCRETE
PAVEMENT

PLAN VIEW

SKEWED JOINT DETAIL

LANE

LANE
NOTES

1. As an acceptable alternate to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used. Wire mesh shall not be placed in knockout areas.

2. The knockout diameter shall not be greater than 20". Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum. Provide a 1.5" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Bdot Spec 8-94-5.

3. The minimum depth from the finished grade to the pipe invert shall be 8".

4. Frame and grate may be installed with flange down or cast into adjustment section.

5. The precast base section may have a rounded floor and the walls may be sloped at a rate of 1:24 or steeper.

6. Opening shall be measured at the top of the precast base section.

<table>
<thead>
<tr>
<th>PIPE MATERIAL</th>
<th>MAXIMUM INWARD DIAMETER</th>
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<tbody>
<tr>
<td>Reinforced or plain concrete</td>
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</tr>
<tr>
<td>All metal pipe</td>
<td>10&quot;</td>
</tr>
<tr>
<td>Corrugated steel (SLP 0.93.03)</td>
<td>12&quot;</td>
</tr>
<tr>
<td>Solid wall PVC (SLP 8.90.34.93)</td>
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</tr>
<tr>
<td>Fiberglass wall PVC (SLP 8.90.36.93)</td>
<td>10&quot;</td>
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</table>

* Corrugated polyethylene storm sewer pipe

CATCH BASIN TYPE 1
STANDARD PLAN B-1

EXPIRES JULY 1, 2003
**NOTES**

1. As an acceptable alternate to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used. Wire mesh shall not be placed in knockouts.

2. The knockout diameter shall not be greater than 30\(^\circ\). Knockouts shall have a wall thickness of 2\(^\circ\) minimum to 2.5\(^\circ\) maximum. Provide a 1.5\(^\circ\) minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mastic in accordance with Std. Spec. R-04.1.

3. The maximum depth from the finished grade to the pipe invert shall be 3\(^\circ\).

4. Frame and grates may be installed with flange down or canted into adjustment sections.

5. The present base section may have a rounded floor and the walls may be sloped at a rate of 1:24 or steeper.

6. Opening shall be measured at the top of the present base section.

---

**FRAME AND VARIED GROVE**

**RECTANGULAR ADJUSTMENT SECTION**

**REDUCING SECTIONS**

**CATCH BASIN TYPE 1L**

**STANDARD PLAN S-1a**
CATCH BASIN TYPE 1P
PARKING LOT C. B.

PRECAST BASE SECTION

- 3 Bar each corner
- 3 Bar each side
- 3 Bar each way

NOTES:

1. As an acceptable alternate to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used. Wire mesh shall not be placed in knockouts.

2. The knockout diameter shall not be greater than 16". Knockouts shall have a wall thickness of 2" minimum to 2 1/2" maximum.

3. The maximum depth from the finished grade to the pipe invert shall be 5'.

4. Frame and grate may be installed with flange down or cast into adjustment section.

5. The precast base section may have a rounded floor and the walls may be sloped at a rate of 1:124 or steeper.

6. Openings shall be measured at the top of the precast base section.
NOTES:
1. No steps are required when height is 4' or less.
2. The bottom of the precast catch basin may be sloped to facilitate cleaning.
3. Frame and grates may be installed with flange down or cast into adjustment section.
4. Knockouts shall have a wall thickness of 2" minimum in 2.5" minimum. Provide a 1.25" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Sect. Spec. 0-04-3.

CATCH BASIN DIMENSIONS

<table>
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<tr>
<th>CATCH BAND DIAMETER</th>
<th>WALL THICKNESS</th>
<th>BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT DIAMETER</th>
<th>MINIMUM DISTANCE BETWEEN KNOCKOUTS</th>
<th>SAME REINFORCING STEEL IN EACH DIRECTION</th>
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<tbody>
<tr>
<td>48&quot;</td>
<td>4&quot;</td>
<td>6&quot;</td>
<td>20&quot;</td>
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PIPE ALLOWANCES

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<th>PIPE MATERIAL WITH MAXIMUM BORE DIAMETER</th>
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<tr>
<td>48&quot;</td>
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<td>3&quot;</td>
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<tr>
<td>72&quot;</td>
<td>4&quot;</td>
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<tr>
<td>96&quot;</td>
<td>6&quot;</td>
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1. CORRUGATED Polyethylene storm sewer pipe (Sect. Spec. 0-02-1).
2. [Other Spec. 0-02-15].
3. [Other Spec. 0-02-25].

CATCH BASIN TYPE 2

STANDARD PLAN B-1e

EXPIRES JULY 1, 2003
1. As an acceptable alternate to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used for adjustment sections.

2. One #8 bar hoop for 6".
   Two #8 bar hoops for 12".

3. One #4 bar hoop for 12".

96" FLAT SLAB TOP

72" FLAT SLAB TOP

48", 54", or 60" FLAT SLAB TOP
1. When bolt down covers are specified in the Contract, provide two slots in the cover that are vertically aligned with the holes in the frame. Location of bolt down slots varies among different manufacturers.

2. Alternate reinforcing rib designs are acceptable.

3. Refer to Standard Specification 0-8152(2) for additional requirements.

4. For frame details, see Standard Plan B-2a.
NOTES

1. This frame is designed to accommodate 20" x 24" gratings or covers as shown on Standard Plans B-2, B-2a, B-2b and B-3d.

2. When bolt down gratings or covers are specified in the Contract, provide two holes in the frame that are vertically aligned with the grate or cover itself. Tap each hole to accept a 3/8" x 11 NC x 2" allen head cap screw. Location of bolt down holes varies among different manufacturers.

3. Refer to Standard Specification 8-05-1620 for additional requirements.
NOTES:
1. When bolt down grates are specified in the Contract, provide two slots in the grates that are vertically aligned with the holes in the frame. Location of bolt down slot varies among different manufacturers.
2. Refer to Standard Specification R-05.162 for additional requirements.
3. For frame details, see Standard Plan B-3a.
SEE SLOT DETAIL & NOTE 1

NOTES
1. When bolt down grates are specified in the Contract, provide two slots in the grates that are vertically aligned with the holes in the frame. Location of bolt down slots varies among different manufacturers.
2. Refer to Standard Specification D-05.162 for additional requirements.
3. For frame details, see Standard Plan B-3a.

SECTION A

SECTION B

4 EQUAL SPACES

1 1/8" MAX.
NOTES:

1. When bolt down grates are specified in the Contract, provide two slots in the grate that are vertically aligned with the holes in the frame. Location of bolt down slots varies among different manufacturers.

2. Refer to Standard Specification 9-05.15(2) for additional requirements.

3. For frame details, see Standard Plan 8-2a.

4. The thickness of the grate shall not exceed 1 5/8".
NOTES:

1. The pipe supports and the weir/isolator shall be constructed of the same material and be anchored at a maximum spacing of 18". Attach the pipe supports to the mainline with 3/4" stainless steel expansion bolts or embed the supports into the mainline wall 2".

2. The vertical weir size of the retort/isolator shall be the same diameter as the horizontal outlet pipe with a minimum diameter of 12".

3. The flow weir/isolator shall be fabricated from one of the following materials:
   - 0.08" Corrugated Aluminum Alloy Drain Pipe
   - 0.08" Corrugated Galvanized Steel Drain Pipe
   - 0.08" Corrugated Aluminized Steel Drain Pipe
   - 0.062" Aluminum alloy flange, in accordance with ASTM B 267, B142, B165, or B166
   - High Density Polyethylene/Steam Boiler Pipe

4. The frame and ladder or steps are to be aligned so the shear gate is visible from the top; the climb-down space is clear of the frame and gate, the frame is clear of the gate.

5. The multi-office boxes may be located as shown, or as placed on one side of the door to assure ladder clearance. The size of the boxes and their placement shall be specified in the Contract.

6. Retaining plate with office as specified in the Contract. Cut-out plate if for oil pollution control only.

7. The spanning of the ring and cover is to be cut around smooth.

8. The shear gate shall be made of stainless steel in accordance with ASTM A 240 and ASTM A 276, designation 201/1A; or cast iron in accordance with ASTM A 416, Grade 316.

9. The ring handle shall be made of a smaller metal to the gate (to prevent galvanic corrosion). It may be of cold rolled or hot-rolled tubing, with adjustable hook as required.

10. A removable rubber gasket is required between the fill mounting flange and the gate flange. Replace the gasket so that the head is not stressed when the gate is closed.

11. The lift surface of the lid and the body shall be machined for proper fit.

12. All shear gate bolts shall be stainless steel.

13. The shear gate mechanism can be controlled by limited hinge movement, a stop, or some other device.

14. Alternate shear gate designs are acceptable, if material specifications are met and gasket bolt pattern matches.

CATCH BASIN TYPE 2
WITH FLOW RESISTOR
STANDARD PLAN B-3

EXPRESS JUNE 2023

APPROVED FOR PUBLICATION
Harald J. Pedersen
01-28-02
Washington State Department of Transportation
1. See Contract for size and location of all pipes and orifices.
2. Baffle wall shall have #4 Bar at 12" spacing each way.
3. Precast baffle shall be keyed and grouted in place.
4. Bottom orifice plate shall be galvanized steel with a minimum thickness of 0.014'. Attach orifice with ½" stainless steel bolts. Orifice plate is not required when only oil separation is desired.
5. Upper flow orifice shall be aluminum, galvanized steel or galvanized steel. Galvanized steel shall have treatment 1.
1. Angles shall be set so that each bearing bar of prefabricated grate shall have full bearing on both ends. The finished top of concrete shall be even with the grate surface.

2. All exposed concrete shall be finished with a 1/2" radius edger tool.

3. The grade line of the top inside of any pipe shall enter no lower than the grade line of the top inside of the outlet pipe.

4. Culvert or sewer pipes may be set at any angle to the centerline of the highway and may enter the inlet on any side at any reasonable angle, provided the outside of the pipe can be contained between two opposite walls.

5. Grate B will be used only when specified in the Contract.

---

**Grate Inlet Type 1**

- Cross bars 3/4" round or rectangular or hexagonal bar of equivalent area
- 3/8" x 3/4" Steel plates
- Eleven spaces
- Gage 46 1/4"

**Notes**

- Two 4" x 3" x 3/8" steel angles
- 5/8" x 4" studs or 5/8" x 1/2" x 1/4" steel anchors
Notes:

Angles shall be set so that each bearing bar or prefabricated grate shall have full bearing on both ends. The finished top of concrete shall be even with the grate surface.

Top of inlet grate shall be placed at ground level to present an unobstructed ditch or median section.

All exposed concrete edges shall be finished with a 1/2" radius edger tool.

Pipes may enter through the knockouts on any side at any reasonable angle, provided the outside of the pipe can be contained between two opposite walls.

The flow line of the outlet pipe shall be 18" minimum above the inside bottom of the inlet structure.

The grade line of the top inside of any inlet pipe shall enter at a point no lower than the grate line of the top inside of the outlet pipe.

Unit H and optional extension units J and K shall be grouted in place to the satisfaction of the Engineer.

All pickup holes shall be grouted full after the basin has been placed.
1. Angles shall be set so that each bearing bar on the grate shall have full seating on both ends. The finished top of concrete shall be even with the grate surface.

2. Top of inlet shall be placed at ground level to present an unobstructed ditch or median section.

3. Bevel or round exposed concrete edges 1/4".

4. Pipes may enter through the knockouts at any reasonable angle provided the outside of the pipe can be contained within the knockout provided.

5. The grade line of the lowest inlet pipe shall enter the structure at an elevation equal to or higher than the grade line of the outlet pipe.

6. Precast inlet shall be marked with manufacturer’s identification inside the structure in some readily accessible location.

7. Inside wall taper for form removal shall not result in any wall section thinner than 6" except in pipe knockout areas.

8. Amount, type and grade of reinforcing steel is the responsibility of the manufacturer. The manufacturer is responsible for the structure until final acceptance in place with all required knockouts removed.
1. Angles shall be set so that each bearing bar on the grate shall have full seating on both ends. The finished top of concrete shall be even with the grate surface.

2. Top of inlet shall be placed at ground level to present an unobstructed ditch or median section.

3. Bevel or round exposed concrete edges ½".

4. Pipes may enter through the knockouts at any reasonable angle provided the outside of the pipe can be contained within the knockout provided.

5. The grade line of the lowest inlet pipe shall enter the structure at an elevation equal to or higher than the grade line of the outlet pipe.

6. Precast inlet shall be marked with the manufacturer's identification inside the structure in some readily accessible location.

7. Inside wall taper for form removal shall not result in any wall section thinner than 6" except in pipe knockout areas.

8. Amount, type and grade of reinforcing steel is the responsibility of the manufacturer. The manufacturer is responsible for the structure until final acceptance in place with all required knockouts removed.
**DROP INLET GRATES**

**SECTION A-A**
- "Grind top and bottom flush after welding"
- "3\(\frac{1}{8}\)" x 3\(\frac{1}{6}\)" x \(\frac{1}{4}\)" Structural tubing (TYP)

**SECTION B-B**
- "Grind top and bottom flush after welding"
- "3\(\frac{1}{8}\)" x 3\(\frac{1}{8}\)" Structural tubing (TYP)

**TYPE 1**
- 3\(\frac{1}{8}\)" x \(\frac{1}{2}\)" x 3\(\frac{3}{8}\)"
- Steel plate (TYP)

**TYPE 2**
- 3\(\frac{1}{8}\)" x \(\frac{1}{2}\)" x 3\(\frac{3}{8}\)"
- Steel plate (TYP)

**TYPE 3**
- 3\(\frac{1}{8}\)" x \(\frac{1}{2}\)" x 3\(\frac{3}{8}\)"
- Steel plate (TYP)
NOTES

1. The culvert ends shall be beveled to match the embankment or ditch slope and shall not be beveled flatter than 4:1. When slopes are between 4:1 and 8:1, place the slope in the vicinity of the culvert end to ensure that no part of the culvert projects more than 4" above the ground line.

2. Field cut of culvert end is permitted, when approved by the Engineer. All field cut culvert pipe shall be treated with treatment as shown in the Standard Specifications or General Special Provisions.

THERMOPLASTIC PIPE

CONCRETE PIPE

METAL PIPE

END SECTION LENGTH SHALL BE AT LEAST SIX TIMES THE DIAMETER OF THE PIPE (SEE STD. SPEC. 7-02.3(1))
1. Span and rise dimensions are nominal and are measured to the inside crests of corrugations.

2. Allowable heights of cover shall be within the limits indicated in the table included herein. Minimums and maximums are shown.

3. Unless indicated otherwise a 10" depth (over the inside crests of corrugations) of earth shall be placed in the invert of the Structural Plate Underpass, Design 1, for its full width and length. The earth shall consist of natural occurring materials available in the vicinity of the structural plate underpass installation.

4. Designed for H-20 live load and maximum allowable soil pressure of 6 Kips per square foot.

### ALLOWABLE HEIGHTS OF COVER

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<th>RISE</th>
<th>12 GAGE THICK METAL</th>
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**ELEVATION**

**SECTION**

**CORRUGATED METAL**

**STRUCTURAL PLATE UNDERPASS DESIGN 1**
### Corrugated Metal

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NOTES:

1. Sockets shall be 3" extra strong steel pipe (3/8" OD). Sockets must be the proper angle to allow safety bar to be easily removed.

2. Safety Bar shall be 4" extra strong (1/4") steel pipe.

3. Bevel culvert pipe to match side slope.

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<th>Culvert Dia</th>
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<td>96&quot; - 120&quot;</td>
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**TOP VIEW**

Culvert is perpendicular to roadway
Headwall is placed parallel to roadway

- **8" x 24" x 5/8"** Steel plate
- Field cut culvert to match blockout in headwall

**SECTION A-A**

- **1" x 4" Slot** with 2" wide oval at bottom (TYP)
- 9/32" x 5/8" Bolt

- **3/4" Dia threaded rod** with nuts or 3/4" x 6" anchor bolts (TYP)

**DETAIL A**

- Notch bottom of culvert pipe to allow anchor/socket placement (TYP)

**ELEVATION**

- **8" x 24" x 5/8"** Steel plate
- 4/16" x 6" x 18" Blockout in headwall

- **Type 1 Safety Bars for Stepped Culvert Pipe or Pipe Arch**

**TOP**

Culvert is skewed to roadway
Headwall is placed parallel to roadway

- 3/4" Dia x 5/8" threaded rod with nut
- Install adhesive anchorage system
1. Maximum span width is 54".

2. Spacing between safety bars, or between bars and the culvert crown shall be equal spaces of 30" maximum.

FRONT VIEW OF CROSS ROAD CULVERT

- **D** = Inside Dia of culvert
- Slope to match side slope, 6:1 preferred, not steeper than 4:1

SIDE ELEVATION VIEW

- **1/4" Dia** Threaded rod
- **1 1/2"**
- **5 1/2"**
- **3/4" Max**

SECTION A-A

- **3/8" x 4" x 10"** Steel plate
- 1" (Typ) Structural tubing

SECTION B-B

TYPE 2 SAFETY BARS FOR CULVERT PIPE OR PIPE ARCH (ON CROSS ROAD)
1. Connection is a ½" Diameter threaded rod over top of end section side lugs and bolted to end section. On 15" through 24" pipe, an alternative may be a 1½" wide strap 14 gauge or 12 gauge galvanized steel, fastened with a ½" Diameter, 6" long galvanized bolt and square head nut.

2. Number of safety bars required will vary depending upon the length of the end section.

### Metal End Sections for Circular Pipes

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<th>Minimum Thickness</th>
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### Metal End Sections for Arched Pipes

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### Tapered End Section

With Type 4 Safety Bars (On Cross Road)

**Safety Bar End Treatment Detail**

- 3" Galvanized pipe: Flatten end, then bend outside 4" to match end section sides.

**Connector Details**

- See Note 1
- Side lug
- End section

**Cross Road Drainage Structure**

- Reinforced edge full length of end section
- See Section A-A
- Galvanized steel rod ⅝" Diameter or No. 4 galvanized reinforcing bar
- Edge of section sheet rolled snugly against steel rod
- ⅜" Diameter head bolts (Typ)
- Optional toe plate extension, ⅜" less than overall width
NOTES
1. See Standard Specifications Section 7-05.8(3) for Pipe Zone Backfill.
2. See Standard Specifications Section 9-03.12(3) for Gravel Backfill for Pipe Zone Bedding
4. For sanitary sewer installation, concrete pipe shall be bedded to spring line.

CLEARANCE BETWEEN PIPES FOR MULTIPLE INSTALLATIONS

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<th>SIZE</th>
<th>MINIMUM DISTANCE BETWEEN BARRELS</th>
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PIPE ZONE BEDDING AND BACKFILL
STANDARD PLAN 5-11
**Ductile Iron Drop Connection**

- **6" Min.**
- **D.I.P. Tee Clearance 2"**
- **Flexible joint**
- **Backfill with compacted material as directed by engineer**
- **Cement Concrete Class 3000 block poured in place**
- **D.I.P. 90° bend clearance 2"**
- **Typical manhole foundation construction**

**Concrete Encased Drop Connection**

- **Mortar dam or plug as required by engineer**
- **2" Min.**
- **Tee**
- **Backfill with compacted material as directed by engineer**
- **Cement Concrete Class 3000 poured in place**
- **90° Bend**
- **Typical manhole foundation construction**

**Drop Connection for Sanitary Sewers**

EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004
Notes:
1. Steel tie rods to be heavily coated with asphalt after installation.
2. Restrained joints may be substituted for tie rods.
3. Surface of ground within 36" of hydrant shall be smooth.

**PLAN**

**ELEVATION**

**HYDRANT SETTING TYPES A AND B**

**TYPE A**

**TYPE B**
1. Size of combination air release/air vacuum valve shall be specified in the Contract. Piping and valves shall be the same size as the combination air release/air vacuum valve.

2. Locate at the high point of the main, top top of main.

Galvanized outlet and pipe to be same size as inlet pipe with beehive strainer and outlet

Match existing grade

Specified minimum depth of water main

Type K copper pipe

Corporation stop

Pipe saddle

Water main

Cast iron valve box

Union

Slope

Air release/air vacuum valve

Brass pipe and fittings

Bronze gate valve with 2" square operating nut

Gravel Backfill for Drains
Two tie rods with turnbuckles
Thread 6"

BLOCKING FOR 11.25° OR 22.5° VERTICAL BENDS

Four tie rods with turnbuckles
Thread 6"

BLOCKING FOR 45° VERTICAL BENDS

### DIMENSION TABLE

<table>
<thead>
<tr>
<th>PIPE DIA</th>
<th>TEST PRESSURE PSI</th>
<th>Bend Angle</th>
<th>Concrete Volum Fight</th>
<th>Cube Size Ft</th>
<th>Tie Rod Dia</th>
<th>Tie Rod Embedment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>250</td>
<td>11.25°</td>
<td>6</td>
<td>1.8</td>
<td>1/8&quot;</td>
<td>17&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22.5°</td>
<td>12</td>
<td>2.1</td>
<td>1/8&quot;</td>
<td>17&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45°</td>
<td>22</td>
<td>2.8</td>
<td>1/8&quot;</td>
<td>17&quot;</td>
</tr>
<tr>
<td>6&quot;</td>
<td>250</td>
<td>11.25°</td>
<td>14</td>
<td>2.4</td>
<td>3/16&quot;</td>
<td>17&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22.5°</td>
<td>21</td>
<td>3.0</td>
<td>3/16&quot;</td>
<td>17&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45°</td>
<td>50</td>
<td>3.7</td>
<td>3/16&quot;</td>
<td>17&quot;</td>
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<td>8&quot;</td>
<td>250</td>
<td>11.25°</td>
<td>25</td>
<td>2.9</td>
<td>1/8&quot;</td>
<td>17&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22.5°</td>
<td>48</td>
<td>3.6</td>
<td>3/16&quot;</td>
<td>17&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>80</td>
<td>4.5</td>
<td>3/16&quot;</td>
<td>17&quot;</td>
</tr>
<tr>
<td>10&quot;</td>
<td>250</td>
<td>11.25°</td>
<td>38</td>
<td>3.4</td>
<td>3/16&quot;</td>
<td>17&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22.5°</td>
<td>75</td>
<td>4.2</td>
<td>3/16&quot;</td>
<td>17&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45°</td>
<td>139</td>
<td>5.2</td>
<td>3/16&quot;</td>
<td>17&quot;</td>
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<td>17&quot;</td>
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<td>200</td>
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<td>3/16&quot;</td>
<td>24&quot;</td>
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<tr>
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<td>250</td>
<td>11.25°</td>
<td>75</td>
<td>4.4</td>
<td>3/16&quot;</td>
<td>24&quot;</td>
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<td>22.5°</td>
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<td>5.3</td>
<td>3/16&quot;</td>
<td>24&quot;</td>
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<tr>
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<td></td>
<td>45°</td>
<td>272</td>
<td>6.5</td>
<td>3/16&quot;</td>
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<td>250</td>
<td>11.25°</td>
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<td>3/16&quot;</td>
<td>24&quot;</td>
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<td></td>
<td></td>
<td>22.5°</td>
<td>192</td>
<td>5.8</td>
<td>3/16&quot;</td>
<td>24&quot;</td>
</tr>
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<td></td>
<td></td>
<td>45°</td>
<td>356</td>
<td>7.1</td>
<td>3/16&quot;</td>
<td>30&quot;</td>
</tr>
</tbody>
</table>

CONCRETE BLOCKING FOR CONVEX VERTICAL BENDS
NOTE:
1. Contractor to provide blocking adequate to withstand full test pressure.
2. Divide thrust by safe bearing load to determine required area (in square feet) of concrete to distribute load.
3. Areas to be adjusted for other pressure conditions.
4. Provide two, 3/8" minimum diameter rods on valves up through 10" diameter. Valves larger than 10" require special tie rod design.

<table>
<thead>
<tr>
<th>Size</th>
<th>Test Pressure (PS)</th>
<th>Thrust at Fittings in Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>4&quot;</td>
<td>250</td>
<td>3,140</td>
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<tr>
<td>6&quot;</td>
<td>250</td>
<td>7,070</td>
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<td>8&quot;</td>
<td>250</td>
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<td>250</td>
<td>19,635</td>
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<td>250</td>
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<td>38,485</td>
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<td>16&quot;</td>
<td>250</td>
<td>50,265</td>
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<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Safe Bearing Load (PSF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muck, peat, etc.</td>
<td>0</td>
</tr>
<tr>
<td>Soft clay</td>
<td>1,000</td>
</tr>
<tr>
<td>Sand</td>
<td>2,000</td>
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<tr>
<td>Sand and gravel</td>
<td>3,000</td>
</tr>
<tr>
<td>Sand and gravel, cemented with clay</td>
<td>4,000</td>
</tr>
<tr>
<td>Hard shale</td>
<td>10,000</td>
</tr>
</tbody>
</table>

CONCRETE THRUST BLOCK
Circular adjustment section

Eccentric cone section

Precast riser sections

Steps or ladder

Mortar Fillet

Channel and shelf

Reinforcing steel

Separate cast-in-place base

Precast base with integral riser

Separate precast base

NOTES:
1. Knockouts shall have a wall thickness of 2" minimum to 2 1/2" maximum.

MANHOLE DIMENSION TABLE

<table>
<thead>
<tr>
<th>DIA</th>
<th>WALL THICKNESS</th>
<th>BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT SIZE</th>
<th>MINIMUM DISTANCE BETWEEN KNOCKOUTS</th>
<th>BASE REINFORCING STEEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>48&quot;</td>
<td>4&quot;</td>
<td>6&quot;</td>
<td>36&quot;</td>
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<td>0.15</td>
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<tr>
<td>54&quot;</td>
<td>4 1/2&quot;</td>
<td>8&quot;</td>
<td>40&quot;</td>
<td>8&quot;</td>
<td>0.19</td>
</tr>
<tr>
<td>60&quot;</td>
<td>5&quot;</td>
<td>8&quot;</td>
<td>48&quot;</td>
<td>8&quot;</td>
<td>0.25</td>
</tr>
</tbody>
</table>
Circular adjustment section

Eccentric cone section

Precast riser section

Flat slab top

Steps or ladder

Mortar fillet

Reinforcing steel

1. Knockouts shall have a wall thickness of 2" minimum to 2½" maximum.

MANHOLE DIMENSION TABLE

<table>
<thead>
<tr>
<th>DIA</th>
<th>WALL THICKNESS</th>
<th>BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT SIZE</th>
<th>MINIMUM DISTANCE BETWEEN KNOCKOUTS</th>
<th>BASE REINFORCING STEEL IN#/+ IN EACH DIRECTION</th>
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<tbody>
<tr>
<td>72&quot;</td>
<td>6&quot;</td>
<td>8&quot;</td>
<td>60&quot;</td>
<td>12&quot;</td>
<td>0.24</td>
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<td>8&quot;</td>
<td>12&quot;</td>
<td>84&quot;</td>
<td>12&quot;</td>
<td>0.29</td>
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</tbody>
</table>

MANHOLE TYPE 2
**NOTES**

1. Knockouts shall have a wall thickness of 2" minimum to 2 1/2" maximum.
NOTES

1. As an acceptable alternate to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used. Wire mesh shall not be placed in knockouts.

2. The knockout diameter shall not be greater than 18". Knockouts shall have a wall thickness of 1/8" minimum to 2" maximum.

3. Frame and grate may be installed with flange down or cast into adjustment section.

4. The precast base section may have a rounded floor and the walls may be sloped at a rate of 1:24 or steeper.

5. Opening shall be measured at the top of the precast base section.

FRAME AND VANED CRATE

RECTANGULAR ADJUSTMENT SECTION

CONCRETE INLET

PRECAST BASE SECTION

*3 Bar each corner

*3 Bar each side top and bottom

One *3 Bar across bottom
NOTES:
1. Precast cone sections may be eccentric or concentric.
2. Seepage port orientation varies among manufacturers.

SEEPAGE PORT DETAIL
(See Note 2)

PRECAST CONCRETE DRYWELL
1. Concrete collar width shall be one half of the outside pipe diameter of the largest pipe. The minimum collar width shall be 12", concrete collars may be used with all pipe materials and diameters. The concrete collar option shall only be used to extend existing pipes.

2. When a coupling band connection requires attaching a bell end of a concrete pipe, the bell end of the pipe shall be removed before the connection is installed.

3. Increase the outside diameter of the metal pipe to match the outside diameter of the concrete pipe with 12" wide rubber gasket. Thickness as required. Rubber gaskets shall be in accordance with Section 9-04.4(3) of the standard specifications.

4. Use a flat type K coupling band. Type K coupling bands with staples are not allowed for the installation detail shown. The coupling band option shall only be used for extending existing pipes that have an inside diameter of 36" or less.

5. Steel welded wire fabric shall be in accordance with Section 8-07.7 of the standard specifications, install two wraps for sizes 8 x 8 W1.4 x W1.4 (10 gauge), steel welded wire fabric or one wrap for any of the following sizes:
   - 6 x 6 W2.1 x W2.1 (8 gauge)
   - 6 x 6 W2.9 x W2.9 (6 gauge)
   - 4 x 4 W3.0 x W3.0 (6 gauge)
   - 4 x 4 W4.0 x W4.0 (4 gauge)
NOTES

1. Install sewer saddle with gasket and stainless steel clamps for connection to existing sewers. Install wye or tee sewer fitting with gaskets for new sewer installations.

2. Mark location of sewer stub in accordance with Contracting Agency requirements.

---

**WYE CONNECTION**

- 4" or 6" DIA Sewer pipe (See Contract)
- Less than 90°
- Wye Branch
- Property Line
- Sewer Main

---

**TEE CONNECTION**

- 4" or 6" DIA Sewer pipe (See Contract)
- Cap
- Tee Branch
- Property Line
- Sewer Main

---

**ELEVATION**
STANDING SIDE SEWER CONNECTION
STANDARD PLAN B-30

45° bend

4" or 6" Sewer Pipe
(See Contract)

Tee

Sewer main

24" x 24" x 24" Concrete block
or Controlled Density Fill
DETAIL A

\( \frac{3}{8}'' \) DIA x \( \frac{1}{2}'' \) hex head bolt with hex nut and \( \frac{15}{16}'' \) square x .135'' washer

DETAIL B

\( \frac{1}{2}'' \) DIA x \( 1\frac{1}{2}'' \) hex head bolt with hex nut. Guardrail rests on top of bolt.

BEAM GUARDRAIL

See Detail A

See Detail B

G-2 Post (See Note 1)

TYPE 20

TYPE 21
1. Saw top of post and block to 1'' above thrie beam guardrail reducer section.

THRIE BEAM GUARDRAIL REDUCER SECTION
TYPE A

THRIE BEAM GUARDRAIL REDUCER SECTION
TYPE B
NOTES

1. Type 4 anchor required. For details, see Standard Plan C-6c.

2. Post spacing is 6-3" unless otherwise shown.

3. For Terminal type and details, see Contract Plans and applicable Standard Plan(s).

4. The slope from the edge of the shoulder into the face of the guardrail should not exceed 12:1 when the face of the guardrail is less than 12-0" from the edge of the shoulder.

5. For one-way traffic, use Type 4 anchor. For two-way traffic, use Type 1 anchor. See applicable Standard Plan(s) for details.

6. When Beam Guardrail Flared Terminals are used on both ends a minimum of 25-4" of Beam Guardrail shall be installed.
1. Attach standard wood or steel blocks to concrete structure with 1/2" expansion anchor or 1/2" threaded rod in a 1" x 8" hole grouted with epoxy.

2. For Type 3 Guardrail, terminate the rub rail by lapping it behind the first 10 x 10 post of the Type 16 Transition Section, or as approved by the Engineer.

3. The Type 10 or Type 11 Guardrail shall extend 12'-6" MIN past the structure to allow installation of the Type 16 Transition for the opposing traffic.

4. If the minimum number of 12'-6" thrice beam sections required to span the structure extends more than 6'-3" (but less than 12'-6") past the structure, then a 6'-3" section of nested thrice beam should be added. Otherwise, install an additional 12'-6" section.

5. Thrice Beam Guardrail Reducer Section Type B.

6. This Type 16 Transition shall end at a 10 x 10 post. Place nested thrice beam with 10 x 10 posts at 3'-1/2" MAX spacing between the end of the transition and the structure.

---

**FLARE RATE TABLE**

<table>
<thead>
<tr>
<th>Rate</th>
<th>Posted Speed (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 l</td>
<td>70</td>
</tr>
<tr>
<td>14 l</td>
<td>60</td>
</tr>
<tr>
<td>12 l</td>
<td>55</td>
</tr>
<tr>
<td>11 l</td>
<td>50</td>
</tr>
<tr>
<td>10 l</td>
<td>45</td>
</tr>
<tr>
<td>9 l</td>
<td>40 or less</td>
</tr>
</tbody>
</table>

---

**GUARDRAIL PLACEMENT**

**STANDARD PLAN C-2b**

**APPROVED FOR PUBLICATION**

Clifford E. Mansfield

6/2/98

DEPUTY STATE DESIGN ENGINEER

RBA

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

The above text and diagram describe the installation and placement of guardrails on a concrete structure, including details on the type of guardrail to be used, the length and spacing of the posts, and the flare rate table for different rates.

The effective dates mentioned are April 7, 2003, to January 4, 2004, and the document is marked with an expiration date of May 5, 2000.
CASE 8A

CASE 8B

CASE 8C

NOTES
1. This Beam Guardrail is used when the distance from the end of the Bullnose Terminal to the beginning of the transition of the Bridge Rail is less than 100 feet.

EXPIRES JUL 21, 2014

GUARDRAIL PLACEMENT
MEDIAN BULL NOSE

STANDARD PLAN C-2c
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Washington State Department of Transportation

RICHARD BARSTON, P.E.

HERALD J. PATTERSON

EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004
NOTES

1. SRT Terminal shown, for terminal type and details, see Contract or applicable Standard Plans.

2. Post spacing is 6'-3" except where noted.

3. Type 4 anchor required. See applicable Standard Plans.

4. The slope from the edge of the shoulder into the face of the guardrail should not exceed 10% when the guardrail is within 12'-0" from the edge of the shoulder.
1. SKT Terminal shown. For terminal type and details see Contract and applicable Standard Plans.

2. Attach standard blocks to concrete structure with ⅜" DIA expansion anchor or ¾" DIA threaded rod in a 1" DIA x 6" hole grouted with epoxy.

3. Type 4 anchor or Type 4 anchor (thrie beam) required.

4. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1 when the guardrail is within 12'-0" from the edge of the shoulder.

5. If the distance from end of Type II guardrail to column structure exceeds 6'-3" using 12'-6" thrie beam sections, add a 6'-3" nested section of thrie beam with 10 x 10 posts, spaced at 3'-1½" (MAX), and begin transition.

6. Thrie Beam Guardrail Reducer Section Type B.

7. Guardrail post spacing for Type II guardrail past the End Bridge Pier shall be at 6'-3" spacing, maximum, with 6 x 8 post and standard block.

---

**GUARDRAIL PLACEMENT**

One Way Traffic

CASE 11C
1. See Contract for guardrail connection to bridge rail and concrete barrier.
2. The slope from the edge of the shoulder into the face of the guardrail shall not be steeper than 10:1.
3. Attach to rail with ⅝" x 9" long bolt, nut and 1½" washer on back of post.
4. For terminal type and details, see Contract and applicable Standard Plans.
5. Radius dimensions shall be etched into plate replacing the letters "MIN", shown on the Identification Plate Detail. Digits shall be ⅝" MIN height and ⅝" MAX width. The plate shall be galvanized after etching.
6. The guardrail radius Identification Plate shall be mounted on the back side of the Rail Element using the lowest splice bolt at the P.I. of the guardrail radius.
7. First letter of case designation placement indicates end treatment on side road. Second letter indicates end treatment on main road. For instance, a Type 5 Anchor on the side road and a bridge connection on the main road would be Case 12 A-C.
8. For the 6’-6” radius, 4½” CRT posts are required including the CRT post at point B.
9. For CRT post details, see Standard Plan "Beam Guardrail Posts and Blocks".

G U A R D R A I L  P L A C E M E N T
WEAK POST INTERSECTION
DESIGN (6’-6” MAX RADIUS)

IDENTIFICATION PLATE
MOUNTING DETAIL

IDENTIFICATION PLATE
(see Note 5)

CASE 12 A
(see Note 8)

CASE 12 B
(see Note 7)

SECTION A-A

See Note 2

See Note 4

See Note 2

See Note 5
NOTES
1. For Service Level 1, Weak Post Bridge Roll System, see Contract.
2. SRT Terminal shown. For Terminal type and details, see Contract and applicable Standard Plans.
3. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1.
4. See Standard Plan "Beam Guardrail Posts and Blocks".

---

**CASE 14**

---

**GUARDRAIL PLACEMENT**
1. SRT Terminal shown. For Terminal type and details, see Contract and applicable Standard Plan(s).

2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1.


**CASE 15**

Guardrail Placement

**DETAIL**

- See Note 3
- 25' (see Note 4)
NOTES

1. Type 4 anchor required. For details, see applicable Standard Plan(s).

2. For terminal type and details, see contract and applicable Standard Plan(s).

3. Post spacing is 6'-3" except where noted.

4. For guardrail to bridge rail connection see applicable Standard Plan or Contract.

5. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1 when the guardrail is within 12'-0" from the edge of the shoulder. Beyond 12'-0", the slope shall not be steeper than 6:1.

FLARE RATE TABLE

<table>
<thead>
<tr>
<th>Rate</th>
<th>Posted Speed (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15:1</td>
<td>70</td>
</tr>
<tr>
<td>14:1</td>
<td>60</td>
</tr>
<tr>
<td>13:1</td>
<td>55</td>
</tr>
<tr>
<td>12:1</td>
<td>50</td>
</tr>
<tr>
<td>11:1</td>
<td>45</td>
</tr>
<tr>
<td>10:1</td>
<td>40 or less</td>
</tr>
</tbody>
</table>

GUARDRAIL PLACEMENT
STANDARD PLAN C-2j

CASE 16

One Way Traffic

CASE 17

Two Way Traffic

CASE 18

One Way Traffic
GUARDRAIL PLACEMENT
18'-0" SPAN
STANDARD PLAN C-2n
NOTES

1. See Contract for transition and connection type.

2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1.

3. Guardrail installation shall be Beam Guardrail Type 1 with standard post and block.

4. First letter of case designation indicates end treatment on side road. Second letter indicates end treatment on main road. For instance, a terminal on the side road and a bridge connection on the main road would be Case 22 BC.

5. For terminal type and details, see Contract and applicable Standard Plan(s).

6. Radius dimensions shall be etched into plate replacing the letters "HH" shown on the Identification Plate Detail. Digits shall be 1½" MIN height and ¾" MAX width. Plate shall be galvanized after etching.

7. The guardrail Identification Plate shall be mounted at the lower splice bolt on the back side of the rail element at the PC of the guardrail radius.

GUARDRAIL PLACEMENT

STRONG POST

INTERSECTION DESIGN

IDENTIFICATION PLATE MOUNTING DETAIL

(See Note B)
GUARDRAIL
TRANSITION SECTIONS
STANDARD PLAN C-3

TYPE 1

1. See Standard Plan, "Guardrail Connection to Bridge Rail or Concrete Barrier."
2. Use 6"-0" long 10x10 timber posts with 8x8 blocks.
3. Use 6"-6" long 10x10 timber posts with 8x8 blocks.

See Note 1

Transition pay limit
Beam guardrail pay limit

Five spaces at 3'-1½" MAX
Thrie beam guardrail reducer section Type B

6x8 post with standard block (TYP)
See Note 3

TYPE 2

1. See Standard Plan, "Guardrail Connection to Bridge Rail or Concrete Barrier."
2. Use 6"-0" long 10x10 timber posts with 8x8 blocks.
3. Use 6"-6" long 10x10 timber posts with 8x8 blocks.

See Note 1

Transition pay limit
Beam guardrail pay limit

Five spaces at 3'-1½" MAX
Thrie beam guardrail reducer section Type B

6x8 post with standard block (TYP)
See Note 3

See Note 2

TYPE 1a

0 or E Connection

12'-6" Nested thrie beam

See Note 1

Transition pay limit
Beam guardrail pay limit

Four spaces at 3'-1½" MAX
Thrie beam guardrail reducer section Type B

6x8 Post with standard block (TYP)
GUARDRAIL TRANSITION SECTIONS

TYPE 3

See Note 1

6x8 Post with standard block (TYP)

Five spaces at 3'-1 1/2" MAX

See Note 1

TYPE 4

(For Construction and Maintenance Operations only)

Three spaces at 3'-1 1/2" MAX

Added 6x8 posts with standard block

Existing 6x8 posts with standard block

TYPE 5

Four spaces at 1'-6 1/2" MAX

Two spaces at 3'-1 1/2" MAX

1'-3" MAX (Total length = 6'-3")

See Note 1

6x8 Post with standard block (TYP)

TYPE 6

6'-3" Post spacing

Eight spaces at 3'-1 1/2" MAX (Total length = 25'-0")

6x8 post with standard block

See Note 1

6x8 Post with standard block (TYP)

NOTES

1. See Standard Plan, "Guardrail Connection to Bridge Rail or Concrete Barrier."

2. For post details, see Standard Plan, "Beam Guardrail Posts and Blocks."
APPROACH END TYPE 10
(Thrie Beam installed at face of curb)

TRAILING END TYPE 11
(Thrie Beam installed at face of curb)

TRAILING END TYPE 12
(Thrie Beam installed at face of curb)


APPRAOCH END TYPE 13
(Thrie Beam installed at face of Bridge Rail)

TRAILING END TYPE 14
(Thrie Beam installed at face of Bridge Rail)

GUARDRAIL TRANSITION SECTIONS
1. See Contract for the number of thrie beam sections for Type II Guardrail.

2. If the distance from the end of the Type II Guardrail to column/structure exceeds 6'-3" using 19'-6" thrie beam sections, add a 6'-3" nested section of thrie beam to reduce the distance to less than 6'-3".
NOTES
1. Unless otherwise indicated in the contract, the SRT-350 (12.5, 8 Post) as manufactured by Trinity Industries, Inc. or a FLEAT 350 as manufactured by Road Systems, Inc. shall be installed per manufacturer's recommendations. If specified in the contract, the FLEAT TL2 as manufactured by Road Systems, Inc. shall be installed per manufacturer's recommendations.

2. Where terminal is placed on a curve, and post offsets would result in the rail running onto the shoulder (e.g., the sides of a curve), the posts shall be installed so that the face of the rail is at the edge of the shoulder.

3. When snow load post washers and snow load rail washers are called for in the contract, the snow load rail washers must be omitted within the terminal limit.

4. Offset distances:
   - FLEAT 350 = 4'-0"
   - FLEAT TL2 = 1'-6" (MIN)
NOTES

1. An ET-PLUS (TL3) as manufactured by Trinity Industries, Inc. or an SKT-380 as manufactured by Road Systems Inc. shall be installed according to manufacturer's recommendations. When a TL2 terminal is specified in the contract an ET-PLUS (TL2) as manufactured by Trinity Industries, Inc. or an SKT-TL2 as manufactured by Road Systems, Inc. shall be installed according to manufacturer's recommendations.

2. A reflectorized object marker shall be installed according to manufacturer's recommendations.

3. When snow load post washers and snow load rail washers are required by the contract, the snow load rail washers must not be installed within the terminal limits.

4. Terminal shall be installed at a taper, ensuring that end piece is entirely off shoulder.

5. Length for ET-PLUS (TL3) and SKT-380 is 86'. Length for ET-PLUS (TL2) and SKT-TL2 is 28'.

EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004
NOTES
1. Attach guardrail to bridge rail or concrete barrier using 3\" high strength bolts with chemically bonded anchors.

2. If the last guardrail post is 3\" or less from the end of the bridge barrier, this attachment and blockout is not necessary.

3. This case is also applicable for vertical faces with no curbs.

C-5
03-14-97
1. Anchor plate may be constructed from 1/4" plates welded to equal strength and dimensions as shown.
2. For end section details see Standard Plan "Beam Guardrail End Sections".
3. For post details, see Standard Plan "Beam Guardrail Posts and Blocks".
4. Eight 3/4" x 1 1/2" machine bolts with hex nut and washer. Place washer on face side of roll.
5. Outside nut shall be torqued against inside nut a minimum of 100 ft-lbs.
6. Torque all bearing plate with 10d nail at corners to prevent turning.
7. Anchor pay limit does not apply when anchor is included in a Beam Guardrail Terminal.

**BEAM GUARDRAIL ANCHOR TYPE 1**

**C-6**

Sheet 1 of 2 Sheets
ANNUAL RAIL WASHER

ANCHOR PLATE
(See Note 4)

BEAM GUARDRAIL ANCHOR
TYPE I

CABLE

BEARING PLATE
1. All bolts shall be high strength 5/8" hex head bolts with anchor roll washers.

2. Roll section and #8 x 17 post shall be fabricated to receive 5/8" hex head bolts as shown.

Beam guardrail anchor type 2

Notes:

- See Note 1
- See Note 2

One 1 3/4" x 5 1/2" x 0.164" washer with two 3/4" holes

6" Post (or 3' MIN in solid rock)

5' - 6' or 2' - 6' MIN in soil or rock

18" DIA

Elevation

PLAN

SECTION B-B

BACKING PLATE
NOTES
1. For details, see Standard Plan C-6b.
2. For end section details see Standard Plan C-7 or C-7a.
3. For details, see Standard Plan C-4b.
4. Outside nut shall be torqued against inside nut a minimum of 100 ft-lbs.
5. Post and block shall match beam guardrail posts.

BEAM GUARDRAIL
PAY LIMIT

ANCHOR POST ASSEMBLY
SEE NOTE 3

ANCHOR RAIL WASHER
(SEE NOTE 1)

END SECTION DESIGN C
(SEE NOTE 2)

ANCHOR PLATE
(SEE NOTE 1)

TWO 1" NUTS AND
WASHERS (SEE NOTE 4)

W BEAM INSTALLATION

THREE BEAM GUARDRAIL
PAY LIMIT

ANCHOR PAY LIMIT

ANCHOR POST ASSEMBLY
SEE NOTE 3

ANCHOR RAIL WASHER
(SEE NOTE 1)

END SECTION DESIGN C
(THREE BEAM) (SEE NOTE 2)

WOOD BREAKAWAY POST
(SEE NOTE 5)

THREE BEAM INSTALLATION

BEAM GUARDRAIL ANCHOR
TYPE 4

STANDARD PLAN C-6c

EXPIRES MAY 5, 2000

Clifford E. Mansfield
01-06-99

NOTE: THIS PLAN IS A TYPICAL ENGINEERING DOCUMENT BUT IS NOT INTENDED TO BE THE COMPLETE DOCUMENT FOR ALL PROJECTS. IT IS INTENDED TO PROVIDE A GUIDELINE FOR THE DESIGN AND CONSTRUCTION OF THE APPROPRIATE TYPE OF GUARDRAIL, ANCHOR, OR ENTRANCE. THIS PLAN IS A WORKING DOCUMENT AND SHOULD NOT BE USED FOR CONTRACTUAL PURPOSES. FOR CONTRACTUAL PURPOSES, THE CONTRACTOR SHOULD REFER TO THE SPECIFICATIONS FOR THE PROJECT. THIS PLAN IS A TYPICAL ENGINEERING DOCUMENT AND SHOULD NOT BE USED FOR CONTRACTUAL PURPOSES. FOR CONTRACTUAL PURPOSES, THE CONTRACTOR SHOULD REFER TO THE SPECIFICATIONS FOR THE PROJECT.

APPROVED FOR PUBLICATION
PLAN

1/2" x 9'-0" Cable with one swaged end

6" x 4" x 12" Steel plate
10" x 13" Standard steel pipe

See Note 1

6'-3"

Two 1" Nuts

Anchor plate

12" 16"

Anchor post assemblies

(see Note 4)

Type 5 Anchor

6/8" Button head bolt
or 6/8" x 1" hex head bolt
and hex nut with anchor rail
washers under bolt head and
nut (see Note 3).

Beam guardrail

pay limit

6'-3"

End Section Design G

(see Note 2)

1/4" Cable clips (6 required)

Torque nuts to 50 ft-lbs.

Bearing plate

(see Note 3)

Standard 2" OD pipe sleeve

(2'/9" OD)

Two 1" nuts and washers

(see Note 5)

1/2" x 2 1/2" x 1/4" x 8"

1/4"

1/4"

1/8"

Tack weld 2 1/2" x 2 1/2" x 1/4" steel plate

with 1/4" hole to tubular steel

1/4"

1/4"

1/4"

End Section Design G

(see Note 2)

1/2" x 2 1/2" x 1/4" x 8"

1/4"

1/4"

1/4"

Tack weld 2 1/2" x 2 1/2" x 1/4" steel plate

with 1/4" hole to tubular steel

1/4"

1/4"

1/4"

Tack weld 2 1/2" x 2 1/2" x 1/4" steel plate

with 1/4" hole to tubular steel

1/4"

1/4"

1/4"

Tack weld 2 1/2" x 2 1/2" x 1/4" steel plate

with 1/4" hole to tubular steel

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Tack weld 2 1/2" x 2 1/2" x 1/4" steel plate

with 1/4" hole to tubular steel

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Tack weld 2 1/2" x 2 1/2" x 1/4" steel plate

with 1/4" hole to tubular steel

1/4"

1/4"

1/4"

Tack weld 2 1/2" x 2 1/2" x 1/4" steel plate

with 1/4" hole to tubular steel

1/4"

1/4"

1/4"

Tack weld 2 1/2" x 2 1/2" x 1/4" steel plate

with 1/4" hole to tubular steel

1/4"

1/4"

1/4"

Tack weld 2 1/2" x 2 1/2" x 1/4" steel plate

with 1/4" hole to tubular steel

1/4"

1/4"

1/4"
BEAM GUARDRAIL ANCHOR
TYPE 7

NOTES

1. For details, see Standard Plan, "Beam Guardrail Anchor Type 1".

2. The roll element is to be included in the "Beam Guardrail" pay item. The "Anchor" pay item includes the anchor post, anchor plate, anchor cable, bearing plate, nuts, and washers.

3. For details, see Standard Plan, "Beam Guardrail Posts and Blocks".

4. Post shall match beam guardrail posts.
1. End Section Design G shall be used except where noted on the plans or contract.

2. Bolts shall be 3/8" ASHTO M 164 chemically bonded anchors. Anchor Installation shall be per manufacturer's recommendations, in dry conditions.

3. A single piece having similar dimensional shape to Design G and mating with the U-beam guardrail is an alternate.

4. In cases where Design "F" end section is lapped on the outside of the guardrail, a galvanized 1" x 2" OD, 0.134" thick, narrow type A Plain Washer or a anchor rail washer shall be placed under the splice bolt heads.

---

**NOTES**

- **Design F end section**
- **Approximate R = 11"**

**Design G**
- **For Design G end section only**
- **Splice bolt slots 3/8" x 3" (Typ)**
- **(See Note 5)**

**Design F**
- **Splice bolt slots 3/8" x 3" (Typ)**
- **(See Note 4)**
- **2½" post bolt slot (optional)**

**Design C**
- **Splice bolt slot (Typ) 3/8" x 1½"**
- **(See Note 5)**

**Design A**
- **Splice bolt slot (Typ) 3/8" x 1½"**
- **(See Note 1)**

---

**BEAM GUARDRAIL END SECTIONS**

**STANDARD PLAN C-7**

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**EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004**

---

**APPROVED FOR PUBLICATION**

**Clifford E. Mansfield**

**DEPUTY STATE DESIGN ENGINEER**

**DATE: 8/10/08**

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**EXPIRES MAY 3, 2000**
NOTES

1. Bolts shall be high strength, ¾", with chemically bonded anchors.

2. In cases where Design F End Section is lapped on the outside of the guardrail, a galvanized 1" OD, 2" OD, 0.134" thick, narrow Type A Plain washer or an anchor roll washer will be placed under the splice bolt heads.
1. Wire rope loops shall be 44" long, except for top loop of terminal, which shall be 24" long.

2. Wire seizing shall be eight wraps of 16 gauge wire with ends twisted together, or equivalent fastening.

SECTION A-A

SECTION B-B

CONCRETE BARRIER
TYPE 2
STANDARD PLAN C-B

NOTE: This plan sheet is subject to engineering changes without written notice. For general, design, and approval certification, refer to the Washington State Department of Transportation. A copy may be obtained upon request.

APPROVED FOR PUBLICATION
Clifford E. Mansfield
8/1/98
DEPUTY STATE DESIGN ENGINEER
WA DEPARTMENT OF TRANSPORTATION

BAR A
#5 Bar

BAR B
#5 Bar

2"-11/4" or 11'-10 1/4"

9'-7" or 12'-1"

1/8" ID loop

1/6" draft

1/4" draft

3/4" wire rope

Wire seizing, see Note 2

1/8" % of pin to face of concrete

3/4" hole for pulling

1/4" thick plate washer

3° Taper

2 1/4" MIN
2 1/2" MAX

1/4" DIA pin with rounded bottom edges

CONNECTING AND DRIFT PINS
1. For details on loops, connecting pin, reinforcing steel, and terminal units see Standard Plan Concrete Barrier Type 2.

2. See plans for surface treatment on back face of barrier.

3. At the juncture between the Concrete Barrier Type 5 and the Bridge Barrier, cover the exposed foot of the Type 5 Barrier with an earth berm.

CONCRETE BARRIER TYPE 5

BERM DETAIL

Point of cover, extend fill about half way down first precast unit. See Note 3.
1. Slope varies to suit conditions
   Not steeper than 2:1
   Not steeper than 3:1 for mowing

2. Berm transition offset optional for approach end

3. 10'-0" Minimum radius rounding when conditions permit
BOX CULVERT GUARDRAIL STEEL POST TYPE 1
10" to 30" ground cover

BASE ATTACHMENT DETAIL

See Base Plate Detail

See Bearing Plate Detail

3/4" Grout pad

Center Line of WBx35

Traffic side

2½" x 2" Bolt with hex nut and washer (TIP)

High strength bolts (four required) (See Note 3)

WBx35

See Cover Plate Detail

Ground Line

Top weld nut to plate

See Post Base Plate Detail

See Post Bearing Plate Detail

WBx35

BOX CULVERT GUARDRAIL STEEL POST TYPE 2
10" to 6" ground cover

POST ATTACHMENT DETAIL

See Post Base Plate Detail

See Cover Plate Detail

1 1/2" Top and Bottom (TIP)

Wood block for steel posts

See Standard Plan C-10

WBx35

See Note 1

See Anchor Attachment Detail for center of double box culvert

3/4" Grout pad

Center Line of WBx35

Traffic side

2½" x 2" Bolt with hex nut and washer (TIP)

High strength bolts (four required) (See Note 3)
EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004

POST ANCHOR ATTACHMENT DETAIL
(See Note 4)

ANCHOR ATTACHMENT DETAIL
(See Note 4)

POST BASE PLATE DETAIL

BASE PLATE DETAIL

COVER PLATE DETAIL

NOTES

1. Length of W8x35 and W6x9 shall be determined by measurement from top of ground to top of grout pad. This distance shall be verified by the contractor.

2. Attach guardrail post to box culvert with 3/4" high strength bolts with resin bonded anchors.

3. Drill 1 1/2" diameter hole in concrete slab for 3/4" high strength bolts. Length of hole is determined by top slab of box culvert thickness which shall be verified by the contractor.

4. For details of post attachment to double box culvert, see Standard Plan "Guardrail Placement," Case 15.

BOX CULVERT GUARDRAIL STEEL POST STANDARD PLAN C-10 SHEET 2 OF 2 SHEETS

EXPIRES MAY 6, 2004

Clifford E. Mansfield 07/31/98
DEPARTMENT OF TRANSPORTATION WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION

Clifford E. Mansfield 07/31/98
DEPARTMENT OF TRANSPORTATION WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004

EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004
1. When installed in front of slopes steeper than 6:1, distance between posts and slope break point shall be 12" Min.

2. Where barrier is parallel to the edge of the travelled way, every sixth post shall have a reflector. Reflectors shall be white when installed on the right side of traffic, and yellow when installed on the left side of traffic.

---

TABLE A

<table>
<thead>
<tr>
<th>Curve Radius</th>
<th>Post Spacing</th>
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<td>700' or more</td>
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<tr>
<td>699' to 220'</td>
<td>12'</td>
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<td>219' to 110'</td>
<td>6'</td>
</tr>
<tr>
<td>Less Than 110'</td>
<td>Use Not Recommended</td>
</tr>
</tbody>
</table>
1. Stagger Spring Cable End assemblies for clearance between units. Installation of cable end assemblies shall be as follows:

LENGTH OF CABLE RUNS:

- Up to 500' - Use the Spring Cable End Assembly on one end, and turnbuckle only on the other end of each cable.
- Over 500' to 2000' - Use the Spring Cable End Assembly on each end of each cable.

2. See Standard Plan C-11a for post spacing.

3. Distance from tangent of barrier run to notch for top cable on breakaway anchor angle shall be 4'.

4. The distance from the top of the footing to top of the highest cable is:
   - 21" for TYPE 1 Cable Barrier,
   - 30" for TYPE 2 and TYPE 3 Cable Barrier.

5. Where the cable is connected to a cable socket with a wedge type connector, one wire of the wire rope shall be crimped over the base of the wedge to hold it firmly in place.

CABLE BARRIER TERMINAL
STANDARD PLAN C-11a

ELEVATION

PLAN VIEW

FOOTING PLAN VIEW

BRACKET DETAIL
(View is oriented 90° from post slip base view shown below)

POST SLIP BASE PLAN VIEW

POST SLIP BASE ELEVATION

Footnote:
- Use 3/8" dia. resin bonded anchor embed 6" minimum (1TP)
- 1/4" x 2 1/4" Bolt with nuts and three washers (1TP)
- Torque to 300 inch-pounds
- Bolt to 3/4" hex head
- Keep plate 1/4" x 1 1/2" x 2 1/2"
- Nuts on 3/8" hex nut
- 1/4" thick top about 1" long, bend around cable
- 1/2" Plate

Footings:
- 3" for TYPE 1 Cable Barriers
- 4 1/2" for TYPE 2 and TYPE 3 Cable Barriers

Footings:
- Nuts and washers (1TP)
- J-Bolt, top 2" threaded
- 3 Bar (1TP)
NOTE:
1. An Energy III System, fabricated by Energy Absorption Systems, Inc., a Fish System as fabricated by Roadway Safety Services, Inc., or a Traffic Band Attenuator as fabricated by Traffic Devices, Inc. shall be installed in accordance with the manufacturer's recommendations.

2. For temporary installations, the inertial barriers may be placed on wood pallets that are 4" or less in height.

3. For Terminal Section or Concrete Barrier details see Standard Plan C-10.

Impact Attenuator Inertial Barrier Configurations Standard Plan C-12

Installation Details

Attenuator Configurations

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<tr>
<th>Speed Range</th>
<th>Type 1</th>
<th>Type 2</th>
<th>Type 3</th>
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<td>75 MPH</td>
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NOTES

1. PERMANENT BARRIER SHALL BE PlACED INTO PLACEMENT MINIMUM 8". NO BARRIER REQUIRED DURING CONSTRUCTION.

2. USE OF BARRIERS FOR SPACING UP TO 3'.
   USE 3'-0" BARRIER FOR SPACING UP TO 5'.
   USE 5'-0" BARRIER FOR SPACING UP TO 10'.

3. USE A BARRIER AT WIDER THAN 2000 REVISED A MINIMUM OF 36".
NOTES

1. Reinforcing steel dimensions and clearances are shown for stationary form construction. When slip-formed construction is used, increase reinforcing steel dimensions by the outside surfaces of the barrier to 1/8" and adjust steel dimensions as required.

2. The Vertical Back Barrier is only used in the configurations shown in Standard Plans C-14f and C-14g.
<table>
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<th>FOOTING REINFORCEMENT</th>
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WALL DESIGN WITH SLOPING FRONT FACE AND 2:1 BACKSLOPE

REINFORCED CONCRETE RETAINING WALL
TYPE 4 AND 4 SW
STANDARD PLAN D-1d
SHEET 2 OF 2 SHEETS
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<th>B</th>
<th>C</th>
<th>D</th>
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**DESIGN WITH VERTICAL FRONT FACE AND 24" BACKSLAB**

**REINFORCED CONCRETE RETAINING WALL TYPE 5 AND 8 SW STANDARD PLAN B-1a**

**APPROVED FOR PUBLICATION**

**Patricia A. Weller**

**State Director of Transportation**

**SHEET 2 OF 2 SHEETS**
<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Bar E (Size #4)</th>
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**WALL DESIGN WITH SLOPING FRONT FACE AND 2:1 BACKSLOPE**
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<th>TYPE IB</th>
<th>TYPE IC</th>
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<td>4'⁷ - 6'⁹</td>
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<td>4'⁷ - 6'⁹</td>
<td>3'⁵ - 6'⁷</td>
<td>5'⁴ - 6'⁶</td>
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</tbody>
</table>

**NOTE:**
- Wall to be designed Noise Barrier Type IA, IB, IC or ID. The Contract specifies actual wall designations.
- For intermediate wall heights, use the next higher H.
- Panels shall have at least 3 feet of level ground on each side.
- Construction joints in the footing shall be spaced at 120 feet maximum.
- The Contract specifies actual foundation requirements 01 or 02.

**NOISE BARRIER - TYPE 1:**
CAST-IN-PLACE CONCRETE WALL ON TRENCH FOOTING

**TYPICAL SECTION:**
- 3" Clearance
- 12" MIN
- 6" MIN
- 3" Clearance
- Construction Joint with Roughened Surface
- Cast against Undisturbed Earth
- Vertical reinforcing steel Bar D centered on wall
- Final ground line
- 6" MIN 2'-0" MAX
- ¾" Chamfer (Typ)
- Surface Treatment
- ¾" Premolded Joint filler (Typ) at 30'-0" Centers MAX
- Reinforcing steel Bar D (see table)

**ELEVATION:**
- Angle point
- 2'-0" MIN
- 3" MIN
- Final ground line
- Construction Joint (See Note 4)

**JOINT AND CORNER DETAIL:**
- 3" (Typ)
- Reinforced per listed panel height reinforcement schedule
- Traffic side

**Effective:** APRIL 7, 2003 TO JANUARY 4, 2004

---

**Notes:**
- 03-14-97
FOOTING WIDTH TRANSITION DETAIL
(For locations without footing step)
NOTE: Transverse bars not shown

JOINT AND CORNER DETAIL

NOISE BARRIER - TYPE 2
CAST-IN-PLACE CONCRETE WALL
ON SPREAD FOOTING

D-2b
03-14-97
NOTES
1. Wall to be designated Noise Barrier Type 3A, 3B or 3C. The Contract specifies actual wall designations.
2. For intermediate wall heights not listed, use the next higher H.
3. Panels shall have at least 3 feet of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet MAX.

D-2c
03-14-97

Sheet 1 of 2 Sheets
FOOTING WIDTH TRANSITION DETAIL
(For locations without footing step)

NOTE: Transverse bars not shown

NOISE BARRIER - TYPE 3
CAST-IN-PLACE CONCRETE WALL ON SPREAD FOOTING
(OFFSET FOOTING)
### Table: Wall Height, Depth, and Reinforcement Details

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<th>DEPTH D2</th>
<th>BAR D</th>
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<td>3'-9&quot;</td>
<td>3'-3&quot;</td>
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<td>#4 at 10&quot;</td>
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<td>4'-6&quot;</td>
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<td>4'-9&quot;</td>
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<td>5&quot;</td>
<td>5'-9&quot;</td>
<td>5'-3&quot;</td>
<td>#6 at 8½&quot;</td>
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### Notes:
1. Wall to be designated Noise Wall Type BA, BB, BC, or BD. The contract specifies actual wall designations.
2. For intermediate wall heights, use the next higher H.
3. Panels shall have at least 1'-0" of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet maximum.
5. All joints shall be in full contact and sealed.
6. The contract specifies actual foundation requirements D1 or D2.

---

**Noise Barrier - Type 8 Precast Concrete Wall on Trench Footing**

- **Elevation**: Bar D center in wall 1½"
- **Trench Footing**: There shall not be more than 1'-0" differential backfill height

---

**Diagram**

- **Joint and Corner Detail**: Reinforced per listed panel height reinforcement schedule
- **Step in Panel Top**: 2'-0" MAX
- **Level (Typ)**: ½" (Typ)
- **Seal**: ½" (Typ)
- **Precast Panel Set Vertical**
- **Compacted Trench**

---

**Page Details**

- **Effective**: April 7, 2003 to January 4, 2004
- **Document Number**: D-2h
DETAIL B

FOOTING WIDTH TRANSITION DETAIL
(for locations without footing step)

NOTE: Transverse bars not shown

NOISE BARRIER - TYPE 9
PRECAST CONCRETE WALL WITH SPREAD FOOTING

D-2i
03-14-97
NOTES:
1. Wall to be designated Noise Barrier Type 10A, 10B, 10C or 100. The Contract specifies actual wall designation.
2. For intermediate wall heights, use the next higher height.
3. Panels shall have at least 3'-0" of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet maximum.
5. All joints shall be in full contact and sealed.
FOOTING WIDTH TRANSITION DETAIL

For locations without footing step
NOTE: Transverse bars not shown

NOISE BARRIER - TYPE 10
PRECAST CONCRETE WALL WITH OFFSET SPREAD FOOTING

D-2j
03-14-97
### Table

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### Diagrams

- **Detail D**: Block-out 10" long, Grout after bolting.
- **Base Plate Detail**: Nuts with hardened washers or plate washer 1/4" x 2 1/2" x 2 1/2"
- **Panel Length**: 12'-0" MAX
- **Shear-Key**: Outside of pilaster to outside of pilaster minus 4 1/2"
- **Wall Reinforcement**: Varies to match angle

### Notes

- **Bar B**: Button head shall bear firmly and uniform against base plate. Bar B shall be held secure during concrete placement to prevent gaps between button head and base plate.
- **END PANEL**: Panel length - 12'-0" MAX
- **Noise Barrier - Type 11**: Precast Concrete Wall on Shaft Foundation
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<td>4 at 12&quot;</td>
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1. Wall to be designated Noise Barrier Type 12A, 12B, 12C and 12D. The Contract specifies actual wall designation.
2. For intermediate wall heights, use the next higher H.
3. Compaction of trench height differential shall not exceed 1 foot.
4. Panels shall have at least 3 feet of level ground on each side.
5. Construction joints in the footing shall be spaced at 120 feet maximum.
6. All joints shall be in full contact and sealed.

---

**Typical Section**
- Height may vary if required to provide a smooth profile consistent with the roadway profile.

**Elevation**
- Panels shall be braced laterally to prevent displacement during backfill.

**Noise Barrier - Type 12**
- Precast Concrete Wall with Traffic Barrier on Trench Footing

D-2I
03-14-97
NOISE BARRIER - TYPE 12
PRECAST CONCRETE WALL WITH TRAFFIC BARRIER ON TRENCH FOOTING
### Table: Wall Height and Bar Details

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<th>Bar D</th>
<th>Bar J</th>
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<tr>
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<td>5'-0&quot; 1&quot; 4 at 15&quot; 3 at 15&quot; 5 at 15&quot;</td>
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</tbody>
</table>

### Diagram: Noise Barrier - Type 13

- Reinforcing steel Bar D centered on wall
- Surface treatment: 1/4" Chamfer
- Grout pad leveling course: 2" Clearance
- Grout pad leveling course: 2" x 2-1/2" Hole for Water B and J
- Final ground line: MAX 2
- Level (Top): 6"-0"
- Elevation: 2'-0" MAX

### Notes:
1. Wall to be designated Noise Wall Type 13A, 13B, 13C or 13D. The Contract specifies actual wall designations.
2. For intermediate wall heights, use the next higher H.
3. Panels shall have at least 3 feet of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet maximum.
5. All joints shall be in full contact and sealed.
6. The Contract specifies actual foundation requirements SI or CG.
NOISE BARRIER - TYPE 14

PRECAST CONCRETE WALL WITH TRAFFIC BARRIER ON SHAFT FOUNDATION

TYPICAL SECTION

**Height may vary if required to provide a smooth profile consistent with the roadway profile**

- **Wall to be designated Noise Barrier Type 14A, 14B, 14C, or 14D. The Contract specifies actual wall dimensions.**
- **For intermediate wall heights, use the next higher height.**
- **Construction joints in the footing wall shall be spaced at 120 feet maximum.**
- **Panels shall have at least 3 feet level ground on each side.**
- **All joints shall be in full contact and sealed.**

**Right-of-Way Traffic SIDE**

- **Bar A centered on wall see chart for gap size and spacing (TYP).**
- **1/2" Seal full height (TYP).**
- **Surface treatment as required.**
- **Optional 2'-0" MIN splice.**
- **Construction joint with roughened surface.**
- **2'-0" MIN splice.**
- **Blockout for shear key - #4 at end of barrier.**
- **Encase base plate and block-out with grout after final alignment at wall pond.**
- **Top of roadway 2'-0" MIN.**
- **1/2" Seal.**
- **Max 1" pitch.**
- **Alternate Anchor Details.**
- **Anchor bolts set bolts with template. Use nuts top and bottom of template to secure location.**
- **Plate 1/2" x 4" x 0'-11" with holes. See Section C-C for bolt hole locations.**
- **Anchor bolts with nuts top and bottom.**

**SECTION AT SHAFT SUPPORT**

- **#4 at end of barrier.**
- **3'-0" MIN.**
- **5'-0" MIN.**
- **9'-0" MAX.**
- **Top of roadway 2'-0" MIN.**
- **1/2" Seal.**
- **Max 1" pitch.**
- **Alternate Anchor Details.**
- **Anchor bolts set bolts with template. Use nuts top and bottom of template to secure location.**
- **Plate 1/2" x 4" x 0'-11" with holes. See Section C-C for bolt hole locations.**
- **Anchor bolts with nuts top and bottom.**

**Notes:**

- **1.**
- **2.**
- **3.**
- **4.**
- **5.**
NOISE BARRIER - TYPE 15
TIMBER PANEL WALL ON TRENCH FOOTING

**Notes:**
1. Walls to be designated Noise Barrier Type 15A, 15B, 15C or 15D. The contract specifies actual wall designations.
2. For intermediate wall heights not listed use the next higher h.
3. Panels shall have at least 3 feet of level ground on each side.
4. Plywood and Glulam panels shall be pressure preservative treated.
5. The contract shall specify actual foundation requirements D1 or D2.

**Elevation:**
- Panel width
- Batten both sides (Typ)
- Panel height
- Batten (Typ)
- Scarf joint with 5:1 slope
- Final ground line
- Batten embedment

**Section A-A:**
- Panel set vertical
- Final ground line
- Trench footing

**Elevation End Detail:**
- Depth D1
- Depth D2
- Glulam + Plywood

<table>
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<tr>
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<th>TYPE 15C</th>
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TYPICAL EXPANSION JOINT

Bond beam limit

BOND BEAM DETAIL

At expansion joints; continuous expansion joint filler placed in both block recesses. Size as required.

Polyurethane sealant

Backer rod

V/2" Joint

DETAIL A

Typical both sides of wall

NOISE BARRIER - TYPE 16
MASONRY WALL ON TRENCH FOOTING
### Noise Barrier - Type 17

**Masonry Wall on Spread Footing**

#### Typical Section

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<th>CMU X</th>
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#### Effectiveness

**Sheet 1 of 2 Sheets**

- **D-2q**
- **03-14-97**

**NOTES**

1. Wall to be designated Noise Barrier Type 17A, 17T, 17C or 17D. The contractor specifies actual wall designations.
2. For intermediate wall heights, use the next higher H.
3. All masonry shall be hollow unit and installed as running bond.
4. All masonry is to be specially inspected.
5. All concrete Masonry Unit (CMU) cells that have vertical steel reinforcing bars or bond beam units shall be filled with grout.
6. Pipers shall have at least 3 feet of level ground on each side.
7. Construction joints in the footing shall be spaced at 120 feet maximum.
8. See "Masonry Wall Finishes and Details" sheets for masonry block finishes, special sizes, shapes, and layout.

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**Effective:** April 7, 2003 to January 4, 2004
<table>
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<th>BAR SIZE</th>
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</table>

**Bond Beam Detail**

Bond beam units

Bond beam limit

*5 at 4'-0" MAX (Typ)

**Typical Expansion Joint**

Cells with vertical reinforcing and bond beams to be filled with grout

*5 (Typ)
See Detail A

Traffic side

**Typical Expansion Joint**

Expansion joint filler placed in sash block recesses.

**Detail A**

Typical both sides of wall

Footing Width Transition Detail

(For locations without footing step)

NOTE: Transverse bars not shown

**Noise Barrier - Type 17**

Masonry Wall on Spread Footing
### Wall and Footing

#### Right-of-Way

- See Contract

#### Solid-Ground Cap

- Bond Beam at Top

#### Reinforcing Steel Bar G (Centered)

- See Note S

### Typical Section

- 3" Clearance
- 2" Clearance
- Bar E

- 2" Clearance at 18'

- 3" Clearance

- 2" Clearance

### Masonry Wall on Offset Spread Footing

- 4'-0" MIN bond beam and reinforced extension at step

- 8'

- 5 (Typ)

- Level (Typ)

- Construction Joint (see Note T)

- Expansion Joints at 40'-0" MAX centers. See Contract for Locations

### Notes:

1. Wall to be designated Noise Barrier Type 18A, 18B, 18C or 18D. The Contract specifies actual wall heights.

2. For intermediate wall heights, use the next higher ft.

3. All masonry shall be hollow unit and installed as running bond.

4. All masonry is to be specially insulated.

5. All concrete Masonry Unit (CMU) cells that have vertical steel reinforcing bars or bond beam units shall be filled with grout.

6. Panels shall have at least 3 stem of level ground on each side.

7. Construction joints in the footing shall be spaced at 120 feet maximum.

8. See "Masonry Wall Finishes and Details" sheets for masonry block finishes, special shapes, sizes, and layout.
### BOND BEAM DETAIL

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<td>#8</td>
<td>4'-10&quot;</td>
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</table>

**Typical Expansion Joint**

Cells with vertical reinforcing and bond beams to be filled with grout.

**Traffic Side**

Expansion joint filler placed in sash block recesses.

**Typical Footing Width Transition Detail**

For locations without footing step.

NOTE: Transverse bars not shown.

**Noise Barrier - Type 18**

Masonry wall on offset spread footing.

D-2r 03-14-97
**DETAIL A**

- Hooks parallel to wall layout line
- #5 Stirrup spacing at 12"
- Three - #4 Stirrup spacing at 6"
- Concrete shaft
- #3.5 spiral at 8" pitch

**TYPICAL EXPANSION JOINT**

- #5 (Typ) Traffic side
- See Note 5
- See Detail B
- At expansion joints, continuous expansion joint filler placed in基础 block recesses. Size as required.
- Polyurethane sealer
- 3⁄8" Joint
- Backer rod

**DETAIL B**

Typical both sides of wall

**BOND BEAM DETAIL**

- Bond beam units
- Bond beam limit

**STEP DETAIL**

- #4 @ 1'-0"
- Even multiples of 8" from 3'-0"

**NOISE BARRIER - TYPE 19**

Masonry Wall on Shaft with Grade Beam Foundation

---

Sheet 2 of 8 Sheets
Provide some number and size dowels as 3 Bar’s lap 2’-0” MIN
One 5’ full height
1½” Clearance

B Bars - for quantities greater than four place balanced on outside faces as shown

**WARNING** See chart for spacing

SECTION A-A

C Pilaster and shaft

Right-of-way

See Contract

Mark line

Provide some number and size dowels as 3 Bar’s laps 2’-0” MIN

4’-5’ Lap 2’-6”
4’ Lap 1’-3”
6’ Lap 2’-0”
8’ Lap 1’-11”
10’ Lap 7’-11”

Bar A

Construction joint with grooved surface

Anchor spirals with two turns top and bottom

Two blocks MIN
Three blocks MAX

Expansion Joint

Top of wall

16’0” CM pilaster 1’-0”

1’-11” MIN

Expansion joint

Final ground line

ELEVATION

NOISE BARRIER - TYPE 20
MASONRY WALL ON SHAFT FOUNDATION

NOTES

1. Wall to be designated Noise Barrier Type 20A, 20B, 20C or 20D. The Contractor specifies actual wall designation.

2. For intermediate wall heights, use the next higher H.

3. All masonry shall be a hollow unit and installed as running bond.

4. All masonry is to be specially inspected.

5. All Concrete Masonry Unit (CMU) cells that have vertical steel reinforcing bars or bond beams shall be filled with grout.

6. Pans shall move at least 3 feet of level ground on each side.

7. Construction joints in the footing shall be spaced at 120 feet maximum.

8. The Contract shall specify actual foundation requirements or D1 or D2.

9. See "Masonry Wall Finishes and Details" sheet for masonry block finishes, special shapes, sizes and layouts.

D-2t
03-14-97
**ELEVATION**

- Install hinges at three locations
- #5 x 4'-0" (TYP)
- 4'-6" MAX opening
- 7'-0" MAX opening
- 1 1/2" Clearance (TYP)
- Galvanized steel type lock which will accommodate state furnished lock or roadway side
- Elevation to match top of final ground line, or top of drainage blanket, whichever is higher
- See Standard Plan, Noise Barrier Type II, Precast Concrete Wall on Shaft Foundation

**SECTION A-A**

- Door (center between shafts)
- Grout metal frame
- See Concrete Pad Detail
- Concrete pad Class 2000
- 8" Chamfer
- Bend wall reinforcement
- Wall reinforcement
- 5" (TYP)
- Top of shaft at equal elevations both sides

**BOTTOM OF WALL DETAIL**

- 1/2" Anchor (TYP)
- 4" Center in Panel MAX
- 4" (TYP)
- Bend wall reinforcement (TYP)

**SECTION B-B**

- Center in Panel MAX
- Grout metal frame
- Concrete wall

**ACCESS DOOR - TYPE I**

- Precast Concrete Wall on Shaft Foundation

---

**CONCRETE PAD**

- Elevation shall match final ground line
- 5'-0"
- Concrete pad Class 2000

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**VIEW C**

- 8 1/2" Chamfer
- Grout metal frame
- Door

---

**TABLE**

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<th>BAR SIZE</th>
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**03-07-97**
GEOSYNTHETIC WALL TYPE 1
HORIZONTAL BACKSLOPE WITH 8 FT. TRAPPING BUNKER

PERMANENT GEOSYNTHETIC WALL CROSS SECTION
(INCLUDES RETAINING DESIGN)
GROUND ACCELERATION COMPONENT, ACCORDING TO CH502

GEOSYNTHETIC WALL TYPE 4
HORIZONTAL BACKSLOPE WITH 8 FT. TRAPPING BUNKER

PERMANENT GEOSYNTHETIC WALL CROSS SECTION
(STATIC DESIGN ONLY)
GROUND ACCELERATION COMPONENT, ACCORDING TO CH502

GEOSYNTHETIC WALL TYPES 2 & 3

GEOSYNTHETIC WALL TYPES 5 & 6

NOTES:
1. THE COMPOSITE GEOSYNTHETIC DESIGN INTERVENTION, WHERE THE COMPOSITE INTERVENTION IS DETERMINED IN ACCORDANCE WITH RETAINING WALL METHOD OF DESIGN, SEE DESIGN PRODUCTS LIST FOR PRODUCTS IN WHICH THE INTERVENTION HAS BEEN DEEMED MARKETABLE.
2. SEE PLANS FOR SPECIFICATION FOR VARIOUS WALL CONFIGURATIONS.
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<th>CIP CONCRETE FLOOR SPACING (ft)</th>
<th>GEOSYNTHETIC REINFORCEMENT LENGTH (ft)</th>
<th>GEOSYNTHETIC REINFORCEMENT TYPE</th>
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<table>
<thead>
<tr>
<th>TOTAL WALL HEIGHT (ft)</th>
<th>GEOSYNTHETIC REINFORCEMENT SPACING AND STRENGTH</th>
<th>CIP CONCRETE FLOOR SPACING (ft)</th>
<th>GEOSYNTHETIC REINFORCEMENT LENGTH (ft)</th>
<th>TOTAL WALL HEIGHT (ft)</th>
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</table>
GEOSYNTHETIC WALL
CONSTRUCTION SEQUENCE

1. SET FORM ON COMPLETED LIFT.

2. UNROLL GEOSYNTHETIC AND POSITION IT SO THAT A -4" HORIZONTAL WEDGE OVER THE TAIL. A -4" HORIZONTAL WEDGE OVER THE TAIL. A GEOSYNTHETIC IS USED FOR THE GEOSYNTHETIC BACKING, POSITION GEOSYNTHETIC TO PREVENT BACKFLOW PROBES, EMBRACE THROUGH GEOSYNTHETIC OPENINGS.

3. PLACE THE BACKFLOW UNTIL THE BACKFLOW IS UP TO 1/2 OF THE INSTALLATION VERTICAL GEOSYNTHETIC LAYER SPACINGS.

4. PLACE A WOODEN TO Gently Gently Greater Than Full Lift Height Against Form.

5. PLACE THE GEOSYNTHETIC TUCK OVER THE BACKFLOW AND LOCK INTO PLACE WITH BACKFLOW.

6. COMPLETE BACKFLOW
   THE COMPLETE BACKFLOW LAYER EMBRACES FOR THE INSTALLED VERTICAL GEOSYNTHETIC LAYER SPACINGS.

7. SET THE FORM AND REPEAT THE SEQUENCE.

NOTES
1. THE TWO LAYERS AT A TIME WILL MAINTAIN THE WALL FACE BATTERY.
2. CONSTRUCTION JOINTS IN THE COAL GANGUE LAYER WILL BE WATERPROOFED AT 18" CERT. EACH.
3. FOR DETAILS OF EXPANSION JOINTS IN CON. FORM, SEE STANDARD PLAN D-3 SHEET 1 & ELEVATION.

GEOSYNTHETIC WALL
TYPES 1-6
STANDARD PLAN D-3
SHEET 4 OF 4 SHEETS

APPROVED FOR PUBLICATION
Harold J. Peterson 01-23-02
Washington State Department of Transportation

EXPIRES JULY 4, 2003
TYPICAL GABION

Unit A - 2 cell gabion = 6'
Unit B - 3 cell gabion = 9'
Unit C - 4 cell gabion = 12'

FASTENING ADJACENT BASKETS

LACING DETAIL

- Six independent wires encompassed
- Double loop
- Single loop
- Double loop

TWISTED FABRIC

Three vertical and two horizontal wires encompassed

WELDED FABRIC

CROSS CONNECTING WIRE PLACEMENT, INTERIOR CELLS OF FRONT GABIONS

CROSS-CONNECTING WIRE PLACEMENT, END CELLS
TYPE 1 ANCHOR
(FOR USE IN EARTH)

TYPE 2 ANCHOR
(FOR USE IN COMBINED EARTH AND ROCK)

TYPE 3 ANCHOR
(FOR USE IN SOLID ROCK)

TYPE 4 ANCHOR
(FOR USE IN SOLID ROCK)
**ELEVATION**

**CONCRETE SLOPE PROTECTION**
(Pneumatically placed or poured in place cement concrete shown)

Concrete Slope Protection

Embarkment slope 1/8" 3/4" 1/8"

**SECTION**

**SECTION**

**TYPE 1 SLOPE PROTECTION FILL SECTION DETAIL**
(Semi-open concrete masonry units shown)

10 Gage 6' x 6' wire mesh reinforcement 0 center (See Std. Spec. 9-07.7)

**SIDE ELEVATION**
(For fill section on lower roadway)

Fill slope shall be rounded to allow placement of concrete slope protection.

**TYPE 2 SLOPE PROTECTION CUT SECTION DETAIL**
(Pneumatically placed or poured in place cement concrete shown)

Slope protection follows bottom of ditch.
1. The design and shape of the semi-open concrete masonry unit shown is only one example of the products that may be used.

2. The Type 3 Slope Protection Curb Detail shall be used only when the lower roadway cross section requires a curb.

SKEWED BRIDGE PLAN
(Semi-open concrete masonry units shown)

TYPE 3 SLOPE PROTECTION
CURB DETAIL (Elevation)
(Semi-open concrete masonry units shown)

CONCRETE SLOPE PROTECTION
STANDARD PLAN D-9

SEMI-OPEN CONCRETE MASONRY UNITS
(See note 1 & 2)
TYPICAL DATE

DATE NUMERALS

NOTE:
Spacing between the numeral "1" and any other numeral is 1". Spacing between all other numerals is 3/8".

Parallel to top of traffic barrier
1. Dimensions and tolerances for superstructure are typical for both single lane and multi-lane bridges.
2. All timber and lumber shall be 8' or better and untreated Douglas fir-larch.
3. All piling shall be untreated Douglas fir and shall be driven to develop a minimum load bearing capacity of 15 tons.
4. Blocking for frame bents shall be proportioned to carry a minimum load of 15 tons per post.
5. All hardware shall be block, ungalvanized.
6. Each deck plant shall be nipped to each stringer with two 1" spikes, number 1 or longer.
7. On 17' spans, stringers shall be 6x16 S1S. On 15' spans, stringers shall be 6x16 S1S.
8. Two lane bridges shall use thirteen times of stringers, one lane bridges shall use seven times of stringers.
9. Overlay thickness must be sufficient to cover bolts.

SECTION A-A

DISTRIBUTION PLATE DETAIL

BASE PLATE DETAIL

BACKING PLATE DETAIL

NOTE:

PILE OR FRAME DETOUR BRIDGE WITH ASPHALT OVERLAY

USE ONLY FOR TEMPORARY BRIDGES

STANDARD PLAN E-2

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION

Brian Ziegler

STATE DESIGN ENGINEER

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

5/29/98

EXPIRES JANUARY 1, 1999

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

M. MINT LIAK

STATE PROFESSIONAL ENGINEER

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
NOTES
2. Type 4a and Type 5a curbs do not require steel tie bars or adhesive for anchoring.

SPACING OF ANCHOR BARS

EXTRUDED CURB

F-2b
03-14-97
NOTES:

1. Avoid placing drainage structures, junction boxes or other obstructions in front of new access ramps.
2. Detectable warning patterns may be created by any method that will achieve the truncated cone dimensions and spacing shown. The detectable warning pattern area shall be yellow, in compliance with Std. Spec. 6-1-1(2).
3. Curb and gutter shown, see the Curb Plan for the curb design specified. Base Std. Plan F-1 for curb details.
4. See Std. Plan F-3 for sidewalk joint placement and details.
5. Ramp slopes shall not be steeper than 1:12 hip.
NOTES:

1. Avoid placing drainage structures, junction boxes or other obstructions in front of ramp access areas.

2. Detectable warning patterns may be created by any material that will achieve the mandated dimensions and spacing shown. The detectable warning pattern area shall be yellow, in compliance with Std. Spec. S-14.300.

3. Curb and gutter shown are the Contractor's for the curb design specified. See Std. Plan P-1 for curb details.

4. See Std. Plan P-3 for sidewalk joint placement and details.

5. Ramp slopes shall be not steeper than 1:20:11V.
NOTES:
1. Avoid placing drainage structures, junction boxes or other obstructions in front of ramp access areas.
2. Detectable warning patterns may be created by any method that will achieve the truncated dome dimensions and spacing shown.
3. Curb and gutter shown, see the Contract Plans for the curb design specified. See Std. Plan F-1 for curb details.
4. See Std. Plan F-3 for sidewalk joint placement and details.
5. Ramp slopes shall not be steeper than 1:24:1.

1.22.5 DETECTABLE WARNING PATTERN DETAIL

TRANSLATED DOME (SEE NOTE B)
DETECTABLE WARNING
PATTERN DETAIL

DETECTABLE WARNING PATTERN AREA
SHALL BE YELLOW IN COMPLIANCE
WITH STD. APBS 8-14-30

DETECTABLE WARNING PATTERN
SEE NOTE A

DETECTABLE WARNING PATTERN
(SEE NOTE A)

DETECTABLE WARNING PATTERN
SEE NOTE A

DETECTABLE WARNING PATTERN
SEE NOTE A

DETECTABLE WARNING PATTERN
SEE NOTE A

DETECTABLE WARNING PATTERN
SEE NOTE A

DETECTABLE WARNING PATTERN
SEE NOTE A

DETECTABLE WARNING PATTERN
SEE NOTE A
CEMENT CONCRETE DRIVEWAY ENTRANCE TYPE 1

NOTES:
1. When the driveway width exceeds 15 feet, construct a full depth expansion joint (see Std. Plan F-3) with 3/8" joint filler along the driveway centerline. Construct expansion joints parallel with the centerline as required at 10' maximum spacing when driveway widths exceed 20'.
2. See Std. Plan F-3 for sidewalk details.
3. Curb and gutter shown, see the Contract Plans for the curb design specified. See Std. Plan F-1 for curb details.
4. Avoid placing drainage structures, junction boxes or other obstructions in front of driveways.

CEMENT CONCRETE DRIVEWAY ENTRANCE TYPE 2

EXPRESS MAY 16, 2003

CEMENT CONCRETE DRIVEWAY ENTRANCE TYPES 1, 2, 3 & 4
STANDARD PLAN F-4

HAROLD J. PETERFEO
REGISTERED ENGINEER

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION
04-15-03

SHEET 1 OF 2 SHEETS

EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004
PLAN

TYPICAL JOINT DETAIL
Chord shown - End Post Splitter

SECTION C-C

DIAGRAMS SHOWN SHOW WELDING TYPICAL.

ALTERNATE JOINT DETAIL

NOTE FOR CONNEC.TIONS BETWEEN VERTICAL DIAGONALS AND CHORDS.

PLAN

SECTION D-D

CHORD FIELD SPLICE
(NO CHORD FIELD SPLICE PERMITTED IN MIDDLE THIRD OF SPAN LENGTH)

CHORD PRODUCTION PLANS

DRAWN:

APPROVED FOR PRINTING:

CONTRACT NO:

SHEET 2 OF 2 SHEETS

6/21/2004

EXPIRES: JUNE 29, 2004

FOR SPAN LENGTHS NOT LISTED, INTERPOLATE VALUES OF DIAMETER.

FOR SPAN LENGTHS NOT LISTED, INTERPOLATE VALUES OF DIAMETER.

FOR SPAN LENGTHS NOT LISTED, INTERPOLATE VALUES OF DIAMETER.
NOTE: APRIL 7, 2003 TO JANUARY 4, 2004

POST will be Micro-Lam® laminated veneer Type L or Type M post manufactured by Trus Joist or an equivalent that has been crash tested and approved by the FHWA.

\[ H_1, H_2, H_3, H_4 = \text{Length of post.} \]
\[ V = \text{Elevation difference from edge of lane to bottom of sign.} \]
\[ W = \text{Distance from edge of lane to center of nearest post.} \]
\[ X = \text{Horizontal measurement of sign.} \]
\[ Y = \text{Vertical measurement of sign (or signs).} \]
\[ Z = \text{Height from ground to mid-height of sign (or signs) at longest post.} \]
\[ D = \text{Post embedment.} \]

See “Sign Specifications” sheet of Contract Plans for \( H, V, W, X, \) and \( Y \) values.

---

**ELEVATION**

**SIDE VIEW**

**DETAIL B**

ROADSIDE SIGNS ON LAMINATED WOOD BOX POSTS

**HEIGHT (FT) | Total Sign Area (Square Feet)**
--- | ---
9 to 12 | 6 to 6
13 to 15 | 6 to 6
16 to 18 | 7 to 7.5
19 to 22 | 7 to 8
23 to 26 | 7.5 to 8.5

**LAMINATED POST EMBEDMENT DEPTH**

Depth \( D \) in FEET

Type L = 15”
Type M = 8”

**SECTION A-A**

Traffic Direction

Galvanized metal cap

Traffic Direction

20 Gauge galvanized metal cap

1" DIA holes connected by sawcut (both sides TYP)

Finished ground line
NOTES

1. Mileposts of the type specified shall be placed as shown hereon. If conditions preclude placement at the correct location, the mileposts may be moved as much as 50' in either directions mileposts that cannot be placed within this degree of accuracy shall be omitted entirely.

2. Mileage for mileposts shall commence at the south or west terminus of the highway route and progress in a north or east direction.

3. All Spur and Equation signs shall have "S" and "B" plaques.

4. Mileposts in cut sections shall be placed at back of ditch. Milepost markers may be placed up to 30' from the edge of the traveled way.

5. See "Washington State Sign Fabrication Manual" for the dimensions and colors of the Milepost/Plaque.

PLACEMENT OF MILEPOST AT CUT SECTION

PLACEMENT OF MILEPOST AT FILL SECTION
### Dimension Table for Type I Bases

<table>
<thead>
<tr>
<th>POST SIZE</th>
<th>BASE CONNECTION DATA</th>
<th>FOUNDATION DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BOLT</td>
<td>DIMENSIONS</td>
</tr>
<tr>
<td>m10x26</td>
<td>A10 x 22</td>
<td>1-1/16 x 1/16</td>
</tr>
<tr>
<td>m8 x 21</td>
<td>A8 x 18</td>
<td>1-1/16 x 1/16</td>
</tr>
<tr>
<td>m6 x 20</td>
<td>A6 x 12</td>
<td>1-1/16 x 1/16</td>
</tr>
<tr>
<td>m4 x 10</td>
<td>A4 x 6</td>
<td>1-1/16 x 1/16</td>
</tr>
</tbody>
</table>

**Primary posts are AASHTO M 183.**
**Secondary posts are AASHTO M 222 or AASHTO M 223, Grade 50.**

### Hinge Connection Detail

- **Hinge Connection Bolts** shall be tightened 1/4 turn past snug tight.
- **Hinge plate shall be Type R-850 as manufactured by Tranto Industries, Inc., or an equal that has been crash tested and approved by FHWA.**

### Type I Base Foundation Detail

- **Concrete Foundation**
- **Drilled hole (not parallel)**
- **Type I Base**
- **Concrete Foundation**
- **Drilled hole (not parallel)**

---

**NOTES:**
- M, N, H = Distance from top of stub post to top of post assembly.
- \( Y = \text{Elevation difference from edge of lane to bottom of sign.} \)
- \( X = \text{Distance from edge of lane to center of nearest post.} \)
- \( V = \text{Horizontal measurement of sign.} \)
- \( Y = \text{Vertical measurement of sign(s).} \)
- \( Z = \text{Length of longest post assembly, minus } \frac{1}{2} \text{ of the } Y \text{ distance.} \)

See "Sign Specifications" sheet of Contract Plans for \( W, V, X \) and \( Y \) values.

**For material requirements, see Standard Specification 9-06.16.**

---

**ROADSIDE SIGN STRUCTURES FOR MULTIPLE STEEL POST SIGNS STANDARD PLAN G-6a SHEET 1 OF 3 SHEETS**

**APPROVED FOR PUBLICATION**

Clifford E. Mansfield 10/08/99

WASHTON STATE DEPARTMENT OF TRANSPORTATION CLINICAL DIRECTIONS

EXPRESS JUNE 30, 2000
**Type 2A Base Connection Detail**

Use only when sign area is less than 35 square feet per post.

**Boss & Offset Table**

<table>
<thead>
<tr>
<th>When ( Z &gt; )</th>
<th>Offset</th>
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<tbody>
<tr>
<td>8' ( &lt; Z \leq 10' )</td>
<td>0.0875&quot;</td>
</tr>
<tr>
<td>10' ( &lt; Z \leq 12' )</td>
<td>0.0625&quot;</td>
</tr>
<tr>
<td>12' ( &lt; Z \leq 15' )</td>
<td>0.0375&quot;</td>
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</tbody>
</table>

**Shims**

Shims shall be 14 gauge or 18 gauge.

**Shim Detail - Type 2A**

Use no more than two shims per anchor coupling, use no more than three shims for any two anchor couplings.

**Bracket Detail - Type 2A**

**Anchor Coupling Detail - Type 2A**

**Coupling Bolt Detail - Type 2A**

**Types 2A Foundation Detail**

- Eight 7/8" diameter, 3/8" thick anchor bolts
- Concrete footing:
  - Drilled shaft permitted
  - Concrete reinforcement
  - 2½" clearance to main reinforcement
DIMENSION TABLE FOR TYPE 2B BASES

<table>
<thead>
<tr>
<th>Post Size</th>
<th>Anchor Ferrule Spacing</th>
<th>Keyway/Offset K Diameters are ≤ 0.004&quot;</th>
<th>Bracket Width B</th>
<th>Hole Dia hD</th>
<th>Spacing S</th>
<th>Fournier</th>
</tr>
</thead>
<tbody>
<tr>
<td>M6x6</td>
<td>13/32&quot;</td>
<td>3&quot;</td>
<td>5/8&quot;</td>
<td>1/2&quot;</td>
<td>1/2&quot;</td>
<td>Top bolt</td>
</tr>
<tr>
<td>M6x8</td>
<td>14/32&quot;</td>
<td>3&quot;</td>
<td>5/8&quot;</td>
<td>1/2&quot;</td>
<td>1/2&quot;</td>
<td>Middle bolt</td>
</tr>
<tr>
<td>M8x10</td>
<td>15/32&quot;</td>
<td>3&quot;</td>
<td>5/8&quot;</td>
<td>1/2&quot;</td>
<td>1/2&quot;</td>
<td>Bottom bolt</td>
</tr>
<tr>
<td>M10x10</td>
<td>16/32&quot;</td>
<td>3&quot;</td>
<td>5/8&quot;</td>
<td>1/2&quot;</td>
<td>1/2&quot;</td>
<td>Cap screw</td>
</tr>
<tr>
<td>M12x12</td>
<td>18/32&quot;</td>
<td>4&quot;</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>2&quot;</td>
<td>3/8&quot; dia bolt w/ locknut</td>
</tr>
</tbody>
</table>

Anchors:
- Top bolt: 3/4" dia bolt w/ locknut
- Middle bolt: 3/8" dia bolt w/ locknut
- Bottom bolt: 3/8" dia bolt w/ locknut
- Cap screw: 3/8" dia bolt w/ locknut

TYPE 2B FOUNDATION DETAIL

Shims shall be 14 gauge or 18 gauge.

SHIM DETAIL - TYPE 2B

Use no more than two shims per anchor coupling.

Use no more than three shims for any two anchor couplings.

ANCHOR FERRULE DETAIL - TYPE 2B

ANCHOR COUPLING DETAIL - TYPE 2B

COUPLING BOLT DETAIL - TYPE 2B

FRONT VIEW TYPE 2B SIDE VIEW BASE CONNECTION DETAIL

ROADSIDE SIGN STRUCTURES FOR MULTIPLE STEEL POST SIGNS STANDARD PLAN G-6a SHEET 3 OF 8 SHEETS

APPROVED FOR PUBLICATION Clifford E. Mansfield 10/08/99 DEPUTY STATE DESIGN ENGINEER

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
1. Refer to Contract Plans for Monotube Beam Bracket element sizes, dimensions and weld symbols.
**NOTES**

1. When guardrail runs concurrent with, the contractor shall either:
   A. Drive the flexible guide post in line with the guardrail posts, or
   B. Mount the shorter flexible guide post onto the guardrail post.

2. Guide posts shall be fastened to the guardrail posts using two 2"x3" x 36" lag screws with washers, along periphery of post. Also acceptable is any approved method submitted by the guardrail post manufacturer.

3. When concrete barrier runs concurrent, the contractor shall mount barrier deflectors where guideposts are required.

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**GUIDE POST REFLECTIVE SHEETING APPLICATIONS**

<table>
<thead>
<tr>
<th>TYPE W</th>
<th>TYPE WW</th>
<th>TYPE Y</th>
<th>TYPE YY</th>
<th>TYPE O1</th>
<th>TYPE O2</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Graphic" /></td>
<td><img src="image2" alt="Graphic" /></td>
<td><img src="image3" alt="Graphic" /></td>
<td><img src="image4" alt="Graphic" /></td>
<td><img src="image5" alt="Graphic" /></td>
<td><img src="image6" alt="Graphic" /></td>
</tr>
</tbody>
</table>

---

**STANDARD PLAN H-1**

**FLEXIBLE GUIDE POST**

- **GROUND MOUNT**
- **SURFACE MOUNT**

---

**TOP EDGE OF REFLECTIVE SHEETING**

- **MANUFACTURER'S BURY DEPTH**
- **TOP EDGE MOUNT**
- **TOP EDGE WITH WEATHER GUARD**

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**GUIDE POSTS**

Sheet 1 of 1 Sheet

* **APPROVED FOR PUBLICATION**
  - Harold J. Petersen  01-10-02
  - Washington State Department of Transportation
GUIDE POST PLACEMENT
GRADE INTERSECTION
STANDARD PLAN H-1a

LEGEND
○ Type W
● Type Y
□ Type WW

SEE TABLE IN STANDARD PLAN H-1 FOR DEFINITION OF GUIDE POST TYPES
NOTE:  
1. SEE PLANS FOR GUIDE POST REQUIREMENTS BETWEEN INTERCHANGES.
2. GUIDE POSTS SHALL BE PLACED AT 100 ON RAMPS TANGENTS AND TAPERS.
3. "P" DIMENSION SHOWN ON STANDARD PLAN H-1b OR 100, WHICHEVER IS SMALLER.
4. ONE HALF OF "P" DIMENSION SHOWN ON STANDARD PLAN H-1b OR 50, WHICHEVER IS SMALLER.
5. TWO SPACES AT 100.
6. THREE EQUAL SPACES WHEN R < 75: FOUR EQUAL SPACES WHEN R > 75.
7. TWO EQUAL SPACES.
GUIDE POST SPACING (FEET)

<table>
<thead>
<tr>
<th>RADIUS (FT)</th>
<th>RADIUS (FEET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>2,000</td>
</tr>
<tr>
<td>100</td>
<td>4,000</td>
</tr>
<tr>
<td>150</td>
<td>6,000</td>
</tr>
<tr>
<td>200</td>
<td>8,000</td>
</tr>
<tr>
<td>250</td>
<td>10,000</td>
</tr>
<tr>
<td>300</td>
<td>12,000</td>
</tr>
<tr>
<td>400</td>
<td>16,000</td>
</tr>
</tbody>
</table>

Interpolate from this table for radius not shown.

NOTES
1. The first guide post is positioned 5 ft distance from the beginning of curvature.
2. If the last guide post beyond the curve is 1/2 5 ft or more, no additional posts are required.
3. If the last guide post beyond the curve is less than 1/2 5 ft, one additional post is required.

LEGEND
- TYPE W
- TYPE Y
- TYPE X

GUIDE POST PLACEMENT FOR CURVES
FOR EACH DIRECTION OF TRAVEL
STRIPES ON THE BARRICADES SHALL SLOPE DOWNWARD IN THE DIRECTION TRAFFIC IS TO PASS

ROAD CLOSURE AT INTERSECTION

ROAD CLOSURE AT OTHER LOCATIONS

TYPE 3 BARRICADE

STANDARD PLAN H-2

SHEET 2 OF 3 SHEETS

APPROVED FOR PUBLICATION

Washington State Department of Transportation

EXPRES MAY 4, 2003
NOTES:

1. Recessed pavement markers, when specified, shall be installed at the locations shown for Type 2W RPM's on multilane one way roadways, and Type 2YY RPM's on two lane two way roadways.

MULTILANE ONE WAY TRAFFIC

M-1. For lane lines, Type 2W RPM's shall be spaced at 80' intervals on tangents and horizontal curves with a radius of 5000' or more, and 40' intervals on horizontal curves having radii of less than 5000'.

M-2. When specified, Type 2Y RPM's shall be placed outside the left edge line. Placement is shown on "Left Edge of Lane Placement".

TWO LANE TWO WAY TRAFFIC

T-1. For center lines, Type 2YY RPM's shall be spaced at 80' intervals on tangents and horizontal curves with a radius of 5000' or more, and 40' intervals on horizontal curves having radii less than 5000'. Type 2YY RPM's are to be centered between skip lines.

RAISED PAVEMENT MARKING DETAILS

STANDARD PLAN H-3

EXPIRES OCTOBER 26, 2003

APPROVED FOR PUBLICATION

Clifford E. Mansfield 4/1/00

DEPARTMENT OF TRANSPORTATION

STATE OF WASHINGTON

Effective: April 7, 2003 to January 4, 2004
LEFT TURN LANE

TAPER LENGTH = T<sub>1</sub> x taper rate

DECEL. TAPER

DOUBLE YELLOW CENTER LINE
SEE DETAIL B

TYPE 2L TRAFFIC
ARROWS, SEE NOTE 1

W<sub>1</sub> = Width of left turn lane on approach side of T<sub>1</sub>

W<sub>2</sub> = Total width of channelization

Type 2L TRAFFIC
ARROWS, SEE NOTE 1

SEE DETAIL D

SEE TABLE 1 FOR TAPER RATE

NOTES:
1. First Type 2L arrow is installed 50' back of stop bar or crosswalk. Second arrow is located 100' back, or at left turn pocket.
2. "S" = 140' for posted speed < 50 MPH.
   "S" = 170' for posted speed ≥ 50 MPH.
3. Stopping point shall be marked with stop bar only when mainline movement is controlled by a stop sign or traffic signal.
4. Raised pavement markers shall be installed only when specified in the Contract Plans.
6. No Pass Line on approach side with skip center line on departure side unless Double Yellow Center Line is required in the contract.

TWO-WAY LEFT TURN LANE

TAPER LENGTH = T<sub>2</sub> x taper rate

SEE DETAIL B

SEE DETAIL C

SEE DETAIL E

SEE DETAIL F

END TWO-WAY LEFT TURN LANE

TABLE 1

<table>
<thead>
<tr>
<th>Posted Speed</th>
<th>Taper Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 mph</td>
<td>60±1</td>
</tr>
<tr>
<td>55 mph</td>
<td>55±1</td>
</tr>
<tr>
<td>50 mph</td>
<td>50±1</td>
</tr>
<tr>
<td>45 mph</td>
<td>45±1</td>
</tr>
<tr>
<td>40 mph</td>
<td>40±1</td>
</tr>
<tr>
<td>35 mph</td>
<td>35±1</td>
</tr>
<tr>
<td>30 mph</td>
<td>30±1</td>
</tr>
<tr>
<td>25 mph</td>
<td>25±1</td>
</tr>
</tbody>
</table>

TABLE 2

<table>
<thead>
<tr>
<th>Posted Speed</th>
<th>Decel Taper Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 mph</td>
<td>180'</td>
</tr>
<tr>
<td>55 mph</td>
<td>165'</td>
</tr>
<tr>
<td>50 mph</td>
<td>150'</td>
</tr>
<tr>
<td>45 mph</td>
<td>135'</td>
</tr>
<tr>
<td>40 mph</td>
<td>120'</td>
</tr>
<tr>
<td>35 mph</td>
<td>105'</td>
</tr>
<tr>
<td>30 mph</td>
<td>90'</td>
</tr>
<tr>
<td>25 mph</td>
<td>75'</td>
</tr>
</tbody>
</table>

TABLE 3

<table>
<thead>
<tr>
<th>Posted Speed</th>
<th>No Pass Length Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 mph</td>
<td>700'</td>
</tr>
<tr>
<td>55 mph</td>
<td>725'</td>
</tr>
<tr>
<td>50 mph</td>
<td>660'</td>
</tr>
<tr>
<td>45 mph</td>
<td>590'</td>
</tr>
<tr>
<td>40 mph</td>
<td>560'</td>
</tr>
<tr>
<td>35 mph</td>
<td>520'</td>
</tr>
<tr>
<td>30 mph</td>
<td>360'</td>
</tr>
</tbody>
</table>

W<sub>1</sub> = Approaching through lane

W<sub>2</sub> = Departing lane

T<sub>1</sub> = Width of left turn lane on approach side of T<sub>1</sub>

T<sub>2</sub> = Width of left turn lane on departure side of T<sub>1</sub>

W<sub>f</sub> = Total width of channelization

(W<sub>1</sub> + W<sub>2</sub> + T<sub>1</sub> + T<sub>2</sub>)

30'

500' MAX

SEE DETAIL F

EXPRES OCTOBER 26, 2000

PAVEMENT MARKING DETAILS
STANDARD PLAN H-3a
Sheet 1 of 9

APPROVED FOR PUBLICATION
Clifford E. Mansfield 6/23/00

EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004
EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004
EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004
Pavement markings may be curved here as shown to allow continuous painting by the striping machine.

When RPM's required by contract, use Type 2Y, see Note 5

20' RPM spacing for decel, taper

40' RPM spacing

Two Way Left Turn Lane

5' to 10'

Type 2L Traffic Arrows

Type 2Y RPMs, see Note 5

Double yellow center line

4'

Type YY RPMs 10' O.C.

4'

Double yellow center line

Type 2Y RPMs see Note 5

Inside edge of lane

15' 10' 30' 10' 15'

Two-way left turn lane

15'

6'

4'

Type 2Y RPMs see Note 5

4'
SHOULDER RUMBLE STRIP
TYPE 2, 3, AND 4
FOR UNDIVIDED HIGHWAYS
STANDARD PLAN H-4a
SHEET 2 OF 2 SHEETS

EXPIRES MAY 31, 2003

HERALD J. PETERSON
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
APPROVED FOR PUBLICATION
SINGLE LANE ON CONNECTION

NOTE:
Where shown on the plans or specified in special provisions, raised pavement markers shall be used to supplement or substitute for the painted pavement markings shown herein.

SINGLE LANE OFF CONNECTION

SINGLE LANE OFF CONNECTION FOR ONE LANE REDUCTION

PAVEMENT MARKING DETAILS
STANDARD PLAN H-5

Randy D. Richman
State of Washington
Professional Engineer

EXPIRES: OCTOBER 26, 2003

APPROVED FOR PUBLICATION
Clifford E. Mansfield 2/18/00

EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004
NOTES:
Where indicated on the plans or special provisions, raised pavement markers shall be used to supplement or substitute for painted pavement markings.

TWO LANE ON CONNECTION

TWO LANE OFF CONNECTION

DETAIL A

DETAIL B

PAVEMENT MARKING DETAILS
STANDARD PLAN H-5a
GENERAL NOTE
See contract for location and material requirements.

NOTES
1. For assured crosswalks, position the lines parallel to the traffic lane.
2. Install Crosswalk Line in shoulder area only when adjacent to sidewalk or separate walkway.

PAVEMENT MARKINGS

STANDARD PLAN H-6a

EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
ALTERNATE PARKING STALL MARKINGS
USE ONLY WHEN SPECIFIED IN THE CONTRACT

NOTES
1. Three, four and five accessible stall arrangements may be either 80° angle or 90° perpendicular parking arrangements. See contract.
2. Signs indicating a parking space or stall for a physically disabled person shall be installed between 25" and 48" above the sidewalk surface.
3. An Access Parking Space Symbol is required for each accessible parking stall. A blue background and white border are required when the symbol is installed on a concrete or metal curb. The symbol shall be at least 3" high and 6" long.
4. Wheel stops, when specified in the contract, shall be approximately 5" high and a minimum of 12" long.
5. Refer to the Standard Plans for sidewalk curb, detectable warning pavement, and curb details.

LEGEND

- Reserved Parking Sign and post with 80° Layout. Plaque, if indicated (See Sign Fabrication Manual)
- Access Parking Space Symbol See Standard Plan H-5a
- Manufactured wheel stop
- Detectable Warning Pattern

ACCESSIBLE PARKING PAVEMENT MARKINGS
STANDARD PLAN H-5a
Sheets 1 of 1 sheet
APPROVED FOR PUBLICATION

Harold J. Peterson 09-28-23
Washington State Department of Transportation
NOTE:
1. The brass disc will be furnished by the state.
2. The hole shall be 3" minimum in depth or 6" below the deepest recorded frost line.
3. All loose material shall be removed from the bottom of the hole so that the concrete is placed on firm undisturbed earth.
4. The top of the concrete shall be troweled smooth and the brass disc set in the center with top flush and level. When the concrete is set, cover the entire monument with moist earth and leave for three days.
5. Top of monument may be recessed or protruding depending on conditions.
NOTES:
1. Slope treatment shall be constructed simultaneously with the roadway
   excavation. Ordinarily hand trimming will not be required if
   satisfactory results are obtained with mechanical equipment.
2. It is essential that the construction of cut and fill slopes and the
   application of slope treatment fit as naturally as possible into the
   existing landscape to provide an aesthetically and geometrically
   satisfactory completed roadway.
3. When the distance K is greater than the distance from the top of cut
   to the bottom of ditch, slope treatment shall begin at bottom of ditch.

LEGENDS:
J Distance from slope stoke to slope treatment stoke, measured on natural ground slope.
K Distance from slope stoke to lower limit of slope treatment, measured down face of cut slope.
H Difference in elevation between finished shoulder grade and slope stoke.
D Difference in elevation between slope stoke and slope treatment stoke.
Z Depth of slope treatment at slope stoke as determined by a straight line
   between the midpoints of J and K.
S Horizontal distance per foot cut for the slope under consideration.
   (For a 5:1 slope, S=3)

<table>
<thead>
<tr>
<th>CUT</th>
<th>Class A</th>
<th>Class B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>J</td>
<td>K</td>
</tr>
<tr>
<td>4:1</td>
<td>7'</td>
<td>5'</td>
</tr>
<tr>
<td>3:1</td>
<td>7'</td>
<td>5'</td>
</tr>
<tr>
<td>2:1</td>
<td>7'</td>
<td>9'</td>
</tr>
<tr>
<td>1.75:1</td>
<td>7'</td>
<td>12'</td>
</tr>
</tbody>
</table>

VALUES OF Z (feet)
For Class A Slope Treatment

\[ Z = \frac{5}{2} \sqrt{\left(\frac{J}{2}\right)^2 + \left(\frac{(D - 3K)}{4}\right)^2} \]

In this equation the term \( 5K/4 \) is positive when the
slope treatment stoke is lower than the slope stoke
(descending ground); and negative when the slope treatment
stoke is higher than the slope stoke (ascending ground).
**POST BASE DETAIL**

- 3/"-0" W

**SLAB AND GRADING SECTION**

- 3/"-0" W

**#4 BAR AT EACH POST**

<table>
<thead>
<tr>
<th>Diagram Description</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slab thickness</td>
<td>3&quot;-0&quot;</td>
</tr>
<tr>
<td>Grade point</td>
<td>3&quot;-0&quot;</td>
</tr>
<tr>
<td>Compacted subgrade</td>
<td>6&quot;-0&quot;</td>
</tr>
</tbody>
</table>

**NOTES**

- Manufacturer shall submit shop drawings of pipe railing for review.
- Design shall be in accordance with AASHTO Specifications.
- Aluminum pipe railing shall have no external surface welds.
ALIGNMENT STAKE
Stake every 100 feet on tangents, every 25 feet on curves.

CLEARING/GRUBBING LATH
Stake at each full station, 100 feet on tangents, every 25 feet on curves. No hub necessary.

SLOPE STAKE

SLOPE LATH REFERENCES

SLOPE TREATMENT (ST) STAKES FOR CUT SECTIONS

DAYLIGHT STAKE

STANDARD PLAN H-14
SHEET 1 OF 2 SHEETS
APPROVED FOR PUBLICATION
Gilford E. Marshfield 04/22/04
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION
CUSTOMER ENGINEERING SERVICES DIVISION
ENGINEERING SERVICES DIVISION
AUTOMATED GROUND WATER MONITORING WELL

NOT TO SCALE

OPTICAL READER

FEATHER RESISTANT BATTERY COMPARTMENT

MOISTURE-PROOF (Potted) INTERNAL DATA LOGGER

REMOVABLE ADJUSTABLE CAP

BENTONITE PELLETS

2' CALIBRATION POINT (FINISHED GRADE)

PELL SCREEN SLOTS DEEPEN

(ALL SLOTS 0.01"

PELL SCREEN

2' MIN. ANNULUS AROUND
PELL SCREEN

No. 1 SAND OR
PEA GRAVEL

END OF SCREEN

END OF PROBE

AUTOMATED GROUND WATER MONITORING WELL

STANDARD PLAN L3
NOTES

1. See Standard Plan C-9b for base plate and foundation requirements when light standards are mounted on concrete barrier.

3. The top of the anchor rod shall be both threaded and galvanized a minimum of 11/4. The bottom of the anchor rod shall be threaded a minimum of 4. Galvanizing shall be in accordance with NASSCO 0013.3.1.2.2.3.82.0.4.

4. Strap templates shall be held in place by nuts 6" from the top of the foundation, and at bottom of anchor bolts resting on 4" x 5/8" square washers.

5. Pole base plate for a slip base design shall be 11/4 AASHTO M233 Gr. 345. Pole base plates for a fixed base design may be either 11/4 AASHTO M233 Gr. 345 or 11/2 AASHTO M183.

6. Installation of a 50' pole with double mast arms on a slip base is not allowed.

SECTION C-C

ELEVATION

LIGHTING BRACKET DETAIL

For light standards with single arm 12' or less and double arms 8' or less mounted on bridges or retaining walls.
PLAN - TOP SLIP PLATE

BOTTOM VIEW

KEEPER PLATE

ANCHOR PLATE

SLIP BASE ADAPTOR FOR
4-BOLT LIGHT STANDARD BASE
STANDARD PLAN J-1c

NOTE:
Plate shall conform to AASHTO M183 W (ASTM A36) except as noted.
Flat washers shall conform to AASHTO M164 W (ASTM A325).

ASSEMBLY DETAILS

After bolting bottom slip plate assembly to foundation,
fill slotted bolt holes with caulk.

Grade around foundation to ensure slab height does not exceed 4".
Removal of the frangible base from the existing base plate is required.
Misaligned anchor bolts must be removed and replaced.

SCHEDULE

<table>
<thead>
<tr>
<th>Adapter Type</th>
<th>Anchor Bolt Diameter</th>
<th>Bolt Length</th>
<th>Existing Base Type</th>
<th>Luminaire Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-2</td>
<td>1 7/8&quot; x 24 t/n</td>
<td>2 1/2&quot;</td>
<td>As cast Aluminum</td>
<td>30</td>
</tr>
<tr>
<td>A-3</td>
<td>1 7/8&quot; x 24 t/n</td>
<td>2 1/2&quot;</td>
<td>Steel Transformer</td>
<td>30</td>
</tr>
<tr>
<td>A-4</td>
<td>1 7/8&quot; x 24 t/n</td>
<td>2 1/2&quot;</td>
<td>Aluminum</td>
<td>40</td>
</tr>
<tr>
<td>A-5</td>
<td>1 7/8&quot; x 24 t/n</td>
<td>2 1/2&quot;</td>
<td>Aluminum Comp.</td>
<td>40</td>
</tr>
</tbody>
</table>

* Use matching diameter for threaded studs
* Contractor shall verify BC in field before ordering, if BC or anchor bolt sizes differ from those listed, contact Bridge and Structures Office

EXPRES JANUARY 17, 1999
APPROVED FOR PUBLICATION
Clifford E. Mansfield
DEPUTY STATE DESIGN ENGINEER
DATE: 4/24/98
**MAST ARM WIRING DETAIL**

- Install sized reducing washer and connector to secure conductors at end of mast arm.
- Single or Double Mast Arm as required.
- For Double Mast Arm, install additional cable and quick disconnects.

**LIGHT STANDARDS WIRING DETAILS**

- 24” Slack required to allow quick disconnects to be pulled outside handhole 6” MIN.
- See Detail A
- Junction box
- Conductor attachment bracket
- Pole and bracket cable to lamp
- Handhole
- Band
- Insulated grounding bushing
- Quick disconnects
- Insulated grounding busing
- Galvanized steel conduit

**TYPICAL JUNCTION BOX LOCATION**

- Alternate locations allowed provided junction box to base distance does not exceed 10’.

**WIRING DETAIL LIGHT STANDARD SLIP BASE**

- Application for fixed base similar except no cable tie is required at junction box.
Galvanized steel mast arm configuration varies with manufacturer
Luminaire - see Contract for type and number
Mounting height - roadway to luminaire elevation difference + 2% - see Contract
Most arm length - see Contract
3/8" galvanized thumb bolt (single or double) with washers and nuts or eyewash
Bonding jumper
Pole and bracket cable
Equipment grounding conductor see Standard Plan J-9a.
From ground line to 10' above ground, enclose equipment grounding conductor in galvanized steel conduit, code sized. Above 10' from ground, staple equipment grounding conductor to pole. Connect to supplemental ground per Standard Plan J-9a.
Service wedge clamp
ACSR triplex or fourplex conductors - see Contract
Copper split bolt connector
Messenger cable
Insulating tape for waterproof connection
Fused quick disconnect - use 30 amp fuses for high mast supports
Weatherhead - size as required
Steel conduit
8" x 8" x 4" NEMA 3R Junction box with rainproof hubs and removable cover
Grounding lug
12 pole terminal block
Direct burial conductors or galvanized steel conduits with conductors - see Contract
Grounding bushing
Supplemental ground - see Standard Plan J-9a.
Class 5 timber pole - length sufficient for mounting height and burial depth
Class 2 timber pole - length sufficient for mounting height and burial depth.
3/4" x 9" step bolt
1 1/4" x 10" plate collar bent to fit pole diameter (8" - 10")
3/4" x 4" machine bolts (four required) with washers and nuts
1/2" lag bolts (six required) - drill 1/2" hole in plate
2" pipe
3/8" wire hole 2" from gusset plate, smooth hole edges
1" nonmetallic conduit with 3/8" straps at code spacing
Distance varies, 35' MIN, 50' MAX, depending on line clearance requirements

NOTE:
1. Timber luminaire supports are allowed only for temporary installations where breakaway or slip bases are not required.
2. When down guys are required, see Standard Plan J-1a.

High Mast Timber Luminaire Support

Shown for 480 VAC power feed. Increase conductor and fuse size as required for 240 VAC power feed.

Plan View

Gusset Detail

Typical Luminaire Mounting Configurations
1. Metering arrangements may vary with different serving utilities. The contractor shall verify the requirements of the utility prior to installing the service equipment.

2. All service pole conduit shall be secured to the pole with conduit strap at 5’ centers.

3. All risers and service equipment shall be installed on side of pole that is away from traffic.

4. Where required by the serving utility, service breakers shall be installed above the meter socket in a separate raintight enclosure.

5. Bend and attach to pole within 1’ of enclosure. See Standard Plan “Typical Grounding Details.”

6. For Type B service wiring diagram, use Standard Plan “Modified Type B Service.”

7. For Type C service wiring diagram, use Standard Plan, “Type C Service.”

8. See breaker schedule in contract for breaker and contactor sizes.

SECTION A-A

TYPE A WIRING DIAGRAM
120 VOLT

TYPE A, B AND C SERVICE LIGHTING DETAILS
NOTES

1. Where pad or pedestal mounts are located in a sidewalk, construct mount top flush with sidewalk grade, omitting chamfer where top and sidewalk abut.

2. Pad mount design is typical.

3. Place a silicone seal between the cabinet foundation and the cabinet for the pad mount design.

PEDESTAL BASE DETAILS

4" steel pipe

3" X 5" handhole with cover

3/8" X 2'-0" X 4'

steel anchor bolts

4" slipfitter

3/4" DIA bolt circle for at least 4 bolt holes

7/8" DIA each

4" x 9" pipe flange

CABINET FOUNDATION DETAILS

STANDARD PLAN J-6c

EXPRESS JUNE 4, 1999

DAVID L. PEAKE
REGISTERED ENGINEER

REVIEWED: 4/7/03
EXECUTIVE SECRETARY
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION
Clifford E. Mansfield
4/24/03
DEPUTY STATE DESIGN ENGINEER
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
NOTES:
1. SEE CONTRACT FOR HEAD TYPE, MOUNTING HEIGHT AND ORIENTATION.
2. ALL NIPPLES, FITTINGS AND CENTER PIPES SHALL BE 1 1/2" DIA NOMINAL TRADE SIZE (NEC).
3. INSTALL NEOPRENE GASKET OUTSIDE HEAD WHEN FLANGED ELBOWS ARE SUPPLIED.

KEY:
1. CENTER PIPE
2. LOCKNUT
3. NIPPLE
4. SERRATED ELBOW
5. SERRATED OR FLANGED ELBOW
6. REAMED TEE WITH SET SCREW
7. REAMED ELBOW WITH SET SCREW
8. BRONZE TERMINAL COMPARTMENT WITH:
   - GASKETED COVER
   - FASTENERS
   - WIRE LEADS
   - MOUNTING SADDLE FOR SIDE MOUNTS
   - 1/2" DIA GRAY HOLE
   - 1/2" POSITION, TERMINAL STRIP
   - WIREWAY FOR SIDE MOUNTS
9. BRONZE COLLAR, 4 1/4" I.D. WITH SET SCREWS
10. CONDUIT CAP
11. GASKET AND WASHER
12. CONDUIT LOCKNUT
13. TYPE E HINGE MOUNTING
14. FASTENER WITH SPACER
   - 1/2" LAG SCREWS ON WOOD POLE
   - 1/2" BOLTS TAPPED TO METAL POLE
15. FLATHEAD SOCKET BOLT
16. 1/2" INSERT HOLE FOR EXTERNAL WIRE ENTRANCE REQUIRED ON TIMBER POLE MOUNTINGS ONLY.
NOTES:
1. Type M mounting shall have 3" ring groove and seal top and bottom at signal attachment.
2. Type M mounting for conventional heads shall have a 2" diameter opening at the signal attachment.
3. Type M mounting for optically programmed heads shall have a 3 1/2" OIA opening at the signal attachment.
4. Type N mounting with optically programmed heads shall be installed with 14" nominal arms.
5. See Standard Plan J-6h for tether wire, and backplate requirements.
**TYPICAL CONDUIT PLACEMENT FOR LOOP LEAD-IN WIRES**

<table>
<thead>
<tr>
<th>Loop Lead Pairs</th>
<th>1-2</th>
<th>3</th>
<th>4-5</th>
<th>6-8</th>
<th>9-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduit Size (MIN)</td>
<td>1&quot;</td>
<td>1/4&quot;</td>
<td>13/16&quot;</td>
<td>2&quot;</td>
<td>3&quot;</td>
</tr>
</tbody>
</table>

**TABLE A**

---

**SPLICE DETAIL**

- Foil shield
- Drain wire
- Cable jacket
- Detector lead-in cable (2C5)

---

**INDUCTION LOOP DETAILS**

- Scotchcast epoxy 82A or 82A-1 splice kit
- Two layers vinyl electric tape
- Plastic mail
- Seal both ends with electric putty and tape
- Soldered compression connection

---

**DETAIL A**

- Install non-metallic bushing and seal conduit with electrical putty or silicone
- Lead-in sawcuts
- Drill hole 1" larger than conduit
- Fill with epoxy

---

**APPLICATION FOR OFF-ROAD PAVED AREAS ONLY**

- 2" Deep sawcut
- Match existing paving material 3 1/2" min. depth
- 3" Crushed surfacing top course
- Sand
- Conduit

---

**SECTION C-C**

---
LOOP INSTALLATION NOTES
1. Install junction box and lead-in conduit.
2. Saw loop slots and lead-in slots.
3. Lay out loop wire beginning at junction box, allowing 5' minimum slack.
4. Install wire in loop slot. See Loop Winding Details.
5. Return to junction box and identify leads with plan detector number and "S" for start and "F" for finish.
6. Twist each pair of lead-in wires two turns per foot from loop to junction box and install in lead-in slot and conduit. Reverse direction of twist for each successive pair installed.
7. Construct supplemental splice containing any series or parallel loop connections required in plans. Supplemental splices are subject to the same requirements shown for the loop lead and shielded cable splice.
8. Splice loop leads or supplemental splice leads to shielded cable as noted.
9. Complete installation and test loop circuits or combination loop circuits.
10. Front of loop should be measured from back of stop bar, or back of crosswalk where no stop bar is installed.
11. Seal ends of conduit.

TYPICAL CORNER SAWCUT
LOOP SAWCUT DETAILS

LOOP WINDING DETAILS

INDUCTION LOOP DETAILS

1. Sealant
2. Twisted polypropylene rope (Size for snug fit)
3. Loop wire - number varies (See Loop Winding Details)
4. Lead-in wires: One pair for each loop served; three pairs maximum per sawcut (See Installation notes)
5. Extend sawcut sufficient length to provide full sawcut depth around corners

SECTION A-A

SECTION B-B

1/4" SAWCUT

1/2" SAWCUT

3.5" MIN

3.5" MIN

2.5" MIN

2.5" MIN

1/2" MIN
1. If parallel circuits of different sizes are contained in one conduit, the size of the grounding conductor shall be determined on the basis of the largest conductor. Only one grounding conductor is required for each conduit regardless of the number of circuits contained.

2. Service ground per serving utility requirement. If the utility uses aluminum service conductors, an approved Al-Cu pressure type ground connector shall be used to secure the service neutral to the copper neutral bar in the service enclosure. Except for the above, all grounding conductors shall be copper.

3. Equipment grounding conductors and grounding electrode conductors shall be sized in accordance with the National Electric Code (No. 8 minimum).

**Supplemental Ground**

- Required to supplement equipment grounding for luminaire standards with direct burial, aerial feeds, or where required in plans.

**Service Ground**

- Required at all services and separately derived systems.

**Ground Rod Details**

**Typical Grounding Details**

**Standard Plan J-90**

**Notes**

- This plan is subject to change without notice. It is the responsibility of the owner or person to whom the plans are delivered to verify that the plans are still current at the time of construction.

**Effective: April 7, 2003 to January 4, 2004**

**Approvals:**

- Cliff E. Mansfield
  - Deputy State Design Engineer
  - State of Washington, Department of Transportation
  - Exp. June 4, 1999

**Notations:**

- The use of this plan is subject to certain conditions and provisions. It is recommended that the user consult all applicable codes and regulations before using the plan.

- Date of Publication: 4/24/98

- Version: 1.0

- Copy of Plan:
  - Original
  - Copy of Plan:
  - Expired

- Exp. June 4, 1999

**End of Document**
NOTES

1. MODIFY REGULATORY TRAFFIC CONTROL DEVICES FOR THE DURATION OF THE DETOUR.

2. TWO FLASHING WARNING LIGHTS (TYPE A, MUTCD) SHALL BE USED TO MARK EACH BARRICADE AT NIGHT.

3. DETOUR TRAILBLAZERS SHALL BE INSTALLED THROUGHOUT THE DETOUR.

4. SIGNING SHOWN FOR ONE DIRECTION ONLY.

5. COORDINATE WITH EMERGENCY SERVICES.

SIGN SPACING = X (FEET)

<table>
<thead>
<tr>
<th>Road Classification</th>
<th>Speed Limit 1</th>
<th>Speed Limit 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Roads</td>
<td>45/55 MPH</td>
<td>500' + -</td>
</tr>
<tr>
<td>Urban Arterials &amp; Rurban Roads</td>
<td>35/40 MPH</td>
<td>350' + -</td>
</tr>
<tr>
<td>Rural Streets</td>
<td>25/30 MPH</td>
<td>200' + -</td>
</tr>
<tr>
<td>Residential Areas &amp; Business Districts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All signs are back on orange unless otherwise designated.
NOTES
1. EXTEND TAPER ACROSS SHOULDER.
2. THE MAXIMUM LENGTH OF WORK AREA CONTROLLED BY
ONE-WAY TRAFFIC SIGNAL IS 400 FT; SIGNAL TIMING
SHALL BE ESTABLISHED BY QUALIFIED PERSONNEL.
3. SIGNS SHALL BE POST MOUNTED IF SIGNAL REMAINS
IN PLACE MORE THAN 3 DAYS.

BUFFER DATA

<table>
<thead>
<tr>
<th>BUFFER SPACE = x ft</th>
<th>SPEED (mph)</th>
<th>25</th>
<th>30</th>
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<th>50</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (feet)</td>
<td>55</td>
<td>65</td>
<td>75</td>
<td>85</td>
<td>95</td>
<td>105</td>
</tr>
<tr>
<td>PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = x + R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VEHICLE TYPE</td>
<td>TYPICAL VEHICLE LOAD WEIGHT (lbs)</td>
<td>POSTED SPEED (mph)</td>
<td>STATIONARY OPERATION (feet)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 YARD DUMP TRUCK</td>
<td>24,000</td>
<td>50</td>
<td>50</td>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 TON CARGO TRUCK</td>
<td>10,000</td>
<td>45</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 TON CARGO TRUCK</td>
<td>0,000</td>
<td>45</td>
<td>75</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT.

SIGN SPACING = X (feet)

<table>
<thead>
<tr>
<th>ROADWAY TYPE</th>
<th>45/55 MPH</th>
<th>50/50 MPH</th>
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<tr>
<td>Rural Routes</td>
<td>45/55 MPH</td>
<td>50/50 MPH</td>
</tr>
<tr>
<td>Urban Arterials</td>
<td>35/40 MPH</td>
<td>35/40 MPH</td>
</tr>
<tr>
<td>Urban Streets</td>
<td>Residually Aces &amp; Business Districts</td>
<td>25/30 MPH</td>
</tr>
</tbody>
</table>

All signs are black on orange unless otherwise designated.
LEGEND

- WORK VEHICLE WITH FLASHING AMBER WARNING BEACON

- SHADOW VEHICLE WITH FLASHING AMBER WARNING BEACON (WITH TRUCK MOUNTED ATTENUATOR WHEN SPECIFIED IN CONTRACT)

NOTES

1. DAYLIGHT HOURS ONLY.

2. RADIO CONTACT BETWEEN WORK CREW AND SHADOW VEHICLE RECOMMENDED.
**BUFFER DATA**

**BUFFER SPACE = R**

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
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<th>30</th>
<th>35</th>
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<th>60</th>
<th>65</th>
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<tbody>
<tr>
<td>LENGTH (feet)</td>
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<td>85</td>
<td>100</td>
<td>120</td>
<td>170</td>
<td>220</td>
<td>280</td>
<td>335</td>
<td>485</td>
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</table>

**PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R**

<table>
<thead>
<tr>
<th>VEHICLE TYPE</th>
<th>TYPICAL VEHICLE WEIGHT (tons)</th>
<th>POSTED SPEED (mph)</th>
<th>STATIONARY OPERATION (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 YARD DUMP TRUCK</td>
<td>24,000</td>
<td>60-65</td>
<td>50</td>
</tr>
<tr>
<td>2 TON CARGO TRUCK</td>
<td>8,000</td>
<td>60-65</td>
<td>50</td>
</tr>
<tr>
<td>1 TON CARGO TRUCK</td>
<td>10,000</td>
<td>60-65</td>
<td>200</td>
</tr>
</tbody>
</table>

**CHANNELIZING DEVICE SPACING (FEET):**

<table>
<thead>
<tr>
<th>MPH</th>
<th>TAPER</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/65</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>35/45</td>
<td>50</td>
<td>80</td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

**MINIMUM TAPER LENGTH = L (FEET):**

<table>
<thead>
<tr>
<th>POSTED SPEED (mph)</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>LANE WIDTH (feet)</td>
<td>105</td>
<td>150</td>
<td>205</td>
<td>270</td>
<td>350</td>
<td>420</td>
<td>500</td>
<td>550</td>
<td>600</td>
<td>650</td>
</tr>
</tbody>
</table>

**NOTES:**

1. EXTEND DEVICE TAPER ACROSS SHOULDER.
2. DEVICES SHOULD NOT ENTRAP INTO ADJACENT LANES.
3. INSTALL PORTABLE CHANGEABLE MESSAGE SIGN (WHEN SPECIFIED) APPROXIMATELY 1 MILE IN ADVANCE OF LANE CLOSURE.
4. USE TRANSVERSE DEVICES IN CLOSED LANE EVERY 1000'.
5. TRAFFIC SAFETY DRUMS RECOMMENDED FOR HIGH SPEED ROADWAYS AND IN TAPER SECTIONS USE IN LIEU OF CONES.
6. ANALYZE THE TRAFFIC VOLUMES TO DETERMINE WORK HOURS TO MINIMIZE TRAFFIC IMPACTS.
7. A TEMPORARY RIGHT EDGE LINE IS REQUIRED FOR A LONG TERM CLOSURE.

**SIGN SPACING = X (FEET):**

- **Rural Roads:** 45/65 MPH 500' +
- **Urban Arterials & Rural Roads:** 35/40 MPH 350' +
- **Rural Roads:** 25/30 MPH 200' +

All signs are block on orange unless otherwise designated.

**END ROAD WORK**

**G20-2A**

**PORTABLE CHANGEABLE MESSAGE SIGN DISPLAYS**

PCMS

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIGHT LANE CLOSED</td>
<td>1 MILE AHEAD</td>
</tr>
</tbody>
</table>

1.5 SEC 1.5 SEC

**LEGEND:**

- **SIGN LOCATION-TRIPOD MOUNTED**
- **D D D** SEQUENTIAL ARROW SIGN
- **TEMPORARY TRAFFIC CONTROL DEVICES**
- **PROTECTIVE VEHICLE (WHEN SPECIFIED IN CONTRACT)**
- **PROTECTIVE VEHICLE WITH TRUCK MOUNTED ATTENUATOR (WHEN SPECIFIED IN CONTRACT FOR HIGH SPEED ROADWAYS)**
- **PORTABLE CHANGEABLE MESSAGE SIGN (WHEN SPECIFIED IN CONTRACT)**

**EXPRESS NOVEMBER 25, 2005**

**RIGHT LANE CLOSURE FOR DIVIDED HIGHWAY**

**STANDARD PLAN K-6**

**SHEET 1 OF 1 SHEET**

**APPROVED FOR PUBLICATION**

**12-02**

**ER 12-02**

**VIRGINIA DEPARTMENT OF TRANSPORTATION**

**APPROVED FOR PUBLICATION**

**HAROLD J. PETERFORD**

**12-02**

**VIRGINIA DEPARTMENT OF TRANSPORTATION**
1. **Existing conflicting pavement markings** no longer applicable shall be removed or obliterated.
2. **Temporary markings** shall be used as necessary.
3. Exposed ends of concrete barriers shall be maintained outside the clear zone and adequately flared or fitted with impact attenuators.
4. Steady burning warning lights (Type C, MUTCD) shall be used to mark channelizing devices at night as needed.
5. Roadside barriers and end treatment shall be crashworthy.
6. Install portable changeable message sign (when specified) approximately 1 mile in advance of lane closure.

**Minimum taper length = L (feet)**

<table>
<thead>
<tr>
<th>LANE WIDTH (feet)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
</tr>
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<tbody>
<tr>
<td>Posted Speed (mph)</td>
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<td>120</td>
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<td>150</td>
<td>165</td>
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<tr>
<td>11</td>
<td>115</td>
<td>130</td>
<td>145</td>
<td>160</td>
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<td>12</td>
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<td>170</td>
<td>185</td>
<td>200</td>
<td>215</td>
<td>230</td>
<td>245</td>
</tr>
</tbody>
</table>

**Channelizing device spacing (feet)**

<table>
<thead>
<tr>
<th>MPH</th>
<th>TAPER</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/65</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>35/45</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

**Road work ahead**

- **Sign location**—Post mounted
- **Temporary traffic control device**
- **Traffic safety drums**
- **Obliterated markings** (see notes 1 & 2)
- **Temporary concrete barrier w/reflectors**
- **Sequential arrow sign**
- **Portable changeable message sign** (when specified in contract)
- **Temporary impact attenuators** (when specified in contract)
- **PCMS**

**Standard plan K-7**

- **Approved for publication**
- **Effective: April 7, 2003 to January 4, 2004**

**NOTES**

- **Legend**
  - @ Temporary changeable message displays
  - + Temporary traffic control device
  - — Traffic safety drums
  - □ Obliterated markings (see notes 1 & 2)
  - □ Temporary concrete barrier w/reflectors
  - ◯ Sequential arrow sign
  - ◯ Portable changeable message sign (when specified in contract)
  - ◯ PCMS

**Buffer data**

**Buffer space = B**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (feet)</td>
<td>55</td>
<td>65</td>
<td>75</td>
<td>85</td>
<td>95</td>
<td>105</td>
<td>115</td>
<td>125</td>
<td>135</td>
</tr>
</tbody>
</table>

**Minimum taper length = L (feet)**

<table>
<thead>
<tr>
<th>LANE WIDTH (feet)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
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<tbody>
<tr>
<td>Posted Speed (mph)</td>
<td>10</td>
<td>105</td>
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<td>125</td>
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<td>170</td>
<td>185</td>
<td>200</td>
<td>215</td>
<td>230</td>
<td>245</td>
</tr>
</tbody>
</table>

**Channelizing device spacing (feet)**

<table>
<thead>
<tr>
<th>MPH</th>
<th>TAPER</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/65</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>35/45</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

**Road work ahead**

- **Sign location**—Post mounted
- **Temporary traffic control device**
- **Traffic safety drums**
- **Obliterated markings** (see notes 1 & 2)
- **Temporary concrete barrier w/reflectors**
- **Sequential arrow sign**
- **Portable changeable message sign** (when specified in contract)
- **PCMS**
NOTES

1. OTHER WARNING SIGNS, SUCH AS LOOSE GRAVEL, TRUCK CROSSING, BUMP, ABRUPT LANE EDGE, ETC., SHALL BE USED AS NECESSARY ALONG WITH ADVISORY SPEED SIGNS.

2. ADVISORY SPEED SIGNS ARE DETERMINED BY THE ENGINEER.

3. FLOODLIGHTS SHALL BE PROVIDED TO MARK FLAGGER STATIONS AT NIGHT.

SIGN SPACING = X (FEET)

| Rural Roads | 45/65 MPH | 500' ++ |
| Urban Arterials & Rural Roads | 35/40 MPH | 350' ++ |
| Rural Roads | Urban Streets | Residential Areas & Business Districts | 25/30 MPH | 200' ++ |

All signs are black on orange unless otherwise designated.

LEGEND
• SIGN LOCATION-POST MOUNTED
1. No encroachment on traveled lane if encroachment is necessary, lane shall be closed.

2. For operations of 15 minutes or less, all signs and channelization devices may be eliminated.
NOTES

1. THE SIGN SHOWN IS NOT REQUIRED IF THE WORK SPACE IS BEHIND A BARRIER, MORE THAN 2' BEHIND THE CURB, OR 15' OR MORE FROM THE EDGE OF ANY ROADWAY.

SIGN SPACING = X (feet)

- Rural Roads: 45/55 MPH 500'--
- Urban Arterials: 35/40 MPH 350'--
- Urban Streets: 25/30 MPH 200'--
- Business Districts: 100'--

All signs are black on orange unless otherwise designated.

WORK BEYOND THE SHOULDER

ABRupt LANE EDGE

WARNING SIGNS - LOCATE AS NEEDED FOR SITE CONDITIONS TO SUPPLEMENT WARNING SIGNS.

NO SHOULDER

2' MIN EXISTING LANE

EXISTING LANE

EXISTING SHOULDER

SHOULDER WORK AREAS PROTECTION
NON-WORKING HOURS

SHOULDER WORK AREAS

STANDARD PLAN K-11

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Harold J. Patek
12-30-02

EXPIRES NOVEMBER 25, 2003

SHOULDER WORK AREAS

STATE OF WASHINGTON
PROFESSIONAL ENGINEER

EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004
## Protective Vehicle Roll Ahead Distance = R

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Vehicle Weight (lbs)</th>
<th>Stationary</th>
<th>Mobile</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Yard Dump Truck</td>
<td>24,000</td>
<td>100'</td>
<td>175'</td>
</tr>
</tbody>
</table>

**Notes**

1. Work vehicle and shadow/protective vehicle shall use warning beacons.
2. Shadow/protective vehicle recommended—shall maintain 500’-1000’ of sight distance to approaching traffic.
3. This plan may be implemented on multi-lane highways with less than 10,000 ADT.
4. In those situations where multiple work locations within a limited distance make it practical to place stationary signs, the distance between the advance warning sign and the work should not exceed 2 miles.
5. In those situations where the distance between the advance warning signs and the work is 1 to 2 miles, a supplemental distance plaque shall be used with the road work ahead sign.

**Legend**

- Sequential Arrow Panel - Type "B" (Caution Mode)
- TMA - Truck Mounted Attenuator
- Warning Beacon

**Diagram**

- W21-5: Black on Orange
- W20-1: Black on Orange

**Mounted on Shoulder Work**

**Road Work Ahead**

**No Encroachment (into Traffic Lane)**

**See Note 4 & 5**

**Short Term Duration or Mobile Operation Shoulder Closure Standard Plan K-12**

**Approved for Publication**

**Sheet 1 of 1 Sheet**

**Effective: April 7, 2003 to January 4, 2004**
LEGEND

- SIGN LOCATION - TRIPOD MOUNT
- TEMPORARY TRAFFIC CONTROL DEVICES
- PROTECTIVE VEHICLE (WHEN SPECIFIED IN CONTRACT)
- PROTECTIVE VEHICLE WITH TRUCK MOUNTED ATTENUATOR (WHEN SPECIFIED IN CONTRACT FOR HIGH SPEED ROADWAYS)

NOTES

1. FOR LONG-TERM PROJECTS, CONFLICTING PAVEMENT MARKINGS NO LONGER APPLICABLE SHALL BE REMOVED. TEMPORARY MARKINGS SHALL BE USED AS NECESSARY AND SIGNS SHALL BE POST MOUNTED.
NOTES
1. CONTROLS SHOWN ARE FOR PEDESTRIAN TRAFFIC ONLY.
2. USE WARNING LIGHTS ON BARRICADES.
3. TEMPORARY PEDESTRIAN ROUTES SHALL BE COMPLIANT WITH ADA REQUIREMENTS.
4. CURB PARKING SHALL BE PROHIBITED FOR AT LEAST 50' IN ADVANCE OF A MID-BLOCK CROSSWALK.

LEGEND
\begin{itemize}
\item \textbf{SIGN LOCATION-TRIPOD MOUNTED}
\item \textbf{TEMPORARY TRAFFIC CONTROL DEVICES}
\item \textbf{TYPE 2 BARRICADE}
\end{itemize}
BUFFER DATA

BUFFER SPACE = B

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (feet)</td>
<td>55</td>
<td>85</td>
<td>120</td>
<td>170</td>
<td>220</td>
<td>280</td>
<td>335</td>
</tr>
</tbody>
</table>

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R

<table>
<thead>
<tr>
<th>VEHICLE TYPE</th>
<th>TYPICAL VEHICLE LOADED WEIGHT (LBS)</th>
<th>POSTED SPEED (MPH)</th>
<th>STATIONARY OPERATION (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 YARD DUMP TRUCK</td>
<td>24,000</td>
<td>50-55</td>
<td>76</td>
</tr>
<tr>
<td>2 TON CARGO TRUCK</td>
<td>15,000</td>
<td>50-55</td>
<td>100</td>
</tr>
<tr>
<td>1 TON CARGO TRUCK</td>
<td>10,000</td>
<td>50-55</td>
<td>150</td>
</tr>
<tr>
<td>ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SIGN SPACING = X (FEET)

- Rural Roads: 45/55 MPH, 500'--
- Urban Arterials: 35/40 MPH, 350'--
- Urban Streets: 25/30 MPH, 200'--

MINIMUM TAPER LENGTH = L (FEET)

<table>
<thead>
<tr>
<th>LANE WIDTH (feet)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>POSTED SPEED (mph)</td>
<td>10</td>
<td>150</td>
<td>205</td>
<td>270</td>
<td>450</td>
<td>500</td>
<td>550</td>
</tr>
<tr>
<td>1</td>
<td>11</td>
<td>115</td>
<td>165</td>
<td>225</td>
<td>295</td>
<td>495</td>
<td>550</td>
</tr>
<tr>
<td>12</td>
<td>125</td>
<td>180</td>
<td>245</td>
<td>320</td>
<td>540</td>
<td>600</td>
<td>660</td>
</tr>
</tbody>
</table>

CHANNELIZING DEVICE SPACING (FEET)

<table>
<thead>
<tr>
<th>MPH</th>
<th>TAPER</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/55</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>35/45</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

LEGEND

- SIGN LOCATION-TRIPOD MOUNT
- TEMPORARY ARROW SIGN
- CENTER TURN LANE SIGN
- PROTECTIVE VEHICLE
- PROTECTIVE VEHICLE WITH TRUCK MOUNTED ATTENUATOR
- PORTABLE CHANGEABLE MESSAGE SIGN

NOTES

1. MAINTAIN A MINIMUM OF ONE ACCESS POINT FOR EACH BUSINESS WITHIN WORK AREA LIMITS.

Field locate 1 mile --
In advance of lane closure.
NOTES
1. No left turn signs are to be used if traffic volumes are too high or there is a signal operating. Close left turn pocket if there is one on the side street.
2. Flashing warning lights (Type A, MUTCD) should be used to mark barricades at night.
3. Steady burning warning lights (Type C, MUTCD) shall be used to mark channelizing devices at night.
4. For long-term projects, conflicting pavement markings no longer applicable shall be removed or obliterated. Temporary markings shall be used.

<table>
<thead>
<tr>
<th>Minimum Taper Length + L (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane Width (feet)</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sign Spacing + X (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Roads</td>
</tr>
<tr>
<td>Urban Arterials</td>
</tr>
<tr>
<td>Urban Streets Residential Areas &amp; Business Districts</td>
</tr>
</tbody>
</table>

Aligns are block on orange unless otherwise designated.

<table>
<thead>
<tr>
<th>Channelizing Device Spacing (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPH</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>50/70</td>
</tr>
<tr>
<td>35/45</td>
</tr>
<tr>
<td>25/30</td>
</tr>
</tbody>
</table>

LEGEND
- Sign Location-Tripod Mount
- Sign Location-Portable Mount
- Temporary Traffic Control Devices
- Type 3 L Barricade
- Sequential Arrow Sign
- Obliterated Markings (See Note 4)
- Painted Traffic Arrow (Optional)
NOTES

1. PROHIBIT TURNS AS NECESSARY FOR TRAFFIC CONDITIONS. CLOSE LEFT TURN POCKET IF THERE IS ONE ON SIDE STREET.

2. FLASHING WARNING LIGHTS (TYPE A, MUTCD) SHOULD BE USED TO MARK BARRICADES AT NIGHT.

3. STEADY BURNING WARNING LIGHTS (TYPE C, MUTCD) SHALL BE USED TO MARK CHANNELIZING DEVICES AT NIGHT.

4. FOR LONG-TERM PROJECTS, CONFLICTING PAVEMENT MARKINGS NO LONGER APPLICABLE SHALL BE REMOVED OR OBLITERATED. TEMPORARY MARKINGS SHALL BE USED.

---

**MINIMUM TAPER LENGTH = L (feet)**

<table>
<thead>
<tr>
<th>LANE WIDTH (feet)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>105</td>
<td>150</td>
<td>205</td>
<td>270</td>
<td>450</td>
<td>520</td>
<td>550</td>
</tr>
<tr>
<td>1.1</td>
<td>115</td>
<td>165</td>
<td>225</td>
<td>295</td>
<td>495</td>
<td>550</td>
<td>605</td>
</tr>
<tr>
<td>1.2</td>
<td>125</td>
<td>180</td>
<td>245</td>
<td>320</td>
<td>540</td>
<td>600</td>
<td>660</td>
</tr>
</tbody>
</table>

**SIGN SPACING = X (feet)**

- Rural Roads: 45/55 MPH, 500+-
- Urban Arterials: 35/45 MPH, 350+-
- Urban Streets: 25/30 MPH, 200+-
- Residential Areas & Business Districts: All signs are back on orange unless otherwise designated.

**CHANNELIZING DEVICE SPACING (feet)**

<table>
<thead>
<tr>
<th>MPH</th>
<th>TAPER</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/70</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>35/45</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>
SIGN SPACING = X (FEET)

<table>
<thead>
<tr>
<th>Route/Roads</th>
<th>45 MPH</th>
<th>502+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Arterials</td>
<td>35/40</td>
<td>350+</td>
</tr>
<tr>
<td>Urban Streets</td>
<td>25/30</td>
<td>200+</td>
</tr>
<tr>
<td>Residential Areas  &amp; Business Districts</td>
<td>25/30</td>
<td>200+</td>
</tr>
</tbody>
</table>

Assign boxes an orange unless otherwise designated.

CHANNELIZING DEVICE SPACING (FEET)

<table>
<thead>
<tr>
<th>MPH</th>
<th>TAPER</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>35/45</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

NOTES

1. EXTEND DEVICES TAPER ACROSS SHOULDER.
2. SIGN SEQUENCE IS THE SAME FOR BOTH DIRECTIONS OF TRAVEL ON THE HIGHWAY.
3. STEADY BURNING WARNING LIGHTS (TYPE C, MUTCD) SHALL BE USED TO MARK TRAFFIC CONTROL DEVICES AT NIGHT.
4. FOR USE WHEN TRAFFIC VOLUMES ARE SUCH THAT SUFFICIENT GAPS EXIST FOR MOTOR VEHICLES THAT MUST YIELD.
5. DRIVERS MUST HAVE SUFFICIENT DISTANCE TO SEE OPPOSING TRAFFIC AS THEY APPROACH. OTHERWISE FLAGGERS AND/OR TEMPORARY SIGNAL IS REQUIRED.

BUFFER DATA

<table>
<thead>
<tr>
<th>BUFFER SPACE</th>
<th>B</th>
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</thead>
<tbody>
<tr>
<td>SPEED (MPH)</td>
<td>25 30 35 40 45</td>
</tr>
<tr>
<td>LENGTH (feet)</td>
<td>55 85 20 10 20</td>
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</tbody>
</table>

LEGEND

- SIGN LOCATION - TRIPOD MOUNT
- TEMPORARY TRAFFIC CONTROL DEVICES
- FLASHING WARNING LIGHT
- TYPE 3L BARRICADE

LANE CLOSURE ON LOW-VOLUME TWO-LANE ROAD WITHOUT FLAGGERS

STANDARD PLAN K-22

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Washington State Department of Transportation

EXPRES. NOVEMBER 25, 2004

EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004
SIGN SPACING = X (FEET)

<table>
<thead>
<tr>
<th>Category</th>
<th>Minimum</th>
<th>Maximum</th>
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<tr>
<td>Rural Roads</td>
<td>500'</td>
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<tr>
<td>Urban Arterials</td>
<td>350'</td>
<td></td>
</tr>
<tr>
<td>Urban Streets</td>
<td>200'</td>
<td></td>
</tr>
<tr>
<td>Residential Areas &amp; Business Districts</td>
<td>100'</td>
<td></td>
</tr>
</tbody>
</table>

Channels are block on orange unless otherwise designated.

CHANNELIZING DEVICE SPACING (FEET)

<table>
<thead>
<tr>
<th>Speed (MPH)</th>
<th>MPH</th>
<th>TAPER</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>35/45</td>
<td>30</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>

BUFFER DATA

<table>
<thead>
<tr>
<th>Speed (MPH)</th>
<th>Buffer Space (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25, 30, 35, 40, 45</td>
<td>55, 85, 100, 110, 220</td>
</tr>
</tbody>
</table>

LEGEND

- **SIGN LOCATION—TRIPOD MOUNT**
- **TEMPORARY TRAFFIC CONTROL DEVICES**

WORK IN CENTER OF LOW-VOLUME ROAD

STANDARD PLAN K-23

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Harold J. Peterson 12-20-03

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

WORK IN CENTER OF LOW-VOLUME ROAD

STANDARD PLAN K-23

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Harold J. Peterson 12-20-03

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
**NOTES**

1. FOR USE WITH SPEEDS OF 45 MPH AND UNDER.
2. 3 ADVANCED WARNING SIGNS ARE REQUIRED FOR FLAGGING OPERATIONS. (L&I REQUIREMENTS)
NOTES

1. PROHIBIT TURNS AS NECESSARY FOR TRAFFIC CONDITIONS. CLOSE LEFT TURN POCKET IF THERE IS ONE ON SIDE STREET.

2. FLASHING WARNING LIGHTS (TYPE A, MUTCD) SHOULD BE USED TO MARK BARRICADES AT NIGHT, AS NEEDED.

3. STEADY BURNING WARNING LIGHTS (TYPE C, MUTCD) SHOULD BE USED TO MARK CHANNELIZING DEVICES AT NIGHT AS NEEDED.

4. FOR LONG-TERM PROJECTS, CONFLICTING PAVEMENT MARKINGS NO LONGER APPLICABLE SHALL BE REMOVED OR OBLITERATED AS SOON AS PRACTICABLE. TEMPORARY MARKINGS SHALL BE USED AS NECESSARY.

---

**LEGEND**

- **SIGN LOCATION-PORTABLE MOUNT**
- **SIGN MOUNT - TRIPOD MOUNT**
- **TEMPORARY TRAFFIC CONTROL DEVICES**
- **SEQUENTIAL ARROW SIGN**
- **PAINTED TRAFFIC ARROW (OPTIONAL)**

---

**LEFT LANE CLOSURE**

**ON FAR SIDE OF INTERSECTION**

**STANDARD PLAN K-25**

EXPRES NOVEMBER 25, 2003

APPROVED FOR PUBLICATION

Harold J. Pettersen 12-20-02

State of Washington, Department of Transportation

Olympia, Washington 98504-0001

EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004
NOTES
1. PROHIBIT TURNS AS NECESSARY FOR TRAFFIC
   CONDITIONS. CLOSE LEFT TURN POCKET IF
   THERE IS ONE ON SIDE STREET.
2. FLASHING WARNING LIGHTS (TYPE A, MUTCD)
   SHOULD BE USED TO MARK BARRICADES AT
   NIGHT, AS NEEDED.
3. STEADY BURNING WARNING LIGHTS (TYPE C,
   MUTCD) SHOULD BE USED TO MARK CHANNELIZING
   DEVICES AT NIGHT AS NEEDED.
4. FOR LONG-TERM PROJECTS, CONFLICTING PAVEMENT
   MARKINGS NO LONGER APPLICABLE SHALL BE
   REMOVED OR OBLITERATED AS SOON AS PRACTICABLE.
   TEMPORARY MARKINGS SHALL BE USED AS NECESSARY.

LEGEND
- - - TEMPORARY TRAFFIC CONTROL DEVICES
### TYPE 3L BARRICADE
📍 SIGN MOUNT - TRIPOD MOUNT
 направлены, чтобы обозначить
 направление движения.

SIGN SPACING - X (feet)

<table>
<thead>
<tr>
<th></th>
<th>Rural Roads</th>
<th>45/55 MPH</th>
<th>500**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>urban Arterials</td>
<td>35/40 MPH</td>
<td>350**</td>
</tr>
<tr>
<td></td>
<td>urban Streets</td>
<td>Residential Areas &amp; Business Districts</td>
<td>25/30 MPH</td>
</tr>
</tbody>
</table>

CHANNELIZING DEVICE SPACING (feet)

<table>
<thead>
<tr>
<th>MPH</th>
<th>TAPER</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/70</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>35/45</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>
WIRE FENCE - TYPE 1

WIRE FENCE - TYPE 2

LINE BRACE
(Maximum spacing 1000 feet)

CORNER BRACE
(Angles 30° and over)

INTERSECTING FENCE BRACE

TREATMENT OF SAGS

STEEL POST DETAILS
Details for Type 2 Fence identical
as shown for Type 1 Fence

L-1
07-18-97
SINGLE WIRE GATE, 14' WIDE

DOUBLE WIRE GATE, 20' WIDE

CORNER BRACE
(Angles 30° and over)

INTERSECTING FENCE BRACE

WIRE FENCE

LINE BRACE
(Maximum spacing 1000 feet)

WOOD POST DETAILS

NOTES:
1. Details for Type 2 Fence, same as Type 1.
2. Wood anchors shall be 2x4 lumber, 12" long MIN, fastened with three 16d galvanized nails.
3. Four wire clamps per post required for mesh wire, three additional clamps per post required in sag section.
ROLL FORMED SECTIONS

### MEMBER

<table>
<thead>
<tr>
<th>TYPE</th>
<th>BRACE RAIL &amp; TOP RAIL</th>
<th>LINE &amp; BRACE POST</th>
<th>END, CORNER, &amp; PULL POST</th>
<th>GATE POST</th>
<th>ALL POSTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ROUND</td>
<td>H-COLUMN</td>
<td>ROLL FORMED</td>
<td>ROUND</td>
<td>H-COLUMN</td>
</tr>
<tr>
<td>1</td>
<td>1 1/4</td>
<td>2.27</td>
<td>1 1/4 x 1 1/4</td>
<td>1.35</td>
<td>3/8 x 1 1/4</td>
</tr>
<tr>
<td>2</td>
<td>1 1/4</td>
<td>2.27</td>
<td>1 1/4 x 1 1/4</td>
<td>1.35</td>
<td>3/8 x 1 1/4</td>
</tr>
<tr>
<td>3</td>
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<td>2.27</td>
<td>1 1/4 x 1 1/4</td>
<td>1.35</td>
<td>3/8 x 1 1/4</td>
</tr>
<tr>
<td>4</td>
<td>1 1/4</td>
<td>2.27</td>
<td>1 1/4 x 1 1/4</td>
<td>1.35</td>
<td>3/8 x 1 1/4</td>
</tr>
<tr>
<td>5</td>
<td>1 1/4</td>
<td>2.27</td>
<td>1 1/4 x 1 1/4</td>
<td>1.35</td>
<td>3/8 x 1 1/4</td>
</tr>
<tr>
<td>6</td>
<td>1 1/4</td>
<td>2.27</td>
<td>1 1/4 x 1 1/4</td>
<td>1.35</td>
<td>3/8 x 1 1/4</td>
</tr>
</tbody>
</table>

**NOTES:**

All concrete post bases shall be 10" minimum diameter.

All posts shall be spaced at 10' maximum intervals unless otherwise directed by the Engineer.

Top or bottom tension wires shall be placed within the limits of the first full fabric weave.

Details are illustrative and shall not limit hardware design or post selection of any particular fence type.
1. Fence fabric shall be secured to gate frames with knuckled selvage along top edge for types 4 & 6 chain link fence installations.

2. Minimum post lengths:
   - Types 1 & 3: 8' - 8'
   - Types 4 & 6: 5' - 6'

**Chain Link Gates**
1. Posts shall be 6 x 8 wood or 6 x 9 steel. See Standard Plan "Beam Guardrail Posts and Blocks".

2. Padlocked end shall be determined by the Project Engineer. Lock shall not be provided.

ELEVATION

GALVANIZED EYE BOLT

GALVANIZED NUT AND WASHER

Burr or swell end of bolt to prevent removal of nut

6" MIN

11" MIN

POSTS (SEE NOTE 11)

GALVANIZED NUT AND WASHER

EFFECTIVE: APRIL 7, 2003 TO JANUARY 4, 2004

ACCESS CONTROL GATE

NOTES

6" MIN galvanized IWRC wire used rope may be approved by the Engineer

Galvanized eye bolt, 5/8" shank, eye to be large enough to allow chain to pass through

5/8" Galvanized chain approximately 2' long, to connect padlocked end (See Note 2)

LOOP AND CLAMP END

L-6

07-25-97

1 of 1