Standard Plans
For Road, Bridge, and Municipal Construction

M 21-01

Washington State Department of Transportation

APWA
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.

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

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Harold Peterfeso
State Design Engineer
<table>
<thead>
<tr>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>From: ___________________________  Date: ________________</td>
</tr>
<tr>
<td>___________________________ Phone: ________________</td>
</tr>
<tr>
<td>___________________________</td>
</tr>
</tbody>
</table>

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| Subject: Standard Plans Manual Comment |

<table>
<thead>
<tr>
<th>Comment (marked copies attached):</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;&quot;&quot;</td>
</tr>
</tbody>
</table>

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## Contents

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section A</strong></td>
<td>Concrete Pavement</td>
<td></td>
</tr>
<tr>
<td>A-1</td>
<td>Cement Concrete Pavement Joints</td>
<td>5/13/02</td>
</tr>
<tr>
<td>A-2</td>
<td>Bridge Approach Slab</td>
<td>5/9/02 2 Sheets</td>
</tr>
<tr>
<td>A-3</td>
<td>Transition from Concrete Overlay</td>
<td>5/30/02 2 Sheets</td>
</tr>
<tr>
<td>A-5</td>
<td>Dowel Bar Retrofit for Cement Concrete Pavement</td>
<td>2/24/03 3 Sheets</td>
</tr>
<tr>
<td>A-6</td>
<td>Cement Concrete Pavement Repair</td>
<td>2/24/03 2 Sheets</td>
</tr>
<tr>
<td>A-7</td>
<td>Bridge Transverse Joint Seal</td>
<td>10/4/05</td>
</tr>
<tr>
<td><strong>Section B</strong></td>
<td>Drainage Structures and Hydraulics</td>
<td></td>
</tr>
<tr>
<td>B-5.20-00</td>
<td>Catch Basin Type 1</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-5.40-00</td>
<td>Catch Basin Type 1L</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-5.60-00</td>
<td>Catch Basin Type 1P (for Parking Lot)</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-10.20-00</td>
<td>Catch Basin Type 2</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-10.40-00</td>
<td>Catch Basin Type 2 with Flow Restrictor</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-10.60-00</td>
<td>Catch Basin Type 2 with Baffle Type Flow Restrictor</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-15.20-00</td>
<td>Manhole Type 1</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-15.40-00</td>
<td>Manhole Type 2</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-15.60-00</td>
<td>Manhole Type 3</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-20.20-00</td>
<td>Drywell Type 1 (for Swale)</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-20.40-00</td>
<td>Drywell Type 2 (with Pipe Inlet)</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-20.60-00</td>
<td>Drywell Type 3 (with At-Grade Inlet)</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-25.20-00</td>
<td>Combination Inlet</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-25.60-00</td>
<td>Concrete Inlet</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-30.10-00</td>
<td>Rectangular Frame (Reversible)</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-30.20-00</td>
<td>Rectangular Solid Metal Cover</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-30.30-00</td>
<td>Rectangular Vaned Grate</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-30.40-00</td>
<td>Rectangular Bi-Directional Vaned Grate</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-30.50-00</td>
<td>Rectangular Herringbone Grate</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-30.70-00</td>
<td>Circular Frame (Ring) and Cover</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-30.80-00</td>
<td>Circular Grate</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-30.90-00</td>
<td>Miscellaneous Details for Drainage Structures</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-35.20-00</td>
<td>Grate Inlet Type 1 (Cast-In-Place)</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-35.40-00</td>
<td>Grate Inlet Type 2</td>
<td>6/8/06 2 Sheets</td>
</tr>
<tr>
<td>B-40.20-00</td>
<td>Welded Grates for Grate Inlet</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-40.40-00</td>
<td>Frame and Dual Vaned Grates for Grate Inlet</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-45.20-00</td>
<td>Drop Inlet Type 1</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-45.40-00</td>
<td>Drop Inlet Type 2</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-50.20-00</td>
<td>Grates for Drop Inlet</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-55.20-00</td>
<td>Pipe Zone Bedding and Backfill</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-60.20-00</td>
<td>Connection Details for Dissimilar Culvert Pipe</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-60.40-00</td>
<td>Coupling Bands for Corrugated Metal Pipe</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-65.20-00</td>
<td>Animal/Pedestrian Underpass</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-65.40-00</td>
<td>Equipment Underpass</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-70.20-00</td>
<td>Beveled End Sections (for Culverts 30&quot; Diameter or Less)</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-70.60-00</td>
<td>Flared End Sections</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-75.20-00</td>
<td>Headwalls for Culvert Pipe and Underpass</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-75.50-00</td>
<td>Type 1 Safety Bars for Stepped Culvert Pipe or Pipe Arch</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-75.60-00</td>
<td>Type 2 Safety Bars for Culvert Pipe or Pipe Arch (On Cross Road)</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-80.20-00</td>
<td>Tapered End Section with Type 3 Safety Bars</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-80.40-00</td>
<td>Tapered End Section with Type 4 Safety Bars (On Cross Road)</td>
<td>6/1/06</td>
</tr>
</tbody>
</table>
Contents

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-82.20-00</td>
<td>Residential Storm Drain, Under Sidewalk</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-85.10-00</td>
<td>Vertical Connection (for Sanitary Sewer Use)</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-85.20-00</td>
<td>Side Sewer Connection (for Sanitary Sewer Use)</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-85.30-00</td>
<td>Standing Side Sewer Connection (for Sanitary Sewer Use)</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-85.40-00</td>
<td>8 Inch Sewer Clean-Out (for Sanitary Sewer Use)</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-85.50-00</td>
<td>Drop Connections (for Sanitary Sewer Use)</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-90.10-00</td>
<td>Hydrant Setting Types A and B</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-90.20-00</td>
<td>2 Inch Blowoff Assembly</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-90.30-00</td>
<td>Combination Air Release / Air Vacuum Valve Assembly</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-90.40-00</td>
<td>Concrete Thrust Block</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-90.50-00</td>
<td>Concrete Thrust Block for Convex Vertical Bends</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-95.20-00</td>
<td>Median Barrier Drainage Installation</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-95.40-00</td>
<td>Inlet Placement at Bridge End</td>
<td>6/8/06</td>
</tr>
</tbody>
</table>

Section C Traffic Barrier

C-1  Beam Guardrail (W-Beam)  10/31/03  2 Sheets
C-1a Beam Guardrail (Thrie Beam)  7/31/98
C-1b Beam Guardrail Posts and Blocks  10/31/03  2 Sheets
C-1c Beam Guardrail  5/30/97
C-1d Thrie Beam Guardrail Reducer Section  10/31/03
C-2  Guardrail Placement (Cases 1, 2 & 3)  1/6/00
C-2a Guardrail Placement (Cases 4, 5 & 6)  6/21/06
C-2b Guardrail Placement (Cases 7 & 8)  6/21/06
C-2c Guardrail Placement, Median Bull Nose (Cases 9A, 9B & 9C)  6/21/06
C-2d Guardrail Placement (Cases 10A, 10B & 10C)  6/21/06
C-2e Guardrail Placement (Cases 11A, 11B & 11C)  6/21/06
C-2f Guardrail Placement, Weak Post Intersection Design (8'-6" Max. Radius) (Cases 12AC, 12AD, 12BC & 12BD)  3/14/97
C-2g Guardrail Placement, Weak Post Intersection Design (35' Max. Radius) (Cases 13AC, 13AD, 13BC & 13BD)  7/27/01
C-2h Guardrail Placement (Case 14)  3/28/97
C-2i Guardrail Placement (Case 15)  3/28/97
C-2j Guardrail Placement (Cases 16, 17 & 18)  6/12/98
C-2k Guardrail Placement 12'-6" Span (Cases 19A & 19B)  7/27/01
C-2n Guardrail Placement 18'-9" Span (Case 20)  7/27/01
C-2o Guardrail Placement 25' Span (Case 21)  7/13/01
C-2p Guardrail Placement, Strong Post Intersection Design (Cases 22AC, 22AD, 22BC & 22BD)  10/31/03
C-2q Barrier Placement, Cable Barrier to W-Beam Connections (Cases 23 & 24)  3/3/05
C-2r Barrier Placement, Cable to Thrie Beam Bull Nose Connection (Case 25)  3/3/05
C-2s Barrier Placement, Cable to W-Beam Shielding for Redirectional Landform (Case 26)  3/3/05
C-2t Barrier Placement, Cable Barrier Shielding for Redirectional Landform (Case 27)  3/3/05
C-3  Beam Guardrail Transition Sections (Types 1, 1A, & 1B)  10/4/05
C-3a Beam Guardrail Transition Sections (Types 2, 4, 5, & 6)  10/4/05
C-3b Beam Guardrail Transition Sections (Types 10 ~ 15)  10/4/05  2 Sheets
C-3c Beam Guardrail Transition Sections (Types 16, 17, & 18)  6/21/06
C-3d Cable Barrier Type 3 Transition to W-Beam Guardrail  3/3/05  2 Sheets
<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-4</td>
<td>Beam Guardrail Buried Terminal Type 1</td>
<td>7/13/01</td>
</tr>
<tr>
<td>C-4a</td>
<td>Beam Guardrail Buried Terminal Type 2</td>
<td>2/25/05</td>
</tr>
<tr>
<td>C-4b</td>
<td>Beam Guardrail Flared Terminal</td>
<td>6/8/06</td>
</tr>
<tr>
<td>C-4c</td>
<td>Beam Guardrail Non-Flared Terminal</td>
<td>2/20/03</td>
</tr>
<tr>
<td>C-4d</td>
<td>Beam Guardrail Bull Nose Terminal</td>
<td>6/30/04</td>
</tr>
<tr>
<td>C-5</td>
<td>Guardrail Connection to Bridge Rail or Concrete Barrier</td>
<td>10/31/03</td>
</tr>
<tr>
<td>C-6</td>
<td>Beam Guardrail Anchor Type 1</td>
<td>5/30/97</td>
</tr>
<tr>
<td>C-6a</td>
<td>Beam Guardrail Anchor Type 2</td>
<td>3/14/97</td>
</tr>
<tr>
<td>C-6b</td>
<td>Beam Guardrail Anchor Type 4</td>
<td>1/6/00</td>
</tr>
<tr>
<td>C-6d</td>
<td>Beam Guardrail Anchor Type 5</td>
<td>5/30/97</td>
</tr>
<tr>
<td>C-6f</td>
<td>Beam Guardrail Anchor Type 7</td>
<td>7/25/97</td>
</tr>
<tr>
<td>C-7</td>
<td>Beam Guardrail End Sections</td>
<td>10/31/03</td>
</tr>
<tr>
<td>C-7a</td>
<td>Thrie Beam End Sections</td>
<td>10/31/03</td>
</tr>
<tr>
<td>C-8</td>
<td>Concrete Barrier Type 2</td>
<td>4/27/04</td>
</tr>
<tr>
<td>C-8a</td>
<td>Concrete Barrier Type 4 and Transition Section</td>
<td>7/25/97</td>
</tr>
<tr>
<td>C-8b</td>
<td>Concrete Barrier Light Standard Section</td>
<td>1/11/06</td>
</tr>
<tr>
<td>C-8c</td>
<td>Precast Concrete Barrier Type 5</td>
<td>11/8/05</td>
</tr>
<tr>
<td>C-8d</td>
<td>Alternative Temporary Concrete Barrier (F-Shape)</td>
<td>11/8/05</td>
</tr>
<tr>
<td>C-8e</td>
<td>Precast Concrete Barrier Anchors</td>
<td>11/8/05</td>
</tr>
<tr>
<td>C-8f</td>
<td>Concrete Barrier Transition, Type 2 to Bridge F-Shape</td>
<td>6/30/04</td>
</tr>
<tr>
<td>C-10</td>
<td>Box Culvert Guardrail Steel Post</td>
<td>7/31/98</td>
</tr>
<tr>
<td>C-11</td>
<td>Cable Barrier</td>
<td>5/20/04</td>
</tr>
<tr>
<td>C-11a</td>
<td>Cable Barrier Placement</td>
<td>5/20/04</td>
</tr>
<tr>
<td>C-11b</td>
<td>Cable Barrier Terminal</td>
<td>5/20/04</td>
</tr>
<tr>
<td>C-12</td>
<td>Impact Attenuator Inertial Barrier Configurations</td>
<td>7/27/01</td>
</tr>
<tr>
<td>C-13</td>
<td>Single Slope Barrier Pre-Cast Type</td>
<td>4/16/99</td>
</tr>
<tr>
<td>C-13a</td>
<td>Single Slope Barrier Pre-Cast Type, Transition Section</td>
<td>4/16/99</td>
</tr>
<tr>
<td>C-13b</td>
<td>Single Slope Barrier Pre-Cast Type, Single Sided Section</td>
<td>4/16/99</td>
</tr>
<tr>
<td>C-14a</td>
<td>Single Slope Concrete Barrier (Dual Face)</td>
<td>7/26/02</td>
</tr>
<tr>
<td>C-14b</td>
<td>Concrete Barrier Transition, Type 2 to Single Slope</td>
<td>7/26/02</td>
</tr>
<tr>
<td>C-14c</td>
<td>Single Slope Concrete Barrier Terminal</td>
<td>7/26/02</td>
</tr>
<tr>
<td>C-14d</td>
<td>Single Slope Concrete Barrier Transition Section</td>
<td>7/26/02</td>
</tr>
<tr>
<td>C-14e</td>
<td>Single Slope Concrete Barrier (Vertical Back)</td>
<td>7/26/02</td>
</tr>
<tr>
<td>C-14f</td>
<td>Single Slope Concrete Barrier Placement (Split)</td>
<td>9/2/05</td>
</tr>
<tr>
<td>C-14g</td>
<td>Single Slope Concrete Barrier Placement (Wrap)</td>
<td>9/2/05</td>
</tr>
<tr>
<td>C-14h</td>
<td>Single Slope Concrete Barrier Light Standard Foundation</td>
<td>1/11/06</td>
</tr>
<tr>
<td>C-14i</td>
<td>Single Slope Concrete Barrier Sign Bridge Foundation</td>
<td>12/2/03</td>
</tr>
<tr>
<td>C-14j</td>
<td>Single Slope Concrete Barrier Transition for Monotube Sign Support</td>
<td>12/2/03</td>
</tr>
<tr>
<td>C-14k</td>
<td>Single Slope Concrete Barrier Cantilever Sign Structure Fdn.</td>
<td>1/11/06</td>
</tr>
<tr>
<td>C-16a</td>
<td>Traffic Barrier Shoulder Widening</td>
<td>11/8/05</td>
</tr>
<tr>
<td>C-16b</td>
<td>Traffic Barrier Shoulder Widening</td>
<td>11/8/05</td>
</tr>
</tbody>
</table>

### Section D  Retaining Walls, Noise Walls, and Slope Protection

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-1a</td>
<td>Reinforced Concrete Retaining Wall Type 1 and 1 SW</td>
<td>1/23/02</td>
</tr>
<tr>
<td>D-1b</td>
<td>Reinforced Concrete Retaining Wall Type 2 and 2 SW</td>
<td>10/6/99</td>
</tr>
<tr>
<td>D-1c</td>
<td>Reinforced Concrete Retaining Wall Type 3 and 3 SW</td>
<td>10/6/99</td>
</tr>
<tr>
<td>D-1d</td>
<td>Reinforced Concrete Retaining Wall Type 4 and 4 SW</td>
<td>10/6/99</td>
</tr>
<tr>
<td>D-1e</td>
<td>Reinforced Concrete Retaining Wall Type 5 and 5 SW</td>
<td>1/23/02</td>
</tr>
</tbody>
</table>

*Effective August 7, 2006*
## Contents

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D-1f</td>
<td>Reinforced Concrete Retaining Wall Type 6 and 6 SW</td>
<td>10/6/99</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>D-2.02-00</td>
<td>Noise Barrier Wall Type 1 (CIP Conc. on Trench Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.04-00</td>
<td>Noise Barrier Wall Type 2 (CIP Conc. on Spread Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.06-00</td>
<td>Noise Barrier Wall Type 3 (... on Offset Spread Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.08-00</td>
<td>Noise Barrier Wall Type 4 (CIP Conc. on Shaft Foundation)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.10-00</td>
<td>Noise Barrier Wall Type 5 (CIP Conc. with Traffic Barrier on Trench Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.12-00</td>
<td>Noise Barrier Wall Type 5SS (CIP Conc. w/ Single Slope Traffic Barrier on Trench Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.14-00</td>
<td>Noise Barrier Wall Type 6 (CIP Conc. with Traffic Barrier on Spread Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.16-00</td>
<td>Noise Barrier Wall Type 6SS (CIP Conc. w/ Single Slope Traffic Barrier on Spread Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.18-00</td>
<td>Noise Barrier Wall Type 7 (CIP Conc. with Traffic Barrier on Shaft Foundation)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.20-00</td>
<td>Noise Barrier Wall Type 7SS (CIP Conc. w/ Single Slope Traffic Barrier on Shaft Fdn.,)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.30-00</td>
<td>Noise Barrier Wall Type 8 (Precast Conc. on Trench Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.32-00</td>
<td>Noise Barrier Wall Type 9 (Precast Conc. on Spread Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.34-00</td>
<td>Noise Barrier Wall Type 10 (... on Offset Spread Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.36-00</td>
<td>Noise Barrier Wall Type 11 (... on Shaft Foundation)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.38-00</td>
<td>Noise Barrier Wall Type 12 (Precast Conc. with Traffic Barrier on Trench Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.40-00</td>
<td>Noise Barrier Wall Type 12SS (Precast w/ Single Slope Traffic Barrier on Trench Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.42-00</td>
<td>Noise Barrier Wall Type 13 (Precast Conc. with Traffic Barrier on Spread Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.44-00</td>
<td>Noise Barrier Wall Type 13SS (Precast w/ Single Slope Traffic Barrier on Spread Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.46-00</td>
<td>Noise Barrier Wall Type 14 (Precast Conc. w/ Traffic Barrier on Shaft Foundation)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.48-00</td>
<td>Noise Barrier Wall Type 14SS (Precast Conc. w/ Single Slope Traffic Barrier on Shaft Fdn.,)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.60-00</td>
<td>Noise Barrier Wall Type 16 (Masonry on Trench Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.62-00</td>
<td>Noise Barrier Wall Type 17 (Masonry on Spread Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.64-00</td>
<td>Noise Barrier Wall Type 18 (Masonry on Offset Spread Ftg.)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.66-00</td>
<td>Noise Barrier Wall Type 19 (Masonry on Shaft with Grade Beam Foundation)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.68-00</td>
<td>Noise Barrier Wall Type 20 (Masonry on Shaft Foundation)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.78-00</td>
<td>Noise Barrier Wall Type 15 (Timber Panel on Trench Footing)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.80-00</td>
<td>Noise Barrier Wall Access Door Type 1 (Cast-In-Place)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.82-00</td>
<td>Noise Barrier Wall Access Door Type 2 (Cast-In-Place)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.84-00</td>
<td>Noise Barrier Wall Access Door Type 3 (Precast)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.86-00</td>
<td>Noise Barrier Wall Access Door Type 4 (Precast)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.88-00</td>
<td>Noise Barrier Wall Access Door Type 5 (Masonry)</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-2.92-00</td>
<td>Noise Barrier Wall Access Door &amp; Frame</td>
<td>11/10/05</td>
<td></td>
</tr>
<tr>
<td>D-3</td>
<td>Permanent Geosynthetic Wall, Types 1 ~ 6</td>
<td>7/13/05</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>D-3a</td>
<td>Permanent Geosynthetic Wall, Fascia and Facing</td>
<td>6/30/04</td>
<td></td>
</tr>
<tr>
<td>D-3b</td>
<td>Permanent Geosynthetic Wall, Single Slope Barrier</td>
<td>6/30/04</td>
<td></td>
</tr>
<tr>
<td>D-3c</td>
<td>Permanent Geosynthetic Wall, F-Shape Barrier</td>
<td>6/30/04</td>
<td></td>
</tr>
<tr>
<td>D-4</td>
<td>Backfill and Drainage for Retaining Walls</td>
<td>12/11/98</td>
<td></td>
</tr>
<tr>
<td>D-6</td>
<td>Gabions</td>
<td>6/19/98</td>
<td></td>
</tr>
<tr>
<td>Plan No.</td>
<td>Plan Title</td>
<td>Publication Approval Date</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------</td>
<td>---------------------------</td>
<td>---</td>
</tr>
<tr>
<td>D-7</td>
<td>Wire Mesh Slope Protection</td>
<td>10/6/99</td>
<td></td>
</tr>
<tr>
<td>D-7a</td>
<td>Wire Mesh Slope Protection Anchors</td>
<td>10/6/99</td>
<td></td>
</tr>
<tr>
<td>D-9</td>
<td>Concrete Slope Protection</td>
<td>12/11/98</td>
<td>2 Sheets</td>
</tr>
</tbody>
</table>

### Section E Bridges and Trestles

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>E-1</td>
<td>Date Numerals</td>
<td>7/25/97</td>
<td></td>
</tr>
<tr>
<td>E-2</td>
<td>Pile or Frame Detour Bridge with Asphalt Overlay</td>
<td>5/29/98</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>E-4</td>
<td>Precast Prestressed Concrete Piles</td>
<td>8/27/03</td>
<td></td>
</tr>
<tr>
<td>E-4a</td>
<td>Precast Prestressed Concrete Piles Handling &amp; Capping</td>
<td>8/27/03</td>
<td></td>
</tr>
<tr>
<td>E-5</td>
<td>Manhole Ring and Cover for Bridges</td>
<td>5/29/98</td>
<td></td>
</tr>
</tbody>
</table>

### Section F Curbs, Approaches, Gutters, and Sidewalks

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>F-1</td>
<td>Cement Concrete Curbs</td>
<td>12/17/02</td>
<td></td>
</tr>
<tr>
<td>F-1a</td>
<td>Cement Concrete Curb and Gutter Pan</td>
<td>12/17/02</td>
<td></td>
</tr>
<tr>
<td>F-2</td>
<td>Precast Traffic Curb</td>
<td>8/27/99</td>
<td></td>
</tr>
<tr>
<td>F-2a</td>
<td>Block Traffic Curb</td>
<td>6/23/04</td>
<td></td>
</tr>
<tr>
<td>F-2b</td>
<td>Extruded Curb</td>
<td>2/9/05</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>F-2c</td>
<td>Precast Concrete Sloped Mountable Curb</td>
<td>6/23/04</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>F-2d</td>
<td>Precast Concrete Dual Faced Sloped Mountable Curb</td>
<td>6/23/04</td>
<td></td>
</tr>
<tr>
<td>F-3</td>
<td>Cement Concrete Sidewalk</td>
<td>1/13/03</td>
<td></td>
</tr>
<tr>
<td>F-3a</td>
<td>Sidewalk Ramp, Types 1A &amp; 1B, with Layouts</td>
<td>2/9/05</td>
<td></td>
</tr>
<tr>
<td>F-3b</td>
<td>Sidewalk Ramp, Types 2A &amp; 2B, with Layouts</td>
<td>9/2/05</td>
<td></td>
</tr>
<tr>
<td>F-3c</td>
<td>Sidewalk Ramp, Types 3A &amp; 3B, with Layouts</td>
<td>2/9/05</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>F-3d</td>
<td>Sidewalk Ramp Type 4A, with Layout</td>
<td>2/9/05</td>
<td></td>
</tr>
<tr>
<td>F-3e</td>
<td>Sidewalk Ramp Type 4B, with Layout</td>
<td>2/9/05</td>
<td></td>
</tr>
<tr>
<td>F-4</td>
<td>Cement Concrete Driveway Entrance, Types 1, 2, 3, &amp; 4</td>
<td>1/13/03</td>
<td>2 Sheets</td>
</tr>
</tbody>
</table>

### Section G Signs and Sign Supports

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>G-1</td>
<td>Ground Mounted Sign Placement</td>
<td>9/12/01</td>
<td></td>
</tr>
<tr>
<td>G-2</td>
<td>Sign Bridge</td>
<td>6/4/02</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>G-2a</td>
<td>Sign Bridge Foundations</td>
<td>6/4/02</td>
<td></td>
</tr>
<tr>
<td>G-3</td>
<td>Cantilever Sign Structure (Truss-Type)</td>
<td>11/9/05</td>
<td>4 Sheets</td>
</tr>
<tr>
<td>G-3a</td>
<td>Cantilever Sign Structure (Truss-Type) Foundation Type 1</td>
<td>11/9/05</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>G-3b</td>
<td>Cantilever Sign Structure (Truss-Type) Fdn., Types 2 &amp; 3</td>
<td>11/9/05</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>G-4a</td>
<td>Timber Sign Supports</td>
<td>11/9/05</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>G-4b</td>
<td>Roadside Signs on Laminated Wood Box Posts</td>
<td>6/30/04</td>
<td></td>
</tr>
<tr>
<td>G-6</td>
<td>Maintenance Walkway for Overhead Sign Structures</td>
<td>8/27/03</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>G-6a</td>
<td>Maintenance Walkway Mounting for Monotube Overhead Sign Structure</td>
<td>8/27/03</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>G-6b</td>
<td>Maintenance Walkway Mounting for Truss-Type Overhead Sign Structure</td>
<td>8/27/03</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>G-7</td>
<td>Milepost</td>
<td>6/8/06</td>
<td></td>
</tr>
<tr>
<td>G-8a</td>
<td>Steel Sign Support, Foundation Details</td>
<td>12/15/04</td>
<td></td>
</tr>
<tr>
<td>G-8b</td>
<td>Steel Sign Support, Types TP-A &amp; TP-B, Installation Details</td>
<td>11/9/05</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>G-8c</td>
<td>Steel Sign Support, Types PL, PL-T, &amp; PL-U, Inst. Det.</td>
<td>8/18/04</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>G-8d</td>
<td>Steel Sign Support Type AS, Installation Details</td>
<td>12/15/04</td>
<td></td>
</tr>
<tr>
<td>G-8e</td>
<td>Steel Sign Support Type AP, Installation Details</td>
<td>8/18/04</td>
<td></td>
</tr>
<tr>
<td>G-8f</td>
<td>Steel Sign Support, Types ST-1 ~ ST-4, Installation Details</td>
<td>11/9/05</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>G-8g</td>
<td>Steel Sign Support, Types SB-1 &amp; SB-2, Installation Details</td>
<td>11/9/05</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>G-8h</td>
<td>Overhead Sign Mounting Details</td>
<td>6/25/02</td>
<td>4 Sheets</td>
</tr>
</tbody>
</table>
Contents

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>G-9b</td>
<td>Sign Installation on Signal and Light Standards</td>
<td>6/8/06</td>
</tr>
<tr>
<td>G-9c</td>
<td>Barrier Mounted Sign Support</td>
<td>11/23/04</td>
</tr>
<tr>
<td>G-9d</td>
<td>Sign Bracing</td>
<td>6/8/06</td>
</tr>
</tbody>
</table>

Section H  Delineators and Miscellaneous Construction

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-1</td>
<td>Guide Posts</td>
<td>1/10/02</td>
</tr>
<tr>
<td>H-1a</td>
<td>Guide Post Placement Grade Intersection</td>
<td>4/14/00</td>
</tr>
<tr>
<td>H-1b</td>
<td>Guide Post Placement for Interchanges</td>
<td>6/21/06</td>
</tr>
<tr>
<td>H-1c</td>
<td>Guide Post Placement for Horizontal Curves</td>
<td>3/4/05</td>
</tr>
<tr>
<td>H-1d</td>
<td>Miscellaneous Guide Post Placement</td>
<td>6/21/06</td>
</tr>
<tr>
<td>H-1e</td>
<td>Guide Post Placement for Bridges</td>
<td>6/21/06</td>
</tr>
<tr>
<td>H-2</td>
<td>Type 3 Barricade</td>
<td>3/4/05</td>
</tr>
<tr>
<td>H-4</td>
<td>Shoulder Rumble Strip Type 1 for Divided Highways</td>
<td>8/18/04</td>
</tr>
<tr>
<td>H-4a</td>
<td>Shoulder Rumble Strip, Types 2, 3 and 4 for Undivided Highways</td>
<td>2/25/05</td>
</tr>
<tr>
<td>H-4b</td>
<td>Center Line Rumble Strip</td>
<td>2/25/05</td>
</tr>
<tr>
<td>H-6</td>
<td>Survey Monuments Type 1 and Type 2</td>
<td>10/29/03</td>
</tr>
<tr>
<td>H-7</td>
<td>Monument Case and Cover</td>
<td>8/10/98</td>
</tr>
<tr>
<td>H-8</td>
<td>Slope Treatment</td>
<td>9/18/98</td>
</tr>
<tr>
<td>H-9</td>
<td>Embankment at Bridge Ends</td>
<td>4/18/97</td>
</tr>
<tr>
<td>H-10</td>
<td>Cement Concrete Stairway Construction Details</td>
<td>5/29/98</td>
</tr>
<tr>
<td>H-12</td>
<td>Mailbox Support Type 1</td>
<td>2/25/05</td>
</tr>
<tr>
<td>H-12a</td>
<td>Mailbox Support Type 2</td>
<td>2/25/05</td>
</tr>
<tr>
<td>H-12b</td>
<td>Mailbox Support Type 3</td>
<td>2/25/05</td>
</tr>
<tr>
<td>H-13</td>
<td>Bollard Type 1</td>
<td>2/25/05</td>
</tr>
<tr>
<td>H-13a</td>
<td>Bollard Type 2</td>
<td>2/25/05</td>
</tr>
<tr>
<td>H-14</td>
<td>Survey Stakes</td>
<td>2/9/05</td>
</tr>
</tbody>
</table>

Section I  Roadside and Site Development

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-1</td>
<td>Rest Area Septic Tank</td>
<td>7/18/97</td>
</tr>
<tr>
<td>I-2</td>
<td>Crest Gage</td>
<td>4/23/99</td>
</tr>
<tr>
<td>I-3</td>
<td>Automated Ground Water Monitoring Well</td>
<td>8/20/99</td>
</tr>
<tr>
<td>I-4</td>
<td>Silt Fence</td>
<td>7/17/03</td>
</tr>
<tr>
<td>I-5</td>
<td>Erosion Control At Culvert Ends</td>
<td>7/17/03</td>
</tr>
<tr>
<td>I-6</td>
<td>Temporary Silt Fence for Inlet Protection In Unpaved Areas</td>
<td>7/17/03</td>
</tr>
<tr>
<td>I-7</td>
<td>Storm Drain Inlet Protection</td>
<td>7/17/03</td>
</tr>
<tr>
<td>I-8</td>
<td>Wattle Installation On Slope</td>
<td>7/17/03</td>
</tr>
<tr>
<td>I-9</td>
<td>Straw Bale Barrier</td>
<td>7/17/03</td>
</tr>
<tr>
<td>I-10</td>
<td>Geotextile Encased Check Dam Installation</td>
<td>7/17/03</td>
</tr>
<tr>
<td>I-11</td>
<td>Check Dams</td>
<td>9/11/03</td>
</tr>
<tr>
<td>I-12</td>
<td>Erosion Control Blanket Placement On Slope</td>
<td>7/17/03</td>
</tr>
<tr>
<td>I-13</td>
<td>Erosion Control Blanket Placement In Channel</td>
<td>7/17/03</td>
</tr>
<tr>
<td>I-14</td>
<td>Miscellaneous Erosion Control Details</td>
<td>7/17/03</td>
</tr>
<tr>
<td>I-15</td>
<td>High Visibility Construction Fencing</td>
<td>7/13/05</td>
</tr>
</tbody>
</table>

Section J  Illumination and Signals

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>J-1b</td>
<td>Steel Light Standard Base Details</td>
<td>10/8/99</td>
</tr>
<tr>
<td>J-1c</td>
<td>Slip Base Adaptor for 4-Bolt Light Standard Base</td>
<td>4/24/98</td>
</tr>
<tr>
<td>J-1d</td>
<td>Steel Light Standard, Barrier Mounted Base</td>
<td>1/11/06</td>
</tr>
<tr>
<td>J-1e</td>
<td>Light Standard Wiring Details</td>
<td>1/11/06</td>
</tr>
</tbody>
</table>
## Contents

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>J-1f</td>
<td>Timber Light Standards</td>
<td>6/23/00</td>
</tr>
<tr>
<td>J-3</td>
<td>Type A, B, and C Service Lighting Details</td>
<td>8/1/97 2 Sheets</td>
</tr>
<tr>
<td>J-3b</td>
<td>Service Cabinet Type B Modified (0 - 200 Amp Type, 120/240 Single Phase)</td>
<td>3/4/05 2 Sheets</td>
</tr>
<tr>
<td>J-3c</td>
<td>Service Cabinet Type D (0 - 200 Amp Type, 120/240 Single Phase)</td>
<td>6/24/02</td>
</tr>
<tr>
<td>J-3d</td>
<td>Service Cabinet Type E (0 - 200 Amp Type, 240/480 Single Phase)</td>
<td>11/5/03</td>
</tr>
<tr>
<td>J-5</td>
<td>Pedestrian Pushbutton Details</td>
<td>8/1/97</td>
</tr>
<tr>
<td>J-6c</td>
<td>Cabinet Foundation Details</td>
<td>4/24/98</td>
</tr>
<tr>
<td>J-6f</td>
<td>Signal Head Mounting Details, Pole &amp; Post Top Mountings</td>
<td>4/24/98</td>
</tr>
<tr>
<td>J-6g</td>
<td>Signal Head Mounting Details, Mast Arm and Span Wire Mountings</td>
<td>12/12/02</td>
</tr>
<tr>
<td>J-6h</td>
<td>Miscellaneous Signal Details</td>
<td>4/24/98</td>
</tr>
<tr>
<td>J-7a</td>
<td>Signal Standard Type Designations and Types PPB, PS, I, RM, and FB Details</td>
<td>9/12/01 2 Sheets</td>
</tr>
<tr>
<td>J-7c</td>
<td>Strain Pole Standards Type IV and V</td>
<td>6/19/98</td>
</tr>
<tr>
<td>J-7d</td>
<td>Span Wire Installation</td>
<td>4/24/98</td>
</tr>
<tr>
<td>J-8a</td>
<td>Type 1 Induction Loop</td>
<td>5/20/04</td>
</tr>
<tr>
<td>J-8b</td>
<td>Type 2 Induction Loop</td>
<td>5/20/04 2 Sheets</td>
</tr>
<tr>
<td>J-8c</td>
<td>Type 3 Induction Loop</td>
<td>5/20/04 3 Sheets</td>
</tr>
<tr>
<td>J-8d</td>
<td>Induction Loop Details</td>
<td>5/20/04 2 Sheets</td>
</tr>
<tr>
<td>J-9a</td>
<td>Typical Grounding Details</td>
<td>4/24/98</td>
</tr>
<tr>
<td>J-10</td>
<td>Electrical Conduit Placement</td>
<td>7/18/97</td>
</tr>
<tr>
<td>J-11a</td>
<td>Standard Junction Box, Types 1 &amp; 2</td>
<td>9/2/05</td>
</tr>
<tr>
<td>J-11b</td>
<td>Heavy Duty Junction Box, Types 4, 5, &amp; 6</td>
<td>9/2/05 2 Sheets</td>
</tr>
<tr>
<td>J-11c</td>
<td>Light Duty Junction Box, Types 7 &amp; 8</td>
<td>6/21/06 2 Sheets</td>
</tr>
<tr>
<td>J-12</td>
<td>Sign Post-Mounted Junction Box</td>
<td>11/8/05 2 Sheets</td>
</tr>
<tr>
<td>J-15a</td>
<td>Pull Box</td>
<td>10/4/05 2 Sheets</td>
</tr>
<tr>
<td>J-15b</td>
<td>Cable Vault</td>
<td>10/4/05 2 Sheets</td>
</tr>
<tr>
<td>J-16a</td>
<td>Junction Box, Traffic Barrier Mounted</td>
<td>3/4/05</td>
</tr>
<tr>
<td>J-16b</td>
<td>Conduit Installation in Retaining Wall Traffic Barrier</td>
<td>9/2/05</td>
</tr>
<tr>
<td>J-18</td>
<td>Permanent Traffic Recorder Site Installations</td>
<td>9/2/05 2 Sheets</td>
</tr>
<tr>
<td>J-19</td>
<td>Weigh-In-Motion Site Installation</td>
<td>9/2/05</td>
</tr>
<tr>
<td>J-20</td>
<td>Permanent Traffic Recorder and Weigh-In-Motion Details</td>
<td>9/2/05 3 Sheets</td>
</tr>
</tbody>
</table>

### Section K Work Zone Traffic Control Plans

**FOR LOCAL AGENCY USE ONLY**

| K-1     | Road Closure With Diversion                                               | 12/20/02                 |
| K-2     | Road Closure With Off Site Detour                                         | 12/20/02                 |
| K-3     | Alternating One Way Traffic, Flagger Controlled or Pilot Car Controlled   | 12/20/02                 |
| K-4     | Alternating One Way Traffic, Temporary Signal Controlled                   | 12/20/02                 |
| K-5     | Mobile Shoulder Operation With Lane Encroachment                          | 12/20/02                 |
| K-6     | Right Lane Closure For Divided Highway                                    | 12/20/02                 |
| K-7     | Lane Closure With Temporary Concrete Barrier                              | 12/20/02                 |
| K-8     | Paving Operations Non-Working Hours                                       | 12/20/02                 |
| K-9     | Shoulder Closure, High Speed                                             | 12/20/02                 |
| K-10    | Shoulder Closure, Low Speed                                               | 12/20/02                 |
| K-11    | Shoulder Work Areas                                                       | 12/20/02                 |
| K-12    | Short Term Duration Or Mobile Operation Shoulder Closure                   | 12/20/02                 |
| K-13    | Intersection Closure Work, 4 Way Intersection                             | 12/20/02                 |
| K-14    | Pedestrian Traffic Control At Intersections                                | 12/20/02                 |
## Contents

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-15</td>
<td>Intersection Lane Closure, Three Lane Roadway</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-16</td>
<td>Intersection Lane Closure, Five Lane Roadway</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-17</td>
<td>Left Lane &amp; Center Turn Lane Closure, Five Lane Roadway</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-18</td>
<td>Lane Shift, Three Lane Roadway</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-19</td>
<td>Right Lane Closure With Lane Shift, Five Lane Roadway</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-20</td>
<td>Half Road Closure</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-21</td>
<td>Multiple Lane Closures At Intersection</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-22</td>
<td>Lane Closure on Low Volume, Two Lane Road w/o Flaggers</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-23</td>
<td>Work In Center Of Low Volume Road</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-24</td>
<td>Surveying Along Centerline Of Low Volume Road</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-25</td>
<td>Left Lane Closure On Far Side Of Intersection</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-26</td>
<td>Right Lane Closure On Far Side Of Intersection</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-27</td>
<td>One Lane Repair During Non-Working Hours</td>
<td>12/20/02</td>
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</table>

### Section L  Fence and Glare Screen

<table>
<thead>
<tr>
<th>Section L</th>
<th>Fence and Glare Screen</th>
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<tbody>
<tr>
<td>L-1</td>
<td>Wire Fence</td>
<td>7/18/97</td>
<td>2</td>
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<td>L-2</td>
<td>Chain Link Fence</td>
<td>7/18/97</td>
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<tr>
<td>L-3</td>
<td>Chain Link Gates</td>
<td>7/18/97</td>
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<tr>
<td>L-5</td>
<td>Glare Screen Type 1</td>
<td>7/31/98</td>
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<tr>
<td>L-5a</td>
<td>Glare Screen Type 2</td>
<td>7/31/98</td>
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<tr>
<td>L-6</td>
<td>Access Control Gate</td>
<td>7/25/97</td>
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### Section M  Pavement Marking

<table>
<thead>
<tr>
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<th>Pavement Marking</th>
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<tbody>
<tr>
<td>M-1.20-00</td>
<td>Ramp Channelization, Single Lane</td>
<td>2/25/05</td>
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</tr>
<tr>
<td>M-1.40-00</td>
<td>Ramp Channelization, Two Lane</td>
<td>2/25/05</td>
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</tr>
<tr>
<td>M-1.60-00</td>
<td>Ramp Channelization, Collector Distributor Road</td>
<td>2/25/05</td>
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<tr>
<td>M-1.80-00</td>
<td>Ramp Channelization, Parallel On &amp; Weaving Section</td>
<td>2/25/05</td>
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<tr>
<td>M-2.20-00</td>
<td>Gore Area Marking Layouts</td>
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<tr>
<td>M-2.40-00</td>
<td>Gore Area Supplement w/ Type 2 Raised Pavement Markers</td>
<td>2/25/05</td>
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<td>M-2.60-00</td>
<td>Gore Area Substitution with Types 1 &amp; 2 RPM's</td>
<td>2/25/05</td>
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<tr>
<td>M-3.10-00</td>
<td>Left Turn Channelization</td>
<td>12/15/04</td>
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</tr>
<tr>
<td>M-3.20-00</td>
<td>Left Turn Channelization, Reduced Tapers</td>
<td>12/15/04</td>
<td></td>
</tr>
<tr>
<td>M-3.30-00</td>
<td>Left Turn Channelization, Tee Intersection and Back-to-back Turn Lanes</td>
<td>12/15/04</td>
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</tr>
<tr>
<td>M-3.40-00</td>
<td>Two-way Left Turn and Median Channelization</td>
<td>12/15/04</td>
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</tr>
<tr>
<td>M-3.50-00</td>
<td>Double Left Turn Channelization</td>
<td>12/15/04</td>
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</tr>
<tr>
<td>M-5.10-00</td>
<td>Right Turn Channelization</td>
<td>12/15/04</td>
<td></td>
</tr>
<tr>
<td>M-7.50-00</td>
<td>High Occupancy Vehicle (HOV) Lane Symbol Layout</td>
<td>3/4/05</td>
<td></td>
</tr>
<tr>
<td>M-9.50-00</td>
<td>Bicycle Lane Symbol Layout</td>
<td>3/4/05</td>
<td></td>
</tr>
<tr>
<td>M-11.10-00</td>
<td>Railroad Crossing Layout</td>
<td>3/4/05</td>
<td></td>
</tr>
<tr>
<td>M-15.10-00</td>
<td>Crosswalk Layout</td>
<td>2/25/05</td>
<td></td>
</tr>
<tr>
<td>M-17.10-00</td>
<td>Parking Space Layout</td>
<td>3/4/05</td>
<td></td>
</tr>
<tr>
<td>M-20.10-00</td>
<td>Long Line Marking Patterns</td>
<td>3/4/05</td>
<td></td>
</tr>
<tr>
<td>M-20.20-00</td>
<td>Profiled Plastic Lines</td>
<td>3/4/05</td>
<td></td>
</tr>
<tr>
<td>M-20.30-00</td>
<td>Long Line Supplement with Raised Pavement Markers</td>
<td>3/4/05</td>
<td></td>
</tr>
<tr>
<td>M-20.40-00</td>
<td>Long Line Supplement with RPM's ~ Turn Lanes</td>
<td>3/4/05</td>
<td></td>
</tr>
<tr>
<td>M-20.50-00</td>
<td>Long Line Substitution with Raised Pavement Markers</td>
<td>3/4/05</td>
<td></td>
</tr>
<tr>
<td>M-24.20-01</td>
<td>Symbol Markings, Traffic Arrows for High Speed Roadways</td>
<td>5/31/06</td>
<td>3</td>
</tr>
<tr>
<td>M-24.40-01</td>
<td>Symbol Markings, Traffic Arrows for Low Speed Roadways</td>
<td>5/31/06</td>
<td>2</td>
</tr>
<tr>
<td>M-24.60-01</td>
<td>Symbol Markings, Miscellaneous</td>
<td>5/31/06</td>
<td>2</td>
</tr>
</tbody>
</table>
PLAN

Asphalt or cement concrete shoulder (See Note 5)

Bridge approach slab

Asphalt or cement concrete pavement

Joint filler (See Note 3)

Beginning of taper

Transverse contraction joints (Cement Concrete Pavement only)

End of taper and overlay

Butt joint at end of overlay

ELEVATION

Asphalt concrete pavement (See Note 1)

Existing transverse contraction joint (Type 1)

Top of existing roadway

Cement concrete pavement (See Note 1)

Sewed groove (See Note 4)

Joint filler (See Note 3)

Bridge approach slab

Top of existing roadway

Concrete overlay

Premolded joint filler (See Note 2)

Bridge pavement seat

CASE 1
CEMENT CONCRETE PAVEMENT WITH ASPHALT OR CEMENT CONCRETE SHOULDER

CASE 2
ASPHALT CONCRETE PAVEMENT (Diaphragm cast on structure)

Taper shall extend across three transverse contraction joints

1'

1'

40' Taper

EXPRES July 31, 2003
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. Use the 1/2" joint details for bridges with a length less than 100' and for bridges with L type abutments. Use the 1" joint details for other applications. Use DETAIL 8 on steel trusses and timber bridges with concrete deck panels.

2. Sealant shall be filled with hot-poured compound in accordance with Standard Specification 6-04.3.1 and sealed in accordance with Standard Specification 6-06.3(3). 

3. The contractor shall avoid sawing existing concrete. The construction tolerance to locate the saw cut is ± 1/8" (6 mm) to 1/2" (12 mm) from the existing concrete (DETAIL 1 and 5).
**NOTES**

1. As acceptable alternatives to the rebar shown in the PRECAST BASE
   SECTION, fibers (placed according to the Standard Specifications), or
   wire mesh having a minimum area of 0.12 square inches per foot shall
   be used with the minimum required rebar shown in the ALTERNATIVE
   PRECAST BASE SECTION. Wire mesh shall not be placed in the
   knockouts.

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 Standard Specification 9-04.3.

3. The maximum depth from the finished grade to the lowest pipe invert
   shall be 6'.

4. The frame and grate may be installed with the flange up or down. The
   frame may be cut into the 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. The opening shall be measured at the top of the precast base section.

7. All pickup holes shall be grouted full after the basin has been placed.
PIPE ALLOWANCES

<table>
<thead>
<tr>
<th>PIPE MATERIAL</th>
<th>MAXIMUM INSIDE DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>REINFORCED OR PLAIN CONCRETE</td>
<td>19&quot;</td>
</tr>
<tr>
<td>ALL METAL PIPE</td>
<td>21&quot;</td>
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<td>SOLID WALL PVC (STD. 8&quot; SPEC. 9-06-12&quot;(1))</td>
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<td>PROFILE WALL PVC (STD. 8&quot; SPEC. 9-06-12(2))</td>
<td>21&quot;</td>
</tr>
</tbody>
</table>

* CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTES

1. As acceptable alternatives to the rebar shown in the PRECAST BASE SECTION, fiberglass (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot shall be used with the minimum required rebar shown in the ALTERNATIVE PRECAST BASE SECTION. Wire mesh shall not be placed in the knockouts.

2. The knockout diameter shall not be greater than 28”。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 Standard Specification 9-04-3.

3. The maximum depth from the finished grade to the lowest pipe invert shall be 8”.

4. The frame and grate may be installed with the flange up or down. The frame may be cast into the 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. The opening shall be measured at the top of the precast base section.

7. All pickup holes shall be grouted full after the basin has been placed.
NOTES

1. As acceptable alternatives to the rebar shown in the PRECAST BASE SECTION, liberal (pleased according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot shall be used with the minimum required rebar shown in the ALTERNATIVE PRECAST BASE SECTION. Wire mesh shall not be placed in the knockouts.

2. The knockout diameter shall not be greater than 18". 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 Standard Specification 9-04.3.

3. The maximum depth from the finished grade to the lowest pipe invert shall be 6".

4. The frame and grate may be installed with the flange up or down. The frame may be cast into the 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. The opening shall be measured at the top of the precast base section.

7. All pickup holes shall be grouted full after the basin has been placed.
NOTES

1. No steps are required when height is 4' or less.
2. The bottom of the present catch basin may be sloped to facilitate cleaning.
3. The rectangular frame and grate may be installed with the flange up or down. The frame may be cast into the adjustment section.
4. Knockout shall have a wall thickness of 2" minimum to 2.6" 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 Standard Specification 6-04-3.

CATCH BASIN DIMENSIONS

<table>
<thead>
<tr>
<th>CATCH BASIN DIAMETER</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>
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PIPE ALLOWANCES

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1. Corrugated Polyethylene Storm Sewer Pipe (Std. Spec. 6-05-20)
2. (Std. Spec. 6-05-1212)
3. (Std. Spec. 6-05-1212)

CATCH BASIN TYPE 2

STANDARD PLAN B-10.20-00
Sheet 1 of 1 Sheet
APPROVED FOR PUBLICATION
Harold J. Petersen 08-01-00
Washington State Department of Transportation
1. The pipe supports and the flare restrictor shall be constructed of the same material and be anchored at a minimum spacing of 20". Attach the pipe supports to the manhole with #6 stainless steel expansion bolts or embed the supports into the manhole wall 2".

2. The vertical flare stem of the flare restrictor shall be the same diameter as the horizontal outlet pipe with a minimum diameter of 3".

3. The flare restrictor shall be fabricated from one of the following materials:
   - 0.062" Corrugated Galvanized Steel Drain Pipe
   - 0.054" Corrugated Galvanized Steel Drain Pipe with Treatment 1
   - 0.060" Corrugated Aluminum Alloy Pipe, in accordance with ASTM B 351, 655 Hi-S 82 or EPS
   - High Density Polyethylene Storm Sewer Pipe

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

5. The multi-critale elbows may be located as shown, or all placed on one side of the rear to assure ladder clearance. The sizes of the elbows and their placement shall be specified in the Contract.

6. Reactor plate with crutches as specified in the Contract. The opening is to be cut round and smooth.

7. The shear gate shall be made of aluminum alloy in accordance with ASTM B 28 and ASTM B 276, designation 2011SA; or cast iron in accordance with ASTM A 48, Class 300.

8. The lid handle shall be made of a similar metal to the gate (to prevent galvanic corrosion). It may be of solid rod or hollow tubing, with adjustable hook as required.

9. A neoprene rubber gasket is required between the frame mounting flange and the gate flange.

10. Install the gate so that the level-line mark is level when the gate is closed.

11. The seating surfaces of the lid and the body shall be machined for proper fit.

All shear gate bolts shall be stainless steel.

The shear gate maximum opening shall be controlled by limited hinge movement, a stop tab, or some other device.

Alternative shear gate designs are acceptable if material specifications are met and hinge bolt pattern matches.
**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 M^2/Ft. in Each Direction</th>
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</tbody>
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**Note:**
Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum.

**Manhole Type 1**

**Standard Plan B-15.20-00**

---

**Effective:** August 7, 2006 to April 1, 2007
NOTE

Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum.

MANHOLE DIMENSION TABLE

<table>
<thead>
<tr>
<th>DIAM</th>
<th>WALL THICKNESS</th>
<th>BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT SIZE</th>
<th>MINIMUM DISTANCE BETWEEN KNOCKOUTS</th>
<th>BASE REINFORCING STEEL B. F. IN EACH DIRECTION</th>
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MANHOLE TYPE 3

STANDARD PLAN B-15.60-00

APPROVED FOR PUBLICATION

Washington State Department of Transportation

WASHINGTON,

HAROLD J. PETERSON 06-01-06

EXPIRES JULY 1, 2007
NOTES:
1. Precast concrete core sections may be eccentric or concentric.
2. Gasket part orientation varies among manufacturers.
3. For depths over 10' use 72" x 8' Alternative Precast Footing.
NOTES

1. The asymmetry of the Combination Inlet shall be considered when calculating the offset distance for the catch basin. See SECTION A.

2. The dimensions of the Frame and Hood may vary slightly among different manufacturers. The Frame may have cast features intended to support a grate guard. Hood units shall mount outside of the Frame. The methods for fastening the Safety Bar / Debris Guard Rod to the Hood may vary. The Hood may include casting lugs. The top of the Hood may be cast with a pattern.

3. Attach the Hood to the frame with two 3/4" x 2" hex head bolts, nuts, and oversize washers. The washers shall have diameter adequate to ensure full bearing across the slots.

4. When bolt-down grates are specified in the contract, provide two holes in the frame that are vertically aligned with the grate slots. Top each hole to accept a 5/16" x 11 N.F. x 2" allin head cap screw. Location of bolt-down holes varies among different manufacturers. See BOLT-DOWN DETAIL, Standard Plan B-30.10.

5. Only round iron Vanned Grates shall be used. See Standard Plans B-30.30 and B-30.40 for grate details. Refer to Standard Specification 0-05.18(2) for additional requirements.

6. This plan is intended to show the installation details of a manufactured product. It is not the intent of this plan to show the specific details necessary to substantiate the castings shown on this drawing.
1. As acceptable alternatives to the rebar shown in the PRECAST BASE SECTION, fibers (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot shall be used with the minimum required rebar shown in the ALTERNATIVE PRECAST BASE SECTION. Wire mesh shall not be placed in the knockouts.

2. The knockout diameter shall not be greater than 18". 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 Standard Specification 9-04-3.

3. The maximum depth from the finished grade to the lowest pipe invert shall be 6".

4. The frame and grate may be installed with the flange up or down. The frame may be cast into the 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. The opening shall be measured at the top of the precast base section.

7. All pickup holes shall be grouted full after the inlet has been placed.
NOTES

1. This frame is designed to accommodate 20" x 24" grates or covers as shown on Standard Plans B-10.30, B-30.30, B-30.40 and B-30.60.

2. When bolt-down grates or covers are specified in the Contract, provide two holes in the frame that are vertically aligned with the grate or cover slots. Top each hole to accept a 5/8" - 11 NC x 2" allen head cap screw. Location of bolt down holes varies among different manufacturers.

3. Refer to Standard Specification 9-08.15(2) for additional requirements.

RECTANGULAR FRAME (REVERSIBLE)

STANDARD PLAN B-30.10-09

Sheet 1 of 1 Sheet

APPROVED FOR PUBLICATION

Matthew J. Klempel
Registered Professional Engineer

Expires July 4, 2007

HERALD J. HESS

Washington State Department of Transportation

AUGUST 7, 2006 TO APRIL 1, 2007
NOTES:

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. The location of the two slots varies among different manufacturers.

2. Alternative reinforcing rib designs are acceptable.


4. For frame details, see Standard Plan B-30.10.
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.


3. For frame details, see Standard Plan B-30.10.
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 8-08.152 for additional requirements.

3. For Frame details, see Standard Plan B-30.10.

4. The thickness of the grate shall not exceed 1 5/8".
TYPICAL ORIENTATION FOR ACCESS AND STEPS

RECTANGULAR ADJUSTMENT SECTION
As an acceptable alternative to mesh, wire mesh having a minimum area of 0.12 square inches per foot may be used for adjustment sections.

CIRCULAR ADJUSTMENT SECTION

48", 54", or 60" FLAT SLAB TOP

ECCENTRIC CONE SECTION

2" (TYP)

34" ULML

48" ULML

6" ULML

5 1/2" MAX

1 1/4" MIN

5 1/2" MAX

11/16" MIN

1/2" MAX

8 BARS @ 7" SPACING

24" DIA HOLE OR 6/4 DUAL HOLE

72" FLAT SLAB TOP

64 BARS @ 6" SPACING

20" x 24" OR 24" DUAL HOLE

48", 54", or 60" FLAT SLAB TOP

2" (TYP)

34" ULML

6" ULML

2 1/2" MAX

8 BARS @ 7" SPACING

24" DIA HOLE OR 6/4 DUAL HOLE

84", 96", or 108" FLAT SLAB TOP

STEP

PREFABRICATED LADDER
1. The Contract may specify a rotated inlet installation. Orient the Grates in the Frame as they intersect flow.

2. When bolt-down grates are specified in the Contract, provide two slots in the grates that are centered with the holes in the frame. Location of bolt-down slots varies among different manufacturers.

CONCRETE COLLAR OPTION

STANDARD PLAN B-66.20-00

CONCRETE PIPE — SEE NOTE 3

CONVOLUTED METAL PIPE

PLASTIC GASKETS — SEE NOTE 4

TYPE "TC" COUPLING BAND — SEE NOTE 5

34" WIDE, 1/THICK RUBBER GASKET
IN ACCORDANCE WITH STI SPEC B-44-02

COUPLING BAND OPTION

NOTES:

1. The Concrete Collar width shall be one half of the outside pipe diameter of the largest pipe. The minimum Concrete 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. Steel Welded Wire Fabric shall be in accordance with Standard Specification B-07.7. Install two wraps for sizes 6 x 6 (W1.4 x W1.4) Steel Welded Wire Fabric or one wrap for any of the following sizes:
   - 5 x 6 W1.1 x W2.1 (6 ga)
   - 5 x 6 W2.0 x W2.0 (6 ga)
   - 4 x 4 W2.0 x W2.0 (6 ga)
   - 4 x 4 W4.0 x W4.0 (4 ga)

3. When a Coupling Band connection requires attachment to the bell end of a concrete pipe, the bell end of the pipe shall be removed before the connection is installed.

4. Increase the outside diameter of the metal pipe to match the outside diameter of the concrete pipe by installing 12" wide rubber gaskets, thickness as required (Coupling Band only). The rubber gaskets shall be in accordance with Standard Specification S-64.02.

5. Use a Red Type K Coupling Band. Type K Coupling Bands with clamps 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.
NOTES:
1. Span and rise dimensions are nominal and are measured to the inside creases of corrugations.
2. Allowable heights of cover shall be within the limits indicated in the table included herein.
Maximums and minimums are shown.
3. Unless indicated otherwise, a 12" depth (over the inside creases 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 naturally occurring materials available in the vicinity of the structural plate underpass installation. See Standard Specification 7-03.03(4).
4. Designed for H-20 live load and maximum allowable soil pressure of 8 kPa per square foot.

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<tr>
<td>6'-10&quot;</td>
<td>5' 2&quot;</td>
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</tbody>
</table>

LENGTH IN A MULTIPLE OF 2'

NOTE:
- SEE NOTE 3

SIDE VIEW - PLACEMENT

ANCHOR TREATMENT
### Table: ALLOWABLE HEIGHTS OF COVER

<table>
<thead>
<tr>
<th>SPAN CODE</th>
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<td>62</td>
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</table>

**NOTES:**
- Span and rise dimensions are measured to the inside edges of corrugations and may vary slightly depending on manufacturer.
END SECTION LENGTH SHALL BE AT LEAST SIX TIMES THE DIAMETER OF THE PIPE (SEE STD. SPEC. 7-02.3(1))

4\+1/2\ OR STEEPER

4\ MAX.

THERMOPLASTIC PIPE

END SECTION LENGTH SHALL BE AT LEAST SIX TIMES THE DIAMETER OF THE PIPE (SEE STD. SPEC. 7-02.3(1))

4\+1/2\ OR STEEPER

4\ MAX.

CONCRETE PIPE

FOR CULVERTS 36" DIAMETER OR LESS

BEVELED END SECTIONS

STANDARD PLAN B-70.20-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Herold J. Peterson 06-01-06

Washington State Department of Transportation

NOTES

1. The culvert ends shall be beveled to match the embankment or ditch slope and shall not be beveled flatter than 4\+1/2\ OR STEEPER. When slopes are between 4\+1/2\ AND 8\+2/3\, shape the slope in the vicinity of the culvert to ensure that no part of the culvert protrudes more than 4\ above the ground line.

2. Field cutting of culvert ends 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.
1. All pipes or pipe arches shall be attached as shown in CONNECTOR DETAIL.

2. When a Top Plate Extension is required, it shall be the same gage as the End Section. The dimensions shall be 6" high, and 6" less than the overall width. Instal centered, and tapped 2", fasten with 3/8" x 3/4" galvanized bolts on 12" maximum centers.

3. Cross Drainage Bar and Safety Bars shall be 3" Schedule-40 galvanized steel pipe. Cross Drainage Bars shall be placed a maximum 30" apart.

4. Slotted holes for safety bar attachment shall be provided on end sections.

5. Number of Safety Bars required will vary depending upon the length of the end section.

---

**TAPERED END SECTION WITH TYPE 3 SAFETY BARS**

**STANDARD PLAN B-60.20-00**

**Sheet 1 of 1 Sheet**

**APPROVED FOR PUBLICATION**

Matthew J. Kellicut 06-06-06

Washington State Department of Transportation

**EXPRESSES JULY 4, 2007**

**EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007**

---

**NOTES**

---

**METAL ENDS FOR CIRCULAR PIPES**

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<th>CIRCUM.</th>
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<th>SLOPE D-2</th>
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**METAL ENDS FOR ARCHED PIPES**

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<th>W</th>
<th>OVERALL WIDTH</th>
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</table>
VERTICAL CONNECTION

STANDARD PLAN B-68.10-00

ELEVATION

SECTION A

FOR SANITARY SEWER USE

MATTHEW J. KETTEN
REGISTRATION NUMBER: 019095

EXPRESSES JUL 1 2007

WASHINGTON DEPARTMENT OF TRANSPORTATION

Effective: August 7, 2006 to April 1, 2007
NOTES:

1. Install sewer saddles with galvanized steel clamps for connection to existing sewers. Install wye or tee sewer fittings with galvanized for new sewer installations.

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

FOR SANITARY SEWER USE

SIDE SEWER CONNECTION

STANDARD PLAN B-85.20-00

Sheet 1 of 1 Sheet

Approved for Publication

Washington State Department of Transportation

Effective: August 7, 2006 to April 1, 2007
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 shell be smooth.

HYDRANT SETTING TYPES A AND B
STANDARD PLAN B-60.10-00
Sheet 1 of 1 Sheet

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007
NOTES
1. Coat the pipe threads with asphalt cement assembly.
2. All piping shall be galvanized steel.
3. Valve and piping to valve shall be 2" unless otherwise noted in the Contract.
4. Locate blowoff outlet near property corner if possible.
COMBINATION AIR RELEASE / AIR VACUUM VALVE ASSEMBLY
STANDARD PLAN B-60.30-00

NOTES

1. The sizes of the combination air release / air vacuum valve shall be specified in the Contract. The piping and valves shall be the same sizes as the combination air release / air vacuum valve.

2. Locate at the high point of the main, top top of main.
**Dimension Table**

<table>
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<tr>
<th>Pipe Size</th>
<th>Bend角度</th>
<th>Concrete Volume</th>
<th>Curve Size</th>
<th>Tie Rod Dia.</th>
<th>Tie Rod Embedment</th>
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<td>30°</td>
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</table>
NOTES:
1. The beam guardrail type, post type, beam guardrail transition section type, connection type, and bridge traffic barrier type may vary from that shown on this plan.
2. The Catch Basin or Grate Inlet shall be centered between the Beam Guardrail Posts.
3. With Beam Guardrail Transition Section Types 1, 2, 4, and 5, use Extended Curb Types 1, 2, 4, 5, or 6.
4. With Beam Guardrail Transition Section Types 1, 2, 3, 4, 6, 11, and 12, use Extended Curb Type 2 (Extended Asphalt Concrete Curb).
5. See Contract Plans for length of Curb and Beam Guardrail Blocks and Rail Elements NOT SHOWN FOR CLARITY.

INLET PLACEMENT AT BRIDGE END

STANDARD PLAN B-084-00

Sheet 1 of 1 Sheet

APPROVED FOR PUBLICATION

Washington State Department of Transportation

EXPIRES JULY 1, 2007

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007
Type 10 posts shall be 6x8 timber or 6x6. Type 11 posts shall be 10x10 timber or 6x6x9. For details, see "Standard Plan "Beam Guardrail Posts and Blocks."

2. Type 10 guardrail post spacing shall be 6'-3" on center. Type 11 shall be a maximum of 3'-0" on center.

NOTES

THREE BEAM RAIL ELEMENT

THREE BEAM EXPANSION SECTION

STEEL POST ASSEMBLY

TYPE 10 and 11

STANDARD PLAN C-1a
1. Wood posts for all guardrail placement plans shall be 6x8 except where noted otherwise.

2. Lower hole is for rub rail of Type 2 and Type 3 Beam Guardrail.

3. W6x9 steel posts and timber blocks are alternates for 6x8 timber posts and blocks. W6x15 steel posts and timber blocks are alternates for 10x10 timber posts and blocks.

4. Holes shall be located on approaching traffic side of web.

5. When contract requires "Beam Guardrail Type 1, 9-foot Long Post," the steel post length shall be marked with numbers to ensure permanent identification of the location where the letter "W" is shown on the detail. The marking shall be 1/2" MIN height.

6. Soil plate may be welded to foundation tube. If so, holes in soil plate and foundation tube may be omitted.
See Detail A

See Detail B

G-2 Post
(See Note 1)

TYPE 20

TYPE 21

DETAIL A

\( \frac{3}{8}'' \) DIA x 1\( \frac{1}{2}'' \) hex head bolt with hex nut and 1\( \frac{1}{2}'' \) 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

NOTES
1. For post details see Standard Plan, "Beam Guardrail Posts and Blocks".
INTERMEDIATE GUARDRAIL POST CONNECTION DETAILS

(TYPE A SHOWN)

THREE BEAM GUARDRAIL REDUCER SECTION

TYPE A

(LEFT SECTION SHOWN, RIGHT SECTION REVERSED)

THREE 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 1:12:1 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 Filed Terminal(s) are used on both ends a minimum of 2'-0" of Beam Guardrail shall be installed.

GUARDRAIL PLACEMENT

STANDARD PLAN C-2

ANCHOR PAY LIMIT (SEE NOTE 1)

BEAM GUARDRAIL PAY LIMIT

TERMINAL (SRT SHOWN) SEE NOTE 3

SEE NOTE 4

VARIES (SEE CONTRACT)

ONE WAY TRAFFIC

EDGE OF SHOULDER

CASE 1

BEAM GUARDRAIL PAY LIMIT

TERMINAL (SRT SHOWN) SEE NOTE 3

SEE NOTE 4

VARIES (SEE CONTRACT)

TWO WAY TRAFFIC

EDGE OF SHOULDER

CASE 2

ANCHOR PAY LIMIT (SEE NOTE 5)

BEAM GUARDRAIL PAY LIMIT

CENTER OF RAILROAD SIGNAL SUPPORT

TERMINAL (SRT SHOWN) SEE NOTE 3

SEE NOTE 4

VARIES (SEE CONTRACT)

ONE OR TWO WAY TRAFFIC

CASE 3

EXPRESSES MAY 3, 2000

Clifford E. Mansfield

APPROVED FOR PUBLICATION

01-06-00
NOTES:

1. For terminal type and details, see Contract and applicable Standard Plans.

2. The slope from the edge of the shoulder into the face of the guardrail should not be slower than 10%:1. When the guardrail is within 12'-0" from the edge of the shoulder.

3. See Standard for Beam Guardrail Transition Section type and Connection to Bridge Traffic Barrier or Concrete Barrier.

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<thead>
<tr>
<th>PORTED SPEED (MPH)</th>
<th>RATE</th>
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<td>14:1</td>
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<td>11:1</td>
</tr>
<tr>
<td>45</td>
<td>10:1</td>
</tr>
<tr>
<td>40 or LESS</td>
<td>9:1</td>
</tr>
</tbody>
</table>
NOTES
1. SRF Terminal shown. For terminal type and details see Contract and applicable Standard Plan(s).
2. Beam Guardrail Anchor Type 4 (W-Beam) or Type 4 (Thru Beam) required.
3. The slope from the edge of the shoulder into the face of the guardrail should not exceed 4:1 when the guardrail is within 12'-0" from the edge of the shoulder.
4. If the distance from end of Beam Guardrail Type 11 to the structure exceeds 8'-3" using 12'-0" single beam sections, add a 6'-0" extended section of thru beam with 10'90 plates, spaced at 3'-0" 1/12" maximum, and begin transition.
5. Guardrail post spacing for Beam Guardrail Type 11 past the end of the structure shall be spaced at 6'-0" maximum with 6'-0" post and standard block.
6. Attach the standard wood block to the rail using two 3/8" x 3/8" lag bolts.
CASE 12 D
(see Note 7)

CASE 12 C
(see Note 7)

CASE 12 A
(see Note 8)

SECTION A-A

IDENTIFICATION PLATE MOUNTING DETAIL
(see Note 9)

IDENTIFICATION PLATE
(see Note 5)

GUARDRAIL PLACEMENT
WEAK POST INTERSECTION
DESIGN (8'-6" MAX RADIUS)

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 should not be steeper than 10:1.
3. Attach to rail with ¾" x 9" long bolt, nut and 1½" washer on back of post.
4. For terminal type and details, see Contract and applicable Standard Plan(s).
5. Radius dimensions shall be etched into plate replacing the letters "WIN", shown on the Identification Plate Detail. Digits shall be ½" MIN height and ¾" 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.C. 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 AC.
8. For the 8'-6" radius, 5" CRT posts are required including the CRT post at point B.
9. For CRT post details, see Standard Plan "Beam Guardrail Posts and Blocks".
NOTES

1. For Service Level I, Weak Post Bridge Roll System, see Contract.

2. SH 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 1:1.

4. See Standard Plan "Beam Guardrail Posts and Blocks".

---

**GUARDRAIL PLACEMENT**

---

**CASE 14**
1. SRT Terminal shown. For Terminal type and details, see Contract and applicable Standard Plans.

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


4. For spans up to 18’-0”, see Standard Plan for Guardrail Placement Cases 19, 20, and 21.

CASE 15

GUARDRAIL PLACEMENT

DETAIL

See Note 3

25’ (see Note 4)
1. Type 4 anchor required. For details, see applicable Standard Plans.

2. For terminal type and details, see contract and applicable Standard Plans.

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

4. For guardrail-to-bridge rail connection see applicable Standard Plans 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>
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<td>9:1</td>
<td>40 or less</td>
</tr>
</tbody>
</table>

### Standard Plan C-2j

**GUARDRAIL PLACEMENT**

**NOTES**

- Anchor pay limit (see Note 1)
- Beam Guardrail pay limit
- Terminal pay limit (SRT shown) (see Note 2)
- See Table
- Varies (see contract)
- Edge of shoulder
- One Way Traffic

**CASE 16**

- Terminal pay limit (SRT shown) (see Note 2)
- Beam Guardrail pay limit (see Note 3)
- Terminal pay limit (SRT shown) (see Note 2)
- See Table
- See Table
- Edge of shoulder
- Varies (see contract)
- Two Way Traffic

**CASE 17**

- Anchor pay limit (see Note 1)
- Beam Guardrail pay limit
- Bridge end
- Curb face extension line
- One Way Traffic

**CASE 18**

**EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007**

**EFFECTIVE: AUGUST 7, 2008 TO APRIL 1, 2007**

**EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007**

**EXPIRES MAY 3, 2008**

**6/12/98 Clifford E. Mansfield DEPT. OF TRANSPORTATION 12724**

**APPROVED FOR PUBLICATION**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION OLYMPIA, WASHINGTON**

**CLIFFORD E. MANSFIELD PROFESSIONAL ENGINEER**
NOTES

1. See Standard Plan C-1b for additional details.

2. One-way traffic layouts are identical to the two-way layout with the exception that only the posts trussing the span need to be CTR1's with double blocks.

CASE 21

QUARDRAIL PLACEMENT
25' SPAN
STANDARD PLAN C-2a

ELEVATION

PLAN

ONE-WAY TRAFFIC LAYOUT

SECTION A

100' OF HIDDEN W-BEAM RAIL ELEMENTS
BEAM GUARDRAIL PLACEMENT - 25' SPAN PAY LIMIT

10' PAY LIMIT

TYPE 1 H-BEAM

PAY LIMIT

10' PAY LIMIT

ONE-WAY TRAFFIC
NOTES
1. See Contract for transition and connection type.
2. The slope from the edge of the shoulder into the face of the guardrail shall 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 Plans.
6. Radius dimensions shall be etched into plate replacing the letters “HH” shown on the Identification Plate Detail. Digits shall be 1/2" MIN height and 3/16" MAX width.
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.

IDENTIFICATION PLATE MOUNTING DETAIL
(See Note 7)
**CASE 23**
CABLE BARRIER TO W-BEAM FLARED TERMINAL

**NOTES**

1. The Design Layout Line shall intersect the Cable Barrier at a point that is at least 12 feet (perpendicular) from the opposite Edge of Travelled Way.

2. A C2.1 or Better taper shall be used when adjusting the alignment of the Cable Barrier, and is required when the W-Beam Guardrail face is less than 12 feet from the Edge of Travelled Way.

3. For Cable Barrier Type 3 Transition to W-Beam Guardrail details, see Standard Plan C-3d.

---

**CASE 24**
CABLE BARRIER TO W-BEAM BULL NOSE

**NOTES**

---

**LEGEND**

- Design Layout Line
- etc.
1. The Design Layout Line shall intercept the Cable Barrier at a point that is at least 12 feet (perpendicularly) from the opposite Edge of Travelled Way.

2. A 30:1 or shallower taper shall be used when adjusting the alignment of the Cable Barrier, and is required when the Vic Beam Guardrail face is less than 12 feet from the Edge of Travelled Way.

LEGEND

--- Design Layout Line
NOTES

1. The Design Layout Line shall intercept the Cable Barrier at a point that is at least 12 feet (perpendicular) from the opposite Edge of Travelled Way.

2. A 20:1 or better taper shall be used when adjusting the alignment of the Cable Barrier, and it is required when the W-Beam Guardrail face is less than 12 feet from the Edge of Travelled Way.

3. For Cable Barrier Type 3 Transition to W-Beam Guardrail details, see Standard Plan C-32.

LEGEND

- Design Layout Line
PLAN VIEW
CASE 27

NOTES:
1. Extend the Cable Barrier Type 2 until the Design Layout Line clears the opening Cable Barrier Type 3 and intersects the Cable Barrier Type 3 at a point that is at least 12 feet (perpendicular) from the opposite Edge of Travelled Way.

2. A 20:1 or flatter taper shall be used when adjusting the alignment of the Cable Barrier. A minimum taper is required, when the Cable Barrier Type 2 is less than 12 feet from the Edge of Travelled Way, before transitioning to Cable Barrier Type 3.

LEGEND
--- Design Layout Line
--- Elevation Line
--- Section Line
--- Offset Reference Line
--- Alignment Reference Line
--- Bituminous Bridge Pier
--- Existing RBFLP
--- Cable Barrier Type 2
--- Cable Barrier Type 3
--- Edge of Shoulder
--- Edge of Travelled Way

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
WASHINGTON, WASHINGTON

BARRIER PLACEMENT - CABLE BARRIER SHIELDING FOR REDIRECTIONAL LANDFORM
STANDARD PLAN 0-22

SHEET 1 OF 1 SHEET
APPROVED FOR PUBLICATION

Harold J. Peterson 06-03-06

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
WASHINGTON, WASHINGTON
NOTE
1. Install a Type 2 Extruded Asphalt Concrete Curb (see Standard Plan F-25) at line of guardrail.

BEAM GUARDRAIL TRANSITION SECTION TYPE 1 - PAY LIMIT

SEE CONTRACT PLAN FOR SPECIFIED CONNECTION

3" CURB

SEE NOTE 1

6'-6" LONG, 6@5" POTS WITH 8" BLOCKS

TYPE 1

BEAM GUARDRAIL TRANSITION SECTION TYPE 1A - PAY LIMIT

SEE STD PLAN C-3, B OR E CONNECTION

4" CURB

SEE NOTE 1

6'-6" LONG, 10@5" POTS WITH 6@4" BLOCKS

TYPE 1A
NOTES

1. See Contract for the number of thrie beam sections for Beam Guardrail Type 11.

2. If the distance from the end of the Beam Guardrail Type 11 to the abutment structure exceeds 0 - 3' using 12 - 36' thrie beam sections, add a 0 - 3' extended section of thrie beam to reduce the distance to less than 0 - 3'.

3. Install a Type 2 Expanded Asphalt Concrete Curb (see Standard Plan F-32) at base of Guardrail.

4. Attach the standard block to the rail using two 5/8" x 4" lag bolts.

BEAM GUARDRAIL

TYPE 18

APPROACH END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG, 10' X 10' POST
WITH STANDARD BLOCK
(TYP)

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 16

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG, 10' X 10' POST
WITH STANDARD BLOCK
(TYP)

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 18

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCER SECTION TYPE B

TO GUARD

BRIESE COLUMN

8' - 0' LONG

4' CURE

SEE NOTE 3

SEE NOTE 4

TYPE 17

TRAILING END

BEAM GUARDRAIL

TYPE 11

PAY LIMIT

SEE NOTE 1

FOUR SPACERS @ F - 1 1/2' MAX.

TWO SPACERS

12' - 6' MOUNTED THREE BEAM

REDUCE
### FLARE RATE TABLE

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<th>POINTED SPEED (mph)</th>
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<td>10:1</td>
<td>48</td>
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<td>9:1</td>
<td>40 or less</td>
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</table>

Beam Guardrail

Buried Terminal Type 2

Standard Plan C-4a

**EFFECTIVE:** AUGUST 7, 2006 TO APRIL 1, 2007

Notes:

1. Poles installed on shoulder slopes steeper than 10H:1V shall be 6' long.
2. The fines rate of the guardrail may be decreased after crossing the ditch bottom to shorten the length of the terminal.
3. Determine the height of the W-Beam at the Anchor (B) by first calculating the perpendicular offset distance (D) from the edge of shoulder (A) to the Anchor (an extension). Multiply that distance by 0.1, then subtract the product from the elevation of the same point (B) on the edge of shoulder used to establish the offset distance (at the same station). Add 27" (2.25") to that remainder for a span that requires the elevation of the top of the W-Beam at the Anchor.

Refer to SECTION "C".

Elevation g = (Elevation g - D(0.1)) + 27"
1. Unless otherwise indicated in the Contract, the SRT - 500 (12.6, 8 Post) as manufactured by Trinity Industries, Inc., or a FLEET 360 as manufactured by Road Systems Inc., shall be installed per manufacturer's recommendations. If specified in the Contract, the FLEET 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 approaching onto the shoulder (e.g., the inside of a curve), the posts shall be installed so that the face of the rail is on 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:
   - FLEET 500 .................................. 6' - 0" (5')
   - FLEET TL2 .................................. 1' - 6" minimum
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 80'. Length for ET-PLUS (TL2) and SKT-TL2 is 20'.
1. Anchor plate may be constructed from 3/4" 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 3/8" x 1 1/2" machine bolts with hex nut and washer. Place washer on face side of rail.

5. Outside nut shall be torqued against inside nut a minimum of 100 ft-lbs.

6. Toenail bearing plate with 10d nail at corners to prevent turning.

7. Anchor post limit does not apply when anchor is included in a Beam Guardrail Terminal.
1. Roll section and W8 x 17 post shall be fabricated to receive 3/8\" hex head bolts as shown.

2. All bolts shall be high strength 3/8\" hex head bolts with anchor roll washers.
NOTES
1. For details, see Standard Plan C-6.
2. For end section details see Standard Plan C-7 or C-7a.
3. For details, see Standard Plan C-1b.
4. Outside nut shall be torqued against inside nut a minimum of 100 ft-lbs.
5. Post and block shall match beam guardrail posts.
1. Attach W-beam to steel plate with ¾" x 1¼" button head bolt with no washer. No connection to the post is required.

2. For end section details see Standard Plan, "Beam Guardrail End Sections".

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

4. For details see Standard Plan, "Beam Guardrail Posts".

5. Outside nut shall be torqued against inside nut a minimum of 100 ft./lbs.

6. ¾" x 9' - 0" Cable with one swaged end

See Detail B

PLAN

¾" x 4" x 12" Steel plate
10" x 13" Standard steel pipe

See Note 1

¾" x 2" Button head bolt
or ¾" x 1½" hex head bolt
and hex nut with anchor rail washers under bolt head and nut (see Note 3).

Beam guardrail pay limit

6'- 3"

Anchor post limit

12' 16' 18'

End Section Design C
(see Note 2)

¼" Cable clips 16 required
torque nuts to 50 ft./lbs.
Bearing plate (see Note 3)

Standard 2" ID pipe sleeve
(2½" OD)

Two 1" nuts and washers
(see Note 5)

Anchor Post Assemblies
(see Note 4)

BEAM GUARDRAIL ANCHOR
TYPE 5

DETAIL B

1/4" Stud threaded full length

Tack weld 2½" x 2½" x ¼" steel plate
with 1¾" hole to tubular steel

1/4" Nut

1/4" x 4" Nut

Two 1" nuts and washer
(see Note 5)
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.

TYPE 7 ANCHOR
**NOTES**

1. Attach guardrail to bridge rail or concrete barrier with 7/8" diameter high strength bolts (Standard Specification 0-28.5 (#6) with fish plates for use in inserts or resin bonded anchors. See the Contract Plan.

2. In cases where Design F End Section is lapped onto the outside of the guardrail, a galvanized 1" ID 2" OD, 0.134" thick, narrow Type A Plain Washer or an equivalent washer will be placed under the splice lock nuts.

**DESIGN C (THREE BEAM)**

**DESIGN D (THREE BEAM)**

**DESIGN E (THREE BEAM END SECTION)**

**DESIGN F (THREE BEAM END SECTION)**

**DESIGN G (THREE BEAM)**

**THREE BEAM END SECTIONS**

**STANDARD PLAN C-7a**

**SHEET 1 OF 1 SHEET**

**APPROVED FOR PUBLICATION**

*Washington, DC - Department of Transportation*

*H. Petersen 15-31-03*
1. Wire rope loops shall be 9'-6" long, except for the top loop of the Barrier Terminal, which shall be 2'-6" long.

2. Except for the locations of the wire rope loops, the dimensions shown in END VIEW "A" are typical for both ends of a Barrier Section or opposing ends of Barrier Terminals.

3. Connecting and Drill Pin head designs vary among different manufacturers. Pin designs that are shaped differently than those shown in the detail are acceptable, if the bearing surface is within the minimum and maximum widths specified.

4. The vertical spacing of the Wire Rope Loops in a Barrier Terminal is determined by the end of the Barrier Segment to which it is being connected. See BARRIER CONNECTION DETAIL (Sheet 5).
NOTES
1. Use Type 1 Anchors when the concrete pavement or bridge deck 18" or wider, use Type 2 Anchors when it is 9" or smaller.
2. Adjust the location of the Type 1 or Type 2 Anchors to avoid the main reinforcement in the deck when drilling holes.
3. Use grout to properly fill the Type 1 or Type 2 Anchors to the barrier and roadway surface.
4. After removing Type 1 or Type 2 Anchors, clean the bolt holes and fill them with grout according to Standard Specifications 6-1-5-23.
5. Remove the Type 3 Anchors by driving the steel pins down through the barrier further into the pavement to allow filling the barrier without interference, then remove the pins from the pavement.
6. After removing Type 3 Anchors, clean the pin holes and fill them with grout according to Standard Specifications 6-1-4-2.

TRAFFIC SIDE

PROTECTED WORK AREA

ATTACHMENT "A" DETAIL

1/16" W.B. NSM

1/16" W.B. NSM

ATTACHMENT "B" DETAIL

1/16" W.B. NSM

TYPE 1 AND TYPE 2 ANCHORS ATTACHMENT LOCATIONS

SECTION VIEW (F-SHAPE SHOWN)

TYPE 1 AND TYPE 2 ANCHORS

FOR THE TEMPORARY INSTALLATION OF PRECAST CONCRETE BARRIER TYPE 1 AND TYPE 2 ANCHORS ON CEMENT BOND PAVER

Traffic Side

Protected Work Area

Type 1 and Type 2 Anchors

Attachment Locations

Type 1 and Type 2 Anchors

For the temporary installation of precast concrete barrier type 1 and type 2 anchors on cement bond pavement.
BOX CULVERT GUARDRAIL STEEL POST TYPE 1
16" to 36" ground cover

BASE ATTACHMENT DETAIL

POST ATTACHMENT DETAIL

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

POST BASE ATTACHMENT DETAIL

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT AND IS NOT INTENDED TO BE USED IN CONSTRUCTION. IT IS INTENDED TO ILLUSTRATE THE DESIGN AND ATTACHMENT DETAILS FOR BOX CULVERT GUARDRAILS. IT IS SOLELY FOR INFORMATIONAL PURPOSES AND SHOULD NOT BE USED FOR LEGAL OR CONTRACTUAL PURPOSES.
**TABLE**

<table>
<thead>
<tr>
<th>Curve Radii</th>
<th>Post Spacing</th>
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<tr>
<td>LESS THAN 180'</td>
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<tr>
<td>115' TO 217'</td>
<td>9'</td>
</tr>
<tr>
<td>220' TO 600'</td>
<td>12'</td>
</tr>
<tr>
<td>TIE-OR MORE AND TANDERL EDGES</td>
<td>15'</td>
</tr>
</tbody>
</table>

**NOTES**

1. When installed in front of slopes steeper than 8:1, the distance between posts and slope break point shall be 1'-0" minimum.

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

3. See Standard Plan C-11a for Cable Barrier Terminal details.

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**CABLE BARRIER PLACEMENT**

**ELEVATION VIEW**

Aluminum backing 3/8" Bolt \( \times \) Lock Nut

**PLAN VIEW**

Reflectors installed on both sides of post when in use.
1. Strapper Spring Cable End assemblies for clearance between units. Installation of cable and assemblies shall be as follows:

   **LENGTH OF CABLE RUNS:**

   Up to 600' - Use the Spring Cable End Assembly on one end, and Larbuckle only on the other end of each cable.

   Over 600' to 2000' - Use the Spring Cable End Assembly on each end of each cable.

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

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

---

**TABLE**

<table>
<thead>
<tr>
<th>CABLE BARREIRER</th>
<th>A (TOP OF FACING TO TOP OF HIGHEST CABLE)</th>
<th>B (SPACING TO TOPS OF INDOOR CABLES)</th>
<th>C (SPACING BETWEEN CABLES)</th>
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<tbody>
<tr>
<td>TYPE 1</td>
<td>52&quot;</td>
<td>88 x 87 x 87 1/2&quot;</td>
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<tr>
<td>TYPE 2</td>
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<td>85 x 87 x 85 1/2&quot;</td>
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<tr>
<td>TYPE 3</td>
<td>50&quot;</td>
<td>83 x 87 x 83 1/2&quot;</td>
<td>4 1/2&quot;</td>
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**CABLE BARRIER TERMINAL**

**STANDARD PLAN C-11b**

**SHEET 1 OF 2 SHEETS**

**APPROVED FOR PUBLICATION**

**HERALD J. PETERSON**

**05-30-04**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**
1. An Energy III System, fabricated by Energy Absorption Systems, Inc., a Fiber-Lite 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-8.

### Impact Attenuator

#### Inertial Barrier Configurations

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<thead>
<tr>
<th>Type 1</th>
<th>Type 2</th>
<th>Type 3</th>
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<td>POSTED SPEED</td>
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### Concrete Barrier Type

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NOTES:
1. All concrete shall be Class 4000 except as noted.
2. For backfill requirements, see Standard Plan "D-4a".
3. When Wall Type 3-SW (saltwater) is specified, the concrete cover over steel in the front face and the total wall thickness shall be increased by 1/2".
4. Concrete in the 24" footwall sections shall be placed separately between expansion joints with a minimum 12 hour period between concrete placement.

WALL TOP DETAIL

GUTTER DETAIL

SECTION - VERTICAL FACE

ELEVATION

REINFORCED CONCRETE RETAINING WALL
TYPE 3 AND 3 SW
STANDARD PLAN D-1c
SHEET 1 OF 2 SHEETS

Clifford E. Mansfield
10/06/99

APPROVED FOR PUBLICATION
### Footing Reinforcement

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<th>BAR F</th>
<th>BAR K</th>
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### Wall Design with Vertical Front Face and 2:1 Backslope

- **Bar E**: 1-5" centers
- **Bar F**: #6
- **Bar K and M**: #6

**Reinforced Concrete Retaining Wall Type 3 and 3 SW Standard Plan D-1c**

**Approved for Publication**

**Clifford E. Mansfield**

**Date**: 10/06/99

**Washinton State Department of Transportaion**

**10/30/99 New approval date.**

**TBS**

**PAS**

**Serial No.** 1213

**Prep.**: Address

**Prep. Date**: 8/7/99

**Printed Date**: 8/7/99

**Effective**: August 7, 2006 to April 1, 2007
### Dimensions

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### Footing Reinforcement

<table>
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<th>BAR E (size #4)</th>
<th>BAR F</th>
<th>BAR K</th>
<th>BAR M</th>
<th>STEM REINFORCEMENT</th>
<th>MATERIAL</th>
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<td>CONCRETE (Cu/ft)</td>
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### Material Quantity

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### Wall Design with Sloping Front Face and 2:1 Backslope

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**Reinforced Concrete Retaining Wall Type 4 and 4 SW Standard Plan D-1d**

Sheet 2 of 2 sheets

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007

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**REINFORCED CONCRETE RETAINING WALL TYPE 4 AND 4 SW STANDARD PLAN D-1d**

**APPROVED FOR PUBLICATION**

Clifford E. Mansfield 10/26/99

**REINFORCED CONCRETE RETAINING WALL TYPE 4 AND 4 SW STANDARD PLAN D-1d**

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007

---

**Notes:**

- The original, signed by the engineer and approved for publication, is kept on file by the Virginia State Department of Transportation. A copy may be obtained upon request.

- Re: Plan No. 1385-4L, for the design of the retaining wall.
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**WALL DESIGN WITH VERTICAL FRONT FACE AND 2x4 BACKSLOPE**
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**Wall Design with Sloping Front Face and 2:1 Backslope**

**Reinforced Concrete Retaining Wall**

**Type 6 and 6 SW Standard Plan D-1f**

**Sheet 2 of 2 Sheets**

**Note:** This plan is not a legal engineering document but an electronic duplicate and a copy. It is subject to change and should be reviewed before publication. The Washington State Department of Transportation. A copy may be obtained from the Department.

**Approved for Publication**

Clifford E. Mansfield

10/06/99

10/06/99
### Wall Thicknesses

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### Notes
1. Walls to be designated Noise Barrier Wall Type 3A, 3B, 3C, or 3D. 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 minimum.

### Wind Exposure & Velocity

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### Cast-in-Place Concrete Wall on Offset Spread Footing

### Elevation

- 1/2" Prime Sand Joint Filler
- Expansion Joints (Typical) @ 36'-0" Centres

---

**NOISE BARRIER WALL TYPE 3**

**STANDARD PLAN D-2.06-00**

**Sheet 1 of 2 Sheets**

**APPROVED FOR PUBLICATION**

Washington State Department of Transportation

**Effective:** AUGUST 7, 2006 TO APRIL 1, 2007
FOOTING WIDTH TRANSITION DETAIL
FOR LOCATIONS WITHOUT FOOTING STRIP

CAST-IN-PLACE CONCRETE WALL ON OFFSET SPREAD FOOTING

NOISE BARRIER WALL
TYPE 3
STANDARD PLAN D-2.06-00

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007
Joint and Corner Detail

Noise Barrier Wall
Type 9

Standard Plan D-2.32-00

PRECAST CONCRETE WALL ON SPREAD FOOTING

Footings Width Transition Detail
For locations without footing step

1 1/4" CUR (TYP)

BAR "N" (TYP)

BAR "Q" (TYP)

J O I N T H O L E 2 1 / 2 " L I L . W I T H REBAR/CEMENT SURFACE.
ANGLE POINT ~ CANTILEVERED

ANGLE POINT ~ ON SHAFT
ANGLE 30° OR LESS

ANGLE POINT ~ ON SHAFT
ANGLE 30° TO 60°

SHAFT (TYP.)

END PANEL OPTIONS

PRECAST CONCRETE WALL ON SHAFT FOUNDATION

NOISE BARRIER WALL
TYPE 11

STANDARD PLAN D-2.36-00

SHEET 3 OF 8 SHEETS

APPROVED FOR PUBLICATION

Harold J. Peterson 11-10-06
Washington State Department of Transportation
NOTES
1. Wall to be designated Noise Barrier Wall Type 14GS, 14G8S, 14G6S or 14G6G. The Contract specifies actual wall designations.
2. For intermediate wall heights, use the next higher H.
3. Panels shall have at least 3 feet wheel ground on each side.
4. All joints shall be in full contact and sealed.
5. Anchor Bolts, Nuts, Washers, Base Plate, and Bar B shall have a Protective Coating of one of the following: Hot Dipped Galvanizing AASHTO M 232 for Hardware, AASHTO M 111 for Washers and Flat Washers; Mechanical Galvanizing AASHTO M 285 CL 80, or Zinc Rich Paint. Paint threads and nuts after installation.
6. The bottom 6" of Bar "A" shall be painted with one coat of Formule A-8-85 Zinc Dust Oxide Primer OR, one coat of Formule A-11-89 Primer.
7. The Contract specifies actual foundation requirements D1 or D2.
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Notes:
1. Wall to be designated Noise Barrier Wall Type 19A, 19B, 19C, or 19D. The Contractor specifies actual wall designation.
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 the have vertical steel reinforcing bars or bond beams units shall be filled with grout.
6. Panels shall have at least 3 feet of level ground on each side.
7. Construction joints in the cast cap shall be spaced 120 feet maximum.
8. See "Masonry Wall Finishes and Details" sheet for masonry block finishes, special shapes, sizes and layout.
9. The Contractor specifies actual foundation requirements D1 or D2.

<table>
<thead>
<tr>
<th>SOIL TYPE</th>
<th>ANGLE OF INTERNAL FRICTION (°)</th>
<th>VERTICAL EXPOSURE</th>
<th>VERTICAL EXPOSURE (MPA)</th>
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<tr>
<td>D1</td>
<td>35</td>
<td>90</td>
<td>300</td>
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<tr>
<td>D2</td>
<td>55</td>
<td>180</td>
<td>500</td>
</tr>
<tr>
<td>D1</td>
<td>35</td>
<td>90</td>
<td>300</td>
</tr>
<tr>
<td>D2</td>
<td>55</td>
<td>180</td>
<td>500</td>
</tr>
</tbody>
</table>

**Masonry Wall on Shaft W/ Grade Beam Foundation**

**Noise Barrier Wall**

**Standard Plan D-2.66-00**

Sheet 1 of 2 sheets

APPROVED FOR PUBLICATION

Harold J. Peterson 11-10-06

Washington State Department of Transportation
NOTES:
1. Wall to be designated Noise Barrier Wall 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 5 feet of level ground on each side.
4. Plywood and Glulam panels and all lumber shall be pressure preservative treated.
5. The Contract shall specify actual foundation requirements D1 or D2.

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007
GEOSYNTHETIC WALL, TYPE 1

GEOSYNTHETIC WALL, TYPE 2 & 3

GEOSYNTHETIC WALL, TYPE 4

GEOSYNTHETIC WALL, TYPE 5 & 6

PERMANENT GEOSYNTHETIC WALLS

KEY NOTES:

1. "N" ROWS OF 6'-0" DIAM. REINFORCEMENT PLACED BETWEEN GEOSYNTHETIC LAYERS AT 6'-0" O.C. HORIZONTAL SPACING.
2. GEOTEXTILE FOR UNDERGROUND DRAINAGE. CLASS A, LOW SUCESSIONALITY (ONLY NEEDED IF Agere PLACED FOR GEOSYNTHETIC REINFORCEMENT)
3. 1'-0" WIDE GEOTEXTILE OVERLAY, TOP & BOTTOM
4. 6" PVC PIPE FOR NEEDS IN WALL FACADES - PLACE BETWEEN GEOSYNTHETIC LAYERS APPX. 3'-0" HORIZONTAL SPACING TO EXTEND TO OUTER SURFACE OF SPECIFIED WALL FACADE.

NOTES:

1. N = GEOSYNTHETIC FACING LENGTH
2. L = WALL BACKFILL WIDTH
3. H = WALL BACKFILL HEIGHT
4. B = WALL BACKFILL BACKFILL
5. C = WALL FACADE CENTERLINE
6. D = WALL FACADE CENTERLINE
7. E = WALL FACADE CENTERLINE
8. F = WALL FACADE CENTERLINE
9. G = WALL FACADE CENTERLINE
10. H = WALL FACADE CENTERLINE
11. I = WALL FACADE CENTERLINE
12. J = WALL FACADE CENTERLINE
13. K = WALL FACADE CENTERLINE
14. L = WALL FACADE CENTERLINE
15. M = WALL FACADE CENTERLINE
16. N = WALL FACADE CENTERLINE
17. O = WALL FACADE CENTERLINE
18. P = WALL FACADE CENTERLINE
19. Q = WALL FACADE CENTERLINE
20. R = WALL FACADE CENTERLINE
21. S = WALL FACADE CENTERLINE
22. T = WALL FACADE CENTERLINE
23. U = WALL FACADE CENTERLINE
24. V = WALL FACADE CENTERLINE
25. W = WALL FACADE CENTERLINE
26. X = WALL FACADE CENTERLINE
27. Y = WALL FACADE CENTERLINE
28. Z = WALL FACADE CENTERLINE

PERMANENT GEOSYNTHETIC WALL TYPES 1 - 6

STANDARD PLAN D-3

SHEET 1 OF 8 SHEETS

APPROVED FOR PUBLICATION

Harold J. Peterson

WASHINGTON DEPARTMENT OF TRANSPORTATION

EXPIRES JULY 1, 2007

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007
### Geosynthetic Reinforcement Length and Dovetails

<table>
<thead>
<tr>
<th>Total Wall Height</th>
<th>Parapet Posting W</th>
<th>Geosynthetic Reinforcement Length (L)</th>
<th>Rows of 64” W Dovetail Bars Required (N)</th>
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<tr>
<td>1’-6”</td>
<td>1-1/2”</td>
<td>Type 1 8.8</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Type 2 8.8</td>
<td>0.0</td>
</tr>
<tr>
<td>2”</td>
<td>1-1/2”</td>
<td>Type 3 8.8</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Type 4 8.8</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Type 5 8.8</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Type 6 8.8</td>
<td>0.0</td>
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### Geosynthetic Reinforcement Spacing and Strength

<table>
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<th>Total Wall Height</th>
<th>H = Hw</th>
<th>Depth Below Top of Bunching (Z) (ft)</th>
<th>Geosynthetic Reinforcement Vertical Spacing (s) (ft)</th>
<th>Long-Term Geosynthetic Reinforcement Strength Required (T) (psi)</th>
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<tbody>
<tr>
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<td></td>
<td></td>
<td>Type 1</td>
<td>Type 2</td>
</tr>
<tr>
<td>5</td>
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<td>225</td>
<td>325</td>
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<td>1.30</td>
<td>235</td>
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<td>325</td>
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<tr>
<td></td>
<td></td>
<td>1.36</td>
<td>235</td>
<td>325</td>
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</tbody>
</table>

**NOTES:**
- The long-term geosynthetic perm strength "T" shall be determined in accordance with WSDOT standard practice Test 602. All current products used for this type of work shall be determined.
- "H", "Z", and "s" are geometrically defined on Sheet 1.
- "Z" is the distance from the top of wall to the top of a geosynthetic layer, and is used to determine "Z" for that layer.
- Column "T" is a reference for Standard Plan D-5.

### Permanent Geosynthetic Wall Types 1 & 2

**STANDARD PLAN D-3**

- Sheet 2 of 4 sheets
- Approved for publication:
  - Harold J. Pizzi
  - 07-13-07
  - Washington State Department of Transportation

**EXPIRES:** JULY 1, 2007
1. Set form on completed lift.

2. Unroll geosynthetic and position it so that 1.5 - 2" wide "tail" drapes over the form. If a geosynthetic is used for reinforcement, position geotextile to prevent backfill from spilling through geosynthetic opening.

3. Place the backfill until the backfill is up to half of the required vertical geosynthetic layer thickness.

4. Place a window to slightly greater than full lift height against the form.

5. Place the geosynthetic "tail" over the window and lock into place with backfill.

6. Complete backfill until the compacted backfill layer thickness is equal to the required vertical geosynthetic layer thickness.

7. The form may be left in place while constructing the next layer (see notes 3). Otherwise, reset the form and repeat the procedure.

NOTES

1. Use of the temporary form system, as detailed in this plan, is optional.

2. To help maintain the wall face batter, leave the form system for the preceding layer in place while constructing the next layer. When the upper layers are complete, remove the form system from the lower layers and reset it for the next layer. See below.

---

**Geosynthetic Wall Construction Sequence**

**Section View**

**Temporary Form System Detail**

**Permanent Geosynthetic Wall Types 1-6**

**Standard Plan D-3**

**Sheets 1 of 3**

**Approved for publication**

Harold J. Peterson 01-13-08

Washington State Department of Transportation
CONDITION A

CONDITION B

ALTERNATE DETAIL
TYPICAL FOR CONSTRUCTION WITH SHOTING.

CONSTRUCTION: GEOTEXTILE FOR UNIFORM DRAINAGE, MODERATE SURVIVABILITY.

CONDITION A OR CONDITION B
WITH GEOTEXTILE

NOTES
1. SEE CONTRACT FOR BACKFILL LIMITS AND GEOTEXTILE CLASS.
1. Two twin rope wire rope clips at 3" centers may be substituted for three unbolted wire rope clips shown.

**TYPE 1 ANCHOR**
(for use in earth)

- #3 bars (four required)
- Reinforced concrete post: 12" x 12" x 5'-6"
- Wire rope at center of post
- Wire rope clip (TYP)

**TYPE 2 ANCHOR**
(for use in combined earth and rock)

- #3 bars (four required)
- Reinforced concrete post: 12" x 12" x 5'-6"
- Wire rope at center of post (TYP)

**TYPE 3 ANCHOR**
(for use in solid rock)

- 3/8" DIA anchor rod with nut and washer
- 1/2" steel wire rope

**TYPE 4 ANCHOR**
(for use in solid rock)

- IBO-drill bit
- Grout
- IBO-rod anchor
- OB-coupler
- Bearing plate
- IBO-hex nut

**WIRE MESH SLOPE PROTECTION**

**STANDARD PLAN D-7a**

- Clifford E. Mansfield
- Date: 10/06/99
- Washington State Department of Transportation

*NOTE:* This plan is not a legal engineering document but an electronic duplicate for the original, issued by the Department and approved for publication in the event the original is lost or destroyed. A copy may be obtained upon request.

- Approved for publication.
- Expires: July 1, 2001
ELEVATION
CONCRETE SLOPE PROTECTION
(Pneumatically placed or poured in place cement concrete shown)

Concrete
Slope protection

Embankment slope

SECTION

SECTION

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

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

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

-This side may be poured against undisturbed soil.

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

Notes:
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.
1. Dimensions and notations for superstructure are typical for both single lane and two lane bridges.
2. All timber and lumber shall be #2 or better and untreated Douglas fir-larch.
3. All piling shall be untreated Douglas fir and shall be driven to 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 plate shall be nailed to each stringer with two 1" spikes, number 1 or larger.
7. On 17' spans, stringers shall be 8x16 S16. On 15' spans, stringers shall be 8x16 S16.
8. Two lane bridges shall use thirteen ties of stringers, one lane bridges shall use seven ties of stringers.
9. Overlay thickness must be sufficient to cover bolts.
### EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007

<table>
<thead>
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<th>PILE TYPE</th>
<th>D (in.)</th>
<th>PERIMETER (in.)</th>
<th>UNIT WEIGHT (lb/ft.)</th>
<th>AREA (sq. ft.)</th>
<th>MOMENT OF INERTIA (in.⁴)</th>
<th>RADIO OF CURVATURE (in.)</th>
<th>NUMBER OF STRANDS MINIMUM</th>
<th>NUMBER OF STRANDS MAXIMUM</th>
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### PILE DETAILS

**NOTES**

1. Place lifting loops at the lifting points shown in the PILE HANDLING DIAGRAM. Standard Plan E-4a, for the case stated in the contract.

2. Spirals shall be applied either by wrapping one full turn and bending the end of the spiral to a 135° angle hook, by welding, or by the use of a mechanical connector that develops 100% of the minimum yield strength of the spirals. Welding shall meet the requirements of Standard Specification 9-02.302.14.

3. All prestressing strands are 1/2" or 0.8" diameter (Aₚ), Grade 70, uncoated strands, AAHTO M229, except for 0.75 Fpu maximum.

4. Strength of concrete shall be 5,000 psi at release and 7,000 psi at final.

5. 2 1/2" cover if pile is exposed to salt water.

---

**Spiral Reinforcement**

**Octagonal Typical Sections**

**Spiral Lap Splice Detail**
The main body of the curb and the longitudinal rib shall form a uniform transition from a Type C section to a Type A (back to back) section.

#3 Rebar TYP

### TYPE A CURB STRAIGHT SECTION

### TYPE A CONNECTING DIVIDER NO. 2

### TYPE A CONNECTING DIVIDER NO. 1

### TYPE C CURB

### TYPE C NOSING

### PLAN VIEW

### LONGITUDINAL SECTION THROUGH TRANSVERSE RIB

### TYPE A AND C NOSING ELEVATION

### TYPE A NOSING

---

**PRECAST TRAFFIC CURB**

**STANDARD PLAN F-2**

**NOTE:** This plan is not a legal engineering document but an electronic duplicate. The original signed by the designer and approved for publication is kept on file at the Washington State Department of Transportation. A copy may be obtained upon request.

**DATE:** 08/27/99

**REVISED:** 08/27/99

**REVISED BY:**
NOTES:
2. Type 4a and Type 5a curbs do not require steel tie bars for anchoring.
3. The installation of curbs in areas with existing Guardrail could require the removal and reattachment of the Guardrail or its components.
4. Curb shall be placed at the face of Guardrail for transitions to concrete barriers.

EXTRUDED CURB

FACE OF CURB

EDGE OF PAVEMENT = BACK OF CURB

TYPE 1, 3, 4, 5, 6
(SEE CONTRACT FOR TYPES)

TRAVELLED WAY

SHOULDER

FACE OF CURB

EDGE OF PAVEMENT = BACK OF CURB

TYPE 1, 3, 4, OR 6
(SEE CONTRACT FOR TYPES)

TRAVELLED WAY

SHOULDER

FACE OF GUARDRAIL

FACE OF GUARDRAIL SHALL NOT EXCEED FACE OF GUARDRAIL

SEE NOTE 4

1" MAX

TYPE 1, 4, OR 6
(SEE CONTRACT FOR TYPES)

Cement Concrete Curb

8 S Bars (Typ.)

Spacings of Anchor Bars

BETWEEN SHANK JOINTS (Typ.)

12" Min (Typ.)

0'-0"

Extruded Curb

Extruded Curbs at Guardrail
NOTES

1. The Type 2A Ramp is used to provide access to two crosswalks only when it is infeasible to provide a separate ramp for each crosswalk.

2. The Type 2B Ramp Layout requires two (2) of the 8 ft. (2.4 m) Curbs which forms the Sidewalk between Ramps, or the Curb & Gutter Curb.

3. Curb & Gutter is shown, not the Standard Plan for the curb design specified. See Standard Plan F-1 for curb details.

4. See Std. Plan F-5 for sidewalk joint placement and details.

5. Detectable warning patterns may be varied by any method that will achieve the truncated cone dimensions and spacing shown.


7. Detectable warning pattern is shown, to be varied by the Contractor at his discretion.

NOTES:
1. Layout 1 and 2 are used to provide access to two crosswalks only when it is infeasible to provide a separate ramp for each crosswalk.
2. Layout 2 requires two (2) of this item Item: "Concrete Sidewalk Ramp Type 3A". Layout 4 requires two (2) of this item Item: "Concrete Sidewalk Ramp Type 3B". These items do not include the adjacent Curb (or Curb & Gutter), the Sidewalk between Ramps, or the Concrete Sidewalk. Please refer to the Standard Plan F-1 for curb details.
3. Ramp slopes shall not be steeper than 1:12 H:V.
4. Avoid placing drainage structures, junction boxes or other obstructions in front of the ramp access area.
5. Curb & Gutter is shown, see the Contract Plans for curb design specified. See Standard Plan F-1 for curb details.
7. Detectable warning patterns may be created by any method that will achieve the truncated dome dimensions and spacing shown.
NOTES

1. When the driveway width exceeds 15 feet, construct a full depth expansion joint (see Standard Plan F-2) 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 30'.

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 driveway entrances.

5. All items (including sidewalks) vary in dimension to suit site conditions.

6. See Note 1 for driveway entrance.
### BAR LIST - TYPES 2 AND 3

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<th>LOCATION</th>
<th>TOTAL SIGN AREA</th>
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<tr>
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<td>CQTY.</td>
<td>SQIN</td>
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<tr>
<td>1</td>
<td>PEDISTAL HOOP</td>
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<tr>
<td>2</td>
<td>FOUNDATION WALL TIES</td>
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</tr>
<tr>
<td>3</td>
<td>FOUNDATION VERTICALES</td>
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<td>4</td>
<td>PEDISTAL VERTICALES</td>
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### VALUES OF Z

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<th>ALL DIMENSIONS LATERAL BENDING STRESSES (MPR)</th>
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<td>TYPE 3</td>
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### MORTAR SPECIFICATIONS

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<td>ANCHOR PLATE</td>
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---

**CANTILEVER SIGN STRUCTURE (TRUSS-TYPE)**

**FOUNDATION TYPE 2 & 3**

**STANDARD PLAN G-3b**

Sheet 3 of 2 Sheets

APPROVED FOR PUBLICATION

Harold J. Petersson 11-06-03

Washington State Department of Transportation

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007
NOTES

1. Notch is only required with multiple post installations.

2. 8 x 10, 8 x 12, and 8 x 12 Timber Sign Posts can not be made brake wise, and do not have holes or notches. These posts shall be installed within the Design Clear Zone. They may be installed behind traffic barriers.

3. Signs with a width less than 12 feet and supported on three 6 x 6 or 8 x 8 posts shall not be installed within the Design Clear Zone. They may be installed behind traffic barriers.

4. Signs with a width less than 17 feet and supported on four 6 x 6 or 8 x 8 posts shall not be installed within the Design Clear Zone. They may be installed behind traffic barriers.


---

**POST INSTALLATION TABLE**

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<th>DEPTH</th>
<th>HOLE DIAMETER</th>
<th>NOTCH DEPTH</th>
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<td>See Note 3 &amp; 4</td>
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<tr>
<td>8 x 12</td>
<td>5&quot; - 0&quot;</td>
<td>See Note 2</td>
<td>See Note 2</td>
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---

**SIGN INSTALLATION DEPT**

MINIMUM POST HOLE DIAMETER IS THE WIDEST POST DIAMETER PLUS 8"
PLAN
STEEL GRATING DETAIL
(RUNNERS NOT SHOWN FOR CLARITY)

SECTION F

SECTION G
MAINTENANCE WALKWAY INSTALLED ON MONOTUBE OVERHEAD SIGN STRUCTURE

1. NOT INTENDED FOR USE IN FRONT OF STATIC GEAR.
2. FOR MAINTENANCE WALKWAY, RAILING, BRACKET, AND Toe PLATE DETAILS, SEE STANDARD PLAN 0-6b.
3. USE TWO LANYARDS THROUGH INTERMEDIATE WIRE ROPE SUPPORT.
4. USE 1/2 IN. WIRE ROPE WIRE-BRAIDED STRENGTH. THE WIRE ROPE SHALL BE INSTALLED WITH 1/4 IN. OPEN CLEVIS, AND WITH 1/4 OF TAKE UP ADJUSTMENT AVAILABLE IN THE TURNBUCKLE.

ELEVATION

NOTE:

SEE SHEET 2 FOR BRACKET DETAILS

FALL RESTRAINT

MATERIAL SPECIFICATIONS

PIPE
AASM A-316 OR ASTM A-316 Type 2 OR 3 OR ASTM A-316 Grade B
PLATES AND SHAPES
AASM A-36
STRUCTURAL TUBING
AASM A-36 AND ENHANCE B
COMMERCIAL PIPE
AASHTO M111
STAINLESS STEEL BAR, ROD, AND WIRE
AASM A18.2
ALL OTHER BOLTS
STD BOLTS, GRADE 8
FASTENER WASHERS
AASM TO M 233
STEEL GRATING
AASM A-99
WIRE ROPE
AASM A-99 WIRE CLAS A WIRE COATED WIRE THROUGHOUT

NOTES

1. NOT INTENDED FOR USE IN FRONT OF STATIC GEAR.
2. FOR MAINTENANCE WALKWAY, RAILING, BRACKET, AND Toe PLATE DETAILS, SEE STANDARD PLAN 0-6b.
3. USE TWO LANYARDS THROUGH INTERMEDIATE WIRE ROPE SUPPORT.
4. USE 1/2 IN. WIRE ROPE WIRE-BRAIDED STRENGTH. THE WIRE ROPE SHALL BE INSTALLED WITH 1/4 IN. OPEN CLEVIS, AND WITH 1/4 OF TAKE UP ADJUSTMENT AVAILABLE IN THE TURNBUCKLE.
TYPICAL INSTALLATION FOR SINGLE-FACED SIGNS

TYPICAL INSTALLATION FOR DOUBLE-FACED SIGNS


2. Provide Supplemental Plaques and install on Mileposts where indicated in the Contract.

3. See the Contract for the width of the Single-Faced Milepost Signs required (10" or 12").

4. For lateral installations behind traffic barrier, 6" high curbs, and catchers, see Standard Plan G-41.

5. Install at the locations shown in the Contract. Installation may be moved 30 feet or less (longitudinally) before or after the contract location if obstructions are encountered, or to utilize the post of another sign. Mileposts that cannot be placed within this degree of accuracy shall be centered entirely.

MILEPOST
STANDARD PLAN G-7

EXPRESS AUGUST 1, 2007

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION

HERALD J. PETESENSE
DEPARTMENT OF TRANSPORTATION

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007
NOTES

1. Dimensions for the parts used to assemble the base connections are intentionally not shown. Base connections are patented, manufactured products that are in compliance with NCHRP 350 crash test criteria. The base connection details are only shown on this plan to illustrate how the parts are assembled.


4. Sign post shall be 2 1/2" steel, galvanized schedule 80 steel pipe.
NOTE:
1. Dimensions for the parts used to assemble the brace connections are intentionally not shown. Brace connections are patented, manufactured products that are in compliance with MOHRP 300 crash test criteria. The brace connection details are only shown on this plan to illustrate how the parts are assembled.
2. For Steel Sign Support Foundation, see Standard Plan 3.0-6.
3. For “H1” refer to the Sign Specification Sheet in the Contract.
4. Mounting brackets with steel straps shall be the stainless steel one cut, slotted leg bracket and 3/8" wide, 0.032" thick strap "brand-i" product or an approved equal.
1. For "W", horizontal distance from edge of traveled way to center of nearest post, and "H", vertical distance from edge of traveled way to top of nearest post, see Standard Plan 0-1.

2. For "X", "Y", "H1", "H2", "H3", and "H4" refer to the Sign Specification Sheet in the Contract.
SIGN INSTALLATION ON LIGHT STANDARD

MAST ARM MOUNTED LANE USE SIGNS
GUIDE POST REFLECTIVE SHEETING APPLICATIONS

<table>
<thead>
<tr>
<th>TYPE W</th>
<th>TYPE WY</th>
<th>TYPE Y</th>
<th>TYPE YY</th>
<th>TYPE 01 [DIAGRAM A]</th>
<th>TYPE 02 [DIAGRAM B]</th>
</tr>
</thead>
<tbody>
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<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

**NOTES**

1. When guardrail runs curvilinear, 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" x 1/2" 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 curvilinear, the contractor shall mount barrier delineator where guide posts are required.

**GUIDE POSTS**

**STANDARD PLAN H-1**

Sheet 1 of 1 Sheet
NOTES:
1. See plans for guide post requirements between interchanges.
2. Guide posts shall be placed at 100' on ramps tangents and tangents.
3. "A" dimension shown on Standard Plan H-1c or 100', whichever is smaller.
4. One half of "A" dimension shown on Standard Plan H-1c or 60', whichever is smaller.
5. Two spaces at 100',
6. Three equal spaces when R < 70', Four equal spaces when R > 70',
7. Two equal spaces.
8. Locate the initial Guide Post so that it does not hinder the visibility of the Bridge Detractor for approaching traffic. The distance between the bridge end and the initial Guide Post shall be 80 feet minimum.
NOTES:

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

LEGEND

○ TYPE W
○ TYPE WAW
○ TYPE Y

GUIDE POST SPACING (FEET)

<table>
<thead>
<tr>
<th>Radius</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>26</td>
</tr>
<tr>
<td>100</td>
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<td>150</td>
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<tr>
<td>1000</td>
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<td>370</td>
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<tr>
<td>2000</td>
<td>530</td>
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<tr>
<td>2500</td>
<td>680</td>
</tr>
<tr>
<td>3000</td>
<td>840</td>
</tr>
<tr>
<td>4000</td>
<td>1430</td>
</tr>
</tbody>
</table>

Interpolate from the table for radii not shown.

TWO-WAY UNDIVIDED HIGHWAYS
GUIDE POSTS ON OUTSIDE OF CURVE
IN DIRECTION OF TRAVEL
NOTES

1. Locate the Initial Guide Post so that it does not hinder the visibility of the Bridge
   Detailer for approaching traffic. The distance between the bridge end and
   the Initial Guide Post shall be 50 feet max.

2. Locate the Initial Guide Post so that its visibility is unimpaired for traffic departing
   the bridge. The distance between the bridge end and the Initial Guide Post shall
   be 50 feet max.

LEGEND

- TYPE W
- TYPE Y
- TYPE HW

See table in Standard
Plan H-1 for definition
of guide post types

GUIDE POST PLACEMENT
FOR BRIDGES

STANDARD PLAN H-1e

Sheet 1 of 1 Sheet
APPROVED FOR PUBLICATION
Herbert J. Peterson 06-31-06
Washington State Department of Transportation
STRIPES ON THE BARRICADES SHALL SLOPE DOWNWARD IN THE DIRECTION TRAFFIC IS TO PAVES

ROAD CLOSURES AT INTERSECTION

ROAD CLOSURES AT OTHER LOCATIONS

TYPE 3 BARRICADE

STANDARD PLAN H-2

SHEET 3 OF 2 SHEETS

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION
Harold J. Peterson 03-06-06

EXPIRES MAY 15, 2005

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007
TYPE 2 - 12" GAP AND 8" WIDE STRIP
TYPE 3 - 16" GAP AND 8" WIDE STRIP
TYPE 4 - 12" WIDE STRIP
1. Center Line Rumble Strip installation requires a minimum distance of 13 feet from roadway center line to edge of paved shoulder.

2. When directed by the Engineer, Rumble Strips may be omitted along the turn pocket taper where noise may adversely effect adjacent facilities.
NOTES
1. The brass disc will be furnished by the State.
2. The test in the shaded area on top view shall be 1/4" high and shall be stamped by WSDOT personnel prior to setting the cap. Only the abbreviated identification letters and numbers are to be placed on the brass disk.
3. The hole shall be 2" minimum in depth or 6" below the design specified frost line. 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 smoothed with the brass disk and 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. The top of the monument may be repositioned or pruned, depending on conditions.
6. To replace a Federal Land Office (FLO) corner, consult a licensed professional land surveyor (PLS).

SHEET 1 OF 1 SHEET

SURVEY MONUMENTS TYPE 1 AND TYPE 2

STANDARD PLAN H-8

EXPRESS MAY 16, 2005

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION

HERALD J. PETERSEN
10-29-02

WASHING TON DEPARTMENT OF TRANSPORTATION
**MONUMENT COVER**

**MONUMENT CASE AND COVER**

**SECTION OF LETTER**

**APPROXIMATE WEIGHTS**
- Case: 60 lbs
- Cover: 19 lbs
- Total: 79 lbs

**RISE RING DIMENSIONS**
- 1 1/2"
- 2"
- 3"

**PLAN**

**RISE RING**

**SECTION**

**RISE RING**

**Concrete base**

**ASSEMBLY SECTION**

**2" galvanized steel pipe**

**EXPRESS MAY 3, 2000**

**MONUMENT CASE AND COVER**

**STANDARD PLAN H-7**

**NOTE:** This plan is NOT a legal engineering document but an electronic drawing of proposed design. This design is preliminary and subject to change. It is the responsibility of the contractor to verify the design before proceeding.

**APPROVED FOR PUBLICATION**

Clifford E. Mansfield
DEPUTY STATE DESIGN ENGINEER
6/10/98

Washington State Department of Transportation
OLYMPIA, WASHINGTON
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 or 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 3½:1 slope, 5'-1)

<table>
<thead>
<tr>
<th>CUT SLOPE</th>
<th>Class A</th>
<th>Class B</th>
</tr>
</thead>
<tbody>
<tr>
<td>4½:1</td>
<td>J 1'</td>
<td>K 5'</td>
</tr>
<tr>
<td></td>
<td>J and K</td>
<td>5'</td>
</tr>
<tr>
<td>3½:1</td>
<td>J 1'</td>
<td>K 5'</td>
</tr>
<tr>
<td></td>
<td>J and K</td>
<td>5'</td>
</tr>
<tr>
<td>2½:1</td>
<td>J 1'</td>
<td>K 9'</td>
</tr>
<tr>
<td></td>
<td>J and K</td>
<td>5'</td>
</tr>
<tr>
<td>1½:1</td>
<td>J 1'</td>
<td>K 12'</td>
</tr>
<tr>
<td></td>
<td>J and K</td>
<td>5'</td>
</tr>
</tbody>
</table>

VALUES OF Z (feet)
For Class A Slope Treatment

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

In this equation the term \(1D/k^4/4\) 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**

- **31⁄2" Schedule 40 pipe railing**
- **1½" keyed, pre-molded joint filler (Typ)**
- **Concrete Class 4000 (Typ)**

**SLAB AND GRADING SECTION**

- **3' - 0"**
- **1½" Schedule 40 pipe railing**

**NOTES:**

1. Manufacturer shall submit shop drawings of pipe railing for review. Design shall be in accordance with AASHO specifications.
2. Aluminum pipe railing shall have no external surface welds.

**CEMENT CONCRETE STAIRWAY CONSTRUCTION DETAILS**

- **STANDARD PLAN H-10**

**TREAD SHAPE DETAIL**

**NOTES:**

1. Manufacturer shall submit shop drawings of pipe railing for review. Design shall be in accordance with AASHO specifications.
2. Aluminum pipe railing shall have no external surface welds.
NOTES

1. A socket and wedge anchoring system that meets the NCHRP 340 crash test criteria may be substituted in lieu of the anti-twist plate designs shown. Anti-twist plates are not required for wood post installations.

2. The platform design shown on the plan features slots that accommodate several types of mailbox support, only those slots necessary for assembling the type being installed are required. An adjustable platform may be used in lieu of this design, but it must fit the bracket design shown on the plan. Brackets are required for all single-post installations. Field drilling may be necessary.

3. Center the mailbox on the platform to ensure space for the mailbox door to open and to avoid scams for installing the last screw. Spacing of mailbox mounting holes varies among manufacturers. Attachment of the mailbox to the platform may require additional holes through the platform to fit the platform.

4. Attach a newspaper box to a steel post with two 1" x 1/4" T-head bolting screws spaced 1/4" apart. Field drill 7/8" holes in the newspaper box to fit. Use 1-1/4" long bolts to attach newspaper boxes to wood posts. Newspaper boxes must extend beyond the front of the mailbox when the mailbox door is closed.

5. A Type 2 Support (Standard Plan H-12a) is required when 2 or more mailboxes are to be installed on one support.

Mailbox Support Type 1
Standard Plan H-12
Sheet 2 of 2 Sheets
Approved for Publication
Harold J. Petersen 63-09-00
Washington State Department of Transportation

EXPRESS JULY 21, 2006
NOTES

1. The anchoring system shall meet MCHP 360 crash test criteria. Use a socket and wrench system, or the anchoring system supplied by or recommended by the Type 2 Support manufacturer.

2. A maximum of 6 mailboxes may be installed on a Type 2 Support.

3. The Platform design shown in this plan is detailed in the PLATFORM DETAIL, Standard Plan H-12a, Sheet 2. This design features slots that accommodate several types of mailbox supports; only those slots necessary for assembling the type being installed are required. An adjustable platform may be used in lieu of this platform design. Adjustable platforms must fit the 1 7/8" H-clamp.

4. Center the mailbox on the platform to ensure space for the mailbox door to open and to allow space for installing the fasteners (See ALIGNMENT DETAIL). Spacing of mailbox mounting holes varies among manufacturers. Attachment of the mailbox to the platform may require drilling additional holes through the mailbox to fit the platform.

5. Attach a newspaper box to a Type 2 Support with two 1 7/8" Muller Clamps spaced 4" apart. Drill 1/16" holes in the newspaper box to fit. Newspaper boxes must not extend beyond the front of the mailbox when the mailbox door is closed.

MAILBOX SUPPORT
Type 2

STANDARD PLAN H-12a
Sheet 1 of 2 Sheets

ASSEMBLY DETAIL
NOTES

1. The insert pipe is 1" nominal diameter, Schedule 40 steel pipe, as indicated; all other pipe lengths shown on this plan is 1 1/4" nominal diameter, Schedule 40 steel pipe. All pipes, couplings, and elbows shall be galvanized in accordance with ASTM A 165.

2. The vertical support may be cast in a concrete foundation, or bolted to a U-channel post (see PLACEMENT DETAIL, Sheet 2). Avoid placing the vertical support in the line of a ditch.

3. The pipe elbows required in this design may be achieved by using pipe fittings, or by bending the pipes. See DETAIL "A", Sheet 2.

4. Coat the 1" diam. pipe with primer (alkyd) before installing the 1 1/4" diam. pipe (coupler arm) onto it, to aid rotation and to guard against corrosion.

5. The Platform design shown in this plan is detailed in the PLATFORM DETAIL, Standard Plan H-125 Sheet 2. This design features slats that accommodate several types of mailbox supports; only those slats necessary for assembling this type being installed as required.

6. Match the edge of the mailbox platform to the end of the horizontal pipe mount. Center the mailbox on the platform to ensure space for the mailbox door to open and to allow space for inspecting the hinges. Spacing of mailbox mounting holes varies among manufacturers. Adjustment of the mailbox to the platform may require drilling additional holes through the mailbox to fit the platform. See ALIGNMENT DETAIL.

7. Attach a newspaper box to the pipe with two 1 3/4" mudder clamps spaced 4" apart. Newspaper boxes must not extend beyond the front of the mailbox when the mailbox door is closed.
This bollard does not have an effective temporary design feature and cannot be installed within the Design Clear Zone.
ALLOCATION STAKE
STAKE EVERY 100 FEET ON TANGENTS, EVERY 25 FEET ON CURVES

CLEARING/RUBBING (C/R) LATH
STAKE AT EACH FULL STATION 100 FEET ON TANGENTS, EVERY 25 FEET ON CURVES.
NO HUB NEEDED.

OFFSET FROM
SLOPE STAKE
CATCH (10 FEET)
FILL AT RP STAKE
(1.8 FEET)
CUT AT CATCH POINT
(BACK OF DITCH)
DISTANCE FROM Q
TO CATCH POINT
SIDE SLOPE RATIO
(4H:V)
BACK OF DITCH

LATH FOR SLOPE REFERENCES

SLOPE TREATMENT (ST) STAKE
FOR CUT SECTIONS

DAYLIGHT (DL) STAKE

SURVEY STAKES

STANDARD PLAN H-14
SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION

Washington State Department of Transportation

DRAWN BY: MARK GODDARD

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007
Approximate Quantities:

<table>
<thead>
<tr>
<th>Tank Capacity (Gals)</th>
<th>Length (Ft)</th>
<th>Concrete (C.Y.)</th>
<th>Steel Rein. (Bars)</th>
<th>Cast Iron Soil Pipe &amp; Fitting</th>
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<tbody>
<tr>
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<td>6</td>
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<td>8500</td>
<td>471</td>
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<td>14</td>
<td>42</td>
<td>7100</td>
<td>473</td>
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Notes:
1. Approval of local health department is required before work is started.
2. Excavated materials shall be disposed of as directed by the Engineer.
3. All work shall be left open until inspected and approved by the Health Officer and the Engineer.
4. All grades shall be checked and approved by the Engineer.
5. Water tight manhole covers shall be approved by the Engineer prior to installation.
6. Precast septic tanks are acceptable, subject to the approval of the Engineer.
7. Plan dimensions may vary as site conditions and system design permit.
8. All concrete shall be Class 4000.
9. Reinforcing steel shall be Grade 300 or Grade 400.

Symmetrical about:

PLAN

SECTION A-A

SECTION B-B

BAR DETAILS

REST AREA SEPTIC TANK

LONGITUDINAL SECTION

INLET 6" cast iron soil pipe (Sanitary tee)
NOTES

1. MAXIMIZE DETENTION OF STORMWATER BY PLACING FENCE AS FAR AWAY FROM THE TOP OF SLOPE AS POSSIBLE WITHOUT ENCROACHING ON SENSITIVE AREAS OR OUTSIDE OF THE CLEARING BOUNDARIES.

2. INSTALL SILT FENCING ALONG CONTOURS WHENEVER POSSIBLE.

3. INSTALL THE ENDS OF THE SILT FENCE TO POINT Slightly UP-SLOPE TO PREVENT SEDIMENT FROM FLOWING AROUND THE ENDS OF THE FENCE.

4. PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATIONS 8-31.5(2)(A) AND 8-01.5(15).

GEOTEXTILE FOR TEMPORARY SILT FENCE (SEE STD. SPEC. 8-31.2, TABLE 6)

POST (SEE STD. SPEC. 8-01.5(A))

BACKFILL WITH NATIVE SOIL AND COMPACT

FLOW

bury geotextile in trench

ELEVATION VIEW

SIDE VIEW

9 MAX. SPACING WITHOUT BACKUP SUPPORT
10' MAX. SPACING WITH BACKUP SUPPORT

SILT FENCE

STANDARD PLAN 1-4

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

HAROLD J. PATON

STATE OF WASHINGTON
DIVISION OF LANDSCAPING
LANDSCAPE ARCHITECT

MARK W. MAURER
CERTIFICATE NO. GE30888

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007
SILT FENCE DESIGN

NOTE
PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATIONS 8.01.2(9)A AND 9.51.4(16).

EROSION CONTROL AT CULVERT ENDS
STANDARD PLAN I-1

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007
NOTES

1. PREFABRICATED UNITS MAY BE USED IN LIEU OF THE DESIGN SHOWN ON THIS PLAN UPON APPROVAL OF THE ENGINEER.

2. STRUCTURE SHALL BE CONSTRUCTED SUCH THAT GEOTEXTILE MATERIAL SHALL BE FASTENED TO POSTS CREATING A GEMSLESS JOINT.

3. ENSURE THAT PONDING HEIGHT OF WATER DOES NOT CAUSE FLOODING ON ADJACENT ROADWAYS OR PRIVATE PROPERTY.

4. PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATION 8-01.3(10).

- Fasten cross braces together with screws, nails, nylon ties or wire
- Attach wood or metal cross braces to stabilize posts
- Belt fence (int. plan 1-4)

SECTION A

GEOTEXTILE FOR TEMPORARY SILT FENCE (SEE STD. SPEC. 8-33.2, TABLE 4)

COMPACTED NATIVE SOIL

Bury geotextile in 4" x 4" trench

FLOW

FLOW
NOTES
1. Perform maintenance in accordance with Standard Specification 3.01.2(16).
2. Size the below grate inlet device (BGID) for the storm water structure it will service.
3. The BGID shall have a built-in high-flow relief system (overflow bypass).
4. The retrieval system must allow removal of the BGID without spilling the collected material.

STORM DRAIN INLET PROTECTION
STANDARD PLAN I-7
Sheets 1 of 1 Sheet
APPROVED FOR PUBLICATION
Mark W. Maurer
Certificate No. 33-903
Washington State Department of Transportation

CROSS SECTION
NOT TO SCALE

ISOMETRIC VIEW
NOT TO SCALE

PREFabricated Below Grate Inlet Device Details
NOTES
1. INSTALL WATTLE ALONG CONTOURS (SEE STANDARD SPECIFICATION G-01.5(15)).
2. WATTLES SHALL BE INSPECTED REGULARLY, AND IMMEDIATELY AFTER A RUNOFF PRODUCING RAINFALL, TO ENSURE THEY REMAIN THOROUGHLY ENTRENCHED AND IN CONTACT WITH THE SOIL.
3. LIVE STAKES MAY BE USED FOR PERMANENT INSTALLATIONS.
4. PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATION G-01.5(19).
5. INSTALL WATTLES SLAVELY INTO THE TRENCH, ABUT ADJACENT WATTLES TIGHTLY, END TO END, WITHOUT OVERLAPPING THE ENDS.
6. PILOT HOLES MAY BE DRIVEN THROUGH THE WATTLE AND INTO THE SOIL, WHEN SOIL CONDITIONS REQUIRE.

WATTLE SPACING TABLE

<table>
<thead>
<tr>
<th>SLOPE</th>
<th>MAXIMUM SPACING</th>
</tr>
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<tbody>
<tr>
<td>1:1</td>
<td>10 FEET</td>
</tr>
<tr>
<td>2:1</td>
<td>20 FEET</td>
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<tr>
<td>3:1</td>
<td>30 FEET</td>
</tr>
<tr>
<td>4:1</td>
<td>40 FEET</td>
</tr>
</tbody>
</table>
NOTES

1. GEOTEXTILE ENCASED CHECK DAMS SHALL MEET THE REQUIREMENTS OF STANDARD SPECIFICATIONS B-01.305(a) AND B-14.2.4.

2. INSTALL THE SLOPED ENDS OF THE CHECK DAM A MINIMUM OF 3" HIGHER THAN THE TOP OF THE CHECK DAM IN THE CHANNEL TO ENSURE THAT WATER FLOWS OVER THE DAM AND NOT AROUND IT.

3. FLAT BOTTOM DITCH DESIGN SHOWN, CHECK DAM INSTALLATION DETAILS ARE SIMILAR FOR "S" BOTTOM DITCHES.

4. PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATION B-01.3(16).

- DIG TRENCH APPROXIMATELY 6" WIDE AND DEEP, STAPLE END OF GEOTEXTILE AND BACKFILL WITH NATIVE MATERIAL
- ORIENT THE SEAWARD EDGE OF THE CHECK DAM TOWARD THE UPSTREAM SIDE

- STAPLES (TYP.) 6" MIN. LENGTH
- STAPLES (TYP.) (3 PT. MAX. SPACING)

- PLAN VIEW
- SECTION A
- SECTION B
- ISOMETRIC VIEW
NOTES

1. MORE THAN THE MINIMUM OF ONE FASTENER PER SQUARE YARD MAY BE REQUIRED DUE TO CONDITIONS SUCH AS BLANKET COMPOSITION, SOIL TYPE, SURFACE UNIFORMITY, AND SLOPE STEEPNESS. 

2. SEE STANDARD SPECIFICATION 6.04.305.

Erosion Control Blanket Placement on Slope
Standard Plan I-12
Sheet 1 of 1 Sheet

Approved for Publication

State of Washington Department of Transportation

Mark W. Mauser
Certificate No. B06022
NOTES

1. MORE THAN THE MINIMUM OF ONE FASTENER PER SQUARE YARD MAY BE REQUIRED DUE TO CONDITIONS SUCH AS BLANKET COMPOSITION, SOIL TYPE, SURFACE UNIFORMITY, AND FLOW VELOCITY.

2. ROLL ENDS MAY BE SPliced IN A CHECK SLOT.

3. SEE STANDARD SPECIFICATION 6-01-24.

EROSION CONTROL BLANKET PLACEMENT IN CHANNEL
STANDARD PLAN I-13

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Harold J. Petersen
Department of Transportation
Washington State Department of Transportation
SECTION C-C

1" bolt threaded full length with two heavy hex nuts and two washers each. (Length = 4½" plus thickness of pole base plate.)

1½", unless parapet face is vertical, then 1" is optional

1/8" thick perforated "Fabredec" fabric pad with 5/32" hole. Cement to flange plate and trim outside edge flush.

1½" DIA bolt

This surface shall be plane after fabrication

1/2" hole

(See Contract Plans for slope of parapet face)

FOR LIGHT STANDARDS WITH SINGLE ARM 12" OR LESS AND DOUBLE ARMS 6" OR LESS MOUNTED ON BRIDGES OR RETAINING WALLS.

STEEL LIGHT STANDARD BASE DETAILS

STANDARD PLAN J-15b

SHEET 3 OF 3 SHEETS

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC COPY OF THE ORIGIAL DRAWN BY THE ENGINEER AND APPROVED FOR PUBLICATION AS NOT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST

Clifford E. Mansfield 10/08/99
DENNY STATE DESIGN ENGINEER

APPRIOVED FOR PUBLICATION

NO CHANGES APPROVED SINCE DATE OF APPROVAL

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007

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ASSEMBLY DETAILS

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

Grade around foundation to ensure stub height does not exceed 4".

Removal of the flange 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 Grade</th>
<th>Existing Base Type</th>
<th>Luminaire Height</th>
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<td>70</td>
<td>1.00</td>
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</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.

Use plus or minus 2-6".
HIGH MAST TIMBER LUMINAIRE SUPPORT

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

GALVANIZED STEEL MAST ARM - a configuration varies with manufacturer.

Luminaire - see Contract for type and number

Mouting height - roadway to luminaire elevation difference + 2%, see Contract

Mast arm length - see Contract

½" galvanized thimble eyebolt (single or double) with washers and nuts or eyelet

Bundling jumper

Pole and bracket cable


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 max supports

Weatherhead - size as required

Steel conduit

8" x 8" x 4" NEMA 3R Junction box with raintight hubs and removable cover

Grounding lug

12 pole terminal block

Direct burial conductors or galvanized steel conductors with connectors - 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.

½" x 9" step bolt

½" x 1½" plate collar bent to fit pole diameter (8" - 10"

¾" x 4" machine bolts (four required) with washers and nuts

½" lag bolts (six required) - drill ¾" hole in plate

2" pipe

¾" wire hole 2" from gusset plate, smooth hole edges

1" nonmetallic conduit with ¾" straps at code spacing

Distance varies, 35'-MIN, 50'-MAX, depending on line clearance requirements

PLAN VIEW
LUMINAIRE SUPPORT BRACKET

GUSSET DETAIL

2 UNITS
3 UNITS
4 UNITS
6 UNITS

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 and 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 right-angle 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.
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" x 9" pipe flange
- 7/8" DIA bolt circle for at least 4 bolt holes
- 3/4" DIA each

4" slipfitter
- 4" steel pipe
- 3" x 5" handhole with cover
- 3/4" x 2'-0" x 4"
- Steel anchor bolts
- 4 bars at approximately 1'-0" centers

PAD MOUNT

- 1'-0" Cabinet depth 1'-0"
- + 2"
- 6" Cabinet width 6"
- + 2"
- Install one spare 2" conduit and cap others as required.
- Locate conduits centrally in foundation

ANCHOR BOLTS AND DATA FOR SPACING TO BE SUPPLIED BY CABINET MANUFACTURER.
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 LOCKNIPPLE
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, 4/4" I.D. WITH SET SCREWS
⑩ CEMENT CAP
⑪ GASKET AND WASHER
⑫ CONDUIT LOCKNUT
⑬ TYPE E HINGE MOUNTING
⑭ FASTENER WITH SPACER
⑮ 1/8" LAG SCREWS ON WOOD POLE
⑯ 1/8" BOLTS TAPPED TO METAL POLE
⑰ FLATHEAD SOCKET BOLT
⑱ 1/8" INSERT HOLE FOR EXTERNAL WIRE ENTRANCE
REQUIRED ON TIMBER POLE MOUNTINGS ONLY.

TOP MOUNT
① CENTER PIPE
② LOCKNIPPLE
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, 4/4" I.D. WITH SET SCREWS
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⑰ FLATHEAD SOCKET BOLT
⑱ 1/8" INSERT HOLE FOR EXTERNAL WIRE ENTRANCE
REQUIRED ON TIMBER POLE MOUNTINGS ONLY.
Key:
1. End cap
2. Conduit locknut, 1/2" DIA
3. Lock nipple, 3/8" DIA
4. Steel washer
5. Neoprene gasket
6. Bronze serrated oil fitting with:
   - 3/8" stainless steel through bolt and nuts
   - Three set screws at nipple connection
   - Three allen head stainless steel set screws of conduit nipple connection
7. Serrated ring with pins
8. Hex lock nut with:
   - Two allen head stainless steel set screws
   - Pin receptacles
9. Conduit nipple, 1-1/2" DIA
10. Hex locknut, 1/2" DIA
11. Mounting assembly
12. Bronze elevator plumbler with 3/4" stainless steel through bolt, washers, and two nuts
13. Aluminum arm with set screw
14. Slotted tube with closure strip
15. Tube clamp, 9/16" ID, MIN
16. Internally threaded clamp assembly with:
   - Two set screws
   - 1/2" x 0.045" stainless steel bolts
   - Screw buckles, 1/16" with swivels, nuts, and washers
   - Band clips with allen head stainless steel set screws
17. Bronze messenger hanger with:
   - 3/8" DIA J-bolts
   - Cable lock bar
   - Rivet
   - Cotter key
18. Bronze internally threaded wire entrance with:
   - Bushing insert
   - Allen head stainless steel set screw
19. Bronze balance adjuster
20. Multi-head mounting assembly
21. Spider assembly
22. Serrated ring with no pins
LOOP INSTALLATION NOTICES
1. Install the Junction Box and the lead-in conduit.
2. Sawcut the loop slots and the lead-in slots.
3. Lay out the loop wire starting at the Junction Box, allowing 8' minimum slack.
4. Install the wire in the loop slot as shown.
5. Finish laying out the wire at the Junction Box and identify the leads with the loop number, the "A" for the start and the "B" for the finish, and the loop series number.
6. Twist each pair of the lead wires two turns per foot from the loop to the Junction Box. Reverse the direction of the twist for each successive pair installed.
7. Construct a supplemental splice containing any series loop connections required in the plans. Supplemental splices are subject to the same requirements shown for the loop lead and the shielded cable splice.
8. Splice the loop leads of supplemental splice leads to the shielded cable as noted in the Contract.
10. Consult with the loop consultant as required in the Contract.

INDUCTION LOOP DETAILS
STANDARD PLAN J-8d
SHEET 3 OF 2 SHEETS
APPROVED FOR PUBLICATION
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. 6 minimum).

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

Required at all services and separately derived systems.

TYPICAL GROUNDING DETAILS

STANDARD PLAN J-90

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT OR ELECTRONIC DOCUMENT FOR ENGINEERING, ISSUED BY THE ENGINEER AND APPROVED FOR PUBLICATION. IT IS TO BE FILED WITH THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

Approved for publication: 4/24/98

Clifford E. Mansfield

4/24/98

Washington State Department of Transportation

Vernon

Washington
1. All box dimensions are approximate. Exact configurations vary among manufacturers.

2. All lid thicknesses are minimum. The diamond pattern shall be 5/32" minimum thick.

3. Lift siteline plates shall be on frames. Lift siteline cover and siteline bar for even contact after fabrication of frame and lid. Lid and frame units with uneven seating will be rejected.

4. The installed lid and frame should fit with full even contact around the perimeter of a junction box after installation. Care shall be taken to prevent debris accumulation on the contact surfaces.

5. A 1/4-20 UNC x 3/4" S.B. ground screw shall be welded to the bottom of each lid. Include S.B. nut and flat washer.

6. The hinge shall allow the lid to open 180°.

7. Bolts and nuts shall be liberally coated with anti-seize compound.

8. Connect a bonding jumper to steel conduit bushing for GRS conduit connect to equipment grounding conductor for PVC conduit. As an alternative, the bonding jumper shall be attached to the front face of the hinge plate of a 3/8-24 UNC x 3/4" bolt, S.B. nut, and flat washer. Bonding jumper shall be 50 mil. 4-4 of threaded brass copper.

9. The system identification label is for U.S. line identification by engraving, stamping, or with a G.S. weld label. Drill off diamond pattern before forming label. See System Identification Data.

10. A ±1% tolerance is allowed for all dimensions.

11. See the Standard Specifications for class of concrete.
NOTES:

1. The Heavy Duty Lid shall be used when a Pull Box is placed in the confined space. Use a 6" thick lid for new pull box installation, otherwise see Contract Plans for overlay depth to match the lid thickness.

2. The diamond pattern shall be 3/32" minimum thick.

3. A 1/4-20NC x 3/4" S.S. ground stud with S.S. nut and fill washer shall be attached to the lid and coated with anti-seize compound.

4. Connect a bonding jumper to all conduit bushings for GRP conduit, connect to equipment grounding conductor and also to the ground rod for PVC conduit. The Bonding Jumper shall be 96" min. x 4 of stranded braided copper.

5. The System Identification label shall be 1/8" thick labels formed by engraving, casting, etching, or with a lead bead. See SYSTEM IDENTIFICATION DETAIL, Standard Plan J-11a.

6. Concrete shall be Class 4000.

7. Plastic plugs shall be put into lid inserts after fabrication and after lid installation.
NOTES

1. The Heavy Duty Lid shall be used when a Cable Vault is placed in the paved shoulder. Use a 6" thick lid for the new cable vault installation, otherwise use Contract Plans for overlay depth to match the lid thickness.

2. The diamond pattern shall be 3/32" minimum thick.

3. A 1/4-20UNC ¥ 3/4" S.S. ground stud with S.S. nut and flat washer shall be attached to the lid and coated with anti-echo compound.

4. Connect a bonding jumper to steel conduit bushings for GRS conduit; connect to equipment grounding conductor and also to the ground rod for PVC conduit. The Bonding Jumper shall be 12 in. ø of stranded braided copper.

5. The System Identification letters shall be 1/8" line thickness formed by engraving, casting, stamping, or with a weld bead. See SYSTEM IDENTIFICATION DETAIL, Standard Plan J-11e.

6. Concrete shall be Class 400.

7. Plastic plugs shall be put into lid inserts after fabrication and after lid installation.
1. The Junction Box shall be of type 304 stainless steel, welded seam construction; #12 gauge
   backbox with steel flange, #12 gauge cover with #4 flange, and #12 gauge mounting tabs.

2. All conduit connections to the Junction Box shall be concrete/tight (i.e., cement shall
   not infiltrate during pour). Field drill or punch the holes in the center of the
   box and, unless adding additional conduit. (See SECTION "A")

3. Use concrete/tight fittings on the outside of the junction box conduit
   connection. Use an insulated, grounded and bushing on the inside for
   ORS conduit. Use an end bell bushing on the inside for PVC conduit.

4. The System Identification letters shall be 1/16" font thickness formed by engraving, stamping, or with a U.S. wall
   bead. See Detail.

5. Literally coat the threads of the cover fasteners with anti
   seizes compound during construction and before final closure.

6. Details shown for box installation in sketchy forms.

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**JUNCTION BOX TRAFFIC BARRIER MOUNTED**

**STANDARD PLAN J-16a**

**Sheet 1 of 1 Sheet**

**APPROVED FOR PUBLICATION**

**Designated Representative**

Harold J. Peterson 03-06-00

Washington State Department of Transportation

**EXPIRES MAY 5, 2005**

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**SYSTEM IDENTIFICATION DETAIL**

- **ITSC**
- **COM**
- **LT**
- **TS**

**COMMUNICATIONS SYSTEM**

**LIGHTING SYSTEM**

**TRAFFIC SIGNAL SYSTEM**

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**EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007**

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**FIELD DRILL 3/8" DIA. HOLE FOR DRN. TUBE (ONE SIDE ONLY).**

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**MOUNTING TAB (TYP.)**
NOTES:
1. The Traffic Data Collection Loop spacing shall be 18'-6" from leading edge to leading edge. The loops shall be centered inside lanes without an adjacent shoulder, the loops in lanes adjacent to shoulders, including the median shoulder, shall be located 1'-6" from the edge of lanes, see Detail "A".

2. Type 2 Advanced Induction Loops may also be used, see Standard Plan J-85.

3. The loops and tape sensors shall be cut in the final lift of asphalt.

4. For concrete pavement lanes with asphalt shoulders, install all of the Puezio sensor and splice in the concrete lane. Also, for concrete pavement lanes install the loops 4'-0" away from the expansion joint.

5. The shoulder notch length along the roadway shall be 4'-0" or the conduit size plus 2", whichever is larger. The shoulder notch width perpendicular to the roadway shall be the conduit size plus 4'-0".

6. After all the wire leads are installed, seat the ends of the conduit with Conduit Sealant. See the Special Provisions in the contract for the material used to fill the notch in the shoulder, or use an asphalt cold-patch.

7. Use Schedule 40 PVC conduit from the junction box to the cabinet. Where there are four or more travel lanes, use one conduit for each direction of travel. For conduit installation, see Standard Specification 6-20.

8. Use Schedule 80 PVC, HDPE, or Steel Conduit under the roadway. For conduit installation, see Standard Specification 8-20.

9. An inspector from the Traffic Data Office (TDO) shall be on site during all phases of the Traffic Recorder Installation. The Contractor shall alert the Engineer 10 days prior to the beginning of any installation activity.

NOTES

1. The Traffic Data Collection Loops shall be centered inside lanes without an
adjacent shoulder; the loops in lanes adjacent to shoulders, including the
median shoulder, shall be located 12" from the edge of lane, see Detail "A".

2. Type 3 Advanced Induction Loops may also be used, see Standard Plan J-3B.

3. The loops and lane sensors shall be set in the lane of asphalt.

4. Pour concrete pavement lane with asphalt shoulders, install all of the Sensor
and finish in the concrete lane. Also pour concrete pavement lane install the loop
4" to 8" away from the expansion joints.

5. The shoulder notch length along the roadway shall be 4" or the conduit size plus
2", whichever is larger. The shoulder notch width perpendicular to the roadway
shall be the conduit size plus 144".

6. After all the wire ends are installed, the ends of the conduit with Conduit
Carcass. See the Special Provisions in the contract for the materials to be used to tie
the wire inside the conduit, or for an asphalt cold-patch.

7. Use Schedule 40 PVC conduit from the junction box to the cabinet. When
there are four or more total lanes, use one conduit for each direction of travel.

8. Use Schedule 80 PVC, HDPE, or steel conduit under the roadway. See Standard
Specification 8-30 for conduit installation.

9. An Inspector from the Traffic Data Office (TDO) shall be on site during all phases
of the Traffic Data Recorder installation. The Inspector shall meet the Engineer 10 days
prior to the beginning of any installation activity.

10. See Standard Plan J-30 for Pi-0 Sensor General Installation Instructions. See
the Special Provisions in the contract for Temperature Sensor Installation Instructions.
**PERMANENT TRAFFIC RECORDER AND WEIGH-IN-MOTION DETAILS**

**STANDARD PLAN J-30**

**SHEET 1 OF 8 SHEETS**

**APPROVED FOR PUBLICATION**

**Harold J. Petersen**
**09-25-06**

**Washington State Department of Transportation**

**EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007**

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**TYPICAL INSTALLATION INSTRUCTIONS:**

1. Use specified manufacturer's installation instructions in the special provisions of the contract.

2. Cut home run slots for Pico sensors. Center the home run slot on the sensor slot. Out the home run slot at least 2 1 1/2 inches deep and 1/4 inch wide. Cut the slots wider if installing conduit.

3. Using a power washer with water, remove and collect all the dust and loose material from the slots. Sweep the slots with a soft wide broom. Fill the slots with a large capacity air compressor (150 CFM minimum). All of the sides and the pavement 7 on either side must be completely dry.

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**SECTION A**

**BEFORE SENSOR INSTALLATION**

---

**SECTION B**

---

**SECTION C**

---

**JUNCTION BOX TYPE 1 OR 2**

---

**EDGES OF SHOULDER**

---

**SHOULDER NOTCH**

---

**34" HOME RUN SLOT**

---

**EDGE OF LANE**

---

**SEE SPECIAL PROVISIONS IN THE CONTRACT FOR THE ROADWAY LOOP CABLE TYPE**

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**TYPE 3 ADVANCE LOOP WIRING DIAGRAM**

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**TOP OF EXISTING PAVEMENT**

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**LEVELING COURSE**

---

**NEW PAVEMENT**

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**LAYOUT OF LOW-PROFILE GAME**

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**SCHEMATIC OF LOW-PROFILE GAME**

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**EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007**
NOTES

1. SIGN SEQUENCE IS THE SAME FOR BOTH DIRECTIONS OF TRAVEL, ADJUSTED FOR THE DIRECTION OF ROADWAY CURVES.

2. FLASHING WARNING LIGHTS (TYPE B, MUTCD) AND/OR FLAGS SHALL BE USED TO CALL ATTENTION TO THE ADVANCE WARNING SIGNS.

3. EXISTING CONFLICTING PAVEMENT MARKINGS AND SIGNS NO LONGER APPLICABLE SHALL BE REMOVED. TEMPORARY PAVEMENT MARKINGS SHALL BE USED TO DELINEATE BYPASS DETOUR.

4. RAISED PAVEMENT MARKERS AND/OR TEMPORARY GUIDEPOSTS MAY BE USED ON BYPASS AS DIRECTED BY THE ENGINEER.

5. STEADY BURNING WARNING LIGHTS (TYPE C, MUTCD) SHALL BE USED TO MARK TRAFFIC CONTROL DEVICES AT NIGHT.

6. WHERE ADVISORY SPEEDS ARE 30 MPH OR LESS, REVERSE TURN SIGNS SHOULD BE USED. OTHER CURVE OR TURN WARNING SIGNS MAY BE SUBSTITUTED TO DEPICT ROADWAY ALIGNMENT AS APPROPRIATE.

7. ROADSIDE BARRIERS AND ENDS TREATMENTS SHALL BE CRASHWORTHY.

SIGN SPACING = X (FEET)

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<tr>
<td>Rural Roads</td>
<td>Urban Streets Residential Areas &amp; Business Districts</td>
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All signs are black on orange unless otherwise designated.

CHANNELIZING DEVICE SPACING (FEET)

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LEGEND

\[ WARNING FLAG - FLUORESCENT RED/ORANGE \]

\[ FLASHING WARNING LIGHT \]

\[ TEMPORARY TRAFFIC CONTROL DEVICES \]

\[ TYPE 3 BARRICADE \]

\[ SIGN LOCATION - POST MOUNT \]

\[ TEMPORARY IMPACT ATTENUATOR (WHEN SPECIFIED IN CONTRACT) \]
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)

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<th>Speed Limit</th>
<th>Sign Spacing</th>
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<td>Urban Arterials &amp; Rural Roads</td>
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<td>350' ++</td>
</tr>
<tr>
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</tr>
<tr>
<td>North &amp; Residential Areas &amp; Business Districts</td>
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<td>200' ++</td>
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*Signs are black on orange unless otherwise designated.*
SIGN SPACING = X (FEET)

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<td></td>
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<td></td>
</tr>
</tbody>
</table>

Aligns are black on orange unless otherwise designated.

NOTES

1. FLAGGER STATIONS SHALL BE ILLUMINATED DURING HOURS OF DARKNESS.

2. EXTEND DEVICES TAPER ACROSS SHOULDER.

3. SIGN SEQUENCE IS THE SAME FOR BOTH DIRECTIONS OF TRAVEL ON THE HIGHWAY.

4. RADIO COMMUNICATION RECOMMENDED BETWEEN FLAGGERS. REQUIRED IF FLAGGERS DO NOT HAVE CLEAR VISION OF EACH OTHER.

BUFFER DATA

<table>
<thead>
<tr>
<th>BUFFER SPACE = B</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPEED (MPH)</td>
</tr>
<tr>
<td>LENGTH (feet)</td>
</tr>
<tr>
<td>TYPE</td>
</tr>
<tr>
<td>VEHICLE TYPE</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

RIDGE AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT.
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>SPEED LIMIT</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>65</td>
<td>75</td>
<td>85</td>
<td>100</td>
<td>120</td>
<td>155</td>
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</table>

<table>
<thead>
<tr>
<th>VEHICLE TYPE</th>
<th>TYPICAL VEHICLE</th>
<th>POSTED SPEED LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 YARD DUMP TRUCK</td>
<td>24,000</td>
<td>50</td>
</tr>
<tr>
<td>2 TON CARGO TRUCK</td>
<td>10,000</td>
<td>40</td>
</tr>
<tr>
<td>1 TON CARGO TRUCK</td>
<td>6,000</td>
<td>45</td>
</tr>
</tbody>
</table>

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R

ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT.

CHANNELIZING DEVICE SPACING (FEET) (EXCEPT FOR FLAGGING REQUIREMENTS)

<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>

LEGEND

• SIGN LOCATION
  ◯ TRIPOD MOUNT
  ◯ TEMPORARY TRAFFIC
  ◯ CONTROL DEVICES
  ◯ FLAGGING STATION
  ◯ PROTECTIVE VEHICLE
  ☢ WHEN SPECIFIED IN CONTRACT
  ◯ PORTABLE SIGNAL
  ○ FLASHING BEACON

SIGN SPACING = x (feet)

Rural/Highways 45/55 MPH 500`
Urban Arterials 35/40 MPH 300`
Urban Streets Residential Areas & Business Districts 25/30 MPH 200`
Arrows are black on orange unless otherwise designated.

ALTERNATING ONE-WAY TRAFFIC SIGNALS
STANDARD PLAN K-4

APPROVED FOR PUBLICATION

Marilyn J. Pedersen 12-20-03
WSDOT 2003-04

EXPRESS NOVEMBER 23, 2003

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007
SIGHT DISTANCE DATA
MIN. STOPPING SIGHT DIST. = S

<table>
<thead>
<tr>
<th>SPEED LIMIT 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>DISTANCE FEET</td>
<td>75'</td>
<td>100'</td>
<td>150'</td>
<td>225'</td>
<td>300'</td>
<td>375'</td>
<td>450'</td>
</tr>
</tbody>
</table>

DISTANCES SHOWN ARE MINIMUMS, USE ADDITIONAL DISTANCE WHEN POSSIBLE.

NOTES
1. DAYLIGHT HOURS ONLY.
2. RADIO CONTACT BETWEEN WORK CREW AND SHADOW VEHICLE RECOMMENDED.

PORTABLE CHANGEABLE MESSAGE SIGN DISPLAYS

<table>
<thead>
<tr>
<th>PCMS</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>WORKERS ON ROADWAY TO STOP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5 SEC</td>
<td>1.5 SEC</td>
<td></td>
</tr>
<tr>
<td>MOUNT TO BACK OF SHADOW VEHICLE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LEGEND

\[\text{\[\text{WV} \}\text{ WORK VEHICLE WITH FLASHING AMBER WARNING BEACON}}\]

\[\text{\[\text{SV} \}\text{ SHADOW VEHICLE WITH FLASHING AMBER WARNING BEACON}}\] (WITH TRUCK MOUNTED ATTENUATOR WHEN SPECIFIED IN CONTRACT)
**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>70</td>
<td>75</td>
<td>80</td>
<td>85</td>
<td>90</td>
<td>95</td>
<td>100</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 YD DUMP TRUCK</td>
<td>24,000</td>
<td>60</td>
<td>65</td>
</tr>
<tr>
<td>2 TON CARGO TRUCK</td>
<td>15,000</td>
<td>60</td>
<td>65</td>
</tr>
<tr>
<td>1 TON CARGO TRUCK</td>
<td>10,000</td>
<td>60</td>
<td>65</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>
</tr>
</thead>
<tbody>
<tr>
<td>POSTED SPEED (mph)</td>
<td>105</td>
<td>150</td>
<td>205</td>
<td>270</td>
<td>345</td>
<td>420</td>
<td>500</td>
<td>550</td>
<td></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 FT.**
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** 35/40 MPH 350’-
- **Rural Roads** 25/30 MPH 200’-

All signs are block on orange unless otherwise designated.

**LEGEND**

- **SIGN LOCATION-TRIPPO MOUNTED**
- **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)**
NOTES
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.

BUFFER DATA
BUFFER SPACE = B

<table>
<thead>
<tr>
<th>SPEED (mph)</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</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>70</td>
<td>75</td>
<td>80</td>
<td>85</td>
<td>90</td>
<td>95</td>
<td>100</td>
<td>105</td>
<td>110</td>
<td>115</td>
<td>120</td>
</tr>
</tbody>
</table>

LONGITUDINAL BARRIER FLARE RATES

<table>
<thead>
<tr>
<th>POSTED 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>RIGID SYSTEM</td>
<td>10</td>
<td>12</td>
<td>15</td>
<td>15</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>UNRESTRICTED RIGID SYSTEM</td>
<td>10</td>
<td>12</td>
<td>15</td>
<td>15</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>SERRATED RIGID SYSTEM</td>
<td>10</td>
<td>12</td>
<td>15</td>
<td>15</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>15</td>
<td>15</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>
</tr>
</thead>
<tbody>
<tr>
<td>uala</td>
<td>10</td>
<td>12</td>
<td>15</td>
<td>15</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>11</td>
<td>13</td>
<td>15</td>
<td>15</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>15</td>
<td>15</td>
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<td>12</td>
<td>13</td>
<td>15</td>
<td>15</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>15</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

CHANNELIZING DEVICE SPACING (FEET)

<table>
<thead>
<tr>
<th>MPH</th>
<th>50/65</th>
<th>40/55</th>
<th>35/45</th>
<th>25/30</th>
<th>20/30</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAPER</td>
<td>40</td>
<td>80</td>
<td>60</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>TANGENT</td>
<td>40</td>
<td>80</td>
<td>60</td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>

SIGN SPACING = X (FEET)

<table>
<thead>
<tr>
<th>Rural Roads</th>
<th>45/65 MPH</th>
<th>500--</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Arterials &amp; Rural Roads</td>
<td>35/40 MPH</td>
<td>350--</td>
</tr>
<tr>
<td>Rural Roads</td>
<td>25/30 MPH</td>
<td>200--</td>
</tr>
</tbody>
</table>

All signs are black on orange unless otherwise designated.

LEGEND
- 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
- TEMPORARY IMPACT ATTENUATORS (WHEN SPECIFIED IN CONTRACT).
- PORTABLE CHANGEABLE MESSAGE SIGN (WHEN SPECIFIED IN CONTRACT).

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007
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)

<table>
<thead>
<tr>
<th>Type</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Roads</td>
<td>45/65</td>
<td>500</td>
</tr>
<tr>
<td>Urban Arterials &amp; Rural Roads</td>
<td>35/40</td>
<td>350</td>
</tr>
<tr>
<td>Urban Streets</td>
<td>25/30</td>
<td>200</td>
</tr>
</tbody>
</table>

All signs are block on orange unless otherwise designated.

LEGEND

● SIGN LOCATION-POST MOUNTED
### Buffer Data

<table>
<thead>
<tr>
<th>Speed Limit (mph)</th>
<th>Buffer Space (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>2</td>
</tr>
<tr>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>35</td>
<td>2</td>
</tr>
<tr>
<td>40</td>
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</tr>
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</tr>
<tr>
<td>60</td>
<td>4</td>
</tr>
<tr>
<td>65</td>
<td>4</td>
</tr>
</tbody>
</table>

**Roll Ahead Stopping Distance**

- Assumes dry pavement.

### Sign Spacing

**Rural Roads**
- Speed Limit: 45/65 mph
- Spacing: 500'-5'

**Urban Arterials**
- Speed Limit: 40 mph
- Spacing: 250'-5'

### Protective Vehicle Roll Ahead Distance

<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>60-65</td>
<td>00</td>
</tr>
<tr>
<td>2 Ton Cargo Truck</td>
<td>15,000</td>
<td>60-65</td>
<td>00</td>
</tr>
<tr>
<td>1 Ton Cargo Truck</td>
<td>10,000</td>
<td>60-65</td>
<td>00</td>
</tr>
</tbody>
</table>

### Channelizing Device Spacing

<table>
<thead>
<tr>
<th>MPH</th>
<th>Taper/Adjacent Lane Spacing (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/70</td>
<td>40/80</td>
</tr>
<tr>
<td>40/45</td>
<td>30/60</td>
</tr>
</tbody>
</table>

### Minimum Taper Length

<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>
</thead>
<tbody>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>11</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Shoulder Closure

**High Speed Standard Plan K-8**

**Legend**

- **SIGN LOCATION-TRIPDC MOUNTED**
- **TEMPORARY TRAFFIC CONTROL DEVICES**
- **PROTECTIVE VEHICLE WITH TRUCK MOUNTED ATTENUATOR (WHEN SPECIFIED IN CONTRACT)**

**Notes**

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.
### Buffer Data

<table>
<thead>
<tr>
<th>Buffer Space (x)</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (mph)</td>
<td>25</td>
</tr>
<tr>
<td>Length (feet)</td>
<td>55</td>
</tr>
</tbody>
</table>

### Sign Spacing = X (Feet)

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel Plate</td>
<td>10</td>
<td>10</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>All signs are black on orange unless otherwise designated.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Minimum Taper Length (L) in Feet

<table>
<thead>
<tr>
<th>Lane Width (feet)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taper Length (feet)</td>
<td>10</td>
<td>10</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Speed (mph)</td>
<td>105</td>
<td>150</td>
<td>205</td>
<td>—</td>
</tr>
<tr>
<td>11</td>
<td>165</td>
<td>225</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>180</td>
<td>245</td>
<td>—</td>
<td></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>35</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

### Standard Plan K-10

**Legend**

- ✩ SIGN LOCATION-TRIPOD MOUNTED
- 🌪 TEMPORARY TRAFFIC CONTROL DEVICES
- ⚠️ PROTECTIVE VEHICLE (WHEN SPECIFIED IN CONTRACT) (35 MPH OR LESS)

**End of Document**
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 Residential Areas & 25/30 MPH 200'--
- Business Districts

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

SHOULDER WORK AREA

4:1 WEDGE OF COMPACTED STABLE MATERIAL

SHOULDER WORK AREA PROTECTION NON-WORKING HOURS

1. SHOULDER EXCAVATION SHALL BE LIMITED TO ONE SIDE AT A TIME.
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
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.

PEDESTRIAN DETOUR (NONWORKING HOURS)

LEGEND

SIGN LOCATION-TRIPOD MOUNTED

TEMPORARY TRAFFIC CONTROL DEVICES

TYPE 2 BARRICADE

PEDESTRIAN DETOUR (WORKING HOURS)
### BUFFER DATA

<table>
<thead>
<tr>
<th>BUFFER SPACE = B</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPEED (MPH)</td>
</tr>
<tr>
<td>LENGTH (feet)</td>
</tr>
<tr>
<td>PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R</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>
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<tbody>
<tr>
<td>SPEED (MPH)</td>
<td>25</td>
<td>30</td>
<td>35</td>
<td>40</td>
<td>45</td>
<td>50</td>
<td>55</td>
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<tr>
<td>10</td>
<td>125</td>
<td>150</td>
<td>205</td>
<td>270</td>
<td>450</td>
<td>500</td>
<td>550</td>
</tr>
<tr>
<td>11</td>
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<td>165</td>
<td>225</td>
<td>295</td>
<td>495</td>
<td>550</td>
<td>605</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>

### SIGN SPACING = X (FEET)

<table>
<thead>
<tr>
<th>ROAD TYPE</th>
<th>SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Roads</td>
<td>45-55 MPH</td>
</tr>
<tr>
<td>Urban Arterials</td>
<td>55-70 MPH</td>
</tr>
<tr>
<td>Urban Streets</td>
<td>70-90 MPH</td>
</tr>
<tr>
<td>Residential Areas &amp; Business Districts</td>
<td>25-30 MPH</td>
</tr>
</tbody>
</table>

### CHANNELIZING DEVICE SPACING (FEET)

<table>
<thead>
<tr>
<th>MHN</th>
<th>TAPER</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/60</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-PORTABLE MOUNT**
- **SIGN LOCATION-TRIPOD MOUNT**
- **SEQUENTIAL ARROW SIGN**
- **TEMPORARY TRAFFIC CONTROL DEVICES**
- **PROTECTIVE VEHICLE**
- **PROTECTIVE VEHICLE WITH TRUCK MOUNTED ATTENUATOR**

### NOTES

1. FOR LONG-TERM PROJECTS, CONFLICTING PAVEMENT MARKINGS NO LONGER APPLICABLE SHALL BE REMOVED OR OBLITERATED AS SOON AS PRACTICAL. TEMPORARY MARKINGS SHALL BE USED AS NECESSARY AND SIGNS SHALL BE POST MOUNTED.

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

3. IF THE LANE SHIFT IS SHORT AND HAS SHARP CURVES (30 MPH OR LESS) USE SIGN W1-3 IN LIEU OF SIGN W1-4.

### LANE SHIFT

**THREE LANE ROADWAY**

**STANDARD PLAN K-18**

**SHR 1 OF 1 SHEET**

**APPROVED FOR PUBLICATION**

**Harold J. Peterson**

**DEPARTMENT OF TRANSPORTATION**

**EXPIRES NOVEMBER 23, 2003**

**EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007**
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.

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>10</td>
<td>105</td>
<td>150</td>
<td>205</td>
<td>270</td>
<td>345</td>
<td>500</td>
<td>550</td>
</tr>
<tr>
<td>11</td>
<td>115</td>
<td>165</td>
<td>225</td>
<td>295</td>
<td>365</td>
<td>520</td>
<td>570</td>
</tr>
<tr>
<td>12</td>
<td>125</td>
<td>175</td>
<td>235</td>
<td>305</td>
<td>375</td>
<td>535</td>
<td>585</td>
</tr>
</tbody>
</table>

SIGN SPACING = X (feet)

<table>
<thead>
<tr>
<th>Type of Street</th>
<th>Maximum Speed (Mph)</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Roads</td>
<td>45/55</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Urban Arterials</td>
<td>35/40</td>
<td>550</td>
<td></td>
</tr>
<tr>
<td>Residential Areas &amp; Business Districts</td>
<td>25/33 Mph</td>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

Channelizing Device Spacing (feet)

<table>
<thead>
<tr>
<th>TAPER</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/70</td>
<td>40</td>
</tr>
<tr>
<td>25/30</td>
<td>20</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 BARRIERS AT NIGHT.

3. STEADY 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>
<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>LANE WIDTH (feet)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>105</td>
<td>150</td>
<td>205</td>
<td>270</td>
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<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>

<table>
<thead>
<tr>
<th>SIGN SPACING : X (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Roads</td>
</tr>
<tr>
<td>Urban Arterials</td>
</tr>
</tbody>
</table>
| Urban Streets           | 25/30 MPH | 200"
| Residential Areas & Business Districts |
| All signs are back on orange unless otherwise designated. |

<table>
<thead>
<tr>
<th>CHANNELIZING DEVICE SPACING (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPH</td>
</tr>
<tr>
<td>50/70</td>
</tr>
<tr>
<td>35/45</td>
</tr>
<tr>
<td>25/30</td>
</tr>
</tbody>
</table>
SIGN SPACING = X (FEET)

<table>
<thead>
<tr>
<th>Route/Roads</th>
<th>45 MPH</th>
<th>50 MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban 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</td>
<td>25/30</td>
<td></td>
</tr>
<tr>
<td>Business Districts</td>
<td>25/30</td>
<td></td>
</tr>
</tbody>
</table>

Channelsizing Device Spacing (Feet)

Mph | Taper | Tangent
--- | ----- | -----
35/45 | 30 | 60
25/30 | 20 | 40

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 adequate sight distance to see opposing traffic as they approach. Otherwise flaggers and/or temporary signal is required.

BUFFER DATA

<table>
<thead>
<tr>
<th>Buffer Space = B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (MPH)</td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>35</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>45</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
</tr>
<tr>
<td>85</td>
</tr>
<tr>
<td>100</td>
</tr>
<tr>
<td>200</td>
</tr>
</tbody>
</table>

LEGEND

\(\times\)  
SIGN LOCATION - TRIPOD MOUNT

\(\mathcal{O}~\mathcal{O}\)  
TEMPORARY TRAFFIC CONTROL DEVICES

\(\triangle\)  
FLASHING WARNING LIGHT

\(\#\#\)  
TYPE 3L BARRICADE

LANE CLOSURE ON LOW-VOLUME TWO-LANE ROAD WITHOUT FLAGGERS
STANDARD PLAN K-22

APPROVED FOR PUBLICATION

Harold J. Peterson  12-20-02

Washington State Department of Transportation

EXPRESS: AUGUST 7, 2006 TO APRIL 1, 2007
SIGN SPACING = X (FEET)

<table>
<thead>
<tr>
<th>Rural Roads</th>
<th>45 MPH</th>
<th>500'++</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Arterials</td>
<td>35/45 MPH</td>
<td>300'++</td>
</tr>
<tr>
<td>Urban Streets Residential Areas &amp; Business Districts</td>
<td>25/30 MPH</td>
<td>200'++</td>
</tr>
</tbody>
</table>

All signs are black 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>35/45</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

BUFFER DATA

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (feet)</td>
<td>55</td>
<td>85</td>
<td>110</td>
<td>170</td>
<td>220</td>
</tr>
</tbody>
</table>

LEGEND

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

<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; Bus Areas</td>
</tr>
</tbody>
</table>

Left Lane Closure
ON FAR SIDE OF INTERSECTION
STANDARD PLAN K-25

LEGEND

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

**SIGN SPACING - X (feet)**
- Rural Roads: 45/55 MPH - 500^+^%
- Urban Arterials: 35/40 MPH - 350^+^%
- Urban Streets: Residential Areas & Business Districts: 25/30 MPH - 200^+^%

*Aligns are black 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>45/55</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>35/40</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>
SINGLE WIRE GATE, 14' WIDE

DOUBLE WIRE GATE, 20' WIDE

CORNER BRACE
(Angles 30° and over)

INTERSECTING FENCE BRACE

WIRE FENCE

END BRACE

LINE BRACE
(Maximum spacing 1000 feet)

WOOD POST DETAILS
ROLL FORMED SECTIONS

<table>
<thead>
<tr>
<th>MEMBER</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>TYPE</td>
<td>ROUND</td>
<td>H-COLUMN</td>
<td>ROLL FORMED</td>
<td>ROUND</td>
<td>ROLL FORMED</td>
</tr>
<tr>
<td></td>
<td>I.D. Pipe (Inches)</td>
<td>Weight Per Foot (Pounds)</td>
<td>Size (Inches)</td>
<td>Weight Per Foot (Pounds)</td>
<td>I.D. Pipe (Inches)</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 3/8</td>
</tr>
<tr>
<td>3</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 3/8</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 3/8</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 3/8</td>
</tr>
</tbody>
</table>
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 length:
   Types 1 & 3 8'-8"  
   Types 4 & 6 5'-8"

Chain Link Gates
NOTES

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.
1. Install a minimum of 3 sets of diagonals/chevrons in the gore area. A 120° spacing is standard; however, for gore areas shorter than 100', use a 90° spacing, and for gore areas greater than 400', a spacing of 120° may be used.

2. The acute angle of the diagonals shall always point in the direction of mainstream traffic.
GORE AREA MARKING LAYOUT
WITH DIAGONALS

1. Install a minimum of 5 sets of diagonals/chevrons in the gore area. A 507 spacing is standard, however, for gore areas shorter than 100' use a 365 spacing, and for gore areas greater than 400' a spacing of 100' may be used.

2. The acute angle of the diagonals shall always point in the direction of mainline traffic.

GORE AREA MARKING LAYOUT
WITH CHEVRONS

NOTES

EXPRESS MAY 5, 2005

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION

Harold J. Peterson 06-30-06

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007
LEFT TURN CHANNELIZATION
TEE INTERSECTION

GENERAL NOTES:
1. The channelization shown on this plan assumes original roadway geometric design. The dimensions may vary to fit existing conditions. See Contract.

L = 12" Typical Lane Width. See Contract for specified lane widths.

LEGEND
 Type 2l Traffic Arrow

NOTE: The plans shall be used to determine the construction requirements. The original, signed and approved plans shall be kept on file at the Washington State Department of Transportation. A copy may be obtained upon request.

EFFECTIVE: AUGUST 7, 2006 TO APRIL 1, 2007

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Harold J. Petereso 12-15-04
Washington State Department of Transportation

EXPRESS: MARCH 6, 2006

ЛЕВОЕ РАБОЧЕЕ РАСПОЛОЖЕНИЕ
TEE INTERSECTION AND
BACK-TO-BACK TURN Lanes
STANDARD PLAN M-3.30-00

APPROVED FOR PUBLICATION
Harold J. Petereso 12-15-04
Washington State Department of Transportation

EXPRESS: MARCH 6, 2006

LEFT TURN CHANNELIZATION
TEE INTERSECTION AND
BACK-TO-BACK TURN Lanes
STANDARD PLAN M-3.30-00

APPROVED FOR PUBLICATION
Harold J. Petereso 12-15-04
Washington State Department of Transportation

EXPRESS: MARCH 6, 2006
NOTE
When specified in the Contract Plans, the HOV Symbol Marking shall be installed with an offset of 1 foot from the lane centerline.
CROSSWALK LAYOUT

TYPICAL APPLICATIONS

NOTE

See the Contract Plans for the locations of Crosswalk centersigns.
ALTERNATE PARKING STALL MARKINGS

NOTES:

1. Three, four and five accessible stall arrangements may be either 60° 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 60° and 90° above the sidewalk surface.

3. An Access Parking Space Symbol is required for each accessible parking stall. A blue background and white border is required when the symbol is installed on a cement concrete surface.

4. Wheel stops, when specified in the contract, shall be approximately 6" high and a minimum of 8" long.

5. Refer to the Standard Plans for sidewalk ramp, detectable warning pattern, and curb details.

LEGEND:

- RP-461: Reserved Parking Sign and post with RP-461A: Plaque, if indicated (See Sign Fabrication Manual)
- Access Parking Space Symbol
- Manufactured wheel stop
- Detectable Warning Pattern
LONG LINE MARKING PATTERNS
STANDARD PLAN 15-30.10-00

NOTES:
1. See the Standard Plan for Pavement Marking Details.
2. Dotted Extension Line shall be the same color as the line it is extending.
3. Double Yellow Center Line shall be 12" between lines for everything, except 4" for left turn channelization and narrow roadways with 10' lane widths or less.
4. Edge Line shall be white on right edge of traveled way, and yellow on left edge of traveled way on one way roadways.
**PROFILED PLASTIC LINES**

**STANDARD PLAN HS-20.20-06**

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**NOTE**
For Longitudinal Lines use the PROFILED PLASTIC LINE in a continuous pattern.
LEFT TURN LANE

TWO-WAY LEFT TURN LANE

NOTES:
1. Raised pavement markers shall be installed only when specified in the Contract Plans.
2. See the Standard Plans for marker designation.
3. The portion labeled "OPTIONAL" is only used when the Optional Marked Deceleration Taper (see Standard Plans H-3.10 and H-3.30) is specified in the contract plans.

END TWO-WAY LEFT TURN LANE
NOTE

Use the dimensions shown on this plan for each type Traffic Arrow being placed on roadways with a posted speed limit of 45 mph or higher.