Standard Plans
For Road, Bridge, and Municipal Construction

M 21-01
English

Washington State Department of Transportation
American Public Works Association
Washington State Chapter
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Foreword

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

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

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

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

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

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

Harold Peterfeso
State Design Engineer
**Comments**

<table>
<thead>
<tr>
<th>From:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phone:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To: Design Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington State Department of Transportation</td>
</tr>
<tr>
<td>Transportation Building</td>
</tr>
<tr>
<td>PO Box 47329</td>
</tr>
<tr>
<td>Olympia, WA 98504-7329</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject: Standard Plans Manual Comment</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Comment (marked copies attached):</th>
</tr>
</thead>
<tbody>
<tr>
<td></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>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-4</td>
<td>Inlet Placement at Bridge End</td>
<td>3/7/97</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>
</tbody>
</table>

### Section A  Concrete Pavement

**A-1** Cement Concrete Pavement Joints  5/13/02

**A-2** Bridge Approach Slab  5/9/02  2 Sheets

**A-3** Transition from Concrete Overlay  5/30/02  2 Sheets

**A-4** Inlet Placement at Bridge End  3/7/97

**A-5** Dowel Bar Retrofit for Cement Concrete Pavement  2/24/03  3 Sheets

**A-6** Cement Concrete Pavement Repair  2/24/03  2 Sheets

### Section B  Drainage Structures and Hydraulics

**B-1** Catch Basin Type 1  7/21/03

**B-1a** Catch Basin Type 1L  6/23/04

**B-1b** Catch Basin Type 1P, Parking Lot C.B.  6/23/04

**B-1c** Catch Basin Type 2  5/20/04

**B-1d** Miscellaneous Details for Manholes and Catch Basins  6/23/04

**B-2** Solid Metal Cover for Catch Basin  6/17/02

**B-2a** Reversible Frame for Catch Basin or Concrete Inlet  6/17/02

**B-2b** Vaned Grate for Catch Basin and Concrete Inlet  6/17/02

**B-2c** Bi-Directional Vaned Grate for Catch Basin and Inlet  6/17/02

**B-2d** Herringbone Grate for Catch Basin and Inlet  6/17/02

**B-2e** Combination Inlet  2/25/04

**B-3** Catch Basin Type 2 with Flow Restrictor-Oil Separator  1/28/02

**B-3a** Catch Basin Type 2 with Baffle Type Flow  5/9/97

**B-3b** Restrictor-Oil Separator  5/9/97

**B-4a** Grate Inlet Type 1  5/9/97

**B-4b** Grate Inlet Type 2  5/9/97  2 Sheets

**B-4d** Frame and Vaned Grates for Grate Inlet Type 2  9/16/02

**B-4f** Drop Inlet Type 1  5/9/97

**B-4g** Drop Inlet Type 2  7/18/97

**B-4h** Drop Inlet Grates  5/9/97

**B-7** Flared End Sections  5/9/97

**B-7a** Beveled End Sections for Culverts 30” Diameter or Less  6/17/02

**B-8** Structural Plate Underpass Design 1  6/23/04

**B-8a** Structural Plate Underpass Design 2  6/23/04

**B-9** Headwalls for Culvert Pipes  5/9/97

**B-9a** Type 1 Safety Bars for Stepped Culvert Pipe or Pipe Arch  5/9/97

**B-9b** Type 2 Safety Bars for Culvert Pipe or Pipe Arch (On Cross Road)  5/9/97

**B-9c** Tapered End Section with Type 3 Safety Bars  7/18/97

**B-9d** Tapered End Section with Type 4 Safety Bars (On Cross Road)  7/18/97

**B-11** Pipe Zone Bedding and Backfill  7/31/01

**B-12** Coupling Bands for Corrugated Metal Pipe  12/4/98

**B-18** Drop Connection for Sanitary Sewers  5/9/97

**B-18a** Vertical Connection  5/9/97

**B-18b** 8 Inch Clean Out  7/18/97

**B-19** Hydrant Setting Types A and B  5/30/97

**B-20d** Residential Sidewalk Drain  6/30/04

**B-21** 2 Inch Blowoff Assembly  7/18/97

**B-21a** Combination Air Release/Air Vacuum Valve Assembly  8/10/98

**B-22** Concrete Blocking for Convex Vertical Bends  7/21/03

**B-22a** Concrete Thrust Block  8/1/97
## Contents

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-23a</td>
<td>Manhole Type 1</td>
<td>5/9/97</td>
</tr>
<tr>
<td>B-23b</td>
<td>Manhole Type 2</td>
<td>5/9/97</td>
</tr>
<tr>
<td>B-23c</td>
<td>Manhole Type 3</td>
<td>5/20/04</td>
</tr>
<tr>
<td>B-23d</td>
<td>Manhole Type 4</td>
<td>5/9/97</td>
</tr>
<tr>
<td>B-25</td>
<td>Manhole Ring and Cover</td>
<td>6/30/04</td>
</tr>
<tr>
<td>B-26</td>
<td>Concrete Inlet</td>
<td>7/18/97</td>
</tr>
<tr>
<td>B-27</td>
<td>Precast Concrete Drywell</td>
<td>8/1/97</td>
</tr>
<tr>
<td>B-28</td>
<td>Connection Details for Dissimilar Culvert Pipe</td>
<td>10/6/99</td>
</tr>
<tr>
<td>B-29</td>
<td>Side Sewer</td>
<td>4/24/98</td>
</tr>
<tr>
<td>B-30</td>
<td>Standing Side Sewer Connection</td>
<td>8/10/98</td>
</tr>
</tbody>
</table>

### Section C  Traffic Barrier

| C-1      | Beam Guardrail (W-Beam)                                  | 10/31/03                  |
| C-1a     | Beam Guardrail (Thrie Beam)                              | 7/31/98                   |
| C-1b     | Beam Guardrail Posts and Blocks                           | 10/31/03                  |
| 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)                     | 7/17/98                   |
| C-2b     | Guardrail Placement (Cases 7 & 8)                        | 6/12/98                   |
| C-2c     | Guardrail Placement, Median Bull Nose (Cases 9A, 9B & 9C)| 2/20/03                   |
| C-2d     | Guardrail Placement (Cases 10A, 10B & 10C)               | 5/22/98                   |
| C-2e     | Guardrail Placement (Cases 11A, 11B & 11C)               | 3/7/97                    |
| 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-3      | Guardrail Transition Sections (Types 1, 1A, & 1B)        | 10/31/03                  |
| C-3a     | Guardrail Transition Sections (Types 2, 4, 5, & 6)       | 10/31/03                  |
| C-3b     | Guardrail Transition Sections (Types 10 ~ 15)             | 10/31/03                  |
| C-3c     | Guardrail Transition Sections (Types 16, 17, & 18)       | 10/31/03                  |
| C-4      | Beam Guardrail Buried Terminal Type 1                     | 7/13/01                   |
| C-4a     | Beam Guardrail Buried Terminal Type 2                     | 7/13/01                   |
| C-4b     | Beam Guardrail Flared Terminal                            | 6/23/00                   |
| C-4e     | Beam Guardrail Non-Flared Terminal                        | 2/20/03                   |
| C-4f     | Beam Guardrail Bull Nose Terminal                         | 6/30/04                   |
| C-5      | Guardrail Connection to Bridge Rail or Concrete Barrier  | 10/31/03                  |
| C-6      | Beam Guardrail Anchor Type 1                              | 5/30/97                   |
| C-6a     | Beam Guardrail Anchor Type 2                              | 3/14/97                   |
| C-6c     | Beam Guardrail Anchor Type 4                              | 1/6/00                    |
## Contents

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
</tr>
</thead>
<tbody>
<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>7/17/98</td>
</tr>
<tr>
<td>C-8c</td>
<td>Concrete Barrier Type 5</td>
<td>5/30/97</td>
</tr>
<tr>
<td>C-8d</td>
<td>Alternative Temporary Concrete Barrier</td>
<td>5/20/04</td>
</tr>
<tr>
<td>C-8e</td>
<td>Precast Concrete Barrier Anchors</td>
<td>6/24/02</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</td>
<td>7/26/02</td>
</tr>
<tr>
<td>C-14g</td>
<td>Single Slope Concrete Barrier Placement</td>
<td>10/31/03</td>
</tr>
<tr>
<td>C-14h</td>
<td>Single Slope Concrete Barrier Light Standard Foundation</td>
<td>12/2/03</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>
</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>
<tr>
<td>D-1f</td>
<td>Reinforced Concrete Retaining Wall Type 6 and 6 SW</td>
<td>10/6/99</td>
</tr>
<tr>
<td>D-2a</td>
<td>Noise Barrier - Type 1</td>
<td>3/14/97</td>
</tr>
<tr>
<td>D-2b</td>
<td>Noise Barrier - Type 2</td>
<td>3/14/97</td>
</tr>
<tr>
<td>D-2c</td>
<td>Noise Barrier - Type 3</td>
<td>3/14/97</td>
</tr>
<tr>
<td>D-2d</td>
<td>Noise Barrier - Type 4</td>
<td>3/14/97</td>
</tr>
<tr>
<td>D-2e</td>
<td>Noise Barrier - Type 5</td>
<td>3/14/97</td>
</tr>
<tr>
<td>D-2f</td>
<td>Noise Barrier - Type 6</td>
<td>3/14/97</td>
</tr>
<tr>
<td>D-2g</td>
<td>Noise Barrier - Type 7</td>
<td>3/14/97</td>
</tr>
<tr>
<td>D-2h</td>
<td>Noise Barrier - Type 8</td>
<td>3/14/97</td>
</tr>
<tr>
<td>D-2i</td>
<td>Noise Barrier - Type 9</td>
<td>3/14/97</td>
</tr>
</tbody>
</table>
## Contents

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
<th>Sheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-2j</td>
<td>Noise Barrier - Type 10</td>
<td>3/14/97</td>
<td>2</td>
</tr>
<tr>
<td>D-2k</td>
<td>Noise Barrier - Type 11</td>
<td>3/14/97</td>
<td>3</td>
</tr>
<tr>
<td>D-2l</td>
<td>Noise Barrier - Type 12</td>
<td>3/14/97</td>
<td>2</td>
</tr>
<tr>
<td>D-2m</td>
<td>Noise Barrier - Type 13</td>
<td>3/14/97</td>
<td>2</td>
</tr>
<tr>
<td>D-2n</td>
<td>Noise Barrier - Type 14</td>
<td>3/14/97</td>
<td>2</td>
</tr>
<tr>
<td>D-2o</td>
<td>Noise Barrier - Type 15</td>
<td>3/14/97</td>
<td></td>
</tr>
<tr>
<td>D-2p</td>
<td>Noise Barrier - Type 16</td>
<td>3/14/97</td>
<td>2</td>
</tr>
<tr>
<td>D-2q</td>
<td>Noise Barrier - Type 17</td>
<td>3/14/97</td>
<td>2</td>
</tr>
<tr>
<td>D-2r</td>
<td>Noise Barrier - Type 18</td>
<td>3/14/97</td>
<td>2</td>
</tr>
<tr>
<td>D-2s</td>
<td>Noise Barrier - Type 19</td>
<td>3/14/97</td>
<td>2</td>
</tr>
<tr>
<td>D-2t</td>
<td>Noise Barrier - Type 20</td>
<td>3/14/97</td>
<td>2</td>
</tr>
<tr>
<td>D-2u</td>
<td>Access Door - Type 1</td>
<td>3/7/97</td>
<td></td>
</tr>
<tr>
<td>D-2v</td>
<td>Access Door - Type 2</td>
<td>3/7/97</td>
<td></td>
</tr>
<tr>
<td>D-2w</td>
<td>Access Door - Type 3</td>
<td>3/7/97</td>
<td></td>
</tr>
<tr>
<td>D-2x</td>
<td>Access Door - Type 4</td>
<td>3/7/97</td>
<td></td>
</tr>
<tr>
<td>D-2y</td>
<td>Access Door - Type 5</td>
<td>9/12/97</td>
<td></td>
</tr>
<tr>
<td>D-3</td>
<td>Permanent Geosynthetic Wall, Types 1 ~ 6</td>
<td>6/30/04</td>
<td>3</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>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</td>
</tr>
</tbody>
</table>

### Section E  Bridges and Trestles

| E-1     | Date Numerals                                       | 7/25/97                   |        |
| E-2     | Pile or Frame Detour Bridge with Asphalt Overlay    | 5/29/98                   | 2      |
| E-4     | Precast Prestressed Concrete Piles                  | 8/27/03                   |        |
| E-4a    | Precast Prestressed Concrete Piles Handling & Capping| 8/27/03                   |        |
| E-5     | Manhole Ring and Cover for Bridges                  | 5/29/98                   |        |

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

| F-1     | Cement Concrete Curbs                               | 12/17/02                  |        |
| F-1a    | Cement Concrete Curb and Gutter Pan                 | 12/17/02                  |        |
| F-2     | Precast Traffic Curb                                | 8/27/99                   |        |
| F-2a    | Block Traffic Curb                                  | 6/23/04                   |        |
| F-2b    | Extruded Curb                                       | 6/23/04                   | 2      |
| F-2c    | Precast Concrete Sloped Mountable Curb              | 6/23/04                   | 2      |
| F-2d    | Precast Concrete Dual Faced Sloped Mountable Curb   | 6/23/04                   |        |
| F-3     | Cement Concrete Sidewalk                            | 1/13/03                   |        |
| F-3a    | Sidewalk Ramp, Types 1A, 1B, 1C & 1D               | 1/29/03                   |        |
| F-3b    | Sidewalk Ramp, Types 2A & 2B                        | 1/13/03                   |        |
| F-3c    | Sidewalk Ramp, Types 3A, 3B, 3C & 3D               | 1/13/03                   | 2      |
| F-3d    | Sidewalk Ramp Type 4A                               | 1/29/03                   |        |
| F-3e    | Sidewalk Ramp Type 4B                               | 1/13/03                   |        |
| F-4     | Cement Concrete Driveway Entrance, Types 1, 2, 3 & 4| 1/13/03                   | 2      |
## Contents

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Section G  Signs and Sign Supports</strong></td>
<td></td>
</tr>
<tr>
<td>G-1</td>
<td>Ground Mounted Sign Placement</td>
<td>9/12/01</td>
</tr>
<tr>
<td>G-2</td>
<td>Sign Bridge</td>
<td>6/4/02 3 Sheets</td>
</tr>
<tr>
<td>G-2a</td>
<td>Sign Bridge Foundations</td>
<td>6/4/02</td>
</tr>
<tr>
<td>G-3</td>
<td>Cantilever Sign Structures</td>
<td>6/4/02</td>
</tr>
<tr>
<td>G-3a</td>
<td>Cantilever Sign Structure Foundations</td>
<td>6/4/02 2 Sheets</td>
</tr>
<tr>
<td>G-4a</td>
<td>Timber Sign Supports</td>
<td>5/20/04 3 Sheets</td>
</tr>
<tr>
<td>G-4b</td>
<td>Roadside Signs on Laminated Wood Box Posts</td>
<td>6/30/04</td>
</tr>
<tr>
<td>G-5</td>
<td>Maintenance Walkway for Overhead Sign Structures</td>
<td>8/27/03 3 Sheets</td>
</tr>
<tr>
<td>G-5a</td>
<td>Maintenance Walkway Mounting for Monotube</td>
<td>8/27/03 3 Sheets</td>
</tr>
<tr>
<td>G-6b</td>
<td>Maintenance Walkway Mounting for Truss-Type</td>
<td>8/27/03 2 Sheets</td>
</tr>
<tr>
<td>G-7</td>
<td>Milepost</td>
<td>7/18/97</td>
</tr>
<tr>
<td>G-8a</td>
<td>Roadside Sign Structures for Multiple Steel Post Signs</td>
<td>10/6/99 3 Sheets</td>
</tr>
<tr>
<td>G-8b</td>
<td>Small Steel Sign Support</td>
<td>6/4/02</td>
</tr>
<tr>
<td>G-8f</td>
<td>Steel Sign Support, Types ST-1, ST-2, &amp; ST-3Installation Details</td>
<td>6/30/04</td>
</tr>
<tr>
<td>G-8g</td>
<td>Steel Sign Support, Types SB-1, SB-2</td>
<td>6/30/04 2 Sheets</td>
</tr>
<tr>
<td>G-9a</td>
<td>Overhead Sign Mounting Details</td>
<td>6/25/02 4 Sheets</td>
</tr>
<tr>
<td>G-9b</td>
<td>Sign Mounting Details</td>
<td>4/2/99 3 Sheets</td>
</tr>
<tr>
<td></td>
<td><strong>Section H  Delineators and Miscellaneous Construction</strong></td>
<td></td>
</tr>
<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>5/5/00</td>
</tr>
<tr>
<td>H-1c</td>
<td>Guide Post Placement for Horizontal Curves</td>
<td>1/10/02</td>
</tr>
<tr>
<td>H-1d</td>
<td>Miscellaneous Guide Post Placement</td>
<td>1/10/02</td>
</tr>
<tr>
<td>H-1e</td>
<td>Guide Post Placement for Bridges</td>
<td>4/14/00</td>
</tr>
<tr>
<td>H-2</td>
<td>Type 3 Barricade</td>
<td>5/29/02 2 Sheets</td>
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<tr>
<td>H-3</td>
<td>Raised Pavement Marking Details</td>
<td>4/14/00</td>
</tr>
<tr>
<td>H-3a</td>
<td>Pavement Marking Details</td>
<td>6/23/00 2 Sheets</td>
</tr>
<tr>
<td>H-4</td>
<td>Shoulder Rumble Strip Type 1 for Divided Highways</td>
<td>10/29/03 3 Sheets</td>
</tr>
<tr>
<td>H-4a</td>
<td>Shoulder Rumble Strip Type 2, 3 and 4 for Undivided Highways</td>
<td>3/11/03 2 Sheets</td>
</tr>
<tr>
<td>H-5</td>
<td>Pavement Marking Details</td>
<td>2/18/00</td>
</tr>
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<td>2/18/00</td>
</tr>
<tr>
<td>H-5c</td>
<td>Pavement Markings</td>
<td>6/24/02 3 Sheets</td>
</tr>
<tr>
<td>H-5d</td>
<td>Raised Pavement Marker Substitution Patterns</td>
<td>4/14/00 2 Sheets</td>
</tr>
<tr>
<td>H-5e</td>
<td>Accessible Parking Pavement Markings</td>
<td>2/20/03</td>
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<tr>
<td>H-5f</td>
<td>Profiled Pavement Markings</td>
<td>6/23/04</td>
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<tr>
<td>H-5h</td>
<td>Long Line Pavement Marking Layouts</td>
<td>4/27/04</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 Installation</td>
<td>5/9/02 3 Sheets</td>
</tr>
</tbody>
</table>
Contents

Plan No.  Plan Title                        Publication Approval Date

H-12b    Mailbox Support Type 3            2/25/04  2 Sheets
H-13     Type 1 Bollard                    7/25/97
H-13a    Type 2 Bollard                    7/25/97
H-14     Survey Stakes                     4/23/99  2 Sheets

Section I  Roadside and Site Development

I-1      Rest Area Septic Tank             7/18/97
I-2      Crest Gage                         4/23/99
I-3      Automated Ground Water Monitoring Well  8/20/99
I-4      Silt Fence                         7/17/03
I-5      Erosion Control At Culvert Ends    7/17/03
I-6      Temporary Silt Fence for Inlet Protection In Unpaved Areas 7/17/03
I-7      Storm Drain Inlet Protection       7/17/03
I-8      Wattle Installation On Slope       7/17/03
I-9      Straw Bale Barrier                 7/17/03
I-10     Geotextile Encased Check Dam Installation 7/17/03
I-11     Check Dams                         9/11/03
I-12     Erosion Control Blanket Placement On Slope 7/17/03
I-13     Erosion Control Blanket Placement In Channel 7/17/03
I-14     Miscellaneous Erosion Control Details    7/17/03

Section J  Illumination and Signals

J-1b     Steel Light Standard Base Details  10/8/99  3 Sheets
J-1c     Slip Base Adaptor for 4-Bolt Light Standard Base 4/24/98
J-1e     Light Standards Wiring Details     8/1/97
J-1f     Timber Light Standards             6/23/00
J-3      Type A, B, and C Service Lighting Details 8/1/97  2 Sheets
J-3b     Service Cabinet Type B Modified (0 - 200 Amp Type, 120/240 Single Phase) 11/5/03  2 Sheets
J-3c     Service Cabinet Type D (0 - 200 Amp Type, 120/240 Single Phase) 6/24/02
J-3d     Service Cabinet Type E (0 - 200 Amp Type, 240/480 Single Phase) 11/5/03
J-5      Pedestrian Pushbutton Details       8/1/97
J-6c     Cabinet Foundation Details          4/24/98
J-6f     Signal Head Mounting Details Pole and Post Top Mountings 4/24/98
J-6g     Signal Head Mounting Details Mast Arm and Span Wire Mountings 12/12/02
J-6h     Miscellaneous Signal Details        4/24/98
J-7a     Signal Standard Type Designations and Type PPB, PS, I, RM, and FB Details 9/12/01  2 Sheets
J-7c     Strain Pole Standards Type IV and V  6/19/98
J-7d     Span Wire Installation              4/24/98
J-8a     Type 1 Induction Loop               5/20/04
J-8b     Type 2 Induction Loop               5/20/04  2 Sheets
J-8c     Type 3 Induction Loop               5/20/04  3 Sheets
## Section K  Work Zone Traffic Control Plans
(Not for use on projects administered by WSDOT)

<table>
<thead>
<tr>
<th>Plan No.</th>
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<th>Publication Approval Date</th>
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<tbody>
<tr>
<td>K-1</td>
<td>Road Closure With Diversion</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-2</td>
<td>Road Closure With Off Site Detour</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-3</td>
<td>Alternating One Way Traffic, Flagger Controlled Or Pilot Car Controlled</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-4</td>
<td>Alternating One Way Traffic, Temporary Signal Controlled</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-5</td>
<td>Mobile Shoulder Operation With Lane Encroachment</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-6</td>
<td>Right Lane Closure For Divided Highway</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-7</td>
<td>Lane Closure With Temporary Concrete Barrier</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-8</td>
<td>Paving Operations Non-Working Hours</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-9</td>
<td>Shoulder Closure, High Speed</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-10</td>
<td>Shoulder Closure, Low Speed</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-11</td>
<td>Shoulder Work Areas</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-12</td>
<td>Short Term Duration Or Mobile Operation Shoulder Closure</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-13</td>
<td>Intersection Closure Work, 4 Way Intersection</td>
<td>12/20/02</td>
</tr>
<tr>
<td>K-14</td>
<td>Pedestrian Traffic Control At Intersections</td>
<td>12/20/02</td>
</tr>
<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 And 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 Without 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>
</tr>
</tbody>
</table>

## Section L  Fence and Glare Screen

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
<th>Sheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-1</td>
<td>Wire Fence</td>
<td>7/18/97</td>
<td>2</td>
</tr>
<tr>
<td>L-2</td>
<td>Chain Link Fence</td>
<td>7/18/97</td>
<td>2</td>
</tr>
<tr>
<td>L-3</td>
<td>Chain Link Gates</td>
<td>7/18/97</td>
<td></td>
</tr>
<tr>
<td>L-5</td>
<td>Glare Screen Type 1</td>
<td>7/31/98</td>
<td></td>
</tr>
<tr>
<td>L-5a</td>
<td>Glare Screen Type 2</td>
<td>7/31/98</td>
<td></td>
</tr>
<tr>
<td>L-6</td>
<td>Access Control Gate</td>
<td>7/25/97</td>
<td></td>
</tr>
</tbody>
</table>
CASE 3
ASPHALT CONCRETE PAVEMENT (L-Type Abutment)

CASE 4
ASPHALT CONCRETE PAVEMENT

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

NOTES

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

2. Before placing overlay, remove top 2" of existing joint filler, or 3" if existing joint is fiberboard, and block out the joint. After overlay, install new preplaced joint filler. Top of joint filler shall be between 3/8" and 3/16" below overlay. When a compression seal is in place, see Bridge Plans.

3. Before placing overlay, block out the joint. After overlay, install preplaced joint filler or rubberized asphalt filler. Top of joint filler shall be between 3/8" and 3/16" below overlay.

4. Full depth sawed grooves between 1/2" and 1/4" wide shall be placed directly over the existing sawed grooves in the cement concrete pavement and cement concrete shoulders.


LEGEND

- Concrete Overlay
- Asphalt Concrete Overlay

EXPRES JULY 23, 2003

TRANSITION FROM CONCRETE OVERLAY

STANDARD PLAN A-3

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION

HAROLD J. PETERSON

06-30-02

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EFFECTIVE: AUGUST 2, 2004 TO APRIL 3, 2005
NOTES

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

2. Catch basin or grate inlet shall be located
   between guardrail posts.

SECTION A-A

INLET PLACEMENT
AT BRIDGE END

SECTION B-B
DIVIDED HIGHWAY
(ONE WAY TRAFFIC)
DOWEL BAR RETROFIT
FOR TWO LANES

SECTION A

INSIDE LANE

OUTSIDE LANE

DIVIDED HIGHWAY
(ONE WAY TRAFFIC)
DOWEL BAR RETROFIT
FOR ONE LANE

SECTION B

INSIDE LANE

OUTSIDE LANE

SEE "DOWEL BAR PLACEMENT DETAIL
PLAN VIEW" (SHEET 3)

EXISTING CEMENT
CONCRETE PAVEMENT

EXISTING CEMENT
CONCRETE PAVEMENT
UNDIVIDED HIGHWAY
(TWO WAY TRAFFIC)
DOWEL BAR RETROFIT
FOR EACH LANE
1. As an acceptable alternate to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used. Wire mesh shall not be placed in knockouts.

2. The knockout diameter shall not be greater than 30°. 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 304.3.

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

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

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

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

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**PIPE ALLOWANCES**

<table>
<thead>
<tr>
<th>PIPE MATERIAL</th>
<th>MAXIMUM DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinforced or Plain Concrete</td>
<td>12&quot;</td>
</tr>
<tr>
<td>All Metal Pipe</td>
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<td>Cast Iron (Std. Spec. 0-6.30)</td>
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</tr>
<tr>
<td>Solid Wall PVC (Std. Spec. 0-6.1212)</td>
<td>15&quot;</td>
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<td>Profile Wall PVC (Std. Spec. 0-6.1222)</td>
<td>15&quot;</td>
</tr>
</tbody>
</table>

*Corrugated Polyethylene Storm Sewer Pipe*
### Pipe Allowances

<table>
<thead>
<tr>
<th>Pipe Material</th>
<th>Maximum Bar/Bearing Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinforced or Plain Concrete</td>
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</tr>
<tr>
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<td>Profile Wall PVC (STD. SPEC. 8-06.12(2))</td>
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</tr>
</tbody>
</table>

* Corrugated Polyethylene Storm Sewer Pipe

### Notes

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

2. The knockout diameter shall not be greater than 20°. Precast shall have a wall thickness of 2½ minimum to 2½ maximum. Provide a 1½ minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with grout mortar in accordance with Standard Specification B-04.3.

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

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

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

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

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

2. The knockout diameter shall not be greater than 10". Knockouts shall have a wall thickness of 3/8" minimum to 3/16" maximum.

3. The maximum depth from the finished grade to the pipe shall not be 6'.

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

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

6. Opening shall be measured at the top of the precast base section.
NOTES:
1. No steps are required when height is 4' or less.
2. The bottom of the precast catch basin may be sloped to facilitate cleaning.
3. Frame and grate may be installed with flange down or cast into adjustment section.
4. Knockouts shall have a wall thickness of 2" minimum to 2-1/2" maximum. Provide a 1/2" 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 Std. Spec. 3-043.

<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 IN EACH DIRECTION</th>
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PIPE ALLOWANCES

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<td>5'</td>
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1. CORRUGATED POLYETHYLENE STORM SEWER PIPE (Std. Spec. 9-05.20)
2. (Std. Spec. 3-05.12(1))
3. (Std. Spec. 3-05.12(2))

CATCH BASIN TYPE 2
STANDARD PLAN 8-10

EXPRESS JULY 7, 2005

APPROVED FOR PUBLICATION

Washington State Department of Transportation
NOTE
As an acceptable alternative to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used for adjustment sections.

TYPICAL ORIENTATION
FOR ACCESS AND STEPS

72" FLAT SLAB TOP

80 x 54" OR 24" DIAM OR 24" DIAM HOLE
2" (TYP)
8" 1" MIN.
2 1/2 MAX

45 BARS AT 8" SPACING

45 BARS AT 7" SPACING

54" OR 60" FLAT SLAB TOP

RECTANGULAR ADJUSTMENT SECTION

ONE 6" BAR HOOP FOR 6" TWO 8" BAR HOOPS FOR 12"
8" OR 12"

36'
28'
20'
36'
6" OR 12"

CIRCULAR ADJUSTMENT SECTION

36'
12' (TYP)

PREFABRICATED LADDER

ECCENTRIC CONE SECTION

48" MIN.
11" MIN.
2 1/2 MAX

45", 54" OR 60" FLAT SLAB TOP

12' (TYP)
36" MAX

STEP
NOTES

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

2. Alternate reinforcing rib designs are acceptable.

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

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

SOLID METAL COVER FOR CATCH BASIN

STANDARD PLAN B-2

SHEET 1 OF 1 SHEET

EXPRESS JULY 1, 2003
NOTES:

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

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 sides. Tap each hole to accept a 63/8" x 11 NC x 3" allen head cap screw. Location of bolt down holes varies among different manufacturers.

3. Refer to Standard Specification 9-03-142(2) for additional requirements.
1. When bolt down grates are specified in the Contract, provide two slots in the grates that are vertically aligned with the holes in the frame. Location of bolt down slots varies among different manufacturers.

2. Refer to Standard Specification S-05162 for additional requirements.

3. For frame details, see Standard Plan B-3a.

SLOT DETAIL

SECTION A

PLAN VIEW

24"

7 OR 8 EQUAL SPACES

1 1/8" MAX

DIRECTION OF FLOW

SEE SLOT DETAIL & NOTE 1
NOTES

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

2. Refer to Standard Specification R-05.162 for additional requirements.

3. For frame details, see Standard Plan B-3a.

4 EQUAL SPACES

SEE SLOT DETAIL & NOTE 1

PLAN VIEW

SECTION A

SLOT DETAIL

SECTION B

1 3/4" MAX

4 EQUAL SPACES

3 1/4"
1. When bolt down grates are specified in the Contract, provide two slots in the grates that are vertically aligned with the holes in the frame. Location of bolt down slots varies among different manufacturers.

2. Refer to Standard Specification 9-06.18.2(c) for additional requirements.

3. For frame details, see Standard Plan 9-3a.

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

SEE SLOT DETAIL & NOTE 1

4 LEVELING PADS
2" x 1 1/8" x 1/8"

1" OPENING (TYP.)
1. See Contract for size and location of all pipes and orifices.
2. Baffle wall shall have #4 Bar at 12” spacing each way.
3. Precast baffle shall be keyed and grouted in place.
4. Bottom orifice plate shall be galvanized steel with a minimum thickness of 3/16”. Attach orifice with 1/2” stainless steel bolts. Orifice plate is not required when only oil separation is desired.
5. Upper flow orifice shall be aluminum, aluminized steel or galvanized steel. Galvanized steel shall have treatment 1.
1. Angles shall be set so that each bearing bar of precasted grate shall have full bearing on both ends. The finished top of concrete shall be even with the grate surface.

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

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

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

5. Grate B will be used only when specified in the Contract.
Angles shall be set so that each bearing bar or prefabricated grate shall have full bearing on both ends. The finished top of concrete shall be even with the grate surface.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

DIKE INSTALLATION FOR PREFERRED SLOPE

*See Contract For Backslope Details

DROP INLET TYPE 1

GRATE SUPPORT
(Two required per grate)
1. Angles shall be set so that each bearing bar on the grate shall have full seating on both ends. The finished top of concrete shall be even with the grate surface.

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

3. Bevel or round exposed concrete edges ½”.

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

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

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

7. Inside wall taper for form removal shall result in any wall section thinner than 6” except in pipe knockout areas.

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

DROP INLET TYPE 2

GRADE SUPPORT (The required per grate)
OPTIONAL: 1/4 MAX vent holes on bottom for galvanizing

3/8" x 1/2" x 34 1/2" Steel plate (TYP)

1/2" MAX

TYPE 1

3/8" Three spaces 1/2"
34 1/2"

Grind top and bottom flush after welding

3/8" x 3/8" x 1/4" x 33 1/4"
Structural tubing (TYP)

SECTION A-A

3/8"

3/8" x 1/2" x 34 1/2" Steel plate (TYP)

1/4

SECTION B-B

3/8"

3/8" x 3/8" x 1/4" x 33 1/4"
Structural tubing (TYP)

1/4

SECTION C-C

DROPPED INLET GRATES
1. The diameter of the end section of Design B shall be at least 1 inch greater than the diameter of the concrete pipe.

2. Skirt sections shall be made in one piece for round pipe with a diameter of 12" or 24" inclusive and for pipe over 12" with a rise of 13" or 25" inclusive. Skirt sections for pipe larger than 12" may be made in multiple pieces in accordance with the tabulated values shown.

3. Design A end sections for 12" thru 84" diameter pipe and 49" thru 33" diameter pipe shall be used with annular corrugations and all helically corrugated pipe arch and pipe arch end sections shall be the same thickness at the end section.

4. Design C may be used in lieu of Design A for all metal pipe sizes except as noted. Coupling bands may be of any acceptable type for the pipe specified.

5. Multiple panel skirts shall have top sections that are to be tightly joined by 3/8" galvanized rivets or bolts.

6. For 60" thru 84" diameter pipe and 77" thru 57" diameter pipe the reinforcement shall be supplemented with galvanized tilt-per-hanger angles of the following sizes:

7. Angle reinforcement will be placed under the center panel seams on the 77" thru 93" pipe and 57" thru 77" pipe arches.

8. As an alternative to the connector lug and threaded rod used on 12" thru 24" curvilinear pipe, the connector may be made with a "H" shaped strap and two galvanized steel angle fastened with a 1/4" diameter, 6-long galvanized bolt and one squareheaded nut.
END SECTION LENGTH SHALL BE AT LEAST 60X TIMES THE DIAMETER OF THE PIPE (SEE STD. SPEC. 7-02.3(1))

1. The culvert ends shall be beveled to match the embankment or ditch slope and shall not be beveled flatter than 4:1. When slopes are between 4:1 and 8:1, place the slope in the vicinity of the culvert end to ensure the portion of the culvert protrudes none more than 4" above the ground line.

2. Field cut 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.
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. Minimums and maximums are shown.
3. Unless indicated otherwise a 10" depth (over the inside creases of corrugations) of earth shall be placed in the invert of the Structural Plate Underpass Design 1, for the full width and length. The earth shall consist of naturally occurring materials available to the vicinity of the structural plate underpass installation. See Standard Specification 7-01.3(d).
4. Designed for H-20 live load and maximum allowable soil pressure of 8 kPa per square foot.
1. The variable dimension indicated for the height of step for step mitered pipes shall conform to manufacturer’s recommendations unless specified differently on the plans or in the special provisions.

2. Reinforcing steel shall have 1/2” clear cover to all concrete surfaces.

3. Headwalls for concrete culvert pipe may omit anchor bolt attachment.

4. When steel pipe safety bars are used, headwall thickness shall be increased to 8”.

**Structural Plate Pipe Arches and Underpasses**

**Step Mitered Pipe**

**Full Mitered Pipe**

**Pipes and Structural Plate Pipes**

**Headwalls for Culvert Pipes**

**Section A-A**

**Anchor Bolt Details**
**NOTES**

1. Sockets shall be 3" extra strong steel pipe (3½" OD). Sockets must be the proper angle to allow safety bar to be easily removed.

2. Safety Bar shall be 4" extra strong (14½" OD) steel pipe.

3. Bevel culvert pipe to match side slope.

<table>
<thead>
<tr>
<th>Culvert Dia</th>
<th>Required number of pipes</th>
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<tbody>
<tr>
<td>Up to 36&quot;</td>
<td>1</td>
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<tr>
<td>42&quot; - 60&quot;</td>
<td>2</td>
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<tr>
<td>66&quot; - 90&quot;</td>
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</tbody>
</table>

**TOP VIEW**

Culvert is perpendicular to roadway
Headwall is placed parallel to roadway

**SECTION A-A**

8" x 24" x 5/8" Steel plate

**ELEVATION**

8" x 24" x 5/8" threaded rod with nut

**TOP**

Culvert is skewed to roadway
Headwall is placed parallel to roadway

**INSTALL ADHESIVE ANCHORAGE SYSTEM**

**TYPE 1 SAFETY BARS FOR STEPPED CULVERT PIPE OR PIPE ARCH**

8" x 24" x 5/8" threaded rod with nut

**STEEL PLATE**
1. Maximum span width is 54".

2. Spacing between safety bars, or between bars and the culvert crown shall be equal spaces of 30" maximum.
1. Connection is a 1/2" DIA threaded rod over top of end sections side lugs and bolted to end section. On 15" through 24" pipe, an alternative may be a 1" wide strap 16 gage or 12 gage galvanized steel, fastened with a 1/2" DIA, 6" long galvanized bolt and square head nut.

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

### METAL END SECTIONS FOR CIRCULAR PIPES

<table>
<thead>
<tr>
<th>Pipe DIA (Inches)</th>
<th>Minimum Thickness</th>
<th>Dimensions (Inches)</th>
<th>L Dimensions</th>
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<tr>
<td></td>
<td>Inches</td>
<td>A</td>
<td>H</td>
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### METAL END SECTIONS FOR ARCHED PIPES

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</tr>
</thead>
<tbody>
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<td>Rise</td>
<td>A</td>
<td>H</td>
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<tr>
<td>72</td>
<td>83</td>
<td>12</td>
<td>16</td>
</tr>
</tbody>
</table>

### TAPERED END SECTION WITH TYPE 4 SAFETY BARS (ON CROSS ROAD)

- 3" Galvanized pipe: Flatten end, then bend outside 4" to match end section sides.
- SAFETY BAR END TREATMENT DETAIL

- 5/8" x 1" Slots
- Optional toe plate extension, 6" less than overall width
NOTES
1. See Standard Specifications Section 7-08.3(2) for Pipe Zone Backfill.
2. See Standard Specifications Section 8-03.12(3) for Gravel Backfill for Pipe Zone Bedding
4. For sanitary sewer installation, concrete pipe shall be bedded to spring line.

CLEARANCE BETWEEN PIPES
FOR MULTIPLE INSTALLATIONS

<table>
<thead>
<tr>
<th>PIPE</th>
<th>SIZE</th>
<th>MINIMUM DISTANCE BETWEEN BARRIERS</th>
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<tbody>
<tr>
<td>CIRCULAR PIPE</td>
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<tr>
<td>(DIAMETER)</td>
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<tr>
<td>12&quot; to 24&quot;</td>
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<td>DIA. / 2.</td>
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<td>PIPE ARCH METAL ONLY</td>
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<tr>
<td>(SPAN)</td>
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<td>18&quot; to 28&quot;</td>
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<td>45° to 142°</td>
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<td>SPAN / 3.</td>
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<td>145° to 200°</td>
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PIPE ZONE BEDDING AND BACKFILL
STANDARD PLAN B-11

APPROVED FOR PUBLICATION
Clifford E. Nordahl 07-31-01
Washington State Department of Transportation

EXPIRES JULY 1, 2003
DROP CONNECTION
FOR SANITARY SEWERS

DUCTILE IRON
DROP CONNECTION

Concrete Encased
Drop Connection

Cement Concrete Class 3000 poured in place

Flexible Joint

D.I.P. 90° bend clearance 2"

Typical Manhole
Foundation construction

Mortar dam or plug as required by engineer

One length of ductile iron pipe (Class 501) to solid bearing when span is more than 48"

All pipe except ductile iron pipe shall be concrete encased

Backfill with compacted material as directed by engineer

D.I.P. Tee Diameter 2"
Single branch wyes for two connections on each side
6" Sewer pipe
Plug

6" Wye

45° Bends for one connection on each side

6" Sewer pipe

Cement Concrete

39" x 39" MIN

SECTION B-B

VERTICAL CONNECTION
1. Steel tie rods to be heavily coated with asphalt after installation.
2. Restrained joints may be substituted for tie rods.
3. Surface of ground within 36" of hydrant shall be smooth.
NOTES

1. Paint pipe threads with asphalt paint after assembly.
2. All piping to be galvanized steel.
3. Valve and piping to valve to be 2" unless otherwise noted on plan.
4. Locate blowoff outlet near property corner if possible.

PLAN

2" Female x 1"P x 2½" male N.S.

hose connection with cap

2 INCH BLOWOFF
ASSEMBLY

ELEVATION

Drill ½" hole

15 Pound
Asphaltic felt

Gravel pocket

Solid concrete bearing
block 4" x 8" x 16"

Gate valve with 2"
square operating nut

Cast iron
valve box and lid

Concrete thrust
blocking

Thrust block
to clear piping

Street elbow

Two 4" x 6" x 16" concrete blocks

Topped cap or plug

Water main

Varies

36" M.L.
1. Size of combination air release/air vacuum valve shall be specified in the Contract. Piping and valves shall be the same size as the combination air release/air vacuum valve.

2. Locate at the high point of the main, top top of main.
TWO TIE RODS WITH TURNBUCKLES

THREAD 8"

BLOCKING FOR 11.26° OR 22.6° VERTICAL BENDS

FOUR TIE RODS WITH TURNBUCKLES

THREAD 8"

BLOCKING FOR 45° VERTICAL BENDS

---

**DIMENSION TABLE**

<table>
<thead>
<tr>
<th>PIPE DIAM</th>
<th>TEST PRESSURE (PSI)</th>
<th>BEND ANGLE</th>
<th>CONCRETE VOLUME (FT^3)</th>
<th>CUBE SIZE (IN)</th>
<th>TIE ROD DIAM</th>
<th>TIE ROD EMBEDMENT</th>
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<tbody>
<tr>
<td>4&quot;</td>
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<td>11.26°</td>
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<td>355</td>
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<td>1 1/8&quot;</td>
<td>30&quot;</td>
</tr>
</tbody>
</table>

**NOTE**

STEEL TIE RODS TO BE HEAVILY COATED WITH ASPHALT AFTER INSTALLATION.
1. Contractor to provide blocking adequate to withstand full test pressure.
2. Divide thrust by safe bearing load to determine required area in square feet of concrete to distribute load.
3. Areas to be adjusted for other pressure conditions.
4. Provide two \( \frac{1}{2} \)" minimum diameter rods on valves up through 10" diameter. Valves larger than 10" require special tie rod design.

<table>
<thead>
<tr>
<th>Size</th>
<th>Test Pressure (PS)</th>
<th>Thrust at Fittings in Pounds</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>250</td>
<td></td>
<td>3,140</td>
<td>4,440</td>
<td>2,405</td>
<td>1,225</td>
<td>615</td>
</tr>
<tr>
<td>6&quot;</td>
<td>250</td>
<td></td>
<td>7,070</td>
<td>9,995</td>
<td>5,410</td>
<td>2,760</td>
<td>1,385</td>
</tr>
<tr>
<td>8&quot;</td>
<td>250</td>
<td></td>
<td>12,565</td>
<td>17,770</td>
<td>9,620</td>
<td>4,905</td>
<td>2,465</td>
</tr>
<tr>
<td>10&quot;</td>
<td>250</td>
<td></td>
<td>19,635</td>
<td>27,770</td>
<td>15,030</td>
<td>7,860</td>
<td>3,850</td>
</tr>
<tr>
<td>12&quot;</td>
<td>250</td>
<td></td>
<td>28,275</td>
<td>39,985</td>
<td>21,640</td>
<td>11,630</td>
<td>5,545</td>
</tr>
<tr>
<td>14&quot;</td>
<td>250</td>
<td></td>
<td>38,480</td>
<td>54,425</td>
<td>29,455</td>
<td>15,015</td>
<td>7,545</td>
</tr>
<tr>
<td>16&quot;</td>
<td>250</td>
<td></td>
<td>50,265</td>
<td>71,085</td>
<td>38,470</td>
<td>19,615</td>
<td>9,855</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Safe Bearing Load (PSF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mud, peat, etc.</td>
<td>0</td>
</tr>
<tr>
<td>Soft clay</td>
<td>1,000</td>
</tr>
<tr>
<td>Sand</td>
<td>2,000</td>
</tr>
<tr>
<td>Sand and gravel</td>
<td>3,000</td>
</tr>
<tr>
<td>Sand and gravel cemented with clay</td>
<td>4,000</td>
</tr>
<tr>
<td>Hard shale</td>
<td>10,000</td>
</tr>
</tbody>
</table>
Circular adjustment section

Eccentric cone section

Precast riser sections

Steps or ladder

Channel and shelf

Reinforcing steel

Mortar fillet

24:1 slope

6'' MAX

1'' MIN

2 1/2'' MAX

SEPARATE CAST IN PLACE BASE

PRECAST BASE WITH INTEGRAL RISER

SEPARATE PRECAST BASE

NOTES:

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

MANHOLE DIMENSION TABLE

<table>
<thead>
<tr>
<th>DIA</th>
<th>WALL THICKNESS</th>
<th>BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT SIZE</th>
<th>MINIMUM DISTANCE BETWEEN KNOCKOUTS</th>
<th>BASE REINFORCING STEEL 50 IN./FT EACH DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>48''</td>
<td>4''</td>
<td>6''</td>
<td>36''</td>
<td>8''</td>
<td>0.15 0.19</td>
</tr>
<tr>
<td>54''</td>
<td>4 1/2''</td>
<td>8''</td>
<td>42''</td>
<td>8''</td>
<td>0.19 0.19</td>
</tr>
<tr>
<td>60''</td>
<td>5''</td>
<td>8''</td>
<td>48''</td>
<td>9''</td>
<td>0.25 0.25</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>DIA</th>
<th>WALL THICKNESS</th>
<th>BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT SIZE</th>
<th>MINIMUM DISTANCE BETWEEN KNOCKOUTS</th>
<th>BASE REINFORCING STEEL IN % IN EACH DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>72&quot;</td>
<td>6&quot;</td>
<td>8&quot;</td>
<td>60&quot;</td>
<td>12&quot;</td>
<td>0.24</td>
</tr>
<tr>
<td>96&quot;</td>
<td>8&quot;</td>
<td>12&quot;</td>
<td>84&quot;</td>
<td>12&quot;</td>
<td>0.29</td>
</tr>
</tbody>
</table>

MANHOLE TYPE 2
**NOTE**

Knockout shall have a wall thickness of 2" minimum to 2.8" minimum.

**MANHOLE DIMENSION TABLE**

<table>
<thead>
<tr>
<th>MANHOLE 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 IN EACH DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>48&quot;</td>
<td>4&quot;</td>
<td>5&quot;</td>
<td>50&quot;</td>
<td>9&quot;</td>
<td>0.19</td>
</tr>
<tr>
<td>60&quot;</td>
<td>4.5&quot;</td>
<td>5&quot;</td>
<td>42&quot;</td>
<td>9&quot;</td>
<td>0.18</td>
</tr>
<tr>
<td>72&quot;</td>
<td>5&quot;</td>
<td>5&quot;</td>
<td>36&quot;</td>
<td>9&quot;</td>
<td>0.25</td>
</tr>
<tr>
<td>84&quot;</td>
<td>6&quot;</td>
<td>5&quot;</td>
<td>30&quot;</td>
<td>12&quot;</td>
<td>0.24</td>
</tr>
<tr>
<td>96&quot;</td>
<td>6&quot;</td>
<td>5&quot;</td>
<td>24&quot;</td>
<td>12&quot;</td>
<td>0.20</td>
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<tr>
<td>120&quot;</td>
<td>6&quot;</td>
<td>5&quot;</td>
<td>18&quot;</td>
<td>12&quot;</td>
<td>0.19</td>
</tr>
</tbody>
</table>

**MANHOLE TYPE 3**

**STANDARD PLAN B-23c**

**Sheet 1 of 1 Sheet**

[Signature]

EXPRESS JULY 4, 2005

**EFFECTIVE: AUGUST 2, 2004 TO APRIL 3, 2005**
NOTES

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

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

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

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

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

CONCRETE INLET

*3 Bar each corner
*3 Bar each side top and bottom
One *3 Bar across bottom

PRECAST BASE SECTION

FRAME AND VANED CRATE

RECTANGULAR ADJUSTMENT SECTION
NOTES:
1. Precast cone sections may be eccentric or concentric.
2. Seepage port orientation varies among manufacturers.

SEEPAGE PORT DETAIL
(See Note 2)

PRECAST CONCRETE DRYWELL
CONCRETE COLLAR OPTION

CAST IN PLACE CONCRETE COLLAR

STEEL WELDED WIRE FABRIC (SEE NOTE 5)

CONCRETE PIPE (SEE NOTE 2)

CORRUGATED METAL PIPE

24" WIDE, 1" THICK RUBBER GASKET
IN ACCORDANCE WITH STD. SPEC. 9-04.4(3)

TYPE K COUPLING BAND (SEE NOTE 4)

COUPLING BAND OPTION

24"
NOTES

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

2. Mark location of sewer stub in accordance with Contracting Agency requirements.
STANDING SIDE SEWER CONNECTION
STANDARD PLAN B-30

NOTE: THIS IS NOT A LEGAL ENGINEERING DOCUMENT BUT MAY BE USED TO ILLUSTRATE THE ORIGINAL DRAWING. IT IS APPROVED FOR PUBLICATION AS AN OFFICIAL PLAN BY THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. IT MAY BE OBTAINED UPON REQUEST.

Clifford E. Mansfield
DEPUTY STATE DESIGN ENGINEER
8/10/99
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
OLYMPIA, WASHINGTON

EFFECTIVE: AUGUST 2, 2004 TO APRIL 3, 2005
Effect: August 2, 2004 to April 3, 2005

NOTES

1. When required by the contract, a Snow Load Post washer shall be used on the backside of the post (in lieu of the 1-1/4" post bolt washer) and a Snow Load Rail Washer shall be placed on the face side of Type 1 and Type 2 Beam Guardrail. Snow load rail washers are not to be installed on terminals.

2. Rail washers, also called "snow load rail washers" are not required on new installations, except as called for in Note 1. Rail washers need not be removed on existing installations, except for 2 through 8 of BCI installation.

3. Guardrail post spacing for Types 1 through 4 shall be 6'-3" on centers.

4. Timber block shall be toe-nailed to post with a 16d galvanized nail to restrict block rotation.

5. For post and block details, see Standard Plan C-1b.

6. When Beam Guardrail Type 1, 2 Foot Long Post, is specified in Contract, the post length shall be staked with numbers 1/2" MIN height and 1/4" deep of the location where the letter "V" is shown on the detail. After installation of long post, it shall be the Contractor's responsibility to ensure that the staked numbers are still legible and 1/4" deep.
NOTES:
1. Type 10 posts shall be 6x8 timber or 6x9.
   Type 11 posts shall be 10x10 timber or 6x9.
   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'-11/2" on center.

THREE BEAM RAIL ELEMENT

THREE BEAM EXPANSION SECTION

WOOD POST ASSEMBLY

STEEL POST ASSEMBLY

TYPE 10 and 11

STANDARD PLAN C-1a

BEAM GUARDRAIL

(TRIPLE BEAM)
W O O D  P O S T

S T E E L  P O S T

STEEL POST

See Notes 3 and 4

W BEAM WOOD BLOCK

FOR STEEL POST

See Table A and Note 6

3/4 holes (TYP)

See Note 2

3/4 hole through block

8" or 10"
(Nominal)

3/4" DIA holes (TYP)

Alternate holes

6x8 or 10x10
(see Note 1)

8" or 10"
(Nominal)

4 1/2" (Nominal)

4 1/2" (Nominal)

17"

15"

22"

15"

22"

W BEAM

THREE BEAM

W BEAM WOOD BLOCK

FOR WOOD POST

THREE BEAM WOOD BLOCK

FOR WOOD POSTS

THREE BEAM WOOD BLOCK

FOR STEEL POST

W BEAM WOOD BLOCK

FOR STEEL POST

W4x9
6" x 4/6
W4x15
8" x 8/6

POST LENGTH TABLE

QUADRAIL TYPE

LENGTH

1 through 4
6'-0"

10 or 11
6'-6"

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION

Herold J. Petterso

10-01-02

E X P I R E S J U L Y 3 1 , 2 0 0 5

E F F E C T I V E :  A U G U S T 2 , 2 0 0 4  T O  A P R I L 3 , 2 0 0 5
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. 6x6.9 steel posts and timber blocks are alternates for 6x8 timber posts and blocks. 6x6.5 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, 8' Foot Long Post," the steel post length shall be marked with numbers to ensure permanent identification at the location where the letter "I" is shown on the detail. The marking shall be 1½ MIN height.

6. Soil plate may be welded to foundation tube. If so, holes in soil plate and foundation tube may be omitted.
**Type 20**

See Detail A

See Detail B

G-2 Post
(See Note 1)

**Type 21**

**Detail A**

\( \frac{1}{4}'' \text{ DIA} \times 1\frac{1}{2}'' \text{ hex head bolt with hex nut and } 1\frac{1}{2}'' \text{ square x 0.125'' washer} \)

**Detail B**

\( \frac{1}{4}'' \text{ DIA} \times 1\frac{1}{2}'' \text{ hex head bolt with hex nut, guardrail rests on top of bolt.} \)

**Beam Guardrail**

---

**NOTES**

1. For post details see Standard Plan, "Beam Guardrail Posts and Blocks".
INTERMEDIATE GUARDRAIL POST CONNECTION DETAILS
(Type A shown)

NOTES
1. For wood posts, saw top of post and block to 1” above thrie beam guardrail reducer section. For steel posts, drive post down to 1” maximum above the thrie beam guardrail reducer section.

THRIE BEAM GUARDRAIL REDUCER SECTION
TYPE A

(Left section shown, right section reversed)

THRIE BEAM GUARDRAIL REDUCER SECTION
TYPE B
NOTES

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

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

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

4. The slope from the edge of the shoulder into the face of the guardrail should not exceed 10:1 when the face of the guardrail is less than 12'-6" 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 Fared Terminals are used on both ends a minimum of 25'-4" of Beam Guardrail shall be installed.

GUARDRAIL PLACEMENT

STANDARD PLAN C-2

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EXPIRES MAY 5, 2006

Clifford E. Mansfield
01-06-00

APPRIRED FOR PUBLICATION

STATE OF WASHINGTON
DEPARTMENT OF TRANSPORTATION

REFERENCES:

[1] Standard Plan C-6c
NOTES
1. Fast spacing is 6'-3" except where noted.
2. For terminal type and details, see Contract and applicable Standard Plans.
3. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1 when the guardrail is within 12'-0" from the edge of the shoulder.
4. See Contract for dimensions.
5. See Contract for Guardrail Transition Section and Guardrail Connection to Bridge Rail or Concrete Barrier.

FLARE RATE TABLE

<table>
<thead>
<tr>
<th>RATE</th>
<th>PISTED SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 ft</td>
<td>70</td>
</tr>
<tr>
<td>12 ft</td>
<td>60</td>
</tr>
<tr>
<td>10 ft</td>
<td>55</td>
</tr>
<tr>
<td>8 ft</td>
<td>50</td>
</tr>
<tr>
<td>6 ft</td>
<td>45</td>
</tr>
<tr>
<td>4 ft</td>
<td>40 or less</td>
</tr>
</tbody>
</table>

CASE 4
One or Two Way Traffic

CASE 5
One Way Traffic

CASE 6
One Way Traffic

MEDIAN
36'-0" MIN

Bridge end

Bridge rail
1. Attach standard wood or steel blocks to concrete structure with ¼" expansion anchor or ¼" threaded rod in a 1" x 8" hole grouted with epoxy.

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

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

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

5. Thrie Beam Guardrail Reducer Section Type B.

6. This Type 16 Transition shall start at a 10 x 10 post. Place nested thrie beam with 10 x 10 posts at 3'-1½" MAX spacing between the end of the transition and the structure.

<table>
<thead>
<tr>
<th>FLARE RATE TABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>15xl</td>
</tr>
<tr>
<td>14xl</td>
</tr>
<tr>
<td>12xl</td>
</tr>
<tr>
<td>11xl</td>
</tr>
<tr>
<td>10xl</td>
</tr>
<tr>
<td>9xl</td>
</tr>
</tbody>
</table>

GUARDRAIL PLACEMENT

STANDARD PLAN C-2b
1. SKI Terminal shown. For terminal type and details see Contract and applicable Standard Plans.

2. Attach standard blocks to concrete structure with 3/8" DIA expansion anchor or 3/8" DIA threaded rod in a 1" DIA x 8" hole grouted with epoxy.

3. Type 4 anchor or Type 4 anchor (Thrle Beam) required.

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

5. If the distance from end of Type II Guardrail to column/structure exceeds 6'-3" using 12'-6" thrle beam sections, add a 6'-3" nested section of thrle beam with 10 x 10 posts, spaced at 3'-11/2" (MAX), and begin transition.

6. Thrle Beam Guardrail Reducer Section Type B.

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

---

**GUARDRAIL PLACEMENT**

---

**CASE IIc**

---

**NOTES**

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

---

**GUARDRAIL PLACEMENT**

**CASE 14**

- Terminal pay limit (see Note 2)
- Type 1 Beam Guardrail pay limit (0 spaces MIN)
- Type 6 Transition post limit
- Type 20 Beam Guardrail pay limit (See Note 1)
- Type 1 Beam Guardrail pay limit (0 spaces MIN)
- Terminal pay limit (see Note 2)
- O Spaces MIN
- C-2 Post (TYP) (see Note 4)
- Edge of bridge
- Triple Beam Guardrail Reducer Section Type B

---

**Direction of Traffic**

C-2h

03-28-97
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**

- 6'-3"  6'-3"  6'-3"  6'-3"

- See Note 3

- 25' (see Note 4)
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 traveling the span need to be CTR's with double blocks.

CASE 21

GD 14 WOOD BLOCKS

WEDGED W 56 90 HAM RAIL ELEMENTS

B 3/4" x 3/8" BUTTON HEAD BOLT
WITH 7/32" CUP WASHER,
SLIP WASHER, AND HEX NUT

SECTION A
1. See Contract for transition and connection type.
2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1.
3. Guardrail installation shall be Beam Guardrail Type 1 with standard post and block.
4. First letter of case designation indicates end treatment on side road. Second letter indicates end treatment on main road. For instance a terminal on the side road and a bridge connection on the main road would be Case 22 BC.
5. For terminal type and details, see Contract and applicable Standard Plans.
6. Radius dimensions shall be etched into plate replacing the letters "hr" shown on the Identification Plate Detail. Digits shall be 1/2" MIN height and 3/16" MAX width.
7. Plate shall be galvanized after etching.

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**

- Splice bolt slot
- Rail element
- Identification plate

**Identification Plate Detail**

- 2"
- 2 1/4"
- 1/4" Steel plate
- 3/8" hole
- 1/4" TAP

**Notes**

- See Note 1
- See Note 2
- See Note 3
- See Note 4
- See Note 5
- See Note 7
NOTES

1. If the distance from the end of the bridge to the end of the three beam bridge rail section exceeds 8'-0" using 12'-0" three beam sections, add a 4'-0" section of three beam bridge rail to reduce the length to less than 8'-0".

2. When three beam is installed at the face of the bridge curb, install a Type 2 Asphalt Extruded Curb at face of Guardrail. See Standard Plan F-3b. Match the height of existing bridge curb with a 3:1 transition.

3. When three beam is installed at the face of rigid bridge rail, an ACP ramp is required from the roadway surface to the top of the bridge curb or abutment. The slope of the ramp shall be 20:1 or taller.
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 reflective object marker shall be installed according to manufacturer's recommendations.

3. Where snow load post washers and snow load rail washers are required by the contract, these 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 87. Length for ET-PLUS (TL2) and SKT-TL2 is 29.'
1. Anchor plate may be constructed from ⅛" 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 ⅜" x 1½" 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. Torque bearing plate with 10d nail at corners to prevent turning.

7. Anchor pay limit does not apply when anchor is included in a Beam Guardrail Terminal.
ANCHOR PLATE
(See Note 1)

BEAM GUARDRAIL ANCHOR
TYPE I

ANCHOR CABLE

1 1/4" Stud
threaded full
length (TYP)
1. Roll section and W8 x 17 post shall be fabricated to receive \( \frac{3}{8}'' \) hex head bolts as shown.

2. All bolts shall be high-strength \( \frac{3}{8}'' \) hex head bolts with anchor roll washers.
NOTES
1. For details, see Standard Plan C-6c.
2. For end section details see Standard Plan C-7 or C-7a.
3. For details, see Standard Plan C-4b.
4. Outside nut shall be torqued against inside nut a minimum of 100 ft-lb.
5. Post and block shall match beam guardrail posts.
1. Attach W-beam to steel pipe with 3/4" x 1 1/2" 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.

1/4" x 9' - 0" Cable with one swaged end

6' - 3"

2 1" Nuts and washers (see Note 5)

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

1/4"

1 1/4"

2 1/2"

3/4" x 4" x 12"

Steel plate

10" x 13"

Standard steel pipe

1/2" x 2" Button head bolt or 3/4" x 1 1/2" hex head bolt and hex nut with anchor rail washers under bolt head and nut (see Note 3).

Anchor post assemblies (see Note 4)

End Section Design C (see Note 2)

1/4" Cable clips (6 required) torque nuts to 50 ft/lbs.

Bearing plate (see Note 3)

Standard 2" OD pipe sleeve (2 3/4" OD)

Two 1" nuts and washer (see Note 5)

Tack weld 2 1/2" x 2 1/2" x 1/4" steel plate with 1/4" hole to tubular steel

DETAIL B

1" Nut

1/4" x 4"

Stud threaded full length
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.

BEAM GUARDRAIL ANCHOR TYPE 7

TYPE 7 ANCHOR
NOTES

1. Attach guardrail to bridge rail or concrete barrier with 7/8" diameter high strength bolts (Standard Specification 0-05.304) with fish slabs female insert or resin bonded anchors. See the Contract Plans.

2. In cases where Design F End Section is used on the outside of the guardrail, a galvanized 1" ID, 2" OD, 0.134" thick, newel Type A Plain Washer or an anchor nut washer will be placed under the splice bolt heads.

DESIGN C (THREE BEAM)

DESIGN D (THREE BEAM)

DESIGN F (THREE BEAM)

DESIGN G (THREE BEAM)

STANDARD PLAN C-7a

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Harold J. Peterson 10-31-03

WASHINGTON DOT DEPARTMENT OF TRANSPORTATION

EFFECTIVE: AUGUST 2, 2004 TO APRIL 3, 2005
1. Wire rope loops shall be 9 - 10' long, except for the top loop of the Barrier Terminal, which shall be 2 - 3' 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 Drift Pins 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 3).
1. For details on loops, connecting pin, reinforcing steel, and terminal unit see Standard Plan Concrete Barrier Type 2.

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

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

Bevel or round edges (3/4" MAX)

Elevation

Plan

Section A-A

Perspective View

Concrete Barrier
Type 5

C-8c 1 of 1
05-30-97
ALTERNATIVE TEMPORARY CONCRETE BARRIER
STANDARD PLAN C-6d
Sheet 1 of 1 Sheet
APPROVED FOR PUBLICATION
June 30, 1994
Washington State Department of Transportation

NOTES
1. Reinforcing Steel as installed by Preactor.
2. The vertical dimensions for the sides and loop bar locations on the NARROW BASE barrier are the same as shown on the END views of the 2'-0" wide barrier.

UNIT LENGTH 12'-0"

2'-0" DUAL LOOP BAR HOT DIP GALVANIZED AFTER FABRICATION

REINFORCING STEEL NOT SHOWN

CONNECTING PIN - SEE STD. PLAN C-6

TOP VIEW

ALTERNATE LOOP BAR 3/8" DIA (A&E)

SECTION A

END DETAIL
NOTES
1. Use Type 1 Anchors when a deeper embedment (9 1/2") into the bridge deck or other pavement is permitted by the Engineer.
2. Adjust the location of the Type 1 or Type 2 Anchors in order to avoid the main reinforcing steel in the bridge deck or roadway surface.
3. Carefully align the Type 1 or Type 2 Anchors to the bridge deck or roadway surface.
4. After removing Type 1 or Type 2 Anchors, check the angle holes and fill them with cement according to Std. Spec. 8404.
5. After removing Type 3 Anchors, clean the angle holes and fill them with cement according to Std. Spec. 8404.
6. After removing Type 3 Anchors, clean the angle holes and fill them with cement according to Std. Spec. 8404.

TYPE 1 AND TYPE 2 ANCHORS
FOR TEMPORARY CONCRETE BARRIER INSTALLATIONS ON CEMENT CONCRETE PAVEMENT

PRECAST CONCRETE BARRIER ANCHORS
STANDARD PLAN C-8a

PROTECTIVE WORK AREA

ATTACHMENT "A" DETAIL

ATTACHMENT "B" DETAIL

EXPRESS JUL 5, 2004

PRECAST CONCRETE BARRIER SECTIONS

TYPE 3 ANCHOR
FOR TEMPORARY OR PERMANENT PRECAST CONCRETE BARRIER INSTALLATIONS ON ASPHALT CONCRETE PAVEMENT

PLAN VIEW TYPE 3 ANCHOR INSTALLATION LOCATIONS

POOL

ATTACHMENT "A" DETAIL

2" DIA. DIAL (Typ)

1" DIA. DIAL X 3/8" CASTED DIAL (Typ)

PRECAST BARRIER SECTIONS
BOX CULVERT GUARDRAIL STEEL POST TYPE 1
10" to 36" ground cover

BASE ATTACHMENT DETAIL

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

POST BASE ATTACHMENT DETAIL

Standing Jointly on the 17th Day of May, A.D. 1776.

BOX CULVERT GUARDRAIL STEEL POST
STANDARD PLAN C-10
SHEET 1 OF 2 SHEETS

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APPROVED FOR PUBLICATION

Clifford E. Mansfield 07/31/98

DEPARTMENT OF TRANSPORTATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EXPIRES MAY 1, 2005

EFFECTIVE: AUGUST 2, 2004 TO APRIL 3, 2005
NOTES

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

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

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

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

POST ANCHOR ATTACHMENT DETAIL

(See Note 1)

ANCHOR ATTACHMENT DETAIL

(See Note 4)

POST BASE PLATE DETAIL

POST BEARING PLATE DETAIL

BASE PLATE DETAIL

COVER PLATE DETAIL

BEARING PLATE DETAIL
TABLE

<table>
<thead>
<tr>
<th>CURVE RADIUS</th>
<th>POST SPACING</th>
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<tr>
<td>LESS THAN 112'</td>
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<td>217' TO 897'</td>
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<tr>
<td>797' OR MORE AND TANGENT SECTIONS</td>
<td>16'</td>
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NOTICE

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 Reflector Details. Reflectors shall be white when installed on the right side of traffic, and yellow when installed on the left side of traffic.


PLAN VIEW

CABLE BARRIER PLACEMENT

ELEVATION VIEW

INSTALL ON BOTH SIDES OF POST WHEN IN USE

CABLE BARRIER TERMINAL PAY LIMIT

ALUMINUM SPACERS

2' SPACER - GALVANIZED STEEL OR ALUMINUM

PLAN VIEW

REFLECTOR DETAIL

6" BOLT/Lock Nut

4" x 5" x 2" 1/2ALUMINUM BACKING WITH 2 3Bolt Spacing (See Notes 2)

ALUMINUM FRAME OF REFLECTOR WITH PLASTIC RESIN
**Standard Turnbuckle 12" Takeup**

- Right-hand threads 7"
- Flatten for wrench

**Galvanized Spring Wire 3/8" Dia.**

- 2 1/2" Right-hand threads
- Spring stop 4 1/2" long
- 3/4" Hex nut

**Spring Cable End Assembly**

**Turnbuckle Assembly**

- Standard Turnbuckle 12" Takeup
- Right-hand threads 7"
- Left-hand threads 7"
- Flatten for wrench

**Cable End Assembly to Breakaway Anchor Angle Detail**

- Brass keeper rod must be installed prior to tensioning cable

**Cable Wedge**

- Use with all cable fittings

**Breakaway Anchor Angle**

**Keeper Plate Detail**

**Inside Gusset 1/8" Plate**

**Plan**

**Elevation**

**Side View**

**28 Gauge Galvanized Sheet Metal**

**Cable Barrier Terminal**

**Standard Plan C-11b**

Sheet 2 of 2 sheets

**Effective:** August 2, 2004 to April 3, 2005

**Expires:** May 16, 2003
1. An Energy III System, fabricated by Energy Absorption Systems, Inc., a Fish System as fabricated by Arrowhead Safety Services, Inc., or a Traffic Barrier 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**

**Standard Plan C-12**

**Notes**

- Type 1: Posted Speed 40 MPH or less
- Type 2: Posted Speed 45 MPH
- Type 3: Posted Speed 50 MPH
- Type 4: Posted Speed 65 MPH
- Type 5: Posted Speed 70 MPH
- Type 6: Posted Speed 80 MPH

**Dimensions**

- 6" Typ Varies from 4" to 2"
- 8" Typ
- 10' (Desirable)

**Installation Details**

- Roadside Installation Detail
- Terminal Section Typ
- Median Installation Detail
- Concrete Barrier Typ

**Installation Details**

- 2.5' Min
- 2.0' Min

**Hazard**

- Varies from 1" to 2"
The Barrier Terminal is only used on the trailing end of a barrier separating two roadways with the same direction of travel.
**EFFECTIVE: AUGUST 2, 2004 TO APRIL 3, 2005**

**ALTERNATE 1**

- Surface treatment as required by contract.
- Construction joint level transverse with roughened surface.
- Level exception: overhang: 1/16" at bridge ends.

**ALTERNATE 2**

- Surface treatment as required by contract.
- Construction joint level transverse with roughened surface.

---

**PLAN - TRAFFIC BARRIER**

- All chisels 1/4".

**DUMMY JOINT SECTION**

- Typical wall section - 24'-0".
- Guard rail attachment, when required, is 10'-0" M.
- Pedestrian railing as required.

**WALL ELEVATION**

- Reinforced concrete retaining wall.
- Type 1 and 1 SW.
- Standard Plan D-1a.

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**EXPIRES JUNE 29, 2002**

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**APPROVED FOR PUBLICATION**

- Harold J. Peterson
- 07-03-02

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**Washington State Department of Transportation**
WALL TOP DETAIL

NOTES:
1. All concrete shall be Class 4000 except as noted.
2. For backfill requirements, see Standard Plan "D-44".
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".
4. When Wall Type 3-SW (saltwater) is specified, concrete in the table column "Material Quantity" shall be increased by 0.003 x N CY/FL.
5. Concrete in the 24"-foot wall sections shall be placed separately between expansion joints with a minimum 12-hour period between concrete placement.

SECTION - VERTICAL FACE

Construction joint with weathered surface.
<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Footing Reinforcement</th>
<th>Stem Reinforcement</th>
<th>Material Quantity</th>
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WALL DESIGN WITH SLOPING
FRONT FACE AND 2:1 BACKSLOPE

REINFORCED CONCRETE
RETAINING WALL
TYPE 4 AND 4 SW
STANDARD PLAN D-1d
SHEET 2 OF 2 SHEETS

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APPROVED FOR PUBLICATION
Clifford E. Mansfield
10/06/99
DEPUTY STATE DESIGN ENGINEER

[Signature]
| EFFECTIVE: AUGUST 2, 2004 TO APRIL 3, 2005 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **DIMENSIONS** | **FOOTING REINFORCEMENT** | **STEM REINFORCEMENT** | **MATERIAL QUANTITY** |
| **H (ft)** | **B** | **C** | **D** | **h** | **SIZE** | **SPAC** | **LENGTH** | **h** | **SIZE** | **SPAC** | **LENGTH** | **h** | **SIZE** | **SPAC** | **LENGTH** | **Concrete** | **Steel** |
| 5 | 3'-0" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 3'-10" | 0.214 |
| 6 | 3'-0" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 4'-10" | 0.266 |
| 7 | 3'-3" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 5'-10" | 0.345 |
| 8 | 3'-6" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 6'-10" | 0.471 |
| 9 | 3'-9" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 7'-10" | 0.597 |
| 10 | 4'-0" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 8'-10" | 0.638 |
| 11 | 4'-3" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 9'-10" | 0.707 |
| 12 | 4'-6" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 10'-10" | 0.791 |
| 13 | 4'-9" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 11'-10" | 0.885 |
| 14 | 5'-0" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 12'-10" | 0.996 |
| 15 | 5'-3" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 13'-10" | 0.108 |
| 16 | 5'-6" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 14'-10" | 0.118 |
| 17 | 5'-9" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 15'-10" | 0.128 |
| 18 | 6'-0" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 16'-10" | 0.138 |
| 19 | 6'-3" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 17'-10" | 0.148 |
| 20 | 6'-6" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 18'-10" | 0.158 |
| 21 | 6'-9" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 19'-10" | 0.168 |
| 22 | 7'-0" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 20'-10" | 0.178 |
| 23 | 7'-3" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 21'-10" | 0.188 |
| 24 | 7'-6" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 22'-10" | 0.198 |
| 25 | 7'-9" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 23'-10" | 0.208 |
| 26 | 8'-0" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 24'-10" | 0.218 |
| 27 | 8'-3" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 25'-10" | 0.228 |
| 28 | 8'-6" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 26'-10" | 0.238 |
| 29 | 8'-9" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 27'-10" | 0.248 |
| 30 | 9'-0" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 28'-10" | 0.258 |
| 31 | 9'-3" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 29'-10" | 0.268 |
| 32 | 9'-6" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 30'-10" | 0.278 |
| 33 | 9'-9" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 31'-10" | 0.288 |
| 34 | 10'-0" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 32'-10" | 0.298 |
| 35 | 10'-3" | 1'-0" | 1'-0" | 0 | 3'-5" | 2'-9" | N/A | 6'-3" | 4'-7" | N/A | 8'-0" | N/A | N/A | N/A | N/A | 33'-10" | 0.308 |

**WALL DESIGN WITH VERTICAL FRONT FACE AND 24" BACKSLOPE**
<table>
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<th>DIMENSIONS</th>
<th>BAR E</th>
<th>BAR F</th>
<th>BAR K</th>
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<th>FOOTING REINFORCEMENT</th>
<th>BAR G</th>
<th>CONCRETE (CYL./CF)</th>
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**WALL DESIGN WITH SLOPING FRONT FACE AND 2:1 BACKSLOPE**

**INVOICE A. TAYLOR**

**REINFORCED CONCRETE RETAINING WALL TYPE 6 AND 6 SW STANDARD PLAN D-1f**

**NOTE:** THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE OF THE ORIGINAL ENGINEERING DRAWINGS AND APPENDICES FOR PUBLICATION. IT IS THE RESPONSIBILITY OF THE INSTITUTE TO DETERMINE THE PRECISION TO WHICH THE DRAWINGS AND APPENDICES ARE INCORPORATED IN THE INSTITUTE'S DRAWINGS AND APPENDICES FOR PUBLICATION. A COPY MAY BE OBTAINED FROM THE UNIVERSITY OF WASHINGTON DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED FROM THE UNIVERSITY OF WASHINGTON DEPARTMENT OF TRANSPORTATION.

**APPROVED FOR PUBLICATION**

**Clifford E. Mansfield**

**DATE:** 10/06/99

**SIGNATURE:**

**WASHINGTON DEPARTMENT OF TRANSPORTATION**

**DATE:** AUGUST 2, 2004 TO APRIL 3, 2006

**EXPIRES:** AUGUST 2, 2004 TO APRIL 3, 2006

**EFFECTIVE:** AUGUST 2, 2004 TO APRIL 3, 2006
1. Wall to be designed Noise Barrier Type 1A, 1B, 1C or 1D. The contract specifies actual wall designations.
2. For intermediate wall heights, use the next higher H.
3. Panels shall have at least 3 feet of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet maximum.
5. The contract specifies actual foundation requirements D1 or D2.

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**NOTES**

- 03-14-97

---

**JOINT AND CORNER DETAIL**

**NOISE BARRIER - TYPE 1A**

**CAST-IN-PLACE CONCRETE WALL ON TRENCH FOOTING**

---

**TYPICAL SECTION**

**ELEVATION**

---

**CONSTRUCTION JOINT (See Note 4)**
FOOTING WIDTH TRANSITION DETAIL
(for locations without footing step)
NOTE: Transverse bars not shown

JOINT AND CORNER DETAIL

NOISE BARRIER - TYPE 2
CAST-IN-PLACE CONCRETE WALL
ON SPREAD FOOTING
FOOTING WIDTH TRANSITION DETAIL
(For locations without footing step)

NOTE: Transverse bars not shown

JOINT AND CORNER DETAIL

NOISE BARRIER - TYPE 3
CAST-IN-PLACE CONCRETE WALL ON SPREAD FOOTING
(OFFSET FOOTING)
DETAIL B

CAST-IN-PLACE CONCRETE WALL ON SHAFT FOUNDATION

NOISE BARRIER - TYPE 4

D-2d
03-14-97
### TYPICAL SECTION

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

### ELEVATION

- Bars A, C, D, and E space as shown on tables.

### JOINT AND CORNER DETAIL

- **6" MIN** level (TYP)
- **3'-0" MIN** top of roadway

### NOISE BARRIER - TYPE 5

- **CAST-IN-PLACE WITH TRAFFIC BARRIER ON TRENCH FOOTINGS**

### NOTES

1. Wall to be designated Noise Barrier Type 5A, 5B, 5C, or 5D. The Contract specifies actual wall designations.
2. For intermediate wall heights, use the next higher H.
3. Panels shall have at least 3 feet MIN of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet maximum.
5. The Contract specifies actual foundation requirements B1 or 02.

<table>
<thead>
<tr>
<th>WALL HT H</th>
<th>TYPE 5A</th>
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<th>TYPE 5C</th>
<th>TYPE 5D</th>
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<td>#4 at 15&quot;</td>
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<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
</tr>
<tr>
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<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
</tr>
<tr>
<td>14'-0&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
</tr>
<tr>
<td>16'-0&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
</tr>
<tr>
<td>18'-0&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
</tr>
<tr>
<td>20'-0&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
</tr>
<tr>
<td>22'-0&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
</tr>
<tr>
<td>24'-0&quot;</td>
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<td>#4 at 15&quot;</td>
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### Table: Joint and Corner Detail

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<th>DEPTH D2</th>
<th>BAR D</th>
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<td>3'-9&quot;</td>
<td>3'-3&quot;</td>
<td>#5 at 13 1/2&quot;</td>
</tr>
<tr>
<td>10'-0&quot;</td>
<td>5&quot;</td>
<td>4'-0&quot;</td>
<td>3'-9&quot;</td>
<td>#4 at 10 1/2&quot;</td>
</tr>
<tr>
<td>12'-0&quot;</td>
<td>5&quot;</td>
<td>4'-3&quot;</td>
<td>4'-0&quot;</td>
<td>#3 at 11&quot;</td>
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<tr>
<td>14'-0&quot;</td>
<td>5&quot;</td>
<td>4'-6&quot;</td>
<td>4'-0&quot;</td>
<td>#3 at 10 1/2&quot;</td>
</tr>
<tr>
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<td>5&quot;</td>
<td>5'-0&quot;</td>
<td>4'-3&quot;</td>
<td>#2 at 9 1/2&quot;</td>
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<td>18'-0&quot;</td>
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<td>5'-3&quot;</td>
<td>5'-0&quot;</td>
<td>#2 at 8 1/2&quot;</td>
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<td>5'-3&quot;</td>
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<td>5'-9&quot;</td>
<td>#2 at 8 1/2&quot;</td>
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</table>

### Notes:
1. Wall to be designated Noise Wall Type 8A, 8B, 8C, or 8D. The contract specifies actual wall designations.
2. For intermediate wall heights, use the next higher H.
3. Panels shall have at least 3' - 0" of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet maximum.
5. All joints shall be in full contact and sealed.
6. The contract specifies actual foundation requirements D1 or D2.
NOTES
1. Wall to be designated Noise Barrier Type 9A, 9B, 9C or 9D. The Contract specifies actual wall designation.
2. For intermediate wall heights, use the next higher H.
3. Panels shall have at least 3'-0" of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet maximum.
5. All joints shall be in full contact and sealed.

D-2i
03-14-97

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

NOTE: Transverse bars not shown

NOISE BARRIER - TYPE 9
PRECAST CONCRETE WALL WITH SPREAD FOOTING
NOTES:
1. Wall to be designated Noise Barrier Type 10A, 10B, 10C or 10D. The contract specifies actual wall designation.
2. For intermediate wall heights, use the next higher H.
3. Panels shall have at least 3'-0" of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet maximum.
5. All joints shall be in full contact and sealed.
**FOOTING WIDTH TRANSITION DETAIL**

(for locations without footing step)

NOTE: Transverse bars not shown.

**NOISE BARRIER - TYPE 10**

PRECAST CONCRETE WALL WITH OFFSET SPREAD FOOTING
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<th>DIMENSION (Inches)</th>
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<td>9/2&quot;</td>
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</table>

**OPTIONAL ANGLE POINT**

**NOISE BARRIER - TYPE II**

PRECAST CONCRETE WALL ON SHAFT FOUNDATION

**D-2k 03-14-97**
Typical Section

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

Elevation

Panel shall be braced laterally to prevent displacement during backfill.
**NOISE BARRIER - TYPE 13**

**PRECAST CONCRETE WALL WITH TRAFFIC BARRIER ON SPREAD FOOTING**

---

**EFFECTIVE:** AUGUST 2, 2004 TO APRIL 3, 2006

---

See Contract

- Reinforcing steel Bar D (centered on wall)
- Alternate sides
- Surface treatment
- 3/4" Chamfer
- No. 4 Place as shown
- At 3 equal spaces
- See detail B
- W 3.0 Wire spirals of pitch
- 2.5" at 18"

**PRECAST PANEL TO BE PLACED VERTICAL**

- Grout hole with duct
- Ducts are to exit opposite side from traffic
- 2.0 x 2.0" hole for Bar E and J (see detail B)
- #4 Place as shown
- Bar J
- 3" Clearance

**ELEVATION**

- Panel width
- 15'-0" MAX
- Level (Typ)
- See Note 4

---

**NOTES**

1. Wall to be designated Noise Wall Type 11A, 11B, 13C or 13D. The Contract specifies actual wall designations.

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

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

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

5. All joints shall be in full contact and sealed. The Contract specifies actual foundation requirements 51 or 62.
1. Wall to be designated Noise Barrier Type 15A, 15B, 15C or 15D. The Contract specifies actual wall designations.

2. For intermediate wall heights not listed use the next higher.

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

4. Plywood and Glulam panels at timber wall to be pressure preservative treated.

5. The Contractor shall specify actual foundation requirements D1 or D2.
NOISE BARRIER - TYPE 16
MASONRY WALL
ON TRENCH FOOTING

**TYPICAL SECTION**

**TYPICAL SECTION**

1. Wall to be designated Noise Barrier Type 16A, 16B, 16C or 16D. The Contract specifies actual wall designations.
2. For Intermediate wall heights, use the next higher H.
3. All masonry shall be of low unit and installed as running bond.
4. All masonry is to be specially inspected.
5. All concrete Masonry Unit (CMU) cells that have vertical steel reinforcing bars or bond beam units shall be filled with grout.
6. Panels shall have at least 3 feet of level ground on each side.
7. Construction joints in the footing shall be spaced at 120 feet maximum.
8. See "Masonry wall Finishes and Details" sheet for masonry block finishes, special shapes, sizes and layouts.

**NOTES**

- Expansion joints at 40'-0" MAX centers. See other sheets for locations.
- Construction joints (see Note 7). Separate from wall joints.
- For reinforcement details, see wall schedule.

---

**Effective:** August 2, 2004 to April 3, 2005

---

**D-2p**

03-14-97
TYPICAL EXPANSION JOINT

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

*5 (Typ)
See Detail A

Right-of-way side

Traffic side

BOND BEAM DETAIL

Bond beam unit

Bond beam limit

Bond beam limit

NOISE BARRIER - TYPE 16
MASONRY WALL ON TRENCH FOOTING

Polyurethane sealant
Backer rod

⅛" Joint

Typical both sides of wall
<table>
<thead>
<tr>
<th>Bar Size</th>
<th>Splice Length</th>
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<td>3'-6&quot;</td>
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<tr>
<td>#8</td>
<td>4'-10&quot;</td>
</tr>
</tbody>
</table>

**BOND BEAM DETAIL**

- Bond beam units
- Bond beam limit

**TYPICAL EXPANSION JOINT**

- Expansion joint filler placed in sawn block recesses.
- Traffic side
- See Detail A

**FOOTING WIDTH TRANSITION DETAIL**

(For locations without footing step)

- 3" Clearance (Typ)
- 1'-0" MIN (Typ)

**NOTE:** Transverse bars not shown

**NOISE BARRIER - TYPE 1B**

- Masonry wall on offset spread footing

**D-2r 03-14-97**
### NOISE BARRIER - TYPE 19

**MASONRY WALL ON SHAFT WITH GRADE BEAM FOUNDATION**

#### EFFECTIVE: AUGUST 2, 2004 TO APRIL 3, 2005

**NOTES:**
1. Wall to be designated "Noise Barrier Type 19A, 19B, 19C, or 19D. The Contract specifies actual wall designations.
2. For intermediate wall heights, use the next higher H.
3. All masonry shall be hollow unit and installed as running bond.
4. All masonry is to be specially inspected.
5. All Concrete Masonry Unit (CMU) cells have vertical steel reinforcing bars or bond beam 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 footing shall be spaced 120 feet maximum.
8. See "Masonry Wall Finishes and Details" sheet for masonry block finishes, special shapes, sizes and layouts.

#### SECTION A-A

- **Spiral reinforcement shall be capped 17" MIN.**
- **135° hook that is hooked around a longitudinal bar shall be used to terminate the ends of the spiral reinforcement at capped splices and at the top and bottom at shaft.**

#### D-2s

03-14-97
**ACCESS DOOR - TYPE 2**

**PRECAST CONCRETE WALL WITH TRAFFIC BARRIER ON SHAFT FOUNDATION**

**ELEVATION**
- 5' x 11'-0" (TYP)
- Install door hinges - three locations
- 6' x 11'-0" (TYP)
- 1½" Clearance (TYP)
- 1'-0" MAX opening
- Install galvanized hasp type lock which will accommodate state furnished lock on roadway side
- Elevations to match top of final ground line

**SECTION A-A**
- Bend wall reinforcement
- 1½" Chamber
- ½" anchor
- Concrete
- Bend wall reinforcement
- Top of shaft of equal elevations both sides

**SECTION B-B**
- Bend wall reinforcement
- 4'' 4'-0" MAX Center in panel
- Grout metal frame
- Noise wall
- Traffic barrier

See Standard Plan, "Noise Barrier Type 14, Concrete Wall with Traffic Barrier on Shaft Foundation"
**Access Door - Type 5**

**Cast-In-Place Wall with Traffic Barrier**

---

**Elevation**

- Install galvanized hinge type lock which will accommodate state furnished lock on roadway side.
- Install door hinges - three locations:
  - 5' x 4'-0" (TYP)
  - 1½" Clearance (TYP)

**Concrete Wall**

- Bend wall reinforcement:
  - See Standard Plan, "Noise Barrier Type 6, Cast-In-Place Concrete Wall with Traffic Barrier on Spread Foundation".

**Section A-A**

- Bottom of doorway:
  - 4'-0" x 7'-0"

**Section B-B**

- Bend wall reinforcement:
  - 4" MAX Center in panel

**Access Door**

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

---

**Specifications Table**

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**Dimensions**

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<tbody>
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</table>

**Notes**

- Bend Type 50
- Bend Type 90
- Bend Type 120
## Geosynthetic Reinforcement Spacing and Strength

### Geosynthetic Reinforcement Length and Dowels

<table>
<thead>
<tr>
<th>Total Wall Height (H)</th>
<th>PARQ0 Footing Width (B) (ft)</th>
<th>Geosynthetic Reinforcement Length (L) (ft)</th>
<th>Geosynthetic Dowels Required of 6&quot; Dowel (H)</th>
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<tbody>
<tr>
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<tr>
<td>8 ft</td>
<td>5.5</td>
<td>6.0</td>
<td>5.5</td>
</tr>
<tr>
<td>9 ft</td>
<td>4.5</td>
<td>6.0</td>
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</tr>
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<tr>
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<tr>
<td>12 ft</td>
<td>1.5</td>
<td>6.0</td>
<td>1.5</td>
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</table>

### Total Reinforcement Spacing

<table>
<thead>
<tr>
<th>Depth Below Top of Bunching (D) (ft)</th>
<th>Geosynthetic Vertical Spacing (L) (ft)</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>0.75</td>
</tr>
<tr>
<td>3</td>
<td>1.50</td>
</tr>
<tr>
<td>4</td>
<td>2.25</td>
</tr>
<tr>
<td>5</td>
<td>2.75</td>
</tr>
</tbody>
</table>

### Long-Term Geosynthetic Reinforcement Strength Required (t, lb/ft)

<table>
<thead>
<tr>
<th>Total Wall Height (H)</th>
<th>Geosynthetic Dowels Required (H)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type 1</td>
</tr>
<tr>
<td>5 ft</td>
<td>0.75</td>
</tr>
<tr>
<td>6 ft</td>
<td>1.50</td>
</tr>
<tr>
<td>7 ft</td>
<td>2.25</td>
</tr>
<tr>
<td>8 ft</td>
<td>3.00</td>
</tr>
<tr>
<td>9 ft</td>
<td>3.75</td>
</tr>
</tbody>
</table>

### Notes

- The long-term geosynthetic design strength of 1st shall be determined in accordance with WSDOT standard practice. See qualified products list for products matching the long-term design strength.
- The distance from the top of the wall to the required depth of reinforcement is determined by the requirements of the design.
- Geosynthetic lengths are required based on the requirements of the design.
- The reinforcing length is based on the requirements of the design.
- Geosynthetic dowels are required based on the requirements of the design.
- The geosynthetic reinforcement spacing is based on the requirements of the design.
- The long-term geosynthetic reinforcement strength is based on the requirements of the design.
1. SET FORM ON COMPLETED LIFT.

2. UNROLL GEOSYNTHETIC AND POSITION IT SO THAT 4-6" WIDE "TAIL" OVERLIES THE FORM. IF A GOOD SEAL IS NEEDED FOR THIS GEOSYNTHETIC REINFORCEMENT, POSITION GEOTEXTILE TO PREVENT BACKFILL FROM ENTERING THROUGH SEAM OR OPENING.

3. PLACE THE BACKFILL UNTIL THE BACKFILL IS UP TO HAlF OF THE REQUIRED VERTICAL GEOSYNTHETIC LAYER SPACING.

4. PLACE A MANORON TO SUBSTANTIALLY GREATER THAN FULL LIFT HEIGHT AGAINST THE FORM.

5. PLACE THE GEOSYNTHETIC "TAIL" OVER THE MANORON AND LOCK INTO PLACE WITH BACKFILL.

6. COMPLETE BACKFILLING UNIL THE COMPACTED BACKFILL LAYER THICKNESS IS EQUAL TO THE REQUIRED VERTICAL GEOSYNTHETIC LAYER SPACING.

7. THE FORM MAY BE LEFT IN PLACE WHILE CONSTRUCTING THE NEXT LAYER (SEE NOTE 3). OTHERWISE, REMOVE THE FORM AND REPEAT THE IRRIGATION.

GEOSYNTHETIC WALL CONSTRUCTION SEQUENCE

(Section View)

NOTES:

1. USE OF THE TEMPORARY FORM SYSTEM, AS DETAILED IN THIS PLAN, IS OPTIONAL.

2. TO HELP MAINTAIN THE WALL FACE STRAIGHT, LEAVE THE FORM SYSTEM FOR THE PREVIOUS LAYER IN PLACE WHILE CONSTRUCTING THE NEXT LAYER. AFTER THE LAYERS ARE COMPLETE, REMOVE THE FORM SYSTEM FROM THE LOWER LAYER AND REINSTALL IT FOR THE NEXT LAYER. SEE BELOW.
CONDITION A

CONDITION B

ALTERNATE DETAIL

BACKFILL AND DRAINAGE
FOR RETAINING WALLS
STANDARD PLAN D-4

NOTES

1. SEE CONTRACT FOR BACKFILL LIMITS AND GEOTEXTILE CLASSES.

EXPRES JANUARY 17, 1999

APPROVED FOR PUBLICATION
Clifford E. Mansfield
12/11/98

TYPICAL FOR CONSTRUCTION WITH SHOTING.
**TYPE 1 ANCHOR**
(for use in earth)

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

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

**NOTE:**
1. Two turn bowl wire rope clips at 3" centers may be substituted for three unbolted wire rope clips shown.

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

---

**STANDARD PLAN D-7a**

---

**WIRE MESH SLOPE PROTECTION**

---

**SECTION A-A**

---

**EFFECTIVE:** AUGUST 2, 2004 TO APRIL 3, 2005

---

**EFFECTIVE:** AUGUST 2, 2004 TO APRIL 3, 2005

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**EFFECTIVE:** AUGUST 2, 2004 TO APRIL 3, 2005

---

**EFFECTIVE:** AUGUST 2, 2004 TO APRIL 3, 2005

---

**EFFECTIVE:** AUGUST 2, 2004 TO APRIL 3, 2005

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

Concrete Slope Protection
Embankment slope 1/8" 3/4" 1/8" 3/4"

SECTION

SECTION

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

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

This side may be poured against undisturbed soil.

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

Slope protection follows bottom of ditch.

SIDE ELEVATION
(For cut section on lower roadway)

See Type 2 Slope Protection Cut Section Detail

SIDE ELEVATION
(For fill section on lower roadway)

See Type 1 Slope Protection Fill Section Detail

*Calculated toe of fill slope

*Fill slope shall be rounded to allow placement of concrete slope protection.
NOTES:
1. The design and shape of the semi-open concrete masonry unit shown is only an example of the products that may be used.
2. The Type 3 Slope Protection Curb Detail shall be used only when the lower roadway cross section requires a curb.

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

OPEN SPACE

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

1. Dimensions and tolerances 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 planking shall be untreated Douglas fir and shall be driven to develop a minimum load bearing capacity of 15 tons.
4. Blocking for frame bent 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 4" spikes, number 1 or larger.
7. On 17' spans, stringers shall be 6x16 S1S. On 15' spans, stringers shall be 6x16 S1S.
8. Two lane bridges shall use thirteen times of stringers, single lane bridges shall use seven times of stringers.
9. Overlay thickness must be sufficient to cover bolts.

SECTION A-A

DISTRIBUTION PLATE DETAIL

BASE PLATE DETAIL

PILE OR FRAME DETOUR BRIDGE WITH ASPHALT OVERLAY
USE ONLY FOR TEMPORARY BRIDGES

STANDARD PLAN E-2
SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION

Brian Ziegler
STATE DESIGN ENGINEER
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

5/29/98

EXPIRES JANUARY 17, 999

BY M. MINT LIAN
STATE PROFESSIONAL ENGINEER

EFFECTIVE: AUGUST 2, 2004 TO APRIL 3, 2005
### Pile Details

1. Place lifting loops at the lifting points shown in the FILE HANDLING DIAGRAM. Standard Plan E-64, for the case stated in the contract.
2. Stairs shall be applied either by lapping one turn and bending the end of the spiral to a 135° series hook, by welding, or by use of a mechanical connector that develops 125% of the minimum yield strength of the spiral. Welding shall meet the requirements of Standard Specification 9-02.3.4.2(E).
3. All prestressing strands are 1/8” or 0.894” diameter (d₁). Grade 770, uncoated strand, AASHTO M229, plus to 0.75 psi maximum.
4. Strength of concrete shall be 6.0 ksi at release and 7.0 ksi at first.
5. 2 1/2” cover if pile is exposed to salt water.

### Typical Sections

- **Square**
- **Octagonal**

### Spiral Reinforcement

- **Embedded Bar**
  - 1/8” Diam. 3/4” W 25/32” L
- **Plan Steel Bar**
  - 1/8” Diam. W 32/32” L
- **Cold Drawn Wire**
  - 1/8” Diam. 32/32” L
- **Deformed Bar**
  - 1/8” Diam. 32/32” L
- **Wild Dimensions**
  - 32/32” L

### Notes

1. Place lifting loops at the lifting points shown in the FILE HANDLING DIAGRAM. Standard Plan E-64, for the case stated in the contract.
2. Stairs shall be applied either by lapping one turn and bending the end of the spiral to a 135° series hook, by welding, or by use of a mechanical connector that develops 125% of the minimum yield strength of the spiral. Welding shall meet the requirements of Standard Specification 9-02.3.4.2(E).
3. All prestressing strands are 1/8” or 0.894” diameter (d₁). Grade 770, uncoated strand, AASHTO M229, plus to 0.75 psi maximum.
4. Strength of concrete shall be 6.0 ksi at release and 7.0 ksi at first.
5. 2 1/2” cover if pile is exposed to salt water.
**RING AND COVER**

- **Top View**
  - 1" Rib (Typ)
  - Integral cast pocket
  - Lift handle
  - ¾" - 10 x 2½" hex head bolt thread 1½"
  - 2"-3"
  - #3 Rebar (Typ) each rib
  - Drill and tap ring for ¾" NC

- **Section A-A**
  - Top of concrete segmental slab
  - 1'-6½" Dia
  - 3½" Dia (Typ)
  - 3½" Dia (Typ) equally spaced.

**MANHOLE COVER**

- **Top View**
  - Bolt cover
  - 1½" Cover
  - 2½" Cover

- **Section C-C**
  - See detail E
  - 1¼" hole
  - 1½" hole

- **Bottom View**
  - 1½" Dia
  - 1½" Dia
  - 2½" R
  - 6" Dia

**DETAIL D**

- Machined V projection in cover
- ½" x ¾" Neoprene recessed gasket

**DETAIL E**

- (Turned 90°)
- ¾" Dia
- ¾" Dia

**SECTION B-B**

- 2½" Dia
- 2½" Dia
- 3½" Dia

*NOTE: Approximate weights:
- Ring: 173 lbs
- Cover: 123 lbs
- Total: 296 lbs*
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.

Note: Scuppers to be provided at intervals as required by the Engineer.
NOTES
2. Type 4a and Type 5a curbs do not require steel tie base or extensions for anchoring.
3. The installation of curb in areas with existing Guardrail could require the removal and replacing of the Guardrail or its components.
SIDewalk RAMP TYPE 1A
PLAN

SIDewalk RAMP TYPE 1B
PLAN

SIDewalk RAMP TYPE 1C
PLAN

SIDewalk RAMP TYPE 1D
PLAN

NOTES:
1. Avoid placing drainage structures, junction boxes or other obstructions in front of ramp access areas.
2. Detectable warning patterns may be created by any method that will achieve the truncated dome dimensions and spacing shown.
3. Curb and gutter shown, see the Contract Plans for the curb design specified. See Std. Plan F-1 for curb details.
4. The plan views for SIDewalk RAMP TYPES 1A, 1B, 1C & 1D are provided to define each ramp type. See the RAMP DETAIL on this sheet. See Fig. Plan F-3 for sidewalk joint placement and details.
5. Ramp slopes shall not be steeper than 1:12 H:V.

EXPRESS MAY 31, 2003

SIDewalk RAMP
TYPES 1A, 1B, 1C & 1D
STANDARD PLAN F-3a
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Herman J. Peterson 01-30-03
Washington State Department of Transportation
NOTES:
1. Avoid placing drainage structures, junction boxes or other obstructions in front of ramp access areas.
2. Detachable warning patterns may be created by any method that will achieve the truncated cone dimensions and spacing shown.
3. Curb and gutter shown, see the Contract Plans for the curb design specified. See Std. Plan F-1 for curb details.
4. See Std. Plan F-3 for sidewalk joint placement and details.
5. Ramp slopes shall not be steeper than 1:12:1:1.
NOTES:
1. Nut 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 breakaway and do not have holes or notches. These posts shall not be installed within the Design Clear Zone. They can be installed behind traffic barrier.
3. Signs with a width less than 17 feet and supported on three 8" x 10" or 8" x 12" posts shall not be installed in the clear zone.
4. Signs with a width less than 17 feet and supported on four 8" x 10" or 8" x 12" posts shall not be installed in the clear zone.

<table>
<thead>
<tr>
<th>POST INSTALLATION TABLE</th>
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<tbody>
<tr>
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<td>4 x 8</td>
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<tr>
<td>5 x 6</td>
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<tr>
<td>5 x 8</td>
</tr>
<tr>
<td>6 x 10</td>
</tr>
<tr>
<td>6 x 12</td>
</tr>
</tbody>
</table>
MAINTENANCE WALKWAY INSTALLED ON MONOTUBE OVERHEAD SIGN STRUCTURE

(AWALKWAYS MAY BE USED WITH OTHER LAYOUTS THAN THAT SHOWN ABOVE)

NOTES:
1. NOT INTENDED FOR USE IN FRONT OF STATIC SIGN.
2. FOR MAINTENANCE WALKWAY, RAILING, SAFETY, AND TOE PLATE DETAILS, SEE STANDARD PLAN 0-0a.
3. USE TWO LANYARDS THROUGH INTERMEDIATE WIRE ROPE SUPPORT.
4. SEE SHEET 2 FOR BRACKET DETAILS.
FALL RESTRAINT BRACKET INSTALLATION ON NEW MONOTUBE SIGN STRUCTURE

MAINTENANCE WALKWAY MOUNTING FOR MONOTUBE OVERHEAD SIGN STRUCTURE

STANDARD PLAN 0-0a

Sheet 2 of 3 SHEETS

APPROVED FOR PUBLICATION

Harold J. Peterson  08-27-03
Washington State Department of Transportation
ELEVATION

MAINTENANCE WALKWAY INSTALLED ON TRUSS-TYPE OVERHEAD SIGN STRUCTURE

1. NOT INTENDED FOR USE IN FRONT OF STATIC SIGN.
2. FOR MAINTENANCE WALKWAY, RAILING, ENTRANCE, AND TOE PLATE DETAILS, SEE STANDARD PLAN 0-9
3. USE TWO CABLES THROUGH INTERMEDIATE WIRE ROPE SUPPORT.
4. WIRE ROPE MAY BE USED FOR MAINTENANCE PURPOSES AS WELL AS WIRE ROPE SUPPORT.

ALL BoltS: STU SPEC. S111 A111 T111 (TYP. 5/16)
NOTES:
1. Mileposts of the type specified shall be placed as shown hereon. If conditions preclude placement at the correct location, the mileposts may be moved as much as 50' in either direction, mileposts that cannot be placed within this degree of accuracy shall be omitted entirely.
2. Mileage for mileposts shall commence at the south or west terminus of the highway route and progress in a north or east direction.
3. All Spur and Equation signs shall have "S" and "B" plaques.
4. Mileposts in cut sections shall be placed at back of ditch. Milepost markers may be placed up to 30' from the edge of the traveled way.
5. See "Washington State Sign Fabrication Manual" for the dimensions and colors of the Milepost/Plaque.

PLACEMENT OF MILEPOST AT CUT SECTION

PLACEMENT OF MILEPOST AT FILL SECTION
**TYPE 2A BASE CONNECTION DETAIL**

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

**BOSS E OFFSET TABLE**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Offset Value</th>
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<tbody>
<tr>
<td>When ( Z &gt; 0 \leq 10 )</td>
<td>0.0875&quot;</td>
</tr>
<tr>
<td>When ( Z &gt; 10 \leq 14 )</td>
<td>0.0525&quot;</td>
</tr>
<tr>
<td>When ( Z &gt; 14 \leq 15 )</td>
<td>0.0375&quot;</td>
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</table>

**SHIM DETAIL - TYPE 2A**

Use no more than two shims per anchor coupling.

**ANCHOR FERRULE DETAIL - TYPE 2A**

Shims shall be 14 gauge or 18 gauge.

**COUPLING BOLT DETAIL - TYPE 2A**

Use no more than three shims for any two anchor couplings.
### Dimension Table for Type 2B Bases

<table>
<thead>
<tr>
<th>Post Size</th>
<th>Anchor Ferrule Spacing</th>
<th>Keyway Offset</th>
<th>K Distances are</th>
<th>Bracket Width</th>
<th>Hole Dia</th>
<th>Spacing</th>
<th>Fasteners</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>K = .200”</td>
<td>K = .150”</td>
<td>K = .100”</td>
<td>9”</td>
<td>1”</td>
<td></td>
</tr>
<tr>
<td>W5x9</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>W6x12</td>
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<td></td>
<td></td>
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<td>W6x16</td>
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<td></td>
<td></td>
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<tr>
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<tr>
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<td></td>
</tr>
</tbody>
</table>

- **Shims:** shall be 14 gage or 18 gage
- **Shim Detail - Type 2B**
  - Use no more than two shims per anchor coupling.
  - Use no more than three shims for any two anchor couplings.

### Type 2B Foundation Detail

- **Anchor Ferrule Spacing:**
  - See Dimension Table for anchor ferrule spacing.

- **Bracket Detail - Type 2B**
  - 1/8” R

- **Coupling Bolt Detail - Type 2B**
  - L keyway
  - 1/8” R

- **Anchor Coupling Detail - Type 2B**
  - 3/4” R

### Roadside Sign Structures

#### Steel Post Signs

- **Standard Plan G-8a**
- SHEET 3 OF 3 SHEETS

---

**Date:**

EXPRESS JUNE 29, 2020

**Approved for Publication:**

Clifford E. Mansfield

10/08/99

**Washigton State Department of Transportation**
NOTES:
1. 1 1/2" x 6 1/2" hex bolt, nut & washer; drill 5/8" hole in sign post.
2. Use a 5/16" x 1" square head bolt with full threads in slot. The bolt head must not turn in the slot.
3. Install the medium nylon washer against sign base to prevent scratching. Use the medium sized steel washer between the nylon washer and the 5/16" galvanized steel or aluminum fastening hex head nut.

MATERIALS:
- Steel Pipe
- Steel Keeper Plate
- Upper Sleeve Base
- Base Plate
- Split Shaft Collar
- Pipe Clamp
- U-Bolts, Nuts, and Washers

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Mat No.</th>
<th>Grade</th>
<th>Supplier</th>
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<tbody>
<tr>
<td>Steel Pipe</td>
<td>ASTM A500 Gr. B or ASTM A53 Gr. B</td>
<td>A-100</td>
<td>AASHTO M11</td>
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<tr>
<td>Steel Keeper Plate</td>
<td>ASTM A500 Gr. B or ASTM A53 Gr. B</td>
<td>A-100</td>
<td>AASHTO M11</td>
</tr>
<tr>
<td>Upper Sleeve Base</td>
<td>ASTM A500 Gr. B or ASTM A53 Gr. B</td>
<td>A-100</td>
<td>AASHTO M11</td>
</tr>
<tr>
<td>Base Plate</td>
<td>ASTM A500 Gr. B or ASTM A53 Gr. B</td>
<td>A-100</td>
<td>AASHTO M11</td>
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<tr>
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<td>A-100</td>
<td>AASHTO M11</td>
</tr>
<tr>
<td>Pipe Clamp</td>
<td>ASTM A500 Gr. B or ASTM A53 Gr. B</td>
<td>A-100</td>
<td>AASHTO M11</td>
</tr>
<tr>
<td>U-Bolts, Nuts, and Washers</td>
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<td>AASHTO M11</td>
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<td>TYPE WW</td>
<td>TYPE Y</td>
<td>TYPE YY</td>
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<tr>
<td>![image]</td>
<td>![image]</td>
<td>![image]</td>
<td>![image]</td>
</tr>
</tbody>
</table>

**NOTES**

1. When guardrail runs concurrent, 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 3/8" lag screws with washers along perimeter of post. Also acceptable is any approved method submitted by the guardrail post manufacturer.

3. When concrete barrier runs concurrent, the contractor shall mount barrier delineators where guide posts are required.

---

**Flexible Guide Post**

**GUIDE POSTS**

**STANDARD PLAN H-1**

Sheet 1 of 1 sheet

**APPROVED FOR PUBLICATION**

Harold J. Petersen  01-10-02

Washington State Department of Transportation

APPROVED:

Washington State Department of Transportation

**EFFECTIVE: AUGUST 2, 2004 TO APRIL 3, 2006**
LEGEND

1. See plans for guide post requirements between interchanges.
2. Guide posts shall be placed at 100 on ramps, tangents and tapers.
3. "F" dimension shown on standard plan H-1a or 100, whichever is smaller.
4. One half of "F" dimension shown on standard plan H-1b or 50, whichever is smaller.
5. Two spaces at 100.
6. Three equal spaces when R < 75; four equal spaces when R > 75.
7. Two equal spaces.
GUIDE POST SPACING (FEET)

<table>
<thead>
<tr>
<th>RADIUS (FEET)</th>
<th>E</th>
<th>RADIUS (FEET)</th>
<th>G</th>
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</thead>
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</tr>
<tr>
<td>500</td>
<td>200</td>
<td>10,200</td>
<td>470</td>
</tr>
<tr>
<td>550</td>
<td>220</td>
<td>11,000</td>
<td>470</td>
</tr>
<tr>
<td>600</td>
<td>240</td>
<td>11,800</td>
<td>510</td>
</tr>
<tr>
<td>650</td>
<td>260</td>
<td>12,600</td>
<td>510</td>
</tr>
<tr>
<td>700</td>
<td>280</td>
<td>13,400</td>
<td>510</td>
</tr>
</tbody>
</table>

Interpolate from this table for rages not shown.

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

NOTES
1. The first guide post is positioned 5 feet distance from the beginning of curvature.
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.
4. For definitions of post types, see Standard Plan H-1.

GUIDE POST PLACEMENT FOR HORIZONTAL CURVES
STANDARD PLAN H-1c
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Harold J. Pettersen 01-10-02
State Traffic Engineer
Washington State Department of Transportation

LEGEND
○ TYPE W
○ TYPE V
△ TYPE X

WASHINGTON STATE PROFESSIONAL ENGINEER

EXPIRES OCTOBER 26, 2002
Stripes on the barricades shall slope downward in the direction traffic is to pass.

Road closure at intersection.

Road closure at other locations.
NOTES:

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

MULTILANE ONE WAY TRAFFIC

M-1. For lane lines, Type 2W RPM's shall be spaced at 80'-0" intervals on tangents and horizontal curves with a radius of 5000'-0" or more, and 40'-0" intervals on horizontal curves having radii of less than 5000'.

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

TWO LANE TWO WAY TRAFFIC

T-1. For center lines, Type 2YY RPM's shall be spaced at 80'-0" intervals on tangents and horizontal curves with a radius of 5000'-0" or more, and 40'-0" intervals on horizontal curves having radii of less than 5000'. Type 2YY RPM's are to be centered between skip lines.
Pavement markings may be curved here as shown to allow continuous painting by the striping machine.

Deceleration taper

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

20' RPM spacing for decel, taper

40' RPM spacing

Type YY RPMs 10' O.C.

Double yellow center line

See "Alternate Line Detail"

Two-way left turn lane

Inside edge of lane

Type 2Y RPMs see Note 5

Type 2Y RPMs see Note 5

Type 2Y RPMs see Note 5

5' to 10'

4'

2.5 Width

2.5 Width

Pavement Marking Details

STANDARD PLAN H-3a

Clifford E. Mansfield 6/23/06

APPROVED FOR PUBLICATION
NOTE
Rumble strips are not installed in certain reduced-width shoulder locations. See the SHOULDER TAPER DETAIL on Standard Plan H-4.

SECTION A

SECTION B

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

UNDIVIDED HIGHWAY
(TYPE 4 PATTERN SHOWN)

PERSPECTIVE VIEW

TYPICAL SHOULDER INSTALLATION

BIMETRIC VIEW

REMANED WAY
SINGLE LANE ON CONNECTION

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

SINGLE LANE OFF CONNECTION

SINGLE LANE OFF CONNECTION
FOR ONE LANE REDUCTION
NOTES:

Where indicated on the plans or special provisions, raised pavement markers shall be used to supplement or substitute for painted pavement markings.
NOTES
1. See Standard Plan H-3a for Pavement Marking Details.
2. Dotted Extension Line shall be the same color as the line it is extending.
3. Double Yellow Center Line spacing 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.
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.

LEGEND:
J Distance from slope stake to slope treatment stake, measured on natural ground slope.
K Distance from slope stake to lower limit of slope treatment, measured down face of cut slope.
H Difference in elevation between finished shoulder grade and slope stake.
D Difference in elevation between slope stake and slope treatment stake.
Z Depth of slope treatment or slope stake as determined by a straight line between the midpoints of J and K.
S Horizontal distance per foot cut for the slope under consideration.

(Treatment in Shallow Cuts)
See Note 3

VALUES OF Z (feet)
For Class A Slope Treatment

\[ Z = \frac{K^2 + (J/2)^2 + (DKS/4)}{2(J/2)} \]

In this equation the term \( DK5/4 \) is positive when the slope treatment stake is lower than the slope stake (descending ground); and negative when the slope treatment stake is higher than the slope stake (ascending ground).

<table>
<thead>
<tr>
<th>CUT SLOPE</th>
<th>J</th>
<th>K</th>
<th>J and K</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:1</td>
<td>7'</td>
<td>5'</td>
<td>5'</td>
</tr>
<tr>
<td>3:1</td>
<td>7'</td>
<td>5'</td>
<td>5'</td>
</tr>
<tr>
<td>2:1</td>
<td>7'</td>
<td>9'</td>
<td>5'</td>
</tr>
<tr>
<td>1.75:1</td>
<td>7'</td>
<td>12'</td>
<td>5'</td>
</tr>
</tbody>
</table>
POST BASE DETAIL

SLAB AND GRADING SECTION

#4 BAR AT EACH POST

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

CEMENT CONCRETE STAIRWAY
CONSTRUCTION DETAILS
STANDARD PLAN H-10

TREAD SHAPE DETAIL

Concrete Class 4000 (Typ)

Grade line

1/2" keyed, premolded joint filler (Typ)

Grade point

1/2" Schedule 40 pipe railing

1/2" R MAX

1/2" at 10 1/2" MAX

See contract

See contract

1/4" tread

Note: The plan sheet is a legal engineering document and is for informational purposes only. Washington Department of Transportation and its contractors will not be responsible for errors or omissions. Any dispute arising from the plan will be resolved by visual measurement. Always verify site conditions or further information in the project specifications and bid documents. Use actual construction practices. Use engineering judgment in field application. This plan sheet is not a contract document.
**Mailbox Placement Sections**

**Mailbox Spacing Detail**

**Type 1 Support**
- Steel post option
- Wood post option

**Type 2 Support**

**NOTES:**
1. An adjustable platform may be used in lieu of the platform design shown on this plan. Adjustable platforms must fit the bonded design shown on this plan. Baskets are required for single pole installations. Field drilling may be required.
2. A Type 2 support is required when 2 or more mailboxes are to be installed on one support. A minimum of 5 mailboxes may be installed on a Type 2 support. See bid spec 9-32.7.
3. Attach a newspaper box to a steel post with two 1/2" mini-clamps spaced 4" apart. Field drill 7/16" holes in the newspaper box to SL. Use 2 1/2" x 4/4 lag bolts to attach newspaper boxes to wood posts. Newspaper boxes must not extend beyond the front of the mailbox when the mailbox door is closed.
4. 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 platforms.
5. Center the mailbox on the platform to ensure space for the mailbox door to open and to allow space for installing the fixtures.
6. A setback and weather anchoring system may be substituted in lieu of the anti-twist plate assembly for single mail posts shown on this plan. The setback and weather anchoring system shall meet HICRP 366 green tear criteria. Anti-twist plates are not required for wood post installations.

**Mailbox Installation**

**Type 1 & Type 2 Standard Plan H-12**

**Effective:** August 2, 2004 to April 3, 2005

**Expiry Date:** May 6, 2003

**Appraiser:** Harold J. Peterson 05-09-02

**Washington State Department of Transportation**

**Approved for Publication Date:** 04/02/2002

**Classification Details:** NA

**Revision:** NA

**Page:** 1 of 5

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- **Mailbox Size:** Size 1, 1A, or 2 (Typ.)
- **Clamps Per Box:** 2 (Typ.)
- **Multiple Mailbox Support:** (See note 3)

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ALLOCATION STAKE
Stake every 100 feet on tangents,
every 25 feet on curves.

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

SLOPE LATH REFERENCES

SLOPE TREATMENT (ST) STAKES
FOR CUT SECTIONS

DAYLIGHT STAKE
Distance from Q to catch point
(2.17 feet)
Cut off ST Stake (2.88 feet)
Distance from Q to catch point
(23.5 feet)
Line stationing
Hundred foot increments

L LINE DESIGNATION
Line stationing
Hundred foot increments
Control point

CUT TO BACK OF DITCH (22.2 feet)
Distance from Q to catch (back of
ditch) (25.68 feet)
Slope Ratio (4:1)
Back of Ditch

SLOPE STAKE
Offset from slope stake
catch (11.23 feet)
Fill at RP stake
catch (11.23 feet)
Cut at Catch Point
(Back of Ditch)
Distance from Q
to Catch Point
Side Slope Ratio
Back of Ditch

STANDARD PLAN H-14
STAKING FOUNDATION FOR LUMINAIRES, SIGNALS OR SIGN STRUCTURES

STAKES FOR DITCH CONSTRUCTION

STAKES FOR DRAINAGE

STAKES FOR CURB/GUTTER

SLOPE STAKING CURB SECTION
Use lath instead of stake

STAKING COMPOUND SLOPES
Use lath instead of stake

STANDARD PLAN H-14
SHEET 3 OF 2 SHEETS

Gilaio E. Marshfield
04/23/04
Washington State Department of Transportation

EXPIRES MAY 1, 2009

STANDARD PLAN H-14
SHEET 3 OF 2 SHEETS

Gilaio E. Marshfield
04/23/04
Washington State Department of Transportation

EXPIRES MAY 1, 2009
### APPROXIMATE QUANTITIES

<table>
<thead>
<tr>
<th>Tank Capacity</th>
<th>Length</th>
<th>Concrete</th>
<th>Steel Reinforcement</th>
<th>Cast Iron Soil Pipe &amp; Fitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gals.</td>
<td>Ft.</td>
<td>Lbs.</td>
<td>Lbs.</td>
<td></td>
</tr>
<tr>
<td>6000</td>
<td>6</td>
<td>23</td>
<td>5500</td>
<td>471</td>
</tr>
<tr>
<td>8000</td>
<td>8</td>
<td>28</td>
<td>6000</td>
<td>471</td>
</tr>
<tr>
<td>10000</td>
<td>10</td>
<td>32</td>
<td>5400</td>
<td>471</td>
</tr>
<tr>
<td>12000</td>
<td>12</td>
<td>37</td>
<td>6300</td>
<td>471</td>
</tr>
<tr>
<td>14000</td>
<td>14</td>
<td>42</td>
<td>7100</td>
<td>471</td>
</tr>
</tbody>
</table>

### NOTES

1. Approval of local health department is required before work is started.
2. Excavated material 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. Materials shall meet or exceed those shown.
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.
NOTES

1. Maximize detention of stormwater by placing fence as far away from the toe of slope as possible without encroaching on sensitive areas or outside of the clearing boundary.

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 8-01.55(4) and 8-01.3(15).

SILT FENCE
STANDARD PLAN 1-4
\[\text{ELEVATION VIEW}\]

\[\text{SIDE VIEW}\]
NOTES
1. PREFABRICATION 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 SEAMLESS 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(15).

PLAN VIEW
(CROSS BRACES NOT SHOWN)

GEOTEXTILE
INLET

GEOTEXTILE FOR
TEMPORARY SILT FENCE
(SEE STD. SPEC. 8-33.2, TABLE 6)

COMPACTED NATIVE SOIL

BURRY GEOTEXTILE IN 4" X 4" TRENCH

POST (SEE STD. SPEC. 8-01.3(WA))

FLOW

ATTACH WOOD OR METAL CROSS BRACES TO STABILIZE POSTS

FASDEN CROSS BRACES TOGETHER WITH SCREWS, NAILS, NYLON TIES OR WIRE

ISOMETRIC VIEW
(ENTIRE FENCE NOT SHOWN FOR ILLUSTRATIVE PURPOSES)

BELT FENCE (INTD. PLAN 1-4)

SECTION A
NOTES

1. Perform maintenance in accordance with standard specification 8-01.016.

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.

PREFabricated Below Grate INLET DEVICE DETAILS
NOTES

1. INSTALL WATTLE ALONG CONTOURS (SEE STANDARD SPECIFICATION 0-01.5(10)).

2. WATTLE SHALL BE INSPECTED REGULARLY, AND IMMEDIATELY AFTER A RUNOFF PRODUCING RAINFALL, TO ENSURE THEY REMAIN THOROUGHLY ENTRANCED AND IN CONTACT WITH THE SOIL.

3. LIVE STAKES MAY BE USED FOR PERMANENT INSTALLATIONS.

4. PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATION 8-01.5(19).

5. INSTALL WATTLE ESUALLY INTO THE TRENCH, ALLOW ADJACENT WATTLE 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>
</thead>
<tbody>
<tr>
<td>1:1</td>
<td>10 FEET</td>
</tr>
<tr>
<td>2:1</td>
<td>20 FEET</td>
</tr>
<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 DAM SHALL MEET THE REQUIREMENTS OF STANDARD SPECIFICATIONS 8-01.3(5A) AND 8-14.8(4).

2. INSTALL THE SLOPE ENDS OF THE CHECK DAM A MINIMUM OF 6" 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 "Z" BOTTOM DITCHES.

4. PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATION 8-01.3(14).

DIG TRENCH APPROXIMATELY 6' WIDE AND DEEP, STAPLE END OF GEOTEXTILE AND BACKFILL WITH NATIVE MATERIAL.

ORIENT THE SEAM EDGE OF THE CHECK DAM TOWARD THE UPSTREAM SIDE.
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 6-01.303.
EFFECTIVE: AUGUST 2, 2004 TO APRIL 3, 2005

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 SPICED IN A CHECK SLOT.

3. SEE STANDARD SPECIFICATION 6-01-3(9).

EROSION CONTROL
BLANKET PLACEMENT
IN CHANNEL

STANDARD PLAN I-13

Sheets: 1 of 1 sheet

APPROVED FOR PUBLICATION

Harold J. Pomeroy  GT-37-53
Washington State Department of Transportation

STATE OF WASHINGTON
REGISTRATION NO. 98680

MARK W. MUIRER
REGISTERED LANDSCAPE ARCHITECT

EFFECTIVE: AUGUST 2, 2004 TO APRIL 3, 2005
SLIP/ANCHOR PLATES DETAIL
Smooth finish top, bottom, and notched surfaces

POLE BASE PLATE
Smooth finish top, bottom, and notched surfaces

SECTION B-B

1 1/4" hole with chamfered edges

PIECE WASHES

1 1/4" hole with chamfered edges

WALL OF POLE

1" MIN

TOWARD ROADWAY

SEE NOTE 5

KEEPER PLATE
Place between pole base plate and slip plate on top of middle washers.

STRAP TEMPLATE ASSEMBLY DETAIL
Place over anchor bolts (See Note 4)

2" x 1/2" x 15" bar

STEEL LIGHT STANDARD BASE DETAILS
STANDARD PLAN J-1b

CLIFFORD E. MANSFIELD
DEPUTY STATE DEPUTY ENGINEER

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION
10/08/99

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC REPLICA
OF THE ORIGINAL ISSUE BY THE AGENCY AND APPROVED FOR PUBLICATION AS OF THE DATE
AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED
UPON REQUEST.

NAME: CLIFFORD E. MANSFIELD
DEPUTY STATE DEPUTY ENGINEER
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
WASHINGTON, WASHINGTON

DATE: 10/08/99

SIGNATURE: CLIFFORD E. MANSFIELD
DEPUTY STATE DEPUTY ENGINEER
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
WASHINGTON, WASHINGTON

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC REPLICA
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UPON REQUEST.
SECTION C-C

1. Bolt threaded full length with two heavy hex nuts and two washers each. (Length = 4 1/2", plus thickness of pole base plate.)

2. 1/4", unless parapet face is vertical, then 1/2" is optional.

3. 3/8" thick preferred "Fabreka" fabric pad with 5/8" dia hole. Cement to flange plate and trim outside edge flush.

4. This surface shall be plane after fabrication.

5. See Contract Plans for slope of parapet face.

STEEL LIGHT STANDARD BASE DETAILS

STANDARD PLAN J-1b

SHEET 3 OF 3 SHEETS
KEY

1. Clamping Bolts, 3/8" DIA hex head bolt & nut, three plate washers, 60 ft-lbs torque, (three per slip base)
2. Threaded Slotted Stud, see SCHEDULE for DIA, hardened washer and heavy hex nut (four per base plate), insert stud and center punch at bottom end to lock tapped stud in place prior to galvanizing.
3. Keeper Plate  
4. Top Slip Plate
5. Grout exist, wrench
6. Pole Bolt existing
7. Bottom Slip Plate
8. New Grout Pad
9. Foundation Existing
10. Hardened Washer
11. Anchor Bolt Existing, hole to clear slip plate by 3/32" MIN.
12. 7/8" Fillet Weld
13. Heavy Hex Nut (typ)

ASSEMBLY DETAILS

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

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>Existing Base Type</th>
<th>Luminaires Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-2</td>
<td>1/4&quot; x 3/8&quot;</td>
<td>Cast Aluminum</td>
<td>30</td>
</tr>
<tr>
<td>A-3</td>
<td>7/32&quot; x 9/32&quot;</td>
<td>Steel Transformer</td>
<td>30</td>
</tr>
<tr>
<td>A-4</td>
<td>1/4&quot; x 3/8&quot;</td>
<td>2-Pc Aluminum</td>
<td>40</td>
</tr>
<tr>
<td>A-5</td>
<td>1/4&quot; x 3/8&quot;</td>
<td>2-Pc. Aluminum</td>
<td>40</td>
</tr>
</tbody>
</table>

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

NOTE: This shear plate is a production drawing. Document for Procurement and Construction is Copyrighted. Issuance of this document by the Washington State Department of Transportation is subject to the following conditions: A copy may be obtained upon written request to the Washington State Department of Transportation, Bridge and Structures Office.
Install sized reducing washer and connector to secure conductors at end of mast arm.

For Double Mast Arm, install additional cable and quick disconnects.

24" slack required to allow quick disconnects to be pulled outside handhole 6" min.

Conductor attachment bracket

Pole and bracket cable to lamp

Handhole

120 Pound tensile strength black cable tie

DETAIL A

WIRING DETAIL LIGHT STANDARD SLIP BASE

*Application for fixed base similar except no cable tie is required at junction box.
Galvanized steel mast arm - configuration varies with manufacturer

2. Luminaire - see Contract for type and number

3. Mounting height - roadway to luminaire elevation difference + 2", see Contract

4. Mast arm length - see Contract

5. 1/2" galvanized channel (single or double) with washers and nuts or eyelet

6. Bonding jumper

7. Pole and bracket cable


9. 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-3a.

10. Service wedge clamp

11. ACER triplex or quadruplex conductors - see Contract

12. Copper split bolt connector

13. Messenger cable

14. Insulating tape for waterproof connection

15. Fuse block - disconnect - use 30 amp fuses for high mast supports

16. Weatherhead - size as required

17. Steel conduit

18. 8" x 8" x 4" NEMA 3R junction box with rainproof hubs and removable cover

19. Grounding lug

20. 12 pole terminal block

21. Direct burial conductors or galvanized steel conduits with conductors - see Contract

22. Grounding bushing


24. Class 5 timber pole - length sufficient for mounting height and burial depth

25. Class 2 timber pole - length sufficient for mounting height and burial depth

26. 0" x 9" step bolt

27. 1/2" x 10" plate collar bent to fit pole diameter (8" - 10")

28. 1/4" x 4" machine bolts (four required) with washers and nuts

29. 1/4" lag bolts (six required) - drill 1/4" hole in plate

30. 2" pipe

31. 1/4" wire hole 2" from gusset plate, smooth hole edges

32. 1" nonmetallic conduit with 1/4" straps at code spacing

33. Distance varies, 35' MIN, 50' MAX, depending on line clearance requirements
**Metal Pole Installation**

**PPB-M**
(Pedestrian PushButton - Metal Pole)

3.374" W x 2.5" H x 0.75" D

**Wood Pole Installation**

**PPB-W**
(Pedestrian PushButton - Wood Pole)

2.5" W x 2.8125" H x 0.9375" D

**Cast Aluminum Conduit**

**Pedestrian Pushbutton Details**

**Key**

1. Pushbutton switch assembly
2. Cast metal housing
3. Protective collar
4. Pushbutton switch
5. Gasket
6. Stainless steel fastener
7. Cast aluminum conduit
8. Aluminum plug with 1/4" drilled weep hole.

**Notes**

- When "PPB-M" or "PPB-W" are specified in the contract, the arrow shall be installed in the opposite direction than as shown for "PPB-M" or "PPB-W".

- Cast Aluminum Conduit

- Pedestrian Pushbutton Details

**Dimensions**

- Front View: 2.8125" W x 0.9375" H
- Side View: 2.8125" W x 0.9375" H
- Top View: 1.75" W x 1.75" H
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
- 3/8" DIA each

- 4" steel pipe
- 3‰ scalable hole with cover

- 3/4‰ x 2‰ x 4‰ steel anchor bolts

- 4‰ bars at approximately 1‰-0‰ centers

CABINET FOUNDATION DETAILS

STANDARD PLAN J-6c

PAD MOUNT

Install one spare 2‰ conduit and caps, others as required.

Locate conduits centrally in foundation

#4 bar each corner

#4 hoops

6‰ Cabinet width 6‰ + 2‰

1‰-6‰ Cabinet depth 1‰-6‰ + 2‰

Locate conduits centrally in foundation

#4 bar each corner

#4 hoops

1‰ x 2‰ conduit and caps, others as required.
NOTES:
1. SEE CONTRACT FOR HEAD TYPE, MOUNTING HEIGHT AND ORIENTATION.
2. ALL NIPPLES, FITTINGS AND CENTER PIPES SHALL BE 1½" DIA. NOMINAL TRADE SIZE (NEC).
3. INSTALL NEOPRENE GASKET OUTSIDE HEAD WHEN FLANGED ELBOWS ARE SUPPLIED.
NOTES:
1. Type M mounting shall have 3/4" ring groove and seal top and bottom at signal attachment.
2. Type M mounting for conventional heads shall have a 2" diameter opening at the signal attachment.
3. Type M mounting for optically programmed heads shall have a 3/4" diameter opening at the signal attachment.
4. Type N mounting with optically programmed heads shall be installed with 14" nominal arms.
5. See Standard Plan J-6h for tether wire, and backplate requirements.
<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type P</td>
<td>P &amp; M</td>
<td>Standard Dimension Chart</td>
</tr>
<tr>
<td>Type PS</td>
<td>P &amp; S</td>
<td>Standard Dimension Chart</td>
</tr>
<tr>
<td>Type PB</td>
<td>P &amp; B</td>
<td>Standard Dimension Chart</td>
</tr>
<tr>
<td>Type PA</td>
<td>P &amp; A</td>
<td>Standard Dimension Chart</td>
</tr>
<tr>
<td>Type PS</td>
<td>P &amp; S</td>
<td>Standard Dimension Chart</td>
</tr>
</tbody>
</table>

- **Notes:**
  - For P, M, S, B, A, and PS, the standard dimension charts are provided in the referenced sheets.
  - The tables are used to specify the dimensions for various parts of the signal structures.

---

**Diagram:**

- The diagram illustrates the layout and dimensions of the signal structures, including clearances, angles, and other critical measurements.
- The details are marked with specific labels and annotations for clear identification.
- The diagram includes scale and measurement references for accurate scaling.

---

**Effective Dates:**

- Effective: August 2, 2004 to April 3, 2005
**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 25' 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 "S" for start and the "F" for finish, and the loop series number.
6. Twist each pair of the leads six 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 plane. 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 splices to the shielded cable as noted in the Contract.
10. Consult for the loop layout shall be as required in the Contract.

**Sawcut and Conduit Connection Plan**

**Loop Lead-In Wiring Label**

- Loop Number
- Loop Series Number
- "S" or "F"
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-Ou 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 ground electrode conductors shall be sized in accordance with the National Electric Code (No. B minimum).

GROUNDING DETAILS

SUPPLEMENTAL GROUND

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

GROUND ROD DETAILS

Required at all services and separately derived systems.

TYPICAL GROUNDING DETAILS

STANDARD PLAN J-90

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING CONTRACT OR CONTRACTUAL DOCUMENT FOR OFFICIAL, ISSUED BY THE ENGINEER AND APPROPRIATE FOR PUBLICATION & COPY RATING AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.

David E. Panish
DEPUTY STATE DESIGN ENGINEER

Sealed: 8-2-2004

4/24/98

APPROVED FOR PUBLICATION

Clifford E. Mansfield
STATE ENGINEER, DEPARTMENT OF TRANSPORTATION
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 END TREATMENTS SHALL BE CRASHWORTHY.

SIGN SPACING = X (FEET)

<table>
<thead>
<tr>
<th>Rural Roads</th>
<th>45/55 MPH</th>
<th>500'--</th>
</tr>
</thead>
</table>
| Urban Arterials &
Rural Roads | 35/40 MPH | 350'-- |
| Urban Streets
Residential Areas &
Business Districts | 25/30 MPH | 200'-- |

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>50/70</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>35/45</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

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)

ROAD CLOSURE WITH DIVERSION

STANDARD PLAN K-1

Sheet 1 of 1 Sheet

APPROVED FOR PUBLICATION

Harold J. Peterson 12-20-02

Washington State Dept. of Transportation

EFFECTIVE: AUGUST 2, 2004 TO APRIL 3, 2005
EFFECTIVE: AUGUST 2, 2004 TO APRIL 3, 2005
EFFECTIVE: AUGUST 2, 2004 TO APRIL 3, 2005
EFFECTIVE: AUGUST 2, 2004 TO APRIL 3, 2005
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 (MPH)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (feet)</td>
<td>55</td>
<td>85</td>
<td>115</td>
<td>145</td>
<td>175</td>
<td>205</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VEHICLE TYPE</th>
<th>4 YARD DUMP TRUCK</th>
<th>2 TON CARGO TRUCK</th>
<th>1 TON CARGO TRUCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>POSTED SPEED (MPH)</td>
<td>30</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>STATIONARY OPERATING DISTANCE (feet)</td>
<td>75</td>
<td>50</td>
<td>45</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

ALTERNATING ONE-WAY TRAFFIC TEMPORARY SIGNAL CONTROLLED STANDARD PLAN K-4

Sheet 1 of 1 SHEET

APPROVED FOR PUBLICATION

Marian L. Peters

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

RECEIVED:

PROFESSIONAL ENGINEER

ALAN D. KING
STATE OF WASHINGTON

EXPIRES: NOVEMBER 23, 2003

WASHINGTON DEPARTMENT OF TRANSPORTATION

APPROVED: AUGUST 2, 2004 TO APRIL 3, 2005

SHEET 1 OF 1 SHEET
**SIGHT DISTANCE DATA**

**MINIMUM STOPPING SIGHT DISTANCE = 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.

**LEGEND**

- **WORK VEHICLE WITH FLASHING AMBER WARNING BEACON**
- **SHADOW VEHICLE WITH FLASHING AMBER WARNING BEACON**
  (with truck mounted attenuator when specified in contract)

---

**PORTABLE CHANGEABLE MESSAGE SIGN DISPLAYS**

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

---

**MOBILE SHOULDER OPERATION WITH LANE ENCROACHMENT STANDARD PLAN K-6**

Sheet 1 of 1 Sheet

Approved for Publication

Harold J. PeteRUso 12-30-02

Washington State Department of Transportation

Effective: August 2, 2004 to April 3, 2005
BUFFER DATA

BUFFER SPACE = B

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
<th>CHANNELIZING DEVICE SPACING (FEET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25/30</td>
<td>35/45 55/65 25/30</td>
</tr>
</tbody>
</table>

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R

<table>
<thead>
<tr>
<th>VEHICLE TYPE</th>
<th>POSTED SPEED (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 YARD DUMP TRUCK</td>
<td>24,000</td>
</tr>
<tr>
<td>2 TON CARGO TRUCK</td>
<td>15,000</td>
</tr>
<tr>
<td>1 TON CARGO TRUCK</td>
<td>10,000</td>
</tr>
</tbody>
</table>

MINIMUM TAPER LENGTH = L (FEET)

<table>
<thead>
<tr>
<th>LANE WIDTH (FEET)</th>
<th>25 30 35 40 45 50 55 60 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>POSTED SPEED (MPH)</td>
<td>10 155 205 255 305 355 405 455 505</td>
</tr>
<tr>
<td>TAPER</td>
<td>10 11 12</td>
</tr>
<tr>
<td>TANGENT</td>
<td>11 12</td>
</tr>
</tbody>
</table>

NOTES

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

SIGN SPACING = X (FEET)

Rural Roads
- 45/65 MPH
- 500'
- 35/40 MPH
- 350'

Urban Arterials
- 25/30 MPH
- 200'

Legend:
- SIGN LOCATION-TRIPOD 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)

PORTABLE CHANGEABLE MESSAGE SIGN DISPLAYS

PCMS

1
2
RIGHT LANE CLOSED I MILE AHEAD
1.5 SEC 1.5 SEC

Right Lane Closure
For Divided Highway

Standard Plan K-6
Sheet 1 of 1

APPROVED FOR PUBLICATION

Right Lane Closure
For Divided Highway

Standard Plan K-6
Sheet 1 of 1

APPROVED FOR PUBLICATION

Right Lane Closure
For Divided Highway

Standard Plan K-6
Sheet 1 of 1

APPROVED FOR PUBLICATION
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>Speed (MPH)</th>
<th>Spacing (FEET)</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>Residential Areas &amp; Business Districts</td>
<td>25/30</td>
<td>200±</td>
</tr>
</tbody>
</table>

*Sign G20-1 shall be used when the work area length exceeds 2 miles.

LEGEND

• SIGN LOCATION-POST MOUNTED
### Buffer Data

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Length (feet)</th>
<th>Protective Vehicle Roll Ahead Distance (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>170</td>
<td>325</td>
</tr>
<tr>
<td>30</td>
<td>170</td>
<td>325</td>
</tr>
<tr>
<td>35</td>
<td>170</td>
<td>325</td>
</tr>
<tr>
<td>40</td>
<td>220</td>
<td>325</td>
</tr>
<tr>
<td>45</td>
<td>220</td>
<td>325</td>
</tr>
<tr>
<td>50</td>
<td>220</td>
<td>325</td>
</tr>
<tr>
<td>55</td>
<td>220</td>
<td>325</td>
</tr>
<tr>
<td>60</td>
<td>220</td>
<td>325</td>
</tr>
<tr>
<td>65</td>
<td>220</td>
<td>325</td>
</tr>
</tbody>
</table>

**Sign Spacing** = X (feet)

- **Rural Roads**: 45-65 mph, 500+ ft
- **Urban Arterials**: 40 mph, 350+ ft

- Signs are black on orange unless otherwise designated.

**Channelizing Device Spacing (feet):**

- MPH Taper Tangent
  - 50/70: 40, 80
  - 40/45: 30, 60

- Roll Ahead Stopping Distance assumes dry pavement.

---

### Minimum Taper Length (ft) in 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>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**End Road Work**

**Road Work Ahead**

**Shoulder Closed**

**Shoulder Work**

**W20-1**

**W20-301**

**W21-5**

---

**Legend:**

- □ □ □ Sign Location—Tripod Mounted
- □ □ □ Temporary Traffic Control Devices
- □ □ □ Protective Vehicle with Truck Mounted Attenuator (when specified in contract)

**Approved for Publication**

**Harold J. Peterson 12-21-02**

**Washington State Department of Transportation**

**Expiration:** November 23, 2003

---

**High Speed Standard Plan K-9**

**Sheet 1 of 1**
### 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>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (FT)</td>
<td>55</td>
<td>85</td>
<td>120</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

### Sign Spacing = X (Feet)

**Urban Arterials**
- **Speed**: 35 MPH
- **Length**: 350’

**Urban Streets**
- **Speed**: 25-30 MPH
- **Length**: 200’

**Residential Areas & Business Districts**
- **Speed**: 20-25 MPH
- **Length**: 100’

All signs are black on orange unless otherwise designated.

### Minimum Taper Length (L) in Feet

<table>
<thead>
<tr>
<th>Width (Feet)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Speed (MPH)</td>
<td>105</td>
<td>150</td>
<td>205</td>
<td>--</td>
</tr>
<tr>
<td>Speed (MPH)</td>
<td>11</td>
<td>165</td>
<td>225</td>
<td>--</td>
</tr>
<tr>
<td>Speed (MPH)</td>
<td>12</td>
<td>180</td>
<td>245</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>

### Diagram

Legend:
- ▲ ▲ ▲ Sign Location – Tripod Mounted
- □ □ □ Temporary Traffic Control Devices
- □ □ □ Protective Vehicle (When Specified in Contract)

- **ROAD WORK AHEAD**
- **SHOULDER WORK**

- **W20-1**
- **W21-5**

- **10’ MIN**
- **2’ MIN.**

- **500’ MAX.**

- **WORK AREA**

- **C20-2A**
- **END ROAD WORK**
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.

<table>
<thead>
<tr>
<th>SIGN SPACING: X (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Roads</td>
</tr>
<tr>
<td>45/55 MPH</td>
</tr>
<tr>
<td>Urban Arterials</td>
</tr>
<tr>
<td>35/40 MPH</td>
</tr>
<tr>
<td>Urban Streets</td>
</tr>
<tr>
<td>Residential Areas &amp; 25/30 MPH</td>
</tr>
<tr>
<td>Business Districts</td>
</tr>
</tbody>
</table>

All signs are black on orange unless otherwise designated.

WORK BEYOND THE SHOULDER

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

SHOULDER WORK AREAS

STANDARD PLAN K-11
### Protective Vehicle Roll Ahead Distance = R

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

**Roll Ahead Stopping Distance Assumes Dry Pavement**

**Notes**

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

**Legend**

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

**Diagram**

- Shoulder Work
- Road Work Ahead
- W21-5 Black on Orange
- W20-1 Black on Orange

**Note**

- No encroachment into traffic lane

**See Note 4 & 5**
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.
<table>
<thead>
<tr>
<th>VEHICLE TYPE</th>
<th>TYPICAL VEHICLE LOADED WEIGHT (LB)</th>
<th>POSTED SPEED (MPH)</th>
<th>STATIONARY OPERATION (FEET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 YARD DUMP TRUCK</td>
<td>24,000 20/65</td>
<td>70</td>
<td>50/50</td>
</tr>
<tr>
<td>2 TON CARGO TRUCK</td>
<td>15,000 30/55</td>
<td>75</td>
<td>50/50</td>
</tr>
<tr>
<td>1 TON CARGO TRUCK</td>
<td>10,000 30/55</td>
<td>75</td>
<td>50/50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT</th>
</tr>
</thead>
</table>

**BUFFER DATA**

**BUFFER SPACE = B**

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (FEET)</td>
<td>55</td>
<td>85</td>
<td>110</td>
<td>120</td>
<td>200</td>
<td>280</td>
<td>335</td>
</tr>
</tbody>
</table>

**SIGN SPACING = X (FEET)**

- **Rural Roads** 45/55 MPH 500'--
- **Urban Arterials** 35/40 MPH 350'--
- **Urban Streets** 25/30 MPH 200'--
- **Residential Areas & Business Districts**
  - Aligns are block on orange unless otherwise designated.

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

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

**CHANNELIZING DEVICE SPACING (FEET)**

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

**NOTES**

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

**LEGEND**

- SIGN LOCATION - TRIPOD MOUNT
- 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)

**DISPLAYS**

1. CENTER LANE CLOSED
2. LIMITED TURNING

<table>
<thead>
<tr>
<th>PCMS</th>
<th>B/D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5 SEC</td>
<td>1.5 SEC</td>
</tr>
</tbody>
</table>

Field locate 1 mile -- in advance of lane closure.
NOTES
1. NO LEFT TURN SIGNS ARE TO BE USED IF TRAFFIC VOLUMES ARE TOO HIGH OR THERE IS A SIGNAL OPERATING. CLOSE LEFT TURN POCKET IF THERE IS ONE ON THE SIDE STREET.
2. FLASHING WARNING LIGHTS (TYPE A, MUTCD) SHOULD BE USED TO MARK BARRIERS 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>350</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>375</td>
<td>550</td>
<td>605</td>
</tr>
<tr>
<td>12</td>
<td>125</td>
<td>185</td>
<td>245</td>
<td>320</td>
<td>500</td>
<td>600</td>
<td>660</td>
</tr>
</tbody>
</table>

SIGN SPACING = X (feet)

<table>
<thead>
<tr>
<th>Residential Areas &amp; Business Districts</th>
<th>25/33 MPH</th>
<th>200**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Roads</td>
<td>45/55 MPH</td>
<td>500++</td>
</tr>
<tr>
<td>Urban Arterials</td>
<td>35/40 MPH</td>
<td>550++</td>
</tr>
</tbody>
</table>

CHANNELIZING DEVICE SPACING (feet)

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

LEGEND
* SIGN LOCATION-TRIPOD MOUNT
** SIGN LOCATION-PORTABLE MOUNT
### TEMPORARY TRAFFIC CONTROL DEVICES
##### TYPE 3L BARRICADE
<<<< SEQUENTIAL ARROW SIGN
----- OBLITERATED MARKINGS (SEE NOTE 4)
| PAINTED TRAFFIC ARROW (OPTIONAL)
NOTES

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

Legend:

- Sign location - tripod mount
- Temporary traffic control devices
- Flashing warning light
- Type 3L barricade

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>
<tr>
<td>Length (feet)</td>
</tr>
<tr>
<td>55</td>
</tr>
<tr>
<td>85</td>
</tr>
<tr>
<td>100</td>
</tr>
<tr>
<td>110</td>
</tr>
<tr>
<td>220</td>
</tr>
</tbody>
</table>

Lane closure on low-volume two-lane road
Without flaggers
Standard Plan K-22

Sheet 1 of 1 sheet

Approved for publication

Harold J. Peterson  12/20/02

Washington State Department of Transportation

Expiring November 25, 2003

Effective: August 2, 2004 to April 3, 2005
**NOTES**

1. For use with speeds of 45 MPH and under.
2. 3 advanced warning signs are required for flagging operations. (L&I requirements)

**SIGN SPACING = X (FEET)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Speed</th>
<th>Min. Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Roads</td>
<td>45 MPH</td>
<td>500'</td>
</tr>
<tr>
<td>Urban Arterials</td>
<td>25/40 MPH</td>
<td>500'</td>
</tr>
<tr>
<td>Urban Streets Residential Areas &amp; Business Districts</td>
<td>25/30 MPH</td>
<td>200'</td>
</tr>
</tbody>
</table>

**CHANNELIZING DEVICE SPACING (FEET)**

<table>
<thead>
<tr>
<th>Speed</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>

**LEGEND**

- ▲ ▲ ▲ Temporary Traffic Control Devices
- ❂ Flagging Station
- ○ Surveyor

**SIGN LOCATION - TRIPOD MOUNT**

**TEMPORARY TRAFFIC CONTROL DEVICES**

**FLAGGING STATION**

**SURVEYOR**

**SURVEYING ALONG CENTERLINE OF LOW-VOLUME ROAD STANDARD PLAN K-24**

**APPROVED FOR PUBLICATION**

**SURVEYING ALONG CENTERLINE OF LOW-VOLUME ROAD STANDARD PLAN K-24**

**SURVEYING ALONG CENTERLINE OF LOW-VOLUME ROAD STANDARD PLAN K-24**

**SURVEYING ALONG CENTERLINE OF LOW-VOLUME ROAD STANDARD PLAN K-24**

**SURVEYING ALONG CENTERLINE OF LOW-VOLUME ROAD STANDARD PLAN K-24**
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.

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>125</td>
<td>150</td>
<td>205</td>
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<td>370</td>
<td>500</td>
<td>650</td>
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<td>11</td>
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<td>225</td>
<td>295</td>
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</tr>
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<td>180</td>
<td>245</td>
<td>320</td>
<td>540</td>
<td>600</td>
<td>660</td>
</tr>
</tbody>
</table>

SIGN SPACING = X (feet)

- Rural Roads: 45/55 MPH
- Urban Arterials: 35/40 MPH
- Urban Streets: 25/30 MPH
- Residential Areas & Business Districts: 200+*

*Unless otherwise designated.

CHANNELIZING DEVICE SPACING (feet)

<table>
<thead>
<tr>
<th>MPH</th>
<th>TAPER</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/70</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>35/45</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>
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 OBSCURED AS SOON AS PRACTICAL. TEMPORARY MARKINGS SHALL BE USED AS NECESSARY.

---

LEGEND

- Temporary Traffic Control Devices
- Type 3L Barricade
- 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** |

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>
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<tbody>
<tr>
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<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>
WIRE FENCE - TYPE 1

- Two strand 12½ gauge four pointed barbed wire
- Gate or end post
- Vertical clinch stay
- Concrete Class 3000
- 12” Round section

14’ MAX

WIRE FENCE - TYPE 2

- Two strand 12½ gauge four pointed barbed wire
- Gate or end post
- Vertical clinch stay
- Concrete Class 3000
- 12” Round section

14’ MAX

LINE BRACE
(Maximum spacing 1000 feet)

Concrete Class 3000
18” Square section
12” Round section

CORNER BRACE
(Angles 30° and over)

Concrete Class 3000
18” Square section
12” Round section

INTERSECTING FENCE BRACE

TREATMENT OF SAGS

- Stone or concrete block (MIN weight 100 pounds) or drilled and grouted hole in solid rock

14’ MAX
14’ MAX

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

L-1
07-18-97
### ROLL FORMED SECTIONS

#### MEMBER

<table>
<thead>
<tr>
<th>Type</th>
<th>Brace Rail &amp; Top Rail</th>
<th>Line &amp; Brace Post</th>
<th>End, Corner, &amp; Pull Post</th>
<th>Gate Post</th>
<th>All Posts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Round</td>
<td>Round</td>
<td>Round</td>
<td>Round</td>
<td>Round</td>
</tr>
<tr>
<td></td>
<td>I.D. Pipe (Inches)</td>
<td>Weight (Pounds)</td>
<td>Size (Inches)</td>
<td>Weight (Pounds)</td>
<td>Size (Inches)</td>
</tr>
<tr>
<td>1</td>
<td>1¼</td>
<td>2.27</td>
<td>1¼ x 1¼</td>
<td>1.39</td>
<td>1¼ x 1¼</td>
</tr>
<tr>
<td>2</td>
<td>1½</td>
<td>2.72</td>
<td>1½ x 1½</td>
<td>1.85</td>
<td>2/₅</td>
</tr>
<tr>
<td>3</td>
<td>1¼</td>
<td>2.72</td>
<td>1¼ x 1¼</td>
<td>1.85</td>
<td>3¼ x 3½</td>
</tr>
<tr>
<td>4</td>
<td>1½</td>
<td>2.72</td>
<td>1½ x 1½</td>
<td>1.85</td>
<td>3¼ x 3½</td>
</tr>
<tr>
<td>5</td>
<td>1¼</td>
<td>2.72</td>
<td>1¼ x 1¼</td>
<td>1.85</td>
<td>3½ x 3½</td>
</tr>
<tr>
<td>6</td>
<td>1½</td>
<td>2.72</td>
<td>1½ x 1½</td>
<td>1.85</td>
<td>3½ x 3½</td>
</tr>
</tbody>
</table>

**NOTES:**
- All concrete post bases shall be 10" minimum diameter.
- All posts shall be spaced at 10' maximum intervals unless otherwise directed by the Engineer.
- Top or bottom tension wires shall be placed within the limits of the first half fabric weave.
- Details are illustrative and shall not limit hardware design or post selection of any particular fence type.
1. Fence fabric shall be secured to gate frames with knuckled selvage along top edge for Types 4 & 6 chain link fence installations.

2. Minimum post lengths:
   - Types 1 & 3: 8' - 9'
   - Types 4 & 6: 5' - 6'
1. Posts shall be 6 x 6 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.