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Washington State Department of Transportation
Engineering and Regional Operations
Development Division, Design Office
PO Box 47329
Olympia, WA 98504-7329

Email: designstandards@wsdot.wa.gov
www.wsdot.wa.gov/design/standards/plans.htm
This manual contains standard engineering drawings used for road, bridge, and municipal construction. These drawings have been prepared under the direct supervision of a Washington State licensed professional engineer, who is knowledgeable in the specialized field of civil engineering depicted in each drawing. This manual standardizes fabrication, installation, and construction methods for specific items of work, and complements the contract documents and the Standard Specifications for Road, Bridge, and Municipal Construction.

Updating the manual is a continual process and revisions are issued periodically. Questions, comments, and recommendations for changes are welcome.

Contact the Design Standards Team at:

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For contact via conventional mail, the Comment Request Form on the reverse side of this page is provided to facilitate routing and prompt delivery. Making a copy will preserve the original form for future use. Attach a copy of the form as a cover sheet when sending comments or sketches made on other documents, such as marked copies of specific Standard Plans. Your questions, comments, and/or recommendations should be sent to:

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/s/Jeff Carpenter
Jeff Carpenter
State Design Engineer
<table>
<thead>
<tr>
<th>From:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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<thead>
<tr>
<th>Comment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ See attached</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-10.10-00</td>
<td>Survey Stakes</td>
<td>8/7/07</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>A-10.20-00</td>
<td>Survey Monument Types 1 and 2</td>
<td>10/5/07</td>
<td></td>
</tr>
<tr>
<td>A-10.30-00</td>
<td>Monument Case and Cover</td>
<td>10/5/07</td>
<td></td>
</tr>
<tr>
<td>A-20.10-00</td>
<td>Slope Treatment</td>
<td>8/31/07</td>
<td></td>
</tr>
<tr>
<td>A-30.10-00</td>
<td>Concrete Slope Protection</td>
<td>11/8/07</td>
<td></td>
</tr>
<tr>
<td>A-30.30-01</td>
<td>Wire Mesh Slope Protection</td>
<td>6/16/11</td>
<td></td>
</tr>
<tr>
<td>A-30.35-00</td>
<td>Slope Protection Anchors</td>
<td>10/12/07</td>
<td></td>
</tr>
<tr>
<td>A-40.00-00</td>
<td>Dowel Bar Baskets</td>
<td>8/11/09</td>
<td></td>
</tr>
<tr>
<td>A-40.10-03</td>
<td>Cement Concrete Pavement Joints</td>
<td>12/23/14</td>
<td></td>
</tr>
<tr>
<td>A-40.15-00</td>
<td>PCC Pavement Isolation Joints</td>
<td>8/11/09</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>A-40.20-04</td>
<td>Bridge Paving Joint Seals</td>
<td>1/18/17</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>A-40.50-02</td>
<td>Bridge Approach Slab</td>
<td>12/23/14</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>A-50.10-00</td>
<td>Embankment Widening at Bridge End with Wing Wall</td>
<td>11/17/08</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>A-50.20-01</td>
<td>Embankment Widening at Bridge End with Curtain Wall</td>
<td>9/22/09</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>A-50.30-00</td>
<td>Embankment Widening at Bridge End with &quot;L&quot; Shaped Abutment</td>
<td>11/17/08</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>A-50.40-00</td>
<td>Embankment Widening at Bridge End with Sidewalk</td>
<td>11/17/08</td>
<td></td>
</tr>
<tr>
<td>A-60.10-03</td>
<td>Cement Concrete Pavement Rehabilitation</td>
<td>12/23/14</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>A-60.20-03</td>
<td>Dowel Bar Retrofit for Cement Concrete Pavement</td>
<td>12/23/14</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>A-60.30-01</td>
<td>Bridge Deck Transition for HMA Overlay</td>
<td>6/28/18</td>
<td></td>
</tr>
<tr>
<td>A-60.40-00</td>
<td>HMA Overlay Further Deck Preparation</td>
<td>8/31/07</td>
<td></td>
</tr>
<tr>
<td>B-5.20-02</td>
<td>Catch Basin Type 1</td>
<td>1/26/17</td>
<td></td>
</tr>
<tr>
<td>B-5.40-02</td>
<td>Catch Basin Type 1L</td>
<td>1/26/17</td>
<td></td>
</tr>
<tr>
<td>B-5.60-02</td>
<td>Catch Basin Type 1P (for Parking Lot)</td>
<td>1/26/17</td>
<td></td>
</tr>
<tr>
<td>B-10.20-02</td>
<td>Catch Basin Type 2</td>
<td>3/2/18</td>
<td></td>
</tr>
<tr>
<td>B-10.40-01</td>
<td>Catch Basin Type 2 with Flow Restrictor</td>
<td>1/26/17</td>
<td></td>
</tr>
<tr>
<td>B-10.70-00</td>
<td>Catch Basin ~ PVC</td>
<td>1/26/17</td>
<td></td>
</tr>
<tr>
<td>B-15.20-01</td>
<td>Manhole Type 1</td>
<td>2/7/12</td>
<td></td>
</tr>
<tr>
<td>B-15.40-01</td>
<td>Manhole Type 2</td>
<td>2/7/12</td>
<td></td>
</tr>
<tr>
<td>B-15.60-02</td>
<td>Manhole Type 3</td>
<td>1/26/17</td>
<td></td>
</tr>
<tr>
<td>B-20.20-02</td>
<td>Drywell Type 1 (for Swale)</td>
<td>3/16/12</td>
<td></td>
</tr>
<tr>
<td>B-20.40-04</td>
<td>Drywell Type 2 (with Pipe Inlet)</td>
<td>2/27/18</td>
<td></td>
</tr>
<tr>
<td>B-20.60-03</td>
<td>Drywell Type 3 (with At-Grade Inlet)</td>
<td>3/15/12</td>
<td></td>
</tr>
<tr>
<td>B-25.20-02</td>
<td>Combination Inlet</td>
<td>2/27/18</td>
<td></td>
</tr>
<tr>
<td>B-25.60-02</td>
<td>Concrete Inlet</td>
<td>2/27/18</td>
<td></td>
</tr>
<tr>
<td>B-30.10-03</td>
<td>Rectangular Frame (Reversible)</td>
<td>2/27/18</td>
<td></td>
</tr>
<tr>
<td>B-30.15-00</td>
<td>ADA Grates for Rectangular Frames</td>
<td>2/27/18</td>
<td></td>
</tr>
<tr>
<td>B-30.20-04</td>
<td>Rectangular Solid Metal Cover</td>
<td>2/27/18</td>
<td></td>
</tr>
<tr>
<td>B-30.30-03</td>
<td>Rectangular Vaned Grate</td>
<td>2/27/18</td>
<td></td>
</tr>
<tr>
<td>B-30.40-03</td>
<td>Rectangular Bi-Directional Vaned Grate</td>
<td>2/27/18</td>
<td></td>
</tr>
<tr>
<td>B-30.50-03</td>
<td>Rectangular Herringbone Grate</td>
<td>2/27/18</td>
<td></td>
</tr>
<tr>
<td>B-30.70-04</td>
<td>Circular Frame (Ring) and Cover</td>
<td>2/27/18</td>
<td></td>
</tr>
<tr>
<td>B-30.80-01</td>
<td>Circular Grate</td>
<td>2/27/18</td>
<td></td>
</tr>
<tr>
<td>B-30.90-02</td>
<td>Miscellaneous Details for Drainage Structures</td>
<td>1/26/17</td>
<td></td>
</tr>
<tr>
<td>B-35.20-00</td>
<td>Grate Inlet Type 1 (Cast-In-Place)</td>
<td>6/8/06</td>
<td></td>
</tr>
<tr>
<td>B-35.40-00</td>
<td>Grate Inlet Type 2</td>
<td>6/8/06</td>
<td>2 Sheets</td>
</tr>
</tbody>
</table>
## Contents

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-40.20-00</td>
<td>Welded Grates for Grate Inlet</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-40.40-02</td>
<td>Frame and Dual Vaned Grates for Grate Inlet</td>
<td>1/26/17</td>
</tr>
<tr>
<td>B-45.20-01</td>
<td>Drop Inlet Type 1</td>
<td>7/11/17</td>
</tr>
<tr>
<td>B-45.40-01</td>
<td>Drop Inlet Type 2</td>
<td>7/21/17</td>
</tr>
<tr>
<td>B-50.20-00</td>
<td>Grates for Drop Inlet</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-55.20-02</td>
<td>Pipe Zone Bedding and Backfill</td>
<td>2/27/18</td>
</tr>
<tr>
<td>B-60.20-01</td>
<td>Connection Details for Dissimilar Culvert Pipe</td>
<td>6/28/18</td>
</tr>
<tr>
<td>B-60.40-01</td>
<td>Coupling Bands for Corrugated Metal Pipe</td>
<td>2/27/18</td>
</tr>
<tr>
<td>B-65.20-01</td>
<td>Animal Underpass</td>
<td>4/26/12</td>
</tr>
<tr>
<td>B-65.40-00</td>
<td>Equipment Underpass</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-70.20-00</td>
<td>Beveled End Sections (for Culverts 30” Diameter or Less)</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-70.60-01</td>
<td>Flared End Sections</td>
<td>1/26/17</td>
</tr>
<tr>
<td>B-75.20-02</td>
<td>Headwalls for Culvert Pipe and Underpass</td>
<td>2/27/18</td>
</tr>
<tr>
<td>B-75.50-01</td>
<td>Type 1 Safety Bars for Stepped Culvert Pipe or Pipe Arch</td>
<td>6/10/08</td>
</tr>
<tr>
<td>B-75.60-00</td>
<td>Type 2 Safety Bars for Culvert Pipe or Pipe Arch (On Cross Road)</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-80.20-00</td>
<td>Tapered End Section with Type 3 Safety Bars</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-80.40-00</td>
<td>Tapered End Section with Type 4 Safety Bars (On Cross Road)</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-85.10-01</td>
<td>Vertical Connection (for Sanitary Sewer Use)</td>
<td>6/10/08</td>
</tr>
<tr>
<td>B-85.20-00</td>
<td>Side Sewer Connection (for Sanitary Sewer Use)</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-85.30-00</td>
<td>Standing Side Sewer Connection (for Sanitary Sewer Use)</td>
<td>6/1/06</td>
</tr>
<tr>
<td>B-85.40-00</td>
<td>8 Inch Sewer Clean-Out (for Sanitary Sewer Use)</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-85.50-01</td>
<td>Drop Connections (for Sanitary Sewer Use)</td>
<td>6/10/08</td>
</tr>
<tr>
<td>B-90.10-00</td>
<td>Hydrant Setting Types A and B</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-90.20-00</td>
<td>2 Inch Blowoff Assembly</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-90.30-00</td>
<td>Combination Air Release / Air Vacuum Valve Assembly</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-90.40-01</td>
<td>Concrete Thrust Block</td>
<td>1/26/17</td>
</tr>
<tr>
<td>B-90.50-00</td>
<td>Concrete Thrust Block for Convex Vertical Bends</td>
<td>6/8/06</td>
</tr>
<tr>
<td>B-95.20-01</td>
<td>Median Barrier Drainage Installation</td>
<td>2/3/09</td>
</tr>
<tr>
<td>B-95.40-01</td>
<td>Inlet Placement at Bridge End</td>
<td>6/28/18</td>
</tr>
</tbody>
</table>

## Section C (Guardrail)

<table>
<thead>
<tr>
<th>Section</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-1</td>
<td>Raising Beam Guardrail Detail</td>
<td>6/28/18</td>
</tr>
<tr>
<td>C-1a</td>
<td>Beam Guardrail (Thrie Beam)</td>
<td>7/14/15</td>
</tr>
<tr>
<td>C-1b</td>
<td>Beam Guardrail Posts and Blocks</td>
<td>7/14/15</td>
</tr>
<tr>
<td>C-1d</td>
<td>Thrie Beam Guardrail Reducer Section</td>
<td>10/31/03</td>
</tr>
<tr>
<td>C-2c</td>
<td>Guardrail Placement Median Bull Nose (Cases 9A, 9B &amp; 9C)</td>
<td>6/21/06</td>
</tr>
<tr>
<td>C-4f</td>
<td>Beam Guardrail Bull Nose Terminal</td>
<td>7/21/17</td>
</tr>
<tr>
<td>C-6a</td>
<td>Beam Guardrail Anchor Type 2</td>
<td>10/14/09</td>
</tr>
<tr>
<td>C-7</td>
<td>Beam Guardrail End Sections</td>
<td>6/16/11</td>
</tr>
<tr>
<td>C-7a</td>
<td>Thrie Beam End Sections</td>
<td>6/16/11</td>
</tr>
<tr>
<td>C-20.10-04</td>
<td>Beam Guardrail Type 31</td>
<td>7/21/17</td>
</tr>
<tr>
<td>C-20.11-00</td>
<td>Beam Guardrail Type 31 Components</td>
<td>7/21/17</td>
</tr>
<tr>
<td>C-20.14-03</td>
<td>Beam Guardrail Type 31 Placement (Cases 1-31, 2-31 &amp; 3-31)</td>
<td>6/11/14</td>
</tr>
<tr>
<td>Plan No.</td>
<td>Plan Title</td>
<td>Publication Approval Date</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>C-20.15-02</td>
<td>Beam Guardrail Type 31 Placement (Cases 4-31 &amp; 5-31)</td>
<td>6/11/14</td>
</tr>
<tr>
<td>C-20.18-02</td>
<td>Beam Guardrail Type 31 Placement (Cases 10A-31, 10B-31 &amp; 10C-31)</td>
<td>6/11/14</td>
</tr>
<tr>
<td>C-20.19-02</td>
<td>Beam Guardrail Type 31 Placement (Cases 11A-31, 11B-31 &amp; 11C-31)</td>
<td>6/11/14</td>
</tr>
<tr>
<td>C-20.40-06</td>
<td>Beam Guardrail Type 31 Placement 12' - 6&quot;, 18&quot; - 9&quot;, or 25&quot; - 0&quot; Span</td>
<td>7/21/17</td>
</tr>
<tr>
<td>C-20.41-01</td>
<td>Box Culvert Guardrail Steel Post ~ Type 31</td>
<td>7/14/15</td>
</tr>
<tr>
<td>C-20.42-05</td>
<td>Guardrail Placement Strong Post ~ Type 31</td>
<td>7/14/15</td>
</tr>
<tr>
<td></td>
<td>Intersection Design</td>
<td></td>
</tr>
<tr>
<td>C-20.45-01</td>
<td>Beam Guardrail Type 31 - DS (Double sided) (W-Beam)</td>
<td>7/2/12</td>
</tr>
<tr>
<td>C-22.16-06</td>
<td>Beam Guardrail Type 31 ~ Buried Terminal Type 2</td>
<td>7/21/17</td>
</tr>
<tr>
<td>C-22.40-06</td>
<td>Beam Guardrail Type 31 Non-Flared Terminal (All Posted Speeds)</td>
<td>7/21/17</td>
</tr>
<tr>
<td>C-22.45-03</td>
<td>Beam Guardrail Type 31 Non-Flared Terminal (Posted Speed - 45 MPH and Below)</td>
<td>7/21/17</td>
</tr>
<tr>
<td>C-23.60-04</td>
<td>Beam Guardrail (Type 31) Anchor Type 10</td>
<td>7/21/17</td>
</tr>
<tr>
<td>C-24.10-01</td>
<td>Guardrail Connection to Bridge Rail or Concrete Barrier</td>
<td>6/11/14</td>
</tr>
<tr>
<td>C-25.20-06</td>
<td>Beam Guardrail (Type 31) Transition Section Type 21</td>
<td>7/14/15</td>
</tr>
<tr>
<td>C-25.22-05</td>
<td>Beam Guardrail (Type 31) Transition Section Type 22</td>
<td>7/14/15</td>
</tr>
<tr>
<td>C-25.26-03</td>
<td>Beam Guardrail (Type 31) Transition Section Type 23</td>
<td>7/14/15</td>
</tr>
<tr>
<td>C-25.30-00</td>
<td>Beam Guardrail (Type 31) Transition Type 24 (Posted Speed 45 MPH and Below)</td>
<td>6/28/18</td>
</tr>
<tr>
<td>C-25.80-04</td>
<td>Beam Guardrail Type 31 to Beam Guardrail Type 1 Adaptor</td>
<td>7/15/16</td>
</tr>
<tr>
<td>C-40.16-02</td>
<td>Barrier Placement ~ Cable to W-Beam Shielding for Redirectional Landform</td>
<td>7/2/12</td>
</tr>
</tbody>
</table>

Section C (Concrete Barrier)

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
<th>Sheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-8</td>
<td>Concrete Barrier Type 2</td>
<td>2/10/09</td>
<td>2</td>
</tr>
<tr>
<td>C-8a</td>
<td>Concrete Barrier Type 4 and Transition Section</td>
<td>7/25/97</td>
<td></td>
</tr>
<tr>
<td>C-8b</td>
<td>Concrete Barrier Light Standard Section</td>
<td>2/29/16</td>
<td>2</td>
</tr>
<tr>
<td>C-8e</td>
<td>Precast Concrete Barrier Anchor ~ Type 3 (Permanent)</td>
<td>2/21/07</td>
<td></td>
</tr>
<tr>
<td>C-8f</td>
<td>Concrete Barrier Transition Type 2 to Bridge F-Shape</td>
<td>6/30/04</td>
<td></td>
</tr>
<tr>
<td>C-70.10-01</td>
<td>Single-Slope Concrete Barrier (Precast)</td>
<td>6/17/14</td>
<td>3</td>
</tr>
<tr>
<td>C-75.10-01</td>
<td>Single-Slope Concrete Barrier (Precast)Transition Section</td>
<td>6/11/14</td>
<td></td>
</tr>
<tr>
<td>C-75.20-01</td>
<td>Single-Slope Concrete Barrier (Precast) Vertical Back</td>
<td>6/11/14</td>
<td></td>
</tr>
<tr>
<td>C-75.30-01</td>
<td>Single-Slope Concrete Barrier (Precast) Terminal</td>
<td>6/11/14</td>
<td></td>
</tr>
<tr>
<td>C-80.10-01</td>
<td>Single-Slope Concrete Barrier (Cast-in-Place) Dual-Faced</td>
<td>6/11/14</td>
<td>3</td>
</tr>
<tr>
<td>C-80.20-01</td>
<td>Single-Slope Concrete Barrier (Cast-in-Place) Terminal</td>
<td>6/11/14</td>
<td></td>
</tr>
<tr>
<td>C-80.30-01</td>
<td>Single-Slope Concrete Barrier (Cast-in-Place) Transition Section</td>
<td>6/11/14</td>
<td></td>
</tr>
<tr>
<td>C-80.40-01</td>
<td>Single-Slope Concrete Barrier (Cast-in-Place) Vertical Back</td>
<td>6/11/14</td>
<td></td>
</tr>
<tr>
<td>C-80.50-00</td>
<td>Concrete Barrier Transition Type 2 to Single-Slope</td>
<td>4/18/12</td>
<td></td>
</tr>
<tr>
<td>C-85.10-00</td>
<td>Single-Slope Concrete Barrier Placement (Split)</td>
<td>4/18/12</td>
<td></td>
</tr>
<tr>
<td>C-85.11-00</td>
<td>Single-Slope Concrete Barrier Placement (Wrap)</td>
<td>4/18/12</td>
<td></td>
</tr>
<tr>
<td>C-85.14-01</td>
<td>Single-Slope Concrete Barrier Light Standard Foundation</td>
<td>6/11/14</td>
<td></td>
</tr>
<tr>
<td>Plan No.</td>
<td>Plan Title</td>
<td>Publication Approval Date</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------------------------------------------------</td>
<td>---------------------------</td>
<td>---</td>
</tr>
<tr>
<td>C-85.15-01</td>
<td>Single-Slope Concrete Barrier (42&quot;) Light Standard Foundation</td>
<td>6/30/14</td>
<td></td>
</tr>
<tr>
<td>C-85.16-01</td>
<td>Single-Slope Concrete Barrier Sign Bridge Foundation</td>
<td>6/17/14 2 Sheets</td>
<td></td>
</tr>
<tr>
<td>C-85.18-01</td>
<td>Single-Slope Concrete Barrier Transition for Monotube Sign Support</td>
<td>6/11/14</td>
<td></td>
</tr>
<tr>
<td>C-85.20-01</td>
<td>Single-Slope Concrete Barrier Cantilever Sign Structure Foundation</td>
<td>6/11/14 2 Sheets</td>
<td></td>
</tr>
</tbody>
</table>

**Section C (Miscellaneous)**

- C-16a  
  Traffic Barrier Shoulder Widening ~ for Shoulders 8.0' and Wider  
  Publication Approval Date: 7/21/17

- C-40.18-03  
  Barrier Placement ~ Cable Barrier Shielding for Redirectional Landform  
  Publication Approval Date: 7/21/17

**Section D  Retaining, Noise Barrier, and Geosynthetic Walls**

- D-2.04-00  
  Noise Barrier Wall Type 2 (CIP Wall on Spread Footing)  
  Publication Approval Date: 11/10/05 2 Sheets

- D-2.06-01  
  Noise Barrier Wall Type 3 (…on Offset Spread Footing)  
  Publication Approval Date: 1/6/09 2 Sheets

- D-2.08-00  
  Noise Barrier Wall Type 4 (…on Shaft Foundation)  
  Publication Approval Date: 11/10/05 2 Sheets

- D-2.14-00  
  Noise Barrier Wall Type 6 (…w/Traffic Barrier on Spread Footing)  
  Publication Approval Date: 11/10/05

- D-2.16-00  
  Noise Barrier Wall Type 6SS (…w/S. S. Traffic Barrier on Spread Footing)  
  Publication Approval Date: 11/10/05

- D-2.18-00  
  Noise Barrier Wall Type 7 (…w/Traffic Barrier on Shaft Foundation)  
  Publication Approval Date: 11/10/05

- D-2.20-00  
  Noise Barrier Wall Type 7SS (…w/S.S. Traffic Barrier on Shaft Foundation)  
  Publication Approval Date: 11/10/05

- D-2.32-00  
  Noise Barrier Wall Type 9 (Precast Wall on Spread Footing)  
  Publication Approval Date: 11/10/05 2 Sheets

- D-2.34-01  
  Noise Barrier Wall Type 10 (…on Offset Spread Footing)  
  Publication Approval Date: 1/6/09 2 Sheets

- D-2.36-03  
  Noise Barrier Wall Type 11 (…on Shaft Foundation)  
  Publication Approval Date: 6/11/14 3 Sheets

- D-2.42-00  
  Noise Barrier Wall Type 13 (…w/Traffic Barrier on Spread Footing)  
  Publication Approval Date: 11/10/05

- D-2.44-00  
  Noise Barrier Wall Type 13SS (…w/S. S. Traffic Barrier on Spread Footing)  
  Publication Approval Date: 11/10/05

- D-2.46-01  
  Noise Barrier Wall Type 14 (…w/Traffic Barrier on Shaft Foundation)(Precast Conc. w/ Traffic Barrier on Shaft Foundation)  
  Publication Approval Date: 6/11/14 3 Sheets

- D-2.48-00  
  Noise Barrier Wall Type 14SS (…w/S. S. Traffic Barrier on Shaft Foundation)(Precast Conc. w/ Single Slope Traffic Barrier on Shaft Fdn.)  
  Publication Approval Date: 11/10/05 2 Sheets

- D-2.60-00  
  Noise Barrier Wall Type 16 (Masonry on Trench Footing)  
  Publication Approval Date: 11/10/05 2 Sheets

- D-2.62-00  
  Noise Barrier Wall Type 17 (Masonry on Spread Footing)  
  Publication Approval Date: 11/10/05 2 Sheets

- D-2.64-01  
  Noise Barrier Wall Type 18 (Masonry on Offset Spread Footing)  
  Publication Approval Date: 1/6/09 2 Sheets
## 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-2.66-00</td>
<td>Noise Barrier Wall Type 19 (…on Shaft w/Grade Beam Foundation)(Masonry on Shaft with Grade Beam Foundation)</td>
<td>11/10/05</td>
<td>2</td>
</tr>
<tr>
<td>D-2.68-00</td>
<td>Noise Barrier Wall Type 20 (Masonry on Shaft Foundation)</td>
<td>11/10/05</td>
<td>2</td>
</tr>
<tr>
<td>D-2.80-00</td>
<td>Noise Barrier Wall Access Door Type 1 (for CIP Wall on Offset Spread Footing)</td>
<td>11/10/05</td>
<td>2</td>
</tr>
<tr>
<td>D-2.82-00</td>
<td>Noise Barrier Wall Access Door Type 2 (…w/Traffic Barrier)</td>
<td>11/10/05</td>
<td>2</td>
</tr>
<tr>
<td>D-2.84-00</td>
<td>Noise Barrier Wall Access Door Type 3 (for Precast Wall on Shaft Foundation)</td>
<td>11/10/05</td>
<td>2</td>
</tr>
<tr>
<td>D-2.86-00</td>
<td>Noise Barrier Wall Access Door Type 4 (…w/Traffic Barrier on Shaft Foundation)</td>
<td>11/10/05</td>
<td>2</td>
</tr>
<tr>
<td>D-2.88-00</td>
<td>Noise Barrier Wall Access Door Type 5 (for Masonry Wall)</td>
<td>11/10/05</td>
<td>2</td>
</tr>
<tr>
<td>D-2.92-00</td>
<td>Noise Barrier Wall Access Door &amp; Frame</td>
<td>11/10/05</td>
<td>2</td>
</tr>
<tr>
<td>D-3.09-00</td>
<td>Permanent Geosynthetic Wall</td>
<td>5/17/12</td>
<td>4</td>
</tr>
<tr>
<td>D-3.10-01</td>
<td>Cast-In-Place Permanent Geosynthetic Wall Fascia and Facing</td>
<td>5/29/13</td>
<td></td>
</tr>
<tr>
<td>D-3.11-03</td>
<td>Precast Permanent Geosynthetic Wall Fascia</td>
<td>6/11/14</td>
<td>2</td>
</tr>
<tr>
<td>D-3.15-02</td>
<td>Permanent Geosynthetic Wall Single Slope Barrier</td>
<td>6/10/13</td>
<td></td>
</tr>
<tr>
<td>D-3.16-02</td>
<td>Permanent Geosynthetic Wall F-Shape Barrier</td>
<td>5/29/13</td>
<td></td>
</tr>
<tr>
<td>D-3.17-02</td>
<td>Permanent Geosynthetic Wall Expansion Joint Details</td>
<td>5/9/16</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-10.10-01</td>
<td>Reinforced Concrete Retaining Wall Type 1 and 1SW</td>
<td>12/2/08</td>
<td>2</td>
</tr>
<tr>
<td>D-10.15-01</td>
<td>Reinforced Concrete Retaining Wall Type 2 and 2SW</td>
<td>12/2/08</td>
<td>2</td>
</tr>
<tr>
<td>D-10.20-00</td>
<td>Reinforced Concrete Retaining Wall Type 3 and 3SW</td>
<td>7/8/08</td>
<td>2</td>
</tr>
<tr>
<td>D-10.25-00</td>
<td>Reinforced Concrete Retaining Wall Type 4 and 4SW</td>
<td>7/8/08</td>
<td>2</td>
</tr>
<tr>
<td>D-10.30-00</td>
<td>Reinforced Concrete Retaining Wall Type 5</td>
<td>7/8/08</td>
<td>2</td>
</tr>
<tr>
<td>D-10.35-00</td>
<td>Reinforced Concrete Retaining Wall Type 6</td>
<td>7/8/08</td>
<td>2</td>
</tr>
<tr>
<td>D-10.40-01</td>
<td>Reinforced Concrete Retaining Wall Type 7</td>
<td>12/2/08</td>
<td>2</td>
</tr>
<tr>
<td>D-10.45-01</td>
<td>Reinforced Concrete Retaining Wall Type 8</td>
<td>12/2/08</td>
<td>2</td>
</tr>
</tbody>
</table>

### Section E  Bridges and Trestles

- **E-1** Date Numeral Placement on Bridge Traffic Barrier  
  Publication Approval Date: 2/21/07  
  Sheets: 2

- **E-2** Pile or Frame Detour Bridge with Asphalt Overlay  
  Publication Approval Date: 5/29/98  
  Sheets: 2

- **E-4** Precast Prestressed Concrete Piles  
  Publication Approval Date: 8/27/03  
  Sheets: 2

- **E-4a** Precast Prestressed Concrete Piles Handling & Capping  
  Publication Approval Date: 8/27/03  
  Sheets: 2

### Section F  Curbs, Sidewalks, and Driveways

- **F-10.12-03** Cement Concrete Curbs  
  Publication Approval Date: 6/11/14  
  Sheets: 2

- **F-10.16-00** Cement Concrete Curb and Gutter Pan  
  Publication Approval Date: 12/20/06  
  Sheets: 2

- **F-10.18-01** Roundabout Cement Concrete Curbs  
  Publication Approval Date: 7/11/17  
  Sheets: 2

- **F-10.40-03** Extruded Curb Placement  
  Publication Approval Date: 6/29/16  
  Sheets: 2

- **F-10.42-00** Extruded Curb  
  Publication Approval Date: 1/23/07  
  Sheets: 2

---

*Standard Plans for Road, Bridge, and Municipal Construction*

*Effective August 6, 2018*
## 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>F-10.62-02</td>
<td>Precast Sloped Mountable Curb</td>
<td>4/22/14</td>
<td>2</td>
</tr>
<tr>
<td>F-10.64-03</td>
<td>Precast Dual Faced Sloped Mountable Curb</td>
<td>4/22/14</td>
<td>2</td>
</tr>
<tr>
<td>F-30.10-03</td>
<td>Cement Concrete Sidewalk</td>
<td>6/11/14</td>
<td>2</td>
</tr>
<tr>
<td>F-40.12-03</td>
<td>Parallel Curb Ramp</td>
<td>6/29/16</td>
<td>2</td>
</tr>
<tr>
<td>F-40.14-03</td>
<td>Combination Curb Ramp</td>
<td>6/29/16</td>
<td>2</td>
</tr>
<tr>
<td>F-40.15-03</td>
<td>Perpendicular Curb Ramp</td>
<td>6/29/16</td>
<td>2</td>
</tr>
<tr>
<td>F-40.16-03</td>
<td>Single Direction Curb Ramp</td>
<td>6/29/16</td>
<td>2</td>
</tr>
<tr>
<td>F-45.10-02</td>
<td>Detectable Warning Surface</td>
<td>7/15/16</td>
<td>2</td>
</tr>
<tr>
<td>F-80.10-04</td>
<td>Cement Concrete Driveway Entrance Types 1, 2, 3, &amp; 4</td>
<td>7/15/16</td>
<td>2</td>
</tr>
</tbody>
</table>

### Section G  Signs and Sign Supports

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
<th>Sheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>G-10.10-00</td>
<td>Milepost</td>
<td>9/20/07</td>
<td>2</td>
</tr>
<tr>
<td>G-22.10-04</td>
<td>Timber Sign Support</td>
<td>6/28/16</td>
<td>2</td>
</tr>
<tr>
<td>G-24.10-00</td>
<td>Steel Sign Support Type AP Installation Details</td>
<td>11/8/07</td>
<td>2</td>
</tr>
<tr>
<td>G-24.20-01</td>
<td>Steel Sign Support Type AS Installation Details</td>
<td>2/7/12</td>
<td>2</td>
</tr>
<tr>
<td>G-24.30-02</td>
<td>Steel Sign Support Types PL, PL-T, &amp; PL-U Installation Details</td>
<td>6/28/18</td>
<td>2</td>
</tr>
<tr>
<td>G-24.40-07</td>
<td>Steel Sign Support Types SB-1, SB-2 &amp; SB-3 Installation Details</td>
<td>6/28/18</td>
<td>6</td>
</tr>
<tr>
<td>G-24.50-04</td>
<td>Steel Sign Support Types ST-1 - ST-4 Installation Details</td>
<td>7/11/17</td>
<td>2</td>
</tr>
<tr>
<td>G-24.60-05</td>
<td>Steel Sign Support Types TP-A and TP-B Installation Details</td>
<td>6/28/18</td>
<td>2</td>
</tr>
<tr>
<td>G-25.10-04</td>
<td>Steel Sign Support Foundation Details</td>
<td>6/10/13</td>
<td>2</td>
</tr>
<tr>
<td>G-30.10-04</td>
<td>Sign Installation on Signal and Light Standards</td>
<td>6/23/15</td>
<td>2</td>
</tr>
<tr>
<td>G-50.10-03</td>
<td>Sign Bracing</td>
<td>6/28/18</td>
<td>2</td>
</tr>
<tr>
<td>G-60.10-04</td>
<td>Cantilever Sign Structure (Truss-Type)</td>
<td>6/28/18</td>
<td>4</td>
</tr>
<tr>
<td>G-60.20-02</td>
<td>Cantilever Sign Structure (Truss-Type) Foundation Type 1</td>
<td>6/18/15</td>
<td>2</td>
</tr>
<tr>
<td>G-60.30-02</td>
<td>Cantilever Sign Structure (Truss-Type) Fdn. Types 2 &amp; 3</td>
<td>6/18/15</td>
<td>2</td>
</tr>
<tr>
<td>G-70.10-03</td>
<td>Sign Bridge (Truss-Type)</td>
<td>6/18/15</td>
<td>4</td>
</tr>
<tr>
<td>G-70.20-04</td>
<td>Sign Bridge (Truss-Type) Foundation Type1</td>
<td>7/21/17</td>
<td>2</td>
</tr>
<tr>
<td>G-70.30-04</td>
<td>Sign Bridge (Truss-Type) Foundation Types 2 &amp; 3</td>
<td>7/21/17</td>
<td>2</td>
</tr>
<tr>
<td>G-90.10-03</td>
<td>Overhead Sign Bracing and Mounting</td>
<td>7/11/17</td>
<td>2</td>
</tr>
<tr>
<td>G-90.11-00</td>
<td>Overhead Sign Lighting Bracing and Placement</td>
<td>4/28/16</td>
<td>2</td>
</tr>
<tr>
<td>G-90.20-05</td>
<td>Overhead Sign Mounting (Monotube Structure)</td>
<td>7/11/17</td>
<td>2</td>
</tr>
<tr>
<td>G-90.30-04</td>
<td>Overhead Sign Mounting (Truss Structure)</td>
<td>7/11/17</td>
<td>2</td>
</tr>
<tr>
<td>G-90.40-02</td>
<td>Overhead Sign Lighting Details</td>
<td>4/28/16</td>
<td>2</td>
</tr>
<tr>
<td>G-95.10-02</td>
<td>Maintenance Walkway for Sign Bridges</td>
<td>6/28/18</td>
<td>3</td>
</tr>
<tr>
<td>G-95.20-03</td>
<td>Maintenance Walkway Mounting for Monotube Sign Bridge</td>
<td>6/28/18</td>
<td>3</td>
</tr>
<tr>
<td>G-95.30-03</td>
<td>Maintenance Walkway Mounting for Truss-Type Sign Bridge</td>
<td>6/28/18</td>
<td>2</td>
</tr>
</tbody>
</table>
## Contents

<table>
<thead>
<tr>
<th>Section H</th>
<th>Roadside and Site Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>H-10.10-00</td>
<td>Tree and Shrub Planting Details</td>
</tr>
<tr>
<td>H-10.15-00</td>
<td>Live Stake Installations</td>
</tr>
<tr>
<td>H-30.10-00</td>
<td>Crest Gage</td>
</tr>
<tr>
<td>H-32.10-00</td>
<td>Automated Ground Water Monitoring Well</td>
</tr>
<tr>
<td>H-60.10-01</td>
<td>Bollard Type 1</td>
</tr>
<tr>
<td>H-60.20-01</td>
<td>Bollard Type 2</td>
</tr>
<tr>
<td>H-70.10-01</td>
<td>Mailbox Support Type 1</td>
</tr>
<tr>
<td>H-70.20-01</td>
<td>Mailbox Support Type 2</td>
</tr>
<tr>
<td>H-70.30-02</td>
<td>Mailbox Support Type 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section I</th>
<th>Site Preservation and Erosion Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-10.10-01</td>
<td>High Visibility Fence</td>
</tr>
<tr>
<td>I-30.10-02</td>
<td>Silt Fence with Backup Support</td>
</tr>
<tr>
<td>I-30.15-02</td>
<td>Silt Fence</td>
</tr>
<tr>
<td>I-30.16-00</td>
<td>High Visibility Silt Fence with Backup Support</td>
</tr>
<tr>
<td>I-30.17-00</td>
<td>High Visibility Silt Fence</td>
</tr>
<tr>
<td>I-30.20-00</td>
<td>Erosion Control At Culvert Ends</td>
</tr>
<tr>
<td>I-30.30-01</td>
<td>Wattle Installation On Slope</td>
</tr>
<tr>
<td>I-30.40-01</td>
<td>Compost Sock</td>
</tr>
<tr>
<td>I-30.60-01</td>
<td>Erosion Control Details Coir Log Placement</td>
</tr>
<tr>
<td>I-40.10-00</td>
<td>Temporary Silt Fence for Inlet Protection In Unpaved Areas</td>
</tr>
<tr>
<td>I-40.20-00</td>
<td>Storm Drain Inlet Protection</td>
</tr>
<tr>
<td>I-50.20-01</td>
<td>Check Dams on Channels</td>
</tr>
<tr>
<td>I-60.10-01</td>
<td>Biodegradable Erosion Control Blanket Placement for Slopes</td>
</tr>
<tr>
<td>I-60.20-01</td>
<td>Biodegradable Erosion Control Blanket Placement for Ditches</td>
</tr>
<tr>
<td>I-80.10-02</td>
<td>Miscellaneous Erosion Control Details</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section J</th>
<th>Illumination, Signals, and ITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>J-10</td>
<td>Electrical Conduit Placement</td>
</tr>
<tr>
<td>J-10.10-03</td>
<td>Cabinet Orientation, Conduit Layout and Foundation Detail</td>
</tr>
<tr>
<td>J-10.15-01</td>
<td>Cabinet Enclosure on Slope</td>
</tr>
<tr>
<td>J-10.16-00</td>
<td>Service Cabinet Type A (0 - 60 Amp Type 120 Volt Single Phase)</td>
</tr>
<tr>
<td>J-10.17-00</td>
<td>Service Cabinet Type B (0 - 60 Amp Type 120/240 Volt Single Phase)</td>
</tr>
<tr>
<td>J-10.18-00</td>
<td>Service Cabinet Type C (0 - 60 Amp Type 240/480 Volt Single Phase)</td>
</tr>
<tr>
<td>J-10.20-01</td>
<td>Service Cabinet Type B Modified (0 - 200 Amp Type 120/240 Single Phase)</td>
</tr>
<tr>
<td>J-10.21-00</td>
<td>Service Cabinet Type D (0 - 200 Amp Type 120/240 Single Phase)</td>
</tr>
<tr>
<td>J-10.22-00</td>
<td>Service Cabinet Type E (0 - 200 Amp Type 240/480 Single Phase)</td>
</tr>
<tr>
<td>J-10.25-00</td>
<td>Transformer Cabinet (480v/240V - 240V/120V)</td>
</tr>
</tbody>
</table>
## Contents

<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
<th>Sheet Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>J-12.15-00</td>
<td>Type 33xL Single-Width Cabinet Housing</td>
<td>6/28/18</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>J-12.16-00</td>
<td>Type 33xD and 34xLX Double-Width Cabinet Housings</td>
<td>6/28/18</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>J-15.15-02</td>
<td>Span Wire Installation</td>
<td>7/10/15</td>
<td></td>
</tr>
<tr>
<td>J-20.10-03</td>
<td>Accessible Pedestrian PushButton Post (PPB) and Foundation</td>
<td>6/30/14</td>
<td></td>
</tr>
<tr>
<td>J-20.11-02</td>
<td>Accessible Pedestrian PushButton with Curb Base</td>
<td>6/30/14</td>
<td></td>
</tr>
<tr>
<td>J-20.15-03</td>
<td>Accessible Breakaway Pedestrian PushButton (PPB) Post</td>
<td>6/30/14</td>
<td></td>
</tr>
<tr>
<td>J-20.16-02</td>
<td>Pedestrian Signal Standard (Type PS) Details</td>
<td>6/30/14</td>
<td></td>
</tr>
<tr>
<td>J-20.20-02</td>
<td>Pedestrian Signal Standard (Type PS) Electrical Details</td>
<td>5/20/13</td>
<td></td>
</tr>
<tr>
<td>J-20.26-01</td>
<td>Accessible Pedestrian PushButton (PPB) Details</td>
<td>7/12/12</td>
<td></td>
</tr>
<tr>
<td>J-21.10-04</td>
<td>Type PS, Type 1, RM &amp; FB Signal Standard Foundation Details</td>
<td>6/30/14</td>
<td></td>
</tr>
<tr>
<td>J-21.15-01</td>
<td>Type 1 Signal Standard Details</td>
<td>6/10/13</td>
<td></td>
</tr>
<tr>
<td>J-21.16-01</td>
<td>Flashing Beacon Type 1 Signal Standard Details</td>
<td>6/10/13</td>
<td></td>
</tr>
<tr>
<td>J-21.17-01</td>
<td>Flashing Beacon Type 1 Signal Standard Electrical Details</td>
<td>6/10/13</td>
<td></td>
</tr>
<tr>
<td>J-21.20-01</td>
<td>Type 1 Signal Standard Electrical Details</td>
<td>6/10/13</td>
<td></td>
</tr>
<tr>
<td>J-22.15-02</td>
<td>Ramp Meter Signal Standard Details</td>
<td>7/10/15</td>
<td></td>
</tr>
<tr>
<td>J-22.16-03</td>
<td>Ramp Meter Signal Standard Electrical Details</td>
<td>7/10/15</td>
<td></td>
</tr>
<tr>
<td>J-26.10-03</td>
<td>Traffic Signal Standard Foundation Details</td>
<td>7/21/16</td>
<td></td>
</tr>
<tr>
<td>J-26.15-01</td>
<td>Signal Standard Foundation Placements</td>
<td>5/17/12</td>
<td></td>
</tr>
<tr>
<td>J-26.20-01</td>
<td>Temporary Signal Standard Adaptor</td>
<td>6/28/18</td>
<td></td>
</tr>
<tr>
<td>J-27.10-01</td>
<td>Type 4 and 5 Strain Pole Foundation</td>
<td>7/21/16</td>
<td></td>
</tr>
<tr>
<td>J-27.15-00</td>
<td>Type 4 and 5 Strain Pole Standard</td>
<td>3/15/12</td>
<td></td>
</tr>
<tr>
<td>J-28.22-00</td>
<td>Steel Light Standard Placement (Slip Base)</td>
<td>8/7/07</td>
<td></td>
</tr>
<tr>
<td>J-28.24-01</td>
<td>Steel Light Standard Placement (Fixed Base)</td>
<td>6/3/15</td>
<td></td>
</tr>
<tr>
<td>J-28.26-01</td>
<td>Steel Light Standard Placement Miscellaneous</td>
<td>12/2/08</td>
<td></td>
</tr>
<tr>
<td>J-28.30-03</td>
<td>Steel Light Standard Foundation Types A &amp; B</td>
<td>6/11/14</td>
<td></td>
</tr>
<tr>
<td>J-28.43-01</td>
<td>Slip Base Adaptor for 4-Bolt Light Standard Base</td>
<td>6/28/18</td>
<td></td>
</tr>
<tr>
<td>J-28.45-03</td>
<td>Steel Light Standard Elbow Mounting on Bridge &amp; Retaining Wall</td>
<td>7/21/16</td>
<td></td>
</tr>
<tr>
<td>J-28.50-03</td>
<td>Steel Light Standard Pole Base and Hand Hole Details</td>
<td>7/21/16</td>
<td></td>
</tr>
<tr>
<td>J-28.60-02</td>
<td>Steel Light Standard Barrier Mounted Base</td>
<td>7/21/16</td>
<td></td>
</tr>
<tr>
<td>J-28.70-03</td>
<td>Steel Light Standard Wiring Details</td>
<td>7/21/17</td>
<td></td>
</tr>
<tr>
<td>J-29.10-01</td>
<td>Type CCTV Traffic Signal Standard (Camera Pole) Foundation Details</td>
<td>7/21/16</td>
<td></td>
</tr>
<tr>
<td>J-29.15-01</td>
<td>Type CCTV Traffic Signal Standard (Camera Pole)</td>
<td>7/21/16</td>
<td></td>
</tr>
<tr>
<td>J-29.16-01</td>
<td>Type CCTV Traffic Signal Standard (Camera Pole)</td>
<td>7/21/16</td>
<td></td>
</tr>
<tr>
<td>J-30.10-00</td>
<td>High Mast Luminaire Maintenance Pad</td>
<td>6/18/15</td>
<td></td>
</tr>
<tr>
<td>J-40.05-00</td>
<td>Existing Junction Box Retrofit Grounding Details</td>
<td>7/21/16</td>
<td></td>
</tr>
<tr>
<td>J-40.10-04</td>
<td>Locking Lid Standard Duty Junction Box Types 1 &amp; 2</td>
<td>4/28/16</td>
<td></td>
</tr>
<tr>
<td>J-40.20-03</td>
<td>Heavy-Duty Junction Box Types 4, 5 &amp; 6</td>
<td>4/28/16</td>
<td></td>
</tr>
</tbody>
</table>
## Section K  Work Zone Traffic Control

### K-70.20-01 Temporary Channelization

### K-80.10-01 Class A Construction Signing Installation

### K-80.20-00 Type 3 Barricade

### K-80.30-00 Alternative Temporary Conc. Barrier (F-Shape)

### K-80.35-00 Temporary Conc. Barrier Anchoring

### K-80.37-00 Temporary Conc. Barrier Anchoring ~ Narrow

---

**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>J-40.30-04</td>
<td>Locking Lid Standard Duty Junction Box Type 8</td>
<td>4/28/16</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>J-40.35-01</td>
<td>Sign Post-Mounted Junction Box</td>
<td>5/29/13</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-40.36-02</td>
<td>Nema 4X Non-Adjustable Junction Box</td>
<td>7/21/17</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>J-40.37-02</td>
<td>Nema 3R Adjustable Flush-Mount Junction Box</td>
<td>7/21/17</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>J-40.38-01</td>
<td>Top Entry Nema 4x Surface-Mount Junction Box</td>
<td>5/20/13</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-40.39-00</td>
<td>Front Entry Nema 4X Surface-Mount Junction Box</td>
<td>5/20/13</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-40.40-01</td>
<td>Nema 4X Junction Box in Sidewalk Located on Structure</td>
<td>4/28/16</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-45.36-00</td>
<td>Nema 3R and 4X Flush-Mount Junction Box - Grounding</td>
<td>7/21/17</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>J-50.05-00</td>
<td>Loop Splice Details</td>
<td>7/21/17</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-50.10-00</td>
<td>Type 1 Induction Loop</td>
<td>6/3/11</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-50.11-01</td>
<td>Type 2 Induction Loop</td>
<td>7/21/17</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-50.12-01</td>
<td>Type 3 Induction Loop</td>
<td>7/21/17</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-50.15-01</td>
<td>Induction Loop Details</td>
<td>7/21/17</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-50.16-01</td>
<td>Preformed Loop Installation Details for New Bridge Decks</td>
<td>3/22/13</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>J-50.20-00</td>
<td>Permanent Traffic Recorder Installations</td>
<td>6/3/11</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-50.25-00</td>
<td>Weigh-In Motion Site Installation Details</td>
<td>6/3/11</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-50.30-00</td>
<td>Permanent Traffic Recorder &amp; Weigh-In-Motion Details</td>
<td>6/3/11</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-60.05-01</td>
<td>Typical Grounding Details</td>
<td>7/21/16</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-60.11-00</td>
<td>Conduit Installation in Traffic Barrier on Retaining Wall</td>
<td>5/20/13</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>J-60.12-00</td>
<td>Conduit Installation in Single-Slope Concrete Barrier (Dual Faced)</td>
<td>5/20/13</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>J-60.13-00</td>
<td>Stainless Steel Channel</td>
<td>6/16/10</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-60.14-00</td>
<td>Stainless Steel Channel Mounting Details on Column or Pole</td>
<td>6/16/10</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-75.10-02</td>
<td>Signal Head Mounting Details ~ Pole and Post Top Mountings</td>
<td>7/10/15</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-75.20-01</td>
<td>Signal Head Mounting Details ~ Mast Arm and Span Wire Mountings</td>
<td>7/10/15</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>J-75.30-02</td>
<td>Miscellaneous Signal Details</td>
<td>7/10/15</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>J-75.40-02</td>
<td>Overhead Sign Electrical Details (Monotube Structure)</td>
<td>6/1/16</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>J-75.41-01</td>
<td>Signal Bridge Standard Electrical Details</td>
<td>6/29/16</td>
<td>4 Sheets</td>
</tr>
<tr>
<td>J-75.45-02</td>
<td>Overhead Sign Electrical Details (Truss Structure)</td>
<td>6/1/16</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>J-80.10-00</td>
<td>Type 332 Signal Cabinet Layout</td>
<td>6/28/18</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-80.15-00</td>
<td>Type 332 Signal Cabinet Detector Test Panel</td>
<td>6/28/18</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-81.10-00</td>
<td>Type 334 Ramp Meter/Data Station Cabinet</td>
<td>6/28/18</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-86.10-00</td>
<td>Highway Advisory Radio (Har) Transmitter</td>
<td>6/28/18</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-90.10-03</td>
<td>Pull Box</td>
<td>6/28/18</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-90.20-03</td>
<td>Cable Vault</td>
<td>6/28/18</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-90.21-02</td>
<td>Small Cable Vault</td>
<td>6/28/18</td>
<td>3 Sheets</td>
</tr>
<tr>
<td>J-90.50-00</td>
<td>Vault Installation Details</td>
<td>6/28/18</td>
<td>3 Sheets</td>
</tr>
</tbody>
</table>

---

**Standard Plans for Road, Bridge, and Municipal Construction**

**Effective August 6, 2018**
**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><strong>Section L</strong> Fence and Glare Screen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L-10.10-02</td>
<td>Wire Fence Types 1 &amp; 2 and Wire Gates</td>
<td>6/21/12</td>
<td>2</td>
</tr>
<tr>
<td>L-20.10-03</td>
<td>Chain Link Fence Types 3 and 4</td>
<td>7/14/15</td>
<td>2</td>
</tr>
<tr>
<td>L-30.10-02</td>
<td>Chain Link Gate</td>
<td>6/11/14</td>
<td>2</td>
</tr>
<tr>
<td>L-40.10-02</td>
<td>Glare Screen Type 1 Design A</td>
<td>6/21/12</td>
<td>2</td>
</tr>
<tr>
<td>L-40.15-01</td>
<td>Glare Screen Type 1 Design B</td>
<td>6/16/11</td>
<td></td>
</tr>
<tr>
<td>L-40.20-02</td>
<td>Glare Screen Type 2 (Chain Link with Slats)</td>
<td>6/21/12</td>
<td></td>
</tr>
<tr>
<td>L-70.10-01</td>
<td>Access Control Gate</td>
<td>5/21/08</td>
<td></td>
</tr>
<tr>
<td>L-70.20-01</td>
<td>Access Control Double Gate</td>
<td>5/21/08</td>
<td></td>
</tr>
<tr>
<td><strong>Section M</strong> Roadway Delineation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M-1.20-03</td>
<td>Ramp Channelization Single Lane</td>
<td>6/24/14</td>
<td></td>
</tr>
<tr>
<td>M-1.40-02</td>
<td>Ramp Channelization Two Lane</td>
<td>6/3/11</td>
<td></td>
</tr>
<tr>
<td>M-1.60-02</td>
<td>Ramp Channelization Collector-Distributor Road</td>
<td>6/3/11</td>
<td></td>
</tr>
<tr>
<td>M-1.80-03</td>
<td>Ramp Channelization Parallel On &amp; Weaving Section</td>
<td>6/3/11</td>
<td></td>
</tr>
<tr>
<td>M-2.20-03</td>
<td>Off-Ramp Gore Area Marking Layouts</td>
<td>7/10/15</td>
<td></td>
</tr>
<tr>
<td>M-2.21-00</td>
<td>On-Ramp Gore Area Marking Layouts</td>
<td>7/10/15</td>
<td></td>
</tr>
<tr>
<td>M-3.10-03</td>
<td>Left Turn Channelization</td>
<td>6/3/11</td>
<td></td>
</tr>
<tr>
<td>M-3.20-02</td>
<td>Left Turn Channelization Reduced Tapers</td>
<td>6/3/11</td>
<td></td>
</tr>
<tr>
<td>M-3.30-03</td>
<td>Left Turn Channelization Tee Intersection and Back-to-Back Turn Lanes</td>
<td>6/3/11</td>
<td></td>
</tr>
<tr>
<td>M-3.40-03</td>
<td>Two-Way Left-Turn and Median Channelization</td>
<td>6/3/11</td>
<td></td>
</tr>
<tr>
<td>M-3.50-02</td>
<td>Double Left-Turn Channelization</td>
<td>6/3/11</td>
<td></td>
</tr>
<tr>
<td>M-5.10-02</td>
<td>Right-Turn Channelization</td>
<td>6/3/11</td>
<td></td>
</tr>
<tr>
<td>M-7.50-01</td>
<td>High Occupancy Vehicle (HOV) Lane Symbol Layout</td>
<td>1/30/07</td>
<td></td>
</tr>
<tr>
<td>M-9.50-02</td>
<td>Bicycle Lane Symbol Layout</td>
<td>6/24/14</td>
<td></td>
</tr>
<tr>
<td>M-9.60-00</td>
<td>Shared - Use Path Markings</td>
<td>2/10/09</td>
<td></td>
</tr>
<tr>
<td>M-11.10-02</td>
<td>Railroad Crossing Layout</td>
<td>7/11/17</td>
<td></td>
</tr>
<tr>
<td>M-12.10-01</td>
<td>Roundabout Pavement Markings</td>
<td>6/28/18</td>
<td></td>
</tr>
<tr>
<td>M-15.10-01</td>
<td>Crosswalk Layout</td>
<td>2/6/07</td>
<td></td>
</tr>
<tr>
<td>M-17.10-02</td>
<td>Parking Space Layouts</td>
<td>7/3/08</td>
<td></td>
</tr>
<tr>
<td>M-20.10-02</td>
<td>Longitudinal Marking Patterns</td>
<td>6/3/11</td>
<td></td>
</tr>
<tr>
<td>M-20.20-02</td>
<td>Profiled and Embossed Plastic Lines</td>
<td>4/20/15</td>
<td></td>
</tr>
<tr>
<td>M-20.30-04</td>
<td>Longitudinal Marking Supplement with Raised Pavement Markers</td>
<td>2/29/16</td>
<td>2</td>
</tr>
<tr>
<td>M-20.40-03</td>
<td>Longitudinal Marking Supplement with RPM's ~ Turn Lanes</td>
<td>6/24/14</td>
<td>2</td>
</tr>
<tr>
<td>M-20.50-02</td>
<td>Longitudinal Marking Substitution with RPM's</td>
<td>6/3/11</td>
<td></td>
</tr>
<tr>
<td>M-24.20-02</td>
<td>Symbol Markings ~ Traffic Arrows for High Speed Roadways</td>
<td>4/20/15</td>
<td>3</td>
</tr>
<tr>
<td>M-24.40-02</td>
<td>Symbol Markings ~ Traffic Arrows for Low Speed Roadways</td>
<td>4/20/15</td>
<td>2</td>
</tr>
<tr>
<td>M-24.50-00</td>
<td>Roundabout Traffic Arrows</td>
<td>6/16/11</td>
<td></td>
</tr>
<tr>
<td>M-24.60-04</td>
<td>Symbol Markings Miscellaneous</td>
<td>6/24/14</td>
<td>2</td>
</tr>
<tr>
<td>M-24.65-00</td>
<td>BMP Delineation - Linear Type</td>
<td>7/11/17</td>
<td></td>
</tr>
<tr>
<td>M-24.66-00</td>
<td>BMP Delineation - Underground and Pond Type</td>
<td>7/11/17</td>
<td></td>
</tr>
<tr>
<td>M-40.10-03</td>
<td>Guide Posts and Barrier Delineators</td>
<td>6/24/14</td>
<td></td>
</tr>
<tr>
<td>M-40.20-00</td>
<td>Guide Post Placement Interchanges</td>
<td>10/12/07</td>
<td></td>
</tr>
<tr>
<td>M-40.30-01</td>
<td>Guide Post Placement Grade Intersections</td>
<td>7/11/17</td>
<td></td>
</tr>
</tbody>
</table>

Standard Plans for Road, Bridge, and Municipal Construction

Effective August 6, 2018
<table>
<thead>
<tr>
<th>Plan No.</th>
<th>Plan Title</th>
<th>Publication Approval Date</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-40.40-00</td>
<td>Guide Post Placement Horizontal Curves</td>
<td>9/20/07</td>
<td></td>
</tr>
<tr>
<td>M-40.50-00</td>
<td>Guide Post Placement Bridges</td>
<td>9/20/07</td>
<td></td>
</tr>
<tr>
<td>M-40.60-00</td>
<td>Guide Post Placement Miscellaneous</td>
<td>9/20/07</td>
<td></td>
</tr>
<tr>
<td>M-60.10-01</td>
<td>Shoulder Rumble Strip Type 1 for Divided Highways</td>
<td>6/3/11</td>
<td>4 Sheets</td>
</tr>
<tr>
<td>M-60.20-02</td>
<td>Shoulder Rumble Strip, Types 2, 3, and 4, for Undivided Highways</td>
<td>6/27/11</td>
<td>2 Sheets</td>
</tr>
<tr>
<td>M-65.10-02</td>
<td>Centerline Rumble Strip</td>
<td>5/11/11</td>
<td>2 Sheets</td>
</tr>
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ALIGNMENT STAKE
STAKE EVERY 100 FEET ON TANGENTS, EVERY 25 FEET ON CURVES

CLEARING/GRUBBING (C&G) LATH
STAKE AT EACH FULL STATION, 100 FEET ON TANGENTS, EVERY 25 FEET ON CURVES. NO HUB NECESSARY.

OFFSET FROM SLOPE STAKE CATCH (10 FEET)
FILL AT RP STAKE (1.2 FEET)
CUT AT CATCH POINT (BACK OF DITCH)
DISTANCE FROM $C$ TO CATCH POINT
SIDE SLOPE RATIO (4H:1V)
BACK OF DITCH

SLOPE TREATMENT (ST) STAKE
FOR CUT SECTIONS

DAYLIGHT (DL) STAKE

DAYLIGHT CATCH (CUT 0.0 FEET)
FILL (0.1 FEET)
SIDE SLOPE TO A 2% ROADWAY SLOPE (52H:1V)
DISTANCE FROM C (18.2 FEET)

OFFSET FROM SLOPE STAKE CATCH (7 FEET)
CUT AT ST STAKE (2.9 FEET)
DISTANCE FROM $C$ TO CATCH (BACK OF DITCH) (23.5 FEET)
SIDE SLOPE RATIO (3H:1V)
LINE STATIONING HUNDRED FOOT INCREMENTS

STANDARD PLAN A-10.10-00
SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION

Washington State Department of Transportation
1. The Brass Disc will be furnished by the State.
2. The text in the shaded area (see TOP VIEW) shall be 3/16" high and will be stamped by WSDOT personnel prior to setting the cap. Only the assigned identification letters and numbers are to be placed on the Brass Disc.
3. The hole shall be 32" minimum in depth or 6" below the deepest recorded frost line. All loose material shall be removed from the bottom of the hole so that the concrete is placed on firm undisturbed earth.
4. The top of the concrete shall be troweled smooth and the Brass Disc set in the center with top flush and level. The top of the monument may be recessed or protruding, depending on conditions.
5. The Brass Disc shall be rotated so it can be read while the observer is facing north.
6. When the concrete is set, cover the entire monument with moist earth and leave for three days.
7. To replace a Public Land Survey System (PLSS) corner, consult a licensed Professional Land Surveyor (PLS).
1. Dimensions may vary according to manufacturer.
2. Base to be placed on a well compacted foundation.
3. Monument case to be installed by contractor.
NOTES

1. Slope treatment shall be constructed simultaneously with the roadway excavation. Hand trimming will not be required if satisfactory results are obtained with mechanical equipment.

2. Slope treatment is used to provide a transition between the existing ground and the cut slope. The intended purpose is to eliminate the abrupt edge and give the area a more natural appearance. The dimensions shown are approximate and can vary to achieve this purpose.

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SLOPE TREATMENT

STANDARD PLAN A-20.10-00

SHEET 1 OF 1 SHEET

STATE OF WASHINGTON
DEPARTMENT OF TRANSPORTATION

CERTIFICATE NO. 000598

SLOPE TREATMENT NOT REQUIRED
Concrete Slope Protection

**Plan**
- **Dummy Joint (Typ.)**
- **Footing**
- **Slope Protection**

**Section A**
- **Existing Soil**
- **Imbedment Slope**

**Section B**
- **Existing Soil**

**Typical Section**
- **Footings**
- **10 Gage 5" x 5" Wire Mesh Reinforcement Centered in Concrete (See Std. Spec. 9-A7/7)**
- **Equal Spacing 6" Centers Min. 8" Centers Max.**
- **Footing**
- **2 1/2"**
- **Bottom Edge of Slope Protection Follows Bottom of Ditch**
- **Edge of Shoulder**

**Note:** This Plan is Not a Legal Engineering Document. The Original, Signed by the Engineer, and Approved for Publication, is Kept at the Washington State Department of Transportation. A Copy May Be Obtained Upon Request.

**Concrex Slop Protection**
**Standard Plan A-30.10-00**

**State of Washington Registered Landscape Architect**

**Approval for Publication**

Washington State Department of Transportation
1. **Maximum anchor spacing (A)** for debris and impact loads required as per table for a minimum allowable anchor capacity of 20,000 lbs. Systems subjected to snow loads may require narrower maximum spacing.

2. Hexagonal mesh must meet minimum requirements of ASTM A975 for gabions.

3. U-Section of wire rope clip must be applied to the dead end, and saddle of wire rope clip must be applied to the live end of the rope as shown.

4. All wire rope loops shall include a standard weight thimble.

---

**Notes**

- **Maximum anchor spacing (A)** for debris and impact loads required as per table for a minimum allowable anchor capacity of 20,000 lbs. Systems subjected to snow loads may require narrower maximum spacing.
- Hexagonal mesh must meet minimum requirements of ASTM A975 for gabions.
- U-Section of wire rope clip must be applied to the dead end, and saddle of wire rope clip must be applied to the live end of the rope as shown.
- All wire rope loops shall include a standard weight thimble.

---

**Table: Maximum anchor spacing (A)**

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**Table: Maximum length of top horizontal support rope (B)**

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**Wire Mesh Slope Protection**

**Standard Plan A-30.30-01**

Sheet 1 of 1 sheet

Washington State Department of Transportation
SLOPE PROTECTION ANCHORS

NOTES

1. SUGGESTED MINIMUM DEPTH
2. MINIMUM ALLOWABLE ANCHOR CAPACITY SHALL BE 20,000 LBS.

TYPE 1
DEADMAN
(For use in soil)

- #3 Bar (TYP.) - four required
- Reinforced concrete post - 12" x 12" x 66". Place wire rope at center of post

TYPE 2
DEADMAN
(For use in soil)

- #3 Bar (TYP.) - four required
- Reinforced concrete post (TYP.) - 12" x 12" x 66". Place wire rope at center of post

TYPE 3
DRILLABLE - GROUTABLE
(For use in rock)

- Hollow core threaded bar
- Sacrificial drill bit
- Cement grout

TYPE 4
3/4" WIRE ROPE
(For use in rock or soil)

- Galvanized wire rope
- Ferrule
- Thimble

TYPE 5
MECHANICAL ANCHOR
(For use in soil)

- Hollow core threaded bar
- Hex nut
- Steel bearing plates

TYPE 6
DEFORMED STEEL THREADED BAR
(For use in rock)

- No. 8 grade 60 deformed steel threaded bar

GROUND LINE

WIRE ROPE CLIP (TYP.)

CEMENT GROUT

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
NOTES

1. The "U" shape or "V" shape are both acceptable.
2. Wire sizes shown are minimum required.
3. All wire intersections are to be welded.
4. Basket must be firmly attached to existing or new base.
5. Dowels and Tie Bars shall be held firmly in the above welded assembly.
6. Do not clip Spreader Wires.

Dowel Bar Basket

PLAN VIEW
"U" Shape Assembly Shown

SECTION A
ELEVATION VIEW
"U" Shape Assembly Shown

SECTION B

Washington State Department of Transportation
July 7, 2007

Dowel Bar Baskets

Standard Plan A-40.00-00
Sheet 1 of 1 Sheet
**TYPICAL ISOLATION JOINT GUIDELINES**

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<th>FEATURE</th>
<th>EDGES, FLANGES OR LIPS IN THE PAVEMENT SECTION</th>
<th>CONTINUOUS VERTICAL FACE THROUGH THE PAVEMENT SECTION</th>
<th>DISTANCE FROM NEAREST TRANSVERSE JOINT</th>
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<td>D</td>
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</table>

* WITH RECTANGULAR GRATE CAST INTO ADJUSTMENT SECTION

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**PLAN TYPICAL APPLICATIONS**

- **ISOLATION JOINT - 3/4" PREMOLDED JOINT FILLER**
  - ISOLATION JOINT - 3/4" PREMOLDED JOINT FILLER
  - CONTINUOUS VERTICAL FACE THROUGH THE PAVED SECTION

---

**TYPICAL APPLICATIONS**

- ISOLATION JOINT - 3/4" PREMOLDED JOINT FILLER
  - EDGES, FLANGES OR LIPS IN PAVEMENT SECTION
  - CONTINUOUS VERTICAL FACE THROUGH THE PAVED SECTION
DETAIL 1
1/2 INCH JOINT SEAL AT END OF CONCRETE

DETAIL 2
1 INCH JOINT SEAL AT END OF CONCRETE

DETAIL 3
1/2 INCH CONCRETE ASPHALT BUTT JOINT

DETAIL 4
1 INCH CONCRETE ASPHALT BUTT JOINT

NOTES
1. Use the 1/2 inch joint details for bridges with expansion length less than 100 feet and for bridges with L type abutments. Use the 1 inch joint details for other applications. Use Detail 5 on steel trusses and timber bridges with concrete deck panels.

2. Sawcut shall be as described in Standard Specification Section 6-05.3(8) and sealed in accordance with Standard Specification Section 5-05.3(8).

3. The Contractor shall avoid sawcutting concrete at all locations. For Details 1 and 2, the construction tolerance to locate the sawcut is 1/4 inch (0 min. to 1/2 inch max.) from the concrete.

4. For Details 1, 2, 3, and 4, the item "HMA SAWCUT AND SEAL" shall be used for payment. For Details 5 and 6, the item "PAVED PANEL JOINT SEAL" shall be used for payment. For Detail 7, the item "SEALING EXISTING LONGITUDINAL AND TRANSVERSE JOINT" shall be used for payment.
NOTES
1. All edges of the approach slab shall have 1/2" (in) radii except at longitudinal construction joints and adjacent to L-Type abutments.

2. Longitudinal joints shall be placed on lane lines and shall be constructed and sealed in accordance with Standard Specification Section 6-05.3(B). Joints may be either a sawcut crack control joint or a construction joint. Sawcut joints shall terminate 1" - 0" before reaching edge of slab and must be sawcut as soon as possible after placement of concrete.

   A) Approach slabs less than 40' (ft) wide -- no joint is required.
   B) Approach slabs wider than 40' (ft) -- one or more joints are required to divide the slab into approximately 24' (ft) wide sections.

3. The minimum lap splice of #5 is 2'-0". #6 is 1'-6". #8 is 3'-0". And #10 is 3'-6". All lap splices shall be staggered so that no more than 50% of rebar is spliced at the same location. Lap splices shall be located within the middle half of the bridge approach slab. Optional splices are allowed for #8 and #6.
EMBANKMENT WIDENING
AT BRIDGE END
WITH WING WALL
STANDARD PLAN A-50.10-00

BEAM GUARDRAIL CONNECTION TO BRIDGE TRAFFIC BARRIER
NOTE:
OMIT BEVELED ENDS ON TOP OF BRIDGE TRAFFIC BARRIER WHEN CONNECTING TO CONCRETE BARRIERS.
NOTES

1. Install tie bars across longitudinal joints between new panels (complete and partial) and existing cement concrete pavement lane or shoulder when four or more adjacent panels are replaced. Place new tie bars between existing tie bars. Tie bars are not installed between cement concrete pavement and hot mix asphalt shoulders.

2. Place a bond-breaking material such as polyethylene film, roofing paper, or other material approved by the Engineer along existing concrete surfaces and between the bottom of the slab and bases prior to placing concrete.

3. Place new dowel bars between existing dowel bars. The 1" - 0" dimension from the edge of the panel may be increased by 6" (in) to avoid bar in existing panel.

4. Bars shall meet the requirements of Standard Specification 9-07.5(1) or 9-07.5(2).

NEW DOWEL BAR – 1 1/2" (IN) DIAM. × 18" (IN)
NEW DOWEL BAR – 9" (IN) DIA. × 9" (IN) HOLE IN EXISTING CEMENT CONCRETE FOR NEW DOWEL BAR (TYP.)
1/2 CONCRETE PAVEMENT DEPTH

SINGED PLAN A-60.10-03 SHEET 1 OF 2 SHEETS

CIMENT CONCRETE PAVEMENT REHABILITATION STANDARD PLAN A-60.10-03

APPROVED FOR PUBLICATION

Dec 21 2014 1:58 PM
Washington State Department of Transportation

Outlook: Jeff
Dec 15 2014 4:09 PM
PLAN VIEW
PARTIAL PANEL REPLACEMENT
WITHOUT JOINT REPLACEMENT

SECTION B

CEMENT CONCRETE PAVEMENT
REHABILITATION
STANDARD PLAN A-60.10-03

NEW TIE BAR = 5/8 x 30" (IN)

DRILL 7/8" (IN) MIN. TO 1 1/8" (IN) MAX. DIAM. X 15" (IN) LONG HOLE IN EXISTING CEMENT CONCRETE FOR NEW TIE BAR
NOTES

1. FINAL GRADE TRANSITION: The maximum longitudinal slope to transition an increase in roadway grade to the new or existing bridge grade will be at most 1 inch rise to 40 feet run (1V:450H or flatter) (0.2% maximum).

2. HMA removal depth and compacted depth shall be as shown in the plans.

3. When lowering bridge profile, no removal of materials below guardrail must be to grade, and allow waterorage to drain towards the ditch line. This work is incidental to other bid items for which payment is made.

4. Where an HMA profile transition ends at exiting HMA, the Engineer may adjust the limits of the transition to improve ride.

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PLAN
RAISING PROFILE AT BRIDGE
TRANSITION FOR SKewed BRIDGES

ELEVATION
RAISING PROFILE AT BRIDGE

ELEVATION
RAISING PROFILE AT BRIDGE (WITH BRIDGE APPROACH SLAB)

ELEVATION
LOWERING PROFILE AT BRIDGE

ELEVATION
LOWERING PROFILE AT BRIDGE (WITH BRIDGE APPROACH SLAB)
NOTES

1. If a zone has rebar section loss or full depth repairs, then the concrete deck repair in each zone shall achieve 3,000 PSI before progressing to the adjacent zone.

2. Remove all concrete 3/4" minimum clearance around all exposed reinforcement bars in accordance with Standard Specification 6-09.3(6).

3. For tension zones of continuous structures, when a longitudinal reinforcement bar has greater than 20% section loss (or damage), remove concrete a minimum of 3'-6" on each side of section loss and place 2 supplemental reinforcement bars, adjacent and parallel to the deficient bar, extending 3'-0" beyond each side having 20% section loss. Mechanical splices may be used to facilitate placement of #4 reinforcement bars.

4. For typical rebar repairs, when the reinforcement has greater than 20% section loss (or damage), remove concrete a minimum of 2'-6" on each side of section loss, and replace with new supplemental reinforcement, same diameter as original, adjacent and parallel to the deficient bar, extending 2'-3" beyond each end of section having 20% section loss.
### PIPE ALLOWANCES

<table>
<thead>
<tr>
<th>PIPE MATERIAL</th>
<th>MAXIMUM INSIDE DIAMETER (INCHES)</th>
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<tbody>
<tr>
<td>REINFORCED OR PLAIN CONCRETE</td>
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<tr>
<td>ALL METAL PIPE</td>
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<tr>
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<td>PROFILE WALL PVC (STD. SPEC. SECT. 8-05.12(2))</td>
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*Corrugated polyethylene storm sewer pipe*

### NOTES

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

2. The knockout diameter shall not be greater than 20" (in). Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) 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 Section 5-04.3.

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

4. The frame and grate may be installed with the flange down, or integrally cast into the adjustment section with flange up.

5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1:24 or steeper.

6. The opening shall be measured at the top of the Precast Base Section.

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

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<th>PIPE MATERIAL</th>
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<tr>
<td>Profile Wall PVC (STD. SPEC. SECT. 1.0-05.12(2))</td>
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</table>

★ Corrugated Polyethylene Storm Sewer Pipe

### NOTES

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

2. The knockout shall not be greater than 20" (in), in any direction. Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) 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 Section 9-04.3.

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

4. The frame and grate may be installed with the flange down or integrally cast into the adjustment section with flange up.

5. The Presta Base Section may have a rounded floor, and the walls may be sloped at a rate of 1:24 or steeper.

6. The opening shall be measured at the top of the Presta Base Section.

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

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

2. The knockout diameter shall not be greater than 18" (in). Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) 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 Section 9-04.3.

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

4. The frame and grate may be installed with the flange down, or integrally cast into the adjustment section with flange up.

5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1:24 or steeper.

6. The opening shall be measured at the top of the Precast Base Section.

7. All pickup holes shall be grouted full after the basin has been placed.
NOTES
1. No steps are required when height is 4' or less.
2. The bottom of the precast catch basin may be sloped to facilitate clearing.
3. The rectangular frame and grate may be installed with the flange up or down. The frame may be cast into the adjustment section.
4. Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) 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 Section 9-04.3.

**CATCH BASIN DIMENSIONS**

<table>
<thead>
<tr>
<th>CATCH BASIN DIAMETER</th>
<th>MIN. WALL THICKNESS</th>
<th>MIN. BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT SIZE</th>
<th>MINIMUM DISTANCE BETWEEN KNOCKOUTS</th>
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**PIPE ALLOWANCES**

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<th>CATCH BASIN DIAMETER</th>
<th>PIPE MATERIAL WITH MAXIMUM INSIDE DIAMETER</th>
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1. Corrugated Polyethylene Storm Sewer Pipe
(See Standard Specification Section 9-05.20)
2. (See Standard Specification Section 9-05.12(1))
3. (See Standard Specification Section 9-05.12(2))
4. Polypropylene Pipe (See Standard Specification Section 9-05.24)
NOTES

1. The pipe supports and the flow restrictor shall be constructed of the same material and be anchored at a maximum spacing of 36" (in). Attach the pipe supports to the manhole with 5/8" (in) stainless steel expansion bolts or embed the supports into the manhole wall 2" (in).

2. The vertical riser stem of the flow restrictor shall be the same diameter as the horizontal outlet pipe with a minimum diameter of 8" (in).

3. The flow restrictor shall be fabricated from one of the following materials:
   - 0.060" (in) Corrugated Aluminum Alloy Drain Pipe
   - 0.064" (in) Corrugated Galvanized Steel Drain Pipe with Treatment 1
   - 0.064" (in) Corrugated Aluminized Steel Drain Pipe
   - 0.060" (in) Aluminum alloy flat sheet, in accordance with ASTM B 209, 5052 H32 or EPS High Density Polyethylene Storm Sewer Pipe

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

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

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

7. The shear gate shall be made of aluminum alloy in accordance with ASTM B 26 and ASTM B 275, designation 2023A; or cast iron in accordance with ASTM A 48, Class 308.

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

9. A neoprene rubber gasket is required between the riser mounting flange and the gate flange. Install the gate so that the level-line mark is level when the gate is closed.

10. The mating surfaces of the lid and the body shall be machined for proper fit.

All shear gate bolts shall be stainless steel.

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

12. Alternative shear gate designs are acceptable if material specifications are met.
1. Drain basin to be custom manufactured according to plan details. Risers are needed for basins over 84" (in) due to shipping restrictions. The maximum depth from finished grade to the lowest invert shall be 8' (ft).

2. Drainage connections shall utilize flexible elastomeric seals conforming to ASTM F477 and shall meet the requirements of ASTM D3212.

3. Risers can be trimmed down to 3" (in) extension without interfering with the installation of the frame.

4. These structures can be used for Type 1, Type 1L, and Type 2 structures. Usage for the Type 2 structures shall be limited to pipe size use only.

5. Basins shall be manufactured from PVC pipe stock meeting the requirements of ASTM D1764, cell classification 12454.

6. Ductile iron castings for PVC catch basins shall conform to the requirements of ASTM A536, grade 70-50-08, and shall meet the proof load testing requirements of AASHTO M 306.

7. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.B.) 5/8" (in) x 11 NC x 2" (in) allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
GRAVEL BACKFILL FOR PIPE ZONE BEDDING

NOTES
1. Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum.
2. For pipe allowances, see Standard Plan B-10.20.

MANHOLE DIMENSION TABLE

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</table>

MANHOLE TYPE 1

STANDARD PLAN B-15.20-01

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
NOTES
1. Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum.
2. For pipe allowances, see Standard Plan B-10.20.

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MANHOLE TYPE 2
STANDARD PLAN B-15.40-01

GRANULAR BACKFILL FOR PIPE SHEARING BEDDING

SEPARATE BASE PRECAST

INTEGRAL BASE PRECAST WITH RISER (60" and 72" ONLY)

CIRCULAR ADJUSTMENT SECTION (TYP.)

ECCENTRIC CONE SECTION

PRECAST RISER SECTION

FLAT SLAB TOP

CHANNEL AND SHELF

REINFORCING STEEL (TYP.)

SEE TABLE
1. Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum.
2. For pipe allowances, see Standard Plan B-10.20.
3. No steps are required when height is 4' (ft) or less.

**MANHOLE DIMENSION TABLE**

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</table>
CIRCULAR FRAME (RING) - SEE STANDARD PLAN B-30.70
CIRCULAR GRATE - SEE STANDARD PLAN B-30.80

TOE OF DRYWELL SLOPE / BOTTOM OF SWALE (TYP.)
ADJUSTMENT SECTION (TYP.)

GROUND LINE
UNDISTURBED SOIL
NATIVE BACKFILL
UNDERGROUND DRAINAGE
GEOTEXTILE, MODERATE SURVIVABILITY, CLASS A

LIMIT OF EXCAVATION
1H : 2V SLOPE (MAX.)

FOUR 6" DIAM. DRAIN HOLES (TYP.) POSITIONED NOT TO INTERFERE WITH REINFORCING BARS

NOTES
1. Precast concrete cone sections may be eccentric or concentric.
2. Seepage port orientation varies among manufacturers.
3. When necessary, knockouts on precast cone, drywell base and riser sections shall have a wall thickness of 1 1/2" minimum and 2" maximum.

DRAWN BY: PERN UDDSELL

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

DATE: 3/4/12

PLAN VIEW

CUTAWAY ELEVATION VIEW

INTEGRAL BASE DETAIL

DRYWELL TYPE 1
(FORE SWALE)

STANDARD PLAN B-20.20-02
SHEET 1 OF 1 SHEET
NOTES
1. Precast concrete cone sections may be eccentric or concentric.
2. Seepage port orientation varies among manufacturers.
3. Connect inlet pipe to structure using precast hole or core drilled hole.
4. For depths over 15" - 2" use 72" x 8" Alternative Precast Footing.
5. When necessary, knockouts on precast cone, drywell base and riser sections shall have a wall thickness of 1 1/2" (in) minimum and 2" (in) maximum.

ALTERNATIVE PRECAST FOOTING DETAIL

FOUR 6" (IN) DRAIN HOLE (TYPE) - POSITIONED NOT TO INTERFERE WITH REINFORCING BARS

ALTERNATIVE FOOTING PRECAST INTEGRAL BASE PRECAST WITH RISER

CUTAWAY ELEVATION VIEW

INTEGRAL BASE DETAIL
1. Precast concrete cone sections may be eccentric or concentric.
2. See note orientation varies among manufacturers.
3. For depths over 16' - 2" use 72" x 8" Alternative Precast Footing.
4. When necessary, knockouts on precast cone, drywell base and riser sections shall have a wall thickness of 1 1/2" minimum and 2" maximum.

ALTERNATIVE PRECAST FOOTING DETAIL

FOUR 6" DIAM. DRAIN HOLES (TYP.) POSITIONED NOT TO INTERFERE WITH REINFORCING BARS

NOTES:

INTEGRAL BASE DETAIL

INTEGRAL BASE PRECAST WITH RISER

CUTAWAY ELEVATION VIEW

ALTERNATIVE FOOTING PRECAST

GRANULAR BACKFILL FOR DRYWELL

SEE NOTE 2

SEEPAGE PORT

UNDERGROUND DRAINAGE GEDTEXILE, MODERATE SURVIVABILITY, CLASS A

FLOORING SURFACE VARIES

CRUSHED SURFACING BASE COURSE

ADJUSTMENT SECTION (TYP.)

CONIC SECTION

4" CONCRETE SLAB COMMERCIAL CONCRETE

FINISHED CURVE

VARIES

CIRCULAR FRAME (RING)

SEE STANDARD PLAN B-30.70

CIRCULAR GRATE

SEE STANDARD PLAN B-30.80

1H : 2V SLOPE (MAX.)

LIMIT OF EXCAVATION

48"

72"

12"

I.D. 48"

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

DRAWN BY: FRED LIDDELL

APPROVED FOR PUBLICATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
NOTES

1. This inlet requires the precast catch basin unit to be rotated 90 degrees so that the narrow side is parallel to the curb line. When calculating offsets from curb to centerline (CL) of the precast catch basin, please note that the CL of the grate is not the CL of the precast catch basin. See Section A.

2. The dimensions of the frame and hood may vary slightly among different manufacturers. The frame may have cast features intended to support a debris guard. Hood units may be mounted inside or outside of the frame. The methods for fastening the safety bar/debris guard rod to the hood may vary. The hood may include casting lugs. The top of the hood may be cast with a pattern.

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

4. Bolt-down capability is required on all frames, gratings, and covers, unless specified otherwise in the Contract. Provide two holes in the frame that are vertically aligned with the grate or cover side. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 UNC x 2" (in) Allen head cap screw to be being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer. See BOLT-DOWN DETAIL, Standard Plan B-30.10.

5. Only ductile iron Vane'd Grates shall be used. See Standard Plans B-30.30 and B-30.40 for grate details. Refer to Standard Specification Section 06-15(2) for additional requirements.

6. This plan is intended to show the installation details of a manufactured product. This plan is not intended to show the specific details necessary to fabricate the castings depicted in this drawing.
### Pipe Allowances

<table>
<thead>
<tr>
<th>Pipe Material</th>
<th>Maximum Inside Diameter (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinforced or Plain Concrete</td>
<td>12&quot;</td>
</tr>
<tr>
<td>All Metal Pipe</td>
<td>18&quot;</td>
</tr>
<tr>
<td>CPSEP (Std. Spec. Sect. 9-06.20)</td>
<td>12&quot;</td>
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<tr>
<td>Polypropylene (Std. Spec. Sect. 9-06.24)</td>
<td>12&quot;</td>
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<tr>
<td>Solid Wall PVC (Std. Spec. Sect. 9-06.12(1))</td>
<td>16&quot;</td>
</tr>
<tr>
<td>Profile Wall PVC (Std. Spec. Sect. 9-06.12(2))</td>
<td>16&quot;</td>
</tr>
</tbody>
</table>

*Corrugated Polyethylene Storm Sewer Pipe*

### Notes

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

2. The knockout diameter shall not be greater than 18" (in). Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum. Provide a 1.5" (in) minimum gap between the knock-out wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Standard Specification Section 9-04.3.

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

4. The frame and grate may be installed with the flanges up or down. The frame may be cast into the adjustment section.

5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1:24 or steeper.

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

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

---

**Concrete Inlet**

Standard Plan B-25.60-02

Sheet 1 of 1 Sheet

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WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

Holman, Julie
Feb 20 2018 12:51 PM
NOTES
1. This frame is designed to accommodate 20" (in) x 24" (in) grates or covers as shown on Standard Plans B-30.20, B-30.30, B-30.40, and B-30.50.
2. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 3/4" Stainless Steel (S.S.) 5/8" (in) - 11 NC X 2" (in) Allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
3. Refer to Standard Specification Section 9-06.16 and 9-06.16(2) for additional requirements.
NOTES

1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (In) x 11 NC x 2" (In) Allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.

2. All grates shall be 20" (In) x 24" (In).

3. Grate alternative shown for informational purposes. Grate design varies by manufacturer and must meet ADA requirements.

4. Refer to Standard Specification Section 9-05.15 and 9-05.15 (2) for additional requirements.
NOTES

1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC x 2" (in) Allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.

2. Alternative reinforcing designs are acceptable in lieu of the rib design.

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

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

1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (14 mm) Allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.

2. Refer to Standard Specification Section 9-05.15 and 9-05.16(2) for additional requirements.

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

BOLT-DOWN DETAILS
SEE NOTE 1

RECTANGULAR VANED GRATE

STANDARD PLAN B-30.30-03

SHEET 1 OF 1 SHEET

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NOTES

1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 3/4 Stainless Steel (S.S.) 5/8" (in) - 11 NC x 2" (in) allen head cap screw by being tapped or other approved mechanism. Location of bolt-down holes varies by manufacturer.

2. Refer to Standard Specification Section 8-05.15, and 9-05.15(2) for additional requirements.

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

RECTANGULAR BI-DIRECTIONAL VANED GRATE
STANDARD PLAN B-30.40-03

ISOMETRIC
NOTES

1. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 3/4" Stainless Steel (5.5) 5/8" (IN) - 11 NC x 2" (IN) allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.

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

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

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

RECTANGULAR HERRINGBONE GRATE
STANDARD PLAN B-30.50-03

HEET 1 OF 1 SHEET

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WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
NOTES
1. The gasket and groove may be in the seat (frame) or in the underside of the cover. The gasket may be "T" shaped in section. The groove may be cast or machined.

2. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 3 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" - 11 NC x 2" (in) Allen head cap screw by being tapped, or other approved mechanism. Location of bolt down holes varies by manufacturer.

3. For bolt-down manhole ring and covers that are not designated "Watertight," the neoprene gasket, groove, and washer are not required.

4. Washer shall be neoprene (Detail "B").

5. In lieu of blind pick notch for manhole covers, a single 1" (in) pick hole is acceptable. Hole location and number of holes may vary by manufacturer.

6. Alternative reinforcing designs are acceptable in lieu of the rib design.

7. For clarity, the vertical scale of the Cover Section has been exaggerated. It is 1.5 times the horizontal scale (1/4:1.5).

CIRCULAR FRAME (RING) AND COVER
STANDARD PLAN B-30.70-04

ISOMETRIC VIEW
1. For use with Circular Frames (rings) detailed in Standard Plan B-30.70.

2. Slotted Manhole Covers are intended for use with Drywells only. See Standard Plans B-20.20 and B-20.60.

3. See Standard Specification Section 5-05.15 for additional requirements.

CIRCULAR GRATE

STANDARD PLAN B-30.80-01

NOTES

SECTION C

ISOMETRIC VIEW

SECTION B

Helmsen, Julie
Feb 20 2018 12:56 PM

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Washington State Department of Transportation
20" x 24" (IN), OR 42" x 24" (IN) RECTANGULAR OPENING

24" (IN) DIAM., 48" (IN) DIAM., OR 54" (IN) DIAM. OPENING

84" (IN) or 96" (IN) FLAT SLAB TOP

2" (TYP.)

1" MIN. Z 1/2" MAX.

20" x 24" (IN), OR 42" x 24" (IN) RECTANGULAR OPENING

24" (IN) DIAM., 48" (IN) DIAM., OR 54" (IN) DIAM. OPENING

72" (IN) FLAT SLAB TOP

2" (TYP.)

1" MIN. Z 1/2" MAX.

20" x 24" (IN) - OR 42" x 24" (IN) RECTANGULAR OPENING

24" (IN) DIAM. OPENING

48" (IN), 54", or 60" (IN) FLAT SLAB TOP

NOTE
1. Ladder rungs for manholes and catch basins shall meet the requirements of AASHTO M 195.

STEP

4" MIN. - 6" MAX.

12" MIN.

15" MAX. (TYP.)

ONE #3 BAR HOOP FOR 2", 4", 6", OR 8" (IN)
TWO #3 BAR HOOPS FOR 12" (IN)
FOUR #3 BAR HOOPS FOR 24" (IN)

PREFABRICATED LADDER

2", 4", 6", 12", OR 24" (IN)

RECTANGULAR ADJUSTMENT SECTION

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.

As an acceptable alternative to conventional steel reinforcement, manufacturers shall use Synthetic Structural Fibers meeting the requirements of Standard Specification Section 9-05.50(10).

ECCENTRIC CONE SECTION

ONE #3 BAR HOOP FOR 2", 4", OR 6" (IN)
TWO #3 BAR HOOPS FOR 12" (IN)

CIRCULAR ADJUSTMENT SECTION

For rectangular and circular adjustment sections, approved alternate material compositions are acceptable in lieu of precast concrete designs

48" (IN), 54", or 60" (IN) FLAT SLAB TOP

2" (TYP.)

1" MIN. Z 1/2" MAX.

2" (TYP.)

1" MIN. Z 1/2" MAX.

# BARS @ 7" (IN) SPACING

# BARS @ 6" (IN) SPACING

#4 BARS @ 6" (IN) SPACING

# BARS @ 7" (IN) SPACING

TYPICAL ORIENTATION FOR ACCESS AND STEPS
NOTES
1. The Steel Angles shall be set so that each bearing bar of prefabricated grate shall have full bearing on both ends. The finished top of concrete shall be even with the grate surface.
2. All exposed concrete shall be finished with a 1/2" radius.
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. Pipes may enter through the knock-outs on any side at any reasonable angle, provided the outside of the pipe can be contained between two opposite walls.
NOTES
1. The steel angles shall be set so that each bearing bar of the grate shall have full bearing on both ends. The finished top of concrete shall be even with the grate surface.
2. Top of inlet grate shall be placed at ground level to present an unobstructed ditch or median section.
3. All exposed concrete edges shall be finished with a 1/2" radius.
4. Pipes may enter through the knockouts on any side at any reasonable angle, provided the outside of the pipe can be contained between opposite walls.
5. The flow line of the outlet pipe shall be 18" minimum above the inside bottom of the structure.
6. The grade line of the top inside of any inlet pipe shall enter no lower than the grade line of the top inside of the outlet pipe.
7. Units "H" and optional extension units "J" and "K" shall be grouted in place to the satisfaction of the Engineer.
8. All pickup holes shall be grouted full after the basin has been placed.

BAR LIST

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<th>MARK</th>
<th>LOCATION</th>
<th>QTY.</th>
<th>SIZE</th>
<th>LENGTH</th>
<th>DESCRIPTION</th>
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<td>6</td>
<td>5'-9&quot;</td>
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<td>WALL</td>
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<td>1/2</td>
<td>9'-1&quot;</td>
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<td>⑥</td>
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<td>3</td>
<td>1/2</td>
<td>14'-6&quot;</td>
<td>HOOP</td>
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<tr>
<td>⑦</td>
<td>UNIT H</td>
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<td>1/2</td>
<td>14'-2&quot;</td>
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<td>⑭</td>
<td>SIDE WALL</td>
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<td>14'-0&quot;</td>
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</tbody>
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BENDING DIAGRAM

(ALL DIMENSIONS ARE OUT TO OUT)
ELEVEN EQUAL SPACES

TOP
CROSS BARS - 3/8" ROUND, OR RECTANGULAR OR HEXAGONAL BAR OF EQUIVALENT AREA.

SIDE

GRATE "A"
(APPROXIMATE WEIGHT 215 LBS)

WELDED GRATES
FOR GRATE INLET

STANDARD PLAN B-40.20-00

SIDE

GRATE "B"
(APPROXIMATE WEIGHT 215 LBS)

EXPRESS JULY 1, 2007

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION
6/1/06

DATE

1 OF 1 SHEET
1. The Contract may specify a rotated inlet installation. Orient the grates in the frame so they intercept flow.

2. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slots. The frame shall accept the 304 Stainless Steel (S.S.) 5/8" (in) - 11 NC x 2" (in) Allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.

3. Refer to Standard Specification Section 9-05-16(2) for additional requirements.

4. Frame and Grates shall be Ductile Iron.
1. The top of the inlet shall be placed at ground level to present an unobstructed ditch or median section.

2. Bevel or round exposed concrete edges 1/2" (in).

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

4. 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.

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

6. The steel angles shall be set so that each bearing bar of the grate shall have full sealing on both ends. The finished top of concrete shall be even with the grate surface. For grates, see Standard Plan B-50-20.

7. The amount, type, and grade of reinforcing steel is the responsibility of the manufacturer.

8. The inside wall taper for form removal shall not result in any wall section thinner than 6" (in) except in pipe knockout areas.

9. Precast inlets shall be marked with the manufacturer's identification on the inside of the structure in some readily accessible location.

DRAFT 11/11/17

STATE DESIGN ENGINEER
Washington State Department of Transportation
NOTES

1. The top of the inlet shall be placed at ground level to present an unobstructed ditch or median section.

2. Bevel or round exposed concrete edges 1/2" (in).

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

4. 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.

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

6. The steel angles shall be set so that each bearing bar of the grate shall have full sealing on both ends. The finished top of concrete shall be even with the grate surface. For grates, see Standard Plan B-50.20.

7. The amount, type, and grade of reinforcing steel is the responsibility of the manufacturer.

8. The inside wall taper for form removal shall not result in any wall section thinner than 6" (in) except in pipe knockout areas.

9. Precast inlets shall be marked with the manufacturer's identification on the inside of the structure in some readily accessible location.
3 1/2" x 1/2" x 34 1/2" STEEL PLATE (Typ.)

OPTIONAL 1" MAX. VENT HOLES ON BOTTOM FOR GALVANIZING

3 1/2" x 1/2" x 34 1/2" STEEL PLATE (Typ.)

3 1/2" x 1/2" x 34 1/2" STEEL PLATE (Typ.)

3 1/2" x 3 1/2" x 1/2" x 33 1/4" STRUCTURAL TUBING (Typ.)

OPTIONAL 1" MAX. VENT HOLES ON BOTTOM FOR GALVANIZING

3 1/2" x 1/2" x 33 1/4" STEEL PLATE (Typ.)

3 1/2" x 1/2" x 34 1/2" STEEL PLATE (Typ.)

3 1/2" x 1/2" x 34 1/2" STEEL PLATE (Typ.)

3 1/2" x 1/2" x 34 1/2" STEEL PLATE (Typ.)

GRIND TOP AND BOTTOM FLUSH AFTER WELDING

SECTION A

SECTION B

SECTION C

GRATES FOR DROP INLET

STANDARD PLAN B-50.20-00
**CONCRETE AND DUCTILE IRON PIPE**

**THERMOPLASTIC PIPE**

**METAL AND STEEL RIB**

**REINFORCED POLYETHYLENE PIPE**

**NOTES**
1. See Standard Specifications Section 7-08.3(3) for Pipe Zone Backfill.
2. See Standard Specifications Section 9-03.12(3) for Gravel Backfill for Pipe Zone Bedding.
4. For sanitary sewer installation, concrete pipe shall be babbled to spring line.

**CLEARANCE BETWEEN PIPES FOR MULTIPLE INSTALLATIONS**

<table>
<thead>
<tr>
<th>PIPE</th>
<th>SIZE</th>
<th>MINIMUM DISTANCE BETWEEN BARRELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIRCULAR PIPE (DIAMETER)</td>
<td>UP TO 48&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>METAL PIPE ARCH (SPAN)</td>
<td>48&quot; AND LARGER</td>
<td>DIAMETER/2 OR 36&quot; WHOMEVER IS LESS</td>
</tr>
</tbody>
</table>
NOTES

1. The Concrete Collar width shall be one half of the outside pipe diameter of the largest pipe. The minimum Concrete Collar width shall be 12" (in). Concrete Collars may be used with all pipe materials and diameters. The Concrete Collar option shall only be used to extend existing pipes. Concrete shall be Commercial Concrete in accordance with Standard Specification Section 6-02.3(2).

2. Steel Welded Wire Fabric shall be in accordance with Standard Specification Section 9-07.7. Install two wraps for size 6 x 6 W1.4 x W1.4 (10 Gages) Steel Welded Wire Fabric or one wrap for any of the following sizes:
   - 6 x 6 W2.1 x W2.1 (8 Gages)
   - 6 x 6 W2.9 x W2.9 (6 Gages)
   - 4 x 4 W2.9 x W2.9 (6 Gages)
   - 4 x 4 W4.0 x W4.0 (4 Gages)
   Provide 1 1/2" min. covering over wire fabric.

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

4. Increase the outside diameter of the metal pipe to match the outside diameter of the concrete pipe by installing 12" (in) wide rubber gaskets, thickness as required (Coupling Band only). The rubber gaskets shall be in accordance with Standard Specification Section 9-04.4(3).

5. Use a flat Type K Coupling Band. Type K Coupling Bands with dimples are not allowed for the installation detail shown. The Coupling Band option shall only be used for extending existing pipes that have an inside diameter of 36" (in) or less.
**NOTES**

1. Span and rise dimensions are nominal and are measured to the inside crests of corrugations.

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

3. Unless indicated otherwise a 10" depth (over the inside crests of corrugations) of earth shall be placed in the invert of the Structural Plate Underpass, Design 1, for its full width and length. The earth shall consist of naturally occurring materials available in the vicinity of the structural plate underpass installation. See Standard Specification 7-03.3(4).

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

**ALLOWABLE HEIGHTS OF COVER**

<table>
<thead>
<tr>
<th>SPAN</th>
<th>RISE</th>
<th>12 GAGE THICK CORRUGATED METAL</th>
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<tr>
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<td></td>
<td>COVER</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MIN.</td>
</tr>
<tr>
<td>6'- 8&quot;</td>
<td>7'- 1&quot;</td>
<td>4</td>
</tr>
<tr>
<td>6'- 10&quot;</td>
<td>8'- 2&quot;</td>
<td>5</td>
</tr>
</tbody>
</table>

**ANIMAL UNDERPASS**

**STANDARD PLAN B-65.20-01**
Span and rise dimensions are measured to the inside crests of corrugations and may vary slightly depending on manufacturer.
END SECTION LENGTH SHALL BE AT LEAST SIX TIMES THE DIAMETER OF THE PIPE (SEE STD. SPEC. 7-02.3(1))

1. The culvert ends shall be beveled to match the embankment or ditch slope and shall not be beveled flatter than 4H:1V. When slopes are between 4H:1V and 6H:1V, shape the slope in the vicinity of the culvert end to ensure that no part of the culvert protrudes more than 4" above the ground line.

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

NOTES

THERMOPLASTIC PIPE

CONCRETE PIPE

METAL PIPE

FOR CULVERTS 30" DIAMETER OR LESS

EXPRES JULY 1 2007

STANDARD PLAN B-70.20-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Harold L. Ylvisaker

6/1/06

Washington State Department of Transportation
### PIPE ARCH

<table>
<thead>
<tr>
<th>PIPE ARCH DIMENSION (INCHES)</th>
<th>THICKNESS (INCHES)</th>
<th>A</th>
<th>B</th>
<th>H</th>
<th>L</th>
<th>W</th>
<th>T</th>
<th>SKIRT</th>
<th>END SECTION SLOPE (H:V)</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>0.056</td>
<td>0.056</td>
<td>9</td>
<td>6</td>
<td>15</td>
<td>33</td>
<td>40</td>
<td>1 PC</td>
<td>2:1 1/2:1</td>
<td>1. The diameter of the end section of Design B shall match the inside diameter of the concrete pipe.</td>
</tr>
<tr>
<td>21</td>
<td>0.064</td>
<td>0.064</td>
<td>7</td>
<td>6</td>
<td>15</td>
<td>33</td>
<td>40</td>
<td>1 PC</td>
<td>2:1 1/2:1</td>
<td>2. Skirt sections shall be made in one piece for round pipe with a diameter of 12&quot; (in) to 24&quot; (in) inclusive and for pipe arches with a rise of 13&quot; (in) to 20&quot; (in) inclusive. Skirt sections for larger sizes of pipes may be multiple pieces in conformance with the tabulated values shown.</td>
</tr>
<tr>
<td>24</td>
<td>0.064</td>
<td>0.064</td>
<td>8</td>
<td>6</td>
<td>16</td>
<td>35</td>
<td>46</td>
<td>1 PC</td>
<td>2:1 1/2:1</td>
<td>3. Design A and sections for 42&quot; (in) thru 84&quot; (in) diameter and 49&quot; (in) x 33&quot; (in) thru 83&quot; (in) x 57&quot; (in) arch with annular corrugations and all helically corrugated pipe arch include one foot of pipe length as a connector section. The connector section shall be attached to the end section by welds, rivets or bolts and shall be the same thickness as the end section.</td>
</tr>
<tr>
<td>27</td>
<td>0.064</td>
<td>0.064</td>
<td>9</td>
<td>6</td>
<td>18</td>
<td>38</td>
<td>54</td>
<td>1 PC</td>
<td>2:1 1/2:1</td>
<td>4. Design C may be used in lieu of Design A for all metal pipe sizes except as noted. Coupling bands may be any acceptable type for the pipe specified.</td>
</tr>
<tr>
<td>30</td>
<td>0.064</td>
<td>0.064</td>
<td>10</td>
<td>6</td>
<td>20</td>
<td>41</td>
<td>62</td>
<td>1 PC</td>
<td>2:1 1/2:1</td>
<td>5. Multiple panel skirts shall have 2&quot; (in) lap seams tightly joined by 3/8&quot; (in) stainless steel rivets or galvanized bolts on 6&quot; (in) max. centers.</td>
</tr>
<tr>
<td>33</td>
<td>0.064</td>
<td>0.064</td>
<td>11</td>
<td>6</td>
<td>22</td>
<td>44</td>
<td>70</td>
<td>1 PC</td>
<td>2:1 1/2:1</td>
<td>6. The reinforced edges of the following size End Sections shall be supplemented with galvanized steel stiffener angles:</td>
</tr>
<tr>
<td>36</td>
<td>0.064</td>
<td>0.064</td>
<td>12</td>
<td>6</td>
<td>24</td>
<td>47</td>
<td>78</td>
<td>1 PC</td>
<td>2:1 1/2:1</td>
<td>60&quot; (in) thru 72&quot; (in) diameter pipe   2&quot; (in) x 2&quot; (in) x 1/4&quot; (in) angle</td>
</tr>
<tr>
<td>39</td>
<td>0.064</td>
<td>0.064</td>
<td>13</td>
<td>6</td>
<td>26</td>
<td>50</td>
<td>86</td>
<td>1 PC</td>
<td>2:1 1/2:1</td>
<td>76&quot; (in) and 84&quot; (in) diameter pipe, and 77&quot; (in) x 52&quot; (in) &amp; 83&quot; (in) x 57&quot; (in) pipe arch   2 1/2&quot; (in) x 2 1/2&quot; (in) x 1/4&quot; (in) angle</td>
</tr>
<tr>
<td>42</td>
<td>0.064</td>
<td>0.064</td>
<td>14</td>
<td>6</td>
<td>30</td>
<td>54</td>
<td>96</td>
<td>1 PC</td>
<td>2:1 1/2:1</td>
<td>The above galvanized angles shall be attached by 3/8&quot; (in) galvanized nuts and bolts.</td>
</tr>
</tbody>
</table>

### PIPE

<table>
<thead>
<tr>
<th>PIPE DIM. (INCHES)</th>
<th>THICKNESS (INCHES)</th>
<th>A</th>
<th>B</th>
<th>H</th>
<th>L</th>
<th>W</th>
<th>T</th>
<th>SKIRT</th>
<th>END SECTION SLOPE (H:V)</th>
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</thead>
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<td>6</td>
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<tr>
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<td>0.064</td>
<td>0.060</td>
<td>7</td>
<td>6</td>
<td>25</td>
<td>30</td>
<td>40</td>
<td>1 PC</td>
<td>2:1 1/2:1</td>
</tr>
<tr>
<td>20</td>
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<td>0.060</td>
<td>9</td>
<td>6</td>
<td>31</td>
<td>36</td>
<td>46</td>
<td>1 PC</td>
<td>2:1 1/2:1</td>
</tr>
<tr>
<td>24</td>
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<td>0.060</td>
<td>10</td>
<td>6</td>
<td>36</td>
<td>42</td>
<td>52</td>
<td>1 PC</td>
<td>2:1 1/2:1</td>
</tr>
<tr>
<td>27</td>
<td>0.064</td>
<td>0.060</td>
<td>11</td>
<td>6</td>
<td>41</td>
<td>48</td>
<td>62</td>
<td>1 PC</td>
<td>2:1 1/2:1</td>
</tr>
<tr>
<td>30</td>
<td>0.064</td>
<td>0.060</td>
<td>12</td>
<td>6</td>
<td>46</td>
<td>55</td>
<td>70</td>
<td>2 PC</td>
<td>2:1 1/2:1</td>
</tr>
<tr>
<td>33</td>
<td>0.064</td>
<td>0.060</td>
<td>13</td>
<td>6</td>
<td>51</td>
<td>60</td>
<td>78</td>
<td>2 PC</td>
<td>2:1 1/2:1</td>
</tr>
<tr>
<td>36</td>
<td>0.064</td>
<td>0.060</td>
<td>14</td>
<td>6</td>
<td>56</td>
<td>65</td>
<td>86</td>
<td>2 PC</td>
<td>2:1 1/2:1</td>
</tr>
<tr>
<td>39</td>
<td>0.064</td>
<td>0.060</td>
<td>15</td>
<td>6</td>
<td>61</td>
<td>70</td>
<td>94</td>
<td>2 PC</td>
<td>2:1 1/2:1</td>
</tr>
</tbody>
</table>

### FLARED END SECTIONS

STANDARD PLAN B-70.60-01

Heilman, Julie  
Jan 25, 2017 3:02 PM

Washington State Department of Transportation

DRAWN BY: BILL SERINO

Approved for publication  
Cooper & Jeff
June 13, 2017 5:13 AM
NOTES

1. The variable dimension indicated for the height of step for step mitered pipes shall conform to the manufacturer's recommendations unless specified differently on the plans or in the Special Provisions.

2. Reinforcing steel shall have 1 1/2" (in) min. 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" (in).

STRUCTURAL PLATE PIPE ARCHES AND UNDERPASSES

STEP MITERED PIPE

PIPES AND STRUCTURAL PLATE PIPES

SECTION A

ANCHOR BOLT DETAIL
SEE STANDARD SPECIFICATION SECTION 9-06.5(1)
NOTES

1. Sockets shall be 3" extra strong steel pipe (3 1/2" O.D.). Sockets must be the proper angle and height so that safety bars are parallel with headwall and side slope, and are easily removable.

2. Safety Bars shall be 4" extra strong steel pipe (4 1/2" O.D.), or 4 1/2" O.D. (250' wall thickness) steel tubing. Length (20' maximum) shall be the minimum required to achieve Resin Bonded Anchor placement in full depth concrete. When multiple bars are required (see table) place bars at equal spacing (30' max.).

3. Bevel culvert pipe to match side slope.

4. Resin bonded anchors shall be 7" in length (5" embedment).

5. Centerline of headwall shall be normal to roadway centerline.

CULVERT DIA. | NUMBER OF BARS REQUIRED
--- | ---
UP TO 36" | NONE
42" - 60" | 1
60" - 90" | 2
90" - 120" | 3
NOTES
1. D = Inside Diameter of Culvert Pipe, or Pipe Arch Span Width, 36" maximum.
2. The distance between the safety bars, and between the top bar and the culvert crown, shall be equal spaces of no more than 24". The distance may vary ±1" between bars to facilitate placement.
3. Slope shall match Side Slope; 6H:1V preferred, not steeper than 4H:1V.
1. All pipes or pipe arches shall be attached as shown in CONNECTOR DETAIL.

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

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

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

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

### METAL END SECTIONS FOR CIRCULAR PIPES

<table>
<thead>
<tr>
<th>PIPE DIAM (INCHES)</th>
<th>MINIMUM THICKNESS</th>
<th>DIMENSIONS (INCHES)</th>
<th>PIPE ARCH DIMENSIONS</th>
<th>MINIMUM THICKNESS</th>
<th>DIMENSIONS (INCHES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>0.109</td>
<td>12</td>
<td>12</td>
<td>9</td>
<td>66</td>
</tr>
<tr>
<td>42</td>
<td>0.109</td>
<td>12</td>
<td>12</td>
<td>9</td>
<td>66</td>
</tr>
<tr>
<td>48</td>
<td>0.109</td>
<td>12</td>
<td>12</td>
<td>9</td>
<td>66</td>
</tr>
<tr>
<td>54</td>
<td>0.109</td>
<td>12</td>
<td>12</td>
<td>9</td>
<td>66</td>
</tr>
<tr>
<td>60</td>
<td>0.109</td>
<td>12</td>
<td>12</td>
<td>9</td>
<td>66</td>
</tr>
</tbody>
</table>

*SAFETY BARS ARE INSTALLED ON END SECTION WHEN SPAN IS GREATER THAN 36"*

### METAL END SECTIONS FOR ARCHED PIPES

<table>
<thead>
<tr>
<th>EQUIV. DIAM (INCHES)</th>
<th>PIPE ARCH SPAN (IN)</th>
<th>MINIMUM THICKNESS</th>
<th>DIMENSIONS (INCHES)</th>
<th>PIPE ARCH RISE (IN)</th>
<th>MINIMUM THICKNESS</th>
<th>DIMENSIONS (INCHES)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0.079</td>
<td>14</td>
<td>12</td>
<td>9</td>
<td>41</td>
</tr>
<tr>
<td>36</td>
<td>42</td>
<td>0.099</td>
<td>12</td>
<td>12</td>
<td>9</td>
<td>48</td>
</tr>
<tr>
<td>42</td>
<td>49</td>
<td>0.099</td>
<td>12</td>
<td>16</td>
<td>12</td>
<td>55</td>
</tr>
<tr>
<td>48</td>
<td>57</td>
<td>0.109</td>
<td>12</td>
<td>16</td>
<td>12</td>
<td>63</td>
</tr>
<tr>
<td>54</td>
<td>64</td>
<td>0.109</td>
<td>12</td>
<td>16</td>
<td>12</td>
<td>70</td>
</tr>
<tr>
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<td>71</td>
<td>0.109</td>
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<td>16</td>
<td>12</td>
<td>77</td>
</tr>
<tr>
<td>66</td>
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<td>0.109</td>
<td>12</td>
<td>16</td>
<td>12</td>
<td>86</td>
</tr>
</tbody>
</table>

### NOTES

- Safety bars are installed on end section when span is greater than 36".

**EXPRES JUL 1 2006**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**

**APPROVED FOR PUBLICATION**

**STATE ENGINEER**

**HAYWARD P. PATRYAS**

**STATE BUREAU OF PUBLIC HIGHWAYS**

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

**STANDARD PLAN B-80.20-00**

**SHEET 1 OF 1 SHEET**
REINFORCED EDGE – FULL LENGTH OF END SECTION (SEE SECTION)

SLOPE

24" MAX TYP.

PIPE DIA. (INCHES)

MINIMUM THICKNESS

DIMENSIONS (INCHES)

INCHES GAGE A H W OVERALL WIDTH L L SLOPE 4:1 SLOPE 6:1

15 0.064 16 8 6 21 37 20 30
18 0.064 16 8 6 24 40 32 40
21 0.064 16 8 6 27 43 44 66
24 0.064 16 8 6 30 46 56 84
30 0.109 12 9 38 60 80 120
36 0.109 12 9 42 66 104 168
42 0.109 12 12 48 90 128 192
48 0.109 12 12 54 86 152 228
54 0.109 12 12 60 92 216 300
60 0.109 12 16 66 98 280 380

METAL END SECTIONS FOR ARCHED PIPES

EQUIV. DIAM. (INCHES)

PIPE ARCH DIMENSIONS

SPAN (IN) RISE (IN)

MINIMUM THICKNESS

DIMENSIONS (INCHES)

INCHES GAGE A H W OVERALL WIDTH L L SLOPE 4:1 SLOPE 6:1

18 21 15 0.064 16 8 6 27 43 20 30
21 24 18 0.064 16 8 6 30 46 32 46
24 28 20 0.064 16 8 6 34 50 40 60
30 35 24 0.079 14 12 9 41 65 56 84
36 42 26 0.109 12 12 9 49 72 76 114
42 49 33 0.109 12 12 16 55 87 92 138
48 57 38 0.109 12 12 16 63 105 112 168
54 64 43 0.109 12 16 12 70 102 152 198
60 71 47 0.109 12 16 12 77 109 148 222
72 83 57 0.109 12 15 12 89 121 188 282

NOTES

1. As an alternative connection on 15" through 24" pipe, a 1" wide strap of 16 gage or 12 gage galvanized steel, fastened with a 1/2" diam. 6" long galvanized bolt and square head nut, may be used.

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

EDGE OF END SECTION

SHEET ROLLED SNUGLY AGAINST STEEL ROD

7/16" DIAM. MIN. GALVANIZED STEEL ROD OR NO.

GALVANIZED REINFORCING BAR

1/2" DIAM. CARRIAGE HEAD BOLTS (TYP.)

1/2" DIAM. THREADED ROD OVER TOP OF END SECTION. SIDE LOGS TO BE BOLTED TO END SECTION

TOE PLATE EXTENSION – WHEN REQUIRED, SAME GAGE AS END SECTION, 6" LESS THAN OVERALL WIDTH, CENTERED, 2" LAP, FASTENED W/ 3/8" x 3/4" GALV. BOLTS ON 12" MAX. CTRS.

SAFETY BAR END TREATMENT DETAIL

BOLT TOE PLATE EXTENSION - WHEN REQUIRED; SAME GAGE AS END SECTION, 6" LESS THAN OVERALL WIDTH; CENTERED, 2" LAP, FASTENED W/ 3/8" x 3/4" GALV. BOLTS ON 12" MAX. CTRS.

SAFETY BAR END TREATMENT - SEE DETAIL

3/8" DIAM. HEX HEAD BOLTS (TYP.)
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.
45° BEND

24" x 24" x 24" CONCRETE BLOCK OR CONTROLLED DENSITY FILL

SEWER MAIN

TIE

FOR SANITARY SEWER USE
CAST IRON RING AND COVER

SECTION A

FOR SANITARY SEWER USE

8 INCH SEWER CLEAN-OUT

STANDARD PLAN B-85.40-00

Sheet 1 of 1 Sheet

Approved for Publication

Washington State Department of Transportation

 Expires July 1, 2007

6/8/06

Matthew J. Stitely

State Design Engineer
One length of ductile iron pipe (Class 50) to solid bearing when span is more than 48".

Flexible joint clearance 2".

Backfill with compacted material as directed by engineer.

Commercial concrete block - poured in place.

Ductile iron drop connection.

Elevation.

Mortar dam or plug as required by engineer.

Typical manhole.

Concrete encased drop connection.

For sanitary sewer use.

TYPICAL MANHOLE FOUNDATION CONSTRUCTION.

6" MIN.

20'-0" MAX.

1/2 BLIND FLANGE AS DAM.

COMMERCIAL CONCRETE BLOCK - POURED IN PLACE.

D.I.P. 90° BEND CLEARANCE 2".

DUCTILE IRON DROP CONNECTION.

ELEVATION.

FLEXIBLE JOINT.

BACKFILL WITH COMPACTED MATERIAL AS DIRECTED BY ENGINEER.

COMMERCIAL CONCRETE - POURED IN PLACE.

90° BEND.

TYPICAL MANHOLE FOUNDATION CONSTRUCTION.

TYPICAL MANHOLE.

MORTAR DAM OR PLUG AS REQUIRED BY ENGINEER.

TEE.

FOR SANITARY SEWER USE.

All pipe, except ductile iron pipe, shall be concrete encased.

Washington State Department of Transportation

STANDARD PLAN B-85.50-01

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EXPRES JUNE 1, 2008
NOTES
1. Steel tie rods to be heavily coated with asphalt after installation.
2. Restrained joints may be substituted for tie rods.
3. Surface of ground within 36" of hydrant shall be smooth.
**NOTES**

1. Coat the pipe threads with asphalt after assembly.
2. All piping shall be galvanized steel.
3. Valve and piping to valve shall be 2" unless otherwise noted in the Contract.
4. Locate blowoff outlet near property corner if possible.

---

**PLAN**

- **METER BOX** (LOCATE IN FIELD)
- **BLOWOFF OUTLET**
- **VALVE MARKER POST**
- **CONCRETE THRUST BLOCKING**
- **STREET ELBOW**
- **TWO CONCRETE BLOCKS 4" x 8" x 16" (TOP BLOCK NOT SHOWN)**
- **TAPPED CAP OR PLUG**
- **WATER MAIN**

**ELEVATION**

- **2" FEMALE x 2 1/2" MALE NST HOSE CONNECTION WITH CAP (BLOWOFF OUTLET)**
- **VALVE BOX AND LID - CAST IRON**
- **GATE VALVE WITH 2" SQUARE OPERATING W/NUT**
- **CONCRETE BLOCK 4" x 8" x 16"**
- **SOLID CONCRETE BEARING BLOCK - 4" x 8" x 16"**
- **DRILL 1/8" HOLE**
- **15 POUND ASPHALTIC FELT**
- **GRAVEL POCKET**

---

**CONCRETE THRUST BLOCKING SHALL CLEAR PIPING**

---

**2 INCH BLOWOFF ASSEMBLY**

**STANDARD PLAN B-90.20-00**

**EXPRESS JULY 1, 2007**

---

**State Design Engineer**

**Washington State Department of Transportation**

---

**APPROVED FOR PUBLICATION**

**6/8/06**
NOTES

1. The size of the combination air release / air vacuum valve shall be specified in the Contract. The 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, tap top of main.

---

METER BOX AND COVER
MATCH EXISTING GRADE

GALVANIZED OUTLET PIPE SHALL BE SAME SIZE AS INLET PIPE WITH BEEHIVE STRAINER AND OUTLET

CAST IRON VALVE BOX
UNION

SLOPE

TYPE K COPPER PIPE

CORPORATION STOP
PIPE SADDLE
WATER MAIN

SPCIFIED MINIMUM DEPTH OF WATER MAIN

AIR RELEASE / AIR VACUUM VALVE
BRASS PIPE AND FITTINGS
BRONZE GATE VALVE WITH 2" SQUARE OPERATING NUT
GRAVEL BACKFILL FOR DRAINS

COMBINATION AIR RELEASE / AIR VACUUM VALVE ASSEMBLY
STANDARD PLAN B-90.30-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
MATT J. BIRD 6-8-04
STATE DESIGN ENGINEER
gate

Washington State Department of Transportation
NOTES
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 1" (in) minimum diameter rods on valves up through 10" (in) diameter. Valves larger than 10" (in) require special tee rod design.

<table>
<thead>
<tr>
<th>SIZE</th>
<th>TEST PRESSURE (PSI)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
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<td>4,440</td>
<td>2,405</td>
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<td>615</td>
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<td>71,095</td>
<td>38,470</td>
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<thead>
<tr>
<th>SOIL TYPE</th>
<th>SAFE BEARING LOAD (PSF)</th>
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<tr>
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<tr>
<td>SOFT CLAY</td>
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<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>
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</tr>
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</table>

CONCRETE THRUST BLOCK

STANDARD PLAN B-90.40-01

HELMAN, JILL
Jan 23 2017 3:02 PM

Washington State Department of Transportation
TWO TIE RODS WITH TURNBUCKLES

THREAD 6”

BLOCKING FOR 11.25° OR 22.5° VERTICAL BENDS

FOUR TIE RODS WITH TURNBUCKLES

THREAD 6”

BLOCKING FOR 45° VERTICAL BENDS

---

**NOTE**

Steel tie rods to be heavily coated with asphalt after installation.

---

**DIMENSION TABLE**

<table>
<thead>
<tr>
<th>PIPE DIAM.</th>
<th>TEST PRESSURE (PSI)</th>
<th>BEND ANGLE</th>
<th>CONCRETE VOLUME (FT³)</th>
<th>CUBE SIZE (Ft)</th>
<th>TIE ROD DIAM.</th>
<th>TIE ROD EMBEDMENT</th>
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<tr>
<td>4”</td>
<td>250</td>
<td>11.25°</td>
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<tr>
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<td>12</td>
<td>2.3</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>45°</td>
<td>22</td>
<td>2.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6”</td>
<td>250</td>
<td>11.25°</td>
<td>14</td>
<td>2.4</td>
<td>5/8”</td>
<td>17”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22.5°</td>
<td>27</td>
<td>3.0</td>
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<td>25</td>
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<td></td>
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<tr>
<td>12”</td>
<td>250</td>
<td>11.25°</td>
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<td>5/8”</td>
<td>17”</td>
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<td>24”</td>
</tr>
<tr>
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<td>11.25°</td>
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<td>17”</td>
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<tr>
<td></td>
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<td>147</td>
<td>5.3</td>
<td>3/4”</td>
<td>20”</td>
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<td>272</td>
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<td>5/8”</td>
<td>17”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22.5°</td>
<td>192</td>
<td>5.8</td>
<td>7/8”</td>
<td>24”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45°</td>
<td>355</td>
<td>7.1</td>
<td>1 1/8”</td>
<td>30”</td>
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</tbody>
</table>
**Section A**

- **Concrete Barrier Type 2**
- **Finished Grade**
- **Pipe (Typical)**
- **Precast Cement Concrete Adjustment Sections (Typ.)**
- **As Required**

**Section B**

- **Median Barrier**
- **Grate Inlet Type 2 (Typ.)**
- **See Standard Plan B-35.40**
- **Frame and Dual Vane Grates (Typ.)**
- **See Standard Plan B-40.40**

**Plan View**

- **Median Barrier Drainage Installation**
- **Standard Plan B-95.20-01**
- **HMA or Concrete (See Contract for Surface Details)**

**Washington State Department of Transportation**
NOTES
1. The Beam Guardrail Type 31, post type, or Beam Guardrail Type 31 Transition Section may vary from that shown on this plan.
2. The Catch Basin or Grate Inlet shall be centered between the Beam Guardrail Posts.
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 3/4" (in Post Bolt Washer) and a Snow Load Rail Washer shall be placed on the face side of Beam Guardrail Types 1 and 2. Snow Load Rail Washers shall not be installed on terminals.

2. Rail Washers, also called "Snow Load Rail Washers", are not required on new installation, except as called for in Note 1. Unnecessary Rail washers need not be removed from existing installations, except those on posts 2 through 8 of a BCT installation shall be removed.

3. Timber blocks shall be toe-nailed to the post with a 1bd galvanized nail to prevent block rotation.

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

5. Existing posts shall not be raised. Replace posts as necessary to achieve required guardrail height.

6. Holes shall be located on approaching traffic side of web.
NOTES

1. Type 10 post shall be 6' x 6' timber, OR either W6 x 8, or W6 x 8.5 steel. Type 11 post shall be 10' x 10' timber or W6 x 15. For additional details see Standard Plan C-1b.

2. Type 10 guardrail post spacing shall be 6' - 3" on center. Type 11 shall be a maximum of 5' - 1 1/2" on center.

3. Spacing may vary depending on application. See Standard Specification Section 9-16.3(1) for rail element requirements.

BEAM GUARDRAIL
(THRIE BEAM)

STANDARD PLAN C-1a

Sheet 1 of 1 Sheet

APPROVED FOR PUBLICATION

Jeff Corcoran, Jeff
Jul 14 2015 7:07 AM

Washington State Department of Transportation
1. Wood posts for all guardrail placement plans shall be 6 x 6 except where noted otherwise.

2. Lower hole is for Rub Rail of Type 2 and Type 3 Beam Guardrail.

3. W6x6.5 or W6x9 steel posts and timber blocks are alternates for 6 x 8 timber posts and blocks. W6x15 steel posts and timber blocks are alternates for 10 x 10 timber posts and blocks.

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

5. When "Beam Guardrail Type - __ FT Long Post" is specified in the Contract, the post length shall be stamped with numbers, 1 1/2" (in) min. high and 3/4" (in) wide at the location where the letter "H" is shown in the ASSEMBLY DETAIL. For wood post applications, the letter shall be stamped to a minimum depth of 1/4" (in). For steel post applications, the letter shall be legible after the post is galvanized. After post installation, it shall be the Contractor's responsibility to ensure the stamped numbers remain visible.

6. Soil plate may be welded to foundation tube. If so, holes in soil plate and foundation tube may be omitted.
1. For wood posts, saw top of post and block to 1" above three beam guardrail reducer section. For steel posts, drive post down to 1" maximum above the three beam guardrail reducer section.
1. **CASE 9C**: Thrie Beam Guardrail is used when the distance from the end of the Bullnose Terminal to the beginning of the transition of the Bridge Rail is less than 100 feet.
**Plan**

**Beam Guardrail Bull Nose Terminal - Design 1**

**Beam Guardrail Bull Nose Terminal Bid Item**

1. **12'-6" Arc Length at Face of Rail (Slotted Rail Element #1)**
2. **12'-6" Rail Length (Slotted Rail Element #2)**
3. **Standard Three Beam Rail Elements**
   - **See Standard Plan C-1a**
4. **W-Beam or Thrie Beam Guardrail (See Contract)**
   - **(See Note 1)**

**Symmetrical About the Centerline**

**Plan**

**Beam Guardrail Bull Nose Terminal - Design 2**

**Beam Guardrail Bull Nose Terminal Bid Item**

1. **12'-6" Arc Length at Face of Rail (Slotted Rail Element #1)**
2. **12'-6" Rail Length (Slotted Rail Element #2)**
3. **Standard Three Beam Rail Elements**
   - **See Standard Plan C-1a**
4. **W-Beam or Thrie Beam Guardrail (See Contract)**
   - **(See Note 1)**

**Symmetrical About the Centerline**

**Note**

1. For W-Beam applications extend the rail from the bullnose terminal by using a "Reducer Element Type C" followed by a standard Post and Block, spaced at 3'-1 1/2". Continue runs with standard 6'-3" post spacing.

For additional details see Standard Plans C-20.10 and C-25.20.
SLOTTED THRIE BEAM RAIL ELEMENT #1
SEE STANDARD PLAN C-1a FOR RAIL ELEMENT DETAILS
(RAIL DIMENSIONS SHOWN ARE BEFORE BENDING TO RADIUS SHOWN IN PLAN)

SLOTTED THRIE BEAM RAIL ELEMENT #2
SEE STANDARD PLAN C-1a FOR RAIL ELEMENT DETAILS
(RAIL DIMENSIONS SHOWN ARE BEFORE BENDING TO RADIUS SHOWN IN PLAN)

SLOTTED THRIE BEAM RAIL ELEMENT #3
SEE STANDARD PLAN C-1a FOR RAIL ELEMENT DETAILS
NOTES

1. Rail section and W8 x 18 steel post shall be fabricated to receive 5/8" hex head bolts as shown.

2. All bolts shall be high strength 5/8" hex head bolts with anchor rail washers.
NOTES
1. End Section Design G shall be used except where noted on the plans or contract.
2. Attach guardrail to bridge rail or concrete barrier with 7/8" diameter bolts (five minimum) Standard Spec. 8-06.5.4(e) with thin slab female inserts or resin bonded anchors. See the Contract Plans.
3. A single piece having similar dimensional shape to Design G and mating with the W-beam guardrail is an alternate.
4. In cases where Design F "end section is lapped on the outside of the guardrail, a galvanized 1" ID, 2" OD, 0.134" thick, narrow Type A Plain Washer or a anchor rail washer shall be placed under the splice bolt heads.

BEAM GUARDRAIL END SECTIONS
STANDARD PLAN C-7
sheet 1 of 1 sheet

APPROVED FOR PUBLICATION

Washington State Department of Transportation
NOTES

1. Attach guardrail to bridge rail or concrete barrier with 7/8" diameter bolts (five minimum) Standard Spec. 5-06.5(4), with thin slab female inserts or resin bonded anchors. See the Contract Plans.

2. In cases where Design F End Section is lapped on the outside of the guardrail, a galvanized 1" ID, 2" OD, 0.134" thick, narrow Type A Plain Washer or an anchor rail washer will be placed under the splice bolt heads.
1. Refer to Standard Plan C-19b and C-20.11 for additional details not shown on this plan.

2. Extend shoulder pavement to provide a base for the extruded curb. See Contract Plans for exceptions to distances shown.

3. Use a single block or combination of blocks (no more than two (2) to achieve the actual 12” (in) offset. See Standard Specification Section 9-16.3(2). Wood blocks shall be secured to the posts with anti-rotation nails. If combination blocks are used, the adjacent blocks shall be toenailed with two 16d galvanized nails to prevent block rotation.

4. Wood blocks are shown. Blocks of an approved alternative material may be used. See Standard Specification Section 9-16.3(2).

5. All posts for any standard barrier run shall be of the same type: timber or steel.

SLOPE 1 EMBANKMENT TABLE

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<th>W (FT)</th>
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<td>2H : 1V OR FLATTER</td>
<td>2.5&quot; MIN.</td>
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<td>STEEPER THAN 2H : 1V BUT NOT</td>
<td>4.0&quot; MIN.</td>
</tr>
<tr>
<td>STEEPER THAN 1H : 1V</td>
<td></td>
</tr>
</tbody>
</table>

BEAM GUARDRAIL TYPE 31

STANDARD PLAN C-20.10-04

Sheet 1 of 1 Sheet

Approved for publication
14 Jul 2010 04:43 AM

Washington State Department of Transportation
1. When required by the Contract, a Snow Load Post Washer shall be used on the backside of the post (in lieu of the 1/3" (in) Post Bolt Washer) and a Snow Load Rail Washer shall be placed on the face side of Beam Guardrail Types 1 and 2. Snow Load Rail Washers shall not be installed on terminals.

2. Rail Washers, also called "Snow Load Rail Washers", are not required on new installation, except as called for in Note 1. Unnecessary Rail washers need not be removed from existing installations, except those on posts 2 through 8 of a BCT installation shall be removed.

3. Timber blocks shall be toe-nailed to the post with a 16d galvanized nail to prevent block rotation.

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

5. When "Beam Guardrail Type 14 - 32 ft. Long Post" is specified in the Contract, the post length shall be stamped with numbers, 1 1/2" (in) min. high and 3/4" (in) wide at the location where the letter "H" is shown in the ASSEMBLY DETAIL. For wood post applications, the letter shall be stamped to a minimum depth of 1/4" (in). For steel post applications, the letter shall be legible after the post is galvanized. After post installation, it shall be the Contractor's responsibility to ensure the stamped numbers remain visible.

6. Existing posts shall not be raised. Replace posts as necessary to achieve required guardrail height.

7. Holes shall be located on approaching traffic side of web.
NOTES
1. For component details, see Standard Plan C-23.60.
2. For terminal type and details, see Contract Plans and applicable drawings.
3. The slope from the edge of the shoulder into the face of the guardrail cannot exceed 10H : 1V when the face of the guardrail is less than 12" - 0" from the edge of the shoulder.
4. For one-way traffic and where a crashworthy terminal is not required, use the Beam Guardrail Anchor Type 10; see Standard Plan C-23.60.
5. Where a crashworthy terminal is required, use a Beam Guardrail Type 31 Non-Flared Terminal; see Standard Plan C-22.40.
6. Timber or steel post. Steel post shown.
CASE 4 - 31

1. For details, see Standard Plan C-22.40.

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

3. See Contract for Beam Guardrail Transition Section type and Connection to Bridge Traffic Barrier or Concrete Barrier. See Standard Plan C-24.10 for connection details.

4. Timber or steel post. Steel post shown.

CASE 5 - 31

<table>
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<th>FLARE RATE TABLE</th>
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<td>55</td>
</tr>
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<td>50</td>
</tr>
<tr>
<td>45</td>
</tr>
<tr>
<td>40 OR LESS</td>
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</tbody>
</table>
NOTES
1. The slope from the edge of the shoulder into the face of the guardrail should not exceed 10H:1V when the guardrail is within 12'-0" from the edge of the shoulder.

2. For details, see Standard Plan C-23.60.

3. For details, see Standard Plan C-22.40.

4. Timber or steel post. Steel post shown.
NOTES
1. For additional details not shown on this plan, refer to Standard Plan C-20.10.
2. CRT post to be wood only.
3. For additional details not shown, see Standard Plan C-1b.
NOTES

1. Attach Guardrail Post to Box Culvert with 7/8" (in) diameter high-strength threaded rod 8 1/2" (in) in length with resin-bonded anchors.

2. Wood blocks are shown. Blocks of an approved alternative may be used. See Standard Specification 9-16.3(2).
NOTES

1. See Contract for transition and connection type.

2. For additional installation requirements for Non-Flared Terminal placement, see Standard Plan C-22.40.

3. Guardrail installation shall be Beam Guardrail Type 31 with standard post and block. See Standard Plan C-20.10 for additional details.

4. The first letter of case designation indicates the end treatment on the side road. The second letter indicates the end treatment on the main road. For instance, a terminal on a side road and a bridge connection on the main road would be Case 22BC-31.

5. The radius dimension shall be etched into the plate as shown in the example on the Identification Plate Detail. Numerals shall be 1 1/2" (in) high minimum, and 3 1/4" (in) wide maximum. Plate shall be galvanized after etching and the letter shall remain permanently legible.

6. 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.
NOTES
1. Beam Guardrail post spacing shall be 6'-3" on centers.
2. Use a single or combination of blocks to achieve the actual 12" offset. See Standard Specification 9-16.3(2). Wood blocks shall be toe-nailed to post (and blocks, if block combinations are used) with 16d galvanized nails to prevent block rotation.
3. Attach blockouts to steel posts using bolt holes on approaching traffic side of post web.
4. For details not shown, see Standard Plan C-20.10.
5. Wood blocks shown. Blocks of alternate material may be used. See Standard Specification 9-16.3(2).
**NOTES**

1. The Implementation of the Manual for Assessment of Safety Hardware (MASH) criteria may result in the acceptance of guardrail terminal systems currently not shown on this plan. Non-Flared terminals shall be selected from the WSDOT Qualified Products List (QPL) or approved through the WSDOT Request for Approval of Materials (RAM) process.

2. This terminal is MASH compliant at Test Level Three (TL-3) and may be used for all posted speeds.

3. An MSKT-SP-MGS (TL-3) as manufactured by Road Systems, Inc. or SOFTSTOP (TL-3) as manufactured by Trinity Highway Products, LLC shall be installed according to manufacturer's recommendations.

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

5. When snow load post washers and snow load rail washers are required by the Contract, the snow load rail washers shall not be installed within the terminal limits.

6. Terminal shall be installed at a widening, ensuring the end piece is entirely off the shoulder. While this terminal does not require an offset at the end, a taper is recommended. For the MSKT-SP-MGS (TL-3), a maximum taper of 25:1 or flatter over the length of the terminal is allowed with a maximum offset of 24" (in) over 50' (ft).

For the SOFTSTOP (TL-3) a maximum taper of 25:1 or flatter is allowed over the system length of 50' - 9 1/2' with a maximum offset of 24" (in) at the anchor post.

7. For terminal details, see WSDOT approved manufacturer's drawings.

8. These terminals are supplied with steel posts only. They can be used with beam guardrail Type 31 runs composed of steel or wood guardrail posts.
1. The implementation of the Manual for Assessment of Safety Hardware (MASH) criteria may result in the acceptance of guardrail terminal systems currently not shown on this plan. Non-Flared terminals shall be selected from the WSDOT Qualified Products List (QPL) or approved through the WSDOT Request for Approval of Materials (RAM) process.

2. This terminal is MASH compliant at Test Level Two (TL-2) and may be used in applications with posted speeds of 45 mph or less.

3. An MSKT-SP-MGS (TL-2) as manufactured by Road Systems, Inc. or SOFTSTOP (TL-2) as manufactured by Trinity Highway Products, LLC shall be installed according to manufacturer's recommendations.

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

5. When snow load post washers and snow load rail washers are required by the Contract, the snow load rail washers shall not be installed within the terminal limits.

6. Terminal shall be installed at a widening, ensuring the end piece is entirely off the shoulder. While this terminal does not require an offset at the end, a flare is recommended. For the MSKT-SP-MGS (TL-2), a maximum flare of 25 : 1 or flatter over the length of the terminal is allowed with a maximum offset of 24" (in) over 50' (ft).

For the SOFTSTOP (TL-2) a maximum flare of 30:20 : 1 or flatter is allowed over the system length of 36" - 3 1/2" with a maximum offset of 12" (in) at the anchor post.

7. For terminal details, see WSDOT approved manufacturer's drawings.

8. These terminals are supplied with steel posts only. They can be used with guardrail runs composed of steel or wood guardrail posts.
NOTES
1. For use on the end of guardrail runs when a crashworthy terminal is not required.
2. For additional details not shown, see Sheet 2 of this Plan.
3. For end section details, see Standard Plane C-7 and C-7a.
4. Use details for Wood Breakaway post shown on this plan and components shown on Standard Plan C-1b.
5. Fasten the Anchor Cable using two 1” (in) nuts and washer, at both ends of cable. Outside nut shall be torqued against inside nut a minimum of 100 ft-lbs.
6. Wood blocks shown. Blocks of alternate material may be used. See Standard Specification, Section 5-16.3(2).
7. Posts shall match those of the connecting run: timber or steel.
8. Anchor plate may be constructed from 1/4” (in) plates welded to equal strength and dimensions as shown.
9. Eight 5/8” (in) x 1 1/2” (in) machine bolts with hex nut and washer. Place washer on face side of rail.

ELEVATION VIEW
W-BEAM

ELEVATION VIEW
THREE BEAM

WOOD BREAKAWAY POST DETAIL

BEAM GUARDRAIL (TYPE 31) ANCHOR TYPE 10
STANDARD PLAN C-23.60-04 SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION

Washington State Department of Transportation
NOTES
1. Attach guardrail to bridge rail or concrete barrier with 7/8" (in) diameter bolts in accordance with Standard Spec. 9-09.5(4), with thin slab ferrous inserts or resin-bonded anchors. See Contract Plans.
2. If the last guardrail post is 3" (in) or less from the end of the bridge barrier, this attachment and blockout is not necessary.
3. This case is also applicable for F-shape and vertical faces with no curbs.
4. When B connection is used with Type 1A Transition, the maximum spacing between bolts is 6' - 3".
5. See Bridge Plans for additional connection details.
6. Wood blocks shown. Blocks of alternate material may be used. See Standard Specification 9-16.3(2).
7. Steel posts shown. Timber posts may be used.

PLAN
A CONNECTION

PLAN
B CONNECTION

PLAN
C CONNECTION

PLAN
D CONNECTION

PLAN
E CONNECTION

PLAN
F CONNECTION
NOTES

1. This guardrail transition is for connection to a vertical concrete shape, a single slope, or a safety-
   shape barrier. The toe of the single slope and the safety-shape barrier shall be tapered or the
   barrier blocked out so that the toe of the barrier does not project past the face of the
   approach guardrail.

2. See Standard Plan C-24.10 for details regarding connection to bridge rail or traffic barrier.

3. For details of typical components, see Standard Plans C-1b and C-20.10.

BEAM GUARDRAIL TRANSITION SECTION TYPE 21 - PAY LIMIT

NOTE: TRANSITION PAY LIMIT SHALL INCLUDE END SECTION FOR CONNECTION TO BARRIER OR FIXED OBJECT

BEAM GUARDRAIL TYPE 31

PAY LIMIT

12 - 6' NESTED THREE BEAM GUARDRAIL
12-GAGE

6 - 3' SHORT THREE BEAM ELEMENT
12-GAGE

REDUCER ELEMENT TYPE C
10-GAGE

W/BEAM GUARDRAIL
12-GAGE

6 x 12 x 18" (IN) LONG BLOCK - SEE DETAIL STD. PLAN C-25.32

W6 x 15 - 7' - 0" LONG STEEL POST
WITH 6 x 12 BLOCK

W6 x 12 - 7' - 6" LONG STEEL POST
WITH 6 x 12 BLOCK

W6 x 8.5 OR W6 x 9 - 6' - 0" LONG STEEL POST
WITH 6 x 12 BLOCK

GROUND LINE

THREE BEAM WOOD BLOCK

REDUCER ELEMENT TYPE C

SHORT THREE BEAM ELEMENT

DETAIL A

DETAIL B

29/32" (IN) X 1 1/8" (IN) SLOT (TYP.)
29/32" (IN) X 1 1/8" (IN) SLOT (TYP.)
3/4" (IN) X 2 1/2" (IN) SLOT (TYP.)
3/4" (IN) X 2 1/2" (IN) SLOT (TYP.)

LEFT (MIRROR OF RIGHT)

1 - 0 1/2"

7 - 3 1/2"

3 - 1 1/2"

7 - 3 1/2"

3 - 1 1/2"

1 - 0 1/2"

1 - 0 1/4"

SYMMETRICAL ABOUT E
NOTES
1. See Standard Plans C-1b, C-1d, C-20.10, and C-25.20 for rail elements and thrie beam block details.
2. When a transition is required on the trailing end of the bridge, use a mirror image of this plan.
NOTES


2. When a transition is required on the trailing end of the bridge, use a mirror image of this plan.

3. For additional alternatives not shown, see Contract Plans.
NOTES

1. Refer to Standard Plans C-1 and C-1b for component details for Beam Guardrail Type 1 (not shown on this plan).

2. Refer to Standard Plan C-20.10 for component details for Beam Guardrail Type 31 (not shown on this plan).

3. Accommodating the wider blockout (12" in width) used with Type 31 guardrail will require widening the embankment by 4" (in) or narrowing the shoulder by 4" (in).

4. Wood blocks shown. Blocks of alternate material may be used. See Standard Specification 9-16.3(2).

5. All posts for any standard barrier run shall be of the same type: timber or steel.
NOTES

1. Wire rope loops shall be 3'-0" long, except for the top loop of the Barrier Terminal, which shall be 2'-0" 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 Pin head designs vary among different manufacturers. Pin designs that are shaped differently than those shown in the detail are acceptable, if the bearing surface is within the minimum and maximum widths specified.

4. The vertical spacing of the Wire Rope Loops in a Barrier Terminal is determined by the end of the Barrier Segment to which it is being connected. See BARRIER CONNECTION DETAIL (Sheet 2).
NOTES
1. This plan shall be used for 40' (ft) and 50' (ft) Light Standards with 16' (ft) max. length double mast arms.
3. Grounding Conductor shall be non-insulated #4 AWG stranded copper; provide 3'-0" min. slack. Clamp to steel reinforcing bar with connector suitable for use embedded in concrete.
4. See the Contract Plans for conduit size and placement.
5. Concrete shall be Class 4000.
6. Install conduit couplings on all conduits. Place coupling tops flush with top of concrete. If PVC conduits are specified, the conduit stub and end bell bushing shall not be glued to the coupling.

GROUNDING CONDUCTOR - ROUTE TO GROUNDING STUD (SEE NOTE 3)

SECTION A

CONCRETE BARRIER LIGHT STANDARD SECTION
STANDARD PLAN C-8b

END

ISOMETRIC
ANOTHER BOLT DETAIL

ALL NUTS, BOLTS, WASHERS, AND RODS SHALL BE FULLY GALVANIZED IN ACCORDANCE WITH ASTM F2329

POLE BASE PLATE - SEE STD. PLAN J-2B60
HEAVY HEX NUTS AND WASHERS
THREADED ROD OR BOLT

1/\(\in\) (IN) DIAM. FULL LENGTH
THREADED ROD OR BOLT -
ASTM F1554 GRADE 105

HEAVY HEX NUT AND WASHER (TYP.)

ANCHOR PLATE (TYP.) -
SEE DETAIL

1/\(\in\) (IN) PLATE -
ASTM A36

BAR LIST

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<thead>
<tr>
<th>MARK</th>
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<tr>
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<td>28</td>
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<tr>
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<tr>
<td>3</td>
<td>FOOTING</td>
<td>9</td>
<td>6' - 8&quot;</td>
<td>6' - 8&quot;</td>
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<td>4</td>
<td>21' - 0&quot;</td>
<td>21' - 0&quot;</td>
</tr>
<tr>
<td>6</td>
<td>BARRIER</td>
<td>30</td>
<td>9' - 3&quot; TO 6' - 0&quot;</td>
<td>9' - 3&quot; TO 6' - 0&quot;</td>
</tr>
</tbody>
</table>

BENDING DIAGRAM

(ALL DIMENSIONS ARE "O" TOT OUT)

FIELD BEND
NOTES

1. The intended use of this plan is for the permanent anchoring of Precast Concrete Barrier Type 2 (see Standard Plan C-8) on hot mix asphalt pavement.

2. Remove the Type 3 Anchors by first driving the steel pins down through the barrier further into the pavement to allow lifting the barrier without interference, then remove the pins from the pavement.

3. After removing the Type 3 Anchors, clean the pin holes and fill them with sealant according to Standard Specification 9-04.2.
REINFORCING STEEL BENDING DIAGRAM

CONCRETE BARRIER TRANSITION
TYPE 2 TO BRIDGE F-SHAPE
STANDARD PLAN C-8f

NOTE
The vertical locations of the Wire Rope Loops at one end compose a set that shall not vary, however, which set is applied to an end is determined by the end to which it is being connected. A set with loops 1" - 5" apart connects to a set with loops 1" - 6" apart. See Standard Plan C-8, BARRIER CONNECTION DETAIL.
REINFORCING STEEL BENDING DIAGRAM

SEE DIMENSION TABLE

DIMENSION TABLE

<table>
<thead>
<tr>
<th>BARRIER HEIGHT</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>HORIZONTAL BARS (QTY.)</th>
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<tr>
<td>3'-6&quot; - 6'</td>
<td>4</td>
<td>2</td>
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<td>1</td>
<td>8</td>
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<td>3</td>
<td>3</td>
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<td>12</td>
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NOTE:
STEEL WELDED WIRE REINFORCEMENT DEFORMED FOR CONCRETE
MAY BE SUBSTITUTED FOR REINFORCING STEEL IN ACCORDANCE
WITH STANDARD SPECIFICATION 6-10-3

BAR RELATION DETAIL
PREPARED GRADED BASE
HYPOTHETICAL GRADE DIFFERENTIAL

NOTES
1. PERMANENT INSTALLATION requirements: Embed barrier 3" (in) minimum; install 3/8" (in) Premolded Joint Filler between segments; fill the Connection Blockout with grout, centering the Rebar Grid in the blockout before adding grout.
2. TEMPORARY INSTALLATION requirement: Place a Rebar Grid in the Connection Blockout between barrier segments.
3. Installation on a horizontal curve with a radius less than 2,000' (ft) requires a modified end design.
4. For Barrier with a 2'-10" reveal, see Sheet 2. For High-Performance Barrier with a 3'-6" reveal, see Sheet 3.
SECTION A
3'-6" BARRIER SHOWN LEVEL

SECTION B
3'-6" BARRIER FOR USE WITH A
0" (IN) TO 5" (IN) MAX. GRADE SEPARATION

SECTION B
4'-0" BARRIER FOR USE WITH A
GREATER THAN 5" (IN) TO 7" (IN) MAX.
GRADE SEPARATION

SECTION B
4'-6" BARRIER FOR USE WITH A
GREATER THAN 7" (IN) TO 10" (IN) MAX.
GRADE SEPARATION

STANDARD MOUNTING HEIGHT
NOTES

1. PERMANENT INSTALLATION requirements: Embed barrier 3" (in) minimum; install 3/8" (in) Premolded Joint Filter between segments; fill the Connection Blockout with grout, centering the Rebar Grid in the blockout before adding grout.

2. TEMPORARY INSTALLATION requirement: Place a Rebar Grid in the Connection Blockout between barrier segments.

3. See Standard Plan C-70.10 for REBAR GRID DETAIL and BARRIER CONNECTION DETAIL.

4. This plan is for transitions to precast concrete barriers only.

5. When High-Performance Concrete Barrier is specified in the Contract, use the dimensions given in the HP row in the DIMENSION TABLE, with a minimum height above roadway of 3" - 6" and a minimum embedment of 3" (in).

---

FERRENCING STEEL BENDING DIAGRAM

SEE DIMENSION TABLE

DIMENSION TABLE

<table>
<thead>
<tr>
<th>BARRIER HEIGHT</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
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<tr>
<td>STD.</td>
<td>2&quot; - 6&quot;</td>
<td>6&quot;</td>
<td>2&quot; - 6&quot;</td>
<td>3&quot; - 6&quot;</td>
<td>3&quot; - 6&quot;</td>
<td>2&quot; - 6&quot;</td>
</tr>
<tr>
<td>HP</td>
<td>4&quot; - 6&quot;</td>
<td>9 1/8&quot;</td>
<td>2&quot; - 2 1/4&quot;</td>
<td>3&quot; - 2 1/4&quot;</td>
<td>4&quot;</td>
<td>3&quot; - 2&quot;</td>
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ISOMETRIC VIEW

STATE HIGHWAY
Washington State Department of Transportation

APPROVED FOR PUBLICATION

SINGLE-SLOPE CONCRETE BARRIER (PRECAST) TRANSITION SECTION
STANDARD PLAN C-75.10-01
NOTES

1. PERMANENT INSTALLATION requirements: Embed barrier 3" (in) minimum; install 3/8" (in) Premolded Joint Filler between segments; fill the Connection Blockout with grout, centering the Rebar Grid in the blockout before adding grout.

2. TEMPORARY INSTALLATION requirement: Place a Rebar Grid in the Connection Blockout between barrier segments.

3. See Standard Plan C-70.10 for REBAR GRID DETAIL and BARRIER CONNECTION DETAIL.

4. Vertical Back barrier is used only in the configurations shown in Standard Plans C-85.10 and C-85.20, and when placed against a retaining wall.

5. When High-Performance Concrete Barrier is specified in the Contract, use the dimensions given in the HP row in the DIMENSION TABLE, with a minimum height above roadway of 3' - 6" and a minimum embedment of 3' (in).

REINFORCING STEEL BENDING DIAGRAM

SEE STD. SPEC. 9-07.10
FOR BENDING DIAMETERS

(SEE NOTE 9)

DIMENSION TABLE

<table>
<thead>
<tr>
<th>BARRIER HEIGHT</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<tr>
<td>STD. 3'-6&quot;</td>
<td>8&quot;</td>
<td>1'-6&quot;</td>
<td>3&quot;</td>
<td>2'-8&quot;</td>
<td>2'-8&quot;</td>
<td>2'-9&quot;</td>
<td>1'-2&quot;</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>HP 4'-0&quot;</td>
<td>9 1/8&quot;</td>
<td>1'-7 1/8&quot;</td>
<td>4</td>
<td>3'-6&quot;</td>
<td>3'-2 1/2&quot;</td>
<td>3'-2&quot;</td>
<td>3'-3 1/2&quot;</td>
<td>1'-3&quot;</td>
<td>10</td>
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</tbody>
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.getConnectionBlockout

(SEE NOTE 9)

ISOMETRIC VIEW

SINGLE-SLOPE CONCRETE BARRIER (PRECAST) VERTICAL BACK
STANDARD PLAN C-75.20-01

APPROVED FOR PUBLICATION

Washington State Department of Transportation
NOTE:
STEEL WELDED WIRE REINFORCEMENT DEFORMED FOR CONCRETE MAY BE SUBSTITUTED FOR REINFORCING STEEL IN ACCORDANCE WITH STANDARD SPECIFICATION 6-16.3

1. PERMANENT INSTALLATION requirements: Embed barrier 3" (in) minimum; install 3/8" (in) Premolded Joint Filler between segments; fill the Connection Blockout with grout, centering the Rebar Grid in the blockout before adding grout.

2. TEMPORARY INSTALLATION requirement: Place a Rebar Grid in the Connection Blockout between barrier segments.

3. See Standard Plan C-70.10 for REBAR GRID DETAIL and BARRIER CONNECTION DETAIL.

4. The Terminal is used only on the trailing end of a barrier, unless otherwise shown in the Contract.

5. When High-Performance Concrete Barrier is specified in the Contract, use the dimensions given in the H/P row in the DIMENSION TABLE, with a minimum height above roadway of 3-5" and a minimum embedment of 3" (in).
3/4" (IN) CHAMFER (TYP.)

SECTION A
3'-6" BARRIER SHOWN LEVEL

3'-6" BARRIER FOR USE WITH A 0" (IN) TO 8" (IN) MAX. GRADE SEPARATION (SEE NOTE 3)

SECTION A
GRADE SEPARATION 7" MAX.

4'-0" BARRIER FOR USE WITH A GREATER THAN 8" (IN) TO 7" (IN) MAX. GRADE SEPARATION (SEE NOTE 3)

SECTION A
GRADE SEPARATION 10" MAX.

STANDARD MOUNTING HEIGHT
1. The Terminal is used only on the trailing end of a barrier, unless otherwise shown in the Contract.
2. See Standard Plan C-80.10, Sheet 1, for EXPANSION JOINT and DUMMY JOINT details.
3. When High-Performance Concrete Barrier is specified in the Contract, use the dimensions given in the H/P row in the DIMENSION TABLE, with a minimum height above roadway of 3'-6" and a minimum embedment of 3" (in).

NOTE:
- STEEL WELDED WIRE REINFORCEMENT DEFORMED FOR CONCRETE MAY BE SUBSTITUTED FOR REINFORCING STEEL IN ACCORDANCE WITH STANDARD SPECIFICATION 6-10.3
1. The Vertical Back barrier is used only in the configurations shown in Standard Plans C-85.10 and C-85.11, and when placed against a retaining wall.

2. See Standard Plan C-80.16, Sheet 1, for EXPANSION JOINT and DUMMY JOINT details. Modify rebar as shown in EXPANSION JOINT MODIFICATION.

3. Reinforcing steel dimensions and clearances are shown for stationary form construction. When slip-form construction is used, increase reinforcing steel clearances to the outside surfaces of the barrier to 2 1/2" (in) and adjust steel dimensions as required.

4. When High-Performance Concrete Barrier is specified in the Contract, use the dimensions given in the H/P row in the DIMENSION TABLE, with a minimum height above roadway of 3' - 0" and a minimum embedment of 3' (in).

NOTE:
- Steel welded wire reinforcement deformed for concrete may be substituted for reinforcing steel in accordance with Standard Specification 6-13.3.
- Reinforcing steel bending diagram (see page 1224)

DIMENSION TABLE (see note 4)

<table>
<thead>
<tr>
<th>BARRIER HEIGHT</th>
<th>A</th>
<th>B</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>HORIZONTAL BARS (QUADS)</th>
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</thead>
<tbody>
<tr>
<td>STD.</td>
<td>3' - 0&quot;</td>
<td>8&quot;</td>
<td>1' - 0&quot;</td>
<td>4</td>
<td>2' - 0&quot;</td>
<td>1&quot; - 0 1/4&quot;</td>
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<tr>
<td>HP</td>
<td>4' - 0&quot;</td>
<td>9 1/8&quot;</td>
<td>1'- 5 1/8&quot;</td>
<td>4</td>
<td>3' - 0&quot;</td>
<td>1&quot; - 1 1/2&quot;</td>
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</table>

SINGLE-SLOPE CONCRETE BARRIER (CAST-IN-PLACE)
VERTICAL BACK
STANDARD PLAN C-80.40-01
NOTES
1. Use the barrier type, precast or cast-in-place, as specified in the Contract.
2. For Single-Slope Concrete Barrier details, see Standard Plan series C-79's (precast) or C-80's (cast-in-place).
NOTES
1. Use the barrier type, precast or cast-in-place, as specified in the Contract.
2. For Single-Slope Concrete Barrier details, see Standard Plan series C-70’s (precast) or C-80’s (cast-in-place).
NOTES

1. When connecting between cast-in-place and precast Single-Slope Barrier, provide a Connection Blockout and Rebar Grid as shown on Standard Plan C-70.10.

2. See the Contract Plans for conduit placement.

3. Grounding Conductor shall be non-insulated #4 AWG stranded copper; provide 3'-0" min. stack. Clamp steel reinforcing bar with connector suitable for use embedded in concrete.

4. Install Conduit Coupling flush with top of foundation. Do not glue PVC stubout.

5. This plan shall be used for 40' (f) and 50' (f) Light Standards with 16"C) max. length double mast arms.

6. Concrete shall be Class 4000.

7. This spread footing is designed for an allowable soil bearing pressure of 2500 psf or better.
1. This Barrier/Foundation combination has been designed in accordance with AASHTO LRFD Test Level 4 requirements. The horizontal vehicle impact force at the top of the barrier is taken at 54 kips for Strength and Extreme Limit States, and 10 kips for footing stability (swelling and sliding) in the Service Limit State.

2. When connecting between cast-in-place and precast Single-Slope Barrier, provide a Connection Blockout and Rebar Grid as shown on Standard Plan C-70.10.

3. Grounding conductor shall be non-insulated #4 AWG stranded copper; provide 3'-0" min. slack. Clamp steel reinforcing bar with connector suitable for use embedded in concrete.

4. See the Contract Plans for conduit placement.

5. Install Conduit Coupling flush with top of foundation. Do not glue PVC stubout.

6. This plan shall be used for 40' (t) and 50' (f) Light Standards with 16' (t) max. length double mast arms.

7. Concrete shall be Class 4000.

8. The factored soil bearing resistance shall equal or exceed the following:
   i) Service limit state = 6 ksf
   ii) Strength limit state = 24 ksf
   iii) Extreme limit state = 48 ksf

---

**BAR LIST**

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<th>QUANTITY</th>
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<tr>
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<td>28</td>
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<tr>
<td>2</td>
<td>BARRIER - BOTTOM VERTICAL</td>
<td>#4</td>
<td>12</td>
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<td>3</td>
<td>FIN. &amp; BARRIER - VERTICAL</td>
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<td>15</td>
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<td>4</td>
<td>BARRIER - HORIZONTAL</td>
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<td>'D'</td>
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**TABLE**

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<th>BARRIER HEIGHT</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
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<tbody>
<tr>
<td>0 TO 3'</td>
<td>4'-0&quot;</td>
<td>9 1/8&quot;</td>
<td>2'-2 1/4&quot;</td>
<td>3'-6 1/4&quot;</td>
<td>VARIES 6&quot; TO 9&quot;</td>
<td>6</td>
<td>1'-2&quot;</td>
<td>14</td>
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<tr>
<td>UP TO 6' MAX</td>
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<td>10 1/4&quot;</td>
<td>2'-4 1/2&quot;</td>
<td>3'-8 1/4&quot;</td>
<td>VARIES 6&quot; TO 9&quot;</td>
<td>5</td>
<td>11&quot;</td>
<td>14</td>
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</tbody>
</table>

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**SINGLE-SLOPE CONCRETE BARRIER (42'') LIGHT STANDARD FOUNDATION**

---

**STANDARD PLAN C-85.15-01**
NOTES
1. When connecting between Cast-In-Place and Precast Single-Slope Barrier, provide a Connection Blockout and Rebar Grid as shown in Standard Plan C-70.10.
2. Grounding Conductor shall be non-insulated #4 AWG stranded copper; provide 3'-0" min. slack. Clamp steel reinforcing bar with connector suitable for use embedded in concrete.
3. Install Conduit Coupling flush with top of Barrier. Do not glue PVC stubout.
4. Concrete shall be Class 4000, unless otherwise noted.

DIMENSIONS "W" AND "Z"

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<th>SIGN BRIDGE SPAN LENGTH</th>
<th>W</th>
<th>Z</th>
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<td>6'-0&quot;</td>
<td>11'-6&quot;</td>
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<td>8'-0&quot; TO 9'-0&quot;</td>
<td>5'-0&quot;</td>
<td>13'-6&quot;</td>
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<tr>
<td>9'-0&quot; TO 12'-0&quot;</td>
<td>6'-0&quot;</td>
<td>15'-0&quot;</td>
</tr>
<tr>
<td>12'-0&quot; TO 15'-0&quot;</td>
<td>7'-0&quot;</td>
<td>16'-6&quot;</td>
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</tbody>
</table>

SHAFT DEPTH Z IS BASED ON ALLOWABLE LATERAL BEARING PRESSURE IN EXCESS OF 1500 PSI WITH Ø = 28 DEGREES OR GREATER

SEE SECTION "C", SHEET 2, FOR GROUNDING CONDUCTOR DETAILS (SEE NOTE 2)
NOTES
1. When connecting between Cast-in-Place and Precast Single-Slope Barrier, provide a Connection Blockout and Rebar Grid as shown in Standard Plan C-70.10.
2. All concrete shall be class 4000.
3. This barrier transition section is designed for an allowable soil bearing pressure of 2500 psf or better.

TABLE

<table>
<thead>
<tr>
<th>GRADE SEPARATION</th>
<th>BARRIER HEIGHT</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>HORIZONTAL BARS (QTY)</th>
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</thead>
<tbody>
<tr>
<td>0' TO 5'</td>
<td>3'-6&quot;</td>
<td>2'-0&quot;</td>
<td>4'-10&quot;</td>
<td>3'-0&quot; MIN.</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>UP TO 7'</td>
<td>4'-0&quot;</td>
<td>9'-0&quot;</td>
<td>2'-2'</td>
<td>1'-8&quot;</td>
<td>5</td>
<td>1/2&quot;</td>
<td>7'-0&quot; MIN.</td>
</tr>
<tr>
<td>UP TO 10'</td>
<td>4'-0&quot;</td>
<td>10'-5/16&quot;</td>
<td>4'-1/2&quot;</td>
<td>2'-2'</td>
<td>1'-10&quot;</td>
<td>10'-0&quot; MIN.</td>
<td>14</td>
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</tbody>
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LEADING END TRANSITION (FROM SINGLE-SLOPE DUAL-FACED BARRIER TO MONOTUBE SIGN STRUCTURE FOUNDATION)

TRAILING END TRANSITION (FROM MONOTUBE SIGN STRUCTURE FOUNDATION TO SINGLE-SLOPE DUAL-FACED BARRIER)

NOTE: Dimension Table - NOT COUNTING SPLICES

ALL DIMENSIONS ARE OUT TO OUT
ALL BENDS ARE 2" RADIUS VARIATION: BARRIER - TOP VERTICAL #4 24
BARRIER - BOTTOM VERTICAL #4 24
BARRIER - HORIZONTAL #5 2

ISOMETRIC VIEW

SINGLE-SLOPE CONCRETE BARRIER TRANSITION FOR MONOTUBE SIGN SUPPORT

STANDARD PLAN C-85.18-01

SOLOMON CONCRETE

ZELLERBASS ZELDENRICH P C I N T E R N A T I O N A L

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION: WSDOT 2019-02-28 00:01:02 PM

DRAWN BY: USA CONCRETE ENG.

SHEET 1 OF 1 SHEET
NOTE
1. For W-Beam Type 31 shoulder application, see Standard Plan C-20.10.
2. See Contract Plans for Barrier location.

TRAFFIC BARRIER
SHOULDER WIDENING
STANDARD PLAN C-16a

BEAM GUARDRAIL TYPE 1
(SEE NOTE 1)

BEAM GUARDRAIL TYPE 1 ON STEEP SLOPES
(SEE NOTE 1)
1. From the End of Landform, use the Design Layout Line to determine the location of the downstream (with traffic) Cable Barrier Terminal.

2. Provide the Lateral Deflection Distance and show in the Contract Plans to accommodate potential opposing traffic encroachments.
NOTES

1. Wall to be designated Noise Barrier Wall Type 2A, 2B, 2C or 2D. The Contract specifies actual wall designations.

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

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

4. Construction joints in the footing shall be spaced at 1/2 foot maximum.

CAST-IN-PLACE CONCRETE WALL ON SPREAD FOOTING

TYPICAL SECTION

TYPICAL SECTION

WIND EXPOSURE & VELOCITY

<table>
<thead>
<tr>
<th>NOISE BARRIER WALL TYPE</th>
<th>WIND EXPOSURE</th>
<th>WIND VELOCITY (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A</td>
<td>B1</td>
<td>90</td>
</tr>
<tr>
<td>2B</td>
<td>B1</td>
<td>90</td>
</tr>
<tr>
<td>2C</td>
<td>B2</td>
<td>80</td>
</tr>
<tr>
<td>2D</td>
<td>B2</td>
<td>90</td>
</tr>
</tbody>
</table>

EXPLODES AUGUST 23, 2006

NOISE BARRIER WALL

STANDARD PLAN D-2.04-00

SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION

Waleed Patiyyo 11/20/05

Washington State Department of Transportation
FOOTING WIDTH TRANSITION DETAIL
FOR LOCATIONS WITHOUT FOOTING STEP

TRANSVERSE BARS NOT SHOWN

FOOTING WIDTH TRANSITION DETAIL
FOR LOCATIONS WITHOUT FOOTING STEP

CAST-IN-PLACE CONCRETE WALL ON SPREAD FOOTING

NOISE BARRIER WALL
TYPE 2
STANDARD PLAN D-2.04-00
SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION

Washington State Department of Transportation
1. Wall to be designated Noise Barrier Wall Type 3A, 3B, 3C, or 3D. The Contract specifies actual wall designations.

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

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

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

---

**CAST-IN-PLACE CONCRETE WALL ON OFFSET SPREAD FOOTING**

**NOISE BARRIER WALL TYPE 3**

**STANDARD PLAN D-2.06-01**

<table>
<thead>
<tr>
<th>M</th>
<th>NOISE BARRIER WALL TYPE</th>
<th>WIND EXPOSURE</th>
<th>WIND VELOCITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>3A</td>
<td>B1</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>3B</td>
<td>B1</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>3C</td>
<td>B2</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>3D</td>
<td>B2</td>
<td>90</td>
<td></td>
</tr>
</tbody>
</table>

---

**NOTES**

1. Wall to be designated Noise Barrier Wall Type 3A, 3B, 3C, 3D. The Contract specifies actual wall designations.

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

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

4. Construction joints in the footing shall be spaced at 120 feet maximum.
FOOTING WIDTH TRANSITION DETAIL
FOR LOCATIONS WITHOUT FOOTING STEP

(TRANSVERSE BARS NOT SHOWN)

CAST-IN-PLACE CONCRETE WALL ON OFFSET SPREAD FOOTING

NOISE BARRIER WALL TYPE 3
STANDARD PLAN D-2.06-01
SHEET 2 OF 2 SHEETS

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
PLACE HOOKS PARALLEL TO WALL LAYOUT LINE (TYP.)

SHAFT LENGTH FROM FOOTING

SPACING @ 12" THREE SPACES @ 6"

#4 STIRRUP

CONCRETE SHAFT
SHAFT REINFORCEMENT
W 3.5 SPIRAL @ 6" PITCH

DETAIL "B"

1/2" NOISE SEALER (TYP.)
1/2" NOISE SEALER (TYP.)

3/4" CHAMFER (TYP.)

REINFORCED PER LISTED WALL HEIGHT REINFORCEMENT TABLE

ANGLE POINT

BAR "D"

CORNER PANEL

JOINT AND CORNER DETAIL

CAST-IN-PLACE CONCRETE WALL ON SHAFT FOUNDATION

NOISE BARRIER WALL TYPE 4
STANDARD PLAN D-2.08-00

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
CONSTRUCTION JOINT WITH
ROUGHENED SURFACE
HEIGHT MAY VARY IF REQUIRED TO
PROVIDE A SMOOTH PROFILE CONSISTENT
WITH ROADWAY PROFILE

REINFORCING STEEL
BAR "B" - CENTERS ON WALL
SURFACE TREATMENT
AS REQUIRED

ALTERNATE SIDES

OPTIONAL

GROUNDD LEVEL LINE

Provide an additional
#4 bar top and bottom
when "H" exceeds 3'

CONSTRUCTION JOINT
(SEE NOTE 4)

WALL H T
H
1/2" PREMOLDED JOINT FILLER
IN EXPANSION JOINTS (TYP.)
@ 24'-0" CENTERS MAX.
LEVEL (TYP.)

FOOTING WIDTH TRANSITION DETAIL

FOOTING (TYP.)

BAR "B" 1.0'-0"
BAR "C" 1.0'-0"
BAR "E" 1.0'-0"

CAST-IN-PLACE CONCRETE
WALL W/ TRAFFIC BARRIER
ON SPREAD FOOTING

NOTES

1. Wall to be designated Noise Barrier Wall
Type 6A, 6B, 6C or 6D. 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 foundation shall
be spaced at 120 feet maximum.
1. Wall to be designated Noise Barrier Wall Type 6SSA, 6SSB, 6SSC, or 6SSD. 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 foundation shall be spaced at 120 feet maximum.

Right-of-Way

SEE CONTRACT

ALTERNATE SIDES

REINFORCING STEEL

BAR "C" - CENTERED ON WALL

SURFACE TREATMENT AS REQUIRED

H @ THREE EQUAL SPACES

FINAL GROUND LINE

LOCATION OF #4 WHEN X = 3

#4 @ 16" "

3" CLR.

2" CLR.

2" CLR.

2" CLR.

BAR "B"

OPTIONAL

BARS "B", "C", "D" & "E" SPACE AS SHOWN ON TABLES

ELEVATION

TYPICAL SECTION

1/2" PREMOLDED JOINT FILLER IN EXPANSION JOINTS (TYP.) @ 2'-0" CENTERS MAX. LEVEL (TYP.)

JOINT AND CORNER DETAIL

CAST-IN-PLACE CONC. WALL W/ SINGLE SLOPE TRAFFIC BARRIER ON SPREAD FOOTING

FOOTING WIDTH TRANSITION DETAIL

(TOP OF ROADWAY)

(TOP OF FOOTING)

REINFORCED PER LISTED WALL HEIGHT REINFORCEMENT TABLE

NOTES

1. Wall to be designated Noise Barrier Wall Type 6SSA, 6SSB, 6SSC or 6SSD. 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 foundation shall be spaced at 120 feet maximum.
1. Wall to be designated Noise Barrier Wall Type 7A, 7B, 7C or 7D. 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. The Contract specifies actual foundation requirements D1 or D2.

CAST-IN-PLACE CONCRETE WALL W/ TRAFFIC BARRIER ON SHAFT FOUNDATION

STATE OF WASHINGTON
DEPARTMENT OF TRANSPORTATION

NOISE BARRIER WALL TYPE 7
STANDARD PLAN D-2.18-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

WASHINGTON DEPARTMENT OF TRANSPORTATION

DRAWN BY: ADAM DOCHRIAN

NOTES

1. Wall to be designated Noise Barrier Wall Type 7A, 7B, 7C or 7D. 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. The Contract specifies actual foundation requirements D1 or D2.
### Notes

1. Wall to be designated Noise Barrier Wall Type 7SSA, 7SSB, 7SSC or 7SSD. 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. The Contract specifies actual foundation requirements D1 or D2.

### Wind Exposure & Velocity

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Angle of Internal Friction (Degrees)</th>
<th>B1</th>
<th>B2</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>52</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>D2</td>
<td>32</td>
<td>80</td>
<td>80</td>
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</tbody>
</table>

### Soil Type

<table>
<thead>
<tr>
<th>B1</th>
<th>B2</th>
</tr>
</thead>
</table>
| 7SSA | 81  
| 7SSB | 81  
| 7SSC | 82  
| 7SSD | 82  

### Wind Exposure

- Wall to be designated Noise Barrier Wall Type 7SSA, 7SSB, 7SSC or 7SSD. The Contract specifies actual wall designations.
- For intermediate wall heights, use the next higher H.
- Panels shall have at least 3 feet of level ground on each side.
- The Contract specifies actual foundation requirements D1 or D2.
JOINT AND CORNER DETAIL

- BAR "D"
- CORNER PANEL
- REINFORCED PIER LISTED WALL HEIGHT REINFORCEMENT TABLE

3/4" CHAMFER (TYP.)

- 1/2" NOISE SEALER (TYP.)
- TRAFFIC SIDE

JOINT HOLE - 2" I.D. WITH ROUGHENED SURFACE, OR RIGID POST-TENSIONED DUCT, OR CORRUGATED STEEL PIPE

FILL VOID WITH GROUT USING DUCTS. DUCTS SHALL BE LOCATED ON PANEL FACE OPPOSITE TRAFFIC

FOOTING WIDTH TRANSITION DETAIL
FOR LOCATIONS WITHOUT FOOTING STEP

- 1" CURL (TYP.)
- 1" CRL (TYP.)
- 1' - 0" MIN. (TYP.)
- TRANSVERSE BARS NOT SHOWN

PRECAST CONCRETE WALL ON SPREAD FOOTING

NOISE BARRIER WALL TYPE 9

STANDARD PLAN D-2.32-00

APPROVED FOR PUBLICATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
Fill the joint hole with grout using ducts. Ducts shall be located on panel face opposite traffic.

Foot the joint hole with a grout pad. Ducts shall be located on panel face opposite traffic.

Reinforced per listed wall height reinforcement table.

Joint and corner detail.

Joint hole - 2" I.D. with roughened surface, or rigid post-tensioned duct, or corrugated steel pipe.

Bar "G" spiral.

Corner panel.

Bar "D".

1/2" Noise Sealer (Typ.)

Traffic side.

1/2" Chamfer (Typ.)

3/4" Chamfer (Typ.)

Corner panel.

Joint and corner detail.

Foot the width transition detail for locations without footing step.

Traffic side.

Foot the joint with a grout pad. Ducts shall be located on panel face opposite traffic.

DETAIL A

Washington State Department of Transportation

Date: 12/31/08

No. 10

Standard Plan D-2.34-01

Sheet 2 of 2 Sheets

Approve for publication

Washington State Department of Transportation
Notes:
1. All rods "A" and Anchor bolts shall be per ASTM F1554 grade 105.
2. Anchor Bolts, Nuts, Washers and Rod "A" shall have a protective coating of either Hot Dipped Galvanizing per AASHTO M232 for hardware or AASHTO M111 for Washers and Plates.
3. For intermediate wall heights, use the next higher H.
4. Panels shall have at least 3 feet of level ground on each side.
5. The Contract specifies actual foundation requirements for D1 or D2 and location of Western WA and Eastern WA.
6. Maximum panel length shall be 12 feet.
7. Materials shall meet the requirements of Standard Specification Section 6-12 and Special Provisions Section 6-12.
**Detail D**

**Shaft to Panel Connection**

- Either option available to grout blockouts, anchor bolts, base plate to limits shown.
- Blockout in panel - to be filled with grout type 2 after setting panel (TYP).
- Tapered hole for wedge head option shown.
- No taper for anchor bolt option with hole diameter = rod "A" diameter + 1/16" (TYP).

**Section F**

**Epoxy Bonding Agent Between Plaster and Base Plate for Rod "A" Threaded Bar Option**

- Edge of panel - surface treatment not shown.
- Blockout in panel - to be filled with grout type 2 after setting panel (TYP).

**Section E**

**Base Plate Detail**

- Base plate, shaft and traffic barrier not shown for clarity.
- See wedge head option for tapered hole dimensions. No taper for anchor bolt option.
  - Hole diam. = rod "A" diam. + 1/16" (TYP).

**Section C**

**Anchor Plate Detail**

- Hole diam. = bolt diam. + 1/8" (see table).

**Wind and Seismic Limitations**

<table>
<thead>
<tr>
<th>Location</th>
<th>Wind Exposure</th>
<th>Wind Velocity (MPH)</th>
<th>Peak Seismic Ground Acceleration Coefficient on Rock, Site Class B (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Washington</td>
<td>160</td>
<td>100</td>
<td>0.45</td>
</tr>
<tr>
<td>Eastern Washington</td>
<td>80</td>
<td>80</td>
<td>0.19</td>
</tr>
</tbody>
</table>

**Foundation Design**

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Angle of Internal Friction, ( \alpha ) (Degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>32</td>
</tr>
<tr>
<td>D2</td>
<td>38</td>
</tr>
</tbody>
</table>

**Note 9 - Sheet 1**

See wedge head option for tapered hole dimensions. No taper for anchor bolt option.
NOTES

1. Walls to be designated Noise Barrier Wall Type 14SSA, 14SSB, 14SSC or 14SSD. The Contract specifies actual wall designations.

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

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

4. All joints shall be in full contact and sealed.

5. Anchor Bolts, Nuts, Washers, Base Plate, and Bar B shall have a Protective Coating of one of the following: Hot Dipped Galvanizing AASHTO M 232 for Hardware, AASHTO M 111 for Washers and Plates. Mechanical Galvanizing AASHTO M 298 CL 55, or Zinc Rich Paint. Paint threads and nuts after installation.

6. The bottom 6" of Bar "B" shall be painted with one coat of Formula A-6-86 Zinc Dust Oxide Primer OR, one coat of Formula A-11-99 Primer.

7. The Contract specifies actual foundation requirements D1 or D2.

WIND EXPOSURE & VELOCITY

<table>
<thead>
<tr>
<th>NOISE BARRIER TYPE</th>
<th>WIND EXPOSURE</th>
<th>WIND VELOCITY (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14SSA</td>
<td>B1</td>
<td>80</td>
</tr>
<tr>
<td>14SSB</td>
<td>B1</td>
<td>90</td>
</tr>
<tr>
<td>14SSC</td>
<td>B2</td>
<td>80</td>
</tr>
<tr>
<td>14SSD</td>
<td>B2</td>
<td>90</td>
</tr>
</tbody>
</table>

PRECAST CONCRETE WALL W/ SINGLE SLOPE TRAFFIC BARRIER ON SHAFT FOUNDATION
### WALL HT | CMU WIDTH | X | DEPTH D1 | DEPTH D2 | BAR "C" | BAR "D"
---|---|---|---|---|---|---
6'-0" | 8" | 3'6" | 3'6" | | | 
8'-0" | 8" | 3'6" | 3'6" | | | 
10'-0" | 8" | 3'10" | 3'10" | | | 
12'-0" | 8" | 4'7" | 3'8" | | | 
14'-0" | 8" | 4'7" | 3'8" | | | 
16'-0" | 10" | 5'10" | 4'3" | | | 
18'-0" | 10" | 6'0" | 4'9" | | | 
20'-0" | 10" | 6'0" | 5'0" | | | 
22'-0" | 10" | 7'4" | 5'5" | | | 
24'-0" | 10" | 7'4" | 5'5" | | | 

### SOIL TYPE | ANGLE OF INTERNAL FRICTION (DEGREES)
---|---
D1 | 32
D2 | 38

### CMU = CONCRETE MASONRY UNIT

### MASONRY WALL ON TRENCH FOOTING

**NOTES**

1. Wall to be designated Noise Barrier Wall 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 hollow unit and installed as running bond.
4. All masonry is to be specially insulated.
5. All Concrete Masonry Unit (CMU) cells that have vertical steel reinforcing bars or bond beam units shall be filled with grout.
6. Panels shall have at least 3 feet of level ground on each side.
7. Construction joints in the trench 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.
9. The Contract specifies actual foundation requirements D1 or D2.

---

1. The Contract specifies Noise Barrier Wall 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 hollow unit and installed as running bond.
4. All masonry is to be specially insulated.
5. All Concrete Masonry Unit (CMU) cells that have vertical steel reinforcing bars or bond beam units shall be filled with grout.
6. Panels shall have at least 3 feet of level ground on each side.
7. Construction joints in the trench 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.
9. The Contract specifies actual foundation requirements D1 or D2.
CELLS WITH VERTICAL REINFORCING AND BOND BEAMS SHALL BE FILLED WITH GROUT

EXPANSION JOINT FILLER PLACED IN SASH BLOCK RECESSES.

8" OR 10" CMU

PLAN VIEW

TYPICAL EXPANSION JOINT

NOTE: FOR TYPICAL BOTH SIDES OF WALL SEE DETAIL A

#5 (TYP.)

TRAFFIC SIDE

EXPANSION JOINT AT WIDTH STEP

BOND BEAM DETAIL

NOISE BARRIER WALL
TYPE 16

STANDARD PLAN D-2.60-00

MASONRY WALL ON TRENCH FOOTING

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

BOND BEAM GROUTING LIMIT

8" OR 10" CMU

10" CMU

#5 @ 4'-0" MAX (TYP.)

TRAFFIC SIDE

8" CMU

CELLS WITH VERTICAL REINFORCING AND BOND BEAMS SHALL BE FILLED WITH GROUT

EXPANSION JOINT FILLER PLACED IN SASH BLOCK RECESSES.

SEE DETAIL A

BOND BEAM UNITS

SYMBOLS

- POLYURETHANE SEALANT

- BACKER ROD

- 1/2" JOINT

- DETAIL A

- TRAFFIC SIDE

- CLASSIC" CMU

- STONE STONE" CMU

- 10"

- 8"
Cells with vertical reinforcing and bond beams shall be filled with grout.

Expansion joint filler placed in sash block recesses.

8" or 10" CMU

Traffic Side

Typical Expansion Joint

See detail A

Plan View

Bond Beam Detail

Bond beam units

Bond beam grouting limit

Expansion joint filler placed in sash block recesses.

3" CLR. (TYP.)

1'-0" MIN. (TYP.)

Bar "A" (TYP.)

Footing width transition detail (for locations without footing step)

Note: Transverse bars not shown
CELLS WITH VERTICAL REINFORCING AND BOND BEAMS SHALL BE FILLED WITH GROUT

EXPANSION JOINT FILLER PLACED IN SASH BLOCK RECESSES.

8" OR 10" CMU

#5 (TYP.)

SEE DETAIL A

PLAN VIEW

TYPICAL EXPANSION JOINT

EXPANSION JOINT FILLER PLACED IN SASH BLOCK RECESSES.

8" CMU

10" CMU

TRAFFIC SIDE

TRAFFIC SIDE

SEE DETAIL A

PLAN VIEW

EXPANSION JOINT AT WIDTH STEP

BOND BEAM DETAIL

BOND BEAM UNITS

BOND BEAM GROUTING LIMIT

#5 @ 4'-0" MAX. (TYP.)

BOND BEAM UNITS

BACKER ROD

1/2" JOINT

POLYURETHANE SEALANT

DETAIL A

TYPICAL BOTH SIDES OF WALL

MASONRY WALL ON OFFSET SPREAD FOOTING

FOOTING WIDTH TRANSITION DETAIL

FOR LOCATIONS WITHOUT FOOTING STEP

NOTE: TRANSVERSE BARS NOT SHOWN

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

NOISE BARRIER WALL

TYPE 18

STANDARD PLAN D-2.64-01

SHEET 2 OF 2 SHEETS

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

12/31/08

KINZI

ENGINEER II

WILLIAM HARRELL
BOND BEAM DETAIL

CELLS WITH VERTICAL REINFORCING AND BOND BEAMS SHALL BE FILLED WITH GROUT

EXPANSION JOINT FILLER PLACED IN SASH BLOCK RECESSES.

#5 (TYP.)

TRAFFIC SIDE

SEE DETAIL B

PLAN VIEW

TYPICAL EXPANSION JOINT

CONCRETE SHAFT

W3 & SPIRAL @ 6" PITCH

DETAIL A

STEP DETAIL

NOTE: SPIRAL REINFORCEMENT SHALL BE LAPED AS SHOWN TO TERMINATE THE ENDS OF THE SPIRAL REINFORCEMENT (TOP AND BOTTOM).

#4 @ 1'-0"

3'-0"

1'-6"

1'-5" MIN. LAP

2" CLR

135° HOOK (TYP.)

8" CMU

#5 (TYP.)

TRAFFIC SIDE

SEE DETAIL B

PLAN VIEW

EXPANSION JOINT AT WIDTH STEP

NOISE BARRIER WALL TYPE 19

STANDARD PLAN D-2.66-00

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION

Washington State Department of Transportation

LYNN A. AUGUST 22, 2006

MASTERS INC. PROFESSIONAL ENGINEERS

NOSE BARRIER WALL TYPE 19

STANDARD PLAN D-2.66-00

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION

Washington State Department of Transportation

LYNN A. AUGUST 22, 2006

MASTERS INC. PROFESSIONAL ENGINEERS
SECTION D

TYPICAL EXPANSION JOINT

TRAFFIC SIDE

EXPANSION JOINT FILLED W/ NOISE SEALER
1 - #5 FULL HEIGHT BAR "C"

BACKER ROD W/ Polyurethane SEALANT - BOTH WALL FACES

#6 x 5'- 0" WITH GREASED OR TAPED END, PENETRATING PIPE SLEEVE 8" MIN.

2 - #4 FULL HEIGHT (TYP.) BAR "C"

1/2" CLEARANCE TO FACE "I"

#4 x 30" GRADE 40 WELDED TAIL AS SHOWN LAPPED WITH AND SPACED PER BAR "C"

TRAFFIC SIDE

SECTION A

1 - #5 FULL HEIGHT BAR "C"

# PILASTER & SHAFT 1 1/2" CLR.

1/2" CLEARANCE TO FACE "I"

# PILASTER & SHAFT 1 3/4"

TRAFFIC SIDE

SECTION B

NOTE

SPIRAL REINFORCEMENT SHALL BE LAPPED 17" MIN. A 135° HOOK THAT IS HOOKED AROUND A LONGITUDINAL BAR SHALL BE USED TO TERMINATE THE ENDS OF THE SPIRAL REINFORCEMENT AT LAPPED SPLICES AND AT THE TOP AND BOTTOM OF SHAFT.

BAR "B" (TYP.) - FOR QUANTITIES GREATER THAN FOUR, PLACE BALANCE ON OUTSIDE FACES AS SHOWN

MASONRY WALL ON SHAFT FOUNDATION

SECTION C

GROUT ALL CELLS BELOW GRADE SOLID MIN. TWO COURSES (TYP.)

VERTICAL REINFORCEMENT BAR "B" #4 @ 4'- 0" MIN.

BAR "C" @ CENTER OF WALL

6" CMU

4" COMPACTED LEVEL CRUSHED GRAVEL BASE

EXPRES AUGUST 23, 2006

NOISE BARRIER WALL TYPE 20

STANDARD PLAN D-2.68-00

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION 11-10-05

Washington State Department of Transportation
NOTES
1. All rebar shall have a minimum 1 1/2" cover.
3. See Standard Plan D-2.06 for wall reinforcement not shown.

FRONT VIEW
A

BENDING DIAGRAM

BAR "A"

4 1/2" (TYP.)

#5 x 6" (TYP.)

DOOR - SEE NOTE 2

BAR "X" (7 BARS PER SIDE)

48" DOOR OPENING

4 1/2" (TYP.)

#5 x 6" (TYP.)

ANCHOR PIN WELDED TO DOOR FRAME (TYP.)

GROUND LINE

CONCRETE SLAB

CONCRETE SLAB

CONCRETE SLAB

CONCRETE SLAB

PLAN VIEW
CONCRETE SLAB DETAIL

FOR CAST-IN-PLACE WALL ON OFFSET SPREAD FOOTING

ISOMETRIC CUTAWAY VIEW

NOISE BARRIER WALL
ACCESS DOOR TYPE 1

STANDARD PLAN D-2.80-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Washington State Department of Transportation
NOTES
1. All rebar shall have a minimum 1 1/2" cover.

FOR CAST-IN-PLACE WALL W/Traffic Barrier

NOISE BARRIER WALL ACCESS DOOR TYPE 2
STANDARD PLAN D-2.82-00

Sheets 1 of 2 Sheets

Daniel M. Pettus, PE

Washington State Department of Transportation
SECTION C

ANCHOR PIN (TYP.)

#6 x 11'-2" (TYP.)

BAR "A" (TYP.)

FINISHED GRADE

TOP OF ROADWAY

BAR "B"

BAR "C"

SECTION D

CONCRETE SLAB DETAIL

DOOR DETAIL (SEE NOTE 2)

ANCHOR PIN WELDED TO DOOR FRAME (TYP.)

46" DOOR OPENING

#5 x 6'-3" (TYP.)

3" (TYP.)

#5 x 6'-8" (TYP.)

4 1/2" (TYP.)

BAR "K" (7 BARS PER SIDE, EQUALLY SPACED)

EXPANSION JOINT

BENDING DIAGRAM

#6-1"

DOOR DETAIL

CONCRETE SLAB

FOR CAST-IN-PLACE WALL WITH TRAFFIC BARRIER

NOISE BARRIER WALL
ACCESS DOOR TYPE 2
STANDARD PLAN D-2.82-00
SHEET 2 OF 2 SHEETS

EXPRESSED AUGUST 23, 2006

NOISE BARRIER WALL
ACCESS DOOR TYPE 2
STANDARD PLAN D-2.82-00
SHEET 2 OF 2 SHEETS

EXPRESSED AUGUST 23, 2006

APPROVED FOR PUBLICATION

November 10, 2005

Washington State Department of Transportation
NOTES:
1. All rebar shall have a minimum 1 1/2" cover.
3. See Standard Plan D-2.36 for wall reinforcement not shown.
CONCRETE SLAB

#5 x 6'-6" (TYP.)
BAR 'W' (TYP.)

48" DOOR OPENING
2'-6" 4'-6"
5'-0" 12'-0"

TOP VIEW

DOOR - SEE DETAIL

TOP OF TRAFFIC BARRIER

FINISHED GRADE LINE

FRONT VIEW

BAR "A"
DOOR FRAME (SEE NOTE 2)

CONCRETE SLAB

TOP OF ROADWAY
FINISHED GRADE

FOR PRECAST WALL W/ TRAFFIC BARRIER ON SHAFT FOUNDATION

NOTES
1. All rebar shall have a minimum 1 1/2" cover.

RELEASED: AUGUST 31, 2005
STANDARD PLAN D-2.86-00
NOISE BARRIER WALL ACCESS DOOR TYPE 4
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
APPROVED FOR PUBLICATION
11/11/05
FOR PRECAST WALL W/ TRAFFIC BARRIER ON SHAFT FOUNDATION

NOISE BARRIER WALL ACCESS DOOR TYPE 4
STANDARD PLAN D-2.86-00

CONCRETE SLAB DETAIL

CONCRETE SLAB

GROUND LINE

WALL

EXPANSION JOINT

BAR "A" (7 BARS PER SIDE)

CONCRETE SLAB NOT SHOWN

DOOR DETAIL

(SEE NOTE 2)

BENDING DIAGRAM

#4 BAR

VARES

BAR "A"

5' 0" 4'-6"

4'-6"

3' (TYP.)

65 x 6'-6" (TYP.)

65 x 11'-0" (TYP.)

65 x 4'-0" (TYP.)

BAR "B"

BAR "C"

BAR "D"

BAR "E"

BAR "F"

94"

2'-0"

4'-0"

2'-0"

STATE OF WASHINGTON

EXPRESS AUGUST 23, 2006

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION

HANNA WILDE

DRAFTSPERSON

STANDARD PLAN D-2.86-00

SHEET 2 OF 2 SHEETS

 chop mark
NOTES
1. All rebar shall have a minimum 1 1/2" cover.
3. See Standard Plan D-2.68 for wall reinforcement not shown.
DOOR FRAMES MAY VARY TO MATCH WALL THICKNESS.

All exposed metal surfaces shall be painted with paint conforming to the requirements in the Standard Specifications, Section 9.

NOTE

ALTERNATE ACCESS DOOR AND FRAME FOR Cаст-IN-PLACE AND PRECAST WALLS

STATE DESIGN DIVISION

NOISE BARRIER WALL
ACCESS DOOR & FRAME

STANDARD PLAN D-2.92-00

SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION

Washington State Department of Transportation

EXPIRES AUGUST 23, 2006
KEY NOTES

1. Geotextile for underground drainage class A, moderate survivability (only needed if a geogrid is used for geosynthetic reinforcement).
2. 1'-0" min. geotextile overlap, top & bottom.

NOTES

1. For the values of "L," see sheet 3, and for the values of "Sv" see sheet 2.
2. For Geosynthetic Wall Construction Sequence, see sheet 4.
3. "A_s" is the peak seismic ground acceleration as defined and applied in the AASHTO LRFD Bridge Design Specifications, Articles 3.10.4.1 and 11.6.5.
4. The long-term geosynthetic design strength "Tal" shall be determined in accordance with WSDOT Standard Practice T925. See Qualified Products List (QPL). Appendix "D," for products in which "Tal" has been determined. "H" and "Z" are graphically defined. "Z" is the distance from the top of the wall to a geosynthetic layer, and is used to determine "Tal" for that layer.
5. "L," the geosynthetic reinforcement length behind the wall face, is graphically defined. The maximum factored bearing stress acts in the vertical direction at the base of the wall. The load factors used are as specified in the AASHTO LRFD Bridge Design Specifications for each specified limit state.
6. Fascia or facing type shall be selected from Standard Plans D-3.10 or D-3.11 and called out in the Contract Plans. Region is to coordinate with the Geotechnical Services and Bridge & Structures offices.

Washington State Department of Transportation
## PERMANENT GEOSYNTHETIC WALL - GEOSYNTHETIC REINFORCEMENT DESIGN

### WALL GEOMETRY AND REINFORCEMENT LAYER LOCATION

<table>
<thead>
<tr>
<th>TOTAL WALL HEIGHT, H (ft)</th>
<th>DEPTH BELOW WALL TOP AT FACE, z (ft)</th>
<th>GEOSYNTHETIC WALL GEOMETRY AND REINFORCEMENT</th>
<th>GEOSYNTHETIC WALL REINFORCEMENT STRENGTH REQUIRED, Ta (lb/ft)*</th>
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NOTE: See Note 4, sheet 1.

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**PERMANENT GEOSYNTHETIC WALL**

**STANDARD PLAN D-3.09-00**

**SHEET 2 OF 4 SHEETS**

APPROVED FOR PUBLICATION

[Signature]

STATE DESIGN ENGINEER

STATE OF WASHINGTON

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
### PERMANENT GEOSYNTHETIC WALL - EXTERNAL STABILITY DESIGN

**Includes Design for Large Earthquake:** A_{0} = 0.55g

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### PERMANENT GEOSYNTHETIC WALL - EXTERNAL STABILITY DESIGN

**Includes Design for Large Earthquake:** A_{0} = 0.25g

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**STANDARD PLAN D-3.09-00**

**PERMANENT GEOSYNTHETIC WALL**

**APPROVED FOR PUBLICATION**

[Washington State Department of Transportation]
GEOTEXTILE GEOSYNTHETIC WALL CONSTRUCTION SEQUENCE

SECTION VIEW

1. SET FORM ON COMPLETED LIFT.

2. UNROLL GEOSYNTHETIC AND POSITION IT SO THAT A 4" - 7" WIDE "TAIL" DRAPES OVER THE FORM. IF A GEOGRID IS USED FOR THE GEOSYNTHETIC REINFORCEMENT, POSITION GEOTEXTILE TO PREVENT BACKFILL FROM SPILLING THROUGH GEOGRID OPENINGS.

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

4. PLACE A WINDROW TO SLIGHTLY GREATER THAN FULL LIFT HEIGHT AGAINST THE FORM.

5. PLACE THE GEOTEXTILE "TAIL" OVER THE WINDROW AND LOCK INTO PLACE WITH BACKFILL.

6. COMPLETE BACKFILLING UNTIL 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 2). OTHERWISE, RESET THE FORM AND REPEAT THE SEQUENCE.

NOTES(SHEET)

1. Use of the Temporary Form System, as detailed in this plan, is optional.

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

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

PERMANENT GEOSYNTHETIC WALL
STANDARD PLAN D-3.09-00
SHEET 4 OF 4 SHEETS

APPROVED FOR PUBLICATION
NOTES
1. All bars shown on this plan shall be ASTM A706 unless otherwise specified in the Contract.
2. Safety cable or fence required when "H" ≥ 10'-0".
3. All cast-in-place concrete shall be class 4000.

CAST-IN-PLACE PERMANENT GEOSYNTHETIC WALL FASCIA AND FACINGS
STANDARD PLAN D-3.10-01
APPROVED FOR PUBLICATION SHEET 1 OF 1 SHEET
STATE DEPARTMENT OF TRANSPORTATION
Washington Department of Transportation
ARCHITECT PER WSDOT DESIGN MANUAL 730.0403

TYPICAL SECTION
PERMANENT GEOSYNTHETIC RETAINING WALL WITH CAST-IN-PLACE CONCRETE FASCIA

KEY NOTES
1. "H" ROWS OF NO. 11 TYPICAL DOWEL REINFORCEMENT PLACE BETWEEN GEOSYNTHETIC LAYERS AT 5'-0" O.C. HORIZONTAL SPACING. SEE TABLE. VERTICAL SPACING BETWEEN ROWS TO BE EQUAL AS MULTIPLES OF "H" ALLOW. ROWS MAY BE STAGGERED. SEE STD. PLAN D-3.09 FOR "H." 
2. INCREASE THE COVER AS REQUIRED TO ACCOMMODATE ARCHITECTURAL FEATURES AND FINISH.
3. CONSTRUCTION JOINT WITH RUGHENED SURFACE
4. 2" LD. PVC PIPE FOR DEEP HOLE IN WALL FACING - PLACE BETWEEN GEOSYNTHETIC LAYERS APPROX. 6" DEEP AT 12'-0" HORIZONTAL SPACING. LENGTH TO EXTEND TO OUTER SURFACE OF SPECIFIED WALL. DEEP HOLE SHALL BE KEPT CLEAN FOR CONCRETE. SEE STANDARD PLAN D-3.09, FOR DETAILS NOT SHOWN.
5. VERTICAL CONSTRUCTION JOINTS IN FASCIA @ 2'-0" O.C. WITH 1/2" PREMOLDED JOINT FILLER (SEE STANDARD PLAN D-10.48, SPLIT ELEVATION)
6. VERTICAL CONSTRUCTION JOINTS IN FOOTING @ 12'-0" O.C. MAX. (SEE STANDARD PLAN D-10.49, ELEVATION). IF THE FOOTING IS STEPPED, PROVIDE 2'-0" NON-CONTACT LAP SPACES FOR THE NO. 4 BARS AT EACH STEP.
7. COORDINATE WALL FINISH AND CONFIGURATION WITH STATE BRIDGE AND STRUCTURES ARCHITECT PER WSDOT DESIGN MANUAL 730.0403. 
8. THE NO. 4 BARS AND INTERIOR NO. 3 BARS SHALL BE USED ONLY IF THE FACE IS VERTICAL.
9. WELDED WIRE FABRIC FOR CONCRETE REINFORCEMENT - COMPLY WITH AASHTO M320. 
10. SHOTCRETE FACING.
11. GEOSYNTHETIC LAYERS (TYP.)
12. APPROXIMATE FINAL BATTER FOR FACE OF GEOSYNTHETIC LAYERS
13. MATCH BATTER OF GEOSYNTHETIC LAYERS
14. FILL MATERIAL SPECIFIED ELSEWHERE IN CONTRACT
15. FOR THE VALUES OF "X," SEE STANDARD PLAN D-3.08, SHEET 1.
1. Anchor Rods shall be ASTM F1554 GR. 55.
2. All cast-in-place concrete shall be Class 4000.
3. Couplers shall conform to the same ASTM Standard Specification as that specified for the nut. Couplers shall be capable of developing 100% of the tensile strength of the anchor rod without evidence of any failure.

NOTES

1. Anchor Rods shall be ASTM F1554 GR. 55.
2. All cast-in-place concrete shall be Class 4000.
3. Couplers shall conform to the same ASTM Standard Specification as that specified for the nut. Couplers shall be capable of developing 100% of the tensile strength of the anchor rod without evidence of any failure.
**KEY NOTES**

1. The barrier geometry reference line (B.G.R.L.) is perpendicular to the transverse roadway slope (T.R.S.). For sufficiently elevated transverse roadway slopes, the B.G.R.L. on the low side of the roadway shall be perpendicular to the T.R.S. up to a maximum of 0% super-elevation. The B.G.R.L. on the high side shall always be perpendicular to the T.R.S.

2. Junction box (mount box so cover is flush with the barrier face; with a 1/8" tolerance protruding beyond the barrier face and 1/8" recessed). See 7x8 junction box with stationary forms - see standard plan J-46.8. Use NEMA 3R junction box with slp-forms - see standard plan J-46.37.

3. 1/2" min. concrete cover - increase the cover as required to accommodate architectural features and finish.

4. Construction joint with roughened surface.

5. The notch detailed by these dimensions and specifications is required only if the barrier is on wall facing.

6. Rustication - see rustication detail.

7. For structural details below the match line, see standard plans D-3.09, D-3.10 or D-3.11.

8. 1/2" expansion joint with premolded joint filler.

9. Install barrier dummy joints on traffic side only when architectural features are specified.

---

**PERMANENT GEOSYNTHETIC WALL**

**SINGLE SLOPE BARRIER**

**STANDARD PLAN D-3.15-02**

---

**NOTE**

1. All cast-in-place concrete shall be class 4000.
1. Ensure that no concrete enters the PVC conduit during concrete placement.
NOTES

1. SEE CONTRACT FOR BACKFILL LIMITS AND GEOTEXTILE CLASS.
VERTICAL FACE WALL DESIGN

NOTES

1. All concrete shall be Class 4000, except as noted.
2. For backfill requirements, see Standard Plan D-4.
3. When Wall Type 1SW (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 1SW (saltwater) is specified, concrete in the table column "Material Quantity" shall be increased by (0.003 x H) CY/LF.
5. Concrete in the 48 foot wall sections shall be placed separately between expansion joints with a minimum 24 hour period before placing concrete in the adjacent section.
6. This wall has been designed in accordance with the requirements of the AASHTO LRFD Bridge Design Specifications 4th Edition 2007 and interims through 2008. The seismic design of these walls has been completed using an effective PGA of 0.51 g.

VERTICAL FACE WALL
WITH A 250 PSF SURCHARGE OR TRAFFIC BARRIER

REINFORCED CONCRETE
RETAINING WALL
TYPE 1 AND 1SW
STANDARD PLAN D-10.10-01

Sheet 1 of 2 Sheets

APPROVED FOR PUBLICATION

Washingon State Department of Transportation

DRAWN BY: BILL BEIDERS

Washington State Department of Transportation

MAY 2008

SHEET 1 OF 2 SHEETS

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
# Footing Reinforcement

## Wall Dimensions

<table>
<thead>
<tr>
<th>WALL HT</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>A</th>
<th>LENGTH</th>
<th>BAR #</th>
<th>BAR</th>
<th>FOOTING REINFORCEMENT</th>
<th>STEM REINFORCEMENT</th>
<th>MATERIAL QUANTITY</th>
<th>MAXIMUM SOIL PRESSURE (PSF)</th>
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<tbody>
<tr>
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<td>6'</td>
<td>6'</td>
<td>6'</td>
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<td>10'-11&quot; 4-5'-11&quot;</td>
<td>N/A</td>
<td>20'-7'-11&quot;</td>
</tr>
<tr>
<td>6'</td>
<td>6'</td>
<td>6'</td>
<td>6'</td>
<td>6'</td>
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<td>10'-11&quot; 4-5'-11&quot;</td>
<td>N/A</td>
<td>20'-7'-11&quot;</td>
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<td>6'</td>
<td>6'</td>
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</tr>
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<td>6'</td>
<td>6'</td>
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<td>10'-11&quot; 4-5'-11&quot;</td>
<td>N/A</td>
<td>20'-7'-11&quot;</td>
</tr>
</tbody>
</table>

## Reinforcement Notes

1. If traffic barrier is used, add 0.100 cy/ft of concrete class 4000 for barrier alternate 1. Add 0.125 cy/ft of concrete class 4000 for barrier alternate 2. See standard plan D-16-10.

2. Add 26 lb of reinforcing steel for barrier alternate 1 or 19 lb of reinforcing steel for barrier alternate 2. See standard plan D-16-10.

## Vertical Face Wall Design

**With a 250 psf Surcharge or Traffic Barrier**

**Reinforced Concrete Retaining Wall**

**Type 1 and 1SW**

**Standard Plan D-10.10.01**

**Archives for Publication**

-DRAWN BY BILL BENDER-
NOTES
1. All concrete shall be Class 4000, except as noted.
2. For backfill requirements, see Standard Plan D-4.
3. When Wall Type 25W (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 25W (saltwater) is specified, concrete in the table column "Material Quantity" shall be increased by (0.003 x H) CY/LF.
5. Concrete in the 48 foot wall sections shall be placed separately between expansion joints with a minimum 24 hour period before placing concrete in the adjacent section.
6. This wall has been designed in accordance with the requirements of the AASHTO LRFD Bridge Design Specifications 4th Edition 2007 and interims through 2008. The seismic design of these walls has been completed using an effective PGA of 0.51 g.
NOTES
1. All concrete shall be Class 4000, except as noted.
2. For backfill requirements, see Standard Plan D-4.
3. When Wall Type 35w (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 35w (saltwater) is specified, concrete in the table column "Material Quantity" shall be increased by (0.003 x H) CY/LF.
5. Concrete in the 48 foot wall sections shall be placed separately between expansion joints with a minimum 24 hour period before placing concrete in the adjacent section.
6. This wall has been designed in accordance with the requirements of the AASHTO LRFD Bridge Design Specifications 4th Edition 2007 and interims through 2008. The seismic design of these walls has been completed using an effective PGA of 0.51 g.

EXPANSION JOINT - 48" CENTERS, W/½" PREMOLDED JOINT FILLER

VERTICAL FACE WALL DESIGN
WITH 2:1 BACKSLOPE
**VERTICAL FACE WALL DESIGN WITH 2:1 BACKSLOPE**

**REINFORCED CONCRETE RETAINING WALL TYPE 3 AND 3SW STANDARD CAN D-10.20-00**

**NOTE:**
- Dimensions are given in inches.
- Materials are listed in pounds per cubic foot (pcf).
- The table provides the dimensions, reinforcing bar sizes, and soil pressure for a typical retaining wall design.

### Dimensions

<table>
<thead>
<tr>
<th>Wall Height (ft)</th>
<th>B</th>
<th>Cc</th>
<th>D</th>
<th>h</th>
<th>A</th>
<th>Length (ft)</th>
<th>Size (in)</th>
<th>Spa. Length (ft)</th>
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<td>2</td>
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<td>1</td>
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<td>0</td>
<td>3 - 3 1/2</td>
<td>8</td>
<td>4 - 0</td>
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<td>8</td>
<td>3</td>
<td>2</td>
<td>1</td>
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<td>0</td>
<td>3 - 3 1/2</td>
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<td>4 - 0</td>
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<td>0</td>
<td>3 - 3 1/2</td>
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<td>4 - 0</td>
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### Footing Reinforcement

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<tr>
<th>Bar (E)</th>
<th>Bar (F)</th>
<th>Bar (G)</th>
<th>Bar (H)</th>
<th>Stem Reinforcement</th>
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<td>C</td>
<td>D</td>
<td>h</td>
<td>A</td>
</tr>
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<td>1 1/2</td>
<td>1 1/2</td>
<td>1 1/2</td>
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<td>1 1/2</td>
<td>1 1/2</td>
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<td>1 1/2</td>
<td>1 1/2</td>
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<td>1 1/2</td>
<td>1 1/2</td>
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<td>1 1/2</td>
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<td>1 1/2</td>
<td>1 1/2</td>
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<td>1 1/2</td>
<td>1 1/2</td>
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### Material Quantity

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<th>Maximum Soil Pressure (psf)</th>
<th>Service Strength</th>
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<td>0 1/2</td>
<td>100</td>
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<tr>
<td>1 0</td>
<td>200</td>
</tr>
<tr>
<td>2 0</td>
<td>300</td>
</tr>
<tr>
<td>3 0</td>
<td>400</td>
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</table>

**DRAWN BY:** BILL BERNING

**APPROVED FOR PUBLICATION:** Washington State Department of Transportation
NOTES

1. All concrete shall be Class 4000, except as noted.

2. For backfill requirements, see Standard Plan D-4.

3. When Wall Type 4SW (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 4SW (saltwater) is specified, concrete in the table column "Material Quantity" shall be increased by \((0.003 \times H)\) CY/LF.

5. Concrete in the 48 foot wall sections shall be placed separately between expansion joints with a minimum 24 hour period before placing concrete in the adjacent section.

6. This wall has been designed in accordance with the requirements of the AASHTO LRFD Bridge Design Specifications 4th Edition 2007 and Interims through 2008. The seismic design of these walls has been completed using an effective PGA of 0.51 g.

SLOPING FACE WALL DESIGN WITH 2:1 BACKSLOPE

REINFORCED CONCRETE RETAINING WALL TYPE 4 AND 4SW

STANDARD PLAN D-10.25-00

SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION

Washington State Department of Transportation

KEY DETAIL

REQUIRED ON WALLS WHERE \(H \geq 13\)
# Vertical Face Wall Design with 2:1 Backslope

## Reinforced Concrete Retaining Wall Type 4 and 4SW

### Standard Plan D-10.25-00

#### Sheet 2 of 2 Sheets

**Reinforcement Details**

- **Footing Reinforcement**
  - **Bar Diameter (in):**
    - #4: 1/2"
    - #5: 5/8"
    - #6: 3/4"
    - #8: 1"
    - #10: 1 1/8"

- **Beam Reinforcement**
  - **Bar Diameter (in):**
    - #4: 1/2"
    - #5: 5/8"
    - #6: 3/4"
    - #8: 1"
    - #10: 1 1/8"

**Material Quantities**

- **Cubic Yards:**
  - #4: 12.5
  - #5: 18.7
  - #6: 25.0
  - #8: 50.0
  - #10: 100

- **Diameter (in):**
  - #4: 1/2"
  - #5: 5/8"
  - #6: 3/4"
  - #8: 1"
  - #10: 1 1/8"

**Maximum Soil Pressure (PSF):**

- **Sheets:**
  - 2:1 Slope
  - 3:1 Slope

**Service Strength**

- **Load Types:**
  - 1, 2, 3, 4

**Concrete Details**

- **Concrete Strength:**
  - 1, 2, 3, 4

**Washita Road**

- **Design:**
  - Vertical Face Wall Design

**Client:**

- **Washita Road**

**Engineer:**

- **W. A. Kemper**

**Typographer:**

- **M. G. Sidarensky**

**Preparer:**

- **J. F. Bublik**

**Date:**

- **1974**
1. All concrete shall be Class 4000, except as noted.

2. For backfill requirements, see Standard Plan D-4.

3. Concrete in the 48 ft wall sections shall be placed separately between expansion joints with a minimum 24-hour period before placing concrete in the adjacent section.

4. This wall has been designed in accordance with the requirements of the AASHTO LRFD Bridge Design Specifications 4th Edition 2007 and Interim through 2008. The seismic design of these walls has been completed using an effective PGA of 0.30 g.

VERTICAL FACE WALL DESIGN WITH 2:1 BACKSLOPE

REINFORCED CONCRETE RETAINING WALL
TYPE 5
STANDARD PLAN D-10.30-00

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
### FOOTING REINFORCEMENT

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<th>#</th>
<th>SIZE</th>
<th>BAR</th>
<th>#</th>
<th>SIZE</th>
<th>BAR</th>
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### STEM REINFORCEMENT

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<td>8 1/2&quot;</td>
<td>14</td>
<td>10</td>
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</tbody>
</table>

### MATERIAL QUANTITY

The table contains quantities of rebar used in various locations and sections.

### MAXIMUM SOIL PRESSURE (PSF)

The maximum soil pressure is listed in the last column of the table.

---

### VERTICAL FACE WALL DESIGN WITH 2:1 BACKSLOPE

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### REINFORCED CONCRETE RETAINING WALL

### STANDARD PLAN D-10.30-00

Sheet 2 of 8 sheets

Approved for Construction

Washington State Department of Transportation

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The image contains a detailed table of rebar sizes and quantities, along with drawings of wall sections and rebar placement. The text is largely numerical, detailing specific rebar sizes and placements for various sections of a retaining wall.
1. All concrete shall be Class 4000, except as noted.
2. For backfill requirements, see Standard Plan D-4.
3. Concrete in the 48 foot wall sections shall be placed separately between expansion joints with a minimum 24 hour period before placing concrete in the adjacent section.
4. This wall has been designed in accordance with the requirements of the AASHTO LRFD Bridge Design Specifications 4th Edition 2007 and interim through 2008. The seismic design of these walls has been completed using an effective PGA of 0.20 g.
NOTES

1. All concrete shall be Class 4000, except as noted.

2. For backfill requirements, see Standard Plan D-4.

3. Concrete in the 48 foot wall sections shall be placed separately between expansion joints with a minimum 24 hour period before placing concrete in the adjacent sections.

4. This wall has been designed in accordance with the requirements of the AASHTO LRFD Bridge Design Specifications 4th Edition 2007 and interims through 2008. The seismic design of these walls has been completed using an effective PGA of 0.20 g.

# Reinforcement Notes

1. If traffic barrier is used, add 0.010 thick of concrete class 4000 for barrier alternate 1.
2. Add 0.123 thick of concrete class 4000 for barrier alternate 2. See standard plan D-10.10.
3. Add 28 lb/ft of reinforcing steel for barrier alternate 1 or 19 lb/ft of reinforcing steel for barrier alternate 2. See standard plan D-10.10.
250 PSF EQUIVALENT LIVE LOAD SURCHARGE WHEN SPECIFIED IN CONTRACT

250 PSF EQUIVALENT LIVE LOAD SURCHARGE WHEN SPECIFIED IN CONTRACT

Cement Conc. Gutter (CL 3000, 4" Thick)

Face of Wall

LONG BAR EACH SIDE OF JOINT

3" CLR.

CONSTRUCTION joint with roughened surface

SEE BAR TABLE

REINFORCED CONCRETE RETAINING WALL TYPES

STANDARD PLAN D-10.45-01 SHEET 1 OF 2 SHEETS

NOTES
1. All concrete shall be Class 4000, except as noted.
2. For backfill requirements, see Standard Plan D-4.
3. Concrete in the 48 foot wall sections shall be placed separately between expansion joints with a minimum 24 hour period before placing concrete in the adjacent section.
4. This wall has been designed in accordance with the requirements of the AASHTO LRFD Bridge Design Specifications 4th Edition 2007 and interims through 2008. The seismic design of these walls has been completed using an effective PGA of 0.20 g.

TYPICAL SECTION

OFFSET: SET 1/2" OF WALL BACK:

H ≥ 27: OFFSET = 1/2" H ≥ 27: OFFSET (inches) = H/24 - 2

3" Diam. drains at about 12" centers and 6" above final ground line at front face of wall

EXPANSION joint - 48" centers, with 1/2" premolded joint filler

CONSTRUCTION joint with roughened surface

SEE BAR TABLE

SPLIT ELEVATION VIEW

(Showing separate Rebar layers)

SPLIT VIEW LINE

CONSTRUCTION joints in footing at 1/2" centers max.

FRONT

BACK

REINFORCED CONCRETE RETAINING WALL TYPE 8

SLOPING FACE WALL DESIGN WITH A 250 PSF SURCHARGE OR TRAFFIC BARRIER

BAR #4

LOCATION

TOP OF FOOTING

BOTTOM OF FOOTING

WALL HEIGHT (in)

≤ 12

13 ≤ 16

17 ≤ 22

23 ≤ 30

≤ 12

13 ≤ 16

17 ≤ 22

23 ≤ 30

QTY.

5

6

7

9

11

5

6

7

9

11

OFFSET - SET 1/2" OF WALL BACK:

H ≥ 27: OFFSET = 1/2" H ≥ 27: OFFSET (inches) = H/24 - 2

WHEN THE CONTRACT SPECIFIES CABLE FENCE, BACKFILL AND THE CEMENT CONCRETE GUTTER SHALL BE PLACED 6" MIN. FROM THE TOP OF THE WALL
NOTES
1. All numerals are approx. 3 1/4" wide except numeral "1" which is approx. 5/8" wide.
2. Spacing between the numeral "1" and any other numeral is 1". Spacing between all other numerals is 3/4".
3. Traffic Barrier Connections between the bridge and the approaching roadway vary and may consist of concrete barrier extensions. Install the Date Numerals on the traffic barrier of the bridge itself.
When $H$ exceeds $20'$, longitudinal bracing shall be used. Longitudinal struts and cross braces shall be fastened at each end with $\frac{3}{4}$" dia bolts and no-bleed washers.

On pile trestles when $H$ exceeds $20'$ but less than $25'$ longitudinal bracing shall be placed on outside of all panels on both sides of trestle in every third panel or as required by local conditions. When $H$ exceeds $20'$ two-story bracing shall be used. Longitudinal struts and cross braces shall be fastened at each end with $\frac{3}{4}$" dia bolts and no-bleed washers.

On frame trestles longitudinal struts and cross braces shall be placed on outside of all panels on both sides of trestle in alternate panels or as required by local conditions. When $H$ exceeds $20'$, two-story bracing shall be placed. Longitudinal struts and cross braces shall be fastened at each end with $\frac{3}{4}$" dia bolts and no-bleed washers.

DECK FRAMING PLAN - SINGLE LANE

DECK FRAMING PLAN - TWO LANE

ELEVATION - PILE TRESTLE

ELEVATION - FRAME TRESTLE

PILE OR FRAME DETOUR BRIDGE WITH ASPHALT OVERLAY

USE ONLY FOR TEMPORARY BRIDGES

STANDARD PLAN E-2

SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION

STATE DESIGN OFFICE
WASHINGTON DEPARTMENT OF TRANSPORTATION
OMAHA, NEBRASKA

5-22-93

LEMON MILL ENGINEERING PROFESSIONAL CORPORATION
NOTES

1. Dimensions and notations for superstructure are typical for both single lane and two lane bridges.
2. All timber and lumber shall be 4" or better and untreated Douglas fir lumber.
3. All girders shall be untreated Douglas fir and shall be driven to develop a minimum load bearing capacity of 15 tons.
4. Blocking for frame bents shall be proportioned to carry a minimum load of 15 tons per post.
5. All hardware shall be black, ungalvanized.
6. Each deck plank shall be nailed to each stringer with two 3" spikes, number 1 or larger.
7. All timber and lumber shall be 4" or better and untreated Douglas fir lumber.
8. Overlay thickness must be sufficient to cover bolts.

SECTION A-A

DISTRIBUTION PLATE DETAIL

BASE PLATE DETAIL

BACKING PLATE DETAIL

PILE OR FRAME DETOUR BRIDGE WITH ASPHALT OVERLAY

USE ONLY FOR TEMPORARY BRIDGES

STANDARD PLAN E-2

SHEET 2 OF 2 SHEETS

EXPIRES JANUARY 17, 1999

APPROVED FOR PUBLICATION

STATE DESIGN DIVISION
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

(A. V. LEYH)

5-22-99

(S. H. LEYH)
PRECAST PILES, HANDLING NOTES

1. For pile lifting Cases 1 and 2, do not allow pile tip to bear on other piling stored in a lower layer.

2. For pile lifting Cases 3 and 4, tilt the pile in the air, do not allow the pile to touch the ground.

3. The minimum angle between the pile and the lifting strap is 60° when the pile is in the horizontal position.

4. When directed to remove a lifting loop, cut it off at the bottom of the recess and patch the recess by filling it with 1:2 mortar, finishing it to the level of the pile face. The patch shall be allowed to cure at least 24 hours prior to driving the pile.

5. The length of the formed or drilled hole shall allow for potential cutoff and full development length of the steel reinforcement. The holes must be roughened and filled with epoxy resin.

6. Expose the spiral reinforcement at the pile head and splice with new spiral in accordance with Standard Plan E-4, Note 2.

7. For handling and bunking, the Prestressed piles shall have at least the minimum number of strands shown on Std Plan E4.

8. Piles stored on the ground should be bunked on level dunnage at no more than 20' on center, with a maximum overhang of 10'.

PILE TO PILE-CAP CONNECTIONS

PILE BUNKING AND SHIPPING SUPPORT DIAGRAMS

PILE HANDLING DIAGRAMS
FACE OF CURB VARIES 12" TO 24" (SEE CONTRACT)

MATCH ROADWAY SLOPE

1/2" (IN) R. ROADWAY

1/2" (IN) R. ROADWAY

1/2" (IN) R. ROADWAY

1/2" (IN) R. ROADWAY

MATCH ROADWAY SLOPE

1/2" (IN) R. ROADWAY

1/2" (IN) R. ROADWAY

1/2" (IN) R. ROADWAY

1/2" (IN) R. ROADWAY

CEMENT CONCRETE PEDESTRIAN CURB

AT CURB RAMPS, LANDINGS, AND DRIVEWAY ENTRANCES

NOTE


CEMENT CONCRETE PEDESTRIAN CURB

AT CURB RAMPS, LANDINGS, AND DRIVEWAY ENTRANCES

NOTE

1. The intent of this design is to facilitate the compaction of Hot Mix Asphalt pavement adjacent to a drainage structure.

2. The centerline of the drainage structure may differ from the centerline of the frame and grate.
NOTES

1. Construct curb joints at cement concrete pavement transverse joint locations. If all adjacent pavement is HMA, see Standard Plan F-30.10 for Curb Expansion and Contraction Joint Spacing.

2. A 2 inch vertical curb may be used where low clearance vehicles or trucks are present.

LEGEND

- Width varies ~ See Contract Plans.
- Match adjacent pavement thickness but not less than 6 inches.
NOTES

1. The installation of curb in areas with existing guardrail could require the removal and resetting of the guardrail or its components.

2. Extend shoulder pavement to provide a base for the extruded curb.

3. See Contract for exception to distances shown.

4. Type 3 and 6 curbs are not used on roadways with a posted speed greater than 40 mph.

5. Type 3 and 6 are not used under beam guardrail on roadways with a posted speed greater than 50 mph.

6. For extruded curb placement at Beam Guardrail Type 31, See Standard Plan C-20.10.

7. For extruded curb details, See Standard Plan F-10.42.
NOTE

JOINTS MAY BE FORMED DURING INSTALLATION USING A RIGID DIVIDER OR SAWCUT AFTER CONCRETE CURES TO MINIMUM STRENGTH.
#3 REBAR – REQUIRED ONLY IN TANGENT BLOCK, WHEN LENGTH EXCEEDS 30" (IN)
1/2" (IN) CLR. BOTH ENDS – SEE STANDARD SPECIFICATION 9-07

TYPICAL OF ALL END VIEW

INSIDE CORNER BLOCK

OUTSIDE CORNER BLOCK

18" RADIUS BLOCK

30" RADIUS BLOCK

INSIDE CORNER BLOCK

OUTSIDE CORNER BLOCK

STATE DESIGN ENGINEER
Washington State Department of Transportation

PRECAST SLOPED MOUNTABLE CURB
STANDARD PLAN F-10.62-02

APPROVED FOR PUBLICATION
Raymond, Fina
Apr 22 2014 9:18 AM

30° MIN. – 60° MAX.
## Curb Radius Table

<table>
<thead>
<tr>
<th>Curb Radius</th>
<th>Dimension A</th>
<th>Dimension B</th>
<th>Dimension C</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'</td>
<td>12&quot;</td>
<td>2&quot;</td>
<td>8'</td>
</tr>
<tr>
<td>4' TO 5'</td>
<td>12&quot;</td>
<td>1 1/2&quot;</td>
<td>9'</td>
</tr>
<tr>
<td>6'</td>
<td>12&quot;</td>
<td>1&quot;</td>
<td>10'</td>
</tr>
<tr>
<td>7'</td>
<td>12&quot;</td>
<td>7 1/8&quot;</td>
<td>10 1/4&quot;</td>
</tr>
<tr>
<td>8'</td>
<td>18&quot;</td>
<td>1 1/8&quot;</td>
<td>15 3/4&quot;</td>
</tr>
<tr>
<td>9'</td>
<td>18&quot;</td>
<td>1&quot;</td>
<td>16'</td>
</tr>
<tr>
<td>10'</td>
<td>18&quot;</td>
<td>7 1/8&quot;</td>
<td>16 1/4&quot;</td>
</tr>
<tr>
<td>11' TO 13'</td>
<td>18&quot;</td>
<td>3/4&quot;</td>
<td>16 1/2&quot;</td>
</tr>
<tr>
<td>14' TO 15'</td>
<td>18&quot;</td>
<td>5/8&quot;</td>
<td>18 3/4&quot;</td>
</tr>
<tr>
<td>16' TO 17'</td>
<td>24&quot;</td>
<td>3/4&quot;</td>
<td>22 1/2&quot;</td>
</tr>
<tr>
<td>18' TO 22'</td>
<td>24&quot;</td>
<td>5/8&quot;</td>
<td>22 3/4&quot;</td>
</tr>
<tr>
<td>23' TO 29'</td>
<td>24&quot;</td>
<td>1/2&quot;</td>
<td>23&quot;</td>
</tr>
<tr>
<td>30' TO 34'</td>
<td>30&quot;</td>
<td>1/2&quot;</td>
<td>29&quot;</td>
</tr>
<tr>
<td>35' TO 45'</td>
<td>30&quot;</td>
<td>3/8&quot;</td>
<td>29 1/4&quot;</td>
</tr>
<tr>
<td>48' TO 60'</td>
<td>30&quot;</td>
<td>1/4&quot;</td>
<td>29 1/2&quot;</td>
</tr>
<tr>
<td>OVER 60'</td>
<td>USE TANGENT BLOCK, SEE SHEET 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This table lists the calculated dimensions for casting blocks suitable for constructing various curb radii. Curved blocks or blocks with different dimensions may be acceptable with prior approval of the engineer.
NOTES

1. The dual faced curb may be constructed by using two precast sloped mountable curbs (longitudinal halves) so long as the installation is consistent with the dimensions shown in the plan.

WITH RAISED EDGE

ADJACENT TO CURB

ADJACENT TO CURB AND RAILING OR WALL

ADJACENT TO BUFFER STRIP

FOR SIDE TREATMENT

CURB NOT INCLUDED IN BID ITEM - SEE STANDARD PLAN F-10.12

CURB NOT INCLUDED IN BID ITEM - SEE STANDARD PLAN F-10.12

CURB NOT INCLUDED IN BID ITEM - SEE STANDARD PLAN F-10.12

CURB NOT INCLUDED IN BID ITEM - SEE STANDARD PLAN F-10.12

MONOLITHIC CEMENT CONCRETE CURB AND SIDEWALK

NOTE

1. Four feet of the sidewalk width shall be the minimum pedestrian accessible route free of vertical and horizontal obstructions. Gratings, Access Covers, Junction Boxes, Cable Vaults, Pull Boxes and other appurtenances within the sidewalk must have slip resistant surfaces, be flush with surface, and match grade of the sidewalk.

SIDEWALK ADJACENT TO WALL DETAIL

RAISED EDGE DETAIL

EXTEND SIDEWALK TRANSVERSE EXPANSION JOINTS TO INCLUDE RAISED EDGE

CURB FACE DETAIL

EXTEND SIDEWALK TRANSVERSE EXPANSION JOINTS TO INCLUDE CURB (FULL DEPTH)

CEMENT CONCRETE CURB (CURB AND GUTTER SHOWN) NOT INCLUDED IN BID ITEM

SEE STANDARD PLAN F-10.12

LEVEL 1/2" (IN) R.

CEMENT CONCRETE CURB AND SIDEWALK STANDARD PLAN F-30.10-03 SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Washington State Department of Transportation
NOTES

1. At marked crosswalks, the connection between the landing and the roadway must be contained within the width of the crosswalk markings.

2. Where "GRADE BREAK" is called out, the entire length of the grade break between the two adjacent surface planes shall be flush.

3. Do not place Gratings, Junction Boxes, Access Covers, or other appurtenances on any part of the Curb Ramp or Landing, or in the Depressed Curb and Gutter where the Landing connects to the roadway.


6. The Bid Item "Cement Concrete Curb Ramp Type ___" does not include the adjacent Curb, Curb and Gutter, Depressed Curb and Gutter, Pedestrian Curb, or Sidewalks.

7. The Curb Ramp length is not required to exceed 15 feet (unless otherwise shown in the Contract Plans). When applying the 15-foot max. length, the running slope of the curb ramp is allowed to exceed 6.3%. Use a single constant slope from bottom of ramp to top of ramp to match into the sidewalk over a horizontal distance of 15 feet. Do not include abutting landing(s) in the 15-foot max. measurement. When a ramp is constructed on a radius, the 15-foot max. length is measured on the inside radius along the back of the walkway.


9. Pedestrian Curb may be omitted if the ground surface at the back of the Curb Ramp and/or Landing will be at the same elevation as the Curb Ramp or Landing and there will be no material to retain.

**SCALE 1/2 IN = 1 FT**

**LEGEND**

- 1.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (2% MAX.)
- 7.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (8.3% MAX.) — SEE NOTE 7

**CONTRACTION JOINT (TYPE) — SEE STANDARD PLAN F-30.1** FOR CURB RAMP LENGTHED GREATER THAN 8 FT, PROVIDE CONTRACTION JOINT EQUALLY SPACED 4'-0" MIN. OC.

**BIDE ITEM "CEMENT CONCRETE CURB RAMP TYPE ___" DOES NOT INCLUDE THE ADJACENT CURB, CURB AND GUTTER, DEPRESSED CURB AND GUTTER, PEDESTRIAN CURB, OR SIDEWALKS.**

**NOTE**

- **CROSSWALK**
- **FACE OF CURB**
- **DEPRESS CURB AND GUTTER**
- **DEPRESS CURB AND GUTTER**
- **CROSSWALK**
- **PLAN VIEW TYPE PARALLEL A**
- **PLAN VIEW TYPE PARALLEL B**
- **SECTION A**
- **SECTION B**
- **SECTION C**

**ISOMETRIC VIEW **

**TYPE PARALLEL A PAY LIMIT**

**TYPE PARALLEL B PAY LIMIT**

**STANDARD PLAN F-40.12-03**

**DRAWN BY FERN L. GODDELL**

Zeller, Scott
Jun 24 2016 7:19 AM

**SHEET 1 OF 1 SHEET**

**APPROVED FOR PUBLICATION**

Colaggio, Jeff
Jun 24 2016 2:21 PM

**WASH. STATE DEPT. OF TRANSPORTATION**
NOTES
1. At marked crosswalks, the connection between the curb ramp and the roadway must be contained within the width of the crosswalk markings.
2. Where “GRADE BREAK” is called out, the entire length of the grade break between the two adjacent surface planes shall be flush.
3. Do not place Gratings, Junction Boxes, Access Covers, or other appurtenances on any part of the Curb Ramp or Landing, or in front of the Curb Ramp where it connects to the roadway.
6. The Bid Item “Cement Concrete Curb Ramp Type _” does not include the adjacent Curb, Curb and Gutter, Depressed Curb and Gutter, Pedestrian Curb, or Sidewalks.
7. The Curb Ramp length is not required to exceed 15 feet (unless shown otherwise in the Contract Plans). When applying the 15-foot max length, the running slope of the Curb Ramp is allowed to exceed 8.3%. Use a single constant slope from bottom of ramp to top of ramp to match into the landing over a horizontal distance of 15 feet. Do not include the abutting landing in the 15-foot max measurement.
9. Pedestrian Curb may be omitted if the ground surface at the back of the Curb Ramp and/or Landing will be at the same elevation as the Curb Ramp or Landing and there will not be material to retain.

LEGEND
- SLOPE IN EITHER DIRECTION
  - 1.0 OR FLATTER RECOMMENDED FOR DESIGN/FormWork (2% MAX.)
  - 7.5% OR FLATTER RECOMMENDED FOR DESIGN/FormWork (8.3% MAX.)
  - 9.5% OR FLATTER RECOMMENDED FOR DESIGN/FormWork (10% MAX.)

PERPENDICULAR CURB RAMP
STANDARD PLAN F-40.15-03

Zeller, Scott
Jun 24 2016 7:20 AM

Sheets 1 of 1 Sheet

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jun 29 2016 2:05 PM

Washington State Department of Transportation
NOTES

1. This plan is to be used where pedestrian crossing in one direction is not permitted.

2. At marked crossings, the connection between the Landing and the roadway must be contained within the width of the crosswalk markings.

3. Where "GRADE BREAK" is called out, the entire length of the grade break between the two adjacent surface planes shall be flush.

4. Do not place Gratings, Junction Boxes, Access Covers, or other appurtenances on any part of the Curb Ramp or Landing, or in the Depressed Curb and Gutter where the Landing connects to the roadway.


7. The Bid Item "Concrete Curb Ramp Type _" does not include the adjacent Curb, Curb and Gutter, Depressed Curb and Gutter, Pedestrian Curb, or Sidewalks.

8. The Curb Ramp length is not required to exceed 15 feet (unless shown otherwise in the Contract Plans). When applying the 15-foot max. length (measured from back of sidewalk) the running slope of the curb ramp is allowed to exceed 8.3%. Use a single constant slope from bottom of ramp to top of ramp to match into the sidewalk over a horizontal distance of 15 feet.


10. Pedestrian Curb may be omitted if the ground surface at the back of the Curb Ramp and/or Landing will be at the same elevation as the Curb Ramp or Landing and there will not be material to retain.

SECTION B

)|(ALONG INSIDE RADIUS AT BACK OF WALKWAY)

"CEMENT CONCRETE CURB RAMP TYPE SINGLE DIRECTION A PAY LIMIT" SEE NOTE 7

DETACHABLE WARNING SURFACE ~ SEE STANDARD PLAN F-45.10
FOR CURB RAMP LENGTHS GREATER THAN 9'-0" PROVIDE CONSTRUCTION JOINT EQUALLY SPACED 4'-0" MIN. OC.

"CEMENT CONCRETE CURB RAMP TYPE SINGLE DIRECTION B PAY LIMIT" SEE NOTE 7

DEPRESSED CURB AND GUTTER ~ SEE STANDARD PLAN F-45.10

DEPRESSED CURB AND GUTTER ~ SEE NOTE 5

SLOPE IN EITHER DIRECTION
1.5 OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (2% MAX.)

7.5% OR FLATTER RECOMMENDED FOR DESIGN/FORMWORK (8.3% MAX.) SEE NOTE 7

PLAN VIEW

TYPE SINGLE DIRECTION A

PLAN VIEW

TYPE SINGLE DIRECTION B

ISOMETRIC VIEW

TYPE SINGLE DIRECTION A

ISOMETRIC VIEW

TYPE SINGLE DIRECTION B

DETAIL

1" (IN) RADIUS CORNER

PEDESTRIAN CURB

90° ANGLE RADUS MAY VARY

1" - 0"

NOTE: DRAWN BY FERN LODELL

Zeller, Scott

Jan 24 2016 7:21 AM

SINGLE DIRECTION CURB RAMP

STANDARD PLAN F-40.16-03

STATE OF WASHINGTON

WASHINGTON DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION
Corporation, Jeff
Jan 30 2016 3:11PM

STATE DESIGN ENGINEER

Sheet 1 of 1 SHEET
NOTES
1. The Detectable Warning Surface (DWS) shall extend the full width of the curb ramp, landing, or other roadway entrance as applicable. Exception: If the Manufacturer of the DWS requires a concrete border around the DWS, a variance of up to 2 inches on each side of the DWS is permitted.
2. The Detectable Warning Surface (DWS) shall be placed at the back of curb, with the two leading corners of the DWS panel placed adjacent to the back of the curb, and with no more than a 2 inch gap between the DWS and the back of the curb measured at the center of the DWS panel. Exception: If the Manufacturer of the selected DWS requires a concrete border around the DWS, a variance of up to 2 inches from the back of the curb is permitted (measured at the leading corners of the DWS panel).
3. The rows of truncated domes shall be aligned to be perpendicular to the grade break at the back of curb.
4. The rows of truncated domes shall be aligned to parallel the direction of travel.
5. If curb and gutter are not present, such as a shared-use path connection, the Detectable Warning Surface shall be placed at the pavement edge.
7. If a curb ramp is required, the location of the Detectable Warning Surface must be at the bottom of the ramp and within the required distance from the rail.
8. When the grade break between the curb ramp and the landing is less than or equal to 5 ft., from the back of curb at all points, place the Detectable Warning Surface on the bottom of the curb ramp directly above the grade break.
NOTES:

1. When the driveway width exceeds 15' (ft), construct a full depth expansion joint with 3/8" (in) joint filler along the driveway centerline. See Standard Plan F-30.10. Construct expansion joints parallel with the centerline as required at 15' (ft) maximum spacing when driveway widths exceed 30' (ft).


3. Curb and Gutter shown; see the Contract Plans for the curb design specified. See Standard Plan F-10.12 for Curb Details.

4. Avoid placing drainage structures, junction boxes or other obstructions in front of driveway entrances.

5. Where "GRADE BREAK" is called out, the entire length of the line between the two adjacent surface planes shall be flush.

6. The Pedestrian Ramp length is not required to exceed 15 feet (unless otherwise shown in the Contract Plans). When applying the 15-foot max. length (measured from back of sidewalk) the running slope of the pedestrian ramp is allowed to exceed 3.3%. Use a single constant slope from bottom of ramp to top of ramp to match into the sidewalk over a horizontal distance of 15 feet.

7. Beyond limits shown. Pay item does not include driveway. See Contract Plans.
TYPICAL INSTALLATION FOR SINGLE-FACED SIGNS

TYPICAL INSTALLATION FOR DOUBLE-FACED SIGNS

NOTES


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

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

4. For lateral installations behind traffic barrier, 6" high curbs, and ditches, see Standard Plan G-20.10.

5. Install at the locations shown in the Contract. Installation may be moved 50 feet or less (longitudinally) before or after the contract location if obstructions are encountered, or to utilize the post of another sign. Mileposts that cannot be placed within this degree of accuracy shall be omitted entirely.
NOTES
1. Refer to the Sign Specification Sheet of the Contract for the V and W distances.
2. The minimum vertical distance from the bottom of the sign to the ground shall not be less than 7' (ft) for signs located within the Design Clear Zone.

SIGN INSTALLATION IN FILL SECTION
SIGN INSTALLATION ON STEEP FILL SLOPES
MULTIPLE SIGN POST INSTALLATION IN FILL SECTION
SIGN INSTALLATION BEHIND TRAFFIC BARRIER
SIGN WITH SUPPLEMENTAL PLAQUE INSTALLATION IN FILL SECTION
GUIDE OR DIRECTIONAL SIGN WITH SECONDARY SIGN INSTALLATION ON EXPRESSWAYS AND FREEWAYS
SIGN INSTALLATION IN CURB SECTION
SIGN INSTALLATION IN DITCH SECTION
MULTIPLE SIGN POST INSTALLATION IN DITCH SECTION

KEYNOTE
3' (FT) MIN. FROM ANY POINT ALONG BOTTOM EDGE OF SIGN PANEL TO THE GROUND

GROUNDMOUNTED SIGN PLACEMENT
STANDARD PLAN G-20.10-02

APPROVED FOR PUBLICATION
Jun 23 2015 7:35 AM

Washington State Department of Transportation
NOTES

1. Notch is only required with multiple post installations.

2. 6x10, 8x10, and 6x12 Timber Sign Posts cannot be made breakaway and do not have holes or notches. These posts shall not be installed within the Design Clear Zone. They may be installed behind traffic barrier.


4. For 6x6 posts and larger, 7” (8") minimum spacing is required between posts.

5. All materials shall meet the requirements of Standard Specification Section 2-28.

POST INSTALLATION TABLE

<table>
<thead>
<tr>
<th>POST SIZE (NOM.)</th>
<th>DEPTH</th>
<th>HOLE DIAMETER</th>
<th>NOTCH DEPTH (SEE NOTE 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6x6</td>
<td>3” x 3”</td>
<td>1-1/2”</td>
<td>NOT REQUIRED</td>
</tr>
<tr>
<td>6x8</td>
<td>3” x 3”</td>
<td>1-1/2”</td>
<td>NOT REQUIRED</td>
</tr>
<tr>
<td>8x8</td>
<td>4” x 4”</td>
<td>2”</td>
<td>SEE NOTES 3 &amp; 4</td>
</tr>
<tr>
<td>8x10</td>
<td>5” x 5”</td>
<td>2”</td>
<td>SEE NOTES 3 &amp; 4</td>
</tr>
<tr>
<td>6x10</td>
<td>6” x 6”</td>
<td>2”</td>
<td>SEE NOTE 2</td>
</tr>
<tr>
<td>8x12</td>
<td>7” x 7”</td>
<td>2”</td>
<td>SEE NOTE 2</td>
</tr>
</tbody>
</table>

ELEVATION VIEW

SINGLE-POST INSTALLATION

MINIMUM POST HOLE DIAMETER IS THE WIDEST POST DIMENSION PLUS 8” (8’)

SIGN PANEL

SIGN BRACE - WHEN REQUIRED (STD. PLAN 5-80.10)

COMPACTED NATIVE BACKFILL MATERIAL

FINISHED GROUND LINE

TRAVELED WAY

DIGITALLY SIGNED BY NISBET, JOHN

DATE: 2018.06.27 11:29:46 -07'00'

Nisbet, John

TIMBER SIGN SUPPORT

STANDARD PLAN G-22.10-04

SHEET 1 OF 3 SHEETS

APPROVED FOR PUBLICATION

WASHINGTON STATE DEPARTMENT OF TRAVELING ENGINEER

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
NOTES

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

2. For Steel Sign Support Foundation, see Standard Plan G-25.10.

3. For 'H1' refer to the Sign Specification Sheet in the Contract.

4. Mounting brackets with steel straps shall be stainless steel one bolt, flared leg bracket and 3/4" wide, 0.030" thick strap "Band-it" products or an approved equal.
1. Dimensions for the parts used to assemble the base connections are intentionally not shown. Base connections are patented manufactured products that are in compliance with NCHRP 350 crash test criteria. The base connection details are only shown on this plan to illustrate how the parts are assembled.


3. For "H1" refer to the Sign Specification Sheet in the Contract.

STEEL SIGN SUPPORT
TYPE AS
INSTALLATION DETAILS
STANDARD PLAN G-24.20-01
SHEET 1 OF 1 SHEET
ASSEMBLY NOTES
1. Dimensions for the parts used to assemble the base connections are intentionally not shown. Base connections are patented, manufactured products that are in compliance with NCHRP 350 crash test criteria. The base connection details are shown on this plan only to illustrate how the parts are assembled.
2. Do not tighten any single Sb Plate Bolt to the recommended torque before pretightening the other bolts. Progressively tighten the three Slip Plate Bolts in 10-f-tb increments, alternately, to a final torque of 40 ft-lbs on each.
3. Slip Base assembly and all other materials shall meet the requirements of Standard Specification Sections 9-06 and 9-28.

STEEL SIGN SUPPORT TYPES SB-1A, SB-2A & SB-3A ~ 8” (IN)
ASSEMBLY NOTES

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

2. Do not tighten any single Slip Plate Bolt to the recommended torque before preweighting the other bolts. Progressively tighten the three Slip Plate Bolts in 10 ft-lb increments, alternately, to a final torque of 40 ft-lbs on each.

ASSEMBLY NOTES

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

2. Do not tighten any single Slip Plate Bolt to the recommended torque before pretightening the other bolts. Progressively tighten the three Slip Plate Bolts in 10 ft-lb increments, alternately, to a final torque of 40 ft-lb on each.

3. Use only Slip Base manufacturer supplied hardware that meets the requirements of Standard Specification Sections 9-06 and 9-28.
ASSEMBLY NOTES

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

2. Do not tighten any single Slip Plate Bolt to the recommended torque before pretightening the other bolts. Progressively tighten the three Slip Plate Bolts in 10 ft-lbs increments, alternately, to a final torque of 40 ft-lbs on each.

3. Use only Slip Base manufacturer supplied hardware that meets the requirements of Standard Specification Sections 9-06 and 9-28.

STEEL SIGN SUPPORT TYPES SB-1, SB-2 & SB-3
INSTALLATION DETAILS

STANDARD PLAN G-24.40-07

Nisbet, John

STEEL SIGN SUPPORT TYPE SB-1B & SB-3B ~ 10" (IN)
(UNIBASE)

DRAWN BY: FERN MOSSIL

DRAFTED FOR: WASHINGTON DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION

Washington State Department of Transportation

[Diagram of steel sign support with labels and dimensions]
**NOTES**

1. Per TRANSPO: 5" to 8" square steel posts are acceptable and require type TP-B foundations.


**KEY NOTES**

- Foundation depth is based on allowable lateral bearing pressure in excess of 2500 PSF.
- Two-post installation.
- Single-post installations require square steel posts. For single-post installations, divide the post MAX. XYZ in half.

**TYPE AS & TYPE AP FOUNDATION**

**TYPE TP-A & TYPE TP-B FOUNDATION**

**TYPE PL, TYPE PL-T & TYPE PL-U FOUNDATION**

**FOUNDATION DETAILS**

**STANDARD PLAN**

**G-25.10-04**

**SHEET 1 OF 1 SHEET**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**

**APPROVED FOR PUBLICATION**
NOTES

1. Mounting brackets with steel straps shall be a stainless steel band and buckle system product or an approved equal. Mounting brackets shall be universal channel clamps; steel straps shall be 3/4" (in) wide and 0.030" (in) thick.

2. All signs installed on mast arms or standards (poles) require windbeams. All signs shall be installed with horizontal edges level. A skewed windbeam is required only when the sign is mounted within 12" (in) of the mast arm base (see Detail "A").

3. The street name sign shall be a maximum of 36 square feet and the sign height is a maximum of 3' (ft); signs larger than 36 square feet require a special design mast arm and signal pole.

SIGN INSTALLATION ON SIGNAL AND LIGHT STANDARDS
STANDARD PLAN G-30.10-04

MAST ARM-MOUNTED STREET NAME SIGNS

TYPICAL MAST ARM INSTALLATION

DRAWN BY FERN LINDALL

Washington State Department of Transportation
SIGN INSTALLATION ON SIGNAL OR LIGHT STANDARD

NOTE:
Any Lane Use Sign greater than 7.5 sq ft. requires a Special Design Mast Arm and Signal Pole.
NOTES

1. Mounting brackets with steel straps shall be a stainless steel band and buckle system product or an approved equal. Mounting brackets shall be one bolt, flared leg; steel straps shall be 3/4” (in) wide and 0.030” (in) thick.

2. Sign braces are required for sign widths of 48” (in) or greater. For sign widths of 36” (in) or less, sign braces are only required when specified in the contract.

3. Sign braces are typically necessary on large sign panels that are exposed to high winds, traffic generated wind buffeting, or when snow thrown from paws might impact the sign.

4. A nylon washer shall be placed between the sign and the steel washer when the sign face has Type III, IV, VII or IX sheeling.

5. Signs 48” (in) or greater can be pinned together, back to back.

6. For signs installed back to back on a single post, no bracing is required.
SIGN BRACE DIMENSIONS

<table>
<thead>
<tr>
<th>SIGN TYPE</th>
<th>YIELD</th>
<th>DIAMOND-SHAPED</th>
<th>OTHERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1/3 SIGN WIDTH - 1 3/4&quot;</td>
<td>1/2 SIGN WIDTH - 2 1/4&quot;</td>
<td>1/2 SIGN WIDTH - 1&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SIGN POST TYPE</th>
<th>4x4 OR 6x6 TIMBER POST</th>
<th>6/8 TIMBER POST</th>
<th>3&quot; DIAM STEEL PIPE</th>
<th>2 1/2&quot; SQUARE TUBE</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>5 1/2&quot;</td>
<td>7 1/2&quot;</td>
<td>4 3/4&quot;</td>
<td>2 1/2&quot;</td>
</tr>
</tbody>
</table>

NOTE
1. For sign installations on round steel posts, see Standard Plan G-30.10, sheet 2 of 2.

SIGN BRACE DETAIL

1/8" (IN) GALV. STEEL OR SS. STRAP

1/2" (IN) DIAM. HOLE

5/16" (IN) DIAM. x 1" LONG SLOT (TYP.)

SIDE

2/3 SIGN WIDTH - 3 1/4"

1/3 SIGN WIDTH - 1"

NO PASSING ZONE SIGN BRACE DETAIL

NO PASSING ZONE SIGN BRACING

SCHOOL ZONE SIGN

NO PASSING ZONE SIGN BRACING

SIGN BRACING

STANDARD PLAN G-50.10-03

SHEET 2 OF 2 SHEETS

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Washington State Department of Transportation

Nisbet, John

SIGN BRACE PLACEMENT
NOTES
1. Vertical and horizontal clearance requirements shall be as shown on the Contract Plans.
2. No post splices permitted in lower third of height, nor closer than 3'-0" to bottom chord, except as otherwise noted. No chord shop splices permitted in first two-thirds of the span, except as otherwise noted. A maximum of two splices are permitted in the post. For post or chord shop splice details, see Standard Plan G-70.10.
3. The back-up plates or rings for all full penetration welds shall be welded continuously to the joined pieces. This can be done by either a continuous fillet weld on the back side of the piece, or by a continuous weld in the root of the full penetration weld.
4. All bolt holes shall be drilled, and the diameter shall be 1/16" (in) larger than the nominal bolt diameter, except as noted.
5. The design and analysis of the structures has been done in accordance with AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires and Traffic Signals Dated 2001, using 90 MPH wind velocity and fatigue category - I.
6. Adjust post alignment in plane normal to roadway centerline by means of leveling nuts located below base plate to maintain upward slope in cantilever arm(s). Tighten anchor nuts above base plate in accordance with Standard Specification Section 6-03.3(33).
7. Vehicular Message Signs (VMS) exceeding 700 lbs., and/or 200 sq. ft. shall not be installed on cantilever structure.
8. For electrical requirements, see Standard Plan J-75.45.

**ELEVATION**

**SINGLE CANTILEVER SIGN STRUCTURE**

<table>
<thead>
<tr>
<th>CHORD SELECTION</th>
<th>SIGN AREA (X TIMES Y) (FT²)</th>
<th>CHORD SIZE</th>
<th>NAME</th>
<th>WALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 OR LESS</td>
<td>2&quot;</td>
<td>0.154&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60&quot; TO 100</td>
<td>2&quot;</td>
<td>0.218&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100&quot; TO 150</td>
<td>2 1/2&quot;</td>
<td>0.203&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150&quot; TO 200</td>
<td>3&quot;</td>
<td>0.210&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MATERIAL SPECIFICATIONS**

| PIPE (CHORDS, DIAGONALS, STRUTS AND POSTS) | ASTM A 36 OR ASTM A 53 TYPE E OR ASTM A 500 TYPE B |
| PLATES | ASTM A 36 |
| SHAPE | ASTM A 36 ASTM A 692 |

**RATIONAL FOR RADIUS**

- Opposite of Main Roadway
- Bottom of Base Plate
- Hand Hole on Side

**HANDLING & STORAGE**

Drawn by: Fern Liddell

CANTILEVER SIGN STRUCTURE (TRUSS TYPE)

STANDARD PLAN G-60.10-04

Sheet 1 of 4 Sheets

APPROVED FOR PRELIMINARY USE 2023 CALIFORNIA DEPARTMENT OF TRANSPORTATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION}

Zahnerer, Richard
Jan 12 2018 2:25 PM

FASTENER GALVANIZING
ASTM F2329

PERSPECTIVE
CANTILEVER SIGN STRUCTURE
(TRUSSE TYPE)
STANDARD PLAN G-60.10-04

ELEVATION
DOUBLE CANTILEVER SIGN STRUCTURE

[Diagram showing various dimensions and components of the sign structure, including vertical struts, panel length, and sign details.]
VALUES OF Z

<table>
<thead>
<tr>
<th>FOUNDATION TYPE</th>
<th>TOTAL SIGN AREA</th>
<th>ALLOWABLE LATERAL BEARING PRESSURE (PSF)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>200 SF OR LESS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>200 SF - 400 SF</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>Z</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13&quot; - 0&quot;</td>
<td>1800 AND UP</td>
</tr>
<tr>
<td></td>
<td>16&quot; - 0&quot;</td>
<td>1000 - 1499</td>
</tr>
</tbody>
</table>

CANTILEVER SIGN STRUCTURE (TRUSS-TYPE) FOUNDATION TYPE 1

STANDARD PLAN G-60.20-02

SHEET 1 OF 2 SHEETS

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WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

1. See Standard Specification B-21.3(9) for construction requirements.
2. Use a template to locate and secure bolts in place during foundation installation.
BAR LIST

<table>
<thead>
<tr>
<th>MARK</th>
<th>LOCATION</th>
<th>QTY.</th>
<th>LENGTH</th>
<th>SIZE</th>
<th>TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CAP VERTICAL</td>
<td>4</td>
<td>3' - 10&quot;</td>
<td>#4</td>
<td>STR.</td>
</tr>
<tr>
<td>2</td>
<td>CAP HOOPS</td>
<td>5</td>
<td>15' - 9&quot;</td>
<td>#5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>SHAFT VERTICAL</td>
<td>12</td>
<td>7&quot; MINUS CLEARANCES</td>
<td>#9</td>
<td>STR.</td>
</tr>
<tr>
<td>4</td>
<td>SHAFT SPIRAL</td>
<td>1</td>
<td>AS REQUIRED</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>CAP TOP</td>
<td>4</td>
<td>10' - 10&quot;</td>
<td>#5</td>
<td></td>
</tr>
</tbody>
</table>

BENDING DIAGRAM
(ALL DIMENSIONS ARE OUT TO OUT)

MATERIAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHAFT CONCRETE</td>
<td>CLASS 4000P</td>
</tr>
<tr>
<td>ALL OTHER CONCRETE</td>
<td>CLASS 4000</td>
</tr>
<tr>
<td>STEEL REINF. BAR</td>
<td>AASHTO M 31</td>
</tr>
<tr>
<td>ANCHOR RODS</td>
<td>ASTM F 1554</td>
</tr>
<tr>
<td>ANCHOR NUTS</td>
<td>ASTM A 560</td>
</tr>
<tr>
<td>ANCHOR WASHERS</td>
<td>ASTM F 436</td>
</tr>
<tr>
<td>ANCHORAGE GALVANIZING</td>
<td>AASHTO M 232</td>
</tr>
<tr>
<td>ANCHOR PLATE</td>
<td>ASTM A 36</td>
</tr>
</tbody>
</table>

COLUMN AND SHAFT SPIRAL OPTIONS

<table>
<thead>
<tr>
<th>DEFORMED BAR</th>
<th>PLAIN STEEL BAR</th>
<th>COLD DRAWN WIRE</th>
<th>DEFORMED WIRE</th>
<th>WELD DIMENSIONS (INCHES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AASHTO M 31</td>
<td>AASHTO M 31</td>
<td>AASHTO M 32</td>
<td>AASHTO M 225</td>
<td>S</td>
</tr>
<tr>
<td>#4 1/2&quot; DIA</td>
<td>W20</td>
<td>D20</td>
<td>1/4</td>
<td>1/8</td>
</tr>
<tr>
<td>#5 5/8&quot; DIA</td>
<td>W31</td>
<td>D31</td>
<td>5/16</td>
<td>3/16</td>
</tr>
<tr>
<td>#6 3/4&quot; DIA</td>
<td>W44</td>
<td>D44</td>
<td>3/8</td>
<td>3/16</td>
</tr>
</tbody>
</table>

SPRAL LAP SPICL DETAIL

MAY BE FIELT BENT (TYP.)

SIRAP WELDED LAP SPICL DETAIL

WELDING SHALL MEET THE REQUIREMENTS OF STANDARD SPEC. 6-02.3(2A)E
FOR WELD DIMENSIONS = SEE TABLE BELOW
1. See Standard Specification B-21.3(0) for construction requirements.

2. Grounding Conductor shall be non-insulated #4 AWG stranded copper. Provide 3'-0" min. slack.
ENDS OF DIAGONALS SHALL BE CUT TO FIT NEATLY AGAINST CHORD OR POST. FILLET WELD SIZE TO BE DIAGONAL TUBE OR PIPE THICKNESS PLUS 1/16" (IN).

CHORD SHOWN – END POST SIMILAR

ELEVATION

SECTION A

TYPICAL JOINT DETAIL

ALTERNATE JOINT DATA

CHORD SHOWN – END POST SIMILAR

SECTION D

ALTERNATE JOINT DETAIL

NOT FOR CONNECTIONS BETWEEN VERTICAL DIAGONALS AND CHORDS

FOR SPAN LENGTHS NOT LISTED, INTERPOLATE VALUES OF.

FABRICATE TRUSSES WITH CHORDS CURVED TO PROVIDE CAMBER. DO NOT CAMBER BY USING SHIMS BETWEEN CHORDS AT SPACES.
NOTES

1. Windbeam and 3" (IN) Z-Bar are aluminum. All nuts, bolts, washers, and other hardware shall be stainless steel per Standard Specification Section 9-28.11, except as noted. Galvanize all non-stainless steel parts.

2. See Standard Plan G-90.20 (Monotube), or G-90.30 (Truss) for additional Overhead Sign Mounting details.

3. For VMS mounting, the Contractor may substitute W6 x 12 steel or W6 x 13 steel sections for the Vertical Brace W4 x 13 steel.
NOTES

1. Install Sign Lighting Luminaires (and Brackets) only when required in the Contract.

2. All nuts, bolts, washers, and other hardware shall be stainless steel per Standard Specification Section 9-28.11, except as noted. Galvanize all non-stainless steel parts.

3. See Standard Plan G-90.20 (Monotube), or G-90.30 (Truss) for additional Overhead Sign Lighting details.
NOTES
1. U-Bolts, Washers and Nuts shall be stainless steel, except as noted.
4. For VMS mounting, the contractor may substitute W6 x 12 Steel or W8 x 13 Steel sections for the Vertical Brace W4 x 13 Steel.
5. 3’ - 0” MAX. Vertical Brace spacing for Walk-In Cabinet Type VMS Installation.
7. For all sign lighting bracing details not shown, See Standard Plan G-90.11.

OVERHEAD SIGN MOUNTING (TRUSS STRUCTURE)

STANDARD PLAN G-90.30-04
NOTES

1. Sign Lighting Luminaire shall include a 3/4" (in) threaded side entry, a gasketed front entry, a door prop, and 4 mounting holes. Refer to Standard Spec. 8-20.3(13) for additional requirements.

2. See Standard Plan J-75.40 and J-75.45 for Sign Light Luminaire Electrical Details.

3. For all sign lighting bracketing details not shown, see Standard Plan G-90.11.
PLAN

STEEL GRATING DETAIL
(RAILING NOT SHOWN FOR CLARITY)

SECTION F
1/4" (IN) TOE PLATE
EVERY FOURTH BEARING BAR AND NEAR ALL TOE PLATE CORNERS
3/16" (IN)
6" MIN.
3/4" MAX.
1/8 / 3/4
GRATING FASTENER SEE DETAIL
CROSS BAR (TYP.)
W4X13

SECTION G
1/4" (IN) TOE PLATE
1/8 V1/12
3/16" (IN)
0" MIN.
3/4" MAX.
1" (IN) MIN.
0" MIN.
3/4" MAX.
GRATING FASTENER SEE DETAIL
CROSS BAR
Bearing Bars
W4X13

INSTALLED AND ARRANGED THE GRATING FASTENERS ACCORDING TO THE GRATING MANUFACTURER'S RECOMMENDATIONS.

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
MAINTENANCE WALKWAY INSTALLED ON MONOTUBE SIGN BRIDGE
(WALKWAYS MAY BE USED WITH OTHER LAYOUTS THAN THAT SHOWN ABOVE)

2. For maintenance walkway, railing, grating, and toe plate details, see Standard Plan G-96-19.
3. Use two tanyards through intermediate wire rope support.
4. 3/8" (in) diameter wire rope with 14 kips min. breaking strength. The wire rope shall be installed with 450 lbs.
of tension, and with 5° (in) of take up adjustment available in the turnbuckles.
5. Handrail "B"-up with VMS door opening is the responsibility of the contractor.

NOTES

1. Allowable alternate material: Federal Standard 904-M or 904-T Class 3 Galvanized.

ELEVATION
NOTES

1. See Plant Material List for size and type of live stake.
2. Do not use axe or sledge for driving stakes.
3. In hard ground use an iron bar or star drill to prepare the holes for the stake.
4. Avoid stripping bark or bruising stakes during installation.
5. Fill void around cutting with soil.

LIVE STAKE INSTALLATION IN RIPRAP

CUT DAMAGED END TO LEAVE TWO BUDS EXPOSED

SEE NOTES

FILL AIDS WITH NATIVE SOIL

EXISTING SOIL

LIVE STAKE INSTALLATION IN QUARRY SPALLS

CUT DAMAGED END TO LEAVE TWO BUDS EXPOSED

MIN. 6" BURIAL INTO EXISTING SOIL

EXISTING SOIL

LIVE STAKE INSTALLATION ON SLOPES

CUT DAMAGED END TO LEAVE TWO BUDS EXPOSED

SEE NOTES

EXISTING SOIL

TYPICAL LIVE STAKE INSTALLATION

CUT DAMAGED END TO LEAVE TWO BUDS EXPOSED

SEE NOTES

EXISTING SOIL

CERTIFICATE NO. 000372

TYPICAL LIVE STAKE INSTALLATION

LIVE STAKE INSTALLATIONS

STANDARD PLAN H-10.15-00

SHEET 1 OF 1 SHEET

WASHINGTON DEPARTMENT OF TRANSPORTATION

WASHINGTON, STATE DEPARTMENT OF TRANSPORTATION
1. All Angle Irons and Steel Straps shall be galvanized in accordance with AASHTO M-232.

2. Pipe, Caps, and T-Adapter shall be 1" I.D. white PVC or Primed Steel, except the water intake pipe shall be white PVC. Pipe shall be Sch. 40. All pipe joints shall be threaded.

3. Gage assembly pipe, fiberglass rod, and angle iron can be extended as needed to fit site requirements. Extra Pipe Clamps shall be added for security.

4. Score the water intake pipe 1/4" deep, 1/32" wide (width of saw blade), every 1/2", alternating cuts on top and bottom for drainage. Place at lowest water level.

5. Water level may vary, depending on season.

6. Pour in approximately 1 tablespoon of cork dust at installation, and after each reading.
BOLLARD TYPE 1

STANDARD PLAN H-60.10-01

NOTE
This bollard does not have an effective breakaway design feature and cannot be installed within the Design Clear Zone.
CONCRETE FOOTING - COMMERCIAL CONCRETE
6" x 1/4" DIAM. STEEL BAR

FINISHED GRADE

SECTION A

POST

CONCRETE FOOTING - COMMERCIAL CONCRETE
6" x 1/4" DIAM. STEEL BAR

NOTE
This bollard does not have an effective breakaway design feature and cannot be installed within the Design Clear Zone.

STEEL PIPE - ASTM A 53, NPS 3 (3" NOM.), SCHEDULE 80

1/2" REFLECTIVE TAPE (TYP.)

1/2" DRILLED HOLE

PAINT ASSEMBLY WITH A "HIGHLY VISIBLE" COLOR
(SAFETY YELLOW IS ACCEPTABLE)

1" - 2 1/2" DIAM.

ROUND FOOTING

SQUARE FOOTING

PLAN VIEW

Washington State Department of Transportation

EXPIRES JUNE 15, 2023

BOLLARD TYPE 2
STANDARD PLAN H-60.20-01
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Washington State Department of Transportation
Wood Post Fasteners

<table>
<thead>
<tr>
<th>Size / Type</th>
<th>3/8&quot; Diameter X 2 3/4&quot; Bolt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 washers &amp; locknut</td>
</tr>
<tr>
<td>3/8&quot; Diameter X 3/4&quot; Bolt</td>
<td>4</td>
</tr>
<tr>
<td>3/16&quot; Diameter X 1&quot; Screw</td>
<td>4</td>
</tr>
</tbody>
</table>

Steel Post Fasteners

<table>
<thead>
<tr>
<th>Size / Type</th>
<th>3/8&quot; Diameter X 2 3/4&quot; Bolt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 washers &amp; locknut</td>
</tr>
<tr>
<td>3/8&quot; Diameter X 3/4&quot; Bolt</td>
<td>4</td>
</tr>
<tr>
<td>3/16&quot; Diameter X 1&quot; Screw</td>
<td>4</td>
</tr>
</tbody>
</table>

Notes

1. A socket and wedge anchoring system that meets the NCHRP 350 crash test criteria may be substituted in lieu of the anti-twist plate designs shown. Anti-twist plates are not required for wood post installations.

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

3. Center the mailbox on the platform to ensure space for the mailbox door to open and to allow space for installing the fasteners (see Alignment Detail, Sheet 2). Spacing of mailbox mounting holes varies among manufacturers. Attachment of the mailbox to the platform may require drilling additional holes through the mailbox to fit the platform.

4. Attach a newspaper box to a steel post with two 1 7/8" Muffler Clamps spaced 4" apart. Field drill 7/16" holes in the newspaper box to fit. Use 2 1/2" x 1/4" 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.

5. A Type 2 Support (Standard Plan H-70.20) is required when 2 or more mailboxes are to be installed on one support.
### Mailbox & Platform Dimensions

<table>
<thead>
<tr>
<th>Size</th>
<th>Mailbox Dimensions</th>
<th>Platform Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19&quot; x 8 1/2&quot; x 17&quot;</td>
<td>6 1/2&quot; x 8 1/2&quot;</td>
</tr>
<tr>
<td>2</td>
<td>21&quot; x 8&quot; x 10 1/2&quot;</td>
<td>9&quot; x 10 1/2&quot;</td>
</tr>
<tr>
<td>3</td>
<td>24&quot; x 11 1/2&quot; x 13 1/2&quot;</td>
<td>11&quot; x 11 1/2&quot;</td>
</tr>
</tbody>
</table>

### Mailbox Placement Sections

- **Behind Curb**
  - *Unless otherwise shown in the plans*

- **Behind Sidewalk**

- **At Edge of Shoulder**

- **Face of Curb**

### Alignment Detail

### Mailbox Support Type 1

**Standard Plan H-70.10-01**

---

**Mailbox, Platform, & Post Placement Details**

---

**Bracket Detail**

---

**Anti-Twist Plate Detail**

---

**Isometric**

---

**Top**

---

**Platform Detail**

---

**Side**

---

**Front**

---

**Mailbox Support Type 2**

For details see STD. PLAN H-70.20
NOTES

1. The anchoring system shall meet NCHRP 350 crash test criteria. Use a socket and wedge system or the anchoring system supplied by or recommended by the Type 2 Support manufacturer.

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

3. The Platform design shown in this plan is detailed in the PLATFORM DETAIL, Standard Plan H-70.10, Sheet 2. The design features slots that accommodate several types of mailbox supports; only those slots necessary for assembling the type being installed are required. An adjustable platform may be used in lieu of this platform design. Adjustable platforms must fit the 1 7/8" M-Clam.

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

5. Attach a newspaper box to a Type 2 Support with two 1 7/8" Muffler Clamps spaced 4" apart. Field drill 7/16" holes in the newspaper box to fit. Newspaper boxes must not extend beyond the front of the mailbox when the mailbox door is closed.
MAILBOX SUPPORT TYPE 2
STANDARD PLAN H-70.20-01
SHEET 2 OF 2 SHEETS

ANCHORING SYSTEM - SOCKET AND WEDGE SHOWN (SEE NOTE 1)

MAILBOX SUPPORT TYPE 1
(WOOD POST SHOWN)

FOR DETAILS, SEE STANDARD PLAN H-70.10

MAILBOX SUPPORT TYPE 2

5" MIN. BETWEEN MAILBOXES

NEWSPAPER BOX - SEE NOTE 2

SNOW GUARD - WHEN REQUIRED, PLACE ON LEADING END OF SUPPORT (SEE DETAIL)

ANCHORING SYSTEM - SOCKET AND WEDGE SHOWN (SEE NOTE 1)
MAILBOX SUPPORT
TYPE 3
STANDARD PLAN H-70.30-02
SHEET 1 OF 2 SHEETS

NOTES
1. The insert pipe is 1" nominal diameter, Schedule 40 steel pipe, as indicated; all other pipe shown on this plan is 1 1/4" nominal diameter, Schedule 40 steel pipe. All pipe, couplings, and elbows shall be galvanized in accordance with ASTM A 153.
2. The vertical support may be cast in a concrete foundation, or bolted to a U-channel post, (see PLACEMENT DETAIL, Sheet 2). Avoid placing the vertical support in the flow line of a ditch.
3. The pipe angles required in this design may be achieved by using pipe fittings or by bending the pipes. See DETAIL "A," Sheet 2.
4. Coat the 1" diam. pipe with grease (petroleum) before sliding the 1 1/4" diam. pipe (cantilever arm) onto it, to aid rotation and to guard against corrosion.
5. The Platform design shown in this plan is detailed in the PLATFORM DETAIL, Standard Plan H-70.10, Sheet 2. The design features slots that accommodate several types of mailbox supports; only those slots necessary for assembling the type being installed are required.
6. Match the edge of the mailbox platform to the end of the horizontal pipe mount. Center the mailbox on the platform to ensure space for the mailbox door to open and to allow space for installing the fasteners. Spacing of mailbox mounting holes varies among manufacturers. Attachment of the mailbox to the platform may require drilling additional holes through the mailbox to fit the platform, (see ALIGNMENT DETAIL).
7. Attach a newspaper box to the pipe with two 1 3/4" muffler clamps spaced 4" apart. Newspaper boxes must not extend beyond the front of the mailbox when the mailbox door is closed.
1. Post shall have sufficient strength and durability to support the fence through the life of the project.
POST - SEE STD. SPEC. 8·01.3(9)A
ATTACH IN A MANNER THAT ASSURES FABRIC IS FIRMLY HELD BY THE BACKUP SUPPORT IN A WAY THAT REDUCES THE POTENTIAL FOR FABRIC TEARING.

FASTEN GEOTEXTILE TO POST EVERY 6" (IN.) O.C.

BACKFILLED & COMPACTED NATIVE SOIL.

FLOW

SELF-LOCKING TIE-NYLON 66 (MIN. GRADE), 120# MIN. TENSILE STRENGTH, UV STABILIZED.

BURY GEOTEXTILE IN TRENCH

NOTE

DURING EXCAVATION, MINIMIZE DISTURBING THE GROUND AROUND TRENCH AS MUCH AS IS FEASIBLE, AND SMOOTH SURFACE FOLLOWING EXCAVATION TO AVOID CONCENTRATING FLOWS. COMPACTION MUST BE ADEQUATE TO PREVENT UNDERCUTTING FLOWS.

TYPICAL INSTALLATION DETAIL
(STEEL POSTS SHOWN)

INSTALL BACKUP SUPPORT FOR THE GEOTEXTILE - SEE STANDARD SPECIFICATION SECTION 8·01.3(9)A

SPlicing FENCE SECTIONS SHALL BE CLOSE ENOUGH TOGETHER TO PREVENT Silt Laden WATER FROM ESCAPING THROUGH THE FENCE AT THE OVERLAP.

TYPICAL INSTALLATION DETAIL
(STEEL POSTS SHOWN)

NOTES

1. Install the ends of the silt fence to point slightly upslope to prevent sediment from flowing around the ends of the fence.
2. Perform maintenance in accordance with Standard Specifications 8·01.3(9)A and 8·01.3(15).
3. Splices shall never be placed in low spots or sump locations. If splices are located in low or sump areas, the fence may need to be reinstalled unless the Project Engineer approves the installation.
4. Install silt fencing parallel to mapped contour lines.
NOTES

1. Install the ends of the silt fence to point slightly upslope to prevent sediment from flowing around the ends of the fence.

2. Perform maintenance in accordance with Standard Specifications 8-01.3(9)A and 8-01.3(16).

3. Splices shall never be placed in low spots or sump locations. If splices are located in low or sump areas, the fence may need to be reinstalled unless the Project Engineer approves the installation.

4. Install silt fencing parallel to mapped contour lines.

DURING EXCAVATION,_MINIMIZE DISTURBING THE GROUND AROUND TRENCH AS MUCH AS IS FEASIBLE, AND SMOOTH SURFACE FOLLOWING EXCAVATION TO AVOID CONCENTRATING FLOWS. COMPACTION MUST BE ADEQUATE TO PREVENT UNDERCUTTING FLOWS.
NOTES
1. Install the ends of the high visibility silt fence to point slightly upslope to prevent sediment from flowing around the ends of the fence.
2. Perform maintenance in accordance with Standard Specifications 8-01.3(9)A and 8-01.3(15).
3. Splices shall never be placed in low spots or sump locations. If splices are located in low or sump areas, the fence may need to be reinstalled unless the Project Engineer approves the installation.
4. Install silt fencing parallel to mapped contour lines.

NOTE
DURING EXCAVATION, MINIMIZE DISTURBING THE GROUND AROUND TRENCH AS MUCH AS IS FEASIBLE, AND SMOOTH SURFACE FOLLOWING EXCAVATION TO AVOID CONCENTRATING FLOWS. COMPACTION MUST BE ADEQUATE TO PREVENT UNDERCUTTING FLOWS.

TYPICAL INSTALLATION DETAIL
(STEEL POSTS SHOWN)
NOTE

DURING EXCAVATION, MINIMIZE DISTURBING THE GROUND AROUND TRENCH AS MUCH AS IS FEASIBLE, AND SMOOTH SURFACE FOLLOWING EXCAVATION TO AVOID CONCENTRATING FLOWS. COMPACTION MUST BE ADEQUATE TO PREVENT UNDERCUTTING FLOWS.

TYPICAL INSTALLATION DETAIL
(Steel Posts Shown)

FASTEN GEOTEXTILE TO POST EVERY 6" (IN.) O.C.

NOTE

FASTEN GEOTEXTILE TO POST EVERY 6" (IN.) O.C.

SPLICED FENCE SECTIONS SHALL BE CLOSE ENOUGH TOGETHER TO PREVENT SILT LADED WATER FROM ESCAPING THROUGH THE FENCE AT THE OVERLAP. JOINING SECTIONS SHALL NOT BE PLACED IN LOW SPOTS OR IN SUMP LOCATIONS.

SPlice DETAIL
(Wood Posts Shown)

NOTES

1. Install the ends of the high visibility silt fence to point slightly upslope to prevent sediment from flowing around the ends of the fence.

2. Perform maintenance in accordance with Standard Specifications 8-01.3(9)A and 8-01.3(15).

3. Splices shall never be placed in low spots or sump locations. If splices are located in low or sump areas, the fence may need to be reinstalled unless the Project Engineer approves the installation.

4. Install silt fencing parallel to mapped contour lines.
PLACE SAND BAGS AS REQUIRED AROUND CULVERT TO PROVIDE SUPPORT FOR SILT FENCE.

SILT FENCE - SEE STD. PLAN I-30.10

CULVERT, BOX CULVERT, OR PIPE ARCH - END TREATMENT VARIES

GEOTEXTILE FOR TEMPORARY SILT FENCE - SEE STD. SPEC. 9-33.2(1), TABLE 6

POST - SEE STD. SPEC. 8-01.3(9A)

EMBED POSTS INTO SAND BAGS AS REQUIRED

FLOW

EDGE OF GEOTEXTILE

SECTION A

COMPOST N/F/M - SEE STD. PLAN I-40.12

CULVERT, BOX CULVERT, OR PIPE ARCH - END TREATMENT VARIES

NOTE
Perfor maintenance in accordance with Standard Specification 8-01.3(9A) and 8-01.3(15).

EROSION CONTROL AT CULVERT ENDS
STANDARD PLAN I-30.20-00
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Washington State Department of Transportation
Wattle shall be installed along contours. Installation shall be in accordance with Standard Specification 8-01.3(10).

2. Securely knot each end of Wattle. Overlap adjacent Wattle ends 12" behind one another and securely tie together.

3. Compact excavated soil and trenches to prevent undercutting. Additional staking may be necessary to prevent undercutting.

4. Install Wattle perpendicular to flow along contours.

5. Wattles shall be inspected regularly, and immediately after a rainfall produces runoff, to ensure they remain thoroughly entrenched and in contact with the soil.

6. Perform maintenance in accordance with Standard Specification 8-01.3(15).

7. Refer to Standard Specification 8-01.3(16) for removal.

**Wattle Spacing Table (Typ.):**

<table>
<thead>
<tr>
<th>SLOPE</th>
<th>MAXIMUM SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1H : 1V</td>
<td>12'-0&quot;</td>
</tr>
<tr>
<td>2H : 1V</td>
<td>20'-0&quot;</td>
</tr>
<tr>
<td>3H : 1V</td>
<td>30'-0&quot;</td>
</tr>
<tr>
<td>4H : 1V</td>
<td>40'-0&quot;</td>
</tr>
</tbody>
</table>

**Plan View:**

- **Allowable Alternative Tie-Down Method**
- **Contour Line (Typ.)**
- **Stagger Overlaps (Typ.)**
- **Angle Terminal End Uphill 24° to 48° to Prevent Flow Around Wattle (Typ.)**
- **Trench - See Note 1**
- **2" x 2" x 24" Untreated Wooden Stake (Typ.)**
- **Wattle**
- **Area Available for Sediment Trapping (Typ.)**
- **Spacing Varies - See Wattle Spacing Table (Typ.)**
- **Trench - See Note 1**
- **Wattle (Typ.) - See Detail**

**Section A:**

Wattle Installation on Slope

**Standard Plan 1-30.30-01**

Sheets 1 of 1 Sheet

Washington State Department of Transportation

State of Washington
Registered Landscape Architect

License No. 850

Date: 6/6/2013

Wattle Installation on Slope

2. Securely knot each end of Compost Sock. Overlap adjacent Compost Sock ends 12" behind one another and securely tie together.

3. Compost to be dispersed on site as determined by the Engineer, when vegetation covers the surface.

4. If Erosion Control Blanket is specified, place Compost Sock on top of blanket. See Standard Plan 1-60.10.

5. Install Compost Sock perpendicular to flow along contours.

6. Remove sediment from the up slope side of the Compost Sock, when accumulation has reached 1/2 of the effective height of the Compost Sock.

7. Perform maintenance in accordance with Standard Specification 8-01.3(15).

8. Refer to Standard Specification 8-01.3(16) for removal.

Notes:

- 8" Diameter Compost Sock shall be in accordance with Standard Specification 9-14.5(6).
- Securely knot each end of Compost Sock. Overlap adjacent Compost Sock ends 12" behind one another and securely tie together.
- Compost to be dispersed on site as determined by the Engineer, when vegetation covers the surface.
- If Erosion Control Blanket is specified, place Compost Sock on top of blanket. See Standard Plan 1-60.10.
- Install Compost Sock perpendicular to flow along contours.
- Remove sediment from the up slope side of the Compost Sock, when accumulation has reached 1/2 of the effective height of the Compost Sock.
- Perform maintenance in accordance with Standard Specification 8-01.3(15).
- Refer to Standard Specification 8-01.3(16) for removal.

**Compost Sock**

- **Standard Plan** 1-30.40-01
- **Sheet 1 of 1 Sheet**

**ISOMETRIC VIEW**

- **COMPOST SOCK DETAIL**
- **CATCH BASIN INSTALLATION**

**8" DIAMETER COMPOST SOCK SPACING TABLE**

<table>
<thead>
<tr>
<th>SLOPE</th>
<th>MAXIMUM SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1H: 1V</td>
<td>12 - 0&quot;</td>
</tr>
<tr>
<td>2H: 1V</td>
<td>20 - 0&quot;</td>
</tr>
<tr>
<td>3H: 1V</td>
<td>30 - 0&quot;</td>
</tr>
<tr>
<td>4H: 1V</td>
<td>40 - 0&quot;</td>
</tr>
</tbody>
</table>

**STATE OF WASHINGTON**

**REGISTERED LANDSCAPE ARCHITECT**

**SANDRA L. SALSBURY**

**LICENSE NO. 880**

**DATE: 6/10/2013**

**COMPOST SOCK**

**STANDARD PLAN** 1-30.40-01

**SHEET 1 OF 1 SHEET**

**APPROVED FOR PUBLICATION**

Washington State Department of Transportation
NOTES

1. Coir logs shall be installed starting at the bottom of the slope and working uphill.
2. Excavated material shall be spread evenly along the uphill slope and compacted by hand tampering or other methods approved by the Engineer.
3. Overlap Coir log ends by 12" (in) to prevent water from moving between logs.
4. Always install Coir log perpendicular to slope along contour lines. Ends shall angle uphill to prevent flow around the Coir log.
5. Use an adequate number of stakes to ensure logs are secure.
6. Coir logs shall be in accordance with Standard Specification Section 9-14.6(7), and be installed in accordance with Standard Specification Section 8-01.36(6)A.
7. Perform maintenance in accordance with Standard Specification Section 8-01.3(15).
Cl...

GEOTEXTILE FOR TEMPORARY SILT FENCE
- SEE STD. SPEC. 9-33.2(1), TABLE 6

COMPACTED NATIVE SOIL
BURIED GEOTEXTELE IN TRENCH

POST (SEE STD. SPEC. 8-01.3(9)A)

GEOTEXTELE FOR TEMPORARY SILT FENCE
- SEE STD. SPEC. 9-33.2(1), TABLE 6

GRATE

FLOW

SECTION A

INLET

ISOMETRIC VIEW
(FULL FENCE NOT SHOWN FOR ILLUSTRATIVE PURPOSES)

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

ATTACH WOOD OR METAL CROSS BRACES TO STABILIZE WOOD

NOTES
1. Prefabricated units may be used in lieu of the design shown on this plan upon approval of the Engineer.
2. Structure shall be constructed such that geotextile material shall be fastened to posts creating a 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).
NOTES

1. Size the Below Inlet Grate Device (BIGD) for the storm water structure it will service.

2. The BIGD shall have a built-in high-flow relief system (overflow bypass).

3. The retrieval system must allow removal of the BIGD without spilling the collected material.

4. Perform maintenance in accordance with Standard Specification 8-01.3(15).
**TYPICAL CHANNEL SECTION**

**BIODEGRADABLE CHECK DAM**

- Space check dams so that points A and B are at the same elevation.
- Effective height varies based on flow.
- Side protection.
- Effective height varies based on flow.

**CHANNEL PROFILE - SECTION A**

**BIODEGRADABLE CHECK DAM**

- Biodegradable Check Dams may need additional or modified staking to prevent undercutting or scouring.

**CHANNEL PROFILE - SECTION B**

**BIODEGRADABLE CHECK DAM**

- Effective height varies based on flow.

**GENERAL NOTES**

1. Check Dams shall meet the requirements of Standard Specifications 8-01.3(6) and 9-14.5(4).

2. In channels, install the sloped ends of the Check Dam a minimum of 8" higher than the spillway to ensure water flows over the dam and not around it.

3. Perform maintenance in accordance with Standard Specification 8-01.3(16).

4. Remove Check Dams in accordance with Standard Specification 8-01.3(16).

**NON-BIODEGRADABLE CHECK DAM**

- Non-Biodegradable Manufactured Check Dam devices approved for use under Standard Specification 9-14.5(4) shall be installed per manufacturer's recommendations and shall perform in accordance with Standard Specification 8-01.3(6).

- Rock Check Dams shall be placed outside of the clear zone or behind traffic barrier.

- To ensure adequate damming time, Rock Check Dams used as sediment control may need to be enhanced with plastic that meets the requirements of Standard Specification 9-14.5(3) or fabric that meets the geotextile requirements of Standard Specification 9-33.2(1), Table 6.

**NOTE:**

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

**CHECK DAMS ON CHANNELS**

**STANDARD PLAN 1-50.20-01**

**SHEET 1 OF 1 SHEET**

**APPROVED FOR PUBLICATION**

**STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT**

**DATE: 6-June 2013**

**WASHINGTON DEPARTMENT OF TRANSPORTATION**

**SANDRA L. SALIBURG**

**LICENSE NO. 860**

**NOTE:**

- The original plan must be accompanied by the printed plan summary and approved for publication. A copy may be obtained upon request.
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 8-01.3(3) and 9-14.5(2).
3. Use manufacturer's requirements. When manufacturer's requirements are not provided, use installation requirements shown on Standard Plans.
4. Additional staples may be required on slopes greater than 3H:1V.

2 Rows of staples 4" apart, staggered, 6" O.C. placed within 6" of blanket edge.

Installation Steps:
1. Prepare smooth slope.
2. Amend soil and seed, as specified.
3. Dig anchor trench. Set aside native soil removed from trench.
4. Secure blanket in anchor trench, staking or stapling blanket as shown.
5. Replace native soil previously removed from trench.
6. Roll blanket down the slope in a controlled manner, taking care to remove excess slack, and taking care not to stretch blanket.
7. Stake or staple blanket as shown so there are no gaps between the blanket and the soil. Staple while unrolling blanket to minimize walking on blanket.

Initial Anchor — Detail

State of Washington
Registered Landscape Architect

Biodegradable Erosion Control Blanket Placement for Slopes
Standard Plan 1-60.10-01

Washington State Department of Transportation
Tamped Native Soil from Pile

Anticipated Water Line

Shingle Splice Blanket must extend 36" above the anticipated water elevation.

Channel Installation - Section A

Erosion Control Blanket

Staple - 18" O.C. max.

Tamped Native Soil

Longitudinal Anchor Detail

Channel Termination - Double Row of Staples Staggered 6" Apart

Initial Anchor - Section B

Erosion Control Blanket

Staple - 6" max. centered

Tamped Native Soil from Pile

Instructions:

1. Prepare smooth slope.
2. Amend soil and seed, as specified.
3. Dig anchor trench. Set aside native soil removed from trench.
4. Secure blanket in anchor trench, staking or stapling blanket as shown.
5. Replace native soil previously removed from trench.
6. Roll blanket parallel to the slope in a controlled manner, taking care to remove excess slack, and taking care not to stretch blanket.
7. Stake or staple blanket as shown so there are no gaps between the blanket and the soil. Staple while unrolling blanket to minimize walking on blanket.

Installation Steps:

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. Install Check Slots per manufacturer's recommendations.
3. See Standard Specification 8-01.2(3) and 8-14.5(2)
4. Use manufacturer's requirements. When manufacturer's requirements are not provided, use installation requirements shown on Standard Plan.
5. Additional staples may be required for high flow exposure.

Washington State Department of Transportation

Biodegradable Erosion Control Blanket Placement for Ditches

Standard Plan 1-60.20-01

Sheet 1 of 1 Sheet

Approved for Publication
OUTFLOW CHANNEL IS CONSTRUCTED BY EXCAVATION

1' (FT) DEPTH OVERFLOW

SEDIMENT TRAP BOTTOM

QUARRY SPALLS - 1' (FT) DEPTH
SEE STANDARD SPECIFICATION SECTION 9-13.16)

PROVIDE GEOTEXTILE FOR SEPARATION -
SEE STANDARD SPECIFICATION
SECTION 9-23

SECTION A

COMPACTED NATIVE MATERIAL
CONSTRUCTED BY EXCAVATION
OR EMBANKMENT

1' (FT) DEPTH OF 3/4" - 1 1/2"
COARSE AGGREGATE FOR
PORTLAND CEMENT CONCRETE -
SEE STANDARD SPECIFICATION
SECTION 9-03.14

OVERFLOW CHANNEL

LIMITS OF QUARRY SPALLS - (TYP.)

QUARRY SPALLS = 1' (FT) DEPTH

DISCHARGE TO STABILIZED
CONVEYANCE, OUTLET, OR
LEVEL SPREADER

PLACE CONSTRUCTION GEOTEXTILE FOR SOIL
STABILIZATION FROM THE EDGE OF THE EXISTING
ROADWAY TO THE CONSTRUCTION ENTRANCE,
OR AS DIRECTED BY THE ENGINEER

AS REQUIRED = 100' (FT) MIN. EXCEPT
MAY BE REDUCED TO 50' (FT) MIN. FOR
SITES WITH LESS THAN ONE ACRE
OF EXPOSED SOIL

3' MIN. (TYP.)

PERMEABLE BALLAST (TYP.) = SEE
STANDARD SPECIFICATION
SECTION 9-03.20

2' MIN.

1' (FT) MIN. DEPTH (TYP.)

EXISTING ROAD

30' MIN. (TYP.)

PROVIDE FULL WIDTH OF INGRESS / EGRESS AREA
15' (FT) MINIMUM

ISOMETRIC VIEW

STABILIZED CONSTRUCTION ENTRANCE
STABILIZED CONSTRUCTION ENTRANCE SHALL MEET THE REQUIREMENTS OF
STANDARD SPECIFICATION SECTION 8-01.37.)

PARTIAL PLAN VIEW OF BERM
SHOWN LARGER FOR CLARITY

COARSE COMPOST

2X

BERM OR PARTIAL OR COMPLETE EXCAVATION

0' - 3' MAX. HT.

GROUND LINE

LONGITUDINAL SECTION

NOTE
PLACE GEOTEXTILE UNDER THE SPILLWAY AND SLOPE SLOPES. PROVIDE A
CONTINUOUS LAYER BETWEEN THE GRAVEL ROCK AND THE NATIVE EARTHEN MATERIAL.

TEMPORARY SEDIMENT TRAP

TEMPORARY SILT FENCE
OR COMPOST SOCK

3' 3'

X = 1' - 0" FOR SLOPES 4H:1V OR FLATTER
X = 1' - 6" FOR SLOPES STEEPER THAN 4H:1V

TYPICAL SECTION
COMPOST BERM DETAIL

WASHINGTON
STATE DEPARTMENT OF TRANSPORTATION
STATE DESIGN ENGINEER
STATE OF WASHINGTON
LICENSE NO. 1422
DATE: 06-21-17

MISCELLANEOUS EROSION CONTROL DETAILS
STANDARD PLAN I-80.10-02

APPROVED FOR PUBLICATION
Carponetti, Jeff
July 15, 2016 2:26 PM
PLAN

SECTION A-A

Conduit reserve area

Face of guardrail

Back of curb

Edge of shoulder

Conduit reserve area

Conduit

J-box

PLAN

ELECTRICAL CONDUIT PLACEMENT

STANDARD PLAN J-10

APPROVED FOR PUBLICATION

HINCTION STATE DEPARTMENT OF TRANSPORTATION

OLYMPIA, WASHINGTON

Contractor State, Department of Transportation

Olympia, Washington
When distance detailed in Typical Foundation Plan is greater than 6' (ft), this conduit end and rebar shall be deleted.

Conduits for service grounding electrodes.

When distance detailed in Typical Foundation Plan is greater than 6' (ft), this conduit end and rebar shall be deleted.
CONCRETE UTILITY REQUIRES MATERIAL #4 REBAR

MAINTENANCE EACH CORNER LOCATION SERVICE (SEE NOTE 18)

SERVICE METER BASE (TYP) = PREFERRED LOCATION WHEN UTILITY REQUIRES METER TO BE MOUNTED ON OUTSIDE OF CABINET

CONDUIT TO ADJACENT JUNCTION BOX (SEE CONTRACT)

WELDED WIRE FABRIC 4 x 4 = W4.0 x W4.0 = SEE STD. SPEC. 9-07.7 (SEE NOTE 20)

JOINT FILLER 3/8" PREMOLD (IN)

CONDUIT LAYOUT FOUNDATION DETAIL

SPARE CONDUIT TO ADJACENT JUNCTION BOX (SEE CONTRACT)

MAINTENANCE PAD

CONDUIT TO ADJACENT JUNCTION BOX (SEE CONTRACT)

GROUND LINE

WELDED WIRE FABRIC (WWF)

CONDUIT TO SERVICE

3/4" CHAMFER (TYP.)

GROUND LINE

FABRIC (WNF)

CONDUIT TO SERVICE

#4 REBAR - 90" WITH 30" (IN) LEGS (2 PLACES)

#4 REBAR - 50" WITH 30" (IN) LEGS (2 PLACES)

#4 HOOP - SEE NOTE 14

#4 HOOP - SEE NOTE 14

GENERATOR ANTI-THEFT TIE-DOWN UNIT

N

WELDED WIRE FABRIC 4 x 4 = W4.0 x W4.0 = SEE STD. SPEC. 9-07.7 (SEE NOTE 20)

18" (IN) x 18" (IN) x 18" (IN) DRAINAGE WELL

GROUND LINE

WELDED WIRE FABRIC (WWF)

CONDUIT TO SERVICE

3/4" CHAMFER (TYP.)

GROUND LINE

FABRIC (WNF)

CONDUIT TO SERVICE

#4 HOOP - SEE NOTE 14

#4 HOOP - SEE NOTE 14

GENERATOR ANTI-THEFT TIE-DOWN UNIT

N

WELDED WIRE FABRIC 4 x 4 = W4.0 x W4.0 = SEE STD. SPEC. 9-07.7 (SEE NOTE 20)

18" (IN) x 18" (IN) x 18" (IN) DRAINAGE WELL

GROUND LINE

FABRIC (WNF)

CONDUIT TO SERVICE

3/4" CHAMFER (TYP.)

GROUND LINE

FABRIC (WNF)

CONDUIT TO SERVICE
--

"""

CONCRETE OR HMA MATERIAL
SLOPE TO DRAIN (TYP.)

--

WITH MEASURE BASE MOUNTED ON INSIDE OF SERVICE CABINET, ALLOW 6" (IN) BETWEEN CABS.
WITH MEASURE BASE MOUNTED ON OUTSIDE OF SERVICE CABINET, ALLOW 30" (IN) FROM FACE OF MEASURE TO ADJACENT CABINET. SEE STANDARD PLAN J-10.32.

---

PLAN VIEW

3/8" (IN) PREMOLDED JOINT FILLER

--

GROUND LINE
CONCRETE OR HMA MATERIAL
SLOPE TO DRAIN (TYP.)

--

TO SERVICE CABINET
Spare CONDUIT TO ADJACENT JUNCTION BOX (SEE CONTRACT)

--

GENERATOR ANTI-THEFT TIE-DOWN UNIT (TYP.)

--

TO SERVICE CABINET
Spare CONDUIT TO ADJACENT JUNCTION BOX (SEE CONTRACT)

--

GENERATOR ANTI-THEFT TIE-DOWN UNIT (TYP.)

---

ELEVATION VIEW

FOUR-CABINET FOUNDATION

(TYPE 332 UNINTERRUPTABLE POWER SUPPLY CABINET, TYPE E SERVICE CABINET, 7.5 KVA TRANSFORMER AND NEMA P44 CONTROLLER CABINET SHOWN)

---

TO SERVICE CABINET
Spare CONDUIT TO ADJACENT JUNCTION BOX (SEE CONTRACT)

---

GENERATOR ANTI-THEFT TIE-DOWN UNIT (TYP.)

---

TO SERVICE CABINET
Spare CONDUIT TO ADJACENT JUNCTION BOX (SEE CONTRACT)

---

GENERATOR ANTI-THEFT TIE-DOWN UNIT (TYP.)

---

PLAN VIEW

3/8" (IN) PREMOLDED JOINT FILLER

---

GROUND LINE
CONCRETE OR HMA MATERIAL
SLOPE TO DRAIN (TYP.)

---

TO SERVICE CABINET
Spare CONDUIT TO ADJACENT JUNCTION BOX (SEE CONTRACT)

---

GENERATOR ANTI-THEFT TIE-DOWN UNIT (TYP.)

---

TO SERVICE CABINET
Spare CONDUIT TO ADJACENT JUNCTION BOX (SEE CONTRACT)

---

GENERATOR ANTI-THEFT TIE-DOWN UNIT (TYP.)

---

ELEVATION VIEW

TWO-CABINET FOUNDATION

(7.5 KVA TRANSFORMER AND TYPE 332 CONTROLLER CABINET SHOWN)

---

TO SERVICE CABINET
Spare CONDUIT TO ADJACENT JUNCTION BOX (SEE CONTRACT)

---

GENERATOR ANTI-THEFT TIE-DOWN UNIT (TYP.)

---

TO SERVICE CABINET
Spare CONDUIT TO ADJACENT JUNCTION BOX (SEE CONTRACT)

---

GENERATOR ANTI-THEFT TIE-DOWN UNIT (TYP.)

---
CONTROLLER CABINET FOUNDATION NOTES

1. Slope conduit reserve area floor 1/4" (in) per 1' (ft) to the sump in the center.
2. All other dimensions shall be approved by the Engineer.
3. Provide 2" (in) clearance between conduit and edge of foundation well for cable slack.
4. For the rest of the foundation, see Standard Plan J-10.20 for details.
REINFORCING STEEL BENDING DIAGRAM

SEE STD. SPEC. 9-07.1C FOR BENDING DIAM.

ALL DIMENSIONS ARE OUT TO OUT

VARIES

ANCHOR BOLT

SEE NOTE 8

PLAN VIEW

CABINETS SHOWN FOR DISPLAY PURPOSES ONLY

(SEE CONTRACT FOR CABINET LAYOUT)

1. Drive ground rods before placing concrete. Move rod(s) and drain tile(s) with cover(s) as required to achieve full ground penetration. Maintain a 6'-0" minimum clearance between ground rods as detailed on Standard Plan J-60.06.
2. Limits of pigmented sealer. Typical for all retaining walls.
3. Delete conduit and conductor when fence is not present.

NOTES

1. Contractor shall orient the maintenance pad to align with the direction of natural grade as shown. Obtain Engineer's approval of maintenance pad orientation prior to proceeding with construction.
2. The maintenance pad and retaining walls have been designed to meet the requirements of the AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012.
3. Concrete for walls and bases shall be class 4000.
4. Height of wall varies to match slope of existing grade. Contractor shall field-determine wall height and each maintenance pad location and obtain approval from the Engineer prior to proceeding with construction.
5. 3/4" (in) chamfer for all exposed corners.
6. For grounding details not shown, see Standard Plan J-60.05.
7. For cabinet and conduit details not shown, see Standard Plan J-10.10.
8. The cabinets shall be attached to the foundation with 4 each: 1 1/2" (in) x 12" (in) x 2" (in) 4" (in) anchor bolts (see Detail on this Sheet), washers, and nuts conforming to Standard Specification 9-06.5(1) and galvanized after fabrication in accordance with AASHTO M 232. Locate anchor bolts per cabinet manufacturer. Stainless steel epoxy anchors may be used as an alternative, and shall be 1/2" (in) diameter x 9" (in), or 5/8" (in) diameter x 9" (in).

All threaded rod (conforming to ASTM F593), washers (conforming to ASTM A240), and nuts (conforming to ASTM F594), shall be Type 304 stainless steel. Bolts shall extend 1 1/2" (in) min to 2" (in) max above the concrete pad.

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

CARLTON P. ZELDEHAGEN, P.E.
STATE DESIGN ENGINEER

APPROVED FOR PUBLICATION
Bainbridge, Wash. 2014. 12:09 PM

STATE OF WASHINGTON

CABINET ENCLOSURE ON SLOPE

STANDARD PLAN J-10.15-01

1 SHEET OF 1 SHEET

DRAWN BY COLBY FLETCHER
52' (FT) CLASS 5 TREATED TIMBER POLE

PHOTOELECTRIC CONTROL
WHERE REQUIRED — SEE DETAILS
JUNCTION BOX
STAINLESS STEEL TWO-HOLE CONDUIT STRAP – ATTACH TO POLE WITH TWO 1/4" (IN) DAM, EX 2" (IN) LONG HOT-DIP GALVANIZED LAG SCREWS
LIQUIDTIGHT FLEXIBLE METAL CONDUIT – 2" (FT) MIN. TO 3" (FT) MAX. LENGTH – STRAP TO POLE
TYPE C CONDUIT BODY WITH COVER AND GASKET
WEATHERHEAD – SIZE AS REQUIRED – LOCATE AS SPECIFIED BY UTILITY

BEND CONDUIT TO ALLOW REMOVAL OF WEATHERHEAD – STRAP BELOW BEND
WEATHERHEAD – SEE CONTRACT
TO LUMINAIRE OR SERVED DEVICE – SEE CONTRACT
BEND CONDUIT TO POLE AND STRAP WITHIN 1' (FT) ABOVE THE METER BASE
METER BASE (WHERE REQUIRED) – MOUNT PER THE MANUFACTURER’S RECOMMENDATIONS

CONDUIT AND CONDUCTORS – SIZE TO UTILITY REQUIREMENTS
CONDUIT STRAP (TYP.)
(SEE NOTE 2)
1" (IN) CONDUIT – THREE #12 AWG
BEND CONDUIT TO POLE AND STRAP WITHIN 1’ (FT) ABOVE THE SERVICE CABINET (TYP.)
3" (IN) TO 6" (IN) STRAIGHT OR OFFSET NIPPLE
TYPE LB CONDUIT BODY WITH COVER AND GASKET (TYP.)
SERVICE CABINET – SEE SERVICE CABINET MOUNTING DETAIL
BEND CONDUIT TO POLE AND STRAP WITHIN 1’ (FT) BELOW THE SERVICE CABINET

GROUND LINE
(SEE NOTE 5)
CONDUIT TO LUMINAIRE OR SERVED DEVICE – SIZE PER CONTRACT

NOTE

1. Metering arrangements may vary with different serving utilities. The Contractor shall verify the requirements of the utility prior to installing the service equipment.
2. All service pole conduits shall be secured to the pole with two-hole conduit straps spaced at 5' (ft) maximum centers. See Standard Plans J-60.13 and J-60.14 for steel channel support and wood pole mounting details. Where required by the Utility, an alternative-use hot-dip galvanized standoff bracket may be used. For details, see ALTERNATE STANDOFF BRACKET DETAIL on Sheet 2.
3. All risers and service equipment shall be installed on side of pole that is away from traffic.
4. Where required by the serving utility, service breakers shall be installed above meter socket in a separate rain-tight enclosure.
5. See Standard Plan J-60.05 for grounding details.
6. See Breaker Schedule in Contract for breaker and contactor sizes.

50' (FT) CLASS 5 TREATED TIMBER POLE

SERVICE CABINET MOUNTING DETAILS

1/2" (IN) DIAM. X 6" (IN) LONG HOT-DIP GALVANIZED LAG BOLT WITH LOCK WASHER

1 5/8" (IN) X 1 5/8" (IN) SLOTTED STEEL CHANNEL

6 x 8.2 LB/FT CHANNEL HOT-DIP GALVANIZED PER AASHTO M 111

1 5/8" (IN) X 1 5/8" (IN)
SLOTTED STEEL CHANNEL (TYP.)

3/8" (IN) – 16 NC X 1" (IN) HEX HEAD BOLT WITH 5/8" (IN) HEX HEAD NUT AND TWO WASHERS (TYP.) – FOR MOUNTING SLOTTED STEEL CHANNEL TO 6 x 8.2 LB/FT CHANNEL

PHOTOELECTRIC CONTROL DETAILS

PHOTOELECTRIC CONTROL ENCLOSURE – 6" (IN) X 6" (IN) X 4" (IN) – SEE STANDARD PLAN J-10.20 FOR MOUNTING DETAILS
PHOTOELECTRIC CONTROL UNIT – ORIENT TO NORTH SKY
JUNCTION BOX – 6" (IN) X 6" (IN) X 4" (IN)
LIQUIDTIGHT THREADLESS COUPLINGS (TYP.)
LIQUIDTIGHT FLEXIBLE METAL CONDUIT

6 x 8.2 LB/FT CHANNEL HOT-DIP GALVANIZED PER AASHTO M 111 – 8" (IN) MIN. LENGTH – SEE STANDARD PLAN J-10.17 FOR JUNCTION BOX MOUNTING DETAILS

TYPE C CONDUIT BODY WITH COVER AND GASKET
1" (IN) CONDUIT – THREE #12 AWG

SECTION 1

DATE: May 28, 2015 10:06 AM

STANDARD PLAN J-10.16-00
(0 - 60 AMP TYPE 120 VOLT SINGLE PHASE)

STANDARD PLAN J-10.16-00 SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION
March 7, 2015 4:16 PM

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

DRAWN BY: COLBY FLETCHER
1. Metering arrangements may vary with different serving utilities. The Contractor shall verify the requirements of the utility prior to installing the service equipment.

2. All service pole conduits shall be secured to the pole with two-hole conduit straps spaced at 5' (15) maximum centers. See Standard Plans J-60.13 and J-60.14 for steel channel support and mounting details. Where required by the Utility, an alternative-use hot-dip galvanized standoff bracket may be used. See Standard Plan J-10.16 for ALTERNATE STANDOFF BRACKET DETAIL.

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

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

5. See Standard Plan J-60.05 for grounding details.

6. See Breaker Schedule in Contract for breaker and contactor sizes.


NOTES (CONTINUED)

10. Hinges shall have stainless steel or brass pins.
11. Cabinet shall be rated NEMA 3R and shall include two rain-tight vents.
13. The following equipment within the service enclosure shall have an appropriately engraved phenolic name plate attached with screws or rivets:
   * Key Numbers 2, 3, 4, 7, 8, and 9.
   * Key Number 4 name plate shall read as follows: "PHOTOCELL BYPASS TEST ON" AND "PHOTOCELL TEST OFF - AUTOMATIC." See service cabinet detail.
14. Metering arrangements vary with serving utilities. The Contractor shall verify the serving utility's requirements prior to fabrication and installation of the service equipment.
15. Dimensions shown are minimum and shall be adjusted to accommodate the various sizes of equipment installed.
16. All buswork shall be high-grade copper and shall equal or exceed the main breaker rating. All breakers shall bolt onto the buswork. Jumping of breakers shall not be allowed. Buswork shall accommodate all future equipment as shown in the Breaker Schedule.
17. The photoelectric control unit shall be centered in the photoelectric control enclosure to permit 360-degree rotation of the photoelectric control unit without removal of the photoelectric control unit or the photoelectric control enclosure.
18. All internal wire runs shall be identified with "T0 - FROM" coded tags labeled with the code letter and/or number shown on the Schedules. Approved PVC or polyethylene wire marking sleeves shall be used.
19. All nuts, bolts, screws, and washers used for mounting the photoelectric control enclosure, conduit body covers, and junction box cover shall be ASTM F693 or A193 Type 304 or Type 316 stainless steel.
20. A 1% tolerance is allowed for all dimensions.
21. Slotted steel channel and mounting hardware components shall be stainless steel. Conduit clamps shall be hot-dip galvanized steel or stainless steel.
22. Install conduit couplings on all conduits.
23. When using alternate door hinge, remove hinge pin prior to welding the hinge to the cabinet and prior to hot-dip galvanizing. After galvanizing, replace pin with a brass pin or solder in place. See Standard Plan J-10.20 for alternate door hinge details.
24. The photoelectric control enclosure shall be fabricated from 5/8" (in) expanded sheet metal with welded seams and mounting flanges and shall be hot-dip galvanized after fabrication. Type 5052 - H32 aluminum with 5/8" (in) x 5/8" (in) expanded sheet metal may be used as an alternative material. See Standard Plan J-10.20 for enclosure mounting details.
25. See Contract for Breaker Schedule.
NOTES (CONTINUED)

10. Hinges shall have stainless steel or brass pins.
11. Cabinet shall be rated NEMA 3R and shall include two rain-tight vents.
12. The metering equipment door shall be pad-lockable. Each door shall be gasketed. See Standard Plan J-10.20 for door hinge details. Concealed heavy-duty stainless steel lift-off hinges are allowed as an alternative. Upper left door shall have three hinges, lower left door shall have two hinges, and right door shall have three hinges. All doors shall have a two-position door stop assembly.
13. The following equipment within the service enclosure shall have an appropriately engraved phenolic name plate attached with screws or rivets.
   Key Numbers 2, 3, 4, 5, 7, 8, and 9.
   Key Number 4 name plate shall read as follows: "PHOTOCELL BYPASS TEST ON" AND "PHOTOCELL TEST OFF - AUTOMATIC."
   See service cabinet detail.
14. Dimensions shown are minimum and shall be adjusted to accommodate the various sizes of equipment installed.
15. All buswork shall be high-grade copper and shall equal or exceed the main breaker rating. All breakers shall bolt on to the buswork. Jumping of breakers shall not be allowed. Buswork shall accommodate all future equipment as shown in the Breaker Schedule.
16. The photocell control unit shall be centered in the photocell control enclosure to permit 360 degree rotation of the photocell control unit without removal of the photocell control unit or the photocell control enclosure.
17. All internal wire runs shall be identified with "TO - FROM" coded tags labeled with the code letters and/or numbers shown on the Schedules. Approved PVC or polyethylene wire marking sleeves shall be used.
18. All nuts, bolts, screws, and washers used for mounting the photocell control enclosure, conduit body covers, and junction box cover shall be ASTM F963 or A183 Type 304 or Type 316 stainless steel.
19. A 1% tolerance is allowed for all dimensions.
20. See Contract for Breaker Schedule.
21. Install conduit couplings on all conduits.
22. The photocell control enclosure shall be fabricated from 5/8" (in) expanded steel mesh with welded seams and mounting flanges and shall be hot-dip galvanized after fabrication. Type 5052 - H32 aluminum with 5/8" (in) x 5/8" (in) expanded steel mesh may be used as an alternative material. See Standard Plan J-10.20 for enclosure mounting details.
23. Slotted steel channel and mounting hardware components shall be stainless steel. Conduit clamps shall be hot-dip galvanized steel or stainless steel.
24. When using alternate door hinge, remove hinge pin prior to welding the hinge to the cabinet and prior to hot-dip galvanizing. After galvanizing, replace pin with a brass pin or solder in place. See Standard Plan J-10.20 for alternate door hinge details.

KEY
1. METER BASE PER SERVING UTILITY REQUIREMENTS – AS A MINIMUM, THE METER BASE SHALL BE OF CAST IRON MATERIAL WITH FACTORY-INSTALLED TEST BYPASS FACILITY THAT MEETS THE REQUIREMENTS OF NUMEROUS DRAWING 304 – METER BASE ENCLOSURE SHALL BE FABRICATED FROM TYPE 304 STAINLESS STEEL.
2. MAIN BREAKER (DPST - SIZE PER BREAKER SCHEDULE)
3. PHOTOCYCLE CONTROL BREAKER (SPDT - 15 AMP – 120/240 VOLT)
5. PHOTOCYCLE CONTROL UNIT – SEE STANDARD SPECIFICATION 9-29.11(2)
6. BRANCH BREAKER (DPST - SIZE PER BREAKER SCHEDULE)
7. SPARE BREAKER – SEE BREAKER SCHEDULE (DPST – 20 AMP – 240/480 VOLT)
8. CONTACTOR – SEE BREAKER SCHEDULE
9. RECEPTACLE BREAKER (SPDT – 20 AMP – 120/240 VOLT)
10. RECEPTACLE – GROUNDED (GFCI – 20 AMP – 125 VOLT)
11. ISOLATED NEUTRAL BUSS – 14 LUG COPPER
12. MOUNTING HOLE – SEE STANDARD PLAN J-10.20 FOR MOUNTING DETAILS
13. 1/4" (IN) DIAMETER DRILL HOLE – DRILL BEFORE GALVANIZING
14. HINGED DEAD FRONT WITH 1/4" TURN FASTENERS OR SLIDE LATCH – DEAD FRONT PANEL BOLTS SHALL NOT EXTEND INTO VERTICAL LIMITS OF THE BREAKER ARRAYS
15. CABINET MAIN BONDING JUMPER ASSEMBLY – BUSS SHALL BE 12 LUG TAPPED COPPER – SEE STANDARD PLAN J-10.20 FOR CABINET MAIN BONDING JUMPER ASSEMBLY DETAILS
16. METAL WIRING DIAMETER HOLDER
17. REMOVABLE SUB-PANEL FOR EQUIPMENT
18. SCREENED VENTS – TWO REQUIRED (ONE EACH SIDE) – LOUVERED PLATES
19. TRANSFORMER BREAKER (DPST – 15 AMP – 480 VOLT)
20. DRY TRANSFORMER (480/120 VOLT) – 3 KVA – COPPER BUSSDED AND COPPER WOUND
21. 12-CIRCUIT PANEL BOARD – MINIMUM SIZE WITH MAIN BREAKER
22. LABEL CABINET WITH BUSSWORK RATING
23. 6-CIRCUIT PANEL BOARD – MINIMUM SIZE
24. UTILITY DISCONNECT Switch ENCLOSURE WITH COVER – OMIT IF UTILITY DOES NOT REQUIRE THE DISCONNECT SWITCH

DRAWN BY: COLBY FLETCHER

SERVIC CABINET TYPE C
(0 - 60 AMP TYPE 240/480 VOLT SINGLE PHASE)
STANDARD PLAN J-10.16-00

APPROVED FOR PUBLICATION
Mabutch, Pasc. Jan 3 2015 4:20 PM

Washington State Department of Transportation
NOTES (200 AMP TYPE 120/240 1e SERVICE CABINET)

2. Hinges shall have stainless steel or brass pins.
3. Cabinets shall be rated NEMA 3R and shall include two rain-tight vents.
4. Metering equipment door shall be pad-lockable. Each door shall be gasketed. Install Best CX Construction Core on right side door. See Door Hinge Detail.
5. The following equipment within the service enclosure shall have an appropriately engraved phenolic name plate attached with screws or rivets:
   Key Numbers 2, 3, 4, 6, 7, 8, 9, 10, 11, 12
   Key Number 1 name plate shall read: “PHOTOCELL BYPASS TEST ON” and “PHOTOCELL TEST OFF-AUTOMATIC.” See Service Cabinet Detail.
6. Metering arrangements vary with different serving Utilities. The Utility may require meter base mounting in the enclosure, on the side, or on the back of the enclosure. The Utility may require the dimension between the door and the front of the safety socket box to be less than the 11” (in) shown in the Left Side - Safety Socket Box Mounting Detail. The Contractor shall verify the utility’s requirements prior to fabrication and installation of the service equipment.
7. Dimensions shown are minimum and shall be adjusted to accommodate the various sizes of equipment installed.
8. All buswork shall be high-grade copper and shall equal or exceed the main breaker rating. All breakers shall bolt onto the buswork. Jumping of breakers shall not be allowed. Buswork shall accommodate all future equipment as shown in the breaker schedule.
9. The photocell unit shall be centered in the photocell enclosure to permit 360 degree rotation of the photocell without removal of the photocell unit or the photocell enclosure.
10. All internal wire runs shall be identified with “TO - FROM” coded tags labeled with the code letters and/or numbers shown on the schedules. Approved PVC or polyolefin marking sleeves shall be used.
11. All nuts, bolts, and washers used for mounting the photocell enclosure shall be stainless steel.
12. A 1% tolerance is allowed for all dimensions.
13. Slotted steel channel and mounting hardware components shall be stainless steel. Conduit clamps shall be hot-dipped galvanized steel or stainless steel.
14. The meter base portion of this service was designed to meet metering portion of EUROCER Drawing 309 requirements.
15. When using alternate door hinge:
   Remove hinge pin prior to welding hinge to cabinet and prior to hot-dip galvanizing. After galvanizing, replace pin with brass pin and solder in place.
16. Verify the service utility stand-off dimension. Adjust the removable panel to the measurement provided by the Utility Company. After adjustment, cut off all-thread bolts so that no less than two and no more than three full threads extend past the face of the nuts.
17. As an alternate to the bolted or field welded strut mount supports, 1 5/8" (in) x 3 1/4" (in) 12-gage continuous slotted steel channel or factory welded 1 5/8" (in) x 1 5/8" (in) 12-gage back to back continuous slotted steel channel may be used. Three pairs required.

LEFT SIDE - SAFETY SOCKET BOX MOUNTING DETAIL

12-GAGE - MATERIAL SHALL BE THE SAME AS CABINET MATERIAL

CABINET MAIN BONDING JUMPER ASSEMBLY

ELEVATION VIEW

SECTION B

SIDE VIEW

DRAWN BY: COLBY FLETCHER
**Service Cabinet Type B**

**120/240 Single Phase**

**Standard Plan J-10.20-01**

---

### Conduit Couplings

- **Anchor Bolt (Typ.):** 4 bars each corner
- **Bases:** Each corner
- **Hoops:** 4

---

### Welded Wire Fabric

- 4 x 4 = W4.0 = W4.0
- Placed in center of pad = See Std. Spec. 9-07.7

---

### Strut Mount Support Details

- **(See Note 11)**

---

### Spacing Table

<table>
<thead>
<tr>
<th>Cabinet Type</th>
<th>&quot;X&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>332 or 334 Type Cabinet</td>
<td>20&quot;</td>
</tr>
<tr>
<td>332D or 334D Type Cabinet</td>
<td>20&quot;</td>
</tr>
<tr>
<td>NEMA P44 Type Cabinet</td>
<td>46 1/2&quot;</td>
</tr>
</tbody>
</table>

*For a special design cabinet that is not listed on Std. Plan J-10.10, "X" = Width of Door Open to 180° plus 2 inches.

---

**Notes:**

1. Drive ground rods before placing concrete – move rod(s) and drain tile(s) with covers as required to achieve full ground penetration – maintain at 6' (ft) minimum clearance between ground rods as detailed on Standard Plan J-60.05.
2. All RMC conductors penetrating cabinet shall be terminated with grounding end bushing and bonded to the cabinet grounding bus.
3. 4" (in) diam. x 1/2" (in) deep slump. Slope foundation toward sump = 3/8" (in) diam. Polyethylene or copper drain pipe = slope to drain outside foundation = locate drain away from access doors.
4. To service ground – per standard plan J-40.05.
5. Install conduit couplings on all conductors = top of conduit couplings shall be flush with top of concrete – if PVC couplings are specified, the conduit stubs and end bell bushings shall not be glued to the coupling.
service cabinet inside right-of-way

install foundation as slab section unless identified for construction in fence line n contract plans

service cabinet within right-of-way

for conduits not shown, drain tile for grounding, drain tiles, reinforcing steel, etc. omitted for clarity, see standard plan J-10.10 for details.

notes
1. metering arrangements vary with different serving utilities. the utility may require meter base mounting in the enclosure, on the side, or on the back of the enclosure. the utility may require the dimension between the door and the front of the safety socket box to be less than the 11" shown in the left side safety socket box mounting detail, see standard plan J-3b. the contractor shall verify the serving utility's requirements prior to fabrication or installing the service equipment.
2. the requirement for a disconnect switch ahead of the meter varies with different serving utilities. the contractor shall verify the serving utility's requirements prior to fabrication and installing the service equipment.
3. see standard specifications 9-28.24, service cabinets.
4. hinges shall have stainless steel or brass pins.
5. cabinets shall be rated nema 3r and shall include two rain tight vents.
6. metering equipment doors shall be pad lockable. each door shall be gasketed. install best construction core on bottom left and right doors. see door hinge detail, standard plan J-3b. concealed heavy duty stainless steel lift off hinges are allowed as an alternative. upper left door shall have 3 hinges, lower left door shall have 2 hinges, and right door shall have 3 hinges. all doors shall have a two position door stop assembly.
7. the following equipment within the service enclosure shall have an appropriately enameled phenolic name plate attached with screws or rivets: key number 2, 3, 4, 5, 7, 8, 9, 10, 12, 21 and 24. key number 4 name plate shall read: "photocell bypass test on" and "photocell test off-automatic." see service cabinet detail.
8. the dimensions shown are minimum and shall be adjusted to accommodate the various sizes of equipment installed.
9. all buswork shall be high grade copper and shall equal or exceed the main breaker rating. all breakers shall bolt onto the buswork. jumpers of breakers shall not be allowed. buswork shall accommodate all future equipment as shown in the breaker schedule.
10. the photocell unit shall be connected to the photocell enclosure to permit 360 degree rotation of the photocell without removal of the photocell unit or the photocell enclosure.
11. all internal wire runs shall be identified with "to-from" coded tags labeled with the code letter(s) and/or numbers shown on the schedules. approved pvc or polyolefin wire marking sleeves shall be used.
12. all nuts, bolts, and washers used for mounting photocell enclosure shall be stainless steel.
13. a 1% tolerance is allowed for all dimensions.
14. see plans for breaker schedule.
15. install conduit couplings on all conduits. place couplings flush with top of concrete foundation.
16. seal cabinet to foundation with a 1/2" bead of silicone. apply silicone to dry surface only.
17. the meter base portion of this service was designed to meet metering portion of eusear drawing 009 requirements.

5-21-15

service cabinet type e
(0-200 amp type 240/480 single phase
standard plan j-10.22-00

service cabinet with right-of-way fence

for conduits not shown, drain tile for grounding, drain tiles, reinforcing steel, etc. omitted for clarity, see standard plan j-10.10 for details.
KEY

1. Meter fuse per serving utility requirements. As a minimum, the meter base shall be safety socket box with factory installed test bypass facility that meets the requirements of Eusarc Drawing 356.

2. Main Breaker (see Breaker Schedule).


4. Test with (SPDT snap action, positive close 15 AMP - 120/277 volt "T" rated).


6. Branch Breaker (see Breaker Schedule).

7. Signal Transformer Breaker (see Breaker Schedule).

8. Contactor (see Breaker Schedule).


11. Neutral Bus, 14 lug copper with stainless steel Allen head screws.

12. Photocell Enclosure - enclosure to be fabricated from 5/8" expanded steel mesh with welded seams and mounting flanges. Hot dip galvanized after fabrication. Type 5052 - H32 aluminum with 5/8" x 5/8" openings equivalent to 5/8" expanded steel mesh may be used as an alternative material. See Photocell Enclosure Mounting details, Standard Plan J-3b.

13. Hinged front facing door with 4" x 4" min. polished wire glass window.

14. Hinged dead front with 1/4 turn fasteners or slide latch.

15. Cabinet Main Bonding Jumper. Buss shall be 4 lug tinned copper.


18. 6" x 6" min. underground feed - service wire-way (left rear corner).

19. Screened Vents. 2 required, 1 each side, louvered plates.


22. Strip Heater (100 watt nominal), with terminal strip cover.

23. Transformer Breaker (SPST 15 AMP - 480 volt).

24. Dry Transformer (480/120 volt) 3 KVA copper bussed and copper wound.

25. Reserved for meter, current transformer and/or disconnect switch as required by the utility.

26. 24 circuit panel board - minimum size with separate main breaker.

27. Label Cabinet with Buss work rating.

28. 6 Circuit Panel Board - minimum size.

29. Molded Case Switch, rating of switch shall equal or exceed main breaker rating. Provide landing lug rated to accept 350 Kcmil conductors. (Omit if utility requires the disconnect switch to be mounted externally, or if the utility does not require the disconnect switch).

30. Molded case switch standoff bracket. (Omit if utility requires the disconnect switch to be mounted externally, or if the utility does not require the disconnect switch).

31. Molded case switch enclosure with cover. (Omit if utility requires the disconnect switch to be mounted externally, or if the utility does not require the disconnect switch).

32. Service Cabinet Details.

33. Wiring Schematic.

34. Foundation Details - see Standard Plan J-10.10.

35. Eusarc Drawing 356.


38. Service Cabinet Type E (6 - 200 Amp Type 240/480 Single Phase)

39. Standard Plan J-10.22-00

40. Sheet 2 of 2 sheets

41. Approved for publication by

42. Joseph B. Slemish, P.E.

43. Washington State Department of Transportation
NOTES


2. Buswork shall be rated for 100 Amps minimum.

3. Transformer size, input voltage, and output voltage shall be as shown in the Contract Plans.


5. Secondary branch breakers may be either single or double pole breakers. Only two double pole breakers may be used.

6. Cabinet anchor bolt pattern is determined by the cabinet manufacturer. All anchor bolts shall either be hot dip galvanized or stainless steel pinch bolts. Bolts shall extend a minimum of 1.5 inches above the concrete pad. See Standard Plan J-10.10 for Foundation details.

7. Transformers 7.5 KVA and larger shall be supplied with two full capacity taps, one at 5%, and one at 10% below normal capacity.

8. Engraved phenolic nameplate shall read "SUPPLIED FROM SERVICE CABINET S77????. See Contract Plans for service cabinet S number. Nameplate shall be attached with screws or rivets.

9. Cabinet shall be oriented such that it opens away from traffic.

10. Available fault current label shall meet the requirements of National Electrical Code Article 110.24.

KEY

1. TRANSFORMER

2. PRIMARY MAIN BREAKER - DPST

3. SECONDARY MAIN BREAKER AND 6 CIRCUIT BREAKER PANEL - SEE BREAKER PANEL DETAIL

4. SECONDARY MAIN BREAKER - DPST: ONE POLE UN-USED FOR 120V ONLY SECONDARY

5. SECONDARY BREAKER(S) - DPST OR DPST (DPST BREAKERS USE TWO POSITIONS)

6. RECEPTACLE BREAKER - SPST 20 AMP

7. ISOLATED NEUTRAL BUSS ~ 12 LUG TINNED COPPER

8. GROUND BUSS ~ 12 LUG COPPER

9. RECEPTACLE (GROUNDED) ~ GFCI 20 AMP

10. ENGRAVED PHENOLIC LABEL PLATE (SEE NOTE B)

11. AVAILABLE FAULT CURRENT LABEL (SEE NOTE 10)

12. UPPER SECTION HINGED DEAD FRONT - ONLY BREAKER AND RECEPTACLE FRONT ACCESSIBLE WHEN CLOSED

13. LOWER SECTION HINGED DEAD FRONT - ONLY MAIN BREAKER ACCESSIBLE WHEN CLOSED

14. ENCLOSED LOW VOLTAGE WIREEWAY

15. SUPPLEMENTAL GROUND ~ CONNECT GROUND BUS TO PAD FOUNDATION REBAR

16. LOW VOLTAGE POWER CONDUIT(S) TO LOADS

17. GROUND ELECTRODE CONDUCT ~ SEE STANDARD PLAN J-40.05, SHEET 3 (SUPPLEMENTAL GROUND)

18. HIGH VOLTAGE INPUT POWER CONDUIT

19. SCREENED VENT LOUVERS ~ MINIMUM 2 REQUIRED (1 EACH SIDE)

20. HIGH VOLTAGE INPUT CONDUIT RESERVE AREA

STANDARD PLAN J-10.25-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Washington State Department of Transportation
1. Cabinet construction shall meet the requirements of Standard Specification Section 9-29.13(10). Aluminum cabinets shall have mill finish.

2. Cabinet construction shall conform to the requirements of Chapter 6, Section 2, of the California Department of Transportation (CalTrans) Transportation Electrical Equipment Specifications (TEES) as currently published, including all errata, with modifications as described in Standard Specification Section 9-29.13(10).

3. The Housing and Cage numbers refer to the designations shown in the TEES. Cabinet Housing #2 (ALT) and Cage #2 (ALT) are the modified versions of Cabinet Housing #2 and Cage #2, respectively, using the shorter vertical dimensions shown. All other dimensions and features are the same.

4. Housing #1B shall always use Cage #1. Housing #2 shall always use Cage #2. Housing #2 (ALT) shall always use Cage #2 (ALT).

5. Cage mounting points are designated by rack units (U), which are numbered starting from the bottom of the cage.

6. Install the following in PANEL A for the applicable cabinet type:
   - Type 331L and 334L Cabinets: Do not install PANEL A.
   - Type 332L Cabinets: Install Generator Transfer Switch.

7. Install the following in PANEL B for the applicable cabinet type:
   - Type 331L Cabinets: Install Generator Transfer Switch when specified in the contract.
   - Type 332L and 334L Cabinets: Install Police Panel.

8. All cabinet locks shall accept Best 6-pin or 7-pin cores, with the exception of the Police Panel. The Police Panel shall use a standard Police Panel lock and keys.
NOTE: DIMENSIONS NOT SHOWN SHALL BE IN ACCORDANCE WITH THE TEES
1. Cabinet construction shall meet the requirements of Standard Specification Section 9-29.13(10). Aluminum cabinets shall have mill finish.

2. Cabinet construction shall conform to the requirements of Chapter 6, Section 2, of the California Department of Transportation (CalTrans) Transportation Electrical Equipment Specifications (TEES) as currently published, including all errata, with modifications as described in Standard Specification Section 9-29.13(10).

3. The Housing and Cage numbers refer to the designations shown in the TEES. Cabinet Housing #1X is a double-width version of Cabinet Housing #1 with overall dimensions as shown.

4. Housing #1X shall always use two of Cage #1 - see Standard Plan J-12.16. Housing #3 shall always use two ITS cages.

5. Cage mounting points are designated by rack units (U), which are numbered starting from the bottom of the cage - see Standard Plan J-12.15.

6. Install the following in PANEL A: Location for the applicable cabinet type:
   - Type 331D and 334D Cabinets: Do not install PANEL A.
   - Type 332D Cabinets: Install Generator Transfer Switches.

7. Install the following in PANEL B: Location for the applicable cabinet type:
   - Type 331D Cabinets: Install Generator Transfer Switch when specified in the contract.
   - Type 332D and 334D Cabinets: Install Police Panel.

8. All cabinet locks shall accept fixed 6-pin or 7-pin cores, with the exception of the Police Panel. The Police Panel shall use a standard Police Panel Lock and Keys.

9. Cage side supports for Cabinet Housing #1X shall be as shown in the TEES for Cabinet Housing #1B. Cage upper and lower center supports shall be as shown here, and installed in the same manner as shown in the TEES for the Cabinet Housing #3 center cage supports.
NOTES
2. Where shown in the plans, install plaque (R10-32P) "PUSH BUTTON FOR 2 SECONDS FOR EXTRA CROSSING TIME" above the Accessible Pedestrian Signal (APS) assembly. Add 14" (in) to post height to accommodate plaque and leave a 2" (in) space between signs.
4. Junction Box serving the Standard shall preferably be located 5' - 0" (10' - 0" Max.) from the Standard.
2. Where shown in the plans, install plaque (R10-32P) "PUSH BUTTON FOR 2 SECONDS FOR EXTRA CROSSING TIME" above the Accessible Pedestrian Signal (APS) assembly. Add 14" (t) to the PPB post height to accommodate plaque and leave a 2" (t) space between signs.
4. Junction Box serving the Standard shall preferably be located 5 - 10" (10" - 0" Max.) from the Standard.
5. Supplemental Grounding Conductor shall be non-insulated #4 AWG stranded copper and shall be clamped to vertical rebar with a connector suitable for use embedded in concrete: Provide 3 - 0" min. slack. Attach to pole grounding stud with a full circle crimp-on connector (crimped with a manufacturer recommended crimper).

ACCESSIBLE PEDESTRIAN PUSHBUTTON WITH CURB BASE
STANDARD PLAN J-20.11-02

REINFORCING STEEL BENDING DIAGRAM

GROUNDING CONNECTION DETAIL
- WELD STUD TO POLE WALL TO MAXIMUM EXTENT POSSIBLE - 1/2" (T) MINIMUM WELD
CONFIGURATIONS VARY AMONG DIFFERENT MANUFACTURERS

4. Junction Box serving the Standard shall preferably be located 5 - 10" (10" - 0" Max.) from the Standard.
5. Supplemental Grounding Conductor shall be non-insulated #4 AWG stranded copper and shall be clamped to vertical rebar with a connector suitable for use embedded in concrete: Provide 3 - 0" min. slack. Attach to pole grounding stud with a full circle crimp-on connector (crimped with a manufacturer recommended crimper).

ACCESSIBLE PEDESTRIAN PUSHBUTTON WITH CURB BASE
STANDARD PLAN J-20.11-02

REINFORCING STEEL BENDING DIAGRAM

GROUNDING CONNECTION DETAIL
- WELD STUD TO POLE WALL TO MAXIMUM EXTENT POSSIBLE - 1/2" (T) MINIMUM WELD
CONFIGURATIONS VARY AMONG DIFFERENT MANUFACTURERS

2. Where shown in the plans, install plaque (R10-32P) "PUSH BUTTON FOR 2 SECONDS FOR EXTRA CROSSING TIME" above the Accessible Pedestrian Signal (APS) assembly. Add 14" (t) to the PPB post height to accommodate plaque and leave a 2" (t) space between signs.
4. Junction Box serving the Standard shall preferably be located 5 - 10" (10" - 0" Max.) from the Standard.
5. Supplemental Grounding Conductor shall be non-insulated #4 AWG stranded copper and shall be clamped to vertical rebar with a connector suitable for use embedded in concrete: Provide 3 - 0" min. slack. Attach to pole grounding stud with a full circle crimp-on connector (crimped with a manufacturer recommended crimper).
NOTES

1. See Standard Specification 9-06.16 for Breakaway Base Connection details. Dimensions for the parts used to assemble the base connections are intentionally not shown. Base connections are patented manufactured products that are in compliance with NCHRP 350 crash test criteria. The Breakaway Base Connection details are only shown on this plan to illustrate how parts are assembled.


4. Where shown in the plans, install plaque (R10-32P) "PUSH BUTTON FOR 2 SECONDS FOR EXTRA CROSSING TIME" above the Accessible Pedestrian Signal (APS) assembly. Add 14" (in) to post height to accommodate plaque and leave a 2" (in) space between signs.

5. Mounting distances vary between manufacturers. See manufacturer's recommendations for mounting information.

6. Junction Box serving the Standard shall preferably be located 5'-0" (10'-0" Max.) from the Standard.

ACCESSIBLE BREAKAWAY PEDESTRIAN PUSHBUTTON (PPB) POST

STANDARD PLAN J-20.15-03

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION

Jun 30 2014 3:11 PM

Real State Design Engineer
NOTES


2. Steel shaft shall be tapered either round or dodecagon (12-sided), 11 gage, 4 1/2" (in) O.D. at slipfitter weld. Taper shall be 0.14" (in) per foot.

3. Welding of structures shall be in accordance with the latest edition of the AWS D1.1 Structural Welding Code - Steel. All butt welds shall be ground flush with base metal.


6. Hand holes shall include a removable, rain-tight cover and gasket, fastened with two stainless steel screws (ASTM 593).

7. Supplemental grounding conductor shall be non-insulated #4 AWG stranded copper and shall be clamped to vertical rebar with a connector suitable for use embedded in concrete. Provide 3'-0" min. slack. Attach to pole grounding stud with a full circle crimp-on connector (crimped with a manufacturer recommended crimper).

8. The junction box serving the standard shall preferably be located 5'-0" (10'-0" max.) from the standard.

9. Where shown in the plans, install plaque (R10 - 32P) "PUSH BUTTON FOR 2 SECONDS FOR EXTRA CROSSING TIME" two inches above the Accessible Pedestrian Signal (APS) Assembly.
2. See Standard Specification 9-29.3 for Cable Conductor requirements.
3. Install heat shrink caps on all spare conductors not terminated on a terminal strip.
4. Supplemental grounding conductor shall be non-insulated #4 AWG stranded copper and shall be clamped to vertical rebar with a connector suitable for use embedded in concrete; provide 3'-0" min. slack. Attach to pole grounding stud with a full circle crimp-on connector (crimped with manufacturer's recommended crimper).
5. Equipment grounding conductor shall attach to grounding stud with a full circle crimp-on connector (crimped with a manufacturer's recommended crimper).
REINFORCING STEEL BENDING DIAGRAM

SEE DETAIL FOR BENDING DIAM.

DIMENSIONS ARE OUT TO OUT

BASE PLATE DETAIL

 SECTION A

SEE DETAILS ABOVE MATCHLINE FOR SQUARE CONCRETE FOUNDATION

MATCHLINE

3/4" (IN) CHAMFER (TYP.)

UNPAVED SURFACE

ELEVATION

ROUND CONCRETE FOUNDATION DETAIL

FIXED BASE

SQUARE CONCRETE FOUNDATION DETAIL

SECTION B

SECTION C

NOTES
1. Clamping bolts shall be tightened to 50 ft-lbs max. torque. After state inspection, turn threads to prevent nut rotation. DO NOT OVERTIGHTEN.
2. The final height of the Anchor Bolts shall be below the top of the slip plate assembly to ensure proper function of the slip base.
3. Supplemental grounding conductor shall be non-insulated #4 AWG stranded copper and shall be clamped to vertical rebar with a connector suitable for use embedded in concrete: Provide 3'-0" min. slack. Attach to pole grounding stud with a full circle crimp-on connector (crimped with a manufacturer recommended crimper).
4. Junction box serving the Standard shall preferably be located 5'-0" (10'-0" Max.) from the Standard.
5. Provide cable tie at wiring entering the junction box (for slip base installations only) - See Detail A, Standard Plan J-28.70.
6. Keeper Plates shall not extend beyond the edges of the pole base plate.

STATE DESIGN ENGINEER

Type PS, Type 1, RM & FB SIGNAL STANDARD FOUNDATION DETAILS

STANDARD PLAN J-21.10-04

SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION

Washington State Department of Transportation
NOTES


2. Steel shaft shall be tapered either round or dodecagon (12 sided), 11 gauge, 4 1/2" O.D. at slipfitter. Taper shall be 0.14 inches per foot.

3. All poles shall be hot dip galvanized per AASHTO M111.

4. Welding of structures shall be in accordance with the latest edition of the AWS D1.1 Structural Welding Code - Steel. All butt welds shall be ground flush with base metal.


6. Pedestrian signal displays mounted on the side of an octagonal (8 sided) traffic signal pole with a pole attachment angle other than 0°, 45°, 90°, 135°, 160°, 225°, 270°, or 315° shall utilize:
   - Type A mounting when two pedestrian heads are installed on the same signal pole.
   - Type B mounting when only one pedestrian signal head is mounted on a signal pole.

7. Junction Box serving the Standard shall preferably be located 5'-0" (10'-0" Max.) from the Standard.

CONCRETE FOUNDATION - SEE NOTE 1

ISOMETRIC VIEW

TYPE 1 SIGNAL STANDARD DETAILS

STANDARD PLAN J-21.15-01
FLASHING BEACON

PLACE BEAD OF SILICONE ON TOP OF SERRATED AREA

MOUNTING BRACKET AND STEEL STRAP (TYP.) - SEE STANDARD PLAN G-24.10

SIGN BRACE - SEE STANDARD PLAN G-50.10

TOP OF POLE

SERRATED OR FLANGED ELBOW

ORNAMENTAL CAP WITH 2-WAY FLASHER

NEOPRENE GASKET AND LOCKNUT

TOP OF POLE


NOTE 2. All poles shall be hot dip galvanized per AASHTO M111.

NOTE 3. Welding of structures shall be in accordance with the latest edition of the AWS D1.1 Structural Welding Code - Steel. All butt welds shall be ground flush with base metal.

NOTE 4. Visor shall be 8" Polycarbonate, fully enclosed circle at bottom to reduce glare on sign. Display shall be of appropriate color needed.


NOTE 6. Junction Box serving the Standard shall preferably be located 5'-0" (10'-0" Max.) from the Standard.

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

ARCHITECT: JOSEPH

DRAFTSMAN: J. CURTIS

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

7/16/13

FLASHER BEACON TYPE 1 SIGNAL

STANDARD DETAILS

STANDARD PLAN J-21.16-01

SHEET 1 OF 1 SHEET

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
FITTING HARDWARE - SEE ALTERNATING FLASHING BEACON DETAIL ON STANDARD PLAN J-21.16

DETAIL A

FLASHING BEACON WIRING
ALTERNATING FLASH WIRING SHOWN

2C (SH) B&W CABLE - FROM FOUNDATION WIRING

GROUNDING STUD WITH NUT - SEE STANDARD PLAN J-30.22 FOR GROUND CONNECTION DETAILS

LEVELING NUT (TYP.)

EQUIPMENT GROUNDING CONDUCTOR

CLAMP CONDUCTOR TO STEEL REINFORCING WITH USTED CONNECTOR SUITABLE FOR USE EMBEDDED IN CONCRETE

INSTALL UNFUSED QUICK DISCONNECT FOR W CONDUCTOR, AND FUSED FOR B CONDUCTOR - PULL DOWN TIGHT TO CONDUIT

CONDUIT COUPLING - INSTALL FLUSH WITH TOP OF FOUNDATION (DO NOT GLUE PVC STUBOUT)

DETAIL C

FOUNDATION WIRING
FIXED BASE SHOWN

PERSPECTIVE VIEW
FLASHING BEACON TYPE 1
SINGLE FLASH BEACON SHOWN

PERSPECTIVE VIEW
FLASHING BEACON TYPE 1
ALTERNATING FLASH BEACON SHOWN

NOTES

1. See Standard Specification 9-29.3 for Cable Conductor requirements.
3. Supplemental Grounding Conductor shall be non-insulated #4 AWG stranded copper, provide 3 - 0' min. slack. Clamp to vertical steel reinforcing bar with listed connector suitable for use embedded in concrete.
5. Provide Cable Tie at wiring entering the Junction Box (for Slip Base installations only) - See Detail A, Standard Plan J-28.70.

COLOR CODE USE
B POWER
W NEUTRAL
R FLASHER 1
Bu FLASHER 2
NOTES
1. See Standard Specification 9-29.3 for Cable Conductor requirements.
3. Supplemental Grounding Conductor shall be non-insulated #4 AWG stranded copper, provide 3" - 5" min. slack. Clamp to steel reinforcing bar with connector suitable for use embedded in concrete.
4. Heat shrink cap all spare conductors not terminated on a terminal strip.
5. When a Pedestrian Push Button is specified in contract plans, see Standard Plan J-20.20 for details.
6. Provide Cable Tie at wiring entering the Junction Box (for Slip Base installations only) - See Detail A, Standard Plan J-28.70.
NOTES

2. Steel shaft shall be tapered either round or dodecagon (12-sided), 11-gage, 4 1/2" (in) O.D. at slipfitter. Taper shall be 0.14" (in) per foot.
3. All poles shall be hot-dip galvanized per AASHTO M111.
4. Welding of structures shall be in accordance with the latest edition of the AWS D1.1 Structural Welding Code - Steel. All butt welds shall be ground flush with base metal.
6. Junction Box serving the Standard shall be located no more than 10'-0" (5'-0" preferred) from the Standard.
7. A backplate shall be installed on the Upper Traffic Signal Head. Install a backplate on the Lower Traffic Signal Head only when required by the contract. Do not install retro-reflective tape on backplates.
10. For Signal Head Mounting Details, see Standard Plan J-75.10.
11. Standard shall use slip base if installed closer than 4' (ft) from the face of guardrail.
12. Treat surrounding pole with galvanizing repair paint meeting the requirements of Standard Specification 9-08(12). Apply two coats. Paint shall be dry before applying second coat.
13. Hand hole shall face toward roadway for Elbow Mount Barrier installations. For all other installations, hand hole face shall be opposite direction from the Upper Traffic Signal Head. Hand hole face shall remain accessible after pole and sign installation is complete.
TOP OF POLE

SIGN R10-601 – SEE SIGN PLACEMENT DETAIL

BOTTOM OF LOWER TRAFFIC SIGNAL HEAD

HAND HOLE (BEYOND) (SEE NOTE 13)

TOP OF BASE PLATE

TOP OF ROADWAY

CUT SECTION BEHIND BARRIER (GROUND-MOUNTED)

TOP OF POLE

BOTTOM OF LOWER TRAFFIC SIGNAL HEAD

TOP OF BASE PLATE

TOP OF ROADWAY

CONCRETE FOUNDATION (SEE NOTE 1)

EMBANKMENT SECTION BEHIND BEAM GUARDRAIL (GROUND-MOUNTED)

TOP OF POLE

SIGN R10-601 – SEE SIGN PLACEMENT DETAIL

HAND HOLE (BEYOND) (SEE NOTE 13)

CONCRETE FOUNDATION (SEE NOTE 1)

MAINTENANCE PAD – SEE STANDARD PLAN J-28.24 FOR DETAILS

BACKPLATES NOT SHOWN FOR CLARITY.
3. Top of Leveling Nut height shall be 1" (in) max. above foundation.
4. Heat-shrink cap for all spare conductors not terminated on a terminal strip.
5. Provide Cable Tie at wiring entering the Junction Box (Slip Base installations only).

### Foundation Reinforcement Detail

**CONCRETE CAST DIRECTLY AGAINST UNDISTURBED EARTH, DRILLED SHAFT**

**ALTERNATE # 1**

- **CAT**
- **GROUT WITH 2/3" DRAIN HOLE**
- **EARTH EMBANKMENT AS REQUIRED - SEE PLACEMENT DETAILS**
- **ANCHOR BOLTS & ANCHOR PLATE SUPPLIED BY SIGNAL POLE MANUFACTURER**
- **COPPER - 5/8" BARS EVENLY SPACED**
- **CONDUIT COUPLING - INSTALL FLUSH WITH TOP OF FOUNDATION (DO NOT GLUE PVC STUBOUT)**
- **GROUT WITH 1/2" DRAIN HOLE**
- **GROUNDED CONDUCTOR NON-INSULATED #4 AND #6 STRANDED COPPER - PROVIDE 3 MIN. SLACK (ROUTE CONDUCTOR TO GROUNDING STUD)**

### Foundation Backfill Detail

- **CONCRETE CAST WITHIN A CORRUGATED METAL PIPE STAY-IN-PLACE FORM**
- **PAPER OR CARDBOARD FORM SHALL NOT STAY-IN-PLACE**
- **CLAMP CONDUCTOR TO STEEL REINFORCING WITH LISTED CONNECTOR**
- **SUITE FOR USE EMBEDDED IN CONCRETE**
- **SEE NOTE 5**

### Foundation Depth “D” Table

**ALTERNATE # 1 DRILLED SHAFT-TYPE CONSTRUCTION**

**FOR LATERAL BEARING PRESSURE = 2500 PSF & Ø = 34", 1500 PSF & Ø = 28", 1000 PSF & Ø = 26"**

<table>
<thead>
<tr>
<th>SLOPE</th>
<th>1:V at 1:3</th>
<th>1:V at 1:2</th>
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<tr>
<td>XYZ (FT)</td>
<td>700</td>
<td>900</td>
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<td>1000 PSF</td>
<td>3° - 0° ROUND</td>
<td>10 - 0°</td>
</tr>
<tr>
<td>1500 PSF</td>
<td>3° - 0° SQUARE</td>
<td>7 - 0°</td>
</tr>
<tr>
<td>2500 PSF</td>
<td>3° - 0° ROUND</td>
<td>6 - 0°</td>
</tr>
</tbody>
</table>

### ALTERNATE # 2 CORRUGATED METAL PIPE TYPE CONSTRUCTION

**FOR LATERAL BEARING PRESSURE = 2500 PSF & Ø = 23", 1500 PSF & Ø = 18", 1000 PSF & Ø = 17"**

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<th>SLOPE</th>
<th>1:V at 1:3</th>
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<td>900</td>
</tr>
<tr>
<td>1000 PSF</td>
<td>3° - 0° ROUND</td>
<td>10 - 0°</td>
</tr>
<tr>
<td>1500 PSF</td>
<td>3° - 0° SQUARE</td>
<td>7 - 0°</td>
</tr>
<tr>
<td>2500 PSF</td>
<td>3° - 0° ROUND</td>
<td>6 - 0°</td>
</tr>
</tbody>
</table>

### ALTERNATE # 2 CONSTRUCTION METHOD METAL (SUBSURFACE) FORM REQUIRED

When the existing soil will not retain a vertical face, over-excavate the foundation area and install a 36" or 48" diameter corrugated metal (pipe) form. The top of the corrugated metal form shall terminate 1 foot below final grade. Continue forming to full height using paper or cardboard form to achieve a smooth finish on final exposed cement concrete. Support the form as necessary to remain plumb.

Place the concrete foundation.

After concrete has cured, remove the entire paper or cardboard form portion.

- **Shoring or Extra Excavation as required.** Excavated area shall be backfilled with Controlled-Density Fill (CDF), or with soil in accordance with Standard Specification Section 9-20.3(2) and Compaction Method 1 of Standard Specification Section 2-03.1(1).

### Notes

1. This structure has been designed according to the Fifth Edition 2009 AASHTO Standard Specifications for Structural Supports for Highway Bridges, Luminaires and Traffic Signals. Basic wind velocity is 90 mph, Design Life/Recurrence Interval 50 years, and Fatigue Category III.
2. Foundations are designed for Type II, III, and 3D Signal Standards with a maximum mast arm length of 62".
3. Foundations are designed for Single Mast Arm Standards and Double Mast Arm Standards with 90° between arms. Special foundation design is required for Double Arm Standards where the angle between mast arms is other than 90°. For Double Mast Arm Standards with 90° between arms, larger XYZ value for foundation depth selection.
4. Foundations not within the parameters of this standard require Special Design. Contact the WSDOT Bridge and Structures Office through the Engineer for Special Foundation Designs.
5. Where a foundation is constructed within a Media Filter Drain, the foundation depth shown in the Contract Plans shall be increased by the depth of the Media Filter Drain.
6. The top 2 feet of the foundation shall use a smooth form (such as paper or cardboard). After the concrete has cured, this entire form shall be removed.
7. For design parameters between the values listed in Table, depth requirements may be interpolated between the values provided.

### Alternate # 2 Construction Method

- **Metal (Subsurface) Form Required**

**TRAFFIC SIGNAL STANDARD FOUNDATION**

**STANDARD PLAN J-26.10-03**

**Sheet 1 of 1 Sheet**

**APPROVED FOR PUBLICATION**

**Corporation, Issued**

Washington State Department of Transportation

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**

**DRAWN BY: FERN LIDELL**

**STRICKER: RICHARD LELAND**

**SIGNED: RICHARD LELAND**

**DATE: 28 July, 2016 8:25 AM**
PREMOLDED JOINT FILLER

SEE TYPICAL SECTION FOR REINFORCEMENT

TOP OF FOUNDATION LEVEL WITH GRADE

NOT STEEPER THAN 1.5H : 1V

SIGNAL STANDARD FOUNDATION
- SEE STANDARD PLAN J-26.10

SLOPE TO DRAIN AWAY FROM THE FOUNDATION
SLOPE NOT STEEPER THAN 5%

SECTION A

PLAN

ELEVATION

EXISTING GRADE OR FILL SLOPE = FLAT TO 10H : 1V

CASE A

EXISTING GRADE OR FILL SLOPE = 3H : 1V TO 2H : 1V

CASE D

FINISHED GRADE
SLOPE = FLAT TO 2H : 1V
(4H : 1V SLOPE SHOWN)

SIGNAL STANDARD FOUNDATION
- SEE STANDARD PLAN J-26.10

SIGNAL STANDARD FOUNDATION
- SEE STANDARD PLAN J-26.10

NOT STEEPER THAN 2H : 1V

SIGNAL STANDARD FOUNDATION
- SEE STANDARD PLAN J-26.10

FINISHED GRADE
SLOPE = FLAT TO 10H : 1V
(10H : 1V SLOPE SHOWN)

SIGNAL STANDARD FOUNDATION
- SEE STANDARD PLAN J-26.10

EXISTING GRADE OR FILL SLOPE = FLAT TO 10H : 1V

CASE B

FINISHED GRADE
SLOPE = FLAT TO 10H : 1V

SIGNAL STANDARD FOUNDATION
- SEE STANDARD PLAN J-26.10

SIGNAL STANDARD FOUNDATION
- SEE STANDARD PLAN J-26.10

NOT STEEPER THAN 1.5H : 1V

FINISHED GRADE
SLOPE = FLatter THAN 3H : 1V BUT NOT STEEPER THAN 2H : 1V

SIGNAL STANDARD FOUNDATION
- SEE STANDARD PLAN J-26.10

EXISTING GRADE OR FILL SLOPE = 3H : 1V TO 2H : 1V

CASE C

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

SIGNAL STANDARD FOUNDATION PLACEMENTS

STANDARD PLAN J-26.15-01

SHEET 1 OF 3 SHEETS

APPROVED FOR PUBLICATION
### NOTES

1. All material and workmanship shall be in accordance with the requirements of the Washington State Department of Transportation Standard Specifications for Road, Bridge, and Municipal Construction.

2. The analysis and design for Adaptors 1 and 2 have been done in accordance with AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals - Fifth Edition - Dated 2009, and Interstate, using basic wind speed of 90 MPH and 50 years of design life.

3. Adaptors' parameters are based on field data and existing signal anchor bolts and bolt circles. Adaptor 1 shall be used for 15' (ft) thru 45' (ft) mast arm signal standards and Adaptor 2 for 45' (ft) thru 65' (ft).

4. Adaptors shall only be used for temporary installation of knocked down signal standards.

5. Materials specifications:
   - All structural steel, except as otherwise noted: ASTM A572 GR. 50 OR ASTM A588
   - Pipes: ASTM A53 GR. B OR A500 GR. B
   - Connecting/clamping bolts: ASTM F3125 GRADE A325
   - Nuts: ASTM A483 GRADE DH
   - Washers: AASHTO M 299 (ASTM F436)

6. All bolts, rods, and related hardware shall be galvanized after fabrication per ASTM F2329.

7. Steel surfaces shall be galvanized after fabrication in accordance with AASHTO M 111.

8. Install and secure adaptor to existing support anchor bolts. Then install signal standard on adaptor top plate. Rake to be plumb after all load has been placed.

9. All holes in top and bottom plates of Adaptor 1 and Adaptor 2 are thru holes. See engraved or stamped text for bolt hole diameter.

### TEMPORARY SIGNAL STANDARD ADAPTOR

**STANDARD PLAN J-26.20-01**

邓小冰

**Sheet 1 of 5 sheets**

**APPROVED FOR PUBLICATION**

Jan 31 2016 10:32 AM

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**
NOTES
1. This structure has been designed according to the Fifth Edition 2009 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals: Basic wind velocity 60 mph, Design Life/Frequency interval 50 years, and Fatigue Category III.
2. Foundations are designed for Type IV and V Strain Pole Standards with a maximum mast arm length of 16’ - 0”.
3. Foundations not within the parameters of this standard require Special Design. Contact the WSDOT Bridge and Structures Office for the Engineer for Special Foundation Design.
4. Where a foundation is constructed within a Media Filter Drain, the foundation depth shown in the Contract Plans shall be increased by the depth of the Media Filter Drain.
5. The top 2 feet of the foundation shall use a smooth form (such as paper or cardboard). After the concrete has cured, this entire form shall be removed.

**ALTERNATE #1 - DRILLED SHAFT-TYPE CONSTRUCTION - DEPTH "D"**

*FOR LATERAL BEARING PRESSURE = 2500 PSF & Ø = 34", 1500 PSF & Ø = 28", 1000 PSF & Ø = 26)*

- **GROUND SLOPE = 3H: 1V OR FLAT**
- **GROUND SLOPE = 3H: 1V TO 2H: 1V**

<table>
<thead>
<tr>
<th>ALLOWABLE LATERAL BEARING PRESSURE</th>
<th>FOUNDATION TYPE</th>
<th>POLE CLASS - RESULTANT HORIZONTAL TENSION (LBS)</th>
<th>ALLOWABLE LATERAL BEARING PRESSURE</th>
<th>FOUNDATION TYPE</th>
<th>POLE CLASS - RESULTANT HORIZONTAL TENSION (LBS)</th>
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<tbody>
<tr>
<td>1000 PSF</td>
<td>3” - 0” ROUND</td>
<td>11’-0” 13’-0” 15’-0” 16’-0” 18’-0” 20’-0”</td>
<td>1000 PSF</td>
<td>3” - 0” ROUND</td>
<td>11’-0” 13’-0” 15’-0” 16’-0” 18’-0” 20’-0”</td>
</tr>
<tr>
<td>3” - 0” SQUARE</td>
<td>11’-0” 13’-0”</td>
<td>15’-0” 16’-0” 18’-0” 20’-0”</td>
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<tr>
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<td>11’-0” 13’-0”</td>
<td>15’-0” 16’-0” 18’-0” 20’-0”</td>
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</tr>
</tbody>
</table>

**ALTERNATE #2 - CONSTRUCTION METHOD METAL (SUBSURFACE) FORM REQUIRED**

When the existing soil will not retain a vertical face, over-excavate the foundation area and install a 36” or 48” (in) diameter corrugated metal (pipe) form. The top of the corrugated metal form shall terminate 1 foot below final grade. Continue forming to full height using a paper or cardboard form to achieve a smooth finish on final exposed cement concrete. Support the form as necessary to remain plumb.

Place the concrete foundation. After concrete has cured, remove the entire paper or cardboard form portion.

- Shoring or Extra Excavation as required. Excavated area shall be backfilled with Controlled-Density Fill (CDF), or with soil in accordance with Standard Specification Section 8.20.3(2) and Compaction Method 1 of Standard Specification Section 2.09.3(1)E.

**TYPE IV AND V STRAIN POLE TRAFFIC SIGNAL FOUNDATION**

STANDARD PLAN J-27.10-01

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION:
Cortesiero, Jeff
July 15, 2014 8:57 AM

Engineer
Washington State Department of Transportation
This structure has been designed according to the Fifth Edition 2009 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals: Basic wind velocity 90 mph, Design Life/Recurrence Interval 50 years, and Fatigue Category III.

2. 1 1/2" diameter weatherhead may be substituted for the elbow and nipple assembly.

3. Pole shaft shall have 0.14" 5/8" steel.


5. Hand holes may be 6" x 4", oval or rectangle. Provide a "J" or "C" hook at 90° or 180° off upper hand hole.

1. This plan depicts the Steel Light Standard types and terms commonly referred to in the Contract. All Steel Light Standards are fabricated in accordance with the Standard Specifications and the Contract Provisions.

2. The Luminaire Pole height shall not exceed 50' (H1).

3. Slip Bases shall not be installed on 50' (H1) poles with Double Mast Arms, nor on poles weighing more than 1000 lbs.

4. The optimal location of the Luminaire head is over the edge of the traveled way. Based on the placement of the Steel Light Standard foundation, the position of the Luminaire head may vary. See Standard Plan J-28.22.

5. Light Standard mast arm orientation is typically perpendicular to roadway centerline.

BOTIOM OF POLE BASE
LIGHT STANDARD BASE MOUNTED ON BRIDGE - SEE STD. PLAN J-28.45

POLE MAST ARM LENGTH
12' MAX. FOR SINGLE ARM
8' MAX. FOR DOUBLE ARM

M°B° LUMINAIRE HEAD
BOLT CONNECTION
LUMINAIRE POLE
= 6.0' R. (TYP.)

LUMINAIRE POLE
STEEL LIGHT STANDARD BARRIER MOUNTED BASE - SEE STD. PLAN J-28.85, C-86, AND C-85.14

MEDIAN BARRIER-MOUNTED LUMINAIRE
(TYPE 1 MAST ARM SHOWN)

TOP OF BRIDGE DECK
BOTTOM OF POLE BASE
LIGHT STANDARD BASE MOUNTED ON BRIDGE - SEE STD. PLAN J-28.45

POST TOP-MOUNTED LUMINAIRE
(SLIP BASE SHOWN)

EDGE OF TRAVELED WAY VARIES WITH OFFSET DISTANCE SHOULDER

STEEL LIGHT STANDARD
STANDARD PLAN J-28.10-01
SHEET 2 OF 2 SHEETS
1. The Steel Light Standard Placement depicted on this plan is only intended for installations where roadside conditions allow its usage. Roadside conditions may require a special design by the Bridge Office, as determined by the Project Engineer.

**TAPER NOTE**
End Taper (on approach from opposing traffic):

- **20’ (longitudinal)** = use on one-way roadways or where the Light Standard is not in the Design Clear Zone of the opposing traffic.
- **6H:1V min. taper** = use when the Light Standard is in the Design Clear Zone of the opposing traffic.

**NOTES**
- **EDGE OF TRAVELED WAY**
- **SHOULDER**
- **FOOTING**
- **BASE**
- **FILL MATERIAL**

**CASES A & B**
**EMBANKMENTS**

**CASE C**
**DITCH SECTIONS**

**TYPICAL EMBANKMENT**
- **END TAPER – FOR OPPOSING TRAFFIC**
- **TOE OF EMBANKMENT WIDENING FOR END TAPER – FOR OPPOSING TRAFFIC**

**TYPICAL MAST ARM**
- **FOOTING**
- **BASE**
- **FILL MATERIAL**

**PLAN VIEW**

**CULVERT – SEE CONTRACT PLANS FOR SIZE AND LOCATION (SEPARATE BID ITEM)**
**TOE OF EMBANKMENT WIDENING**
**BEVELED END SECTION**
**DITCH INVERT (FLOW DIRECTION NOT INDICATED)**

**END TAPER**

- **FOR OPPOSING TRAFFIC**
- **SEE TAPER NOTE**
- **TOE OF EMBANKMENT WIDENING**

**SEE TAPER NOTE**

**20’ END TAPER**

**4.5’**

**6 MIN.**

**4.5’ MIN.**

**VARIIES**

**SHOULDER**

**EDGE OF TRAVELED WAY**

**FILL MATERIAL**

**TRAFFIC**

**MAST ARM**

**PLAN VIEW**

**CASES A & B**
**EMBANKMENTS**

**PLAN VIEW**

**CASE C**
**DITCH SECTIONS**

**NOTE**
- **BASE ON FIELD CONDITIONS, STEEL LIGHT STANDARD PLACEMENT CAN BE ADJUSTED ± 4.0’, WHEN APPROVED BY THE PROJECT ENGINEER.**

**STEEL LIGHT STANDARD PLACEMENT (SLIP BASE)**
**STANDARD PLAN J-28.22-00**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**

**EXPIRES AUGUST 5, 2017**

**APPROVED FOR PUBLICATION**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**

**DRAWN BY BILL BERENS**

**SHEET 1 OF 2 SHEETS**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**
**SECTION VIEW**

**CASE A**
SLOPES 3H:1V THRU 2H:1V (MAX.)

**EMBANKMENTS**

**SECTION VIEW**

**CASE B**
SLOPES FLATTER THAN 3H:1V

**SECTION VIEW**

**CASE C**
FORE SLOPES 4H:1V OR FLATTER

**SECTION VIEW**

**CASE D**
FORE SLOPES STEEPER THAN 4H:1V (2H:1V MAX.)

**DITCH SECTIONS**

STEEL LIGHT STANDARD PLACEMENT (SLIP BASE)
STANDARD PLAN J-28.22-00
NOTES

This option is used only when the existing soil in the hole will 
remain standing and the cement concrete can be placed with­
out causing the soil to collapse. Concrete shall be cast directly 
against undisturbed soil.

Auger the hole for the foundation. Use a paper or cardboard form 
to achieve a smooth finish on the final exposed cement concrete. 
Support the form as necessary to remain plumb.

of exposed foundation when no embankment widening is to be 
installed.

Place the concrete foundation.

After concrete has cured, remove the paper or cardboard form portion.

Construct the embankment widening (if required).

When the existing soil will not retain a vertical face, over-excavate 
the foundation area and install a 36" (in) diameter corrugated metal 
(pipe) form. The corrugated metal form shall not extend more than 
5" (in) +/- 1" (in) below any portion of the foundation that will remain 
exposed upon final grading. Continue forming to full height using a 
paper or cardboard form to achieve a smooth finish on final exposed 
cement concrete. Support the form as necessary to remain plumb.

of exposed foundation when no embankment widening is to be 
installed.

Place the concrete foundation.

After concrete has cured, remove the paper or cardboard form portion.

Backfill with controlled-density fill or compacted borrow in accord­
ance with Standard Specification 8-20.3(2).

Construct the embankment widening (if required).
HEAVY HEX NUT (TYP.) - SIZE TO MATCH ANCHOR BOLT - SEE TABLE - STD. PLAN J-28.30
RND WASHER (TYP.) - SIZE TO MATCH ANCHOR BOLT
LUMINAIRE POLE
POLE BASE PLATE
KEEPER PLATE
ANCHOR/SLIP PLATE ASSEMBLY - SEE STD. PLAN J-28.42
CAPPED CONDUIT
SLIP BASE FOUNDATION - SEE STD. PLAN J-28.30
2" (IN) DIA. x 3/4" (IN) GROUT WELL (TYP.)

PLATE WASHER DETAIL

3/8" (IN) I.D. DRAIN TUBE IN GROUT PAD

PLATE WASHER (TYP.) - SEE TABLE - STD. PLAN J-28.30

FIXED BASE FOUNDATION - SEE DETAIL
CAPPED CONDUIT
3" (IN) DIA. x 3/4" (IN) GROUT WELL (TYP.)

EXPLODED VIEW

PLAN VIEW

SLIP BASE

THE FINAL HEIGHT OF THE ANCHOR BOLTS MUST BE 1/16" (IN) BELOW THE TOP OF THE ANCHOR/SLIP PLATE ASSEMBLY TO ENSURE PROPER FUNCTION OF THE SLIP BASE

TOP OF ANCHOR BOLT
3 3/8" MAX
LEAVE ±8" (IN) HOLLOW IN THE CENTER OF THE GROUT PAD

APPLY GROUT EVEN WITH THE BOTTOM OF THE ANCHOR PLATE AFTER PLUMBING THE LIGHT STANDARD

EXPLODED VIEW

FIXED BASE

APPLY GROUT EVEN WITH THE BOTTOM OF THE POLE BASE PLATE AFTER PLUMBING THE LUMINAIRE POLE
BOLT CAN PROTRUDE 5/8" (IN) MAX. WITH A MIN. OF TWO THREADS EXPOSED ABOVE NUT

ELEVATION VIEW

ASSEMBLED AND GRouted

SECTION A
(CONDUIT NOT SHOWN)

NOTES
1. 50' (ft) (H1) poles with double mast arms or poles weighing in excess of 1000 LBS shall not be installed on a slip base.
2. Galvanizing shall be in accordance with AASHTO M 111.
3. See Standard Plans C-85b, C-85.15, and J-28.60 for foundation and base plate requirements when light standards are mounted on concrete traffic barrier.
4. See Standard Specification Sections 6-03.3(33) and 8-20.3 (4) for the torque requirements for all of the anchor bolt installations. Install 1" (in) diameter clamping bolts in all slip bases to a torque of 95 Foot-Pounds - See Standard Specification Section 8-20.3 (13a). DO NOT OVERTIGHTEN. After state inspection, burt threads to prevent nut rotation.

APPL Y GROUT EVEN WITH THE BOTTOM OF THE POLE BASE PLATE AFTER PLUMBING THE LUMINAIRE POLE

ASSEMBLED
ISOMETRIC VIEW
SLIP BASE

EXPLODED VIEW

ISOMETRIC VIEW
FIXED BASE

STANDARD PLAN J-28.40-02
SHEET 1 OF 1 SHEET
APPROVED FOR PUBLICATION
Debrah, Pam
Jun 11 2014 1:31 PM
STATE DESIGN ENGINEER
Washington State Department of Transportation
1. 50' (H1) poles with double mast arms or poles weighing in excess of 1000 lbs. shall not be installed on a slip base.

2. The Slip and Anchor Plates shall be manufactured from ASTM A572 GR.50 or ASTM A588. All Slip Plate notched surfaces shall be finished smooth.

3. The clamping bolts shall be high-strength steel, manufactured from AASHTO M 164, with heavy hex nut and hardened washer. Galvanize the Clamping Bolts according to AASHTO M 232.


5. Galvanize the Anchor/Slip Plate after fabrication according to AASHTO M 111.

6. Clamping Bolt diameters may vary on existing installations. Replace them with the same size as the originals when repairing or reusing a luminaire pole. For 1" (in) clamping bolts, tighten to 95 ft-lbs. For 1 1/4" (in) clamping bolts, tighten to 104 ft-lbs. DO NOT OVERTIGHTEN. After state inspection, burr threads to prevent nut rotation.

**NOTES**

**TABLE**

**LUMINAIRE HEIGHT (FT)** | **MAST ARM TYPE** | **MAST ARM LENGTH (FT)** | **CLAMPING BOLT DIAMETER (IN)** | **D =**
---|---|---|---|---
20' TO 50' | SINGLE | 6' TO 16' | 1"
20' TO 46' | DOUBLE | 6' TO 8' | 1"
46' TO 50' | DOUBLE | 6' TO 8' | 1"
20' TO 46' | DOUBLE | 10' TO 16' | 1"
46' TO 50' | DOUBLE | 10' TO 16' | 1"

**SLIP BASE NOT ALLOWED**

**EXPLODED ISOMETRIC VIEW**

**TOP VIEW**

**SECTION B**

**STANDARD PLAN J-28.42-01**

**APPROVED FOR PUBLICATION**

Washington State Department of Transportation
CONSTRUCTION NOTES
1. Wire brush existing threads.
2. Apply two coats of galvanizing paint (per Standard Specification Section 9-08.1(238)).
3. Tighten bolt by "Turn of Nut" method (per Standard Specification Section 6-03.3(33)).

PLATE WASHER DETAIL (ASTM A36 OR A327 GRADE 50)
ROUGHENED SURFACE AND APPLY EPOXY BONDING AGENT PRIOR TO PLACING GROOVE PER STANDARD SPECIFICATION SECTION 9-26.11.

NOTES
1. The purpose of this plan is to provide the details for retrofitting a 4-bolt light base with a slip base assembly.
2. Existing anchor bolts shall be inspected for corrosion, thread damage, and galvanizing. To minimize galvanic corrosion between dissimilar metals, ensure galvanizing remains intact while installing aluminum luminaire.
3. After bolting the bottom slip plate assembly to the foundation, fill the slotted bolt holes with mastic per Standard Specification Section 9-08.7.
4. Grade around the foundation to ensure the stub height does not exceed 3 7/8" (In). For grading requirements, see Standard Plan J-28.22.
5. Removal of the flange base from the existing base plate is required.
6. Misaligned anchor bolts shall be removed and replaced.
7. This adaptor shall be used only on luminaire poles that contain a handhole. Replace stands and foundation when the handhole is in the flange base.
8. Galvanize the anchor plate, bottom slip plate, and top slip plate after fabrication according to ASTM A123.
9. Galvanize all hardware according to ASTM F239.

SLIP BASE ADAPTOR FOR 4-BOLT LIGHT STANDARD BASE
STANDARD PLAN J-28.43-01
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Jan 31 2018 5:30 AM
Washington State Department of Transportation
NOTES
1. Galvanize the Elbow Assembly after fabrication according to AASHTO M 111. All bolts, nuts, and related hardware shall be galvanized after fabrication per ASTM F2329.
3. The presence of pedestrian railing shall be verified prior to light standard fabrication. When pedestrian railing is present or to be installed, locate hand hole as detailed in the Bridge Pedestrian Barrier details.

STEEL LIGHT STANDARD ELBOW DETAIL

FOR LUMINAIRE POLES WITH SINGLE MAST ARM 12' - 0" OR LESS AND DOUBLE MAST ARMS 8' - 2" OR LESS, MOUNTED ON BRIDGE OR RETAINING WALLS.
NOTE:
1. Pole Base Plate for a Slip Base design shall be 1 1/4" (in) steel manufactured from ASTM A572 GR.50 or ASTM A588. Pole Base Plate for a Fixed Base design shall be either 1 1/4" (in) steel manufactured from ASTM A572 GR. 50, ASTM A588, or 1 1/2" (in) manufactured from ASTM A36. All Pole Base Plate notched surfaces shall be finished smooth.
3. Galvanizing shall be in accordance with AASHTO M 111.
4. See Standard Plans C-8b, C-85.14, and J-28.60 for foundation and base plate requirements when steel light standards are mounted on concrete traffic barrier.

STEEL LIGHT STANDARD POLE BASE AND HAND HOLE DETAILS
STANDARD PLAN J-28.50-03

---

ELEVATION VIEW
Configuration and location of the hand hole varies among manufacturers – minimum size opening shown

VIEW A
FOR DETAILS NOT SHOWN, SEE VIEW A ABOVE ORIENTATION FOR INSTALLATION ON BRIDGE OR RETAINING WALL – SEE STANDARD PLAN J-28.45

VIEW B
LUMINAIRE POLE
POLE BASE PLATE
GROUNDING BOLT
CLAMP = 1 1/8" (IN) THICK STEEL + 2" WIDE + 3" (IN) LONG

VIEW C
TYPICAL HAND HOLE ORIENTATION

VIEW D
SPECIAL BACK-UP RING
1" MIN.
6" DIAM. HOLE
1 1/4" BACK-UP RING
POLE BASE PLATE
LUMINAIRE POLE

SECTION D
POLE BASE PLATE DETAIL
LUMINAIRE POLE
POLE BASE PLATE
CONTINUOUS BACK-UP RING
1" MIN.
6" DIAM. HOLE
3/16" T
T = SIZE OF FILLET WELD BY LUMINAIRE POLE FABRICATOR

ISOMETRIC VIEW

TOP VIEW
POLE BASE PLATE
LUMINAIRE POLE
POLE BASE PLATE
CONTINUOUS BACK-UP RING
1" MIN.
6" DIAM. HOLE
3/16" T
T = SIZE OF FILLET WELD BY LUMINAIRE POLE FABRICATOR

FUSED BASE: RADIUS = (D2+1/16") (TYP.) – FOR "D" SEE TABLE ON STANDARD PLAN J-28.30
SLIP BASE: RADIUS = 3/16" (TYP.) – MATCH SLIP PLATE. STANDARD PLAN J-28.42

REMOVABLE BAINITE HAND HOLE COVER WITH GASKET – FASTEN WITH TWO STAINLESS STEEL (ASTM F 593) SCREWS

ROUND AND SMOOTH INSIDE EDGES

CONDUCTOR ATTACHMENT BRACKET – 1/4" (IN) THICK STEEL * 2" (IN) WIDE * 4" (IN) LONG

THE CONDUCTOR ATTACHMENT CONFIGURATIONS VARY AMONG DIFFERENT MANUFACTURERS. CONDUCTOR ATTACHMENTS ARE REQUIRED ON ALL POLES, FIXED OR SLIP BASE.

COVER NOT SHOWN FOR CLARITY
NOTES
2. Round and smooth all edges around hand hole and along the wire-way to protect the conductors.
4. Install grout after plumbing the pole.
1. Each wire shall be physically separated by at least 1/4" (6 mm) so that sealing material can fill in between the wires; where heat shrink tubing is used for the outer splice enclosure, it shall meet one of the following requirements:
   a. Have separate ports for each conductor ("Y"-shaped tubing). ~ or ~
   b. Have rubber electrical mastic tape wrapped around each conductor to ensure a waterproof seal. See Rubber Electrical Mastic Tape Installation Detail, Standard Plan J-60.05.

2. Heat shrink tubing shall extend a minimum of one inch onto the original wire insulation of each wire in the splice. Rigid splice enclosures shall be centered over the cramped connection.

3. Electrical tape used in splicing applications shall be 3/4" (19 mm) wide, be UL listed under UL 510, and be CSA Certified under C22.2 No. 197-M1883.

4. Crimp splices shall be installed with an approved crimping tool for the type and size of crimp splice used. Pliers and similar multi-purpose tools may not be used.

**NOTES**

- **Equipment Bonding Jumpers** - From RMC Conduit
  - **Application for Fixed Base Similar, Except No Cable Tie Is Required at Junction Box**
  - **Cable Tie = 120 Pound Tensile Strength, Black**

**CONNECTION AND INTERNAL SEALING DETAILS**

- **Connector and Internal Sealing Details**
  - **Connector Assembly - See Connectors and Internal Sealing Details Below**
  - **Limits of Splice Enclosure - 5" Min.**
  - **Single Wire**

**STEP 1 - CRIMP CONNECTION**

- **Single Wire**
- **Crimp Splice**
- **Single Wire**

**STEP 2 - WRAP CONNECTION**

- **Vinyl Electrical Tape** (See Note 3)

**TAPE OVERLAP DIAGRAM**

- When using wrapped Vinyl Electrical Tape:
  - Install two layers of spiral wrapped tape.
  - Each spiral layer shall have an overlap of 1/2 of the tape width (See Diagram Above).

**JUNCTION BOX WIRING DETAIL**

For grounding requirements, see Standard Plan J-60.05
NOTES
1. These Foundations are designed for a minimum of 1,500 PSF allowable lateral bearing pressure for the soil. A Special Foundation shall be required with soil allowing lateral bearing pressure lower than 1,500 PSF.
2. These Foundations are designed for installation on level ground, or on sloping ground, not to exceed 2H : 1V slopes. Slopes steeper than 2H : 1V require special design.
3. Where a foundation is constructed within a Media Filter Drain, the foundation depth shown in the Contract Plans shall be increased by the depth of the Media filter Drain.
4. Foundations not within the parameters of this standard require Special Design. Contact the WSDOT Bridge and Structures Office through the Engineer for Special Foundation Designs.
5. The top 2' - 0" of the foundation shall use a smooth form (such as paper or cardboard). After the concrete has cured, this entire form shall be removed.

DESIGN CRITERIA
This structure has been designed according to the Fifth Edition 2009 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. Basic wind velocity is 90 MPH. Design Life/Recurrence Interval 50 years and Fatigue Category III.

WIND VELOCITY:
90 MPH
Maximum Pole Deflection shall not exceed 0.7" in 30 MPH and 1.4" in 70 MPH wind.

LOAD CASE #1
Camera (1) - EPA = 4.00 sq. ft. @ 2'-0" above pole top, and:
Dish (1) - 1'-0" diameter @ pole top level.

LOAD CASE #2
Camera (1) - EPA = 4.00 sq. ft. @ 2'-0" above pole top, and:
Camera (2) - EPA = 0.54 sq. ft. each @ 1'-0" and 2'-0" from pole top, and:
NEMA Cabinet (2) - EPA = 1.33 sq. ft. each @ 3'-0" from pole top, install both NEMA cabinets back to back, and:
Radio Equipment (2) - EPA = 2.25 sq ft. each @ 2'-0" and 9'-0" from pole top.

EPA = Effective Projected Area

ALTERNATE #2 - CONSTRUCTION METHOD
1. Shoring or Extra Excavation as required. Excavated area shall be backfilled with Controlled-Density Fill (CDF), or with soil in accordance with Standard Specification Section 6-20.3(2) and Compaction Method 1 of Standard Specification Section 2-08.3(1).E
2. GROUNDING CONDUCTOR #4 AWG STRANDED COPPER WITH 3' (3T) MIN. SLACK ROUTE CONDUCTOR TO CCTV TRAFFIC SIGNAL STANDARD (CAMERA POLE) GROUNDING STUD.
3. CLAMP CONDUCTOR TO STEEL REINFORCING WITH UNEVEN CONNECTOR SUITABLE FOR USE EMBEDDED IN CONCRETE.
4. SEE NOTE 3.

TYPE CCTV TRAFFIC SIGNAL STANDARD (CAMERA POLE) FOUNDATION DETAILS
STANDARD PLAN J-29.10-01

FOUNDATION REINFORCEMENT DETAIL
(CONCRETE CAST DIRECTLY AGAINST UNDISTURBED EARTH)
ALTERNATE #1

FOUNDATION REINFORCEMENT AND BACKFILL DETAIL
( CONCRETE CAST INSIDE CORRUGATED METAL PIPE STAY-IN-PLACE FORM) (SEE NOTE 5)
ALTERNATE #2
NOTES
1. Verify Pole Top Plate, Camera Mount Plate, Bolt Circle, and Bolt Holes are adequate for the required Camera prior to releasing poles for manufacturing.

2. Steel shall be galvanized after fabrication per AASHTO M111. Hardware shall be galvanized per AASHTO M232. Fasteners less than 0.50" (in.) diameter shall be stainless or brass.

3. Attach Camera to Camera Mount Plate using four (4) 3/8"-16 UNC x 1.75" stainless steel bolts with eight (8) stainless steel washers and four (4) lock-nuts with nylon inserts, or as approved by the Camera Supplier.


DESIGN CRITERIA:
This structure has been designed according to the Fifth Edition 2009 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. Basic wind velocity is 90 MPH. Design Life/Recurrence Interval 50 years.

WIND VELOCITY:
90 MPH
Maximum Pole Deflection shall not exceed 0.7" in 30 MPH and 1.4" in 70 MPH wind.

LOAD CASE #1:
Camera (1) - EPA = 4.00 sq. ft. @ 2'-0" above pole top, and:
Dish (1) - 1'-0" diameter @ pole top level.

LOAD CASE #2:
Camera (1) - EPA = 4.00 sq. ft. @ 2'-0" above pole top, and:
Camera (2) - EPA = 0.54 sq. ft. @ 1'-0" and 2'-0" from pole top, and:
NEMA Cabinet (2) - EPA = 1.33 sq. ft. @ 3'-8" from pole top, install back-to-back NEMA Cabinets, and:
Radio Equipment (2) - EPA = 2.25 sq. ft. each @ 2'-0" and 9'-0" from pole top.

EPA = Effective Projected Area

CAMERA POLE DATA

CAMERA POLE TABLE
<table>
<thead>
<tr>
<th>CAMERA HEIGHT (FT)</th>
<th>POLE MOUNT TYPE</th>
<th>POLE DIAM. &quot;D&quot; (IN.)</th>
<th>POLE TUBE &quot;A&quot; (IN.)</th>
<th>ANCHOR BOLT DIAM. (IN.)</th>
<th>CONNECTION BOLT DIAM. (IN.)</th>
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<td>1.25</td>
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CAMERA POLE BASE

(CAMERA POLE AND 1'-0" DIAM DISH)
NOTES

1. For information not shown, see Steel Light Standard Elbow detail, Standard Plan J-28.45.
   For Camera Pole Details, see Standard Plan J-29.15.

2. Round and smooth all edges along wire-way to protect conductors.

3. The manufacturer shall verify that the Elbow Top Plate matches the Camera Pole Base, and shall
   submit the shop drawings for approval.

4. Galvanize after fabrication according to AASHTO M111.

5. Install galvanized steel protective band (3/16" thick × 4" high (ASTM A36) on all four sides,
   as shown in Standard Plan J-28.45, except fasten 6" from corners on 25" square base.

CAMERA POLE ELBOW MOUNT ~ 25" SQUARE

VIEW A

TAP FOR 1 1/4" (IN)
DIAM. BOLT (TYP.)

25.50" (IN) DIAM
BOLT CIRCLE

5" (IN) DIAM
HAND HOLE

1.5/8" (IN) ELBOW TOP PLATE
(ASTM A36)

VIEW B

1.25" DIAM. HOLE (TYP.) –
FOR 1" DIAM. ANCHOR BOLT
ASSEMBLY TO BARRIER OR WALL
(ASTM A449 OR F1554 GR. 105)

3/16" (IN) OR 1/4" (IN) THICK PREFORMED
"FABREX" FABRIC PADS WITH 5" (IN) DIAM
HOLE = CEMENT TO FLANGE PLATE AND
TRIM OUTSIDE EDGE FLUSH

SEE CONTRACT PLANS FOR
SLOPE OF PARAPET FACE

ELEVATION VIEW

CAMERA POLE – INSTALL PLUMB

LUMINARE POLE

1 1/4" - 8 UNC, 8 1/2" LONG BOLT –
THREADED FULL LENGTH WITH TWO HEAVY HEX
NUTS AND 3 ROUND WASHERS (TYP.)
(ASTM A449 OR F1554 GR. 105)
(GALVANIZE PER ASTM F 2328)
3/8" (in) x 2" (in) x 2" (in) Frame Bonding Stud Plate with 1/4 NC x 1" Stainless Steel Bonding Stud.

- Weld Bonding Stud to Frame Bonding Plate.
- Weld to lid support frame.
- 1/4" (in) weld = 3 sides.
- Grind lid bearing surface flat after welding.
- All corners rounded. Corners along exposed sheared or cut edges shall be broken by light grinding to achieve an approximate 1/16" (in) chamfer or rounding.
- Protect conductors with fireproof cloth prior to welding.
- Omit Frame Bonding Stud Plate if the Frame Bonding point already exists.

Weld all around lid bonding stud ~ 1/4 NC x 1" stainless steel ~ liberally coat entire assembly w/ anti-seize compound.

**KEY**

1. BONDING JUMPER
2. EQUIPMENT GROUNDING CONDUCTOR
3. BONDING JUMPER ATTACHED TO BOX WALL COUPLING NUT
4. BONDING JUMPER ATTACHED TO BOX LID(S) GROUND STUD. #8 AWG (MIN.) x 4' (FT) TINNED BRAIDED COPPER.

**DRAWN BY**: BILL SEIDEN

**PLAN**

**LID BONDING DETAIL**

**FRAME BONDING DETAIL**

**ELEVATION**

**STANDARD PLAN J-40.05-00**

**APPROVED FOR PUBLICATION**

**Carleton, GJF**

**SENIOR DESIGN ENGINEER**

**Washington State Department of Transportation**
COVER MARKING DETAIL

1. All box dimensions are approximate. Exact configurations vary among manufacturers.
2. Minimum lid thicknesses are shown. Junction Boxes installed in sidewalks, walkways, and
shared-use paths shall have a slip-resistant coating on the lid and lip cover plate and shall
be installed with the surface flush with and matched to the grade of the sidewalk, walkway,
or shared-use path. The non-slip lid shall be identified with permanent markings on the
underside, indicating the type of surface treatment (see Contract Documents for details) and
the year of manufacture. The permanent marking shall be 1/8" (0.125 in) thickness formed with
a mild steel weld bead and shall be placed prior to hot-dip galvanizing.
3. Lid support members shall be 3/16" (4.8 mm) thick steel C, L, or T shape, welded to the frame.
Exact configurations vary among manufacturers.

4. A 1/4-20 NC x 3/4" (19 mm) S. S. ground stud shall be welded to the bottom of each lid; include (2) S. S. nuts and (2) S. S. flat washers.
5. The hinges shall allow the lids to open 180°.
6. Bolts and nuts shall be liberally coated with anti-seize compound.
7. Connect Equipment Bonding Jumper to ground stud on lid. As an alternative to the ground stud connection, the Equipment Bonding Jumper shall be attached to the front face of the hinge pocket with a 5/16-20 NC x 3/4" (19 mm) S. S. bolt, (2) each S. S. nuts, and (2) each S. S. flat washers. Equipment Bonding Jumper shall be #8 AWG min. x 4" (102 mm) of stranded copper.
8. The System Identification letters shall be 1/8" (3 mm) in thickness formed by a mild steel weld bead. See Cover Marking detail. Grid off diamond pattern before forming letters. See Standard Specification 9-29.2(4) for details.
9. See the Standard Specifications for alternative reinforcement and class of concrete.
11. Capacity - conduit diameter = 24" (600 mm)
12. Lid Bolt Down Attachment Tab provides a method of retrofitting by using a mechanical process in lieu of welding. Attachment Tab shown depicts a typical component arrangement; actual configurations of assembly will vary among manufacturers. See approved manufacturers' shop drawing for specifics.
13. Unless otherwise noted in the plans or approved by the Engineer, Junction Boxes, Cable Vaults and Pull Boxes shall not be placed within the sidewalk, walkway, shared use path, traveled way or paved shoulders. All Junction Boxes, Cable Vaults, and Pull Boxes placed within the traveled way or paved shoulders shall be Heavy-Duty.
14. Distance between the top of the conduit and the bottom of the Junction Box lid shall be 6" (150 mm) to 8" (200 mm) max. for final grade of new construction only. See Standard Specification 8-20.3(6). Where adjustments are to be made to existing Junction Boxes, or for interim construction stages during the contract, the limits shall be from 6" (150 mm) to 10" (250 mm) max. See Standard Specification 8-20.3(6).
1. Install the Junction Box on the Timber Sign Post or the Steel Sign Support that is farthest from the roadway.
FLASHING BEACON ATTACHMENT
(STEEL SIGN SUPPORT SHOWN)

STAINLESS STEEL 2 HOLE CONDUIT STRAP (TYP.)
STAINLESS STEEL CONDUIT STRAP SUPPORT (TYP.)
STAINLESS STEEL CONDUIT STRAP (TYP.)
SEALTITE FLEX CONDUIT
SEAL TITE FLEX CONDUIT
SLOTTED STAINLESS STEEL CONDUIT STRAP SUPPORT - STRAPPED VERTICALLY TO SIGN POST (TYP.)
POST-MOUNTED (NEMA 3) J-BOX

SIGN PANEL
STEEL SIGN SUPPORT (TYP.)
BREAKAWAY SIGN SUPPORT HINGE
SEALTITE FLEX CONDUIT
SEALTITE FLEX CONDUIT

ELEVATION
VIEW G
RIGHT ISOMETRIC VIEW

8" FLASHING BEACON ATTACHMENT
8" FLASHING BEACON WITH CAP VISOR - SEE NOTE 2

1" CONDUIT
STAINLESS STEEL 2 HOLE CONDUIT STRAP (TYP.)

TRAFFIC ADVISORY WHEN FLASHING
TRAVELER INFO TUNE 830 AM

STANDARD PLAN J-40.35-01
SHEET 3 OF 3 SHEETS
APPREVED FOR PUBLICATION
Washington State Department of Transportation
5-29-13
SIGN POST-MOUNTED JUNCTION BOX

TRAVELER INFORMATION SIGN SHOWN - SEE CONTRACT FOR SIGN MESSAGE AND SIZE

8" FLASHING BEACON - SEE CONTRACT
~
8"

NOTE: VARIES - SEE CONTRACT

(1YP)

POST-MOUNTED (NEMA 3) J-BOX

V SAW W

I

POST-MOUNTED (NEMA 3) J-BOX

V SAW W

SEAL TITE FLEX CONDUIT

RIGHT ISOMETRIC VIEW

TRAFFIC ADVISORY WHEN FLASHING
NOTES

1. Junction Box shall be constructed of 12-gage, Type 304 stainless with steel welded seam construction. Finish shall be # 28 for backbox and # 4 for the cover. Mounting Tabs shall be constructed of 12-gage, Type 304 stainless steel. All hardware shall be Type A304 Stainless Steel.

2. The System Identification letters shall be 1/8” line thickness formed by engraving, stamping, or with a stainless steel weld bead. See Standard Specification 9-29.2(4) for details.

3. Conduit Capacity = 8” (4” per end).

PLAN VIEW

ELEVATION VIEW

SIDE VIEW

EXPLODED ISOMETRIC VIEW

ASSEMBLY DETAIL
1. Junction Box shall be constructed of 12-gage, Type 304 stainless steel with steel welded seam construction. Finish shall be #4 for barrier box and #4 for the cover. Support anchor shall be constructed of 12-gage, Type 304 stainless steel. All hardware shall be Type A304 Stainless Steel.

2. The System Identification letters shall be 1/8" line thickness formed by engraving, stamping, or with a stainless steel weld bead. See Standard Specification 9-29.2(4) for details.

3. Conduit capacity = 8" (4" per end).

4. Box shall include #8 AWG (min.) x 1 foot tinned, braided copper Bonding Juniper for bonding Box and Telescoping Top.
NOTES
1. Drilling through reinforcing steel is not allowed. If steel is hit while drilling, the location shall be moved and the abandoned hole filled with grout conforming to Standard Specification 1-03.3(20).
2. Mount the stainless steel support using an approved resin-bonded anchor system installed per manufacturer’s recommendation. Anchor bolt embedment shall be 4 1/2" minimum. Resin-bonded anchors shall be stainless steel and shall be 3/8" diameter. Expansion Anchors are not allowed.
3. There shall be a minimum of 3" edge distance to the centerline of anchor holes in the concrete.
5. The System Identification letters on the box lid shall be 1/8" line thickness formed by engraving, stamping, or with a stainless steel weld bead. See System Identification Detail and Standard Specifications J-97.4(4).
6. Junction Box shall be dimensioned as shown in the Contract. If the conduit sizes shown in the Contract are changed, the box dimensions shall be revised in accordance with NEC 314.28 using the 8 times multiplier for length and width dimensions.
7. Equipment Bonding Jumper shall be # 8 AWG (min.) x 1 foot of tinned, braided copper.
8. Fittings shall be UL listed and CSA-certified for conduit size and # 4 finish. Mounting Flange shall also be #12-gage, #10 stainless steel.

S-16-13
TOP ENTRY
NEMA 4X SURFACE-MOUNT JUNCTION BOX
STANDARD PLAN J-40.38-01
SHEET 1 OF 1 SHEET

APPROVED FOR USE
Washington State Department of Transportation

Equipment Grounding Conductor
Copper Solderless Crimp Connector
Equipment Bonding Jumper – See Contract for conduit size and number
Equipment Bonding Jumper

1 1/4" x 1/4" CLOSED CELL NEOPRENE GASKET
1/16" PAN HEAD 1/4" x #3 STAINLESS STEEL PHILLIPS PAN HEAD SCREWS TO INSIDE BACK OF BOX
TAPE 1/2 SPARE 1/4 - 20 NC - #3 STAINLESS STEEL PHILLIPS PAN HEAD SCREWS TO INSIDE BACK OF BOX

1 1/4" x 1/4" CLOSED CELL NEOPRENE GASKET
NUT - SPOT WELD (4) PLACES
1 1/2" CAPTIVE SCREW - BURR END
JUNCTION BOX LID
LOCKING TAB

3/8" DIAM. x 1/2" STAINLESS STEEL BOLT (TYP.)

1 1/4" x 1/4" CLOSED CELL NEOPRENE GASKET
NUT - SPOT WELD (4) PLACES
1 1/2" CAPTIVE SCREW - BURR END
LOCKING TAB

1 1/4" x 1/4" CLOSED CELL NEOPRENE GASKET
NUT - SPOT WELD (4) PLACES
1 1/2" CAPTIVE SCREW - BURR END
LOCKING TAB

NOT LESS THAN 3"
SEE 1"

1/4" x 1/2" CAPTIVE CELL NEOPRENE STAINLESS STEEL CHANNEL STEEL BURR END SCREW~

18-GAGE STAINLESS STEEL MOUNTING DETAIL

BARREL. 1/8"

CLOSED-GASKET 1/4" STAINLESS STEEL LOCKING FLANGE BEADING ON PIN DETAIL 0

PIANO HINGE DETAIL

BEADING ON BARREL, 1/8"

BOLT- SEE NOTE

RESIN-BONDED ANCHOR OF BOX

CONNECTION DETAIL

2. Mount the stainless steel support using an approved resin-bonded anchor system, installed per manufacturer's recommendation. Resin-bonded anchors shall be stainless steel and shall be of 3/8" diameter (Expansion Anchors are not allowed). Anchor bolt embedment shall be 4 1/2" min.

3. There shall be a minimum of 3" edge distance to the centerline of anchor holes. See Standard Plan J-60.13 for Stainless Steel Channel details.

4. The System Identification letters on the box lid shall be 1/8" line thickness formed by engraving, stamping, or with a stainless steel weld bead. See System Identification Detail and Standard Specifications 9-23.2(4).

5. Junction Box shall be dimensioned as shown in the Contract. If the conduit sizes shown in the Contract are changed, the box dimensions shall be revised in accordance with NEC 314.28 using the 8 times multiplier for length and width dimensions.

6. Fittings shall be UL listed and CSA-certified watertight on the outside of the Junction Box conduit connection. An insulated grounded end bushing shall be used to terminate Rigid Metal Conduit.

7. Equipment Bonding Jumper shall be # 8 AWG (min.) x 1 foot of tinned, braided copper.

8. Junction Box shall be constructed of 12-gage, Type 304 stainless steel with welded seam construction and # 4 finish. Mounting Flange shall also be 12-gage, Type 304 stainless steel.
1. Junction Box shall be constructed of 12-gage, Type 304 stainless steel with welded seam construction. Mounting Tabs shall be constructed of 12-gage, Type 304 stainless steel. Cover shall be constructed of ASTM A 36 steel with slip-resistant surfacing.

2. Fittings shall be UL listed and CSA-certified concrete tight on the outside of the Junction Box connection. Use an insulated, grounding and bushing on the inside for Rigid Metal Conduit.

3. Equipment Bonding Jumper shall be # 6 AWG (min.) x 3 feet minimum of tinned, braided copper.


5. Junction Box shall be dimensioned as shown in the Contract. If the conduit sizes shown in the Contract are changed, the box dimensions shall be revised in accordance with NEC 314.28 using the b times multiplier for length and width dimension.
   - Maximum Height = Sidewalk Depth
   - Maximum Interior Length = 29" (in)
   - Maximum Interior Width = 16" (in)


7. Field drill 1/2" (in) diameter hole for Drain Tube from the inside to the outside of Junction Box. One pole, on the lowest side only. Seal with bead of silicone. See Standard Specification 9-29.23. For drain tube routing, see Standard Plan J-50.16.

8. Conduit capacity is 12" (in) ~ 4" (in) per side.

9. Conduits shall enter through the sides as shown. Conduits shall not enter through the bottom of Junction Box.

10. Liberally coat the threads of the cover fasteners with anti-seize compound during construction and before final closure.
NOTES

1. Each wire shall be physically separated by at least 1/4" (in) so that sealing material can fill in between the wires; where heat shrink tubing is used for the outer splice enclosure, it shall meet one of the following requirements:

   a. Have separate ports for each conductor ("WYE" or "X" shaped tubing). ~ or ~

   b. Have rubber electrical mastic tape wrapped around each conductor to ensure a weatherproof seal. See Rubber Electrical Mastic Tape Installation Detail.

2. Heat shrink tubing shall extend a minimum of one inch onto the original wire insulation of each wire in the splice. Rigid splice enclosures shall be centered over the crimped connection(s).

3. Electrical tape used in splicing applications shall be 3/4" (in) wide, be UL listed under UL 510, and be CSA certified under C22.2 No. 197-M1983.

4. No more than two splices may be installed in the same splice enclosure.

5. Crimp splices shall be installed with an approved crimping tool for the type and size of crimp splice used. Pliers and similar multi-purpose tools may not be used.
Type 1 Stop Line Loops

1. For installation notes and details see Standard Plan J-50.15.
2. For Sections A, C, and D see Standard Plan J-50.15.
NOTES
1. For Installation Notes and Details see Standard Plan J-50.15.
3. All of the loop lead-in wires shall return to the Junction Box.
4. For Splice Detail. see Standard Plan J-50.05.
5. For additional Induction Loop details, see Standard Plan J-50.15.
NOTES
1. For Installation Notes and Details see Standard Plan J-50.15.
3. All of the loop lead-in wires shall return to the Junction Box.
4. For Splice Detail, see Standard Plan J-50.05.
5. For Loop numbering Layout Details, see sheet 3.
6. For additional Induction Loop Details, see Standard Plan J-50.15.
Loop numbering layout will be similar to Loop Numbering Layout Detail, Sheet 3.
TYPE 3A STOP LINE LOOPS

PLAN

CIRCULAR SAWCUT (TYP.)

6'-0" DIA. (TYP.)

5'-0"

6'-0"

STOP LINE

EDGE OF LANE

JUNCTION BOX

LEAD-IN SAWCUTS (TYP.)

CONDUIT

SEE DETAIL "B",
STANDARD PLAN J-50.15
SHEET 2

SEE ENTRANCE
SAWCUT DETAIL,
SHEET 1 (TYP.)

VEHICLE LANE

LANE

SHOULDER

CABLE TRACTOR (TYP.)

OFFSET CRIMPING

LOOP SERIES MARKING SLEEVE (TYP.)

S = START
F = FINISH

LOOP SERIES MARKING SLEEVE (TYP.)

LOOP SERIES START OR FINISH
MARKING SLEEVE (TYP.)

LOOP NUMBER MARKING DETAIL

LOOP SERIES LETTER

PHASE NUMBER

LANE NUMBER

LOOP NUMBER

LOOP SERIES LETTER

SERIES LOOPS ONLY

LOOP NUMBER

1 1 1 1

TYPE 3A STOP LINE LOOP WIRING DIAGRAM

SERIES SPLICE SHOWN

TRAFFIC FLOW

TYPE 3 INDUCTION LOOP

STANDARD PLAN J-50.12-01

SHEET 3 OF 3 SHEETS

APPROVED FOR PUBLICATION

Washington State Department of Transportation

STATE DESIGN ENGINEER

Joseph Bailey

Jul 18 2017 9:43 AM

Type: Joseph Bailey

Bailey, Ted

Jul 18 2017 9:57 AM
**LOOP INSTALLATION NOTES**

1. Install the Junction Box and the stub-out conduit with Sch. 80 PVC stub-out sleeve. Conduit for the loop stub-out shall be as required in the conduit size table shown on sheet 1 of this set.

2. Lay out loops and loop lead-ins to miss cracks/joints in road, when possible. Maintain 18" (in) minimum clearance from manholes and valve boxes.

3. The opening around the loop stub shall be patched with matching paving material if opened larger than PVC sleeve + 2" (in).

4. Sawcut the loop slots and the lead-in slots. File edges to remove burred edges of all saw-cuts into stub-out sleeve.

5. Lay out the loop wire starting at the Junction Box, allowing 5' (ft) minimum slack.

6. Install the wire in the loop slot as shown.

7. Finish laying out the wire at the Junction Box and identify the loops with the loop number, the "S" for start and the "F" for the finish, the loop series number, and the loop lead-in conductor number.

8. Twist each pair of the lead-in wires a minimum of two times per foot each foot, from the loop to the Junction Box. Reverse the direction of the twist for each successive pair installed. Seal loops/sawcuts.

9. Construct a supplemental splice containing any series loop connections in the adjacent junction box as required in the plans. Supplemental splices are subject to the same requirements shown for the loop lead-in and the shielded cable splice.

10. Splice the loop lead-ins to the shielded cable as noted in the Contract. See Standard Plan J-50.05 for Loop Splice details.

11. All loop circuits shall be tested per Standard Specification Section B-20.3(14D) once installation is complete.

12. Existing stub-out shall be upgraded as necessary to conform to the conduit size table shown on sheet 1.

13. All loop lead-in sawcuts parallel to lane edge shall be at least 12" (in) from edge of pavement and within six inches outside of lane or curb line when possible. Maintain 12" (in) separation between parallel cuts or joints.

14. The loop stub-out sleeve shall have an inside diameter 1" (in) larger than the outside diameter of the End Bell Bushing. Sleeve shall be notched 5/8" (in) to 3/4" (in) to accommodate loop wires. Plug conduit and fill sleeve with sand until loops are installed to keep out Hot Asphalt during paving operations.

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**INDUCTION LOOP DETAILS**

**STANDARD PLAN J-50.15-01**

**SHEET 2 OF 3 SHEETS**

APPROVED FOR PUBLICATION

Washington State Department of Transportation

Ted Bailey

Jul 18 2017 9:57 AM
NOTES

1. Installation of signal detection loops in the bridge deck shall be cast-in-place and installation by saw cutting an existing bridge deck shall not be allowed. This plan is intended for new construction only (not allowed for existing structures).

2. For Supplemental Splice in adjacent junction box, see Splice Detail, per Standard Plan J-50.15.

3. Prefomed loops shall conform to the layouts, numbering details, marking requirements, and wiring diagrams of Standard Plan J-50.12 for the number and types of loops shown in the Contract Plans.

4. Loops shall be tested immediately prior to pouring concrete, per Standard Specification 8-20.3(14)(D).

5. Lay-out Prefomed loops and loop leads-ins to maintain 1' (ft.) clearance from joints.

6. Construct a supplemental splice containing any series loop connections in adjacent Junction Box as required in the Plans. Supplemental splices are subject to the same requirements shown for the loop lead-in and the shielded cable splice, as shown in Standard Plan J-50.12.

7. Barrier Junction Box - 8" x 8" x 18" NEMA 4X in stationary-form barrier, adjustable NEMA 3R in slip-form barrier. (Junction Box can be recessed up to 1/8".) See Standard Plan J-40.36 or J-40.37.

8. For installation of Junction Box in the sidewalk, see Standard Plan J-40.40.

PREFORMED LOOP INSTALLATION DETAILS FOR NEW BRIDGE DECKS

STANDARD PLAN J-50.16-01

SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION

Washington State Department of Transportation
NOTES
1. See Standard Plan J-50.30 for Piezo axle sensor General Installation instructions, and Modified Type 2 Loop wiring details.
2. The contractor shall notify the Statewide Travel and Collision Data Office (STCDO) (formerly TDO) a minimum of five working days prior to the scheduled site installation. An inspector from the WSDOT STCDO shall be on site for all phases of installation.
3. The loop inductance of two loops within the same lane shall be within 0.02 micro henries each other. All piezo Homer readings shall be 0 from shield to center conductor. See piezo specifications for piezo capacitance readings.
4. The loops and axle sensors shall be cut in the final lift of asphalt after lane striping is completed. All PTR loops shall be spaced @10 ft leading edge to trailing edge.
5. For concrete pavement lanes with asphalt shoulders, install all of the piezo sensors and splices in the concrete lane. Also, for concrete lanes, install the loops 4" and 6" away from the expansion joints.
6. The shoulder notch length along the roadway shall be 6" or the conduit diameter plus 2" or whichever is larger. The shoulder notch width perpendicular to the roadway shall be the conduit size plus 1.5".
7. After all sensor leads are installed, seal the end of the conduit with conduit sealant. Use asphalt cold-patch to fill notch unless otherwise specified in the contract.
8. Use Schedule 40 PVC conduit from the Junction box to the Cabinet. Where there are two to four lanes, use one 1.5" conduit for each direction of travel. Where there are five lanes in either direction of travel, use one 2" min. conduit in each direction. Where there are six or more lanes in either direction, use one 3" min. conduit for each direction.
9. Use Schedule 80 PVC, HDPE, or steel conduit under the roadway. For conduit installation see Standard Specification 8-20.3(6).
10. Junction boxes installed in the paved shoulder or median shall be a Heavy Duty Junction box. If box is installed in unpaved shoulder, use type 1 or 2. See Standard Plan J-40.10 for size and type. See Standard Specification 9.29.2(1B) for further information.
11. All loop wire, loop leads, and piezo leads shall be labeled with colored electrical tape at all Junction Boxes, Pull Boxes and Cabinets, according to the Color Code Identification Chart. For Wire Color Code Detail see Standard Plan J-50.30.
12. Cabinet can be placed on either side of road depending on terrain/slope, etc. It does not have to be placed on increasing milepost side of the roadway.
13. For six-lane layouts and above, see Contract.

PLAN VIEW
TYPICAL 2 LANE PTR LAYOUT
**INDUCTION LOOP / PIEZOE AXLE SENSOR NUMBER IDENTIFICATION**

Lane 1 - (drive lane) - Loop L1, Piezo P1, Loop L2
Lane 2 - (pass lane) - Loop L3, Piezo P2, Loop L4
Lane 3 - (drive lane) - Loop L1, Piezo P1, Loop L2
Lane 4 - (pass lane) - Loop L3, Piezo P2, Loop L4

**PLAN VIEW**

**TYPICAL 4 LANE PTR LAYOUT WITH MEDIAN**

**SECTION A**

**SHOULDER NOTCH**
- See Notes 6 and 7 for conduit size - See Note 8

**PORTAL BOX**
- See Note 10

**LEAD-IN SAWCUT**
- Typical

**OFFSET LANE LINE (TYP.)**

**LOOPO LEAD-IN WIRES**

**HOME RUN CONDUIT (WHERE APPLICABLE)**

**SENSOR LEADS**

**HOME RUN CONDUIT**
- See Note 12

**ON-OFF CONDUIT**
- See Note 11

**PERMANENT TRAFFIC RECORDER INSTALLATIONS**
- Standard Plan J-50.20-00

**STANDARD PLAN J-50.20-00 SHEET 2 OF 3 SHEETS**
PLAN VIEW
TYPICAL 6 LANE PTR LAYOUT WITH MEDIAN

INCREASING MILEPOST DIRECTION

OFFSET LANE LINE (TYP.)

JUNCTION BOX – SEE NOTE 10

HOME RUN CONDUIT UNDER THE ROADWAY (TYP.)

LOOPS CENTERED IN LANE

HOME RUN CONDUIT UNDER ROADWAY (WHERE APPLICABLE)

HOME RUN CONDUIT – SEE NOTE 6

PVC CONDUIT

1 1/4" SCHEDULE 40

LEAD-IN SAWCUT (TYP.)

EDGE OF SHOULDER

EDGE OF LANE

16' - 0"

2' - 0"

P1

L1

L2

L3

L4

L5

L6

P2

P3

SECTION A

INDUCTION LOOP / PIEZO AXLE SENSOR NUMBER IDENTIFICATION

Lane 1 - (drive lane) – Loop L1, Piezo P1, Loop L6
Lane 2 - (center lane) – Loop L3, Piezo P2, Loop L4
Lane 3 - (center lane) – Loop L1, Piezo P1, Loop L6

Lane 2 - (center lane) – Loop L3, Piezo P2, Loop L4
Lane 3 - (center lane) – Loop L1, Piezo P1, Loop L6

SHOULDER NOTCH – SEE NOTES 6 AND 7 FOR CONDUIT SIZE – SEE NOTE 8

HOME RUN CONDUIT – SEE NOTE 8

CONDUIT FOR LOOP WIRES

FOR CONDUIT (OF AMM)
SEE NOTE 8

EDGE OF SHOULDER

SENSOR LEADS

PERMANENT TRAFFIC RECORDER INSTALLATIONS
STANDARD PLAN J-50.20-00

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
1. See Standard Plan J-50.30 for Piezo Axle Sensor General Installation instructions, and Modified Type 2 Loop Wiring Details.

2. The Contractor shall notify the Statewide Travel and Collision Data Office (STCDO) (formerly TDC) a minimum of five working days prior to the scheduled site installation. An inspector from the WSDOT STCDO shall be on site for all phases of installation.

3. The loop inductance of two loops within the same lane shall be within 20 micro henries of each other. All piezo ohms readings shall be OIL from shield to center conductor. Class WM piezo capacitance shall be 6nf to 20nf.

4. The loops and axle sensors shall be cut in the final lift of asphalt after lane striping is completed. All PTR loops shall be spaced @ 10 ft. leading edge to leading edge.

5. For concrete pavement lanes with asphalt shoulders, install all of the piezo sensors and splices in the concrete lane. Also, for concrete pavement lanes, install the loops 4" to 6" away from the expansion joints.

6. The shoulder notch length along the roadway shall be 4" or the conduit diameter plus 2" or whichever is larger. The shoulder notch width perpendicular to the roadway shall be the conduit plus 1¼".

7. After all sensor leads are installed, seal the end of the conduit with conduit sealant. Use asphalt cold-patch to fill notches unless otherwise specified in Contract.

8. Use Schedule 40 PVC conduit from the Junction Box to the Cabinet. Where there are 2 to 4 lanes, use one 1¼" min. conduit for each direction of travel. Where there are 5 lanes in either direction of travel, use one 2" min. conduit for each direction. Where there are 6 or more lanes in either direction, use one 3" min. conduit for each direction.

9. Use Schedule 80 PVC, HDPE, or steel conduit under the roadway. For conduit installation, see Standard Specification 8-20.3(5).

10. Junction Boxes installed in the paved shoulder or median shall be a Heavy Duty Junction Box. If box is installed in unpaved shoulder use type 1 or 2. See Standard Plan J-40.10 for size and type. See Standard Specification 9-29.2(1)(B) for further information.

11. All loop wire, loop leads, and piezo leads shall be labeled with colored electrical tape at all Junction Boxes, Pull Boxes and Cabinets. For Wire Color Code Identification Chart & Detail see Standard Plan J-50.30.

12. Cabinet can be placed on either side of the road depending on terrain/slope, etc. It does not have to be placed on increasing milepost side of the roadway.

13. For 6-lane layouts and above, see Contract.

14. Concrete lanes shall use 11" class 1 piezos. Asphalt lanes with 1" shoulder or less may use 12" piezos. For shoulders over 1", use 13 piezos.
**Typical 4-lane WIM Layout with Median**

**Increasing Direction**
- Lane 1 (drive lane) - Loop L1, Piezo P1, Piezo P2, Loop L2
- Lane 2 (pass lane) - Loop L3, Piezo P3, Piezo P4, Loop L4

**Decreasing Direction**
- Lane 3 (drive lane) - Loop L1, Piezo P1, Piezo P2, Loop L2
- Lane 4 (drive lane) - Loop L3, Piezo P3, Piezo P4, Loop L4

**Induction Loop to Piezo Axle Sensor Number Identification**

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
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</thead>
<tbody>
<tr>
<td>Rural</td>
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<tr>
<td>Urban</td>
<td>2'</td>
<td>10'</td>
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</table>
These are general installation instructions

See specific manufacturer's installation instructions in the special provisions of the contract.

1. Using paint and a straight edge, carefully mark the layout of the sensor installation. Ensure sensors are placed exactly perpendicular to the flow of traffic and that all lines are straight. Verify that the piezo coax length can reach the cabinet with a minimum of 8 ft. of cable inside the cabinet.

2. Using a wet-cutting pavement saw with a 3/4" blade width, cut the piezo slot approximately 4 to 6 inches longer than the piezo length. The piezo slot depth must be a minimum of 1" to a maximum of 1 1/2".

3. Lead-in cuts for the piezo coax should be 1/4" minimum wide, at a depth of 1 1/2" to 2".

4. Using a pressure washer, remove all slurry and loose material from the piezo slot.

5. Completely dry piezo slot. No moisture or oily residue shall be allowed in piezo slot.

6. After piezo cut is dry, wire brush sides and bottom of entire piezo slot. Blow out loose debris.

7. Install the piezo according to manufacturer's recommendations. Class 2 piezo sensors shall be placed at bottom of piezo slot. Class 1 sensors must be installed at a specific depth particular to each site location. This depth will be measured and set by Statewide Travel and Collision Data Office (formerly TDC) inspector on site.

8. Place two pieces of 2" duct tape along the length of the sensor slot. Tape should be about 1/16" from slot edge.

9. Mix epoxy according to manufacturer's recommendations and pour in slot into every 1/4" of epoxy. Make sure grout pours into slot slowly to avoid air pockets. Start at the piezo end and pour toward the coax to piezo attachment point. Repeat until the slot is completely full, at least two passes.

10. Use a putty knife with a notched center to spread the epoxy smooth the length of the sensor. Use a belt sander with a coarse grit paper to get an even surface finish. Be sure the sensor is placed exactly perpendicular to the flow of traffic and that all lines are straight. Ensure sensors are placed exactly perpendicular to the flow of traffic and that all lines are straight. Verify that the piezo coax length can reach the cabinet with a minimum of 8 ft. of cable inside the cabinet.

11. Remove tape.

12. Class 2 sensor installation is complete after epoxy has cured. Class 1 WIM sensors shall be placed flush with the pavement surface the entire length of the piezo sensor. Use a belt sander with a coarse grit paper to get an even surface finish.

13. Lead-in placement and saw-cut methods vary depending on Regional preference and location. Coordination between WSDOT and Contractor is needed to determine method to be used prior to installation.

14. Place the Installation Brackets on the sensor every 12" for class 2 sensor, and every 5" for class 1 sensor, for the length of the sensor. Use the 3/4" brackets.

Permanent Traffic Recorder and Weigh-In-Motion Details

Standard Plan J-50.30-00

Approved for Publication 4/30/11

Washington State Department of Transportation
**INSTALLATION BRACKET (TYP.)**

- See Note 7

**SECTION D**

- Piezo Axle Sensor Class 1 or 2 - See Notes
- Fill Sensor Slot with Grout - See Note 9
- Top of Roadway
- Level

3/8" - See Note 7

**SIDE VIEW**

- Sensor End
- Piezo Axle Sensor Class 1 or 2 - See Note 14
- Fill Sensor Slot with Grout - See Note 14

**SECTION E**

- Sensor Lead Attachment End
- Loop Sealant
- Piezo Coax Wire
- Polypropylene High-Temp Rope or Backer Rod

- Home Run Slot
- 4" to 6"
- 3"

**PLAN VIEW**

- Sensor Lead Attachment End
- Home Run Slot
- Installation Bracket (Typ.)
- 4" to 6"
- 3"

**PERMANENT TRAFFIC RECORDER AND WEIGH-IN-MOTION DETAILS**

**STANDARD PLAN J-50.30-00**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**

**APPROVED FOR PUBLICATION**

**SHEET 2 OF 3 SHEETS**
8 CIRCUIT LOOP TERMINAL STRIP WITH CLOSED BACK PANEL

SECOND TERMINAL STRIP IF NEEDED

POWER IN / BREAKER BOX 15 AMP CIRCUIT BREAKER

4 PLUG OUTLET

TO JUNCTION BOX

TO UTILITY

TYPICAL SERVICE CABINET
SEE NOTES 2 THRU 5

COLOR CODE IDENTIFICATION

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<tr>
<td>BROWN &amp; VIOLET</td>
<td>17</td>
</tr>
</tbody>
</table>

WHITE IS ALSO USED FOR DESIGNATING INCREASING MILE POSTS

COLOR CODE WIRE DETAIL

SINGLE PAIR LOOP LEAD CABLE

WHITE BAND = INCREASING MILE POST DIRECTION

YELLOW BAND = 4

COLOR CODED LABELS ON ALL WIRES SEE COLOR CODE IDENTIFICATION TABLE AND NOTE 1

SPLICE DETAIL

SEE SPECIAL PROVISIONS IN THE CONTRACT FOR SPLICE KIT ENCLOSURE.

SEE STANDARD SPECIFICATION 9-28.12 FOR SPLICE REQUIREMENTS

NOTES

1. The Loop and Piezo leads in all Junction Boxes and Cabinets are to be color-coded. Use colored tape on each specific wire, see table. Wrap the tape on the wires approximately 6" beyond conduit in all Junction Boxes.

2. The maximum load in the cabinet is 5 Amps.

3. The cabinet may be pedestal or pad mount. See Standard Plan J-10.10 for details.


5. For Grounding Details, See Standard Plan J-60.05. See Standard Specification 8-20.3(9) for other requirements.

Washington State Department of Transportation

PERMANENT TRAFFIC RECORDER AND WEIGHT-IN-MOTION DETAILS
STANDARD PLAN J-50.30-00

SHEET 3 OF 3 SHEETS

APPROVED FOR PUBLICATION

Washington State Department of Transportation
SUPPLEMENTAL GROUND

SERVICE GROUND

DETAIL A

RIGID PVC CONDUIT (PVC) APPLICATION

SEE KEY ON SHEET 1 FOR PARTS

SERVICE GROUND

DETAIL B

SUPPLEMENTAL GROUND

SERVICE GROUND

DETAIL C

GALVANIZED STEEL RIGID METAL CONDUIT (RMC) APPLICATION

TYPE D SERVICE CABINET

SEE STANDARD PLAN J-10.10

6' - 0" MIN.

6' - 0" MIN.

SEE STANDARD PLAN J-10.20

6' - 0" MIN.

6' - 0" MIN.

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

Required at all service and separately derived systems.

Type D service cabinet shown. Use this concept for Type B cabinet or transformer. Type D service cabinet shall be installed on lower surface of foundation only. Type B service cabinet and transformer cabinet shall be installed on raised surface of foundation only.

Type B modified service cabinet.

Grounding electrode conductor and equipment grounding conductor shall not be routed through lug on grounding bushing.

RIGID PVC CONDUIT (PVC) APPLICATION

GALVANIZED STEEL RIGID METAL CONDUIT (RMC) APPLICATION

TYPICAL GROUNDING DETAILS

STANDARD PLAN J-60.05-01

SHEET 3 OF 3 SHEETS

APPROVED FOR PUBLICATION

Washington State Department of Transportation

COPYRIGHTED MATERIAL NO DUPLICATION ALLOWED
1. Install Galvanized Steel Rigid Metal Conduit (RMC) between the Junction Box(es) Type 1 and the DX fitting(s) "A". RMC conduit shall also be used from the DX fitting(s) "A" to the PVC adaptor in the barrier.

   PVC Conduit may be used only in stationary-form barriers. Connect to RMC using a PVC adaptor.

   RMC Conduit may be used in stationary-form barriers, but it shall be used in slip-form barriers.


3. Pipe wrap tape shall be 2" wide, 20 mil thick, and installed with 1" minimum overlap.

NOTES

KEY NOTES

1. Junction Box (mount box so cover is flush with the barrier face with a 0" tolerance protruding beyond the barrier face and 1/8" recessed) Use NEMA 4X Junction Box with stationary-forms – See Standard Plan J-40.37. Use NEMA 3R Junction Box with slip-forms – See Standard Plan J-40.37.

2. Type DX Deflection (DX) Fitting with Internal Bonding Jumper.

3. Wrap Conduit Pipe from Conduit Deflection Fitting to 1" -0" beyond (inside) barrier surface

4. 1" - 0" long, 3/4" thick expanded closed-cell foam sleeve around conduit and fitting. After placing wire ties, duct tape seams and ends to seal and prevent concrete from bonding with fitting and conduit.

5. Where conduit in a structure is routed across a joint, wrap the conduit pipe for 1" - 0" on each side of the joint.

6. 10" - 0" long section of RMC conduit

7. Deflection Fitting shall be in neutral state after installation.

CONDUIT INSTALLATION IN TRAFFIC BARRIER ON RETAINING WALL

STANDARD PLAN J-60.11-00
CONDUIT INSTALLATION IN TRAFFIC BARRIER ON RETAINING WALL
STANDARD PLAN J-60.11-00
SHEET 2 OF 2 SHEETS

CONDUIT DEFLECTION FITTING "B" DETAIL
CONDUIT FITTING - TYPE DX - FOR DEFLECTION OF 30° AND 3/4" MOVEMENT
CONDUIT FITTING - TYPE DX FOR DEFLECTION OF 30° AND 3/4" MOVEMENT. CONDUIT PIPE PLACED THROUGH RETAINING WALL TRAFFIC BARRIER. SHALL BE FITTED WITH DEFLECTION FITTINGS AT MAXIMUM SPACING OF 120". THE DEFLECTION FITTINGS SHALL BE PLACED AT THE TRAFFIC BARRIER OPEN JOINT THAT COINCIDES WITH THE RETAINING WALL STEM EXPANSION JOINT NEAREST TO THE TRANSVERSE CONSTRUCTION JOINT IN THE WALL FOOTING.

CONDUIT DEFLECTION FITTING "A" DETAIL
CONDUIT FITTING - TYPE DX - PLACE AT CONDUIT PIPE EXIT FROM STRUCTURE

PREMOLDED JOINT FILLER

CONCRETE

CONDUIT PIPE

PLACE @ EXIT FROM STRUCTURE

CONDUIT PIPE

3" MIN - 6" MAX - CONDUIT AND THREADS - CAST OUTSIDE STRUCTURE

CONCRETE

CONDUIT PIPE

CONDUIT PIPE

TIES @ 2 1/2" SPACING

WIRE TIE (TY) - (5) REQUIRED

1" CONDUIT PIPES

1"-0"

1"-0"

1"-0"

2"-0" RMC

2"-0" RMC

1"-0"

3/4" CLOSED-CELL FOAM SLEEVE - WRAP 1 1/2 TIMES AROUND CONDUIT AND CONDUIT FITTING

PVC ADAPTOR (TY)

PVC ADAPTOR (TY)

CONDUIT WRAP TAPE

CONDUIT WRAP TAPE

CONCRETE

PREMOLDED JOINT FILLER

CONCRETE

CONCRETE

CONCRETE

CONCRETE

CONCRETE

CONCRETE

CONCRETE

CONCRETE

CONCRETE
**NOTEs**

1. Install a Conduit Deflection (DX) Fitting "A" at the exit from the barrier. Install a Conduit Deflection (DX) Fitting "B" to connect conduit ends at each concrete barrier expansion joint. See Standard Plan J-60.11 for Conduit Deflection Fitting details.

2. Install Galvanized Steel Rigid Metal Conduit (RMC) between the Junction Box(es) Type 1 and the DX fitting(s) "A". RMC conduit shall also be used from the DX fitting(s) "A" to the PVC adapter in the barrier. PVC conduit may be used only in stationary-form barriers. Connect to RMC using a PVC adapter. RMC conduit may be used in stationary-form barriers, but it shall be used in slip-form barriers.

3. See Standard Plan C-80.10 for additional details on Single-Slope Concrete Barrier.


5. Pipe-wrap tape shall be 2" wide, 20 mil thick, and installed with 1" minimum overlap.

**KEY NOTES**

1. Junction Box (mount box so cover is flush with the barrier face with a 0" tolerance protruding beyond the barrier face and 1/8" recessed). Use NEMA 4X Junction Box with stationary-forms. See Standard Plan J-40.10. Use NEMA 3R Junction Box with slip-forms. See Standard Plan J-40.37.

2. Where conduit is a structure is routed across a cold joint with continuous reinforcing steel, install premolded joint filler and wrap the conduit pipe for 1" - 0" on each side of the joint. Omit pipe-wrap tape on PVC conduit.

3. Where conduit exits from a structure, wrap the conduit pipe for 1" - 0" on each side from the exiting point.

4. 10" - 0" long section of RMC conduit.

5. Conduit Deflection Fitting shall be in neutral state after installation.

6. Where conduit in a structure is routed across a joint, wrap the conduit pipe for 1" - 0" on each side of the joint.
NOTES

1. Drilling through reinforcing steel is not allowed. If steel is hit while drilling, the location shall be moved and the abandoned hole filled with grout conforming to Standard Specification 6-02.3(20). There shall be a minimum of a 3\" edge distance to the centerline of anchor holes in concrete. Mount the stainless steel support using an approved resin bonded anchor system. Anchors shall be stainless steel and shall be of 3/8\" diameter (expansion anchors are not allowed). Anchor Bolt embedment shall be a minimum of 4\".

2. Number of clamps shall be determined by number of conduits to be attached to the Stainless Steel Channel Support. See Conduit Plans for conduit routing.

3. Additional Attachment Bolts when required to maintain 8\" maximum spacing between adjacent Attachment Bolts.

4. Stainless Steel Channel to be plumb to face of structure. Size spacer to maintain plumb line. When barrier is not plumb, size spacer to maintain back of barrier line.

NOTES

2. Stainless Steel Channel to be plumb to face of structure. Size spacer to maintain plumb line.
3. Slotted Channel mounting plate shall be installed where conduit is routed along column.

2. Stainless Steel Channel to be plumb to face of structure. Size spacer to maintain plumb line.
3. Slotted Channel mounting plate shall be installed where conduit is routed along column.

STAINLESS STEEL CHANNEL MOUNTING DETAILS ON COLUMN OR POLE
STANDARD PLAN J-60.14-00

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
NOTES

1. See Contract for head type, mounting height, and orientation.
2. All nipples, fittings, and center pipes shall be 1 1/2" (in) diameter.
3. Install neoprene gasket inside head when flanged elbows are supplied.
4. Extend wire sheath a minimum of 1" (in) inside all signal and sign housings and terminal compartments.
5. Apply bead of silicone to the serrated ring and around the perimeter of all top openings prior to installation of fittings.
6. See Standard Specification 8-38.16 for backplate requirements. Where required, prismatic sheeting shall be applied in accordance with the manufacturer's recommendations. The application surface of the backplate shall be cleaned, degreased with isopropyl alcohol, and dried prior to application of the sheeting.
7. Drill a 1/4" (in) drain hole in the bottom of each signal display assembly, and one in the bottom of each pedestrian head. When signal display assembly is mounted horizontally, drill a 1/4" (in) drain hole at the lowest point of each section of the signal assembly.
NOTES
1. Type M mounting shall have "O" ring groove and seal on top and bottom of signal attachment.
2. Type M mounting for conventional heads shall have a 2" (in) diameter opening at the signal attachment.
3. Type M mounting for optically programmed heads shall have a 3 1/2" (in) diameter opening at the signal attachment.
4. Type N mounting with optically programmed heads shall be installed with 14" (in) nominal arms.
5. See Standard Plan J-75.30 for tether wire and backplate requirements.
6. Apply bead of silicone around the perimeter of all top end cap openings prior to installation of the end cap assembly.
7. See Standard Specification S-29.16 for backplate requirements. Where required, prismatic sheeting shall be applied in accordance with the manufacturer's recommendations. The application surface of the backplate shall be cleaned, degreased with isopropyl alcohol, and dried prior to application of the sheeting.
8. Drill a 1/4" (in) drain hole in the bottom of each signal assembly. When signal display assembly is mounted horizontally, drill a 1/4" (in) drain hole at the lowest point of each section of the signal assembly.

NOTE: BACKPLATES NOT SHOWN FOR CLARITY
NOTES
1. Sign bridge, sign support structure and signal bridge foundation shall be designed by the Engineer of Record for all installations (at grade, mounted on a bridge structure or on a wall structure).

2. Typical view shown. See Contract Plans for quantities and locations of signal heads, EVP detectors, cameras, and signs.

3. Route signal cable(s) from terminal cabinet along inside bottom of the Signal Bridge to the Tenon(s) connector(s) at hand hole(s). Provide sufficient slack wire to allow the conductor or cable to be pulled a minimum of 18" (in) outside the Signal Bridge at the nearest hand hole to the equipment connection point.

4. All conductors shall be labeled in accordance with Standard Specification 6-30.30. Labels shall be provided at the terminal cabinet (at the terminal board and conduits), equipment terminals, and at the hand hole nearest equipment connection point.

5. All RMC conduits embedded in foundation shall be terminated with a grounding end bushing and bonded to the structure grounding terminal. All PVC conduits embedded in foundations shall be terminated with end bell bushing.

6. Hand hole(s) shall be designed by the Engineer of Record and installed per manufacturer recommendations.

7. Install hand hole on outside of the post at beam level when foundation is cast at grade. Install hand hole on traffic side of post when signal bridge is mounted on bridge, retaining wall or other structure.

8. Equipment grounding conductor shall be non-insulated #4 AWG copper with 3/8" (in) minimum slack. Clamp to horizontal steel reinforcing with a listed connector suitable for use embedded in concrete. For details, see Elevation View Signal Bridge Hand Hole Placement on Standard, Sheet 2. Or see Foundation Detail in Bridge Deck or Bridge Deck Island, Sheet 2.

9. Equipment grounding conductor shall be non-insulated #4 AWG copper with 3/8" (in) minimum slack. Clamp to vertical steel reinforcing with a listed connector suitable for use embedded in concrete. For Detail, see Partial Foundation Detail, Sheet 2.

10. Variable Message Signs (VMS) shall not be installed on signal bridge.

11. No sign larger than 12" (ft) long x 4" (in) tall shall be installed on signal bridge.
SIGN MOUNTING NOTES
2. Hot dip galvanize all non-stainless parts.
3. For sign lighting details, See Standard Plans J-75.40 (for Monotube) and J-75.45 (for Round or Multi-sided) structures.
4. Each sign shall be supported by a minimum of two support structures.
5. This details conceptual sign support and bracing. Engineer of Record shall design and analyze sign support in accordance with AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signal - Latest edition.

OBLIQUE VIEW
(VIEW IS FROM BELOW LOOKING UP)
ROUND OR MULTI-SIDED SIGNAL BRIDGE
SIGN MOUNTING DETAILS FOR SMALL SIGN
(FOR SIGNS - 36" (IN) x 36" (IN) OR LESS)

STANDARD PLAN J-75.41-01
SHEET 4 OF 4 SHEETS
APPROVED FOR PUBLICATION
Corporation, Jeff
Jun 23 2016 2:10 PM
Washington State Department of Transportation

SIGNAL BRIDGE STANDARD ELECTRICAL DETAILS

MONOTUBE SIGNAL BRIDGE SIGN MOUNTING DETAILS
(SKEWED SIGN DETAIL)
FOR DETAILS NOT SHOWN SEE STANDARD PLAN G-50.20

ISOMETRIC VIEW
MONOTUBE BEAM

STIFFENER PLATE DETAIL

ISOMETRIC VIEW
ROUND OR MULTI-SIDED SIGNAL BRIDGE
SIGN MOUNTING DETAILS FOR LARGE SIGN
(FOR SIGNS - 4' (FT) x 12' (FT) OR LESS)
NOTES
1. Typical view shown. Verify power source location, quantities, and location of signs and sign structure fixtures in Contract Plans.
2. Route separate IMSA 20-1 3C #14 cables from load side of terminal strip to each additional Sign-Lighting Luminaires (where applicable) and provide sufficient slack wire per Standard Specification 8-20.3(B).
3. Label all conductors with sign light and circuit number at isolation switch, hand hole, and ballast enclosure. Label shall be a PVC or Polyolefin wire marking sleeve per Standard Specification 9-29.
4. Install quick-disconnect fuse kits between the power supply wires and pole and bracket cable per Standard Specification 9-29.7. Pull down light to control. Fuse size shall be 200% larger than load size. (Disconnections shown left up for clarity.)
5. The conductors in the IMSA 20-1 3C #14 cable shall be black, red, and white. The white conductor shall be permanently identified as an equipment grounding conductor per the NEC.
6. All RMC conductors embeded in foundation shall be terminated with grounding end bushing and bonded to the ground terminal in the base of pole. All PVC conductors embeded in foundations shall be terminated with end bell bushing. See Standard Plan J-10.10 note (3).
7. Hand holes shall be installed at the time of fabrication. Hand Hole may be installed in field only when additional conductors for lighting accommodations to previously non-illuminated structures is needed, and as long as the proper repairs are made to structure. Contact Bridge and Structures office thru PE for installation/repair procedures.
8. For details not shown, see Standard Plan G-90.40.
9. All holes shall be drilled and tapped.

10. Use the Retrofit details only when the following conditions apply:
   A. Existing W4 x 13 Steel Beam sign brackets are to be reused for a new Sign-Lighting Luminaires.
   B. The span between the existing Luminaire Brackets is too wide to attach the new Sign-Lighting Luminaires and Luminare Mounting Plate.
11. If the sign structure includes a maintenance walkway, the Luminare Mounting Plate shall be bolted to the walkway grating.
NOTES
1. Upper and lower channel identification labels shall match the detector channels shown in the Contract Plans.

2. Connectors DT3B, DT3P, DT4S, and DT4P are Type DD50 D-Sub connectors with pin layouts and assignments as shown. The suffix "B" indicates a socket (female connector) and the suffix "P" indicates a plug (male connector).

3. Detector Termination Interface Panel terminals not shown due to variations in arrangement and numbering between manufacturers.

4. Connectors DT3P and DT4S shall be installed in the following order:
   a. Mounted to the back of the Detector Test Panel. Connectors shall use a spring latch (ball) to secure the connection.
   b. Mounted on a cabinet, within six inches of the back of the Detector Test Panel. Connectors shall use thumb-screws to secure the connection.

5. Connectors DT3S and DT4P shall be designed such that they can be connected directly, bypassing the Detector Test Panel.

6. The Detector Termination Interface Panel shall be installed electrically between the Detector Test Panel and the C1 connector. A second additional terminal block may be installed electrically between the Input File(s) and the Detector Test Panel.

7. Test switches shall be three position switches with the "Test" position being a momentary contact with spring return to the "OFF" position. Test switch position functions shall be as described in Standard Specification section 9.29.13(10).

8. Location of the Display On/Off switch is approximate. This switch shall be located to the right of all individual channel test switches and clear of the mounting rack.

CONNECTOR PIN ASSIGNMENTS (SEE NOTE 3)

**CONNECTOR DT3S**

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<td></td>
</tr>
<tr>
<td>5</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

**FUNCTIONAL BLOCK DIAGRAMS**

**PIN TABLE EXAMPLES:**

<table>
<thead>
<tr>
<th>J1F</th>
<th>Input File J, Slot 1, Terminal F</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1T</td>
<td>Detector #14</td>
</tr>
<tr>
<td>IBU</td>
<td>- IN: Detector Test Panel Position 9, Upper Channel</td>
</tr>
<tr>
<td></td>
<td>- OUT: Detector Test Panel</td>
</tr>
<tr>
<td></td>
<td>C1-88: C1 Connector, Pin 88</td>
</tr>
<tr>
<td></td>
<td>C1-89: C1 Connector, Pin 89</td>
</tr>
</tbody>
</table>

N/A: Not Applicable
NC: Not Connected
1. Equipment shall meet the requirements of and be constructed in accordance with the California Department of Transportation (CalTrans) Transportation Electrical Equipment Specifications (TEES) as currently published, including all errata, with modifications as shown here and described in Standard Specification Section S-29.13(10), Pre-Terminated Fiber-optic Patch Panel field installed separately.

2. The following input file terminal blocks shall be wired in parallel:
   - 115 to J15
   - 116 to J16

3. Power Distribution Assembly (PDA) #3XL shall be modified as follows:
   a. The C6P connector shall be included and wired as referenced in TEES Drawing A6-15, Note 9.
   b. A second Model 430 Transfer Relay (TR2) shall be installed on the rear of the PDA and wired as shown.
   c. The following terminals shall be wired together as follows:
      | From | To | Function |
      |------|----|----------|
      | T2-2 | T2-6 | TR1 Output to Field Green 2 |
      | T1-1, T1-2 | T2-6 | MU-3 Energizes TR1 and TR2 when MU is normal |
      | T1-3, T1-4 | SR-3 | Field Output - Sign On |
      | T1-3, T1-4 | SR-4 | Field Output - Sign Off |

4. Input Panel #1D shall meet the requirements of Input Panel #1 in the TEES, with the modifications shown here. Do not include ground bus bars between terminal blocks TSB through TSB. Relabel the C5 connector as C4P. The C4 connector cable shall be 4 feet in length.

5. Service Panel #1D shall meet the requirements of Service Panel #1 in the TEES, with the modifications shown here. The model 204 flasher shall include a socket and retaining strap, providing a snug fit and allowing the flasher to be removed, without tools, by pulling upwards.

6. Bus Bars shall be capable of being used without installing lugs on field wires.

7. The Sign Switch shall be a 3-position, stationary type toggle switch with a 10 amp contact rating.

8. The Police Control Switch shall be a 2-position, stationary type toggle switch with a 10 amp contact rating.

---

**Power Distribution Block Diagram**

- **PDA #3LX**
- **MONITOR UNIT**
- **FLD 15A**
- **INHIBIT**
- **CABINET LOCKING**
- **INPUT FILE**
- **TO ADVANCE WARNING SIGNS**
- **INPUT FILE**
- **CABINET PACK**
- **BACK FLASHER**
- **TO ADVANCE WARNING SIGNS**

**Type 334 Ramp Meter/Data Station Cabinet Standard Plan J-81.10-00**

**Transfer Relay Details**

<table>
<thead>
<tr>
<th>Function</th>
<th>Connect 10</th>
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<tbody>
<tr>
<td>AC SUPPLY</td>
<td>SPW-27</td>
</tr>
<tr>
<td>AC</td>
<td>CB3</td>
</tr>
<tr>
<td>NA</td>
<td>NO</td>
</tr>
<tr>
<td>TR2</td>
<td>TRC5</td>
</tr>
<tr>
<td>AC</td>
<td></td>
</tr>
<tr>
<td>MU DX (AC1)</td>
<td></td>
</tr>
</tbody>
</table>

**Transfer Relay 1 (TR1)**

**Transfer Relay 2 (TR2)**

---

**NOTES**

- Dimensions not shown shall be in accordance with the TEES.
- R = DUPLEX RECEPTACLE
- R = RELAY COIL
- R = RELAY CONTACT - NORMALLY CLOSED
- R = RELAY CONTACT - NORMALLY OPEN

**Customer:**

**Engineer:**

**Drawn by:**

**Approved for publication:**

**Washington State Department of Transportation**
DISPLAY PANEL NOTES

D1. The Display Panel shall be 0.125" (in) thick aluminum with a brushed finish. All text on the Display Panel shall be a minimum of 0.25" (in).

D2. The Cabinet Name Plate shall be a phenolic label with white minimum 0.375" (in) text on a black background, permanently affixed to the panel. See Contract Plans for cabinet identification number.

D3. The Detector Labels shall have 0.5" (in) black text on a white background. The labels may be phenolic or industrial grade outdoor vinyl, and shall be permanently affixed to the panel.

D4. All other text shall be black and screened directly onto the panel.

D5. The Sign Relay socket and connectors P1P, P2S, and CSP shall be installed on the back of the panel. Connectors P1PS and P2PS are Type D069 D-Sub connectors with pin assignments as shown on sheet 3. The suffix "S" indicates a socket (female connector) and the suffix "P" indicates a plug (male connector).

D6. The Sign Relay shall be DPDT, wired as shown, with a contact rating not less than 10 amps continuous duty. The relay shall operate on ground output from the controller, and draw less than 75 mA at 11 VDC when energized. AC wiring between the relay and the PDA shall be #14 AWG.


<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>CONNECT TO</th>
<th>SIGN RELAY (SR)</th>
<th>SIGN RELAY (SK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
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<tr>
<td>GRDC</td>
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<tr>
<td>30 VDC</td>
<td>30 VDC</td>
<td>30 VDC</td>
<td>30 VDC</td>
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</table>

SHOWN DE-ENERGIZED (NOT METERING)

SIGN RELAY DETAIL
(SEE NOTE D8)

TYPE 334
RAMP METER/
DATA STATION CABINET
STANDARD PLAN J-81.10-00

APPROVED FOR PUBLICATION
January 28, 2010 10:29 AM
Washington State Department of Transportation
### C1 Connector Pin Assignments

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<thead>
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<th>PIN CONNECT</th>
<th>FUNCTION</th>
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<th>FUNCTION</th>
<th>CONNECT</th>
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<tbody>
<tr>
<td>D1 NC</td>
<td>C1 NC</td>
<td>D2 NC</td>
<td>C1 NC</td>
<td>D3 NC</td>
<td>C1 NC</td>
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<td>D4 NC</td>
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<td>C1 NC</td>
<td>D8 NC</td>
<td>C1 NC</td>
<td>D9 NC</td>
<td>C1 NC</td>
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<tr>
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<td>C1 NC</td>
<td>D11 NC</td>
<td>C1 NC</td>
<td>D12 NC</td>
<td>C1 NC</td>
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<td>D13 NC</td>
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<td>C1 NC</td>
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<tr>
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<td>D29 NC</td>
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<td>D30 NC</td>
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### C4, C5, and C6 Connector Pin Assignments

<table>
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<th>FUNCTION</th>
<th>CONNECT</th>
<th>FUNCTION</th>
<th>CONNECT</th>
<th>FUNCTION</th>
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</thead>
<tbody>
<tr>
<td>C4 NC</td>
<td>C4 NC</td>
<td>C5 NC</td>
<td>C5 NC</td>
<td>C6 NC</td>
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<td>C5 NC</td>
<td>C6 NC</td>
<td>C6 NC</td>
</tr>
</tbody>
</table>

### Display Panel Inputs

**Functional Block Diagram**

- **Input Panel**: Connect to **C1 Connector**
- **Display Panel**: Connect to **Connector P25**

**NOTE**: Connectors P15 and P25 shall be mounted to the back of the display panel and shall be secured using a spring latch (ball) type connection.

### Pin Table Examples:

- J-1F: Input File 2, Slot 1, Terminal F
- D1: Display Panel
- DET-1: Display Panel, Detector 1 Position
- C1: 8B: C1 Connector, Pin 88

---

**DD50 D-SUB Connector Pins**

Plug (male) connector shown – mirror for socket (female) connector –

---

**Type 334 Ramp Meter/ Data Station Cabinet**

**Standard Plan J-81.10-00**

Authorized: Washington State Department of Transportation

Approved for Publication: Capron, All

**Sheet 3 of 3 Sheets**

Notary, Mathew

Approved: 18 Jul 2010 10:27 AM
NOTES
1. Under FCC Rules & Regulations 90.242, the antenna is limited to a maximum height of 15 meters (49.2 feet). Mount the antenna to the pole with a bracket and high-strength insulated antenna mounts with stainless steel hardware.
2. The antenna shall be center or base loaded vertical featuring a low-loss, embedded weatherproof loading coil.
3. The amplitude modulated transmitter must be FCC type approved. See Contract for the transmitter frequency.
4. The voice storage unit shall be as specified in the Contract.
5. See Standard Plan J-60.14 for details on mounting a NEMA junction box to a timber pole.
6. All HAR conduits shall be secured to the pole with two-hole conduit straps spaced at 5 (5) maximum centers. See Standard Plans J-60.13 and J-60.14 for steel channel support and mounting details.
7. The shield shall be tightly wrapped around the center conductor when attaching the PL 259 connector to the UG 175/U adapter. The shield wrapping on the center conductor may ONLY come in contact with the center pin at the solder point. The shield MUST NOT come in contact with the PL 259 shell.
8. The shield shall be soldered through all of the holes on the PL 259 connector, and the center conductor shall be soldered at the tip of the connector. The shield and center conductor MUST NOT be shorted together.
9. The shield shall be tightly wrapped around the center conductor. Crimp and solder the center conductor and shield to the terminal lug and attach securely to the antenna. Seal the entire connection assembly. Including the antenna connection point, with butyl tape or heat shrink.
CONSTRUCTION NOTES
1. Backfill material shall meet ANSI/NSF Environmental Standard 60. Follow manufacturer’s mixing recommendations.
2. Ground Pipe and types of non-hazardous salts will vary per manufacturer. See the WSDOT Qualified Products List (QPL) for approved manufacturers and follow guidance provided.

GROUND ROD (TYP.) – SEE GROUND ROD DETAIL

#2 AWG BARE STRANDED COPPER GROUND WIRE (TYP.)

35 FT (10M) CLASS 4 TREATED TIMBER SERVICE SUPPORT POLE – SEE STD. SPEC. Sect. D-29.6(b)

2" (50MM) DIAMETER CONDUIT – ANTENNA COAX CABLE

1 1/2" (40MM) DIAMETER CONDUIT – CONTROLLER CABINET GROUND WIRE

EXOTHERMIC WELD TO PIGTAIL (TYP.)

HIGHWAY ADVISORY RADIO (HAR) TRANSMITTER
STANDARD PLAN J-86.10-00

ELEVATION VIEW GROUND ROD DETAIL

FACTORY INSTALLED EXOTHERMIC WELD CONNECTION

HOPE BELOW GRADE ENCLOSURE WITH LID

FINISHED GRADE

DIAMETER

18" (TYP.)

1 1/2" (40MM) DIAMETER CONDUIT – CONTROLLER CABINET GROUND WIRE

GROUND PIPE FILLED WITH NON-HAZARDOUS SALTS (SEE NOTE 2)

BACKFILL MATERIAL (SEE NOTE 1)

#2 AWG SOLID TINNED COPPER PIGTAIL – DIRECT BURY AND CONNECT TO #2 AWG GROUND WIRE

GROUNDED DETAIL

PLAN VIEW GROUND ROD LAYOUT

TRIAD GROUNDING SYSTEM DETAILS
CABINET NOTES
1. The cabinet is a Type 331 with housing and rack as shown in Standard Plan J-12.10.
2. The service panel shall be installed on the left side of the cabinet as viewed from the rear.
3. Service PDA (SPDA) shall be as shown in the TEES, with the modifications shown here.
4. The battery shelf shall not obstruct any outlets on the SPDA.
5. The Receptacle Shelf shall be plugged into a clean receptacle on the SPDA.
6. DSL Modem may be set on the drawer shelf if it is not designed for wall mounting.
7. Bus bars shall be capable of being used without lugs on wiring.

KEY NOTES
- POWER MODULE
- INTERFACE MODULE
- DIGITAL COMMUNICATION CONTROLLER MODULE
- AM TRANSMITTER MODULE
- MODULATION PICK-OFF

HIGHWAY ADVISORY
RADIO (HAR) TRANSMITTER
STANDARD PLAN J-86.10-00

SERVICE POWER
DISTRIBUTION ASSEMBLY
WITH GENERATOR
TRANSFER SWITCH
WIRING DIAGRAM
SEE NOTE 3

PHONE LINE SURGE SUPPRESSOR

COMMUNICATION INTERFACE PANEL
REAR VIEW - PHONEDSL

COMMUNICATION INTERFACE PANEL
REAR VIEW - FIBER

NETWORK INTERFACE DEVICE
(UTILITY PROVIDER)

COMMUNICATION INTERFACE PANEL
FRONT VIEW

COMMUNICATION INTERFACE PANEL
FRONT VIEW

DSL MODEM
TELEPHONE HANDSET WITH RETENTION STRAP FOR HANDSET

CLEAN RECEPTACLES
RAW RECEPTACLES

CABINET LIGHTING
FAN HEATER AND THERMOSTAT

COMMUNICATION INTERFACE PANEL
ISOMETRIC VIEW

EQUIP. GROUND BUS
PORTABLE GENERATOR RECEPTACLE
GENERATOR TRANSFER SWITCH

AC (NEUTRAL) BUS
CB-1 (50A) 15A
SHARP IT GS1 FILTER / SURGE PROTECTOR
CB-4 (40A) 15A
CB-2 (15A)
CB-3 (15A)

SERVICE POWER IN
MAIN 30A
32 15A 32 15A 186A 186A 186A

HAR EQUIPMENT RACK LAYOUT
FRONT VIEW

SERVICE PANEL LAYOUT

REAR VIEW

FRONT VIEW
NOTES

1. The Heavy Duty Lid thickness varies by installation type:
   a) 9" (in) for all new installations
   b) 6" (in) for existing boxes with no roadway overlay
   c) Such that it is flush with the surface of the new overlay, when a new overlay is specified

2. Minimum lid thickness shown. The diamond pattern shall be a minimum of 3/32" (in) thick.

3. Slip-resistant lids shall be identified with a permanent marking on the underside of the lid, indicating the type of surface treatment (see Contract Documents for details) and the year of manufacture. The marking shall use 1/8" (in) thick lines formed with a web bed, and shall be placed prior to galvanizing.

4. For Standard Duty Lids, attach a 1/4-20 UNC x 1" (in) S.S. ground stud coated with anti-seize compound. For Heavy Duty Lids, install a 1/2-13 UNC x 1 1/4" (in) S.S. bolt in a 5/8" (in) diameter cored hole in the ductile iron lid gusset as a ground stud. All ground studs shall include (3) S.S. nuts and (2) S.S. flat washers. See Standard Plan J-90.60 for grounding and bonding details.

5. The bonding jumper between the lid and frame shall be #8 AWG (min.) x 4" (in) stranded braided copper.

6. System identification letters shall use 1/8" (in) wide lines. Cover marking for steel lids shall be formed by casting or with a mild steel weld bead. Cover marking for ductile iron lids shall be recessed. See COVER MARKING DETAIL and Standard Specification section 9-29.2(4) for additional details. Ductile iron lids shall also provide a minimum 1 1/2" (in) wide x 3 1/2" (in) thick, flat area for labeling purposes.

7. Cement concrete shall be Class 4000.

8. Plastic plugs shall be put into the lid inserts after fabrication and the lid installation.

9. Conduit Capacity = 60 inches (sum total of all conduit diameters).

10. This drawing depicts a typical Pull Box assembly. Reinforcing not shown. Each manufacturer’s Pull Box assembly will vary. Refer to the approved manufacturer’s shop drawings for all dimensions and the actual arrangement.

11. The lid is an assembly consisting of the metal lid and frame, reinforcing steel, brass ground inserts, and concrete.

12. #3 reinforcing bar shall be capable of being bent out of the way and restored, to allow for conduit installation.
HEAVY DUTY LID
SEE NOTE 1

SECTION A
(DUCTILE IRON COVER NOT SHOWN)

① EQUIPMENT BONDING JUMPER (SEE NOTE 5)
② SYSTEM IDENTIFICATION (SEE NOTE 6)
③ AGENCY LOGO (SEE DETAIL, SHEET 2)

NOTES
1. The Heavy Duty Lids thickness varies by Installation type:
   a. 6" (150 mm) for all new installations
   b. 3" (75 mm) for existing boxes with no roadway overlay
   c. Such that it is flush with the surface of the new overlay, when a new overlay is specified
2. Minimum lid thickness shown. The diamond pattern shall be a minimum of 3/16" (5 mm) thick.
3. Slit-resistant lids shall be identified with a permanent marking on the underside of the lid.
   Indicating the type of surface treatment (see Contract Documents for specific details and the year
   of manufacture. The marking shall use 1/8" (3 mm) thick times formed with a weld bead, and
   shall be placed prior to galvanizing.
4. For Standard Duty Lids, attach a 1/4-20 UNC x 1" (38 mm) S.S. ground stud, coated with
   anti-seize compound. For Heavy Duty Lids, install a 1/2-13 UNC x 1 1/4" (34 mm) S.S. bolt in a
   5/8" (16 mm) diameter core hole in the ductile iron lid gasket as a ground stud. All ground
   studs shall include (3) S.S. nuts and (2) S.S. flat washers. See Standard Plan J-90.09
   for grounding and bonding details.
5. The bonding jumper between the lid and frame shall be #8 AWG (min.) x 4" (100 mm) tinned
   braided copper.
6. System identification letters shall use 1/8" (3 mm) wide lines. Cover markings for steel lids
   shall be formed by casting or with a mild steel weld bead. Cover marking for ductile
   iron lids shall be recessed. See COVER MARKING DETAIL and Standard Specification
   section 9-28.2(4) for additional details. Ductile iron lids shall also provide a minimum
   1 1/2" (38 mm) wide x 3 1/2" high x 3/16" (5 mm) thick flat area for lifting purposes.
7. Cement concrete shall be Class 4000.
8. Plastic plugs shall be put into the lid inserts after fabrication and the lid installation.
9. Conduit Capacity = 60 inches (sum total of all conduit diameters).
10. This drawing depicts a typical assembly. Reinforcing not shown. Each manufacturer's
    assembly will vary. Refer to the approved manufacturer's shop drawings for all
    dimensions and the actual arrangement.
11. The lid is an assembly consisting of the metal lid(s) and frame, reinforcing steel, brass
    ground inserts, and concrete.
12. #3 reinforcing bar shall be capable of being bent out of the way and restored, to allow for
    conduit installation.

CABLE VAULT

STANDARD PLAN J-90.20-03

SECTIONS 1-2 SHEETS

APPROVED FOR PUBLICATION

Washington State Department of Transportation

Matthew, Matthew
Jun 25 2018 12:53 PM
NOTES

1. The diamond pattern shall be a minimum of 3/32" (in) thick.

2. Slip-resistant lids shall be identified with a permanent marking on the underside of the lid, indicating the type of surface treatment (see Contract Documents for details) and the year of manufacture. The marking shall use 1/8" (in) thick free forms with a weld bead, and shall be placed prior to galvanizing.

3. A 1/4 - 20 UNC x 1" (in) ground stud with three nuts and two flat washers shall be welded to each lid and coated with anti-seize compound. A 1/4 - 20 UNC x 1" (in) ground stud with three nuts and four washers shall be welded to the frame and coated with anti-seize compound. See Standard Plan J-90.60 for grounding and bonding details.

4. The bonding jumper between the lid and the frame shall be #6 AWG (min.) x 4 (ft) tinned braided copper.

5. The system identification letters shall be 1/8" (in) line thickness formed with a mild steel weld bead. See COVER MARKING DETAIL. See Standard Specification Section 9-29.2(4).

6. Cement concrete shall be Class 4000.

7. Conduit Capacity = 40 Inches (sum total of all conduit diameters).

8. Typical Small Cable Vault features and arrangement shown. Reinforcing not shown. Dimensions and arrangements will vary slightly by manufacturer. See Approved shop drawings.

9. Small Cable Vaults for WSDOT Projects shall only be installed with the lid frame bearing on the concrete portion of cable vault.
HOT MIX ASPHALT PAVEMENT

TWO-LANE ROADWAY

BITUMINOUS SURFACE TREATMENT

NOTE

1. For Hot Mix Asphalt Paving projects ~ "DO NOT PASS" and "PASS WITH CARE" signs shall be included for passing zones.

HOT MIX ASPHALT PAVEMENT

ONE-WAY TWO-LANE ROADWAY

BITUMINOUS SURFACE TREATMENT

YELLOW TEMPORARY TAPE OR PAINTED CENTER LINE (TYP.)

WHITE TEMPORARY TAPE OR PAINTED CENTER LINE (TYP.)

6'

34'

6'

34'

3'

3'

TEMPORARY TURN ARROW (TYP.)

YELLOW TRPM (TYP.)

YELLOW TRPM (TYP.)
NOTES
1. For sign installation details, see Standard Plan G - series.
2. Where it is impractical to locate a sign with the lateral offset, a minimum of Zft offset may be used. A 1’(ft) lateral offset may be used in business, commercial or residential areas.
3. The "V" height for signs, with an area of more than 50 square feet and two or more sign supports, is 7 feet in both rural and urban areas.

<table>
<thead>
<tr>
<th>HEIGHT</th>
<th>V</th>
</tr>
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<tbody>
<tr>
<td>TO BOTTOM OF SIGN</td>
<td>TO BOTTOM OF SUPPLEMENTAL PLAQUE</td>
</tr>
<tr>
<td>(NO SUPPLEMENTAL PLAQUE)</td>
<td>(WHEN REQUIRED)</td>
</tr>
<tr>
<td>RURAL</td>
<td>5' MINIMUM</td>
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<tr>
<td>URBAN</td>
<td>7' MINIMUM</td>
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CLASS A
CONSTRUCTION SIGNING INSTALLATION
STANDARD PLAN K-80.10-01

Sheet 1 of 1 Sheet

Approved for Publication
Carpenter, J.D.
Washington State Department of Transportation
TYPE 3 BARRICADE

NOTES

1. All fasteners may be zinc plated, galvanized or stainless steel. All steel angle and tubular steel shall be hot-rolled, high carbon steel, painted or galvanized.

2. Install one lightweight Type A Low-Intensity flashing warning light on the traffic side of the barricade. Install two Type A Low-Intensity flashing warning lights per barricade when the barricades are used to close a roadway. Attach the light to the barricade according to the light manufacturer’s recommendations or use the details shown on this plan.

3. Stripes on barricade rails shall be alternating orange and white retroreflective stripes (sloping downward at an angle of 45 degrees in the direction traffic is to pass).

4. The Type 3 barricade design shown on this plan meets the crash test requirements of NCHRP 350. Alternative designs may be approved if they conform to the NCHRP 350 crash test criteria and the MUTCD.

5. When a sign is mounted on the barricade, it shall be securely bolted to at least two plywood panels. The top of the sign shall not be higher than the top panel of the barricade.

6. When sandbags are used in freezing weather, Urea fertilizer shall be mixed with the sand in a quantity to prevent the sand from freezing.

WARNING LIGHT ATTACHMENT DETAIL

ATTACHMENT DETAIL A

ATTACHMENT DETAIL B

8’-0” MIN. TO 8’-0” MAX.

USE ATTACHMENT DETAIL A OR ATTACHMENT DETAIL B

TOP OF BARRICADE SUPPORT ANGLE

DRILL THREE 1/2” DIAM. HOLES

6” X 1 1/2” X 1 1/2” X 1/8” STEEL ANGLE

TOP OF BARRICADE SUPPORT ANGLE

ATTACHMENT DETAIL A

DRILL TWO 1/2” DIAM. HOLES THROUGH BARRICADE SUPPORT ANGLE

1) 3/8” - 16 x 1 3/4” STEEL HEX BOLT
2) 1” FLAT WASHERS
3) 3/8” - 16 STEEL HEX NUT (TYP.)

(SEE NOTE 2)

3/4” ACX PLYWOOD PANEL

SANDBAGS AS REQUIRED TO STABILIZE BASE.

TOP OF BARRICADE SUPPORT ANGLE

DRILL TWO 1/2” DIAM. HOLES THROUGH BARRICADE SUPPORT ANGLE

1) 3/8” - 16 x 3” STEEL HEX BOLT
2) 1” FLAT WASHERS
3) 3/8” - 16 STEEL HEX NUT

TOP OF BARRICADE SUPPORT ANGLE

DRILL TWO 1/2” DIAM. HOLES THROUGH BARRICADE SUPPORT ANGLE

1) 3/8” - 16 x 3” STEEL HEX BOLT
2) 1” FLAT WASHERS
3) 3/8” - 16 STEEL HEX NUT

TOP OF BARRICADE SUPPORT ANGLE

3/4” ACX PLYWOOD PANEL

SANDBAGS AS REQUIRED TO STABILIZE BASE.

ISOMETRIC VIEW

TYPE 3 BARRICADE

STANDARD PLAN K-80.20-00

EXP IR 8-0 2011

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

50TH ANNIVERSARY OF TRANSPORTATION ENGINEERING

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
USEABLE TRAFFIC LANE  
AREA CLOSED TO TRAFFIC

TYPE 3L BARRICADE

STRIPE ON THE BARRICADES SHALL SLOPE DOWNWARD IN THE DIRECTION TRAFFIC IS TO PASS

AREA CLOSED TO TRAFFIC  
USEABLE TRAFFIC LANE

TYPE 3R BARRICADE

ROAD CLOSURE AT INTERSECTION

WORK AREA

TYPE 3L BARRICADE

TYPE 3R BARRICADE

ROAD CLOSURE AT OTHER LOCATIONS

WORK AREA

TYPE 3R BARRICADE

TYPE 3L BARRICADE

BARRICADE PLACEMENT
1. The reinforcing steel details for the Narrow Base barrier are the same as those shown for the 2' wide barrier except that the bars along the vertical face run vertically with a 1 1/2" clearance.

2. The vertical dimensions for the slots and loop bar locations on the Narrow Base barrier are the same as those shown on the END views of the 2' wide barrier.
NOTES

1. Use Type 1 Anchors when the concrete pavement or bridge deck is 6" or thicker with 2' wide concrete barrier only. Use Type 2 Anchors (Standard Plan K-80.37) with narrow base barrier.

2. Adjust the location of the Type 1 Anchors to avoid the main reinforcing in the deck when drilling holes.

3. Use shims to properly fit the Type 1 Anchors to the barrier and roadway surfaces.

4. Upon removal of the Type 1 Anchors, clean the bolt holes and fill them with grout according to Standard Specification 6.02.3(20).

5. Remove the Type 3 Anchors by first driving the steel pins down through the barrier further into the pavement to allow lifting the barrier without interference, then remove the pins from the pavement.

6. After removing the Type 3 Anchors, clean the pin holes and fill them with sealant according to Standard Specification 9-04.2.
NOTES

1. The intended use of this plan is for the temporary installation of Alternative Temporary Concrete barrier (F-Shape), Narrow Base (see Standard Plan K-80.30) on cement concrete pavement or bridge deck.

2. Use Class 1 when the concrete pavement or bridge deck is 9" or thicker; use Class 2 when it is 6" or thicker.

3. Adjust the location of the anchors to avoid the main reinforcing in the deck when drilling holes.

4. Use shims to properly fit the anchors to the barrier and roadway surfaces.

5. Upon removal of the anchors, clean the bolt holes and fill them with grout according to Standard Specification 6.02.3(20).

The intended use of this plan is for the temporary installation of Alternative Temporary Concrete barrier (F-Shape), Narrow Base (see Standard Plan K-80.30) on cement concrete pavement or bridge deck.

Use Class 1 when the concrete pavement or bridge deck is 9" or thicker; use Class 2 when it is 6" or thicker.

Adjust the location of the anchors to avoid the main reinforcing in the deck when drilling holes.

Use shims to properly fit the anchors to the barrier and roadway surfaces.

Upon removal of the anchors, clean the bolt holes and fill them with grout according to Standard Specification 6.02.3(20).
**Wire Fence Types 1 & 2 and Wire Gates**

**Standard Plan L-10.10-02**

**Sheet 2 of 2 Sheets**

**Wire Fence Types 1 & 2**
- **Single Gate** (Steel Posts Shown)
- **Double Gate** (Steel Posts Shown)
- **End Bracing** (Wire Fence Type 1 Shown)
- **Intermediate Bracing/Pull Post** (Wire Fence Type 1 Shown)
- **Corner Bracing** (Wire Fence Type 1 Shown)
- **Wood Posts and Braces**
- **Intersection Bracing** (Wire Fence Type 1 Shown)

**Gates**
- **Single Wire Gate 14 ft. Wide**
- **Double Wire Gate 20 ft. Wide**

**Brace Post**
- 14" - 0" Centers
- @ 1000 Max. - See Note 3

**Recirculation**
- SEE NOTE 3

**Drum by Lisa Chyord**

**Date:** 6/19/12

**APPROVED FOR ISSUANCE**

**Washington State Department of Transportation**
1. All concrete post bases shall be 10" (in) minimum diameter.
2. Along the top and bottom, using Hog Rings, fasten the Chain Link Fence Fabric to the Tension Wire within the limits of the first full fabric weave.
3. Details are illustrative and shall not limit hardware design or post selection of any particular fence type.
4. Fencing shall be used for security and boundary delineation only.

**NOTES**

**TYPE 3**

**POST AND RAIL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>POST AND RAIL SPECIFICATIONS</th>
<th>PIPE</th>
<th>ROLL FORMED</th>
</tr>
</thead>
<tbody>
<tr>
<td>POST</td>
<td>NOM. SIZE (SCH. 40) L.D.</td>
<td>SECTION</td>
</tr>
<tr>
<td>END, CORNER, OR PULL POST</td>
<td>2 1/2&quot; Diam.</td>
<td>Y</td>
</tr>
<tr>
<td>LINE OR BRACE POST</td>
<td>2&quot; Diam.</td>
<td>Z</td>
</tr>
</tbody>
</table>

**METHOD OF FASTENING STRETCHER BAR TO POST**

**CHAIN LINK FENCE TYPES 3 AND 4**

**STANDARD PLAN L-20.10-03**

Sheet 1 of 2 sheets

Approved for publication: Carpenter, Jeff

Jul 14 2015 11:24 AM

Barry, Ed

Jul 14 2015 11:14 AM
NOTES
1. All glare screen posts shall be 2 1/2" I.D. galvanized steel.
2. Wood blocks shown. Blocks of alternate material may be used. Wood blocks shall be toe-nailed to post with 16d galvanized nails to prevent block rotation. See Standard Specification 9-16.3(2).
3. Attach blocks to steel posts using bolt holes on approaching traffic side of post web.
GLARE SCREEN TYPE 1
DESIGN A

END OR CORNER (BRACE) POST DETAIL

PULL POST (WITHIN RUN) DETAIL

U-BOLT (TYP.)
- SEE DETAIL A

GUARDRAIL POST
(STEEL SHOWN)

FABRIC BAND
(TYP.)

TENSION WIRE

1/8" EYE BOLT (TYP.)
WITH HEX NUT AND WASHER

HOG RING - SPACED
@ 24" MAX. (TYP.)

STRETCHER BAR (TYP.)

U-BOLT (TYP.)
- SEE DETAIL A

GUARDRAIL POST
(STEEL SHOWN)

FABRIC BAND
(TYP.)

TENSION WIRE

1/8" EYE BOLT (TYP.)

TURNBUCKLE

TENSION WIRE
GLARE SCREEN TYPE 2
(CHAIN LINK WITH SLATS)

STANDARD PLAN L-40.20-02

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

5-21-2012

PAGE 1 OF 1 SHEET

ELEVATION VIEW

DETAIL A

DETAIL B

DETAIL C

DETAIL D
PLASTIC PIPE CAP (TYP.)

SIGN PANEL W12-502 SP
- 48" X 12" (TYP.)

5/8" DIAM. WIRE ROPE

SEE MOUNTING DETAIL

TOP OF ROADWAY

YELLOW REFLECTIVE TAPE - 3" (TYP.)

NOTE

Hardware shall be stainless steel or galvanized in accordance with AASHTO M222.

ELEVATION

WOOD SPACER
- 3" X 2" X 12" (TYP.)

TIMBER POST
- 4 X 6 (NOM.)

PLASTIC PIPE - 12" (NOM.) X 2" - 7" LONG
COLOR SHALL BE HIGHLY VISIBLE (SAFETY YELLOW IS ACCEPTABLE)

EYE SCREW - 5/8" DIAM. X 6" WITH 2" FLAT WASHER

HEX LAG BOLT - 3/8-7UNC X 5"
WITH 1" DIAM. FLAT WASHER
(4 SETS TOTAL)

1 1/2" DIAM. HOLE (TYP.)

ACCESS CONTROL GATE

STANDARD PLAN L-70.10-01

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
PLASTIC PIPE CAP (TYP.)
SIGN PANEL W12-502 SP
- 48" x 12" (TYP.)
SEE MOUNTING DETAIL
5/8" DIAM. WIRE ROPE
MIDDLE POST - REMOVABLE
TOP OF ROADWAY
YELLOW REFLECTIVE TAPE - 3" (TYP.)
PADDLOCK (TYP.) - AGENCY PROVIDED

ELEVATION

NOTE
Hardware shall be stainless steel or galvanized in accordance with AASHTO M232.

TOP VIEW
(CAP NOT SHOWN)
END POST

EYE SCREW - 5/8" DIAM. x 6" WITH 2 FLAT WASHER
PLASTIC PIPE - 12" (NOM.) x 2' - 7" LONG COLOR SHALL BE HIGHLY VISIBLE (SAFETY YELLOW IS ACCEPTABLE)
WOOD SPACER - 3" x 2 1/2" x 13"
TIMBER POST - 4 x 6 (NOM.)

PLASTIC PIPE - 12" (NOM.) x 2' - 7" LONG COLOR SHALL BE HIGHLY VISIBLE (SAFETY YELLOW IS ACCEPTABLE)
WOOD SPACER - 3" x 2 1/2" x 13"
TIMBER POST - 4 x 6 (NOM.)

TOP VIEW
(CAP NOT SHOWN)
MIDDLE POST

EYE SCREW - 5/8" DIAM. x 6" WITH 2 FLAT WASHER
PLASTIC PIPE - 12" (NOM.) x 2' - 7" LONG COLOR SHALL BE HIGHLY VISIBLE (SAFETY YELLOW IS ACCEPTABLE)
WOOD SPACER - 3" x 2 1/2" x 13"
TIMBER POST - 4 x 6 (NOM.)

ELEVATION

SECTION A

PLASTIC PIPE- 12" (NOM.) x 2' - 7" LONG COLOR SHALL BE HIGHLY VISIBLE (SAFETY YELLOW IS ACCEPTABLE)
EYE SCREW- 5/8" DIAM. x 6" WITH 2" FLAT WASHER (TYP.)
HEX LAG BOLT- 3/8-7UNC X 5" WITH 1" DIAM. FLAT WASHER (4 SETS TOTAL)
1 1/2" DIAM. HOLE (TYP.)
1 12" DIAM. HOLE (TYP.)
GALV. LAG SCREW - 3/16" DIAM. W/ FLAT WASHER (TYP.) (2 SETS REQ.)
GALV. STEEL TUBE - 3/8" X 4" X 6"
COMMERCIAL CONCRETE

SECTION B

NOTE
Hardware shall be stainless steel or galvanized in accordance with AASHTO M232.

POLISHED, PASCAL, P.M.
STATE DESIGN ENGINEER

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

ACCESS CONTROL
DOUBLE GATE
STANDARD PLAN L-70.20-01
SHEET 1 OF 1 SHEET
APPROVED FOR PUBLICATION
STATE DESIGN ENGINEER

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EXPRES JUNE 30, 2008
NOTES

1. Where shown on the Plans or specified in the Special Provisions, raised pavement markers shall be used to supplement or substitute for the painted pavement markings shown hereon. See the Standard Plans for RPM supplement and substitution patterns.

2. The channelization shown on this plan assumes optimal roadway geometric design. The dimensions may vary to fit existing conditions. See Contract.

SINGLE-LANE ON-CONNECTION

LEGEND
R = RAMP LANE WIDTH
L = LANE WIDTH

SINGLE-LANE OFF-CONNECTION

TRAFFIC ARROW TYPE MAY VARY – SEE CONTRACT FOR TYPE SPECIFIED

SINGLE-LANE OFF-CONNECTION FOR ONE-LANE REDUCTION
1. Where shown on the plans or specified in the Special Provisions, raised pavement markers shall be used to supplement or substitute for the painted pavement markings shown hereon. See the Standard Plans for RPM supplement and substitution patterns.

2. The channelization shown on this plan assumes optimal roadway geometric design. The dimensions may vary to fit existing conditions. See Contract.

LEGEND

R = RAMP LANE WIDTH
L = LANE WIDTH

TWO-LANE ON-CONNECTION

TWO-LANE OFF-CONNECTION

RAMP CHANNELIZATION TWO LANE

STANDARD PLAN M-1.40-02
LEGEND

C-D R = COLLECTOR DISTRIBUTOR RAMP LANE WIDTH
C-D L = COLLECTOR DISTRIBUTOR LANE WIDTH
R = RAMP LANE WIDTH
L = LANE WIDTH

NOTES

1. Where shown on the plans or specified in the Special Provisions, raised pavement markers shall be used to supplement or substitute for the painted pavement markings shown hereon. See the Standard Plans for RPM supplement and substitution patterns.

2. The channelization shown on this plan assumes optimal geometric design. The dimensions may vary to fit existing conditions. See Contract.

COLLECTOR-DISTRIBUTOR ROAD
ON-CONNECTION
Where shown on the plans or specified in the Special Provisions, raised pavement markers shall be used to supplement or substitute for the painted pavement markings shown hereon. See the Standard Plans for RPM supplement and substitution patterns.

When weaving section is more than 3/4 of a mile in length, use lane line.

The channelization shown on this plan assumes optimal roadway geometric design. The dimensions may vary to fit existing conditions. See Contract.

**LEGEND**

- **L** = LANE WIDTH
- **R** = RAMP LANE WIDTH

**SINGLE-LANE, PARALLEL TYPE - ON-CONNECTION**

<table>
<thead>
<tr>
<th>POSTED MAIN LINE SPEED</th>
<th>D</th>
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<tbody>
<tr>
<td>35 MPH</td>
<td>565'</td>
</tr>
<tr>
<td>40 MPH</td>
<td>610'</td>
</tr>
<tr>
<td>45 MPH</td>
<td>672'</td>
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<td>50 MPH</td>
<td>645'</td>
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<td>55 MPH</td>
<td>990'</td>
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<tr>
<td>60 MPH</td>
<td>1102'</td>
</tr>
<tr>
<td>65 MPH</td>
<td>1200'</td>
</tr>
<tr>
<td>70 MPH</td>
<td>1290'</td>
</tr>
</tbody>
</table>

**DOUBLE-LANE, PARALLEL TYPE - ON-CONNECTION**
NOTE

1. Install a minimum of 3 sets of diagonals/chevrons in the gore area. A 50' (ft) spacing is standard; however, for gore areas shorter than 150' (ft), use a 25' (ft) spacing, and for gore areas greater than 400' (ft), a spacing of 100' (ft) may be used.
NOTE

1. Install a minimum of 3 sets of diagonals/chevrons in the gore area. A 50' (ft) spacing is standard; however, for gore areas shorter than 150' (ft), use a 25' (ft) spacing, and for gore areas greater than 400' (ft), a spacing of 100' (ft) may be used.

GORE AREA MARKINGS WITH CHEVRONS

(SEE NOTE 1)

YELLOW EDGE LINE

WHITE EDGE LINE

(SEE NOTE 1)

CONTINUE GORE MARKINGS AT SAME SPACING TO END OF GORE AREA (SEE NOTE 1)

(SEE NOTE 1)

GORE AREA SUPPLEMENT WITH TYPE 2 RAISED PAVEMENT MARKERS

(SEE NOTE 1)

(SEE NOTE 1)

(SEE NOTE 1)

WHITE EDGE LINE

YELLOW EDGE LINE

(SEE NOTE 1)

CONTINUE GORE MARKINGS AT SAME SPACING TO END OF GORE AREA (SEE NOTE 1)

TRUNCATED GORE ALTERNATIVE

3' (FT) MIN TO 6' (FT) MAX.
STOPPING POINT FOR LEFT TURN LANE

DOUBLE CENTERLINE (YELLOW) (NARROW PATTERN)

LEFT-TURN CHANNELIZATION
SYMMETRICAL WIDENING ABOUT CENTERLINE

LEFT-TURN CHANNELIZATION
ASYMMETRICAL WIDENING LEFT OF CENTERLINE

LEFT-TURN CHANNELIZATION
ASYMMETRICAL WIDENING RIGHT OF CENTERLINE

LEGEND

L = 1⁄2' Typical Lane Width. See Contract for specified lane width.

Type 2L (SL) Traffic Arrow

NOTES
1. The channelization shown on this plan assumes optimal roadway geometric design. The dimensions may vary to fit existing conditions. See Contract.
2. The channelization shown on this plan is for a two-lane highway. The channelization plan may be used on four-lane undivided highways, with the appropriate considerations.
3. Centerline striping on the approach to raised channelization shall be No Pass in accordance with MUTCD figure 38-15. Centerline striping on the departure from raised channelization shall be determined by an engineering study.
4. Centerline striping on the approach to and departure from painted channelization shall be determined by an engineering study.
5. Centerline striping on four-lane undivided highways shall be a double centerline.

The two Type 2L (SL) Traffic Arrows shown in the left-turn storage lane are optional, but recommended. Arrows may be added for longer storage lanes or deleted for shorter storage lanes. See Contract Plans.

**POSTED SPEED**

<table>
<thead>
<tr>
<th>Speed</th>
<th>APPEARANCE TAPER</th>
<th>DIMENSION</th>
<th>APPEARANCE TAPER</th>
</tr>
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<tbody>
<tr>
<td>60 MPH</td>
<td>36'</td>
<td>60'</td>
<td>720</td>
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<tr>
<td>55 MPH</td>
<td>33'</td>
<td>55'</td>
<td>550</td>
</tr>
<tr>
<td>50 MPH</td>
<td>30'</td>
<td>50'</td>
<td>500</td>
</tr>
<tr>
<td>45 MPH</td>
<td>27'</td>
<td>45'</td>
<td>450</td>
</tr>
<tr>
<td>40 MPH</td>
<td>24'</td>
<td>40'</td>
<td>400</td>
</tr>
<tr>
<td>35 MPH</td>
<td>21'</td>
<td>35'</td>
<td>350</td>
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<tr>
<td>30 MPH</td>
<td>18'</td>
<td>30'</td>
<td>300</td>
</tr>
<tr>
<td>25 MPH</td>
<td>15'</td>
<td>25'</td>
<td>250</td>
</tr>
<tr>
<td>20 MPH</td>
<td>12'</td>
<td>20'</td>
<td>200</td>
</tr>
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LEFT-TURN CHANNELIZATION
STANDARD PLAN M-3.10-03

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
LEFT-TURN CHANNELIZATION
REMOVED TAPER LENGTHS - SYMMETRICAL WIDENING
FOR LIMITED USE IN URBAN AREAS WITH POSTED SPEEDS OF 40 MPH OR LESS

LEFT-TURN CHANNELIZATION
REDUCED TAPER LENGTHS - ASYMMENTRICAL WIDENING RIGHT OF CENTER LINE
FOR LIMITED USE IN URBAN AREAS WITH POSTED SPEEDS OF 40 MPH OR LESS

LEFT-TURN CHANNELIZATION
REDUCED TAPER LENGTHS - ASYMMENTRICAL WIDENING LEFT OF CENTER LINE
FOR LIMITED USE IN URBAN AREAS WITH POSTED SPEEDS OF 40 MPH OR LESS

NOTES
1. The channelization shown on this plan assumes optimal roadway geometric design. The dimensions may vary to fit existing conditions. See Contract.
2. The channelization shown on this plan is for a two-lane highway. The channelization plan may be used on four-lane undivided highways with the appropriate considerations.
3. Centerline striping on the approach to raised channelization shall be No Pass In accordance with MUTCD figure 3B-15. Centerline striping on the departure from raised channelization shall be determined by an engineering study.
4. Centerline striping on the approach to and departure from painted channelization shall be determined by an engineering study.
5. Centerline striping on four lane undivided highways shall be a double centerline.
6. The two Type 2L (SL) Traffic Arrows shown in the left-turn storage lane are optional, but recommended. Arrows may be added for longer storage lanes or deleted for shorter storage lanes. See Contract Plans.

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

- Type 2L (SL) Traffic Arrow

<table>
<thead>
<tr>
<th>POSTED SPEED</th>
<th>APPROACH TAPER G</th>
<th>DIMENSION P</th>
<th>APPROACH TAPER J</th>
<th>DIMENSION K</th>
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<td>35 MPH</td>
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<td>30 MPH</td>
<td>15'</td>
<td>17'</td>
<td>180'</td>
<td>30'</td>
</tr>
<tr>
<td>25 MPH</td>
<td>17'</td>
<td>10'</td>
<td>123'</td>
<td>21'</td>
</tr>
<tr>
<td>20 MPH</td>
<td>20'</td>
<td>7'</td>
<td>80'</td>
<td>13'</td>
</tr>
</tbody>
</table>

OPTIONAL MARKED ACCELERATION TAPER
FOR LIMITED USE IN URBAN AREAS

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

LICENSED TO PRACTICE ENGINEERING

LEFT-TURN CHANNELIZATION
REDUCED TAPER LENGTHS
STANDARD PLAN M-3.20-02
SHEET 1 OF 1 SHEET
The channelization shown on this plan assumes optimal roadway geometric design. The dimensions may vary to fit existing conditions. See Contract.

The channelization shown on this plan is for a two-lane highway. The channelization plan may be used on four-lane undivided highways with the appropriate considerations.

Centerline striping on the approach to raised channelization shall be No Pass in accordance with MUTCD figure 38-15. Centerline striping on the departure from raised channelization shall be determined by an engineering study.

Centerline striping on the approach and departure from painted channelization shall be determined by an engineering study.

Centerline striping on four-lane undivided highways shall be a double centerline.

The two Type 2L (SL) Traffic Arrows shown in the left-turn storage lane are optional, but recommended. Arrows may be added for longer storage lanes or deleted for shorter storage lanes. See Contract Plans.

This dimension is based on a 12’ turn lane width.

Centerline stripe (see notes)
LEFT-TURN CHANNELIZATION IN TWO-WAY LEFT-TURN LANE

NOTES
1. The channelization shown on this plan assumes optimal roadway geometric design. The dimensions may vary to fit existing conditions. See Contract.
2. The channelization shown on this plan is for a two-lane highway. The channelization plan may be used on four-lane undivided highways with the appropriate considerations.
3. Centerline striping on the approach to raised channelization shall be No Pass in accordance with MUTCD figure 3B-13. Centerline striping on the departure from raised channelization shall be determined by an engineering study.
4. Centerline striping on the approach to and departure from painted channelization shall be determined by an engineering study.
5. Centerline striping on four-lane undivided highways shall be a double centerline.
6. The two Type 2L (SL) Traffic Arrows shown in the left-turn storage lane are optional, but recommended. Arrows may be added for longer storage lanes or deleted for shorter storage lanes. See Contract Plans.

POSTED SPEED | DIMENSION E | APPROACH SAFER F
---|---|---
60 MPH | 180' | 360'
55 MPH | 180' | 330'
50 MPH | 180' | 300'
45 MPH | 180' | 270'
40 MPH | 120' | 240'
35 MPH | 120' | 210'
30 MPH | 120' | 180'
25 MPH | 120' | 150'
20 MPH | 120 | 120

*Can be reduced to a minimum of 50' to increase storage capacity.*

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

Type 2L (SL) Traffic Arrow

TWO-WAY LEFT-TURN AND MEDIAN CHANNELIZATION STANDARD PLAN M-3.40-03 SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
-state seal-
NOTES

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

2. The channelization shown on this plan is for a two lane highway. The channelization plan may be used on four lane undivided highways with the appropriate considerations.

3. Centerline striping on the approach to raised channelization shall be No Pass in accordance with MUTCD Figure 38-15. Centerline striping on the departure from raised channelization shall be determined by an engineering study.

4. Centerline striping on the approach to and departure from painted channelization shall be determined by an engineering study.

5. Centerline striping on four lane undivided highways shall be double centerline.

6. All turn traffic arrows are optional, but recommended. Arrows may be added for longer storage lanes or deleted for shorter storage lanes. See Contract Plans.

LEGEND

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

Type 2L (SL) Traffic Arrow

Type 2R (SR) Traffic Arrow

DRAWN BY: L.M. COYNE

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
NOTES
1. The channelization shown on this plan assumes optimal roadway geometric design. The dimensions may vary to fit existing conditions. See Contract.

2. The channelization shown on this plan is for a two-lane highway. The channelization plan may be used on four-lane undivided highways with the appropriate considerations.

3. Centerline striping on the approach to raised channelization shall be No Pass in accordance with MUTCD figure 3B-15. Centerline striping on the departure from raised channelization shall be determined by an engineering study.

4. Centerline striping on the approach to and departure from painted channelization shall be determined by an engineering study.

5. Centerline striping on four-lane undivided highways shall be a double centerline.

6. All Traffic Arrows not required are optional, but recommended. Arrows may be added for longer storage lanes, or deleted for shorter storage lanes. See Contract Plans.

LEGEND
- L = 12' Typical Lane Width. See Contract for specified lane widths.
- Type 2R (SR) Traffic Arrow
- Type 3L (SL) Traffic Arrow

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

RIGHT-TURN CHANNELIZATION

STANDARD PLAN M-5.10-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Washington State Department of Transportation
When specified in the Contract Plans, the HOV Symbol Marking shall be installed with an offset of 1 foot max. from the lane centerline.
**BICYCLE LANE SYMBOL LAYOUT**

**KEY NOTES**

1. Bid Item "Bicycle Lane Symbol" includes Bike Lane Arrow and Bike Rider Symbol.
2. 2' (ft) x 6' (ft) White Bike Lane Arrow.

**GENERAL NOTE**

See Contract for location and material requirements.
**Plan: Centerline Marking**

- 4" wide broken yellow painted line
- Paved path

**Plan: Marking Around Multiple Bollards**

- 4" wide solid yellow painted line
- Bollard
- Paved path

**Plan: Marking Around Bollard**

- 4" wide solid yellow painted line
- Bollard
- Paved path

**Plan: Marking at Intersection with Roadway**

- 4" wide solid yellow painted line
- Bollard
- Paved path

**Note:**

1. In cases where the bollard location is not visible to an approaching bicyclist, use the minimum sight distance for the solid yellow painted line (taper portion), to extend the solid yellow painted line as needed to provide advanced warning of the upcoming obstruction.

2. In cases where there is a crossing, bridge or other structure on the path that does not support or accommodate a vehicle. (See Contract)

3. Provide Breakaway Bollards within the Roadway Design Clear Zone.

**Shared - Use Path Markings**

**Standard Plan M-9.60-00**

**Sheet 1 of 1 Sheet**

[Signature]

Washington State Department of Transportation
NOTE
See contract for location and material requirements.

KEY NOTES
1. Std Item “Railroad Crossing Symbol” includes "X" symbol, letters, and two 24" (ft) white transverse lines.
2. 24" (in) white transverse line.
3. W-10-1 Advance Warning sign (not included in RR crossing Symbol Std Item).
4. Place Stop Line 15' (ft) from RR gate, if present.

STANDARD SYMBOL

ALTERNATIVE SYMBOL

RAILROAD CROSSING
LAYOUT

STANDARD PLAN M-11.10-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Washington State Department of Transportation

Brian R. Walsh

May 19, 2017 9:29 AM
1. These details can vary greatly according to the contract plans.
2. The need for advance roundabout traffic arrows is based upon posted speed of approach roadway.
3. Place arrows in the circulating lanes as close as possible to the center of the lane to avoid having them in the wheel path.
4. Local agencies (on non-state route intersections) may elect to use yield line symbol type 2 (shark teeth) prior to the wide dotted entry line. See standard plan M-24.60 for details.

**ROUNDABOUT CIRCLE MARKING DETAIL WITH TYPE 3SB TRAFFIC ARROW**

**STANDARD PLAN M-12.10-01**

**DRAWN BY:** FERN L. UDEL

**APPROVED FOR PUBLICATION**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**
1. See the Contract Plans for locations of crosswalk centerlines.

2. To the maximum extent possible, curb ramp centerline should be perpendicular to the crosswalk centerline.

3. To the maximum extent possible, crosswalks should be perpendicular to the centerline of the traveled way.
1. Three, four and five accessible stall arrangements may be either 60° (angled) or 90° (perpendicular) parking arrangements. See Contract.

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

3. All accessible stalls shall have wheel stops. Place wheel stops in other stalls when specified in the contract. Wheel stops shall be approximately 6" high and a minimum of 6' long.


**NOTES**

**PLAN**

**ONE ACCESSIBLE STALL**

90° PARKING STALL ARRANGEMENT

**TWO ACCESSIBLE STALLS**

90° PARKING STALL ARRANGEMENT

**ALTERNATIVE PARKING STALL MARKINGS**

USE ONLY WHEN SPECIFIED IN THE CONTRACT

**NOTES**

1. Three, four and five accessible stall arrangements may be either 60° (angled) or 90° (perpendicular) parking arrangements. See Contract.

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

3. All accessible stalls shall have wheel stops. Place wheel stops in other stalls when specified in the contract. Wheel stops shall be approximately 6" high and a minimum of 6' long.


**LEGEND**

- **Alternate Parking Stall Markings**
- **See Sign Fabrication Manual**
- **See Detail A**

**PARKING SPACE LAYOUTS**

**STANDARD PLAN M-17.10-02**

**Washington State Department of Transportation**

**APPROVED FOR PUBLICATION**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**
NOTES

1. Dotted Extension Line shall be the same color as the line it is extending.

2. Edge Line shall be white on the right edge of traveled way, and yellow on the left edge of traveled way (on one-way roadways). Solid Lane Line shall be white.

3. The distance between the lines of the Double Centerline shall be 12" everywhere, except 4" for left-turn channelization and narrow roadways with lane widths of 10 feet or less. Local Agencies (on non-state routes) may specify a 4" distance for all locations.

The distance between the lines of the Double Lane Line shall be 4".
1. Raised Pavement Markers Types 2YY and 2W shall be spaced at 80’ (ft) intervals on tangents and on horizontal curves with a radius of 1500’ (ft) or more, and at 40’ (ft) intervals on horizontal curves having radii of less than 1500’ (ft). Center the RPMs in the gaps between the pavement marking lines.

2. Type 2Y RPMs, when specified, shall be placed outside the left edge line at 80’ (ft) intervals. See "LEFT EDGE OF LANE PLACEMENT DETAIL.”

3. Recessed pavement markers, when specified, shall be installed at the locations shown for Type 2W RPMs on multilane one-way roadways, and Type 2YY RPMs on two-lane two-way roadways.

4. The Type 2W RPMs placed on multilane one-way roadways and all RPMs set in recesses shall have an abrasion-resistant coating.

5. Do not recess side-to-side RPMs on Wide Dotted Lane Lines.

**TYPE 2 RPM RAISED FACE COLORS**

- TYPE 2YY: YELLOW AND YELLOW
- TYPE 2W: WHITE – ONE SIDE ONLY
- TYPE 2Y: YELLOW – ONE SIDE ONLY
SECTION A

TWO-WAY ROADWAY RECESSSED PAVEMENT MARKER DETAILS
FOR USE WHERE SPECIFIED IN CONTRACT

SECTION B

ONE-WAY ROADWAY RECESSSED PAVEMENT MARKER DETAILS
FOR USE WHERE SPECIFIED IN CONTRACT
NOTES
1. Raised pavement markers shall be installed only when specified in the Contract Plans.
2. See the Standard Plans for marker designation.
3. The portion labeled "OPTIONAL" is used only when the Optional Marked Deceleration Tape (see Standard Plans M-3.10 and M-3.20) is specified in the Contract Plans.

Type 2L (SL) Traffic Arrow

LONGITUDINAL MARKING
SUPPLEMENT WITH RPMs ~
TURN LANES
STANDARD PLAN M-20.40-03

WASHINGTON DEPARTMENT OF TRANSPORTATION
STATE TRANSPORTATION ENGINEER

END TWO-WAY LEFT-TURN LANE
NOTE

1. The NO PASS LINE (when required) is applied parallel to the CENTERLINE, 4" away, with the Type 2YY RPM’s aligned (similar to TWO-WAY LEFT-TURN LINE).
NOTE

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

Use the dimensions shown on this plan for each type of Traffic Arrow being placed on roadways with a posted speed limit of 40 mph or lower.

SYMBOL MARKINGS for TRAFFIC ARROWS FOR LOW-SPEED ROADWAYS

STANDARD PLAN M-24.40-02

DRAWN BY: COLBY FLETCHER

APPROVED FOR PUBLICATION

Wash. State Dept. of Transp.

APR 16 2015 2:21 PM
Type TC 18.56 SQ.FT.

Type LTC 24.19 SQ.FT.

Type TRC 23.07 SQ.FT.

Type LTRC 28.70 SQ.FT.

Type LT 19.56 SQ.FT.

Type TR 20.69 SQ.FT.

Type LTR 25.20 SQ.FT.

Pavement Marking - Roundabout Traffic Arrow

Reverse curve ellipses are symmetrical about

Grids are 4" square

Assume points not dimensioned to be coincident with grid lines

Component Key

The labeled areas above correspond to the portions needed for each type of roundabout traffic arrow.

For example: the roundabout traffic arrow type TRC requires the "common", "T", "R", and "C" areas.

Center the arrow on the lane centerline between the lateral extremities of that arrow type.

Roundabout Traffic Arrow Type TRC

Scale 1:50

North

5'-0" 3'-4"

4'-7"

18'-8"

7'-8"

1'-6"

5'-4"

1'-4"

2'-0"

2'-8"

3'-0"

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NOTE
1. If Rumble Strips are present, install marking outside of the Rumble Strip.
1. If rumble strips are present, install marking outside of the rumble strip.
3. WSDOT BMP sticker to be placed on first flexible guide post only.
NOTES:
1. If rumble strips are present, install marking outside of the rumble strip.
**BARRIER DELINEATOR REQUIREMENTS**

- Spacing of Barrier Delineators shall be as shown in the Plans.
- The housing or bracket can be flexible or rigid, molded from a durable plastic or other durable material approved by the Engineer, and shall be attached to the barrier with an adhesive recommended by the manufacturer. The attachment point on the barrier surface shall be free of dirt, curing compound, moisture, paint, or any other matter that would adversely affect the adhesive bond.
- Barrier Delineators shall be one-sided for single direction traffic, or two-sided for bi-directional traffic.
- Color shall be white on the right of traffic, and yellow on the left of traffic.
- The reflective surface shall be rectangular or trapezoidal.
- Reflective Sheeting: 12 square inches minimum surface area; Type III, IV, V, or VI, selected from approved materials listed in the Qualified Products List.
- Plastic Reflectors: 8 square inches minimum surface area; acrylic or polycarbonate conforming to AASHTO M 290. Reflectors shall equal or exceed the following minimum values of Specific Intensity:

<table>
<thead>
<tr>
<th>Observation Angle</th>
<th>Entrance Angle</th>
<th>Specific Intensity (cd/ft-c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>0</td>
<td>126</td>
</tr>
<tr>
<td>0.1</td>
<td>20</td>
<td>56</td>
</tr>
</tbody>
</table>

**NOTES**

1. When the Contract Plans requires a guide post with concurrent guardrail runs, 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 wooden guardrail post using two 2" (in) x 3/8" (in) lag screws with washers, along centerline of post. Also acceptable is any approved attachment method submitted by the guide post manufacturer.

3. Guide posts shall be fastened to the steel guardrail posts using two galvanized 2" (in) x 3/8" (in) bolts with a washer on both sides, a lock washer, and nut. The nut shall be tightened to properly compress the lock washer. The drilled holes in the guardrail post web shall be painted with galvanizing repair paint as described in Standard Specification Section 8-11.3(1b). Also acceptable is any approved attachment method submitted by the guide post manufacturer.

4. When concrete barrier runs concurrent, the Contractor shall mount Barrier Delineators where guide posts are required.

### GUIDE POST TYPE DEFINITIONS - REFLECTIVE SHEETING APPLICATIONS

<table>
<thead>
<tr>
<th>Type W</th>
<th>Type WW</th>
<th>Type Y</th>
<th>Type YY</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHITE</td>
<td>WHITE</td>
<td>WHITE</td>
<td>WHITE</td>
</tr>
<tr>
<td>YELLOW</td>
<td>YELLOW</td>
<td>YELLOW</td>
<td>YELLOW</td>
</tr>
</tbody>
</table>

**GUIDE POSTS AND BARRIER DELINEATORS**

**STANDARD PLAN M-40.10-03**

**SIDE MOUNT PER CONTRACT**

**TOP MOUNT PER CONTRACT**

<table>
<thead>
<tr>
<th>Reflective Sheeting, or Flat Plastic Reflector Lens</th>
<th>Housing or Bracket</th>
<th>Traffic Face of Barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>REFLECTIVE SHEETING, OR FLAT PLASTIC REFLECTOR LENS</td>
<td>HOUSING OR BRACKET</td>
<td>TRAFFIC FACE OF BARRIER</td>
</tr>
</tbody>
</table>

**BARRIER DELINEATORS**

(Concrete barrier types and locations vary; single slope in median shown)
NOTES


2. Guide posts shall be placed at 100’ spacing on ramp tangents and tapers.

3. "S" dimension shown on Standard Plan M-40.40 or 100', whichever is smaller.

4. One half of "S" dimension shown on Standard Plan M-40.40 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.

8. Locate the initial Guide Post so that it does not hinder the visibility of the Bridge Delineator for approaching traffic. The distance between the bridge end and the initial Guide Post shall be 50’ feet maximum.

LEGEND

- TYPE W
- TYPE Y

SEE TYPE DEFINITIONS, STD. PLAN M-40.10

GUIDE POST PLACEMENT
INTERCHANGES
STANDARD PLAN M-40.20-00

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EXPIRES AUGUST 9, 2009

APPROVED FOR PUBLICATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

DRANN B. ADAM DOCHNIAL

AVENDO DESIGN ASSOCIATES
NOTE

DIVIDED HIGHWAY

REFLECTIVE SHEETING APPLICATIONS

<table>
<thead>
<tr>
<th>TYPE G1</th>
<th>TYPE G2</th>
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<tbody>
<tr>
<td><img src="image1" alt="Type G1" /></td>
<td><img src="image2" alt="Type G2" /></td>
</tr>
</tbody>
</table>

LEGEND
- TYPE W
- TYPE WW
- TYPE Y

SEE TYPE DEFINITIONS,
STANDARD PLAN M-40.10

UNDIVIDED HIGHWAY
WITHOUT ILLUMINATION

GUIDE POST PLACEMENT
GRADE INTERSECTIONS

STANDARD PLAN M-40.30-01

APPROVED FOR PUBLICATION

Washington State Department of Transportation
### GUIDE POST SPACING (FEET)

<table>
<thead>
<tr>
<th>RADIUS (FEET)</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
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<td>7,600</td>
<td>260</td>
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<tr>
<td>8,800</td>
<td>280</td>
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<tr>
<td>10,000</td>
<td>300</td>
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</table>

INTERPOLATE FROM THE TABLE FOR RADIUS NOT SHOWN.

### TWO-WAY UNDIVIDED HIGHWAYS

GUIDE POSTS ON OUTSIDE OF CURVE IN DIRECTION OF TRAVEL.

### MULTI-LANE DIVIDED HIGHWAYS

GUIDE POSTS ON INSIDE AND OUTSIDE OF CURVE FOR EACH DIRECTION OF TRAVEL.

### NOTES

1. The first guide post is positioned "S" 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.

### LEGEND

- **TYPE W**
- **TYPE WW**
- **TYPE Y**

SEE TYPE DEFINITIONS, STD. PLAN M-40.10.
NOTES

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

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

NOTE

MEDIAN Crossovers

TAPER (TYP.)

LANE reductions

LEGEND

□ TYPE W
○ TYPE Y

SEE TYPE DEFINITIONS, STD. PLAN M-40.10

NOTE
SHOULDER RUMBLE STRIP
ON LEFT SHOULDER

END RUMBLE STRIP ON RIGHT SHOULDER AT BEGINNING OF
DECELERATION TAPER

TWO-LANE OFF-CONNECTION

END RUMBLE STRIP ON RIGHT SHOULDER AT BEGINNING OF
DECELERATION TAPER

WIDE LANE LINE

BEGIN RUMBLE STRIP ON
RIGHT SHOULDER AT END
OF WIDE LANE LINE

OFF RAMP

SHOULDER RUMBLE STRIP
ON LEFT SHOULDER

END RUMBLE STRIP ON RIGHT SHOULDER AT BEGINNING OF
DECELERATION TAPER

SINGLE-LANE OFF-CONNECTION

SHOULDER RUMBLE STRIP
ON LEFT SHOULDER

BEGIN RUMBLE STRIP ON
RIGHT SHOULDER AT END
OF WIDE LANE LINE

OFF RAMP

END RUMBLE STRIP ON RIGHT SHOULDER AT BEGINNING OF
DECELERATION TAPER

WIDE LANE LINE

BEGIN RUMBLE STRIP ON
RIGHT SHOULDER AT END
OF WIDE LANE LINE

SINGLE-LANE OFF-CONNECTION

FOR ONE LANE REDUCTION

SHOULDER RUMBLE STRIP
TYPE 1
FOR DIVIDED HIGHWAYS
STANDARD PLAN M-60.10-01

SHEET 4 OF 4 SHEETS

WASHINGTON DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION
STATE HIGHWAY ENGINEER
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
SHOULDER RUMBLE STRIP
TYPE 1
FOR DIVIDED HIGHWAYS
STANDARD PLAN M-60.10-01
SHEET 3 OF 4 SHEETS

SHOULDER TAPER DETAIL

5' MIN. WITH GUARDRAIL OR CURB
4' MIN. - 2 MIN. WITH BARRELS
10' MIN.
6' MIN.

SHOULDER RUMBLE STRIPS
STRUCTURE OR OTHER FEATURE NECESSITATING
A REDUCTION IN SHOULDER WIDTH

MEDIAN SHOULDER

BEGIN RUMBLE STRIP ON
RIGHT SHOULDER AT END
OF ACCELERATION TAPER

SHOULDER RUMBLE STRIP
ON LEFT SHOULDER

SHOULDER RUMBLE STRIP
ON RIGHT SHOULDER

SINGLE-LANE ON-CONNECTION

WIDE LANE LINE

END RUMBLE STRIP ON
RIGHT SHOULDER ADJACENT
TO BEGINNING OF ON RAMP
WIDE LANE LINE

SHOULDER RUMBLE STRIP
ON OUTSIDE SHOULDER

SHOULDER RUMBLE STRIPS
ON MEDIAN SHOULDERS

SHOULDER RUMBLE STRIP
ON OUTSIDE SHOULDER

500'
450'
600'
450'
600'

MEDIAN CROSSOVER

SHOULDER RUMBLE STRIP
ON MEDIAN SHOULDERS

MINIMUM BARRIER OR GUARDRAIL AT
EDGE OF SHOULDER

Washington State Department of Transportation
IF A MEDIAN ACCELERATION TAPER IS INCLUDED, START THE RUMBLE STRIP AT THE END OF THE TAPER.

TERMINATE THE SHOULDER RUMBLE STRIPS AT THE BEGINNING OF THE DECELERATION TAPER.

IF A MEDIAN ACCELERATION TAPER IS INCLUDED, START THE RUMBLE STRIP AT THE END OF THE TAPER.

RADIUS POINT OF RIGHT TURN RADIUS (TYP.)

TERMINATE THE SHOULDER RUMBLE STRIPS AT THE BEGINNING OF THE DECELERATION TAPER.
ISOMETRIC VIEW
TYPICAL SHOULDER INSTALLATION

UNIT SECTION A

UNIT SECTION B

PERSPECTIVE VIEW
UNDIVIDED HIGHWAY
(TYPE 4 PATTERN SHOWN)

SHOULDER RUMBLE STRIP
TYPES 2, 3, AND 4
FOR UNDIVIDED HIGHWAYS
STANDARD PLAN M-60.20-02
SHEET 1 OF 2 SHEETS
APPROVED FOR PUBLICATION

Washington State Department of Transportation
SHOULDER RUMBLE STRIP TYPES 2, 3, AND 4 FOR UNDIVIDED HIGHWAYS
STANDARD PLAN M-60.20-02 SHEET 2 OF 2 SHEETS

SHOULDER TAPER DETAIL

1. NOT LESS THAN 5' PROVIDE 9' WHEN BARRIER OR GUARDRAIL IS PLACED AT EDGE OF SHOULDER

RUMBLE STRIP PLACEMENT AT INTERSECTIONS

TERMINATE SHOULDER RUMBLE STRIPS AT THE BEGINNING OR END OF EACH RIGHT TURN RADIUS.

40' MINIMUM FROM THE BEGINNING OR END OF EACH RIGHT TURN RADIUS (TYP.).

RADIUS POINT OF RIGHT TURN RADIUS (TYP.)

MAJOR ROAD

TERMINATE SHOULDER RUMBLE STRIPS AT THE BEGINNING OR END OF EACH RIGHT TURN TAPER.

MAJOR ROAD

SHOULDER RUMBLE STRIPS TYPES 2, 3, AND 4 FOR UNDIVIDED HIGHWAYS STANDARD PLAN M-60.20-02 SHEET 2 OF 2 SHEETS

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION
1. Centerline Rumble Strip installation requires a minimum distance of 12 feet from Centerline to edge of paved shoulder.

2. When directed by the Engineer, Rumble Strips may be installed along the turn p=ocket taper where there is a history of rear-end collisions in the turn p=ocket.

NOTES
INTERSECTION WITH LEFT TURN CHANNELIZATION

INSTALL RUMBLE STRIP

TERMINATE AT END OF LEFT TURN CHANNELIZATION STRIPING

APPROX. MIDWAY BETWEEN MILLED GROOVES

RAISED PAVEMENT MARKER
WHEN SPECIFIED IN CONTRACT

REFER TO STANDARD PLAN M-20.30 FOR
RECESS PAVEMENT MARKER DETAIL

RECESSED PAVEMENT MARKER
WHEN SPECIFIED IN CONTRACT

LONGITUDINAL MARKING (TYP.)

RUMBLE STRIP USAGE AS
DIRECTED BY ENGINEER

NON-COMMERCIAL ROAD APPROACHES AND DRIEVWAYS

LONGITUDINAL MARKING (TYP.)

CENTERLINE RUMBLE STRIP

STANDARD PLAN M-65.10-02

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
TRAFFIC LANE

HIGH-SPEED APPLICATION

LOW-SPEED APPLICATION

NOTE

1. Typically, four times the letter or numeral height — minimum, up to ten times — maximum, or according to Plans.

TRAFFIC LETTER AND NUMERAL APPLICATIONS
STANDARD PLAN M-80.10-01
SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION
Yield, school zone, stop, and bus signs with high-speed and low-speed application details.
EIGHT FOOT HIGH LETTERS AND NUMERALS ARE SHOWN ON A FOUR-INCH SQUARE GRID FOR USE ON ROADWAYS WITH A POSTED SPEED OF 45 MPH OR MORE.
SIX FOOT HIGH LETTERS AND NUMERALS SHOWN ON A THREE-INCH SQUARE GRID

TEN FOOT HIGH LETTERS SHOWN ON A FIVE-INCH SQUARE GRID

FOR USE ON ROADWAYS WITH A POSTED SPEED OF 40 MPH OR LESS