Standard Plans
For Road, Bridge, and Municipal Construction

M 21-01

Washington State Department of Transportation

American Public Works Association
Washington State Chapter
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Foreword

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

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

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

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

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

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

Harold Peterfeso
State Design Engineer
Comments

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| To: Design Standards                 |
| Washington State Department of Transportations |
| Transportation Building             |
| PO Box 47329                        |
| Olympia, WA 98504-7329              |

Subject: Standard Plans Manual Comment

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<td>K-24</td>
<td>Surveying Along Centerline Of Low Volume Road</td>
<td>12/20/02</td>
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<tr>
<td>K-25</td>
<td>Left Lane Closure On Far Side Of Intersection</td>
<td>12/20/02</td>
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<tr>
<td>K-26</td>
<td>Right Lane Closure On Far Side Of Intersection</td>
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<tr>
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<td>One Lane Repair During Non-Working Hours</td>
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### Section L  Fence and Glare Screen

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<th>Fence Type</th>
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<tr>
<td>L-1</td>
<td>Wire Fence</td>
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<td>L-2</td>
<td>Chain Link Fence</td>
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<tr>
<td>L-3</td>
<td>Chain Link Gates</td>
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<tr>
<td>L-5</td>
<td>Glare Screen Type 1</td>
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<td>L-5a</td>
<td>Glare Screen Type 2</td>
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<td>L-6</td>
<td>Access Control Gate</td>
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### Section M  Pavement Marking

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

- **Approach Anchor - Method A**
  - Bridge
  - Approach Slab
  - Semi-Integral Type Only

- **Approach Anchor - Method B**
  - Bridge
  - Approach Slab
  - Semi-Integral Type Grey

**Compression Seal Detail**

- Bridge
- Approach Slab
- Compression Seal Detail

- **Anchor Head Detail**
  - Bridge
  - Approach Slab
  - Anchor Head Detail

**L Type Abutment**

- Bridge
- Approach Slab
- Semi-Integral Type Only

- **Expansion Joint (Rise Plans)**
  - Bridge
  - Approach Slab
  - Expansion Joint Gasket detail

- **Construction Joint @ Column & Piers**
  - Bridge
  - Approach Slab
  - Construction Joint Gasket detail

**Bridge Approach Slab**

- Standard Plan A-2
- Sheet 2 of 2 Sheets
- Approved for publication
- Harold J. Petersen 08-09-01
- Washington State Department of Transportation

**Effective:** January 3, 2006 to August 6, 2006

**Expiry:** June 30, 2002
1. Plane a taper into the existing pavement and shoulders (if paved). Depth shall taper from 0" at the beginning of pavement, to 1" at end of taper. Does not apply when existing pavement has been planed.

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

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

4. Full depth sawed grooves between 3/4" and 1/2" wide shall be placed directly over the existing sawed grooves in the cement concrete pavement and cement concrete shoulders.


LEGEND
- Concrete Overlay
- Asphalt Concrete Overlay

CASE 5
ASPHALT CONCRETE PAVEMENT
(ACP was on bridge and/or roadway grade slopes up from bridge)
NOTES
1. Curb shall be Extruded Curb Type 1, 2, 4, 4a, 5, or 5a, as specified in the contract.
2. Catch basin or grate inlet shall be located between guardrail posts.
UNDIVIDED HIGHWAY (TWO WAY TRAFFIC)
DOWEL BAR RETROFIT FOR EACH LANE

SECTION C
ROADWAY

LANE

SECTION D
EXISTING CONCRETE PAVEMENT
DOWEL BAR (TYP)
SKewed TRANSVERSE CONSTRUCTION JOINT (SEE DETAIL PLAN A-3)

LANE

PLAN VIEW

SHEET 2 OF 8 SHEETS
STANDARD PLAN A-6
DOwEL BAR RETROFIT FOR CEMENT CONCRETE PAVEMENT
EXPIRES JULY 27, 2003
APPROVED FOR PUBLICATION
Herold J. Petersen G2-84-83
Washington State Department of Transportation

EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006
PIPE ALLOWANCES

<table>
<thead>
<tr>
<th>PIPE MATERIAL</th>
<th>MAXIMUM INSERT DIA.</th>
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<tbody>
<tr>
<td>REINFORCED OR PLAIN CONCRETE</td>
<td>12&quot;</td>
</tr>
<tr>
<td>ALL METAL PIPE</td>
<td>18&quot;</td>
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<tr>
<td>CRIMP (STD. SPEC. 0-06-20)</td>
<td>12&quot;</td>
</tr>
<tr>
<td>SOLID WALL PVC (STD. SPEC. 0-06-1213)</td>
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</tr>
<tr>
<td>PROFILE WALL PVC (STD. SPEC. 0-06-1220)</td>
<td>18&quot;</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, therein (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot shall be used with the minimum required rebar shown in the ALTERNATIVE PRECAST BASE SECTION. Wire mesh shall not be placed in the knockouts.

2. The knockout diameter shall not be greater than 20". Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum. Provide a 1.5" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Standard Specification 9-04.3.

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

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

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

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

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

<table>
<thead>
<tr>
<th>PIPE MATERIAL</th>
<th>MAXIMUM INSIDE DIAMETER</th>
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</thead>
<tbody>
<tr>
<td>REINFORCED OR PLAIN CONCRETE</td>
<td>18&quot;</td>
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<tr>
<td>ALL METAL PIPE</td>
<td>21&quot;</td>
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<tr>
<td>GRP SP (STD. SPEC. 0-05.20)</td>
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<tr>
<td>PROFILE WALL PVC (STD. SPEC. 0-05.1222)</td>
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* CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTES

1. As acceptable alternatives to the rebar shown in the PRECAST BASE SECTION, those (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 25". Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum. Provide a 1.5" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Standard Specification B-04.3.

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

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

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

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

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

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

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

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

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

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

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

7. All pickup holes shall be grouted full after the basin has been placed.
NOTES
1. No steps are required when height is 4' or less.
2. The bottom of the precast catch basin may be sloped to facilitate cleaning.
3. Frame and grate may be installed with hinge down or cast into adjustment section.
4. Knockouts shall have a wall thickness of 2" minimum to 3" maximum. Provide a 1/4" minimum gap between the knockout wall and the outside of the pipe. Allow the pipe to be installed, fill the gap with joint mortar in accordance with Std. Spec. 9-04.3.

<table>
<thead>
<tr>
<th>CATCH BASIN DIAMETER</th>
<th>WALL THICKNESS</th>
<th>BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT SIZE</th>
<th>MINIMUM DISTANCE BETWEEN KNOCKOUTS</th>
<th>BASE REINFORCING STEEL IN EACH DIRECTION</th>
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<td>16&quot;</td>
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<td>4.5&quot;</td>
<td>8&quot;</td>
<td>16&quot;</td>
<td>6&quot;</td>
<td>0.15 / 0.23</td>
</tr>
<tr>
<td>60&quot;</td>
<td>5&quot;</td>
<td>8&quot;</td>
<td>16&quot;</td>
<td>6&quot;</td>
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<td>16&quot;</td>
<td>6&quot;</td>
<td>0.59 / 0.59</td>
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PIPE ALLOWANCES

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<th>PIPE MATERIAL WITH MAXIMUM INSIDE DIAMETER</th>
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1. CORRUGATED POLYETHYLENE STORM SEWER PIPE (Std. Spec. 9-05.20)
2. (Std. Spec. 9-05.12(1))
3. (Std. Spec. 9-05.12(2))
**NOTE**
As an acceptable alternative to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used for adjustment sections.

**TYPICAL ORIENTATION FOR ACCESS AND STEPS**

**RECTANGULAR ADJUSTMENT SECTION**

**CIRCULAR ADJUSTMENT SECTION**

**ECCENTRIC CONE SECTION**

**72" FLAT SLAB TOP**

**34" OR 60" FLAT SLAB TOP**

**4 5/8" BARS AT 8" SPACING**

**3 1/2" (TYP)**

**8"**

**24" MIN. 2 1/2" MAX.**

**48" MIN. 3 1/2" MAX.**

**12" (TYP)**

**6"**

**80" 5/8" OR**

**24" DIAM. OR 24" DIAM. HOLE**

**140 5/8" OR**

**24" DIAM. OR 24" DIAM. HOLE**

**30" x 30"**

**30" x 30"**

**12" MIN.**

**12" MIN.**

**8"**

**6" OR 12")**

**ONE BAR HOOP FOR 8"**

**TWO BAR HOOPS FOR 12"**

**STEP**

**PREFABRICATED LADDER**

**EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006**

**STANDARD PLAN 8-1x**

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**MICROSOFT WORD DOCUMENT**

**EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006**
1. When bolt down covers are specified in the Contract, provide two slots in the cover that are vertically aligned with the holes in the frame. Location of bolt down slots varies among different manufacturers.

2. Alternate rib designs are acceptable.

3. Refer to Standard Specification 0-08-1403 for additional requirements.

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

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

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

3. Refer to Standard Specification 9-06.10(2) for additional requirements.
1. When bolt down grates are specified in the Contract, provide two slots in the grates that are vertically aligned with the holes in the frame. Location of bolt down slot varies among different manufacturers.

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

3. For frame details, see Standard Plan B-3a.
8 LEVELING PADS
2" x 1 1/8" x 1 1/8"

SEE SLOT DETAIL & NOTE 1

PLAN VIEW

SECTION A

SECTION B

4 EQUAL SPACES
4 EQUAL SPACES

1 1/4" MAX

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

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

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

SLOT DETAIL

EXPRESSED JULY 1, 2003

BI-DIRECTIONAL VANED GRADE FOR CATCH BASHIN AND INLET

STANDARD PLAN B-2a

SHEET 1 OF 3 SHEETS

APPROVED FOR PUBLICATION

Washington State Department of Transportation

Harold J. Peterson 08-17-02
NOTES:

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

2. Refer to Standard Specification 9-06.15(2) for additional requirements.

3. For frame details, see Standard Plan 9-2a.

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

HERRINGBONE GRATE FOR CATCH BASIN AND INLET
STANDARD PLAN B-2d

SEE SLOT DETAIL & NOTE 1
NOTES:

1. THE ASYMMETRY OF THE COMBINATION INLET SHALL BE CONSIDERED WHEN CALCULATING THE OFFSET DISTANCE FOR THE CATCH BASIN. SEE SECTION "A".

2. THE DIMENSIONS OF THE FRAME AND HOOD MAY VARY SLIGHTLY AMONG DIFFERENT MANUFACTURERS. THE FRAME MAY HAVE CAST FEATURES INTENDED TO SUPPORT A GRATE GUARD. HOOD UNITS SHALL MOUNT OUTSIDE OF THE FRAME. THE METHODS FOR FASTENING THE SAFETY BAR / DEBRIS GUARD ROD TO THE HOOD MAY VARY. THE HOOD MAY INCLUDE CASTING LUGS. THE TOP OF THE HOOD MAY BE CAST WITH A PATTERN.

3. ATTACH THE HOOD TO THE FRAME WITH TWO 5/16" X 2" HEX HEAD BOLTS, NUTS, AND OVERSIZE WASHERS. THE WASHERS SHALL BE USED ON THE BLOTTED SIDE, AND SHALL HAVE DIAMETERS ADEQUATE TO ASSURE FULL BEARING ACROSS THE BOLTS.

4. WHEN BOLT DOWN GRATES ARE SPECIFIED IN THE CONTRACT, PROVIDE TWO HOLES IN THE FRAME THAT ARE VERTICALLY ALIGNED WITH THE GRATE BOLTS. TAP EACH HOLE TO ACCEPT A 6" X 1/2" ALLEN HEAD CAP SCREW. LOCATION OF BOLT DOWN HOLES VARIES AMONG DIFFERENT MANUFACTURERS. SEE "BOLT DOWN DETAIL". STANDARD PLAN B-2e.

5. ONLY DUCTILE IRON VAINED GRATES SHALL BE USED. SEE STANDARD PLANS S-8 and S-8a for grate details. Refer to Standard Specification 505.606 for additional requirements.

6. THIS PLAN IS INTENDED TO SHOW THE INSTALLATION DETAILS OF A MANUFACTURED PRODUCT. IT IS NOT THE INTENT OF THIS PLAN TO SHOW THE SPECIFIC DETAILS NECESSARY TO FABRICATE THE CASTINGS SHOWN ON THIS DRAWING.
NOTES

1. The pipe supports and the weir/drain/separators shall be constructed of the same material and be arranged at a maximum spacing of 36". Attach the pipe support to the weir/drain/separators with 3/4" stainless steel expansion bolts or enable the supports into the weir/drain wall 2".

2. The vertical drain lines of the weir/drain/separators shall be the same diameter as the horizontal outlet pipe with a minimum diameter of 6".

3. The flow weir/drain/separators shall be fabricated from one of the following materials:
   - ASTM A633 Grade C Carbon Steel Pipe
   - ASTM A106 Grade B Carbon Steel Pipe
   - ASTM A53 Grade B Carbon Steel Pipe
   - ASTM A500 Grade B Carbon Steel Pipe
   - ASTM A36 Carbon Steel Pipe

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

5. The multi-tube filters may be located as shown, or all placed on one side of the drain to assure ladder clearance. The size of the filters and filter placement shall be specified in the Contract.

6. The catch basin with offices as specified in the Contract. The filter shall be made for all pollutants coated only. The opening is to be cut out and smooth.

7. The pipe support shall be made of aluminum alloy in accordance with ASTM B 209 and ASTM B 275, designation 2024-T4, or cast iron in accordance with ASTM A 48, Class 301.

8. The gate shall be made of a stainless steel in the gate (to prevent galvanic corrosion). It may be of end not or hinged section, with adjustable hook as required.

9. A reversible rubber gasket is required between the floor mounting flange and the gate flange. Install the gate so that the level line axis is level when the gate is closed.

10. The sealing surfaces of the lid and the body shall be machined for proper fit. All chain gate bolts shall be stainless steel.

11. The sheath gate mechanism opening shall be controlled by limited hinge movement, a stop, or some other device.

12. Alternate sheath gate designs are acceptable, if material specifications are met and flange bolt pattern matches.

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

EXPRESS A 1-2003

APPROVED FOR PUBLICATION

Harold J. Peterson 01-29-03
Washington State Department of Transportation
1. See Contract for size and location of all pipes and orifices.

2. Baffle wall shall have #4 Bar at 12" spacing each way.

3. Precast baffle shall be keyed and grouted in place.

4. Bottom orifice plate shall be galvanized steel with a minimum thickness of 1/8". Attach orifice with 1/2" stainless steel bolts. Orifice plate is not required when only oil separation is desired.

5. Upper flow orifice shall be aluminum, aluminized steel or galvanized steel. Galvanized steel shall have treatment 1.

CATCH BASIN TYPE 2
WITH BAFFLE TYPE FLOW
RESTRICITOR-OIL SEPARATOR
1. The frame and grate design shown on this plan is for use with the concrete
   drainage structure shown on Standard Plan B-4d.

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

3. Refer to Standard Specification B-06.10(2) for additional requirements.

4. RECESSED ALLEN
   HEAD CAP SCREW
   1 5/8" X 1 1/2" X 2"  
   (SEE NOTE 2)

5. DIRECTION OF FLOW
   NORMAL INSTALLATION

6. ROTATED INSTALLATION

NOTE: SEE SLOT DETAIL & NOTE 2

SECTION A

SECTION B

SECTION C

SECTION D

FRAME DETAIL

GRATE DETAIL

SLOT DETAIL
NOTES:
1. Angles shall be set so that each bearing bar on the grate shall have full seating on both ends. The finished top of concrete shall be even with the grate surface.
2. Top of inlet shall be placed at ground level to prevent an unobstructed ditch or median section.
3. Bevel or round exposed concrete edges 1/4".
4. Pipes may enter through the knockouts at any reasonable angle provided the outside of the pipe can be contained within the knockout provided.
5. The grade line of the lowest inlet pipe shall enter the structure at an elevation equal to or higher than the grade line of the outlet pipe.
6. Precast inlet shall be marked with manufacturer's identification inside the structure in some readily accessible location.
7. Inside wall type for form removal shall not result in any wall section thinner than 6" except in pipe knockout areas.
8. Amount, type and grade of reinforcing steel is the responsibility of the manufacturer. The manufacturer is responsible for the structure until final acceptance in place with all required knockouts removed.

DIKE INSTALLATION FOR PREFERRED SLOPE
*See Contract For Backslope Details

DROP INLET TYPE 1

EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006
1. Angles shall be set so that each bearing bar on the grate shall have full seating on both ends. The finished top of concrete shall be even with the grate surface.

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

3. Bevel or round exposed concrete edges 1/2".

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

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

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

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

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

DROP INLET TYPE 2

GRATE SUPPORT (two required per grate)

ELEVATION

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

45°/14 OR STEEPER

- 4 MAX.

1. The culvert ends shall be beveled to match the embankment or ditch slope and shall not be beveled flatter than 45°/14. When slopes are between 45°/14 and 86°/14, shape the slope to the vicinity of the culvert end to ensure that no part of the culvert projects more than 4" above the ground line.

2. Field cut culvert ends are 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.

THERMOLASTIC PIPE

CONCRETE PIPE

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

45°/14 OR STEEPER

- 4 MAX.

METAL PIPE

NOTES

BEVELED END SECTIONS FOR CULVERTS 30" DIAMETER OR LESS

STANDARD PLAN B-7a

EXPIRES: JULY 1, 2005

APPROVED FOR PUBLICATION

Herold J. Peterson 03-06-06

Washington State Department of Transportation

Sheet 1 of 1 Sheet
NOTES:
1. Span and rise dimensions are nominal and are measured to the inside crests of corbels.
2. Allowable heights of cover shall be within the limits indicated in the table included herein. Minimums and maximums are shown.
3. Unless indicated otherwise a "10" depth (over the inside crests of corbels) of earth shall be placed in the invert of the Structural Plate Underpass. Design 1, for the full width and length. The earth shall consist of naturally occurring materials available 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 8 kips per square foot.

### ALLOWABLE HEIGHTS OF COVER

<table>
<thead>
<tr>
<th>SPAN</th>
<th>12 GAUGE THICK CORRUGATED IRON COVER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MIN</td>
</tr>
<tr>
<td>6 - 20</td>
<td>6</td>
</tr>
<tr>
<td>6 - 10</td>
<td>8</td>
</tr>
</tbody>
</table>

**SECTION**

**ELEVATION**
### Dimensions

<table>
<thead>
<tr>
<th>SPAN</th>
<th>RISE</th>
<th>ANGLES (DEGREES)</th>
<th>BASE (INCHES)</th>
<th>A (INCHES)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>AT</td>
<td>AB</td>
<td>AC</td>
</tr>
<tr>
<td>12'-0&quot;</td>
<td>12'-0&quot;</td>
<td>32</td>
<td>42</td>
<td>65</td>
</tr>
<tr>
<td>12'-0&quot;</td>
<td>12'-0&quot;</td>
<td>32</td>
<td>44</td>
<td>68</td>
</tr>
<tr>
<td>13'-0&quot;</td>
<td>13'-0&quot;</td>
<td>32</td>
<td>42</td>
<td>65</td>
</tr>
<tr>
<td>13'-0&quot;</td>
<td>13'-0&quot;</td>
<td>32</td>
<td>42</td>
<td>65</td>
</tr>
<tr>
<td>14'-0&quot;</td>
<td>14'-0&quot;</td>
<td>32</td>
<td>44</td>
<td>68</td>
</tr>
<tr>
<td>14'-0&quot;</td>
<td>14'-0&quot;</td>
<td>32</td>
<td>44</td>
<td>68</td>
</tr>
<tr>
<td>15'-0&quot;</td>
<td>15'-0&quot;</td>
<td>32</td>
<td>42</td>
<td>65</td>
</tr>
<tr>
<td>15'-0&quot;</td>
<td>15'-0&quot;</td>
<td>32</td>
<td>42</td>
<td>65</td>
</tr>
</tbody>
</table>

### Allowable Heights of Cover

<table>
<thead>
<tr>
<th>12'-0&quot;</th>
<th>12'-0&quot;</th>
<th>13'-0&quot;</th>
<th>13'-0&quot;</th>
<th>14'-0&quot;</th>
<th>14'-0&quot;</th>
<th>15'-0&quot;</th>
<th>15'-0&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>UML</td>
<td>MAX</td>
<td>UML</td>
<td>MAX</td>
<td>UML</td>
<td>MAX</td>
<td>UML</td>
<td>MAX</td>
</tr>
<tr>
<td>3</td>
<td>14</td>
<td>3</td>
<td>14</td>
<td>3</td>
<td>14</td>
<td>3</td>
<td>14</td>
</tr>
</tbody>
</table>
1. The variable dimension indicated for the height of step for step relieved pipes shall conform to the manufacturer recommendations unless specified differently on the plans or in the Special Provisions.

2. Reinforcing steel shall have 1 1/2" min. cover to all concrete surfaces.

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

4. When steel plate is used, headwall thickness shall be increased to 8".
1. As an alternative connection on 12" through 24" pipe, a 1" wide strap of 10 gauge or 12 gauge galvanized steel, fastened with a 1/2" sheet, 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.

### Metal End Sections for Cylindrical Pipes

<table>
<thead>
<tr>
<th>Pipe Diameter (Inches)</th>
<th>Minimum Thickness</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Overall</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Width</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Slope 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Slope 2</td>
</tr>
</tbody>
</table>

### Metal End Sections for Anchored Pipes

<table>
<thead>
<tr>
<th>Span (Feet)</th>
<th>Pipe Diameter (Inches)</th>
<th>Minimum Thickness</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Width</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Slope 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Slope 2</td>
</tr>
</tbody>
</table>

**Tapered End Section with Type 4 Safety Bars (On Cross Road)**

**Standard Plan B-9d**

sheet 1 of 1 sheet

APPROVED FOR PUBLICATION

Harold J. Peterseso 11-23-04

Washington State Department of Transportation
NOTES
1. See Standard Specifications Section 7-06.2(5) for Pipe Zone Backfill.
2. See Standard Specifications Section 5-06.12(9) for Gravel Backfill for Pipe Zone Bedding.
3. See Standard Specifications Section 2-06.4 for Measurement of Trench Width.
4. For sanitary sewer installation, concrete pipe shall be bedded to spring line.

CLEARANCE BETWEEN PIPES FOR MULTIPLE INSTALLATIONS

<table>
<thead>
<tr>
<th>PIPE</th>
<th>SIZES</th>
<th>MINIMUM DISTANCE BETWEEN BARRIERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIRCULAR PIPE (DIAMETER)</td>
<td>12&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td></td>
<td>0&quot; to 8&quot;</td>
<td>0&quot; to 12&quot;</td>
</tr>
<tr>
<td></td>
<td>10&quot; to 18&quot;</td>
<td>48&quot;</td>
</tr>
<tr>
<td>PIPE ARCH (SPAN METAL ONLY)</td>
<td>45&quot;  to 142&quot;</td>
<td>45&quot; to 200&quot;</td>
</tr>
<tr>
<td></td>
<td>145&quot; to 200&quot;</td>
<td>48&quot;</td>
</tr>
</tbody>
</table>
NOTES
1. Paint pipe threads with asphalt paint after assembly.
2. All piping shall be galvanized steel.
3. Valve and piping to valve shall be 2" unless otherwise noted on plan.
4. Locate blowoff outlet near property corner if possible.
NOTES

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

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

STEEL TIE RODS TO BE HEAVILY COATED WITH ASPHALT AFTER INSTALLATION.

<table>
<thead>
<tr>
<th>PIPE DIAM</th>
<th>TEST PRESSURE (PSI)</th>
<th>BEND ANGLE</th>
<th>CONCRETE VOLUME (FT³)</th>
<th>CUBE SIZE (%)</th>
<th>TIE ROD DIAM</th>
<th>TIE ROD EMBEDMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>250</td>
<td>11.25°</td>
<td>0</td>
<td>1.0</td>
<td>5/8</td>
<td>17&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22.5°</td>
<td>12</td>
<td>2.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>45°</td>
<td>23</td>
<td>2.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6&quot;</td>
<td>250</td>
<td>11.25°</td>
<td>14</td>
<td>2.4</td>
<td>5/8</td>
<td>17&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22.5°</td>
<td>37</td>
<td>3.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>45°</td>
<td>60</td>
<td>3.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8&quot;</td>
<td>250</td>
<td>11.25°</td>
<td>25</td>
<td>2.9</td>
<td>5/8</td>
<td>17&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22.5°</td>
<td>48</td>
<td>6.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>45°</td>
<td>85</td>
<td>8.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10&quot;</td>
<td>250</td>
<td>11.25°</td>
<td>28</td>
<td>3.4</td>
<td>5/8</td>
<td>17&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22.5°</td>
<td>76</td>
<td>4.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>45°</td>
<td>135</td>
<td>6.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12&quot;</td>
<td>250</td>
<td>11.25°</td>
<td>65</td>
<td>5.6</td>
<td>5/8</td>
<td>17&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22.5°</td>
<td>105</td>
<td>6.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>45°</td>
<td>200</td>
<td>8.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14&quot;</td>
<td>250</td>
<td>11.25°</td>
<td>78</td>
<td>4.2</td>
<td>5/8</td>
<td>17&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22.5°</td>
<td>147</td>
<td>6.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>45°</td>
<td>275</td>
<td>8.6</td>
<td>1&quot;</td>
<td>37&quot;</td>
</tr>
<tr>
<td>16&quot;</td>
<td>250</td>
<td>11.25°</td>
<td>98</td>
<td>4.6</td>
<td>5/8</td>
<td>17&quot;</td>
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<tr>
<td></td>
<td></td>
<td>22.5°</td>
<td>192</td>
<td>6.8</td>
<td>7/8</td>
<td>24&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45°</td>
<td>385</td>
<td>7.1</td>
<td>1 1/8&quot;</td>
<td>38&quot;</td>
</tr>
</tbody>
</table>
1. Contractor to provide blocking adequate to withstand full test pressure.
2. Divide thrust by safe bearing load to determine required area (in square feet) of concrete to distribute load.
3. Areas to be adjusted for other pressure conditions.
4. Provide two 3” minimum diameter rods on valves up through 10” diameter. Valves larger than 10” require special tie rod design.

### Thrust at Fittings in Pounds

<table>
<thead>
<tr>
<th>Size</th>
<th>Test Pressure PS</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>4”</td>
<td>250</td>
<td>3,140</td>
<td>4,440</td>
<td>2,405</td>
<td>1,225</td>
<td>615</td>
</tr>
<tr>
<td>6”</td>
<td>250</td>
<td>7,070</td>
<td>9,595</td>
<td>5,410</td>
<td>2,760</td>
<td>1,385</td>
</tr>
<tr>
<td>8”</td>
<td>250</td>
<td>12,565</td>
<td>17,770</td>
<td>9,620</td>
<td>4,905</td>
<td>2,465</td>
</tr>
<tr>
<td>10”</td>
<td>250</td>
<td>19,635</td>
<td>27,770</td>
<td>15,030</td>
<td>7,660</td>
<td>3,850</td>
</tr>
<tr>
<td>12”</td>
<td>250</td>
<td>28,275</td>
<td>39,985</td>
<td>21,640</td>
<td>11,030</td>
<td>5,545</td>
</tr>
<tr>
<td>14”</td>
<td>250</td>
<td>38,485</td>
<td>54,425</td>
<td>29,455</td>
<td>15,015</td>
<td>7,545</td>
</tr>
<tr>
<td>16”</td>
<td>250</td>
<td>50,765</td>
<td>71,085</td>
<td>38,470</td>
<td>19,615</td>
<td>9,855</td>
</tr>
</tbody>
</table>

### Safe Bearing Load

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

**Concrete Thrust Block**
MANHOLE DIMENSION TABLE

<table>
<thead>
<tr>
<th>DIAM</th>
<th>WALL THICKNESS</th>
<th>BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT SIZE</th>
<th>MINIMUM DISTANCE BETWEEN KNOCKOUTS</th>
<th>BASE REINFORCING STEEL (in 2 in each direction)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60&quot;</td>
<td>4&quot;</td>
<td>5&quot;</td>
<td>30&quot;</td>
<td>6&quot;</td>
<td>0.18</td>
</tr>
<tr>
<td>48&quot;</td>
<td>4 1/2&quot;</td>
<td>5&quot;</td>
<td>28&quot;</td>
<td>6&quot;</td>
<td>0.18</td>
</tr>
<tr>
<td>36&quot;</td>
<td>5&quot;</td>
<td>5&quot;</td>
<td>26&quot;</td>
<td>6&quot;</td>
<td>0.20</td>
</tr>
</tbody>
</table>

NOTE: Knockouts shall be a wall thickness of 2" minimum to 3 1/2" maximum.

MANHOLE TYPE 1

STANDARD PLAN B-33a

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Washington State Department of Transportation

EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006
NOTE
Knock-out shall have a wall thickness of 2" minimum to 2.5" minimum.

MANHOLE DIMENSION TABLE

<table>
<thead>
<tr>
<th>MANHOLE DIAMETER</th>
<th>WALL THICKNESS</th>
<th>BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT SIZE</th>
<th>MINIMUM CLEARANCE BETWEEN KNOCKOUTS</th>
<th>BASE REINFORCING STEEL W/F A/F IN EACH DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>60&quot;</td>
<td>4&quot;</td>
<td>3'</td>
<td>20'</td>
<td>1'</td>
<td>.012</td>
</tr>
<tr>
<td>64&quot;</td>
<td>4.5&quot;</td>
<td>3'</td>
<td>22'</td>
<td>1'</td>
<td>.019</td>
</tr>
<tr>
<td>66&quot;</td>
<td>5&quot;</td>
<td>3'</td>
<td>24'</td>
<td>1'</td>
<td>.025</td>
</tr>
<tr>
<td>72&quot;</td>
<td>6&quot;</td>
<td>5'</td>
<td>24'</td>
<td>12'</td>
<td>.24</td>
</tr>
<tr>
<td>84&quot;</td>
<td>6&quot;</td>
<td>5'</td>
<td>24'</td>
<td>12'</td>
<td>.50</td>
</tr>
<tr>
<td>96&quot;</td>
<td>6&quot;</td>
<td>5'</td>
<td>24'</td>
<td>12'</td>
<td>.50</td>
</tr>
</tbody>
</table>

MANHOLE TYPE 3

STANDARD PLAN B-23c

EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006
NOTES
1. For use with Rings (circular frames) detailed in Standard Plans B-25.
2. Slotted Manhole Covers are intended for use with Drywells only. See Standard Plans B-27 and B-27B.
PIPE ALLOWANCES

<table>
<thead>
<tr>
<th>PIPE MATERIAL</th>
<th>MAXIMUM INSIDE DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>REINFORCED OR PLAIN CONCRETE</td>
<td>12&quot;</td>
</tr>
<tr>
<td>ALL METAL PIPE</td>
<td>15&quot;</td>
</tr>
<tr>
<td>CRISP (STD. SPEC. 0-05.26)</td>
<td>12&quot;</td>
</tr>
<tr>
<td>SOLID WALL PVC (STD. SPEC. 0-05.12(1))</td>
<td>18&quot;</td>
</tr>
<tr>
<td>PROFILE WALL PVC (STD. SPEC. 0-05.12(2))</td>
<td>15&quot;</td>
</tr>
</tbody>
</table>

1. As acceptable alternatives to the rebar shown in the PRECAST BASE SECTION, therein (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 ALTERNATE PRECAST BASE SECTION. Wire mesh shall not be placed in the knockouts.

2. The knockout diameter shall not be greater than 15". Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum. Provide a 1.5" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Standard Specification 0-04.3.

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

4. The frame and grate may be installed with the flange up or down. The grate 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 when the inlet has been placed.
NOTES:
1. Precast concrete core sections may be eccentric or concentric. 
2. Sampage port orientation varies among manufacturers. 
3. Connect inlet pipe to structure using precast hole or core drilled hole. 
4. For depths over 15' use 72" x 8' alternative Precast Footing. 
5. All pitpump holes shall be grouted but after the basin has been placed.
1. The Concrete Collar width shall be one half of the outside pipe diameter of the largest pipe. The minimum Concrete Collar width shall be 12". Concrete Collars may be used with all pipe materials and diameters. The Concrete Collar option shall only be used to extend existing pipes.

2. Steel Welded Wire Fabric shall be in accordance with Standard Specification D-977. Install two wraps for sizes 6 x 6 W1.4 x W1.4 (10 Gauge) Steel Welded Wire Fabric or one wrap for any of the following sizes:
   - 5 x 6 W2.1 x W2.1 (8 Gauge)
   - 6 x 6 W2.6 x W2.6 (8 Gauge)
   - 4 x 4 W2.6 x W2.6 (8 Gauge)
   - 4 x 4 W4.0 x W4.0 (4 Gauge)

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

4. Increase the outside diameter of the metal pipe to match the outside diameter of the concrete pipe by installing 12" wide rubber gaskets, thickness as required (Coupling Band only). The rubber gaskets shall be in accordance with Standard Specification S-444d.

5. Use a Bell Type K Coupling Band. Type K Coupling Bands with clamps are not allowed for the installation detail shown. The Coupling Band option shall only be used for extending existing pipes that have an inside diameter of 36" or less.
NOTES:
1. Install sewer conduit with galvanized steel or stainless steel clamps for connection to existing sewer. Install wye or tee sewer fitting with gaskets for new sewer installations.
2. Mark location of sewer stub in accordance with Contracting Agency requirements.

EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006

SIDE SEWER
STANDARD PLAN B-39
Sheet 1 of 1 Sheet
APPROVED FOR PUBLICATION
Herold J. Peterson 11-08-06

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
1-51-30-04-02

DRAWN BY: M. CORPAN
EXPIRES JULY 1, 2007

4" OR 6" DIA. SEWER PIPE (SEE CONTRACT)

CAP

PROPERTY LINE

WYE BRANCH

SEWER MAIN

PLATE VIEW

ELEVATION VIEW

WYE CONNECTION

2% HLL, 40' HLL

40' ELBOW

NOTE 1

NOTE 2

NOTE 3

2% HLL, 40' HLL

PROPERTY LINE

TEE BRANCH

SEWER MAIN

PLATE VIEW

ELEVATION VIEW

TEE CONNECTION
1. Wood posts for all guardrail placement plans shall be 6x8 except where noted otherwise.

2. Lower hole is for rubber roll of Type 2 and Type 3 Beam Guardrail.

3. 6x6-9 steel posts and timber blocks are alternate for 6x8 timber posts and blocks. 6x6-9 steel posts and timber blocks are alternate for 10x10 timber posts and blocks.

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

5. When contract requires "Beam Guardrail Type 1, 52" Foot Long Post," the steel post length shall be marked with numbers to ensure permanent identification of the location where the letter "F" is shown on the detail. The marking shall be 1/2 M X 1/2 M height.

6. Soil plate may be welded to foundation tube. If so, holes in soil plate and foundation tube may be omitted.
BEAM GUARDRAIL

TYPE 20

See Detail A

See Detail B

G-2 Post
(See Note 1)

TYPE 21

DETAIL A

1/4" DIA x 1/2" hex head bolt with hex nut and 1 1/2" square x 135" washer

DETAIL B

1/4" DIA x 1 1/2" hex head bolt with hex nut. Guardrail rests on top of bolt.

NOTES

1. For post details see Standard Plan, "Beam Guardrail Posts and Blocks".
NOTES

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

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

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

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

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

6. When Beam Guardrail Flared Terminals are used on both ends a minimum of 25'-0" of Beam Guardrail shall be installed.
1. Attach standard wood or steel blocks to concrete structure with 1/4" expansion anchor or 3/8" threaded rod in a 1" x 8" hole grouted with epoxy.

2. For Type 3 Guardian, terminate the rubber end by tapping it behind the first 10 x 10 post of the Type 16 Transition Section, or as approved by the Engineer.

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

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

5. Thrie Beam Guardian Reducer Section Type B.

6. This Type 16 Transition shall end at a 10 x 10 post. Place nested thrie beam with 10 x 10 posts at 3′-11/2" MAX spacing between the end of the transition and the structure.

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<tr>
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<th>Posted Speed (MPH)</th>
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<tr>
<td>9</td>
<td>40 or less</td>
</tr>
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GUARDRAIL PLACEMENT

STANDARD PLAN C-2b
**NOTES**

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

---

**CASE 8A**

- Beam Guardrail Bullnose Terminal - Design 1
- Edge of traveled way
- Clear area
  - See STD. PLAN C-47

**CASE 8B**

- Beam Guardrail Bullnose Terminal - Design 2
- Edge of traveled way
- Clear area
  - See STD. PLAN C-47

**CASE 8C**

- Beam Guardrail Bullnose Terminal - Design 3
- Edge of traveled way
- Clear area
  - See STD. PLAN C-47

---

**GUARDRAIL PLACEMENT**

**M chỉnh BULL NOSE**

**STANDARD PLAN C-2c**

Sheet 1 of 1 Sheet

[Signature]

Washington State Department of Transportation

Effective: January 3, 2006 to August 6, 2006
NOTES:

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

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

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

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

GUARDRAIL PLACEMENT

STANDARD PLAN C-2d

Approved for Publication

Washington State Department of Transportation

5/22/98

Brian Ziegler
State Design Engineer

5/19/98

Deleted Flare Rod Table.

MB4

5/22/98

FHWA

5/22/98

EPC
1. SRT Terminal shown. For terminal type and details see Contract and applicable Standards Plans.

2. Attach standard blocks to concrete structure with ¾" DIA expansion anchor or ¾" DIA threaded rod in a 1" DIA x 8" hole grouted with epoxy.

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

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

5. If the distance from end of Type 11 Guardrail to column/structure exceeds 6'-3" using 12'-6" thrie beam sections, add a 6'-3" nested section of thrie beam with 10 x 10 posts, spaced at 3'-1½" (MAX), and begin transition.

6. Thrie Beam Guardrail Reducer Section Type B.

7. Guardrail post spacing for Type 11 Guardrail past the End Bridge Pier shall be at 6'-3" spacing, maximum, with 6 x 8 post and standard block.

---

**GUARDRAIL PLACEMENT**

- Anchor pay limit (see Note 3)
- Beam Guardrail pay limit
- Type 11 Guardrail pay limit (see Note 7)
- Type 16 Transition pay limit
- Terminal pay limit (see Note 11)
- X Spaces at 6'-3" D Spaces MIN

---

**CASE 11C**

One Way Traffic
**Notes**

1. See Contract for guardrail connection to bridge rail and concrete barrier.

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

3. Attach to rail with 3/8" x 9" long bolt, nut and 1/2" washer on back of post.

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

5. Radius dimensions shall be etched into plate replacing the letters "MIN," shown on the Identification Plate Detail. Digits shall be 1/2" MIN height and 3/8" MAX width. The plate shall be galvanized after etching.

6. The guardrail radius Identification Plate shall be mounted on the back side of the Rail Element using the lowest splice bolt at the P.C. of the guardrail radius.

7. First letter of case designation placed indicates end treatment on side road. Second letter indicates end treatment on main road. For instance, a Type 5 Anchor on the side road and a bridge connection on the main road would be Case 12 AC.

8. For the 6'-0" radius, 5ive CRT posts are required including the CRT post at point B.

9. For CRT post details, see Standard Plan "Beam Guardrail Posts and Blocks".

**Guardrail Placement**

**Weak Post Intersection**

**Design (8'-6" Max Radius)**
1. For Service Level 1, Week Post Bridge Roll System, see Contract.

2. STR Terminal shown. For Terminal type and details, see Contract and applicable Standard Plans.

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

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

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


---

**CASE 15**

**GUARDRAIL PLACEMENT**

**DETAIL**

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

25' (see Note 4)

---

See Note 3

---

See Note 2

---

Modified Beam Guardrail (see Detail and Note 3)

---

Box Culvert

---

Spaces at 6'-3"

D Spacing MIN (TYP)
1. Type 4 anchor required. For details, see applicable Standard Plan No. 1.

2. For terminal type and details, see contract and applicable Standard Plan No. 1.

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

4. For guardrail to bridge rail connection see applicable Standard Plan No. 1 or Contract.

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

---

**Flare Rate Table**

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<th>Rate</th>
<th>Posted Speed (MPH)</th>
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<td>45</td>
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<td>9:1</td>
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</tbody>
</table>

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**Guardrail Placement**

**Standard Plan C-2J**

---

**Clifford E. Mansfield**

State of Washington

Professional Engineer

Approved for Publication

6/12/98

Deputy State Director of Transportation

Pendleton, Washington
GUARDRAIL PLACEMENT
12'-6" SPAN
STANDARD PLAN C-28

CASE 19 A
SPLICE IN CENTER

CASE 19 B
SPLICE AT POSTS

GROUND LINE
ELEVATION

SECTION A

SECTION B

SINGLE H-BEAM RAIL ELEMENT

HEXED H-BEAM RAIL ELEMENTS
NOTES

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

2. One-way traffic layouts are identical to the two-way layout with the exception that only the posts trailing the span need to be CRT's with double blocks.
CASE 22 A. (See Note 4)

CASE 22 B. (See Note 4)

CASE 22 C. (See Note 4)

CASE 22 D. (See Note 4)

TRANSITION PAY LIMIT
(See Note 1)

Bridge end

Radius varies (see Contract)

POINT B

POINT A

X Spacings at 6" - 3" (1 space MIN)

Terminal Pay Limit
(see Note 5)

IDENTIFICATION PLATE MOUNTING DETAIL
(See Note 7)

Identification plate
(see detail)

Splice bolt slot

Rail element

Past

IDENTIFICATION PLATE DETAIL
(See Note 6)

¾" DIA hole

½" 2¼" 1¼" MIN

2½" 1¼" Steel plate

NOTES
1. See Contract for transition and connection type.
2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1.
3. Guardrail installation shall be Beam Guardrail Type 1 with standard post and block.
4. First letter of case designation indicates end treatment on side road. Second letter indicates end treatment on main road. For instance a terminal on the side road and a bridge connection on the main road would be Case 22 BC.
5. For terminal type and details, see Contract and applicable Standard Plans.
6. Radius dimensions shall be etched into plate replacing the letters "HD" shown on the Identification Plate Detail. Digits shall be ¾" MIN height and ⅜" MAX width.
Plate shall be galvanized after etching.
7. The guardrail Identification Plate shall be mounted at the lower splice bolt on the back side of the rail element at the PC of the guardrail radius.
1. The Design Layout Line shall intercept the Cable Barrier at a point that is at least 12 feet (perpendicular) from the opposite Edge of Travelled Way.

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

LEGEND
--- Design Layout Line

CASE 25

EDGE OF TRAVELED WAY

EDGES OF PAVEMENT

CABLE BARRIER

EDGE OF PAVEMENT

TWO BEAM BULL HORE

NOTE 1

20' MIN.
(30:1 OR FLATTER)

MIDIAN

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

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

3. For Cable Barrier Type 3 Transition to W-Beam Guardrail details, see Standard Plan C-30.

NOTES

LEGEND

DESIGN Layout Line
**Plan View**

**CASE 27**

**NOTES**

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

2. A 2011 or flatter taper shall be used when adjusting the alignment of the Cable Barrier. A minimum taper is required, when the Cable Barrier Type 2 is less than 12 feet from the Edge of Travelled Way, before transitioning to Cable Barrier Type 3.

**LEGEND**

- Design Layout Line

---

**Barrier Placement - Cable Barrier Shielding for Redirectional Landform**

**Standard Plan C-22**

Sheet 1 of 1

Approved for Publication

Harold J. Petersen 03-03-06

Washington State Department of Transportation
NOTES:

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

2. If the distance from the end of the Beam Guardrail Type 11 to the column structure exceeds 9'-3" using 12'-4" thir beam sections, cut a 5'-3" nested section of thin beam to reduce the distance to less than 6'-3".

3. Install a Type 2 Extended Asphalt Concrete Curb (see Standard Plan E-28) at face of Guardrail.
NOTES
1. Posts installed on shoulder slopes steeper than 10H:1V shall be 0" long.
2. The nose rate of the guardrail may be increased after areas where the ditch bottom is shorter than the length of the terminal.
3. Determine the height of the W-Beam at the Anchor (B) by first calculating the perpendicular offset distance (D) from the edge of the bottom (B) to the Anchor (B). Multiply that distance by 0.1, then subtract the product from the elevation of the anchor point (E) on the edge of shoulder used to match the offset distance at the same station. Add 2" (2.5") to that remainder for a beam that complies with the elevation of the top of the W-Beams at the Anchor.

Refer to SECTION 2.

Elevation g = (Elevation g - D(0.1)) + 2"
NOTES

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

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

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

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

5. Length for ET-PLUS (TL3) and SKT-380 is 87'. Length for ET-PLUS (TL2) and SKT-TL2 is 26'.

---

EXPRESS JUL 24, 2001

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ELEVATION

BEAM GUARDRAIL
NON-FLAIRED TERMINAL
STANDARD PLAN C-4a
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Hershel J. Potts, P.E.
OS-90-53

DATE: 01/03
REVISED NOTES 1 & 4 ADDED SLOPES.

WASHINGTON DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 1 SHEET

BEAM GUARDRAIL
NON-FLAIRED TERMINAL
STANDARD PLAN C-4a
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Hershel J. Potts, P.E.
OS-90-53

DATE: 01/03
REVISED NOTES 1 & 4 ADDED SLOPES.

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

1. Attach W-beam to steel pipe with ⅜" x 1¼" button head bolt with no washer. No connection to the post is required.

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

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

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

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

**DETAIL B**

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

**BEAM GUARDRAIL ANCHOR TYPE 5**

- Anchor plate (see Note 3)
- Two 1" nuts and washers (see Note 5)

**END SECTION DESIGN C**

- ¼" cable clamps (6 required) torque nuts to 50 ft-lbs.
- Bearing plate (see Note 3)
- Standard 2" ID pipe sleeve (2½" OD)

**TYPE 5 ANCHOR**

- Anchor post assemblies (see Note 4)
NOTES

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

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

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

4. Post shall match beam guardrail posts.

TYPE 7 ANCHOR
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 high strength bolts (Standard Specification 0623-02) with hex or dome heads, washers or resin bonded anchors. See the Contract Plans.

3. A single plane having similar dimensional shape to Design G and matching with the W-beam guardrail is an alternate.

4. f. In cases where Design F end section is placed on the outside of the guardrail, a galvanized 1/16" D. 3/8" OD, 3/16" thick, hot-dipped Type A Plain Washer or a anchor rail washer shall be placed under the splice bolt head.
NOTES:

1. Attach guardrail to bridge rail or concrete barrier with 7/8" diameter high strength bolts (Standard Specification 0-38.5-34) with fish slugs and fusion anchors or resin bonded anchors. See the Contract Plans.

2. In cases where Design F End Section is lapped onto the outside of the guardrail, a galvanized 1 3/8" OD, 2" OD, 0.134" thick, narrow Type A Plain Washer or an anchor nut washer will be placed under the splice bolt heads.
1. Wire rope loops shall be 8" - 9" long except for the top loop of the Barrier Terminal, which shall be 2" - 3" long.

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

3. Connecting and Drift Pins had 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).
BOX CULVERT GUARDRAIL STEEL POST TYPE 1
10" to 36" ground cover

BASE ATTACHMENT DETAIL

See Base Plate Detail
3" Grout pad
Varies 6" to 10" (See Note 1)
See Bearing Plate Detail

HIGH STRENGTH BOLTS (4 are required) (See Note 3)

POST ATTACHMENT DETAIL

See Cover Plate Detail

Wood block for steel posts
See Standard Plan C-10

1" Top and bottom (TIP)

1" Top and bottom (TIP)

BOX CULVERT GUARDRAIL STEEL POST TYPE 2
10" to 24" ground cover

POST BASE ATTACHMENT DETAIL

See Post Base Plate Detail

3/4" x 2" Bolt with hex nut and washer (TIP)

See Post Bearing Plate Detail

3/4" x 2" Bolt with hex nut and washer (TIP)

See Cover Plate Detail

W8x35

W8x35

See Post Attachment Detail

See Anchor Attachment Detail for center of double box culvert

See Post Attachment Detail

See Anchor Attachment Detail for center of double box culvert

Center line of W8x35

Center line of W8x9

6/98 Added wood block for steel posts. REV.

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION
Clifford E. Mansfield 07/31/98

EXPIRES MAY 4, 2009

1998 USGS Map 03500 Ledge Lake Ave

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN EXHIBIT DISPLAYED TO THE PUBLIC, BOUND BY THE ENGINEER AND APPROVED FOR PUBLICATION. IT IS INTENDED TO PROVIDE A LOOK INTO THE DEVELOPMENT PROCESS OF THE DEPARTMENT OF TRANSPORTATION. IT MAY CONTAIN CRITICAL INFORMATION OF A TEMPORARY NATURE.

STANDARD PLAN C-10

SHEET 1 OF 2 SHEETS
CABLE BARRIER
TYPE 1

HOLE IN OPPOSITE PLANGE ARE
REQUIRED ONLY FOR ALTERNATE
HOOK BOLTS (SEE DETAIL 'C')

DETAIL "A"

CABLE BARRIER
TYPE 2

HOLE IN OPPOSITE PLANGE ARE
REQUIRED ONLY FOR ALTERNATE
HOOK BOLTS (SEE DETAIL 'C')

DETAIL "B"

CABLE BARRIER
TYPE 3

HOLE IN OPPOSITE PLANGE ARE
REQUIRED ONLY FOR ALTERNATE
HOOK BOLTS (SEE DETAIL 'C')

DETAIL "C"

ALTERNATE HOOK BOLT
DETAIL

TOP AND BOTTOM 1/4" 2 1/4" 2 3/4" 2 3/4" 2 3/4"

2" x 3/4" x 1/8 PLATE

BOTTOM CORNERS MAY BE GROOVED 2" x 2"
TO AID DRAWER

OPTIONAL 3/8" DOWAM
HOLE FOR HANDLE DURING GALLVIZICATION

ISOMETRIC VIEW

STANDARD CABLE
C-11

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Harold J. Peterson 05-30-04

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006
**NOTES**

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

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


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<td>217’ TO 357’</td>
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<td>357’ OR MORE AND TERMINAL EMBLEMS</td>
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**ELEVATION VIEW**

- (SEE NOTE 2)
- 1/4" BOLT W/ LOCK NUT
- 1/4" SPACER - GALVANIZED STEEL OR ALUMINUM

**PLAN VIEW**

- REFLECTOR DETAIL
- ALUMINUM BACKING WITH PLANE REFLECTIVE MATERIAL
- POST

---

**PLAN VIEW**

CABLE BARRIER PLACEMENT

**ELEVATION VIEW**

CABLE BARRIER TERMINAL

**PLAN VIEW**

CABLE BARRIER TERMINAL
NOTES

1. An Energizer™ System, fabricated by Energy Absorption Systems, Inc., a Fish System as fabricated by Roadway Safety Services, Inc., or a Traffic Barrier Attenuator as fabricated by Traffic Devices, Inc. shall be installed in accordance with the manufacturer's recommendations.

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

3. For Terminal Section or Concrete Barrier details see Standard Plan C-5.

IMPACT ATTENUATOR INERTIAL BARRIER CONFIGURATIONS
STANDARD PLAN C-12

EXPIRES MAY 3, 2009

CLIFFORD E. MUEHLSTADT
STATE OF WASHINGTON
PROFESSIONAL ENGINEER
NOTES
1. Reinforcing steel dimensions and clearances are shown for stationary form construction. When slip-form construction is used, increase reinforcing steel dimensions by the outside surfaces of the barrier to 2 1/2" and adjust steel dimensions as required.

2. The Vertical Back Barrier is only used in the configurations shown in Standard Plans C-14f and C-14g.
**WALL DESIGN WITH VERTICAL FRONT FACE AND 2" SURCHARGE OR TRAFFIC BARRIER**

**REINFORCED CONCRETE RETAINING WALL**

**TYPE 1 AND 1 1/2 STANDARD PLAN D-1**

| BAR | MIN Splice | # | 0" | 2" | 3" | 4" | 5" | 6" | 7" | 8" | 9" | 10" | 12" | 14" | 15" | 17" | 19" | 21" | 22" | 23" | 24" | 25" | 26" | 28" | 30" | 32" | 34" | 36" | 40" |
|-----|------------|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| MIN |            |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 1/2" |            |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 3/4" |            |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 1"   |            |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 1 1/2 |          |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 2"   |            |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

**SHEET 1 OF 2 SHEETS**

**APPROVED FOR PUBLICATION**

**HAROLD J. PETERSON - 01-35-02**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**

**EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006**

**DIMENSIONS (Ft)**

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**REINFORCED CONCRETE**

- All concrete including traffic barrier shall be Class 4000 except as noted.
- For embedment requirements, see Standard Plan "D.4.5.1.2.
- When wall is Type 1 or 1 1/2, spalling is specified, the concrete cover over steel in the front face and the total wall thickness shall be increased by 1/8".
- Concrete in the 24 foot wall section shall be poured separately between expansion joints with a minimum 12 hour period between concrete placements.

**REINFORCED CONCRETE RETAINING WALL**

- Type 1 and 1 1/2 Standard Plan D-1

**SHEET 1 OF 2 SHEETS**

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- Concrete in the 24 foot wall section shall be poured separately between expansion joints with a minimum 12 hour period between concrete placements.
### Dimensions

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<td>7 1/2</td>
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### Footing Reinforcement

- If traffic barrier is used, add 0.120 cubic yards of concrete for traffic barriers at 8' intervals along the top of the wall.
- The total wall thickness shall be increased by 0.120 cubic yards for each 8' traffic barrier used.

### Stem Reinforcement

- Concrete (cubic yards) and reinforcing steel (bars) required for each 8' section of wall.
- Bars are spaced at 12" centers except at the top and bottom of the wall.

### Notes

1. All concrete including traffic barrier shall be Class 4000 except as noted.
2. For backfill requirements, see Standard Plan.
3. When Type 2-5S is specified, the concrete cover over reinforcing steel shall be increased by 2".
4. If solid concrete is specified, the material quantity in the table shall be increased by 1.5 cubic yards for each 8' of solid concrete.
5. If Bar M intersects with the reinforcing wall, it shall be cut to the width of the angle point. The arrow heads will not be permitted.
6. The placement of concrete in the 24 foot wall sections shall be placed separately between expansion joints with a minimum 12 hour period between concrete placement.

### Wall Design with Sloping Face

- Reinforced concrete retaining wall.
- Type 2 and 2W standard plan.
- Sheet 1 of 2 sheets.

### Section - Sloping Face

- Elevation

---

**Effective:** January 3, 2006 to August 6, 2006
**WALL TOP DETAIL**

Set top of retaining wall back 1/4" from face of wall at footing for wall heights H to 20'. For H above 20' use formula (inches) 2 x H - 2 (in feet).

**GUTTER DETAIL**

Provide 24" bars (MIN) vertical curve at all angle for break points in top of wall profile.

**SECTION - VERTICAL FACE**

Unit on walls H ≤ 14' and lower.
- Add one bar 21" ≥ H ≤ 18'
- Add two bars 23" ≥ H ≤ 26'
- Add five bars 27" ≥ H ≤ 30'
- Add six bars H ≥ 31'

Unit on walls H ≤ 28' and lower.
- Add one bar 21" ≥ H ≤ 20'
- Add two bars 23" ≥ H ≤ 26'
- Add three bars 29" ≥ H ≤ 31'

Concrete cut-off at 120" center to wall face.
### Dimensions

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<th>BAR K</th>
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### Footing Reinforcement

Bar E: 1.5" centers

Bar F: 1.5" centers

Bar K: 1.5" centers

Bar M: 1.5" centers

### Stem Reinforcement

Bar J: 1.5" centers

Bar C: 1.5" centers

### Material Quantity

- Concrete: 23,680 lb
- Steel: 9,590 lb
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WALL DESIGN WITH SLOPING FRONT FACE AND 2:1 BACKSLOPE

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

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

APPROVED FOR PUBLICATION
Clifford E. Mansfield
10/06/99

DEPARTMENT OF TRANSPORTATION
WASHINGTO ST. DEPARTMENT OF TRANSPORTATION

CONTRACT NO.
10

10/06/99 New approval date.

10/06/99 Date of issuance.

47942 47942
Gutter Detail

Set top of retaining wall back 6" from face of wall at footing for wall heights h to 20'.
For h above 24', use formula: offset (inches) = 11 - 0.5 h (h is in feet).

WALL TOP DETAIL

Special wall face treatment when specified in contract.

WALL DESIGN WITH VERTICAL FRONT FACE AND 2:1 BACKSLOPE

SECTION - VERTICAL FACE

1/2" Clearance
Bar J
3" DIA drains
Bars M
Construction joint
1/2" Clearance
2" Clearance

1/2" MIN 3/4" MAX

2"-0" MIN Splice
Bars E
Bars F

1/2" MIN Splice
Bars G #4
at 1"-6" centers
Bars K

2"-0" MIN Splice
Bars L #4
at 1"-6" centers

3/4" Chamber (Typ)

3" Clearance

3/4" Clearance

3" Clearance

WALL DESIGN WITH VERTICAL FRONT FACE AND 2:1 BACKSLOPE

1/2" Clearance MIN 6/12 Clearance MAX

BARS K AND M

BARS K AND M

BARS K AND M

BARS K AND M

Construction joints

3" Drains at about 12" centers and 6" above final grade line at front face of wall

WALL DESIGN WITH VERTICAL FRONT FACE AND 2:1 BACKSLOPE

EXPRESS JUL 21, 2002

REINFORCED CONCRETE RETAINING WALL
TYPE 5 AND 8 SW
STANDARD PLAN D-4e

SHEET 1 OF 2 SHEETS
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WALL DESIGN WITH SLOPING FRONT FACE AND 2:1 BACKSLOPE
FOOTING WIDTH TRANSITION DETAIL
FOR LOCATIONS WITHOUT FOOTING STEP

ANGLE POINT

2'-0" BAR /" (TP)

FOOTING

BAR 1/2" (TP)

TRIANGULAR BARS NOT SHOWN

JOINT AND CORNER DETAIL

3/4" CHAMFER (TP)

1/2" HONED SEALER (TP)

REINFORCED PER LISTED WALL NERMIT
REINFORCEMENT TABLES

TRAFFIC SIDE
NOTES
1. Wall to be designated Noise Barrier Wall Type 658A, 658B, 658C or 658D. The Contract specifies actual wall designations.
2. For intermediate wall heights, use the next higher H.
3. Panel ends have at least 3 feet of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet max.
5. The Contract specifies actual foundation requirements D1 or D2.
<table>
<thead>
<tr>
<th>WALL HT</th>
<th>TYPE 1A</th>
<th>TYPE 1B</th>
<th>TYPE 1C</th>
<th>TYPE 1D</th>
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</table>

**NOTES**

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

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

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

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

5. Minimum panel length shall be 12 feet.

**CONCRETE WALL ON SHAFT FOUNDATION**

**NOISE BARRIER WALL TYPE 11**

**STANDARD PLAN D-2.36-00**

**SOIL TYPE**

<table>
<thead>
<tr>
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<th>D2</th>
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<td>80</td>
</tr>
<tr>
<td>110</td>
<td>82</td>
<td>80</td>
</tr>
</tbody>
</table>

**APPROVED FOR PUBLICATION**

Harold J. Peterson 11-10-06

Washington State Department of Transportation
**NOTES:**

- The bottom "P" of bar "P" shall be painted with one coat of Formula A-8-66 zinc dust primer.
- Primer on one coat of Formula A-4-68 primer.

**DETAIL E**

- Anchor bolts:
  - 1/4" x 1-1/2" x 1-1/2"
  - A490 M11 (热)

- Nuts with:
  - Hardened washers
  - Or plate washers

**BASE PLATE DETAIL**

- Hole for bar "P" (热)
  - (Tapered for wedge head shown)

- Base plate to 1" O.C. x 1" O.C.

- Anchor bolts and washers:
  - Threaded with breakout 3/4" diameter all around.

- Anchors:
  - A490 M11 (热)
  - For hardware

- Mechanical anchors:
  - A490 M11 (热)

- Zinc roof purlin, paint threads and nuts after installation.

---

**NOISE BARRIER WALL TYPE 11**

**STANDARD PLAN D-2.36-00**

**Sheet 3 of 6 sheets**

**APPROVED FOR PUBLICATION**

**11-10-06**

**Washington State Department of Transportation**

---

**SPECIFICATIONS**

- **NOTE:** The bottom "P" of bar "P" shall be painted with one coat of Formula A-8-66 zinc dust primer.
- Primer on one coat of Formula A-4-68 primer.

- **DETAIL E**
  - Anchor bolts:
    - 1/4" x 1-1/2" x 1-1/2"
    - A490 M11 (热)
  - Nuts with:
    - Hardened washers
    - Or plate washers

- **BASE PLATE DETAIL**
  - Hole for bar "P" (热)
    - (Tapered for wedge head shown)
  - Base plate to 1" O.C. x 1" O.C.
  - Anchor bolts and washers:
    - Threaded with breakout 3/4" diameter all around.
  - Anchors:
    - A490 M11 (热)
    - For hardware
  - Mechanical anchors:
    - A490 M11 (热)
    - Zinc roof purlin, paint threads and nuts after installation.
# Wall Height and Footing

### Wall Height

<table>
<thead>
<tr>
<th>Type</th>
<th>Height (ft)</th>
<th>GCM Width (in)</th>
<th>X (in)</th>
<th>W (in)</th>
<th>Bar “A” (in)</th>
<th>Bar “C” (in)</th>
<th>Bar “B” (in)</th>
<th>Bar “F” (in)</th>
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<td>1C</td>
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<td>1D</td>
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</tbody>
</table>

### Footing

- Type 1A:
  - Footing: Offset Spread Footing
  - Construction Joint: See Note 7
  - Expansion Joints: @ 24’-0” max, see contract for locations

### Notes
1. Walls to be designated Noise Barrier Wall Type 1A, 1B, 1C, or 1D. The contract specifies actual wall designation.
2. For intermediate wall heights, use the next higher height.
3. All masonry shall be hollow unit and laid in a running bond.
4. All masonry is to be spalled immediately
5. All concrete masonry (CMU) units that have vertical steel reinforcing bars or bond beam units shall be placed with grout.
6. Panels shall have at least 3 feet of level grade on each side.
7. Construction joints in the footing shall be spaced at 120 feet maximum.
8. See “Masonry Wall Details” sheets for masonry block finishes, special shapes, sizes, and layout.
NOISE BARRIER WALL
TYPE 18

FOOTING WIDTH TRANSITION DETAIL
FOR LOCATIONS WITHOUT FOOTING STEPS
NOTE: TRANSVERSE BASE NOT SHOWN

MASONRY WALL ON
OFFSET SPREAD FOOTING
NOTES
1. All rebar shall have a minimum 1 1/2" cover.
2. See Standard Plan D-2.82 for door and frame details.
3. See Standard Plan D-2.05 for wall reinforcement not shown.

FOR CAST-IN-PLACE WALL ON OFFSET SPREAD FOOTING

HOESE BARRIER WALL ACCESS DOOR TYPE 1

STANDARD PLAN D-2.80-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Harold J. Peterson 11-10-06
Washington State Department of Transportation
NOTES:
1. All pipes shall have a minimum 1 1/2" cover.
2. See Standard Plan D-2.02 for door and frame details.

FOR PRECAST WALL WITH TRAFFIC BARRIER ON SHAFT FOUNDATION

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

Sheets 1 of 2

APPROVED FOR LUBICATION

Harold J. Peterson 11-10-06
Washington State Department of Transportation
<table>
<thead>
<tr>
<th>TOTAL WALL HEIGHT (H-w) (ft)</th>
<th>PARCEL FOOTING WIDTH (B, in)</th>
<th>GEOSYNTHETIC REINFORCEMENT LENGTH (L, ft)</th>
<th>NUMBERS OF 6&quot; DOWELS REQUIRED</th>
<th>REMARKS</th>
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</tbody>
</table>

**NOTES:**
- The long-term geosynthetic cement strength "L" shall be determined in accordance with ACI-211P standard practice.
- The maximum product list for products used in this application shall be determined by the manufacturer.
- "B", "H", "L", and "D" are shown in the diagram on Sheet 1.
- "D" is the distance from the top of the wall (usually to a geosynthetic layer), and is used to determine "L" for that layer.
- Column "L" is a reference for standard wall D-3.
**Geosynthetic Wall Construction Sequence**

1. Set form on completed lift.

2. Unroll geosynthetic and position it so that 1.5 - 2.0 wide "tail" drapes over the form. If a geosynthetic is used for the geosynthetic reinforcement, position geotextile to prevent backfill from spilling through weave openings.

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

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

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

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

7. The form may be left in place while constructing the next layer (see note 2). Otherwise, reset the form and repeat the sequence.

**Notes**

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

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

**Permanent Geosynthetic Wall Types 1 - 8**

**Standard Plan D-3**

Sheet 3 of 3 sheets

**Approved for Publication**

Harold J. Peterce 07-13-00

Washington State Department of Transportation

**Effective:** January 3, 2006 to August 6, 2006
ELEVATION
CONCRETE SLOPE PROTECTION

(Pneumatically placed or poured in place cement concrete shown)

Concrete Slope Protection

Fill Slope

*Calculated toe of fill slope

Top of slope protection

See Type 1 Slope Protection Fill Section Detail

SIDE ELEVATION
(For fill section on lower roadway)

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

SECTION A

SECTION B

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

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

SIDE ELEVATION
(For cut section on lower roadway)

Slope protection follows bottom of ditch.

Cut slope

See Type 2 Slope Protection Cut Section Detail

BOTTOM EDGE OF SLOPE PROTECTION

Shoulder

EDGE OF LANE

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

This side may be poured against undisturbed soil.

6" (TYP.)

Outer extremity of bridge

Equal spacing 6" centers MIN B' centers MAX
SKEWED BRIDGE PLAN
(Semi-open concrete masonry units shown)

See note 2.

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

NOTES

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

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

CONCRETE SLOPE PROTECTION
STANDARD PLAN D-9

REGISTERED ARCHITECT
ALEXANDER YOUNG
STATE OF WASHINGTON

Principal Architect

APPROVED FOR PUBLICATION
Clifford E. Manfield
12/11/98
1. Dimensions and notations for superstructure are typical for both single lane and two lane bridges.
2. All timber and lumber shall be #2 or better and untreated Douglass fir-larch.
3. All girding shall be untreated Douglass fir and shall be driven to develop a minimum load bearing capacity of 15 tons.
4. Blocking for frame bends shall be proportioned to carry a minimum load of 15 tons per post.
5. All hardware shall be black, ungalvanized.
6. Each deck plate shall be fastened to each stringer with two 1/4" spikes, number 1 or larger.
7. On 17' spans, stringers shall be #2 x 6 x 10. On 15' spans, stringers shall be #2 x 6 x 8.
8. Two lane bridges shall use eleven ties of stringers, one lane bridges shall use seven ties of stringers.
9. Overlay thickness must be sufficient to cover bolts.
PRECAST PILES, HANDLING NOTES

1. For pile lifting Cases 1 and 2, do not allow pile tip to bear on other
   piling below 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 tilting shaft 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
   hoop and patch the hoop by taping it with 1/2-inch metal, 4-inch wide
   tape at 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 cut-
   off and full development length of the steel reinforcement. The
   hole must be reinforced and filled with spay cement.

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

7. For handling and bunting, the Precast Piles shall have at least the
   minimum number of strands shown on Std Plan E-4.

8. Pile stored on the ground should be buried or on level ground at
   no more than 30° on center, with a maximum overhang of 10°.
The main body of the curb and the longitudinal rib shall form a uniform transition from a Type C section to a Type A (back to back) section.

Note: Scapers to be provided at intervals as required by the Engineer.
2. Type 4a and Type 5a curbs do not require steel tie bars for anchoring.
3. The installation of curbs in areas with existing Guardrail could require the removal and re-erection of the Guardrail or its components.
4. Curb shall be placed at the face of Guardrail for transition to concrete barriers.
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>5'</td>
<td>18'</td>
<td>2'</td>
<td>6'</td>
</tr>
<tr>
<td>4' TO 8'</td>
<td>15'</td>
<td>1 1/2'</td>
<td>5'</td>
</tr>
<tr>
<td>6'</td>
<td>12'</td>
<td>1'</td>
<td>10'</td>
</tr>
<tr>
<td>7'</td>
<td>12'</td>
<td>1 1/2'</td>
<td>10 1/4'</td>
</tr>
<tr>
<td>8'</td>
<td>10'</td>
<td>1 1/2'</td>
<td>10 3/4'</td>
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<td>9'</td>
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<td>11' TO 12'</td>
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<td>10 1/4'</td>
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<tr>
<td>14' TO 16'</td>
<td>6'</td>
<td>3 1/2'</td>
<td>10 3/4'</td>
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<td>18' TO 20'</td>
<td>3'</td>
<td>3'</td>
<td>10 1/2'</td>
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<td>18' TO 22'</td>
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<td>30' TO 40'</td>
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<td>10 1/2'</td>
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<td>40' TO 60'</td>
<td>5'</td>
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<td>OVER 60'</td>
<td>LINE TANGENT BLOCK, SEE SHEET 1</td>
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<td></td>
</tr>
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</table>

This table lists the calculated dimensions for drafting 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 Type 2A Ramp is used to provide access to two crosswalks whenever it is infeasible to provide a separate ramp for each crosswalk.

2. The Type 2B Ramp Layout requires that this plan be used in conjunction with Plan F-100 or F-101 for the 600 series. The plan is not intended to be used for any other design. See Standard Plan F-1 for curb details.


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

5. Curb & Gutter is shown on this contract for the curb design specified. See Standard Plan F-1 for curb details.

6. Curb & Gutter is shown on the contract plans for the curb design specified. See Standard Plan F-1 for curb details.

7. Detectable warning patterns may be created by any method that will achieve the truncated dome dimensions and spacing shown.
NOTES:
1. Layout 1 and 3 are used to provide a separate ramp for each crosswalk only when it is feasible to provide a separate ramp for each crosswalk, and when 2. Layout 2 requires two (2) of the existing curb. "Concrete Curb, Sidewalk Ramp Type 3A" (see Note D) is used for one (1) of the existing curb. "Concrete Curb, Sidewalk Ramp Type 3B" (see Note D) is used for one (1) of the existing curb.
3. Ramp slopes shall not be steeper than 12":1.
4. Avoid placing drainage structures, junction boxes, or other obstructions in front of ramp access areas.
5. Curb and Gutter is shown, see the Contract Plans for curb design special. See Standard Plan F-1 for curb details.
7. Detectable warning patterns may be created by any method that will achieve the truncated dome dimensions and spacing shown.
PLANE

TYPICAL JOINT DETAIL
Chord shown - End Post Similar

SECTION C-C

DIAGNOL Where Required

DIOOOGAL SELL served for gusset

\( \frac{1}{4} \)" Gusset plate. See Note 7

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

SECTION D-D

ALTERNATE JOINT DETAIL
Not for connections between vertical diagonals and chords.

END POST OR CHORD SHOP SPLICE
See Note 9

DEAD LOAD CAMBER

If span lengths not listed, interpolate values of \( \beta \).
Fabricate truss with chords curved to provide camber. Do not camber by using shims between chord or splices.
**Maintenance Walkway Installed on Monotube Overhead Sign Structure**

Plan:
- Safety cable and intermediate support are optional in this zone.
- Intermediate support for wire rope (Type V) (See Note 2).
- Top of variable message sign.
- Fall restraint bracket (Type IV) (See Note 1).

Elevation:
- Fall restraint bracket (Type IV) (See Note 1).
- 2-0" min. from top of grate.
- Fall restraint bracket (Type IV) (See Note 1).
- See contract for VMR dimensions.

Notes:
2. For maintenance walkway, railing, brackets, and toe plate details, see standard plan O-6a.
3. Use two walkways through intermediate wire rope support.
4. Use two walkways through intermediate wire rope support.

**Material Specifications**
- **Pipe**: ASTM A 36 OR ASTM A 500 GRADE B Type E OR A OR ASTM A 500 GRADE C
- **Plates and Shaper**: ASTM A 36
- **Structural Tubing**: ASTM A 500 AND GRADE B
- **Galvanized Pipe**: ASTM A 111
- **High Strength Bolts**: ASTM A 325, ASTM A 499, SAE J 1199, MOUNTING BOLT BOLTS
- **All Other Bolts**: STD J 1199, STD J 1199, SAE J 1199
- **Fastener Galvanize**: ASTM A 193 B
- **Steel Grating**: ASTM A 36
- **Wire Rope**: ASTM A 876 WIRE CLAS A WIRE THROUGHOUT

**Standard Plan O-6a**

Sheet 1 of 3 sheets

**Approved for Publication**

Washington State Department of Transportation

**Effective** January 3, 2006 to August 6, 2006
Notes:

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

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

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

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

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

Placement of Milepost at Cut Section:

Placement of Milepost at Fill Section:
1. Dimensions for the parts used to assemble the base connections are intentionally not shown. These connections are patented, manufactured products that are in compliance with MCHRP 580 crash test criteria. The base connection details are only shown on this plan to illustrate how the parts are assembled.

2. Do not tighten any single Slip Plate Bolt to the recommended torque before pre-tightening 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.
OVERHEAD SIGN MOUNTING DETAILS
STANDARD PLAN G-6a

NOTE: ALL METAL, BOLTS, WASHERS AND OTHER HARDWARE SHALL BE STAINLESS STEEL, EXCEPT AS NOTED.

SECTION A

DETAIL "A"

SIGN LIGHTING LUMINAIRE MOUNTING DETAILS FOR TRUSS STRUCTURES

FURTHER DETAILS TO BE PROVIDED BY LIGHTING MANUFACTURER

LUMINAIRE MOUNTING PLATE
ITEM AVAILABLE FROM FIXTURE MANUFACTURER, MATERIAL IS INCL. 18 GUAGE STEEL PLATE
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 3/16" wide and 0.250" thick.

2. All signs shall be installed with horizontal edges level. Oversized windstorms are required only when the sign is mounted within 12" of the mast arm base (see detail "A").

NOTE:

- Back of sign panel
- Mast arm base
- Signal standard
- Mast arm
- Steel strap
- Bracket
- Back of sign panel

Typical Mast Arm Installation

Mast Arm Mounted Street Name Signs
SIGN INSTALLATION ON LIGHT STANDARD

MAST ARM MOUNTED LANE USE SIGNS
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, sized leg; steel straps shall be 3/4" wide and 0.030" thick.

2. Sign braces are only installed when specified in the contract.

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

4. A nylon washer shall be placed between the sign and the steel washer where the sign brace has Type 3 or 4 sheeting.

**Notes**

**Plan**

- **Sign Brace on Timber Post**
- **Sign Brace on Steel Tube**
- **Sign Brace on Steel Pipe**

**Details**

- **Mounting Bracket and Steel Strap**
- **Steel Pipe Sign Post**
- **Sign Brace**

**Standard Plan G-8d**

---

End of document.
### Guide Post Reflective Sheeting Applications

<table>
<thead>
<tr>
<th>Type W</th>
<th>Type WW</th>
<th>Type Y</th>
<th>Type YY</th>
<th>Type Q1</th>
<th>Type Q2</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="type_w.png" alt="Image" /></td>
<td><img src="type_y.png" alt="Image" /></td>
<td><img src="type_q1.png" alt="Image" /></td>
<td><img src="type_q2.png" alt="Image" /></td>
<td><img src="type%F0%AB%B7%B7.png" alt="Image" /></td>
<td>![Image](type OTHERWISE.png)</td>
</tr>
</tbody>
</table>

**Facing**
- Traffic
- Side

**Traffic**
- White
- Yellow
- Green

**Side**
- White

**Back**
- White
- Yellow

**NOTES**

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

2. Guardrail posts shall be fastened to the guardrail posts using two 2” x 36” lag screws with washers, along centerline of post. Also acceptable is any approved method submitted by the guide post manufacturer.

3. When concrete barrier runs concurrently, the contractor shall mount barrier definitions where guideposts are required.

---

**Guide Posts**

#### STANDARD PLAN H-1

*Sheet 1 of 1 Sheet*

- **GUIDE POSTS**
- **TOP EDGE OF REFLECTIVE SHEETING**
- **TOP EDGE OF REFLECTIVE SHEETING**
- **FLEXIBLE GUIDE POST**
- **GROUND MOUNT**
- **SURFACE MOUNT**

---

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(Harold J. Peterson) 01-10-02

Washington State Department of Transportation

[Logo]
NOTES:
1. See plans for guide post requirements between interchanges.
2. Guide posts shall be placed at 100' on ramp tangents and topers.
3. *6* dimension shown on Standard Plan H-1c or 100', whichever is smaller.
4. One half of *6* dimension shown on Standard Plan H-1c 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.
STRIPES ON THE BARRIAGES SHALL SLOPE
DOWNWARD IN THE DIRECTION TRAFFIC IS TO PABS

ROAD CLOSURES AT INTERSECTION

ROAD CLOSURES AT OTHER LOCATIONS

TYPE 3 BARRICAPE

STANDARD PLAN H-2

EXPRESS MAY 13, 2005

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006

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IMOMETRIC VIEW

TYPICAL SHOULDER INSTALLATION

SECTION A

SECTION B

PERSPECTIVE VIEW

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

SHOULDER RUMBLE STRIP
TYPES 2, 3, & 4
FOR UNDIVIDED HIGHWAYS
STANDARD PLAN H-4a

UNDIVIDED HIGHWAY
(TYPE 1 PATTERN ARMOR)
1. Center Line Rumble Strip Installation requires a minimum distance of 12 feet from roadway center line to edge of paved shoulder.

2. When directed by the Engineer, Rumble Strips may be omitted along the turn pocket taper where noise may adversely affect adjacent facilities.
1. Slope treatment shall be constructed simultaneously with the roadway excavation. Ordinarily hand trimming will not be required if satisfactory results are obtained with mechanical equipment.

2. It is essential that the construction of cut and fill slopes and the application of slope treatment fit as naturally as possible into the existing landscape to provide an aesthetically and geometrically satisfactory completed roadway.

3. When the distance K is greater than the distance from the top of cut to the bottom of ditch, slope treatment shall begin at bottom of ditch.

**LEGEND:**

J Distance from slope stoke to slope treatment stoke, measured on natural ground slope.

K Distance from slope stoke to lower limit of slope treatment, measured down face of cut slope.

H Difference in elevation between finished shoulder grade and slope stoke.

D Difference in elevation between slope stoke and slope treatment stoke.

Z Depth of slope treatment or slope stoke as determined by a straight line between the midpoints of J and K.

S Horizontal distance per foot cut for the slope under consideration. (For a 3:1 slope, 5')

**VALUES OF Z (feet)**

For Class A Slope Treatment

\[ z = \frac{J}{2} \sqrt{\left(\frac{J}{2}\right)^2 + \left(\frac{K}{2}\right)^2} \]

In this equation the term \(1DS/4\) is positive when the slope treatment stoke is lower than the slope stoke (descending ground) and negative when the slope treatment stoke is higher than the slope stoke (ascending ground).
1. Manufacturer shall submit shop drawings of pipe railing for review. Design shall be in accordance with AASHO Specifications.

2. Aluminum pipe railing shall have no external surface welds.
1. A socket and washer 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 sheet 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. Carrier the mailbox on the platform to ensure space for the mailbox door to open and to raise scams for installing the mailbox (See ALIGNMENT DETAILS 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" Mueller Clamps spaced 4" apart. Field drill 7/16" holes in the newspaper box to fit. Use 2 1/2" x 1/4" leg bolts to attach newspaper boxes to wood posts. Newspaper box must not extend beyond the front of the mailbox when the mailbox door is closed.

5. A Type 2 Support (Standard Plan H-12a) is required when 2 or more mailboxes are to be installed on one support.
1. The anchoring system shall meet MCH-100-360 crash test criteria. Use a socket and wrench system, or the anchoring system supplied by or recommended by the Type 2 Support manufacturer.

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

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

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

5. Attach a newspaper box to a Type 2 Support with two 1 1/4" Stellite 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.
NOTE
This bollard does not have an effective interim design feature and cannot be installed within the Design Clear Zone.

BOLLARD TYPE 2

PLAN VIEW

ROUND FOOTING

SQUARE FOOTING

CONCRETE FOOTING
- CONCRETE GRADE 3000
6\(\times\) 1/2" DIA. STEEL BAR
NOTES

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

2. INSTALL SILT FENCING ALONG CONTOURS WHENEVER POSSIBLE.

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

4. PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATIONS 8-01.5(a) AND 8-01.3(15).

**SILT FENCE**

**STANDARD PLAN 1-4**

Sheet 1 of 1 Sheet

APPROVED FOR PUBLICATION

Harold J. Peterson 8T-77-03

Washington State Department of Transportation
**SILT FENCE DESIGN**

- Place band bags as required around culvert to provide support for silt fence.
- Embed posts into band bags as required.
- Flow direction.
- Disturbed area.
- Protected area.

**NOTE**

- Perform maintenance in accordance with standard specifications 8.01.205A and 8.01.210B.

**EROSION CONTROL AT CULVERT ENDS**

**STANDARD PLAN 1-8**

**COMPOST BERM DESIGN**

- Compost berm.
- Flow direction.
- Disturbed area.
- Protected area.

**STATE OF WASHINGTON DEPARTMENT OF TRANSPORTATION**

**MARK W. MAUBER**
Certificate No. 080388

**Harold J. Peterman**
Certificate No. 07-11-02

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Washington State Department of Transportation

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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 6-01.3(16).

STATE OF WASHINGTON  
DEPARTMENT OF TRANSPORTATION  
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

TEMPORARY SILT FENCE  
FOR INLET PROTECTION  
IN UMPIED AREAS  
STANDARD PLAN 1-4

SHEET 1 OF 1 SHEET

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ST-37-03  
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

MARK W. MABER  
CERTIFICATE NO. 000808

STATE OF WASHINGTON  
DEPARTMENT OF TRANSPORTATION  
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

TEMPORARY SILT FENCE  
FOR INLET PROTECTION  
IN UMPIED AREAS  
STANDARD PLAN 1-4

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION  

Harold J. Peterson  
ST-37-03  
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

MARK W. MABER  
CERTIFICATE NO. 000808
NOTES
1. PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATION 5-01.3169.
2. SIZE THE BELOW GRATE INLET DEVICE (BDID) FOR THE STORM WATER STRUCTURE IT WILL SERVE.
3. THE BDID SHALL HAVE A BUILT-IN HIGH-FLOW RELIEF SYSTEM (OVERFLOW BYPASS).
4. THE RETRIEVAL SYSTEM MUST ALLOW REMOVAL OF THE BDID WITHOUT SPILLING THE COLLECTED MATERIAL.

PREFABRICATED BELOW GRATE INLET DEVICE DETAILS
NOTES
1. INSTALL WATTLE ALONG CONTOURS (SEE STANDARD SPECIFICATION 4-01.5(10)).
2. WATTLE SHALL BE INSPECTED REGULARLY, AND IMMEDIATELY AFTER A RUNOFF
   PRODUCING RAINFALL, TO ENSURE THEY REMAIN THOROUGHLY ENTRAINED AND
   IN CONTACT WITH THE SOIL.
3. LIVE STAKES MAY BE USED FOR PERMANENT INSTALLATIONS.
4. PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATION 4-01.5(15).
5. INSTALL WATTLE SLUGGITION INTO THE TRENCH. ABUT ADJACENT WATTLE TIGHTLY,
   END TO END, WITHOUT OVERLAPPING THE ENDS.
6. PILOT HOLES MAY BE DRIVEN THROUGH THE WATTLE AND INTO THE SOIL, WHEN SOIL
   CONDITIONS REQUIRE.

WATTLE SPACING TABLE

<table>
<thead>
<tr>
<th>SLOPE</th>
<th>MAXIMUM SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:1</td>
<td>10 FEET</td>
</tr>
<tr>
<td>2:1</td>
<td>20 FEET</td>
</tr>
<tr>
<td>3:1</td>
<td>30 FEET</td>
</tr>
<tr>
<td>4:1</td>
<td>40 FEET</td>
</tr>
</tbody>
</table>
STEEL OR 2" X 2" WOODEN STAKE

BALES SHALL BE PLACED IN A ROW WITH THE ENDS TIGHTLY ABLUTING

PLAN

FLOW

DRIVE FIRST STAKE AT AN ANGLE TOWARD THE PREVIOUS Bale TO PROMOTE A TIGHT FIT

STEEL OR 2" X 2" WOODEN STAKES

STRaw stalkS STAND VERTICALLY

FIRST STAKE

SECOND STAKE

BALE BINDINGS

1" - 6" MIN. PENETRATION

KEY-IN BALES TO PREVENT EROSION OR FLOW UNDER BALES: 4" MINIMUM

STRaw bALE

COMPACT NATIVE MATERIAL TO PREVENT PIPEING
1. Geotextile encased check dam shall meet the requirements of standard specifications S-81-3.05A and B-114.04.

2. Install the sloped ends of the check dam a minimum of 3' higher than the top of the check dam in the channel to ensure that water flows over the dam and not around it.

3. Flat bottom ditch design shown, check dam installation details are similar for "V" bottom ditches.

4. Perform maintenance in accordance with standard specifications S-81.3(13).

- Dig trench approximately 6' wide and deep, staple end of geotextile and backfill with native material.
- Orient the seam edge of the check dam toward the upstream side.
SPACE CHECK DAMS THE DISTANCE APART WHERE POINTS A' AND B' ARE THE SAME ELEVATION

FULLY

FLOWLINE

SIDE PROTECTION
SPLILWAY

ROCK CHECK DAM

SECTION A

ROCK CHECK DAMS SHALL BE PLACED OUTSIDE OF THE CULVET ZONE, OR BEHIND TRAFFIC BARRIER.

QUARRY SMALLS (STD. BPSD 3-12)
SPLILWAY
ELEVATION

ELEVATION

GAGS SHALL BE DIS. SURFACE, OR APPROVED ALTERNATE MATERIAL WITH 4:1 TO 6:1, OR GRAVEL BACKFILL FOR DRAIN.

EXTENDED SECTION B

SPILLWAY

PLACE BAGS FIRMLY AGAINST SPILLWAY EDGE AND ADJACENT BAGS.

EXTENDED SECTION A

CHECK DAMS

STANDARD PLAN I-11

Sheet 1 of 1

APPROVED FOR PUBLICATION

WATTLE CHECK DAM

STATE OF WASHINGTON
DEPARTMENT OF TRANSPORTATION

MARK W. MANNER
CERTIFICATE NO. 060612

WASHINGTON DEPARTMENT OF TRANSPORTATION

EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006

EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006

EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006
1. MORE THAN THE MINIMUM OF ONE FASTENER PER SQUARE YARD MAY BE REQUIRED DUE TO CONDITIONS SUCH AS BLANKET COMPOSITION, SOIL TYPE, SURFACE UNIFORMITY, AND SLOPE STEEPNESS.

2. SEE STANDARD SPECIFICATION 6-01.303.
NOTES
1. MORE THAN THE MINIMUM OF ONE FASTENER PER SQUARE YARD MAY BE REQUIRED DUE TO CONDITIONS SUCH AS BLANKET COMPOSITION, SOIL TYPE, SURFACE UNIFORMITY, AND FLOW VELOCITY.
2. ROLL ENDS MAY BE SPICED IN A CHECK SLOT.
3. SEE STANDARD SPECIFICATION 8-01-309.
SLIP/ANCHOR PLATES DETAIL
Smooth finish top, bottom, and notched surfaces

SECTION A-A

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

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

SECTION B-B

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

1½" hole with chartered edges

2⅜" bolt circle
2⅜" MIN

2⅜" MIN

½" plate

PLATE WASHER

1⅛" hole

1⅛" MIN

⅝" hole

⅝" MIN

⅞" R

⅞" ø14 bolt circle

⅝" ø14 bolt circle

½" back-up strip

Wall of pole
NOTES:
1. See Standard Plan C-6b for base plate and foundation requirements when light standards are mounted on concrete barrier.

2. Round and smooth all edges along wireway to protect conductors. See Standard Plan J-16 for wiring details.

3. The top of the anchor rod shall be both threaded and galvanized a minimum of 12%. The bottom of the anchor rod shall be threaded a minimum of 3'. Galvanizing shall be in accordance with AASHTO M 273. Galvanized anchor bolts are not allowed.

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

5. Pole base plate for a slip base design shall be 1 1/2" AASHTO M 273 Gr. 345. Pole base plates for a fixed base design may be either 1 1/2" AASHTO M 273 Gr. 345 or 1 1/2" AASHTO M 233.

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

SECTION C-C

ELEVATION

LIGHTING BRACKET DETAIL

For light standards with single arm 12' or less and double arms 8' or less mounted on bridges or retaining walls.
ASSEMBLY DETAILS

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

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

Removal of the frangible base from the existing base plate is required.

Misaligned anchor bolts must be removed and replaced.

SCHEDULE

<table>
<thead>
<tr>
<th>Adapter Type</th>
<th>Anchor Bolt Size</th>
<th>Bar Size</th>
<th>Existing Base Type</th>
<th>Lumineire Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-2</td>
<td>1/2 x 2'</td>
<td>1/4-20</td>
<td>Cast Aluminum</td>
<td>10</td>
</tr>
<tr>
<td>A-3</td>
<td>1/2 x 2'</td>
<td>1/4-20</td>
<td>Steel Transformer</td>
<td>30</td>
</tr>
<tr>
<td>A-4</td>
<td>1/2 x 2'</td>
<td>1/4-20</td>
<td>7050 Aluminum</td>
<td>40</td>
</tr>
<tr>
<td>A-5</td>
<td>1/2 x 2'</td>
<td>1/4-20</td>
<td>2-pg. Alum. Comp.</td>
<td>60</td>
</tr>
</tbody>
</table>

Note: Contractor shall verify BC in field before ordering. If BC or anchor bolt sizes differ from those listed, contact Bridge and Structures Office.

+ Plus or minus 2'-6"
Install sized reducing washer and connector to secure conductors at end of mast arm.

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

Mast Arm Wiring Detail

24" Slack required to allow quick disconnects to be pulled outside handhole 6" MIN.

See Detail A

Junction box

Wiring Detail Light Standard Slip Base*

*Application for fixed base similar except no cable tie is required at junction box.
TIMBER LUMINAIRE SUPPORT

HIGH MAST TIMBER LUMINAIRE SUPPORT

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

1. Galvanized steel mast arm - configuration varies with manufacturer
2. Luminaire - see Contract for type and number
3. Mounting height - roadway to luminaire elevation difference + 2%, see Contract
4. Mast arm length - see Contract
5. ½" galvanized thimble eyebolt (single or double) with washers and nuts or eyelet
6. Bonding jumper
7. Pole and bracket cable
8. Equipment grounding conductor see Standard Plan J-9a
9. From ground line to 10' above ground, enclose equipment grounding conductor in galvanized steel conduit, code sized. Above 10' from ground, staple equipment grounding conductor to pole. Connect to supplemental ground per Standard Plan J-9a.
10. Service wedge clamp
11. ACER triplex or quadplex conductors - see Contract
12. Copper split bolt connector
13. Messenger cable
14. Insulating tape for waterproof connection
15. Fused quick disconnect - use 30 amp fuses for high mast supports
16. Weatherhead - size as required
17. Steel conduit
18. 8" x 8" x 4" NEMA 3R junction box with raintight hubs and removable cover
19. Grounding lug
20. 12 pole terminal block
21. Direct burial conductors or galvanized steel conduits with conductors - see Contract
22. Grounding bushing
23. Supplemental ground - see Standard Plan J-9a
24. Class 5 timber pole - length sufficient for mounting height and burial depth
25. Class 2 timber pole - length sufficient for mounting height and burial depth
26. ¾" x 9" step bolt
27. 1¼" x 10" plate collar bent to fit pole diameter (8" - 10")
28. ¾" x 4" machine bolts (four required) with washers and nuts
29. ⅞" lag bolts (six required) - drill ⅞" hole in plate
30. 2" pipe
31. ¼" wire hole 2" from gusset plate, smooth hole edges
32. 1" nonmetallic conduit with ⅛" straps at code spacing
33. Distance varies, 35' MIN, 50' MAX, depending on line clearance requirements

AERIAL FEED

UNDERGROUND FEED

2 UNITS 3 UNITS 4 UNITS 6 UNITS

TYPICAL LUMINAIRE MOUNTING CONFIGURATIONS

See Gusset Detail

GUSSET DETAIL

PLAN VIEW
LUMINAIRE SUPPORT BRACKET
GALVANIZE AFTER FABRICATION

STEP BOLT PLACEMENT

120°

NOTE:
1. Timber luminaire supports are used only for temporary installations where breakaway or slip bases are not required.
2. When down guys are required, see Standard Plan J-1a.
TYPE A SERVICE, 120 VOLT

- Liquid tight flexible conduit, length 2' MIN, 3' MAX - strap to pole
- Conduit and conductors, size to utility requirements
- 1" conduit, three #12
- 30' Class V treated timber pole
- Bend conduit to pole and strap within 1' above meter
- 3" x 6" nipple or wnr fitting
- LR Conduit Body
- Hub and gasket
- Service breaker, 120VAC, 1P 50A
- See Note 5
- Conduct to luminaire, size as required

TYPE B SERVICE, 120/240 VOLT

- Liquid tight flexible conduit, length 2' MIN, 3' MAX - strap to pole
- Conduit and conductors, size to utility requirements
- 1" conduit, three #12
- 30' Class V treated timber pole
- Bend conduit to pole and strap within 1' above cabinet
- 3" x 6" nipple or wnr fitting
- Hub and gasket (Typ)
- Service cabinet
- Use metal standoffs to mount to pole
- See Note 5
- Conduct to luminaire, size as required

TYPE C SERVICE, 480 VOLT

- Liquid tight flexible conduit, length 2' MIN, 3' MAX - strap to pole
- Conduit and conductors, size to utility requirements
- 1" conduit, three #12
- 30' Class V treated timber pole
- Bend conduit to allow removal of weatherhead, strap below bend
- Conduit and conductors, size to utility requirements
- 3" x 6" nipple or wnr fitting
- Hub and gasket (Typ)
- Service cabinet
- Use metal standoffs to mount to pole
- See Note 5
- Conduct to luminaire, size as required

PHOTOELECTRIC CONTROL DETAILS

- Two 3/8" x 3" galvanized log screws
- Two 1/2" x 3/4" brass bolts
- Drill bracket to fit meter base

J-3
08-01-97
Sheet 1 of 2 Sheets
1. Metering arrangements may vary with different serving utilities. The contractor shall verify the requirements of the utility prior to installing the service equipment.

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

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

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

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

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

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

1. See breaker schedule in contract for breaker and contactor sizes.
**KEY**

1. Pushbutton switch assembly
2. Cast metal housing
3. Protective collar
4. Pushbutton switch
5. Gasket
6. Stainless steel fastener
7. Cast aluminum conduit
8. Aluminum plug with ¼" drilled weep hole.
9. Aluminum "H" extrusion
10. Chase nipple - ½" hex head x ½" pipe thread x 2½" long
11. ⅝" - 16 x 2½" stainless steel bolt with washer
12. ½" X 4" lag bolt with washer
13. Drill and tap shaft for ¾" bolt
14. Drill and tap shaft for ⅝" nipple
15. Conduit and fittings as required for timber pole installations; reverse conduit and conduit for top feed
16. Drill pilot hole for ¼" lag bolt
17. 1.75" x 2.5" base plate
18. 0.391" hole for metal post mount
19. 0.391" hole for wood post mount
20. 0.875" hole for metal post mount
21. 0.9375" hole for wood post mount

**NOTE:**
When "PPB-MR" or "PPB-WR" are specified in the contract, the arrow shall be installed in the opposite direction than as shown for "PPB-M" or "PPB-W"
NOTES

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

2. Pad mount design is typical.

3. Place a silicone seal between the cabinet foundation and the cabinet for the pad mount design.
NOTES:
1. Type M mounting shall have "O" ring groove and seal top and bottom at signal attachment.
2. Type M mounting for conventional heads shall have a 2" diameter opening at the signal attachment.
3. Type M mounting for optically programmed heads shall have a 2 1/2" DIA opening at the signal attachment.
4. Type N mounting with optically programmed heads shall be installed with 14" nominal arms.
5. See Standard Plan J-6h for tether wire, and backplate requirements.

KEYS:
1. End cap
2. Conduit locknut, 1/2" DIA
3. Locknipple, 1/2" DIA
4. Steel washer
5. Neoprene gasket
6. Bronze serrated oil fitting with:
   - 3/8" stainless steel through bolt and nuts
   - Three set screws at gasket connection
   - Three Allen head stainless steel set screws of conduit nipple connection
7. Serrated ring with pins
8. Hex locknut with:
   - Two Allen head stainless steel set screws
   - Pin receptacles
9. Conduit nipple, 1 1/2" DIA
10. Hex locknut, 1/2" DIA
11. Mounting assembly
12. Bronze elevator plumizer with 3/8" stainless steel through bolt, washers, and two nuts
13. Aluminum arm with set screw
14. Slotted tube with closure strip
15. Tube clamp, 2 1/2" ID, WIN
16. Internally threaded clamp assembly with:
   - Two set screws
   - 1/2" x 0.045" stainless steel bolts
   - Screw buckles, 1/16" with swivels, nuts, and washers
   - Band clips with Allen head stainless steel set screws
17. Bronze messenger hanger with:
   - 3/8" DIA J bolts
   - Cable lock bar
   - Wall
   - Cotter key
18. Bronze internally threaded wire entrance with:
   - Bushing insert
   - Allen head stainless steel set screw
19. Bronze balance adjuster
20. Multi-Head mounting assembly
21. Spider assembly
22. Serrated ring with no pins
**Slip/Anchor Plates Detail**

1. **Slip Plate**
2. **Anchor Plate**
3. **Steel Plate**

**Slip/Anchor Plates Detail**

- 1" DIA hole
- 1.5" DIA bolt circle
- KEEPER PLATE: Piece between pole base plate and slip plate on top of middle washer.

**Base Plate**

- See Slip Anchor Plate detail for dimensions not shown. Match Slip Plate dimensions.
- Plate washer TYP (see detail): Keeper plate
- Base plate (1/8"
- Silica plate (1/16"
- Hardened washers (TYP)
- Anchor plate (1/2"
- Top of concrete
- 1/8" Chamfer
- Install grout pad after plumbing standard
- 1/8" Heavy hex nuts TYP

**Flashing Beacon and Ramp Meter Base Elevation**

- See "FOUNDATION DETAIL" for other requirements.

**Ramp Meter Detail**

- Shaft, slipfitter, welded and non-welded are the same as shown for Type J Standard, except shaft length is 34".

**Flashing Beacon Detail**

- Shaft, slipfitter, welded and non-welded are the same as shown for Type J Standard, except shaft length is 34".

**Traffic Signal Head**

- Type D standard signal head mounting, Standard Plan J-6f (stiff slipfitter to seat set screws)

**Stop Here on Red**

- Install 5 amp quick disconnect for A, B, & C conductors.
- Install unsubscribed quick disconnect for D conductor. Tape off B conductor. See Std. Spec. 9-29.7

**Anchor Bolt Layout**

- Secure 5c cable with cable ties. See Std. Plan J-16.

**Ramp Metered Ahead When Flashing**

- R010-610433-1

**Expiring: October 26, 2002**

**State of Washington**

**Professional Engineer**

**Approved for Publication**

**Harold J. Petersen**

**Sheet 3 of 3**

**Signal Standard Type Designations and Type Details**

**P P B, P S, I, R B A, & P B Details**

**Standard Plan J-7a**

**Effective: January 3, 2006 to August 6, 2006**
1. An eight-way expanding anchor may be used as an acceptable alternative to power installed helical screw anchor.

2. If anchor hole diameter is greater than nominal diameter of bored anchors, a 5" cover at 6" to 12" size rock shall be tamped in to replace the disturbed soil immediately above the anchor.

3. See "Strain Clamp Detail" on Standard Plan, "Strain Pole Standards: Types IV and V.

ANALYZE DOWN GUY DETAIL

10'-0" MIN. 15'-0" MAX

TIMBER STRAIN POLE

Strain insulator (See detail)

8"-0" yellow reflective plastic guy guard

Power installed helical screw anchor (See Notes)

4. 8"-0" yellow reflective plastic guy guard

10'-0" MIN. 15'-0" MAX

VERTICAL CLEARANCE

16'-6" MIN
19'-0" MAX

WEATHERHEAD TERMINAL COMPONENT (See note 3)

Bonding lug

Bond

Clamp

Cable ties at 1'-0"

3 turn cable

Drip loop

Tamped pit run rock 6" to 12"

Elevation Side View Plan

ANCHOR ASSEMBLY

SPAN WIRE INSTALLATION

STRAIN INSULATOR DETAIL

4/24/98

APPROVED FOR PUBLICATION

Clifford E. Mansfield
DEPUTY STATE DESIGN ENGINEER Date: 4/24/98

HIGHWAY ENGINEER'S OFFICE DEPARTMENT OF TRANSPORTATION SEATTLE, WASHINGTON

WASH
LOOP INSTALLATION NOTES:
1. Install the Junction Box and the lead-in conduit.
2. Lay out the loop slots and the lead-in slots.
3. Lay out the loop wire starting at the Junction Box, allowing 3" minimum slack.
4. Install the wire in the loop slot as shown.
5. Finish laying out the wire at the Junction Box and identify the leads with the loop number, the "L" for loop and the "F" for the lead, and the loop series number.
6. Twist each pair of the lead wires two turns per foot from the loop to the Junction Box. Reverse the direction of the twist for each successive pair installed.
7. Construct a supplemental splice containing any series loop connections required in the plane. Supplemental splices are subject to the same requirements shown for the loop lead and the shielded cable splice.
8. Splice the loop leads of supplemental splices to the shielded cable as noted in the Contract.
10. Consult the loop conduit shall be as required in the Contract.
NOTES

1. The Heavy Duty Lid shall be used when a Pull Box is placed in the ground. Use a 1/2" thick lid for new pull box installation, otherwise use Contract Plans for overlay depth to match the lid thickness.

2. The lid pattern shall be 333% minimum thick.

3. A 1/4-20UNC x 3/4" S.S. ground stud with S.S. nut and field fastener shall be attached to the lid and welded with 3/4"-long weld.

4. Contract a bonding jumper to steel conduit bushing for GRS conductive connect to equipment grounding conductor and also to the ground rod for PVC conduit. The Bonding Jumper shall be 1/8" minimum of stranded copper.

5. The System identification label shall be a 1/2" thick label formed by engraving, casting, stenciling, or with a void bead. See SYSTEM IDENTIFICATION DETAIL, Standard Plan J-11a.

6. Concrete shall be Class C200.

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

---

**STANDARD PLAN J-18a**

**SECTION A**

Pull Box

9-Way with Heavy Duty Lid

**SECTION B**

Pull Box

4-Way with Heavy Duty Lid

**HEAVY DUTY LID**

See Note 1

**GALVANIZED FULL LID IRON**

1 EACH CORNER (4 REQUIRED)

**GROUND ROD**

**GROUND ROD KNOCKOUT**

**HARDWARE MOUNTING RACK**

2 & 4 W1 SPLITTED CHANNEL

**TO BOTTOM OF LID**

1'-0"

**LIFT HOLE**

1'-0" TO 2'-0"

**ISOMETRIC CUTAWAY VIEW**

2'-0"

---

**EXPRESS MAY 31, 2007**

**APPROVED FOR PUBLICATION**

Harold J. Peterson 10-04-08

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

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

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

4. Connect a bonding jumper to steel conduit bushings for DUS conduit; connect to equipment grounding conductor and also to the ground rod for PVC conduit. The bonding jumper shall be 16 gauge, 1/4" of braided copper.

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

6. Concrete shall be Class 400.

7. Plastic plugs shall be put into lid inserts after fabrication and after lid installation.
1. The Junction Box shall be of type 304 stainless steel, welded seam construction; #12 gauge backbox with #16 sleeve, #12 gauge cover with #10 sleeve, and #12 gauge mounting tabs.

2. All conduit connections to the Junction Box shall be cast-concrete, leaded concrete shall not interfere with conduit. Field drill or punch the holes in the same of the box end, unless adding additional conduit. (See SECTION B)

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

4. The System Identification letters shall be 1/4" high, beading formed by engraving, etching, or with a 1/4" weld bead. See Detail.

5. Literally cost the threads of the cover fasteners with anti-seize compound during construction and before final closure.

6. Details shown for box installation in assembly forms.
1. The Traffic Data Collection Loop spacing shall be 18'-5" from leading edge to leading edge. The loops shall be centered inside lanes without an adjacent shoulder. The loops in lanes adjacent to shoulder, including the median shoulder, shall be located 1'-9" from the edge of lane, see Detail "A".

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

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

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

5. The shoulder notch length along the roadway shall be 4'-0" or the conduit slip plus 2", whichever is larger. The shoulder notch width perpendicular to the roadway shall be the conduit slip plus 1'-0".

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

7. Use Schedule 40 PVC conduit from the junction box to the cabinet. When there are four or more travel lanes, use one conduit for each direction of travel. For conduit installation, see Standard Specification 8-20.

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

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

1. Level pavement around, paint, tape measure and 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 passive cable length is enough to reach the cabinet. Do not splice cable. Leave a 4' minimum cable length inside the cabinet.

2. Using a vise-grip wrench or a 3/4" diamond blade, cut the slot for the sensor. The slot must be 3/4" wide, 1/2" deep, and 1" minimum long. Cut all slits at least 90°. The length of the slot should be less than the sensor width, including the bond attachment.

3. Cut home run slots for Pico sensors. Center the home run slot on the sensor slot. Out the home run slots at 3" minimum in the northern hemisphere and 1/2" minimum in the southern hemisphere. Cut the slots wider if installing conduct.

4. Using a power water jet with water, remove and collect all the dusty and loose material from the slots. Blow the slots with a soft wire bristle brush. Dry all of the slots with a large vacuum cleaner (150 CFM minimum). All of the slits should be completely dry.

**Type 3 Advance Loop Wiring Diagram**

**Section A**

**Section B**

**Section C**

**Permanent Traffic Recorder and Weigh-in-Motion Details**

**Standard Plan J-30**

**Sheet 1 of 4 Sheets**

**Approved for Publication**

Herman J. Petersen

**Washington State Department of Transportation**

**Effective: January 3, 2006 to August 6, 2006**
These are general installation instructions. See specific manufacturer's installation instructions in the special provisions of the contract.

5. Place 2" duct tape along length of both sides of the sensor slit. Tape 1/16" away from the slot.

6. Visually inspect sensor to ensure it is straight without any twists or curls. Check passive cable for bare wire. Check lead attachment for cracks or gaps. Check the die sleeve to ensure the correct sensor is being installed. (Class 1 Piezo Axle sensor for Weigh-in-Motion, and Class 2 Piezo Axle sensor for Permanent Traffic Recorder.

7. Place the sensor on the tape next to the slit. Handle the sensor with clean latex (or equivalent) gloves.

8. Clean the sensor with the grit of a steel wool or empty pad. Wipe it down with isopropyl alcohol and a clean, lint free cloth.

9. Place the installation brackets on the sensor every 6" for the length of the sensor. Use the 3/4" bracket.

10. Place the sensor in the slot in the road. The end of the sensor should be at least 2" from the end of the slot, and should not touch the bottom of the slot. The lead attachment and should not touch the bottom or the sides of the slot.

11. If any of the 3/4" brackets do not fit snugly against the edges of the slot or are loose, replace them with a 1" bracket.

12. Starting at the lead attachment end, position the sensor so that it is parallel to the surface of the road, approximately 3/8" below the surface of the road. At this depth, the installation brackets are 1/8" below the surface of the road.

13. Visually inspect the length of the sensor to ensure that it is at a uniform depth along its length and that it is level (not twisted, cracked or bent).

14. Run the passive wire the length of the home run slot. Place the polypropylene rope under and over the passive cable (inside the slot). This will keep the grout from running out into the deeper home run slot.

15. Place all of the insulation pads to the side specifications.


17. Using a low speed mixer (450 rpm) and a mixing paddle, prepare the grout for 3 minutes or until smooth. Add hardener to the grout and mix according to the manufacturer's instructions.

18. Pour the grout into the slot using a steel head. Make sure that the grout fills the space under the sensor slowly, eliminating air pockets. Start at the end and pour toward the lead attachment. Repeat until the slot is completely full of grout, at least 2" in panels, (approximately 1/2" thick each).

19. Using a putty knife or a trowel, spread the grout smooth along the length of the slot. The grout should be slightly higher (1/16") than the tape as it will shrink while curing.

20. Remove the tape as soon as the final grout pour is complete.

21. Once the grout for the Weigh-in-Motion Piezo Sensors is cured, (approximately 25 minutes, depending on grout type and ambient temperature), use a saw sampler to score the top of the grout flush with the surface.

22. Allow the loop assistant and the grout for both sensor installations to fully cure (48-50 minutes) before opening to traffic.
NOTES:
1. SIGN SEQUENCE IS THE SAME FOR BOTH DIRECTIONS OF TRAVEL, ADJUSTED FOR THE DIRECTION OF ROADWAY CURVES.
2. FLASHING WARNING LIGHTS (TYPE B, MUTCD) AND/OR FLAGS SHALL BE USED TO CALL ATTENTION TO THE ADVANCE WARNING SIGNS.
3. EXISTING CONFLICTING PAVEMENT MARKINGS AND SIGNS NO LONGER APPLICABLE SHALL BE REMOVED. TEMPORARY PAVEMENT MARKINGS SHALL BE USED TO DELINEATE BYPASS DETOUR.
4. RAISED PAVEMENT MARKERS AND/OR TEMPORARY GUIDEPOSTS MAY BE USED ON BYPASS AS DIRECTED BY THE ENGINEER.
5. STEADY BURNING WARNING LIGHTS (TYPE C, MUTCD) SHALL BE USED TO MARK TRAFFIC CONTROL DEVICES AT NIGHT.
6. WHERE ADVISORY SPEEDS ARE 30 MPH OR LESS, REVERSE TURN SIGNS SHOULD BE USED. OTHER CURVE OR TURN WARNING SIGNS MAY BE SUBSTITUTED TO DEPICT ROADWAY ALIGNMENT AS APPROPRIATE.
7. ROADSIDE BARRIERS AND END TREATMENTS SHALL BE CRASHWORTHY.

SIGN SPACING = X (FEET)

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All signs are black on orange unless otherwise designated.

CHANNELIZING DEVICE SPACING (FEET)

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LEGEND:

- WARNING FLAG - FLUORESCENT RED/ORANGE
- FLASHING WARNING LIGHT
- TEMPORARY TRAFFIC CONTROL DEVICES
- TYPE 3 BARRICADE
- SIGN LOCATION - POST MOUNT
- TEMPORARY IMPACT ATTENUATOR (WHEN SPECIFIED IN CONTRACT)
NOTES

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

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

3. DETOUR TRAILBLAZERS SHALL BE INSTALLED THROUGHOUT THE DETOUR.

4. SIGNING SHOWN FOR ONE DIRECTION ONLY.

5. COORDINATE WITH EMERGENCY SERVICES.

SIGN SPACING = X (FEET)

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

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EXPIRES: NOVEMBER 23, 2003

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

APPROVED FOR PUBLICATION

MARIO P. PEDRAZZI
DEPUTY CHIEF

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED: JANUARY 3, 2006 TO AUGUST 6, 2006
SIGHT DISTANCE DATA
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Distances shown are minimums. Use additional distance when possible.

NOTES
1. Daylight hours only.
2. Radio contact between work crew and shadow vehicle recommended.

PORTABLE CHANGEABLE MESSAGE SIGN DISPLAYS

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<td></td>
</tr>
<tr>
<td>MOUNT TO BACK OF SHADOW VEHICLE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LEGEND

\[\text{W21-1 Black on Orange}\]

WORKERs
MOUNT TO BACK OF WORK VEHICLE

\[\text{W20-1 Black on Orange}\]

ROAD WORK AHEAD
MOUNT TO BACK OF SHADOW VEHICLE

\[\text{S} \]

SHADOW VEHICLE MAINTAIN MIN. SIGHT DISTANCE "S" (SEE CHART) TO APPROACHING TRAFFIC.

MOBILE SHOULDER OPERATION WITH LANE ENCOmRATION STANDARD PLAN K-5

APPROVED FOR PUBLICATION
Harold J. Petersen 12-29-02
Washington State Department of Transportation

EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006

EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006
BUFFER DATA

BUFFER SPACE = B

SPEED MPH
25 30 35 40 45 50 55 60 65 —
LENGTH (feet) 55 85 100 170 120 280 335 45 485 —

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R

<table>
<thead>
<tr>
<th>VEHICLE TYPE</th>
<th>TYPICAL VEHICLE LOADED WEIGHT</th>
<th>POSTED SPEED (mph)</th>
<th>STATIONARY OPERATION (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 YARD DUMP TRUCK</td>
<td>24,000</td>
<td>60-65 90</td>
<td>50-55 75</td>
</tr>
<tr>
<td>2 TON CARGO TRUCK</td>
<td>1,000</td>
<td>60-65 90</td>
<td>50-55 75</td>
</tr>
<tr>
<td>1 TON CARGO TRUCK</td>
<td>500</td>
<td>60-65 90</td>
<td>50-55 75</td>
</tr>
</tbody>
</table>

ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT.

MINIMUM TAPER LENGTH = L (FEET)

LANE WIDTH (feet): 25 30 35 40 45 50 55 60 65

<table>
<thead>
<tr>
<th>POSTED SPEED (mph)</th>
<th>10</th>
<th>155</th>
<th>205</th>
<th>250</th>
<th>450</th>
<th>500</th>
<th>550</th>
<th>600</th>
<th>660</th>
<th>780</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/65</td>
<td>40</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25/55</td>
<td>20</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CHANNELIZING DEVICE SPACING (FEET):

<table>
<thead>
<tr>
<th>MPH</th>
<th>TAPER</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/65</td>
<td>40</td>
</tr>
<tr>
<td>25/55</td>
<td>20</td>
</tr>
</tbody>
</table>

RIGHT LANE CLOSURE FOR DIVIDED HIGHWAY

SIGN SPACING = X (FEET)

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

All signs are block on orange unless otherwise designated.

PORTABLE CHANGEABLE MESSAGE SIGN DISPLAYS

PCMS

1 2

RIGHT LANE CLOSED 1 MILE AHEAD

1.5 SEC 1.5 SEC

NOTES

1. EXTEND DEVICE TAPER ACROSS SHOULDER.
2. DEVICES SHOULD NOT ENCROACH INTO ADJACENT LANES.
3. INSTALL PORTABLE CHANGEABLE MESSAGE SIGN WHEN SPECIFIED APPROXIMATELY 1 MILE IN ADVANCE OF LANE CLOSURE.
4. USE TRANSVERSE DEVICES IN CLOSED LANE EVERY 1000' +
5. TRAFFIC SAFETY DRUMS RECOMMENDED FOR HIGH SPEED ROADWAYS AND IN TAPER SECTIONS, USE IN LIEU OF CONES.
6. ANALYZE THE TRAFFIC VOLUMES TO DETERMINE WORK HOURS TO MINIMIZE TRAFFIC IMPACTS.
7. A TEMPORARY RIGHT EDGE LINING REQUIRED FOR A LONG TERM CLOSURE.
1. EXISTING CONFLICTING PAVEMENT MARKINGS NO LONGER APPLICABLE SHALL BE REMOVED OR OBLITERATED.

2. TEMPORARY MARKINGS SHALL BE USED AS NECESSARY.

3. EXPOSED ENDS OF CONCRETE BARRIERS SHALL BE MAINTAINED OUTSIDE THE CLEAR ZONE AND ADEQUATELY FLARED OR FITTED WITH IMPACT ATTENUATORS.

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

5. ROADSIDE BARRIERS AND END TREATMENT SHALL BE CRASHWORTHY.

6. INSTALL PORTABLE CHANGEABLE MESSAGE SIGN (WHEN SPECIFIED) APPROXIMATELY 1 MILE IN ADVANCE OF LANE CLOSURE.

**BUFFER DATA**

<table>
<thead>
<tr>
<th>SPEED (mph)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (feet)</td>
<td>55</td>
<td>65</td>
<td>80</td>
<td>100</td>
<td>120</td>
<td>150</td>
<td>180</td>
<td>200</td>
<td>250</td>
</tr>
</tbody>
</table>

**LONGITUDINAL BARRIER FLARE RATES**

- 70: 18x1
- 60: 14x1
- 55: 11x1
- 50: 11x1
- 45: 9x1
- 40: 8x1

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

<table>
<thead>
<tr>
<th>LANE WIDTH (feet)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>POSTED SPEED (mph)</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>65</td>
</tr>
</tbody>
</table>

**CHANNELIZING DEVICE SPACING (FEET)**

- MPH: 50/65
- TAPER: 40/40

**SIGN SPACING = X (FEET)**

- Rural Roads: 45/65 MPH
- Urban Streets: 35/40 MPH
- Rural Roads: 25/30 MPH

All signs are black on orange unless otherwise designated.
NOTES
1. OTHER WARNING SIGNS, SUCH AS LOOSE GRAVEL, TRUCK CROSSING, BUMP, ABRUPT LANE EDGE, ETC. SHALL BE USED AS NECESSARY ALONG WITH ADVISORY SPEED SIGNS.
2. ADVISORY SPEED SIGNS ARE DETERMINED BY THE ENGINEER.
3. FLOODLIGHTS SHALL BE PROVIDED TO MARK FLAGGER STATIONS AT NIGHT.

SIGN SPACING = X (FEET)

<table>
<thead>
<tr>
<th>Type</th>
<th>Rural Roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (MPH)</td>
<td>45/65</td>
</tr>
<tr>
<td>Sign Spacing (ft)</td>
<td>500+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Urban Streets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (MPH)</td>
<td>35/40</td>
</tr>
<tr>
<td>Sign Spacing (ft)</td>
<td>350+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Residential Areas &amp; Business Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (MPH)</td>
<td>25/30</td>
</tr>
<tr>
<td>Sign Spacing (ft)</td>
<td>200+</td>
</tr>
</tbody>
</table>

All signs are block on orange unless otherwise designated.
### Buffer Data

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (ft)</td>
<td>170</td>
<td>220</td>
<td>280</td>
<td>335</td>
<td>415</td>
<td>485</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protect. Veh. Roll Ahead Distance (ft)</td>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Sign Spacing = X (feet)

- Rural Roads: 45/65 MPH, 500’+.
- Urban Arterials: 40 MPH, 350’+.

- Signs are black on orange unless otherwise designated.

### Channelizing Device Spacing (feet):

- MPH
- Taper (Tangent)
- Taper Length (ft)

### Minimum Taper Length (L) in Feet

<table>
<thead>
<tr>
<th>Lane Width (ft)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Legend

- ■ ■ ■ SIGN LOCATION—TRIP 3D MOUNTED
- □ ◇ ◇ TEMPORARY TRAFFIC CONTROL DEVICES
- ○ ◇ ◇ PROTECTIVE VEHICLE WITH TRUCK MOUNTED ATTENUATOR (WHEN SPECIFIED IN CONTRACT)

---

**ALAN O. KING, ING.
DEPARTMENT OF TRANSPORTATION
STATE OF WASHINGTON**

**SHOULDER CLOSURE
HIGH SPEED**

**STANDARD PLAN K-9**

**EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006**

---

**LEGEND**

- ■ ■ ■ SIGN LOCATION—TRIP 3D MOUNTED
- ◆ ◆ ◆ TEMPORARY TRAFFIC CONTROL DEVICES
- ◇ ◇ ◇ PROTECTIVE VEHICLE WITH TRUCK MOUNTED ATTENUATOR (WHEN SPECIFIED IN CONTRACT)
NOTES

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

<table>
<thead>
<tr>
<th>SIGN SPACING = X (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Roads 45/55 MPH 500'--</td>
</tr>
<tr>
<td>Urban Arterials 35/40 MPH 350'--</td>
</tr>
<tr>
<td>Urban Streets 25/30 MPH 200'--</td>
</tr>
<tr>
<td>Residential Areas &amp; Business Districts 150'--</td>
</tr>
</tbody>
</table>

All signs are black on orange unless otherwise designated.
NOTES

1. WORK VEHICLE AND SHADOW/PROTECTIVE VEHICLE SHALL USE WARNING BEACONS.

2. SHADOW/PROTECTIVE VEHICLE RECOMMENDED- SHALL MAINTAIN 500'-1000' OF SIGHT DISTANCE TO APPROACHING TRAFFIC.

3. THIS PLAN MAY BE IMPLEMENTED ON MULTI-LANE HIGHWAYS WITH LESS THAN 10,000 ADT.

4. IN THOSE SITUATIONS WHERE MULTIPLE WORK LOCATIONS WITHIN A LIMITED DISTANCE MAKE IT PRACTICAL, TO PLACE STATIONARY SIGNS, THE DISTANCE BETWEEN THE ADVANCE WARNING SIGN AND THE WORK SHOULD NOT EXCEED 2 MILES.

5. IN THOSE SITUATIONS WHERE THE DISTANCE BETWEEN THE ADVANCE WARNING SIGNS AND THE WORK IS 1 TO 2 MILES, A SUPPLEMENTAL DISTANCE PLACARD SHALL BE USED WITH THE ROAD WORK AHEAD SIGN.
NOTE:
1. CONTROLS SHOWN ARE FOR PEDESTRIAN TRAFFIC ONLY.
2. USE WARNING LIGHTS ON BARRICADES.
3. TEMPORARY PEDESTRIAN ROUTES SHALL BE COMPLIANT WITH ADA REQUIREMENTS.
4. CURB PARKING SHALL BE PROHIBITED FOR AT LEAST 50' IN ADVANCE OF A MID-BLOCK CROSSWALK.
BUFFER DATA

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

<table>
<thead>
<tr>
<th>VEHICLE TYPE</th>
<th>TYPICAL VEHICLE</th>
<th>LOAD (LB)</th>
<th>ROLL AHEAD DISTANCE</th>
<th>ROLL AHEAD STOPPING DISTANCE</th>
<th>TYPICAL VEHICLE</th>
<th>LOAD (LB)</th>
<th>ROLL AHEAD DISTANCE</th>
<th>ROLL AHEAD STOPPING DISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DUMP TRUCK</td>
<td>24,000</td>
<td>2000</td>
<td>90</td>
<td>20</td>
<td>2000</td>
<td>90</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>CARGO TRUCK</td>
<td>15,000</td>
<td>5000</td>
<td>60</td>
<td>15</td>
<td>5000</td>
<td>60</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>CARGO TRUCK</td>
<td>10,000</td>
<td>4000</td>
<td>50</td>
<td>10</td>
<td>4000</td>
<td>50</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

NOTES:
1. For long-term projects, conflicting pavement markings no longer applicable shall be removed or obliterated as soon as practicable. Temporary markings shall be used as necessary and signs shall be post-mounted.
2. Steady burning warning lights (type C, MUTCD) shall be used to mark channelizing devices at night as needed.
3. If the lane shift is short and has sharp curves (30 MPH or less) use sign W1-3 in lieu of sign W1-4.

EFFECTIVE: JANUARY 3, 2006 TO AUGUST 6, 2006
NOTES
1. NO LEFT TURN SIGNS ARE TO BE USED IF TRAFFIC VOLUMES ARE TOO HIGH OR THERE IS A SIGNAL OPERATING. CLOSE LEFT TURN POCKET IF THERE IS ONE ON THE SIDE STREET.

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

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

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

MINIMUM TAPER LENGTH = L (feet)

<table>
<thead>
<tr>
<th>LANE WIDTH (feet)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>105</td>
<td>150</td>
<td>205</td>
<td>270</td>
<td>450</td>
<td>500</td>
<td>550</td>
</tr>
<tr>
<td>11</td>
<td>115</td>
<td>165</td>
<td>225</td>
<td>295</td>
<td>495</td>
<td>550</td>
<td>605</td>
</tr>
<tr>
<td>12</td>
<td>125</td>
<td>185</td>
<td>245</td>
<td>320</td>
<td>540</td>
<td>600</td>
<td>660</td>
</tr>
</tbody>
</table>

SIGN SPACING = X (feet)

<table>
<thead>
<tr>
<th></th>
<th>Rural Roads</th>
<th>45/55 MPH</th>
<th>500''--</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Arterials</td>
<td>35/40 MPH</td>
<td>350''--</td>
<td></td>
</tr>
<tr>
<td>Urban Streets</td>
<td>25/33 MPH</td>
<td>200''--</td>
<td></td>
</tr>
<tr>
<td>Residential Areas &amp; Business Districts</td>
<td>25/33 MPH</td>
<td>200''--</td>
<td></td>
</tr>
</tbody>
</table>

Channelizing Device Spacing (feet)

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

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

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

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

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

### MINIMUM TAPER LENGTH + L (feet)

<table>
<thead>
<tr>
<th>LANE WIDTH (feet)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>105</td>
<td>150</td>
<td>205</td>
<td>270</td>
<td>450</td>
<td>520</td>
<td>550</td>
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<tr>
<td>11</td>
<td>115</td>
<td>165</td>
<td>225</td>
<td>295</td>
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<td>565</td>
<td>605</td>
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<tr>
<td>12</td>
<td>125</td>
<td>180</td>
<td>245</td>
<td>320</td>
<td>540</td>
<td>600</td>
<td>660</td>
</tr>
</tbody>
</table>

### SIGN SPACING x X (feet)

- Rural/Roads: 45/55 MPH 500'
- Urban Arterials: 35/45 MPH 350'
- Urban Streets: 25/30 MPH 200'
- Residential Areas &
  Business Districts: 600'

All signs are back on orange
unless otherwise designated.

### CHANNELIZING DEVICES SPACING (feet)

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

1. EXTEND DEVICES TAPER ACROSS SHOULDER.

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

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

4. FOR USE WHEN TRAFFIC VOLUMES ARE SUCH THAT SUFFICIENT GAPS EXIST FOR MOTOR VEHICLES THAT MUST YIELD.

5. DRIVERS MUST HAVE ADEQUATE SIGHT DISTANCE TO SEE OPPOSING TRAFFIC AS THEY APPROACH. OTHERWISE FLAGGERS AND/OR TEMPORARY SIGNAL IS REQUIRED.

LEGEND

SIGN LOCATION - TRIPOD MOUNT

TEMPORARY TRAFFIC CONTROL DEVICES

FLASHING WARNING LIGHT

TYPE 3L BARRICADE
NOTES

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

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

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

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

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

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

<table>
<thead>
<tr>
<th>Sign Spacing = X (feet)</th>
<th>Rural Roads</th>
<th>45/55 MPH</th>
<th>500&quot;+</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban Arterials</td>
<td>35/40 MPH</td>
<td>350&quot;+</td>
</tr>
<tr>
<td></td>
<td>Residential Areas &amp;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Business Districts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All signs are black on orange, unless otherwise designated.

<table>
<thead>
<tr>
<th>Channelizing Device Spacing (feet)</th>
<th>MPH</th>
<th>Taper</th>
<th>Tangent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50/70</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>35/45</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>
NOTES
1. PROHIBIT TURNS AS NECESSARY FOR TRAFFIC CONDITIONS. CLOSE LEFT TURN POCKET IF THERE IS ONE ON SIDE STREET.

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

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

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

LEGEND

- TEMPORARY TRAFFIC CONTROL DEVICES

## TEMPORARY TRAFFIC CONTROL DEVICES

### TYPE 3L BARRICADE

- SIGN MOUNT - TRIPOD MOUNT

- PAINTED TRAFFIC ARROW (OPTIONAL)

SIGN SPACING - X (feet)

<table>
<thead>
<tr>
<th>Rural Roads</th>
<th>45/55 MPH</th>
<th>50+/-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Arterials</td>
<td>35/40 MPH</td>
<td>35+/-</td>
</tr>
<tr>
<td>Urban Streets Residential Areas &amp; Business Districts</td>
<td>25/30 MPH</td>
<td>20+/-</td>
</tr>
</tbody>
</table>

All signs are black on orange unless otherwise designated.

CHANNELIZING DEVICES SPACING (feet)

<table>
<thead>
<tr>
<th>MPH</th>
<th>TAPER</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-70</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>35-45</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25-30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>
SINGLE WIRE GATE, 14' WIDE

DOUBLE WIRE GATE, 20' WIDE

CROSS SECTION

WOOD POST DETAILS

LINE BRACE (Maximum spacing 1000 feet)

WIRE FENCE

END BRACE

BRACE POST

WOOD BRACE

GATE POST

1" MIN Standard weight pipe

8' WIDE

INTERSECTING FENCE BRACE

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

#### MEMBER

<table>
<thead>
<tr>
<th>TYPE</th>
<th>BRACE RAIL &amp; TOP RAIL</th>
<th>LINE &amp; BRACE POST</th>
<th>END, CORNER, &amp; PULL POST</th>
<th>GATE POST</th>
<th>ALL POSTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ROUND</td>
<td>H-COLUMN</td>
<td>ROLL FORMED</td>
<td>ROUND</td>
<td>H-COLUMN</td>
</tr>
<tr>
<td>1</td>
<td>1 1/4</td>
<td>2.27</td>
<td>1 1/4 x 1 1/4</td>
<td>1.35</td>
<td>3 1/2 x 3 1/2</td>
</tr>
<tr>
<td>2</td>
<td>1 1/4</td>
<td>2.27</td>
<td>1 1/4 x 1 1/4</td>
<td>1.35</td>
<td>3 1/2 x 3 1/2</td>
</tr>
<tr>
<td>3</td>
<td>1 1/4</td>
<td>2.27</td>
<td>1 1/4 x 1 1/4</td>
<td>1.35</td>
<td>3 1/2 x 3 1/2</td>
</tr>
<tr>
<td>4</td>
<td>1 1/4</td>
<td>2.27</td>
<td>1 1/4 x 1 1/4</td>
<td>1.35</td>
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</tr>
<tr>
<td>5</td>
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<td>2.27</td>
<td>1 1/4 x 1 1/4</td>
<td>1.35</td>
<td>3 1/2 x 3 1/2</td>
</tr>
<tr>
<td>6</td>
<td>1 1/4</td>
<td>2.27</td>
<td>1 1/4 x 1 1/4</td>
<td>1.35</td>
<td>3 1/2 x 3 1/2</td>
</tr>
</tbody>
</table>
NOTES:
1. Fence fabric shall be secured to gate frames with knuckled selvage along top edge for Types 4 & 6 chain link fence installations.
2. Minimum post lengths:
   Types 1 & 3 8'-9''
   Types 4 & 6 5'-6''

CHAIN LINK GATES
NOTES

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

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

PLAN

6" MIN galvanized SWR wires
used rope may be approved by the Engineer

Galvanized nut and washer

Burr or swell end of bolt

to prevent removal of nut

6" MIN

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

1/2" Galvanized chain
approximate 2' long,
to connect padlocked end.
(See Note 2)

1/2" Galvanized eye bolt

Lock and clamp end

Access Control Gate

ELEVATION

Posts (See Note 11)

Galvanized nut and washer

Ground Line

Lock 11" MIN
NOTES

1. Where shown on the plans or specified in the Special Provisions, raised pavement markers shall be used for supplementing or substituting the painted pavement markings shown herein. See the Standard Plans for RPP supplement and substitution patterns.

2. The channelization shown on this plan assumes optimal roadway geometric design. The dimensions may vary in final grading conditions. See Contract.

LEGEND

R = RAMP LANE WIDTH
L = LANE WIDTH

RAMP CHANNELIZATION
TWO LANE

STANDARD PLAN M-1.40-00

Sheet 1 of 1 Sheet

APPROVED FOR PUBLICATION

Harold J. Peterson  6/30/06

Washington State Department of Transportation
NOTES
1. Install a minimum of 5 sets of diagonals/chevrons in the gore area.
   A 10' spacing is standard, however, for gore areas shorter than 150' use a 35' spacing, and for gore areas greater than 400' a spacing of 100' may be used.

2. The acute angle of the diagonals shall always point in the direction of mainline traffic.
GORE AREA MARKINGS
WITH CHEVRONS

WHITE EDGE LINE

YELLOW EDGE LINE

WIDTH LINE SUBSTITUTION PATTERN (TYP.)

DIAGONAL MARKING (TYP.)

CENTERLINE OF GORE AREA

NOTE
1. Install a minimum of 3 sets of diagonal/bowmarking in the gore areas. A 50' spacing is standard, however, for gore areas shorter than 150', use a 25' spacing, and for gore areas greater than 400', a spacing of 100' may be used.

2. The exact angle of the diagonal shall always point in the direction of mainline traffic.
**GENERAL NOTES**

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

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

**LEGEND**

- Type 2d Traffic Arrow

**LEFT TURN CHANNELIZATION**

**TEE INTERSECTION**

**DOUBLE YELLOW CENTER LINE (MARGO PATTEN)**

**DOUBLE YELLOW CENTER LINE (MARGO PATTEN)**

**WHITE EDGE LINE**

**WHITE EDGE LINE**

**SIDE RADIUS OF LEFT TURNING VEHICLE**

**STopping POINT FOR LEFT TURN LANE**

**APPROACH TAPER "A"**

**VANSER**

**VANSER**

**WHITE EDGE LINE**

**WHITE EDGE LINE**

**APPROACH TAPER "A"**

**VEHICLE SPEED**

<table>
<thead>
<tr>
<th>SPEED</th>
<th>APPROACH TAPER &quot;A&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 MPH</td>
<td>16'</td>
</tr>
<tr>
<td>35 MPH</td>
<td>11'</td>
</tr>
<tr>
<td>30 MPH</td>
<td>10'</td>
</tr>
<tr>
<td>25 MPH</td>
<td>9'</td>
</tr>
<tr>
<td>20 MPH</td>
<td>8'</td>
</tr>
<tr>
<td>15 MPH</td>
<td>7'</td>
</tr>
<tr>
<td>10 MPH</td>
<td>6'</td>
</tr>
<tr>
<td>5 MPH</td>
<td>5'</td>
</tr>
</tbody>
</table>

**NOTE:** This plan and related engineering data are subject to change. The dimensions and channelization information are for planning purposes only and are subject to change upon receipt of final plans and specifications.

**APPROVED FOR PUBLICATION**

Harold J. Petereso 12-15-04

Washington State Department of Transportation
GENERAL 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 lane message "ONLY" may be added to the Traffic Arrow Type 2R locations shown, in which case, substitute the Arrow as per the LANE MESSAGE DETAIL.

L = 1/2 Typical Lane Width. See Contract for specified lane widths.

LEGEND:
- Type 2R Traffic Arrow
- Type 3L Traffic Arrow

RIGHT TURN CHANNELIZATION

STANDARD PLAN M-510-00

HEET 1 OF 1 SHEET

HAROLD J. PATERSONO

APPROVED FOR PUBLICATION

12-15-04

Washington State Department of Transportation
NOTE

When specified in the Contract Plans, the HOV Symbol Molding shall be installed with an offset of 1 foot from the lane centerline.
NOTES
1. Three, four and five accessible stall arrangements may be either 60° angle or 90° perpendicular parking arrangements. See contract.
2. Signs indicating a parking space or stall for a physically disabled person shall be installed between 36" and 48" above the sidewalk surface.
3. An Access Parking Space Symbol is required for each accessible parking stall. A blue background and white border are required when the symbol is installed on a cement concrete surface.
4. Wheel edges, when specified in the contract, shall be approximately 6" high and a minimum of 6" long.
5. Refer to the Standard Plans for sidewalk ramp, detectable warning pattern, and curb details.

LEGEND
- RT-401 Reserved Parking Sign and post with RT-451A, Plaque, if indicated
- RT-461 Access Parking Space Symbol
- RT-501 Manufactured Wheel stop
- RT-502 Detectable Warning Pattern

ALTERTANE PARKING STALL MARKINGS
USE ONLY WHEN SPECIFIED IN THE CONTRACT

PARKING SPACE LAYOUTS
STANDARD PLAN 55-17.10-00

APPROVED FOR PUBLICATION
Harold J. Peterson 03-04-00
Washington State Department of Transportation

EXPIRES MAY 5, 2005
NOTES:
1. Raised pavement markers shall be installed only when specified in the Contract Plans.
2. See the Standard Plans for marker designation.
3. The portion labeled "OPTIONAL" is only used when the Optional Marked Descaler (Taper, see Standard Plans M-3.12 and M-3.20) is specified in the contract plans.