Standard Plans

M 21-01

August 2, 2010

Environmental and Engineering Programs
Design Office
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Foreword

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

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

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Pasco Bakotich III
State Design Engineer
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<td>M-2.60-01</td>
<td>Gore Area Substitution with Types 1 &amp; 2 RPM's</td>
<td>1/30/07</td>
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<tr>
<td>M-3.10-02</td>
<td>Left Turn Channelization</td>
<td>2/10/09</td>
</tr>
<tr>
<td>M-3.20-01</td>
<td>Left Turn Channelization: Reduced Tapers</td>
<td>1/30/07</td>
</tr>
<tr>
<td>M-3.30-02</td>
<td>Left Turn Channelization: Tee Intersection and Back-to-back Turn Lanes</td>
<td>2/10/09</td>
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<tr>
<td>M-3.40-03</td>
<td>Two-way Left-Turn and Median Channelization</td>
<td>2/10/09</td>
</tr>
<tr>
<td>M-3.50-01</td>
<td>Double Left Turn Channelization</td>
<td>1/30/07</td>
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<tr>
<td>M-5.10-01</td>
<td>Right Turn Channelization</td>
<td>1/30/07</td>
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<tr>
<td>M-7.50-01</td>
<td>High Occupancy Vehicle (HOV) Lane Symbol Layout</td>
<td>1/30/07</td>
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<tr>
<td>M-9.50-01</td>
<td>Bicycle Lane Symbol Layout</td>
<td>1/30/07</td>
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<tr>
<td>M-9.60-00</td>
<td>Shared - Use Path Markings</td>
<td>2/10/09</td>
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<tr>
<td>M-11.10-01</td>
<td>Railroad Crossing Layout</td>
<td>1/30/07</td>
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<tr>
<td>M-15.10-01</td>
<td>Crosswalk Layout</td>
<td>2/6/07</td>
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<tr>
<td>M-17.10-02</td>
<td>Parking Space Layout</td>
<td>7/3/08</td>
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<tr>
<td>M-20.10-01</td>
<td>Longitudinal Marking Patterns</td>
<td>1/30/07</td>
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<tr>
<td>M-20.20-01</td>
<td>Profiled and Embossed Plastic Lines</td>
<td>1/30/07</td>
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<td>M-20.30-02</td>
<td>Longitudinal Marking Supplement with Raised Pavement Markers (RPM's)</td>
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<tr>
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<td>Longitudinal Marking Supplement with RPM's ~ Turn Lanes</td>
<td>1/30/07</td>
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<td>Longitudinal Marking Substitution with RPM's</td>
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</tr>
<tr>
<td>M-24.20-01</td>
<td>Symbol Markings: Traffic Arrows for High Speed Roadways</td>
<td>5/31/06</td>
</tr>
<tr>
<td>M-24.40-01</td>
<td>Symbol Markings: Traffic Arrows for Low Speed Roadways</td>
<td>5/31/06</td>
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<td>M-24.60-02</td>
<td>Symbol Markings: Miscellaneous</td>
<td>2/6/07</td>
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<tr>
<td>M-40.10-01</td>
<td>Guide Posts and Barrier Delineators</td>
<td>6/3/10</td>
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<td>M-40.20-00</td>
<td>Guide Post Placement: Interchanges</td>
<td>10/12/07</td>
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<tr>
<td>M-40.30-00</td>
<td>Guide Post Placement: Grade Intersections</td>
<td>9/20/07</td>
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<tr>
<td>M-40.40-00</td>
<td>Guide Post Placement: Horizontal Curves</td>
<td>9/20/07</td>
</tr>
<tr>
<td>M-40.50-00</td>
<td>Guide Post Placement: Bridges</td>
<td>9/20/07</td>
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<tr>
<td>M-40.60-00</td>
<td>Guide Post Placement: Miscellaneous</td>
<td>9/20/07</td>
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<tr>
<td>M-60.10-00</td>
<td>Shoulder Rumble Strip Type 1, for Divided Highways</td>
<td>9/5/07</td>
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<tr>
<td>M-60.20-01</td>
<td>Shoulder Rumble Strip, Types 2, 3, and 4, for Undivided Highways</td>
<td>2/3/09</td>
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<td>M-65.10-01</td>
<td>Center Line Rumble Strip</td>
<td>5/21/08</td>
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<td>M-80.10-00</td>
<td>Traffic Letter and Numeral Applications</td>
<td>6/10/08</td>
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<td>M-80.20-00</td>
<td>Traffic Letters and Numerals (High Speed Roadways)</td>
<td>6/10/08</td>
</tr>
<tr>
<td>M-80.30-00</td>
<td>Traffic Letters and Numerals (Low Speed Roadways)</td>
<td>6/10/08</td>
</tr>
</tbody>
</table>
ALIGNMENT STAKE
$T$ake every 100 feet on tangents, every 25 feet on curves

DISTANCE FROM Q
(40.1 FEET)

LINE DESIGNATION
LINE STATIONING
HUNDRED FOOT INCREMENTS

CONTROL POINT

CLEARING/GRUBBING (C&G) LATH
$T$ake at each full station,
500 feet on tangents,
every 25 feet on curves.
No hub necessary.

SIDE SLOPE RATIO
(4H:1V)

OFFSET FROM SLOPE STAKE
CATCH (10 FEET)

FILL AT STAKE
(11.3 FEET)

CUT AT STAKE
(28.8 FEET)

DISTANCE FROM C
TO CATCH
(2.2 FEET)

SIDE SLOPE RATIO
(4H:1V)

BACK OF DITCH

CUT AT CATCH POINT
(2.2 FEET)

DISTANCE FROM C
TO CATCH
(24.8 FEET)

SIDE SLOPE RATIO
(4H:1V)

LINE STATIONING
HUNDRED FOOT INCREMENTS

OFFSET FROM SLOPE STAKE
CATCH (2.9 FEET)

DISTANCE FROM C
TO CATCH (BACK OF DITCH)
(23.5 FEET)

SIDE SLOPE RATIO
(4H:1V)

BACK OF DITCH

DAYLIGHT (D/L) STAKE

FILL (0.1 FEET)

SIDE SLOPE TO A 2% ROADWAY SLOPE (50H:1V)

DISTANCE FROM C
(16.2 FEET)

CUT AT CATCH POINT
(2.2 FEET)

DISTANCE FROM C
TO CATCH (BACK OF DITCH) (27.6 FEET)

SIDE SLOPE RATIO
(4H:1V)

BACK OF DITCH

CUT AT STAKE
(2.9 FEET)

DISTANCE FROM C
(27.6 FEET)

FILL AT RP STAKE
(1.2 FEET)

SIDE SLOPE RATIO
(4H:1V)

BACK OF DITCH

DISTANCE FROM C
(23.5 FEET)

OFFSET FROM SLOPE STAKE
CATCH (10 FEET)

DISTANCE FROM C
TO CATCH (BACK OF DITCH) (25.7 FEET)

SIDE SLOPE RATIO
(4H:1V)

BACK OF DITCH

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BY THE ENGINEER AND APPROVED FOR PUBLICATION,
IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT
OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.
COMPOUND SLOPE LATH

FILL FROM CATCH POINT TO BEGINNING OF SECOND SLOPE (3.8 FEET)
SLOPE RATIO (2H:1V)
FILL TO SUBGRADE SHOULDER (2.25 FEET)
SLOPE RATIO (4H:1V)
DISTANCE FROM C TO CATCH POINT (35.7 FEET)

DITCH CUT TO BOTTOM OF DITCH (2.4 FEET)
SIDE SLOPE RATIO (4H:1V)
DISTANCE FROM CATCH POINT TO BOTTOM OF DITCH (14.3 FEET)
SLOPE RATIO (2H:1V)

STAKE FOR CURB/GUTTER
STAKE FOR DRAINAGE
STAKE FOR FOUNDATION OF LUMINAIRES, SIGNALS OR SIGN STRUCTURES
STAKE FOR DITCH CONSTRUCTION

DISTANCE FROM C (14.3 FEET)
SLOPE RATIO (2H:1V)
FILL TO SUBGRADE (0.35 FEET)
FILL TO FINISH GRADE (CURB ELEVATION) (0.73 FEET)

DISTANCE FROM C TO CATCH POINT (28.7 FEET)
SLOPE RATIO (4H:1V)
FILL FROM CATCH POINT TO BEGINNING OF SECOND SLOPE (3.8 FEET)
FILL TO SUBGRADE SHOULDER (2.25 FEET)
SLOPE RATIO (4H:1V)
DISTANCE FROM C TO CATCH POINT (35.7 FEET)

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

1. Dimensions may vary according to manufacturer.
2. Base to be placed on a well-compacted foundation.
3. Monument case to be installed by contractor.

**APPROXIMATE WEIGHTS**

<table>
<thead>
<tr>
<th>Case</th>
<th>90 LBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover</td>
<td>18 LBS</td>
</tr>
<tr>
<td>Total</td>
<td>108 LBS</td>
</tr>
</tbody>
</table>

1. SOIL
2. MONUMENT CASE AND COVER
3. STANDARD PLAN A-10.30-00

---

**MOGRT Data**

Pasco Bakotich III 10-05-07

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

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

**Notes**

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

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

### Slope Treatment

<table>
<thead>
<tr>
<th>Cut Slope (H:V)</th>
<th>Ground Line (H:V)</th>
<th>Class A</th>
<th>Class B</th>
</tr>
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<tbody>
<tr>
<td>L = 10.0'</td>
<td>D = 1.0'</td>
<td>D = 1.0'</td>
<td></td>
</tr>
<tr>
<td>L = 6.0'</td>
<td>D = 1.0'</td>
<td>D = 1.0'</td>
<td></td>
</tr>
<tr>
<td>6:1</td>
<td>H : V</td>
<td>3.0'</td>
<td>1.0'</td>
</tr>
<tr>
<td>4:1</td>
<td>H : V</td>
<td>3.0'</td>
<td>1.0'</td>
</tr>
<tr>
<td>3:1</td>
<td>H : V</td>
<td>3.0'</td>
<td>1.0'</td>
</tr>
<tr>
<td>2:1</td>
<td>H : V</td>
<td>3.0'</td>
<td>1.0'</td>
</tr>
<tr>
<td>1:1</td>
<td>H : V</td>
<td>3.0'</td>
<td>1.0'</td>
</tr>
</tbody>
</table>

**Standard Plan A-30.10-00**

Sheet 1 of 1 Sheet

Approved for Publication

Ferre Bakutis
08-31-07

Washington State Department of Transportation

SLOPE TREATMENT
Embankment Slope Protection

Standard Plan A-30.10-00

1/2" DUMMY JOINT (TYP.)

EQUALLY SPACED
6" CENTERS MIN.
6" CENTERS MAX.

OUTER EXTREMITY
OF BRIDGE

EXTEND SLOPE PROTECTION
6" BEYOND OUTER EXTREMITY
OF BRIDGE

PNEUMATICALLY PLACED
OR CAST-IN-PLACE
CEMENT CONCRETE

FOOTING 6"

SECTION A

SECTION B

PNEUMATICALLY PLACED
OR CAST-IN-PLACE
CEMENT CONCRETE

FOOTING 6"

EXISTING SOIL

BOTTOM EDGE OF SLOPE PROTECTION
FOLLOWS BOTTOM OF DITCH

10 GAUGE 6" × 6" WIRE WARPED REINFORCEMENT CENTERED IN CONCRETE
(SEE STD. SPEC. 9-07-7)

PNEUMATICALLY PLACED
OR CAST-IN-PLACE
CEMENT CONCRETE

SLOPE PROTECTION

BA

BB

DUMMY JOINT

(TYP.)

EDGE OF SHOULDER 1'-6" (SHOWN ON LOWER ROADWAY)

1/2" Footing

TYPICAL SECTION

(BOTTOM EDGE OF SLOPE PROTECTION
FOLLOWS BOTTOM OF DITCH)

PNEUMATICALLY PLACED
OR CAST-IN-PLACE
CEMENT CONCRETE

FOOTING 6"

EXISTING SOIL

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STATE OF WASHINGTON
REGISTERED LANDSCAPE ARCHITECT
CERTIFICATE NO. 000860
SANDRA L. SALISBURY

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION

Pasco Bakotich III
11-8-07

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION

Fern Liddell
11-8-07
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 Curb Section shall be used only when the lower roadway cross section requires a curb.
**High Tensile Steel Fasteners**

- Maximum anchor spacing (A) for debris and impact loads required as per table for a minimum allowable anchor capacity of 20,000 lbs. Systems subjected to snow loads may require narrower maximum spacing.
- Hexagonal mesh must meet minimum requirements of ASTM A 975 for gabions.
- U-Section of wire rope clips must be applied to the dead end of the rope as shown.

**Notes**

1. Maximum anchor spacing (A) for debris and impact loads required as per table for a minimum allowable anchor capacity of 20,000 lbs. Systems subjected to snow loads may require narrower maximum spacing.
2. Hexagonal mesh must meet minimum requirements of ASTM A 975 for gabions.
3. U-Section of wire rope clips must be applied to the dead end of the rope as shown.

**Wire Mesh Slope Protection**

**Standard Plan A-30.30-00**

**Wire Rope Detail**

- DISTANCES X,Y,Z AND TORQUE TO COMPLY WITH MANUFACTURER'S SPECIFICATIONS

**Approved for Publication**

Pasco Bakotich III

**Expiry:** November 8, 2007
### Typical Isolation Joint Guidelines

<table>
<thead>
<tr>
<th>Condition</th>
<th>Feature</th>
<th>Line or LIPS in the Pavement Section</th>
<th>Continuous Vertical Joint Passed Through the Pavement Section</th>
<th>Distance from Barrier Transverse Joint</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>Catch Basin on Combination Grate</td>
<td>Line</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>B</td>
<td>Catch Basin on Combination Grate</td>
<td>Line</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C</td>
<td>Catch Basin on Combination Grate</td>
<td>Line</td>
<td>&gt; 4 ft from joint</td>
<td>-</td>
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<tr>
<td>D</td>
<td>Grate Inlet on Catch Basin on Concrete Inlet</td>
<td>-</td>
<td>Line</td>
<td>&lt; 4 ft from joint</td>
</tr>
<tr>
<td>E</td>
<td>Grate Inlet on Catch Basin on Concrete Inlet</td>
<td>-</td>
<td>Line</td>
<td>&lt; 4 ft from joint</td>
</tr>
<tr>
<td>F</td>
<td>Grate Inlet on Catch Basin on Concrete Inlet</td>
<td>-</td>
<td>Line</td>
<td>&gt; 4 ft from joint</td>
</tr>
<tr>
<td>G</td>
<td>Manhole or Catch Basin Type 2</td>
<td>Line</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>H</td>
<td>Manhole or Catch Basin Type 2</td>
<td>Line</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>I</td>
<td>Manhole or Catch Basin Type 2</td>
<td>Line</td>
<td>&lt; 4 ft from joint</td>
<td>-</td>
</tr>
<tr>
<td>J</td>
<td>Manhole or Catch Basin Type 2</td>
<td>Line</td>
<td>&gt; 4 ft from joint</td>
<td>-</td>
</tr>
</tbody>
</table>

* With rectangular grate cut into adjustment section.

---

### T-Joint Detail

- **Pavement Joint (Typical)**

---

### Typical Applications

- **Isolation Joint - 3/4" Presized Joint Filler**
- **Isolation Joint - 3/4" Presized Joint Filler**
- **Continuous Vertical Joint Passed Through the Pavement Section**

---

### PCC Pavement Isolation Joints

**Standard Plan A-40.15-08**

[End of Document]
NOTES

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

2. Sawcut shall be filled with hot-poured compound in accordance with Standard Specification 9-04.2(1) and sealed in accordance with Standard Specification 5-05.3(8).

3. The contractor shall avoid sawing existing concrete. The construction tolerance to locate the saw cut is ±3/64" (0 min. to 1/2" max.) from the existing concrete (DETAIL 1 and 5).
All edges of the approach slab shall have 1/2" radii except the longitudinal edge of the preceding pour of a LONGITUDINAL CONSTRUCTION JOINT.

Longitudinal joints shall be placed on lane lines and shall be constructed and sealed in accordance with Standard Specification Section 5-05.3(8). Joints may be either a sawcut crack control joint or a construction joint. Basrelief joints shall terminate 1' - 0" before reaching edge of slab and must be saw cut as soon as possible after placement of concrete.

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

See Note 2

Dowels: 1 1/2" Dia. x 2' - 0" L.

Incorporate dowels parallel to centerline along transverse construction joint.

Insert dowels parallel to centerline along transverse construction joint.

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1. Install tie bars along longitudinal joints between full panel replacement and existing cement concrete pavement. The bars are not installed between cement concrete pavement and hot mix asphalt shoulders.

2. Place polyethylene film (per AASHTO M171) or building paper along the longitudinal joint between partial panel replacement and existing panel.

3. Place new dowel bars between existing dowel bars. Don't place any dowel bars closer than 1'-0" from edge of concrete panel.
PLAN VIEW
Dowel Bar Retrofit
For two lane divided highway (one way traffic)
For each lane in undivided highway (two way traffic)

SECTION A

SECTION B

SECTION C

Dowel Bar Retrofit
For cement concrete pavement
Standard Plan A-60.20-01
Sheet 1 of 5 sheets

Approved for publication
Peaco Byrd
06-11-06
Washington State Department of Transportation
NOTES

1. A typical bridge overlay will remove 0.07 feet of Asphaltic Concrete Pavement (ACP) and place 0.15 feet of new Hot Mixed Asphalt (HMA). Depth of removal and placement will vary for each bridge. Total depth of HMA on the bridge shall not exceed 0.25 feet, unless shown otherwise in the plans.

2. If the existing depth of asphalt on the bridge deck is 0.25 feet, then the overlay will remove 0.15 feet of ACP and place 0.15 feet of new HMA. The existing bridge grade will remain unchanged.

3. FINAL GRADE TRANSITION: The maximum longitudinal taper slope to transition an increase in roadway grade to the new or existing bridge grade will be at most 1 inch rise to 40 feet run (1V:480H or flatter) (0.2% maximum). If several overlays are present, sequential taper lengths shall be required to maintain the transition slope (1V:480H or flatter) (0.2% maximum).

4. If the ACP and membranes are to be removed from the bridge deck, see GSP 023106 for deck preparation before placing new membranes.

5. In accordance with Standard Specification 5-05.3(12), when pavement abuts bridges, the finished pavement parallel to centerline shall be uniform to a degree that no variations greater than 1/8-inch are present when tested with a 10-foot straightedge.

ELEVATION VIEW

HMA OVERLAY WITHOUT BRIDGE APPROACH SLAB

ELEVATION VIEW

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

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

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

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

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NOTES

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

2. The knockout diameter shall not be greater than 20". Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum. Provide a 1-1/2" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Standard Specification 9-04.3.

3. The maximum depth from the finished grade to the lowest 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.
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2. The knockout diameter shall not be greater than 26". 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.

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NOTES

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

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

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

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

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.

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

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

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

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

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

CATCH BASIN DIMENSIONS

<table>
<thead>
<tr>
<th>CATCH BASIN DIAMETER</th>
<th>WALL THICKNESS</th>
<th>BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT SIZE</th>
<th>MINIMUM DISTANCE BETWEEN KNOCKOUTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>48&quot;</td>
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PIPE ALLOWANCES

<table>
<thead>
<tr>
<th>CATCH BASIN DIAMETER</th>
<th>PIPE MATERIAL WITH MAXIMUM INSIDE DIAMETER</th>
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<tr>
<td>CONCRETE</td>
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</table>

1. Corrugated Polyethylene Elbow Fitting (Std. Spec. 9-05.20)
2. (Std. Spec. 9-05.13(1))
3. (Std. Spec. 9-05.13(2))
NOTES

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

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

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

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

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

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

7. The shear gate shall be made of aluminum alloy in accordance with ASTM B 28 and ASTM B 275, designation 2024A; or cast iron in accordance with ASTM A 48, Class 30B. The lift handle shall be made of a similar metal to the gate (to prevent galvanic corrosion), it may be of solid rod or hollow tubing, with adjustable hook as required.

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

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

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

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

12. Alternative sheet gate designs are acceptable if material specifications are met and flange bolt pattern matches.
NOTES

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 1/4". Attach orifice with 1/2" stainless steel bolts.

5. Upper flow orifice plates and elbows shall be aluminum, aluminized steel or galvanized steel. Galvanized steel shall have Treatment 1.

See Contract for size and location of all pipes and orifices.

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

Precast baffle shall be keyed and grouted in place.

Bottom orifice plate shall be galvanized steel with a minimum thickness of 1/4". Attach orifice with 1/2" stainless steel bolts.

Upper flow orifice plates and elbows shall be aluminum, aluminized steel or galvanized steel. Galvanized steel shall have Treatment 1.
**NOTE**
Knockout shells have a wall thickness of 2" minimum to 2.5" maximum.

### MANHOLE DIMENSION TABLE

<table>
<thead>
<tr>
<th>DIAM (in.)</th>
<th>WALL THICKNESS (in.)</th>
<th>BASE THICKNESS (in.)</th>
<th>MAXIMUM KNOCKOUT SIZE (in.)</th>
<th>MINIMUM DISTANCE BETWEEN KNOCKOUTS (in.)</th>
<th>BASE REINFORCING STEEL H/A-E IN EACH DIRECTION</th>
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<tbody>
<tr>
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**Harold J. Peterfeso**
06-01-06

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**MANHOLE TYPE 1**

**STANDARD PLAN B-15.20-00**

Sheet 1 of 1 Sheet

APPROVED FOR PUBLICATION

**Washington State Department of Transportation**

**EXPIRES JULY 1, 2007**
Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum.

**MANHOLE DIMENSION TABLE**

<table>
<thead>
<tr>
<th>DIAM.</th>
<th>WALL THICKNESS</th>
<th>BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT SIZE</th>
<th>MINIMUM DISTANCE BETWEEN KNOCKOUTS</th>
<th>BASE REINFORCING STEEL H_2/A IN EACH DIRECTION</th>
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</thead>
<tbody>
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<td>84&quot;</td>
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<td>0.20</td>
</tr>
</tbody>
</table>
NOTES
1. Precast cone sections may be eccentric or concentric.
2. Seepage port orientation varies among manufacturers.

CONE SECTION
SEE NOTE 1

ADJUSTMENT SECTION (TYP.)

DISTANCE VARIES
SEE CONTRACT

LIMIT OF EXCAVATION
48" I.D.

-6" (TYP.)

UNDERGROUND DRAINAGE
GEOTEXTILE, MODERATE SURVIVABILITY, CLASS A

CIRCULAR FRAME (RING)
SEE STD. PLAN B-30.70

CIRCULAR GRATE
SEE STD. PLAN B-30.80

PRECAST FOOTING DETAIL

SEEPAGE PORT (TYP.)
SEE NOTE 2

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

SEE CONTRACT
GRAVEL BACKFILL
FOR DRYWELL

#4 BARS

6" DIAM. DRAIN HOLE (TYP.)
PRECAST FOOTING WITH DRAIN HOLES

6H:1V SLOPE (MAX.)

LIMIT OF EXCAVATION
1H:2V SLOPE (MAX.)
The asymmetry of the Combination Inlet shall be considered when calculating the offset distance for the catch basin. See SECTION A.

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 top of the Hood may be cast with a pattern.

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

When bolt-down grates are specified in the contract, provide two holes in the frame that are vertically aligned with the grate slots. Tap each hole to accept a 5/8" × 11 NC × 2" allen head cap screw. Location of bolt-down holes varies among different manufacturers. See BOLT-DOWN DETAIL, Standard Plan B-30.10.

Only ductile iron Vaned Grates shall be used. See Standard Plans B-30.20 and B-30.40 for grate details. Refer to Standard Specification 9-05.15(2) for additional requirements.

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

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

3. The maximum depth from the finished grade to the lowest pipe invert shall be 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 inlet has been placed.

<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>
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<td>PROFILE WALL PVC (STD. SPEC. 9-08.12(2))</td>
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</tbody>
</table>

* CORRUGATED POLYETHYLENE STORM SEWER PIPE

FRAME AND VANED GRATE

RECTANGULAR ADJUSTMENT SECTION

PRECAST BASE SECTION

ALTERNATIVE PRECAST BASE SECTION

CONCRETE INLET

STANDARD PLAN B-25.60-09
NOTES

1. This frame is designed to accommodate 20" x 24" grates or covers as shown on Standard Plans B-30.20, B-30.30, B-30.40 and B-30.50.

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

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

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

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

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

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

2. Refer to Standard Specification 0-05.15(2) for additional requirements.

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

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. Refer to Standard Specification 0-05.15(2) for additional requirements. For Frame details, see Standard Plan B-30.10.

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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 0-06(12) for additional requirements.

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

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. Refer to Standard Specification 0-06(12) for additional requirements. For frame details, see Standard Plan B-30.10.
NOTES

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

2. Refer to Standard Specification 0-06.15(2) for additional requirements.

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

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

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.

Refer to Standard Specification 0-06.15(2) for additional requirements.

For Frame details, see Standard Plan B-30.10.

The thickness of the grate shall not exceed 1 5/8".
The gasket and groove may be in the seat (frame) or in the underside of the cover. The gasket may be "T" shaped in section. The groove may be cast or machined.

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

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

4. In lieu of blind pick notch for storm sewer manhole covers, drill three 1" diameter holes at 120° spacing.

5. Proprietary manhole covers without bottom ribs are acceptable.

6. For clarity, the vertical scale of the Cover Section has been exaggerated, it is 1.5 times the horizontal scale (1H:1.5V).
CIRCULAR GRATE

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

For use with Circular Frames (rings) detailed in Standard Plan B-30.70.
Slotted Manhole Covers are intended for use with Drywells only. See Standard Plans B-30.30 and B-20.30.

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Harold J. Petersen 06-06-06
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.

Ladder rungs for manholes and catch basins shall meet the requirements of AASHTO M 199.
NOTES
1. The Steel Angle shall be set so that each bearing bar of prefabricated grate shall have full bearing on both ends. The finished top of concrete shall be even with the grate surfaces.
2. All exposed concrete shall be finished with a 1/2" radius.
3. The grade line of the top inside of any pipe shall enter no lower than the grade line of the top inside of the outlet pipe.
4. Pipes may enter through the knockouts on any side at any reasonable angle, provided the outside of the pipe can be contained between two opposite walls.
**NOTES**

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

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

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

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

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

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

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

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


---

**Bar List**

<table>
<thead>
<tr>
<th>BAR LIST</th>
<th>MARK</th>
<th>LOCATION</th>
<th>QTY.</th>
<th>SIZE</th>
<th>LENGTH</th>
<th>DESCRIPTION</th>
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<td>2</td>
<td>BOTTOM SLAB AND SIDE WALL</td>
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<td>5 1/2'</td>
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</tbody>
</table>

**Bending Diagram**

(all dimensions are out to out)
WELDED GRATES FOR GRATE INLET

STANDARD PLAN B-40.20-00

Sheet 1 of 1 Sheet

EFFECTIVE: AUGUST 2, 2010 TO JULY 31, 2011

Harold J. Peterfeso 06-01-06

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.
NOTES:
1. The Contractor may specify a rotated inlet installation. Orient the Grates in the Frame so they intersect flow.
2. When bolt-down grates are specified in the contract, provide two slots in the grates that are centered with the holes in the frame. Location of bolt-down slots varies among different manufacturers.
3. Refer to Standard Specification 9-05.1523 for additional requirements.
4. Frames and Grates shall be Ductile Iron.
DROP INLET TYPE 1

NOTES:
1. The top of the inlet shall be placed at ground level to present an unobstructed ditch or median section.
2. Bevel or round exposed concrete edges 1/2".
3. Pipes may enter through the knockouts at any reasonable angle provided the outside of the pipe can be contained within the knockout provided.
4. The grade line of the lowest inlet pipe shall enter the structure at an elevation equal to or higher than the grade line of the outlet pipe.
5. All pickup holes shall be grouted full after the inlet has been placed.
6. The steel angles shall be set so that each bearing bar of the grate shall have full seating on both ends. The finished top of concrete shall be even with the grate surface. For grates, see Standard Plan B-50-20.
7. The amount, type, and grade of reinforcing steel is the responsibility of the manufacturer.
8. The inside wall taper for form removal shall not result in any wall section thinner than 6" except in pipe knockout areas.
9. Precast inlets shall be marked with the manufacturer's identification on the inside of the structure in some readily accessible location.

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

Bevel or round exposed concrete edges 1/2".

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

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.

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

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

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

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

Precast inlets shall be marked with the manufacturer's identification on the inside of the structure in some readily accessible location.
The top of the inlet shall be placed at ground level to present an unobstructed ditch or median section.

Bevel or round exposed concrete edges 1/2".

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

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.

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

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

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

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

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

Standard Plan B-69.30-09

- Type 1: 3 1/2" x 1/2" x 34 1/2" Steel Plate (Typ.)
- Type 2: 3 1/2" x 1/2" x 34 1/2" Steel Plate (Typ.)
- Type 3: 3 1/2" x 1/2" x 34 1/2" Structural Tubing (Typ.)

Optional: 1" Max. Vent Holes on Bottom for Galvanizing

Grind Top and Bottom flush after welding

Harold J. Peterfeso 06-01-06

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CONCRETE AND DUCTILE IRON PIPE

PIPE ZONE BACKFILL (SEE NOTE 1)

Gravel backfill for pipe zone bedding (SEE NOTE 2)

FOUNDAION LEVEL

TRENCH WIDTH

(SEE NOTE 3)

THERMOPLASTIC PIPE

PIPE ZONE BACKFILL (SEE NOTE 1)

Gravel backfill for pipe zone bedding (SEE NOTE 2)

FOUNDAION LEVEL

TRENCH WIDTH

(SEE NOTE 3)

METAL PIPE

PIPE ZONE BACKFILL (SEE NOTE 1)

Gravel backfill for pipe zone bedding (SEE NOTE 2)

FOUNDAION LEVEL

TRENCH WIDTH

(SEE NOTE 3)

NOTES

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

CLEARANCE BETWEEN PIPES FOR MULTIPLE INSTALLATIONS

<table>
<thead>
<tr>
<th>PIPE</th>
<th>SIZE</th>
<th>MINIMUM DISTANCE BETWEEN BARRELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIRCULAR PIPE (DIAMETER)</td>
<td>6&quot; to 24&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td></td>
<td>30&quot; to 48&quot;</td>
<td>48&quot;</td>
</tr>
<tr>
<td></td>
<td>102&quot; to 180&quot;</td>
<td>48&quot;</td>
</tr>
<tr>
<td>PIPE ARCH (SPAN)</td>
<td>METAL ONLY</td>
<td>14&quot;</td>
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<tr>
<td></td>
<td>45&quot; to 142&quot;</td>
<td>SPAN 3</td>
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<td></td>
<td>148&quot; to 200&quot;</td>
<td>48&quot;</td>
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</table>

GRAVEL BACKFILL FOR PIPE ZONE BEDDING (SEE NOTE 2)

GRAVEL BACKFILL FOR PIPE ZONE BEDDING (SEE NOTE 2)

GRAVEL BACKFILL FOR PIPE ZONE BEDDING (SEE NOTE 2)

GRAVEL BACKFILL FOR PIPE ZONE BEDDING (SEE NOTE 2)

GRAVEL BACKFILL FOR PIPE ZONE BEDDING (SEE NOTE 2)
CONCRETE COLLAR OPTION

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 9-07.7. Install two wraps for size 6 × 6 W1.4 × W1.4 (10 Gage) Steel Welded Wire Fabric or one wrap for any of the following sizes:
   - 6 × 6 W2.1 × W2.1 (8 Gage)
   - 6 × 6 W2.9 × W2.9 (6 Gage)
   - 4 × 4 W2.9 × W2.9 (6 Gage)
   - 4 × 4 W4.0 × W4.0 (4 Gage)

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 9-04.4(3).

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

NOTES:

1. The Concrete Collar width shall be one half of the outside pipe diameter of the largest pipe. The minimum Concrete Collar width shall be 12". Concrete Collars may be used with all pipe materials and diameters. The Concrete Collar option shall only be used to extend existing pipes.

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   - 6 × 6 W2.1 × W2.1 (8 Gage)
   - 6 × 6 W2.9 × W2.9 (6 Gage)
   - 4 × 4 W2.9 × W2.9 (6 Gage)
   - 4 × 4 W4.0 × W4.0 (4 Gage)

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5. Use a Flat Type K Coupling Band. Type K Coupling Bands with dimples are not allowed for the installation detail shown. The Coupling Band option shall only be used for extending existing pipes that have an inside diameter of 36" or less.
Span and rise dimensions are nominal and are measured to the inside crests of corrugations.

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

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

Designed for H-20 live load and maximum allowable soil pressure of 6 kips per square foot.
END SECTION LENGTH SHALL BE AT LEAST SIX TIMES THE DIAMETER OF THE PIPE (SEE STD. SPEC. 7-02.3(1))

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NOTES

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

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

CONCRETE PIPE

4H:1V OR STEEPER

4H:1V OR STEEPER

THERMOPLASTIC PIPE

4H:1V OR STEEPER

4H:1V OR STEEPER

METAL PIPE

4H:1V OR STEEPER

4H:1V OR STEEPER

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STANFORD PLAN B-70.30-00

BEVELED END SECTIONS

FOR CULVERTS 30” DIAMETER OR LESS

STANDARD PLAN B-70.30-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

EXPIRES JULY 1, 2007

Washington State Department of Transportation
NOTES

1. D = Inside Diameter of Culvert Pipe, or Pipe Arch Span Width, 36" maximum.

2. The distance between the safety bars, and between the top bar and the culvert crown, shall be equal spaces of no more than 24". The distance may vary 35/64" between bars to facilitate placement.

3. Slope shall match Side Slope; 6H:1V preferred, not steeper than 4H:1V.

D = Inside Diameter of Culvert Pipe, or Pipe Arch Span Width, 36" maximum.

The distance between the safety bars, and between the top bar and the culvert crown, shall be equal spaces of no more than 24". The distance may vary 35/64" between bars to facilitate placement.

Slope shall match Side Slope; 6H:1V preferred, not steeper than 4H:1V.

TYPE 2 SAFETY BARS FOR CULVERT PIPE OR PIPE ARCH (ON CROSS ROAD)

STANDARD PLAN B-75.60-00

[Diagram of culvert setup with dimensions and notes]
1. All pipes or pipe arches shall be attached as shown in CONNECTOR DETAIL.

2. When a Toe Plate Extension is required, the slab shall be the same gage as the End Section. The dimensions shall be 18\" high, and 6\" less than the overall width. Install centered, and lapped 2\". Fasten with 3/8\" × 3/4\" galvanized bolts on 12\" maximum centers.

3. Cross Drainage Bar and Safety Bars shall be 3\" Schedule 40 galvanized steel pipe. Cross Drainage Bars shall be spaced a minimum 30\" apart.

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

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

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

## Notes

**Metal End Sections for Circular Pipes**

<table>
<thead>
<tr>
<th>Pipe Dia. (Inches)</th>
<th>Nominal Wall Thickness</th>
<th>Overall Dimension</th>
<th>Slope 5:1</th>
<th>Slope 6:1</th>
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<td>12</td>
<td>6</td>
<td>69</td>
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**Metal End Sections for Arched Pipes**

<table>
<thead>
<tr>
<th>Equal Arch (Inches)</th>
<th>Pipe Dia. (Inches)</th>
<th>Nominal Wall Thickness</th>
<th>Overall Dimension</th>
<th>Slope 4:1</th>
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</tr>
<tr>
<td>72</td>
<td>97</td>
<td>0.109</td>
<td>12</td>
<td>18</td>
</tr>
</tbody>
</table>

*Safety Bars are installed on end section when span is greater than 36\".*

## Diagrams

- **Reinforced Edge Section**
- **Safety Bar End Treatment Detail**
- **Cross Drainage Bar Detail**
- **Cross Drainage Structure**
- **Circuit Drainage Structure**
- **Circuit Drainage Structure**
- **Metal End Section with Type 3 Safety Bars**

**Standard Plan B-80.30-09**

**Approved for Publication**

Harold J. Peterfeso 09-09-05
TYPICAL DAMPED JOINT AT EDGE OF RIGHT OF WAY, UNLESS OTHERWISE DIRECTED IN CONTRACT

WIRE MESH

4" DRAIN PIPE

CONCRETE CURB

TYPE MAY VARY

ROADWAY

ISOMETRIC

DRAIN, UNDER SIDEWALK

STANDARD PLAN B-82.20-00

RESIDENTIAL STORM

DRAINAGE SYSTEM

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Harold J. Peterfeso
06-01-06
1. Install sewer saddle with gasket and stainless steel clamps for connection to existing sewers. Install wye or tee sewer fitting with gaskets for new sewer installations.

2. Mark location of sewer stub in accordance with Contracting Agency requirements.
45° BEND

4" OR 6" SEWER PIPE (SEE CONTRACT)

54" x 54" x 54" CONCRETE BLOCK
OR CONTROLLED DENSITY FILL

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

STANDING SIDE SEWER CONNECTION

FOR SANITARY SEWER USE

STANDARD PLAN B-85.30-00

06-01-06

APPROVED FOR PUBLICATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EXPIRES JULY 1, 2007

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Harold J. Peterfeso
PLUG

4"

9"

10"

1"

1/2"

1/8"

1/2" WIDE, 1/8" HIGH
RAISED BORDER

8 3/4"

5/8"

1/2"

1 1/4"

8 3/4"

4 3/4"

4 1/8"

FIBER JOINT PACKING

45° BEND

CAST IRON RING AND COVER

FOR SANITARY SEWER USE

STANDARD PLAN B-85.40-00

8 INCH SEWER CLEAN-OUT

SECTION A

CAST IRON RING AND COVER

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DUCTILE IRON DROP CONNECTION

TYPICAL MANHOLE

CONCRETE ENCASED DROP CONNECTION

MORTAR DAM OR PLUG AS REQUIRED BY ENGINEER

ONE LENGTH OF DUCTILE IRON PIPE CLASS 30 TO 39" INSIDE DIAMETER MUST BE USED IN MORE THAN 48" DIAMETER MAIN.

CIP FOR SANITARY SEWER USE

COMMERCIAL CONCRETE BLOCK - POURED IN PLACE

D.J.P. OF 12" DEEP CLEARANCE 2"
1. Steel tie rods to be evenly coated with asphalt after installation.
2. Restrained joints may be substituted for tie rods.
3. Surface of ground within 36" of hydrant shall be smooth.

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

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

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

**WATER MAIN**

**STREET ELBOW**

**CONCRETE THRUST BLOCKING**

**THRUST BLOCKING SHALL CLEAR PIPING**

**TAPPED CAP OR PLUG**

**GATE VALVE WITH 2" SQUARE OPERATING NUT**

**2" FEMALE × IP × 2 1/2" MALE NST HOSE CONNECTION WITH CAP** *(BLOWOFF OUTLET)*

**VALVE BOX AND LID** ~ CAST IRON

**VALVE MARKER POST**

**PROPERTY LINE**

**METER BOX** *(LOCATE IN FIELD)*

**BLOWOFF OUTLET**

**DRILL 1/8" HOLE**

**15 POUND ASPHALTIC FELT**

**GRAVEL POCKET**

**SOLID CONCRETE BEARING BLOCK ~ 4" × 8" × 16"**

**CONCRETE THRUST BLOCKING**

**BLOWOFF OUTLET**

**ELEVATION**

**THROUGH BLOCKING 4" × 8" × 16" (TOP BLOCK NOT SHOWN)**

**TWO CONCRETE BLOCKS 4" × 8" × 16"**

Coat the pipe threads with asphalt after assembly.

All piping shall be galvanized steel.

Valve and piping to valve shall be 2" unless otherwise noted in the Contract.

Locate blowoff outlet near property corner if possible.
NOTES

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

2. Locate at the high point of the main, tap top of main.
NOTES
1. Contractor to provide blocking adequate to withstand full test pressure.
2. Divide thrust by safe bearing load to determine required area (in square feet) of concrete to distribute load.
3. Areas to be adjusted for other pressure conditions.
4. Provide two 1” minimum diameter rods on valves up through 10” diameter. Valves larger than 10” require special tie rod design.

<table>
<thead>
<tr>
<th>SIZE</th>
<th>TEST PRESSURE (PSI)</th>
<th>THRUST AT FITTINGS IN POUND</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>A TEE AND DEAD END</td>
<td>B TEE AND DEAD END</td>
</tr>
<tr>
<td>4”</td>
<td>4,440</td>
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<tr>
<td>6”</td>
<td>7,070</td>
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<tr>
<td>5”</td>
<td>17,770</td>
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</tbody>
</table>

SOIL TYPE | SAFE BEARING LOAD (PSF)
---|-------------------
MUCK, PEAT, ETC. | 0
SOFT CLAY | 1,000
SAND | 2,000
SAND AND GRAVEL | 3,000
GRAVEL CEMENTED WITH CLAY | 4,000
HARD SHALE | 10,000

CONCRETE THRUST BLOCK

STANDARD PLAN B-90.40-00

Sheet 1 of 1 Sheet

Approved for Publication

Washington State Department of Transportation

EXPIRES JULY 1, 2007
TWO TIE RODS
WITH TURNBUCKLES

THREAD 6"

BLOCKING FOR 11.25° OR 22.5° VERTICAL BENDS

FOUR TIE RODS
WITH TURNBUCKLES

THREAD 6"

BLOCKING FOR 45° VERTICAL BENDS

<table>
<thead>
<tr>
<th>PIPE DIAM (IN)</th>
<th>TEST PRESSURE (PSI)</th>
<th>BEND ANGLE (°)</th>
<th>CONCRETE VOLUME (FT³)</th>
<th>CURB SIZE (FT)</th>
<th>TIE ROD DIAM (IN)</th>
<th>TIE ROD EMBEDMENT (IN)</th>
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<td>5/8&quot;</td>
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<td>22.5°</td>
<td>12</td>
<td>2.3</td>
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<td>7.1</td>
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<td>17&quot;</td>
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<tr>
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1. The beam guardrail type, post type, beam guardrail transition section type, connection type, and bridge traffic barrier shape may vary from that shown on this plan.

2. The Catch Basin or Grate Inlet shall be centered between the Beam Guardrail Posts.

3. With Beam Guardrail Transition Section Types 2, 4, and 5, use Extruded Curb Types 1, 2, 4, 4a, 5, or 5a.

4. With Beam Guardrail Transition Section Types 1, 1A, 1B, 10, 11, and 12, use Extruded Curb Type 2 (Extruded Asphalt Concrete Curb).

5. See Contract Plans for length of Curb.
1. When required by the Contract, a Snow Load Rail Washer shall be placed on the inside of the post (in lieu of the 1-3/4" Post Bolt Washer) and a Snow Load Rail Washer shall be placed on the face side of the Beam Guardrail Type 1 and 2. Snow Load Rail Washers shall not be installed on interim.

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

3. Beam Guardrail post spacing for Types 1 through 4 shall be 9’ 3” on centers.

4. Timber block shall be nailed to the post with a 1 3/4” galvanized nail to prevent stock rotation.

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

6. When “Beam Guardrail Type 1 – 7’ 9” Long Post” is specified in the Contract, the post length shall be stamped with numbers, 1 7/8” high and 1 3/4” deep, at the location where the letter “P” is shown in the ASSEMBLY DETAIL. After installing the Long Post, it shall be the Contractor's responsibility to ensure that the stamped numbers are still legible and 1 3/4” deep.

7. Existing posts shall not be relocated. Replace posts as necessary to achieve required guardrail height.
NOTES

1. Wood posts for all guardrail placement planes shall be 5 x 5 except where noted otherwise.

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

3. WB x 9 stainless posts and timber blocks are alternates for 5 x 5 timber posts and blocks. WB x 15 steel posts and timber blocks are alternates for 10 x 10 timber posts and blocks.

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

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

6. Soil plates may be welded to foundation tube. If so, holes in soil plates and foundation tube may be covered.

BEAM GUARDRAIL POSTS AND BLOCKS

STANDARD PLAN C-1b

PARTIAL ASSEMBLY DETAIL
**Post Length Table**

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 ft</td>
<td>4 ft</td>
</tr>
<tr>
<td>6 ft</td>
<td>12 ft</td>
</tr>
</tbody>
</table>

**Wood Post**

**W-Beam**

**Steel Post**

**Three Beam**

**W-Beam Wood Block for Wood Posts**

**Three Beam Wood Block for Steel Post**

**W-Beam Wood Block for Steel Post**

**Controlled Releasing Terminal (CRT) Post**

**Foundation Tube**

**Three Beam Wood Breakaway Post**

**Soil Plate**
1. For post details see Standard Plan, "Beam Guardrail Posts and Blocks.

NOTES

1. See Detail A

BEAM GUARDRAIL

DETAIL A

DETAIL B

G-2 Post (See Note 1)

5/16” Dia x 1 1/2” hex head bolt with hex nut and 1 3/4” square x .135” washer

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

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See Note 1

INTERMEDIATE GUARDRAIL
POST CONNECTION DETAILS
(Type A shown):

THRIE BEAM GUARDRAIL REDUCER SECTION
TYPE A
(Left section shown, right section reversed):

- Post bolt slots: \( \frac{3}{8}'' \times 2\frac{1}{2}'' \) (TYP)
- Splice bolt slots: \( \frac{3}{8}'' \times 1\frac{1}{4}'' \) (TYP)

THRIE BEAM GUARDRAIL REDUCER SECTION
TYPE B
(Left section shown, right section reversed):

- Post bolt slots: \( \frac{3}{8}'' \times 2\frac{1}{2}'' \) (TYP)
- Splice bolt slots: \( \frac{3}{8}'' \times 1\frac{1}{4}'' \) (TYP)

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

ADDED 10 GAGE STEEL DESIGNATION; REV. NOTE 1

NOTES
1. For wood posts, saw top of post and block to 1'' above thrie beam guardrail reducer section. For steel posts, drive post down to 1'' maximum above the thrie beam guardrail reducer section.
1. Type 4 anchor required. For details, see Standard Plan C-6c.

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

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

4. The slope from the edge of the shoulder into the face of the guardrail should not exceed 10:1 when the face of the guardrail is less than 12'-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.
For terminal type and details, see Contract and applicable Standard Plan(s).

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

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

### Flare Rate Table

<table>
<thead>
<tr>
<th>Posted Speed (MPH)</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>15:1</td>
</tr>
<tr>
<td>65</td>
<td>14:1</td>
</tr>
<tr>
<td>55 or less</td>
<td>12:1</td>
</tr>
<tr>
<td>45 or less</td>
<td>10:1</td>
</tr>
<tr>
<td>35 or less</td>
<td>9:1</td>
</tr>
</tbody>
</table>

### Notes

1. 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 10H:1V when the guardrail is within 12' - 0" from the edge of the shoulder.

3. See Contract for Beam Guardrail Transition Section type and Connection to Bridge Traffic Barrier or Concrete Barrier.
**BEAM GUARDRAIL**

**ATTACH RAIL & BLOCK TO POST WITH TWO 5/8" × 14" LAG BOLTS**

**PAY LIMIT (SEE NOTE 1)**

**ONE-WAY TRAFFIC**

**ATTACH STANDARD BLOCK TO RAIL EQUALLY SPACED @ 6' - 3" MAX. (TYP.)**

**PAY LIMIT (SEE NOTE 2)**

**ATTACH RAIL & BLOCK TO POST WITH TWO 5/8" × 14" LAG BOLTS (TYP.)**

**PAY LIMIT (SEE NOTE 3)**

**REDUCER SECTION TYPE B**

**THREE BEAM GUARDRAIL REDUCER SECTION TYPE B**

**PLAN VIEW**

**CASE 7**

**NOTE:**

1. Varying flare rates and structure widths may require a length of Beam Guardrail Type 1 or 2 between the Beam Guardrail Type 3 or 4 and the Transition on one side, and the Beam Guardrail Type 10 on the other. For Beam Guardrail Type 2 or 3, terminate the rub rail (channel rail) at the last 6'-6" beam of the Beam Guardrail Transition Section Type 16, and by tapering it behind the second 6'-6" post on the Beam Guardrail Type 10 side, or as approved by the Engineer.

2. Use the minimum number of nested 12' - 6" thrie beam sections needed to span the structure. This run may extend past the end of the structure, and an excess of 6' - 3" minimum is acceptable. If the last 12' - 6" section extends more than 6' - 3" but less than 12' - 6", use a nested 6' - 3" thrie beam section in its place.

3. The Beam Guardrail Transition Section Type 16 on this end shall terminate at a 10×10 post. Place a nested 6' - 3" beam with 10×10 posts at 3' - 1 1/2" equally spaced between the end of the transition and the structure.

4. If full post depth cannot be achieved due to the structure foundation, post length shall be adjusted to the top of foundation. The Beam Guardrail Type 11 post height shall be 2' - 9".

5. Varying flare rates and structure widths may require a length of Beam Guardrail Type 1 or 2 between the Beam Guardrail Type 3 or 4 and the Transition on one side, and the Beam Guardrail Type 10 on the other. For Beam Guardrail Type 2 or 3, terminate the rub rail (channel rail) at the last 6'-6" beam of the Beam Guardrail Transition Section Type 16, and by tapering it behind the second 6'-6" post on the Beam Guardrail Type 10 side, or as approved by the Engineer.

**FLARE RATE TABLE**

<table>
<thead>
<tr>
<th>POINTED SPEED (MPH)</th>
<th>RATE</th>
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<tbody>
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<td>10:1</td>
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<tr>
<td>20</td>
<td>11:1</td>
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<td>28:1</td>
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<tr>
<td>200</td>
<td>29:1</td>
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</table>

**NOTE:**

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NOTE: CASE 9C: Three 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 9A

EDGE OF TRAVELED WAY

CASE 9B

DIRECTION OF TRAFFIC

CASE 9C

THREE BEAM GUARDRAIL REDUCER SECTION Type B

THREE BEAM GUARDRAIL

REDUCER SECTION Type B

LONGITUDINAL VIEW

NOTE: BEAM GUARDRAIL BULL NOSE TERMINAL (DESIGN 2)

THREE BEAM GUARDRAIL

REMOTE TERMINAL (DESIGN 2)

BEAM GUARDRAIL

TRANSITION SECTION Type 1

BEAM GUARDRAIL BULL NOSE TERMINAL (DESIGN 2)

BEAM GUARDRAIL BULL NOSE TERMINAL (DESIGN 1)

BEAM GUARDRAIL TRANSITION SECTION Type 1

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NOTES:
1. SRT Terminal shown, for terminal type and details, see Contract or applicable Standard Plan(s).
2. Post spacing is 9'-0" except where noted.
3. Type 4 anchor required. See applicable Standard Plan(s).
4. The slope from the edge of the shoulder into the face of the guardrail should not exceed 10H:1V when the guardrail is within 12'-0" from the edge of the shoulder.
NOTES

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

2. Beam Guardrail Anchor Type 4 (W-Beam) or Type 4 (Thrie Beam) required.

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

4. If the distance from end of Beam Guardrail Type 11 to the structure exceeds 6'-3" using 12'-6" thrie beam sections, add a 6'-3" nested section of thrie beam with 10x10 posts, spaced at 3'-1 1/2" maximum, and begin transition.

5. Guardrail post spacing for Beam Guardrail Type 11 past the end of the structure shall be spaced at 6'-3" maximum with 6x8 post and standard block.

6. Attach the standard wood block in the rail using two 5/8" x 4" lag bolts.
GUARDRAIL PLACEMENT
WEAK POST INTERSECTION
DESIGN (8'-6" MAX RADIUS)

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 5/16" x 9" long bolt, nut and 1 1/2" washer on back of post.
4. For terminal type and details, see Contract and applicable Standard Plans.
5. Radius dimensions shall be etched into plate replacing the letters "HH", shown on the Identification Plate Detail. Digits shall be 1 1/2" MIN height and 3/4" MAX width. The plate shall be galvanized after etching.
6. The guardrail radius Identification Plate shall be mounted on the back side of the Rail Element using the lowest splice bolt at the P.C. of the guardrail radius.
7. First letter of case designation placement indicates end treatment on side road. Second letter indicates end treatment on main road. For instance, a Type 5 Anchor on the side road and a bridge connection on the main road would be Case 12 AC.
8. For the 8'-6" radius, five CRT posts are required including the CRT post at point B.
9. For CRT post details, see Standard Plan "Beam Guardrail Posts and Blocks".

IDENTIFICATION PLATE
MOUNTING DETAIL
(see Note 6)

SECTION A-A

CASE 12 A
(see Note 8)

CASE 12 B
(see Note 7)

CASE 12 C
(see Note 7)

CASE 12 D
(see Note 7)

SHEET PLATE

3/4" Hole

1/4" Steel plate

5/16" Bolt

1 1/2" Washer

NOTES
- For CRT post details, see Standard Plan "Beam Guardrail Posts and Blocks".
1. See Contract Plans 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. Fewer CRT posts are required for smaller radii; include CRT Post at Point B. Attach guardrail to post with a 5/16" x 9" long bolt, a 3/8" I.D. x 7 1/2" snug fitting insert, and a 1 1/2" washer with nut 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 “HH”, shown on the GUARDRAIL RADIUS IDENTIFICATION PLATE DETAIL. Digits shall be 1 1/2" minimum height and 3/4" maximum width. 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 nearest the PC of the guardrail radius (See View A).

7. The first letter of the Case Designation indicates the end treatment on the side road. The second letter indicates the end treatment on the main road. For example, a Type 5 Anchor on the side road with a bridge connection on the main road would be Case 13 AC, the combination shown.

8. For CRT post details, see Standard Plan C-1b.
NOTES
1. For Service Level 1, Weak Post Bridge Rail System, see Contract.
2. SRT Terminal shown. For Terminal type and details, see Contract and applicable Standard Plan(s).
3. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1.
4. See Standard Plan "Beam Guardrail Posts and Blocks".

NOTES

CASE 14
NOTES

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

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


Donald K. Nelson
3/28/97

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**FLARE RATE TABLE**

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<th>Rate</th>
<th>Posted Speed (MPH)</th>
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<td>15:1</td>
<td>70</td>
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<tr>
<td>10:1</td>
<td>45</td>
</tr>
<tr>
<td>9:1</td>
<td>40 or less</td>
</tr>
</tbody>
</table>

1. Type 4 anchor required. For details, see applicable Standard Plan(s).
2. For terminal type and details, see contract and applicable Standard Plan(s).
3. Post spacing is 6'-3" except where noted.
4. For guardrail to bridge rail connection see applicable Standard Plan(s) 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.

**NOTES**

1. Type 4 anchor required. For details, see applicable Standard Plan(s).
2. For terminal type and details, see contract and applicable Standard Plan(s).
3. Post spacing is 6'-3" except where noted.
4. For guardrail to bridge rail connection see applicable Standard Plan(s) 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.

**GUARDRAIL PLACEMENT**

**STANDARD PLAN C-2j**

**APPROVED FOR PUBLICATION**

**EXPIRES MAY 3, 2000**
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.

PLAN

ELEVATION

CASE 21

WOOD BLOCKS

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.
NOTES
1. See Contract for transition and connection type.
2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1.
3. Guardrail installation shall be Beam Guardrail Type 1 with standard post and block.
4. First letter of case designation indicates end treatment on side road. Second letter indicates end treatment on main road. For instance a terminal on the side road and a bridge connection on the main road would be Case 22 BC.
5. For terminal type and details, see Contract and applicable Standard Plan(s).
6. Radius dimensions shall be etched into plate replacing the letters "HH" shown on the Identification Plate Detail. Digits shall be 1 1/2" MIN height and 3/4" 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.
NOTE
1. Install a Type 2 Extruded Asphalt Concrete Curb (see Standard Plan F-2b) at base of Guardrail.

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**BEAM GUARDRAIL TRANSITION SECTIONS**

**STANDARD PLAN C-3a**

**TYPE 2**
- 6' - 0" POST WITH STANDARD BLOCK (TYP.)
- TOTAL LENGTH = 6' - 3"

**TYPE 4**
- 6' - 0" LONG, 6×8 POST WITH STANDARD BLOCK (TYP.)

**TYPE 5**
- 6' - 0" LONG, 6×8 POST WITH STANDARD BLOCK (TYP.)

**TYPE 6**
- 6' - 0" LONG, 6×8 POST WITH STANDARD BLOCK (TYP.)

---

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NOTES

1. If the distance from the end of the bridge to the end of the thrie beam bridge rail section exceeds 6' - 3" using 12' - 6" thrie beam sections, add a 6' - 0" section of thrie beam bridge rail to reduce the length to less than 6' - 3".

2. When thrie beam is installed at the face of the bridge curb, install a Type 2 Extruded Asphalt Concrete Curb (see Standard Plan F-2b) at face of Guardrail. Match the height of existing bridge curb with a 20:1 transition.

3. When thrie beam is installed at the face of rigid bridge rail, an HMA ramp is required from the roadway surface to the top of the bridge curb or sidewalk. The slope of the ramp shall be 20:1 or flatter.

THREE BEAM INSTALLED AT FACE OF BRIDGE CURB

TYPE 10
APPROACH END

THREE BEAM INSTALLED AT FACE OF BRIDGE CURB

TYPE 11
TRAILING END

THREE BEAM INSTALLED AT FACE OF BRIDGE CURB

TYPE 12
TRAILING END

NO. 6 POST WITH STANDARD BLOCK (TYP.)

6' - 6" LONG, 10×10 POST WITH STANDARD BLOCK (TYP.)

6' - 6" LONG, 10×10 POST WITH STANDARD BLOCK (TYP.)

6' - 6" LONG, 10×10 POST WITH STANDARD BLOCK (TYP.)

6' - 6" LONG, 10×10 POST WITH STANDARD BLOCK (TYP.)

6' - 6" LONG, 10×10 POST WITH STANDARD BLOCK (TYP.)

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6' - 6" LONG, 10×10 POST WITH STANDARD BLOCK (TYP.)

6' - 6" LONG, 10×10 POST WITH STANDARD BLOCK (TYP.)

6' - 6" LONG, 10×10 POST WITH STANDARD BLOCK (TYP.)

6' - 6" LONG, 10×10 POST WITH STANDARD BLOCK (TYP.)

6' - 6" LONG, 10×10 POST WITH STANDARD BLOCK (TYP.)

6' - 6" LONG, 10×10 POST WITH STANDARD BLOCK (TYP.)

6' - 6" LONG, 10×10 POST WITH STANDARD BLOCK (TYP.)
TYPE 13

APPROACH END
THREE BEAM INSTALLED AT FACE OF BRIDGE RAIL

THREE BEAM GUARDRAIL TRANSITION SECTION TYPE 13 ~ PAY LIMIT

BEAM GUARDRAIL

PAY LIMIT

THREE BEAM GUARDRAIL TRANSITION 12'-0" MOUNTED THREE BEAM (10 GAUGE)
FOUR SPACES @ 3'-1 1/2" MAX.
THREE SPACES @ 1'-1 1/2" MAX.

SHEET 2 OF 2 SHEETS

TYPE 14

TRAILING END
THREE BEAM INSTALLED AT FACE OF BRIDGE RAIL

THREE BEAM GUARDRAIL TRANSITION SECTION TYPE 14 ~ PAY LIMIT

BEAM GUARDRAIL

PAY LIMIT

THREE BEAM GUARDRAIL TRANSITION 12'-0" MOUNTED THREE BEAM (10 GAUGE)
FOUR SPACES @ 3'-1 1/2" MAX.

SHEET 2 OF 2 SHEETS

TYPE 15

TRAILING END
THREE BEAM INSTALLED AT FACE OF BRIDGE RAIL

THREE BEAM GUARDRAIL TRANSITION SECTION TYPE 15 ~ PAY LIMIT

BEAM GUARDRAIL

PAY LIMIT

THREE BEAM GUARDRAIL TRANSITION 12'-0" MOUNTED THREE BEAM (10 GAUGE)
FOUR SPACES @ 3'-1 1/2" MAX.

SHEET 2 OF 2 SHEETS

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1. See Contract for the number of thrie beam sections for Beam Guardrail Type 11.
2. If the distance from the end of the Beam Guardrail Type 11 to the column/structure exceeds 6'-3" using 12'-6" thrie beam sections, add a 6'-3" nested section of thrie beam to reduce the distance to less than 6'-3".
3. Install a Type 2 Extruded Asphalt Concrete Curb (see Standard Plan F-2b) at face of Guardrail.
4. Attach the standard block to the rail using two 5/8" × 4" lag bolts.
1. Unless otherwise indicated in the contract, the SRT - 350 (12.5, 8 Post) as manufactured by Trinity Industries, Inc., or a FLEAT 350 as manufactured by Road Systems Inc., shall be installed per manufacturer's recommendations. If specified in the Contract, the FLEAT TL2 as manufactured by Road Systems, Inc. shall be installed per manufacturer's recommendations.

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

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

4. Offset distances:
   - FLEAT 350: 4' - 0" (RELATIVE TO GRADE)
   - FLEAT TL2: 1' - 8" minimum (RELATIVE TO GRADE)
1. An ET-PLUS (TL2) as manufactured by Trinity Industries, Inc. or an SKT-350 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-350 is 50’. Length for ET-PLUS (TL2) and SKT-TL2 is 25’.

6. Length for ET-PLUS (TL3) and SKT-350 is 50’. Length for ET-PLUS (TL2) and SKT-TL2 is 25’.
GUARDRAIL POST LAYOUT - DESIGN 1

GUARDRAIL POST LAYOUT - DESIGN 2

NOTE: CABLE BEARING PLATE NOT SHOWN

BEAM GUARDRAIL BULL NOSE TERMINAL

STANDARD PLAN C-4f

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SLOTTED THREE BEAM RAIL ELEMENT #1
SEE STD PLAN C-1a FOR RAIL ELEMENT DETAILS
(RAIL DIMENSIONS SHOWN ARE BEFORE BENDING TO RADIUS SHOWN IN PLAN)
SPLICE BOLT SLOT
SLOTTED THREE BEAM RAIL ELEMENT #2
SEE STD PLAN C-1a FOR RAIL ELEMENT DETAILS
(RAIL DIMENSIONS SHOWN ARE BEFORE BENDING TO RADIUS SHOWN IN PLAN)
SPLICE BOLT SLOT
SLOTTED THREE BEAM RAIL ELEMENT #3
SEE STD PLAN C-1a FOR RAIL ELEMENT DETAILS
SPLICE BOLT SLOT
POST BOLT SLOT
STANDARD PLAN C-4f
SLOT A  DETAIL
SLOT B  DETAIL
SLOT C  DETAIL
SLOT D  DETAIL
BEAM GUARDRAIL
BULL NOSE TERMINAL
NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.
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 5/8" x 1 1/2" machine bolts with hex nut and washer. Place washer on face side of rail.
5. Outside nut shall be torqued against inside nut a minimum of 100 ft-lbs.
6. Toenail bearing plate with 10d nail at corners to prevent turning.
7. Anchor pay limit does not apply when anchor is included in a Beam Guardrail Terminal.

NOTES
NOTES:
1. Roll section and W8 x 18 steel post shall be fabricated to receive 5/8" hex head bolts as shown.
2. All bolts shall be high strength 5/8" hex head bolts with anchor nail washers.
NOTES
1. For details, see Standard Plan C-6.
2. For end section details see Standard Plan C-7 or C-7a.
3. For details, see Standard Plan C-1b.
4. Outside nut shall be torqued against inside nut a minimum of
300 ft-lbs.
5. Post and block shall match beam guardrail posts.
1. Attach V-beam to steel pipe with 5/8" x 1 1/2" button head bolt with no washer. No connection to the post is required.

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

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

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

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

**NOTES**

1. Attach W-beam to steel pipe with 5/8" x 1 1/4" 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**

- 1/4" x 4" Stud threaded full length
- 1/2" x 2" Button head bolt or 5/8" x 1 1/2" hex head bolt and hex nut with anchor rail washers under bolt head and nut (see Note 3).
- 1/4" x 2" Button head bolt and 1/2" x 1 1/2" hex head bolt and hex nut with anchor rail washers under bolt head and nut (see Note 3).

**END SECTION DESIGN G**

- 10\" x 13\" Standard steel pipe
- 1/4" x 4" x 12\" Steel plate
- 5/8" x 2" Button head bolt or 5/8" x 1 1/2" hex head bolt and hex nut with anchor rail washers under bolt head and nut (see Note 3).

**BEAM GUARDRAIL ANCHOR TYPE 5**

- 3/4" x 9'-0" Cable with one swaged end
- 3/8" x 4" x 12" Steel plate
- Standard 2" ID pipe sleeve (2 3/8" OD)
- Two 1" Nuts and washer (see Note 5)
- 3/4" Cable clips (6 required) torque nuts to 50 ft/lbs.
- Two 1" Nuts and washer (see Note 5)
- Bearing plate (see Note 3)
- Standard 2" ID pipe sleeve (2 3/8" OD)
- Two 1" Nuts and washer (see Note 5)
- Standard steel pipe 1/4"
NOTES

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

2. The rail 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.

NOTES

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

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

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

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

2. Attach guardrail to bridge rail or concrete barrier with 7/8” diameter high strength bolts (Standard Specification 6-06 6-06.5(4)) with thin slat ferrule inserts or resin bonded anchors. See the Contract Plans.

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

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

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1. Attach guardrail to bridge rail or concrete barrier with 7/8" diameter high strength bolts (Standard Specification 6-03634) with thin slab ferrule inserts or thin bonded anchors. See the Contract Plans.

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

3. Attachment of guardrail or concrete barrier to bridge rail or to concrete barrier with 7/8" diameter high strength bolts (Standard Specification 6-03634) with thin slab ferrule inserts or thin bonded anchors. See the Contract Plans.
1. Wire rope loops shall be 3' - 6" long, except for the top loop of the Barrier Terminal, which shall be 2' - 0" long.

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

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

4. The vertical spacing of the Wire Rope Loops in a Barrier Terminal is determined by the end of the Barrier Segment to which it is being connected. See BARRIER CONNECTION DETAIL (Sheet 3).
NOTES:
1. This plan shall be used for 47° and 50° Light Standards with 16' max. length double mast arms.
3. See the Contract Plans for anchor & placement.
4. Concrete shall be Class 400C.
NOTES

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

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

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

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

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

3. After removing the Type 3 Anchors, clean the pin holes and fill them with sealant according to Standard Specification 9-04.2.
The vertical locations of the Wire Rope Loops at one end compose a set that shall not vary; however, which set is applied to an end is determined by the end to which it is being connected. A set with loops 1' - 5" apart connects to a set with loops 1' - 8" apart. See Standard Plan C-8, BARRIER CONNECTION DETAIL.

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BOX CULVERT GUARDRAIL STEEL POST TYPE 2
(6" TO 9" GROUND COVER)

PORT BASE PLATE DETAIL

PORT BEARING PLATE DETAIL

NOTE:

1. Length of H48 x 36 and H48 x 9 shall be determined by measurement from top of ground to top of guard rail. This distance shall be verified by the Contractor.

2. Attach Guardrail Post to Box Culvert with 3/4" diameter high strength bolt with
   relaxation anchors.

3. Drill 1 1/4" diameter hole in concrete slab for 7/8" diameter high strength bolt.
   Length of bolt is determined by top slab of Box Culvert thickness which shall be
   verified by the Contractor.

4. For details of post attachment to Double Box Culvert, see Standard Plan C-28.
NOTES

1. PERMANENT INSTALLATION requirement: embed barrier 3" minimum, install 1/4" Pre-molded Joint Filler between segments, fill the Connection Blockout with grout. Center the Rebar Grid in the blockout before adding grout.

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

3. See Standard Plan C-13b for REBAR GRID DETAIL and BARRIER CONNECTION DETAIL.

4. Vertical R behaving barrier is used only in the configurations shown in Standard Plans C-13a and C-13b, and when placed against a retaining wall.

5. When High Performance Concrete Barrier is specified in the Contract, use the dimensions given in the HP row in the DIMENSION TABLE, with a minimum height above roadway of 3' - 6", and a minimum embedment of 6'.
1. Reinforcing steel dimensions and clearances are shown for exterior form construction. When slip form construction is used, increase reinforcing steel clearances to the outside surfaces of the barrier to 2.5" and adjust the rib dimensions as required.

2. When connecting between cast-in-place and prestressed single drop barriers, provide a Blockout, Riser, and tie, as shown in Standard Plan C-12.

3. The actual dimensions will vary as the concrete changes and the barrier transitions in height and width. The dimensions may be interpreted for intermediate barrier heights.

4. For Barriers with a 2'-0" radius, see Sheet 2. For High Performance Barrier with a 3'-0" radius, see Sheet 3.
This plan is for transitions to Pre-cast Concrete Barrier Type 2 only. See contract for transitions to other barrier shapes and bridge rails.

1. Field bend as required in transition.
2. All bends are 2" radius.

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

2. See Standard Plan C-14a, Sheet 1, for EXPANSION JOINT and DUMMY JOINT details.

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

REINFORCING STEEL BEND BLANK DIAGRAM

A1436, Section 13.85.115 for Minimum Diameter

DIMENSION TABLE

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<th>DIMENSION</th>
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<th>CENTER</th>
<th>RIGHT</th>
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<td>0.5</td>
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NOTE: A - 5'-0" B - 2'-0" C - 1'-0" D - 5'-0" E - 5'-0" F - 5'-0"

HORIZONTAL BARRIER (FENG) 10
1. The Vertical Back barrier is used only in the configurations shown in Standard Plan C-14a and C-14b, and when placed against a retaining wall.

2. See Standard Plan C-14a, Sheet 1, for Expansion Joint and Dummy Joint details. Identify rebar as shown in Expansion Joint Modification.

3. Reinforcing steel dimensions and clearances shown for sectional type construction. When full-bore construction is used, increase reinforcing steel clearances to the outside surface of the barrier to 2.12" and adjust steel dimensions as required.

4. When High Performance Concrete Barrier is specified in the Contract, use the dimensions given in the HP row in the DIMENSION TABLE, with a minimum height above roadway of 7'-10" and a minimum embedment of 3'.
1. For W-Beam Type 31 shoulder application, see Standard Plan C-26-40.
1. For component details, see Standard Plan C-32.46.
2. For terminal type and details, see Contract Plans and applicable drawings.
3. The slope from the edge of the shoulder to the face of the guardrail cannot exceed 10H : 1V when the face of the guardrail is less than 12'-6" from the edge of the shoulder.
4. For one-way traffic and when a crashworthy terminal is not required, use the Beam Guardrail Anchor Type 10, see Standard Plan C-32.30.
5. Where a crashworthy terminal is required use a Beam Guardrail Type 31 Non-Flared Terminal, see Standard Plan C-32.48.
**NOTES:**

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

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

3. See Contract for Beam Guardrail Transition Section type and Connection to Bridge Traffic Barrier or Concrete Barrier. See Standard Plan C-8 for details.

---

**FLARE RATE TABLE**

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<td>10:1</td>
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<td>20</td>
<td>9:1</td>
</tr>
<tr>
<td>10 or Less</td>
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</table>
NOTES

1. See Contract for transition and connection type.

2. For additional installation requirements for Non-Flared Terminal

3. GUARDRAIL INSTALLATION SHALL BE SEEN GUARDRAIL TYPE 31
   WITH STANDARD POST AND BUSHING.

4. The first letter of case designation indicates the end treatment
   at the side road. The second letter indicates the end treatment
   at the main road. For instance, a terminal on a side road and a
   bridge connection on the main road would be Case S236-C1.

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

6. The guardrail identification plate shall be mounted at the
   lower notice bolt on the back side of the rail element at the
   PC of the guardrail radius.
NOTES

1. Posts installed on shoulder slopes steeper than 10H : 1V shall be 3' long.

2. The flare rate of the guardrail may be increased after crossing the ditch bottom to shorten the length of the terminal.

3. Determine the height of the W-Beam of the Anchor (68) by that calculating the perpendicular offset distance (25) from the edge of shoulder (90) to the Anchor (on station). Multiply that distance by 0.1, then subtract the product from the elevation of the same point (68) on the edge of shoulder used to obtain the offset distance (at the same station). Add Beam Guardrail design height (11") to that remainder for a man that equals the elevation of the top of the W-Beam at the Anchor.

Refer to SECTION "C":

Elevation g = (Elevation g - (0.1 x 85")) + 11"

FLARE RATE TABLE

<table>
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<tr>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td>8</td>
<td>36</td>
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</tbody>
</table>

BEAM GUARDRAIL TYPE 31
BURIED TERMINAL TYPE 2
STANDARD PLAN C-23.18-01

Sheet 1 of 1 Sheet

APPROVED FOR PUBLICATION

Peora Rabidovich 9/13/10
Washington State Department of Transportation
NOTES

1. These terminal are FHWA accepted at Test Level Three (TL-3) and may be used for all posted speeds.

2. An ET-51 (Steel) as manufactured by Trinity Industries, Inc. or an SKT-6P-90G as manufactured by Road Systems Inc. shall be installed according to manufacturer's recommendations.

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

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

5. Terminal shall be installed at a widening, ensuring that the end piece is entirely off the shoulder. While these terminals do not require an offset at the end, a 36" is recommended. A maximum slope of 1:6:1, or flatter over the length of the terminal is allowed for either the ET-31 (Base) or the SKT-6P-90G, with a maximum offset of 36" (914mm) over 60' (18m).

6. For Terminal details, see WADOT approved manufacturer's drawings.
NOTES

1. For use on the end of guardrail run when a discontinuous terminal is not required.

2. For additional details not shown, see Standard Plan C-9a.

3. For End Section details, see Standard Plan C-7 and C7a.

4. For Anchor Post Assembly details, see Standard Plan C-1a. Use detail on this plan for Wood Breakaway Post. (No Block on this post)

5. Fasten the Anchor Cadle using two 7' nuts and washers, at both ends of cable. Outside nut shall be torqued against cable nut a minimum of 100 ft-lbs.

6. Posts shall match those of connecting run. (Timber or Steel)
This guardrail transition is for connection to a vertical concrete shape or single slope barrier and cannot be connected directly to a concrete utility shape.

Do not bolt nested W-Beam or rubrail W-Beam to posts and blocks on posts 1, 2, 3 and 6. Bolt tapered blocks directly to posts.

The rubrail W-Beam can be shop bent to facilitate installation.

Posts 1, 2, 4 and 6 require an additional hole to attach tapered blocks and/or rubrail.

Posts 1 and 2 are 10×10 timber or W8×13 steel posts ~ 7'-6" long. Posts 3 through 9 are 6×8 timber or W6×9 steel posts ~ 6'-0" long.

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NOTES:


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

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

1. Refer to Standard Plan 0-1 and 0-1b for component details for Beam Guardrail Type 1 not shown on this plan.

2. Refer to Standard Plan 0-304-40 for component details for Beam Guardrail Type 31 not shown on this plan.

3. Where post cast-in is constrained, and when the existing shoulder will not be widened and is wider than 4 feet, the existing shoulder may be reduced up to 4" to accommodate the 12" blockout of the Beam Guardrail Type 31. See PLAN VIEW - ALIGNMENT TAPER.

4. All posts for any standard barrier run shall be of the same type, timber or steel.
NOTE:
1. Refer to Standard Plan C-1 and C-1a, for additional details not shown on this plan.
2. All posts for any standard barrier run shall be of the same type: Timber or Steel.
3. See Contract for type of curb required.
5. Use a single or combination of blocks to achieve the actual 12" offset. See Standard Specification 9-16.3 (2).
6. On steel posts, attach blockouts using bolt holes on approaching traffic side of post web.

Refer to Standard Plan C-1 and C-1b, for additional details not shown on this plan.

All posts for any standard barrier run shall be of the same type: Timber or Steel.

See Contract for type of curb required.

See Standard Plans for dimensions.

Use a single or combination of blocks to achieve the actual 12" offset. See Standard Specification 9-16.3 (2).

On steel posts, attach blockouts using bolt holes on approaching traffic side of post web.
1. Approved Inertial Barrier Systems (sand barrel, etc.) are listed in the Qualified Products List and shall be installed in accordance with the manufacturer's recommendations. When products not listed on the Qualified Products List are considered, a Request of Approval of Materials (ROAM) form is required.

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

**Example Configuration**

**Installation Details**

**Attenuator Configurations** (numbers inside barriers indicate look)
The Contract specifies actual foundation requirements D1 or D2.

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

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

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

5. The Contract specifies actual wall designations.

6. The Contract specifies actual foundation requirements D1 or D2.
FOOTING WIDTH TRANSITION DETAIL
FOR LOCATIONS WITHOUT FOOTING STEP

FOOTING

W/2

BAR 'C' (TYP.)

2' - 0"

C CORNER PANEL

3/4" CHAMFER (TYP.)

2" (TYP.)

ANGLE POINT

REINFORCED PER
LIMITED WALL HEIGHT
REINFORCEMENT TABLE

1/2" NOISE SEALER (TYP.)

CAST-IN-PLACE CONCRETE WALL ON SPREAD FOOTING

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Harold J. Peterfeso
11-10-05

DRAWN BY: ADAM COCHRAN
### Walls

| WALL Ht | Type IA | | Type IB | | Type IC | | Type ID | | Type IE | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0-6'    | 0-6'    | 0-6'    | 0-6'    | 0-6'    | 0-6'    | 0-6'    | 0-6'    | 0-6'    | 0-6'    |
| 6'-12'  | 6'-12'  | 6'-12'  | 6'-12'  | 6'-12'  | 6'-12'  | 6'-12'  | 6'-12'  | 6'-12'  | 6'-12'  |
| 12'-18' | 12'-18' | 12'-18' | 12'-18' | 12'-18' | 12'-18' | 12'-18' | 12'-18' | 12'-18' | 12'-18' |
| 18'-24' | 18'-24' | 18'-24' | 18'-24' | 18'-24' | 18'-24' | 18'-24' | 18'-24' | 18'-24' | 18'-24' |

### Notes
1. Walls to be designated Noise Barrier Wall Type 3A, 3B, 3C, or 3D. The Contract specifies actual wall designations.
2. For intermediate wall heights not listed, use the next higher H.
3. Fences shall have at least 3 feet of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet maximum.

### Wind Exposures and Velocities

<table>
<thead>
<tr>
<th>Wind Exposure</th>
<th>Wind Velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10</td>
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<tr>
<td>B</td>
<td>15</td>
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<tr>
<td>C</td>
<td>20</td>
</tr>
<tr>
<td>D</td>
<td>25</td>
</tr>
</tbody>
</table>

### Noise Barrier Wall

**Type 3**

**Standard Plan D-206-01**

Effective: August 2, 2010 to July 31, 2011

**Designated by:**

- 01-06-00

Washington State Department of Transportation
NOTES:
1. Wall to be designated Noise Barrier Wall Type 5A, 5B, 5C or 5D. The Contract specifies actual wall designation.
2. For intermediate wall heights, use the next higher H.
3. Panels shall have at least 5 feet min. 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.

CAST-IN-PLACE W/ TRAFFIC BARRIER ON TRENCH FOOTING
1. BAR “B” ~ CENTERED
2. BAR “C” ~ CENTERED

REINFORCING STEEL
#4 BARS 2'-0" MIN. SPLICE
#5 BARS 2'-2" MIN. SPLICE

22'-0"
20'-0"
18'-0"
16'-0"
14'-0"
12'-0"
10'-0"
8'-0"
6'-0"

5. SOIL

4. TYPE 5A

3. TYPE 5B

2. TYPE 5C

1. TYPE 5D

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

1. Wall to be designated Noise Barrier Wall Type 6A, 6B, 6C or 6D. The Contract specifications actual wall designations.

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

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

4. Construction joints in the foundation shall be spaced at 120 feet minimum.

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

**FOOTING WIDTH TRANSITION DETAIL**

**REINFORCEMENT TABLE**

**SHEET 1 OF 1 SHEET**

**APPENDIX A**

**_TYPE 6**

**STANDARD PLAN D-2.14-00**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**

**STATE DESIGN ENGINEER**

**DATE**

**NOISE BARRIER WALL**

**APPROVED FOR PUBLICATION**

**REINFORCEMENT TABLE**

<table>
<thead>
<tr>
<th>WALL HT</th>
<th>TYPE 5A</th>
<th>TYPE 5B</th>
<th>TYPE 5C</th>
<th>TYPE 5D</th>
<th>TYPE 5E</th>
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<td>20'-0&quot;</td>
<td>40'-0&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DRAWN BY:**  ADAM COCHRAN

**GROUND LINE**

**EQUAL SPACES**

**WALL HT**

- 18'-0"
- 16'-0"
- 14'-0"
- 12'-0"
- 10'-0"
- 8'-0"
- 6'-0"

**#4 @ THREE**

- 60'-0"

**#4 @ 10" MAX. SPACING**

- 2'-0"

**FINAL**

- SEE CONTRACT

**ALTERNATE**

**RIGHT-OF-WAY**

**TYPICAL SECTION**

**OPTIONAL**

**SIDES**

- 5'-0"
- 5'-0"
- 5'-3"
- 5'-6"

**3" CLR.**

**C WALL**

- 1'-1 3/4"

**1 1/2"**

**#4 (TYP.) ~ PLACE AS SHOWN**

**2" CLR.**

**AS SHOWN**

**#4 (TYP.) ~ PLACE AS SHOWN WITH ROADWAY PROFILE**

**2' - 0" MIN.**

**CONSTRUCTION JOINTS**

**2' - 2" FOR**

**#4 BAR TOP AND BOTTOM**

**PROVIDE AN ADDITIONAL**

**2' - 0" SPLICE AND EXTENDING THRU**

**#4 (TYP.) PLACE AS SHOWN WITH**

**CONSTRUCTION JOINT WITH ROUNDED SURFACE.**

**HEIGHT MAY VARY IF REQUIRED TO PROVIDE A SMOOTH PROFILE CONSISTENT WITH ROADWAY PROFILE.**

**REINFORCING STEEL**

**BAR 12" CENTERED ON WALL**

**SURFACE TREATMENT AS REQUIRED**

**#4 (TYP.) - PLACE AS SHOWN**

**PROVIDE AN ADDITIONAL #4 BAR TOP AND BOTTOM HAVING 12" SPACING.**

**CONSTRUCTION JOINTS**

**CONSTRUCTION JOINTS**

**ELEVATION**

**TOP OF ROADWAY**

**TOP OF FOOTING**

**REINFORCED PER LEVEL WALL HEIGHT REINFORCEMENT TABLES**

**PANEL CORNER**

**TRAFFIC BARRIER**

**B2**

**B2**

**B1**

**B1**

**#3 OR**

**7' - 5" FOR #3**

**OR**

**7' - 9" #5 BAR**

**FOOTING WIDTH TRANSITION DETAIL**

**FOR LOCATIONS WITHOUT FOOTING STEP**

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

**NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.**
NOTES
1. Wall to be designated Noise Barrier Wall Type 6SSA, 6SSB, 6SSC or 6SSD. The Contract specifies actual wall designations.
2. For intermediate wall heights, use the next higher H.
3. Panel shall have at least 5 feet of level ground on each side.
4. Construction joints in the foundation shall be spaced at 120 feet maximum.

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

NOISE BARRIER WALL
TYPE 6SS

STANDARD PLAN D-2.16-00

NOTE:  THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE.  THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION.  A COPY MAY BE OBTAINED UPON REQUEST.
1. Wall to be designated Noise Barrier Wall Type 7SSA, 7SSB, 7SSC or 7SSD. The Contract specifies actual wall designations.

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

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

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

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

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

The Contract specifies actual foundation requirements D1 or D2.

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

Walls to be designated Noise Barrier Wall Type 7SSA, 7SSB, 7SSC or 7SSD. The Contract specifies actual wall designations.

For intermediate wall heights, use the next higher H.

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

The Contract specifies actual foundation requirements D1 or D2.
### Notes

1. Wall to be designated Noise Barrier Wall Type 8A, 8B, 8C, or 8D. The Contract specifies actual wall designations.

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

3. Panels shall have at least 5'-0" of level ground on each side.

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

5. The Contract specifies actual foundation requirements.

6. The wall to be designated Noise Barrier Wall Type 8A, 8B, 8C, or 8D.

### Section

There shall not be more than 1'-0" differential backfill height.

### Designation

- **Type 8A**
- **Type 8B**
- **Type 8C**
- **Type 8D**

### Table

<table>
<thead>
<tr>
<th>WALL HT</th>
<th>TYPE 8A</th>
<th>TYPE 8B</th>
<th>TYPE 8C</th>
<th>TYPE 8D</th>
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<tr>
<td>16'-0&quot;</td>
<td>6&quot;</td>
<td>6&quot;</td>
<td>6&quot;</td>
<td>2&quot;</td>
</tr>
</tbody>
</table>

### Joint and Corner Detail

- **Angle Point**
- **Real 1/2" (Typ.)**

### Precast Concrete Wall

- **Traffic Side**
- **Precast Panel**

### Scale

- **1-1/2" = WALL THICKNESS**
- **24' - 0" WALL HT**
- **22' - 0" WALL HT**
- **18' - 0" WALL HT**
- **16' - 0" WALL HT**
- **14' - 0" WALL HT**
- **12' - 0" WALL HT**
- **10' - 0" WALL HT**
- **8' - 0" WALL HT**
- **6' - 0" WALL HT**
- **5' - 0" WALL HT**

### Scale

- **1' - 0" = PANEL HEIGHT (H)**
- **5'-0" CENTER IN WALL**

### Differential Backfill Height

- **1'-0" MAX.**
- **2'-0" MIN.**

### Compact Trench

- **3'-0" MIN.**
- **6'-0" MIN.**

### Level (Typ.)

- **5'-9" DEPTH**
- **5'-6" DEPTH**
- **5'-3" DEPTH**
- **5'-0" DEPTH**
- **4'-9" DEPTH**
- **4'-6" DEPTH**
- **4'-3" DEPTH**
- **3'-9" DEPTH**
- **3'-6" DEPTH**

### DEPTH

- **5'-0" DEPTH**
- **4'-9" DEPTH**
- **4'-6" DEPTH**
- **4'-3" DEPTH**
- **3'-9" DEPTH**
- **3'-6" DEPTH**
- **3'-3" DEPTH**

### Bar "D" Center In Wall

- **6" MIN.**
- **6" MAX.**

### Reinforced Pre-Cast Wall Height

- **3/4" CHAMFER (Typ.)**

### Wind Exposure & Velocity

- **Type 8A**
- **Type 8B**
- **Type 8C**
- **Type 8D**

### Soil Type

- **FRICTION SOIL**
- **B1**
- **B2**

### Depth

- **6'-0" DEPTH**
- **6'-9" DEPTH**
- **6'-6" DEPTH**
- **6'-3" DEPTH**
- **6'-0" DEPTH**
- **5'-9" DEPTH**
- **5'-6" DEPTH**
- **5'-3" DEPTH**
- **5'-0" DEPTH**
- **4'-9" DEPTH**
- **4'-6" DEPTH**
- **4'-3" DEPTH**
- **3'-9" DEPTH**
- **3'-6" DEPTH**

### Angle of Internal Fricion

- **(DEGREES)**
- **1**
- **2**
- **3**

### Joint and Corner Detail

- **Precast Panel**
- **Corner Panel**

### PAN PANEL CORNER

- **BAR "D"**

### Notation

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### Table - Wall Design Specifications

<table>
<thead>
<tr>
<th>Wall Height</th>
<th>Type 9A</th>
<th>Type 9B</th>
<th>Type 9C</th>
<th>Type 9D</th>
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<tbody>
<tr>
<td>6' - 0&quot;</td>
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<td>12' - 0&quot;</td>
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<tr>
<td>14' - 0&quot;</td>
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<td>16' - 0&quot;</td>
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<tr>
<td>18' - 0&quot;</td>
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<td>20' - 0&quot;</td>
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<td>24' - 0&quot;</td>
<td>6' - 0&quot;</td>
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### Notes
1. Wall to be designated Noise Barrier Wall Type 9A, 9B, 9C or 9D. The Contract specifies actual wall designation.
2. For intermediate wall heights, use the next higher H.
3. Panels shall have at least 3' - 0" of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet minimum.
5. All joints shall be in full contact and sealed.

### Diagram - Precast Concrete Wall on Spread Footing

- **General Information**
  - Wall section details
  - Typical section
  - Level (Typ.)
  - Wind exposure & Velocity
  - Typical Section
  - Noisy working area
  - Panel width 12' - 0" max

- **Construction Details**
  - Bar "A" (Typ.)
  - Bar "B" (Typ.)
  - Bar "C" (Typ.)
  - Bar "D" (Typ.)
  - Bar "E" (Typ.)
  - Bar "F" (Typ.)
  - Noisy working area
  - Panel width 12' - 0" max

- **Notes**
  - This plan is not a legal engineering document but an electronic duplicate. The original, signed by the State Design Engineer, expires August 23, 2006.
  - A copy may be obtained upon request.

---

**Harold J. Peterfeso**

Approved for Publication

PRECAST CONCRETE WALL ON SPREAD FOOTING

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**NOTES**

1. Wall to be designated Noise Barrier Wall Type 12A, 12B, 12C, and 12D. The Contract specifies actual wall designation.

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

3. Compaction of trench height differential shall not exceed 1 foot.

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

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

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

---

**REINFORCEMENT TABLE**

<table>
<thead>
<tr>
<th>WALL HT</th>
<th>TYPE 12A</th>
<th>TYPE 12B</th>
<th>TYPE 12C</th>
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<tr>
<td></td>
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<td>BAR &quot;C&quot;</td>
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<td>#6 @ 12&quot;</td>
<td>#6 @ 12&quot;</td>
<td>#6 @ 12&quot;</td>
</tr>
</tbody>
</table>

**TYPICAL SECTION**

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

**SHEET 1 OF 1 SHEET**

**DATE**

- 11-10-05

**PRECAST CONCRETE WALL**

- W/ Traffic Barrier
- On Trench Footing

**APPROVED FOR PUBLICATION**

- 11-10-05

**STANDARD PLAN D-2.38-00**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**

- EFFECTIVE: AUGUST 2, 2010 TO JULY 31, 2011
NOTES

1. Slab to be designated Noise Barrier Wall Type 12SSA, 12SSB, 12SSC and 12SSD. The Contract specifies actual wall designation.
2. For intermediate wall heights, use the next higher H.
3. Compaction of bench height differential shall not exceed 1 foot.
4. Panels shall have at least 3 feet of level ground on each side.
5. All joints shall be in full contact and sealed.
6. The Contract specifies actual foundation requirements D1 or D2.

HEIGHT MAY VARY IF REQUIRED TO PROVIDE A SMOOTH PROFILE CONSISTENT WITH THE ROADWAY PROFILE.

NUMBER OF PRECAST PANELS REQUIRED:

- **Type 12SSA**: 12 panels
- **Type 12SSB**: 12 panels
- **Type 12SSC**: 12 panels
- **Type 12SSD**: 12 panels

PRECAST CONCRETE WALL W/ SINGLE SLOPE TRAFFIC BARRIER ON TRENCH FOOTING

STANDARD PLAN D-2.40-00

Sheet 1 of 1 Sheet

APPROVED FOR PUBLICATION

Harold J. Peterfeso 11-10-05

Washington State Department of Transportation
Joint and Corner Detail

- All joints shall be in full contact and sealed.
- Panels shall have at least 3 feet of level ground on each side.
- For intermediate wall heights, use the next higher H.
- Wall to be designated Noise Barrier Wall Type 13A, 13B, 13C or 13D. The Contract specifies actual wall designations.
- Panels shall have at least 3 feet of level ground on each side.
- Construction joints in the footing shall be spaced at 120 feet max.
- All joints shall be in full contact and sealed.
- The Contract specifies actual foundation requirements D1 or D2.

Joint and Corner Detail

- All joints shall be in full contact and sealed.
- Panels shall have at least 3 feet of level ground on each side.
- For intermediate wall heights, use the next higher H.
- Wall to be designated Noise Barrier Wall Type 13A, 13B, 13C or 13D. The Contract specifies actual wall designations.
- Panels shall have at least 3 feet of level ground on each side.
- Construction joints in the footing shall be spaced at 120 feet max.
- All joints shall be in full contact and sealed.
- The Contract specifies actual foundation requirements D1 or D2.

Joint and Corner Detail

- All joints shall be in full contact and sealed.
- Panels shall have at least 3 feet of level ground on each side.
- For intermediate wall heights, use the next higher H.
- Wall to be designated Noise Barrier Wall Type 13A, 13B, 13C or 13D. The Contract specifies actual wall designations.
- Panels shall have at least 3 feet of level ground on each side.
- Construction joints in the footing shall be spaced at 120 feet max.
- All joints shall be in full contact and sealed.
- The Contract specifies actual foundation requirements D1 or D2.

Joint and Corner Detail

- All joints shall be in full contact and sealed.
- Panels shall have at least 3 feet of level ground on each side.
- For intermediate wall heights, use the next higher H.
- Wall to be designated Noise Barrier Wall Type 13A, 13B, 13C or 13D. The Contract specifies actual wall designations.
- Panels shall have at least 3 feet of level ground on each side.
- Construction joints in the footing shall be spaced at 120 feet max.
- All joints shall be in full contact and sealed.
- The Contract specifies actual foundation requirements D1 or D2.
1. Wall to be designated Noise Barrier Wall Type 13SSA, 13SSB, 13SSC or 13SSD. The Contract specifies actual wall designations.
2. For intermediate wall heights, use the next higher H.
3. Panels shall have at least 3 feet of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet maximum.
5. All joints shall be in full contact and sealed.
6. The Contract specifies actual foundation requirements D1 or D2.

- **Wind Exposure & Velocity**
  - **Wind Exposure Type:** B1
  - **Wind Velocity (MPH):**
    - B1 Level (Typ.):
      - 90
      - 80
      - 70
      - 60

**NOTES**
- The Contract specifies actual foundation requirements D1 or D2.
- For Construction joints in the footing shall be spaced at 120 feet maximum.
- All joints shall be in full contact and sealed.
- The Contract specifies actual foundation requirements D1 or D2.

**PRECAST CONCRETE WALL W/ SINGLE SLOPE TRAFFIC BARRIER ON SPREAD FOOTING**

**NOTICE**

The original, signed by the Engineer and approved for publication, is kept on file. A copy may be obtained upon request.
The Contract specifies actual foundation requirements.
TYPICAL EXPANSION JOINT

EXPANSION JOINT
FILLED PLACED IN SASH BLOCK RECESSES.

PLAN VIEW

EXPANSION JOINT AT WIDTH STEP

#5 (TYP.)

BOND BEAM DETAIL

TRAFFIC SIDE

#5 (TYP.)

MASONRY WALL ON TRENCH FOOTING

NOISE BARRIER WALL
TYPE 16

STANDARD PLAN D-3.60-00

SEE DETAIL A

TYPICAL BOTH SIDES OF WALL

BOND BEAM
GROUTING LIMIT

SEE DETAIL A

10" JOINT

POLYURETHANE
SEALANT

BACKER ROD

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

#5 (TYP.)

MASONRY WALL ON TRENCH FOOTING

NOISE BARRIER WALL
TYPE 16

STANDARD PLAN D-3.60-00

SEE DETAIL A

TYPICAL BOTH SIDES OF WALL

BOND BEAM
GROUTING LIMIT

SEE DETAIL A

10" JOINT

POLYURETHANE
SEALANT

BACKER ROD

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

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

MASONRY WALL ON SPREAD FOOTING

DATE: 11-10-05

STANDARD PLAN D-3.62-00
NOTE: TRANSVERSE BARS NOT SHOWN

MASONRY WALL ON SPREAD FOOTING

Typical Expansion Joint

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

Expansion joint filler placed in each block recession.

Traffic Side

9" (Typ.)

Traffic Side

10" (Typ.)

Plan View

Typical Expansion Joint

8" (Typ.)

Plan View

Expansion Joint at Width Step

Bond Beam Details

Bond beam units

Sealant

Backer Rod

Polyurethane

Typical Both Sides of Wall

Noise Barrier Wall Type 17

Standard Plan D-2.62-00

Approved for Publication

Harold J. Peterfeso 11-10-05

Washington State Department of Transportation

Expires: August 23, 2006

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NOTES:
1. Wall to be designated Noise Barrier Wall Type 1A, 1B, 1C or 1D. The Contract specifies actual wall designations.
2. For intermediate wall heights, use the next higher H
3. All masonry shall be hollow unit and隔离有 or running bond
4. All masonry is to be spalled
5. All Concrete Masonry Units (CMU) units that have vertical reinforcing bars or bond beam
6. CMU = concrete masonry unit
7. Footing shall be spaced at 120 feet maximum
8. Masonry Wall Finish and Details sheets for masonry block finishes, special shapes, sizes and layout

Noise Barrier Wall
Type 1A

Standard Plan D-2.64-01
Sheet 1 of 3 sheets

Approved for Publication
Peaco Balokitch
01/06/20

Washington State Department of Transportation
### Noise Barrier Wall

#### Type 2A

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<th>BAR &quot;C&quot;</th>
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#### Type 4

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#### Notes

1. Walls to be designated noise barrier wall type 2A, 2B, 2C, or 2D. The contract specifies actual wall designations.
2. For intermediate wall heights, use the next higher height.
3. All masonry shall be hollow unit and installed as running bond.
4. All masonry is to be spalled to ensure consolidated concrete as specified in Section 23.
5. Concrete masonry unit (CMU) cells that have vertical steel reinforcing bars or bond beam units shall be spalled to expose aggregate.
6. Panels shall have at least 3 feet of level ground on each side.
7. See "Masonry Wall Finishes and Details" sheet for masonry block finishes, special shapes, sizes and layouts.
8. The Contract specifies actual foundation requirements D1 or D2.
NOTES:

1. Wall to be designated Noise Barrier Wall Type 15A, 15B, 15C or 15D. The Contract specifies actual wall designations.

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

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

4. Plywood and Glulam panels and all lumber shall be pressure preservative treated.

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

- Plywood and Glulam panels and all lumber shall be pressure preservative treated.

- The Contract shall specify actual foundation requirements D1 or D2.
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-2.06 for wall reinforcement not shown.

ANCHOR PIN WELDED TO DOOR FRAME (TYP.)

EXPANSION JOINT

FOR CAST-IN-PLACE WALL ON OFFSET SPREAD FOOTING

NOISE BARRIER WALL
ACCESS DOOR TYPE 1

STANDARD PLAN D-2.80-00

Sheet 1 of 1 Sheet

APPROVED FOR PUBLICATION

Harold J. Petersen 11-10-05

Washington State Department of Transportation

EXPIRES AUGUST 23, 2006

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NOTES
1. All rebar shall have a minimum 1 1/2" cover.
2. See Standard Plan D-2.02 for door and frame details.

1. 25' - 0"
2. 4' - 6"
3. 2' - 6"
4. 8"
5. 2' - 8"

SECTION A

SECTION B

FINISHED GRADE LINE

TOP OF TRAFFIC BARRIER

TOP OF FOOTING

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Harold J. Pietrafesa
11-10-05
All rebar shall have a minimum 1 1/2" cover.


See Standard Plan D-2.36 for wall reinforcement not shown.
NOTES

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

FOR PRECAST WALL W/ TRAFFIC BARRIER ON SHAFT FOUNDATION

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

DRAWN BY:  ADAM COCHRAN

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CONCRETE SLAB DETAIL
(SEE NOTE 2)

CONCRETE SLAB NOT SHOWN

EXPANSION JOINT

4' DOOR OPENING

BAR "A" (7 BARS PER SIDE)

4 1/2" (TYP.) #5 x 6' - 8" (TYP.)

#5 x 4' - 0" (TYP.)

12"

12"

4' - 0"

2' - 0"

GROUND LINE

WALL

CONCRETE SLAB DETAIL

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Harold J. Peterfeso
11-10-05

STANDARD PLAN D-2.66-00

FOR PRECAST WALL W/ TRAFFIC BARRIER ON SHAFT FOUNDATION

NOISE BARRIER WALL
ACCESS DOOR TYPE 4

EXPIRES AUGUST 23, 2006

DRAWN BY: ADAM COCHRAN
NOTES
1. All rebar shall have a minimum 1 1/2" cover.
3. See Standard Plan D-2.68 for wall reinforcement not shown.

DRAWN BY: ADAM COCHRAN

Harold J. Peterfeso

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ACCESS DOOR AND FRAME FOR PRECAST WALLS ONLY

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**NOTE:** See general note 4, sheet 1.

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**PERMANENT GEOSYNTHETIC WALL - EXTERNAL STABILITY DESIGN**

(NONLINEAR DESIGN FOR LARGE EARTHQUAKES, $A_s = 0.35g$)

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**NOTE:** See general note 4, sheet 1.

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**PERMANENT GEOSYNTHETIC WALL - EXTERNAL STABILITY DESIGN**

(NONLINEAR DESIGN FOR LARGE EARTHQUAKES, $A_s = 0.35g$)

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</tbody>
</table>

**NOTE:** See general note 4, sheet 1.
1. Get form on completed lift.

2. Unroll geosynthetic and position it so that 2'-6" wide "tail" comes over the form. If a geotextile is used for the geosynthetic reinforcement, position geotextile to prevent backfill from spilling through second opening.

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

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

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

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

7. The form may be left in place while constructing the next layer (see note 3). Otherwise, paint the form and repeat the process.

8. Finish backfilling, using 2'-0" high geosynthetic layer imaging.

Notes:
1. Use of this temporary form system, as detailed in this plan is optional.
2. To help maintain the wall face better, leave the form system for the preceding layer in place while constructing the next layer. When the upper layer is complete, remove the form system from the lower layer and reset it for the next layer. See below.

Permanent Geosynthetic Wall
Standard Plan D-3
Sheet 4 of 4 sheets

Approved for publication
Peaco Baloch
08-10-10
Washington State Department of Transportation
ASPHALT CONCRETE PAVEMENT

CONDITION A

GRAVEL BACKFILL FOR WALLS

UNDERDRAIN PIPE

1/8" MIN

CONDITION A OR CONDITION B WITH GEOTEXTILE

CONSTRUCTION GEOTEXTILE FOR UNDERGROUND DRAINAGE, MODERATE SURVIVABILITY.

GRAVEL BACKFILL FOR DRAINS

CONDITION A

GRAVEL BACKFILL FOR WALLS

CONDITION B

GRAVEL BACKFILL FOR DRAINS

UNDERDRAIN PIPE

1/8" MIN

ALTERNATE DETAIL TYPICAL FOR CONSTRUCTION WITH SHORING

GRAVEL BACKFILL FOR DRAINS

Cement Concrete Slab WHERE SHOWN ON PLANS

APPROVED FOR PUBLICATION

10/98

DATE

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

FASTENING ADJACENT BASKETS

CROSS CONNECTING WIRE PLACEMENT, INTERIOR CELLS OF FRONT GABIONS

CROSS-CONNECTING WIRE PLACEMENT, END CELLS

LACING DETAIL

Gabions
Standard Plan D-6

Approved for publication
Clifford E. Mansfield 6/19/98

Washington State Department of Transportation

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### Reinforcement Notes:
1. If trapped bar(s) is used, add 0.4% GVF of concrete class A520 for barrier alternate 1, add 0.6% GVF of concrete class A520 for barrier alternate 2, use standard plan D-15.45.
2. Add 25 L/ft of reinforcing steel for barrier alternate 1 or 10 L/ft of reinforcing steel for barrier alternate 2, use standard plan D-16.10.

### Verticial Face Wall Design
With a 250 psf surcharge or traffic barrier.
1. All concrete shall be Class 4000, except as noted.

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

3. When Wall Type 25W (safeguard) is specified, the concrete cover over steel in the front face and the base wall thickness shall be increased by 1".

4. When Wall Type 29W (safeguard) is specified, concrete in the table column "Material Quantity" shall be increased by (0.003 x H) CY/LF.

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

6. This wall has been designed in accordance with the requirements of the AASHTO LRFD Bridge Design Specifications 4th Edition 2007 and through 2008. The analysis of these walls has been completed using an elliptical PDA of 0.61 g.

7. If Traffic Barriers are required, see Standard Plane D-16.10, D-16.15 and D-16.20.

REINFORCED CONCRETE RETAINING WALL
TYPE 2 AND 25W
STANDARD PLAN D-16.18-01
SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION
Puente Baldecini M
12-25-01
Washington State Department of Transportation
### Reinforcement Notes

1. If trapezoidal barrier is used, add 0.113 CF of concrete class AC210 for barrier alternative 4. Add 0.116 CF of concrete class AC210 for barrier alternative 5. See standard plan D-63.10.

2. Add 0.65 yield of reinforcing steel for barrier alternative 1 or 0.65 yield of reinforcing steel for barrier alternative 2. See standard plan D-63.10.

### Reinforced Concrete Retaining Wall

| Type 2 and 2BW | Standard Plan D-10.10-01 |

#### Footing Reinforcement

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<th>Dimensions</th>
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#### Sloping Face Wall Design

With a 250 PSF surcharge.
NOTES
1. All concrete shall be Class 4000, except as noted.
2. For butt joint requirements, see Standard Plan D-4.
3. When Wall Type 35W (self-sharpen) is specified, the concrete cover over steel in the front face and the total wall thickness shall be increased by 1".
4. When Wall Type 35W (self-sharpen) is specified, concrete in the table column "Material Quantity" shall be increased by (0.004 x ft^2) CY/fY.
5. Concrete in the 4" footwall sections shall be placed separately between expansion joints with a minimum 24 hour period before placing concrete in the adjacent section.
6. This wall has been designed in accordance with the requirements of the AASHTO LRFD Bridge Design Specifications 4th Edition 2007 and Interim through 2009. The seismic design of these walls has been completed using an effective PGA of 0.16 g.
### Table: Footing Reinforcement

| WALL HT | D | C1 | D | No. | A | LENGTH (E) | SIZE | EPL | LENGTH (F) | SIZE | EPL | LENGTH (G) | SIZE | EPL | LENGTH (H) | SIZE | EPL | LENGTH (I) | SIZE | EPL | LENGTH (J) | SIZE | EPL | LENGTH (K) | SIZE | EPL | LENGTH (L) | SIZE | EPL | LENGTH (M) | SIZE | EPL | LENGTH (N) | SIZE | EPL | LENGTH (O) | SIZE | EPL | 
|---------|---|----|---|-----|---|------------|------|-----|------------|------|-----|------------|------|-----|------------|------|-----|------------|------|-----|------------|------|-----|------------|------|-----|------------|------|-----|------------|------|-----|------------|------|-----|
| 6       | 4 | F-P | 7 | F-P | 1 | 1-1/2" | 4-1/2' | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" |
| 6       | 3 | F-P | 7 | F-P | 1 | 1-1/2" | 4-1/2' | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" |
| 6       | 2 | F-P | 7 | F-P | 1 | 1-1/2" | 4-1/2' | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" |
| 6       | 1 | F-P | 7 | F-P | 1 | 1-1/2" | 4-1/2' | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" | 64 | 1"-F | 1-1/2" |

### Diagram: Vertical Face Wall Design with 1:1 Backslope

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  r
  
  b = 1 1/2"
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### Table: Reinforced Concrete Retaining Wall Type 3 and 3BW Standard Plan D-10.20-00

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**Effective:** August 2, 2010 to July 31, 2011

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**Effective:** August 2, 2010 to July 31, 2011

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**Effective:** August 2, 2010 to July 31, 2011
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### Vertical Face Wall Design

**With 2:1 Backslope**

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**Reinforced Concrete Retaining Wall**

TYPE 4 AND 4BW

STANDARD PLAN D-10.25-00

SHEET 2 OF 2 SHEETS

APPROVED FOR PUBLICATION

Peavey, Bohannan 

Washington State Department of Transportation

EFFECTIVE: AUGUST 2, 2010 TO JULY 31, 2011

EFFECTIVE: AUGUST 2, 2010 TO JULY 31, 2011

EFFECTIVE: AUGUST 2, 2010 TO JULY 31, 2011
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**Diagram:**

- **Radiator Plane Table:**
  - **Bar ③:**
    - ①-6 CENTURY

**Note:**
- Vertical Face Wall Design with 2:1 Backslope

**Approved for Publication:**
- Nadeem Raza
- 07-01-04

**Effective Dates:**
- August 2, 2010 to July 31, 2011
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**SLOPING FACE WALL DESIGN**
WITH 2:1 BACKSLOPE

**REINFORCED CONCRETE RETAINING WALL**
TYPE 8
STANDARD PLAN D-10.35-00

**APPROVED FOR PUBLICATION**
Peacock & Peacock 07-06-00
Washington State Department of Transportation
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**REINFORCEMENT NOTES**

1. If traffic barrier is used, add 0.100 clap of concrete class 4000 for barrier alternate 1. Add 0.100 clap of concrete class 4000 for barrier alternate 2. Use standard plan D-14.40.

2. Add 25% of reinforcing steel for barrier alternate 1 or 25% of reinforcing steel for barrier alternate 2. Use standard plan D-14.10.

**VERTICAL FACE WALL DESIGN WITH A 250 PSF SURcharge OR TRAFFIC BARRIER**

**REINFORCED CONCRETE RETAINING WALL**

**TYPE 7**

**STANDARD PLAN D-14.46.01**

Sheet 2 of 3 sheets

Approved for publication

Peconis Baldrich & 11-23-09

Washington State Department of Transportation
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### Stem Reinforcement

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### Material Quantity

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</table>

### Reinforcement Notes

1. For projects where barrier is used, add 6 4 1/8 OD of concrete Class 460 for barrier alternatives. Add 6 1/4 OD of concrete Class 460 for barrier alternatives. See standard plan D-10, 10.
2. Add 50 layers of reinforcing steel for barrier alternatives 1 or 2 layers of reinforcing steel for barrier alternatives. See standard plan D-10.

### Sloping Face Wall Design

With a 250 PSF SURCHARGE

**Reinforced Concrete Retaining Wall**

**Type B**

**Standard Plan D-10, 10**

Sheet 2 of 2 sheets

Approved for publication

Pease, Balduzzi, Inc.

Washington State Department of Transportation

Effective: August 2, 2010 to July 31, 2011
REINFORCING STEEL BENDING DIAGRAM

NOTE
WEB ELONGATION FOR LAP SPlice REQUIREMENTS

CONSTRUCTION JOINT – LEVEL TRANSVERSE WITH
ROUGHENED SURFACE

PLAN VIEW
FRACturE PIN FINISH DETAIL

DUMMY JOINT DETAIL

ALL DIMENSIONS ARE C.A.T. TO C.A.T. FOR REBAR DIAMETERS

TRAFFIC BARRIER DETAILS
FOR REINFORCED CONCRETE
RETAI NING WALLS
STANDARD PLAN D-15.10-01

WASHINGTON DEPARTMENT OF TRANSPORTATION
NOTES

1. All numerals are approx. 3 1/4" wide except numeral "1" which is approx. 5/8" wide.

2. Spacing between numeral "1" and any other numeral is 1". Spacing between all other numerals is 3/4".

3. Traffic Barrier Connections between the bridge and the approaching roadway vary and may consist of concrete barrier extensions. Install the Date Numerals on the traffic barrier of the bridge itself.
1. Dimensions and notations for superstructure are typical for both single lane and two lane bridges.
2. All timber and lumber shall be #2 or better and untreated Douglas fir-larch.
3. All piling shall be untreated Douglas fir and shall be driven to develop a minimum load bearing capacity of 15 tons.
4. Blocking for frame bents shall be proportioned to carry a minimum load of 15 tons per post.
5. All hardware shall be black, ungalvanized.
6. Each deck plant shall be nailed to each stringer with two 7" spikes, number 1 or larger.
7. On 17' spans, stringers shall be 6x16 S1E. On 15' spans, stringers shall be 5x16 S1E.
8. Two-lane bridges shall use thirteen lines of stringers, one-lane bridges shall use seven lines of stringers.

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**Overlay thickness must be sufficient to cover bolts.**

**SECTION A-A**

**SECTION B-B**

**DISTRIBUTION PLATE DETAIL**

**BASE PLATE DETAIL**

**BACKING PLATE DETAIL**

**PILE OR FRAME DETOUR BRIDGE WITH ASPHALT OVERLAY**

**STANDARD PLAN E-2**

**USE ONLY FOR TEMPORARY BRIDGES**

**APPROVED FOR PUBLICATION**

**Brian Ziegler 05-29-98**
NOTES

1. Use Fig. 2.2.1 of the ACI 318-11 code in the PILE HANDLING DIAGRAM furnished.

2. Splices shall be spliced either by lap-welding one full turn and bending the end of the spiral to
   vary pitch in the lesser of D/5, 6d, or 8".

3. At AASHTO M203, jack to 0.75 Fpu maximum.  The engineer shall be consulted for application.

4. Strength of concrete shall be 6,000 psi at column and 7,000 psi at beam.

5. Minimum moments of inertia shall be 8 in.4.  Dimensions and tolerances to be provided by
   the engineer.

6. Typical elevation shall be provided by the engineer.

7. Section 6.3.1 of AASHTO M203 shall be consulted for application.

8. Syrup shall be spliced either by lap-welding one full turn and bending the end of the spiral to
   vary pitch in the lesser of D/5, 6d, or 8".

9. Dimensions and tolerances to be provided by the engineer.

10. Typical elevation shall be provided by the engineer.

11. Section 6.3.1 of AASHTO M203 shall be consulted for application.
1. For pile lifting, Cases 1 and 2, do not allow pile tip to bear on other piles stored in a lower layer.

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

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

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

5. Exposure of spiral reinforcement at the pile head and splice with new spirals in accordance with Standard Plan E-4, Note 2.

6. Piles stored on the ground should be bunked on level dunnage at no more than 20' on center, with a maximum overhang of 10'.
1. The intent of this design is to facilitate the compaction of Hot-Mix Asphalt pavement adjacent to a drainage structure.

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

NOTES

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1. The installation of curbs in areas with existing guardrail would require the removal and reinstallation of the guardrail or its components.

2. Extend shoulder pavement to provide a base for the extended curbs.

3. See Contract for exception to distances shown.

4. Type 3 and 5 curbs are not used on roadways with a posted speed greater than 40 mph.

5. Type 5 are not used under beam guardrail on roadways with a posted speed greater than 60 mph.
NOTE: JOINTS MAY BE FORMED DURING INSTALLATION USING A RIGID DIVIDER OR SAWCUT AFTER CONCRETE CURES TO MINIMUM STRENGTH.
ISCO CONCRETE
SLOPED MOUNTABLE CURB

18" RADIUS BLOCK

20º RADIUS BLOCK

OUTSIDE CORNER BLOCK

INSIDE CORNER BLOCK

IN histo of ALL TO h View

30" RADIUS BLOCK

TOP VIEW

INSIDE CORNER BLOCK

OUTSIDE CORNER BLOCK

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### Precast Concrete SLOPED MOUNTABLE CURB

This table lists the calculated dimensions for curbing blocks suitable for constructing various curve radii. Curved blocks, or blocks with different dimensions may be acceptable with prior approval of the Engineer.

**Curb Radius Table**

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<tr>
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<tr>
<td>OVER 60</td>
<td>USE TANGENT BLOCK, SEE SHEET 1</td>
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File: 09-05-07

Pasco Bakotich III

Washington State Department of Transportation
NOTE

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

SIDE

DUAL SLOPED BLOCK

SIDE

NOISNG BLOCK

SIDE

DUAL SLOPED BLOCK

SIDE

18 x 12 TAPER BLOCK

SIDE

20 x 10 TAPER BLOCK

SIDE

24 x 20 TAPER BLOCK

SIDE

20 x 18 TAPER BLOCK

SIDE

34 x 20 TAPER BLOCK

ISOMETRIC VIEW
1. Provide separate curb ramps for each marked or unmarked crosswalk. Curb ramp location shall be placed within the width of the associated crosswalk, or as shown in the Contract Plans.

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

3. Do not place curbs, junction boxes, access covers, or other obstructions in front of the curb ramp or on any part of the curb ramp or landing.

4. See Contract Plans for the curb design specified. See standard Plan F-10-12 for Curb, Curb and Gutters, and Pedestrian Curbs.


6. The bit item "Cement Concrete Curb Ramp Type 3..." does not include the adjacent Curb, Curb and Gutters, Pedestrian Curb or Sidewalks.

7. The curb ramp maximum running slope shall not exceed 15 feet to avoid sloping the slope inadvisably when connecting to steep grades. When applying the 16 foot max. length, the running slope of the curb ramp shall be as flat as feasible.


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

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

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

5. Install at the locations shown in the Contract. Installation may be moved 20 feet or less (longitudinally) before or after the contract location if obstructions are encountered, or to utilize the post of another sign. Mileposts that cannot be placed within this degree of accuracy shall be omitted entirely.


double-faced sign

Typical Installation for Single-Faced Signs

Typical Installation for Double-Faced Signs

Single-Faced Sign

Supplemental Plaque - Mounting Detail

See Note 2

NOTES

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

2. See Note 2

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NOTES
1. Refer to the Sign Specification Sheet of the Contract for the "V" and "W" distances.
2. The minimum vertical distance from the bottom of the sign to the ground shall not be less than 7' for signs located within the Design Clear Zone.

Refer to the Sign Specification Sheet of the Contract for the 'V' and 'W' distances.

The minimum vertical distance from the bottom of the sign to the ground shall not be less than 7' for signs located within the Design Clear Zone.

DRAWN BY: MARK SUJKA

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

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

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

3. Mounting brackets with steel straps shall be the stainless steel one bolt, flared leg bracket and 3/4" wide, 0.030" thick strap "Band-it" products or an approved equal.

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

3. For "X", "Y", "H1", and "H2", refer to the Sign Specification Sheet in the Contract.

4. Pipe clamp shall be 2 1/2" nominal I.D. galvanized schedule 80 steel pipe.

5. Do not tighten any 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 38 ft-lbs on each bolt.

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STEEL SIGN SUPPORT
TYPES PL, PL-T, & PL-U
INSTALLATION DETAILS

STANDARD PLAN G-24.30-00

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<table>
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A, B, C, D, E, F MAY BE INTERPOLATED FOR INTERMEDIATE SIGN SIZES

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

For "H1" refer to the Sign Specification Sheet in the Contract.
Dimensions for the parts used to assemble the base connections are intentionally not shown. Base connections are patented, manufactured products that are in compliance with NCHRP 350 crash test criteria. The base connection details are only shown on this plan to illustrate how the parts are assembled.

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

STEEL SIGN SUPPORT TYPES TP-A AND TP-B
INSTALLATION DETAILS
STANDARD PLAN G-24.60-00

SEE NOTE 3

SEE NOTE 3

SEE NOTE 3

SEE STD. PLAN G-20.10

DRAWN BY: LISA CYFORD

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NOTES

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

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

---

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SIGN INSTALLATION ON SIGNAL OR LIGHT STANDARD

DIMENSIONS

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>8'-0&quot;</td>
<td>5'-0&quot;</td>
<td>5'-0&quot;</td>
<td>5'-0&quot;</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>5'-0&quot;</td>
<td>5'-0&quot;</td>
<td>5'-0&quot;</td>
</tr>
</tbody>
</table>

MOUNTING BRACKET AND STEEL STRAP
~ SEE NOTE 1

X

Y

LEVEL

MAST ARM MOUNTED LANE USE SIGNS
**NOTES**

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

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

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

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

---

**FOR SIGN ATTACHMENT, SEE STD. PLAN G-22.10**

**FOR SIGN ATTACHMENT, SEE STD. PLAN G-24.50**

**FOR SIGN ATTACHMENT, SEE STD. PLAN G-30.10**

---

**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 strap shall be 3/4” wide and 0.030” thick.**

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---

**DRAWN BY:  ELIZA BRUNSTEIN**

**APPROVED FOR PUBLICATION**

**DATE**

**WASHING STATE DEPARTMENT OF TRANSPORTATION**

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MATERIAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>POST SELECTION</th>
<th>TOTAL SIGN AREA</th>
<th>POST SIZE</th>
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<tbody>
<tr>
<td>X 0.125</td>
<td>10</td>
<td>0.125</td>
</tr>
<tr>
<td>X 0.25</td>
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<tr>
<td>X 0.50</td>
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<td>0.125</td>
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<tr>
<td>X 1.00</td>
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<tr>
<td>PIPE, PLATE, OR WASHERS</td>
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<tr>
<td>TYPE E OR S, OR ASTM A 53</td>
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<td>ASTM A 36</td>
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<td>251 TO 300</td>
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<td>301 TO 350</td>
</tr>
<tr>
<td>351 TO 400</td>
</tr>
<tr>
<td>401 TO 450</td>
</tr>
</tbody>
</table>

NOTES

1. Vertical and horizontal clearance requirements shall be shown on the contract plans.

2. No post splice permitted in lower third of height, nor closer than 3' - 0" to bottom chord, except as otherwise noted. No chord shop splice permitted in first two-thirds of the span, except as otherwise noted. A maximum of two splices are permitted in the post. For post or chord shop splice details, see Standard Plan 0-70.10.

3. The back-up plates or rings for full penetration welds shall be welded continuously to the joined pieces. This can be done by either a continuous fillet weld on the back side of the piece, or by a continuous weld in the root of the full penetration weld.

4. All bolt holes shall be drilled, and the diameter shall be 1/8" larger than the nominal bolt diameter, except as noted.

5. The design and analysis of the structure has been done in accordance with AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signs Dated 2001, using 60 MPH wind velocity and fatigue category - 1.

6. Adjust post alignment in plane normal to roadway center line by means of leveling nuts located below base plate to maintain upward slope in cantilever arm(s). Tighten anchor nuts above base plate in accordance with Standard Specification 6-03.3(33).

7. Variable Message Signs (VMS) exceeding 700 lbs. and/or 200 sq. ft. shall not be installed on cantilever structure.
VERTICAL STRUTS
AT SPAN END ONLY

PANEL LENGTH (F - 8' MAX) TO BE
CONSISTENT "FARMHOUSE" BMPL

X
X/2

Y/2

Y = 5' - 0" MIN.

1' - 8" MIN. TO
1' - 6" MAX.

7"

2' - 0"

H

POST

BOTTOM OF LUMINAIRE BRACKET, WHEN SIGN LIGHTING IS SHOWN IN THE CONTRACT

ELEVATION

DOUBLE CANTILEVER SIGN STRUCTURE

PERSPECTIVE

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HEMISPHERICAL POST FINIAL, 1/8" WALL THICKNESS, INSTALL AFTER GALVANIZING

3/8" ALUM. HOLLOW SET SCREW WITH BAG NUT (TYP.)
(CORROSION RESISTANT METAL OR COATING AT 80 INTERVALS)

OUT HOLE IN POST FOR WIDE PLATED, 1/8" MAX. CLEARANCE ALL AROUND

ELIMINATION
ROTATED 90° TO SHOW CUTOUT

ELEVATION

SECTION THROUGH FINIAL AND POST

FINIAL BRACKET

DIAGONAL CONNECTION DETAIL
TYPICAL OF ALL DIAGONALS

DIAGONAL HOLES: 3/4" MAX. HOLE IN CHORD AT EACH END OF ALL DIAGONAL CHORDS AND STRUTS

SPAN END ~ SIDE
SPAN END ~ END

END OF CHORD

CHORD TO POST CONNECTION DETAIL

BASE ~ SIDE
BASE ~ TOP

TYPICAL TRUSSES DETAILS
END OF DIAGONALS SHALL BE CUT TO FIT NEATLY AGAINST CHORDS

DRAWN BY:  BILL BERENS
CANTILEVER SIGN STRUCTURE
(TRUSS-TYPE)
STANDARD PLAN G-60.10-60

SECTION B

POST BASE DETAILS

DETAIL "G"

BASE WELD DETAIL

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CANTILEVER SIGN STRUCTURE (TRUSS-TYPE)
FOUNDATION TYPE 1
STANDARD PLAN G-60.20-00
Sheet 2 of 2 Sheets

APPROVED FOR PUBLICATION
Pasco Bakodich III  08-31-07
Washington State Department of Transportation

COLUMNS AND SHAFT SPIRAL OPTIONS

<table>
<thead>
<tr>
<th>BAR SIZE</th>
<th>BAR DIAMETER</th>
<th>BAR LENGTH</th>
<th>BAR TYPE</th>
<th>BAR PLATE</th>
<th>WELD DIMENSIONS (INCHES)</th>
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<td>10'</td>
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<tr>
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<td>PLAIN STEEL</td>
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<td>J: 10 L: 20</td>
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MATERIAL SPECIFICATIONS

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ANCHOR PLATE DETAILS

ANCHOR PLATE DETAIL

ANCHOR PLATE DETAIL

ANCHOR PLATE DETAIL
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<th>MARK</th>
<th>LOCATION</th>
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<th>200 SF OR LESS</th>
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<td>QTY.</td>
<td>SIZE</td>
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<td>#9</td>
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<td>Foundation Verticals</td>
<td>14</td>
<td>9</td>
<td>14</td>
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<tr>
<td>④</td>
<td>Pedestal Verticals</td>
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<td>10</td>
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<tr>
<td>⑤</td>
<td>Foundation Wall Horizontal at slope</td>
<td>2</td>
<td>8</td>
<td>2</td>
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<tr>
<td>⑥</td>
<td>Foundation Wall Horizontals</td>
<td>VARIES</td>
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<td>VARIES</td>
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**VALUES OF Z**

<table>
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<tr>
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<th>TOTAL SIGN AREA</th>
<th>ALLOWABLE LATERAL BEARING PRESSURE (PSF)</th>
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<td>200 SF ~ 400 SF</td>
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<tr>
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<td>9' - 0&quot;</td>
<td>11' - 0&quot;</td>
</tr>
<tr>
<td>TYPE 3</td>
<td>11' - 0&quot;</td>
<td>13' - 6&quot;</td>
</tr>
</tbody>
</table>

**BENDING DIAGRAM**

- **Concrete:** CLASS R200
- **Steel Rebars:** AASHTO M 31, Grade 60
- **Anchor Rods:** ASTM F 1554, Grade 105
- **Anchor Nuts:** AASHTO M 291
- **Anchor Washers:** AASHTO M 293
- **Anchor Plates:** AASHTO M 232

**MATERIAL SPECIFICATIONS**

- **Foundation Wall Ties:** #5
- **Foundation Verticals:** #6
- **Foundation Wall Horizontal:** VARIES per plans
- **Foundation Verticals:** #4
- **Foundation Horizontal:** VARIES per plans

**CANTILEVER SIGN STRUCTURE (TRUSS-TYPE) FOUNDATION TYPES 2 & 3 STANDARD PLAN G-60.30-00**

Sheet 2 of 2 Sheets

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**TOP ELEVATION**

- CHORD TO END POST CONNECTION TYPE R
- USED WHERE NO DIAGONALS CONNECT

- DETAILS NOT SHOWN ARE SAME AS CHORD TO END POST CONNECTION TYPE R, CUTTING THE 3/4" PLATE STIFFENER ON THE TEE MEMBER.

**HANDHOLE DETAIL**

- COVER NOT SHOWN FOR CLARITY

**FABRICATE FROM W8 x 40 WEB**

**3/4" MAX.**

**3/8"**

**5/16"**

**SYMMETRICAL ABOUT END POST AND CHORD**

**1 3/4"**

- INSTALL BOLTS WITH HEAD UPWARD.
- EXCLUDE BOLT THREADING FROM GRIP.

**HORIZONTAL DIAGONAL CONNECTION WHEN ALTERNATE JOINT DETAIL IS USED**

- SEE DETAIL, SHEET 3

**ELEVATION (COVER NOT SHOWN FOR CLARITY)**

**HAND HOLE FRAME**

**HORIZONTAL DIAGONAL**

**FACE OF POST**

**REMOVABLE RAINTIGHT HAND HOLE COVER WITH GASKET**

- FASTEN WITH TWO STAINLESS STEEL (ASTM F 593) SCREWS

**DRILL PER FIELD MEASUREMENT OF SPAN BETWEEN COMPLETED FOUNDATIONS**

**ELEVATION**

**TOP**

**3/16"**

**1/8"**

- BEND FOR SNUG FIT

**FINIAL DETAIL**

**5/16" x 1/2" SLOT FOR 3/8" ALLEN SET SCREW**

**PLATE ~ 1/8" MIN.**

**PREHOLE HEMISPHERICAL POST FINIAL, 1/8" MIN. THICKNESS. INSTALL AFTER GALVANIZING**

**3/8" ALLEN HOLLOW SET SCREW WITH DOG POINT (TYP.)**

**EXCLUDE BOLT THREADING FROM GRIP.**

**4" DIAM. STANDARD GALVANIZED STEEL SQUARE HEAD PLUG**

**INSTALL PLUG AFTER GALVANIZING TRUSS**

**ELEVATION**

**SECTION THROUGH FINIAL AND POST**

**FINIAL BRACKET**

**PLATE = 1/8" LIA**

**R SPAN**

**BOLT DIAMETER**

<table>
<thead>
<tr>
<th>SPAN LENGTH</th>
<th>A</th>
<th>B</th>
<th>BOLT DIAMETER</th>
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</thead>
<tbody>
<tr>
<td>15/16&quot; (TYP.)</td>
<td>1 1/8&quot;</td>
<td>1 1/8&quot;</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>1 5/8&quot; TO 2 3/8&quot;</td>
<td>2 7/8&quot;</td>
<td>3 3/8&quot;</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>2 1/8&quot; TO 2 5/8&quot;</td>
<td>3 3/8&quot;</td>
<td>4 1/16&quot;</td>
<td>1 5/8&quot;</td>
</tr>
<tr>
<td>2 7/8&quot; TO 3 3/8&quot;</td>
<td>4 1/16&quot;</td>
<td>4 1/16&quot;</td>
<td>4 1/16&quot;</td>
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</tbody>
</table>

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### TYPICAL JOINT DETAIL

- **Chord shown = End Post similar**

### ALTERNATE JOINT DATA

<table>
<thead>
<tr>
<th>Span Length</th>
<th>6' OR LESS</th>
<th>9' TO 12'</th>
<th>15' TO 18'</th>
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</thead>
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<tr>
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<tr>
<td>BOLT G MIN.</td>
<td>3 1/2&quot;</td>
<td>4 1/2&quot;</td>
<td>5 1/2&quot;</td>
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</table>

### INTERIOR DIAGONAL

- **Dimension shall equal chord thickness or 1/4" whichever is lesser.**
- **For spans 60' or less, diameter shall be 3/4".**

### DEAD LOAD CAMBER

- **Drilled hole in chord at each diagonal and strut shall be 1" diameter for spans over 60'.**
- **For spans 60' or less, diameter shall be 3/4".**

### CHORD FIELD SPlice DATA

<table>
<thead>
<tr>
<th>Span Length</th>
<th>F</th>
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<th>Bolt K Diameter</th>
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<td>1/2&quot;</td>
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<tr>
<td>9' TO 12'</td>
<td>9&quot;</td>
<td>7/8&quot;</td>
<td>3/4&quot;</td>
</tr>
<tr>
<td>15' TO 18'</td>
<td>12&quot;</td>
<td>1 1/4&quot;</td>
<td>1 3/4&quot;</td>
</tr>
</tbody>
</table>

**NOT FOR CONNECTIONS BETWEEN VERTICAL DIAGONALS AND CHORDS**

**NOT SHOWN FOR CLARITY**

**FOR SPAN LENGTHS NOT LISTED, INTERPOLATE VALUES OF**

### SIGN BRIDGE (TRUSS-TYPE)

**STANDARD PLAN G-70.10-00**

**Sheets 3 of 4 Sheats**

**APPROVED FOR PUBLICATION**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**

**DATE**

**STATE DESIGN ENGINEER**

**DRAWN BY: BILL BERENS**

**SHEET 3 OF 4 SHEETS**

**APPROVED FOR PUBLICATION**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**

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**Base Plate Details**

1. **Base Plate Hole**: 8" Diameter
2. **Drill and Tap for 1/4" Diameter Cap Screw**
3. **Welded Sluice Cloth**: 1/16" x 7/16" Square Wrap around Base Plate with 3" Minimum Lap

**Screen Detail**

1. **Anchor Bolt (Typ.)**
2. **Anchor Rod (Typ.)**
3. **Top of Foundation**
4. **Top of Base**

**Section B**

1. **Handhole**
2. **1/8" Seal Weld**
3. **Base Weld Details**

**View C**

1. **Anchor Bolt (Typ.)**
2. **Top of Foundation**
3. **Handhole**

**NOTE:** This plan is not a legal engineering document but an electronic duplicate. The original, signed by the engineer and approved for publication, is kept on file at the Washington State Department of Transportation. A copy may be obtained upon request.
NOTES:
1. Install Sign Lighting Luminaire (and Brackets) only when required in the Contract.
2. Windbrace and 3" Z-Bar are aluminum. All nuts, bolts, washers, and other hardware shall be stainless steel, except as noted.
3. See Standard Plan G-98.20 (Monobloc), or G-98.30 (Trahx) for additional Overhead Sign Mounting details.
4. Galvanize all non-stainless steel parts.
OVERHEAD SIGN MOUNTING (TRUSS STRUCTURE)

STANDARD PLAN G-88.30-00

NOTE:
1. U-Bolts, Washers and Nuts shall be stainless steel, except as noted.
2. See standard Plan G-88.19 for Overhead Sign Lighting details.
3. Galvanize all non-stainless steel parts.

DETAIL A

U-BOLT CONNECTION — SIP TYPE U-BOLT WITH 2 LOCKNUTS AND PLAIN WASHERS (TYP)

VERTICAL BRACE — V4A (3/8" STEEL)

TOP TRUSS CHORD

BOTTOM TRUSS CHORD

PITCH LINE

WINDWARD AND LEeward TRUSS CONNECTION

SIDE VIEW

TRUSS BRACKET

FOR VERTICAL BRACEx WITH LUMINAIRES USE DETAIL BELOW MOUNTING ON LUMINAIRES BRACKET DETAIL, SEE STANDARD PLAN G-88.30-00

HORIZONTAL 3 BAR

AT TOP OF SIGN

HORIZONTAL BRACKET (TYP)

SIDE VIEW

TRUSS STRUCTURE

VERTICAL BRACE (TYP) — 3/4" X 12" STEEL (TYP)

U-BOLT CONNECTION (TYP)

LUMINAIRES BRACKET (TYP)

SIDE VIEW

TRUSS STRUCTURE

SKIN FADE

SKIN FADE

SIDE VIEW

TRUSS STRUCTURE

SIDE VIEW

TRUSS STRUCTURE

SIDE VIEW

TRUSS STRUCTURE

SIDE VIEW

TRUSS STRUCTURE

SIDE VIEW

TRUSS STRUCTURE

SIDE VIEW

TRUSS STRUCTURE
NOTES
1. NOT INTENDED FOR USE IN FRONT OF STATIC GUIDES.
2. FOR MOUNTING THE MAINTENANCE WALKWAY TO A MONOTUBE SIGN BRIDGE, SEE STANDARD PLAN G-95.20.
3. FOR MOUNTING THE MAINTENANCE WALKWAY TO A TRUSS-TYPE SIGN BRIDGE, SEE STANDARD PLAN G-95.30.
4. LOCATION OF RAILING SPLICES TO BE DETERMINED BY FABRICATOR. SEE "RAILING SPLICE DETAIL."

MATERIAL SPECIFICATIONS

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<tr>
<th>MATERIAL</th>
<th>SPECIFICATION</th>
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<tr>
<td>STRUCTURAL TUBING</td>
<td>ASTM A 500 GRADE B</td>
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<tr>
<td>GALVANIZED PIPE, PLATES, AND SHAPES</td>
<td>AASHTO M 111</td>
</tr>
<tr>
<td>HIGH STRENGTH BOLTS, NUTS, &amp; WASHERS</td>
<td>AASHTO M 232</td>
</tr>
<tr>
<td>ALL OTHER BOLTS</td>
<td>STD SPEC. BOLT RT</td>
</tr>
<tr>
<td>PAINTED GALVANIZED</td>
<td>AASHTO M 233</td>
</tr>
<tr>
<td>STEEL GRATING</td>
<td>ASTM A 36</td>
</tr>
</tbody>
</table>

PROVIDE A 3/4" DIAM. HOLE IN PIPES, AT PIPE CROSSINGS, FOR GALVANIZING.

MAINTENANCE WALKWAY FOR SIGN BRIDGES
STANDARD PLAN G-95.10-00
Sheet 1 of 3 sheets

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

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

**Panel Span (Typ.)**

- **1/4" Toe Plate**
- **Cross Bar (Typ.)**
- **Bearing Bar, 3/16" Min. Thickness (Typ.)**

**Panel EW (Typ.)**

- **1/4" Toe Plate**
- **Cross Bar, 1/8" Min. Thickness (Typ.)**
- **Bearing Bar, 3/16" Min. Thickness (Typ.)**

**1/4" Clear Grating Fastener (Typ.)**

- **Every Fourth Bearing Bar and Near All Toe Plate Corners**

**Section F**

- **W4 x 13 (Typ.)**
- **4" Min.**

**Section G**

- **W4 x 13 (Typ.)**
- **4" Max.**

**Grating Fastener (Typ.) See Detail**

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MAINTENANCE WALKWAY INSTALLED ON MONOTUBE SIGN BRIDGE

MATERIAL SPECIFICATIONS

- **PIPE**: ASTM A 25 OR ASTM A 53 GRADE B, TYPE C OR E OR ASTM A 106 GRADE B
- **PLATES AND SHAFTS**: ASTM A 563
- **STRUCTURAL TUBING**: ASTM A 500 GRADE B
- **WALKWAYS FOR FUMI PLANTING AND SHAFTS**: ASTM A 111
  - HIGH STRENGTH BAR (HSB) METALS, & WIRE ROPE INCL. MOUNTAIN BEAM ROLLS
  - WIRE SPEC. D-8245
- **ALL OTHER BOLTS**: STD SPIRAL BOLTS
  - FASTENER: QUADROFAST
  - STEEL GRATING: ASTM A 36
  - WIRE ROPE: ASTM A 492 CLASS A WEIGHTED ZINC COATED WIRE STRAND OR WIRE

**NOTES**

1. NOT INTENDED FOR USE IN FRONT OF STATUE MURAL.
2. FOR MAINTENANCE WALKWAY, RAILING, GRATING, AND TOE PLATE DETAILS, SEE STANDARD PLAN 0-86.33.
3. UNIT TWO LANYARDS THROUGH INTERMEDIATE WIRE ROPE SUPPORT.
4. 2/3 DIA. WIRE ROPE WITH 14 STRANDS WITH BREAKING STRENGTH. THE WIRE ROPE SHALL BE INSTALLED WITH 45 DEG. OF TERMINAL AND WITH 6 OF EACH OF ADJACENT AVAILABLE IN THE TURNBOLDS.

**MAINTENANCE WALKWAY MOUNTING FOR MONOTUBE SIGN BRIDGE**

STANDARD PLAN 0-86.20-01

SHEET 1 OF 1 SHEETS

APPROVED FOR PUBLICATION

Peano Balderich III 07-10-08

Washington State Department of Transportation
LIVE STAKE INSTALLATION IN RIPRAP

CUT DAMAGED END TO LEAVE TWO BUDS EXPOSED

SEE NOTES

FILL VOPSE WITH NATIVE SOIL

BLOWING SOIL

TYPICAL LIVE STAKE INSTALLATION

CUT DAMAGED END TO LEAVE TWO BUDS EXPOSED

SEE NOTES

BLOWING SOIL

1. See Plant Material List for size and type of live stakes.
2. Do not use nos or sludge for driving stakes.
3. In hard ground use an iron bar or star drill to prepare the holes for the stakes.
4. Avoid stripping bark or bruising stakes during installation.
5. Fill void around cutting with soil.

LIVE STAKE INSTALLATION IN QUARRY SPALLS

CUT DAMAGED END TO LEAVE TWO BUDS EXPOSED

SEE NOTES

BLOWING SOIL

LIVE STAKE INSTALLATION ON SLOPES

CUT DAMAGED END TO LEAVE TWO BUDS EXPOSED

SEE NOTES

BLOWING SOIL

STATE OF WASHINGTON
DEPARTMENT OF TRANSPORTATION
SALLY A. ANDERSON
CERTIFICATE No. 16007

LIVE STAKE INSTALLATIONS
STANDARD PLAN H-16.16-00
SHEET 1 OF 1 SHEET
APPROVED FOR PUBLICATION
Peetz Road
07-12-00
Washington State Department of Transportation
1. All Angle Irons and Steel Straps shall be galvanized in accordance with AASHTO M 232.
2. Pipe, Caps, and T-Adapter shall be 1" I.D. white PVC, or Primed Steel, except the water intake pipe shall be white PVC. Pipe shall be Sch. 40. All pipe joints shall be threaded.
3. Gage assembly pipes, stainless rod, and angle iron can be extended as needed to fit site requirements. Extra Pipe Clamps shall be added for security.
4. Score the water intake pipe 1/4" deep, 1/32" wide (width of saw blade), every 1/2", alternating cuts on top and bottom for drainage. Place at lowest water level.
5. Water level may vary, depending on season.
6. Pour in approximately 1 tablespoon of cork dust at installation, and after each reading.
Automated Ground Water Monitoring Well

Standard Plan H-32.10-50

Sheet 1 of 1 Sheet

Effective: August 2, 2010 to July 31, 2011

Approved for Publication

Mark W. Maurer
Registered Landscape Architect
Certificate No. 000598

Washington State Department of Transportation

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This bolted does not have an effective breakaway design feature and cannot be installed within the Design Clear Zone.
A socket and wedge anchoring system that meets the NCHRP 350 crash test criteria may be substituted in lieu of the anti-twist plate designs shown. Anti-twist plates are not required for wood post installations.

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

Center the mailbox on the platform to ensure space for the mailbox door to open and to allow space for installing the fasteners (See ALIGNMENT DETAIL, Sheet 2). Spacing of mailbox mounting holes varies among manufacturers. Attachment of the mailbox to the platform may require drilling additional holes through the mailbox to fit the platform.

Attach a newspaper box to the steel post with two 1 7/8" Muffler Clamps spaced 4" apart. Field drill 7/16" holes in the newspaper box to fit. Use 2 1/2" × 1/4" lag bolts to attach newspaper boxes to wood posts. Newspaper boxes must not extend beyond the front of the mailbox when the mailbox door is closed.

A Type 2 Support (Standard Plan H-70.20) is required when 2 or more mailboxes are to be installed on one support.
1. The anchoring system shall meet NCHRP 350 crash test criteria. Use a socket and wedge system, or the anchoring system supplied by or recommended by the Type 2 Support manufacturer.

2. A maximum of 5 mailboxes may be installed on a Type 2 Support.

3. The Platform design shown in this plan is detailed in the PLATFORM DETAIL, Standard Plan H-70.10, Sheet 2. The design features slots that accommodate several types of mailbox supports; only those slots necessary for assembling the type being installed are required. An adjustable platform may be used in lieu of this platform design. Adjustable platforms must fit the 1 7/8" M-Clamp.

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

5. Attach a newspaper box to a Type 2 Support with two 1 7/8" Muffler Clamps spaced 4" apart. Field drill 7/16" holes in the newspaper box to fit. Newspaper boxes must not extend beyond the front of the mailbox when the mailbox door is closed.
MAILBOX SUPPORT
TYPE 3
STANDARD PLAN H-70.30-01
SHEET 1 OF 2 SHEETS
APPROVED FOR PUBLICATION
Peaco Balkovich III
11-17-00
Washington State Department of Transportation

NOTES:
1. The inlets pipe is 1" nominal diameter. Schedule 40 steel pipe, as indicated; all other pipe shown on the plan is 1 1/4" nominal diameter. Schedule 40 steel pipe. All pipe, couplings, and elbows shall be galvanized in accordance with ASTM A 153.

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

3. The pipe height required in this design may be achieved by using pipe fillings, or by bending the pipe. See DETAIL "K", Sheet 2.

4. Coat the 1" diameter pipe with grease (petroleum) before fitting the 1 1/4" diameter pipe (canister type) onto it, to aid rotation and to guard against corrosion.

5. The Platform design shown in this plan is detailed in the PLATFORM DETAIL, standard Plan H-70.31, Sheet 2. This design features side attachments that accommodate several types of mailbox supports; these details are necessary for assembling the type being installed and are required.

6. Match the edges of the mailbox platform to the end of the horizontal pipe mount. Center the mailbox to the platform to ensure space for the mailbox door to open and to allow space for installing the brackets. Specifying a mailbox mounting hole varies among manufacturers. Attachment of the mailbox to the platform may require drilling additional holes through the mailbox to fit the platform, see ALIGNMENT DETAIL.

7. Attach a newspaper box to the pipe with two 1 3/4" muther clamps spaced 4" apart. Newspaper boxes must not extend beyond the front of the mailbox when the mailbox door is closed.
NOTES

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

2. Install silt fencing along contours.

3. Install the ends of the silt fence in a point slightly up-slope to prevent sediment from flowing around the ends of the fence.

4. Perform maintenance in accordance with standard specifications 8.01.2(a) and 8.01.3(a).

SILT FENCE

STANDARD PLAN I-30.15-09

SPLODED FRAME SECTIONS SHALL BE CLOSE ENOUGH TOGETHER TO PREVENT SILT LAIDEN WATER FROM DRIPPING THROUGH THE FENCE. THE OVERLAP JOINING SECTIONS SHALL NOT BE PLANTED IN LOW SPOTS OR IN WATER LOCALIZED SPOLCE DETAIL.

SEE NOTE 2

FABRIC (DRIED TEXTILE) (TYPICAL)

STAPLE (TYPICAL) (4 PER POLE)

TYPICAL SPLICE

SEE DETAIL

NOTE

DURING EXCAVATION, MINIMIZE DISTURBING THE GROUND AROUND TRENCH AS MUCH AS IS FEASIBLE AND SMOOTH SURFACE FOLLOWING EXCAVATION TO AVOID CONCENTRATING FLOODED.

SECTION A

TYPICAL SPLICE

SEE NOTE 3

COMPACTED NATIVE SOIL

MATERIAL

FLOW

FLOW
SILT FENCE DESIGN

PLACE SAND BAGS AS REQUIRED AROUND CULVERT TO PROVIDE SUPPORT FOR SILT FENCE.

DISTURBED AREA

PROTECTED AREA

GEOTEXTILE FOR TEMPORARY SILT FENCE ~ SEE STD. SPEC. 9-33.2(1), TABLE 6

POST ~ SEE STD. SPEC. 8-01.3(9)A

EMBED POSTS INTO SAND BAGS AS REQUIRED

EDGE OF GEOTEXTILE

PLACE SAND BAGS AS REQUIRED AROUND CULVERT TO PROVIDE SUPPORT FOR SILT FENCE.

DISTURBED AREA

PROTECTED AREA

COMPOST BERM DESIGN

CULVERT, BOX CULVERT, OR PIPE ARCH ~ END TREATMENT VARIES

EMBED POSTS INTO SAND BAGS AS REQUIRED

FLow

NOTE: Perform maintenance in accordance with Standard Specification 8-01.3(9)A and 8-01.3(15).

SILT FENCE ~ SEE STD. PLAN I-30.20

COMPOST BERM ~ SEE STD. PLAN I-80.10

EROSION CONTROL AT CULVERT ENDS

STANDARD PLAN I-30.20-00

Sheet 1 of 1 sheet

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Wattles shall be in accordance with Standard Specification 9-14.5(5). Install Wattles along contours. Installation shall be in accordance with Standard Specification 8-01.3(10).

2. Securely knot each end of Wattles. Abut adjacent Wattles tightly, end to end, without overlapping the ends.

3. Pilot holes may be driven through the Wattles and into the soil when soil conditions require.

4. Live stakes may be used for permanent installation and shall be in accordance with Standard Specification 9-14.5(6).

5. Wattles shall be inspected regularly, and immediately after a rainfall produces runoff, to ensure they remain thoroughly entrenched and in contact with the soil.

6. Perform maintenance in accordance with Standard Specification 8-01.3(15).
Compost Sock shall be in accordance with Standard Specification 9-14.5(6). Compost Sock shall be a minimum of 8" in diameter or sized to suit conditions as specified by the Engineer or Contractor.

Compost material to be dispersed on site, as determined by the Engineer.

When placing Compost Sock on slopes, use Erosion Control Blanket if specified by the Engineer and in accordance with Standard Specification 9-14.8(2). See Standard Plan I-60.10.

Always install Compost Sock perpendicular to slope and along contour lines.

Remove sediment from the up-slope side of the Compost Sock when accumulation has reached 1/2 of the effective height of the Compost Sock.

Live stakes can be used in addition to wooden stakes and shall be in accordance with Standard Specification 9-14.K(1). See plans for species selection and spacing.
Bales shall be placed in a row with the ends tightly abutting.

Steel or 2x4 wooden stakes (Typ.)

Drive fruit stake at an angle towards the previous bale to promote a tight fit.

Steel or 2x4 wooden stakes (Typ.)

Bale bindings

8-12 in. penetration

Firely pack any spaces with straw

Straw stake

Stake vertically

Second stage

Steel or 2x4 wooden stake

Straw bale

Key in bales to prevent erosion or flow under bales - 4" minimum

Compact native material to prevent erosion

Flow

Notes:

1. See Standard Specification 8-01.3(16) for additional information.

2. Perform maintenance in accordance with Standard Specification 8-01.3(16).
Prefabricated units may be used in lieu of the design shown on this plan upon approval of the Engineer. Structure shall be constructed such that geotextile material shall be fastened to posts creating a seam-less joint.

Ensure that ponding height of water does not cause flooding on adjacent roadways or private property.

Perform maintenance in accordance with Standard Specification 8-01.3(16).

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 seam-less joint.
3. Ensure that ponding height of water does not cause flooding on adjacent roadways or private property.
4. Perform maintenance in accordance with Standard Specification 8-01.3(16).
NOTES

1. Size the Below Inlet Grate Device (BIGD) for the storm water structure it will service.

2. The BIGD shall have a built-in high-flow relief system (overflow bypass).

3. The retrieval system must allow removal of the BIGD without spilling the collected material.


SIZE THE BELOW INLET GRATE DEVICE (BIGD) FOR THE STORM WATER STRUCTURE IT WILL SERVICE.

THE BIGD SHALL HAVE A BUILT-IN HIGH-FLOW RELIEF SYSTEM (OVERFLOW BYPASS).

THE RETRIEVAL SYSTEM MUST ALLOW REMOVAL OF THE BIGD WITHOUT SPILLING THE COLLECTED MATERIAL.

PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATION 8-01.2(15).

STORM DRAIN INLET PROTECTION

STANDARD PLAN I-40.20-00

Sheet 1 of 1 Sheet

APPROVED FOR PUBLICATION

Washington State Department of Transportation

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Washington State Department of Transportation

NOT TO SCALE

BELOW INLET GRATE DEVICE

OVERFLOW BYPASS (TYP.)
Geotextile encased Check Dams shall meet the requirements of Standard Specifications 8-01.3(6)A and 9-14.5(4).

1. 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.

2. Dig trench approximately 6" wide and deep, staple end of geotextile, and backfill with native material.

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

4. Perform maintenance in accordance with Standard Specifications 8-01.3(15).

Flat bottom ditch design shown, Check Dam installation details are similar for "V" bottom ditches.

Perform maintenance in accordance with Standard Specifications 8-01.3(15).
ROCK CHECK DAM

SPACE CHECK DAMS THE DISTANCE APART WHERE POINTS "A" AND "B" ARE THE SAME ELEVATION.

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

SACKS SHALL BE #10 BURLAP OR APPROVED ALTERNATE FILLED WITH 48 TO 55 LBS. OF GRAVEL BACKFILL FOR DRAINS.

SPACE CHECK DAMS THE DISTANCE APART WHERE POINTS "A" AND "B" ARE THE SAME ELEVATION.

NOTE: SPACE CHECK DAMS THE DISTANCE APART WHERE POINTS "A" AND "B" ARE THE SAME ELEVATION.

SPILLWAY

EFFECTIVE DAM HEIGHT

SIDE PROTECTION

SPILLWAY

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

SACKS SHALL BE #10 BURLAP OR APPROVED ALTERNATE FILLED WITH 48 TO 55 LBS. OF GRAVEL BACKFILL FOR DRAINS.

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

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EFFECTIVE DAM HEIGHT

SIDE PROTECTION

SPILLWAY

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

SACKS SHALL BE #10 BURLAP OR APPROVED ALTERNATE FILLED WITH 48 TO 55 LBS. OF GRAVEL BACKFILL FOR DRAINS.

SPACE CHECK DAMS THE DISTANCE APART WHERE POINTS "A" AND "B" ARE THE SAME ELEVATION.
NOTES

1. More than the minimum of one fastener per square yard may be required due to conditions such as blanket composition, soil type, surface uniformity, and slope steepness.

2. See Standard Specification 8-01.3(3).
EROSION CONTROL BLANKET

FASTENER

TAMPED NATIVE SOIL

EROSION CONTROL BLANKET

FLOW

EROSION CONTROL BLANKET

6" MIN. END OVERLAP

6" MIN. EDGE OR END OVERLAP

6" × 6" TRENCH

ENDS BLANKET EDGES

APPROVED FOR PUBLICATION

DATE

STATE DESIGN ENGINEER

Washington State Department of Transportation

SHEET 1 OF 1 SHEET

EROSION CONTROL BLANKET PLACEMENT IN CHANNEL

PERSPECTIVE VIEW

DRAWN BY: MARK SUJKA

STANDARD PLAN I-60.20-00

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. Provide Check Slots per manufacturer's recommendations.

3. Roll edges may be spliced in a check slot.


Roll ends may be spliced in a check slot.

Provide Check Slots per manufacturer's recommendations.

See Standard Specification 8-01.3(3).

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.

Landscape architect's certificate number 000598.

Mark W. Maurer

Pasco Bakotich III

08-31-07

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SECTION A

TEMPORARY SEDIMENT TRAP

1. Provide a minimum of 0.5 m crushed rock beneath the silt fence. Do not use the same crushed rock used for the berm.

OUTFLOW CHANNEL IS CONSTRUCTED BY EXCAVATION

1.5' DEPTH OVERFLOW

Sediment Trap Bottom

1.5' DEPTH OF 47 M, 1/2-YARD WASHED GRAVEL BACKFILL

NOTE

PLACE SEDIMENT TRAP UNDER THE SILLFENCE AND RISE SLOPES. PROVIDE A CONTINUOUS LAYER BETWEEN THE GRAVEL ROCK AND THE NATIVE SEDIMENT MATERIAL.

1. COMPACTED NATIVE MATERIAL

2. CONSTRUCTED BY EXCAVATION

3. ON EMBANKMENT

X = 1' IF FOR SLOPES 4:1 V OR FLATTER

X = 1.5' IF FOR SLOPES STEEPER THAN 4:1 V

TYPICAL SECTION

COMPOST BERM DETAIL
HIGH MAST TIMBER LUMINAIRE SUPPORT

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

EQUIPMENT

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. Visit arm length - see Contract
5. 1/4" galvanized thimble eyebolt (single or double) with washers and nuts or eyenut
6. Bending jumper
7. Pole and bracket cable
9. From ground line to 10' above ground, enclose equipment grounding conductor in galvanized steel conduit, code sized. Above 10' from ground, staple equipment grounding conductor to pole. Connect to supplemental ground per Standard Plan J-9a.
10. Service wedge clamp
11. ACSR triplex or quadruplex 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
19. Class 5 timber pole - length sufficient for mounting height and burial depth
20. Class 2 timber pole - length sufficient for mounting height and burial depth
21. 3/8" x 4" machine bolts (four required) with washers and nuts
22. 1/2" lag bolts (six required) - drill 9/16" hole in plate
23. 2" pipe
grounding lug
24. 3/4" wire hole 2" from gusset plate, smooth hole edges
25. 1" nonmetallic conduit with 3/4" straps at code spacing
26. Distance varies, 35' MIN, 50' MAX, depending on line clearance requirements

NOTES:

1. Timber luminaire supports are allowed only for temporary installations where breakaway or slip bases are not required.
2. When down guys are required, see Standard Plan J-7a.
3. Timber luminaire supports are allowed only for temporary installations where breakaway or slip bases are not required.

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

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

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

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

5. Bend and attach to pole within 2' of enclosure. See Standard Plan "Typical Grounding Details."

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

7. For Type C service wiring diagram, use Standard Plan "Type E Service."

8. See breaker schedule in contract for breaker and contactor sizes.
**Wireway Detail**

- All handholes 180°
- Wireway 270°
- Luminaire and wireway 180°

**Attachment Point Angles**

- Cone section
- Wireways (two per pole) (See Detail)
- Removeable cap
- Handhole per cable connection (See Detail)

**Cone Section Detail**

- 3/4" x 3/4" Light hex bolt and nut (5 each per clamp)
- 1 1/4" (TYP)
- 5/8" DIA x 3 1/2" Heavy hex bolt

**Handhole Detail**

- See Note 4

**Foundation Detail**

- 1 1/2" DIA x 60" Chase nipple
- 2 1/2" Split coupling (see Note 1)

**Pole Wall**

- 2 1/4" TYP
- 2 1/2" DIA elbow (see Note 1)
- 3 1/2" (TYP)

**Handhole Details**

- Removable raintight handhole cover with gasket.
- Fasten with 2 stainless steel (ASTM F-593) screws

**Foundation Design**

- Two threads 1/4" x 1/2" Clearance
- 3/8" DIA Plastic drain tube

**Strain Pole Standards Type IV and V**

- #4 hoops, round or square at 1'-0" approximate centers
- 3' Square or round or 4' round

**Key**

- A: Base plate width
- B: Anchor bolt circle diameter
- C: Pole base diameter
- D: Base plate thickness
- E: Anchor bolt size
- F: Anchor plate size
- G: Vertical steel number and size

**Notes**

1. 2 1/2" diameter weatherhead may be substituted for the elbow and nipple assembly.
2. Pole shaft shall have 0.14"/ft taper.
4. Handholes may be 6" x 4" oval or rectangle.

**Strain Pole Dimension Chart**

<table>
<thead>
<tr>
<th>Item</th>
<th>Type IV</th>
<th>Type V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base plate width</td>
<td>12&quot;</td>
<td>10&quot;</td>
</tr>
<tr>
<td>Anchor bolt circle diameter</td>
<td>18&quot;</td>
<td>14&quot;</td>
</tr>
<tr>
<td>Pole base diameter</td>
<td>14&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>Base plate thickness</td>
<td>1 3/4&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>Anchor bolt size</td>
<td>1&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>Anchor plate size</td>
<td>1&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>Vertical steel number and size</td>
<td>2 1/2&quot; DIA, 1/0</td>
<td>2&quot; DIA, 1/0</td>
</tr>
</tbody>
</table>

**Pole Classes (Resultant Horizontal Tension)**

- Type IV: 1900, 2700, 3700, 4800, 5600, 6300, 7200
- Type V: 2700, 3700, 4800, 5600, 6300, 7200

**Base Plate Details**

- 3/8" Thick (A36) steel clamps
- 1 1/4" x 60" Schedule 80 pipe sleeve
- 1 1/2" DIA x 1/4" Schedule volunteer bolt

**Strain Clamp Detail**

- 1/2" for 3 Gauge
- 3/8" for 1/0 Gauge

**Foundation Depth**

- (See Contract)

**Strain Pole Standards**

- Type IV and V

**Approval**

- Clifford E. Mansfield
- State Design Engineer
- Washington State Department of Transportation

**Expiration**

- January 11, 1999
TYPE 1 INDUCTION LOOP

STANDARD PLAN J-8a

NOTE
1. For Sections A and B, see Standard Plan J-8d.

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1. For Sections A and B, see Standard Plan J-8d.
1. All of the loop lead-in wires shall return to the Junction Box.
2. For splice detail, see Standard Plan J-8d.
NOTE

1. For Sections A and B, see Standard Plan J-8d.
1. All of the loop lead-in wires shall return to the Junction Box.

2. For Splice Detail, see Standard Plan J-8d.

NOTES

1. Traffic Flow

SPLICE (TYP.)

S = START

F = FINISH

STOP LINE

SPLICE (TYP.)

S1

F1

S2

F2

S3

F3

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1. Fill the conduit trench to the top of the existing or new surfacing with CSTC, sand or controlled density fill. See "Standard Specifications" Section 2-09.3(1)E.

2. Minor Regional variations are allowed in the soft pocket closure. Consult with the Engineer or see the Contract for additional requirements.

3. Conductors shall be snug to the bottom of the sawcut. High temperature backer rod shall be snug to the conductors.

**CONDUIT SIZING TABLE**

<table>
<thead>
<tr>
<th>LOOP LEAD PAIRS</th>
<th>1-2</th>
<th>3</th>
<th>4-5</th>
<th>6-8</th>
<th>9-12</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CONDUIT SIZE (IN)</strong></td>
<td>1&quot;</td>
<td>1 1/4&quot;</td>
<td>1 1/2&quot;</td>
<td>2&quot;</td>
<td>2 1/2&quot;</td>
</tr>
</tbody>
</table>

**NOTES**

- For conduit size to controller cabinet, see contract.
- See conduit bending table for conduit bend.
- Lead-in conduit, 5 ft pocket section.
- Junction box placement.
- See conduit end table for conduit end.
- Lead-in conduit.
- Twin conductor.
- Band or controller density pull.
- See conduit end table for additional conduit details.

**INDUCTION LOOP DETAILS**

- Standard Plan J-8d
- Sheet 1 of 2 sheets
- Approved for publication
- Harold J. Peterfeso 03-30-04
- Washington State Department of Transportation

**EXPIRES MAY 5, 2005**
1. Install the Junction Box and the lead-in conduit.
2. Sawcut the loop slots and the lead-in slots.
3. Lay out the loop wire starting at the Junction Box, allowing 5' minimum slack.
4. Install the wire in the loop slot as shown.
5. Finish laying out the wire at the Junction Box and identify the leads with the loop number, the "S" for start and the "F" for finish, and the loop series number.
6. Twist each pair of the lead-in wires two times per foot from the loop to the Junction Box. Reverse the direction of the twist for each successive pair installed.
7. Construct a supplemental splice containing any series loop connections required in the plans. Supplemental splices are subject to the same requirements shown for the loop lead and the shielded cable splice.
8. Splice the loop leads of supplemental splice leads to the shielded cable as noted in the Contract.
9. Complete installation and test loop circuits or combination loop circuits. See Standard Specifications 8-20.3(14)D.
10. Consult for the loop stubout shall be as required in the Contract.

**LOOP INSTALLATION NOTES**

**SPLICE DETAIL**

**SAWCUT AND CONDUIT CONNECTION PLAN**

**DETAIL "A"**

**DETAIL "B"**

**LOOP LEAD-IN WIRING LABEL**

**STANDARD PLAN J-8d**

**INDUCTION LOOP DETAILS**

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

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

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

---

**GROUNDING DETAILS**

- **Service Neutral**
- **Service Ground**
- **Grounding Electrode Conductor**
- **Bonding Jumper**
- **Grounding Bushing (typ. all conduit terminations)**
- **Service Neutral Bus (Copper)**
- **Service Enclosure**
- **Equipment Grounding Conductor**
- **Junction Box**
- **Electrical Load Support (luminaire pole)**
- **Copper Split Bolt Clamp**
- **Galvanized Steel Conduit (GSC)**
- **Non-metallic Conduit (NMC)**
- **Option A - 10’ GSC with Field Bend**
  - Approved Adapter Fitting
  - Grounding Bushing
- **Option B - 10’ GSC**
  - GS Factory Elbows
  - Approved Adapter Fitting
  - GS Coupling
  - Grounding Bushing

**SUPPLEMENTAL GROUND**

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

**SERVICE GROUND**

Required at all services and separately derived systems.

**GROUND ROD DETAILS**

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

---

**NOTES**

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

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

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

<table>
<thead>
<tr>
<th>ITEM</th>
<th>TYPE 4</th>
<th>TYPE 5</th>
<th>TYPE 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOX INN. LENGTH</td>
<td>10&quot;</td>
<td>20&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>LID LENGTH</td>
<td>10&quot;</td>
<td>20&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>LID WIDTH</td>
<td>15 1/4&quot;</td>
<td>21 1/4&quot;</td>
<td>25 1/4&quot;</td>
</tr>
<tr>
<td>LID THICKNESS</td>
<td>1/8&quot;</td>
<td>1/8&quot;</td>
<td>1/8&quot;</td>
</tr>
<tr>
<td>STIFFENER SPACING</td>
<td>4&quot;</td>
<td>5 1/2&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>STIFFENER LENGTH</td>
<td>12 1/4&quot;</td>
<td>18 1/4&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>STIFFENER SPACING</td>
<td>0&quot;</td>
<td>1&quot;</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>STIFFENER LENGTH</td>
<td>16 1/4&quot;</td>
<td>21 1/4&quot;</td>
<td>25 1/4&quot;</td>
</tr>
<tr>
<td>CAPACITY ~ CONDUIT DIA.</td>
<td>0&quot;</td>
<td>1/2&quot;</td>
<td>3/4&quot;</td>
</tr>
</tbody>
</table>

### Notes

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

2. All lid thicknesses are minimum. The diamond pattern shall be 3/32" minimum thick.

3. Lid stiffener plates shall bear on frame. Mill to bearing seat and perimeter bar for full even contact after fabrication of frame and lid. Lid and frame units with uneven bearing will be rejected.

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

5. The hinges shall allow the lids to open 180°.

6. The hinges shall allow the lids to open 180°.

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

8. Connect a bonding jumper to steel conduit bushing for GRS conduit, connect to equipment grounding conductor for PVC conduit. As an alternative, the bonding jumper shall be attached to the front face of the hinge pocket with a 5/16-20NC × 3/4" bolt, S.S. nut, and flat washer. Bonding jumper shall be 60 min. W of framed inside spacer.

9. The System Identification letters shall be 1/8" line thickness formed by engraving, stamping, or with a S.S. weld bead. Grind off diamond pattern before forming letters. See System Identification Detail.

10. A 1/4-20NC × 3/4" S.S. ground stud shall be welded to the bottom of each lid; include S.S. nut and flat washer.

11. See the Standard Specifications for class of concrete.
These are general installation instructions
See specific manufacturer's installation instructions in the special provisions of the contract.

1. Using pavement crayons, paint, tape measure and cord, carefully mark the layout of the sensor installation. Ensure sensors are placed exactly perpendicular to the flow of traffic and that all lines are straight. Verify that the passive cable length is enough to reach the cabinet. Do not splice cable. Leave a 4' minimum cable length inside of the cabinet.

2. Using a wet-cutting pavement saw with a 3/4" diamond blade, wet-cut the slot for the sensor. The slot must be 3/4" wide, +/- 1/16", by 1" minimum deep. Cut the slot 8" longer than the sensor length, including the lead attachment.

3. Cut home run slots for Piezo sensors. Center the home run slot on the sensor slot. Cut the home run slots 2" minimum to 2 1/2" maximum deep and 1/4" minimum wide. Cut the slots wider if installing conduit.

4. Using a power washer with water, remove and collect all the slurry and loose material from the slots. Sweep the slots with a stiff wire bristled brush. Dry all of the slits with a large capacity air compressor (150 CFM minimum). All of the slits and the pavement 1' on either side must be completely dry.

Using pavement crayons, paint, tape measure and cord, carefully mark the layout of the sensor installation. Ensure sensors are placed exactly perpendicular to the flow of traffic and that all lines are straight. Verify that the passive cable length is enough to reach the cabinet. Do not splice cable. Leave a 4' minimum cable length inside of the cabinet.

Using a wet-cutting pavement saw with a 3/4" diamond blade, wet-cut the slot for the sensor. The slot must be 3/4" wide, +/- 1/16", by 1" minimum deep. Cut the slot 8" longer than the sensor length, including the lead attachment.

Cut home run slots for Piezo sensors. Center the home run slot on the sensor slot. Cut the home run slots 2" minimum to 2 1/2" maximum deep and 1/4" minimum wide. Cut the slots wider if installing conduit.

Using a power washer with water, remove and collect all the slurry and loose material from the slots. Sweep the slots with a stiff wire bristled brush. Dry all of the slits with a large capacity air compressor (150 CFM minimum). All of the slits and the pavement 1' on either side must be completely dry.
**WEIGH-IN-MOTION DETAILS**

**STANDARD PLAN J-20**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**

**APPROVED FOR PUBLICATION**

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---

1. **Class 1 Piezo Axle Sensor for Weigh-in-Motion, and Class 2 Piezo Axle Sensor for Permanent Traffic Recorder.**

2. **Installation Brackets (Typ.)**

3. **Home Run Slot (Typ.) SEE NOTE 9**

4. **Home Run Slot -**

5. **Loop Sealant SEE NOTE 22**

6. **Passive Wire**

7. **Rope or Backer Rod**

8. **Perm. Traffic Recorder Peizo Sensors and Weigh-in-Motion Peizo Sensors.**

9. **Induction Loops**

10. **Induction Loops to the site specifications.**

11. **Tape**

12. **Tape 2" duct tape along length of both sides of the sensor slot.**

13. **Tape 1/16" away from the slot.**

14. **Tape, 3/8" and 3/8" - SEE NOTES 12 & 13**

15. **Tape, 3/16" away from the slot.**

16. **Tape, 1/16" away from the slot.**

17. **Tape, 1/16" away from the slot.**

18. **Tape, 2" duct tape along length of both sides of the sensor slot.**

19. **Tape, 1/16" away from the slot.**

20. **Tape, 3/16" away from the slot.**

21. **Tape, 1/16" away from the slot.**

22. **Tape, 1/16" away from the slot.**

---

**TOP OF ROADWAY**

**PLATE**

**SECTION**

**3/4" SEE NOTES 16 THRU 21**

**FILL SENSOR SLOT WITH GROUT**

**SEE NOTES 16 THRU 21**

**SEE NOTES 16 THRU 21**

**FILL SENSOR SLOT WITH GROUT**

**SEE NOTES 16 THRU 21**

**SEE NOTES 16 THRU 21**

**FILL SENSOR SLOT WITH GROUT**

**SEE NOTES 16 THRU 21**

**SEE NOTES 16 THRU 21**

**SEE NOTES 16 THRU 21**

**SEE NOTES 16 THRU 21**

**SEE NOTES 16 THRU 21**

**SEE NOTES 16 THRU 21**

**SEE NOTES 16 THRU 21**

**SEE NOTES 16 THRU 21**

---

**THESE ARE GENERAL INSTALLATION INSTRUCTIONS**

**SEE SPECIFIC MANUFACTURER’S INSTALLATION INSTRUCTIONS IN THE SPECIAL PROVISIONS OF THE CONTRACT**

**1. 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.**

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

**3. Place the sensor in the slot in the road. The end of the sensor should be 4" to 6" away from the slot.**

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

**5. Place the sensor in the slot in the road. The end of the sensor should be 4" to 6" away from the slot.**

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

**7. Place the sensor in the slot in the road. The end of the sensor should be 4" to 6" away from the slot.**

**8. Place the sensor in the slot in the road. The end of the sensor should be 4" to 6" away from the slot.**

**9. Place the sensor in the slot in the road. The end of the sensor should be 4" to 6" away from the slot.**

**10. Place the sensor in the slot in the road. The end of the sensor should be 4" to 6" away from the slot.**

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

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

**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, canted or bent).**

**14. Run the passive wire the length of the home run slot. Place the polypropylene tape 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 induction loops to the site specifications.**

**16. 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.**

**17. Using a low speed mixing drill (400 rpm) and a mixing paddle, pour the grout for 2 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 small beak. Mix until the grout starts to harden. Use a belt sander to sand the top of the grout flush with the surface.**

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

**20. Apply latex (or equivalent) tape along length of both sides of the sensor slot.**

**21. Apply latex (or equivalent) tape along length of both sides of the sensor slot.**

**22. Apply latex (or equivalent) tape along length of both sides of the sensor slot.**

**23. Run the passive wire the length of the home run slot. Place the polypropylene tape under and over the passive cable inside the slot. This will keep the grout from running out into the deeper home run slot.**

**24. Once the grout for the Weigh-in-Motion Peizo Sensors is cured, approximately 35 minutes, depending on grout type and ambient temperature.**

**25. Once the grout for the Weigh-in-Motion Peizo Sensors is cured, approximately 35 minutes, depending on grout type and ambient temperature.**

**26. Once the grout for the Weigh-in-Motion Peizo Sensors is cured, approximately 35 minutes, depending on grout type and ambient temperature.**

**27. Once the grout for the Weigh-in-Motion Peizo Sensors is cured, approximately 35 minutes, depending on grout type and ambient temperature.**

**28. Once the grout for the Weigh-in-Motion Peizo Sensors is cured, approximately 35 minutes, depending on grout type and ambient temperature.**

---

**PERMANENT TRAFFIC RECORDER AND WEIGH-IN-MOTION DETAILS**

**STANDARD PLAN J-20**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**

**APPROVED FOR PUBLICATION**

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**TEMPERATURE, HUMIDITY, AND ATMOSPHERIC INFLUENCES**

**MEASUREMENTS**

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1. The Loop and Piezo leads in all Junction Boxes and Cabinets are to be color-coded. Use colored tapes on each specific wire, see table. Wrap the tapes on the wires approximately 6” beyond conduit in all Junction Boxes.

2. The maximum load in the Cabinet is 5 Amps.

3. The Cabinet may be pedestal or pad mount, see Standard Plan J-6c for details.


6. Color Code Identification Table

<table>
<thead>
<tr>
<th>Color</th>
<th>Circuit No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>0</td>
</tr>
<tr>
<td>Brown</td>
<td>1</td>
</tr>
<tr>
<td>Red</td>
<td>2</td>
</tr>
<tr>
<td>Orange</td>
<td>3</td>
</tr>
<tr>
<td>Yellow</td>
<td>4</td>
</tr>
<tr>
<td>Green</td>
<td>5</td>
</tr>
<tr>
<td>Blue</td>
<td>6</td>
</tr>
<tr>
<td>Violet</td>
<td>7</td>
</tr>
<tr>
<td>Gray</td>
<td>8</td>
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<td>Brown</td>
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<td>Green</td>
<td>15</td>
</tr>
<tr>
<td>Blue</td>
<td>16</td>
</tr>
<tr>
<td>Violet</td>
<td>17</td>
</tr>
</tbody>
</table>

NOTES:
- Color coded labels on all wires and for splice kit enclosure.
- Standard Specification 9-29 for splice requirements.

See Special Provisions in the contract for splice kit enclosure.
NOTES

2. Steel shaft shall be tapered either round or hexagonal (12 sides), 11 gages, 4 1/2" O.D. at 12.5 ft. Taper shall be 0.14 inches per foot.

3. All poles shall be hot-dip galvanized per AASHTO M111.

4. Welding of structures shall be in accordance with the latest edition of the AWS D1.1 Structural Welding Code - Steel. All butt welds shall be ground flush with base metal.


2. Steel shaft shall be tapered either round or diamond (12:16), 11 ga, 1 1/2" O.D., all galvanized. Taper shall be 0.14 inches per foot. Pedestrian signal display shall be mounted on an octagonal (8-sided) traffic signal pole with a pole attachment angle offset at 0°, 45°, 100°, 135°, 180°, 225°, 270°, or 315° shall utilize:
   - Type A mounting when two pedestrian heads are installed on the same signal pole.
   - Type B mounting when only one pedestrian signal head is mounted on a signal pole.

3. All poles shall be hot dip galvanized per AASHTO M111.

4. Welding of structures shall be in accordance with the latest edition of the AASHTO D1.1 Structural Welding Code - Steeel. All welds shall be ground flush with base metal.

5. Vane shall be 6F Polycarbonate, fully enclosed drive at bottom to reduce glare on sign. Display shall be of appropriate color needed.

NOTES
2. See Standard Specifications Sec. 8-89.17 for additional Mounting Bracket and Fitting information not shown.
3. Grounding Conductor shall be non-insulated 8 AWG stranded copper, provide 3'-7" min. burial. Clamp to steel mounting bar with connector suitable for use embedded in concrete.
4. Top of Leveling Nut height shall be 1" maximum above foundation.
5. Heat shrink cap all spares conductors not terminated on a terminal strip.
# Foundation Reinforcement Detail

**ALTERNATE #1**

Concrete cast directly against undisturbed earth, drilled shaft

Assembly Note:
A temporary template shall be used to hold the top of the support. Adequate security in the proper position during the foundation installation.

---

# Foundation Depth "D" Table

**ALTERNATE #1 - DRILLED SHAFT TYPE CONSTRUCTION**

<table>
<thead>
<tr>
<th>Allowable Lateral Stabilization Pressure</th>
<th>Basis Aisle Widths (Ft)</th>
<th>Ground Area of Foundation (Ft²)</th>
<th>Allowable Lateral Stabilization Pressure</th>
<th>Basis Aisle Widths (Ft)</th>
<th>Ground Area of Foundation (Ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 Pfs</td>
<td>3'-0&quot; ROUND</td>
<td>3'-0&quot; x 6'-0&quot;</td>
<td>1000 Pfs</td>
<td>3'-0&quot; ROUND</td>
<td>3'-0&quot; x 6'-0&quot;</td>
</tr>
<tr>
<td>1500 Pfs</td>
<td>4'-0&quot; ROUND</td>
<td>4'-0&quot; x 8'-0&quot;</td>
<td>1500 Pfs</td>
<td>4'-0&quot; ROUND</td>
<td>4'-0&quot; x 8'-0&quot;</td>
</tr>
<tr>
<td>2500 Pfs</td>
<td>6'-0&quot; SQUARE</td>
<td>6'-0&quot; x 12'-0&quot;</td>
<td>2500 Pfs</td>
<td>6'-0&quot; SQUARE</td>
<td>6'-0&quot; x 12'-0&quot;</td>
</tr>
<tr>
<td>4000 Pfs</td>
<td>8'-0&quot; ROUND</td>
<td>8'-0&quot; x 16'-0&quot;</td>
<td>4000 Pfs</td>
<td>8'-0&quot; ROUND</td>
<td>8'-0&quot; x 16'-0&quot;</td>
</tr>
<tr>
<td>5000 Pfs</td>
<td>10'-0&quot; ROUND</td>
<td>10'-0&quot; x 20'-0&quot;</td>
<td>5000 Pfs</td>
<td>10'-0&quot; ROUND</td>
<td>10'-0&quot; x 20'-0&quot;</td>
</tr>
<tr>
<td>6000 Pfs</td>
<td>12'-0&quot; SQUARE</td>
<td>12'-0&quot; x 24'-0&quot;</td>
<td>6000 Pfs</td>
<td>12'-0&quot; SQUARE</td>
<td>12'-0&quot; x 24'-0&quot;</td>
</tr>
<tr>
<td>8000 Pfs</td>
<td>15'-0&quot; ROUND</td>
<td>15'-0&quot; x 30'-0&quot;</td>
<td>8000 Pfs</td>
<td>15'-0&quot; ROUND</td>
<td>15'-0&quot; x 30'-0&quot;</td>
</tr>
<tr>
<td>10000 Pfs</td>
<td>18'-0&quot; SQUARE</td>
<td>18'-0&quot; x 36'-0&quot;</td>
<td>10000 Pfs</td>
<td>18'-0&quot; SQUARE</td>
<td>18'-0&quot; x 36'-0&quot;</td>
</tr>
<tr>
<td>12000 Pfs</td>
<td>20'-0&quot; ROUND</td>
<td>20'-0&quot; x 40'-0&quot;</td>
<td>12000 Pfs</td>
<td>20'-0&quot; ROUND</td>
<td>20'-0&quot; x 40'-0&quot;</td>
</tr>
<tr>
<td>15000 Pfs</td>
<td>24'-0&quot; SQUARE</td>
<td>24'-0&quot; x 48'-0&quot;</td>
<td>15000 Pfs</td>
<td>24'-0&quot; SQUARE</td>
<td>24'-0&quot; x 48'-0&quot;</td>
</tr>
</tbody>
</table>

**ALTERNATE #2 - CORRUGATED METAL PIPE TYPE CONSTRUCTION**

<table>
<thead>
<tr>
<th>Allowable Lateral Stabilization Pressure</th>
<th>Basis Aisle Widths (Ft)</th>
<th>Ground Area of Foundation (Ft²)</th>
<th>Allowable Lateral Stabilization Pressure</th>
<th>Basis Aisle Widths (Ft)</th>
<th>Ground Area of Foundation (Ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 Pfs</td>
<td>3'-0&quot; ROUND</td>
<td>3'-0&quot; x 6'-0&quot;</td>
<td>1000 Pfs</td>
<td>3'-0&quot; ROUND</td>
<td>3'-0&quot; x 6'-0&quot;</td>
</tr>
<tr>
<td>1500 Pfs</td>
<td>4'-0&quot; ROUND</td>
<td>4'-0&quot; x 8'-0&quot;</td>
<td>1500 Pfs</td>
<td>4'-0&quot; ROUND</td>
<td>4'-0&quot; x 8'-0&quot;</td>
</tr>
<tr>
<td>2500 Pfs</td>
<td>6'-0&quot; SQUARE</td>
<td>6'-0&quot; x 12'-0&quot;</td>
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<td>6'-0&quot; SQUARE</td>
<td>6'-0&quot; x 12'-0&quot;</td>
</tr>
<tr>
<td>4000 Pfs</td>
<td>8'-0&quot; ROUND</td>
<td>8'-0&quot; x 16'-0&quot;</td>
<td>4000 Pfs</td>
<td>8'-0&quot; ROUND</td>
<td>8'-0&quot; x 16'-0&quot;</td>
</tr>
<tr>
<td>5000 Pfs</td>
<td>10'-0&quot; ROUND</td>
<td>10'-0&quot; x 20'-0&quot;</td>
<td>5000 Pfs</td>
<td>10'-0&quot; ROUND</td>
<td>10'-0&quot; x 20'-0&quot;</td>
</tr>
<tr>
<td>6000 Pfs</td>
<td>12'-0&quot; SQUARE</td>
<td>12'-0&quot; x 24'-0&quot;</td>
<td>6000 Pfs</td>
<td>12'-0&quot; SQUARE</td>
<td>12'-0&quot; x 24'-0&quot;</td>
</tr>
<tr>
<td>8000 Pfs</td>
<td>15'-0&quot; ROUND</td>
<td>15'-0&quot; x 30'-0&quot;</td>
<td>8000 Pfs</td>
<td>15'-0&quot; ROUND</td>
<td>15'-0&quot; x 30'-0&quot;</td>
</tr>
<tr>
<td>10000 Pfs</td>
<td>18'-0&quot; SQUARE</td>
<td>18'-0&quot; x 36'-0&quot;</td>
<td>10000 Pfs</td>
<td>18'-0&quot; SQUARE</td>
<td>18'-0&quot; x 36'-0&quot;</td>
</tr>
<tr>
<td>12000 Pfs</td>
<td>20'-0&quot; ROUND</td>
<td>20'-0&quot; x 40'-0&quot;</td>
<td>12000 Pfs</td>
<td>20'-0&quot; ROUND</td>
<td>20'-0&quot; x 40'-0&quot;</td>
</tr>
<tr>
<td>15000 Pfs</td>
<td>24'-0&quot; SQUARE</td>
<td>24'-0&quot; x 48'-0&quot;</td>
<td>15000 Pfs</td>
<td>24'-0&quot; SQUARE</td>
<td>24'-0&quot; x 48'-0&quot;</td>
</tr>
</tbody>
</table>

**SHMOVED STANDARD FOUNDATION PLAN**

**STANDARD PLAN J-26.10-00**

Approved for Publication: 8-15-10

Peconic Bayfront Trail
Washington State Department of Transportation
1. This plan depicts the Steel Light Standard types and terms commonly referred to in the contract. All Steel Light Standards are fabricated in accordance with the Standard Specifications and the Contract Provisions.

2. The Luminaire Pole height shall not exceed 50’ (H1).

3. Slip Bases shall not be installed on 50’ (H1) poles with Double Mast Arms, nor on poles weighing more than 1000 lbs.

4. The optimal location of the Luminaire head is over the edge of the traveled way. Based on the placement of the Steel Light Standard foundation, the position of the Luminaire head may vary. See Standard Plan J-28.22.

5. The Light Standard mast arm orientation is typically perpendicular to roadway centerline. See Standard Plan J-28.50 for Hand Hole Details.


STEEL LIGHT STANDARD

STANDARD PLAN J-32.10-00

EFFECTIVE: AUGUST 2, 2010 TO JULY 31, 2011

POST TOP MOUNTED LUMINAIRE
SLIP BASE SHOWN

BRIDGE MOUNTED (TYPE 1 MAST ARM SHOWN)

MOUNTING HEIGHT
POLE

HOLES
LUMINAIRE POLE

BOTTOM OF POLE BASE
HAND HOLE

TOP OF BRIDGE DECK

STEEL LIGHT STANDARD BASE
MOUNTED ON BRIDGE
~ SEE STD. PLAN J-28.60,
C-8b, AND C-14h

MEDIAN BARRIER MOUNTED
(TYPE 1 MAST ARM SHOWN)

MOUNTING HEIGHT
POLE

HOLES
LUMINAIRE POLE

BOTTOM OF POLE BASE
HAND HOLE

STEEL LIGHT STANDARD BASE
MOUNTED ON MEDIAN
~ SEE STD. PLAN J-28.60,
C-8b, AND C-14h

POST TOP MOUNTED LUMINAIRE
SLIP BASE SHOWN

BOTTOM OF POLE BASE
HAND HOLE

STEEL LIGHT STANDARD
BARRIER MOUNTED BASE
~ SEE STD. PLAN J-28.60,
C-8b, AND C-14h

Hand hole

STEEL LIGHT STANDARD BASE
MOUNTED ON BRIDGE
~ SEE STD. PLAN J-28.60,
C-8b, AND C-14h

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

Pasco Bakotich III
08-07-07
NOTES

1. The Steel Light Standard Placement depicted on this plan is only intended for installations where roadside conditions allow its usage. Roadside conditions may require a special design by the Bridge Office, as determined by the Project Engineer.


TAPER NOTE

End Taper (on approach from opposing traffic):
20' (longitudinal) = use on one-way roadways, or where the Light Standard is not in the Design Clear Zone of the opposing traffic.
6H:1V min. taper = use when the Light Standard is in the Design Clear Zone of the opposing traffic.

BASED ON FIELD CONDITIONS, STEEL LIGHT STANDARD PLACEMENT CAN BE ADJUSTED

6 MIN.

1

6 MIN.

1
**CASE A**

Slopes 3H:1V thru 8H:1V (Max.)

**CASE B**

Slopes flatter than 3H:1V

**CASE C**

Fore slopes 4H:1V or flatter

**CASE D**

Fore slopes steeper than 4H:1V (3H:1V Max.)

**EMBANKMENTS**

- Not steeper than 10H:1V slope
- Fore slope steeper than 4H:1V (2H:1V Max.)
- Not steeper than 10H:1V slope (3.0' Min.)
- Not steeper than 2H:1V
- Slope flatter than 3H:1V
- Slopes flatter than 3H:1V
- Not steeper than 1.5H:1V
- Slope 3H:1V thru 2H:1V
- Fore slopes 4H:1V or flatter
- Fore slope steeper than 4H:1V (3H:1V Max.)

**DITCH SECTIONS**

- Not steeper than 10H:1V slope
- Fore slopes steeper than 4H:1V (2H:1V Max.)
- Slope flatter than 3H:1V
- Not steeper than 2H:1V
- Slope 3H:1V thru 2H:1V (Max.)
- Fore slopes 4H:1V or flatter
- Fore slope steeper than 4H:1V (3H:1V Max.)

**NOTE:**

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

METHOD 1
NO SUBSURFACE FORM

This option is only used when the existing soil in the hole will remain standing and the cement concrete can be placed without causing the soil to collapse. Concrete shall be cast directly against undisturbed soil.

Auger the hole for the foundation. Use paper or cardboard form to achieve a smooth finish on the final exposed cement concrete. Support the form as necessary to remain plumb.

See Standard Plane J-38.23 and J-38.33 for maximum heights of focused foundation when no embankment widening is to be installed.

Place the concrete foundation.

After concrete has cured, remove the paper or cardboard form.

Construct the embankment widening (if required).

METHOD 2
METAL (SUBSURFACE) FORM REQUIRED

When the existing soil will not remain a vertical face, over-excavate the foundation area and install a 36" diameter, corrugated metal (pipe) form. The corrugated metal forms shall not extend more than 6" below any portion of the foundation that will remain exposed upon final grading. continues forming to full height using paper or cardboard form to achieve a smooth finish on final exposed cement concrete. Support the form as necessary to remain plumb.

See Standard Plane J-38.24 and J-38.25 for maximum heights of focused foundation when no embankment widening is to be installed.

Place the concrete foundation.

After concrete has cured, remove the paper or cardboard form.

Backfill with controlled-density fill or compacted borrow in accordance with Standard Specification 8.30.A.3.

Construct the embankment widening (if required).
1. 60 (157) poles with double mast arms or pole weighing in excess of 1000 LBS shall not be installed on a slip base.
2. Galvanizing shall be in accordance with AASHTO M 111.
3. See Standard Plans C-86a, C-144a, and J-28.40 for foundation and base plate requirements when light standards are mounted on cement concrete traffic barriers.
4. See Standard Specifications Section 3-2A-2250 and 3-2A-2 (4) for the torque requirements for all of the Anchor Bolt installations. Install 1-inch diameter Diameter Bolt in all slip bases to a torque of 50 Foot-Pounds. See Standard Specifications Section 3-2A-2 (14a).

1. LF (H) poles with double mast arms or poles weighing in excess of 1000 lbs. shall not be installed on a Slip Base.

2. The Slip and Anchor Plates shall be manufactured from ASTM A572 GR. 50 or ASTM A588. All Slip Plates notched surfaces shall be finished smooth.

3. The Clamping Bolts shall be high strength steel, manufactured from AASHTO M164, with heavy hex nut and hardened washer. Galvanize the Clamping Bolts according to AASHTO M232.


5. Galvanize the Anchor/Slip Plate after fabrication according to AASHTO M 111.

6. Clamping Bolt diameters may vary on existing installations. Replace them with the same size as the originals when repairing or reusing a luminaire pole.
1. Designate the Elbow Assembly after fabrication according to AASHTO M 111.
NOTES
1. See Standard Plans C-8b and C-14h for foundation and anchor bolt details.
2. Round and smooth all edges around hand hole and along the wire-way to protect the conductors.
4. Install grout after plumbing the pole.

View A

- Steel plate 1 3/4"
- See detail
- Pole wall
- Grounding bolt
- Hand hole
- 1 1/4" drain hole (typ)

CONDUCTOR ATTACHMENT
- See detail
- Pole wall
- Tack weld to plate

CONTINUOUS BACK-UP RING
- 1/4", or no thinner than pole wall thickness, tack weld to plate

GROUNDING BOLT
- T = rim plate thickness by luminaire pole fabricator
- t = size of fillet weld by luminaire pole fabricator

Hand hole - configurations vary among different manufacturers

Anchor bolt (typ)
- See note 1
- Top of pole base plate

3/8" drain tube

See Standard Plans C-8b and C-14h for foundation and anchor bolt details.
Round and smooth all edges around hand hole and along the wire-way to protect the conductors.
Install grout after plumbing the pole.
SHOULDER
5' MIN. (PREFERRED)
10' MAX.

REMOVE ALL SLACK BEFORE INSTALLING CABLE TIE

DETAIL "B"
DETAIL "C"
DETAIL "D"

SEE DETAIL "A" OR "B" PER CONDUIT TYPE

HANDHOLE
SINGLE QUICK DISCONNECTS

CONCRETE FOUNDATION
FINISHED GROUND LINE

GROUNDING NUT
SINGLE OR DOUBLE MAST ARM AS REQUIRED

PVC CONDUIT
SEE DETAIL "C" OR "D" PER CONDUIT TYPE

LIGHT STANDARD BASE
(SLIP BASE SHOWN)

FOR GROUNDING REQUIREMENTS, SEE STD. PLAN J-9a

POLE AND BRACKET CABLE ~ TO LUMINAIRE HEAD
POLE AND BRACKET CABLE ~ TO LUMINAIRE HEAD
POLE AND BRACKET CABLE ~ TO LUMINAIRE HEAD

BASE WIRING DETAIL
FOR SINGLE MAST ARM
(SLIP BASE SHOWN)
BASE WIRING DETAIL
FOR DOUBLE MAST ARMS
(SLIP BASE SHOWN)

CONDUCTOR WIRES
ATTACHMENT
BRACKET

END BELL BUSHING

INSTALL SIZED REDUCING WASHER AND CONNECTOR TO SECURE CONDUCTORS AT END OF MAST ARM (TYP.)

EQUIPMENT GROUNDING CONDUCTOR ~ FROM FOUNDATION

BONDING JUMPER WIRE FOR GRS STEEL CONDUIT ~ GRS OR PVC

DOUBLE QUICK DISCONNECTS - PULL DOWN TIGHT TO CONDUIT (SHOWN LEFT UP FOR CLARITY)

INSULATING GROUNDING BUSHING

TRAVELED WAY
SIDEWALK

TYPICAL LOCATION OF JUNCTION BOX AND FOUNDATION

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.
1. Junction Box shall be constructed of Type 304 stainless steel, welded seam construction, 12 gage box with #581 finish, 12 gage adjustment tabs, and 12 gage mounting tabs.

2. Field drill or punch holes in the center of Junction Box ends. Additional holes may be required.

3. Use fittings that are UL listed and CSA certified. Conduit with flush bolt fasteners must protrude through the outside of the Junction Box. Use an insulated ground bushing on the inside for GCFI conductor. Use an end bell bushing on the inside for PVC conduit.

4. The system identification letters shall be 1/8th line thickness formed by engraving, stamping or with a B.F. weld bead.

5. Liberty cast the threads of the upper flange with anti-seize compound during construction and before final closure.

6. Detail shown for box installation in step form barrier.

7. Conduit capacity = 6".

8. Conduit shall enter Junction Box from inside only.

9. Not to be used for Stainless Steel Junction Box that are traffic barrier mounted. See Standard Plan J-40.30.

**Notes:**

- Junction Box shall be constructed of Type 304 stainless steel, welded seam construction, 12 gage box with #581 finish, 12 gage adjustment tabs, and 12 gage mounting tabs.
- Field drill or punch holes in the center of Junction Box ends. Additional holes may be required.
- Use fittings that are UL listed and CSA certified. Conduit with flush bolt fasteners must protrude through the outside of the Junction Box. Use an insulated ground bushing on the inside for GCFI conductor. Use an end bell bushing on the inside for PVC conduit.
- The system identification letters shall be 1/8th line thickness formed by engraving, stamping or with a B.F. weld bead.
- Liberty cast the threads of the upper flange with anti-seize compound during construction and before final closure.
- Detail shown for box installation in step form barrier.
- Conduit capacity = 6".
- Conduit shall enter Junction Box from inside only.
- Not to be used for Stainless Steel Junction Box that are traffic barrier mounted. See Standard Plan J-40.30.
KEY
① CENTER HOLE
② COLUMN
③ PIPE
④ GUARDIAN SLIDE
⑤ SEPARATED OR FLANGED SLIDE
⑥ BASE MOUNT WITH GUT WORM
⑦ REORDERED ELBOW WITH GUT WORM
⑧ INTEGRAL TERMINAL COMPARTMENT WITH:
  - D RATED COVER
  - PARTITION
  - K E E LEAD
  - MOUNTING MUDGE FOR SIDE MOUNT
  - 1/4" OAL EBM HOLE
  - 3/8" FIBER TERMINAL JUMP
  - WARNING FOR SIDE MOUNT
⑨ COMBINATION OF ④ & ⑤
⑩ SURFACE COLLAR - 4 1/4" LB WITH SET SCREW
⑪ BARREL CAP
⑫ MOUNTING BRACKET
⑬ WASHER
⑭桂 NUT LOUXT
⑮ TYPE E INHANCE MOUNTING -
⑯ PARTNER WITH BRAGON -
  - 1/2" LAS SCREW ON ADDED POLE
  - 1/2" SLOO TAPPED TO METAL POLE
⑰ FLATHEAD 4/5" T Bolt
⑱ 1/4" SPOX HOLE FOR EXTERNAL HME ENTRANCE
  - (INSOURED OR TURBO POLE MOUNTING ONLY)
⑲ TERMINAL BLOCK AND PREVIOUS TAP
⑳ EKULAR..

NOTES
1. See contract for head type, mounting height and orientation.
2. All nipples, fittings and center plate shall be 1 1/2" diameter.
3. Install resealable gasket outside head when flanged nipples are supplied.
4. Extend wire length, a minimum of 1" inside all signal and sign housings, and terminal compartments.
5. Apply heat of silicone around the perimeter of all top and cap openings prior to installation of the end cap assembly.
NOTES:

1. The Heavy Duty Lid shall be used when a Pull Box is placed in the paved shoulder or the traveled way. Use a 6” thick lid for new Pull Box installations. Use a 6” thick Heavy Duty Lid when converting a Standard Duty Pull Box into a Heavy Duty Pull Box in the paved shoulder or the traveled way and no overlay is called for in the contract. Otherwise, use contract plans for overlay depth and standard lid thickness to match overlay depth.

2. Use Standard Duty Pull Box and Lid when placed in unopened areas.

3. The diamond pattern shall be 3/8” minimum thick.

4. A 14” x 14” UNC x 3/8” #8 ground stud with 2 1/8” and 2 1/8” flat washers shall be attached to the Standard Duty Lid and coated with anti-seize compound. Provide a 3/8” diameter carbon hole in the ductile iron lid gasket (Heavy Duty Lid) with 1/2” or 1/2” UNC bolt, 2 1/8” flat and 2 1/8” washer for the standard Jack.

5. Connect a Bonding Jack to the box. Connect the bonding washer to the ground stud as shown. Use the equipment grounding conductor to the ground stud as shown. The bonding washer shall be 10”, 3/8” flat washers shall be used. All bonding washers shall be connected to the ground stud as shown.

6. The system identification letters shall be 1/8” wide thickness formed by engraved, stenciled, stamping or with a vinyl label. See SYSTEM IDENTIFICATION DETAIL, Standard Plan J-4110. Ductile Iron Lid gasket shall be removed.

7. Current conductors shall be Class 4000.

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

9. Capacity – cut-out diameter = 4” (100 mm)

10. Concrete material, place 6” crushed surfacing pad or slab. Specification Section 9-605.09. Field bond all reinforcing bars into the Pull Box. Field bond all reinforcing bars into the Pull Box. Field bond all reinforcing bars into the Pull Box. Field bond all reinforcing bars into the Pull Box. Field bond all reinforcing bars into the Pull Box. Field bond all reinforcing bars into the Pull Box.

11. The drawing depicts a typical Pull Box assembly. Referencing not shown. Each manufacturer’s Pull Box assembly will vary. Refer to the approved manufacturer’s shop drawings for all dimensions and the actual arrangement.
**NOTES**

1. Sign sequences is the same for both directions of travel. Adjust for the direction of roadway curves.

2. Flashing Warning Lights (Type B per MUTCD) and/or flags may be used to call attention to the advance Warning Signs.

3. Existing conflicting pavement markings and signs that are no longer applicable shall be removed or obliterated. 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 Light (Type C per MUTCD) shall be used to mark Channelizing Devices at night.

6. Where advisory speed is 30 mph or less, reverse turn signs should be used. Other curves or turn Warning Signs may be substituted to depict roadway alignment.

7. Temporary barriers and end treatments shall be crashworthy.

8. To improve visibility, consider use of temporary illumination at closure points.

9. For signs refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual MS9-05.

10. Consider using a PCMS for additional advance warning.

---

**STANDARD PLAN K-10.20-01**

**ROAD CLOSURE WITH DIVERSION**

**FOR LOCAL AGENCY USE ONLY NOT FOR USE ON STATE ROUTES**

**EXPIRES AUGUST 9, 2009**

Pasco Bakotich III 10-12-07

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1. Modify Regulatory Traffic Control Devices, as needed, for the duration of the detour.
2. Two Flashing Warning Lights (Type A per MUTCD) may be used to mark each barricade at night.
3. Trail Blazers shall be installed throughout the detour, as appropriate.
4. Signing shown for the one direction only.
5. Coordinate with emergency services.

For signs refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.
NOTES
1. This plan is intended for use on roadways when traffic volumes create sufficient gaps for motor vehicles to yield.
2. Steady Burning Warning Lights (Type C per MUTCD) shall be used to mark Channelizing Devices at night.
3. Adequate sight distance shall be provided for drivers to see opposing traffic, otherwise use flaggers and/or Temporary Signal.
4. Extend Channelizing Device taper across shoulder ~ recommended.
5. Post mounted signs when in place for 3 days or longer.
6. For speed limit 35 mph or higher replace W1-3R with W1-4R.
7. For signs size refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.
8. Consider using a PCMS for additional advance warning.

1. ROAD WORK AHEAD
2. ROAD WORK AHEAD
3. ROAD WORK AHEAD
4. ROAD WORK AHEAD
5. ROAD WORK AHEAD

LONGITUDINAL BUFFER SPACE = B

<table>
<thead>
<tr>
<th>POSTED SPEED (MPH)</th>
<th>LEN (FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 / 30</td>
<td>25 / 40</td>
</tr>
</tbody>
</table>

CHANNELIZING DEVICE SPACING

<table>
<thead>
<tr>
<th>POSTED SPEED (MPH)</th>
<th>IN TAPER (FT)</th>
<th>IN TAM (FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 / 30</td>
<td>25 / 40</td>
<td></td>
</tr>
</tbody>
</table>

ALL SIGNS ARE BLACK ON ORANGE UNLESS DESIGNATED OTHERWISE.

SIGN SPACING = X

<table>
<thead>
<tr>
<th>POSTED SPEED (MPH)</th>
<th>LENGTH B (FEET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 / 30</td>
<td>25 / 40</td>
</tr>
</tbody>
</table>

Channelizing Devices

<table>
<thead>
<tr>
<th>LEGEND</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
</tr>
<tr>
<td>•</td>
</tr>
<tr>
<td>☑</td>
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<tr>
<td>☑</td>
</tr>
</tbody>
</table>

FOR LOCAL AGENCY USE ONLY
NOT FOR USE ON STATE ROUTES

LANE CLOSURE
WITHOUT FLAGGERS
~ LOW VOLUME ROAD
STANDARD PLAN K-30.30-01

Sheet 1 of 1 Sheet

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
APPROVED FOR PUBLICATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
APPROVED FOR PUBLICATION
1. A Protective Vehicle is recommended regardless if a Truck Mounted Attenuator (TMA) is available; a work vehicle may be used. When no TMA is used, the Protective Vehicle shall be strategically located to shield workers, with no specific Roll-Ahead distance.

2. Night work requires additional roadway lighting at flagging stations. See WSDOT Standard Specifications for additional details.

3. Extend Channelizing Device taper across shoulder ~ recommended.

4. Sign sequence is the same for both directions of travel on the roadway.

5. Channelizing Device spacing for the downstream taper option shall be 20’ O.C.

6. For signs also refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.

---

SIGN SPACING = X (1)

<table>
<thead>
<tr>
<th>SPACING</th>
<th>SPEED LIMIT</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>100’</td>
<td>30-40 MPH</td>
<td>2550 a</td>
</tr>
<tr>
<td>200’</td>
<td>35-45 MPH</td>
<td>2600 a</td>
</tr>
<tr>
<td>300’</td>
<td>40-50 MPH</td>
<td>2650 a</td>
</tr>
<tr>
<td>400’</td>
<td>45-55 MPH</td>
<td>2700 a</td>
</tr>
</tbody>
</table>

(1) ALL SIGN SPACING MAY BE ADJUSTED TO ACCOMMODATE INTERCHANGE RAMPS, AT-GRADE INTERSECTIONS, AND DRIVEWAYS.

(2) THIS SIGN SPACING MAY BE REDUCED IN URBAN AREAS TO FIT ROADWAY CONDITIONS.

---

LEGAL NOTICE:

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Channelizing Devices are recommended along centerline to separate traffic from work operation. Devices are required at tapers to shift traffic movement between lanes and to protect all flagging stations.

Night work requires additional roadway lighting at flagging stations. See WSDOT Standard Specifications for additional details.

For signs size refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-06.

**NOTES:**

1. A Protective Vehicle is recommended regardless if a Truck Mounted Attenuator (TMA) is available; a work vehicle may be used. When no TMA is used, the Protective Vehicle shall be strategically located to shield workers, with no specific Roll-Ahead distance.

2. Devices shall not encroach into adjacent lanes.

3. Extend device taper (L/3) across shoulder recommended.

4. Portable Changeable Message Sign (PCMS) recommended.

5. Use Transvene Devices in closed lane every 1000 ft ~ recommended.

6. Traffic Safety Drums for all tapers on high-speed roadway recommended.

7. Channelizing Device spacing for the downstream taper option shall be 20 O.C.C.

8. For signs size refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.

**CHANNELIZING DEVICE SPACING**

<table>
<thead>
<tr>
<th>POSTED SPEED (MPH)</th>
<th>15/70</th>
<th>40</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN TAPER (FEET)</td>
<td>40</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>IN TANPER (FEET)</td>
<td>1.5</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**SIGN SPACING = X (1)**

- **RURAL HIGHWAYS**: 60 / 75 MPH, 100 ft.
- **RURAL ROADS**: 45 / 55 MPH, 100 ft.
- **RURAL ROADS & URBAN ARTERIALS**: 45 / 55 MPH, 100 ft.
- **RURAL RESIDENTIAL & BUSINESS DISTRICTS**: 25 / 30 MPH, 30 ft.
- **UGLINE STREETS**: 25 MPH or less, 10 ft.
- **ALL SIGNS ARE BLACK ON ORANGE UNLESS DESIGNATED OTHERWISE**

1. All sign spacing may be adjusted to accommodate interchange ramps, at-grade intersections, and driveways.
2. This sign spacing may be reduced in urban areas to fit roadway conditions.

**LONGITUDINAL BUFFER SPACE = B**

<table>
<thead>
<tr>
<th>POSTED SPEED (MPH)</th>
<th>35</th>
<th>30</th>
<th>25</th>
<th>20</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (FEET)</td>
<td>154</td>
<td>200</td>
<td>250</td>
<td>300</td>
<td>350</td>
</tr>
</tbody>
</table>

**BUFFER DATA**

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

<table>
<thead>
<tr>
<th>LANE WIDTH (FEET)</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>POSTED SPEED (MPH)</td>
<td>35</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>MINIMUM WEIGHT (1500 LBS)</td>
<td>3200</td>
<td>3000</td>
<td>4000</td>
</tr>
</tbody>
</table>

For Local Agency Use Only
Not for Use on State Routes

---

**Double Lane Closure on Multilane Roadway**

**STANDARD PLAN K-24.40-01**

**Effective**: August 2, 2010 to July 31, 2011

---

**APPROVED FOR PUBLICATION**

Pasco Bakotich III
10-12-07

**NOTES:**

1. This plan is not a legal engineering document but an electronic duplicate. The original, signed by the engineer and approved for publication, is kept on file at the Washington State Department of Transportation. A copy may be obtained upon request.
A Protective Vehicle is recommended regardless if a Truck-Mounted Attenuator (TMA) is available; a work vehicle may be used. When no TMA is used, the Protective Vehicle shall be strategically located to shield workers, with no specific Roll-Head distance.

Devices shall not encroach into adjacent lanes.

Extend device taper (L/3) across shoulder ~ recommended.

Portable Changeable Message Sign (PCMS) ~ recommended.

Use Transverse Devices in closed lane every 1000' 35/64 ~ recommended.

Traffic Safety Drums for all tapers on high speed roadway ~ recommended.

Channelizing Device spacing for the downstream taper option shall be 20' O.C.

For signs size refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.
A Protective Vehicle is recommended regardless if a Truck Mounted Attenuator (TMA) is available; a work vehicle may be used. When no TMA is used, the Protective Vehicle shall be strategically located to shield workers, with no specific Roll-Ahead distance. Extend device taper (L/3) across shoulder ~ recommended. Portable Changeable Message Sign (PCMS) ~ recommended. If the lane shift is short and has minimal radius curve (30 mph or less) use sign W1-3 in lieu of sign W1-4. For signs size refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.
MINIMUM WEIGHT 15,000 LBS.  
(MAXIMUM WEIGHT SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION)

TYPICAL PROTECTIVE VEHICLE WITH TMA  
(SEE NOTE 1)

LOADED WEIGHT

ROLL AHEAD STOPPING DISTANCE = 30 FEET MIN.  
(DRY PAVEMENT ASSUMED)

POSTED SPEED (MPH)

LONGITUDINAL BUFFER SPACE = B

WORK AREA

L2

L L B L B

L2

LANE WIDTH 10' MIN. ~ SEE STANDARD PLAN K-24.20 FOR ALTERNATE ENCROACHMENT

NOTES

1. A Protective Vehicle is recommended regardless if a Truck Mounted Attenuator (TMA) is available; a work vehicle may be used. When no TMA is used, the Protective Vehicle shall be strategically located to shield workers, with no specific Roll-Ahead distance.

2. Portable Changeable Message Sign (PCMS) ~ recommended.

3. Prohibit turns as necessary for traffic conditions.

4. For sign sizes refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.

LEFT AND CENTER LANE CLOSURE - TWO-WAY 
LEFT TURN LANE

STANDARD PLAN K-2640-01

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

1. If the work space extends across a crosswalk, the crosswalk should be closed (see Standard Plan K-34.20).
2. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a left lane having significant left-turning movements, the left lane may be reopened as a turn bay for left-turns only, as shown.
3. Prohibit turns as necessary for traffic conditions.
4. Flashing Warning Lights (Type A per MUTCD) should be used, as needed, to mark barricades at night.
5. Steady Burning Warning Lights (Type C per MUTCD) shall be used to mark channelizing devices at night.
6. For long term projects, conflicting pavement markings that are no longer applicable shall be removed or obliterated. Temporary markings shall be used as necessary.
7. For signs size refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.

LEGEND:

1. SIGN LOCATION
2. CHANNELIZING DEVICES
3. TEMPORARY TRAFFIC ARROW - OPTIONAL
4. ARROW PANEL
5. BARRICADE - TYPE 3 R

MINIMUM TAPER LENGTH = L (FEET)

<table>
<thead>
<tr>
<th>LANE WIDTH (FEET)</th>
<th>POSTED SPEED (MPH)</th>
<th>MIN TAPER (FEET)</th>
<th>MIN TAPER (FEET)</th>
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<tbody>
<tr>
<td>8</td>
<td>25 / 30</td>
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<td>11</td>
<td>30 / 35</td>
<td>20</td>
<td>20</td>
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</table>

CHANNELIZING DEVICES SPACING

<table>
<thead>
<tr>
<th>POSTED SPEED (MPH)</th>
<th>IN TAPER (FEET)</th>
<th>MIN TAPER (FEET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 / 30</td>
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<td>20</td>
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<tr>
<td>35 / 40</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>40 / 45</td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>

FOR LOCAL AGENCY USE ONLY
NOT FOR USE ON STATE ROUTES
1. Prohibit turns as necessary for traffic conditions.
2. Flashing Warning Lights (Type A per MUTCD) should be used, as needed, to mark barriers at night.
3. Steady Burning Warning Lights (Type C per MUTCD) shall be used to mark channelizing devices at night.
4. For long term projects, conflicting pavement markings that are no longer applicable shall be removed or obliterated. Temporary markings shall be used as necessary.
5. For signs size refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-0A.

All signs are black on orange unless designated otherwise.

Installed Width = X

<table>
<thead>
<tr>
<th>Minimum Taper Length = L (feet)</th>
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<tbody>
<tr>
<td>LANE WIDTH</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>13</td>
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</tbody>
</table>

Channelizing Device Spacing

<table>
<thead>
<tr>
<th>POSTED SPEED (MPH)</th>
<th>IN TAPER (FEET)</th>
<th>IN TANGENT (FEET)</th>
</tr>
</thead>
<tbody>
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<td>10/70</td>
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<td>50</td>
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</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

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### Sign Spacing = X

<table>
<thead>
<tr>
<th>ROADWAY</th>
<th>SPEED LIMIT (MPH)</th>
<th>SPACING (FT)</th>
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</thead>
<tbody>
<tr>
<td>Rural Roads</td>
<td>35 / 30</td>
<td>35 / 64</td>
</tr>
<tr>
<td>Rural Roads &amp; Urban Arterials</td>
<td>25 / 30</td>
<td>35 / 64</td>
</tr>
</tbody>
</table>

### Minimum Taper Length = L (Feet)

<table>
<thead>
<tr>
<th>LANE WIDTH (FT)</th>
<th>POSTED SPEED (MPH)</th>
<th>POSTED SPEED (MPH)</th>
<th>POSTED SPEED (MPH)</th>
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<tbody>
<tr>
<td>10</td>
<td>35 / 40</td>
<td>25 / 40</td>
<td>35 / 40</td>
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<tr>
<td>11</td>
<td>35 / 40</td>
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<td>35 / 40</td>
</tr>
<tr>
<td>12</td>
<td>35 / 40</td>
<td>25 / 40</td>
<td>35 / 40</td>
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</table>

### Channelizing Device Spacing

<table>
<thead>
<tr>
<th>POSTED SPEED (MPH)</th>
<th>BI-TAPER (FT)</th>
<th>IN TAPER (FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 / 70</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>30 / 45</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>25 / 30</td>
<td>40</td>
<td>10</td>
</tr>
</tbody>
</table>

### Notes

1. NO LEFT TURN signs are to be used if traffic volumes are too high or there is an operating signal. Close the left turn pocket if there is one on the side street.
2. When turn prohibitions are implemented, two turn prohibition signs should be used, one on the near side and, space permitting, one on on the far side of the intersection.
3. If the work space extends a crosswalk, the crosswalk should be closed (see Standard Plan K-34.20).
4. Flashing Warning Lights (Type A per MUTCD) should be used, as needed, to mark barricades at night.
5. Steady Burning Warning Lights (Type C per MUTCD) shall be used to mark channelizing devices at night.
6. For long term projects conflicting pavement markings that are no longer applicable shall be removed or obliterated. Temporary markings shall be used.
7. For signs size refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.

### Legend

- **X** Sign Location
- **D** Channelizing Devices
- **P** Arrow Panel
- **B** Barricade – Type 3
- **O** Obstructed Warning

---

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1. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

2. Controls shown are for pedestrian traffic only.

3. Use Warning Lights on barricades.

4. Maintain a minimum width of 3 feet for pedestrian path.

5. For signs also refer to Manual on Uniform Traffic Control Devices (MUTCD) and WIDOT Sign Fabrication Manual M55-05.

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1. A Protective Vehicle is recommended regardless if a Truck Mounted Attenuator (TMA) is available; a work vehicle may be used. Where no TMA is used, the Protective Vehicle shall be strategically located to shield workers, with no specific Roll-Ahead distance.

2. For long term projects conflicting pavement markings that are no longer applicable should be removed. Temporary markings shall be used as necessary and signs shall be post mounted.

3. The sign MOTORCYCLES USE EXTREME CAUTION may be used.

4. For signs size refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.

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1. A Protective Vehicle is recommended regardless if a TMA is available; a work vehicle may be used. When no TMA is used, the Protective Vehicle shall be strategically located to shield workers, with no specific Roll-Ahead distance.

2. Channelizing Device spacing for the downstream taper option shall be 20' O.C.

3. No Encroachment on the traveled lane is permitted. If Encroachment is necessary, the lane shall be closed (see Standard Plan K-24.20).

4. Signs to be post mounted for long term projects.

5. For sign size refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.

6. For signs size refer to Manual on Uniform Traffic Control Devices (MUTCD).

All sign spacing may be adjusted to accommodate interchange ramps, at-grade intersections, and driveways.

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APPROVED FOR PUBLICATION

DATE

WSDOT

STANDARD PLAN K-40.40-60

SHOULDER CLOSURE - HIGH SPEED ROADWAY (45 MPH OR HIGHER)

EXPIRES AUGUST 9, 2007

Ken L. Smith
A Protective Vehicle is recommended regardless if a Truck Mounted Attenuator (TMA) is available; a work vehicle may be used. When no TMA is used, the Protective Vehicle shall be strategically located to shield workers, with no specific Roll-Ahead distance.

Channelizing Device spacing for the downstream taper option shall be 20' O.C.

For signs sizes refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.

1. All sign spacing may be adjusted to accommodate interchange ramps, at-grade intersections, and driveways.
2. This sign spacing may be reduced in urban areas to fit roadway conditions.

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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 Area should not exceed 5 miles.

In those situations where the distance between the advance signs and the Work Area is 2 to 5 miles, a Supplemental Distance plaque should be used with the ROAD WORK AHEAD sign.

No encroachment into traffic lane is permitted with this plan.

Work vehicle and Shadow vehicle shall use Warning Beacons.

Shadow vehicle shall maintain 500' to 1000' of sight distance to approaching traffic.

For signs size refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.

**NOTES:**

1. 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 Area should not exceed 5 miles.

2. In those situations where the distance between the advance signs and the Work Area is 2 to 5 miles, a Supplemental Distance plaque should be used with the ROAD WORK AHEAD sign.

3. No encroachment into traffic lane is permitted with this plan.

4. Work vehicle and Shadow vehicle shall use Warning Beacons.

5. Shadow vehicle shall maintain 500' to 1000' of sight distance to approaching traffic.

For local agency use only. Not for use on state routes.

**LEGEND**

- **SIGN LOCATION**
- **PROTECTIVE VEHICLE**
- **TRUCK MOUNTED ATTENUATOR — RECOMMENDED**
- **SEQUENTIAL ARROW PANEL TYPE B**
- **WARNING BEACON — REQUIRED**

**SHOULDER CLOSURE ~ SHORT DURATION**

**STANDARD PLAN K-40.60-00**

**FOR LOCAL AGENCY USE ONLY**

**NOT FOR USE ON STATE ROUTES**

**APPROVED FOR PUBLICATION**

Ken L. Smith 02-15-07

Washington State Department of Transportation
<table>
<thead>
<tr>
<th>Sign at A</th>
<th>Sign at B</th>
<th>Sign at C</th>
<th>Sign at D</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 MPH</td>
<td>35 MPH</td>
<td>55 MPH</td>
<td>60 MPH</td>
</tr>
</tbody>
</table>

NOTES:

1. The sign shown is not required in the following cases: the work space is behind a barrier, or more than 2' behind the curb, or more than 15' from the edge of a roadway.

2. For sign sizes, refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual MG5-05.

---

**Legend**

- **H**: Sign location

---

**Drawn by:** ELENA BRUNSTEIN

---

**For Local Agency Use Only**

**NOT FOR USE ON STATE ROUTES**

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**Expires August 9, 2007**

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**Ken L. Smith 02-15-07**

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1. Install for emergency use, as needed, on passable roadways with spot or construction hazards requiring minimal or no specific warning.

2. This sign is not a replacement for required traffic control measures needed at more substantial hazard locations.

3. Spot hazards shall be marked with barricades or channelizing devices to alert motorists.

4. Portable Changeable Message Sign (PCMS) ~ recommended. For one-lane two-way situations (see Standard Plan K-20.40) for additional details.

5. For signs size refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.

NOTES

- Install these or other warning signs as needed for the specific hazard.

- Spot hazards shall be marked with barricades or channelizing devices to alert motorists.

- PORTABLE CHANGEABLE MESSAGE SIGN ~ recommended. For one-lane two-way situations (see Standard Plan K-20.40) for additional details.

- Portable Changeable Message Sign (PCMS) ~ recommended. For one-lane two-way situations (see Standard Plan K-20.40) for additional details.

- Spot hazards shall be marked with barricades or channelizing devices to alert motorists.

- For signs size refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.

- For signs size refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.

- Portable Changeable Message Sign (PCMS) ~ recommended. For one-lane two-way situations (see Standard Plan K-20.40) for additional details.

- Spot hazards shall be marked with barricades or channelizing devices to alert motorists.

- For signs size refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.
**NOTES**


2. **Motorcycles Use Extreme Caution** signs shall be installed when the following roadway conditions exist:
   - Grooved pavement
   - Abrupt lane edge
   - Steel plates
   - Loose gravel of earth

Specific signs, for each of the conditions noted, shall be installed using WITH MOTORCYCLES USE EXTREME CAUTION signs.

3. For signs size refer to Manual on Uniform Traffic Control Devices (MUTCD) and WSDOT Sign Fabrication Manual M55-05.

---


**Motorcycle Warning Sign** (W21-1701) should be installed at 1 mile spacing, throughout the work zone where the condition exists, as part of the sequence of other appropriate standard warning signs on 1 mile spacing.
1. For long term projects conflicting pavement markings that are no longer applicable shall be removed or obliterated. Temporary markings shall be used as necessary.

2. For Hot Mixed Asphalt Pavement, a temporary striping tape shall be installed in conjunction with "DO NOT PASS" and "PASS WITH CARE" sign locations.

3. Temporary roadside delineation with Channelization Devices is optional. The appropriate taper length shall be L/2. See Standard Plan K-34-20 for minimum taper length (L).

4. For long term projects a channelization/pavement marking plan should be implemented.

5. Temporary Raised Pavement Marker (TRPM) may be used on a pattern spacing 5' O.C. to simulate a solid line.
For sign installation details, see Std. Plan G - series.

1. For sign installation details, see Std. Plan G - series.
2. In rural areas, the "V" Height can be a minimum of 7 feet for primary signs and 6 feet for the supplemental plaques for greater visibility, as directed by the engineer.
3. The "V" height for signs, with an area of more than 50 square feet and two or more sign supports, is 7 feet in both rural and urban areas.

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WARNING LIGHT ATTACHMENT DETAIL

DRILL TWO 1/2" DIAM. HOLES THROUGH BARRICADE SUPPORT ANGLE

NOTES

1. All fasteners may be zinc plated, galvanized or stainless steel. All steel angle and tubular steel shall be hot-rolled, high carbon steel, painted or galvanized.

2. Install one lightweight Type A Low-Intensity flashing warning light on the traffic side of the barricade. Install two Type A Low-Intensity flashing warning lights per barricade when the barricades are used to close a roadway. Attach the light to the barricade according to the light manufacturer's recommendations or use the details shown on this plan.

3. Stripes on barricade rails shall be alternating orange and white retroreflective stripes (sloping downward at an angle of 45 degrees in the direction traffic is to pass).

4. The Type 3 barricade design shown on this plan meets the crash test requirements of NCHRP 350. Alternative designs may be approved if they conform to the NCHRP 350 crash test criteria and the MUTCD.

5. When a sign is mounted on the barricade, it shall be securely bolted to at least two plywood panels. The top of the sign shall not be higher than the top panel of the barricade.

6. When sandbags are used in freezing weather, Urea fertilizer shall be mixed with the sand in a quantity to prevent the sand from freezing.
AREA CLOSED TO TRAFFIC

USEABLE TRAFFIC LANE

ROAD CLOSURE AT INTERSECTION

ROAD CLOSURE AT OTHER LOCATIONS

2' MIN.

STRIPES ON THE BARRICADES SHALL SLOPE DOWNWARD IN THE DIRECTION TRAFFIC IS TO PASS.

BARRICADE PLACEMENT
The reinforcing steel details for the NARROW BASE barrier are the same as those shown for the 2' wide barrier except that the bars along the vertical face run vertically with a 1 1/2" clearance.

The vertical dimensions for the slots and loop bar locations on the NARROW BASE barrier are the same as those shown on the END views of the 2' wide barrier.

# 4 (PAIRS) ~ 6 SPACES @ 1' - 8 1/2"
1. Use Type 1 Anchors when the concrete pavement or bridge deck is 6" or thicker with 2' wide concrete barrier only. Use Type 2 Anchors (Standard Plan K-80.37) with narrow base barrier.

2. Adjust the location of the Type 1 Anchors to avoid the main reinforcing in the deck when drilling holes.

3. Use shims to properly fit the Type 1 Anchors to the barrier and roadway surfaces.

4. Upon removal of the Type 1 Anchors, clean the hole and fill with grout according to Standard Specification 6.02.3(20).

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

6. After removing the Type 3 Anchors, clean the pin holes and fill them with sealant according to Standard Specification 9-04.2.
The intended use of this plan is for the temporary installation of Alternative Temporary Concrete Barrier (F-Shape), Narrow Base (see Standard Plan K-80.33) on cement concrete pavement or bridge deck.

1. Use Class 1 when the concrete pavement or bridge deck is 9" or thicker; use Class 2 when it is 6" or thicker.
2. Adjust the location of the anchors to avoid the main reinforcing in the deck when drilling holes.
3. Use shims to properly fit the anchors to the barrier and roadway surfaces.
4. Upon removal of the anchors, clean the bolt holes and fill them with grout according to Standard Specification 6.02.3(20).

NOTES
1. See DETAIL ATTACHMENT "A"
2. See DETAIL ATTACHMENT "B"

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

Ken L. Smith
03-21-07

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**Wire Fence Types 1 & 2 and Wire Gates**

**Standard Plan L-10.10-00**

**Sheet 1 of 2 Sheets**

---

**Notes**

1. The bracing and pull post details for Wire Fence Type 2 are the same as for Type 1.

2. Attach the wire mesh to the posts using four fasteners. Three additional fasteners per post are required within and at the limits of sag conditions. Use additional fasteners on posts which mark the angle point of any sudden change in topography.

3. Wood anchors (for wood posts) shall be 2×4 lumber, 12” long minimum, and fastened with three 16d galvanized nails.

---

Wire Fence Type 1

- Steel posts shown
- Interim bracing / pull post (shown for fence type 1)
- Line post w/ anchor plate (Typ.)
- Wire mesh (shown for fence type 1)
- Wire cinch stay (Typ.)
- Wire fence type 1 ~ spaced @ 12”
- Pull post - spaced @ 1000’ max.
- 4’ - 4” max.
- 1000’ max. to pull post
- 14’ - 0” max.
- Grade depression (rash) detail

Wire Fence Type 2

- Steel posts shown
- Interim bracing / pull post (shown for fence type 1)
- Line post w/ anchor plate (Typ.)
- Wire mesh (shown for fence type 1)
- Wire cinch stay (Typ.)
- Wire fence type 2 ~ spaced @ 12”
- Pull post - spaced @ 1000’ max.
- 4’ - 6” max.
- 1000’ max. to pull post
- 14’ - 0” max.
- Grade depression (rash) detail

---

**Intermediate Bracing / Pull Post**

- (Shown for fence type 1)
- Line post w/ anchor plate (Typ.)
- Wire mesh (shown for fence type 1)
- Wire cinch stay (Typ.)
- Wire fence type 1 ~ spaced @ 12”
- Pull post - spaced @ 1000’ max.
- 4’ - 4” max.
- 1000’ max. to pull post
- 14’ - 0” max.
- Grade depression (rash) detail

---

**Steel Posts and Braces**

- (Steel posts shown)
- Grade depression (rash) detail
- Deadman
- Guy wire
- Additional fasteners - see note 2

---

**Ken L. Smith**

02-21-07

Washington State Department of Transportation
1. All concrete post bases shall be 10" minimum diameter.
2. Along the top and bottom, using Hog Rings, secure the Chain Link Fence Fabric to the Tension Wire and Tension Cable within the limits of the first full fabric weave.

Details are illustrative and shall not limit hardware design or post selection of any particular fence type.

All concrete post bases shall be 10" minimum diameter.
Along the top and bottom, using Hog Rings, fasten the Chain Link Fence Fabric to the Tension Wire and Tension Cable within the limits of the first full fabric weave.

Details are illustrative and shall not limit hardware design or post selection of any particular fence type.

**POST AND RAIL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>POST</th>
<th>PIPE</th>
<th>ROLL FORMED</th>
<th>H - COLUMN</th>
</tr>
</thead>
<tbody>
<tr>
<td>END, CORNER, OR PULL POST</td>
<td>2 1/2&quot; DIA</td>
<td>Y</td>
<td>8.10</td>
</tr>
<tr>
<td>LINE OR BRACE POST</td>
<td>2&quot; DIA</td>
<td>Y</td>
<td>1.60</td>
</tr>
</tbody>
</table>

**CHAIN LINK FENCE TYPES 3 AND 4**

**STANDARD PLAN L-30.10-00**

**SHEET 1 OF 2 SHEETS**

**APPROVED FOR PUBLICATION**

Ken L. Smith 02-07-07
Washington State Department of Transportation
NOTES

1. All glare screen posts shall be 1 5/8" × 2 1/4" Galvanized Steel H-Columns.

2. Post Bolts shall be:

- On Timber Posts: Hex head bolt 6/8-16 UNC × 6" with lock washer.
- On Steel Posts: Hex head bolt 6/8-16 UNC × 2 1/2" with lock washer.

Either with hex nut and washer, or eye nut and washer where shown in the plan.
NOTICE: The plans, specifications and other data in this contract document are the exclusive property of the Washington State Department of Transportation. The reproduction or use of the plans, specifications and other data in this contract document, in whole or in part, is prohibited except with the written permission of the Washington State Department of Transportation.
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 RPM supplement and substitution patterns.
2. The channelization shown on this plan assumes optimal roadway geometric design. The dimensions may vary to fit existing conditions. See Contract.

LEGEND
R = RAMP LANE WIDTH
L = LANE WIDTH

WHERE SHOWN ON THE PLANS OR SPECIFIED IN THE SPECIAL PROVISIONS, RAISED PAVEMENT MARKERS SHALL BE USED FOR SUPPLEMENTING OR SUBSTITUTE THE PAINTED PAVEMENT MARKINGS SHOWN HEREIN. SEE THE STANDARD PLANS FOR RPM SUPPLEMENT AND SUBSTITUTION PATTERNS.

THE CHANNELIZATION SHOWN ON THIS PLAN ASSUMES OPTIMAL ROADWAY GEOMETRIC DESIGN. THE DIMENSIONS MAY VARY TO FIT EXISTING CONDITIONS. SEE CONTRACT.
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 RPM supplement and substitution patterns.

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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 RPM supplement and substitution patterns.

2. When weaving section is more than 3/4 of a mile in length use lane line.

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

**LEGEND**

- L = LANE WIDTH
- R = RAMP LANE WIDTH

**TABLE**

<table>
<thead>
<tr>
<th>POSTED MAINLINE SPEED</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 MPH</td>
<td>0.67</td>
</tr>
<tr>
<td>40 MPH</td>
<td>0.72</td>
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<tr>
<td>65 MPH</td>
<td>1.47</td>
</tr>
<tr>
<td>70 MPH</td>
<td>1.67</td>
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- The channelization shown on this plan assumes optimal roadway geometric design. The dimensions may vary to fit existing conditions. See Contract.

**RAMP CHANNELIZATION**

**PARALLEL ON & WEAVING SECTION**

**STANDARD PLAN M-1.80-02**

**SHEET 1 OF 1 SHEET**

**APPROVED FOR PUBLICATION**

**DATE**

**STATE DESIGN ENGINEER**

**Washington State Department of Transportation**

**DRAWN BY:** ADAM COCHRAN

**END OF TAPER (SEE CONTRACT)**

**NOTES**

- 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 RPM supplement and substitution patterns.

- When weaving section is more than 3/4 of a mile in length use lane line.

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

**LEGEND**

- L = LANE WIDTH
- R = RAMP LANE WIDTH

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</tr>
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<td>70 MPH</td>
<td>1.67</td>
</tr>
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**RAMP CHANNELIZATION**

**PARALLEL ON & WEAVING SECTION**

**STANDARD PLAN M-1.80-02**

**SHEET 1 OF 1 SHEET**

**APPROVED FOR PUBLICATION**

**DATE**

**STATE DESIGN ENGINEER**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**

**DRAWN BY:** ADAM COCHRAN

**END OF TAPER (SEE CONTRACT)**

**NOTES**

- 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 RPM supplement and substitution patterns.

- When weaving section is more than 3/4 of a mile in length use lane line.

- The channelization shown on this plan assumes optimal roadway geometric design. The dimensions may vary to fit existing conditions. See Contract.
1. Install a minimum of 3 sets of diagonals/chevrons in the gore area. A 60° 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 acute angle of the diagonals shall always point in the direction of mainline traffic.

NOTES:

1. See Note 1.

GORE AREA MARKING LAYOUT
WITH DIAGONALS

---

GORE AREA MARKING LAYOUT
WITH CHEVRONS

---

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NOTES

1. Install a minimum of 3 sets of diagonals/chevrons in the gore area. 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 acute angle of the diagonals shall always point in the direction of mainline traffic.

GORE AREA MARKING LAYOUT WITH DIAGONALS

GORE AREA MARKING LAYOUT WITH CHEVRONS
1. Install a minimum of 3 sets of diagonal/chevron in the gore area. 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 acute angle of the diagonals shall always point in the direction of mainline traffic.
GENERAL NOTES

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

L = 1.2 Typical Lane Width. See Contract for specified lane widths.

LEGEND

Type 2L Traffic Arrow

<table>
<thead>
<tr>
<th>POSTED SPEED</th>
<th>APPROACH TAPER</th>
<th>H DIMENSION</th>
<th>K DIMENSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 MPH</td>
<td>110'</td>
<td>37&quot;</td>
<td>503&quot;</td>
</tr>
<tr>
<td>25 MPH</td>
<td>127'</td>
<td>30&quot;</td>
<td>449&quot;</td>
</tr>
<tr>
<td>30 MPH</td>
<td>118'</td>
<td>17&quot;</td>
<td>150&quot;</td>
</tr>
<tr>
<td>35 MPH</td>
<td>68'</td>
<td>10&quot;</td>
<td>108&quot;</td>
</tr>
<tr>
<td>40 MPH</td>
<td>40'</td>
<td>7&quot;</td>
<td>88&quot;</td>
</tr>
</tbody>
</table>

RESPECTIVE H or K

OPTIONAL MARKED DECELERATION TAPER

FOR LIMITED USE IN URBAN AREAS

DRAWN BY: BILL BERENS

STOPPING POINT FOR LEFT TURN LANE

WHITE EDGE LINE

WHEN REQUIRED

STOPPING POINT FOR LEFT TURN LANE

DOUBLE CENTER LINE (YELLOW)

ASYMMETRICAL WIDENING RIGHT OF CENTERLINE

WIDE LANE LINE

NO PASS LINE

FOR LIMITED USE IN URBAN AREAS WITH POSTED SPEEDS OF 40 MPH OR LESS

APPROACH TAPER

APPROACH TAPER

CENTRAL LINE

CENTRAL LINE

REDUCED TAPER LENGTHS ~ SYMMETRICAL WIDENING

REDUCED TAPER LENGTHS ~ ASYMMETRICAL WIDENING RIGHT OF CENTERLINE

REDUCED TAPER LENGTHS ~ ASYMMETRICAL WIDENING LEFT OF CENTERLINE

STANDARD PLAN M-3.20-01

APPROVED FOR PUBLICATION

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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
- 12' Typical Lane Width. See Contract for specified lane widths.
- WHITE DOTTED EXTENSION LINE
- DOUBLE CENTER LINE (YELLOW) (NARROW PATTERN)
- CENTER LINE
- WHITE EDGE LINE
- DROP LANE LINE
- LANE LINE
- STANDARD PLAN M-5.10-01

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NOTE
When specified in the Contract Plans, the HOV Symbol Marking shall be installed with an offset of 1 foot max. from the lane centerline.

CITY STREET SPACING = 80 FEET MIN.
HIGHWAY SPACING = 1000 FEET MAX.
Bid Item "Bicycle Lane Symbol" includes Bike Lane Arrow and Bike Rider Symbol.

1. 2' x 6' White Bike Lane Arrow
2. Bike Rider Symbol
1. In areas where the bollard location is not visible to an approaching bicyclist, use the minimum sight distance for the Solid Yellow Painted Line (upper portion), to extend the Solid Yellow Painted Line as needed to provide advanced warning of the upcoming obstruction.

2. In areas where there is a crossing, bridge or other structure on the path that does not support or accommodate a vehicle, (See Note 1).

3. Provide Breakaway Bollards within the Roadway Design Clear Zone.

/shared - use path markings
standard plan H-0.60-00
sheet 1 of 1 sheet

approved for publication
Washington State Department of Transportation
Pepea Balogh/NI 05-10-06
NOTES
1. See the Contract Plans for locations of crosswalk centerlines.
2. To the maximum extent possible, curb ramp centerline should be perpendicular to the crosswalk centerline.
3. To the maximum extent possible, crosswalks should be perpendicular to the centerline of the traveled way.
NOTES

1. Three, four, and five accessible stall arrangements may be either 80° (angled) or 180° (perpendicular) parking arrangements. See Contract.

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

3. All accessible stalls shall have wheel stops. Place wheel stops in other stalls when specified in the contract. Wheel stops shall be approximately 6" high and a minimum of 6" long.


LEGEND

- Reserved Parking Sign and post with I-526A: Please, if indicated (See sign fabrication manual)
- Access Parking Space Symbol
- Manufacured wheel stop
- Detectable Warning Pattern

PARKING SPACE LAYOUTS
STANDARD PLAN N-17.10-02
APPROVED FOR PUBLICATION
Pepeo Balokich III 07-02-08
Washinigton State Department of Transportation
NOTES:
1. Dotted Extension Line shall be the same color as the line it is extending.
2. Edge Line shall be white on the right edge of traveled way, and yellow on the left edge of traveled way (on one-way roadways). Solid Lane Line shall be white.
3. The distance between the lines of the Double Center Line shall be 12" everywhere, except 4" for left turn channelization and narrow medians with lane widths of 10 feet or less. Local Agencies (on non-State Routes) may specify a 4" distance for all locations.
4. The distance between the lines of the Double Lane Line shall be 4".
5. Wide Lane Line shall be white.
6. Wide Line shall be yellow or white as specified in the Plans.

LONGITUDINAL MARKING PATTERNS
STANDARD PLAN M-20.10-01
EFFECTIVE: AUGUST 2, 2010 TO JULY 31, 2011

Drawn by: Mark Sujka

Ken L. Smith 07-30-07
Washington State Department of Transportation
1. Raised Pavement Markers Types 3Y/2Y and 2Y shall be spaced at 20' intervals on tangents and on horizontal curves with a radius of 6000' or more, and at 40' intervals on horizontal curves having radius of less than 6000'. Center the RPM's in the gaps between the pavement marking line.

2. Type 2Y RPM's, when specified, shall be placed outside the left edge line at 80' intervals. See "LEFT EDGE OF LANE PLACEMENT DETAIL".

3. Raised pavement markers, when specified, shall be installed at the locations shown for Type 2W RPM's on multilane one-way roadways, and Type 3Y RPM's on two lane two-way roadways.

4. The Type 2W RPM's placed on multilane one-way roadways and all RPM's set in recesses shall have an elevation resistant coating.

---

**TYPE 3 RPM RAISED FACE COLORS**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>RPM Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>3Y</td>
<td>Yellow and Yellow</td>
</tr>
<tr>
<td>2W</td>
<td>White - One Side Only</td>
</tr>
<tr>
<td>2Y</td>
<td>Yellow - One Side Only</td>
</tr>
</tbody>
</table>

---

**LONITUDINAL MARKING SUPPLEMENT WITH RAISED PAVEMENT MARKERS**

**STANDARD PLAN N-30.30-02**

---

**SECTION A**

RECESSED PAVEMENT MARKER DETAILS

FOR USE WHERE SPECIFIED IN CONTRACT

---

**APPROVED FOR PUBLICATION**

Pepe Rodilich M
10-14-01

Washington State Department of Transportation
Raised pavement markers shall be installed only when specified in the Contract Plans. See the Standard Plans for marker designation.

The portion labeled "OPTIONAL" is only used when the Optional Marked Deceleration Taper (see Standard Plans M-3.10 and M-3.20) is specified in the contract plans.

NOTES
1. Raised pavement markers shall be installed only when specified in the Contract Plans.
2. See the Standard Plans for marker designation.
3. The portion labeled "OPTIONAL" is only used when the Optional Marked Deceleration Taper (see Standard Plans M-3.10 and M-3.20) is specified in the contract plans.

Ken L. Smith 01-30-07
**LONGITUDINAL MARKING SUPPLEMENT WITH RPM's**

**~ TURN LANES**

STANDARD PLAN M-20.40-01

**Sheet 2 of 2 Sheets**

**EXPIRES AUGUST 9, 2007**

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KEN L. SMITH

01-30-07

Washington State Department of Transportation

DRAWN BY: ADAM COCHRAN

LEFT TURN LANE

TYPE 2YY RPM (TYP.)

40' - 0" SPACING

DETAIL A

DOUBLE CENTER LINE (YELLOW)

(NARROW PATTERN)

40' RPM SPACING

DETAIL B

ALTERNATIVE LINE DETAIL

TYPE 2YY RPM (TYP.)

15' - 0"

10' - 0"

30' - 0"

10' - 0"

15' - 0"

DETAIL C

DOUBLE CENTER LINE (YELLOW)

(NARROW PATTERN)

20' RPM SPACING FOR DECELERATION TAPER

DETAIL D

DOUBLE CENTER LINE (YELLOW)

(NARROW PATTERN)

DETAIL E
NOTE 1. The NO PASS LINE (when required) is applied parallel to the CENTER LINE, 4" away, with the Type 2yy RPM's aligned (similar to TWO-WAY LEFT-TURN LINE).

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

**Symbol Markings for Traffic Arrows**

- **Type 2L (Left) Traffic Arrow**
- **Type 2R (Right) Traffic Arrow**

**Dimensions**

- **Marking Area:** 17.44 SQ.FT.
- **17.93 SQ.FT.**
- **17.44 SQ.FT.**

**Notes**

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

**DRAWN BY:** Mark Sujka

**NOTE:**

This plan is not a legal engineering document but an electronic duplicate. The original, signed by the engineer and approved for publication, is kept on file at the Washington State Department of Transportation. A copy may be obtained upon request.
SYMBOL MARKINGS
TRAFFIC ARROWS FOR
HIGH SPEED ROADWAYS

STANDARD PLAN M-24.20-01

DRAWN IN: MARK SUJKA
GRID IS 4" SQUARE

MARKING AREA
28.40 SQ.FT.
MARKING AREA
33.82 SQ.FT.

SYMMETRICAL ABOUT
CENTER LINE

SYMBOL MARKINGS
TRAFFIC ARROWS FOR
HIGH SPEED ROADWAYS

STANDARD PLAN M-34.20-01

DRAWN IN: MARK SUJKA
GRID IS 4" SQUARE

MARKING AREA
33.82 SQ.FT.

MARKING AREA
33.82 SQ.FT.

EXPLODED VIEW

SYMBOL & LANE
MARKINGS

MARKING AREA
33.82 SQ.FT.

MARKING AREA
33.82 SQ.FT.

SYMBOL MARKINGS
TRAFFIC ARROWS FOR
HIGH SPEED ROADWAYS

STANDARD PLAN M-24.20-01

DRAWN IN: MARK SUJKA
GRID IS 4" SQUARE

MARKING AREA
28.40 SQ.FT.
MARKING AREA
33.82 SQ.FT.

SYMMETRICAL ABOUT
CENTER LINE
SYMBOL Markings
TRAFFIC Arrows For
HIGH SPEED ROADWAYS
STANDARD Plan M-34.20-01

SYMBOL & LANE CENTERLINE

3'-0"

2'-0"

1'-0"

1'-8"

4'-4"

4'-8"

ELLIPSE "A" AXIS

ELLIPSE "B" AXIS

SYMMETRICAL ABOUT CENTERLINE

MARKING AREA 35.88 SQ.FT.

MARKING AREA 45.17 SQ.FT.

MARKING AREA 35.88 SQ.FT.

MARKING AREA
35.88 SQ.FT.

SYMMETRICAL ABOUT CENTERLINE

SYMBOL & LANE CENTERLINE

3'-0"

2'-0"

1'-0"

1'-8"

4'-4"

4'-8"

ELLIPSE "A" AXIS

ELLIPSE "B" AXIS

SYMMETRICAL ABOUT CENTERLINE

MARKING AREA 35.88 SQ.FT.

MARKING AREA 45.17 SQ.FT.

MARKING AREA 35.88 SQ.FT.

SYMMETRICAL ABOUT CENTERLINE

SYMBOL & LANE CENTERLINE

3'-0"

2'-0"

1'-0"

1'-8"

4'-4"

4'-8"

ELLIPSE "A" AXIS

ELLIPSE "B" AXIS

SYMMETRICAL ABOUT CENTERLINE

MARKING AREA 35.88 SQ.FT.

MARKING AREA 45.17 SQ.FT.

MARKING AREA 35.88 SQ.FT.
NOTE:
Use the dimensions shown on this plan for each type Traffic Arrow being placed on roadways with a posted speed limit of 40 mph or lower.
SYMBOL MARKINGS

TRAFFIC ARROWS FOR LOW SPEED ROADWAYS

STANDARD PLAN M-24.40-01

SYMBOL & LANE

8" 8"

2' - 0"

SYMBOL & LANE

2' - 5/8"

8"

2' - 0"

SYMBOL & LANE

3' - 8"

ELLIPSE "A" AXIS

2' - 0"

ELLIPSE "B" AXIS

SYMMETRICAL ABOUT CENTERLINE

GRID IS 4" SQUARE

MARKING AREA 10.00 SQ.FT.

MARKING AREA 23.14 SQ.FT.

MARKING AREA 15.94 SQ.FT.

MARKING AREA 15.94 SQ.FT.

DRAWN BY:  MARK SUJKA

EXPLORES AUGUST 9,  2007

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THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON
FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANS-
PORTATION.   A COPY MAY BE OBTAINED UPON REQUEST.

Harold J. Peterfeso  05-31-06

Washington State Department of Transportation
Symbol Markings

MISCELLANEOUS

STANDARD PLAN M-34.60-02

Sheet 1 of 2 Sheets

AERIAL SURVEILLANCE MARKERS

MARKING AREA = 0.56 SQ.FT.

PAVED SHOULDER

MARKING AREA = 1.06 SQ.FT.

DRAINAGE STRUCTURE INLET

MARKING AREA = 6.00 SQ.FT.

MARKING AREA = 11.73 SQ.FT.

EDGE LINE

STOP LINE

1' - 0" ~ UNLESS NOTED OTHERWISE IN CONTRACT

LENGTH VARIES ~ SEE CONTRACT

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2. Guide posts shall be placed at 100' spacing on ramp tangents and tapers.
3. "S" dimension shown on Standard Plan M-40.40 or 100', whichever is smaller.
4. One half of "S" dimension shown on Standard Plan M-40.40 or 50', whichever is smaller.
5. Two spaces at 100'.
6. Three equal spaces when R < 75', four equal spaces when R ≥ 75'.
7. Two equal spaces.
8. Locate the initial Guide Post so that it does not hinder the visibility of the Bridge Delineator for approaching traffic. The distance between the bridge end and the initial Guide Post shall be 50 feet maximum.
GUIDE POST PLACEMENT
GRADE INTERSECTIONS

STANDARD PLAN M-40.30-00


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

| RADIUS (ft) | 8   | 10  | 12  | 16  | 20  | 25  | 30  | 35  | 40  | 50  | 60  | 75  | 100 | 125 | 150 | 200 | 250 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1,000 | 1,200 | 1,500 | 2,000 | 2,500 | 3,000 | 3,500 | 4,000 | 4,500 | 5,000 | 5,500 | 6,000 | 6,500 | 7,000 | 7,500 | 8,000 | 8,500 | 9,000 | 9,500 | 10,000 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 20         | 20  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 30         | 25  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 40         | 30  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 50         | 35  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 60         | 40  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 75         | 50  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 100        | 50  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 125        | 60  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 150        | 65  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 200        | 70  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 250        | 75  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 300        | 80  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 400        | 90  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 500        | 100 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 600        | 110 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 700        | 120 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 800        | 130 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 900        | 140 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 1,000      | 150 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 1,200      | 160 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 1,500      | 180 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 2,000      | 200 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 2,500      | 220 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 3,000      | 240 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 4,000      | 280 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |

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

1. Locate the initial Guide Post so that it does not hinder the visibility of the Bridge Delineator for approaching traffic. The distance between the bridge end and the initial Guide Post shall be 60 feet max.

2. Locate the initial Guide Post so that its visibility is unhindered for traffic departing the bridge. The distance between the bridge end and the initial Guide Post shall be 60 feet max.

BEGIN RUMBLE STRIP ON RIGHT SHOULDER AT END OF ACCELERATION TAPER

4' MIN. ~ 5' MIN. WITH BARRIER OR GUARDRAIL AT EDGE OF SHOULDER

60' MIN.

4' MIN. ~ 5' MIN. WITH BARRIER OR GUARDRAIL AT EDGE OF SHOULDER

600' MIN.

100' MIN.

450'

600'

RUMBLE STRIPS SHALL NOT BE PLACED ON BRIDGE APPROACH SLABS

SHOULDER RUMBLE STRIP ON LEFT SHOULDER

SHOULDER RUMBLE STRIP ON OUTSIDE SHOULDER

SHOULDER RUMBLE STRIPS ON MEDIAN SHOULDERS

SHOULDER RUMBLE STRIP ON MEDIAN CROSSOVER

SHOULDER RUMBLE STRIP
ON OUTSIDE SHOULDER

WIDE LANE LINE

SHOULDER TAPER DETAIL

MEDIAN CROSSOVER

SHOULDER TAPER DETAIL

STRUCTURE OR OTHER FEATURE NECESSITATING A REDUCTION IN SHOULDER WIDTH

SHOULDER RUMBLE STRIP
ON LEFT SHOULDER

SHOULDER RUMBLE STRIP ON LEFT SHOULDER

MEDIAN SHOULDER

OUTSIDE SHOULDER

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL, SIGNED BY THE ENGINEER AND APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION. A COPY MAY BE OBTAINED UPON REQUEST.
SHOULDER RUMBLE STRIP
TYPE 1
FOR DIVIDED HIGHWAYS
STANDARD PLAN M-60.10-00

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NOTES

1. Center Line Rumble Strip installation requires a minimum distance of 12 feet from Center Line to edge of paved shoulder.

2. When directed by the Engineer, Rumble Strips may be installed along the turn pocket taper where there is a history of near-end collisions in the turn pocket.
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| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 |

Eight foot high letters and numerals are shown on a four-inch square grid for use on roadways with a posted speed of 45 mph or more.