Standard Plans
For Road, Bridge, and Municipal Construction

M 21-01

Washington State Department of Transportation

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

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

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Harold Peterfeso
State Design Engineer
## Comments

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| To: | Design Standards  
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|     | Transportation Building  
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<td>Surveying Along Centerline Of Low Volume Road</td>
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<tr>
<td>K-25</td>
<td>Left Lane Closure On Far Side Of Intersection</td>
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<tr>
<td>K-26</td>
<td>Right Lane Closure On Far Side Of Intersection</td>
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<tr>
<td>K-27</td>
<td>One Lane Repair During Non-Working Hours</td>
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<tr>
<th>Section L</th>
<th>Fence and Glare Screen</th>
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<tr>
<td>L-1</td>
<td>Wire Fence</td>
</tr>
<tr>
<td>L-2</td>
<td>Chain Link Fence</td>
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<td>L-3</td>
<td>Chain Link Gates</td>
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<td>L-5</td>
<td>Glare Screen Type 1</td>
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<td>L-6</td>
<td>Access Control Gate</td>
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<th>Pavement Marking</th>
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<tr>
<td>M-1.20-00</td>
<td>Ramp Channelization, Single Lane</td>
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<td>M-1.40-00</td>
<td>Ramp Channelization, Two Lane</td>
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<td>M-1.60-00</td>
<td>Ramp Channelization, Collector Distributor Road</td>
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<td>M-1.80-00</td>
<td>Ramp Channelization, Parallel On &amp; Weaving Section</td>
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<td>M-2.20-00</td>
<td>Gore Area Marking Layouts</td>
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<td>Gore Area Supplement with Type 2</td>
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<tr>
<td>M-2.60-00</td>
<td>Gore Area Substitution with Types 1 &amp; 2</td>
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<th>Publication Approval Date</th>
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<td>Left Turn Channelization</td>
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<td>Left Turn Channelization, Reduced Tapers</td>
<td>12/15/04</td>
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<td>M-3.30-00</td>
<td>Left Turn Channelization, Tee Intersection and Back-to-back Turn Lanes</td>
<td>12/15/04</td>
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<tr>
<td>M-3.40-00</td>
<td>Two-way Left Turn and Median Channelization</td>
<td>12/15/04</td>
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<td>M-3.50-00</td>
<td>Double Left Turn Channelization</td>
<td>12/15/04</td>
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<tr>
<td>M-5.10-00</td>
<td>Right Turn Channelization</td>
<td>12/15/04</td>
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<td>M-7.50-00</td>
<td>High Occupancy Vehicle (HOV) Lane Symbol Layout</td>
<td>3/4/05</td>
</tr>
<tr>
<td>M-9.50-00</td>
<td>Bicycle Lane Symbol Layout</td>
<td>3/4/05</td>
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<td>M-11.10-00</td>
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<td>3/4/05</td>
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<td>M-15.10-00</td>
<td>Crosswalk Layout</td>
<td>2/25/05</td>
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<tr>
<td>M-17.10-00</td>
<td>Parking Space Layout</td>
<td>3/4/05</td>
</tr>
<tr>
<td>M-20.10-00</td>
<td>Long Line Marking Patterns</td>
<td>3/4/05</td>
</tr>
<tr>
<td>M-20.20-00</td>
<td>Profiled Plastic Lines</td>
<td>3/4/05</td>
</tr>
<tr>
<td>M-20.30-00</td>
<td>Long Line Supplement with Raised Pavement Markers</td>
<td>3/4/05</td>
</tr>
<tr>
<td>M-20.40-00</td>
<td>Long Line Supplement with Raised Pavement Markers</td>
<td>3/4/05</td>
</tr>
<tr>
<td>M-20.50-00</td>
<td>Long Line Substitution with Raised Pavement Markers</td>
<td>3/4/05</td>
</tr>
<tr>
<td>M-24.20-00</td>
<td>Symbol Markings, Traffic Arrows for High Speed Roadways</td>
<td>3/4/05</td>
</tr>
<tr>
<td>M-24.40-00</td>
<td>Symbol Markings, Traffic Arrows for Low Speed Roadways</td>
<td>3/4/05</td>
</tr>
<tr>
<td>M-24.60-00</td>
<td>Symbol Markings, Miscellaneous</td>
<td>3/4/05</td>
</tr>
</tbody>
</table>
**CASE 3**
**ASPHALT CONCRETE PAVEMENT**
*(L-Type Abutment)*

- Plane a taper into the existing pavement and shoulders (if paved). Depth shall taper from 0" at the beginning of pavement, to 1" at end of taper. Does not apply when existing pavement has been planed.
- Before placing overlay, remove top 2" of existing joint filler, or 3" if existing joint is fiberboard, and block out the joint. After overlay, install new preformed joint filler. Top of joint filler shall be between 3/8" and 5/8" below overlay. When a compression seal is in place, see Bridge Plans.
- Before placing overlay, block out the joint. After overlay, install preformed joint filler or rubberized asphalt filler. Top of joint filler shall be between 3/8" and 5/8" below overlay.
- Full depth sawed grooves between 3/8" and 1/4" wide shall be placed directly over the existing sawed grooves in the cement concrete pavement and cement concrete shoulders.
- Cement concrete shoulders shall be overlaid with cement concrete. Asphalt concrete shoulders shall be overlaid with asphalt concrete.

**LEGEND**
- Concrete Overlay
- Asphalt Concrete Overlay

---

**CASE 4**
**ASPHALT CONCRETE PAVEMENT**

**CASE 5**
**ASPHALT CONCRETE PAVEMENT**
*(ACP was on bridge and/or roadway grade slopes up from bridge)*
1. Curb shall be Extruded Curb Type 1, 2, 4, 4a, 5, or 5a, as specified in the contract.

2. Catch basin or grate inlet shall be located between guardrail posts.
UNDIVIDED HIGHWAY (TWO WAY TRAFFIC) 
DOWEL BAR RETROFIT FOR EACH LANE

SECTION C

SECTION D

SKEWED JOINT DETAIL

PLANE VIEW

EXISTING CEMENT CONCRETE PAVEMENT

BASED TRANSVERSE
CONTRACTION JOINT
(SEE WTS. PLAN A-1)

DOWEL BAR (TYP)

EXISTING CEMENT CONCRETE PAVEMENT

DOWEL BAR PLACEMENT DETAIL
PLAN VIEW (SHEET 3)
NOTES:

1. Install tie bars along longitudinal joint between full panel replacement and existing cement concrete pavement. Tie bars are not installed between cement concrete pavement and asphalt concrete shoulders.

2. Place polyethylene film (per AASHO M 171-92) along the longitudinal joint between partial panel replacement and existing panel.
NOTES

1. AS AN ACCEPTABLE ALTERNATIVE TO REBAR, WIRE MESH HAVING A MINIMUM AREA OF 0.12 SQUARE INCHES PER FOOT MAY BE USED. WIRE MESH SHALL NOT BE PLACED IN KNOCKOUTS.

2. THE KNOCKOUT DIAMETER SHALL NOT BE GREATER THAN 30°. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 2" MINIMUM TO 2.5" MAXIMUM FOR A 1.5" MINIMUM GAP BETWEEN THE KNOCKOUT WALL AND THE SIDE WALL OF THE PIPE. AFTER THE PIPE IS INSTALLED, FILL THE GAP WITH JOINT MORTAR IN ACCORDANCE WITH STANDARD SPECIFICATION D-433.

3. THE MAXIMUM DEPTH FROM THE FINISHED GRADE TO THE PIPE INVERT SHALL BE 6".

4. FRAME AND GRATE MAY BE INSTALLED WITH PLANCHE DOWN OR CAST INTO ADJUSTMENT SECTION.

5. THE PRECAST BASE SECTION MAY HAVE A ROUNDED FLOOR AND THE WALLS MAY BE SLOPED AT A RATE OF 1:24 OR STEEPER.

6. OPENING SHALL BE MEASURED AT THE TOP OF THE PRECAST BASE SECTION.

PIPE ALLOWANCES

<table>
<thead>
<tr>
<th>PIPE MATERIAL</th>
<th>MAXIMUM BURIED DIAMETER</th>
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</thead>
<tbody>
<tr>
<td>REINFORCED OR PLAIN CONCRETE</td>
<td>12&quot;</td>
</tr>
<tr>
<td>ALL METAL PIPE</td>
<td>15&quot;</td>
</tr>
<tr>
<td>CASING (STD. SPEC. 06-10)</td>
<td>12&quot;</td>
</tr>
<tr>
<td>SOLID WALL PVC (STD. SPEC. 06-1213)</td>
<td>15&quot;</td>
</tr>
<tr>
<td>PROFILE WALL PVC (STD. SPEC. 06-1202)</td>
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</tbody>
</table>

* CORRUGATED POLYETHYLENE STORM SEWER PIPE
**PIPE ALLOWANCES**

<table>
<thead>
<tr>
<th>PIPE MATERIAL</th>
<th>MAXIMUM BARE DIAMETER</th>
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</thead>
<tbody>
<tr>
<td>REINFORCED OR PLAIN CONCRETE</td>
<td>18&quot;</td>
</tr>
<tr>
<td>ALL METAL PIPE</td>
<td>21&quot;</td>
</tr>
<tr>
<td>CP-68P # (STD. SPEC. 8-06.02)</td>
<td>18&quot;</td>
</tr>
<tr>
<td>SOLID WALL PVC (STD. SPEC. 8-06.12)</td>
<td>21&quot;</td>
</tr>
<tr>
<td>PROFILE WALL PVC (STD. SPEC. 8-06.12)</td>
<td>21&quot;</td>
</tr>
</tbody>
</table>

* Corrugated Polyethylene storm sewer pipe

**NOTES**

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

2. The inside diameter shall not be greater than 20% of the shroud shall have a wall thickness of 20 minimum to 21" maximum. Provide a 1-1/2" minimum gap between the inside wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar to Standard Specification 8-04.3.

3. The maximum depth from the finished grade to the pipe invert shall be 46.5.

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

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

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

**RECTANGULAR ADJUSTMENT SECTION**

**REDUCING SECTION**

**PRECAST BASE SECTION**

**CATCH BASIN TYPE 1L**

**STANDARD PLAN B-1a**

Sheet 1 of 1 Sheet

APPROVED FOR PUBLICATION

Harold J. Petersen
06-23-04
NOTES

1. As an acceptable alternative to wire mesh having a minimum area of 6.12 square inches per foot, 8" wide netting may be used. Wire mesh shall not be placed in trellises.

2. The inlet/exit diameter shall not be greater than 10". Inlet/exit shall have a wall thickness of 5/8" minimum to 9/16" maximum.

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

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

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

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

FRAME AND VANE GRATE

RECTANGULAR ADJUSTMENT SECTION

ONE #8 BAR HOOP FOR 6' HEIGHT TWO #8 BAR HOOPS FOR 12' HEIGHT

#8 BAR EACH CORNER
#8 BAR EACH SIDE
#8 BAR EACH WAY

PRECAST BASE SECTION
NOTES:

1. No steps are required when height is 4’ or less.
2. The bottom of the precast catch basin may be sloped to facilitate cleaning.
3. Frame and grate may be sized with range down or cast into 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. Allow the pipe to install, fill the gap with joint mortar in accordance with Std. Spec. 0-043.

CATCH BASIN DIMENSIONS

<table>
<thead>
<tr>
<th>CATCH BASIN DIAMETER</th>
<th>WALL THICKNESS</th>
<th>BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT SIZE</th>
<th>MINIMUM DISTANCE BETWEEN KNOCKOUTS</th>
<th>BASE REINFORCING STEEL</th>
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<tr>
<td>48&quot;</td>
<td>4&quot;</td>
<td>8&quot;</td>
<td>10&quot;</td>
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<td>6&quot;</td>
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<td>6&quot;</td>
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PIPE ALLOWANCES

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<th>PIPE MATERIAL WITH MAXIMUM INSIDE DIAMETER</th>
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<td>54&quot;</td>
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<tr>
<td>96&quot;</td>
<td>60&quot;</td>
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</tbody>
</table>

1. CORRUGATED POLYETHYLENE STORM SEWER PIPE (Std. Spec. 0-05.30)
2. (Std. Spec. 0-05.12(1))
3. (Std. Spec. 0-05.12(2))
NOTES:
1. When bolt down covers are specified in the Contract, provide two angles in the cover that are vertically aligned with the holes in the frame. Location of bolt down slots varies among different manufacturers.
2. Alternate reinforcing rib designs are acceptable.
3. Refer to Standard Specification 9-02.14(G) for additional requirements.
4. For flange details, see Standard Plan B-3a.
1. This frame is designed to accommodate 20" x 24" grates or covers as shown on Standard Plans B-3, B-2a, B-2b and B-2d.

2. When bolt down grates or covers are specified in the Contract, provide two holes in the frame that are vertically aligned with the grate or cover slots. Tap each hole to accept a 5/16" - 11 NC x 2" self-drill cap screw. Location of bolt down holes varies among different manufacturers.

3. Refer to Standard Specification 0-05.10(2) for additional requirements.

NOTES

REVERSIBLE FRAME FOR CATCH BASIN OR CONCRETE INLET

STANDARD PLAN B-3a

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Matthew J. Ballew

Expires: July 1, 2005

Drainage

Bolt Down Detail

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

2. Refer to Standard Specification R-05.16.2 for additional requirements.

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

SECTION A

SLOT DETAIL

24"

7 OR 8 EQUAL SPACES

DIRECTION OF FLOW

1 5/8 MAX.

PLAN VIEW

SEE SLOT DETAIL & NOTE 1

SECTION B

VANED GRATE FOR CATCH BASIN AND CONCRETE INLET

STANDARD PLAN B-2b

SHEET 1 OF 1 SHEET

EXPIRES JULY 1, 2003

APPROVED FOR PUBLICATION

HAROLD J. FURTHROW

08/17/02

08/02

DELETED HAND DRAFTED ADDED SLOT DETAILS REPLACED NOTE

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006
NOTES

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

2. Refer to Standard Specification R-06.162 for additional requirements.

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

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

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

3. For frame details, see Standard Plan 8-2a.

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

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


3. ATTACH THE HOOD TO THE FRAME WITH TWO 3/4" X 2" HEX HEAD BOLTS, NUTS, AND OVERSIZE WASHERS. THE WASHERS SHALL BE USED ON THE BLOTTED SIDE, AND SHALL HAVE DIAMETERS ADEQUATE TO ASSURE FULL BEARING ACROSS THE BOLTS.


5. ONLY DUCTILE IRON VANED GRATES SHALL BE USED. SEE STANDARD PLANS B-20 AND B-24 FOR GRATE DETAILS. REFER TO STANDARD SPECIFICATION 802.102 FOR ADDITIONAL REQUIREMENTS.

6. THIS PLAN IS INTENDED TO SHOW THE INSTALLATION DETAILS OF A MANUFACTURED PRODUCT. IT IS NOT THE INTENT OF THIS PLAN TO SHOW THE SPECIFIC DETAILS NECESSARY TO FABRICATE THE CASTINGS SHOWN ON THIS DRAWING.
1. Angles shall be set so that each bearing bar of prestressed grate shall have full bearing on both ends. The finished top of concrete shall be even with the grate surface.

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

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

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

5. Grate "B" will be used only when specified in the Contract.

NOTE:"

GROUT INLET TYPE 1
STANDARD PLAN R-4b
Sheet 1 of 1 Sheet
APPROVED FOR PUBLICATION
Harold J. Petersoff 02-09-05
Washington State Department of Transportation

NOTE: NOT TO SCALE. MAINTAIN DRAWING AND CLEARY AT THE DISCRETION OF THE CONTRACTOR. DRAWN FOR THEflake FOR PUBLICATION OF THE CONTRACTOR'S CONSTRUCTION.
1. The frame and grate design shown on this plan is for use with the concrete drainage structure shown on Standard Plan B-4d.

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

3. Refer to Standard Specification 9-05.1(2) for additional requirements.
1. Angles shall be set so that each bearing bar on the grate shall have full seating on both ends. The finished top of concrete shall be even with the grate surface.

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

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

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

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

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

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

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

**DIKE INSTALLATION FOR PREFERRED SLOPE**

*See Contract For Backslope Details*

**DROP INLET TYPE 1**

**ELEVATION**

4" x 3" x 1/2" x 35/16" Steel angle

1/2" x 1 1/4" x 1/4" Steel angle or 1/2 DIA X 4" stud

**END VIEW**

4" x 1 1/2" x 1/8" Steel plate (Tack weld to angle)
1. Angles shall be set so that each bearing bar on the grate shall have full seating on both ends. The finished top of concrete shall be even with the grate surface.

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

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

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

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

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

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

8. Amount, type and grade of reinforcing steel is the responsibility of the manufacturer. The manufacturer is responsible for the structure until final acceptance in place with all required knockouts removed.
1. The culvert ends shall be beveled to match the embankment or ditch slope and shall not be beveled flatter than 4:1:1. When slopes are between 4:1:1 and 8:1:1, 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 cut 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 Provision.

NOTES
NOTES:
1. Span and rise dimensions are nominal and are measured to the inside crests of corrugations.
2. Allowable heights of cover shall be within the limits indicated in the table included herein. Minimum and maximums are shown.
3. Unless indicated otherwise a 10' depth (over the inside crests of corrugations) of earth shall be placed in the invert of the Structural Plate Underpass, Design 1, for the full width and length. The earth shall consist of naturally occurring materials available to the vicinity of the structural plate underpass installation. See Standard Specification 7-33.3(4).
4. Designed for 1-20 live load and maximum allowable soil pressure of 2 kips per square foot.

<table>
<thead>
<tr>
<th>SPAN</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>8'</td>
<td>7'</td>
<td>8'</td>
</tr>
<tr>
<td>10'</td>
<td>9'</td>
<td>9'</td>
</tr>
</tbody>
</table>
1. \( D \) = Inside Diameter of Culvert Pipe, or Pipe Arch Span Width, 30\" minimum.
2. The distance between the safety bars, and between the top bar and the culvert crown, shall be equal spaced of no more than 36\".  The distance may vary \( \pm 1\" \) between bars to facilitate placement.
3. Slope shall match Side Slopes, S-6:1 or S-1:4, preferred, not steeper than S-1:4.5.
NOTES

1. See Standard Specifications Section 7-03.3(5) for Pipe Zone Backfill.
2. See Standard Specifications Section 5-03.12(5) for Gravel Backfill for Pipe Zone Backing.
3. See Standard Specifications Section 2-06.4 for Measurement of Trench Width.
4. For sanitary sewer installation, concrete pipe shall be backfilled 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</td>
<td>12&quot; to 24&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>(Diameter)</td>
<td>30&quot; to 48&quot;</td>
<td>EXAM. 12</td>
</tr>
<tr>
<td></td>
<td>102&quot; to 150&quot;</td>
<td>48&quot;</td>
</tr>
<tr>
<td>PIPE ARCH</td>
<td>18&quot; to 30&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>(SPAN METAL ONLY)</td>
<td>45&quot; to 142&quot;</td>
<td>8SPAN 35</td>
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<tr>
<td></td>
<td>145&quot; to 200&quot;</td>
<td>48&quot;</td>
</tr>
</tbody>
</table>
PLAN

1/8” Raised squares, 3/8” apart, 1/4” high

1/2” wide, 1/4” high raised border

SECTION A-A

CAST IRON RING AND COVER

8 INCH CLEAN-OUT

Fibre joint packing
45° Bend
Plug

10”
9”
8 1/4”
5/8”
7”
1 1/2”
1”
1/2”
1/2”

12”
12”
4 1/2”
8”

24”
1. Size of combination air release/air vacuum valve shall be specified in the Contract. Piping and valves shall be the same size as the combination air release/air vacuum valve.

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

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

**DIMENSION TABLE**

<table>
<thead>
<tr>
<th>PIPE DIAM</th>
<th>TEST PRESSURE (PSI)</th>
<th>BEND ANGLE</th>
<th>CONCRETE VOLUME (FT³)</th>
<th>CUBE SIZE (IN)</th>
<th>TIE ROD DIAM</th>
<th>TIE ROD EMBEDMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>280</td>
<td>11.25°</td>
<td>6</td>
<td>1.6</td>
<td>66&quot;</td>
<td>17&quot;</td>
</tr>
<tr>
<td></td>
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<td>22.5°</td>
<td>12</td>
<td>2.3</td>
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<tr>
<td></td>
<td></td>
<td>45°</td>
<td>23</td>
<td>2.6</td>
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<tr>
<td>6&quot;</td>
<td>280</td>
<td>11.25°</td>
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<td>2.4</td>
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<td>22.5°</td>
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<td>3.0</td>
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<td>45°</td>
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<td>8&quot;</td>
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<td>2.9</td>
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<td>45°</td>
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<td>17&quot;</td>
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<td>22.5°</td>
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<td></td>
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<td>45°</td>
<td>135</td>
<td>6.3</td>
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<tr>
<td>12&quot;</td>
<td>280</td>
<td>11.25°</td>
<td>65</td>
<td>3.8</td>
<td>66&quot;</td>
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<tr>
<td></td>
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<td>22.5°</td>
<td>108</td>
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<td></td>
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<td>45°</td>
<td>200</td>
<td>6.5</td>
<td>75&quot;</td>
<td>24&quot;</td>
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<tr>
<td>14&quot;</td>
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<td>11.25°</td>
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<td>66&quot;</td>
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<tr>
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<td>22.5°</td>
<td>147</td>
<td>5.5</td>
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<td></td>
<td></td>
<td>45°</td>
<td>272</td>
<td>8.5</td>
<td>1&quot;</td>
<td>27&quot;</td>
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<tr>
<td>16&quot;</td>
<td>280</td>
<td>11.25°</td>
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<td></td>
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<td>385</td>
<td>7.1</td>
<td>1 1/8&quot;</td>
<td>35&quot;</td>
</tr>
</tbody>
</table>

**CONCRETE BLOCKING FOR Convex Vertical Bends**

**STANDARD PLAN B-22**

Sheet 1 of 1 Sheet

Approved for publication

Harold J. Potratz 07-31-03

Washington State Department of Transportation

Effective: April 4, 2005 to January 2, 2006
### Thrust at Fittings in Pounds

<table>
<thead>
<tr>
<th>Size</th>
<th>Test Pressure PS 250</th>
<th>Test Pressure PS 250</th>
<th>Test Pressure PS 250</th>
<th>Test Pressure PS 250</th>
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<td>3,140</td>
<td>4,440</td>
<td>2,405</td>
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<td>6&quot;</td>
<td>7,070</td>
<td>9,955</td>
<td>5,410</td>
<td>2,760</td>
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<td>8&quot;</td>
<td>12,565</td>
<td>17,770</td>
<td>9,620</td>
<td>4,905</td>
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<td>10&quot;</td>
<td>19,635</td>
<td>27,770</td>
<td>15,030</td>
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<td>39,955</td>
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<td>50,265</td>
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<td>19,615</td>
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### Safe Bearing Load

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<thead>
<tr>
<th>Soil Type</th>
<th>Safe Bearing Load (PSF)</th>
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</thead>
<tbody>
<tr>
<td>Muck, peat, etc.</td>
<td>0</td>
</tr>
<tr>
<td>Soft clay</td>
<td>1,000</td>
</tr>
<tr>
<td>Sand</td>
<td>2,000</td>
</tr>
<tr>
<td>Sand and gravel</td>
<td>3,000</td>
</tr>
<tr>
<td>Sand and gravel cemented with clay</td>
<td>4,000</td>
</tr>
<tr>
<td>Hard shale</td>
<td>10,000</td>
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</table>
NOTE
Knockouts shall have a wall thickness of 2" minimum to 2 1/2" 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 (呎²/呎 in each direction)</th>
</tr>
</thead>
<tbody>
<tr>
<td>48&quot;</td>
<td>4&quot;</td>
<td>5&quot;</td>
<td>36&quot;</td>
<td>6&quot;</td>
<td>0.16</td>
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<tr>
<td>60&quot;</td>
<td>4 1/2&quot;</td>
<td>6&quot;</td>
<td>42&quot;</td>
<td>6&quot;</td>
<td>0.16</td>
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<td>5&quot;</td>
<td>6&quot;</td>
<td>48&quot;</td>
<td>6&quot;</td>
<td>0.26</td>
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MANHOLE TYPE 1
STANDARD PLAN B-23a
SHEET 1 OF 1 SHEET
APPROVED FOR PUBLICATION
Harold J. Peterson 03-30-20
**Manhole Type 2**

**Standard Plan B-23b**

**Manhole Dimension Table**

<table>
<thead>
<tr>
<th>Diam</th>
<th>Wall Thickness</th>
<th>Base Thickness</th>
<th>Maximum Knockout Size</th>
<th>Minimum Distance Between Knockouts</th>
<th>Base Reinforcing Steel (in(^2) in each direction)</th>
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</thead>
<tbody>
<tr>
<td>72&quot;</td>
<td>6&quot;</td>
<td>8&quot;</td>
<td>60&quot;</td>
<td>12&quot;</td>
<td>Integral 0.54 Separate 0.58</td>
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<tr>
<td>84&quot;</td>
<td>5&quot;</td>
<td>12&quot;</td>
<td>72&quot;</td>
<td>12&quot;</td>
<td>Integral 0.59 Separate 0.58</td>
</tr>
<tr>
<td>96&quot;</td>
<td>5&quot;</td>
<td>12&quot;</td>
<td>84&quot;</td>
<td>12&quot;</td>
<td>Integral 0.59 Separate 0.58</td>
</tr>
</tbody>
</table>

**NOTE**

Knockouts shall have a wall thickness of 2" minimum to 3 1/2" maximum.
NOTE
Knockout shell have a wall thickness of 2" minimum to 2.5" minimum.

MANHOLE DIMENSION TABLE

<table>
<thead>
<tr>
<th>MANHOLE DIAMETER</th>
<th>WALL THICKNESS</th>
<th>BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT SIZE</th>
<th>MINIMUM SPACING BETWEEN KNOCKOUTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>12&quot;</td>
<td>4&quot;</td>
<td>4&quot;</td>
<td>12&quot;</td>
<td>5/16&quot;</td>
</tr>
<tr>
<td>18&quot;</td>
<td>4.5&quot;</td>
<td>5&quot;</td>
<td>18&quot;</td>
<td>5/16&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>5&quot;</td>
<td>5&quot;</td>
<td>24&quot;</td>
<td>5/8&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>6&quot;</td>
<td>6&quot;</td>
<td>30&quot;</td>
<td>5/8&quot;</td>
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<tr>
<td>36&quot;</td>
<td>8&quot;</td>
<td>8&quot;</td>
<td>36&quot;</td>
<td>1&quot;</td>
</tr>
</tbody>
</table>

MANHOLE TYPE 3
STANDARD PLAN B-23c

Sheet 1 of 1 Sheet

APPROVED FOR PUBLICATION

Harold J. Peterson 06-30-04

Washington State Department of Transportation
ELEVATION

Reinforced concrete pipe

12" MIN

Graft riser section to pipe

SECTION

12'-0" MAX

4'-0" MIN, 16'-0" MAX

Mortar

Weld reinforcing steel at joints

Precast riser sections

Steps or ladder

Eccentric cone section

Circular adjustment section

Manhole ring and cover

48" MIN

48" MAX

48" MIN
FRAME AND VANED CRATE

RECTANGULAR ADJUSTMENT SECTION

NOTES
1. As an acceptable alternate to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used. Wire mesh shall not be placed in knockouts.
2. The knockout diameter shall not be greater than 18”. Knockouts shall have a wall thickness of 1/8” minimum to 2” maximum.
3. Frame and grate may be installed with flange down or cast into adjustment section.
4. The precast base section may have a rounded floor and the walls may be sloped at a rate of 1:24 or steeper.
5. Opening shall be measured at the top of the precast base section.

CONCRETE INLET

*3 Bar each corner

*3 Bar each side top and bottom

One *3 Bar across bottom
NOTES:
1. Precast cone sections may be eccentric or concentric.
2. Seepage port orientation varies among manufacturers.
1. Concrete collar width shall be one half of the outside pipe diameter of the largest pipe. The minimum 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. When a coupling band connection requires attaching a bell end of a concrete pipe, the bell end of the pipe shall be removed before the connection is installed.

3. Increase the outside diameter of the metal pipe to match the inside diameter of the concrete pipe with 18" wide rubber gaskets. Thickness as required. Rubber gaskets shall be in accordance with Section 9-04.4(3) of the standard specifications.

4. Use a type K coupling band. Type K coupling bands with diimplies 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.

5. Steel welded wire fabric shall be in accordance with Section 8-07.7 of the standard specifications. Install two wraps for size 6 x 6 W1.4 x W1.4 (10 gauge) steel welded wire fabric or one wrap for any of the following sizes:
   - 6 x 6 W2.1 x W2.1 (8 gauge)
   - 6 x 6 W2.9 x W2.9 (6 gauge)
   - 4 x 4 W2.9 x W2.9 (6 gauge)
   - 4 x 4 W4.0 x W4.0 (4 gauge)
NOTES

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

2. Mark location of sewer stub in accordance with Contracting Agency requirements.
STANDING SIDE SEWER CONNECTION

STANDARD PLAN B-30

45° bend

4" or 6" Sewer Pipe (See Contract)

Tee

Sewer main

24" x 24" x 24" Concrete block or Controlled Density Fill
NOTES
1. Type 10 posts shall be 6x6 timber or W6x9.
   Type 11 posts shall be 10x10 timber or W6x15.
   For details, see "Standard Plan "Beam Guardrail Posts and Blocks."
2. Type 10 guardrail post spacing shall be 6' - 3" on center.
   Type 11 shall be a maximum of 3' - 11/2" on center.

THRIE BEAM RAIL ELEMENT
THRIE BEAM EXPANSION SECTION

STEEL POST ASSEMBLY

TYPE 10 and 11

STANDARD PLAN C-1a
NOTES

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

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

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

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

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

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

See Detail B

G-2 Post (See Note 1)

DETAIL A

V6” DIA x 1\(\frac{1}{2}\)” hex head bolt with hex nut and 1\(\frac{1}{4}\)” square x .135” washer

DETAIL B

V6” DIA x 1\(\frac{1}{2}\)” hex head bolt with hex nut, guardrail rests on top of bolt.

BEAM GUARDRAIL

TYPE 20

TYPE 21
INTERMEDIATE GUARDRAIL POST CONNECTION DETAILS
(Type A shown)

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

THREE BEAM GUARDRAIL REDUCER SECTION
TYPE B

NOTES
1. For wood posts, saw top of post and block to 1” above three beam guardrail reducer section. For steel posts, drive post down to 1” maximum above the three beam guardrail reducer section.
NOTES
1. Type 4 anchor required. For details, see Standard Plan C-6c.
2. Post spacing is 6'-3" unless otherwise shown.
3. For Terminal type and details, see Contract Plans and applicable Standard Plan(s).
4. The slope from the edge of the shoulder into the face of the guardrail should not exceed 12:1 when the face of the guardrail is less than 12'-0" from the edge of the shoulder.
5. For one-way traffic, use Type 4 anchor. For two-way traffic, use Type 1 anchor. See applicable Standard Plan(s) for details.
6. When Beam Guardrail Flared Terminals are used on both ends a minimum of 25'-0" of Beam Guardrail shall be installed.
NOTES
1. Post spacing is 6'-3" except where noted.
2. For terminal type and details, see Contract and applicable Standard Plans.
3. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1 when the guardrail is within 12'-0" from the edge of the shoulder.
4. See Contract for dimensions.
5. See Contract for Guardrail Transition Section and Guardrail Connection to Bridge Rail or Concrete Barrier.

FLARE RATE TABLE

<table>
<thead>
<tr>
<th>RATE</th>
<th>PISSED SPEED (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15x1</td>
<td>70</td>
</tr>
<tr>
<td>14x1</td>
<td>60</td>
</tr>
<tr>
<td>13x1</td>
<td>55</td>
</tr>
<tr>
<td>11x1</td>
<td>50</td>
</tr>
<tr>
<td>10x1</td>
<td>45</td>
</tr>
<tr>
<td>9x1</td>
<td>40 or less</td>
</tr>
</tbody>
</table>

GUARDRAIL PLACEMENT
STANDARD PLAN C-2a
1. Attach standard wood or steel blocks to concrete structure with 1/4" expansion anchor or 1/4" threaded rod in a 1" x 8" hole grouted with epoxy.

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

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

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

5. Thrie Beam Guardrail: Reduce Section B.

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

<table>
<thead>
<tr>
<th>Rate</th>
<th>Posted Speed (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15&quot;l</td>
<td>70</td>
</tr>
<tr>
<td>14&quot;l</td>
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<td>10&quot;l</td>
<td>45</td>
</tr>
<tr>
<td>9&quot;l</td>
<td>40 or less</td>
</tr>
</tbody>
</table>

FLAIRE RATE TABLE

GUARDRAIL PLACEMENT

STANDARD PLAN C-2b

EFFECTIVE: APRIL 4, 2006 TO JANUARY 2, 2008

NOTE: THIS CAD IS NOT ALIGNED, MARGINAL DIMENSIONS FOR MACHINING MJNOTICE THE EXISTING BORDERS OF THE UNDERSIZED AND OR FORCED CROSSED LIMITS ON THIS DRAFT SHEET. USE THE ORIGINAL SHEET OF INSTRUCTION FOR A COMPLETE SEQUENCE FOR THIS DRAWING.
NOTES:

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

STANDARD PLAN C-2d

NOTES

1. SRT Terminal shown, for terminal type and details, see Contract or applicable Standard Plan(s).
2. Post spacing is 6'-3" 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 10:1 when the guardrail is within 12'-0" from the edge of the shoulder.

CASE 10A

CASE 10B

CASE 10 C

One Way Traffic

One or Two Way Traffic (see Note 4)
1. SK1 Terminal shown. For terminal type and details see Contract and applicable Standards Plans.

2. Attach standard blocks to concrete structure with \( \frac{3}{4} \)" DIA expansion anchor or \( \frac{3}{4} \)" DIA threaded rod in a 1" DIA x 8" hole grouted with epoxy.

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

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

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

6. Thrie beam guardrail reducer Section Type B.

7. Guardrail post spacing for Type 11 guardrail past the end of bridge pier shall be at 6'-3" spacing, maximum, with 6 x 8 post and standard block.

Guardrail Placement

One Way Traffic

CASE 11C
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 Plans.

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

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

---

**GUARDRAIL PLACEMENT**

**CASE 14**

Direction of Traffic

- Type 1 Beam Guardrail (see Note 2)
- Type 6 Transition
  - Type 20 Beam Guardrail (0 spaces MIN)
- Type 1 Beam Guardrail (0 spaces MIN)
- Terminal pay limit (see Note 2)
- 0 Spaces MIN
- Edge of bridge
- Thrie Beam Guardrail Reducer Section Type B
- See Note 3
- C-2 Post (TYP) (see Note 4)

---

**C-2h**

03-28-97
1. SRT Terminal shown. For Terminal type and details, see Contract and applicable Standard Plans(I).
2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1.

CASE 15

GUARDRAIL PLACEMENT

DETAIL

See Note 3

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

2. For terminal type and details, see contract and applicable Standard Plan 1.

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

4. For guardrail to bridge rail connection see applicable Standard Plan 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.

<table>
<thead>
<tr>
<th>FLARE RATE TABLE</th>
<th>Rate</th>
<th>Posted Speed (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15:1</td>
<td>70</td>
<td></td>
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<tr>
<td>14:1</td>
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<td>12:1</td>
<td>55</td>
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</tr>
<tr>
<td>11:1</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>10:1</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>9:1</td>
<td>40 or less</td>
<td></td>
</tr>
</tbody>
</table>
NOTES
1. See Contract for transition and connection type.
2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1.
3. Guardrail installation shall be Beam Guardrail Type 1 with standard post and block.
4. First letter of case designation indicates end treatment on side road. Second letter indicates end treatment on main road. For instance a terminal on the side road and a bridge connection on the main road would be Case 22 BC.
5. For terminal type and details, see Contract and applicable Standard Plans.
6. Radius dimensions shall be etched into plate replacing the letters "HR" shown on the Identification Plate Detail. Digits shall be 1½" MIN height and ¾" MAX width.
7. The guardrail Identification Plate shall be mounted at the lower splice bolt on the back side of the rail element at the PC of the guardrail radius.

CASE 22 A.
(See Note 4)

CASE 22 B.
(See Note 4)

CASE 22 C.
(See Note 4)

CASE 22 D.
(See Note 4)

IDENTIFICATION PLATE MOUNTING DETAIL
(See Note 7)
NOTES:

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

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

3. For Cable Barrier Type 3 Transition to W-Beam Guardrail details, see Standard Plan C-2e.

LEGEND:

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

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

LEGEND
--- Design Layout Line
NOTE
1. Install Type 2 Asphalt Extended Curb at face of Guardrail. See Standard Plan P-23.

GUARDRAIL TRANSITION SECTIONS
STANDARD PLAN G-3
SHEET 1 OF 1 SHEET
APPROVED FOR PUBLICATION
Herold J. Peterson 10-31-83
Washington State Department of Transportation

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006
GUARDRAIL TRANSITION SECTIONS
STANDARD PLAN C-3a

TYPE 2
- 6'-10" LOAD, 16'-10" POSTS
- WITH STABILIZERS

TYPE 3
- TWO SPACES @ 6'-0"
- TWO SPACES @ 2'-0"
- TOTAL LENGTH = 8'-0"

TYPE 4
- 1'-6"
- FOUR SPACES @ 2'-0"
- TOTAL LENGTH = 8'-0"

TYPE 5
- 6'-0" LOAD, 16'-0" POST WITH STANDARD BLOCK

TYPE 6
- 8'-0" LOAD, 16'-0" POST WITH STANDARD BLOCK

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006
3 CABLE TRANSITION TO W-BEAM BRACKET DETAIL

STREET LINED IN THE FABRICATION OF THE BRACKET SHALL CONFORM TO AASTMT A80 AND THE BRACKET SHALL BE BALANCED AFTER FABRICATION IN ACCORDANCE WITH AASHTO A15.

BREAKAWAY ANCHOR DETAIL

2 1/8" BOLTS WELDED ROD, 1" UNL. - BEND ONE INCH AT 90 DEGREES, TO KEEP IN PLACE. BOLTS INSTALLED PRIOR TO TIGHTENING THE CABLES.
SECTION A

SECTION B

TOP OF CUT

BEAM GUARDRAIL ANCHOR TYPE 2

TOP OF SLOPE

BEAM GUARDRAIL ANCHOR TYPE 2

PLANE

EDGE OF SHOULD

EDGE OF ENHANCED EMBANKMENT

VARIER (SEE CONTRACT)

FLARE RATE (SEE TABLE)

BEAM GUARDRAIL TYPE 1

PAY LIFT

ELEVATION

BEAM GUARDRAIL, BURIED TERMINAL TYPE 1

PAY LIFT

BURIAL POINT

TOP OF CUT

FLARE RATE TABLE

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<th>POSTED SPEED (MPH)</th>
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<td>50</td>
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<tr>
<td>9:1</td>
<td>40 or less</td>
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</tbody>
</table>

CGRIFORD E. MUNSEFIELD

LICENSE NUMBER: 10224

PROFESSIONAL ENGINEER

STATE OF WASHINGTON

EXPIRES MAY 3, 2009

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION

CLIFFORD E. MUNSEFIELD

07-13-01

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006
1. Unless otherwise indicated in the contract, the SRT-350 (12.5, 8 Post) as manufactured by Trinity Industries, Inc. or the 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 terminals are 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 placed 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" ELEVATION VIEW
   - FLEAT TL2 - 1'-8" (MIN)

NOTE: The plans are subject to change and are not intended to be used as a contract document. They are for informational purposes only and do not constitute an agreement.
1. An ET-PLUS (TL3) as manufactured by Trinity Industries, Inc. or an SKT-380 as manufactured by Road Systems Inc. shall be installed according to manufacturer's recommendations. When a TL2 terminal is specified in the contract an ET-PLUS (TL2) as manufactured by Trinity Industries, Inc. or an SKT-TL2 as manufactured by Road Systems, Inc. shall be installed according to manufacturer's recommendations.

2. A reflected object marker shall be installed according to manufacturer’s recommendations.

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

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

5. Length for ET-PLUS (TL3) and SKT-380 is 80'. Length for ET-PLUS (TL2) and SKT-TL2 is 28'.

---

**BEAM GUARDRAIL**

**NON-FLARED TERMINAL**

**ELEVATION**

**PLAN**

**NOTES**

**EDGE OF WIDENED EMBANKMENT**

**6:1 TAPER**

**20:1 SLOPE OR FLATTER (RELATIVE TO SCALE)**

**10:1 SLOPE OR FLATTER**

**EDGE OF SHOULDER**

**GROUND LINE**

**SEE NOTE 2**

**SEE NOTE 2**

**SEE NOTE 2**

**SEE NOTE 2**

**SEE NOTE 2**

**SEE NOTE 2**

**SEE NOTE 2**
A CONNECTION

Unrestrained precast barrier

W Beam or Thrie Beam end section Design F

Transition pay limit

See Notes 1 and 2

2' 5" MAX

See Note 4

Face of guardrail, edge of shoulder

Curb width 8" or less, or concrete barrier

B CONNECTION

Transition pay limit

See Note 1

2' 6" MAX

See Note 1

Face of guardrail, edge of shoulder

Curb width greater than 9', 18" MAX

C CONNECTION

Type 3 transition pay limit

6' 3"

2' 5"

MAX

W Beam end section Design F

Face of guardrail, edge of shoulder

D CONNECTION

See Note 3

Transition pay limit

See Notes 1 and 2

2' 5" MAX

See Note 4

Face of guardrail, edge of shoulder

W Beam or Thrie Beam end section Design F

Bridge traffic barrier

E CONNECTION

Beam guardrail pay limit

2' 4"

MAX

End Section design F

Inside face of rail base

Direction of traffic (one-way only)

F CONNECTION

NOTES
1. Attach guardrail to bridge rail or concrete barrier with 7/8" diameter high strength bolts (Standard Specification 9-86, 514) with thin slab terrile inserts or resin bonded anchors. See the Contract Plans.
2. If the last guardrail post is 3' or less from the end of the bridge barrier, this attachment and blockout is not necessary.
3. This case is also applicable for vertical faces with no curbs.
4. When B Connection is used with Type IA Transition, the maximum spacing between bolts is 6' 3".
1. Anchor plate may be constructed from 1⁄4" plates welded to equal strength and dimensions as shown.
2. For end section details see Standard Plan "Beam Guardrail End Sections".
3. For post details, see Standard Plan "Beam Guardrail Posts and Blocks".
4. Eight 3⁄4" x 1 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.
1. Roll section and W8 x 17 post shall be fabricated to receive 3/8" hex head bolts as shown.

2. All bolts shall be high strength 3/8" hex head bolts with anchor roll washers.

---

**ELEVATION**

- **Beam Guardrail Anchor Type 2**
- **Back body plate**
  - 4" bolts
  - 2 1/8" washers
  - 2" 5/8" bolts
- **W8 x 17 Steel post**
- **2 3/4" backing plate**
- 3/8" hex head bolts
- **6" Post (or 3' MIN in solid rock)**
- **5' - 8' or 2' - 6' MIN in soil/rock**
- **18" DIA**

---

**SECTION B-B**

- **W8 x 17 Steel post**
- **30"**
- **22"**
- **2 3/4"**
- **1 1/2"**
- **10%"**
- **4" bolts**
- **4" washers**
- **4" bolts**
- **5/8" bolts**

---

**Notes**

See Note 1

See Note 2
NOTES
1. For details, see Standard Plan C-6c.
2. For end section details see Standard Plan C-7 or C-7a.
3. For details, see Standard Plan C-7b.
4. Outside nut shall be torqued against inside nut a minimum of 100 ft-lbs.
5. Post and block shall match beam guardrail posts.
1. Attach W-beam to steel pipe with ⅜" x 1¾" 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.

⅜" x 2" Button head bolt
or ⅜" x 1¾" hex head bolt
and hex nut with anchor rail washers under bolt head and nut (See Note 3).

Beam guardrail pay limit
6' 3"

Two 1" Nuts and washers (see Note 5)
12" 16" 18"

End Section Design G
(see Note 2)

⅜" Cable holds 6 required
torque nuts to 50 ft/lbs.
Bearing plate (see Note 3)

Standard 2" ID pipe sleeve
(2½" OD)

Two 1" nuts and washers
(see Note 5)

1½" Nut

1" x 4"
Stud threaded full length

BEAM GUARDRAIL ANCHOR
TYPE 5

C-6d 05-30-97
NOTES

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

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

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

4. Post shall match beam guardrail posts.

Beam Guardrail anchor limit (see Note 2)

5' - 3''

Two 1'' nuts and washers (see Note 1)

Anchor plate (see Note 1)

Standard 2'' 10 pipe sleeve (2 11/16'' OD)

Bearing plate (see Note 1)

Two 1'' nuts and washers (see Note 1)

Anchor Post Assembly (see Note 3)

Anchor post limit (see Note 2)

TYPE 7 ANCHOR
NOTES
1. End Section Design G shall be used except where noted on the plans or contract.

2. Attach guardrail to bridge rail or concrete barrier with 7/8" diameter high strength bolts (Standard Specification SOL-140) with flat washers, lock washers, or resin bonded anchors. See the Contract Plans.

3. A single plate having smaller dimensional shape to Design F and mating with the #4-400 guardrail is an alternate.

4. In areas where Design F end section is located on the outside of the guardrail, a galvanized 1" ID, 2" OD, 0.14" thick, 0.50" radius Type A Plain Washer or a anchor rail washer shall be placed under the splice bolt head.

BEAM GUARDRAIL
END SECTIONS
STANDARD PLAN C-7

Bolt Dimensions:
- M8 x 3" (Ref. #5 or Note 4)
- M8 x 3.5" (Ref. #5 or Note 4)
- M10 x 3" (Ref. #5 or Note 4)
- M10 x 3.5" (Ref. #5 or Note 4)

R. Peterhouse
10-31-03

MCR

Washington, D.C. Department of Transportation

APPROVED FOR PUBLICATION

Sheets 1 of 1 SHEET

GRAPHIC DESIGNER

DATE

REV.

10-07-05

10-13-05

10-19-05

10-25-05

10-31-05

11-07-05

11-13-05

11-19-05

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4-07-07

4-13-07

4-19-07

4-25-07

5-01-07

5-07-07

5-13-07

5-19-07
NOTES

1. Attach guardrail to bridge rail or concrete barrier with 7/8" diameter high strength bolts (Standard Specification 0-36.50) with inspection formica inserts or resin bonded anchors. See the Contract Plans.

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

DESIGN C (THREE BEAM)

DESIGN D (THREE BEAM)

DESIGN G (THREE BEAM)

DESIGN F (THREE BEAM)

THREE BEAM END SECTIONS

STANDARD PLAN C-7a
NOTES:
1. Wire rope loops shall be 8' - 8" long, except for the top loop of the Barrier Terminal, which shall be 12" long.
2. Except for the locations of the wire rope loops, the dimensions shown in END VIEW "A" are typical for both ends of a Barrier Section or opposing ends of Barrier Terminals.
3. Connecting and Drift Pins used are from a manufacturer. 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 Ropes in a Barrier Terminal is determined by the end of the Barrier Segment to which it is being connected. See BARRIER CONNECTION DETAIL (Sheet 2).

CONCRETE BARRIER
TYPE 2
STANDARD PLAN C-6
Sheet 1 of 2 sheets
APPROVED FOR PUBLICATION
Harold J. Peterson 04-37-64
Washington State Department of Transportation
1. For details on loops, connecting pin, reinforcing steel, and terminal unit see Standard Plan Concrete Barrier Type 2.

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

3. At the juncture between the Concrete Barrier Type 5 and the Bridge Barrier, cover the exposed foot of the Type 5 Barrier with an earth berm.
1. Length of W8x35 and W6x3 shall be determined by measurement from top of ground to top of guard pad. This distance shall be verified by the contractor.

2. Attach guardrail post to box culvert with 3/8” high strength bolts with resin bonded anchors.

3. Drill 1/2” diameter hole in concrete slab for 3/8” high strength bolts. Length of hole is determined by top slab of box culvert thickness which shall be verified by the contractor.

4. For details of post attachment to double box culvert see Standard Plan "Guardrail Placement," Case 18.
### TABLE

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<thead>
<tr>
<th>Curve Radii</th>
<th>Post Spacing</th>
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<td>Less than 18'</td>
<td>Use Not Recommended</td>
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<td>115' to 211'</td>
<td>7'</td>
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<tr>
<td>225' to 687'</td>
<td>12'</td>
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<tr>
<td>785' or More</td>
<td>15'</td>
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</tbody>
</table>

### NOTES

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

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

The Barrier Terminal is only used on the trailing end of a barrier separating two roadways with the same direction of travel.
NOTES

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

2. The Vertical Back Barrier is only used in the configurations shown in Standard Plans C-14f and C-14g.
### Reinforced Concrete Retaining Wall

#### Type 1 and 1 SW

**Standard Plan D-1e**

**Sheet 1 of 2 Sheets**

#### Effective: April 4, 2006 to January 2, 2006

**WALL DESIGN WITH VERTICAL FRONT FACE AND 2" SURCHARGE OR TRAFFIC BARRIER**

**REINFORCED CONCRETE RETAINING WALL**

**Type 1 and 1 SW**

**STANDARD PLAN D-1e**

**EXPIRES JUNE 29, 2002**

---

**Footing and Pile Requirements**
- All concrete including traffic barrier shall be Class 4000 except as noted.
- For backfill requirements, see Standard Plan "D-4." When Type 1 SW (saltwater) is specified, the concrete cover over steel in the root face and the total wall thickness shall be increased by 1".
- When Type 1 SW (saltwater) is specified, concrete cover over steel in the root face and the total wall thickness shall be increased by 0.003 m x CYPL.
- If bar W-141 interfaces with the retaining wall face, it shall be field bent only at the angle point. The bar shall not be twisted.
- The height for traffic barrier may vary, 2" MIN to 6" MAX.
- Slope of traffic barrier may vary 1" required to provide a profile pleasing to the eye and minimize the height of the wall.
- Concrete in the 24 foot wall sections shall be placed separately between expansion joints with a minimum 12 hour period between concrete placements.

---

**Section - Vertical Face**

- **Set top of retaining wall back 1/2" from face of wall at footing for wall heights 0.5 to 20." For above 20," use the formula offset (inches) = H - 2 (in feet)

**Surface treatment**
- **Bars G #4 at 1'-6" centers**
- **Bars E #4 at 1'-6" centers**
- **Bars L #4 at 1'-6" centers**
- **Bars M #4 at 1'-6" centers**
- **Bars N #4 at 1'-6" centers**
- **Bars O #4 at 1'-6" centers**
- **Bars P #4 at 1'-6" centers**
- **Bars Q #4 at 1'-6" centers**
- **Bars R #4 at 1'-6" centers**
- **Bars S #4 at 1'-6" centers**

**Drainage**
- **Bays A - I**
- **Bays J - N**

**Construction joints**
- **Bays A - I**
- **Bays J - N**

**3" DIA drains at about 1/2" up from the finished ground at the front face of wall**

**Steel Rebars**
- **BARS K AND M**

---

**Elevation**

- **1/2" Clearance**
- **2" Clearance**
- **11/2" Clearance**
- **21/2" Clearance**

**Material Quantity**
- **LENGTH CONCRETE CYPL**
- **STEEL LB/FL**
- **#**

**Reinforcement**
- **BAR C (g) size**
- **LENGTH**
- **CONCRETE CYPL**
- **STEEL LB/FL**
- **#**

---

**Dimensions (ft)**

- **BAR E**
- **BAR F**
- **BAR K**

**Size**
- **SPAC**
- **LENGTH**
- **h**

---

**Notes**

1. All concrete including traffic barrier shall be Class 4000 except as noted.
2. For backfill requirements, see Standard Plan "D-4." When Type 1 SW (saltwater) is specified, the concrete cover over steel in the root face and the total wall thickness shall be increased by 1".
3. When Type 1 SW (saltwater) is specified, concrete cover over steel in the root face and the total wall thickness shall be increased by 0.003 m x CYPL.
4. If bar W-141 interfaces with the retaining wall face, it shall be field bent only at the angle point. The bar shall not be twisted.
5. The height for traffic barrier may vary, 2" MIN to 6" MAX.
6. Slope of traffic barrier may vary 1" required to provide a profile pleasing to the eye and minimize the height of the wall.
7. Concrete in the 24 foot wall sections shall be placed separately between expansion joints with a minimum 12 hour period between concrete placements.
GUTTER DETAIL

WALL TOP DETAIL

KEY DETAIL

ELEVATION

SECTION - SLOPING FACE

NOTES

1. All concrete shall be Class 4000 except as noted.
2. For backfill requirements, see Standard Plan "D-4".
3. When Wall Type 4-SW (self-feeding) is specified, the concrete cover over steel in the front face and the total wall thickness will be increased by 1/4 in.
4. When Wall Type 4-SW (self-feeding) is specified, concrete in the field column "Material Quantity" shall be increased by 0.005 x H SYLF.
5. Concrete in the 24-foot wall sections shall be placed separately between expansion joints with a minimum 17 hour period between concrete placements.

Reinforced Concrete Retaining Wall Type 4 and 4 SW
Standard Plan D-1d
Sheet 1 of 2 Sheets

Approved for Publication
Clifford E. Mansfield
10/06/99
### Dimensions

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<td>9</td>
<td>20</td>
<td>19</td>
<td>9</td>
<td></td>
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</tbody>
</table>

### Footing Reinforcement

- **Bar E** (size 4#): 
  - Length: 3
  - Space: 4
  - Size: 5
  - Length: 6
  - Space: 7
  - Size: 8
  - Length: 9
  - Space: 10
  - Size: 11
  - Length: 12

- **Bar F** (size 5#): 
  - Length: 4
  - Space: 5
  - Size: 6
  - Length: 7
  - Space: 8
  - Size: 9
  - Length: 10
  - Space: 11
  - Size: 12
  - Length: 13

- **Bar K** (size 6#): 
  - Length: 5
  - Space: 6
  - Size: 7
  - Length: 8
  - Space: 9
  - Size: 10
  - Length: 11
  - Space: 12
  - Size: 13
  - Length: 14

- **Bar M** (size 7#): 
  - Length: 6
  - Space: 7
  - Size: 8
  - Length: 9
  - Space: 10
  - Size: 11
  - Length: 12
  - Space: 13
  - Size: 14
  - Length: 15

### Stem Reinforcement

- **Bar J** (size 8#): 
  - Length: 7
  - Space: 8
  - Size: 9
  - Length: 10
  - Space: 11
  - Size: 12
  - Length: 13

- **Bar G** (size 9#): 
  - Length: 8
  - Space: 9
  - Size: 10
  - Length: 11
  - Space: 12
  - Size: 13
  - Length: 14

### Material Quantity

- **Concrete (LCY/FL):** 22,063
- **Steel (LSQ/FL):** 23,906

### Notes

- WALL DESIGN WITH SLOPING FRONT FACE AND 2:1 BACKSLOPE
- EFFECTIVE: APRIL 4, 2006 TO JANUARY 2, 2008
- APPROVED FOR PUBLICATION: 10/6/99
- Clifford E. Mansfield

---

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

---

**Note:** This plan is not a legal engineering document but an electronic duplicate. The original, signed by the Engineer and approved for publication, is on file at the Wisconsin Department of Transportation. A copy may be obtained upon request.
NOTES
1. All concrete shall be Class 4000 except as noted.
2. For backfill requirements, see Standard Plan "D-4".
3. When Wall Type 6-SL (SolHecor) 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 6-SK (SolHecor) is specified, concrete in the table column "Material Quantity" shall be increased by 0.003 x M TYP.
5. Concrete in the 24 in. wall sections shall be placed separately between expansion joints with a minimum 12 hour period between concrete placements.

SECTION - SLOPING FACE

ELEVATION

WALL DESIGN WITH SLOPING
FRONT FACE AND 2:1 BACKSLOPE

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

APPROVED FOR PUBLICATION
Clifford E. Mansfield
10/06/98

STATE OF WASHINGTON
DEPARTMENT OF TRANSPORTATION
ENGINEERING

EXPRESS OAKS, 2000

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

DATE: 10/06/98

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

SHEET 1 OF 5 SHEETS

10/06/98

APPROVED FOR PUBLICATION
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DATE: 10/06/98

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

SHEET 1 OF 5 SHEETS
<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Bar K (size #4)</th>
<th>Bar F</th>
<th>Bar K</th>
<th>Bar N</th>
<th>Stem Reinforcement</th>
<th>Material Quantity</th>
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<tr>
<td><strong>H</strong> (in)</td>
<td><strong>B</strong></td>
<td><strong>C</strong></td>
<td><strong>D</strong></td>
<td><strong>N</strong></td>
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**Concrete (cu.ft.)**

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

**Reinforced Concrete Retaining Wall Type 6 and 6 SW Standard Plan D-1f**

**Sheet 2 of 2 Sheets**

**Approved for Publication**

Clifford E. Mansfield

10/22/02

**Date**

**Department of Transportation**

**Washington State Department of Transportation**

**EXPRESS June 22, 2000**

**NOTE:** This plan is not a legal engineering document but an electronic duplicate for review and approval by the Washington State Department of Transportation. A copy may be obtained upon request.

**Effective:** April 4, 2005 to January 2, 2006
1. Walls to be designated Noise Barrier Type IA, IB, IC or ID. The Contract specifies actual wall designations.

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

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

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

5. The Contract specifies actual foundation requirements 01 or 02.

**Table: Wall Height vs. Depth**

<table>
<thead>
<tr>
<th>WALL HT</th>
<th>EFFECTIVE</th>
<th>APRIL 4, 2005 TO JANUARY 2, 2006</th>
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<tr>
<td>6'-0&quot;</td>
<td>6'-0&quot;</td>
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<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>10'-0&quot;</td>
<td>10'-0&quot;</td>
<td>10'-0&quot;</td>
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<tr>
<td>12'-0&quot;</td>
<td>12'-0&quot;</td>
<td>12'-0&quot;</td>
</tr>
<tr>
<td>14'-0&quot;</td>
<td>14'-0&quot;</td>
<td>14'-0&quot;</td>
</tr>
<tr>
<td>16'-0&quot;</td>
<td>16'-0&quot;</td>
<td>16'-0&quot;</td>
</tr>
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<td>18'-0&quot;</td>
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<td>18'-0&quot;</td>
</tr>
<tr>
<td>20'-0&quot;</td>
<td>20'-0&quot;</td>
<td>20'-0&quot;</td>
</tr>
<tr>
<td>22'-0&quot;</td>
<td>22'-0&quot;</td>
<td>22'-0&quot;</td>
</tr>
<tr>
<td>24'-0&quot;</td>
<td>24'-0&quot;</td>
<td>24'-0&quot;</td>
</tr>
</tbody>
</table>

**Diagram: Joint and Corner Details**

- ½" Chamfer (Typ)
- Reinforced per listed panel height reinforcement schedule
- 3" (Typ)

**Note:**
- Construction joint with roughened surface
- Cast against undisturbed earth
- Final ground line
- Reinforcing steel: Bar D (see table)
- Level (Typ)
- 6" MIN 2'-0" MAX

**Typical Section:**

- Wall thickness
- Right-of-way
- Work line
- See Contract

**Elevation:**

- Construction joint (see Note 4)
- Final ground line
- 3" MAX spacing
- Depth D1 or D2
- 6" MIN 12" MIN
- 1/2" Premolded joint filler in expansion joints (Typ) at 30'-0" centers MAX
- Vertical reinforcing steel Bar D (centered on wall)
- Surface treatment

**Noise Barrier - Type 1:**

- Cast-in-Place Concrete Wall on Trench Footing

**Date:**

03-14-97
FOOTING WIDTH TRANSITION DETAIL
(For locations without footing step)
NOTE: Transverse bars not shown

JOINT AND CORNER DETAIL

NOISE BARRIER - TYPE 2
CAST-IN-PLACE CONCRETE WALL
ON SPREAD FOOTING

D-2b
03-14-97
FOOTING WIDTH TRANSITION DETAIL
(For locations without footing step)

NOTE: Transverse bars not shown

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

D-2c
03-14-97
### Table: Shaft DIA and Depth

<table>
<thead>
<tr>
<th>WALL H</th>
<th>TYPE 4A</th>
<th>TYPE 4B</th>
<th>TYPE 4C</th>
<th>TYPE 4D</th>
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<tr>
<td></td>
<td>SHAFT DIA</td>
<td>DEPTH D1</td>
<td>DEPTH D2</td>
<td>P BARS</td>
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<td>6'-0&quot;</td>
<td>5&quot;-12&quot;</td>
<td>5'-3&quot;</td>
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<td>5&quot;-12&quot;</td>
<td>5'-3&quot;</td>
<td>4'-9&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>10'-0&quot;</td>
<td>5&quot;-12&quot;</td>
<td>5'-3&quot;</td>
<td>4'-9&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>12'-0&quot;</td>
<td>5&quot;-12&quot;</td>
<td>5'-3&quot;</td>
<td>4'-9&quot;</td>
<td>9&quot;</td>
</tr>
</tbody>
</table>

### Notes:
1. Wall to be designated Noise Wall Type 4A, 4B, 4C, or 4D. The Contract specifies actual wall designations.
2. For intermediate wall heights, see next higher H.
3. Panels shall have at least 3 feet of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet maximum.
5. The Contract specifies actual foundation requirements D1 or D2.

---

### Typical Section:

- **Level (Typ):** 3'-0"
- **Top of ground line:** 1'-6" MIN 5'-0" MAX
- **15'-0" MAX Shaft spacing**
- **4 x #4 or FIVE #4 Bars**

---

**Noise Barrier - Type 4**

**Cast-in-Place Concrete Wall on Shaft Foundation**

---

**D-2d**

**03-14-97**
DETAIL B

NOISE BARRIER - TYPE 4
CAST-IN-PLACE CONCRETE WALL
ON SHAFT FOUNDATION

D-2d
03-14-97
1. Wall to be designated Noise Wall Type 6A, 6B, 6C, or 6D. The contract specifies actual wall designations.

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

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

4. Construction joints in the footing shall be spaced at 120 feet max.
DETAIL B

FOOTING WIDTH TRANSITION DETAIL
(for locations without footing step)

NOTE: Transverse bars not shown

JOINT AND CORNER DETAIL

D-2i
03-14-97
FOOTING WIDTH TRANSITION DETAIL

NOTE: Transverse bars not shown

NOISE BARRIER - TYPE 10

PRECAST CONCRETE WALL WITH OFFSET SPREAD FOOTING
1. Wall to be designated Noise Barrier Type 12A, 12B, 12C, and 12D. The Contract specifies actual wall designation.

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

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

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

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

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

TYPICAL SECTION

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

ELEVATION

NOISE BARRIER - TYPE 12

PRECAST CONCRETE WALL WITH TRAFFIC BARRIER ON TRENCH FOOTING

Sheet 1 of 2 Sheets

D-21

03-14-97
1. Wall to be designated Noise Wall Type 11A, 11B, 11C or 11D. 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 SI or CS.

---

### Table: Noise Wall Design Specifications

<table>
<thead>
<tr>
<th>WALL HT</th>
<th>X</th>
<th>BAR B and C</th>
<th>BAR E</th>
<th>BAR D</th>
<th>BAR J</th>
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<td>*4 at 15&quot;</td>
<td>*4 at 15&quot;</td>
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<td>5'</td>
<td>*4 at 15&quot;</td>
<td>*4 at 15&quot;</td>
<td>*4 at 15&quot;</td>
<td>*4 at 15&quot;</td>
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<tr>
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<td>5'</td>
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<td>*4 at 15&quot;</td>
<td>*4 at 15&quot;</td>
<td>*4 at 15&quot;</td>
</tr>
<tr>
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<td>5'</td>
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<td>5'</td>
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<td>*4 at 15&quot;</td>
</tr>
<tr>
<td>18'-0&quot;</td>
<td>5'</td>
<td>*4 at 15&quot;</td>
<td>*4 at 15&quot;</td>
<td>*4 at 15&quot;</td>
<td>*4 at 15&quot;</td>
</tr>
</tbody>
</table>

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### Diagram: Noise Barrier - Type 13

**Precast Concrete Wall with Traffic Barrier on Spread Footing**

- Reinforcing steel Bar D (centered on wall)
- Surface treatment
  - 1/4" Chamfer
- Grout pad leveling course
  - 2" Clearance
  - 1/2" Clearance
- Grout pad leveling course
  - Bar E
  - 3" Clearance
- Grout pad leveling course
  - Bar C
  - 3" Clearance
- Final ground line
  - MAX 2
- Final ground line

---

### Notes:

- Wall height may vary as required to provide a smooth profile consistent with the roadway profile.
DETAIL B

JOINT AND CORNER DETAIL

NOISE BARRIER - TYPE 13
PRECAST CONCRETE WALL
WITH TRAFFIC BARRIER ON
SPREAD FOOTING

D-2m
03-14-97
1. Wall to be designated Noise Barrier Type 14A, 14B, 14C or 14D. The contract specifies actual wall dimensions.
2. For intermediate wall heights, use the next higher W.
3. Construction joints in the footing wall shall be spaced at 120 ft maximum.
4. Panels shall have at least 3 feet level ground on each side.
5. All joints shall be in full contact and sealed.
1. Wall to be designated Noise Barrier Types 15A, 15B, 15C or 15D. The Contract specifies actual wall designs.

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 timber to be pressure preservative treated.

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

NOISE BARRIER - TYPE 16
MASONRY WALL ON TRENCH FOOTING
### BAR SIZE vs SPlice LENGTH

<table>
<thead>
<tr>
<th>BAR SIZE</th>
<th>SPlice LENGTH</th>
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</thead>
<tbody>
<tr>
<td>#5</td>
<td>2'-6&quot;</td>
</tr>
<tr>
<td>#7</td>
<td>3'-0&quot;</td>
</tr>
<tr>
<td>#8</td>
<td>4'-0&quot;</td>
</tr>
</tbody>
</table>

### BOND BEAM DETAIL

- Bond beam units
- Bond beam limit

- *5 at 4'-0" MAX (TYP)

**Typical Expansion Joint**

- Cells with vertical reinforcing and bond beams to be filled with grout
- Expansion joint filler placed in sash block recesses

**TYPICAL EXPANSION JOINT**

- *5 (TYP)
- See Detail A

**DETAIL A**

- Typical both sides of wall

**FOOTING WIDTH TRANSITION DETAIL**

(For locations without footing step)

- Note: Transverse bars not shown

**NOISE BARRIER - TYPE 1**

- Masonry wall on spread footing

*D-2q*

03-14-97
DETAIL A

Hooks parallel to wall layout line

Shaft

3' Stirrup spacing at 12'

Three - #4 Stirrup spacing at 6'

Concrete shaft

#3,5 spiral at 6" pitch

DETAIL B

TYPICAL EXPANSION JOINT

@ expansion joints
Continuous expansion joint filler placed in
basalt block recesses. Size as required.

Polyurethane sealant

1/2" Joint

Backer rod

Typical both sides of wall

BOND BEAM DETAIL

Bond beam units

Bond beam limits

NOISE BARRIER - TYPE 18
MASONRY WALL ON SHAFT
WITH GRADE BEAM FOUNDATION

STEP DETAIL

D-2s
03-14-97
Access Door - Type 2
Precast Concrete Wall with Traffic Barrier on Shaft Foundation

Elevation

See Standard Plan, "Noise Barrier Type 14, Concrete Wall with Traffic Barrier on Shaft Foundation"

Access Door - Type 2
Precast Concrete Wall with Traffic Barrier on Shaft Foundation

Section A-A

Section B-B

BOTTOM OF WALL DETAIL
<table>
<thead>
<tr>
<th>TOTAL WALL HEIGHT H=Hb (ft)</th>
<th>GEOSYNTHETIC REINFORCEMENT LENGTH L (ft)</th>
<th>GEOSYNTHETIC REINFORCEMENT TYPE</th>
<th>DOWEL BARS REQUIRED N (Nm)</th>
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<td>0.4 - 0.06</td>
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<td>41</td>
</tr>
<tr>
<td>5 - 10</td>
<td>0.2 - 0.06</td>
<td>41</td>
<td>42</td>
</tr>
</tbody>
</table>

NOTES:

- The long-term geosynthetic design strength "T" shall be determined in accordance with WSDOT standard practice No. 23, the qualified products list for products in which the "T" has been determined.
- For plastic and "T", and 2 are graphically defined on Sheet 1.
- "L" is the distance from the top of the wall (or return to a geosynthetic layer) and is used to determine the "T" for that layer.
- Column 4 in a reference for standard plan D-3.

PERMANENT GEOSYNTHETIC WALL TYPES 1 - 8

STANDARD PLAN D-3

APPROVED FOR PUBLICATION

HAROLD J. PETERSON 08-30-06
Washington State Department of Transportation

EXPRESS JUL 1, 2006
1. Get form on completed lift.

2. Unroll geosynthetic and position it so that 3'-4" wide "tail" overlaps over the form. If a geotextile is used for the geosynthetic reinforcement, position geotextile to prevent backfill from spilling through recorded openings.

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

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

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

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

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

GEOSYNTHETIC WALL CONSTRUCTION SEQUENCE

SECTION VIEW
CONDITION A

CONDITION B

ALTERNATE DETAIL
TYPICAL FOR CONSTRUCTION WITH SHOTING.

NOTES
1. SEE CONTRACT FOR BACKFILL LIMITS AND GEOFABRIC CLASS.

BACKFILL AND DRAINAGE
FOR RETAINING WALLS
STANDARD PLAN D-4

EXPIRES JANUARY 17, 1999
TYPICAL GABION

Unit A - 2 cell gabion = 6'
Unit B - 3 cell gabion = 9'
Unit C - 4 cell gabion = 12'

CROSS-CONNECTING WIRE PLACEMENT, END CELLS

CROSS CONNECTING WIRE PLACEMENT, INTERIOR CELLS OF FRONT GABIONS

FASTENING ADJACENT BASKETS

LACING DETAIL

WELDED FABRIC

TWISTED FABRIC

Three vertical and two horizontal wires encompassed

Six independent wires encompassed

Single loop

Double loop

Single loop
TYPE 1 ANCHOR
(FOR USE IN EARTH)

1. Two twin bore wire rope clips at 3’ centers may be substituted for three wholesale wire rope clips shown.

2. Bend eye parallel to direction of pull.

3. 10” MIS R

4. 9/16” DIS anchor rod with nut and washer

TYPE 2 ANCHOR
(FOR USE IN COMBINED EARTH AND ROCK)

TYPE 3 ANCHOR
(FOR USE IN SOLID ROCK)

TYPE 4 ANCHOR
(FOR USE IN SOLID ROCK)
ELEVATION

CONCRETE SLOPE PROTECTION

(Pneumatically placed or poured in place cement concrete shown)

Concrete Slope Protection

Embarkment slope 1/8” 3/4” 1/8”

SECTION

SECTION

TYPE 1 SLOPE PROTECTION FILL SECTION DETAIL

(Semi-open concrete masonry units shown)

Slope Protection

Cut Slope

See Type 2 Slope Protection Cut Section Detail

SIDE ELEVATION (For fill section on lower roadway)

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

SIDE ELEVATION (For cut section on lower roadway)

Slope Protection follows bottom of ditch.

Bottom edge of slope protection

Edge of lane

Shoulder

LEVEL

4'-0''

6'-0''

Rounding

TYPE 2 SLOPE PROTECTION CUT SECTION DETAIL

(Pneumatically placed or poured in place cement concrete shown)

10 Gage 6" x 6" wire mesh reinforcement

@ center (See Std. Spec. 9-07.7)

This side may be poured against undisturbed soil.

Clifford E. Menefield
DEPUTY STATE DESIGN ENGINEER
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
SKewed Bridge Plan
(Semi-open concrete masonry units shown)

Type 3 Slope Protection
Curb Detail (Elevation)
(Semi-open concrete masonry units shown)

Notes:
1. The design and shape of the semi-open concrete masonry unit shown is only one example of the products that may be used.
2. The Type 3 Slope Protection Curb Detail shall be used only when the lower roadway cross section requires a curb.

Concrete
Slope protection
Embankment slope

Open space

Semi-open Concrete Masonry Units
(See note 1 & 2)

Registered Architect
Alexandra Young
State of Washington
Principal Architect
1. Dimensions and tolerances for superstructure are typical for both single lane and two lane bridges.
2. All timber and lumber shall be 2” or better and untreated Douglas fir-larch.
3. All planking shall be untreated Douglas fir and shall be driven to develop a minimum load bearing capacity of 15 tons.
4. Blocking for frame ends shall be proportioned to carry a minimum load of 15 tons per post.
5. All hardware shall be block, ungalvanized. Each deck plate shall be riveted to each stringer with two 1” spikes, number 1 or larger.
6. On 17’ spans, stringers shall be 6x6 S16. On 15’ spans, stringers shall be 6x6 S16. Two lane bridges shall use thirteen lines of stringers, single lane bridges shall use seven lines of stringers.
7. Overlay thickness must be sufficient to cover bolts.
PILE DETAILS

1. Place lifting loops at the lifting points shown in the FILE HANDLING DIAGRAM. Standard Plan 5-4, for the case stated in the contract.

2. Spirals shall be applied either by lapping one full turn and bending the end of the spiral to a 135° semi-circle, by welding, or by the use of a mechanical connector that develops 125% of the minimum yield strength of the spiral. Welding shall meet the requirements of Standard Specification 9-03.3(2)(C).

3. All prestressing strands are 1/2" or 0.62 diameter (d_p). Grade 270, uncoated strands, AASHTO M228, but to 0.75 Fpu maximum.

4. Strength of concrete shall be 5.0 ksi at release and 7.0 ksi at final.

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

![Diagram of spiral reinforcement and typical sections for square and octagonal piles.](image-url)
PRECAST PILES, HANDLING NOTES

1. For pile lifting Cases 1 and 2, do not allow pile tip to bear on other piles placed 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 a pile is removed, cut it off at the bottom of the hole and patch the hole by filling it with 1:2 mortar. Remove all the material that is 24 hours prior to driving the pile.

5. The length of the formed or drilled hole shall be for potential cut-off and full development length of the steel reinforcement. The hole must be reinforced with steel wire mesh.

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

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

8. Piles stored on the ground should be buried on level ground at no more than 50° on center, with a maximum overhang of 10°.
The main body of the curb and the longitudinal rib shall form a uniform transition from a Type C section to a Type A (back to back) section.
NOTES:
2. Type 4a and Type 5a curbs do not require steel tie bases for anchoring.
3. The installation of curbs in areas with existing Guardrail could require the removal and reposting of the Guardrail or its components.
4. Curb shall be placed at the face of Guardrail for transitions to concrete barriers.
NOTES
1. The Type 1A Ramp is used to provide access to two crosswalks only when it is infeasible to provide a separate ramp for each crosswalk.
2. Layouts 1, 2, & 3 make use of the bid item: "Concrete Sidewalk Ramp Type 1B". The bid item does not include the adjacent Curb (or Curb & Gutter), or Sidewalk.
3. Ramp slopes shall not be steeper than 1:12:15.
4. Avoid placing drainage structures, junction boxes or other obstructions in front of ramp access areas.
5. Curb & Gutter is shown, see the Contract Plans for the curb design specified. See Standard Plan F-1 for curb details.
6. See standard Plan F-3 for sidewalk joint placement and details.
7. Detectable warning patterns may be created by any method that will achieve the truncated dome dimensions and spacing shown.
NOTES
1. This layout is used to provide access to a single crosswalk parallel to the major street. The bid item “Cement Curb" Sidewalk Ramp Type 4A" does not include the adjacent Curb (or Curb & Gutter), the Sidewalk, or the Cement Curb/Pedestrian Curb.

2. Ramp slopes shall not be steeper than 1:12:16.

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

4. Curb & Gutter is shown on the Contract Plans for the curb design specified. See Standard Plan F-1 for curb details.

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

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

DETECTABLE WARNING PATTERN AREA SHALL BE YELLOW IN COMPLIANCE WITH STD. SPEC. 8-14.13B.

DETECTABLE WARNING PATTERN DETAIL

SIDEWALK RAMP TYPE 4A WITH LAYOUT
STANDARD PLAN F-3d
Sheet 1 of 1 Sheet
APPROVED FOR PUBLICATION

Harold J. Peterson 02-09-05
Washington State Department of Transportation

EXPIRES MAY 8, 2005
NOTES

1. This layout is used to provide access to a single crosswalk parallel to the major street. The block "Cement Curb, Sidewalk Ramps Type 4S does not include the adjacent Curb (or Curb & Gutter). The Sidewalk, or the Cement Curb, Pedestrian Curb.

2. Ramp slope shall not be shallower than 1:12:1.

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

4. Curb & Gutter is shown, see the Contract Plans for the curb design specified. See Standard Plan F-1 for curb details.

5. See Std. Plan P-3 for sidewalk joint placement and details.

6. Detectable warning patterns may be created by any material that will achieve the intended dimensions and spacing shown.
SIGN BRIDGE LAYOUT

- Chord to End Post Connection
- Interior diagonal
- Top truss diagonal
- Bottom truss diagonal
- Chords
- Vertical diagonal
- Panel length P to be constant throughout span and not to exceed 6’-2”
- Span length S (e - e of end posts)

ELEVATION

- Top and bottom chords
- Chords
- Panel points (TP)
- See Notes 5 & 6

PLAN

- For truss diagonal
- Chords
- Vertical diagonal
- Panel length P to be constant throughout span and not to exceed 6’-2”

EJECTION

- SPAN LENGTH
- DIMENSION
- DIAGONAL
- END TRUSS POSTS
- END TRUSS STRUTS AND DIAGONALS
- TOTAL SIGN AREA (MAX)
- A
- B

<table>
<thead>
<tr>
<th>SPAN LENGTH</th>
<th>DIMENSION</th>
<th>DIAGONAL</th>
<th>END TRUSS POSTS</th>
<th>END TRUSS STRUTS AND DIAGONALS</th>
<th>TOTAL SIGN AREA (MAX)</th>
<th>A</th>
<th>B</th>
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</thead>
<tbody>
<tr>
<td>0’ to 6’</td>
<td>4”-0”</td>
<td>2” x .210</td>
<td>1/2” x .150</td>
<td>10” x 250</td>
<td>2” x 203</td>
<td>.54 sq ft</td>
<td>3%</td>
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<tr>
<td>6’1” to 9’</td>
<td>5”-0”</td>
<td>2” x .230</td>
<td>2” x .154</td>
<td>10” x 250</td>
<td>2” x 203</td>
<td>.62 sq ft</td>
<td>3%</td>
</tr>
<tr>
<td>9’1” to 12’</td>
<td>6”-0”</td>
<td>2” x .250</td>
<td>2” x .154</td>
<td>10” x 250</td>
<td>3” x 216</td>
<td>.86 sq ft</td>
<td>3%</td>
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<td>12’1” to 15’</td>
<td>7”-0”</td>
<td>2” x .280</td>
<td>2” x .203</td>
<td>10” x 365</td>
<td>3” x 226</td>
<td>1.10 sq ft</td>
<td>4%</td>
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</table>

All members are pipe. Values shown are nominal pipe size and wall thickness.

STRUCTURE DIMENSIONS

- Top and bottom chord diagonal joints and posts of chord where vertical and horizontal diagonals connect.
- Chord to end post connection type
- END POST
- END TRUSS DIAGONAL (THP)
- END TRUSS STRUT

CHORD TO END POST CONNECTION TYPE R

- Where diagonals connect

MATERIAL SPECIFICATIONS

- PIPE (Chords, Struts, and Diagonals)
- ASTM A 36
- OR ASTM A 502
- Type E or S, or A 500 Grade B

- PLATE & SHAPE
- ASTM A 36

- BOLTS, NUTS, AND WASHERS
- STD. SPEC.
- 9-06.01.03

- PIPE, PLATE & SHAPE
- AASHTO M 115

- FASTENER
- GALVANIZING
- AASHTO W 235

EXPRESS 29, 2004

SIGN BRIDGE

STANDARD PLAN G-3

SHEET 1 OF 8 SHEETS

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006
TIMBER SIGN SUPPORTS
STANDARD PLAN G-64a

ELEVATION VIEW
SINGLE POST INSTALLATION

BOTTOM OF SIGN
TIMBER SIGN POST
(TOP PORT HEIGHT"

SIDE VIEW
MINIMUM PORT HOLE
DIAMETER IS THE NARROWEST
PORT DIMENSION PLUS 6".

TOP VIEW
NARROWEST PORT DIMENSION

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006

Washington State Department of Transportation

EXPIRES MAY 31, 2005
NOTES:
1. Nut is only required with multiple post installations.

2. 6'' x 10'', 8'' x 12'', and 8'' x 12'' Timber Sign Posts can be made beveled and do not have holes or notches. These posts shall not be installed within the Design Clear Zone. They can be installed behind traffic barrier.

3. Signs with a width less than 12 feet and supported on three 6'' x 10'' or 8'' x 8'' posts shall not be installed in the clear zone.

4. Signs with a width less than 17 feet and supported on four 6'' x 8'' or 8'' x 8'' posts shall not be installed in the clear zone.


---

**POST INSTALLATION TABLE**

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<thead>
<tr>
<th>POST SIZE</th>
<th>DEPTH</th>
<th>HOLE DIAMETER</th>
<th>NOTCH LENGTH</th>
<th>SEE NOTE 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 x 4</td>
<td>3-1/8''</td>
<td>1-1/2''</td>
<td>NOT REQUIRED</td>
<td>SEE NOTE 1</td>
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<tr>
<td>4 x 6</td>
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<td>1-1/2''</td>
<td>2-1/2''</td>
<td>SEE NOTE 3 &amp; 4</td>
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<tr>
<td>5 x 6</td>
<td>4-1/2''</td>
<td>2-7/8''</td>
<td>2''</td>
<td>SEE NOTE 3 &amp; 4</td>
</tr>
<tr>
<td>5 x 8</td>
<td>4-1/2''</td>
<td>2-7/8''</td>
<td>2''</td>
<td>SEE NOTE 3 &amp; 4</td>
</tr>
<tr>
<td>6 x 10</td>
<td>6-1/4''</td>
<td>SEE NOTE 2</td>
<td>SEE NOTE 2</td>
<td></td>
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<tr>
<td>8 x 12</td>
<td>8-1/4''</td>
<td>SEE NOTE 2</td>
<td>SEE NOTE 2</td>
<td></td>
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</tbody>
</table>

---

**TIMBER SIGN SUPPORTS**

**STANDARD PLAN C-6a**

**SHEET 3 OF 3 SHEETS**

**APPROVED FOR PUBLICATION**

HAROLD W. PETERSON 06-30-04
Washington State Department of Transportation

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**REFERENCES**

- **Construciton Sign Specification Sheet**
- **H1**, **H2**, **H3**, **H4**, **C1** & **C2** values and definitions.
MAINTENANCE WALKWAY INSTALLED ON MONOTUBE OVERHEAD SIGN STRUCTURE

1. NOT INTENDED FOR USE IN FRONT OF STATIC GEAR.
2. FOR MAINTENANCE WALKWAY, RAILINGS,IENTMENTS, AND TOE PLATE DETAILS, SEE STANDARD PLAN 0-0a.
3. USE TWO LAVERDARS THROUGH INTERMEDIATE WIRE ROPE SUPPORT.
4. WIRE ROPE SHALL BE INSTALLED WITH 45° LINES OF TRELICAL AND WITH OF TIRE ADJUSTMENT AVAILABLE IN THE TURNBUCKLE.

NOTES:

- ADDITIONAL SUPPORT SHOULD BE PROVIDED IN THE AREA OF INTERSECTION WITH THE TURNBUCKLE.
- STRUTS TO BE INSTALLED TO PROVIDE ADDITIONAL STRENGTH.
- WIRE ROPE TO BE MAINTAINED IN A TIGHT STATE.
- SAFETY CABLE AND INTERMEDIATE SUPPORT TO BE PROVIDED.

MATERIAL SPECIFICATIONS:

- PIPE: ASTM A 18, OR ASTM A 53, TYPE 2 OR 3, OR ASTM A 36 GRADE B
- PLATES AND SHAPE: ASTM A 36
- STRUCTURAL TUBING: ASTM A 36 AND GRADE B
- CALLOUGING FOR PLATE AND SHAPE: AMHS TO 111
- STRONG-BRIDE, GAGES:
- STEEL GRATING: ASTM A 56
- WIRE ROPE: ASTM A 470 WIRE CLASP A WEIGE ZINC COATED WIRE THROUGHOUT
1. Mileposts of the type specified shall be placed as shown hereon. If conditions preclude placement at the correct location, the mileposts may be moved as much as 30' in either directions mileposts that cannot be placed within this degree of accuracy shall be omitted entirely.

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

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

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

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

PLACEMENT OF MILEPOST AT CUT SECTION

PLACEMENT OF MILEPOST AT FILL SECTION
NOTES

1. Dimensions for the parts used to assemble the sign support are intentionally not shown. Basic connections are permitted, manufactured products that are in compliance with NCSP 320 crash test criteria. The basic connection details are only shown in this plan to illustrate how the parts are assembled.

2. For steel sign support foundations, see Standard Plan G-49.


4. Sign post shall be 2 1/2" clean, galvanized schedule 10 steel pipe.

STEEL SIGN SUPPORT TYPES FL, PLT, & PLU INSTALLATION DETAILS
STANDARD PLAN G-6e

Sheet 2 of 2 Sheets

Approved for Publication

Herold J. Petersen 06-18-04
Washington State Department of Transportation

EXPIRES MAY 5, 2005
SIGN INSTALLATION ON LIGHT STANDARD

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, bent leg, steel strap shall be 3/4" wide and 0.030" thick.

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

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

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

SIGN BRACE ON TIMBER POST

SIGN BRACE ON STEEL PIPE

SIGN BRACE ON STEEL TUBE

SIGN BRACING

STANDARD PLAN G-8d

Sheet 1 of 2 sheets

APPROVED FOR PUBLICATION

Harold J. Petersen 03-09-00

Washington State Department of Transportation
### Guide Post Reflective Sheeting Applications

<table>
<thead>
<tr>
<th>Type W</th>
<th>Type WY</th>
<th>Type Y</th>
<th>Type YY</th>
<th>Type 01 (External Plan H-14)</th>
<th>Type 02 (External Plan H-14)</th>
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<tbody>
<tr>
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<td><img src="image2.png" alt="Diagram" /></td>
<td><img src="image3.png" alt="Diagram" /></td>
<td><img src="image4.png" alt="Diagram" /></td>
<td><img src="image5.png" alt="Diagram" /></td>
<td><img src="image6.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

**NOTES**

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

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

3. When concrete barrier runs concomitant, the contractor shall mount barrier delineators where guideposts are required.

---

**STANDARD PLAN H-1**

**Sheet 1 of 1 Sheet**

**Guide Posts**

- **Surface Mount**
- **Ground Mount**

**Repor of Approval:**

- Approved for Publication: 09-10-22
- Signature: [Name]

---

**Effective:** April 4, 2005 to January 2, 2006
GUIDE POST PLACEMENT FOR INTERCHANGES
STANDARD PLAN H-1b

NOTE 1: See plans for guide post requirements between interchanges.

NOTE 2: Guide posts shall be placed at 100' on ramp tangents and tapers.

NOTE 3: "6" dimension shown on Standard Plan H-1c or 100', whichever is smaller.

NOTE 4: One half of "6" dimension shown on Standard Plan H-1c or 50', whichever is smaller.

NOTE 5: Two spaces at 100'.

NOTE 6: Three equal spaces when R < 750, Four equal spaces when R > 750.

NOTE 7: Two equal spaces.
NOTES

1. All fixturers may be hot-dipped galvanized or stainless steel. All steel angle and tubular steel shall be hot-dipped, high carbon steel, painted or galvanized.

2. Install one lightweight Type A Low-intensity flashing warning light on the top rail 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. Strips on barricade rails shall be alternating orange and white reflective stripes (stamping 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 the NCHRP 350. Alternate designs may be approved if they conform to the NCHRP 350 crash test criteria.

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, use fertilizer shall be mixed with the sand in a quantity to prevent the sand from freezing.

---

TYPE 3 BARRICADE

STANDARD PLAN H-2

SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION

Harold J. Petree

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EXPRES MAY 1, 2005
STRIPEs ON THE BARRIcADEs SHALL SLOPE DOWNWARD IN THE DIRECTION TRAFFIC IS TO PANS

ROAD CLOSURE AT INTERSECTION

STRIPEs ON THE BARRIcADEs SHALL SLOPE DOWNWARD IN THE DIRECTION TRAFFIC IS TO PANS

ROAD CLOSURE AT OTHER LOCATIONS
IMOMETRIC VIEW
TYPICAL SHOULDER INSTALLATION

SECTION A

SECTION B

PERSPECTIVE VIEW
MULTILANE DIVIDED HIGHWAY
NOTE

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

SECTION A

SECTION B

SHOULDER RUMBLE STRIP

TYPES 2, 3, & 4

FOR UNDIVIDED HIGHWAYS

STANDARD PLAN H-4a

UNDIVIDED HIGHWAY

(TYPE 1 PATTERN AROMA)

PERSPECTIVE VIEW

NOTE

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

SECTION A

SECTION B

SHOULDER RUMBLE STRIP

TYPES 2, 3, & 4

FOR UNDIVIDED HIGHWAYS

STANDARD PLAN H-4a

UNDIVIDED HIGHWAY

(TYPE 1 PATTERN AROMA)

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

SHEET 5 OF 6 SHEETS
APPROVED FOR PUBLICATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

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

SHEET 5 OF 6 SHEETS
APPROVED FOR PUBLICATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
1. Center Line Rumble Strip Installation requires a minimum distance of 12 feet from roadway center line to edge of paved shoulder.

2. When directed by the Engineer, Rumble Strips may be installed along the turn pocket taper where noise may adversely affect adjacent facilities.
NOTES:
1. Slope treatment shall be constructed simultaneously with the roadway
   excavation. Ordinary hand trimming will not be required if
   satisfactory results are obtained with mechanical equipment.
2. It is essential that the construction of cut and fill slopes and the
   application of slope treatment fit as naturally as possible into the
   existing landscape to provide an aesthetically and geometrically
   satisfactorily completed roadway.
3. When the distance K is greater than the distance from the top of cut
   to the bottom of ditch, slope treatment shall begin at bottom of ditch.

LEGEND:
J Distance from slope stoke to slope treatment stoke, measured from natural ground slope.
K Distance from slope stoke to lower limit of slope treatment, measured from face of cut slope.
H Difference in elevation between finished shoulder grade and slope stoke.
D Difference in elevation between slope stoke and slope treatment stoke.
Z Depth of slope treatment or slope stoke as determined by a straight line
   between the midpoints of J and K.
S Horizontal distance per foot cut for the slope under consideration.
   (For a 3:1 slope, S:3)

<table>
<thead>
<tr>
<th>CUT SLOPE</th>
<th>Class A</th>
<th>Class B</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:1</td>
<td>J:7'</td>
<td>K:5'</td>
</tr>
<tr>
<td>3:1</td>
<td>J:7'</td>
<td>K:5'</td>
</tr>
<tr>
<td>2:1</td>
<td>J:7'</td>
<td>K:9'</td>
</tr>
<tr>
<td>1.75:1</td>
<td>J:7'</td>
<td>K:12'</td>
</tr>
</tbody>
</table>

TREATMENT IN SHALLOW CUTS
See Note 3

VALUES OF Z (feet)
For Class A Slope Treatment

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

In this equation the term IDKS/4 is positive when the
slope treatment stoke is higher than the slope stoke
(descending ground); and negative when the slope treatment
stroke is higher than the slope stoke (ascending ground).
PLAN AT BRIDGE END

GENERAL SECTION AT BRIDGE END

BRIDGE ON COLUMNS OR PILES

EMBANKMENT AT BRIDGE ENDS

FLAT SLAB BRIDGE

BRIDGE ON BEARINGS
POST BASE DETAIL

SLAB AND GRADING SECTION

#4 BAR AT EACH POST

CEMENT CONCRETE STAIRWAY
CONSTRUCTION DETAILS
STANDARD PLAN H-10

NOTES:

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

STANDARD PLAN H-13a

PLAN VIEW

ROUND FOOTING

SQUARE FOOTING

NOTE
This bollard does not have an effective temporary design feature and cannot be installed within the Design Clear Zone.
### Approximate Quantities

<table>
<thead>
<tr>
<th>Tank Capacity</th>
<th>Length (x)</th>
<th>Concrete</th>
<th>Steel Rein.</th>
<th>Cast Iron Soil Pipe &amp; Fitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gallons</td>
<td>Feet</td>
<td>Cubic Yd.</td>
<td>Bars</td>
<td>Lbs.</td>
</tr>
<tr>
<td>6000</td>
<td>6</td>
<td>23</td>
<td>1450</td>
<td>471</td>
</tr>
<tr>
<td>8000</td>
<td>8</td>
<td>28</td>
<td>1600</td>
<td>471</td>
</tr>
<tr>
<td>10000</td>
<td>10</td>
<td>32</td>
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<td>471</td>
</tr>
<tr>
<td>12000</td>
<td>12</td>
<td>37</td>
<td>2050</td>
<td>471</td>
</tr>
<tr>
<td>14000</td>
<td>14</td>
<td>42</td>
<td>2100</td>
<td>471</td>
</tr>
</tbody>
</table>

### Notes
1. Approval of local health department is required before work is started.
2. Excavated material shall be disposed of as directed by the Engineer.
3. All work shall be left open until inspected and approved by the Health Officer and the Engineer.
4. All grades shall be checked and approved by the Engineer.
5. Water tight manhole covers shall be approved by the Engineer prior to installation.
6. Precast septic tanks are acceptable, subject to the approval of the Engineer. Materials shall meet or exceed those shown.
7. Plan dimensions may vary as site conditions and system design permit.
8. All concrete shall be Class 4000.
9. Reinforcing steel shall be Grade 300 or Grade 400.
AUTOMATED GROUND WATER MONITORING WELL

NOT TO SCALE

- Optical Reader
- Asphalt Resistant Battery Compartment
- Moisture-Proof (Potted) Internal Data Logger
- Removable Adapter Cap
- Bentonite Pellets
- "C" Calibration Point (Finished Grade)
- Well Screen Slots Begin (All Slots 0.019"
- Well Screen
- 2" Min Annuli Around
- Well Screen
- No. 1 Sand or
- Pea Gravel
- End of Screen
- End of Probe

AUTOMATED GROUND WATER MONITORING WELL

STANDARD PLAN L3

NOTE: THIS IS NOT A LEGAL ENGINEERING DOCUMENT BUT IS DRAWN TO SCALE. THE DRAWING IS AN APPROXIMATION AND IS NOT INTENDED FOR USE IN THE CONSTRUCTION OF A WATER WELL. IT IS INTENDED FOR USE AS A DESIGN STANDARDS DOCUMENT.
NOTES:
1. MAXIMIZE DETENTION OF STORMWATER BY PLACING FENCE AS FAR AWAY FROM THE TOP OF SLOPE AS POSSIBLE WITHOUT ENCROACHING ON SENSITIVE AREAS OR OUTSIDE OF THE CLEARING BOUNDARIES.
2. INSTALL SILT FENCING ALONG CONTOURS WHENEVER POSSIBLE.
3. INSTALL THE ENDS OF THE SILT FENCE TO POINT SLIGHTLY UP-SLOPE TO PREVENT SEDIMENT FROM FLOWING AROUND THE ENDS OF THE FENCE.
4. PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATIONS 8-31.5(14) AND 8-31.3(15).

STATE OF WASHINGTON
DEPARTMENT OF TRANSPORTATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

SILT FENCE

STANDARD PLAN I-4

ELEVATION VIEW

SIDE VIEW

BURY GEOFABRIC IN TRENCH

POST (SEE STD. SPEC. 8-01.5(14))

BACKFILL WITH NATIVE SOIL AND COMPACT

FLOW

9" MAX. SPACING WITHOUT BACKUP SUPPORT
10" MAX. SPACING WITH BACKUP SUPPORT
NOTES

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

2. STRUCTURE SHALL BE CONSTRUCTED SUCH THAT GEOFABRIC MATERIAL SHALL BE FASTENED TO POSTS CREATING A SEAMLESS JOINT.

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

4. PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATION 0-01.2(15).

ISOVIEWING VIEW
(ENTIRE FENCE NOT SHOWN FOR ILLUSTRATIVE PURPOSES)

ATTACH WOOD OR METAL CROSS BRACES TO STABILIZE POSTS

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

POST (SEE STD. SPEC. 0-01.3(MA))

GEOFABRIC FOR
TEMPORARY SILT FENCE
(SEE STD. SPEC. 0-38.2, TABLE 4)

COMPACTED NATIVE SOIL

BURY GEOFABRIC IN 4" X 4" TRENCH

SECTION A

2 - 6" MIN.

7 - 9" MIN.

INLET

GEOTEXTILE

PLAN VIEW
(CROSS BRACES NOT SHOWN)
NOTES

1. PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATION 8-01.2(16).

2. SIZE THE BELOW GRATE INLET DEVICE (BGID) FOR THE STORM WATER STRUCTURE IT WILL SERVE.

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

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

PREFabricated Below Grate
Inlet Device Details
NOTES
1. INSTALL WATTLE ALONG CONTOURS (SEE STANDARD SPECIFICATION 0-015-10).
2. WATTLE SHALL BE INSPECTED REGULARLY, AND IMMEDIATELY AFTER A RUNOFF PRODUCING RAINFALL, TO ENSURE THEY REMAIN THOROUGHLY ENTRANCED AND IN CONTACT WITH THE SOIL.
3. LIVE STAKES MAY BE USED FOR PERMANENT INSTALLATIONS.
4. PERFORM MAINTENANCE IN ACCORDANCE WITH STANDARD SPECIFICATION 0-015-10.
5. INSTALL WATTLE SLIGHTLY INTO THE TRENCH, ALTB ADJACENT WATTLE TIGHTLY, END TO END, WITHOUT OVERLAPPING THE ENDS.
6. PILOT HOLES MAY BE DRIVEN THROUGH THE WATTLE AND INTO THE SOIL, WHEN SOIL CONDITIONS REQUIRE.

WATTLE SPACING TABLE

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

WATTLE INSTALLATION ON SLOPE

STANDARD PLAN 1-8

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

HAROLD J. PETERSON  ST-77-2
WASHINGTON DEPARTMENT OF TRANSPORTATION
NOTES

1. GEOTEXTILE ENCASED CHECK DAM SHALL MEET THE REQUIREMENTS OF STANDARD SPECIFICATIONS 8-01.3(5A) AND 8-14.3(4).

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

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

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

PLAN VIEW

SECTION A

BEFORE DITCH (SEE NOTE 3)

BACK OF DITCH (TYP.)

3" MIN. (SEE NOTE 3)

CHECK DAM

STAPLES (TYP.)

3 PT. MAX. SPACING

REAR APRON

SECTION B

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

FLOW

ORIENT THE SEAM EDGE OF THE CHECK DAM TOWARD THE UPSTREAM SIDE

CHECK DAM

STAPLES (TYP.)

5' MIN. LENGTH

FLOW

REAR APRON

BACK OF DITCH (TYP.)

FRONT APRON

ISOMETRIC VIEW
NOTES

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

2. SEE STANDARD SPECIFICATION 6-01.300.
NOTES
1. MORE THAN THE MINIMUM OF ONE FASTENER PER SQUARE YARD MAY BE REQUIRED DUE TO CONDITIONS SUCH AS BLANKET COMPOSITION, SOIL TYPE, SURFACE UNIFORMITY, AND FLOW VELOCITY.
2. ROLL ENDS MAY BE SPUCED IN A CHECK SLOT.
3. SEE STANDARD SPECIFICATION 8-01:23.
SLIP BASE
PLAN

3/8" wide drain hole in grout pad

Pole base plate

Foundations

Toward Roadway

FIXED BASE
PLAN

3/8" wide drain hole in grout pad

Pole base plate

Toward Roadway

ANCHOR BOLT LAYOUT

Anchor bolts
Install pole base plate directly on leveling nuts and washers.

FIXED BASE
ANCHOR BOLT LAYOUT

Anchor bolts

Toward Roadway

SLIP BASE
ANCHOR BOLT LAYOUT

Anchor bolts

Toward Roadway

FOUNDATION DETAIL
(See Note 1)

Light Standard Orientation

(See Note 1)

Light Standard Orientation

Toward Roadway

SLIP BASE
ELEVATION

Three 2" anchor bolts, 4-6' long (See Notes 3 & 4)

Plate washer (TYP)

Pole base plate

Keeper plate

1/2" anchor plate

Pole base plate

1/2" clamping bolts

Stap templates (See Detail)

Eight #4 bars evenly spaced

"4 Hoops at 1'-0" centers

2" clearance (TYP)

Square or round

See Note 4

Toward Roadway

SLIP BASE
ELEVATION

Details similar to slip base except where noted

NOTE: This Plan is not a Legal Engineering Document but an Electronic Depiction. The Original, Issued by the Engineer and Approving for Publication, is Not on File at the Washington State Department of Transportation. A Copy May Be Obtained Upon Request.

Clifford E. Mansfield 10/08/99
EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006
**SLIP/ANCHOR PLATES DETAIL**
Smooth finish top, bottom, and notched surfaces

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

**SECTION A-A**

**SECTION B-B**

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

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

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

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

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

Misaligned anchor bolts must be removed and replaced.

SCHEDULE

<table>
<thead>
<tr>
<th>Adapter Type</th>
<th>Anchor Bolt Order</th>
<th>Existing Base Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-2</td>
<td>1, 2</td>
<td>Cast Aluminum</td>
</tr>
<tr>
<td>A-3</td>
<td>1, 1</td>
<td>Steel Transformer</td>
</tr>
<tr>
<td>A-4</td>
<td>1/2, 1/2</td>
<td>2&quot; Alum. Comp.</td>
</tr>
</tbody>
</table>

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

NOTE: This slip base adaptor is for use with standard bridge and structures systems. It is not intended for use with other systems. It is designed to be installed with the manufacturer's instructions. It is not intended for use with any other system. It is not intended for use with any other system.
Install sized reducing washer and connector to secure conductors at end of mast arm.

Single or Double Mast Arm as required

For Double Mast Arm, install additional cable and quick disconnects

MAST ARM WIRING DETAIL

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

See Detail A

Junction box

WIRING DETAIL LIGHT STANDARD SLIP BASE

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

For Double Mast Arm, install additional cable and quick disconnects

TYPICAL JUNCTION BOX LOCATION

Alternate locations allowed provided junction box to base distance does not exceed 10'

DETAIL A

LIGHT STANDARDS WIRING DETAILS

Remove all slack before installing cable tie

Conductors

Insulating grounding bushing

120 Pound tensile strength black cable tie

Pole and bracket cable to lamp

Handhole

Galvanized steel conduit

Quick disconnects

Insulated grounding bushing

Junction box

Edison

10" MAX

5' NOM
HIGH MAST TIMBER LUMINAIRE SUPPORT

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

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

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

7. See breaker schedule in contract for breaker and contactor sizes.
NOTES
1. Where pad or pedestal mounts are located in a sidewalk, construct mount top flush with sidewalk grade, omitting chamfer where top and sidewalk abut.

2. Pad mount design is typical.

3. Place a silicone seal between the cabinet foundation and the cabinet for the pad mount design.

PEDESTAL BASE DETAILS

- 4" x 9" pipe flange
- 7/8" DIA bolt circle for at least 4 bolt holes
- 3/4" DIA each
- 4" slipfitter
- 4" steel pipe
- 3" x 5" handhole with cover
- 3/4" x 2'-0" x 4'
- Steel anchor bolts
- "4 bars at approximately 1'-0" centers

PAD MOUNT

- 6" Cabinet width
- 6" Cabinet height
- 1" to 2"-0" x 4"
- Steel anchor bolts
- 4" bar each corner
- 4" bar each corner
- Locate conduits centrally in foundation
- Install one spare 2" conduit and cap others as required.
NOTES:
1. SEE CONTRACT FOR HEAD TYPE, MOUNTING HEIGHT AND ORIENTATION.
2. ALL NIPPLES, FITTINGS AND CENTER PIPES SHALL BE 1\(\frac{1}{2}\)" DIA.
3. NOMINAL TRADE SIZE (NEC).
4. INSTALL NEOPRENE GASKET OUTSIDE HEAD WHEN FLANGED ELBOWS ARE SUPPLIED.

KEY
1. CENTER PIPE
2. LOCK NIPPLE
3. NIPPLE
4. SERRATED ELBOW
5. SERRATED OR FLANGED ELBOW
6. REAMED TEE WITH SET SCREW
7. REAMED ELBOW WITH SET SCREW
8. BRONZE TERMINAL COMPARTMENT WITH:
   - GASKETED COVER
   - FASTENERS
   - WIRE LEADS
   - MOUNTING SADDLE FOR SIDE MOUNTS
   - 1/2" DIA. DRAIN HOLE
   - 12 POSITION TERMINAL STRIP
   - WIREWAY FOR SIDE MOUNTS
9. BRONZE COLLAR, 4/4" I.D. WITH SET SCREWS
10. GASKET AND WASHER
11. CONDUIT LOCKNUT
12. CONDUIT LOCKNUT
13. TYPE E MOUNTING HINGE
14. FASTENER WITH SPACER
15. 7/8" LAG SCREWS ON WOOD POLE
16. 7/8" BOLTS TAPPED TO METAL POLE
17. FLATHEAD SOCKET BOLT
18. 7/8" INSERT HOLE FOR EXTERNAL WIRE ENTRANCE

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

KEYS:
1. End cap
2. Conduit locknut, 1/2" DIA
3. Locknut, 1/2" DIA
4. Steel washer
5. Neoprene gasket
6. Bronze serrat ed oil fitting with:
   - 3/8" stainless steel through bolt and nuts
   - Three set screws at lip/grip connection
   - Three allen head stainless steel set screws at conduit nipple connection
7. Serrated ring with pins
8. Hex locknut ID 1/2" DIA
9. Conduit nipple, 1/2" DIA
10. Mounting assembly
11. Aluminum arm with set screw
12. Slotted tube with closure strip
13. Tube clamp, 2 1/2" ID, MIN
14. Internally threaded clamp assembly with:
   - Two set screws
   - 1/2" x 0.045" stainless steel bands
   - Screw buckles, 1/16" with swivels, nuts, and washers
   - Band clips with allen head stainless steel set screws
15. Bronze messenger hanger with:
   - 3/8" DIA J bolts
   - Cable lock bar
   - Rivet
   - Cotter key
16. Bronze internally threaded wire entrance with:
   - Bushing
   - Allen head stainless steel set screw
17. Bronze balance adjuster
18. Multi-Head mounting assembly
19. Spider assembly
20. Serrated ring with pins

SPAN WIRE
TYPE P (1 HEAD)

SPAN WIRE
TYPE Q (2 HEADS)
TYPE R (3 HEADS)
TYPE S (4 HEADS)

ARM MOUNT
TYPE L

ARM MOUNT
TYPE LE
(TYPE L WITH EXTENSION FITTINGS)

ARM MOUNT
TYPE M

ARM MOUNT
TYPE N
**Anchor Bolt, Nut, & Washer Sizes**

<table>
<thead>
<tr>
<th>Name</th>
<th>Standard</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>S TYPE PPB</td>
<td>4-7/16</td>
<td>12 x 2&quot;</td>
</tr>
<tr>
<td>S TYPE PS &amp; I</td>
<td>4-7/16</td>
<td>30 x 4&quot;</td>
</tr>
<tr>
<td>S TYPE FB &amp; RM</td>
<td>3-1/8</td>
<td>30 x 4&quot;</td>
</tr>
</tbody>
</table>

**Signal Standard Type Designations**

- **Type PPB**: Ped. Push Button Post
- **Type PS**: Ped. Head Standard
- **Type I & RM**: Vehicle Head and Ramp Meter Standard
- **Type FB**: Flashing Beacon Standard
- **Type II**: Mast Arm Standard
- **Type III**: Lighting and Mast Arm Standard
- **Type IV**: Strain Pole Standard
- **Type V**: Lighting and Strain Pole Standard

**Type PPB, PS, I, RM & FB Standard Dimension Chart**

<table>
<thead>
<tr>
<th>Item</th>
<th>Type PPB</th>
<th>Type PS</th>
<th>Type I</th>
<th>Type RM</th>
<th>Type FB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Height</strong></td>
<td>4-1/16</td>
<td>8-1/8</td>
<td></td>
<td></td>
<td>SEE SHEET 2</td>
</tr>
<tr>
<td><strong>B. Plate Diameter</strong></td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>SEE SHEET 2</td>
</tr>
<tr>
<td><strong>C. Plate Thickness</strong></td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>SEE SHEET 2</td>
</tr>
<tr>
<td><strong>E. Bolt Circle</strong></td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>SEE SHEET 2</td>
</tr>
<tr>
<td><strong>F. Foundation Depth</strong></td>
<td>3-1/4&quot;</td>
<td>3-1/4&quot;</td>
<td>3-1/4&quot;</td>
<td>3-1/4&quot;</td>
<td>3-1/4&quot;</td>
</tr>
<tr>
<td><strong>G. Foundation Diameter</strong></td>
<td>3-1/4&quot;</td>
<td>3-1/4&quot;</td>
<td>3-1/4&quot;</td>
<td>3-1/4&quot;</td>
<td>3-1/4&quot;</td>
</tr>
<tr>
<td><strong>I. Gasket Pad Thickness</strong></td>
<td>NONE</td>
<td><strong>&quot;</strong></td>
<td><strong>&quot;</strong></td>
<td><strong>&quot;</strong></td>
<td>SEE SHEET 2</td>
</tr>
<tr>
<td><strong>J. Plastic Drain Tube Diameter</strong></td>
<td>NONE</td>
<td><strong>&quot;</strong></td>
<td><strong>&quot;</strong></td>
<td><strong>&quot;</strong></td>
<td>SEE SHEET 2</td>
</tr>
<tr>
<td><strong>K. Vertical Rebar</strong></td>
<td>NONE</td>
<td><strong>&quot;</strong></td>
<td><strong>&quot;</strong></td>
<td><strong>&quot;</strong></td>
<td><strong>&quot;&quot;</strong></td>
</tr>
<tr>
<td><strong>L. Handrail Diameter</strong></td>
<td>NONE</td>
<td><strong>&quot;&quot;</strong></td>
<td><strong>&quot;&quot;</strong></td>
<td><strong>&quot;&quot;</strong></td>
<td><strong>&quot;&quot;</strong></td>
</tr>
<tr>
<td><strong>M. Cap Diameter</strong></td>
<td>3/8&quot;</td>
<td>NONE</td>
<td>NONE</td>
<td>NONE</td>
<td>NONE</td>
</tr>
</tbody>
</table>

* Tapered round or octagonal shaft, 11 gauge, 4" OD at slipfitter weld. Taper = 0.14 inches/ft.
** Leveling nut height 1" maximum.
*** Leveling nuts not required for type PPB standard.
LOOP INSTALLATION NOTICES

1. Install the Junction Box and the lead-in conduit.
2. Sawout the loop slots and the lead-in slots.
3. Lay out the loop wire starting at the Junction Box, allowing 8” minimum slack.
4. Install the wire in the loop slot as shown.
5. Finish laying out the wires at the Junction Box and identify the leads with the loop number, the “S” for start and the “E” for end, and the loop series number.
6. Twist each pair of the lead wires two turns per foot from the loop to the Junction Box. Reverse the direction of the twist for each successive pair installed.
7. Construct a supplemental splice containing any series loop connections required in the plan. Supplemental splices are subject to the same requirements shown for the loop lead and the shielded cable splice.
8. Splice the loop leads of supplemental splices to the shielded cable as noted in the Contract.
9. Complete installation and test loop circuits or combination loop circuits. See Standard Specifications 9-20.3 (1.9).
10. Consult for the loop on/off shall be as required in the Contract.

SHEET 3 OF 3 SHEETS
APPROVED FOR PUBLICATION
Herald J. Peterson 06-30-06
Washington State Department of Transportation

EXPIRES MAY 5, 2005
1. If parallel circuits of different sizes are contained in one conduit, the size of the grounding conductor should 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-Co pressure type ground connector shall be used to secure the service neutral to the copper neutral bus 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 1</th>
<th>TYPE 2</th>
<th>TYPE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>41&quot;</td>
<td>35&quot;</td>
<td>29&quot;</td>
</tr>
<tr>
<td>B</td>
<td>21-1/2&quot;</td>
<td>13-1/2&quot;</td>
<td>9-1/2&quot;</td>
</tr>
<tr>
<td>C</td>
<td>12-1/2&quot;</td>
<td>9&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>D</td>
<td>10-1/2&quot;</td>
<td>7-1/2&quot;</td>
<td>5-1/2&quot;</td>
</tr>
<tr>
<td>E</td>
<td>8-1/2&quot;</td>
<td>6&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>F</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
</tr>
<tr>
<td>G</td>
<td>1&quot;</td>
<td>1&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>H</td>
<td>4-1/2&quot;</td>
<td>4-1/2&quot;</td>
<td>4-1/2&quot;</td>
</tr>
<tr>
<td>I</td>
<td>4-1/2&quot;</td>
<td>4-1/2&quot;</td>
<td>4-1/2&quot;</td>
</tr>
<tr>
<td>J</td>
<td>2&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>K</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
</tr>
</tbody>
</table>

NOTES:
1. All box dimensions are nominal. Ideal configurations vary among different manufacturers.
2. The noted lid thicknesses are nominal minimums. The diamond pattern for Type 1 or 2 boxes shall be 25% minimum of overall thickness. The diamond pattern for Type 3 boxes shall have a minimum thickness of 1/2".
3. Lid support members shall be 3/16" min. Black iron O, L or T shape welded to the frame.
4. When specified in the Contract, Type 2 and Type 3 boxes shall be provided with 1/2” deep cutouts access.
5. A 1/4” NPS x 3/4” Stainless Steel Ground Stud with 6” nut shall be welded to the bottom of the box.
6. See the Standard Specifications for alternate use of materials.

LEGEND

LT - LIMITING SYSTEM
COMM - COMMUNICATION SYSTEM
TS - TRAFFIC SIGNAL SYSTEM
TE - TELEPHONE SYSTEM
IT - INTELLIGENT TRANSPORTATION SYSTEM

ALL DIMENSIONS ARE NOMINAL

EXPRESS OCTOBER 26, 2002

STANDARD JUNCTION BOX
STANDARD PLAN J-11a

APPROVED FOR PUBLICATION

HAROLD J. PETERFSON 08-13-01
DEPARTMENT OF TRANSPORTATION
STATE OF WASHINGTON PROFESSIONAL ENGINEER
1. The Junction Box shall be of type 304 stainless steel, welded seam construction; #12 gauge backbox with #8 steel, #12 gauge cover with #8 steel, and #12 gauge mounting tabs.

2. All conduit connections to the Junction Box shall be concrete-light; cast concrete shall not interfere during pour. Field drill or punch the holes in the center of the box end, unless adding additional conduit. (See SECTION 88)

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

4. The System Identification letters shall be 1/8" deep impressions formed by engraving, stenciling, or with a #8 steel bar. (See Detail).

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

6. Details shown for box installation in stationary forms.

---

**JUNCTION BOX**

**TRAFFIC BARRIER MOUNTED**

**STANDARD PLAN J-16a**

---

**SHEET 1 OF 1 SHEET**

---

**APPROVED FOR PUBLICATION**

**HEROLD S. PETERSON 03-04-00**

**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**
NOTES

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

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

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

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

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

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

7. ROADSIDE BARRIERS AND END TREATMENTS SHALL BE CRASHWORTHY.

SIGN SPACING = X (FEET)

<table>
<thead>
<tr>
<th>Rural Roads</th>
<th>Urban Arterials &amp;</th>
</tr>
</thead>
<tbody>
<tr>
<td>45/55 MPH</td>
<td>35/40 MPH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rural Roads</th>
<th>Urban Streets</th>
</tr>
</thead>
<tbody>
<tr>
<td>25/30 MPH</td>
<td>200'--</td>
</tr>
</tbody>
</table>

All signs are black on orange unless otherwise designated.

CHANNELIZING DEVICE SPACING (FEET)

<table>
<thead>
<tr>
<th>50/70</th>
<th>35/45</th>
<th>25/30</th>
</tr>
</thead>
<tbody>
<tr>
<td>40/80</td>
<td>60/120</td>
<td>40/120</td>
</tr>
</tbody>
</table>
NOTES
1. MODIFY REGULATORY TRAFFIC CONTROL DEVICES FOR THE DURATION OF THE DETOUR.
2. TWO FLASHING WARNING LIGHTS (TYPE A, MUTCD) SHALL BE USED TO MARK EACH BARRICADE AT NIGHT.
3. DETOUR TRAILBLAZERS SHALL BE INSTALLED THROUGHOUT THE DETOUR.
4. SIGNING SHOWN FOR ONE DIRECTION ONLY.
5. COORDINATE WITH EMERGENCY SERVICES.

SIGN SPACING = X (FEET)

<table>
<thead>
<tr>
<th>Type of Road</th>
<th>Rural Roads</th>
<th>Urban Arterials &amp; Rural Roads</th>
<th>Urban Streets Residential Areas &amp; Business Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Limit</td>
<td>45/55 MPH</td>
<td>35/40 MPH</td>
<td>25/30 MPH</td>
</tr>
<tr>
<td>Spacing</td>
<td>500'</td>
<td>350'</td>
<td>200'</td>
</tr>
</tbody>
</table>

Assumed signs are black on orange unless otherwise designated.

LEGEND
- TYPE 3L BARRICADE
- TYPE 3R BARRICADE
- SIGN LOCATION - POST MOUNT
NOTES
1. EXTEND TAPER ACROSS SHOULDER.
2. THE MAXIMUM LENGTH OF WORK AREA CONTROLLED BY ONE-WAY TRAFFIC SIGNAL IS 400 FT. SIGNAL TIMING SHALL BE ESTABLISHED BY QUALIFIED PERSONNEL.
3. SIGNS SHALL BE POST MOUNTED IF SIGNAL REMAINS IN PLACE MORE THAN 3 DAYS.

BUFFER DATA

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

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Typical Vehicle (LBS)</th>
<th>Posted Speed (mph)</th>
<th>Stationary Operation (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Yard Dump Truck</td>
<td>24,000</td>
<td>50-50</td>
<td>75</td>
</tr>
<tr>
<td>2 Ton Cargo Truck</td>
<td>10,000</td>
<td>50-55</td>
<td>100</td>
</tr>
<tr>
<td>1 Ton Cargo Truck</td>
<td>0,000</td>
<td>50-55</td>
<td>150</td>
</tr>
</tbody>
</table>

ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT.

SIGN SPACING = X (feet)
- Rural/Res. 45/55 MPH 100+X
- Urban arterial 35/45 MPH 75+X
- Urban streets 25/30 MPH 200+X
- Residential areas & Business districts 150+X

All signs are black on orange unless otherwise designated.

EXPLORES NOVEMBER 25, 2003

APPROVED FOR PUBLICATION

ALTERNATING ON-E WAY TRAFFIC SIGNAL CONTROLLED STANDARD PLAN K-4

SHEET 1 OF 1 SHEET

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
SIGHT DISTANCE DATA
MIN. STOPPING SIGHT DIST. = S

<table>
<thead>
<tr>
<th>SPEED LIMIT MPH</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISTANCE FEET</td>
<td>75'</td>
<td>100'</td>
<td>150'</td>
<td>225'</td>
<td>300'</td>
<td>375'</td>
<td>450'</td>
</tr>
</tbody>
</table>

DISTANCES SHOWN ARE MINIMUMS. USE ADDITIONAL DISTANCE WHEN POSSIBLE.

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

LEGEND
- WORK VEHICLE WITH FLASHING AMBER WARNING BEACON
- SHADOW VEHICLE WITH FLASHING AMBER WARNING BEACON (WITH TRUCK MOUNTED ATTENUATOR WHEN SPECIFIED IN CONTRACT)

PORTABLE CHANGEABLE MESSAGE SIGN DISPLAYS

PCMS

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>WORKERS ON ROADWAY TO STOP</td>
<td>1.5 SEC</td>
</tr>
</tbody>
</table>

MOUNT TO BACK OF WORK VEHICLE
MOUNT TO BACK OF SHADOW VEHICLE
**BUFFER DATA**

**BUFFER SPACE = B**

<table>
<thead>
<tr>
<th>SPEED MPH</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (feet)</td>
<td>55</td>
<td>55</td>
<td>50</td>
<td>45</td>
<td>40</td>
<td>35</td>
<td>30</td>
<td>25</td>
<td>20</td>
</tr>
</tbody>
</table>

**PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R**

- 4 YARD DUMP TRUCK: 24,000
  - Typical Vehicle Loaded Weight (lbs): 6,850
  - Tapering: 60-65, 50
  - Stationary Operation (feet): 45, 50
- 2 TON CARGO TRUCK: 18,000
  - Tapering: 60-65, 50
  - Stationary Operation (feet): 45, 50
- 1 TON CARGO TRUCK: 10,000
  - Tapering: 60-65, 200
  - Stationary Operation (feet): 45, 50

**CHANNELIZING DEVICE SPACING (FEET)**

<table>
<thead>
<tr>
<th>LANE WIDTH (feet)</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXIMUM TAPER LENGTH = L (FEET)</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>POSTED SPEED (mph)</th>
<th>50/65</th>
<th>55/70</th>
<th>60/75</th>
<th>65/80</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAPERING</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>TANGENT</td>
<td>80</td>
<td>90</td>
<td>100</td>
<td>110</td>
</tr>
</tbody>
</table>

**NOTES**

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

**SIGN SPACING = X (FEET)**

- Rural Roads: 45/65 MPH, 500 ft
- Urban Arterials: 35/40 MPH, 350 ft
- Rural Roads: 25/30 MPH, 200 ft

**PORTABLE CHANGEABLE MESSAGE SIGN DISPLAYS**

- **PCMS**: 1.5 sec, 1.5 sec

---

**LEGEND**

- **S**: SIGN LOCATION—TRIPOD MOUNTED
- **D**: SEQUENTIAL ARROW SIGN
- **T**: TEMPORARY TRAFFIC CONTROL DEVICES
- **W**: PROTECTIVE VEHICLE (WHEN SPECIFIED IN CONTRACT)
- **E**: PROTECTIVE VEHICLE WITH TRUCK MOUNTED ATTENUATOR (WHEN SPECIFIED IN CONTRACT FOR HIGH SPEED ROADWAYS)
- **PCMS**: PORTABLE CHANGEABLE MESSAGE SIGN (WHEN SPECIFIED IN CONTRACT)
1. EXISTING CONFLICTING PAVEMENT MARKINGS NO LONGER APPLICABLE SHALL BE REMOVED OR OBLITERATED.
2. TEMPORARY MARKINGS SHALL BE USED AS NECESSARY.
3. EXPOSED ENDS OF CONCRETE BARRIERS SHALL BE MAINTAINED OUTSIDE THE CLEAR ZONE AND ADEQUATELY FLARED OR FITTED WITH IMPACT ATTENUATORS.
4. STEADY BURNING WARNING LIGHTS (TYPE C, MUTCD) SHALL BE USED TO MARK CHANNELIZING DEVICES AT NIGHT AS NEEDED.
5. ROADSIDE BARRIERS AND END TREATMENT SHALL BE CRASHWORTHY.
6. INSTALL PORTABLE CHANGEABLE MESSAGE SIGN (WHEN SPECIFIED) APPROXIMATELY 1 MILE IN ADVANCE OF LANE CLOSURE.

BUFFER DATA
BUFFER SPACE = B

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (feet)</td>
<td>55</td>
<td>85</td>
<td>120</td>
<td>200</td>
<td>220</td>
<td>280</td>
<td>335</td>
<td>455</td>
<td>485</td>
</tr>
</tbody>
</table>

LONGITUDINAL BARRIER FLARE RATES

<table>
<thead>
<tr>
<th>POSTED SPEED MPH</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIGID SYSTEM 45</td>
<td>181</td>
<td>181</td>
<td>181</td>
<td>181</td>
</tr>
<tr>
<td>RIGID SYSTEM 50</td>
<td>181</td>
<td>181</td>
<td>181</td>
<td>181</td>
</tr>
<tr>
<td>RIGID SYSTEM 55</td>
<td>181</td>
<td>181</td>
<td>181</td>
<td>181</td>
</tr>
<tr>
<td>RIGID SYSTEM 60</td>
<td>181</td>
<td>181</td>
<td>181</td>
<td>181</td>
</tr>
</tbody>
</table>

MINIMUM TAPER LENGTH = L (FEET)

<table>
<thead>
<tr>
<th>LANE WIDTH (feet)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feet</td>
<td>100</td>
<td>105</td>
<td>110</td>
<td>115</td>
</tr>
<tr>
<td>Feet</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Feet</td>
<td>450</td>
<td>450</td>
<td>450</td>
<td>450</td>
</tr>
</tbody>
</table>

CHANNELIZING DEVICE SPACING (FEET)

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

LEGEND

- SIGN LOCATION-POST MOUNTED
- TEMPORARY TRAFFIC CONTROL DEVICE
- TRAFFIC SAFETY DRUMS
- OBLITERATED MARKINGS (see notes 1 & 2)
- TEMPORARY CONCRETE BARRIER W/REFLECTORS
- SEQUENTIAL ARROW SIGN
- TEMPORARY IMPACT ATTENUATORS (WHEN SPECIFIED IN CONTRACT)
- PORTABLE CHANGEABLE MESSAGE SIGN (WHEN SPECIFIED IN CONTRACT)

SIGN SPACING = X (FEET)

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

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

SIGN SPACING = X (FEET)

<table>
<thead>
<tr>
<th>Type of Road</th>
<th>Speed (MPH)</th>
<th>Spacing (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Roads</td>
<td>45/65</td>
<td>500'</td>
</tr>
<tr>
<td>Urban Arterials &amp; Rural Roads</td>
<td>35/40</td>
<td>350'</td>
</tr>
<tr>
<td>Rural Roads</td>
<td>25/30</td>
<td>200'</td>
</tr>
<tr>
<td>Residential Areas &amp; Business Districts</td>
<td>25/30</td>
<td>200'</td>
</tr>
</tbody>
</table>

All signs are black on orange unless otherwise designated.

LEGEND

- SIGN LOCATION-POST MOUNTED
BUFFER SPACE = B

<table>
<thead>
<tr>
<th>SPEED MPH</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (feet)</td>
<td>170</td>
<td>220</td>
<td>280</td>
<td>335</td>
<td>415</td>
<td>485</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = B

<table>
<thead>
<tr>
<th>VEHICLE TYPE</th>
<th>FREIGHT TRUCK</th>
<th>4 YARD DUMP TRUCK</th>
<th>2 TON CARGO TRUCK</th>
<th>1 TON CARGO TRUCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPEED MPH</td>
<td>60-65</td>
<td>50-55</td>
<td>50-75</td>
<td>50-75</td>
</tr>
<tr>
<td>POSTED SPEED mph</td>
<td>45</td>
<td>50</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>STATIONARY OPERATION (feet)</td>
<td>200</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

SIGN SPACING = X (FEET)

|                      | Rural Roads
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>45/65 MPH</td>
<td>500'--</td>
</tr>
<tr>
<td>Urban Arterial</td>
<td>40 MPH</td>
</tr>
<tr>
<td>350'--</td>
<td></td>
</tr>
</tbody>
</table>

Assigns are black on orange unless otherwise designated.

CHANNELIZING DEVICE SPACING (FEET)

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

ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT.

1. NO ENCROACHMENT ON TRAVELLED LANE IF ENCROACHMENT IS NECESSARY, LANE SHALL BE CLOSED.

2. FOR OPERATIONS OF 15 MINUTES OR LESS, ALL SIGNS AND CHANNELIZATION DEVICES MAY BE ELIMINATED.

MINIMUM TAPER LENGTH (L) IN FEET

<table>
<thead>
<tr>
<th></th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>-</td>
<td>-</td>
<td>*</td>
<td>265</td>
<td>450</td>
<td>500</td>
<td>550</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>-</td>
<td>-</td>
<td>*</td>
<td>295</td>
<td>495</td>
<td>550</td>
<td>605</td>
<td>660</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>-</td>
<td>-</td>
<td>*</td>
<td>320</td>
<td>540</td>
<td>600</td>
<td>660</td>
<td>720</td>
<td>780</td>
</tr>
</tbody>
</table>

LEGEND

□ □ □ SIGN LOCATION–TRIPOD MOUNTED
□ □ □ TEMPORARY TRAFFIC CONTROL DEVICES
□ □ □ □ □ PROTECTIVE VEHICLE WITH TRUCK MOUNTED ATTENUATOR (WHEN SPECIFIED IN CONTRACT)

SHOULDER CLOSURE
HIGH SPEED
STANDARD PLAN K-8
SHEET 1 OF 1 SHEET
APPROVED FOR PUBLICATION
Harold J. Pietruszka 12-20-02
Washington State Department of Transportation
NOTES

1. The sign shown is not required if the work space is behind a barrier, more than 2' behind the curb, or 15' or more from the edge of any roadway.

SIGN SPACING = X (feet)
- Rural Roads: 45/55 MPH 500'±
- Urban Arterials: 35/40 MPH 350'±
- Urban Streets: Residential Areas & 25/30 MPH 200'±
- Business Districts: All signs are black on orange unless otherwise designated.

WORK BEYOND THE SHOULDER

ABRUPT LANE EDGE

WARNING SIGNS - LOCATE AS NEEDED FOR SITE CONDITIONS TO SUPPLEMENT WARNING SIGNS.

NO SHOULDER

1. Shoulder excavation shall be limited to one side at a time.

TEMPORARY TRAFFIC CONTROL DEVICE

4:1 WEDGE OF COMPACTED STABLE MATERIAL

SHOULDER WORK AREAS

SHOULDER WORK AREA PROTECTION

NON-WORKING HOURS

EXPRESSES NOVEMBER 25, 2003

1. 12-31-02

APPROVED FOR PUBLICATION

HAROLD J. FLOHR

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
NOTES

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

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

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

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

5. IN THOSE SITUATIONS WHERE THE DISTANCE BETWEEN THE ADVANCE WARNING SIGNS AND THE WORK IS 1 TO 2 MILES, A SUPPLEMENTAL DISTANCE PLAQUE SHALL BE USED WITH THE ROAD WORK AHEAD SIGN.
NOTES

1. CONTROLS SHOWN ARE FOR PEDESTRIAN TRAFFIC ONLY.
2. USE WARNING LIGHTS ON BARRICADES.
3. TEMPORARY PEDESTRIAN ROUTES SHALL BE COMPLIANT WITH ADA REQUIREMENTS.
4. CURB PARKING SHALL BE PROHIBITED FOR AT LEAST 50' IN ADVANCE OF A MID-BLOCK CROSSWALK.
BUFFER SPACE = B

<table>
<thead>
<tr>
<th>SPEED MPH</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (feet)</td>
<td>170</td>
<td>210</td>
<td>290</td>
<td>335</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R

<table>
<thead>
<tr>
<th>VEHICLE TYPE</th>
<th>TYPICAL VEHICLE LOADED WEIGHT (lbs)</th>
<th>POSTED SPEED LIMIT (mph)</th>
<th>STATIONARY OPERATION (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 YARD DUMP TRUCK</td>
<td>24,000</td>
<td>50-55</td>
<td>75</td>
</tr>
<tr>
<td>2 TON CARGO TRUCK</td>
<td>6,000</td>
<td>50-55</td>
<td>60</td>
</tr>
<tr>
<td>1 TON CARGO TRUCK</td>
<td>10,000</td>
<td>50-55</td>
<td>50</td>
</tr>
</tbody>
</table>

ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT

MINIMUM TAPER LENGTH = L (FEET)

<table>
<thead>
<tr>
<th>LANE WIDTH (feet)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>POSTED SPEED (mph)</td>
<td>100</td>
<td>150</td>
<td>200</td>
<td>250</td>
<td>300</td>
<td>350</td>
<td>400</td>
</tr>
</tbody>
</table>

SIGN SPACING = X (FEET)

<table>
<thead>
<tr>
<th>RURAL ROADS</th>
<th>45/55 MPH</th>
<th>50''</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>125</td>
<td>150</td>
</tr>
<tr>
<td>11</td>
<td>115</td>
<td>165</td>
</tr>
<tr>
<td>12</td>
<td>125</td>
<td>180</td>
</tr>
</tbody>
</table>

CHANNELIZING DEVICE SPACING (FEET)

<table>
<thead>
<tr>
<th>MNH</th>
<th>TAPER</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>25/30</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>35/45</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/30</td>
<td>60</td>
<td>40</td>
</tr>
</tbody>
</table>

LEGEND

- SIGN LOCATION-PORTABLE MOUNT
- SIGN LOCATION-TRIPOD MOUNT
- SEQUENTIAL ARROW SIGN
- TEMPORARY TRAFFIC CONTROL DEVICES
- PROTECTIVE VEHICLE (WHEN SPECIFIED IN CONTRACT)
- PROTECTIVE VEHICLE WITH TRUCK MOUNTED ATTENUATOR (WHEN SPECIFIED IN CONTRACT FOR HIGH SPEED ROADWAYS)

NOTES

1. FOR LONG-TERM PROJECTS, CONFLICTING PAVEMENT MARKINGS NO LONGER APPLICABLE SHALL BE REMOVED OR OBLITERATED AS SOON AS PRACTICABLE. TEMPORARY MARKINGS SHALL BE USED AS NECESSARY AND SIGNS SHALL BE POST MOUNTED.
2. STEADY BURNING WARNING LIGHTS (TYPE C, MUTCD) SHALL BE USED TO MARK CHANNELIZING DEVICES AT NIGHT AS NEEDED.
3. IF THE LANE SHIFT IS SHORT AND HAS SHARP CURVES (30 MPH OR LESS) USE SIGN W1-3 IN LIEU OF SIGN W1-4.

LANE SHIFT THREE LANE ROADWAY STANDARD PLAN K-18 SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Harold J. Peterkofsky 12-20-02 2002-06-07

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
NOTES
1. NO LEFT TURN SIGNS ARE TO BE USED IF TRAFFIC VOLUMES ARE TOO HIGH OR
   THERE IS A SIGNAL OPERATING. CLOSE LEFT TURN POCKET IF THERE IS ONE ON
   THE SIDE STREET.
2. FLASHING WARNING LIGHTS (TYPE A, MUTCD) SHOULD BE USED TO MARK BARRICADES AT
   NIGHT.
3. STEADY BURNING WARNING LIGHTS (TYPE C, MUTCD) SHALL BE USED TO MARK CHANNELIZING
   DEVICES AT NIGHT.
4. FOR LONG-TERM PROJECTS, CONFLICTING PAVEMENT MARKINGS NO LONGER APPLICABLE SHALL BE
   REMOVED OR OBLITERATED. TEMPORARY MARKINGS SHALL BE USED.

MINIMUM TAPER LENGTH = L (feet)

<table>
<thead>
<tr>
<th>LANE WIDTH (feet)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>105</td>
<td>150</td>
<td>205</td>
<td>270</td>
<td>370</td>
<td>450</td>
<td>550</td>
</tr>
<tr>
<td>11</td>
<td>115</td>
<td>165</td>
<td>225</td>
<td>295</td>
<td>395</td>
<td>495</td>
<td>595</td>
</tr>
<tr>
<td>12</td>
<td>125</td>
<td>180</td>
<td>245</td>
<td>320</td>
<td>410</td>
<td>510</td>
<td>610</td>
</tr>
</tbody>
</table>

SIGN SPACING = X (feet)

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Roads</td>
<td>45/55</td>
</tr>
<tr>
<td>Urban Arterial</td>
<td>35/40</td>
</tr>
<tr>
<td>Urban Streets, Residential Areas &amp; Business Districts</td>
<td>25/33</td>
</tr>
</tbody>
</table>

Aligns are block on orange unless otherwise designated.

CHANNELIZING DEVICE SPACING (feet)

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

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

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

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

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

<table>
<thead>
<tr>
<th>LANE WIDTH (feet)</th>
<th>24</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>105</td>
<td>150</td>
<td>205</td>
<td>270</td>
<td>450</td>
<td>520</td>
<td>550</td>
</tr>
<tr>
<td>11</td>
<td>115</td>
<td>165</td>
<td>225</td>
<td>295</td>
<td>495</td>
<td>550</td>
<td>605</td>
</tr>
<tr>
<td>12</td>
<td>125</td>
<td>180</td>
<td>245</td>
<td>320</td>
<td>540</td>
<td>600</td>
<td>660</td>
</tr>
</tbody>
</table>

SIGN SPACING = X (feet)
- Rural Roads: 45/55 MPH: 500'-
- Urban Arterials: 35/45 MPH: 350'-
- Urban Streets: 25/30 MPH: 200'-
- Residential Areas & Business Districts: 100'-

All signs are back on orange unless otherwise designated.

<table>
<thead>
<tr>
<th>CHANNELIZING DEVICE SPACING (feet)</th>
<th>MPH</th>
<th>TAPER</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-70</td>
<td>40</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>35-45</td>
<td>30</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>25-30</td>
<td>20</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>

LEGEND
- SIGN LOCATION - PORTABLE MOUNT
- SIGN LOCATION - POST MOUNT
- TEMPORARY TRAFFIC CONTROL DEVICES
- TYPE 3R BARRICADE
- SEQUENTIAL ARROW SIGN
- PAINTED TRAFFIC ARROW (OPTIONAL)
NOTES
1. EXTEND DEVICES TAPER ACROSS SHOULDER.
2. SIGN SEQUENCE IS THE SAME FOR BOTH DIRECTIONS OF TRAVEL ON THE HIGHWAY.
3. STEADY BURNING WARNING LIGHTS (TYPE C, MUTCD) SHALL BE USED TO MARK TRAFFIC CONTROL DEVICES AT NIGHT.
4. FOR USE WHEN TRAFFIC VOLUMES ARE SUCH THAT SUFFICIENT GAPS EXIST FOR MOTOR VEHICLES THAT MUST YIELD.
5. DRIVERS MUST HAVE ADEQUATE SIGHT DISTANCE TO SEE OPPOSING TRAFFIC AS THEY APPROACH. OTHERWISE FLAGGERS AND/OR TEMPOARY SIGNAL IS REQUIRED.

BUFFER DATA
BUFFER SPACE = B
SPEED (MPH) 25 30 35 40 45
LENGTH (feet) 55 85 100 110 220

LEGEND
- SIGN LOCATION - TRIPOD MOUNT
- TEMPORARY TRAFFIC CONTROL DEVICES
- FLASHING WARNING LIGHT
# TYPE 3L BARRICADE
NOTES

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

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

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

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

---

**LEGEND**

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

---

**SIGN SPACING = X (feet)**

- Rural Routes: 45/55 MPH 500'++
- Urban Arterials: 35/40 MPH 350'++
- Urban Streets, Residential Areas & Business Districts: 25/30 MPH 200'++

All signs are black on orange unless otherwise designated.

---

**CHANNELIZING DEVICE SPACING (feet)**

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

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

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

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

4. FOR LONG-TERM PROJECTS, CONFLICTING PAVEMENT MARKINGS NO LONGER APPLICABLE SHALL BE REMOVED OR OBLITERATED AS SOON AS PRACTICABLE. TEMPORARY MARKINGS SHALL BE USED AS NECESSARY.
SINGLE WIRE GATE, 14' WIDE

DOUBLE WIRE GATE, 20' WIDE

INTERSECTING FENCE BRACE

WIRE FENCE

END BRACE

LINE BRACE
(Maximum spacing 1000 feet)

WOOD POST DETAILS

- Brace post
- Wire brace
- Line posts on 14' centers

GATE POST

1. Details for Type 2 Fence, same as Type 1.
2. Wood anchors shall be 2x4 lumber, 12" long MIN., fastened with three 16d galvanized nails.
3. Four wire clamps per post required for mesh wire. Three additional clamps per post required in sag section.
### Roll Formed Sections

**End, Corner and Pull Post**

**Rail and Brace**

**Line Post**

---

#### Chain Link Fence

<table>
<thead>
<tr>
<th>Type</th>
<th>Brace Rail &amp; Top Rail</th>
<th>Line &amp; Brace Post</th>
<th>End, Corner, &amp; Pull Post</th>
<th>Gate Post</th>
<th>All Posts</th>
<th>Member</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Round</td>
<td>H-Column</td>
<td>Roll Formed</td>
<td>Round</td>
<td>H-Column</td>
<td>Roll Formed</td>
</tr>
<tr>
<td>1</td>
<td>1 1/4</td>
<td>2.27</td>
<td>1 1/4 x 1 1/4</td>
<td>1.35</td>
<td>3 1/2 x 1 1/4</td>
<td>1.35</td>
</tr>
<tr>
<td>3</td>
<td>1 1/4</td>
<td>2.27</td>
<td>1 1/4 x 1 1/4</td>
<td>1.35</td>
<td>3 1/2 x 1 1/4</td>
<td>1.35</td>
</tr>
<tr>
<td>4</td>
<td>1 1/4</td>
<td>2.27</td>
<td>1 1/4 x 1 1/4</td>
<td>1.35</td>
<td>3 1/2 x 1 1/4</td>
<td>1.35</td>
</tr>
<tr>
<td>6</td>
<td>1 1/4</td>
<td>2.27</td>
<td>1 1/4 x 1 1/4</td>
<td>1.35</td>
<td>3 1/2 x 1 1/4</td>
<td>1.35</td>
</tr>
</tbody>
</table>

**NOTES:**

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

2. Minimum post lengths:
   Types 1 & 3 8’ - 9’
   Types 4 & 6 5’ - 6’

CHAIN LINK GATES
ACCESS CONTROL GATE

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006

1. Posts shall be 6 x 8 wood or 6 x 9 steel. See Standard Plan "Beam Guardrail Posts and Blocks".
2. Padlocked end shall be determined by the Project Engineer. Lock shall not be provided.

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**Plan**

- **6" MIN galvanized IWRC wires**
- **Galvanized eye bolt, 5/8" shank**, eye to be large enough to allow chain to pass through
- **Galvanized nut and washer**
- **Burr or swell end of bolt to prevent removal of nut**

**Elevation**

- **Ground line**
- **Posts**
- **Loop and clamp end**
- **5/8" Galvanized eye bolt**
- **Galvanized nut and washer**
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 in site existing conditions. See Contract.

LEGEND

R = RAMP LANE WIDTH
L = LANE WIDTH

TWO LANE ON- CONNECTION

TWO LANE OFF- CONNECTION
LEGEND

G D R = COLLECTOR DISTRIBUTOR RAMP LANE WIDTH
G D L = COLLECTOR DISTRIBUTOR LANE WIDTH
R = RAMP LANE WIDTH
L = LANE WIDTH

NOTES

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

2. The channelization shown on this plan assumes optimal geometric design. The dimensions may vary to fit existing conditions. See Contract.
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 5/4 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.

SINGLE LANE, PARALLEL TYPE ON-CONNECTION

DOUBLE LANE, PARALLEL TYPE ON-CONNECTION

RAIL CHANNELED PARALLEL ON & WEAVING SECTION

STANDARD PLAN M-1.80-00

APPROVED FOR PUBLICATION

Harold J. Petersen

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006
1. Install a minimum of 3 sets of diagonal chevrons in the gore area. A 10' spacing is standard; however, for gore areas shorter than 100' use a 20' spacing, and for gore areas greater than 400' a spacing of 100' may be used.

2. The exit angle of the diagonals shall always point in the direction of mainline traffic.
1. Install a minimum of 3 sets of diagonal chevrons in the gore area. A 102' spacing is standard, however, for gore areas shorter than 180', 102' spacing, and for gore areas greater than 400' a spacing of 160' may be used.

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

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

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

GORE AREA SUBSTITUTION WITH TYPES 1 & 2 RAISED PAVEMENT MARKERS

STANDARD PLAN 14-2.60-00

Sheet 1 of 1 Sheet

APPROVED FOR PUBLICATION

Washington State Department of Transportation

Harold J. Peterson 02-30-08
LEFT TURN CHANNELIZATION
TEE INTERSECTION

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

LEGEND
- Type 21 Traffic Arrow

DRAWN: BL DESIGNS

EXPIRES: MAY 15, 2006

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

SHEET 1 OF 1 SHEET

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

NOTES:
- The plan and field verification are subject to change for construction and issuance of permits. The plan may be modified at any time. A copy may be obtained upon request.
GENERAL NOTES

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

2. The lane message "ONLY" may be added to the Traffic Arrow Type 2R locations shown, in which case, substitute the Arrow as per the LANE MESSAGE DETAIL.

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

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

RIGHT TURN CHANNELIZATION
WITH DROP LANE

DOUBLE RIGHT TURN CHANNELIZATION

STANDARD PLAN M-5.10-00
SHEET 1 OF 1 SHEET
APPROVED FOR PUBLICATION
HAROLD J. PETERSEN 12-15-04
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

REQUIRED: MAY 3, 2005

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006
NOTE

When specified in the Contract Plans, the HOV Symbol Marking shall be installed with an offset of 1 foot from the lane centerline.
KEY NOTES

1. Bid Item "Bicycle Lane Symbol" includes Bicycle Lane Arrow and Bicycle Rider Symbol.
2. 2" x 6" White Bicycle Lane Arrow
3. Bicycle Rider Symbol

GENERAL NOTE
See contract for location and material requirements.
ALTERNATE PARKING STALL MARKINGS
USE ONLY WHEN SPECIFIED IN THE CONTRACT

NOTES

1. Those, four and five accessible stall arrangements may be either 60° single or 90° perpendicular parking arrangements. See contract.

2. Signs indicating a parking space or stall for a physically disabled person shall be installed between 82° and 96° above the sidewalk surface.

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

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

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

LEGEND

- RP-461 Reserved Parking Sign and post with RP-461A. Plaque, if indicated
  (See Sign Fabrication Manual)
- Access Parking Space Symbol
- Manufactured wheel stop
- Detectable Warning Pattern
NOTES:

1. Reeded pavement markers, when specified, shall be installed at the
   locations shown for Type 2Y RPM's on multisite one-way roadways, and
   Type 2Y RPM's on two lane two-way roadways.

2. For lane lines, Type 2Y RPM's shall be spaced at 60' intervals on
tangents and horizontal curves with a radius of 5000' or more, and
40' intervals on horizontal curves having radii less than 5000'.

3. Type 2Y RPM's, when specified, shall be placed outside the Left Edge
   Line. See "LEFT EDGE OF LANE PLACEMENT DETAIL".

4. For divider lines, Type 2Y RPM's shall be spaced at 98' intervals on
tangents and horizontal curves with a radius of 5000' or more, and
40' intervals on horizontal curves having radii less than 5000'.
   Type 2Y RPM's are to be centered between skid lines.

MULTILANE ONE-WAY TRAFFIC

TWO LANE TWO-WAY TRAFFIC

RECESSED PAVEMENT MARKER DETAILS
FOR USE WHERE SPECIFIED IN CONTRACT

LONG LINE SUPPLEMENT
WITH RAISED PAVEMENT
MARKERS ~ GENERAL
STANDARD PLAN 15-30.30-00

APPROVED FOR PUBLICATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
HAROLD J. PETERSON 06-04-00

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006
DOUBLE YELLOW CENTER LINE
- SEE DETAIL "B"

NOTE:
1. Raised pavement markers shall be installed only when specified in the Contract Plans.
2. See the Standard Plans for marker designation.
3. The portion labeled "OPTIONAL" is only used when the Optional Marked Deceleration Taper (see Standard Plans H-3.10 and H-3.20) is specified in the contract plans.

LEFT TURN LANE
(SEE NOTE 3)

TWO-WAY LEFT TURN LANE

END TWO-WAY LEFT TURN LANE
NOTE

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

SYMBOL MARKINGS
TRAFFIC ARROWS FOR
HIGH SPEED ROADWAYS
STANDARD PLAN H-34.20-00
Sheet 1 of 8 Sheets
APPROVED FOR PUBLICATION
Harold J. Petersen 03-04-00
Washington State Department of Transportation

EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006

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EFFECTIVE: APRIL 4, 2005 TO JANUARY 2, 2006
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.