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Design Office, Engineering and Regional Operations

Remarks and Instructions
The complete manual and revision packages can be accessed at www.wsdot.wa.gov/design/standards/plans.htm.

Please contact Bill Berens at 360-705-7256 or berensb@wsdot.wa.gov with comments, questions, or suggestions for improvement to the manual.

Instructions
• Replace Cover page with new Cover page provided.
• Remove pages 3 ~ 13 from your current manual.
• Insert pages 3 ~ 13.
• Refer to the REMOVE & INSERT INSTRUCTIONS – Standard Plans Revision 8-7-2017

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Engineering and Regional Operations
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Olympia, WA 98504-7329

Email: designstandards@wsdot.wa.gov
www.wsdot.wa.gov/design/standards/plans.htm

John Donahue
Approved By

Signature
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August 7, 2017

Engineering and Regional Operations
Development Division, Design Office
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## Typical Isolation Joint Guidelines

| Condition | Feature | Edges, Flanges or Lips in the Pavement Section | Continuous Vertical Face Through the Pavement Section | Distance From Nearest Transverse Joint
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* With Rectangular Grate Cast Into Adjustment Section.
NOTES

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

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

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

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

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

(A) Approach slabs less than 40' (ft) wide — no joint is required.

(B) Approach slabs wider than 40' (ft) — one or more joints are required to divide the slab into approximately 24' (ft) wide sections.

3. The minimum lap splice of No. 5 is 2'-0". ▽ #5 is 2'-0". ▽ #6 is 3'-0". And #8 is 3'-3". All lap splices shall be staggered so that no more than 50% of rebar is spliced at the same location. Lap splices shall be located within the middle half of the bridge approach slab. Optional splices are allowed for #8). ▽ #6.

4. SEE STANDARD PLAN A-42.20 (DETAIL 1) FOR JOINT DETAILS

5. FOR LOCAL AGENCY USE ONLY

6. BRIDGE APPROACH SLAB

7. STANDARD PLAN A-40.50-02

8. SHEET 1 OF 2 SHEETS

9. APPROVED FOR PUBLICATION

10. Washington State Department of Transportation

11. Dec 18 2014 5:06 PM

Bijan Khaledi, Bijan

Khaledi, Bijan

Dec 23 2014 1:57 PM

Gage
PIPE ALLOWANCES

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* CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTES

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

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

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

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

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

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

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

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<th>MAXIMUM INSIDE DIAMETER (INCHES)</th>
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<td>ALL METAL PIPE</td>
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★ CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTES

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

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

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

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

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

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

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

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

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

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

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

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

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

7. All pickup holes shall be grouted full after the basin has been placed.
1. No steps are required when height is 4' or less.
2. The bottom of the precast catch basin may be sloped to facilitate cleaning.
3. The rectangular frame and grate may be installed with the flange up or down. The frame may be cast into the adjustment section.
4. Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum. Provide a 1.0" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Standard Specification 9-04.3.

### CATCH BASIN DIMENSIONS

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### PIPE ALLOWANCES

| CATCH BASIN DIAMETER | PIPE MATERIAL WITH CONCRETE ALL METAL CPSSP SOLID WALL PVC INSIDE DIA. PROFILE WALL PVC |
|---------------------|---------------------------------------------|----------------------------------|--------------------------|-------------------------------|
| 48"                 | 24"                                         | 30"                              | 49"                      | 30"                           |
| 54"                 | 30"                                         | 36"                              | 30"                      | 36"                           |
| 60"                 | 36"                                         | 42"                              | 36"                      | 42"                           |
| 72"                 | 42"                                         | 54"                              | 48"                      | 48"                           |
| 84"                 | 54"                                         | 60"                              | 48"                      | 48"                           |
| 96"                 | 60"                                         | 72"                              | 60"                      | 48"                           |
| 120"                | 68"                                         | 84"                              | 60"                      | 48"                           |
| 144"                | 78"                                         | 96"                              | 60"                      | 48"                           |

1. Corrugated Polyethylene Storm Sewer Pipe (Standard Specification 9-05.20)
2. Standard Specification 9-05.12(1)
NOTES

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

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

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

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

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

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

7. The shear gate shall be made of aluminum alloy in accordance with ASTM B 26 and ASTM B 275, designation 2023A; or cast iron in accordance with ASTM A 48, Class 30B.

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

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

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

All shear gate bolts shall be stainless steel.

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

11. Alternative shear gate designs are acceptable if material specifications are met.
NOTES
1. See Contract for size and location of all pipes and orifices.
2. Baffle wall shall have #4 Bar at 12" spacing each way.
3. Precast baffle shall be keyed and grouted in place.
4. Bottom orifice plate shall be galvanized steel with a minimum thickness of 1/4". Attach orifice with 1/2" stainless steel bolts.
5. Upper flow orifice plates and elbows shall be aluminum, aluminized steel or galvanized steel. Galvanized steel shall have Treatment 1.
1. Drain basin to be custom manufactured according to plan details. Risers are needed for basins over 84” (in) due to shipping restrictions. The maximum depth from finished grade to the lowest invert shall be 8’ (ft).

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

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

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

5. Basins shall be manufactured from PVC pipe stock meeting the requirements of ASTM D1784, cell classification 12454.

6. Ductile iron castings for PVC catch basins shall conform to the requirements of ASTM A536, grade 70-50-06, and shall meet the proof load testing requirements of AASHTO M 306.

7. Bolt-down capability is required on all frames, grates, and covers, unless specified otherwise in the Contract. Provide 2 holes in the frame that are vertically aligned with the grate or cover slot. The frame shall accept a 304 Stainless Steel (S.S.) 5/8” (in) - 11 NC x 2” (in) allen head cap screw by being tapped, or other approved mechanism. Location of bolt-down holes varies by manufacturer.
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NOTES
1. Knockouts shall have a wall thickness of 2" (in) minimum to 2.5" (in) maximum.
2. For pipe allowances, see Standard Plan B-10.20.
3. No steps are required when height is 4' (ft) or less.

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MANHOLE TYPE 3

STANDARD PLAN B-15.60-02
NOTES
1. Precast concrete cone sections may be eccentric or concentric.
2. See page port orientation varies among manufacturers.
3. When necessary, knockouts on precast cone, drywell base and riser sections shall have a wall thickness of 1 1/2" minimum and 2" maximum.

PLAN VIEW

CUTAWAY ELEVATION VIEW

INTEGRAL BASE DETAIL

DRAINAGE - SEE CONTRACT

CONE SECTION - SEE NOTE 1

UNDISTURBED SOIL

NATIVE BACKFILL

UNDERGROUND DRAINAGE CEDTEXSTLE. MODERATE DURABILITY, CLASS A

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

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

TOE OF SWALE SLOPE / BOTTOM OF SWALE

DISTANCE VARIES
SEE CONTRACT

TOE OF DRYWELL SLOPE / BOTTOM OF SWALE

TOE OF DRYWELL SLOPE / BOTTOM OF SWALE

CIRCULAR FRAME (RING) - SEE STANDARD PLAN B-30.78

CIRCULAR GRATE - SEE STANDARD PLAN B-56.80

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

ADJUSTMENT SECTION (TYP.)

6H : 1V

GROUNDFICE

6H : 1V

VARIES

VARIES

48" I.D.

GRAVEL BACKFILL

FOR DRYWELL

SEEPAGE PORT (TYP.) - SEE NOTE 2

STATE OF WASHINGTON
DEPARTMENT OF TRANSPORTATION

DRAINAGE TYPE 1
(FOR SWALE)

STANDARD PLAN B-20.20-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

SHEEET 1 OF 1 SHEET

STATE ENGINEER

Washington State Department of Transportation

3/14/12
NOTES

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

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

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

4. Bolt-down capability is required on all frames, grates and covers, unless specified in the Contract. Provide two holes in the Frame that are vertically aligned with the grate slots. The frame shall accept the 5/8" x 11 NC x 2" Allen head cap screw by being tapped, or other approved mechanism. The location of bolt-down holes varies among manufacturers. See BOLT-DOWN DETAIL, Standard Plan B-30.10.

5. Only ductile iron Vaned Grates shall be used. See Standard Plans B-30.30 and B-30.40 for grate details. Refer to Standard Specification 8-25.10(2) for additional requirements.

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

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* CORRUGATED POLYETHYLENE STORM SEWER PIPE

### NOTES

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

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

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

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

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

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

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

### RECTANGULAR ADJUSTMENT SECTION

- **One #3 bar across bottom**
- **Two #3 bar hoops for 12" (in) height**
- **One #3 bar for 6" (in) height**

### PRECAST BASE SECTION

- **#3 bar each corner**
- **#3 bar hoop top and bottom**

### ALTERNATIVE PRECAST BASE SECTION

- **#3 bar each corner 18" (in) min.**
- **#3 bar hoop**

**CONCRETE INLET**

**STANDARD PLAN B-25.60-01**

Heilman, Julie Jan 25 2017 2:58 PM assign

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**WASHINGTON STATE DEPARTMENT OF TRANSPORTATION**

**STATE DESIGN ENGINEER**
NOTES

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

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

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

RECTANGULAR FRAME (REVERSIBLE)

STANDARD PLAN B-30.10-02

ISOMETRIC VIEW
SHOWING THE VARIATIONS
NOTES

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

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

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

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

RECESSED ALLEN HEAD CAP SCREW
304 S.S. 5/8" (N) - 11 NC x 2" (IN)

RECESSED ALLEN HEAD CAP SCREW
5/8" x 2" (IN)

3/4" DIA M. HOLE
1/2" DIA M. HANDLE

ISOMETRIC
NOTES

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

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

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

RECESSED ALLEN HEAD CAP SCREW
304 S.S. 5/8\" (IN) - 11 NC x 2\" (IN)

BOLT-DOWN DETAILS
SEE NOTE 1

RECTANGULAR VANED GRATE
STANDARD PLAN B-30.30-02

ISOMETRIC

DRAWN BY: JON LIDDELL

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

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

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

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

RECTANGULAR BI-DIRECTIONAL VANED GRATE
STANDARD PLAN B-30.40-02

NOTES
NOTES

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

2. Refer to Standard Specification section 9-05.16(2) for additional requirements.

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

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

RECTANGULAR HERRINGBONE GRATE

STANDARD PLAN B-30.50-02
1. The gasket and groove may be in the seat (frame) or in the underside of the cover. The gasket may be "T" shaped in section. The groove may be cast or machined.

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

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

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

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

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

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

CIRCULAR FRAME (RING) AND COVER
STANDARD PLAN B-30.70-03

DRAWN BY: USA CROFT
4-15-12

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
STATE DESIGN ENGINEER
APPROVED FOR PUBLICATION
NOTES
1. For use with Circular Frames (rings) detailed in Standard Plan B-30.70.
2. Slotted Manhole Covers are intended for use with Drywells only. See Standard Plans B-20.20 and B-20.60.
NOTE
1. Ladder rungs for manholes and catch basins shall meet the requirements of AASHTO M 199.

DIRECT BY: FERN LIDDELL

TYPICAL ORIENTATION FOR ACCESS AND STEPS

RECTANGULAR ADJUSTMENT SECTION

- As an acceptable alternative to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used for adjustment sections.
- As an acceptable alternative to conventional steel reinforcement, manufacturers shall use Synthetic Structural Fibers meeting the requirements of Standard Specification Section 9-05.50(10).

MISSANCE DETAILS
FOR DRAINAGE STRUCTURES
STANDARD PLAN B-30.90-02

CIRCULAR ADJUSTMENT SECTION

For rectangular and circular adjustment sections, approved alternate material compositions are acceptable in lieu of precast concrete designs.
1. The Contract may specify a rotated inlet installation. Orient the grates in the frame so they intercept flow.

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

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

4. Frame and Grates shall be Ductile Iron.
SECTION ON DITCH LINE
DIKE INSTALLATION FOR PREFERRED SLOPE

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

DROP INLET TYPE 1
STANDARD PLAN B-45.20-01

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
APPROVED FOR PUBLICATION
C 2017 3/25

JULIE HEILMANN
STAFF DESIGN ENGINEER

SECTION ON DITCH LINE
DIKE INSTALLATION FOR PREFERRED SLOPE

SECTION A

PLAN

SECTION B

GRATE SUPPORT DETAIL
(FOUR SUPPORTS REQUIRED)

ISOMETRIC
(SHOWN WITH TYPE 1 GRATE)
NOTES

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

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

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

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

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

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

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

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

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

**DROP INLET TYPE 2**

**STANDARD PLAN B-45.40-01**

**HELMAN, JULIE**

Jul 13 2017 7:18 AM

**WASHINGTON STATE**

**DEPARTMENT OF TRANSPORTATION**
GRATES FOR DROP INLET

TYPE 1
3 1/2" x 3 1/2" x 33 1/4" STRUCTURAL TUBING (TYP.)
GRIND TOP AND BOTTOM FLUSH AFTER WELDING

SECTION A

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

SECTION B

OPTIONAL 1" MAX. VENT HOLES ON BOTTOM FOR GALVANIZING

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

SECTION C

FIVE SPACES

3 1/2"
3 1/2"

34 1/2"
34 1/2"
NOTES
1. See Standard Specifications Section 7-06.3(3) for Pipe Zone Backfill.
2. See Standard Specifications Section 9-03.12(3) for Gravel Backfill for Pipe Zone Bedding.
4. For sanitary sewer installation, concrete pipe shall be bedded to spring line.
NOTES

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

2. Steel Welded Wire Fabric shall be in accordance with Standard Specification 9-07.7. 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)

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

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

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

CONCRETE COLLAR OPTION

COUPLING BAND OPTION
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**NOTES**

1. The diameter of the end section of Design B shall match the inside diameter of the concrete pipe.
2. Skirt sections shall be made in one piece for round pipe with a diameter of 12" (in) to 24" (in) inclusive and for pipe arches with a rise of 13" (in) to 20" (in) inclusive. Skirt sections for larger sizes of pipes may be multiple pieces in conformity with the tabulated values shown.
3. Design A and sections for 42" (in) thru 84" (in) diameter and 49" (in) thru 63" (in) arch with annular corrugations and all helically corrugated pipe sections include one foot of pipe length as a connector section. The connector section shall be attached to the end section by welds, rivets or bolts and shall be the same thickness as the end section.
4. Design C may be used in lieu of Design A for all metal pipe sizes except as noted. Coupling bands may be any acceptable type for the pipe specified.
5. Multiple panel skirts shall have 2" (in) lap seams tightly joined by 3/8" (in) stainless steel rivets or galvanized bolts on 6" (in) max. centers.
6. The reinforced edges of the following size End Sections shall be supplemented with galvanized steel stiffener angles:
   - 60" (in) thru 72" (in) diameter pipe
   - 76" (in) and 84" (in) diameter pipe, and
   - 77" (in) thru 84" (in) diam. pipe

   Above galvanized angles shall be attached by 3/8" (in) galvanized nuts and bolts.
7. Galvanized steel angle reinforcement shall be placed under the center panel seams on the 72" (in) thru 84" (in) diam. pipe and 77" (in) thru 84" (in) diam. pipe arch End Sections. These angles shall be attached with a 1/2" (in) wide strap, 16 gauge galvanized steel fastened with a 1/2" (in) diam., 6" (in) long galvanized bolt and one squarehead nut.
8. As an alternative to the connector lug and threaded rod used on 12" (in) thru 24" (in) culvert pipe, the attachment may be made with a 1" (in) wide strap, 16 gauge galvanized steel fastened with a 1/2" (in) diam., 6" (in) long galvanized bolt and one squarehead nut.

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**FLARED END SECTIONS**

**STANDARD PLAN B-70.60-01**

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**PIPE & PIPE ARCH - PLAN**

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**PIPE - ELEVATION**

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**SECTION A**
FLARED END SECTIONS

**DESIGN A**
- **TYPE 1** CONNECTION TO METAL PIPE
- **TYPE 2** CONNECTION TO METAL OR CONCRETE HDPE PIPE
- **TYPE 3** CONNECTION TO METAL PIPE

**DESIGN B**
- CONNECTION TO CONCRETE OR HDPE PIPE
- **INLET END ONLY**

**DESIGN C**
- CONNECTION TO METAL OR CONCRETE PIPE
- **OUTLET ONLY**

**SMOOTH TAPERED SLEEVE DETAIL**
- FOR USE WITH CONCRETE OR HDPE PIPE

**NOTES:**
- PIPE PAYMENT TO THIS POINT
- CONNECTOR LUG (SEE NOTES)
- THREADED ROD
- END SECTION
- PIPE
- PIPE PAYMENT TO THIS POINT
- MASTIC WHERE REQUIRED
- ALTERNATE VIEW FOR FEMALE END
- PIVOT BOLT
- EXPANDER LUG
- CONCRETE PIPE
- SMOOTH GALVANIZED STEEL, ALUMINUM, OR ALUMINIZED STEEL PIPE
- LESS THAN 33" DIA. = 7"
- 33" DIA. AND OVER = 13"
- PIPE COUPLING BAND, SHOP BOLTED TO FLARED END SECTION WITH 3/8" (IN) BOLTS AT 6" (IN) ON CENTER MAXIMUM OR EQUIVALENT RIVETED OR WELDED CONNECTION. FOR USE WITH ALL SIZES OF PIPE AND PIPE ARCH WITH ANNULAR ENDS
- FORM 1/2" (IN) X 2 2/3" (IN) CORRUGATIONS - MAINTAIN INSIDE DIAMETER OF SLEEVE FINISHED END TO BE SAME DIAMETER AS CORRUGATED STEEL PIPE DIAMETER.
1. The variable dimension indicated for the height of step for step mitered pipes shall conform to the manufacturers recommendations unless specified differently on the plans or in the Special Provisions.
2. Reinforcing steel shall have 1 1/2" min. clear cover to all concrete surfaces.
3. Headwalls for concrete culvert pipe may omit anchor bolt attachment.
4. When steel pipe safety bars are used, headwall thickness shall be increased to 6".

**Structural Plate Pipe Arches and Underpasses**

**Step Mitered Pipe**

**Pipes and Structural Plate Pipes**

**Headwalls for Culvert Pipe and Underpass**

**Standard Plan B-75.20-01**

*Approved for publication*

Washington State Department of Transportation
NOTES

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

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

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

1. Type 10 post shall be 6 x 8 timber, OR either W6 x 9, or W6 x 8.5 steel.
   Type 11 post shall be 10 x 10 timber or W6 x 10.
   For additional details see Standard Plan C-1b.

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

3. Spacing may vary depending on application. See Standard Specification Section 9-16.3(1) for rail element requirements.
NOTES
1. Wood posts for all guardrail placement plans shall be 6 x 6 except where noted otherwise.
2. Lower hole is for Rub Rail of Type 2 and Type 3 Beam Guardrail.
3. W6 x 8.5 or W6 x 9 steel posts and timber blocks are alternates for 6 x 8 timber posts and blocks. W6 x 15 steel posts and timber blocks are alternates for 10 x 10 timber posts and blocks.
4. Holes shall be located on approaching traffic side of web.
5. When "Beam Guardrail Type ___ Ft Long Post" is specified in the Contract, the post length shall be stamped with numbers, 1 1/2" in min. high and 3/4" in wide at the location where the letter "H" is shown in the ASSEMBLY DETAIL. For wood post applications, the letter shall be stamped to a minimum depth of 1/4". For steel post applications, the letter shall be legible after the post is galvanized. After post installation, it shall be the Contractor's responsibility to ensure the stamped numbers remain visible.
6. Soil plate may be welded to foundation tube. If so, holes in soil plate and foundation tube may be omitted.
NOTES
1. For wood posts, saw top of post and block to 1" above thrie beam guardrail reducer section. For steel posts, drive post down to 1" maximum above the thrie beam guardrail reducer section.
1. End Section Design G shall be used except where noted on the plans or contract.
2. Attach guardrail to bridge rail or concrete barrier with 7/8" diameter bolts (five minimum) Standard Spec. S-065.6(4), with thin slab female inserts or resin bonded anchors. See the Contract Plans.
3. A single piece having similar dimensional shape to Design G and mating with the W-beam guardrail is an alternate.
4. In cases where Design F end section is taped on the outside of the guardrail, a galvanized 1" ID, 2" OD, 0.134" thick, narrow Type A Plain Washer or a anchor rail washer shall be placed under the splice bolt heads.
NOTES

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

2. In cases where Design F End Section is lapped on the outside of the guardrail, a galvanized 1" ID, 2" OD, 0.134" thick, narrow Type A Plain Washer or an anchor rail washer will be placed under the splice bolt heads.
1. When required by the Contract, a Snow Load Post Washer shall be used on the backside of the post (in lieu of the 1 3/4" (in) Post Bolt Washer) and a Snow Load Rail Washer shall be placed on the face side of Beam Guardrail Types 1 and 2. Snow Load Rail Washers shall not be installed on terminals.

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

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

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

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

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

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

1. For component details, see Standard Plan C-23.60.

2. For terminal type and details, see Contract Plans and applicable drawings.

3. The slope from the edge of the shoulder into the face of the guardrail cannot exceed 10H : 1V when the face of the guardrail is less than 12" - 0" from the edge of the shoulder.

4. For one-way traffic and where a crashworthy terminal is not required, use the Beam Guardrail Anchor Type 10; see Standard Plan C-23.60.

5. Where a crashworthy terminal is required, use a Beam Guardrail Type 31 Non-Flared Terminal; see Standard Plan C-22.40.

6. Timber or steel post. Steel post shown.
NOTES
1. For details, see Standard Plan C-22.40.
2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10H : 1V when the guardrail is within 12' - 0" from the edge of the shoulder.
3. See Contract for Beam Guardrail Transition Section type and Connection to Bridge Traffic Barrier or Concrete Barrier. See Standard Plan C-24.10 for connection details.
4. Timber or steel post. Steel post shown.
NOTES
1. The slope from the edge of the shoulder into the face of the guardrail should not exceed 10H:1V when the guardrail is within 12'-0" from the edge of the shoulder.
2. For details, see Standard Plan C-23.60.
3. For details, see Standard Plan C-22.40.
4. Timber or steel post. Steel post shown.

CASE 10A-31
(TRAILING END)

CASE 10B-31
(TRAILING END)

CASE 10C-31
(TRAILING END)
NOTES

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

2. Attach the standard wood block to the rail using two 5/8" (in) x 4" (in) lag bolts.

3. Beam Guardrail Anchor Type 10 (W-Beam) or Type 10 (Thin Beam) required. For details, see Standard Plan C-23.69.


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

6. Timber or steel post. Steel post shown.
NOTES

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

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

1. See Contract for transition and connection type.

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


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

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

6. The guardrail Identification Plate shall be mounted at the lower splice bolt on the back side of the rail element at the PC of the guardrail radius.
1. Beam Guardrail post spacing shall be 6'-0" on centers.

2. Use a single or combination of blocks to achieve the actual 12" offset. See Standard Specification 5-16.3(2). Wood blocks shall be toe-nailed to post (and blocks, if block combinations are used) with 16d galvanized nails to prevent block rotation.

3. Attach blockouts to steel posts using bolt holes on approaching traffic side of post web.

4. For details not shown, see Standard Plan C-20.10.

5. Wood blocks shown. Blocks of alternate material may be used. See Standard Specification 5-16.3(2).

NOTES
NOTES

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

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

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

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

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

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

For the SOFTSTOP (TL-3) a maximum taper of 25.4 : 1 or flatter is allowed over the system length of 50' - 9 1/2' with a maximum offset of 24" (in) at the anchor post.

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

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

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

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

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

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

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

For the SOFTSTOP (TL-2) a maximum flare of 38.23 : 1 or flatter is allowed over the system length of 36' - 3 1/2" with a maximum offset of 1/2" (in) at the anchor post.

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

8. These terminals are supplied with steel posts only. They can be used with guardrail runs composed of steel or wood guardrail posts.
NOTES

1. For use on the end of guardrail runs when a crashworthy terminal is not required.
2. For additional details not shown, see Sheet 2 of this Plan.
3. For end section details, see Standard Plane C-7 and C-7a.
4. Use details for Wood Breakaway post shown on this plan and components shown on Standard Plan C-15.
5. Fasten the Anchor Cable using two 1" (in) nuts and washer, at both ends of cable. Outside nut shall be torqued against inside nut a minimum of 100 ft-lbs.
6. Wood blocks shown. Blocks of alternate material may be used. See Standard Specification, Section 5-16.3(2).
7. Posts shall match those of the connecting run: timber or steel.
8. Anchor plate may be constructed from 1/4" (in) plates welded to equal strength and dimensions as shown.
9. Eight 5/8" (in) x 1 1/2" (in) machine bolts with hex nut and washer. Place washer on face side of rail.
NOTES

1. Attach guardrail to bridge rail or concrete barrier with 7/8" (in) diameter bolts in accordance with Standard Spec., 9-08.06(4), with thin slab ferrule inserts or resin-bonded anchors. See Contract Plans.

2. If the last guardrail post is 3' (in) or less from the end of the bridge barrier, this attachment and blockout is not necessary.

3. This case is also applicable for F-shape and vertical faces with no curbs.

4. When B connection is used with Type 1A Transition, the maximum spacing between bolts is 6'-3".

5. See Bridge Plans for additional connection details.

6. Wood blocks shown. Blocks of alternate material may be used. See Standard Specification 5-16.3 (2).

7. Steel posts shown. Timber posts may be used.

GUARDRAIL CONNECTION TO BRIDGE RAIL OR CONCRETE BARRIER

PLAN A CONNECTION

PLAN B CONNECTION

PLAN C CONNECTION

PLAN D CONNECTION

PLAN E CONNECTION

PLAN F CONNECTION
NOTES

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

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

3. For details of typical components, see Standard Plans C-10 and C-20.10.
NOTES
1. See Standard Plans C-1b, C-1d, C-20.10, and C-25.20 for rail elements and thrie beam block details.

2. When a transition is required on the trailing end of the bridge, use a mirror image of this plan.
NOTES
2. When a transition is required on the trailing end of the bridge, use a mirror image of this plan.
3. For additional alternatives not shown, see Contract Plans.
NOTES

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

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

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

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

5. All posts for any standard barrier run shall be of the same type: timber or steel.
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1. When required by the Contract, a Snow Load Post Washer shall be used on the backside of the post (in lieu of the 1 3/4" (in) Post Bolt Washer) and a Snow Load Rail Washer shall be placed on the face side of Beam Guardrail Types 1 and 2. Snow Load Rail Washers shall not be installed on terminals.

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

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

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

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

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

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

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

NOTES
NOTES
1. For post details see Standard Plan C-1b.

DETAIL A
5/16" (IN) DIAM. x 1 1/2" (IN) HEX HEAD BOLT WITH HEX NUT AND 1 3/4" (IN) SQUARE x .135" (IN) WASHER

DETAIL B
1/2" (IN) DIAM. x 1 1/2" (IN) HEX HEAD BOLT WITH HEX NUT GUARDRAIL RESTS ON TOP OF BOLT
NOTES

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

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

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

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

GUARDRAIL PLACEMENT

STANDARD PLAN C-2
CASE 4

CASE 5

NOTE 5

1. For terminal type and details, see Contract and applicable Standard Plan(s).
2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10H:1V when the guardrail is within 12' - 0" from the edge of the shoulder.
3. See Contract for Beam Guardrail Transition Section type and Connection to Bridge Traffic Barrier or Concrete Barrier.

FLARE RATE TABLE

<table>
<thead>
<tr>
<th>POSTED-SPEED (MPH)</th>
<th>RATE</th>
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<tbody>
<tr>
<td>70</td>
<td>15 : 1</td>
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<tr>
<td>60</td>
<td>14 : 1</td>
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<td>55</td>
<td>12 : 1</td>
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<td>50</td>
<td>11 : 1</td>
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<td>45</td>
<td>10 : 1</td>
</tr>
<tr>
<td>40 OR LESS</td>
<td>9 : 1</td>
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CASE 6
FLARE RATE TABLE

<table>
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<tr>
<th>POSTED SPEED (MPH)</th>
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<td>11 : 1</td>
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<tr>
<td>45</td>
<td>10 : 1</td>
</tr>
<tr>
<td>40 OR LESS</td>
<td>9 : 1</td>
</tr>
</tbody>
</table>

NOTES

1. Varying flare rates and structure widths may require a length of Beam Guardrail Type 1 or 2 between the Beam Guardrail Type 3 or 4 and the Transition on one side, and the Beam Guardrail Type 10 on the other. For Beam Guardrail Type 2 or 3, terminate the rub rail (channel rail) at the first 6'-8" post of the Beam Guardrail Transition Section Type 16, and by stopping it behind the second 8'-6" post on the Beam Guardrail Type 10 side, or as approved by the Engineer.

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

3. The Beam Guardrail Transition Section Type 16 on this end shall terminate at a 10'x10 post. Place nested thrie beam with 10'x10 posts at 3' - 1 1/2" maximum spacing between the end of the transition and the structure.

4. If full post depth cannot be achieved due to the structure foundation, post length shall be adjusted to the top of foundation. The Beam Guardrail Type 11 post height shall be 2' - 6".

GUARDRAIL PLACEMENT

STANDARD PLAN C-2b

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

June 15, 2005

Washington State Department of Transportation

DRAWN BY: ELISA BIRKINSELL

EXPRES JULY 24, 2005

06/21/2006
NOTE
1. CASE 9C: Thrie Beam Guardrail is used when the distance from the end of the Bullnose Terminal to the beginning of the transition of the Bridge Rail is less than 100 feet.
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 10H:1V when the guardrail is within 12' - 0" from the edge of the shoulder.

GUARDRAIL PLACEMENT

STANDARD PLAN C-2d

EXPIRES JULY 24, 2006
CASE 11A

NOTES
1. SRT Terminal shown. For terminal type and details see Contract and applicable Standard Plan(s).
2. Beam Guardrail Anchor Type 4 (W-Beam) or Type 4 (Thrie Beam) required.
3. The slope from the edge of the shoulder into the face of the guardrail should not exceed 10°:1V when the guardrail is within 12'-0" from the edge of the shoulder.
4. If the distance from end of Beam Guardrail Type 11 to the structure exceeds 6'-3" using 12'-6" thrie beam sections, add a 6'-3" nested section of thrie beam with 10x10 posts, spaced at 3'-1 1/2" maximum, and begin transition.
5. Guardrail post spacing for Beam Guardrail Type 11 past the end of the structure shall be spaced at 6'-3" maximum with 6x8 post and standard block.
6. Attach the standard wood block to the rail using two 5/8" x 4" lag bolts.

CASE 11B

CASE 11C
CASE 12 _D
(see Note 7)

CASE 12 _C
(see Note 7)

CASE 12 _A_
(see Note 8)

SECTION A-A

IDENTIFICATION PLATE
MOUNTING DETAIL
(see Note 6)

CASE 12 _B_
(see Note 7)

GUARDRAIL PLACEMENT
WEAK POST INTERSECTION DESIGN (8' - 6" MAX RADIUS)

STANDARD PLAN C-2f
APPROVED FOR PUBLICATION
STATE DESIGN ENGINEER
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
OLYMPIA, WASHINGTON
REQUIREMENTS

<table>
<thead>
<tr>
<th>RADIUS</th>
<th>NUMBER OF CRT POSTS (SEE NOTE 3)</th>
<th>CLEAR AREA</th>
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</thead>
<tbody>
<tr>
<td>1'7'-0&quot;</td>
<td>6</td>
<td>30'</td>
</tr>
<tr>
<td>25'-6&quot;</td>
<td>8</td>
<td>40'</td>
</tr>
<tr>
<td>35'-0&quot;</td>
<td>11</td>
<td>50'</td>
</tr>
</tbody>
</table>

NOTE 2

CASE 13 D

SEE NOTE 7

CASE 13 C

SEE NOTE 7

CASE 13 A

SEE NOTE 7

CASE 13 B

SEE NOTE 7

NOTES

1. See Contract Plans for guardrail connection to bridge rail and concrete barrier.
2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 1:1.
3. Fewer CRT posts are required for smaller radius; include CRT Post at Point B. Attach guardrail to post with a 5/16" x 9" long bolt, a 3/8" I.D. x 7 1/2" snug fitting insert, and a 1 1/2" washer with nut on back of post.
4. For terminal type and details, see Contract and applicable Standard Plan(s).
5. Radius dimensions shall be etched into plate replacing the letters "HV", shown on the GUARDRAIL RADIUS IDENTIFICATION PLATE DETAIL. Digits shall be 1 1/2" minimum height and 3/4" maximum width. Plate shall be galvanized after etching.
6. The guardrail radius Identification Plate shall be mounted on the back side of the rail element using the lowest splice bolt nearest the PC of the guardrail radius (See View A).
7. The first letter of the Case Designation indicates the end treatment on the side road. The second letter indicates the end treatment on the main road. For example, a Type 5 Anchor on the side road with a bridge connection on the main road would be Case 13 AC, the combination shown.
8. For CRT post details, see Standard Plan C-1b.
NOTES
1. For Service Level 1, Weak Post Bridge Rail System, see Contract.
2. SRT Terminal shown. For Terminal type and details, see Contract and applicable Standard Plan(s).
3. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1.
4. See Standard Plan "Beam Guardrail Posts and Blocks".

CASE 14
NOTES
1. SRT Terminal shown. For Terminal type and details, see Contract and applicable Standard Plans.
2. The slope from the edge of the shoulder into the face of the guardrail should not be steeper
   than 10:1.

CASE 15

GUARDRAIL PLACEMENT

STANDARD PLAN C-21

APPROVED FOR PUBLICATION
STATE DESIGN ENGINEER
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
OLYMPIA, WASHINGTON
NOTES

1. Type 4 anchor required. For details, see applicable Standard Plans.

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

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

4. For guardrail to bridge rail connection see applicable Standard Plans or Contract.

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

---

**FLARE RATE TABLE**

<table>
<thead>
<tr>
<th>Rate</th>
<th>Posted Speed (MPH)</th>
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</tr>
<tr>
<td>9x1</td>
<td>40 or less</td>
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</tbody>
</table>

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GUARDRAIL PLACEMENT

STANDARD PLAN C-2j

APPROVED FOR PUBLICATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

Olympia, Washington

5/98 Revise Flare Rate Table

6/98 Date

Revision

5-7
**BEAM GUARDRAIL PAY LIMIT**

25 NESTED W-BEAM

GROUND LINE

ELEVATION

CASE 19 A
SPLICE IN CENTER

**BEAM GUARDRAIL PAY LIMIT**

37'-6" NESTED W-BEAM

GROUND LINE

ELEVATION

CASE 19 B
SPLICE AT POSTS

SINGLE W-BEAM RAIL ELEMENT

NESTED W-BEAM RAIL ELEMENTS

SECTION A

SECTION B

GUARDRAIL PLACEMENT
12'-6" SPAN

STANDARD PLAN C-2k

Sheet 1 of 1 Sheet

APPROVED FOR PUBLICATION
Carpenter, S.J.
14/12/2019 11:33 AM

Washington State Department of Transportation
ELEVATION

CASE 20

SINGLE W-BEAM RAIL ELEMENT

NESTED W-BEAM RAIL ELEMENTS

SECTION A

SECTION B

BEAM GUARDRAIL PAY LIMIT

37'-6" NESTED W-BEAM

6'-3" (TYP.)

18'-9"

6'-3" (TYP.)

2'-6"

GROUND LINE

GUARDRAIL PLACEMENT

18'-9" SPAN

STANDARD PLAN C-2n

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Washington State Department of Transportation
1. See Standard Plan C-1b for additional details.

2. One-way traffic layouts are identical to the two-way layout with the exception that only the posts trailing the span need to be CRT's with double blocks.
NOTES

1. See Contract for transition and connection type.

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

3. Guardrail installation shall be Beam Guardrail Type 1 with standard post and block.

4. First letter of case designation indicates end treatment on side road. Second letter indicates end treatment on main road. For instance a terminal on the side road and a bridge connection on the main road would be Case 22 BC.

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

6. Radius dimensions shall be etched into plate replacing the letters "HH" shown on the Identification Plate Detail. Digits shall be 1/2" MIN height and 1/4" MAX width. Plate shall be galvanized after etching.

7. The guardrail Identification Plate shall be mounted at the lower splice bolt on the back side of the rail element at the PC of the guardrail radius.
NOTE
1. Install Extruded Curb at face of Guardrail. See Standard Plan F-10.40 for details.

BEAM GUARDRAIL TRANSITION SECTION TYPE 1 - PAY LIMIT

SEE CONTRACT PLANS FOR SPECIFIED CONNECTION

FIVE SPACES @ 3'-1 1/2" MAX.

12'-6" NESTED THRIE BEAM
(12 GAGE)

THREE BEAM GUARDRAIL REDUCER SECTION TYPE B
(10 GAGE)

GROUND LINE

6'-6" LONG

8" X 8" POST WITH STANDARD BLOCK (TYP.)

6'-6" LONG, 10 + 10 POSTS WITH 8 X 8 BLOCKS

TYPE 1

4" EXTRUDED CURB
SEE NOTE 1

BEAM GUARDRAIL TRANSITION SECTION TYPE 1A - PAY LIMIT

SEE STANDARD PLAN C-24.10, B OR E CONNECTION

FOUR SPACES @ 3'-1 1/2" MAX.

12'-6" NESTED THRIE BEAM (12 GAGE)

THREE BEAM GUARDRAIL REDUCER SECTION TYPE B
(10 GAGE)

GROUND LINE

6'-6" LONG

8" X 8" POST WITH STANDARD BLOCK (TYP.)

6'-6" LONG, 10 + 10 POSTS WITH 8 X 8 BLOCKS

TYPE 1A

4" EXTRUDED CURB
SEE NOTE 1

NOTE
1. Install Extruded Curb at face of Guardrail. See Standard Plan F-10.40 for details.

BEAM GUARDRAIL TRANSITION SECTION TYPE 1B - PAY LIMIT

SEE CONTRACT PLANS FOR SPECIFIED CONNECTION

FIVE SPACES @ 3'-1 1/2" = 15'-7 1/2"

12'-6" NESTED THRIE BEAM
(12 GAGE)

TERMINATE CURB AT BRIDGE RAIL OR BARRIER, MATCH FACE

4" EXTRUDED CURB
SEE NOTE 1

6'-6" LONG, 6 + 8 POST WITH STANDARD BLOCK (TYP.)

GROUND LINE

TYPE 1B

6'-6" LONG

8" X 8" POST WITH STANDARD BLOCK (TYP.)
BEAM GUARDRAIL TRANSITION SECTION TYPE 2 – PAY LIMIT

SEE CONTRACT PLANS FOR SPECIFIED CONNECTION

FIVE SPACES @ 3' - 1 1/2" MAX.

12' - 6" NESTED W BEAM (12 GAGE)

6' - 6" LONG, 10+10 POSTS WITH 6x8 BLOCKS

TYPE 2

BEAM GUARDRAIL TRANSITION SECTION TYPE 4 – PAY LIMIT

SEE CONTRACT PLANS FOR SPECIFIED CONNECTION

12' - 6" NESTED W BEAM (12 GAGE)

2' - 1 1/2" THREE SPACES @ 3' - 1 1/2"

6' - 6" LONG, 6x8 POST WITH STANDARD BLOCK (TYP.)

TYPE 4

FOR 45 MPH AND BELOW

BEAM GUARDRAIL TRANSITION SECTION TYPE 5 – PAY LIMIT

SEE CONTRACT PLANS FOR SPECIFIED CONNECTION

1' - 3" MAX.

FOUR SPACES @ 1' - 6 3/4", TWO SPACES @ 3' - 1 1/2"

TOTAL LENGTH = 6' - 3"

TOTAL LENGTH = 6' - 3"

TYPE 5

BEAM GUARDRAIL TRANSITION SECTION TYPE 6 – PAY LIMIT

SEE CONTRACT PLANS FOR SPECIFIED CONNECTION

6' - 6" LONG, 6x8 POST WITH STANDARD BLOCK (TYP.)

G-2 POST (TYP.) SEE STD. PLAN C-1b

6' - 3" POST SPACING

EIGHT SPACES @ 3' - 1 1/2" MAX.

TOTAL LENGTH = 25' - 0"

TYPE 6

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

2. When thrie beam is installed at the face of the bridge curb, install Extruded Curb at face of Guardrail. See Standard Plan P-10.40 for details. Match the height of existing bridge curb with a 20H : 1V transition.

3. When thrie beam is installed at the face of rigid bridge rail, an HMA ramp is required from the roadway surface to the top of the bridge curb or sidewalk. The slope of the ramp shall be 20H : 1V or flatter.
1. See Contract for the number of thrie beam sections for Beam Guardrail Type 11.

2. If the distance from the end of the Beam Guardrail Type 11 to the column/structure exceeds 6'-3" using 12'-6" thrie beam sections, add a 6'-3" nested section of thrie beam to reduce the distance to less than 6'-3".

3. Install Extruded Curb (See Standard Plan F-10.40) at face of Guardrail.

4. Attach the standard block to the rail using two 5/8" x 4" lag bolts.
NOTES

1. Unless otherwise indicated in the contract, the SRT - 350 (12.5, 8 Post) as manufactured by Trinity Industries, Inc., or a FLEAT 350 as manufactured by Road Systems Inc., shall be installed per manufacturer's recommendations. If specified in the Contract, the FLEAT TL2 as manufactured by Road Systems, Inc. shall be installed per manufacturer's recommendations.

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

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

4. Offset distances:
   - FLEAT 350 ................................................. 4' - 0"
   - FLEAT TL2 .................................................. 1' - 8" minimum
Notes

1. An SKT-350 as manufactured by Road Systems, Inc. shall be installed according to manufacturer’s recommendations. When a TL2 terminal is specified in the Contract an SKT-TL2 as manufactured by Road Systems, Inc. shall be installed according to the manufacturer’s recommendations.

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

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

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

5. Length for SKT-350 is 50’ (ft). Length for SKT-TL2 is 25’ (ft).
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NOTE

1. For W-Beam applications extend the rail from the bulrnose terminal by using a "Reducer Element Type C" followed by a standard Post and Block, spaced at 3' - 1 1/2". Continue runs with standard 6' - 3" post spacing. For additional details see Standard Plans C-20.10 and C-25.29.
SLOTTED THRIE BEAM RAIL ELEMENT #1
SEE STANDARD PLAN C-1a FOR RAIL ELEMENT DETAILS
(RAIL DIMENSIONS SHOWN ARE BEFORE BENDING TO RADIUS SHOWN IN PLAN)

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

SLOTTED THRIE BEAM RAIL ELEMENT #3
SEE STANDARD PLAN C-1a FOR RAIL ELEMENT DETAILS
NOTES
1. Anchor plate may be constructed from 1/4" (in) plates welded to equal strength and dimensions as shown.
2. For end section details see Standard Plan C-7.
3. For post details, see Standard Plan C-tb.
4. Eight 5/8" (in) x 1 1/2" (in) 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. Toesail 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.
BEAM GUARDRAIL TYPE 1

ELEVATION

ANCHOR PLATE
(SEE NOTE 1)

SECTION A

ANCHOR CABLE

3/4" (IN) CABLE
SWAGE

5/8" (IN) STEEL PLATE

1 1/16" (IN) HOLE

5/8" (IN) STEEL PLATE

1" (IN) x 7" (IN) STUD THREADED FULL LENGTH (TYP.)

3/16" (IN) x 1" (IN) x 8" (IN) PLATE TACK WELDED TO 5/8" (IN) PLATE

15/16" (IN) HOLES (EIGHT REQUIRED)

3" (IN) x 2 1/4" (IN) x 1/2" (IN) END PLATE

6" - 6"

1 1/16" 5 1/2">

1 1/2" 3/8"
NOTES

1. Rail section and W8 x 18 steel post shall be fabricated to receive 5/8" hex head bolts as shown.
2. All bolts shall be high strength 5/8" hex head bolts with anchor rail washers.
W BEAM INSTALLATION

NOTES
1. For anchor details, see Standard Plan C-6.
2. For end section details see Standard Plan C-7 or C-7a.
3. For post details, see Standard Plan C-1b.
4. Outside nut shall be torqued against inside nut a minimum of 100 ft-lbs.
5. Post and block shall match beam guardrail posts.

THREE BEAM INSTALLATION

BEAM GUARDRAIL ANCHOR TYPE 4

STATE OF WASHINGTON
PROFESSIONAL ENGINEER

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
3/4" (IN) x 9' - 0" CABLE WITH ONE SWAGED END

SEE DETAIL A

3/8" (IN) x 4" (IN) x 12" (IN)
STEEL PLATE

10" (IN) x 13" (IN) STANDARD STEEL PIPE

SEE NOTE 1

NOTES
1. Attach W-beam to steel pipe with 5/8" (IN) x 1 1/4" (IN) button head bolt with no washer. No connection to the post is required.
2. For end section details see Standard Plan C-7.
3. For anchor details see Standard Plan C-6.
4. For post details see Standard Plan C-1b.
5. Outside nut shall be torqued against inside nut a minimum of 100 ft/ls.

DETAIL A

TACK VELD 2 1/2" (IN) x 2 1/2" (IN) x 1/4" (IN) STEEL PLATE WITH 1 1/16" (IN) HOLE TO TUBULAR STEEL

1" (IN) NUT

1" (IN) x 4" (IN) STUD THREADED FULL LENGTH

BEAM GUARDRAIL
TYPE 5
STANDARD PLAN C-6d

BEAM GUARDRAIL
PAY LIMIT

ANCHOR PAY LIMIT

6' - 3''

12''

16''

18''

ANCHOR PLATE
(SEEN NOTE 3)

BEARING PLATE
(SEEN NOTE 3)

STANDARD 3" (IN) I.D. PIPE SLEEVE
(2 3/8" (IN) O.D.)

TS

2 1/2" (IN) x 2 1/2" (IN) x 1/4" (IN) x 8" (IN)

3/4" (IN) CABLE CLIPS
(6 REQUIRED) TORQUE NUTS TO 50 FT/LS.

1/4"

1/4"

2"

2 1/2" (IN) x 2 1/2" (IN) x 1 1/4" (IN) x 8" (IN)

ANCHOR POST ASSEMBLIES
(SEEN NOTE 4)

* 5/16" x 2" (IN) BUTTON HEAD BOLT OR 5/8" x 1 1/2" (IN) HEX HEAD BOLT AND HEX NUT WITH ANCHOR RAIL WASHERS UNDER BOLT HEAD AND NUT (SEEN NOTE 3)

1 1/16" (IN) HOLE TO TUBULAR STEEL

SEEN NOTE 5

1 1/16" (IN) HOLE TO TUBULAR STEEL

SEEN NOTE 5

5/16" x 2" (IN) BUTTON HEAD BOLT OR 5/8" x 1 1/2" (IN) HEX HEAD BOLT AND HEX NUT WITH ANCHOR RAIL WASHERS UNDER BOLT HEAD AND NUT (SEEN NOTE 3)
NOTES
1. For anchor details, see Standard Plan C-6.
2. The rail element is to be included in the "Beam Guardrail" pay item. The "Anchor" pay item includes the anchor post, anchor plate, anchor cable, bearing plate, nuts and washers.
3. For post details, see Standard Plan C-1b.
4. Post material shall match beam guardrail posts on rest of guardrail run.

TYPE 7 ANCHOR
NOTES

1. Length of W6 x 35, W6 x 8.5 or W6 x 9 shall be determined by measurement from ground line to top of grout pad. This distance shall be verified by the Contractor.

2. Attach Guardrail Post to Box Culvert with 3/4" (in) diameter high-strength bolts with resin-bonded anchors.

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

4. For details of post attachment to Double Box Culvert, see Standard Plan C-2L.

BOX CULVERT GUARDRAIL STEEL POST TYPE 2
(5" (in) TO 6" (in) GROUND COVER)
NOTES

1. Posts installed on shoulder slopes steeper than 10:1 shall be 6’ (ft) long.

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

3. Determine the height of the W-Beam at the Anchor (G) by first calculating the perpendicular offset distance (D) from the edge of shoulder (B) to the Anchor (on station). Multiply that distance by 0.1, then subtract the product from the elevation of the same point (B) on the edge of shoulder to obtain the offset distance (at the same station). Add Beam Guardrail design height (28” (in)) to that remainder for a sum that equals the elevation of the top of the W-Beam at the Anchor.

Refer to SECTION C:

Elevation g = (Elevation g - D x (0.1)) + 28

4. Timber or steel post. Steel post shown.

FLARE RATE TABLE

<table>
<thead>
<tr>
<th>RATE (FT)</th>
<th>POSTED SPEED (MPH)</th>
</tr>
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<tbody>
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<td>11:1</td>
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<tr>
<td>10:1</td>
<td>45</td>
</tr>
<tr>
<td>9:1</td>
<td>40 OR LESS</td>
</tr>
</tbody>
</table>
This page left blank intentionally.
NOTES

1. Wire rope loops shall be 3' - 8" long, except for the top loop of the Barrier Terminal, which shall be 2' - 0" long.

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

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

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

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

STEEL LIGHT STANDARD - SEE STD. PLAN J-28.60
GROUT - 2" (IN) MAX.
1/2" (IN) DRAIN HOLE
ANCHOR BOLT OR ROD (TYP.) - SEE DETAIL

ANCHOR PLATE - SEE DETAIL

CONSTRUCTION JOINT WITH ROUGHENED SURFACE

SECTION A

CONCRETE BARRIER LIGHT STANDARD SECTION

STANDARD PLAN C-8b

END

ISOMETRIC

Sheet 1 of 2 sheets

APPROVED FOR PUBLICATION

Washington State Department of Transportation
NOTES

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

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

3. After removing the Type 3 Anchors, clean the pin holes and fill them with sealant according to Standard Specification 9-04.2.
CONCRETE BARRIER TRANSITION
TYPE 2 TO BRIDGE F-SHAPE
STANDARD PLAN C-8f

SECTION A
(Shown at Limit of Transition)

SECTION B
(Shown at Limit of Transition)

REINFORCING STEEL BENDING DIAGRAM
1 5/8" - 10 3/4" FOR 12" - 6" LONG TRANSITION
1 2/16" - 6 1/2" FOR 12" - 6" LONG TRANSITION

NOTE
The vertical locations of the Wire Rope Loops at one end compose a set that shall not vary; however, which set is applied to an end is determined by the end to which it is being connected. A set with loops 1" - 5" apart connects to a set with loops 1" - 6" apart. See Standard Plan C-8, BARRIER CONNECTION DETAIL.
NOTES
1. PERMANENT INSTALLATION requirements: Embed barrier 3" (in) minimum; install 3/8" (in) Premolded Joint Filler between segments; fill the Connection Blockout with grout, centering the Rebar Grid in the blockout before adding grout.
2. TEMPORARY INSTALLATION requirement: Place a Rebar Grid in the Connection Blockout between barrier segments.
3. Installation on a horizontal curve with a radius less than 2,000' (ft) requires a modified end design.
4. For Barrier with a 2'-10" reveal, see Sheet 2. For High-Performance Barrier with a 3'-6" reveal, see Sheet 3.

NOTE:
STEEL WELDED WIRE REINFORCEMENT DEFORMED FOR CONCRETE MAY BE SUBSTITUTED FOR REINFORCING STEEL IN ACCORDANCE WITH STANDARD SPECIFICATION 6-10.3

REINFORCING STEEL BENDING DIAGRAM
SEE STD. SPEC. 6-47.1(a) FOR BENDING DIAMETERS

DIMENSION TABLE

<table>
<thead>
<tr>
<th>BARRIER HEIGHT</th>
<th>A</th>
<th>B</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>HORIZONTAL BARS (QTY.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'-0&quot;</td>
<td>6&quot;</td>
<td>2'-6&quot;</td>
<td>3&quot;</td>
<td>2'-6&quot;</td>
<td>2'-10&quot;</td>
<td>1'-7&quot;</td>
<td>8</td>
</tr>
<tr>
<td>4'-0&quot;</td>
<td>9 1/8&quot;</td>
<td>2'-2 1/8&quot;</td>
<td>4&quot;</td>
<td>3'-2&quot;</td>
<td>3'-4&quot;</td>
<td>1'-6&quot;</td>
<td>10</td>
</tr>
<tr>
<td>4'-6&quot;</td>
<td>10 1/4&quot;</td>
<td>2'-4 1/2&quot;</td>
<td>5&quot;</td>
<td>3'-8&quot;</td>
<td>3'-10&quot;</td>
<td>1'-11&quot;</td>
<td>12</td>
</tr>
</tbody>
</table>

PREPARED GRADED BASE
HYPOTHETICAL GRADE DIFFERENTIAL

BARRIER TRANSITION DETAIL
SECTION A
4'-0" BARRIER SHOWN LEVEL

SECTION B
4'-0" BARRIER FOR USE WITH A 0" (IN) TO 3" (IN) MAX. GRADE SEPARATION

SECTION C
4'-0" BARRIER FOR USE WITH A GREATER THAN 3" (IN) TO 6" (IN) MAX. GRADE SEPARATION

HIGH-PERFORMANCE BARRIER
NOTES

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

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

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

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

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

REINFORCING STEEL BENDING DIAGRAM

VARIIES: 5" to 1" - 5"

135° HOOK (TYP.)

VARIIES: 1" - 7 1/2"

15" HOOK (TYP.)

DIMENSION TABLE

(SEE NOTE 5)

<table>
<thead>
<tr>
<th>BARRIER</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>HORIZONTAL BARS (QTY.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEIGHT</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STD</td>
<td>3&quot; - 6&quot;</td>
<td>6&quot;</td>
<td>2&quot; - 6&quot;</td>
<td>3&quot; - 6&quot;</td>
<td>3&quot; - 6&quot;</td>
<td>2&quot; - 9&quot;</td>
<td>8</td>
</tr>
<tr>
<td>HP</td>
<td>4&quot; - 6&quot;</td>
<td>9 1/8&quot;</td>
<td>2&quot; - 2 1/4&quot;</td>
<td>3&quot; - 2 1/4&quot;</td>
<td>4</td>
<td>3&quot; - 2&quot;</td>
<td>3&quot; - 3&quot;</td>
</tr>
</tbody>
</table>
NOTES

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

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

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

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

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

REINFORCING STEEL BENDING DIAGRAM

SEE STD. SPECS. 8-07.10
FOR BENDING DIAMETERS

DIMENSION TABLE

(SEE NOTE 9)

<table>
<thead>
<tr>
<th>BARRIER HEIGHT</th>
<th>A</th>
<th>B</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J</th>
<th>HORIZONTAL BARS (QTY.)</th>
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</thead>
<tbody>
<tr>
<td>STD.</td>
<td>3&quot;</td>
<td>6&quot;</td>
<td>1&quot;-6&quot;</td>
<td>3</td>
<td>3-0&quot;</td>
<td>2-6 10&quot;</td>
<td>2-8&quot;</td>
<td>2&quot;-9 1/2&quot;</td>
<td>1&quot;-2&quot;</td>
</tr>
<tr>
<td>HIP</td>
<td>4&quot;</td>
<td>0&quot;</td>
<td>9 1/8&quot;</td>
<td>7-1 1/8&quot;</td>
<td>4</td>
<td>3-6&quot;</td>
<td>3-2 1/2&quot;</td>
<td>3-2&quot;</td>
<td>3-3 1/2&quot;</td>
</tr>
</tbody>
</table>

NOTE:
STEEL WELDED WIRE REINFORCEMENT DEFORMED FOR CONCRETE
MAY BE SUBSTITUTED FOR REINFORCING STEEL IN ACCORDANCE
WITH STANDARD SPECIFICATION 6-10.3
NOTES

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

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

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

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

5. When High-Performance Concrete Barrier is specified in the Contract, use the dimensions given in the H/P row in the DIMENSION TABLE, with a minimum height above roadway of 3" - 5" and a minimum embedment of 3" (in).
1. Reinforcing steel dimensions and clearances are shown for stationary form construction. When slipform construction is used, increase reinforcing steel clearances to the outside surfaces of the barrier to 2 1/2" (in) and adjust the rebar dimensions as required.

2. When connecting between cast-in-place and precast single-slope barrier, provide a Blockout, Rebar Grid, and added rebar, as shown in Standard Plan C-70.10.

3. The actual dimensions will vary as the grades change and the barrier transitions in height and width. The dimensions may be interpolated for intermediate barrier heights.

4. For barrier with a 2'-10" reveal, see Sheet 2. For High-Performance Barrier with a 3'-0" reveal, see Sheet 3.

TYPICAL SECTION

DUMMY JOINT DETAIL

NOTE:
STEEL WELDED WIRE REINFORCEMENT DEFORMED FOR CONCRETE MAY BE SUBSTITUTED FOR REINFORCING STEEL IN ACCORDANCE WITH STANDARD SPECIFICATION §18.3

REINFORCING STEEL BENDING DIAGRAM

DIMENSION TABLE (SEE NOTE 3)

<table>
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<tr>
<th>BARRIER HEIGHT</th>
<th>A</th>
<th>B</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>HORIZONTAL BARS (QTY.)</th>
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</thead>
<tbody>
<tr>
<td>3'-0&quot;</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1'-8&quot;</td>
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<td>4'-0&quot;</td>
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<td>3</td>
<td>1'-10&quot;</td>
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<td>10</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2'-0&quot;</td>
</tr>
</tbody>
</table>

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EXPANSION JOINT DETAIL

ISOMETRIC VIEW

PREPARED GRADED BASE
HYPOTHETICAL GRADE SEPARATION
BARRIER TRANSITION DETAIL

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

NOTE: STEEL WELDED WIRE REINFORCEMENT DEFORMED FOR CONCRETE MAY BE SUBSTITUTED FOR REINFORCING STEEL IN ACCORDANCE WITH STANDARD SPECIFICATION 6-10.3

REINFORCING STEEL BENDING DIAGRAM
SEE STD. SPEC. 9-07.142 FOR BENDING DIAMETERS

DIMENSION TABLE (SEE NOTE 3)

<table>
<thead>
<tr>
<th>BARRIER HEIGHT</th>
<th>A</th>
<th>B</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>HORIZONTAL BARS (COUNT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STD.</td>
<td>3'-6&quot;</td>
<td>8&quot;</td>
<td>2'-0&quot;</td>
<td>3&quot;</td>
<td>1'-0&quot;</td>
<td>8</td>
</tr>
<tr>
<td>H/P</td>
<td>6'-0&quot;</td>
<td>9 1/8&quot;</td>
<td>2'-2 1/8&quot;</td>
<td>4&quot;</td>
<td>3'-0&quot;</td>
<td>1'-10&quot;</td>
</tr>
</tbody>
</table>
1. The Vertical Back barrier is used only in the configurations shown in Standard Plans C-85.10 and C-85.11, and when placed against a retaining wall.

2. See Standard Plan C-85.10, Sheet 1, for EXPANSION JOINT and DUMMY JOINT details. Modify rebar as shown in EXPANSION JOINT MODIFICATION.

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

4. When High-Performance Concrete Barrier is specified in the Contract, use the dimensions given in the H/P row in the DIMENSION TABLE, with a minimum height above roadway of 3' - 6" and a minimum embedment of 3' (in).
This plan is for transitions to Precast Concrete Barrier Type 2 only. See contract for transitions to other barrier shapes and bridge rails.
NOTES

1. Use the barrier type, precast or cast-in-place, as specified in the Contract.

2. For Single-Slope Concrete Barrier details, see Standard Plan series C-79's (precast) or C-80's (cast-in-place).
NOTES
1. Use the barrier type, precast or cast-in-place, as specified in the Contract.
2. For Single-Slope Concrete Barrier details, see Standard Plan series C-70's (precast) or C-80's (cast-in-place).
NOTES

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

2. See the Contract Plans for conduit placement.

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

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

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

6. Concrete shall be Class 4000.

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

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

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

4. See the Contract Plans for conduit placement.

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

6. This plan shall be used for 40° (ft) and 50° (ft) Light Standards with 16" (ft) max. length double mast arms.

7. Concrete shall be Class 4000.

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

---

**Bar List**

<table>
<thead>
<tr>
<th>MARK NO.</th>
<th>LOCATION</th>
<th>SIZE</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BARRIER - TOP VERTICAL</td>
<td>#4</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>BARRIER - BOTTOM VERTICAL</td>
<td>#4</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>FIN. &amp; BARRIER - VERTICAL</td>
<td>#4</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>BARRIER - HORIZONTAL</td>
<td>#5</td>
<td>'C'</td>
</tr>
<tr>
<td>5</td>
<td>FOUNDATION</td>
<td>#5</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>FOUNDATION</td>
<td>#5</td>
<td>32</td>
</tr>
</tbody>
</table>

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**Table**

<table>
<thead>
<tr>
<th>GRADE SEPARATION</th>
<th>BARRIER HEIGHT</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 TO 3'</td>
<td>4&quot; - 0&quot;</td>
<td>10 1/8&quot;</td>
<td>2 - 2 1/4&quot;</td>
<td>3 - 6 1/4&quot;</td>
<td>Varies 6&quot; to 9&quot;</td>
</tr>
<tr>
<td>UP TO 6&quot; MAX.</td>
<td>4&quot; - 0&quot;</td>
<td>10 1/8&quot;</td>
<td>2 - 4 1/2&quot;</td>
<td>3 - 8 1/2&quot;</td>
<td>Varies 6&quot; to 9&quot;</td>
</tr>
</tbody>
</table>

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**Notes**

- The 1" (in) diam. anchor bolt (Typ.) is required for stability and should be firmly secured into the foundation.

---

**Drawn by:** USA CIVRAID

**Appointed for Publication**

**Design Engineer**

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

2. All concrete shall be class 4000.

3. This barrier transition section is designed for an allowable soil bearing pressure of 2500 psf or better.

<table>
<thead>
<tr>
<th>TABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRADE SEPARATION</td>
</tr>
<tr>
<td>0&quot; TO 6&quot;</td>
</tr>
<tr>
<td>UP TO 7&quot;</td>
</tr>
<tr>
<td>UP TO 10&quot;</td>
</tr>
</tbody>
</table>
This page left blank intentionally.
NOTES
1. See Standard Specification 8-21.3(9) for construction requirements.
2. Use a template to locate and secure the bolts during foundation installation.
3. When connecting between cast-in-place and precast Single-Slope Barrier, provide a Connection Blockout and Rebar Grid as shown in Standard Plan C-70.10.
4. Grounding Conductor shall be non-insulated #4 AWG stranded copper, provide 3'-0" min. slick. Clamp steel reinforcing bar with connector suitable for use embedded in concrete.
5. Install Conduit Coupling flush with top of Barrier. Do not glue PVC stubout.
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NOTE

1. For W-Beam Type 31 shoulder application, see Standard Plan C-20.10.

2. See Contract Plans for Barrier location.

PRECAST CONC. BARRIER TYPE 2

SINGLE SLOPE CONC. BARRIER
CAST-IN-PLACE

SINGLE SLOPE CONC. BARRIER
PRECAST

CABLE BARRIER

BEAM GUARDRAIL TYPE 1
(SEE NOTE 1)

BEAM GUARDRAIL TYPE 1 ON STEEP SLOPES
(SEE NOTE 1)
LEGEND

- Design Layout Line

NOTES

1. From the End of Landform, use the Design Layout Line to determine the location of the downstream (with traffic) Cable Barrier Terminal.

2. Provide the Lateral Deflection Distance and show in the Contract Plans to accommodate potential opposing traffic encroachments.
1. Approved Inertial Barrier Systems (sand barrel arrays) are listed in the Qualified Products List and shall be installed in accordance with the manufacturer’s recommendations. When products not listed on the Qualified Products List are considered, a Request of Approval of Materials (RAM) form is required.

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

NOTES

INSTALLATION DETAILS

ATTENUATOR CONFIGURATIONS
(NUMBERS INSIDE BARRELS INDICATE LBS.)
NOTES

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

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

CEMENT CONCRETE CURB AND GUTTER PAN

PLAN VIEW

CATCH BASIN GUTTER PAN

SECTION B

ISOMETRIC VIEW

SECTION A

ADJUSTMENT SECTION – NOT INCLUDED IN CURB AND GUTTER BID ITEM

DRAINAGE STRUCTURE – NOT INCLUDED IN CURB AND GUTTER BID ITEM

MATCH ROADWAY SLOPE

FACE OF CURB

VARIIES

1/2" R.

1/2" R.

1/2" R.

1/2" R.

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1/2" R.

1/2" R.

1/2" R.
NOTES
1. Construct curb joints at cement concrete pavement transverse joint locations. If all adjacent pavement is HMA, see Standard Plan F-30.10 for Curb Expansion Joint Spacing.
2. A 2 inch vertical curb may be used where low clearance vehicles or trucks are present.

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

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

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

3. Use only Slip Base manufacturer supplied hardware that meets the requirements of Standard Specifications 9-09 and 9-29.
1. Dimensions for the parts used to assemble the base connections are intentionally not shown. Base connections are patented, manufactured products that are in compliance with NCHRP 350 crash test criteria. The base connection details are shown on this plan only to illustrate how the parts are assembled.

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

3. A 2" (in) post with a 2 1/4" (in) PSST anchor or a 2 1/4" (in) post with a 2 1/2" (in) PSST anchor may be substituted. See Contract Plans.

4. Perforated square steel post shall meet the requirements of Standard Specification 9-06.

5. Use only base connection manufacturer supplied hardware that meets the requirements of Standard Specifications 9-06 and 9-28.
Concrete below finished ground line shall be placed directly against undisturbed earth, or alternately, backfill placed around foundation shall be compacted in conformance with Standard Specification 2-09.31(1e), method 1 or 4. All formwork shall be removed.

FOUNDATION TYPES 2 & 3

<table>
<thead>
<tr>
<th>MATERIAL SPECIFICATIONS</th>
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<tr>
<td>CONCRETE</td>
</tr>
<tr>
<td>STEEL REIN. BAR</td>
</tr>
<tr>
<td>GRADE 60</td>
</tr>
<tr>
<td>ANCHOR RODS</td>
</tr>
<tr>
<td>GRADE 150</td>
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<tr>
<td>ANCHOR NUTS</td>
</tr>
<tr>
<td>ANCHOR WASHERS</td>
</tr>
<tr>
<td>ANCHORAGE GALVANIZED</td>
</tr>
<tr>
<td>ANCHOR PLATE</td>
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<table>
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<tr>
<th>TABLE</th>
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<tbody>
<tr>
<td>VARIABLES</td>
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<tr>
<td>SPAN LENGTH</td>
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<tr>
<td>ALLOWABLE LATERAL BEARING PRESSURE (PSF)</td>
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<tr>
<td>DIMENSION – D</td>
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<tr>
<td>60' OR LESS</td>
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<tr>
<td>BAR SPACES – N</td>
</tr>
<tr>
<td>SHAFT DEPTH – Z</td>
</tr>
<tr>
<td>TYPE</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>2000 OR BETTER</td>
</tr>
<tr>
<td>1500-2499</td>
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<table>
<thead>
<tr>
<th>BAR LIST</th>
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<tbody>
<tr>
<td>LOCATION</td>
</tr>
<tr>
<td>SPAN LENGTH</td>
</tr>
<tr>
<td>QTY.</td>
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<tr>
<td>CAP – TOP</td>
</tr>
<tr>
<td>CAP – SIDES</td>
</tr>
<tr>
<td>CAP – HOOPS</td>
</tr>
<tr>
<td>CAP – BOTTOM</td>
</tr>
<tr>
<td>FND WALL – VERTICAL</td>
</tr>
<tr>
<td>FND WALL – HORIZONTAL</td>
</tr>
</tbody>
</table>

| BENDING DIAGRAM |

| Concrete below finished ground line shall be placed directly against undisturbed earth, or alternately, backfill placed around foundation shall be compacted in conformance with Standard Specification 2-09.31(1e), method 1 or 4. All formwork shall be removed. | FOUNDATION TYPES 2 & 3 |

<table>
<thead>
<tr>
<th>DRAWN BY</th>
<th>COLBY FLETCHER</th>
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<tbody>
<tr>
<td>SHEET 1 OF 1 SHEET</td>
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<tr>
<td>STANDARD PLAN G-70.30-04</td>
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<td>APPROVED FOR PUBLICATION</td>
<td></td>
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<tr>
<td>Washington State Department of Transportation</td>
<td></td>
</tr>
</tbody>
</table>
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NOTES

1. Windbeam and 3" (IN) Z-Bar are aluminum. All nuts, bolts, washers, and other hardware shall be stainless steel per Standard Specification Section 9-28.11, except as noted. Galvanize all non-stainless steel parts.

2. See Standard Plan G-90.20 (Monotube), or G-90.30 (Truss) for additional Overhead Sign Mounting details.

3. For VMS mounting, the Contractor may substitute W6 x 12 steel or W6 x 13 steel sections for the Vertical Brace W4 x 13 steel.

ASSEMBLY NOTES
All parts shall be plumb and square.
Bring all parts into full contact with each other.
Fasteners and associated hardware shall be in a snug tight condition when assembled.
Bolted parts shall fit solidly together.

OVERHEAD SIGN BRACING AND MOUNTING

STANDARD PLAN G-90.10-03

 SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Washington State Department of Transportation
VERTICAL BRACE SPACING WITH SIGN LIGHTING

**NOTES**

1. Install Sign Lighting Luminaires (and Brackets) only when required in the Contract.
2. All nuts, bolts, washers, and other hardware shall be stainless steel per Standard Specification Section 9.28.11, except as noted. Galvanize all non-stainless steel parts.
3. See Standard Plan G-90.20 (Monotube), or G-90.30 (Tnas) for additional Overhead Sign Lighting details.

**SIGN WIDTH**

(A' - SEE CONTRACT)

**VERTICAL BRACE SPACING**

<table>
<thead>
<tr>
<th>SIGN LIGHTING LUMINARES</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONE SIGN LIGHTING LUMINARES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8' - 0'</td>
<td>6'</td>
<td>3' - 6'</td>
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<tr>
<td>12' - 0'</td>
<td>6'</td>
<td>6' - 0'</td>
</tr>
<tr>
<td>14' - 0'</td>
<td>6'</td>
<td>6' - 0'</td>
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<tr>
<td>6' - 0'</td>
<td>6'</td>
<td>2' - 0'</td>
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<tr>
<td>TWO SIGN LIGHTING LUMINARES</td>
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<td></td>
</tr>
<tr>
<td>18' - 0'</td>
<td>6'</td>
<td>6' - 3'</td>
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<tr>
<td>20' - 0'</td>
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<tr>
<td>22' - 0'</td>
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<tr>
<td>34' - 0'</td>
<td>6'</td>
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<tr>
<td>24' - 0'</td>
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<td>6' - 3'</td>
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<tr>
<td>28' - 0'</td>
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<tr>
<td>30' - 0'</td>
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<tr>
<td>32' - 0'</td>
<td>6'</td>
<td>6' - 6'</td>
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<tr>
<td>THREE SIGN LIGHTING LUMINARES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34' - 0'</td>
<td>6'</td>
<td>6' - 6'</td>
</tr>
<tr>
<td>36' - 0'</td>
<td>6'</td>
<td>6' - 4.12'</td>
</tr>
</tbody>
</table>

* B' B' EXCEEDS THE SPACING LISTED ON THE VERTICAL BRACE SPACING TABLE, ADD AN ADDITIONAL VERTICAL BRACE
1. U-Bolts, Washers and Nuts shall be stainless steel, except as noted.
4. For VMS mounting, the contractor may substitute W6 x 12 Steel or W8 x 13 Steel sections for the Vertical Brace W4 x 13 Steel.
5. 3' - 0" MAX. Vertical Brace spacing for Walk-In Cabinet Type VMS Installation.
7. For all sign lighting bracing details not shown, see Standard Plan G-90.11.

NOTE: DO NOT SCALE TRUSS FOR VARIOUS APPLICATIONS WITHOUT REVIEWING REQUISITE MOUNTING SPECIFICATIONS FOR EACH APPLICATION.
NOTES

1. Cabinet construction shall meet the requirements of Standard Specification 9-20.25. Aluminum cabinets shall have mill finish.

2. Busswork shall be rated for 100 Amps minimum.

3. Transformer size, input voltage, and output voltage shall be as shown in the Contract Plans.


5. Secondary branch breakers may be either single or double pole breakers. Only two double pole breakers may be used.

6. Cabinet anchor bolt pattern is determined by the cabinet manufacturer. All anchor bolts shall either be hot-dip galvanized or stainless steel cinch bolts. Bolts shall extend a minimum of 1.5 inches above the concrete pad. See Standard Plan J-10.10 for Foundation details.

7. Transformers 7.5 kVA and larger shall be supplied with two full capacity taps, one at 5%, and one at 10% below normal capacity.

8. Engraved phenolic nameplate shall read “SUPPLIED FROM SERVICE CABINET S77777.” See Contract Plans for service cabinet S number. Nameplate shall be attached with screws or rivets.

9. Cabinet shall be oriented such that it opens away from traffic.

10. Available fault current label shall meet the requirements of National Electrical Code Article 110.24.
NOTES

1. Pole Base Plate for a Slip Base design shall be 1 1/4" (in) steel manufactured from ASTM A572 GR.50 or ASTM A588. Pole Base Plate for a Fixed Base design shall be either 1 1/4" (in) steel manufactured from ASTM A572 GR. 50, ASTM A588, or 1 1/2" (in) manufactured from ASTM A36. All Pole Base Plate notched surfaces shall be finished smooth.


3. Galvanizing shall be in accordance with AASHTO M 111.

4. See Standard Plans C-8b, C-85.14, and J-28.60 for foundation and base plate requirements when steel light standards are mounted on concrete traffic barrier.

NOTES
2. Round and smooth all edges around hand hole and along the wire-way to protect the conductors.
4. Install grout after plumbing the pole.
NOTES

1. Each wire shall be physically separated by at least 1/4" (6 mm) so that sealing material can fill in between the wires; where heat shrink tubing is used for the outer splice enclosure, it shall meet one of the following requirements:

   a. Have separate ports for each conductor ("Y" or "T" shaped tubing). ~ or ~
   b. Have rubber electrical mastic tape wrapped around each conductor to ensure a weatherproof seal. See Rubber Electrical Mastic Tape Installation Detail, Standard Plan J-50.05.

2. Heat shrink tubing shall extend a minimum of one inch onto the original wire insulation of each wire in the splice. Rigid splice enclosures shall be centered over the cramped connection.

3. Electrical tape used in splicing applications shall be 3/4" (19 mm) wide, be UL listed under UL 510, and be CSA Certified under C22.2 NO. 197-M1983.

4. Crimp splices shall be installed with an approved crimping tool for the type and size of crimp splice used. Fliers and similar multi-purpose tools may not be used.

CONNECTOR AND INTERNAL SEALING DETAILS

- CONNECTOR ASSEMBLY - SEE CONNECTOR AND INTERNAL SEALING DETAILS BELOW
- LIMITS OF SPlice ENCLOSURE = 5" MIN.
- SINGLE WIRE
- CONDUCTOR (WIDTH VARIES)
- SEE NOTE 2
- (TYP.) 1" MIN.
- 9/16" - 11/16"
- (TYP.) 1" MIN.
- 1" MIN.
- SEe NOTE 2

SPlice DETAIL

STEP 1 - CRIMP CONNECTION

SINGLE WIRE
CRIMP SPLICE
SINGLE WIRE

STEP 2 - WRAP CONNECTION

- TAPE OVERLAP DIAGRAM
- WHEN USING WRAPPED VINYL ELECTRICAL TAPE:
- INSTALL TWO LAYERS OF SPIRAL WRAPPED TAPE,
- EACH SPIRAL LAYER SHALL HAVE AN OVERLAP OF 1/2" OF THE TAPE WIDTH (SEE DIAGRAM ABOVE).

- TAPE WIDTH
- OVERLAP
- (12 TAPE WIDTH)

- VINYL ELECTRICAL TAPE
- (SEE NOTE 3)
- 1" MIN.
- CONNECTOR
- 1" MIN.
- SEE NOTE 2
- TAPE WIDTH
- SEE NOTE 2
- 1" MIN.
- SEE NOTE 2
- 1" MIN.

- APPLICATION FOR FIXED BASE SIMILAR, EXCEPT NO CABLE TIE IS REQUIRED AT JUNCTION BOX
- 24" (60 Min.) SLACK REQUIRED TO ALLOW QUICK Disconnects TO BE PULLED OUTSIDE HEAD HOLE 6" (150 mm)

- EQUIPMENT GROUNDING CONDUCTOR
- CABLE TIE = 120 POUND TENSILE STRENGTH, BLACK
- EQUIPMENT BONDING JUMPER = FROM RMC CONDUIT

- NOTE: AND MAY BE SAME WIRE

PREPARED BY:

Fern Liddell

STATE DESIGN ENGINEER

Washington State Department of Transportation

STEEL LIGHT STANDARD WIRING DETAILS

STANDARD PLAN J-28.70-03

SYLVA, TED

Jul 18 2017 9:52 AM

APPROVED FOR PUBLICATION

12/1/2011

Sheet 2 of 2 SHEETS
NOTES

1. Junction Box shall be constructed of 12-gage, Type 304 stainless with steel welded seam construction. Finish shall be # 2B for backbox and # 4 for the cover. Mounting Tabs shall be constructed of 12-gage, Type 304 stainless steel. All hardware shall be Type A304 Stainless Steel.

2. The System Identification letters shall be 1/8" line thickness formed by engraving, stamping, or with a stainless steel weld bead. See Standard Specification 9-282(4) for details.

3. Conduit Capacity = 8" (4" per end).

---

PLAN VIEW

- Stainles steel nut
- Stainless steel adjusting nut (Typ, of 2)
- 1/4-20 x 1" (in) long stainless steel (S.S.) ground stud (typical 2 places)
- 1/4-20 NC x 1" (in) stainless steel standoff - silicone sealant applied to the open end of the standoff (Typ.)
- Tack weld 3 places per standoff (Typ.)
- All seams

ELEVATION VIEW

- 0.237" (in) diameter hole (Typ.)
- Stainless steel flat washer (Typ. of 2)
- Stainless steel adjusting nut (Typ. of 2)
- Stainless steel nut
- All around

SIDES VIEW

- 1.5" (in) x 1.5" (in) x 1.5" (in) 12-gage mounting tab with 0.5" (in) diam. hole

EXPLODED ISOMETRIC VIEW

- Barrier box
- Closed cell neoprene gasket
- Universal barrier lid
- 1/4-20 x 1.00" (in) long, S.S. machine screw, Phillips/slot head (Typ.)
UNIVERSAL BARRIER LID

1/4 - 20 x 1.00" (IN) LONG, S.S., MACHINE SCREW, PHILLIPS/SLOTTED HEAD (TYP.)

CLOSED CELL NEOPRENE GASKET

COVER PLATE

10 - 32 x 0.375" (IN) LONG, S.S., SELF-TAPPING (TYP.)

TEMPORARY COVER

1/4 - 20 x 1.00" (IN) LONG, S.S., MACHINE SCREW, PHILLIPS/SLOTTED HEAD (TYP.)

ADJUSTMENT BOLT - SEE DETAIL, THIS PLAN

EXPLODED ISOMETRIC VIEW

ASSEMBLY DETAIL
1. Junction Box shall be constructed of 12-gage, Type 304 stainless steel with steel welded seam construction. Finish shall be # 38 for barrier box and # 4 for the cover. Support anchor shall be constructed of 12-gage, Type 304 stainless steel. All hardware shall be Type A304 Stainless Steel.

2. The System Identification letters shall be 1/8" line thickness formed by engraving, stamping, or with a stainless steel weld bead. See Standard Specification 9-29.2(4) for details.

3. Conduit capacity = 8" (4" per end).

4. Box shall include # 8 AWG (min.) x 1 foot tinned, braided copper Bonding Juniper for bonding Box and Telescoping Top.

NOTES

ELEVATION VIEW
MOUNTING TAB DETAILS

STAINLESS STEEL FLAT WASHER
(TYP. OF 3)

STAINLESS STEEL NUT
STAINLESS STEEL ADJUSTING NUT
(TYP. OF 2)

1/4 - 20 X 1" (IN)
GROUND LUG

1/16

0.33" (TYP. OF 3)

STAINLESS STEEL FLAT WASHER
(TYP. OF 2)

STAINLESS STEEL ADJUSTING NUT
(TYP. OF 2)

STAINLESS STEEL NUT

1/16

R = 0.65" (TYP.)

0.50" (IN)
DAM. HOLE

1/2"

6.25" (TYP.)

1/16

1/4 - 20 X 1" (IN) LONG STAINLESS STEEL
(S.S.) GROUND STUD
(TYPICAL 2 PLACES)

1/4 - 20 x 1.25" (IN) LONG, S.S., HEX CAP BOLT WITH 1/4" (IN) S.S. LOCK WASHER (TYP.)

ADJUSTMENT TAB - SEE DETAILS, THIS PLAN (TYP.)

1/16

5.00"

1.61"

18.41"

TACK WELD 3 PLACES
PER STANDOFF (TYP.)

1/4 - 20 X 1" (IN) S.S. STANDOFF - SILICONE SEALANT APPLIED TO THE OPEN END OF THE STANDOFF (TYP.)

1/16

3.25"

2.00"

1/16

6.41"

6.41"
NOTES
1. Drilling through reinforcing steel is not allowed. If steel is hit while drilling, the location shall be marked and the abandoned hole filled with grout conforming to Standard Specification 6-02.3(20).
2. Mount the stainless steel support using an approved resin-bonded anchor system installed per manufacturer’s recommendation. Anchor bolt embedment shall be 4 1/2" minimum. Resin-bonded anchors shall be stainless steel and shall be 3/8" diameter. Expansion Anchors are not allowed.
3. There shall be a minimum of 3" edge distance to the centerline of anchor holes in the concrete.
5. The System Identification letters on the box lid shall be 1/8" line thickness formed by engraving, stamping, or with a stainless steel weld bead. See System Identification Detail and Standard Specifications 9-23.2(4).
6. Junction Box shall be dimensioned as shown in the Contract. If the conduit sizes shown in the Contract are changed, the box dimensions shall be revised in accordance with NEC 314.28 using the 8 times multiplier for length and width dimensions.
7. Equipment Bonding Jumper shall be # 8 AWG (min.) x 1 foot of tinned, braided copper.
8. Fittings shall be UL listed and CSA-certified wet tight on the outside of the Junction Box conduit connection. An insulated grounded end bushing shall be used to terminate Rigid Metal Conduit.
9. Junction Box shall be constructed of 12-gage, Type 304 stainless steel with welded seam construction and # 4 finish. Mounting Flange shall also be 12-gage, Type 304 stainless steel.

SYSTEM IDENTIFICATION DETAIL

15-GAGE STAINLESS STEEL PIANO HINGE
- 1 1/2" OPEN
(1/4" STAINLESS STEEL BARREL
1 1/2" PIN
1 3/4" x 1 1/4" CLOSED CELL NEOPRENE GASKET

SECTION A
ISOMETRIC VIEW

LOCKNUT = SEAL WITH BEAD OF SILICONE CAULK (TYP.) SEE NOTE 6
2" (TYP.)

1 1/2" x 1 1/2" STAINLESS STEEL CHANNEL ON STRUCTURE (TYP.)

1 1/2" CAPTIVE SCREW - BURRN END
NUT = SPOT WELD (4) PLACES

DETAIL B
LOCKNG TAB DETAIL
15-GAGE STAINLESS STEEL PIANO HINGE
JUNCTION BOX LID
LOCKING TAB
1 1/4" x 1/4" CLOSED CELL NEOPRENE GASKET

DETAIL C

ELEVATION VIEW (MOUNTING FLANGE SHOWN)

NOT LESS THAN 3" DRAIN HOLE (TYP.)

ES-15-13
NEMA 4X SURFACE-MOUNT JUNCTION BOX
STANDARD PLAN J-40.38-01 SHEET 1 OF 1 SHEET

TOP ENTRY
Equipment Grounding Conductor
Copper Solderless Crimp Connector
Equipment Bonding Jumper - See Note 7
Equipment Bonding Jumper - See Contract for conduit size and number

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

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1. Each wire shall be physically separated by at least 1/4" (in) so that sealing material can fill in between the wires; where heat shrink tubing is used for the outer splice enclosure, it shall meet one of the following requirements:
   a. Have separate ports for each conductor ("WYE" or "X" shaped tubing).
   b. Have rubber electrical mastic tape wrapped around each conductor to ensure a weatherproof seal. See Rubber Electrical Mastic Tape Installation Detail.

2. Heat shrink tubing shall extend a minimum of one inch onto the original wire insulation of each wire in the splice. Rigid splice enclosures shall be centered over the crimped connection(s).

3. Electrical tape used in splicing applications shall be 3/4" (in) wide, be UL listed under UL 510, and be CSA certified under C22.2 No. 197-M1983.

4. No more than two splices may be installed in the same splice enclosure.

5. Crimp splices shall be installed with an approved crimping tool for the type and size of crimp splice used. Pliers and similar multi-purpose tools may not be used.
NOTES
1. For Installation Notes and Details see Standard Plan J-50.15.
NOTES
1. For Installation Notes and Details see Standard Plan J-50.15.
3. All of the loop lead-in wires shall return to the Junction Box.
4. For Splice Detail see Standard Plan J-50.05.
5. For additional Induction Loop details, see Standard Plan J-50.15.
TYPE 2 STOP LINE LOOP WIRING DIAGRAM
SERIES SPLICE SHOWN

TYPE 2 SAMPLING LOOP WIRING DIAGRAM
SERIES SPLICE SHOWN

TYPE 2 ADVANCE LOOP WIRING DIAGRAM
NOTES
1. For Installation Notes and Details see Standard Plan J-50.15.
3. All of the loop lead-in wires shall return to the Junction Box.
4. For Splice Detail, see Standard Plan J-50.05.
5. For Loop numbering Layout Details, see sheet 3.
6. For additional Induction Loop Details, see Standard Plan J-50.15.
Notes
Loop numbering layout will be similar to Loop Numbering Layout Detail, Sheet 3.
TYPE 3 INDUCTION LOOP

STANDARD PLAN J-50.12-01

TYPE 3A STOP LINE LOOP WIRING DIAGRAM
SERIES SPlice SHOWN

TRAFFIC FLOW
LOOP INSTALLATION NOTES

1. Install the Junction Box and the stub-out conduit with Sch. 80 PVC stub-out sleeve. Conduit for the loop stub-out shall be as required in the conduit size table shown on sheet 1 of this set.

2. Lay out loops and loop lead-ins to miss cracks/joints in road, when possible. Maintain 18" (in) minimum clearance from manholes and valve boxes.

3. The opening around the loop stub shall be patched with matching paving material if opened larger than PVC sleeve + 2" (in).

4. Sawcut the loop slots and the lead-in slots. File edges to remove burr of all saw-cuts into stub out sleeve.

5. Lay out the loop wire starting at the Junction Box, allowing 5 (ft) minimum slack.

6. Install the wire in the loop slot as shown.

7. Finish laying out the wire at the Junction Box and identify the leads with the loop number, the "S" for start and the "F" for the finish, the loop series number, and the loop lead-in conductor number.

8. Twist each pair of the lead-in wires a minimum of two times per foot each foot, from the loop to the Junction Box. Reverse the direction of the twist for each successive pair installed. Seal loops/sawcuts.

9. Construct a supplemental splice containing any series loop connections in the adjacent junction box as required in the plans. Supplemental splices are subject to the same requirements shown for the loop lead-in and the shielded cable splice.

10. Splice the loop lead-ins to the shielded cable as noted in the Contract. See Standard Plan J-50.05 for Loop Splice details.

11. All loop circuits shall be tested per Standard Specification Section 8-20.3(14D) once installation is complete.

12. Existing stub-out shall be upgraded as necessary to conform to the conduit size table shown on sheet 1.

13. All loop lead-in sawcuts parallel to lane edge shall be at least 12" (in) from edge of pavement and within six inches outside of lane or fog line when possible. Maintain 12" (in) separation between parallel cuts or joints.

14. The loop stub-out sleeve shall have an inside diameter 1" (in) larger than the outside diameter of the End Bell Bushing. Sleeve shall be notched 5/8" (in) to 3/4" (in) to accommodate loop wires. Plug conduit and fill sleeve with sand until loops are installed to keep out hot asphalt during paving operations.

INDUCTION LOOP DETAILS

STANDARD PLAN J-50.15-01

Sheet 2 of 3 Sheets

Approved for Publication by the Washington State Department of Transportation
NOTES

1. Installation of signal detection loops in the bridge deck shall be cast-in-place and installation by saw cutting an existing bridge deck shall not be allowed. This plan is intended for new construction only (not allowed for existing structures).

2. For Supplemental Splice in adjacent junction box, see Splice Detail, per Standard Plan J-50.15.

3. Prefabricated loops shall conform to the layouts, numbering details, marking requirements, and wiring diagrams of Standard Plan J-50.12 for the number and types of loops shown in the Contract Plans.

4. Loops shall be tested immediately prior to pouring concrete, per Standard Specification 8-20.3(14)D.

5. Layout Preferred loops and loop leads-ins to maintain 1" (ft) clearance from joints.

6. Construct a supplemental splice containing any series loop connections in adjacent Junction Box as required in the Plans. Supplemental splices are subjected to the same requirements shown for the loop lead-in and the shielded cable splice, as shown in Standard Plan J-50.12.

7. Barrier Junction Box ~ 8" x 8" x 18" NEMA 4X in stationary-form barrier, adjustable NEMA 3R in slip-form barrier. (Junction Box can be recessed up to 1 1/8") See Standard Plan J-40.36 or J-40.37.

8. For installation of Junction Box in the sidewalk, see Standard Plan J-40.40.

PREFORMED LOOP INSTALLATION DETAILS FOR NEW BRIDGE DECKS

STANDARD PLAN J-50.16-01

SHEET 1 OF 2 SHEETS

APPROVED FOR PUBLICATION 3/14/13

Washington State Department of Transportation
NOTE
See contract for location and material requirements.

GRID IS 1" SQUARE "R" DETAIL

KEY NOTES
1. TOTAL MARKING AREA (PER 12' (FT) WIDE LANE) = 109.75 SQ FT.
2. LANE LINE OR ROADWAY CENTERLINE
3. EDGE LINE

STANDARD SYMBOL

- TOTAL MARKING AREA (PER 12' (FT) WIDE LANE) = 109.75 SQ FT.
- LANE LINE OR ROADWAY CENTERLINE
- EDGE LINE

ALTERNATIVE SYMBOL

- TOTAL MARKING AREA (PER 12' (FT) WIDE LANE) = 111.59 SQ FT.
- LANE LINE OR ROADWAY CENTERLINE
- EDGE LINE

MPH     D
25      50 FL
30      75 FL
35      100 FL
40      125 FL
45      150 FL
50      175 FL
55      200 FL
60      225 FL
65      250 FL

DIMENSIONS SHOWN ARE APPROXIMATE SEE CONTRACT

- Place Stop Line 15' (ft) from RR gate, if present.

- W-10-1 Advance Warning sign (not included in RR crossing Symbol Bid Item).

- 24" (in) white transverse line.

- "X" symbol, letters, and two 24" (in) white transverse lines.
1. These details can vary greatly according to the Contract Plans.
2. The need for Advance Roundabout Traffic Arrows is based upon posted speed of approach roadway.
3. Place Arrows in the circulating lanes as close as possible to the center of the lane to avoid having them in the wheel paths.
NOTES:
1. If rumble strips are present, install marking outside of the rumble strip.
3. WSDOT BMP sticker to be placed on first flexible guide post only.

STORMWATER BMP DELINEATION DETAIL

STORMWATER BMP MARKING DETAIL
MARKING AREA = 1.75 SQ. FT. FOR PAIR

STORMWATER BMP LIMITS
(VARIES ACCORDING TO BMP DESIGN)

FLEXIBLE GUIDEPOST
SEE NOTE 2

MANUFACTURER'S BURY DEPTH

EDGE OF SHOULDER

FLEXIBLE GUIDE POST DETAIL
TYPICAL FOR ALL STORMWATER BMP GUIDE POSTS AS DETAILED ON THIS SHEET

WSDOT STORMWATER BMP STICKER
(FACING TRAFFIC)

WSDOT COMBINATION
STORMWATER
TREATMENT
WETLAND
DETENTION
POND
UNIQUE ID #

STORMWATER BMP NAME AS SHOWN IN THE CONTRACT PLANS

1/4" LETTER HT.
(TYP.)

EDGE OF TRAFFIC

EDGE LINE

DIRECTION OF TRAFFIC

STORMWATER BMP MARKING
SEE STORMWATER BMP MARKING DETAIL (TYP.)

FLEXIBLE GUIDE POST (TYP.)
SEE FLEXIBLE GUIDE POST DETAIL

60" SPACING (TYP.)
OR AS SHOWN IN THE CONTRACT PLANS

EDGE OF SHOULDER

STORMWATER BMP (LINEAR TYPE)

SEE NOTE 1

EDGE LINE

VARES

1/8" (TYP.)

4" (TYP.)

1'-6" (TYP.)

(SEE NOTE 1)

(SEE NOTE 3)

(SEE NOTE 3)
NOTES:
1. If rumble strips are present, install marking outside of the rumble strip.
BARRIER DELINEATOR REQUIREMENTS

- Spacing of Barrier Delineators shall be as shown in the Plans.
- The housing or bracket can be flexible or rigid, molded from a durable plastic or other durable material approved by the Engineer, and shall be attached to the barrier with an adhesive recommended by the manufacturer.
- The attachment point on the barrier surface shall be free of dirt, curing compound, moisture, paint, or any other matter that would adversely affect the adhesive bond.
- Barrier Delineators shall be one-sided for single direction traffic, or two-sided for bi-directional traffic.
- Color shall be white on the right of traffic, and yellow on the left of traffic.
- The reflective surface shall be rectangular or trapezoidal.
- Reflective Sheeting: 12 square inches minimum surface area; Type III, IV, V, or VI, selected from approved materials listed in the Qualified Products List.
- Plastic Reflector: 9 square inches minimum surface area; acrylic or polycarbonate conforming to AASHTO M 290. Reflectors shall equal or exceed the following minimum values of Specific Intensity:

<table>
<thead>
<tr>
<th>OBSERVATION ANGLE</th>
<th>ENTRANCE ANGLE</th>
<th>SPECIFIC INTENSITY (cd/ft²-c)</th>
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</thead>
<tbody>
<tr>
<td>0°</td>
<td>0°</td>
<td>WHITE: 125</td>
</tr>
<tr>
<td>20°</td>
<td>0°</td>
<td>YELLOW: 75</td>
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</table>

NOTES

1. When the Contract Plans requires a guide post with concurrent guardrail runs, the Contractor shall either:
   A. Drive the flexible guide post in line with the guardrail posts, or
   B. Mount the shorter flexible guide post onto the guardrail post.

2. Guide posts shall be fastened to the wooden guardrail post using two 2" (in) × 3/8" (in) lag screws with washers, along centerline of post. Also acceptable is any approved attachment method submitted by the guide post manufacturer.

3. Guide posts shall be fastened to the steel guardrail posts using two galvanized 2" (in) × 3/8" (in) bolts with a washer on both sides, a lock washer, and nut. The nut shall be tightened to properly compress the lock washer. The drilled holes in the guardrail post web shall be painted with galvanizing repair paint as described in Standard Specification Section 8-11.3.1(b). Also acceptable is any approved attachment method submitted by the guide post manufacturer.

4. When concrete barrier runs concurrent, the Contractor shall mount Barrier Delineators where guide posts are required.

GUIDE POST TYPE DEFINITIONS – REFLECTIVE SHEETING APPLICATIONS

<table>
<thead>
<tr>
<th>TYPE W</th>
<th>TYPE WW</th>
<th>TYPE Y</th>
<th>TYPE YY</th>
</tr>
</thead>
<tbody>
<tr>
<td>FACING TRAFFIC</td>
<td>FACING TRAFFIC</td>
<td>BACK SIDE</td>
<td>FACING TRAFFIC</td>
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<tr>
<td>3&quot;</td>
<td>3&quot;</td>
<td>3&quot;</td>
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<td>YELLOW</td>
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<tr>
<td>REFLECTIVE SHEETING, OR FLAT PLASTIC REFLECTOR LENS</td>
<td>REFLECTIVE SHEETING, OR FLAT PLASTIC REFLECTOR LENS</td>
<td>HOUSING OR BRACKET</td>
<td>TRAFFIC FACE OF BARRIER</td>
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<tr>
<td>SIDE MOUNT PER CONTRACT</td>
<td>TOP MOUNT PER CONTRACT</td>
<td></td>
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</tbody>
</table>

GUIDE POSTS AND BARRIER DELINEATORS

STANDARD PLAN M-40.10-03

WASHINGTON DELINEATION ENGINEER

Brian J. Walsh

Jan 24 2014 2:37 PM

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
NOTES


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

3. "S" dimension shown on Standard Plan M-40.40 or 100', whichever is smaller.

4. One half of "S" dimension shown on Standard Plan M-40.40 or 50', whichever is smaller.

5. Two spaces at 100'.

6. Three equal spaces when R < 75', four equal spaces when R ≥ 75'.

7. Two equal spaces.

8. Locate the initial Guide Post so that it does not hinder the visibility of the Bridge Delineator for approaching traffic. The distance between the bridge end and the initial Guide Post shall be 50 feet maximum.

LEGEND

SEE TYPE DEFINITIONS, STD. PLAN M-40.10

TYPE W

TYPE Y

GUIDE POST PLACEMENT INTERCHANGES

STANDARD PLAN M-40.20-00

APPROVED FOR COMPLIANCE

Washington State Department of Transportation

EXPIRES AUGUST 9, 2023