Persons with disabilities may request this information be prepared and supplied in alternate formats by calling the WSDOT ADA Accommodation Hotline collect (206) 389-2839. Persons with hearing impairments may access WA State Telecommunications Relay Service at TT 1-800-833-6388, Tele-Braille 1-800-833-6385, or Voice 1-800-833-6384, and ask to be connected to (360) 705-7097.
Foreword

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

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

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

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

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

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

Harold Peterfeso
State Design Engineer
Comments

From: ___________________________ Date: ____________

______________________________ Phone: ______________

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

Subject: Standard Plans Manual Comment

Comment (marked copies attached):
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- E-1 Date Numerals 7/25/97
- E-2 Pile or Frame Detour Bridge with Asphalt Overlay 5/29/98 2 Sheets
- E-5 Manhole Ring and Cover for Bridges 5/29/98

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- F-1 Cement Concrete Curbs and Gutters 7/18/97
- F-2 Precast Traffic Curb 8/27/99
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### Section H  Delineators and Miscellaneous Construction
- H-1 Guide Posts 1/10/02
- H-1a Guide Post Placement Grade Intersection 4/14/00
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- **I-1** Rest Area Septic Tank  7/18/97
- **I-2** Crest Gage  4/23/99
- **I-3** Automated Ground Water Monitoring Well  8/20/99

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- **J-1b** Steel Light Standard Base Details  10/8/99  3 Sheets
- **J-1c** Slip Base Adaptor for 4-Bolt Light Standard Base  4/24/98
- **J-1e** Light Standards Wiring Details  8/1/97
- **J-1f** Timber Light Standards  6/23/00
- **J-3** Type A, B, and C Service Lighting Details  8/1/97  2 Sheets
- **J-3b** Service Cabinet Type B Modified (0 - 200 Amp Type 120/240 Single Phase)  6/24/02  2 Sheets
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- **J-5** Pedestrian Pushbutton Details  8/1/97
- **J-6c** Cabinet Foundation Details  4/24/98
- **J-6f** Signal Head Mounting Details Pole and Post Top Mountings  4/24/98
- **J-6g** Signal Head Mounting Details Mast Arm and Span Wire Mountings  8/1/97
- **J-6h** Miscellaneous Signal Details  4/24/98
- **J-7a** Signal Standard Type Designations and Type PPB, PS, I, RM, and FB Details  9/12/01  2 Sheets
- **J-7c** Strain Pole Standards Type IV and V  6/19/98
- **J-7d** Span Wire Installation  4/24/98
- **J-8a** Induction Loop Details  8/1/97  2 Sheets
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<td>Traffic Control Plan (road closed, detour)</td>
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<td>Traffic Control Plan (four lanes, one closed)</td>
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<td>Traffic Control Plan (four lane divided, one closed)</td>
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### Section L  Fence and Glare Screen

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<td>L-6</td>
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CASE 3
ASPHALT CONCRETE PAVEMENT
(L-Type Abutment)

CASE 4
ASPHALT CONCRETE PAVEMENT

CASE 5
ASPHALT CONCRETE PAVEMENT
(ACP was on bridge and/or roadway
grade slopes up from bridge)

NOTES

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

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

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

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


LEGEND

- Concrete Overlay
- Asphalt Concrete Overlay

Transition from
Concrete Overlay

Standard Plan A-3
Sheet 2 of 2Sheets

Approved for Publication

Harold J. Peterson 08-30-02

Washington State Department of Transportation

Expires July 27, 2003

Effective: August 5, 2002 to April 6, 2003
1. Curb shall be Extruded Curb Type 1, 2, 4, 4a, 5, or 5a, as specified in the contract.

2. Catch basin or grate inlet shall be located between guardrail posts.

INLET PLACEMENT AT BRIDGE END

SECTION A-A

SECTION B-B
NOTES

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

2. The lid cut diameter shall not be greater than 20". 
   Foundations shall have a wall thickness of 2" minimum to 
   2.5" maximum. Provide a 1.5" minimum gap between the 
   lid cut wall and the outside of the pipe. After the pipe is 
   installed, fill the gap with joint mortar in accordance with 
   BID SPEC. 8-04.3.

3. The minimum depth from the finished grade to the pipe 
   invert shall be 8".

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

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

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

PIPE ALLOWANCES

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<th>PIPE MATERIAL</th>
<th>MAXIMUM INSIDE DIAMETER</th>
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<td>ALL METAL PIPE</td>
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<td>PISTON WALL PVC</td>
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*Corroded Polyethylene Storm sewer pipe
Notes:

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

2. The knockout diameter shall not be greater than 3/8". Knockout shall have a wall thickness of 2" minimum to 3/8" maximum. Provide a 1/8" 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 Std. Spec. S-64.3.

3. The minimum depth from the finished grade to the pipe invert shall be 12".

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

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

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

---

**Catch Basin Type 1L**

**Standard Plan B-1a**

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**Pipe Allowances**

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<th>Minimum Allowance Diameter</th>
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<td>All Metal Pipe</td>
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<td>CPSPH 4 (Std. Pipe: 8&quot; B 32)</td>
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<tr>
<td>Solid Wall Pipe</td>
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<tr>
<td>Profile Wall Pipe</td>
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*Corrugated Polyethylene Storm Drain Pipe*
1. As an acceptable alternative to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used. Wire mesh shall not be placed in knockouts.

2. The knockout diameter shall not be greater than 16". Knockouts shall have a wall thickness of 2" minimum to 2 1/2" maximum.

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

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

5. The precast base section may have a rounded floor and the walls may be sloped at a rate of 1:12 or steeper.

6. Openings shall be measured at the top of the precast base section.
NOTES:

1. No steps are required when height is 4' or less.

2. The bottom of the precast catch basin may be sloped to facilitate cleaning.

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

4. Knockout shall have a wall thickness of 3/16" minimum to 2.5" minimum. Provide a 1.5" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Sec. Spec. 04-04-3.

### CATCH BAYN DIMENSIONS

<table>
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<th>BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT SIZE</th>
<th>MINIMUM DISTANCE BETWEEN KNOCKOUTS</th>
<th>SAME REINFORCING STEEL IN EACH DIRECTION</th>
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### PIPE ALLOWANCES

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<th>PIPE MATERIAL WITH MAXIMUM INSIDE DIAMETER</th>
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<td>CONCRETE</td>
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1. CORRUGATED POLYETHYLENE INTERIOR SPOUT PIPE (Sec. Spec. 5-04-13)
2. (Use Spec. 5-04-05)
3. (Use Spec. 5-04-08)
**NOTES:**

1. As an acceptable alternate to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used for adjustment sections.

---

**96" FLAT SLAB TOP**

- 20" x 24", 24" DIA, 48" DIA or 54" DIA Hole
- 2" (TYP)
- 12" MIN
- 2½" MAX

**72" FLAT SLAB TOP**

- 20" x 24", 24" DIA, 48" DIA or 54" DIA Hole
- 2" (TYP)
- 8" MIN
- 2½" MAX

**48", 54" or 60" FLAT SLAB TOP**

- 22" x 24" or 24" DIA Hole
- 2" (TYP)
- 8" MIN
- 2½" MAX

**CIRCULAR ADJUSTMENT SECTION**

- One #3 bar hoop for 6"
- Two #3 bar hoops for 12"

**RECTANGULAR ADJUSTMENT SECTION**

**PREFABRICATED LADDER**

**STEP**

**MISCELLANEOUS DETAILS FOR MANHOLES AND CATCH BASINS**

**ECCENTRIC CONE SECTION**

**12" (TYP)**
NOTES

1. This frame is designed to accommodate 20" x 24" grates or covers as shown on Standard Plans B-2, B-2b, B-2c, and B-3d.

2. When bolt down grates or covers are specified in the Contract, provide two holes in the frame that are vertically aligned with the grate or cover area. Tap each hole to accept a 3/8" x 11 NC x 3" Allen head cap screw. Location of bolt down holes varies among different manufacturers.

3. Refer to Standard Specification 9-05-182(f) for additional requirements.
NOTES
1. When bolt down grates are specified in the Contract, provide two slots in the grates that are vertically aligned with the holes in the frame. Location of bolt down slots varies among different manufacturers.
2. Refer to Standard Specification 05.16.02 for additional requirements.
3. For frame details, see Standard Plan B-3a.

SECTION A

SECTION B

24" 7 OR 8 EQUAL SPACES
1 1/8" MAX.

DIRECTION OF FLOW
8 LEVELING PADS
2" x 1 1/8" x 1/8"

SEE SLOT DETAIL & NOTE 1

PLAN VIEW

SECTION A

NOTES
1. When bolt down grates are specified in the Contract, provide two slots in the grates that are vertically aligned with the holes in the frame. Location of bolt down slots varies among different manufacturers.
2. Refer to Standard Specification R-05.16C2 for additional requirements.
3. For frame details, see Standard Plan B-5a.

SECTION B

4 EQUAL SPACES

1 1/4" MAX.

SLOT DETAIL

Bi-DIRECTIONAL VANED GRATE FOR CATCH BASIN
AND INLET

STANDARD PLAN B-5a

Sheet 1 of 1
NOTES:
1. When bolt down grates are specified in the Contract, provide two slots in the grate that are vertically aligned with the holes in the frame. Location of bolt down slots varies among different manufacturers.
2. Refer to Standard Specification 9-05.18(2) for additional requirements.
3. For frame details, see Standard Plan 9-2a.
4. The thickness of the grate shall not exceed 1 1/8".

SEE SLOTS DETAIL & NOTE 1
CATCH BASIN TYPE 2
WITH FLOW RESTRICTOR
- OIL SEPARATOR
STANDARD PLAN B-3

NOTES
1. The pipe supports and the receptacle/separater shall be constructed of the same material and be anchored at a maximum spacing of 12". Attach the pipe supports to the manifold with 3/8" stainless steel expansion bolts or cement the supports into the manifold wall 2".

2. The vertical clear space of the receptacle/separater shall be the same diameter as the horizontal outlet pipe with a minimum diameter of 6".

3. The flow separator/separater shall be fabricated from one of the following materials:
   - 0.0625" Corrugated Aluminum Alloy Drain Pipe
   - 0.084" Corrugated Galvanized Steel Drain Pipe with Treatment
   - 0.084" Corrugated Aluminized Steel Drain Pipe
   - 0.0625" Aluminum alloy flat sheet, in accordance with ASTM B 280M, B 202 M12 or EPB

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

5. The multi-axle axles may be located as shown or all placed on one side of the door to assist in cleaning or service. The size of the axles and their placement shall be specified in the Contract.

6. Receptacle plates with office as specified in the Contract. Bolt plate for all pollution control only.

7. The opening is to be cut out round and smooth.

8. The opening is to be cut out round and smooth.

9. The frame and ladder or steps are to be affixed so that the sheave gate is visible from the top; the climb-down space is clear of the frame and gate; the frame is clear of the rails.

10. The frame and ladder or steps are to be affixed so that the sheave gate is visible from the top; the climb-down space is clear of the frame and gate; the frame is clear of the rails.

11. The frame and ladder or steps are to be affixed so that the sheave gate is visible from the top; the climb-down space is clear of the frame and gate; the frame is clear of the rails.

12. The frame and ladder or steps are to be affixed so that the sheave gate is visible from the top; the climb-down space is clear of the frame and gate; the frame is clear of the rails.

13. The frame and ladder or steps are to be affixed so that the sheave gate is visible from the top; the climb-down space is clear of the frame and gate; the frame is clear of the rails.

14. The frame and ladder or steps are to be affixed so that the sheave gate is visible from the top; the climb-down space is clear of the frame and gate; the frame is clear of the rails.

15. The frame and ladder or steps are to be affixed so that the sheave gate is visible from the top; the climb-down space is clear of the frame and gate; the frame is clear of the rails.

16. The frame and ladder or steps are to be affixed so that the sheave gate is visible from the top; the climb-down space is clear of the frame and gate; the frame is clear of the rails.

17. The frame and ladder or steps are to be affixed so that the sheave gate is visible from the top; the climb-down space is clear of the frame and gate; the frame is clear of the rails.

18. The frame and ladder or steps are to be affixed so that the sheave gate is visible from the top; the climb-down space is clear of the frame and gate; the frame is clear of the rails.

19. The frame and ladder or steps are to be affixed so that the sheave gate is visible from the top; the climb-down space is clear of the frame and gate; the frame is clear of the rails.

20. The frame and ladder or steps are to be affixed so that the sheave gate is visible from the top; the climb-down space is clear of the frame and gate; the frame is clear of the rails.

21. The frame and ladder or steps are to be affixed so that the sheave gate is visible from the top; the climb-down space is clear of the frame and gate; the frame is clear of the rails.
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 1/8". Attach orifice with 1/4" stainless steel bolts. Orifice plate is not required when only oil separation is desired.

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

CATCH BASIN TYPE 2
WITH BAFFLE TYPE FLOW
RESTRIC-TOR-OIL SEPARATOR

SECTION A-A

SECTION B-B

MONOPOLE RING AND COVER
WITH LOCKING BOLTS, MARKED "DRAIN"
1. Angles shall be set so that each bearing bar of prefabricated grate shall have full bearing on both ends. The finished top of concrete shall be even with the grate surface.

2. All exposed concrete shall be finished with a ½" radius edger tool.

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

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

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

GRATE A
(Weight is approximately 215 lbs)

GRATE B
(Weight is approximately 215 lbs)

SECTION C-C

GRATE INLET TYPE 1

Invert of outlet pipe
Sitting basin

Two 4" x 3" x ½" steel angles
1½" x ⅜" x 4" studs in 3½" x ⅜" x ⅛" steel anchors
**BAR LIST**

(All dimensions are out to out)

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<tr>
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<th>LOCATION</th>
<th>UNIT SIZE</th>
<th>LENGTH</th>
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<td>Unit J</td>
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<td>14'-6&quot; Hoop</td>
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**BENDING DIAGRAM**

**SECTION**

**UNIT H**

- Two 4" x 3" x 3/8" steel angles
- Six 5 5/8" x 1 1/2" x 1/4" steel angles

**UNIT J AND K**

- 3 1/4" x 1/2" steel plate
- 3 1/2" x 5/8" steel tube
- 3 3/4" x 7/8" steel tube
- 2 3/8" x 1/2" steel tube
- 2 1/4" x 1/4" steel tube

**GRATE DETAILS**

**GRATE INLET TYPE 2**
Angles shall be set so that each bearing bar or prefabricated grate shall have full bearing on both ends. The finished top of concrete shall be even with the grate surface.

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

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

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

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

The grade line of the top inside of any inlet pipe shall enter at a point no lower than the grate line of the top inside of the outlet pipe.

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

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

SIDE

SECTIONS
(Two Piece Base)

END

SIDE

SECTIONS
(One Piece Base)

GRATE INLET TYPE 2

B-4c
05-09-97
NOTE:

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

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

3. Bevel or round exposed concrete edges ½".

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

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

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

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

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

DIKE INSTALLATION FOR PREFERRED SLOPE

*See Contract For Backslope Details

DROP INLET TYPE 1

ELEVATION

GRATE SUPPORT

(Two required per grate)
1. Angles shall be set so that each bearing bar on the grate shall have full seating on both ends. The finished top of concrete shall be even with the grate surface.

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

3. Bevel or round exposed concrete edges ½".

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

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

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

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

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

1. The culvert ends shall be beveled to match the embankment or ditch slope and shall not be beveled steeper than 4:1. When slope is between 4:1 and 8:1, make the slope in the vicinity of the culvert and to ensure that no part of the culvert protrudes more than 4" above the ground line.

2. Field cut of culvert end is permitted, when approved by the Engineer. All field cut culvert pipe shall be treated with treatment as shown in the Standard Specifications or General Special Provisions.
1. Span and rise dimensions are nominal and are measured to the inside crests of corrugations.

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

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

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

**NOTES**

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**ELEVATION**

**SECTION**

**CORRUGATED METAL**

**STRUCTURAL PLATE UNDERPASS DESIGN 1**
ALLOWABLE HEIGHTS OF COVER IN FEET

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CIRCULATED METAL

DIMENSIONS

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<td>46</td>
<td>65</td>
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1. Span and rise dimensions are measured to the inside crests of corrugations and may vary slightly depending on manufacturer.
1. The variable dimension indicated for the height of step for step mitered pipes shall conform to manufacturers' recommendations unless specified differently on the plans or in the special provisions.

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

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

4. When steel pipe safety bars are used, headwall thickness shall be increased to 8".

---

**STRUCTURAL PLATE PIPE ARCHES AND UNDERPASSES**

**STEP MITERED PIPE**

**FULL MITERED PIPE**

**PIPES AND STRUCTURAL PLATE PIPES**

**SECTION A-A**

**ANCHOR BOLT DETAILS**
TOP VIEW

Culvert is perpendicular to roadway
Headwall is placed parallel to roadway

SECTION A-A

8" x 24" x 5/8" Steel plate

1" x 4" Slot with 2" wide oval at bottom (TYP)
3/8" x 5/8" Bolt

STEEL PLATE

TOP

Culvert is skewed to roadway
Headwall is placed parallel to roadway

Install adhesive anchorage system

TYPE 1 SAFETY BARS FOR STEPPED CULVERT PIPE OR PIPE ARCH

ELEVATION

DETAIL A

8" x 24" x 5/8" threaded rod with nut
4 1/2" x 6" x 18" Blanking in headwall

HEADWALL

8" x 24" x 5/8" Steel plate

STEEL PLATE

EFFECTIVE: AUGUST 5, 2002 TO APRIL 6, 2003

NOTES

1. Sockets shall be 3" extra strong steel pipe (3½" OD). Sockets must be the proper angle to allow safety bar to be easily removed.

2. Safety Bar shall be 4" extra strong (4½" OD) steel pipe.

3. Bevel culvert pipe to match side slope.

Culvert DIA

<table>
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<th>Required number of pipes</th>
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<td>Up to 36&quot;</td>
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<td>96&quot; - 120&quot;</td>
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| 1 | 2 | 3 |

B-9a 1 of 1

05-09-97
1. Maximum span width is 54".

2. Spacing between safety bars, or between bars and the culvert crown shall be equal spaces of 30" maximum.
1. Connection is a 1/2" DIA threaded rod over top of end sections side lugs and bolted to end section. On 15" through 24" pipe, an alternative may be a 1" wide strap 16 gage or 12 gage galvanized steel, fastened with a 1/2" DIA, 6" long galvanized bolt and square head nut.

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

### METAL END SECTIONS FOR CIRCULAR PIPES

<table>
<thead>
<tr>
<th>Pipe Dia (Inches)</th>
<th>Minimum Thickness</th>
<th>Gage</th>
<th>A</th>
<th>H</th>
<th>Overall Width</th>
<th>Slope</th>
<th>Length Inches</th>
<th>Slope</th>
<th>Length Inches</th>
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<tbody>
<tr>
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<td>98 41</td>
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### METAL END SECTIONS FOR ARCHED PIPES

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<tr>
<th>Equivalent DIA Inches</th>
<th>Rise</th>
<th>Minimum Thickness</th>
<th>Gage</th>
<th>A</th>
<th>H</th>
<th>Overall Width</th>
<th>Slope</th>
<th>Length Inches</th>
<th>Slope</th>
<th>Length Inches</th>
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<td>42</td>
<td>66</td>
<td>41</td>
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<td>98</td>
<td>41</td>
<td>200</td>
<td>61</td>
<td>300</td>
</tr>
</tbody>
</table>

### TAPERED END SECTION WITH TYPE 4 SAFETY BARS (ON CROSS ROAD)

3" Galvanized pipe: Flatten end, then bend outside 4" to match end section sides.

### CROSS ROAD DRAINAGE STRUCTURE

**NOTES:**

- Reinforced edge full length of end section. See Section A-A.
- Safety bars (TYP) See Note 2.
- Galvanized steel rod 1/4" DIA MIN or No. 4 galvanized reinforcing bar.
- Edges of end section sheet rolled snugly against steel rod.
- 1/16" (Approximately)
- See SAFETY BAR END TREATMENT DETAIL.
- 30" and larger end sections may be multiple panels. Seams shall be lapped 2" and joined with 3/4" x 3/4" bolts on 6" centers maximum.
- 1/4" DIA max head bolts (TYP).
- 1/2" DIA carriage head bolts (TYP).
- Optional toe plate extension, 6" less than overall width.
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.

<table>
<thead>
<tr>
<th>CLEARANCE BETWEEN PIPES FOR MULTIPLE INSTALLATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIPE</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>CIRCULAR PIPE (DIAMETER)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>PIPE ARCH METAL ONLY (SPAN)</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
</tbody>
</table>
DUCTILE IRON DROP CONNECTION

CONCRETE ENCASED DROP CONNECTION
NOTES
1. Paint pipe threads with asphalt paint after assembly.
2. All piping to be galvanized steel.
3. Valve and piping to valve to be 2" unless otherwise noted on plan.
4. Locate blowoff outlet near property corner if possible.

PLAN

2" Female x 1"P x 2/3" male NPS hose connection with cap

ELEVATION

Drill 1/2" hole

15 Pound Asphal tic seat

Gravel packet

Solid concrete bearing block 4" x 8" x 16"

Cast iron valve box and lid

Gate valve with 2" square operating nut

Water main

Water box (locate in field)

Thrust block to clear piping

Concrete thrust blocking

Street elbow

Two 4" x 6" x 16" concrete blocks

Topped cap or plug

Varies

36'-6" H

2 Inch Blowoff Assembly
1. Size of combination air release/air vacuum valve shall be specified in the Contract. Piping and valves shall be the same size as the combination air release/air vacuum valve.

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

<table>
<thead>
<tr>
<th>PIPE DIA</th>
<th>TEST PRESSURE PSI</th>
<th>BEND ANGLE</th>
<th>CONCRETE VOLUME</th>
<th>CUBE SIZE FT</th>
<th>TIE ROD DIAM</th>
<th>TIE ROD EMBEMENT</th>
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<tbody>
<tr>
<td>4&quot;</td>
<td>250</td>
<td>11.25°</td>
<td>6</td>
<td>1.8</td>
<td>3/8&quot;</td>
<td>1/2&quot;</td>
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<tr>
<td></td>
<td></td>
<td>22.5°</td>
<td>12</td>
<td>2.3</td>
<td>5/8&quot;</td>
<td></td>
</tr>
<tr>
<td>6&quot;</td>
<td>250</td>
<td>11.25°</td>
<td>14</td>
<td>2.4</td>
<td>5/8&quot;</td>
<td>1/2&quot;</td>
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<tr>
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<td></td>
<td>22.5°</td>
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</tr>
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<td>3/4&quot;</td>
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<td>11.25°</td>
<td>38</td>
<td>4.5</td>
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<td></td>
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<tr>
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<td>250</td>
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<td>60</td>
<td>6.8</td>
<td>5/8&quot;</td>
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<td>250</td>
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<td>1&quot;</td>
<td>2&quot;</td>
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<tr>
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<td>250</td>
<td>11.25°</td>
<td>100</td>
<td>10</td>
<td>5/8&quot;</td>
<td>1/2&quot;</td>
</tr>
</tbody>
</table>

**CONCRETE BLOCKING FOR CONVEX VERTICAL BENDS**

BIG TRACKING FOR 11.25° OR 22.5° VERTICAL BENDS

Four tie rods with turnbuckles Thread 6"
1. Contractor to provide blocking adequate to withstand full test pressure.
2. Divide thrust by safe bearing load to determine required area (in square feet) of concrete to distribute load.
3. Areas to be adjusted for other pressure conditions.
4. Provide two 1” minimum diameter rods on valves up through 10” diameter. Valves larger than 10” require special tie rod design.

<table>
<thead>
<tr>
<th>Size</th>
<th>Pressure (PS)</th>
<th>Test Tee and End</th>
<th>90° Bend</th>
<th>45° Bend</th>
<th>22.5° Bend</th>
<th>11.25° Bend</th>
</tr>
</thead>
<tbody>
<tr>
<td>4”</td>
<td>250</td>
<td>3,140</td>
<td>4,440</td>
<td>2,405</td>
<td>1,225</td>
<td>615</td>
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<tr>
<td>6”</td>
<td>250</td>
<td>7,070</td>
<td>9,995</td>
<td>5,410</td>
<td>2,780</td>
<td>1,385</td>
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<td>8”</td>
<td>250</td>
<td>12,065</td>
<td>17,770</td>
<td>9,620</td>
<td>4,905</td>
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<td>10”</td>
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<td>27,770</td>
<td>15,030</td>
<td>7,660</td>
<td>3,850</td>
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<td>14”</td>
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<td>38,480</td>
<td>54,425</td>
<td>29,455</td>
<td>15,015</td>
<td>7,545</td>
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<td>16”</td>
<td>250</td>
<td>50,765</td>
<td>71,085</td>
<td>38,470</td>
<td>19,615</td>
<td>9,885</td>
</tr>
</tbody>
</table>

**Soil Type** | **Safe Bearing Load (PSF)**
--- | ---
Muck, peat, 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

**Concrete Thrust Block**
1. Knockouts shall have a wall thickness of 2" minimum to 2 1/4" maximum.
1. Knockouts shall have a wall thickness of 2" minimum to 2½" maximum.

**MANHOLE DIMENSION TABLE**

<table>
<thead>
<tr>
<th>DIA</th>
<th>WALL THICKNESS</th>
<th>BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT SIZE</th>
<th>MINIMUM DISTANCE BETWEEN KNOCKOUTS</th>
<th>BASE REINFORCING STEEL IN % OF EACH DIRECTION</th>
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</thead>
<tbody>
<tr>
<td>72&quot;</td>
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<td>8&quot;</td>
<td>60&quot;</td>
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<td>8&quot;</td>
<td>12&quot;</td>
<td>84&quot;</td>
<td>12&quot;</td>
<td>0.39</td>
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</tbody>
</table>

**SEPARATE CAST IN PLACE BASE**

**PRECAST BASE WITH INTEGRAL RISER**

**NOTES**

- Precast riser section
- Flat slab top
- Precast base with integral riser
- "O" Ring
- Reinforcing shelf
- Channel and shelf
- 1" MIN, 2½" MAX
- 72" or 96" £ 72" MIN
- 24:1 Slope
- Motor Fillet
- 6" or 5½" 4½" MIN
- 16" MAX
- Circular adjustment section
- Eccentric cone section
- Manhole ring and cover
NOTES
1. Knockouts shall have a wall thickness of 2" minimum to 2 1/2" maximum.

MANHOLE DIMENSION TABLE

<table>
<thead>
<tr>
<th>DIA</th>
<th>WALL THICKNESS</th>
<th>BASE THICKNESS</th>
<th>MAXIMUM KNOCKOUT SIZE</th>
<th>MINIMUM DISTANCE BETWEEN KNOCKOUTS</th>
<th>BASE REINFORCING STEEL in^2/ft IN EACH DIRECTION</th>
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<tbody>
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<td>12&quot;</td>
<td>84&quot;</td>
<td>12&quot;</td>
<td>0.29</td>
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</tbody>
</table>

MANHOLE TYPE 3

SEPARATE CAST IN PLACE BASE

PRECAST BASE WITH INTEGRAL RISER

Gravel backfill for pipe zone bedding

"O" Ring

SEPARATE PRECAST BASE
MANHOLE TYPE 4

SECTION

Reinforced concrete pipe

ELEVATION

Mortar

Weld reinforcing steel at joints

Precast riser sections

Steps or ladder

Eccentric cone section

Circular adjustment section

Manhole ring and cover

48" MIN

48" MAX

12'-0" MAX

4'-0" MIN

12'-0" MIN

Draft riser section to pipe

Reinforced concrete pipe
1. Gasket and groove may be in the seat or underside of cover.
2. For bolt-down manhole ring and covers that are not designated "watertight", the neoprene gasket, groove and washer are not required.
3. Washer shall be lead or neoprene.
4. In lieu of blind pick notch for storm sewer manhole covers, drill three 1" diameter holes at 120° spacing.
5. Proprietary manhole covers without bottom ribs are acceptable.
NOTES

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

2. The knockout diameter shall not be greater than 18". Knockouts shall have a wall thickness of 1/8" minimum to 2" maximum.

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

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

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

FRAME AND VANED GRATE

RECTANGULAR ADJUSTMENT SECTION

CONCRETE INLET
NOTES:
1. Precast cone sections may be eccentric or concentric.
2. Seepage port orientation varies among manufacturers.
CONCRETE COLLAR OPTION

CIRCULAR PIPE

CORRUGATED METAL PIPE

CONCRETE PIPE (SEE NOTE 2)

SEE NOTE 3

TYPE K COUPLING BAND (SEE NOTE 4)

COUPLING BAND OPTION

24" WIDE, 1" THICK RUBBER GASKET
IN ACCORDANCE WITH STD SPEC. 9-04.4(3)

NOTE:
1. CONCRETE COLLAR WIDTH SHALL BE ONE HALF OF THE OUTSIDE DIAMETER OF THE LARGEST PIPE. THE MINIMUM COLLAR WIDTH SHALL BE 12". CONCRETE COLLARS MAY BE USED WITH ALL PIPE MATERIALS AND DIAMETERS. THE CONCRETE COLLAR OPTION SHALL ONLY BE USED TO EXTEND EXISTING PIPEWORK.

2. WHEN A COUPLING BAND CONNECTION REQUIRED ATTACHING A BELL END OF A CONCRETE PIPE THE BELL END OF THE PIPE SHALL BE REMOVED BEFORE THE CONNECTION IS INSTALLED.

3. INCREASE THE OUTSIDE DIAMETER OF THE METAL PIPE TO MATCH THE OUTSIDE DIAMETER OF THE CONCRETE PIPE WITH 1/8" WIDE RUBBER GASKETS. THICKNESS AS REQUIRED. RUBBER GASKETS SHALL BE IN ACCORDANCE WITH SECTION 9-04.4(3) OF THE STANDARD SPECIFICATIONS.

4. USE A PLAIN TYPE K COUPLING BAND. TYPE K COUPLING BANDS WITH DIPPLES ARE NOT ALLOWED FOR THE INSTALLATION DETAILED SHOWN. THE COUPLING BAND OPTION SHALL ONLY BE USED FOR EXTENDING EXISTING PIPE THAT HAVE AN INSIDE DIAMETER OF 36" OR LESS.

5. STEEL WELDED WIRE FABRIC SHALL BE IN ACCORDANCE WITH SECTION 9-07.7 OF THE STANDARD SPECIFICATIONS. INSTALL TWO WRAPS FOR SIZE 8 x 8, W14 x W14 (10 BASE STEEL WELDED WIRE FABRIC OR ONE WRAP FOR ANY OF THE FOLLOWING SIZES:

- 8 x 8 W2,1 x W2,1 (8 BASE)
- 8 x 8 W2,9 x W2,9 (8 BASE)
- 4 x 4 W3,0 x W3,0 (8 BASE)
- 4 x 4 W4,0 x W4,0 (8 BASE)
NOTES

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

2. Mark location of sewer stub in accordance with Contracting Agency requirements.
STANDING SIDE SEWER CONNECTION
STANDARD PLAN B-30

45° bend

4" or 6" Sewer Pipe
(See Contract)

Tee

24" x 24" x 24" Concrete block
or Controlled Density Fill

Sewer main

NOTE: This is not a legal engineering document but a working draft.
The original drawing by the engineer has approved for publication is kept on file
by the Washington State Department of Transportation. A copy may be obtained
upon request.

Clifford E. Mansfield
8/10/99

APPROVED FOR PUBLICATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

EXPIRES JULY 1, 1999

PROFESSIONAL ENGINEER
**WOOD POST ASSEMBLY DETAIL**

- Type 1 and 2 rails:
  - 5/8" x 18" button head bolt with 1/2" oval grip and recessed hex nut
  - See Note 4, 5, and 6

- Type 3 and 4 rails:
  - 5/8" x 25" button head bolt with oval grip and recessed hex nut or 5/8" rod threaded both ends with hex nuts

- 5/8" x 1/2" Button head splice bolt with 5/8" oval grip and recessed hex nut (length required per splice). Screwdriver slot or milled wrench shoulders in bolt heads.

**STEEL POST ASSEMBLY DETAIL**

- Type 1 and 2 rails:
  - 3/4" x 10" button head bolt with 5/8" oval grip and hex nut and cut washer

- Type 3 and 4 rails:
  - 5/8" Carriage bolt with hex nut and post bolt washer in 3/4" hole

- 5/8" Carriage bolt with hex nut and post bolt washer in 3/4" hole

**BEAM GUARDRAIL (W BEAM)**

**STANDARD PLAN C-1**

Sheet 1 of 2 sheets

**NOTES:**
- All HC and HC outrigger guardrail posts are 6x6 and 16x16 HDG.
- All guardrail posts are 6" long.
- Steel guardrail posts are 3.125" long - 1/4" hex head bolts with 5/8" oval grip and recessed hex nut.
- Face rivets are 5/16"x1 1/2" HDG.
- See Notes 4, 5, and 6.

**APPROVED FOR PUBLICATION**

Clifford E. Mansfield
Deputy State Design Engineer

Washington State Department of Transportation

7/31/98
1. When required by the contract, a Snow Load Post Washer shall be used on the backside of the post in lieu of the 1/2" post bolt washer and a Snow Load Rail Washer shall be placed on the face side of Type 1 and Type 2 Beam Guardrail. Snow load rail washers are not to be installed on terminals.

2. Rail washers, also called “snow load rail washers” are not required on new installations, except as called for in Note 2. Rail washers need not be removed on existing installations, except posts 2 through 8 of a BCT installation.

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

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

5. For post and block details see Standard Plan "Beam Guardrail Posts and Blocks."

6. When Beam Guardrail Type 1, 2 Foot Long Post, is specified in Contract, the post length shall be stamped with numbers 1/2" MIN height and 1/4" deep at the location where the letter "N" is shown on the detail. After installation of long post, it shall be the Contractor’s responsibility to ensure that the stamped numbers are still legible and 1/4" deep.

7. When Beam Guardrail Type 1, 2 Foot Long Post, is specified in the Contract, steel post lengths shall be increased 1"-0" for doweled or bolted installation. The identification stamp of the long post shall remain as specified by the Contract.
NOTES
1. Type 10 posts shall be 6x6 timber or 6x6x9.
   Type 11 posts shall be 10x10 timber or 6x6x15.
   For details, see "Standard Plan "Beam Guardrail Posts and Blocks."
2. Type 10 guardrail post spacing shall be 6'-3" on center.
   Type 11 shall be a maximum of 3'-6½" on center.

THRIE BEAM RAIL ELEMENT

THRIE BEAM EXPANSION SECTION

STEEL POST ASSEMBLY

TYPE 10 and 11

STANDARD PLAN C-1a
NOTES

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

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

3. Wood steel posts and timber blocks are alternate for 6x8 timber posts and blocks. 7'-0" long 8x15 steel posts and timber blocks are alternate for 6'-0" long 10x10 timber posts and blocks.

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

5. When contract requires "Beam Guardrail Type 1, 1.25 Foot Long Post," the steel post length shall be marked with numbers to indicate permanent identification at the location where the letter "P" is shown on the detail. The marking shall be 1/2" W x H height.

6. When contract requires "Beam Guardrail Type 1, 1.25 Foot Long Post," steel post lengths shall be increased by 0.5 meter for larger and bubbling [insert] installation. The identification stamp of the long post shall remain as specified by the contract.

7. Soil plate may be grouted to foundation tube. If so, holes in soil plate and foundation tube may be omitted.
DETAIL A

\( \frac{3}{4} \)" DIA x \( \frac{1}{2} " \) hex head bolt with hex nut and 1\( \frac{1}{4} " \) square x .135" washer

DETAIL B

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

See Detail A

See Detail B

G-2 Post

(See Note 1)

TYPE 20

TYPE 21

BEAM GUARDRAIL

NOTES
1. For post details see Standard Plan, "Beam Guardrail Posts and Blocks".
1. Saw top of post and block to 1" above thrie beam guardrail reducer section.
NOTES

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

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

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

4. The slope from the edge of the shoulder to 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 Terminal(s) are used on both ends a minimum of 25'-0" of Beam Guardrail shall be installed.
NOTES
1. Past spacing is 6'-3" except where noted.
2. For terminal type and details, see Contract and applicable Standard Plans.
3. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1 when the guardrail is within 12'-0" from the edge of the shoulder.
4. See Contract for dimensions.
5. See Contract for Guardrail Transition Section and Guardrail Connection to Bridge Rail or Concrete Barrier.

FLARE RATE TABLE

<table>
<thead>
<tr>
<th>RATE</th>
<th>PIVOTED SPEED (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15'-1</td>
<td>70</td>
</tr>
<tr>
<td>14'-1</td>
<td>60</td>
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<td>12'-1</td>
<td>55</td>
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<tr>
<td>11'-1</td>
<td>50</td>
</tr>
<tr>
<td>10'-1</td>
<td>45</td>
</tr>
<tr>
<td>9'-1</td>
<td>40 or less</td>
</tr>
</tbody>
</table>

CASE 6

MEDIAN

36'-0" MIN

Bridge end

Bridge rail

Variates (see Note 4)

See Note 3

Curb face extension line

See Note 3

Transition pay limit (see Note 5)

Beam Guardrail pay limit

10'-0" - 55 mph or less
13'-6" - 60 mph
20'-0" - 70 mph

See Note 2

See Flare Rate Table

One Way Traffic
1. Attach standard wood or steel blocks to concrete structure with 1/2" expansion anchor or 3/4" threaded rod in a 1" x 8" hole grouted with epoxy.

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

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

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

5. Thrie Beam Guardrail Reducer Section Type B.

6. This Type 16 Transition shall end at a 10 x 10 post. Place nested thrie beam with 10 x 10 posts at 3'-1/2" MAX spacing between the end of the transition and the structure.

**Flare Rate Table**

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

**CASE 7**

**CASE 8**
### Guardrail Placement

**Median Bull Nose**

**Standard Plan C-2c**

**EFFECTIVE:** AUGUST 5, 2002 TO APRIL 6, 2003

**CASE 9**

<table>
<thead>
<tr>
<th>Table of All Dimensions in Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>$W$ (ft)</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>14'</td>
</tr>
<tr>
<td>15'</td>
</tr>
<tr>
<td>16'-25'</td>
</tr>
<tr>
<td>24'-29'</td>
</tr>
<tr>
<td>30'-35'</td>
</tr>
</tbody>
</table>

**Notes**

1. $L_1$ and $L_2$ are measured along the tangent line. $X_1$ and $X_2$ are measured from the tangent line to the face of the guardrail.

2. The distance between the Type T anchors is measured from centerline to centerline of anchor posts.

3. The guardrail should be curved and tapered to fit. Reverse curves shall not be used.

4. Type T anchor required.

5. For bridge connection details, see applicable Standard Plans.

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

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

8. Within this area, the slope normal from each roadway should not be steeper than 10:1. The slope in the longitudinal direction should be approximately level.

9. The nose terminal section shall be lapped to the outside of each connecting guardrail section. All other laps shall be in the direction of traffic.

10. For Transition Type and details, see the Contract and applicable Standard Plans.

**Word of Traffic**

**Face of Bridge Rail**
GUARDRAIL PLACEMENT

STANDARD PLAN C-2d

NOTES
1. SRT Terminal shown, for terminal type and details, see Contract or applicable Standard Plans.
2. Post spacing is 6'-3" except where noted.
3. Type 4 anchor required. See applicable Standard Plans.
4. The slope from the edge of the shoulder into the face of the guardrail should not exceed 10% when the guardrail is within 12'-0" from the edge of the shoulder.

CASE 10A

CASE 10B

CASE 10C
1. SKI Terminal shown. For terminal type and details see Contract and applicable Standard Plans.

2. Attach standard blocks to concrete structure with 1/8" DIA expansion anchor or 5/8" DIA threaded rod in a 1" DIA x 8" hole grouted with epoxy.

3. Type 4 anchor or Type 4 anchor (Thrie Beam) required.

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

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

6. Thrie Beam Guardrail Reducer Section Type B.

7. Guardrail post spacing for Type 11 Guardrail past the End Bridge Pier shall be at 6'-3" spacing, maximum, with 6 x 8 post and standard block.
1. See Contract for guardrail connection to bridge rail and concrete barrier.

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

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

4. For terminal type and details, see Contract and applicable Standard Plans.

5. Radius dimensions shall be etched into plate replacing the letters "MM", shown on the Identification Plate Detail. Digits shall be 1/4" MIN height and 3/4" MAX width. The plate shall be galvanized after etching.

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

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

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

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

Guardrail Placement
Weak Post Intersection Design (8'- 6" Max Radius)
NOTES
1. For Service Level I, Weak Post Bridge Rail System, see Contract.
2. SRT Terminal shown. For Terminal type and details, see Contract and applicable Standard Plans.
3. The slope from the edge of the shoulder into the face of the guardrail should not be steeper than 10:1.
4. See Standard Plan "Beam Guardrail Posts and Blocks".
1. SRT Terminal shown. For Terminal type and details, see Contract and applicable Standard Plan(s).

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


CASE 15

GUARDRAIL PLACEMENT

DETAIL

See Note 3

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

2. For terminal type and details, see contract and applicable Standard Plan(s).

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

4. For guardrail to bridge rail connection see applicable Standard Plan(s) or Contract.

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

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</tr>
</tbody>
</table>

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**GUARDRAIL PLACEMENT**

**STANDARD PLAN C-2j**

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**EFFECTIVE: AUGUST 5, 2002 TO APRIL 6, 2003**

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Clifford E. Mansfield  
DEPUTY STATE DESIGN ENGINEER  
6/12/98

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CASE 21

8" x 8" STORM CULTURE BLOCKS

WASH. DEPT. OF TRANSPORTATION

NOTES:

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

2. One-way traffic layouts are identical to the two-way layout with the exception that only the posts entering the span need to be
  C&R's with double blocks.

ELEVATION

PLAN

TWO-WAY TRAFFIC

TYPE 1 AND 2 BEAM PAY LIMIT

10" OF HEAVEY W-BEAM RAIL ELEMENTS

BEAM GUARDRAIL PLACEMENT - 25" SPAN PAY LIMIT

TYPE 1 W-BEAM

PAY LIMIT

25'-0" SPAN

STANDARD PLAN C-2a

GUARDRAIL PLACEMENT

WOOD BLOCKS

1 1/2" x 1 1/2" BOLT WITH 1 1/2" LOOSE NUT

WASH. DEPT. OF TRANSPORTATION

EXPRESSES MAY 5, 2023

WASHINGTON DISTR. DEPARTMENT OF TRANSPORTATION

APPROVED FOR PUBLICATION

Clifford E. Mansfield
07-13-91

EFFECTIVE: AUGUST 5, 2002 TO APRIL 6, 2003
NOTES

1. See Contract for transition and connection type.

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

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

4. First letter of code 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 1½” MIN height and ½” 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.

GUARDRAIL PLACEMENT

STRONG POST INTERSECTION DESIGN

IDENTIFICATION PLATE MOUNTING DETAIL

(See Note 6)
GUARDRAIL TRANSITION SECTIONS
STANDARD PLAN C-3

NOTES:
1. See Standard Plan, "Guardrail Connection to Bridge Rail or Concrete Barrier."
2. Use 6"-0" long 10x10 timber posts with 8x8 blocks.
3. Use 6"-6" long 10x10 timber posts with 8x8 blocks.

TYPE 1

12'-6" Nested thrie beam

Transition pay limit

Beam guardrail pay limit

Five spaces at 3'-11/2" MAX

Thrie beam guardrail reducer section Type B

See Note 1

6x8 Post with standard block (TYP)

TYPE 2

12'-6" Nested W-beam

Transition pay limit

Beam guardrail pay limit

Five spaces at 3'-11/2" MAX

Thrie beam guardrail reducer section Type B

See Note 1

6x8 Post with standard block (TYP)

See Note 2

0 or E Connection

See Note 3

Approved for publication by:
Clifford E. Mansfield
DEPUTY STATE DESIGN ENGINEER
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
OLYMPIA, WASHINGTON

Approved: 8/10/98

REVISED: 8/8/98

APPROVED NOTE 3

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GUARDRAIL TRANSITION SECTIONS

TYPE 3

Five spaces at 3'-1½" MAX

See Note 1

6x8 Post with standard block (TYP)

TYPE 4

(For Construction and Maintenance Operations only)

Three spaces at 3'-1½" MAX

See Note 1

Added 6x8 posts with standard block

Existing 6x8 posts with standard block

TYPE 5

Four spaces at 1'-6½" MAX

Two spaces at 3'-1½" MAX

1'-3" MAX

(total length = 6'-3"

See Note 1

6x8 Post with standard block (TYP)

TYPE 6

Eight spaces at 3'-1½" MAX (Total length = 25'-0"

C-2 Post (TYP)

6x8 Post with standard block

NOTES

1. See Standard Plan, "Guardrail Connection to Bridge Rail or Concrete Barrier."

2. For post details, see Standard Plan, "Beam Guardrail Posts and Blocks."
1. See contract for number of three beam sections for bridge rail.

2. If the distance from the end of the bridge to the end of the three beam bridge rail section exceeds 6’-3” using 12’-6” three beam sections, add a 6’-3” section of three beam bridge rail to reduce the length to less than 6’-3”.

3. An ACP ramp is required from the roadway surface to the top of the bridge curb or sidewalk. The slope of the ramp shall be 20:1 or flatter.
1. See Contract for the number of thirle beam sections for Type II Guardrail.

2. If the distance from the end of the Type II Guardrail to column/structure exceeds 6' - 3" using 12' - 6" thirle beam sections, add a 6' - 3" nested section of thirle beam to reduce the distance to less than 6' - 3".
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 anchoring 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" (MIN)
NOTES:

1. An ET2000-PLUS (TL3) as manufactured by Triilly Industries, Inc. or an SKT-350 as manufactured by Road Systems Inc. shall be installed according to manufacturer's recommendations. When a TL2 terminal is specified in the contract an ET 2000-PLUS (TL2) as manufactured by Triilly Industries, Inc. or an SKT-TL2 as manufactured by Road Systems, Inc. shall be installed according to manufacturer's recommendations.

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

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

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

5. Length for ET 2000-PLUS (TL3) and SKT-350 is 50’. Length for ET 2000-PLUS (TL2) and SKT-TL2 is 29’.
1. Attach guardrail to bridge rail or concrete barrier using 3⁄4" high strength bolts with chemically bonded anchors.

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

3. This case is also applicable for vertical faces with no curbs.
1. Anchor plate may be constructed from 3/4" plates welded to equal strength and dimensions as shown.

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

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

4. Eight 3/4" x 1/2" machine bolts with hex nut and washer. Place washer on face side of rail.

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

6. Torqued 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.
ELEVATION

3" x 2 1/4" x 1/2" End plate

1/8" Hole (tight required)

SECTION B-B

ANCHOR PLATE

(See Note 1)

BEAM GUARDRAIL ANCHOR

TYPE 1

1" x 7" Stud threaded full length (TYP)

1/4" Cable Swage

1/8" Hole

1/4" Steel plate

3/8" x 1" x 8" plate
tack welded to 3/8" plate

ANCHOR RAIL WASHER

8" Cage MIN

6'-6"

5 1/4"

3/4"

1 1/4"

1/32"

1/4"

1 1/4" Hole (TYP)
1. Roll section and W8 x 17 post shall be fabricated to receive 3/8" hex head bolts as shown.

2. All bolts shall be high strength 3/8" hex head bolts with anchor roll washers.
NOTES
1. For details, see Standard Plan C-6c.
2. For end section details, see Standard Plan C-7 or C-7a.
3. For details, see Standard Plan C-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.
1. Attach W-beam to steel pipe with 3/8" x 1/4" button head bolt with no washer. No connection to the post is required.

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

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

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

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

6. Anchor post assemblies (See Note 4)
NOTES

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

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

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

4. Post shall match beam guardrail posts.

BEAM GUARDRAIL ANCHOR
TYPE 7 ANCHOR
NOTES

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

2. Bolts shall be 5/8" ASHTO M 164 chemically bonded anchors. Anchor installation shall be per manufacturer’s recommendations, in dry conditions.

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 "K" end section is lapped on the outside of the guardrail, a galvanized 1 1/2" x 2 1/2" x 0.134" thick, narrow type A Plain Washer or a anchor rail washer shall be placed under the splice bolt heads.

BEAM GUARDRAIL END SECTIONS
STANDARD PLAN C-7

Clifford E. Mansfield
DEPUTY STATE DESIGN ENGINEER
8/10/98

APPROVED FOR PUBLICATION

WASHINGTO STATE DEPARTMENT OF TRANSPORTATION
EVERETT, WASHINGTON
NOTES

1. Bolts shall be high strength, 3/4", with chemically bonded anchors.

2. In cases where Design F End Section is lapped on the outside of the guardrail, a galvanized 1" OD, 2" OD, 0.134" thick, narrow Type A Plain washer or an anchor roll washer will be placed under the splice bolt heads.
1. Wire rope loops shall be 44" long, except for top loop of Terminal, which shall be 24" long.

2. Wire seizing shall be eight wraps of 16 gauge wire with ends twisted together, or equivalent fastening.
1. For details on loops, connecting pin, reinforcing steel, and terminal unit see Standard Plan Concrete Barrier Type 2.

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

3. At the juncture between the Concrete Barrier Type 5 and the Bridge Barrier, cover the exposed foot of the Type 5 Barrier with an earth berm.
CABLE BARRIER

Type 1

Type 2

Type 3

Holes in back of web required only for alternate hook bolts

Detail A

Detail B

Detail C
1. When installed in front of slopes steeper than 6% distance between posts and slope break point shall be 12" Min.

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

CABLE BARRIER PLACEMENT
STANDARD PLAN C-11a

Table A

<table>
<thead>
<tr>
<th>Curve Radius</th>
<th>Post Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>700' or more</td>
<td>16'</td>
</tr>
<tr>
<td>699' to 220'</td>
<td>12'</td>
</tr>
<tr>
<td>219' to 110'</td>
<td>6'</td>
</tr>
<tr>
<td>Less Than 110'</td>
<td>Use Not Recommended</td>
</tr>
</tbody>
</table>
1. Stagger Spring Cable End assemblies for clearance between units. Installation of cable end assemblies shall be as follows:

**LENGTH OF CABLE RUNS:**
- Up to 500’ - Use the Spring Cable End Assembly on one end, and turnbuckle only on the other end of each cable.
- Over 500’ to 2000’ - Use the Spring Cable End Assembly on each end of each cable.

2. See Standard Plan C-11a for post spacing.

3. Distance from tangent of barrier run to notch for top cable on breakaway anchor shall be 4’.

4. The distance from the top of the footing to top of the highest cable is:
   - 21” for TYPE 1 Cable Barrier,
   - 30” for TYPE 2 and TYPE 3 Cable Barrier.

5. Where the cable is connected to a cable socket with a wedge type connector, one wire of the wire rope shall be crimped over the base of the wedge to hold it firmly in place.
Standard turnbuckle 12" takeup

Right-hand threads 2"

Flatten for wrench

Flatten for wrench

Galvanized spring wire 3/16" DIA

2 1/2" Right-hand threads

Spring stop 4 1/2" long

3/4" Hex nut

SPRING CABLE END ASSEMBLY

1/4" Cable

Cable end (cast steel or malleable iron)

Flatten for wrench

Plain washer 3/8" ID x 1/2" OD x 0.165"

Two plain washers 3/8" ID x 1/2" OD x 0.148"

3/8" Welding rod, ends bent to keep in place

Two 3/8" hex nuts

CABLE END ASSEMBLY TO BREAKAWAY ANCHOR ANGLE DETAIL

Brass keeper rod must be installed prior to tensioning cable

BREAK AWAY ANCHOR ANGLE

0.0125 R

0.203" (Typ)

0.037"

0.0647"

0.032"

Breakaway anchor angle

CABLE WEDGE

Use with all cable fittings

TURNBUCKLE ASSEMBLY

1/2" #

1/4" (Typ)

1/2" DIA

INNER GUSSET 1/2" Plate

SIDE VIEW

KEEPER PLATE DETAIL

EXPIRES MAY 16, 2003

CABLE BARRIER TERMINAL

STANDARD PLAN C-41b

SHEET 2 OF 2 SHEETS
NOTES

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

2. When connecting between cast-in-place and prestressed single slope barrier, provide a slot and rebar grid as shown in Standard Plan C-13.

SINGLE SLOPE CONCRETE BARRIER (DUAL FACE)
STANDARD PLAN C-14a

REINFORCING STEEL BENDING DIAGRAM

DIMENSION TABLE

<table>
<thead>
<tr>
<th>GRADE SEPARATION</th>
<th>BARRIER HEIGHT</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 TO 1'</td>
<td>2' 3'</td>
<td>1'</td>
<td>4'</td>
<td>4'</td>
<td>6'</td>
</tr>
<tr>
<td>UP TO 3'</td>
<td>4' 4' 3'</td>
<td>2'</td>
<td>7'</td>
<td>3'</td>
<td>8'</td>
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<tr>
<td>UP TO 6'</td>
<td>4' 4' 3' 2' 1'</td>
<td>3'</td>
<td>9'</td>
<td>4'</td>
<td>9'</td>
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</table>

EFFECTIVE: AUGUST 5, 2002 TO APRIL 6, 2003

EXPRESS: JULY 24, 2004

APPROVED FOR PUBLICATION: 07-25-02

Washington State Department of Transportation
SINGLE SLOPE CONCRETE BARRIER (VERTICAL BACK)
STANDARD PLAN C-14a

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

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

REINFORCING STEEL BENDING DIAGRAM

ALL BENDS ARE 2" RADIALS
NOTES:

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

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

3. When Wall Type 3-5w (saltwater) is specified, the concrete cover over steel in the front face and the total wall thickness shall be increased by 1".

4. When Wall Type 3-5w (saltwater) is specified, concrete in the table column "Material Quantity" shall be increased by 0.003 x N CY/FL.

5. Concrete in the 24" foot wall sections shall be placed separately between expansion joints with a minimum 24 hour period between concrete placement.
<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>FOOTING REINFORCEMENT</th>
<th>STEM REINFORCEMENT</th>
<th>MATERIAL QUANTITY</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>BAR E (size #4)</td>
<td>BAR F</td>
<td>BAR K</td>
</tr>
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WALL DESIGN WITH SLOPING FRONT FACE AND 2:1 BACKSLOPE

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

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

APPROVED FOR PUBLICATION
Clifford E. Mansfield 10/06/99
DEPUTY STATE DESIGN ENGINEER DATE
WASHINGTOM STATE DEPARTMENT OF TRANSPORTATION CAPITAL, WASHINGTON

EFFECTIVE: AUGUST 5, 2002 TO APRIL 6, 2003

EFFECTIVE: AUGUST 5, 2002 TO APRIL 6, 2003
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<tr>
<th>Dimensions</th>
<th>Footing Reinforcement</th>
<th>Stem Reinforcement</th>
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**WALL DESIGN WITH VERTICAL FRONT FACE AND 2 1/2 BACKSLOPES**
### Wall Design with Sloping Front Face and 2:1 Backslope

#### Reinforced Concrete Retaining Wall

**Type 6 and 6 SW Standard Plan D-1f**

**Effective: August 5, 2002 to April 6, 2003**

---

#### Dimensions

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---

**Concrete** (Yard/Lb/Ft)

**Steel** (Lb/Ft)

EXPRES JUNE 24, 2000

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**Note:** This plan is not a legal engineering document but an electronic duplicate of the original that was reviewed and approved for publication by the Washington State Department of Transportation. A copy may be obtained upon request.

---

**Approved for Publication**

Clifford E. Mansfield

**Date:** 10/0999

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

---

**Sheets:** 2 of 2
FOOTING WIDTH TRANSITION DETAIL
(for locations without footing step)
NOTE: Transverse bars not shown

JOINT AND CORNER DETAIL

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

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

NOTE: Transverse bars not shown

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

D-2c
03-14-97
## TYPICAL SECTION

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

### Notes
1. Wall to be designated Noise Barrier Type SA, SB, SC or SD. The Contract specifies actual wall designations.
2. For intermediate wall heights, use the next higher H.
3. Panels shall have at least 3 feet MIN of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet maximum.
5. The Contract specifies actual foundation requirements DI or D2.

### Joint and Corner Detail

- **Angle point**
- **Corner Bar D**
- **Reinforced per listed panel height reinforcement schedule**
- **Traffic side**

### Noise Barrier - Type 5
**Cast-in-Place with Traffic Barrier on Trench Footings**

### Trench Footing

**8" Chamfer (Typ)**

**3' 0" MIN**

**2" MAX 1**

**2" R**

**1' 9"**

**3' 0" MIN**

**2" CLEARANCE**

**Bar C**

**Construction joint (see Note 4)**

**Bars A, C, D and E space as shown on table**

### Table:

<table>
<thead>
<tr>
<th>Wall H</th>
<th>Type SA</th>
<th>Type SB</th>
<th>Type SC</th>
<th>Type SD</th>
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NOTES:
1. Wall to be designated Noise Barrier Type 10A, 10B, 10C or 10D. The contract specifies actual wall designation.
2. For intermediate wall heights, use the next higher H.
3. Panels shall have at least 3'-0" of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet maximum.
5. All joints shall be in full contact and sealed.

NOISE BARRIER - TYPE 10
PRECAST CONCRETE WALL WITH OFFSET SPREAD FOOTING

TYPICAL SECTION

D-2j
03-14-97
DETAIL B

FOOTING WIDTH TRANSITION DETAIL

FOR LOCATIONS WITHOUT FOOTING CLEARANCE

NOTE: Transverse bars not shown

NOISE BARRIER - TYPE 10
PRECAST CONCRETE WALL WITH OFFSET SPREAD FOOTING
**WALL REINFORCEMENT**

Outside of pilaster to outside of pilaster minus 4½

**Step Detail**

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<th>Hole Dia</th>
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</table>

**Bar B**

Button head shall bear firmly and uniformly against base plate. Bar B shall be held secure during concrete placement to prevent gaps between button head and base plate.

**Deformed Reinforcement Bar**

**Standard Rivet Head Based on Nominal Size Bar**

**End Panel**

Panel length - 12'-0" MAX

**Optional Shear-Key**

**Shear-Key**

**Noise Barrier - Type 11**

Precast concrete wall on shaft foundation
<table>
<thead>
<tr>
<th>ANGLE (Degree)</th>
<th>DIMENSION A (Inches)</th>
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<tbody>
<tr>
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<tr>
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<tr>
<td>90</td>
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</tr>
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</table>

**OPTIONAL ANGLE POINT**

**NOISE BARRIER - TYPE 11**

PRECAST CONCRETE WALL ON SHAFT FOUNDATION

D-2k

03-14-97
1. Walls to be designated Noise Barrier Type 12A, 12B, 12C and 12D. The contract specifies actual wall designation.

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

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

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

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

6. All joints shall be in full contact and sealed.
Joint and Corner Detail

Bar A

Bar C

Noise Barrier - Type 12
Precast Concrete Wall with Traffic Barrier on Trench Footing

Trench Footing
See Note 3
### TYPE 13A

<table>
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<tr>
<th>WALL HT H</th>
<th>X</th>
<th>BAR B and C</th>
<th>BAR E</th>
<th>BAR D</th>
<th>BAR J</th>
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<tr>
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<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#3 at 15&quot;</td>
</tr>
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<td>#4 at 15&quot;</td>
<td>#3 at 15&quot;</td>
</tr>
<tr>
<td>14'-0&quot;</td>
<td>4`-9&quot;</td>
<td>1&quot;</td>
<td>#4 at 11&quot;</td>
<td>#4 at 11&quot;</td>
<td>#3 at 11&quot;</td>
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<td>#4 at 10&quot;</td>
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### TYPE 13B

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<th>BAR J</th>
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</thead>
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<td>5`-6&quot;</td>
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<td>#4 at 15&quot;</td>
<td>#3 at 15&quot;</td>
</tr>
<tr>
<td>8'-0&quot;</td>
<td>5`-3&quot;</td>
<td>1&quot;</td>
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<td>#4 at 15&quot;</td>
<td>#3 at 15&quot;</td>
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<tr>
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<td>#4 at 15&quot;</td>
<td>#3 at 15&quot;</td>
</tr>
<tr>
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<td>5`-0&quot;</td>
<td>1&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#3 at 15&quot;</td>
</tr>
<tr>
<td>14'-0&quot;</td>
<td>4`-9&quot;</td>
<td>1&quot;</td>
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<td>#4 at 12&quot;</td>
<td>#3 at 12&quot;</td>
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<tr>
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<td>5`-0&quot;</td>
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<td>#4 at 12&quot;</td>
<td>#4 at 12&quot;</td>
<td>#3 at 12&quot;</td>
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<tr>
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### TYPE 13C

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<th>BAR J</th>
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<td>1&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#3 at 15&quot;</td>
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<tr>
<td>8'-0&quot;</td>
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<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#3 at 15&quot;</td>
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<tr>
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<td>5`-3&quot;</td>
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<td>#4 at 15&quot;</td>
<td>#3 at 15&quot;</td>
</tr>
<tr>
<td>12'-0&quot;</td>
<td>5`-0&quot;</td>
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<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#3 at 15&quot;</td>
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<td>14'-0&quot;</td>
<td>4`-9&quot;</td>
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<td>#4 at 12&quot;</td>
<td>#3 at 12&quot;</td>
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### TYPE 13D

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<th>BAR J</th>
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<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#3 at 15&quot;</td>
</tr>
<tr>
<td>8'-0&quot;</td>
<td>5`-3&quot;</td>
<td>1&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#3 at 15&quot;</td>
</tr>
<tr>
<td>10'-0&quot;</td>
<td>5`-3&quot;</td>
<td>1&quot;</td>
<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#3 at 15&quot;</td>
</tr>
<tr>
<td>12'-0&quot;</td>
<td>5`-0&quot;</td>
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<td>#4 at 15&quot;</td>
<td>#4 at 15&quot;</td>
<td>#3 at 15&quot;</td>
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<tr>
<td>14'-0&quot;</td>
<td>4`-9&quot;</td>
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<td>#4 at 12&quot;</td>
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<tr>
<td>18'-0&quot;</td>
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<td>#4 at 12&quot;</td>
<td>#4 at 12&quot;</td>
<td>#3 at 12&quot;</td>
</tr>
</tbody>
</table>

---

**NOTES**

1. Wall to be designated Noise Wall Type 13A, 13B, 13C or 13D. The Contract specifies actual wall designations.
2. For intermediate wall heights, use the next higher H.
3. Panels shall have at least 3 feet of level ground on each side.
4. Construction joints in the footing shall be spaced at 120 feet maximum.
5. All joints shall be in full contact and sealed.
6. The Contract specifies actual foundation requirements 51 or 52.

---

**NOISE BARRIER - TYPE 13**

**PRECAST CONCRETE WALL WITH TRAFFIC BARRIER ON SPREAD FOOTING**

---

See Note 4

**TYPICAL SECTION**

---

See Note 4

**ELEVATION**

---

See Note 4

---

**REINFORCEMENT SECTION**

---

See Note 4

---

**DIAGRAM**

---

**Sheet 1 of 2 Sheets**
**TO APRIL 6, 2003**

**NOTES**

1. Wall to be designated Noise Barrier Type 14A, 14B, 14C, or 14D. The Contract specifies actual wall dimensions.

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

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

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

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

---

**TYPICAL SECTION**

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

---

**SECTION AT SHAFT SUPPORT**

---

**SECTION C-C**

---

**NOISE BARRIER - TYPE 14**

**PRECAST CONCRETE WALL WITH TRAFFIC BARRIER ON SHAFT FOUNDATION**

---

**D-2n 03-14-97**
At expansion joints, continuous expansion joint filler placed in both block recesses. Size as required.

TYPICAL EXPANSION JOINT

*5 (TYP)
See Detail A

Traffic side
Right-of-way side

Polyurethane sealant
Backer rod

DETAIL A
Typical both sides of wall

BOND BEAM DETAIL

Bond beam unit
Bond beam limit
Bond beam limit

NOISE BARRIER - TYPE 16
MASONRY WALL
ON TRENCH FOOTING
### Bar Size Splice Length

<table>
<thead>
<tr>
<th>Bar Size</th>
<th>Splice Length</th>
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</thead>
<tbody>
<tr>
<td>5</td>
<td>2'-9&quot;</td>
</tr>
<tr>
<td>7</td>
<td>3'-6&quot;</td>
</tr>
<tr>
<td>8</td>
<td>4'-10&quot;</td>
</tr>
</tbody>
</table>

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

### Bond Beam Detail
- 5 at 4'-9" MAX (TYP)

### Typical Width Transition Detail
- For locations without footing step.
- Note: Transverse bars not shown.

### Noise Barrier - Type 17
- Masonry Wall on Spread Footing
### Noise Barrier - Type 18

**Masonry Wall on Offset Spread Footing**

#### Effective: August 8, 2002 to April 6, 2003

<table>
<thead>
<tr>
<th>WALL H</th>
<th>X</th>
<th>W</th>
<th>BAR A</th>
<th>BAR C</th>
<th>BAR D</th>
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<td>4'-4&quot;</td>
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<td>*#6 at 18&quot;</td>
<td></td>
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<td>8&quot;</td>
<td>3'-3&quot;</td>
<td>4'-4&quot;</td>
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<td>*#6 at 18&quot;</td>
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<td>5'-1&quot;</td>
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<td>*#6 at 18&quot;</td>
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<td>4'-0&quot;</td>
<td>6'-3&quot;</td>
<td>*#6 at 16&quot;</td>
<td>*#6 at 18&quot;</td>
<td></td>
</tr>
</tbody>
</table>

#### Effective: August 8, 2002 to April 6, 2003

1. Wall to be designated Noise Barrier Type 18A, 18B or 18C. The Contract specifies actual wall designations.
2. For intermediate wall heights, use the next higher H.
3. All masonry shall be hollow unit and installed as running bond.
4. All masonry is to be specially insulated.
5. All Concrete Masonry Unit (CMU) cells that have vertical steel reinforcing bars or bond beam units shall be filled with ground granulated blast-furnace slag.
6. Panels shall have at least 3 feet of level ground on each side.
7. Construction joints in the footing shall be spaced at 120 feet maximum.
8. See "Masonry Wall Finishes and Decorative" sheets for masonry bond finishes, special shapes, sizes, and layout.

---

**Typical Section:**

- **4'-0" MIN bond beam and reinforced extension at step**
- **2'-0" MIN spread footing**
- **2'-0" Clearance at equal spacing with 2'-0" MIN splice (TYP)**
- **Continuous footing reinforcing steel Bar A at equal spacing with 2'-0" MIN splice (TYP)**
- **Final ground line 2'- MAX**
- **Clearance 2'- MAX**

**Elevation:**

- **Expansion Joints at 40'-0" MAX centers. See Contract for locations**
DETAIL A

Hooks parallel to wall layout line

$\#$ Stirrup spacing of 12'

Three - $\#$ Stirrup spacing at 6'

Concrete shaft

$\#$ 3.5 spiral at 6' pitch

TYPICAL EXPANSION JOINT

See Note 5

$S \text{TYP}$ Traffic side

See Detail B

$\frac{1}{2}$ Joint

Polyurethane sealant

Backer rod

DETAIL B

Typical both sides of wall

NOISE BARRIER - TYPE 19
MASONRY WALL ON SHAFT WITH GRADE BEAM FOUNDATION

BOND BEAM DETAIL

STEP DETAIL


Elevation to match top of final ground line

See Standard Plan, "Noise Barrier Type 14, Concrete Wall with Traffic Barrier on Shaft Foundation"
### Geosynthetic Reinforcement Spacing and Strength

<table>
<thead>
<tr>
<th>Total Wall ( H ) (m)</th>
<th>Depth ( H_{C} ) ( H_{G} ) (m)</th>
<th>Geosynthetic ( L_{A} ) (m)</th>
<th>Total Wall ( H ) (m)</th>
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<td>( \geq 1 )</td>
<td>( \geq 5 )</td>
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### Geosynthetic Reinforcement Length and Dowels

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<th>Total Wall Height (m)</th>
<th>Type</th>
<th>Dowel Length (m)</th>
<th>Dowel Spacing (m)</th>
<th>Dowel Diameter (mm)</th>
<th>Dowel Type</th>
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<td>1.2</td>
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</tr>
<tr>
<td></td>
<td>Type 2</td>
<td>0.5</td>
<td>1.0</td>
<td>1.2</td>
<td>Type A</td>
</tr>
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</table>

### Permanent Geosynthetic Wall Types 1-4

#### Standard Plan D-3

- Sheet 1 of 4 sheets
- Approved for publication
- Effective: August 5, 2002 to April 6, 2003
1. Get form on completed lift.

2. Unroll geosynthetic and position it so that a 2" drop is created over the baffle. If a geotextile is used, tor the geosynthetic requirement. Position geotextile to prevent sagging. Primarily deployed through geosynthetic overlap.

3. Place the baffle until the baffle is 1/2" higher than the lowest vertical geosynthetic layer spacings.

4. Place a minimum to slightly greater than full lift height adjacent the form.

5. Place the geosynthetic stack over the baffle and lock into place with baffle.

6. Complete geosynthetic units, then compacted baffle layer that is 1" higher to the required vertical geosynthetic layer spacings.

7. Reset the form and repeat the sequence.

---

**Temporary Form System Detail, This Sheet**

**Geosynthetic Wall Construction Sequence**

---

**Notes**

1. Permit may be required at that time will maintain the wall face batter.

2. Construction joints in the long panel shall be spaced at 5000 ft. max.

3. For details of expansion joints in concrete, see standard plan D-7, Sheet 1, Elevation.

---

**Permanent Geosynthetic Wall**

Types 1-6

**Standard Plan D-3**

Sheet 4 of 4 Sheets

**Effective:** August 5, 2002 to April 6, 2003
CONDITION A OR CONDITION B WITH GEOTEXTILE

CONDITION A

ALTERNATE DETAIL
TYPICAL FOR CONSTRUCTION WITH SHOTING.

CONDITION B

NOTES

1. See contract for backfill limits and geotextile class.
TYPE 1 ANCHOR
(FOR USE IN EARTH)

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

TYPE 3 ANCHOR
(FOR USE IN SOLID ROCK)

TYPE 4 ANCHOR
(FOR USE IN SOLID ROCK)

NOTE:
1. Two twin box wire rope clips at 3" centers may be substituted for three unbolted wire rope clips shown.

WIRE MESH SLOPE PROTECTION
STANDARD PLAN D-7a
ELEVATION
CONCRETE SLOPE PROTECTION
(Pneumatically placed or poured in place cement concrete shown)

Concrete
Slope
protection

Embankment slope 1/8 3/4"
1/2"
F 3/4"

SECTION

SECTION

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

SIDE ELEVATION
(For fill section on lower roadway)

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

SIDE ELEVATION
(For cut section on lower roadway)

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

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

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

SKEWED BRIDGE PLAN
(Semi-open concrete masonry units shown)

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

SEMI-OPEN CONCRETE MASONRY UNITS
(See note 1 & 2)

CONCRETE SLOPE PROTECTION STANDARD PLAN D-9
PRECAST CEMENT CONCRETE BUMPER CURB

INTEGRAL CEMENT CONCRETE BARRIER CURB

CEMENT CONCRETE BARRIER CURB AND GUTTER

SINGLE FACED MOUNTABLE CEMENT CONCRETE CURB

MOUNTABLE INTEGRAL CEMENT CONCRETE CURB

MOUNTABLE CEMENT CONCRETE CURB AND GUTTER

CEMENT CONCRETE CURBS AND GUTTERS
NOTES
2. Type 4a and Type 5a curbs do not require steel tie bars or adhesive for anchoring.
PLAN

TYPICAL JOINT DETAIL
Chord shown - End Post Splice

SECTION C-C

INTERIOR DIAGONAL
where required

\( 1/4'' \) for spans over
120; otherwise \( 3/8'' \)

\( 1/4'' \) GUSSET
PLATE

Diagonal shall be
slotted for gusset

\( 3/8'' \) SLOTS at two chords

W/IN GUSSET
PLATE

DIAGONAL

PLATE 1/4''

平面 B

PLAN

ALTERNATE JOINT DETAIL

Not for connections between
vertical diagonals and chords.

SECTION D-D

1/4'' BACKING PLATE

See Note 8

END POST OR CHORD SHOP SPlice

See Note 9

CHORD FIELD SPlice
(NO CHORD FIELD SPlice PERMITTED IN
MIDDLE THIRD OF SPAN LENGTH)

Table:

<table>
<thead>
<tr>
<th>SPAN LENGTH</th>
<th>DIAMETER</th>
</tr>
</thead>
<tbody>
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<tr>
<td>60'' to 80''</td>
<td>1-1/4''</td>
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<tr>
<td>80'' to 100''</td>
<td>1-1/2''</td>
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<tr>
<td>100'' to 120''</td>
<td>2''</td>
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<tr>
<td>120'' to 150''</td>
<td>2-1/2''</td>
</tr>
<tr>
<td>150'' to 180''</td>
<td>3''</td>
</tr>
</tbody>
</table>

CHORD FIELD SPlice
(NO CHORD FIELD SPlice PERMITTED IN
MIDDLE THIRD OF SPAN LENGTH)

DIAGRAM:

Bolt circle

\( 1/4'' \) GUSSET PLATE

See Note 7

FIBERBOARD
FINISHING SHEET

EXPRES JUNE 29, 2004

SIGN BRIDGE

STANDARD PLAN 8-3

SHEET 2 OF 3 SHEETS
**ROADSIDE SIGN STRUCTURES ON TIMBER POSTS**

**STANDARD PLAN G-4s**

**ELEVATION TWO POST SIGNS**

**ELEVATION THREE POST SIGNS**

**NOTES**

1. See "Sign Specifications" sheet of contract for Hs, H2, Ks, K4, X & Y values.
2. Post sizes 4" X 10", 6" X 10", & 6" X 12" can only be installed behind traffic barrier.
3. Use two 3/8" X 3" lag screws to hold the sign post in the foundation sleeve.
4. See Std. Plan G-1 for sign placement requirements.

---

**ELEVATION FOUR POST SIGNS**
NOTES:
Post will be Micro-Lam® laminated veneer Type L or Type M post manufactured by Trus Joist or an equivalent that has been crash tested and approved by the FHWA.

\( H_1, H_2, H_3, H_4 \) = Length of post.

\( V \) = Elevation difference from edge of lane to bottom of sign.

\( W \) = Distance from edge of lane to center of nearest post.

\( X \) = Horizontal measurement of sign.

\( Y \) = Vertical measurement of sign (or signs).

\( Z \) = Height from ground to mid-height of sign (or signs) at longest post.

\( D \) = Post embedment.

See “Sign Specifications” sheet of Contract Plans for \( H, V, W, X, \) and \( Y \) values.

---

**ELEVATION**

**SIDE VIEW**

**TABLE:**

<table>
<thead>
<tr>
<th>Height (Z FT)</th>
<th>Total Sign Area (Square Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Up to 50</td>
</tr>
<tr>
<td>9 to 12</td>
<td>6</td>
</tr>
<tr>
<td>13 to 15</td>
<td>6</td>
</tr>
<tr>
<td>16 to 18</td>
<td>7</td>
</tr>
<tr>
<td>19 to 22</td>
<td>7</td>
</tr>
<tr>
<td>23 to 26</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Not Permitted

**LAMINATED POST EMBEDMENT DEPTH**

Depth (D) in Feet

Type L = 15”
Type M = 8”

1½” 1½” 1½” 1½”

**DETAILED B**

Traffic Direction

**ROADSIDE SIGNS ON LAMINATED WOOD BOX POSTS**

**SECTION A-A**
NOTES

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

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

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

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

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

PLACEMENT OF MILEPOST AT CUT SECTION

PLACEMENT OF MILEPOST AT FILL SECTION
FRONT VIEW

SIDE VIEW

TYPE 2A BASE CONNECTION DETAIL

Use only when sign area is less than 35 square feet per post.

<table>
<thead>
<tr>
<th>BOSS Е OFFSET TABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>When Z &gt; 8 x 10&quot;</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

ANCHOR FERRULE DETAIL - TYPE 2A

Anchor ferrule shall be 1/4 inch or 1/8 inch UNC.

SHIM DETAIL - TYPE 2A

Use no more than two shims per anchor coupling. Use no more than three shims for any two anchor couplings.

BRACKET DETAIL - TYPE 2A

ANCHOR COUPLING DETAIL - TYPE 2A

COUPLING BOLT DETAIL - TYPE 2A
### Table: Dimensions for Type 2B Bases

<table>
<thead>
<tr>
<th>Post Size</th>
<th>Anchor Ferrule Spacing</th>
<th>Keyway Distance</th>
<th>Bracket Width</th>
<th>Hole D12 Size</th>
<th>Spacing</th>
<th>Fasteners</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length: Width</td>
<td>K = 0.004&quot;</td>
<td>B1 (W)</td>
<td>A1 (H)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 x 9</td>
<td>13/16&quot;</td>
<td>3&quot;</td>
<td>51/16&quot;</td>
<td>15/16&quot;</td>
<td>13/16&quot;</td>
<td>Top bolt 21/2&quot;</td>
</tr>
<tr>
<td>8 x 12</td>
<td>14/16&quot;</td>
<td>3&quot;</td>
<td>51/16&quot;</td>
<td>15/16&quot;</td>
<td>13/16&quot;</td>
<td>Middle bolt 21/2&quot;</td>
</tr>
<tr>
<td>8 x 16</td>
<td>14/16&quot;</td>
<td>3&quot;</td>
<td>51/16&quot;</td>
<td>15/16&quot;</td>
<td>13/16&quot;</td>
<td>Bottom bolt 3&quot;</td>
</tr>
<tr>
<td>8 x 18</td>
<td>16/16&quot;</td>
<td>3&quot;</td>
<td>51/16&quot;</td>
<td>15/16&quot;</td>
<td>13/16&quot;</td>
<td>Cap screw 1/2&quot;</td>
</tr>
<tr>
<td>8 x 21</td>
<td>26/16&quot;</td>
<td>3&quot;</td>
<td>51/16&quot;</td>
<td>15/16&quot;</td>
<td>13/16&quot;</td>
<td>1/2&quot; bolt 1/2&quot;</td>
</tr>
<tr>
<td>10 x 22</td>
<td>18/16&quot;</td>
<td>4&quot;</td>
<td>65/16&quot;</td>
<td>15/16&quot;</td>
<td>2&quot;</td>
<td>Top bolt 21/2&quot;</td>
</tr>
<tr>
<td>10 x 26</td>
<td>18/16&quot;</td>
<td>4&quot;</td>
<td>65/16&quot;</td>
<td>15/16&quot;</td>
<td>2&quot;</td>
<td>Middle bolt 3&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Bottom bolt 3/8&quot;</td>
</tr>
</tbody>
</table>

---

### Diagram: Type 2B Foundation Detail

- **Type 2B Foundation Detail**
- Shim detail - Type 2B
  - Shims shall be 14 gauge or 18 gauge.
  - Use no more than two shims per anchor coupling.
  - Use no more than three shims for any two anchor couplings.

- **Bracket Detail - Type 2B**
- **Anchor Ferrule Detail - Type 2B**
- **Anchor Coupling Detail - Type 2B**
- **Coupling Bolt Detail - Type 2B**

---

### Diagram: Type 2B Base Connection Detail

- **Front View**
- **Side View**

---

### Diagram: Roadside Sign Structures for Multiple Steel Post Signs

- **Standard Plan G-6a**
- **Sheet 3 of 3 Sheets**

---

**Roadside Sign Structures for Multiple Steel Post Signs**

**Standard Plan G-6a**

---

**Clifford E. Mansfield**

**Deputy State Design Engineer**

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

<table>
<thead>
<tr>
<th>TYPE W</th>
<th>TYPE Y</th>
<th>TYPE VY</th>
<th>TYPE 01</th>
<th>TYPE 02</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="#" alt="Diagram" /></td>
<td><img src="#" alt="Diagram" /></td>
<td><img src="#" alt="Diagram" /></td>
<td><img src="#" alt="Diagram" /></td>
<td><img src="#" alt="Diagram" /></td>
</tr>
</tbody>
</table>

### Notes
1. When guardrail runs concurrent, the contractor shall either:
   - Drive the flexible guide post in line with the guardrail posts, or
   - Mount the shorter flexible guide post onto the guardrail post.
2. Guide posts shall be fastened to the guardrail posts using two 2" x 36" lag screws with washers, along centerline of post. Also acceptable is any approved method submitted by the guardrail post manufacturer.
3. When concrete barrier runs concurrent, the contractor shall mount barrier deflectors where guardposts are required.

---

**Guide Posts**

**Standard Plan H-1**

Sheet 1 of 1 Sheet

Effective: August 5, 2002 to April 6, 2003

Approved for publication: [Stamp] 01-10-02

Washington State Department of Transportation

[Stamp] [Name]
THREE EQUAL SPACES WHEN R<15
FOUR EQUAL SPACES WHEN R=75 (TYP)

100' DECELERATION TAPER

DIVIDED HIGHWAY

LEGEND
○ TYPE W
● TYPE Y
〇 TYPE WW

SEE TABLE IN STANDARD PLAN H-1 FOR DEFINITION OF GUIDE POST TYPES

GUIDE POST PLACEMENT
GRADE INTERSECTION
STANDARD PLAN H-1a

EXPIRES OCTOBER 26, 2000

APPROVED FOR PUBLICATION
Clifford E. Mansfield 4/14/00

NOTE: THIS PLAN IS NOT A LEGAL DRAWING OR ENGINEERING DOCUMENT BUT AN ELECTRONIC REPLICA OF THE OFFICIAL COPY FILLED BY THE BRIDGE ENGINEER AND TRANSMITTED TO THE DEPARTMENT OF TRANSPORTATION FOR THE PURPOSE OF RECORDING IN PERPETUITY. A COPY MAY NOT BE DUPLICATED.
GUIDE POST SPACING (FEET)

<table>
<thead>
<tr>
<th>RADIUS (FEET)</th>
<th>RADIUS</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.10</td>
<td>3,000</td>
<td>340</td>
</tr>
<tr>
<td>100</td>
<td>0.43</td>
<td>3,000</td>
<td>340</td>
</tr>
<tr>
<td>150</td>
<td>0.63</td>
<td>4,000</td>
<td>380</td>
</tr>
<tr>
<td>200</td>
<td>0.75</td>
<td>5,000</td>
<td>380</td>
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<tr>
<td>250</td>
<td>0.83</td>
<td>6,000</td>
<td>380</td>
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<td>300</td>
<td>0.93</td>
<td>7,000</td>
<td>380</td>
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<tr>
<td>350</td>
<td>1.10</td>
<td>8,000</td>
<td>400</td>
</tr>
<tr>
<td>400</td>
<td>1.30</td>
<td>9,000</td>
<td>410</td>
</tr>
<tr>
<td>450</td>
<td>1.48</td>
<td>10,000</td>
<td>470</td>
</tr>
<tr>
<td>500</td>
<td>1.65</td>
<td>12,000</td>
<td>460</td>
</tr>
<tr>
<td>550</td>
<td>1.80</td>
<td>13,000</td>
<td>510</td>
</tr>
<tr>
<td>600</td>
<td>2.00</td>
<td>14,000</td>
<td>560</td>
</tr>
<tr>
<td>650</td>
<td>2.23</td>
<td>16,000</td>
<td>590</td>
</tr>
</tbody>
</table>

INTERPOLATE FROM THE TABLE FOR RADIUS NOT SHOWN

NOTES
1. The first guide post is positioned 5' distance from the
   beginning of curvature.
2. If the last guide post beyond the curve is 1/2 "S" or more,
   no additional posts are required.
3. If the last guide post beyond the curve is less than 1/2 "S",
   one additional post is required.
4. For definitions of guide post types, see Standard Plan H-1c,
   GUIDE POSTS.

LEGEND
○ TYPE W
○ TYPE V
○ TYPE X

MULTIPLE DIVIDED HIGHWAYS
GUIDE POSTS ON INSIDE AND OUTSIDE OF CURVE
FOR EACH DIRECTION OF TRAVEL

NOTE 1

TWO-WAY UNDIVIDED HIGHWAYS
GUIDE POSTS ON OUTSIDE OR CURVE
IN DIRECTION OF TRAVEL

NOTE 1
**Type 3 Barricade**

**Standard Plan H-2**

Sheet 3 of 3 Sheets

Approved for Publication

[Signature]

Washington State Department of Transportation

Expire: May 5, 2003

---

**Effective:** August 6, 2002 to April 6, 2003

---

**Stripes on the barricades shall slope downward in the direction traffic is to pass.**

**Road Closure at Intersection:**

---

**Road Closure at other locations:**

---

**Type 3 L Barricade**

**Type 3 R Barricade**

---

**Area closed to traffic**

---

**Unusable Traffic Lane**

---

**Leaflet**

---

**Line**

---

**Effective:** August 6, 2002 to April 6, 2003
1. Recessed pavement markers, when specified, shall be installed at the locations shown for Type 2Y RPM's on multilane one way roadways, and Type 2YY RPM's on two lane two way roadways.

**MULTILANE ONE WAY TRAFFIC**

**M-1.** For lane lines, Type 2Y RPM's shall be spaced at 80' intervals on tangents and horizontal curves with a radius of 5000' or more, and 40' intervals on horizontal curves having radii of less than 5000'.

**M-2.** When specified, Type 2Y RPM's shall be placed outside the left edge line. Placement is shown on "Left Edge of Lane Placement".

**TWO LANE TWO WAY TRAFFIC**

**T-1.** For center lines, Type 2YY RPM's shall be spaced at 80' intervals on tangents and horizontal curves with a radius of 5000' or more, and 40' intervals on horizontal curves having radii less than 5000'. Type 2YY RPM's are to be centered between skip lines.

**RAISED PAVEMENT MARKING DETAILS STANDARD PLAN H-3**

**Type 2 RPM Raised Face Colors**
- Type 2Y: Yellow and yellow
- Type 2W: White - one side only
- Type 2Y: Yellow - one side only
- Type 1 RPM Colors
- Type Y: White
- Type Y: Yellow

**ADHESIVE**
- 3M
- 40
- 0.5" MIN.
- 1/4" MAX.

**ELEVATION VIEW**

**RECESSED PAVEMENT MARKER DETAILS**
LEFT TURN LANE

TAPER LENGTH = T₁ × taper rate

Decel. taper
See Table 1
for taper rate

Approach

Departure

Wide Line
see Detail A

Stopping point
see Note 3

Variable
see Plans

50'

500' MAX

Taper length = T₂ × taper rate

Approach

Departure

Wide Line
see Detail A

Stopping point
see Note 3

Variable
see Plans

LEFT TURN LANE

TWO-WAY LEFT TURN LANE

Two-way left turn line, See Detail C

Type 2L traffic arrows see Note 1

Double yellow center line, See Detail B

Two-way left turn line, See Detail C

Type 2L traffic arrows see Note 1

Double yellow center line, See Detail B

TWO-WAY LEFT TURN LANE

Two way left turn termination at tee intersection or where left turns are not permitted and two way left turn is not continued beyond intersection.

END TWO-WAY LEFT TURN LANE

TABLE 1

Table 2

Table 3

<table>
<thead>
<tr>
<th>Posted Speed</th>
<th>Taper Rate</th>
<th>Decel. Taper Length</th>
<th>Posted Speed</th>
<th>No pass length Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 mph</td>
<td>60:1</td>
<td>180'</td>
<td>60 mph</td>
<td>790'</td>
</tr>
<tr>
<td>55 mph</td>
<td>55:1</td>
<td>165'</td>
<td>55 mph</td>
<td>725'</td>
</tr>
<tr>
<td>50 mph</td>
<td>50:1</td>
<td>150'</td>
<td>50 mph</td>
<td>660'</td>
</tr>
<tr>
<td>45 mph</td>
<td>45:1</td>
<td>135'</td>
<td>45 mph</td>
<td>590'</td>
</tr>
<tr>
<td>40 mph</td>
<td>40:1</td>
<td>120'</td>
<td>40 mph</td>
<td>500'</td>
</tr>
<tr>
<td>35 mph</td>
<td>35:1</td>
<td>105'</td>
<td>35 mph</td>
<td>260'</td>
</tr>
<tr>
<td>30 mph</td>
<td>30:1</td>
<td>90'</td>
<td>30 mph</td>
<td>200'</td>
</tr>
<tr>
<td>25 mph</td>
<td>25:1</td>
<td>75'</td>
<td>25 mph</td>
<td>150'</td>
</tr>
</tbody>
</table>

W₁ = Approaching through lane

W₂ = Departing lane

T₁ = Width of left turn lane on approach side of Q

T₂ = Width of left turn lane on departure side of Q

W₃ = Total width of channelization (W₁ + W₂ + T₁ + T₂)

NOTES:

1. First Type 2L arrow is installed 50' back of stop bar or crosswalk. Second arrow is located 100' back, or at left turn pocket.

2. "S" = 140' for posted speed < 50 MPH, "S" = 170' for posted speed ≥ 50 MPH.

3. Stopping point shall be marked with stop bar only when mainline movement is controlled by a stop sign or traffic signal.

4. Raised pavement markers shall be installed only when specified in the Contract Plans.


6. No Pass Line on approach side with skip center line on departure side unless Double Yellow Center Line is required in the contract.

TABLE 1

Table 2

Table 3

<table>
<thead>
<tr>
<th>Posted Speed</th>
<th>Taper Rate</th>
<th>Decel. Taper Length</th>
<th>Posted Speed</th>
<th>No pass length Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 mph</td>
<td>60:1</td>
<td>180'</td>
<td>60 mph</td>
<td>790'</td>
</tr>
<tr>
<td>55 mph</td>
<td>55:1</td>
<td>165'</td>
<td>55 mph</td>
<td>725'</td>
</tr>
<tr>
<td>50 mph</td>
<td>50:1</td>
<td>150'</td>
<td>50 mph</td>
<td>660'</td>
</tr>
<tr>
<td>45 mph</td>
<td>45:1</td>
<td>135'</td>
<td>45 mph</td>
<td>590'</td>
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<tr>
<td>40 mph</td>
<td>40:1</td>
<td>120'</td>
<td>40 mph</td>
<td>500'</td>
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<tr>
<td>35 mph</td>
<td>35:1</td>
<td>105'</td>
<td>35 mph</td>
<td>260'</td>
</tr>
<tr>
<td>30 mph</td>
<td>30:1</td>
<td>90'</td>
<td>30 mph</td>
<td>200'</td>
</tr>
<tr>
<td>25 mph</td>
<td>25:1</td>
<td>75'</td>
<td>25 mph</td>
<td>150'</td>
</tr>
</tbody>
</table>

W₁ = Approaching through lane

W₂ = Departing lane

T₁ = Width of left turn lane on approach side of Q

T₂ = Width of left turn lane on departure side of Q

W₃ = Total width of channelization (W₁ + W₂ + T₁ + T₂)
Pavement markings may be curved here as shown to allow continuous painting by the stripping machine.

When RPM's required by contract, use Type 2Y, see Note 5

20' RPM spacing for decel, taper

40' RPM spacing

DOUBLE YELLOW CENTER LINE

See "Alternate Line Detail"

Lane width measurement point

5' to 10'

4''

Detail A

Detail B

Detail C

Detail D

Detail E

Detail F

Alternate Line Detail
SINGLE LANE ON CONNECTION

NOTE:
Where shown on the plans or specified in special provisions, raised pavement markers shall be used to supplement or substitute for the painted pavement markings shown herein.

SINGLE LANE OFF CONNECTION

SINGLE LANE OFF CONNECTION FOR ONE LANE REDUCTION
NOTES:
Where indicated on the plans or special provisions, raised pavement markers shall be used to supplement or substitute for painted pavement markings.

TWO LANE ON CONNECTION

TWO LANE OFF CONNECTION

DETAIL A

DETAIL B
GENERAL NOTE
See contract for location and material requirements.

NOTES
1. For planned crosswalks, position the lines parallel to the traffic lane.
2. Install Crosswalk Line in shoulder area only when adjacent to sidewalk or separate walkway.
TWO WAY LEFT TURN LINE

GORE AREA MARKINGS

Type 2Y RPM (TYP)
Type 1Y RPM (TYP)
Type 2Y RPM (TYP)
Type 1W RPM (TYP)
Yellow edge LINE

Centerline of Gore area

Direction of travel (Off ramp)
Direction of travel (Main line)

Continue markings to end of Gore area or as shown in the contract
NOTE:
1. The brass disc will be furnished by the state.
2. The hole shall be 3/4" minimum in depth or 6" below the deepest recorded frost line.
3. All loose material shall be removed from the bottom of the hole so that the concrete is placed on firm undisturbed earth.
4. The top of the concrete shall be troweled smooth and the brass disc set in the center with top flush and level. When the concrete is set, cover the entire monument with moist earth and leave for three days.
5. Top of monument may be recessed or protruding depending on conditions.

DETAIL OF GROOVE FOR 1/8" LETTERS

DETAIL OF GROOVE FOR 3/8" LETTERS

LEDGE ROCK OR CONCRETE INSTALLATION

SECTION A-A

SECTION B-B

SECTION C-C

SURVEY MONUMENT STANDARD PLAN H-8

EFFECTIVE: AUGUST 5, 2002 TO APRIL 6, 2003

NOTE: Dotted letters to be 1/8" high and will be stamped by WSDOT Personnel. Only the assigned identification numbers are to appear on the brass disc.
NOTES:
1. Slope treatment shall be constructed simultaneously with the roadway excavation. Ordinarily hand trimming will not be required if satisfactory results are obtained with mechanical equipment.
2. It is essential that the construction of cut and fill slopes and the application of slope treatment fit as naturally as possible into the existing landscape to provide an aesthetically and geometrically satisfactory completed roadway.
3. When the distance K is greater than the distance from the top of cut to the bottom of ditch, slope treatment shall begin at bottom of ditch.

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

For a 3:1 slope, S = 5' Check table for 4:1, 5:1, and 6:1 slopes.

TREATMENT IN SHALLOW CUTS
See Note 3

VALUES OF Z (feet)
For Class A Slope Treatment

\[ Z = \frac{\frac{K}{2} \left( \frac{j}{2} \right)^2 + \left( \frac{j}{2} \right)^2 + \left( \frac{D-K}{4} \right)^2}{\frac{K}{2} \left( \sqrt{j^2 + 5^2} \right) \left( \sqrt{j^2 + 5^2} - \left( \frac{3}{2} \right)^2 \right)} \]

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

2. Aluminum pipe railing shall have no external surface welds.
Mailbox Placement Sections:

1. An adjustable platform may be used in lieu of the platform design shown on this plan. Adjustable platforms must fit the trunked design shown on this plan. Blankets are required for all single post installations. Field drilling may be required.

2. A Type 2 support is required when 2 or more mailboxes are to be installed on one support. A maximum of 6 mailboxes may be installed on a Type 2 support. See 616. Spec. 9-313.7.

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

4. Spacing of mailbox mounting holes varies among manufacturers. Attachment of the mailbox to the platform may require drilling additional holes through the mailbox to fit the platforms.

5. Center the mailbox on the platform to ensure space for the mailbox door to open and to allow space for installing the fasteners.

6. A sectional and waistanchoring system may be substituted in lieu of the split-plate assembly for single mailboxes shown on this plan. The sectional and waist anchoring system shall meet IND/965 360 green wire criteria. Anchor plates are not required for wood post installations.

Mailbox Installation Type 1 & Type 2
Standard Plan H-12

Mailbox Spacing Detail:
**ALLOCATION STAKE**
Stake every 100 feet on tangents, every 25 feet on curves.

**CLEANING/GRAVING STAKE**
Stake at each full station, 100 feet on tangents, every 25 feet on curves. No hub necessary.

**SLOPE STAKE**

**SLOPE LATH REFERENCES**

**SLOPE TREATMENT (ST) STAKES**
For cut sections.

**DAYLIGHT STAKE**

---

**STANDARD PLAN H-14**
**SURVEY STAKES**

**NOTICE**
This plan is not a legal instrument. It is intended for use as a guide and to provide information for surveying and staking purposes. It is not to be used for legal or professional purposes without further review and approval by the appropriate authorities.
SLOPE STAKING CURB SECTION
Use look instead of stake

STAKING COMPOUND SLOPES
Use look instead of stake

STAKES FOR DITCH CONSTRUCTION

STAKES FOR DRAINAGE

STAKES FOR CURB/GUTTER

STAKING FOUNDATION FOR LUMINAIRES,
SIGNALS OR SIGN STRUCTURES

Offset (10 feet)
Cut to flow line (1.261 feet)

Structure note reference
Plan sheet number (6)
Structure note number (3)
Drainage alignment
Stationing
25' Increments

Offset (3 feet)
Fill to top and back edge of curb (0.90 feet)

Line designation
Line stationing
Hundred foot increments

Luminaire number (23)
Line designation
and stationing
Hundred foot increments

Fill to subgrade (0.35 feet)
Fill to Finish Grade (Curb Elevation) (0.73 feet)
Distance from Q (14.33 feet)
Slope ratio (2:1)

ditch cut to bottom of ditch (10.60 feet)
Ditch section alignment
stationing

Distance from catch point to bottom of ditch (2.40 feet)
Side slope ratio (4:11)

Offset to center of base (10 feet)
Fill to top of concrete base (1.03 feet to top of foundation)

LOC # 23 CE 120484
**SLIP/ANCHOR PLATES DETAIL**
Smooth finish top, bottom, and notched surfaces

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

**SECTION B-B**

**SECTION A-A**

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

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

**STEEL LIGHT STANDARD BASE DETAILS**

**STANDARD PLAN J-1b**

**NOTE:** This plan is not a legal engineering document but an electronic duplicate.
The original, issued by the engineer and approved for publication, is kept on file at the Washington State Department of Transportation. A copy may be obtained upon request.

**APPROVED FOR PUBLICATION**

Clifford E. Mansfield
Deputy State Design Engineer

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
SPOKANE, WASHINGTON
NOTES:
1. See Standard Plan C-6b for base plate and foundation requirements when light standards are mounted on concrete barrier.
2. Round and smooth all edges along wireway to protect conductors. See Standard Plan J-16 for wiring details.
3. The top of the anchor rod shall be both threaded and galvanized a minimum of 3/4". The bottom of the anchor rod shall be threaded a minimum of 3/4". Galvanizing shall be in accordance with AASHTO W121 after threading. Washed anchor bolts are not allowed.
4. Strap templates shall be held in place by nuts 6" from the top of the foundation, and at bottom of anchor bolts resting on 4" x 4" square washers.
5. Pole base plate for a serif base design shall be 1/4" AASHTO M233 Gr. 345. Pole base plates for a serif base design may be either 1/4" AASHTO M233 Gr. 345 or 1/2" AASHTO M215.
6. Installation of a 50' pole with double mast arms on a slip base is not allowed.

SECTION C-C

ELEVATION

LIGHTING BRACKET DETAIL

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

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

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

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

Misaligned anchor bolts must be removed and replaced.

---

SCHEDULE

<table>
<thead>
<tr>
<th>Adapter Type</th>
<th>Anchor Bolt Size</th>
<th>Bolt Order</th>
<th>Existing Base Type</th>
<th>Laminated Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-2</td>
<td>1/2&quot; x 3&quot;</td>
<td>1, 2, 3</td>
<td>A-2</td>
<td>30</td>
</tr>
<tr>
<td>A-3</td>
<td>1/2&quot; x 3/4&quot;</td>
<td>1, 2</td>
<td>A-3</td>
<td>30</td>
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<tr>
<td>A-4</td>
<td>1/2&quot; x 3/4&quot;</td>
<td>1, 2, 3</td>
<td>A-4</td>
<td>40</td>
</tr>
<tr>
<td>A-5</td>
<td>1/2&quot; x 2-1/2&quot;</td>
<td>1, 2, 3</td>
<td>A-5</td>
<td>45</td>
</tr>
</tbody>
</table>

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

---

NOTE: Plate shall conform to AASHTO M64 M (ASTM A36) except as noted. Flat washer shall conform to AASHTO M164 M (ASTM A325).
Install sized reducing washer and connector to secure conductors at end of mast arm.

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

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

See Detail A

Junction box

MAST ARM WIRING DETAIL

WIRING DETAIL LIGHT STANDARD SLIP BASE

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

JUNCTION BOX LOCATION

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

LIGHT STANDARDS WIRING DETAILS

120 Pound tensile strength black cable tie

Conductor attachment bracket

Strip outer cable sheath below bracket

Eliminate all slack

Conductor
cable to lamp

Pole and bracket

Handhole

Band

Quick disconnects

Insulated grounding

bushing

Galvanized steel conduit

Conductors

Insulating grounding bushing

Bead

NEW J-1e

08-01-97
**TYPE B SERVICE CABINET**

- 1P 15 amp 125VAC flasher breaker
- 2P 240VAC service breaker
- Branch breaker
- Test switch
- Neutral busbar
- Jack mounted flasher (where required)
- 120 VAC coil contactor

**TYPE C SERVICE CABINET**

- 1P 15 amp 125VAC flasher breaker
- 2P 240VAC branch breaker
- Control breaker
- Test switch
- Flasher breaker
- Neutral busbar
- Jack mounted flasher (where required)
- 150 VA 480/277 VAC dry transformer (500 VA 1" flasher used)

**SECTION A-A**

- Welded hinges
- Meter base (where required)
- Test switch

**TYPE A WIRING DIAGRAM**

- 120 VAC

**TYPE A, B AND C SERVICE LIGHTING DETAILS**

1. Metering arrangements may vary with different services. The contractor shall verify the requirements of the utility prior to installing the service equipment.
2. All service pole conduit shall be secured to the pole with conduit strap at 5' centers.
3. All risers and service equipment shall be installed on side of pole that is away from traffic.
4. Where required by the serving utility, service breakers shall be installed above the meter socket in a separate raintight enclosure.
5. Bend and attach to pole within 1' of enclosure. See Standard Plan "Typical Grounding Details."
6. For Type B service wiring diagram, use Standard Plan "Modified Type B Service."
7. For Type E service wiring diagram, use Standard Plan, "Type E Service."
8. See breaker schedule in contract for breaker and contactor sizes.
NOTES

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

2. Pad mount design is typical.

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

1. SEE CONTRACT FOR HEAD TYPE, MOUNTING HEIGHT AND ORIENTATION.
2. ALL NIPPLES, FITTINGS AND CENTER PIPES SHALL BE 1 1/2" DIA NOMINAL TRADE SIZE (NEC).
3. INSTALL NEOPRENE GASKET OUTSIDE HEAD WHEN FLANGED ELBOWS ARE SUPPLIED.

**KEY:**

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

**STANDARD PLAN J-6f**

**SIGNAL HEAD MOUNTING DETAILS POLE & POST TOP MOUNTINGS**

**EXPIRES June 4, 1999**

**APPROVED FOR PUBLICATION**

Clifford E. Mansfield 4/24/98

Deputy State Design Engineer

Washington State Department of Transportation

Olympia, Washington
**TETHER WIRE DETAIL**

**SPAN WIRE MOUNT**

**MAST ARM MOUNT**

**WIREWAY DETAIL**

**ELEVATION**

**CABINET MOUNTING DETAIL**

**SIDE POLE MOUNT**

**INTERNALLY ILLUMINATED SIGN DETAILS**

**KEYS:**
- Metal or timber pole
- 2" x 3/4" S.S. band with 2 each, 3/8" hex x 3/4" stainless steel hex head bolt, lock washers and nuts
- 1/4" eye and eye, turnbuckle
- 5 hook, 3/8" mild steel
- 1/4" wire rope clamp (U bolt type)
- 1/4" stainless steel tether wire
- Wire clamp with lead wire wrap
- Signal head
- 6 x 8 x 1/2" wood channel
- 2 each, 3/8-20NF X 2 1/2" hex head bolt, lock washer or drill and tap hole to accept
- Wireway (see detail this sheet)
- Metal pole
- Cabinet
- End bushing
- Conduit locknut
- Steel washer
- Weatherproof seal
- 2" O/A x 4" nipple

**NOTES:**
1. Backplates shall be installed with 8 stainless steel screws and washers.

**MISCELLANEOUS SIGNAL DETAILS**

**STANDARD PLAN J-6h**

**EXPRESS JUNE 4, 1999**

**APPROVED FOR PUBLICATION**

Clifford E. Mansfield 4/24/98

DEPARTMENT OF TRANSPORTATION

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

Olympia, Washington
ANCHOR BOLT, NUT, & WASHER SIZES

<table>
<thead>
<tr>
<th>SIZE</th>
<th>STANDARD</th>
<th>DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>TYPE PPB</td>
<td>4 - 5/8&quot; DIA x 12&quot; x 2&quot;</td>
</tr>
<tr>
<td>S</td>
<td>TYPE PS</td>
<td>4 - 5/8&quot; DIA x 30&quot; x 4&quot;</td>
</tr>
<tr>
<td>S</td>
<td>TYPE FB &amp; RM</td>
<td>5 - 3/4&quot; DIA x 30&quot; x 4&quot;</td>
</tr>
</tbody>
</table>

TYPE PPB
PED. PUSH BUTTON POST

TYPE PS
PED. HEAD STANDARD

TYPE I & RM
VEHICLE HEAD AND RAMP METER STANDARD

TYPE FB
FLASHING BEACON STANDARD

TYPE II
MAST ARM STANDARD

TYPE III
LIGHTING AND STRAIN POLE STANDARD

TYPE IV
MAST ARM STANDARD

TYPE V
LIGHTING AND STRAIN POLE STANDARD

TYPE PPB, PS, I, RM & FB STANDARD DIMENSION CHART

<table>
<thead>
<tr>
<th>SIZE</th>
<th>ITEM</th>
<th>TYPE PPB</th>
<th>TYPE PS</th>
<th>TYPE I</th>
<th>TYPE RM</th>
<th>TYPE FB</th>
</tr>
</thead>
<tbody>
<tr>
<td>8&quot;</td>
<td>H-1</td>
<td>4 - 5/8&quot;</td>
<td>8 - 5/8&quot;</td>
<td>10 - 5/8&quot;</td>
<td>SEE SHEET 2</td>
<td>SEE SHEET 2</td>
</tr>
<tr>
<td>8&quot;</td>
<td>H-2</td>
<td>4 - 5/8&quot;</td>
<td>8 - 5/8&quot;</td>
<td>10 - 5/8&quot;</td>
<td>SEE SHEET 2</td>
<td>SEE SHEET 2</td>
</tr>
<tr>
<td>8&quot;</td>
<td>H-3</td>
<td>4 - 5/8&quot;</td>
<td>8 - 5/8&quot;</td>
<td>10 - 5/8&quot;</td>
<td>SEE SHEET 2</td>
<td>SEE SHEET 2</td>
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<tr>
<td>8&quot;</td>
<td>H-4</td>
<td>4 - 5/8&quot;</td>
<td>8 - 5/8&quot;</td>
<td>10 - 5/8&quot;</td>
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<td>8 - 5/8&quot;</td>
<td>10 - 5/8&quot;</td>
<td>SEE SHEET 2</td>
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<tr>
<td>8&quot;</td>
<td>H-6</td>
<td>4 - 5/8&quot;</td>
<td>8 - 5/8&quot;</td>
<td>10 - 5/8&quot;</td>
<td>SEE SHEET 2</td>
<td>SEE SHEET 2</td>
</tr>
</tbody>
</table>

**NOTES:**
- *TAPERED ROUND OR OCTAGONAL SHAFT, 11 1/2" DLEG, 24" OD AT SLIPFITTER WELD. TAPER = 0.14 INCHES/FT.*
- **LEVELING NUT HEIGHT 1/2 MAXIMUM. LEVELING NUTS NOT REQUIRED FOR TYPE PPB STANDARD**
### Strain Pole Dimension Chart

<table>
<thead>
<tr>
<th>KEY</th>
<th>ITEM</th>
<th>POLE CLASS (Resistant Horizontal Tension)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1000 LB</td>
</tr>
<tr>
<td>A</td>
<td>Base plate width</td>
<td>15”</td>
</tr>
<tr>
<td>B</td>
<td>Anchor bolt circle diameter</td>
<td>16”</td>
</tr>
<tr>
<td>C</td>
<td>Pole base diameter</td>
<td>10”</td>
</tr>
<tr>
<td>D</td>
<td>Base plate thickness</td>
<td>1/4”</td>
</tr>
<tr>
<td>E</td>
<td>Anchor bolt size</td>
<td>1/4” x 2”</td>
</tr>
<tr>
<td>F</td>
<td>Anchor plate size</td>
<td>1/4” x 2”</td>
</tr>
<tr>
<td>G</td>
<td>Vertical steel number and size</td>
<td>Eight #8</td>
</tr>
</tbody>
</table>

### Effective Dates
- Effective: August 5, 2002 to April 6, 2003
- Expires: January 17, 1999

### Foundation Details
- 1/2” clearance

### Strain Pole Standards
- Type IV and V

### Strain Clamp Details
- Anchor Bolt DIA x 1/4”
- Schedule 80 pipe sleeve
- 1/4” Thick (A36) steel clamps

### Handhole Details
- See Note 4

### Cone Section Detail
- 2” Clearance

### Wireway Detail
- Wireways two per pole
- See Detail

### Attach Point Angles
- 90° Wireway
- 160° - 0° from light source to base plate
- See Contract

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

### Wireway Detail Notes
- Most arm length as noted in Contract
- 40’ – 0” or 50’ – 0” from light source to base plate
- See Contract

### Diagram
- Various components such as base plate, pole, wireways, strain clamps, and foundation details are shown.

---

**Clifford E. Mansfield**
Approved for Publication
6/19/98

**Department of Transportation**
Washington State Department of Transportation

---

**Engineering**
Approved for Publication
6/19/98

**State Bridge Inspection**
Washington State Department of Transportation
OLYMPIA, WASHINGTON
TYPICAL CONDUIT PLACEMENT FOR LOOP LEAD-IN WIRES

<table>
<thead>
<tr>
<th>Loop lead pairs</th>
<th>1-2</th>
<th>3</th>
<th>4-5</th>
<th>6-8</th>
<th>9-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduit size (MIN)</td>
<td>1&quot;</td>
<td>7/16&quot;</td>
<td>1½&quot;</td>
<td>2&quot;</td>
<td>3&quot;</td>
</tr>
</tbody>
</table>

**TABLE A**

---

**Splice Detail**

- **Scotchcast epoxy 82A or 82A-1 splice kit**
- **Foil shield**
- **Drain wire**
- **Cable jacket**
- **Detector lead-in cable (205)**

**Lead-In Sawcuts and Conduit Placement Details**

**Induction Loop Details**

- **Foil shield**
- **Drain wire**
- **Cable jacket**
- **Detector lead-in cable (205)**

---

**SPLICE DETAIL**

- **Scotchcast epoxy 82A or 82A-1 splice kit**
- **Foil shield**
- **Drain wire**
- **Cable jacket**
- **Detector lead-in cable (205)**

---

**INSTALLATION**

- **Install non-metallic bushing and seal conduit with electrical putty or silicone**
- **Lead-in sawcuts**
- **Drill hole 1" larger than conduit**
- **Fill with epoxy**

---

**SECTION C-C**

- **2" Deep sawcut**
- **Match existing paving material, 3" min. depth**
- **3" Crushed surfacing**
- **Top course**
- **Sand**
- **Conduit**

---

**For conduit size to amplifier, see Contract**

---

**See Splice Details and Notes**

---

**See Note II**

---

**See Detail A**

---

**Paved shoulder or sidewalk area**

---

**Travelled way**

---

**Supplemental splice if required in Contract**

---

**For conduit size, see Table A**
LOOP INSTALLATION NOTES
1. Install junction box and lead-in conduit.
2. Saw loop slots and lead-in slots.
3. Lay out loop wire beginning at junction box, allowing 6’ minimum slack.
4. Install wire in loop slot. See Loop Winding Details.
5. Return to junction box and identify leads with plan detector number and "S" for start and "F" for finish.
6. Twist each pair of lead-in wires two turns per foot from loop to junction box and install in lead-in slot and conduit. Reverse direction of twist for each successive pair installed.
7. Construct supplemental splice containing any series or parallel loop connections required in plans. Supplemental splices are subject to the same requirements shown for the loop lead and shielded cable splice.
8. Splice loop leads or supplemental splice leads to shielded cable as noted.
9. Complete installation and test loop circuits or combination loop circuits.
10. Front of loop should be measured from back of stop bar, or back of crosswalk where no stop bar is installed.
11. Seal ends of conduit.

INDUCTION LOOP DETAILS
1. Sealant
2. Twisted polypropylene rope (Size for snug fit)
3. Loop wire - number varies (See Loop Winding Details)
4. Lead-in wires: One pair for each loop served, three pairs maximum per sawcut (See Installation notes)
5. Extend sawcut sufficient length to provide full sawcut depth around corners

TYPICAL CORNER SAWCUT
LOOP SAWCUT DETAILS

SECTION A-A
SECTION B-B

1/8" SAWCUT
1/2" SAWCUT

LOOPER WINDING DETAILS

TYPE 1
TYPE 2
GALVANIZED STEEL CONDUIT (GSC) APPLICATION

GROUNDING DETAILS

1. If parallel circuits of different sizes are contained in one conduit, the size of the grounding conductor shall be determined on the basis of the largest conductor. Only one grounding conductor is required for each conduit regardless of the number of circuits contained.

2. Service ground per serving utility requirement. If the utility uses aluminum service conductors, an approved Al - Cu pressure type ground connector shall be used to secure the service neutral to the copper neutral bar in the service enclosure. Except for the above, all grounding conductors shall be copper.

3. Equipment grounding conductors and grounding electrode conductors shall be sized in accordance with the National Electric Code (No. 8 minimum).

Supplemental Ground

Required to supplement equipment grounding for luminaire standards with direct burial, aerial feed, or where required in plans.

Ground Rod Details

Required at all services and separately derived systems.

KEY

1. Service Neutral
2. Service Ground
3. Grounding Electrode Conductor
4. Bonding Jumper
5. Grounding Bushing (typ. all conduit terminations)
6. Service Neutral Bus (Copper)
7. Service Enclosure
8. Equipment Grounding Conductor
9. Junction Box
10. Electrical Load Support (luminaire pole)
11. Copper Split Bolt Clamp
12. Galvanized Steel Conduit (GSC)
13. Non-metallic Conduit (NMC)
14. Option A - 10' GSC with Field Bend
   - Approved Adapter Fitting
   - Grounding Bushing
15. Option B - 10' GSC
   - GS Factory Elbows
   - Approved Adapter Fitting
   - GS Coupling
   - Grounding Bushing
16. Ground Rod
17. Edge of Foundation, Pole or Service Support
18. Clamp
19. Junction Box or 8" Drain Tile with Approved Cover
20. Code Size GSC
21. To Service Neutral Bus
22. To Grounding Terminal or Connection to Equipment Grounding System
1. Sign sequence is the same for both directions of travel, adjusted for direction of roadway curves.

2. Steady burning warning lights (Type C, MUTCD) may be used to mark channelizing devices at night as needed.

3. Either reverse cone taper or sign G20-2a may be used to show end of work area.

4. Other curve or turn warning signs may be substituted for sign W1-3l or W1-3r to depict roadway alignment as appropriate.

**Channelizing Device Spacing (FT)**

<table>
<thead>
<tr>
<th>Speed (MPH)</th>
<th>Taper</th>
<th>Tangent</th>
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<tbody>
<tr>
<td>35/50</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>35/40</td>
<td>350'</td>
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<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
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**For Local Agency Use**

**Traffic Control Plan**

**Buffer Data**

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<thead>
<tr>
<th>Speed (MPH)</th>
<th>Buffer Space</th>
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<tr>
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<td>40</td>
<td>170</td>
</tr>
<tr>
<td>45</td>
<td>220</td>
</tr>
<tr>
<td>50</td>
<td>280</td>
</tr>
</tbody>
</table>

**Buffer Vehicle Roll Ahead Distance**

- 4 Yard Dump Truck 24,000 LBS
- Stationary Operation
  - R (FT) = 100
1. Floodlights shall be provided to mark flagger stations at night.

2. If entire work area is visible from one station, one flagger may be used, otherwise two flaggers and signing will be required each direction.

3. Sign sequence is the same for both directions of travel.

4. See Buffer Data Table. Use of buffer vehicle is recommended. It may be a work vehicle. If buffer vehicle is used, minimum from end of taper to work area shall be total of “R” (roll ahead distance) plus length of vehicle, plus “B” (buffer space). If buffer vehicle is not used, minimum distance shall be “B”.

5. Steady burning warning lights (Type C, MUTCD) should be used to mark channelizing devices at night as needed.

6. Either reverse cone taper or sign G20-2a may be used to show end of work area.

<table>
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<th>CHANNELIZING DEVICE SPACING (FT)</th>
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<td>MPH</td>
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<tr>
<td>35/50</td>
</tr>
<tr>
<td>25/30</td>
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</tbody>
</table>

<table>
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<th>SIGN SPACING TABLE</th>
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</thead>
<tbody>
<tr>
<td>Speed</td>
</tr>
<tr>
<td>45/50 MPH</td>
</tr>
<tr>
<td>35/40 MPH</td>
</tr>
<tr>
<td>25/30 MPH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BUFFER DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffer Space</td>
</tr>
<tr>
<td>Speed (MPH)</td>
</tr>
<tr>
<td>B (FT)</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Buffer Vehicle Roll Ahead Distance</th>
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</thead>
<tbody>
<tr>
<td>4 Yard Dump Truck 24,000 LBS</td>
</tr>
<tr>
<td>R (FT) =</td>
</tr>
</tbody>
</table>

Typical application of traffic control devices on a two-lane highway where one lane is closed and flagging is provided.

FOR LOCAL AGENCY USE

TRAFFIC CONTROL PLAN
NOTES
1. Regulatory traffic control devices to be modified as needed for the duration of the detour.
2. Flashing warning lights (Type A, MICCD) shall be used to mark barricades at night as needed.
3. Detour trailblazers shall be installed as necessary throughout detour route.

SIGN SPACING TABLE

<table>
<thead>
<tr>
<th>Speed</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>45/50 MPH</td>
<td>500'</td>
</tr>
<tr>
<td>35/40 MPH</td>
<td>350'</td>
</tr>
<tr>
<td>25/30 MPH</td>
<td>200'</td>
</tr>
</tbody>
</table>

LEGEND
Type III Barricade

Typical application - Roadway closed beyond detour point
1. For long-term projects, conflicting pavement markings no longer applicable shall be removed or obliterated as soon as practicable. Temporary markings shall be used as necessary.

2. See Buffer Data Table. Use of buffer vehicle is recommended. It may be a work vehicle, if buffer vehicle is used, minimum distance from end of taper to work area shall be a total of \( R \) (tapered distance) plus length of vehicle, plus \( R \) (buffer space). If buffer vehicle is not used, minimum distance shall be \( R \).

3. This application may be used during peak traffic periods. Lane distribution may be reversed (signs changed accordingly) when peak traffic flow changes direction.

4. Other curve or turn warning signs may be substituted for sign W-4kbl; and W-4dpl, to depict roadway alignment as appropriate.

---

**BUFFER DATA**

<table>
<thead>
<tr>
<th>Speed (MPH)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>B (FT) =</td>
<td>50</td>
<td>85</td>
<td>120</td>
<td>170</td>
<td>220</td>
<td>280</td>
</tr>
</tbody>
</table>

**For Local Agency Use**

**TRAFFIC CONTROL PLAN**

Legend:
- @ Channelizing Devices
- " Collocated Markings (see notes)
- + Sequential Arrow Sign

Typical application of traffic control devices where directional traffic volumes are uneven.
EFFECTIVE: AUGUST 5, 2002 TO APRIL 6, 2003

END ROAD WORK
or reverse cone taper to show end of work area

G20-2a

Buffer Vehicle with TMA (optional) (See Note 1)

Buffer Area

WORK AREA

W2-2(L)
Black on Orange

W20-5(R)

RIGHT LANE CLOSED AHEAD

W20-1
ROAD WORK AHEAD

500' MAX
100'

L
X
X
X

B

NOTES
1. Flashing warning lights and/or flags shall be used to call attention to early warning signs when specified in contract.

2. See Buffer Data Table. Use of buffer vehicle is recommended. It may be a work vehicle. If buffer vehicle is used, minimum from end of taper to work area shall be total of "R" (roll ahead distance) plus length of vehicle, plus "B" (Buffer space). If buffer vehicle is not used, minimum distance shall be "B".

CHANNELIZING DEVICES SPACING (FTI)

<table>
<thead>
<tr>
<th>MPH</th>
<th>Taper</th>
<th>Tangent</th>
</tr>
</thead>
<tbody>
<tr>
<td>35/50</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

BUFFER DATA

Buffer Spacing

Speed (MPH) 25 30 35 40 45 50
B (FT) 55 85 120 170 220 280

Buffer Vehicle Roll Ahead Distance

4 Yard Dump Truck 24,000 LBS Stationary Operation
R (FT) = 100

MINIMUM TAPER LENGTH = L IN FEET

<table>
<thead>
<tr>
<th>Lane Width (Feet)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>105</td>
<td>150</td>
<td>205</td>
<td>270</td>
<td>450</td>
<td>500</td>
</tr>
<tr>
<td>11</td>
<td>115</td>
<td>165</td>
<td>225</td>
<td>295</td>
<td>495</td>
<td>550</td>
</tr>
<tr>
<td>12</td>
<td>125</td>
<td>180</td>
<td>245</td>
<td>320</td>
<td>540</td>
<td>600</td>
</tr>
</tbody>
</table>

LEGEND

 Channels Device
 Sequential Arrow Sign

Typical application - daytime operation of short duration on a four-lane divided roadway where one lane is closed.
1. Flashing warning lights and/or flags shall be used to call attention to early warning signs when specified in contract.

2. See Buffer Data Table. Use of buffer vehicle is recommended. If a work vehicle, the buffer vehicle is used, minimum distance from end of taper to work area shall be total of "R" (roll ahead distance) plus length of vehicle, plus "B" (buffer space). If buffer vehicle is not used, minimum distance shall be "B".

**Buffer Data**

<table>
<thead>
<tr>
<th>Speed (MPH)</th>
<th>Buffer Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Buffer Vehicle Roll Ahead Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Yard Bump Truck</td>
</tr>
<tr>
<td>24,000 lbs</td>
</tr>
<tr>
<td>Stationary Operation</td>
</tr>
<tr>
<td>R (FT) = 100</td>
</tr>
</tbody>
</table>

**Minimum Taper Length = L in Feet**

<table>
<thead>
<tr>
<th>Width (Feet)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>105</td>
<td>115</td>
<td>125</td>
<td>135</td>
<td>145</td>
<td>155</td>
</tr>
<tr>
<td>12</td>
<td>125</td>
<td>135</td>
<td>145</td>
<td>155</td>
<td>165</td>
<td>175</td>
</tr>
</tbody>
</table>

**Sign Spacing Table**

<table>
<thead>
<tr>
<th>Speed</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>45/50 MPH</td>
<td>500'</td>
</tr>
<tr>
<td>35/40 MPH</td>
<td>350'</td>
</tr>
<tr>
<td>25/30 MPH</td>
<td>200'</td>
</tr>
</tbody>
</table>

**Channelizing Device Spacing (FT):**

<table>
<thead>
<tr>
<th>MPH</th>
<th>Taper</th>
<th>Tangent</th>
</tr>
</thead>
<tbody>
<tr>
<td>35/50</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/35</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

**Legend**

- Channelizing Devices
- Sequential Arrow Sign

Typical Application - Closing two lanes of a multilane highway
1. Flashing warning lights (Type A, MUTCD) should be used to mark barricades at night as needed.

2. Steady burning warning lights (Type C, MUTCD) should be used to mark channelizing devices at night as needed.

3. Conflicting pavement markings and those no longer applicable shall be removed or obliterated.

4. Prohibit turns as necessary for traffic conditions.

### Minimum Taper Length

<table>
<thead>
<tr>
<th>Lane Width (feet)</th>
<th>Posted Speed (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>25, 30, 35, 40, 45, 50</td>
</tr>
<tr>
<td>10</td>
<td>10, 15, 20, 25, 30, 40</td>
</tr>
<tr>
<td>12</td>
<td>12, 15, 20, 25, 30, 40</td>
</tr>
</tbody>
</table>

### Sign Spacing Table

<table>
<thead>
<tr>
<th>Speed</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>45/50 MPH</td>
<td>500'</td>
</tr>
<tr>
<td>35/40 MPH</td>
<td>350'</td>
</tr>
<tr>
<td>25/30 MPH</td>
<td>200'</td>
</tr>
</tbody>
</table>

### Channelizing Device Spacing (ft)

<table>
<thead>
<tr>
<th>MPH</th>
<th>Taper</th>
<th>Tangent</th>
</tr>
</thead>
<tbody>
<tr>
<td>35/50</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>
1. No encroachment on travelled lane, if encroachment is necessary, lane must be closed.

2. See Buffer Data Table. Use of buffer vehicle is recommended, if may be a work vehicle. If buffer vehicle is used, minimum distance from end of taper to work area shall be total of "R" (roll ahead distance) plus length of vehicle, plus "B" (buffer space). If buffer vehicle is not used, minimum distance shall be "B".

### BUFFER DATA

<table>
<thead>
<tr>
<th>Speed (MPH)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>B (FT)</td>
<td>55</td>
<td>85</td>
<td>120</td>
<td>170</td>
<td>220</td>
<td>280</td>
</tr>
</tbody>
</table>

### Buffer Vehicle Roll Ahead Distance

<table>
<thead>
<tr>
<th>4 Yard Dump Truck</th>
<th>24,000 LBS</th>
<th>Stationary Operation</th>
<th>Moving Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>R (FT)</td>
<td>100</td>
<td></td>
<td>175</td>
</tr>
</tbody>
</table>

### CHANNELIZING DEVICE SPACING (FT)

<table>
<thead>
<tr>
<th>Speed</th>
<th>X</th>
<th>500'</th>
<th>350'</th>
<th>200'</th>
</tr>
</thead>
<tbody>
<tr>
<td>45/50 MPH</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35/50 MPH</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25/30 MPH</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### MINIMUM TAPER LENGTH - L IN FEET

<table>
<thead>
<tr>
<th>Lane Width (feet)</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>105</td>
<td>150</td>
<td>205</td>
<td>270</td>
<td>450</td>
<td>500</td>
</tr>
<tr>
<td>11</td>
<td>115</td>
<td>165</td>
<td>225</td>
<td>295</td>
<td>495</td>
<td>550</td>
</tr>
<tr>
<td>12</td>
<td>125</td>
<td>180</td>
<td>245</td>
<td>320</td>
<td>540</td>
<td>600</td>
</tr>
</tbody>
</table>

**Legend:**
- Channelizing Devices

*Typical application - Shoulder work on four lane highway.*
1. See Buffer Data Table. Use of buffer vehicle is recommended. It may be a work vehicle. If buffer vehicle is used, minimum distance from end of taper to work area shall be total of "R" (roll ahead distance) plus length of vehicle, plus "B" buffer space. If vehicle is not used, minimum distance shall be "B".

Buffer vehicle with beacon (optional) (See Note 1)

or reverse cone taper to show end of work area

### CHANNELIZING DEVICE SPACING (FT)

<table>
<thead>
<tr>
<th>MPH</th>
<th>Taper</th>
<th>Tangent</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>25/30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

### MINIMUM TAPER LENGTH = L IN FEET

<table>
<thead>
<tr>
<th>Lane Width (Feet)</th>
<th>Posted Speed (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>30, 35</td>
</tr>
<tr>
<td>10</td>
<td>105, 150, 205</td>
</tr>
<tr>
<td>11</td>
<td>115, 165, 225</td>
</tr>
<tr>
<td>12</td>
<td>125, 180, 245</td>
</tr>
</tbody>
</table>

### SIGN SPACING TABLE

<table>
<thead>
<tr>
<th>Speed</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 MPH</td>
<td>350'</td>
</tr>
<tr>
<td>25/30 MPH</td>
<td>200'</td>
</tr>
</tbody>
</table>

### BUFFER DATA

<table>
<thead>
<tr>
<th>Speed (MPH)</th>
<th>Buffer Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>55</td>
</tr>
<tr>
<td>30</td>
<td>85</td>
</tr>
<tr>
<td>35</td>
<td>120</td>
</tr>
</tbody>
</table>

Buffer Vehicle Roll Ahead Distance

4 Yard Dump Truck 24,000 LBS  84,000 LBS Stationary Operation

R (FT) = 100

**LEGEND**

- Channelizing Devices

Typical application - shoulder work on urban street with minor encroachment on traveled lane.
WIRE FENCE - TYPE 1

LINE BRACE
(Maximum spacing 1000 feet)

18" Square section
12" Round section

Concrete
Class 3000

60° MIN, 65° MAX

Wire clamp
(See Note 3)

13/4" Square

TREATMENT OF SAGS

Stone or concrete block
(MIN weight 1000 pounds)
or drilled and grouted
hole in solid rock

14' MAX

14' MAX

STEEL POST DETAILS
Details for Type 2 Fence identical
as shown for Type 1 Fence
**SINGLE WIRE GATE, 14' WIDE**

**DOUBLE WIRE GATE, 20' WIDE**

**WIRE FENCE**

**END BRACE**

**LINE BRACE**

(Maximum spacing 1000 feet)

**INTERSECTING FENCE BRACE**

**CORNER BRACE**

(Angles 30° and over)

**WOOD POST DETAILS**

**NOTES:**

1. Details for Type 2 Fence, see as Type 1.
2. Wood anchors shall be 2x4 lumber, 12" long MIN, fastened with three 16d galvanized nails.
3. Four wire clamps per post required for mesh wire, three additional clamps per post required in sag section.
END, CORNER AND PULL POST

RAIL AND BRACE

LINE POST

ROLL FORMED SECTIONS

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>BRACE RAIL &amp; TOP RAIL</th>
<th>LINE &amp; BRACE POST</th>
<th>END, CORNER, &amp; PULL POST</th>
<th>GATE POST</th>
<th>ALL POSTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ROUND</td>
<td>H-COLUMN</td>
<td>ROLL FORMED</td>
<td>ROUND</td>
<td>H-COLUMN</td>
</tr>
<tr>
<td>1</td>
<td>1 1/4</td>
<td>1 1/4</td>
<td>1 3/8</td>
<td>2</td>
<td>1 1/4</td>
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<tr>
<td>2</td>
<td>1 1/4</td>
<td>1 1/4</td>
<td>1 3/8</td>
<td>2</td>
<td>1 1/4</td>
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<tr>
<td>3</td>
<td>1 1/4</td>
<td>1 1/4</td>
<td>1 3/8</td>
<td>1 1/2</td>
<td>1 1/4</td>
</tr>
<tr>
<td>4</td>
<td>1 1/4</td>
<td>1 1/4</td>
<td>1 3/8</td>
<td>1 1/2</td>
<td>1 1/4</td>
</tr>
<tr>
<td>5</td>
<td>1 1/4</td>
<td>1 1/4</td>
<td>1 3/8</td>
<td>1 1/2</td>
<td>1 1/4</td>
</tr>
</tbody>
</table>

CHAIN LINK FENCE

L-2
07-18-97
1. Fence fabric shall be secured to gate frames with knuckled selvage along top edge for Types 4 & 6 chain link fence installations.

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

CHAIN LINK GATES
1. Posts shall be 6 x 8 wood or 6 x 9 steel. See Standard Plan "Beauce Guardrail Posts and Blocks".

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