DESCHUTES COUNTY ROAD DEPARTMENT
PLANS FOR
2022 GUARDRAIL IMPROVEMENTS
JAN 2022

BEND

LA PINE

VICTORY MAP and SITE NUMBER

LEGEND

GENERAL NOTES:

INDEX OF SHEETS

1 COVER SHEET
2 SITE MAPS
3 PLAN AND DETAILS SOLAR DR, SUNRIVER
4 PLAN AND DETAILS COTTONWOOD RD, SUNRIVER

CDOT STANDARD DRAWING NO.

BG303 Transition Type "W" Concrete Rail to Guardrail
BG304 Thrie Beam Rail and Transition
BG305 Type "W" Concrete Rail Retrofit of Existing Peaprod Rail
RD405 Guardrail and Metal Median Barrier
RD410 Midwest Guardrail System Types
RD430 Midwest Guardrail System Wood Post and Block
RD440 Midwest Guardrail System Steel Post and Block
RD460 Guardrail and Metal Median Barrier Posts
RD461 MidWest Guardrail System (W Beam)
RD465 Thrie Beam Guardrail
RD466 Guardrail and Metal Median Barrier Posts
RD468 Midwest Guardrail System Standard Hardware
RD470 Midwest Guardrail System End Sections
RD490 Midwest Guardrail System Guardrail for Terminals
RD492 Midwest Guardrail System Non-Plated Energy-Absorbing Terminal
RD494 Wood Breakaway Posts
RD496 Midwest Guardrail System Over Low-Fill Culverts
RD498 Midwest Guardrail System Height Conversion
TM800 2-Lane, 2-Way Roundabouts
NOTES:
1. RAIL HEIGHT ON BRIDGE IS 27'; GRADUALLY INCREASE THE HEIGHT TO 31' AT RAIL ENDS PER R481
2. DRILL BOTTOM HOLES ON ALL EXTD BRIDGE POSTS TO ACCOMMODATE TYPE 4 RAIL
3. FOR THREE SAWN AND TRANSITIONS SEE R223 & R404 FOR DETAILS NOT SHOWN
4. ENERGY ABSORBING END TREATMENT MUST BE MASH TEST LEVEL 3 COMPLIANT AND FROM COOT QPL

DESCHUTES COUNTY ROAD DEPARTMENT
61150 S.E. 27TH STREET
BEND, OR 97702

2022 QUADRAIL IMPROVEMENTS

DRATTER: T. WILSON DATE: 12/13/21
REVIEWED BY: C. SMITH DATE: 12/13/21

CONDITIONS & REMOVAL

SOLAR DR - PLAN

SHEET NO. 3 OF 4
NOTES:
1. SEE OREGON STANDARD DRAWINGS FOR DETAILS NOT SHOWN.
2. INSTALL SNOWLOAD WASHERS ON POSTS AND RAILS PER RD416
3. ENERGY ABSORBING END TREATMENT MUST BE MASH TEST LEVEL 3 COMPLIANT AND FROM ODOT QPL

INSTALL RAIL RETROFIT ON EXISTING PAVEMENT PER DET3283
FOR 3" OR 6" CURB

SEE BR303 AND DET 3283 FOR DETAILS NOT SHOWN

INSTALL MIDWEST GUARDRAIL SYSTEM TYPE 2A (TY)
LENGTH VARIES

ADD 1 EXTRA THREE BEAM (DOUBLE THICKNESS) TO EXTEND BEYOND THE RECESS TERMINAL AREA

INSTALL TYPE 6 DELINEATORS -25' SPACING
PLAN

- Transition posts may be steel W6x9 or timber 8" x 8".
- All posts to be of same material.

End Panel

Concrete Bridge Rail

5'-0" taper

12" Post

(3) spaces @ 3'-0"

9'-4"

(5) spaces @ 1'-6"

4'-7"

2'-6"

Bars "a"

Bar "b"

Bars "a"

Bar "b"

W6 x 9, typ.

W6 x 15, typ.

8" x 8" timber blocks, typ.

End of Bridge End Panel

GENERAL NOTES:

Thrie beam terminal connector

See Detail A

Thrie beam rail, double thickness,
(2) 0.105" thick elements.

Thrie beam rail, single thickness,
(1) 0.135" thick element.

See Std. Dwg. RD410

Guardrail Transition, each

See Grading

(2) 0.105" thick elements.

Thrie beam rail, double thickness,
(1) 0.135" thick element.

See Std. Dwg. RD410

Pay Length for Bridge Rail

Concrete Bridge Rail

Edge of Bridge End Panel

- 3⁄4" preformed expansion joint filler or expansion joint. See Bridge Plans

- 3⁄4" dia. hole, typ.

- 5⁄16" dia. hole, typ.

- 5⁄16" dia. post bolts (ASTM A307) w/rod, steel washers (on back side) and lock nuts or jam nuts.

- 5⁄16" dia. bolts (ASTM A193) w/rod, steel washers and lock nuts or jam nuts, snug tight.

- 10'-0" taper

4'-3"

THRIE BEAM BLOCK (W8 x 15)

 bred in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

The selection and use of this Standard Drawing, while designed in accordance with the current Oregon Standard Specifications, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

All material and workmanship shall be in accordance with the current Oregon Standard Specifications.

NOTE: All materials see accompanying notes and drawings.
**NOTE 1**

Transition posts may be steel W6x9 or timber 8"x8". All posts to be of same material. See depo. BR203 for Thrie Beam blockouts.

**CONCRETE INSERTS**

Not-dig galvanized expanded core inserts with closed-back ferrule threaded to receive

- 3/8" dia., Gr36 (ASTM A307)
- Minimum insert length= 4".
- Minimum safe working load in tension= 4000 lbs.

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**POST DETAILS: SIDE MOUNT**

- **Slotted holes**: 3/8" dia., Gr36 (ASTM A307)
- **Slotted holes**: 2-1" dia.

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**GENERAL NOTES**

- Provide steel posts and plates conforming to AASHTO Specification M163 (ASTM A325), unless noted otherwise.
- Provide anchor bolts conforming to ASTM A193, (AASHTO M164).
- Provide guardrail hardware as shown on Std. Dwg. RD405 and RD410. Hot dip galvansize all structural steel and hardware after fabrication. Fabricate railing to the horizontal and vertical alignment of the structure. Install posts normal to grade. When wearing surface thickness varies due to beam camber and/or superelevation, vary rail post lengths to provide uniform rail height.
- Tap nuts and inserts 0.005 oversize after galvanizing in accordance with ASTM A563.
- Tighten upper high strength post bolts 1/6 turn past snug tight condition. Tighten lower high strength post bolts 1/3 turn past snug tight condition. Do not use this rail for 12" thick slab.
- Transition posts may be steel W6x9 or timber 8"x8". All posts to be of same material. See depo. BR203 for Thrie Beam blockouts.

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**OREGON STANDARD DRAWINGS**

**THRIE-BEAM RAIL AND TRANSITION**

**ELEVATION**

- **1-Plate Washer "C" and SAE lock washer**
- **2-Plate Washer "B"**
- **2-H.S. bolts (A325) with washer and Plate Washer "A"**
- **2-concrete inserts**

---

**SIDE ELEVATION**

- **Double thickness (2) rail elements**
- **1/4" dia. hole**

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**SECTION A-A**

- **Plate Washer "A"**
- **Position washer to completely cover slotted hole.**
- **PLATE WASHER "B"**
- **Position washer to completely cover slotted hole.**
- **PLATE WASHER "C"**
- **Position washer to completely cover slotted hole.**
- **WASHER "D"**
- **1" dia. hole**

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**NOTE:**

Provide steel posts and plates conforming to AASHTO Specification M163 (ASTM A325), unless noted otherwise.

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**DATE:**

December 1, 2021 - May 31, 2022

**ORIGIN: SHINGE**

- Registered Professional Engineer.
For Existing Parapet with 3" or 6" Curb

EXISTING PARAPET with 1'-6" CURB

Silicone sealant

NOTE

1'-0" x 1'-0" x 1'-0" x 1'-0" - DET3283

For details not shown, see diag. BR203.

Remove existing rail over end post to elevation top of deck.

*See dwg. BR203 (NOTE 3 and SECTION D-D)

Remove existing rail over end post to elevation top of deck.

*Post 3 " away

W8x15

1 - 4" dia. straight threaded resin bonded anchor, each end of bridge.

Removal

2 - #6 longitudinal bars stop 2" clear all joints

(3 required for 6" and 1'-6" curb) - 4'-0" max.

1'-7" taper

Bridge Rail Pay Length

1'-8" cl.

7/8" dia. rod, see typical rail section.

NOTE

For transition details not shown, see diag. BR203.

*See diag. BR203 (NOTE 3 and SECTION D-D)

Remove existing rail over end post to elevation top of deck.

*Post 3 " away

W8x15

1 - 4" dia. straight threaded resin bonded anchor, each end of bridge.

Removal

2 - #4 longitudinal bars stop 2" clear all joints

(3 required for 6" and 1'-6" curb) - 4'-0" max.

1'-8" cl.

7/8" dia. rod, see typical rail section.

NOTE

For transition details not shown, see diag. BR203.

*See diag. BR203 (NOTE 3 and SECTION D-D)

Remove existing rail over end post to elevation top of deck.

*Post 3 " away

W8x15

1 - 4" dia. straight threaded resin bonded anchor, each end of bridge.

Removal

2 - #4 longitudinal bars stop 2" clear all joints

(3 required for 6" and 1'-6" curb) - 4'-0" max.

1'-8" cl.

7/8" dia. rod, see typical rail section.

NOTE

For transition details not shown, see diag. BR203.

*See diag. BR203 (NOTE 3 and SECTION D-D)

Remove existing rail over end post to elevation top of deck.

*Post 3 " away

W8x15

1 - 4" dia. straight threaded resin bonded anchor, each end of bridge.

Removal

2 - #4 longitudinal bars stop 2" clear all joints

(3 required for 6" and 1'-6" curb) - 4'-0" max.

1'-8" cl.

7/8" dia. rod, see typical rail section.

NOTE

For transition details not shown, see diag. BR203.

*See diag. BR203 (NOTE 3 and SECTION D-D)

Remove existing rail over end post to elevation top of deck.

*Post 3 " away

W8x15

1 - 4" dia. straight threaded resin bonded anchor, each end of bridge.

Removal

2 - #4 longitudinal bars stop 2" clear all joints

(3 required for 6" and 1'-6" curb) - 4'-0" max.

1'-8" cl.

7/8" dia. rod, see typical rail section.

NOTE

For transition details not shown, see diag. BR203.

*See diag. BR203 (NOTE 3 and SECTION D-D)

Remove existing rail over end post to elevation top of deck.

*Post 3 " away

W8x15

1 - 4" dia. straight threaded resin bonded anchor, each end of bridge.

Removal

2 - #4 longitudinal bars stop 2" clear all joints

(3 required for 6" and 1'-6" curb) - 4'-0" max.

1'-8" cl.

7/8" dia. rod, see typical rail section.

NOTE

For transition details not shown, see diag. BR203.

*See diag. BR203 (NOTE 3 and SECTION D-D)

Remove existing rail over end post to elevation top of deck.

*Post 3 " away

W8x15

1 - 4" dia. straight threaded resin bonded anchor, each end of bridge.

Removal

2 - #4 longitudinal bars stop 2" clear all joints

(3 required for 6" and 1'-6" curb) - 4'-0" max.

1'-8" cl.

7/8" dia. rod, see typical rail section.
Instructions to Designer:

"Butterfly" delineators supplement delineators Type 1 through 4. Use the appropriate detail images on project plans and delete the remainder.
W-BEAM GUARDRAIL

NORMAL RAIL ELEMENT DATA

<table>
<thead>
<tr>
<th>TYPE</th>
<th>RAIL</th>
<th>EFFECTIVE LENGTHS</th>
<th>GAUGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A</td>
<td>W-beam</td>
<td>6.25', 12.5', 25'</td>
<td>10 &amp; 12</td>
</tr>
<tr>
<td>3</td>
<td>Thrie-beam</td>
<td>6.25', 12.5', 25'</td>
<td>10 &amp; 12</td>
</tr>
<tr>
<td>4 TRANSITION</td>
<td>Thrie-beam</td>
<td>6.25'</td>
<td>10 &amp; 12</td>
</tr>
</tbody>
</table>

WOOD OR STEEL

Post

Type 3 use double thickness (2) rail elements

1. See appropriate guardrail standard drawings for details not shown.
2. When required by the plans, drainage curb alignment same as face of guardrail.
3. Orient post bolts with the button head located on the side nearest the traffic lane.
4. Lap guardrail in direction of adjacent traffic.
5. Final paved surface to extend to face of post. Rail height measured from final paved surface at face of rail (typical all types). 1/8" tolerance.
6. Wood block shall be toe-nailed to the post with 2 - 16d galvanized nails in top of block to prevent block rotation.
7. Wood blocks shown. Blocks of approved alternate material may be used. (See ODOT's OP).
8. Existing posts shall not be raised.
9. Replace posts as necessary to achieve required guardrail height.

General Notes for All Details on This Sheet:

Replace posts as necessary to achieve required guardrail height.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.
1. See appropriate guardrail standard drawing(s) for details not shown.
2. See Bridge Dwgs. for bridge transition guardrail post and block requirements.
3. Lowest hole(s) required only when channel rail is to be installed. Drill 12" below top 1/2" or 3/4" hole(s) used.
4. Dimensions shown are for nominal posts and blocks.
5. Wood blocks shown. Blocks of an approved alternate material may be used. See ODOT's QPL.
6. When required by the plans, nested three beam wood post shall be 6"x8".
7. Wood block shall be toe-nail to the post with 2 - 16d galvanized nails in top of block to prevent block rotation.

**General Notes for All Details on This Sheet:**

- The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

**Guardsrail Wood Post Table**

<table>
<thead>
<tr>
<th>Guardsrail Type</th>
<th>Post Size</th>
<th>Post Length</th>
<th>Post Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>W Beam</td>
<td>6x6 or 8x8</td>
<td>0'-6&quot;</td>
<td>6'-3&quot;</td>
</tr>
<tr>
<td>Metal Median Barrier</td>
<td>6x6 or 8x8</td>
<td>6'-0&quot;</td>
<td>6'-3&quot;</td>
</tr>
<tr>
<td>Thrie Beam</td>
<td>4x4</td>
<td>8x8</td>
<td>6'-0&quot;</td>
</tr>
</tbody>
</table>

**Effective Date:** December 1, 2021 – May 31, 2022
### General Notes for All Details on This Sheet:

1. See appropriate guardrail standard drawing(s) for details not shown.
2. See Bridge Dwg. for bridge transition guardrail post & block requirements. Multiple holes are not required in bridge transition rail posts.
3. Posts and blocks to be pre-drilled for the intended guardrail installation.
4. Post and block dimensions are nominal.
5. Steel posts are shifted to accommodate bolt holes. Holes may be on left, right, or both sides of web.
6. Wood blocks shown. Blocks of an approved alternate material may be used. See ODOT’s QPL.

### OREGON STANDARD DRAWINGS

**GUARDRAIL AND METAL MEDIAN BARRIER PARTS (29° RAIL HEIGHT)**

**NOTE:** DO NOT USE FOR NEW CONSTRUCTION.

**NOTE:** All material and workmanship shall be in accordance with the current Oregon Standard Specifications.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

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**Effective Date:** December 1, 2021 – May 31, 2022

**CALC. BOOK NO.:**

**DATE: 20-JUL-2020**

**REVISION DESCRIPTION:**

**SDR DATE:**

**O/N/A**

**DATE:**

**NOTE:** THIS DRAWING IS RETAINED FOR MAINTENANCE PURPOSES. DO NOT USE FOR NEW CONSTRUCTION.
TYPICAL SECTION
(Steel post shown)

NORMAL RAIL ELEMENT DATA

<table>
<thead>
<tr>
<th>Type</th>
<th>Effective Lengths</th>
<th>Width (Galv.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A.0</td>
<td>6'-3&quot;, 12'-3&quot;, 25'</td>
<td>10 ga &amp; 12 ga</td>
</tr>
</tbody>
</table>

NOTES:

a. When required by the plans, post bolts to extend beyond the tightened nuts within limits of 1/4 to 3/4.
b. All post bolt threads to be set after assembly for wrench removal only.

g. 16d galv. anti-rotation rail (See gen. note 5).

SECTION THRU RAIL ELEMENT

1/2" post bolt with washer & recessed hex nut (Typ.)

FITTINGS

1/2" splice bolt with
recessed hex nut & washer (Typ.)

W-beam rail element

POST BOLT SLOT

1/2" rad.

1/2" rad.

SPICE BOLT SLOT

16d galv.
anti-rotation rail
(See gen. note 2)

Mid-span splice

Effective Date: December 1, 2021 – May 31, 2022

OREGON STANDARD DRAWINGS

MIDWEST GUARDRAIL SYSTEM

W-BEAM

2021

CALC. BOOK NO. N/A

SDR DATE 19-JUL-2021

NOTE: All material and workmanship shall be in accordance with the current Oregon Standard Specifications

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.
**GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:**

1. See appropriate guardrail standard drawings for details not shown.
2. Lap guardrail in direction of adjacent traffic.
3. Hole layout per manufacturer with appropriate post and block.
4. Final paved surfacing to extend to face of post. Rail height measured from final paved surface at face of rail to top of rail (Typ. all types). ± 1" tolerance.
5. Wood block shall be toe-nailed to the post with 2 - 16d galvanized nails in top of block to prevent block rotation.
6. Wood blocks shown. Blocks of an approved alternate material may be used. See ODOT's QPL.
7. All posts for guardrail run shall be of the same type: wood or steel.
8. When required by the plans, nested thrie beam post shall be 8x8 wood or W16x9 steel.

**THRIE BEAM GUARDRAIL**

All material and workmanship shall be in accordance with the current Oregon Standard Specifications.

**NOTE:** The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

Effective Date: December 1, 2021 - May 31, 2022

RD409
**THRIE BEAM TRANSITION ELEMENT**

1. See general note 4

**SYMMETRICAL THRIE BEAM TRANSITION ELEMENT**

(Left section shown, right section reversed)

**TYPICAL THRIE BEAM TRANSITION ELEMENT**

(Reverse of right section)

**LEFT SECTION**

**(4) POST SPACING**

(12'-6" section shown)

**RIGHT SECTION**

**THRIE BEAM GUARDRAIL**

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

OREGON STANDARD DRAWINGS

Effective Date: December 1, 2021 - May 31, 2022
**BASE PLATE DETAILS**

**STEEL POST**
- 2"

**ALTERNATE 2**
- Radius Identification Plate
- Pre-curved to industry standard. Install or less (5' min. radius) use rail elements

**NOTES:**
- Lowest splice bolt nearest the P.C. of the guardrail radius.
- For details of guardrail connections to structural handrails, see special details or Standard Drawings as required.
- Use on back of post.

**SECTION THRU RAIL ELEMENT**

**TERMINAL CONNECTOR**
- Use on rail element face.
- Rectangular
- Use on back of post.

**TYPE B END PIECE**
- Splice bolt slots (A reqd.)
- Section C-C

**GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:**
1. See applicable guardrail standard drawings for details not shown.
2. For details of guardrail connections to structural handrails, see special details or Standard Drawings as called for on plans.
3. All indicated welds shall attain the full strength of the section welded.
4. Radius dimensions, in feet to the nearest 0.5 foot, shall be placed on the plate with a raised weld bead replacing the letters "R", shown on the Radius Identification Plate detail. Digits shall be 1 1/2" min. height and 1/2" max. width. Plate shall be galvanized after placement of digits.
5. The guardrail radius identification plate is to be mounted on the back side of the rail element with the lowest splice bolt nearest the P.C. of the guardrail radius.

**Notes:**
- All material and workmanship shall be in accordance with the current Oregon Standard Specifications.
- The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

**OREGON STANDARD DRAWINGS**

**GUARDRAIL AND METAL MEDIAN BARRIER PARTS**
- 29" RAIL HEIGHT
- 2021

Effective Date: December 1, 2021 – May 31, 2022
**GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:**

1. See appropriate guardrail standard drawing(s) for details not shown.
2. For details of guardrail connections to structural handrails, see special details or Standard Drawings as called for on plans.
3. All indicated welds shall attain the full strength of the section welded.
4. Radius dimensions, in feet to the nearest 0.5 foot, shall be placed on the plate with a raised weld bead replacing the letters "HHH", shown on the Radius Identification Plate detail. Digits shall be 1½" min. height and ½ max. width. Plate shall be galvanized after placement of digits.
5. The guardrail radius identification plate is to be mounted on the backside of the rail element with the lowest splice bolt nearest the P.C. of the guardrail radius.
6. When required by the plans, a Snow Load Post Washer shall be used on the backside of the post and a Snow Load Rail Washer shall be placed on rail element face. Snow Load Rail Washers shall not be installed on terminals.

**SUPPLEMENTARY NOTES:**

- a. Not required if Snow Load Post Washer option is used.
- b. Use rectangular Snow Load Rail washer under bolt head and nut on Type C End Piece as shown.
- c. Fitted & installed by structure contractor when shown on structure plans.
- d. 6" min. penetration into concrete slabs other than bridge decks. Cast in place or core and install using approved resin bonding system.
- e. Use in area of heavy snow, as directed by the engineer (See general note 4).
- f. Use on back of post. Snow Load Rail Washers shall not be installed on the backside of the post and a Snow Load Rail Washer shall be placed on the rail element face. Snow Load Rail Washers shall not be installed on terminals.
- g. Leveling nut & washer (4 reqd.)
- h. Slotted hole
- i. Use in area of heavy snow, as directed by the engineer (See general note 4).

**SHIPPING & INSTALLATION:**

Revised by: 

- Date: 3/17/2020

**REGISTRATION SEAL:**

- The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

**OREGON STANDARD DRAWINGS MIDWEST GUARDRAIL SYSTEM STANDARD HARDWARE (NUTS, BOLTS, WASHERS AND MISC.)**

- Date: 3/17/2020
- Revised Description: 

**NOTE:** All material and workmanship shall be in accordance with the current Oregon Standard Specifications.

**BOLT DIMENSION TABLE**

<table>
<thead>
<tr>
<th>Length</th>
<th>Thread Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1½&quot;</td>
<td>1½ min.</td>
</tr>
<tr>
<td>2&quot;</td>
<td>1½ min.</td>
</tr>
<tr>
<td>10&quot;</td>
<td>4 min.</td>
</tr>
<tr>
<td>18&quot;</td>
<td>4 min.</td>
</tr>
<tr>
<td>25&quot;</td>
<td>4 min.</td>
</tr>
</tbody>
</table>

**PLAN**

Welded steel post to be vertical. Height as reqd.

**ELEVATION**

- Concrete top of box culvert, etc.
- Leveling nut & washer (4 reqd.)

**BASE PLATE DETAILS**

For additional details, see Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

**CALC. BOOK NO.**

- N/A

**DATE**

- 12-JAN-2020

**NOTE:** All material and workmanship shall be in accordance with the current Oregon Standard Specifications.

**OREGON STANDARD DRAWINGS MIDWEST GUARDRAIL SYSTEM STANDARD HARDWARE (NUTS, BOLTS, WASHERS AND MISC.)**

- 2021

**STANDARD HARDWARE**

- Type C End Piece as shown.
- Use rectangular Snow Load Rail washer under bolt head and nut on Type C End Piece as shown.
- Cast in place or core and install using approved resin bonding system.
- Fitted & installed by structure contractor when shown on structure plans.
- Use in area of heavy snow, as directed by the engineer (See general note 4).
- Leveling nut & washer (4 reqd.)
- Slotted hole
- Use in area of heavy snow, as directed by the engineer (See general note 4).
- Use on back of post. Snow Load Rail Washers shall not be installed on the backside of the post and a Snow Load Rail Washer shall be placed on the rail element face. Snow Load Rail Washers shall not be installed on terminals.

**REVISION DESCRIPTION**

rd416

**NOTE:** All material and workmanship shall be in accordance with the current Oregon Standard Specifications.

**OREGON STANDARD DRAWINGS MIDWEST GUARDRAIL SYSTEM STANDARD HARDWARE (NUTS, BOLTS, WASHERS AND MISC.)**

- 2021

**STANDARD HARDWARE**

- Type C End Piece as shown.
- Use rectangular Snow Load Rail washer under bolt head and nut on Type C End Piece as shown.
- Cast in place or core and install using approved resin bonding system.
- Fitted & installed by structure contractor when shown on structure plans.
- Use in area of heavy snow, as directed by the engineer (See general note 4).
- Leveling nut & washer (4 reqd.)
- Slotted hole
- Use in area of heavy snow, as directed by the engineer (See general note 4).
- Use on back of post. Snow Load Rail Washers shall not be installed on the backside of the post and a Snow Load Rail Washer shall be placed on the rail element face. Snow Load Rail Washers shall not be installed on terminals.

**REVISION DESCRIPTION**

rd416

**NOTE:** All material and workmanship shall be in accordance with the current Oregon Standard Specifications.

**OREGON STANDARD DRAWINGS MIDWEST GUARDRAIL SYSTEM STANDARD HARDWARE (NUTS, BOLTS, WASHERS AND MISC.)**

- 2021

**STANDARD HARDWARE**

- Type C End Piece as shown.
- Use rectangular Snow Load Rail washer under bolt head and nut on Type C End Piece as shown.
- Cast in place or core and install using approved resin bonding system.
- Fitted & installed by structure contractor when shown on structure plans.
- Use in area of heavy snow, as directed by the engineer (See general note 4).
- Leveling nut & washer (4 reqd.)
- Slotted hole
- Use in area of heavy snow, as directed by the engineer (See general note 4).
- Use on back of post. Snow Load Rail Washers shall not be installed on the backside of the post and a Snow Load Rail Washer shall be placed on the rail element face. Snow Load Rail Washers shall not be installed on terminals.

**REVISION DESCRIPTION**

rd416

**NOTE:** All material and workmanship shall be in accordance with the current Oregon Standard Specifications.

**OREGON STANDARD DRAWINGS MIDWEST GUARDRAIL SYSTEM STANDARD HARDWARE (NUTS, BOLTS, WASHERS AND MISC.)**

- 2021

**STANDARD HARDWARE**

- Type C End Piece as shown.
- Use rectangular Snow Load Rail washer under bolt head and nut on Type C End Piece as shown.
- Cast in place or core and install using approved resin bonding system.
- Fitted & installed by structure contractor when shown on structure plans.
- Use in area of heavy snow, as directed by the engineer (See general note 4).
- Leveling nut & washer (4 reqd.)
- Slotted hole
- Use in area of heavy snow, as directed by the engineer (See general note 4).
- Use on back of post. Snow Load Rail Washers shall not be installed on the backside of the post and a Snow Load Rail Washer shall be placed on the rail element face. Snow Load Rail Washers shall not be installed on terminals.

**REVISION DESCRIPTION**

rd416

**NOTE:** All material and workmanship shall be in accordance with the current Oregon Standard Specifications.
THRIE BEAM TYPE C END PIECE

(For details not shown, see Type B End Piece)

1. Use rectangular washer under bolt head and nut on Type C End Piece as shown.

Symmetrical about:

Metal thin. 12 ga. galv.

32°

12 ga. galv. plate

Trim post as required

Splice bolt slot in rail member

ELEVATION

W-BEAM TYPE C END PIECE

4 1/2° rad.

1 1/8" slot (Typ.)

2 1/8" x 1 1/8" splice bolt slots (Typ.)

2 1/8" x 1 1/8" splice bolt slots (Typ.)

Thrie beam terminal connector (See detail)

Thrie beam terminal connector (See detail)

PLAN

ALTERNATE 1

ALTERNATE 2

Effective Date: December 1, 2021 – May 31, 2022
GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Use details shown as a general guide since manufacturer's details may vary.
2. See appropriate guardrail standard drawing(s) for details not shown.
3. Guardrail Non-flared terminal shall be installed with a minimum 1 foot offset ensuring that the end piece is entirely off normal shoulder.
4. Cross slope to match adjacent roadway cross slope (preferred).
5. On two way two lane highways, both ends of guardrail runs shall be provided with a terminal flared or non-flared. Paving of widened shoulder to the face of posts on both ends of guardrail runs is required.
6. Provide guardrail terminal from ODOT's QPL. Install according to manufacturer's recommendations (post count varies). Provide shop drawings to Engineer.
7. Install a reflectorized object marker on head of every guard rail terminal with "W" 4 feet or less according to manufacturer's recommendations. Ensure that guardrail terminal meets appropriate test level for the project.
8. Provide guardrail terminal system that meets MASH requirements per manufacturer's recommendations. Ensure that guardrail terminal meets appropriate test level for the project.
9. See note 6 and 9
10. See note 10
These general notes are intended to guide the installation of guardrail systems on projects. They include guidelines for the selection, installation, and testing of guardrail systems, as well as specific requirements for the design and construction of guardrail systems. The notes cover topics such as the selection of guardrail systems, the installation of end posts, the use of reflectorized object markers, and the testing of guardrail systems. The notes also provide information on the use of guardrail systems in different types of roadways, such as two-lane highways and multi-lane highways. The notes also include information on the selection of guardrail systems that meet MASH requirements, as well as information on the testing of guardrail systems to ensure they meet the appropriate test levels for the project.
W-BEAM WOOD BREAKAWAY POST

THRIE BEAM WOOD BREAKAWAY POST

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. See appropriate guardrail standard drawing(s) for details not shown.
2. Use only 6"x8" S4S wood posts, trim to fit steel tube if req'd.

NOTE: All material and workmanship shall be in accordance with the current Oregon Standard Specifications.

OREGON STANDARD DRAWINGS

WOOD BREAKAWAY POSTS

Effective Date: December 1, 2021 - May 31, 2022

RD451
1. See appropriate guardrail standard drawing(s) for details not shown.
2. Only those posts required to span the obstacle shall be eliminated.
   A maximum of three posts may be eliminated within a 25'-0" span of W-beam guardrail.
3. CRT post to be wood only.
4. Guardrail shall be lapped in the direction of adjacent traffic.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

Effective Date: December 1, 2021 - May 31, 2022
1. See appropriate guardrail standard drawing(s) for details not shown.

2. When required by the plans, drainage curb alignment same as face of guardrail. See Std. Dwg. RD701 for drainage curbs.

3. Lap guardrail in direction of adjacent traffic.

4. Guardrail shoulder installation shown, metal median barrier installation similar.

5. Final paved surfacing to extend to face of post. Rail height measured from final paved surface at face of rail to top of rail (typical all types). 1" tolerance.

6. Wood block shall be toe-nailed to the post with 2 - 16d galvanized nails in top of block to prevent block rotation.

7. Wood blocks shown. Blocks of an approved alternate material may be used. See ODOT’s QFL.

8. All posts for guardrail run shall be of the same type: wood or steel.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

Effective Date: December 1, 2021 – May 31, 2022
At night, flagger stations shall be illuminated according to the closed and bikes are expected.

Install a "BICYCLES ON ROADWAY" (CW11-1) sign in advance of (Relocated sign)

When using pilot cars with flaggers to control traffic during paving operations, the tubular marker spacing along centerline may be increased to 200' within the Activity Area, as shown or as directed.

Include "WAIT FOR FLAGGER" (CR4-23) signs mounted on type II Barriers located approx. 50' before each flagger.

Coordinate and control pedestrians movements through the TPAR using flaggers, other TCM, or as directed. When the existing shoulder is greater than or equal to 4' wide, provide a minimum of 4' of width for the TPAR.

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

Effect Date: December 1, 2021 – May 31, 2022