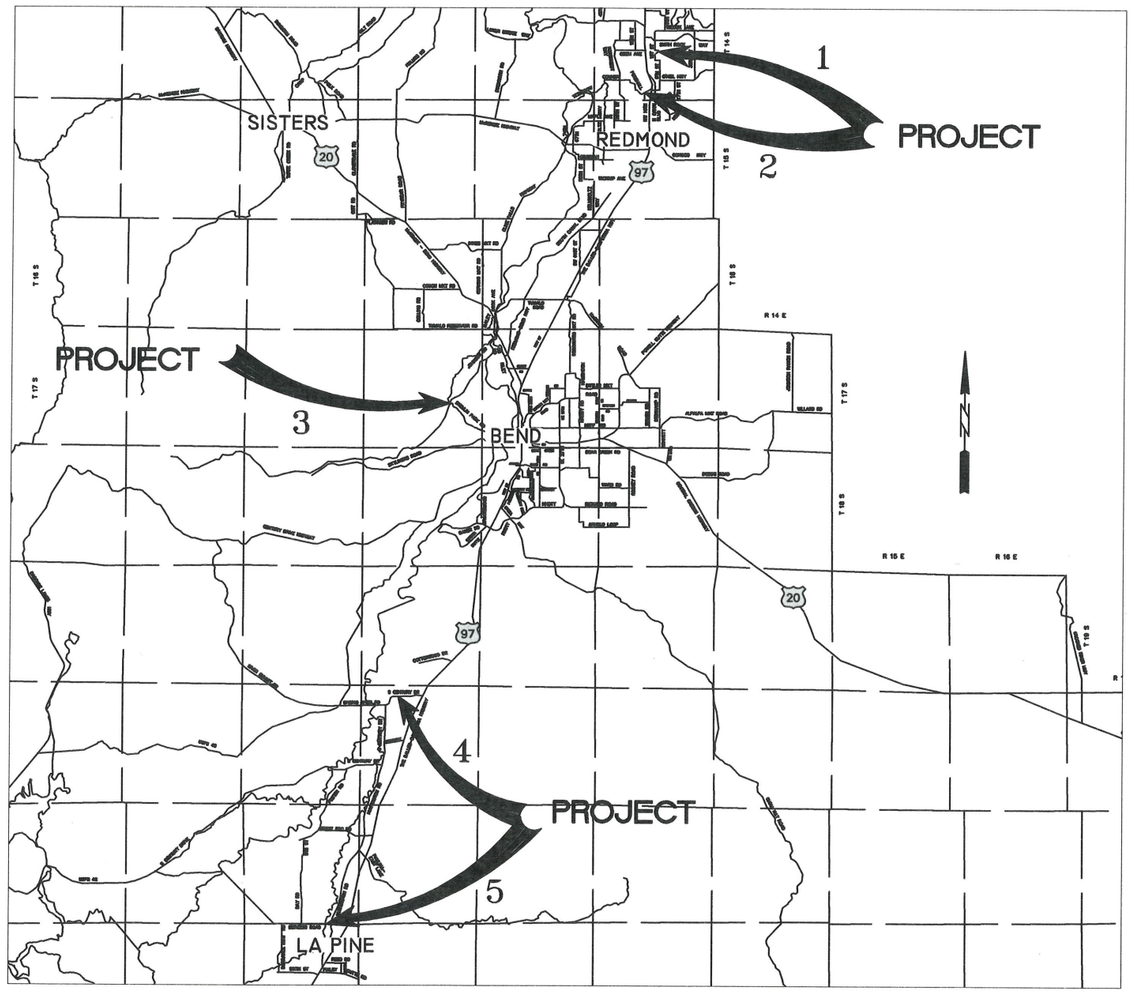
DESCHUTES COUNTY ROAD DEPARTMENT

PLANS FOR

2018 GUARDRAIL IMPROVEMENTS

FEBRUARY 2018



VICINITY MAP and SITE NUMBER

NOT TO SCALE

LEGEND

MAIL	EXIST. MAILBOXES
	EXISTING SIGN
	TREE
W	WATER MANHOLE
S	SEWER MANHOLE
	WATER GATE VALVE
	WATER METER
W	WATER MAINLINE
PP	EXIST. UTILITY POLE
OE OE	EXIST. OVERHEAD POWER LINE
T T	TELEPHONE UTILITY
X	BARBED WIRE FENCE
	PROPERTY BOUNDARY APPROX.
	EXISTING CENTERLINE OF ROAD
	EXISTING EDGE OF ROAD
SP	APPROXIMATE SEWER PRESSURE LINE LOCATION

GENERAL NOTES:

ALL WORK DETAILED ON THESE PLANS TO BE PERFORMED UNDER CONTRACT SHALL, EXCEPT AS OTHERWISE STATED IN THIS CONTRACT'S SPECIAL PROVISIONS, BE CONSTRUCTED IN ACCORDANCE WITH THE "OREGON STANDARD SPECIFICATIONS FOR CONSTRUCTION", REVISED 2018 EDITION.

IT IS THE CONTRACTORS RESPONSIBILITY TO RE-ESTABLISH, PER OREGON REVISED STATUES, ALL SURVEY MONUMENTS DISTURBED OR DESTROYED BY THIS WORK. THIS INCLUDES MONUMENTS NOT SHOWN IN THESE PLANS, WHICH ARE DISCOVERED DURING THE COURSE OF CONSTRUCTION. IT IS THE CONTRACTORS RESPONSIBILITY TO VERIFY ELEVATIONS OF SIDE SHOT MONUMENTS FOR USE AS TEMPORARY BENCH MARKS AND SET TEMPORARY BENCH MARKS OR ADDITIONAL HORIZONTAL CONTROL AS NEEDED.

NO UTILITIES HAVE BEEN LOCATED FOR THIS DESIGN

ATTENTION:
Oregon Law Requires You To Follow Rules Adopted By The Oregon Utility Notification Center. Those Rules Are Set Forth In OAR 952-001-0010 Through OAR 952-001-0090 You May Obtain Copies Of The Rules By Calling The Center At 811

INDEX OF SHEETS

ODOT STANDARD DRAWING NO.	
RD400	Guardrail and Metal Median Barrier
RD405	Guardrail and Metal Median Barrier Parts
RD410	Guardrail Pats (Thrie Beam)
RD415	Guardrail and Metal Median Barrier Parts
RD420	Energy-Absorbing Terminal
RD425	Non Energy-Absorbing Terminal 3' or4' Flare
RD440	Guardrail Installation At Bridge Ends
RD450	Guardrail Anchors (Steel)
RD451	Wood Breakaway Posts
TM800	Tables, Abrupt Edge and PCMS Details
TM850	2-Lane, 2-Way Roadways

ODOT STANDARD DETAIL NO.	
DET3276	Rail Transition Details Flex Beam Rail to Three Tube Rail

DESCHUTES COUNTY ROAD DEPARTMENT
61150 S.E. 27TH STREET
BEND, OR. 97702
PHONE: 541-388-6581 FAX: 541-388-2719

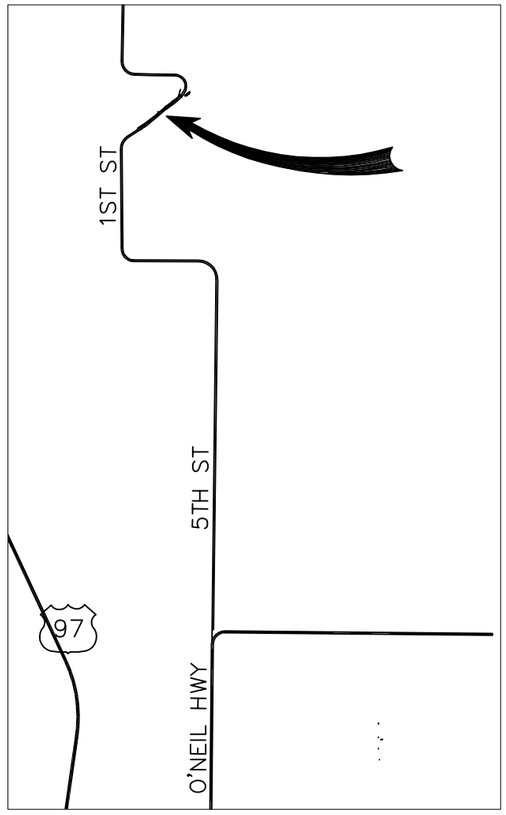
2018 GUARDRAIL IMPROVEMENTS

COUNTY ENGINEER — DATE 2-23-18

ROAD DEPT DIRECTOR — DATE 02/23/18

COVER SHEET

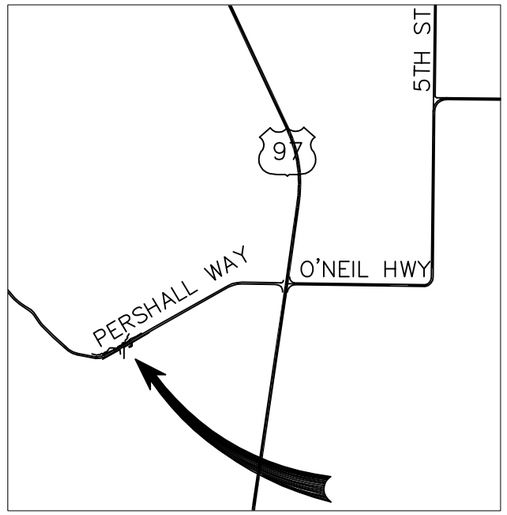
SHEET NO. 1 OF 7



SITE MAP 1

NOT TO SCALE

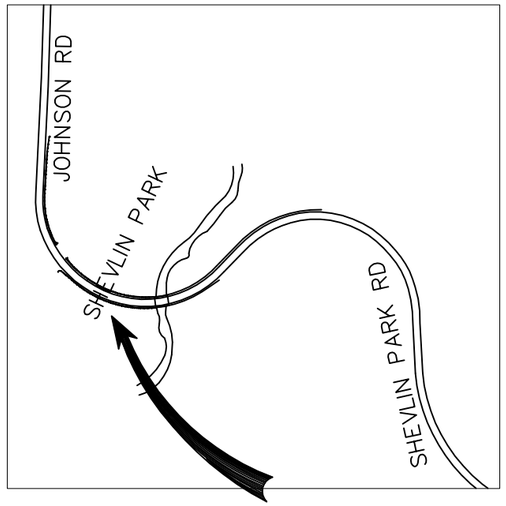
NE 1ST ST
REDMOND, OR



SITE MAP 2

NOT TO SCALE

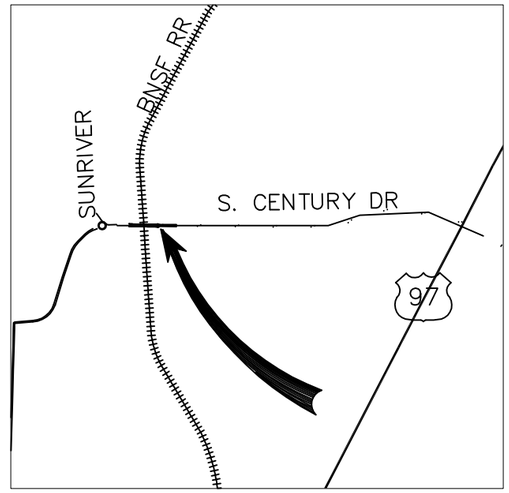
PERSHALL WAY
REDMOND, OR



SITE MAP 3

NOT TO SCALE

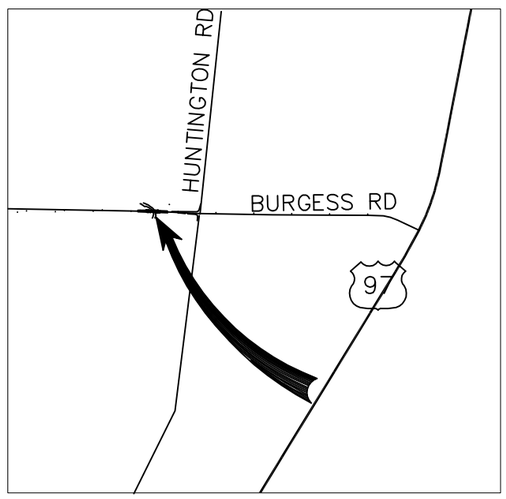
SHEVLIN PARK RD
BEND, OR



SITE MAP 4

NOT TO SCALE

S. CENTURY DR
SUNRIVER, OR



SITE MAP 5

NOT TO SCALE

BURGESS RD
LA PINE, OR

DESCHUTES COUNTY ROAD DEPARTMENT
61150 S.E. 27TH STREET
BEND, OR. 97702
PHONE: 541-388-6581 FAX: 541-388-2719

2018 GUARDRAIL IMPROVEMENTS

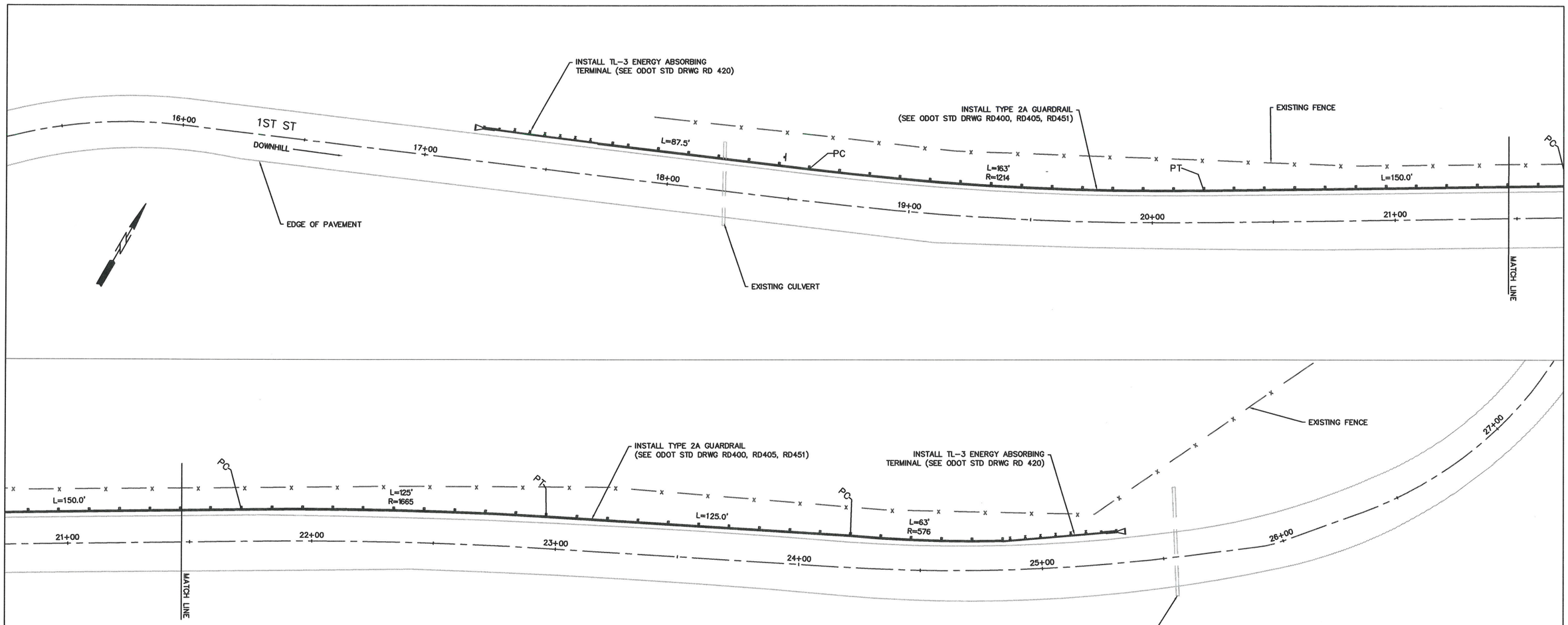
DRAFTER: T.WILSON DATE: 2/7/18

REVIEWED BY: C.SMITH DATE:

SITE MAPS

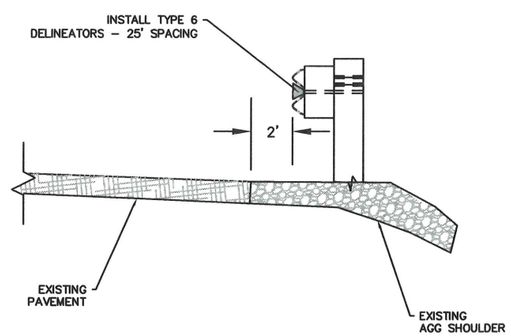
SHEET NO. 2 OF 7

2018 GrdRl-MapImport.dwg



NOTES:
1. FACE OF GUARDRAIL ALIGNMENT TO BE MARKED IN THE FIELD BY AGENCY
2. FOR DETAILS NOT SHOWN, SEE ODOT STD DRWG RD 400, RD 405 AND RD420

PLAN VIEW



TYPICAL SECTION

REGISTERED PROFESSIONAL ENGINEER
83448PE
OREGON
NOVEMBER 10, 2009
CODY C. SMITH

EXPIRATION DATE: 6-30-18

DESCHUTES COUNTY ROAD DEPARTMENT
61150 S.E. 27TH STREET
BEND, OR. 97702
PHONE: 541-388-6581 FAX: 541-388-2719

2018 GUARDRAIL IMPROVEMENTS

DRAFTER: T.WILSON DATE: 2/7/18

REVIEWED BY: C.SMITH DATE:

NE 1ST ST

SHEET NO. 3 OF 7

2018 GrdRl-MapImport.dwg

GRAVEL PIT CLIFF WALL

INSTALL TL-3 ENERGY ABSORBING TERMINAL (SEE ODOT STD DRWG RD 420)

REMOVE AND DISPOSE OF APPROX 212.5' OF EXISTING GUARDRAIL AND 18 POSTS

L=175.0'

INSTALL TYPE 2 GUARDRAIL (SEE ODOT STD DRWG RD400, RD405, RD451)

EXISTING CURVE SIGN

INSTALL TL-3 ENERGY ABSORBING TERMINAL (SEE ODOT STD DRWG RD 420)

PERSHALL WAY

HIGHWAY 97

24+00

25+00

26+00

27+00

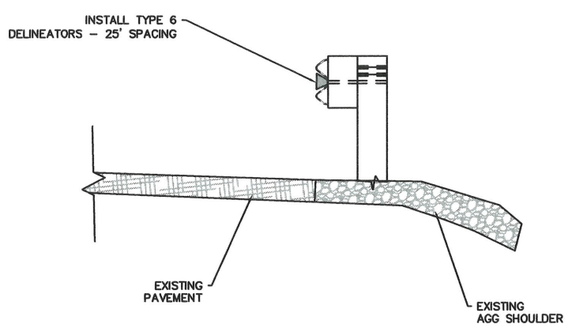
EXISTING FENCE

N

0 20 40

SCALE 1" = 20'

NOTES:
1. FOR DETAILS NOT SHOWN, SEE ODOT STD DRWG RD 400, RD 405 AND RD420



TYPICAL SECTION

REGISTERED PROFESSIONAL ENGINEER
83448PE
OREGON
NOVEMBER 10, 2009
CODY C. SMITH

EXPIRATION DATE: 6-30-18

DESCHUTES COUNTY ROAD DEPARTMENT
61150 S.E. 27TH STREET
BEND, OR. 97702
PHONE: 541-388-6581 FAX: 541-388-2719

2018 GUARDRAIL PROJECT

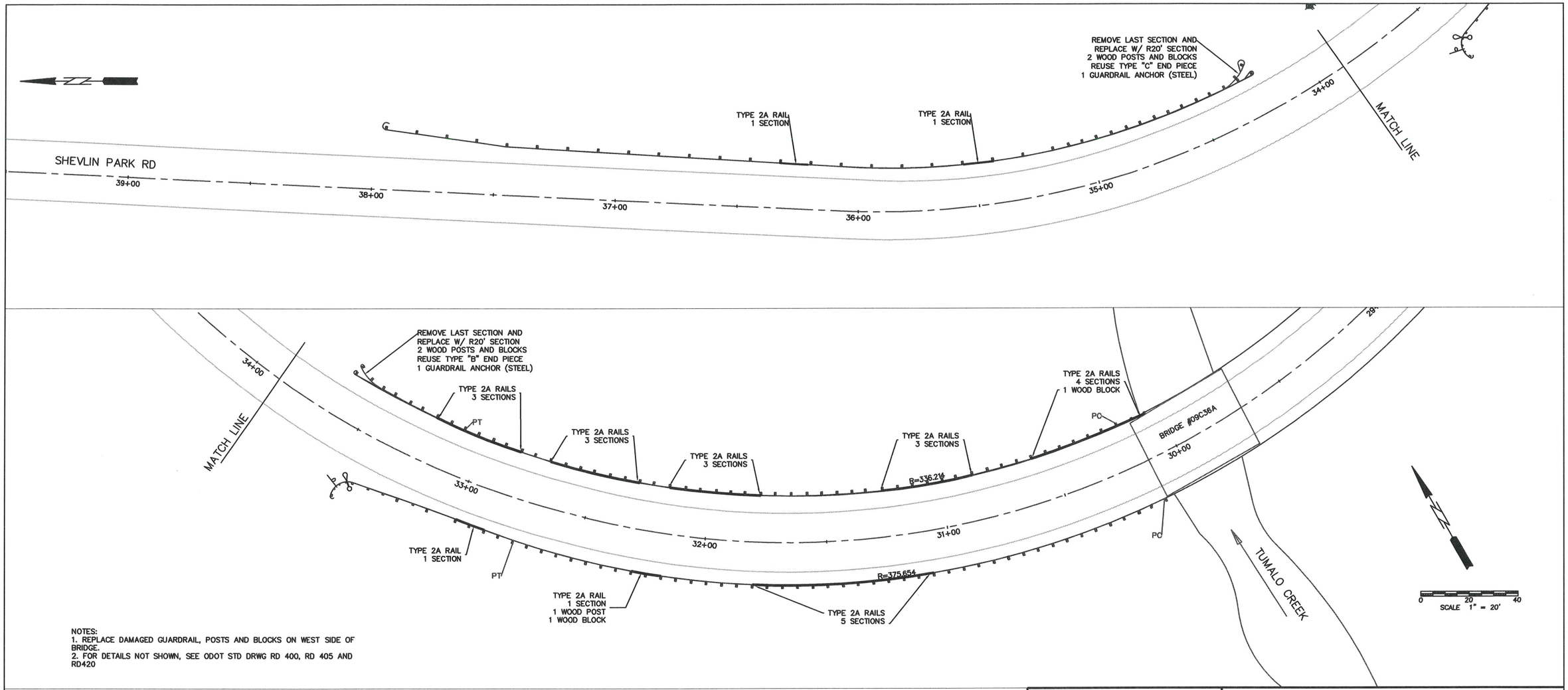
DRAFTER: T.WILSON DATE: 2/7/18

REVIEWED BY: C.SMITH DATE:

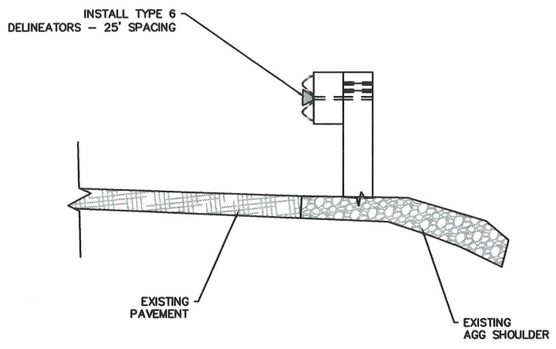
PERSHALL WAY

SHEET NO. 4 OF 7

2018 GrdRl-MapImport.dwg



NOTES:
1. REPLACE DAMAGED GUARDRAIL, POSTS AND BLOCKS ON WEST SIDE OF BRIDGE.
2. FOR DETAILS NOT SHOWN, SEE ODOT STD DRWG RD 400, RD 405 AND RD420



TYPICAL SECTION

REGISTERED PROFESSIONAL ENGINEER
83448PE
OREGON
NOVEMBER 10, 2009
CODY C. SMITH
EXPIRATION DATE: 6-30-18

DESCHUTES COUNTY ROAD DEPARTMENT
61150 S.E. 27TH STREET
BEND, OR. 97702
PHONE: 541-388-6581 FAX: 541-388-2719

2018 GUARDRAIL PROJECT

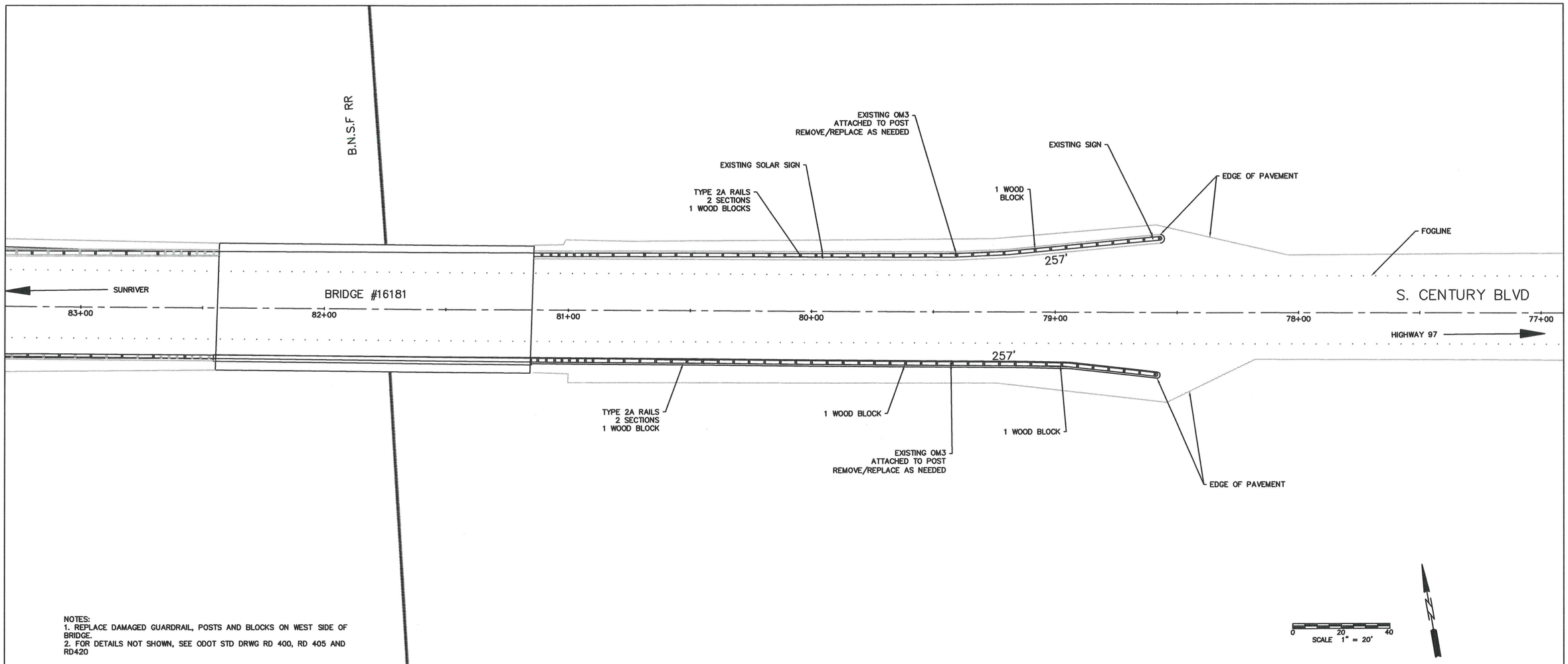
DRAFTER: T.WILSON DATE: 2/17/18

REVIEWED BY: C.SMITH DATE:

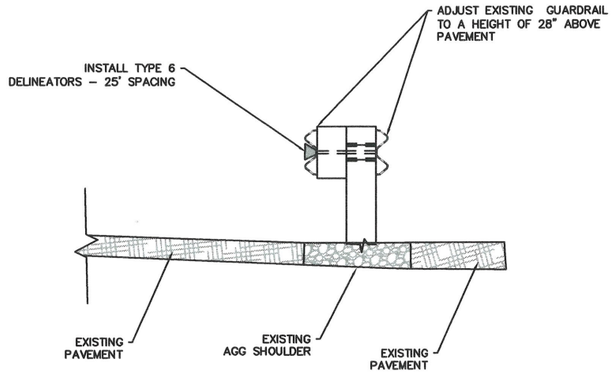
SHEVLIN PARK RD

SHEET NO. 5 OF 7

2018 GrdRl-MapImport.dwg



NOTES:
1. REPLACE DAMAGED GUARDRAIL, POSTS AND BLOCKS ON WEST SIDE OF BRIDGE.
2. FOR DETAILS NOT SHOWN, SEE ODOT STD DRWG RD 400, RD 405 AND RD420



TYPICAL SECTION

REGISTERED PROFESSIONAL ENGINEER
83448PE
OREGON
NOVEMBER 10, 2009
CODY C. SMITH

EXPIRATION DATE: 6-30-18

DESCHUTES COUNTY ROAD DEPARTMENT
61150 S.E. 27TH STREET
BEND, OR. 97702
PHONE: 541-388-6581 FAX: 541-388-2719

2018 GUARDRAIL PROJECT

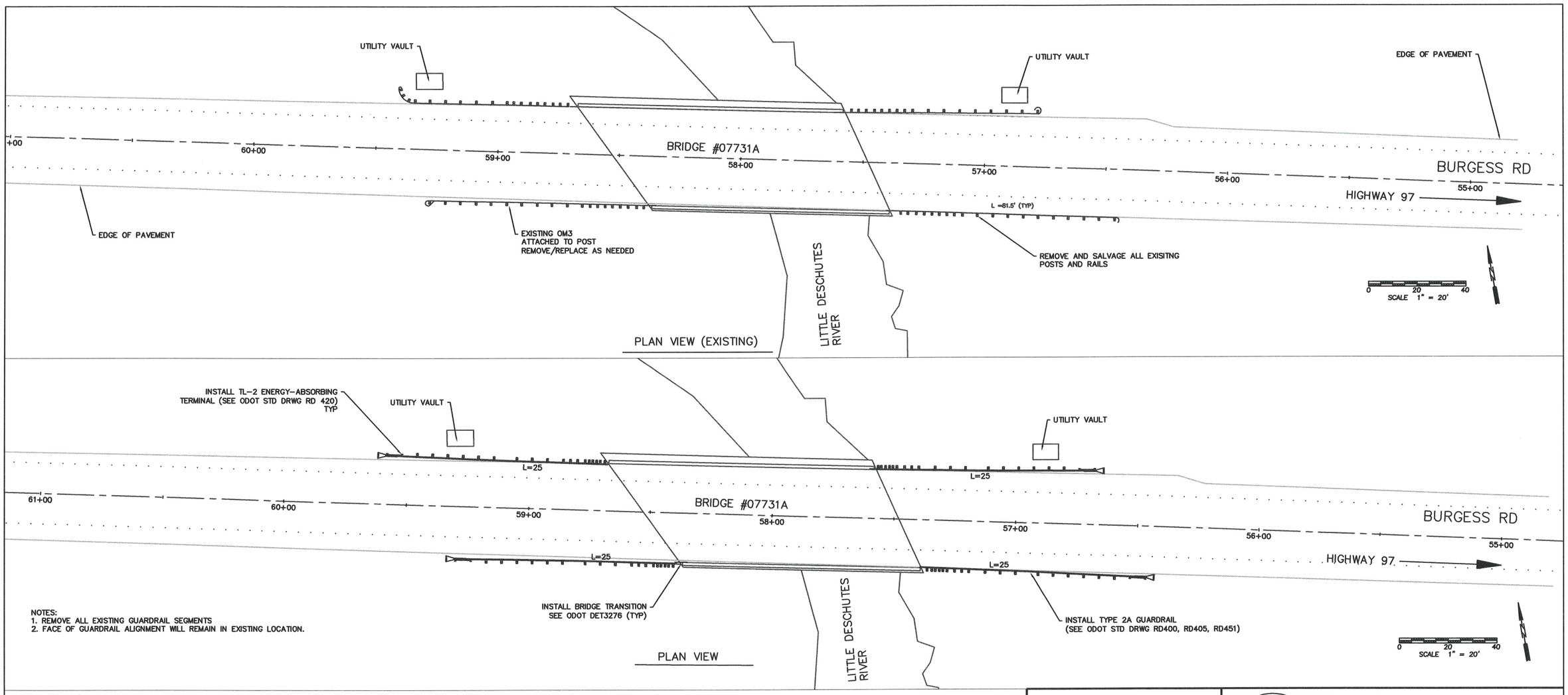
DRAFTER: T.WILSON DATE: 2/7/18

REVIEWED BY: C.SMITH DATE:

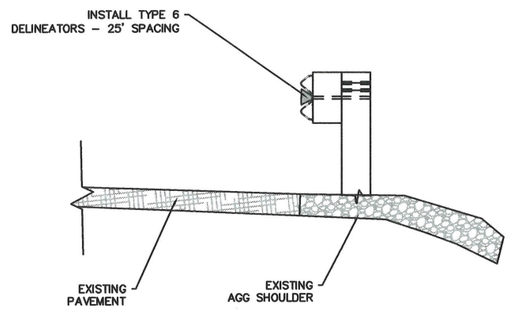
S, CENTURY BLVD

SHEET NO. 6 OF 7

2018 GrdRl-MapImport.dwg



NOTES:
1. REMOVE ALL EXISTING GUARDRAIL SEGMENTS
2. FACE OF GUARDRAIL ALIGNMENT WILL REMAIN IN EXISTING LOCATION.



TYPICAL SECTION

REGISTERED PROFESSIONAL ENGINEER
83448PE
OREGON
NOVEMBER 10, 2009
CODY C. SMITH
EXPIRATION DATE: 6-30-19

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PHONE: 541-388-6581 FAX: 541-388-2719

2018 GUARDRAIL PROJECT

DRAFTER: T.WILSON DATE: 2/7/18

REVIEWED BY: C,SMITH DATE:

BURGESS RD

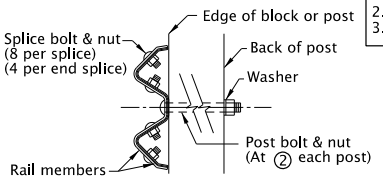
SHEET NO. 7 OF 7

2018 GrdRl-MapImport.dwg

rd400.dgn 25-JUL-2017

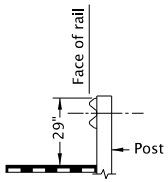
RD400

NOTES:
1. Rail height measured from final paved surface at face of rail to top of rail (Typ. all types).
2. Final paved surfacing to extend to face of post.
3. Drainage curb alignment same as face of guardrail.



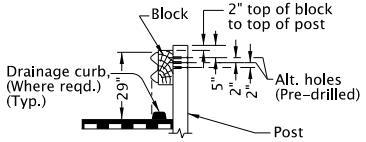
1. When required by the plans, post bolts to extend beyond the tightened nuts within limits of ¼" to ½".
2. When steel posts are used see "APPURTENANCES" for modified bolt detail, Std. Dwg. RD415.
3. All post bolt threads to be set after assembly for wrench removal only.

FITTINGS

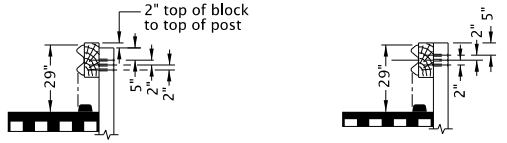


TYPE 1
(Use restricted to non-roadway applications)

GUARDRAIL



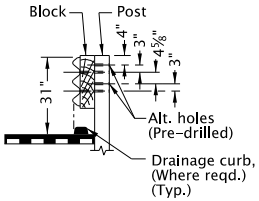
INITIAL INSTALLATION



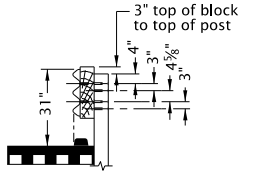
FUTURE ADJUSTMENT

ALTERNATE INITIAL INSTALLATION OR FUTURE ADJUSTMENT

TYPES 2A & 3
(See general note 2)
(For Type 3 use double thickness (2) rail elements)



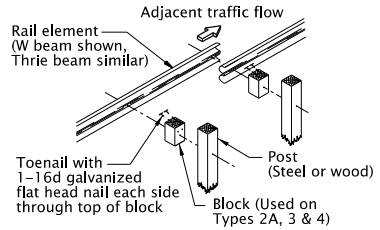
INITIAL INSTALLATION



RAIL AFTER OVERLAY
(Adjust as shown)

TYPE 4

ASSEMBLY DETAILS



RELATION OF PARTS

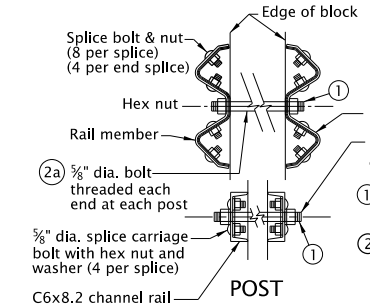
TABLE OF POST SPACING				
TYPE	1	2A	3	4
SPACING	12'-6"	6'-3"	3'-1½"	6'-3"

NORMAL RAIL ELEMENT DATA			
Type	Rail	Effective Lengths	Thkn. *
1, 2A, 3	W beam	6.25', 12.5', 25'	0.105" & 0.135"
4	Thrie beam	6.25', 12.5', 25'	0.105" & 0.135"

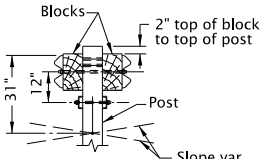
* Base metal thkn. nom. (Before galv.)

METAL MEDIAN BARRIER

NOTE:
Median barrier post spacing 6'-3".
See end construction for variations.



POST

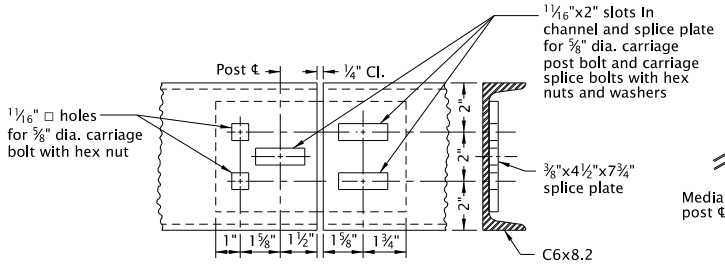


SECTION
(See "Guardrail" details and general note 2)

① Post bolts to extend beyond the tightened nuts within limits of ¼" to ½".

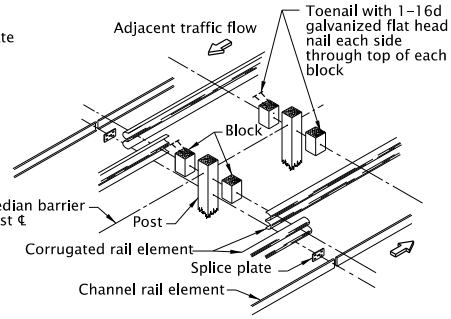
② When barrier separates to double post mounting:
a) Use ⅝" dia. button or alternate bolt with washer and hex nut.
b) Use ⅝" dia. carriage bolt with washer and nut.

CHANNEL RAIL AND SPLICE PLATE (METAL MEDIAN BARRIER)



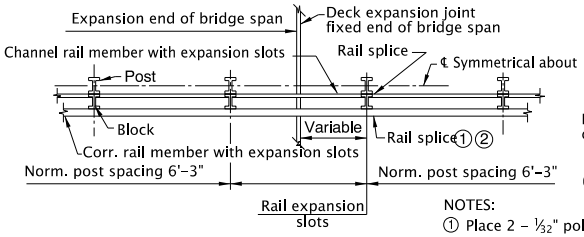
NOTE:
Clearance to be 1 9/16" at rail splice for bridge expansion joints.

ASSEMBLY DETAILS

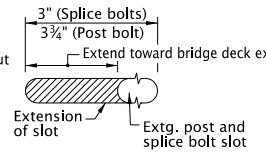


RELATION OF PARTS

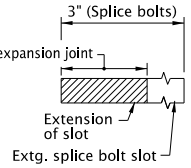
METAL MEDIAN BARRIER/SHOULDER GUARDRAIL INSTALLATION AT BRIDGE DECK EXPANSION JOINT



PLAN



CORRUGATED RAIL



CHANNEL RAIL AND SPLICE PLATE

NOTES:
① Place 2 - 1/32" polytetrafluoroethylene (TFE) sheets between corrugated rail members. The sheets shall be 12½" x 1'-7".

② Adjust nuts to provide a sliding fit and set threads to prevent loosening.

GENERAL NOTES FOR ALL DETAILS:

1. See appropriate guardrail standard drawing(s) for details not shown.
2. Use "Alternate Initial Installation", at bridge ends (See Std. Dwg. RD440), adjacent to P.C.C. pvmt., for temporary guardrail, to match existing guardrail, for Type 1 rail or as directed.
3. See Std. Dwg. RD701 for drainage curbs, where required.
4. Lap guardrail in 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.

CALC. BOOK NO. N/A

BASELINE REPORT DATE 23-JAN-2017

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

OREGON STANDARD DRAWINGS

GUARDRAIL AND METAL MEDIAN BARRIER

2018

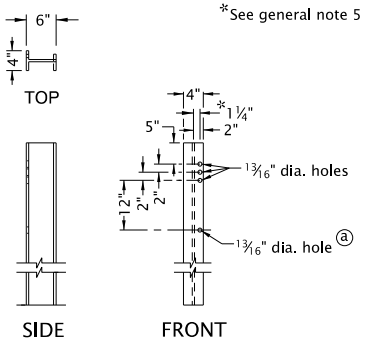
DATE	REVISION DESCRIPTION

Effective Date: December 1, 2017 - May 31, 2018

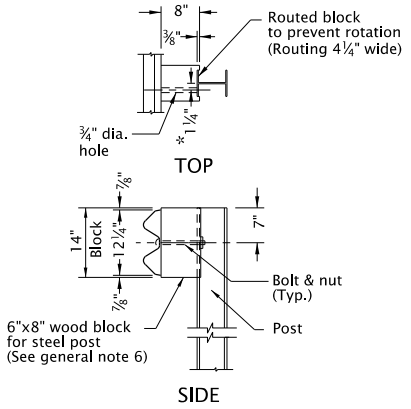
RD400

POSTS

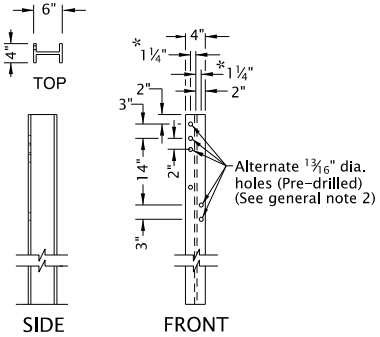
STEEL



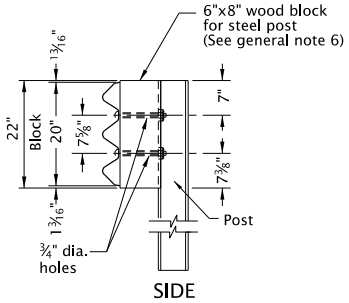
TYPE 2A, 3 OR METAL MEDIAN BARRIER



TYPE 2A, 3 OR METAL MEDIAN BARRIER
WOOD BLOCK FOR STEEL POST



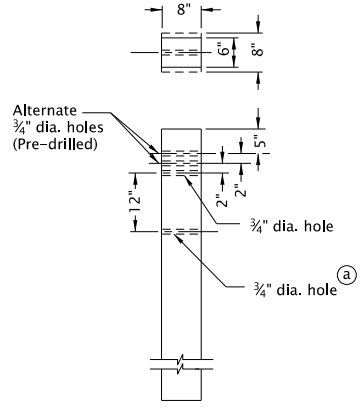
TYPE 4 OR TYPE 4 (TRANSITION) POST



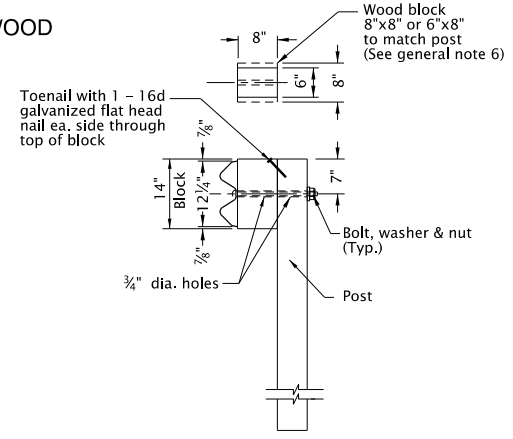
TYPE 4 OR TYPE 4 (TRANSITION) BLOCK
(Routing not required)

ⓐ Lowest hole(s) required only where channel rail is to be installed. Drill 12" below top 1³⁄₁₆" hole(s) used. (See general note 3)

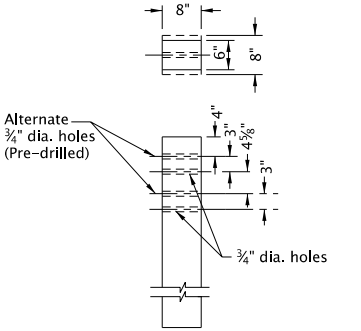
WOOD



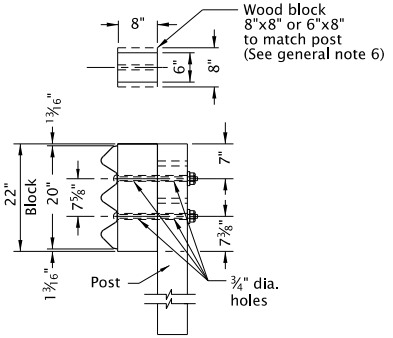
TYPE 1, 2A, 3 OR
METAL MEDIAN BARRIER



TYPE 2A, 3 OR
METAL MEDIAN BARRIER



TYPE 4 OR TYPE 4 (TRANSITION)
POST



TYPE 4 OR TYPE 4 (TRANSITION) BLOCK

GUARDRAIL POST TABLE				
GUARDRAIL TYPE	POST SIZE		POST LENGTH	
	WOOD	STEEL *	WOOD	STEEL
1	6"x8" or 8"x8"	—	6'-0"	—
2A	6"x8" or 8"x8"	W6x9 or W6x8.5	6'-0"	6'-6" or 6'-0"
3	8"x8"	W6x9 or W6x8.5	6'-0"	6'-6"
Metal median barrier	8"x8"	W6x9 or W6x8.5	6' 6"	6'-6"
4	6"x8" or 8"x8"	W6x9 or W6x8.5	7'-0"	7'-0"
4 (Transition)	8"x8"	W6x9 or W6x8.5	6'-0"	6'-9"

GENERAL NOTES FOR ALL DETAILS:

1. See appropriate guardrail standard drawing(s) for details not shown.
2. See Bridge Drgs. 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 accomodate 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.

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.

CALC. BOOK NO. N/A

BASELINE REPORT DATE 23-JAN-2017

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

OREGON STANDARD DRAWINGS

GUARDRAIL AND METAL MEDIAN BARRIER PARTS

2018

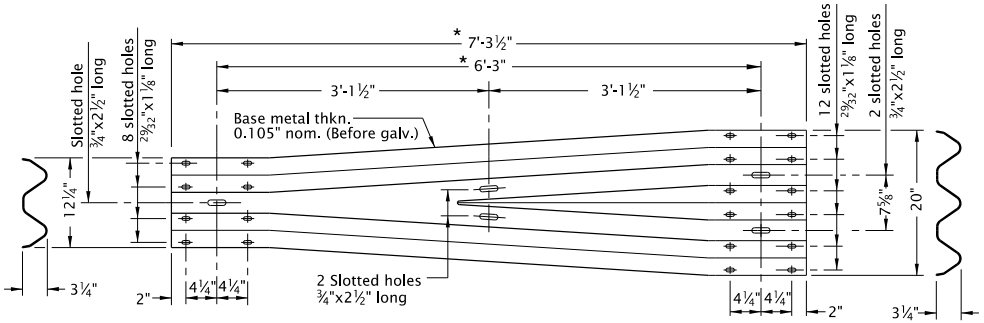
DATE	REVISION DESCRIPTION

rd405.dgn 25-JUL-2017

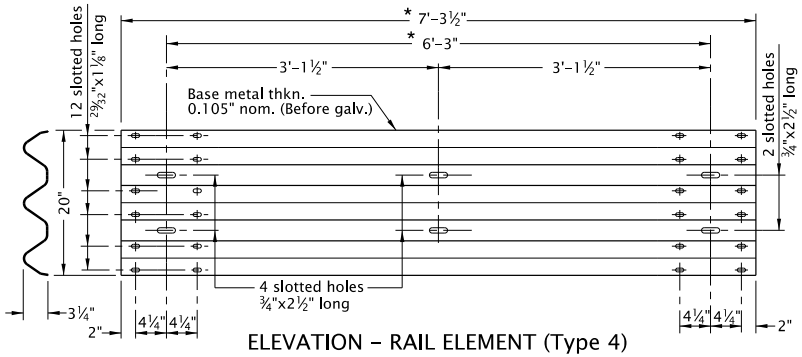
RD405

Effective Date: December 1, 2017 - May 31, 2018

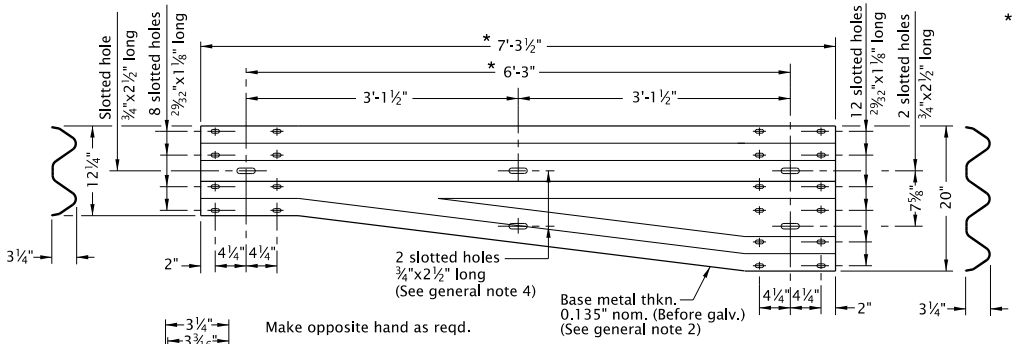
RD405



ELEVATION - SYMMETRICAL TRANSITION ELEMENT



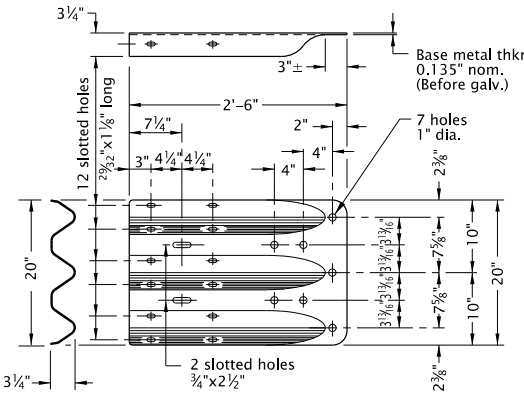
ELEVATION – RAIL ELEMENT (Type 4)



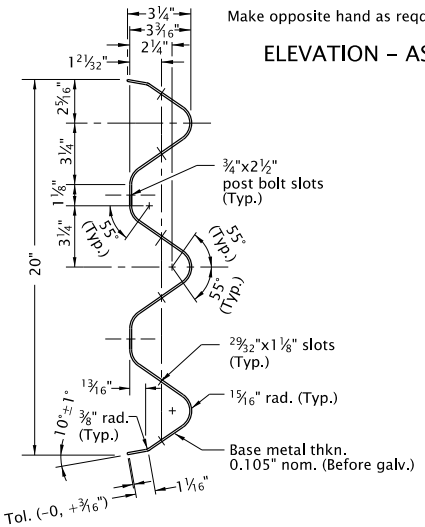
Make opposite hand as reqd.

* See general note 4

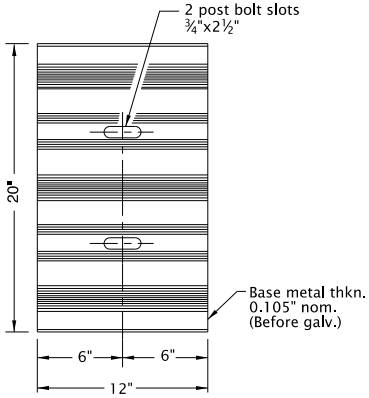
ELEVATION – ASYMMETRICAL TRANSITION ELEMENT



TERMINAL CONNECTOR

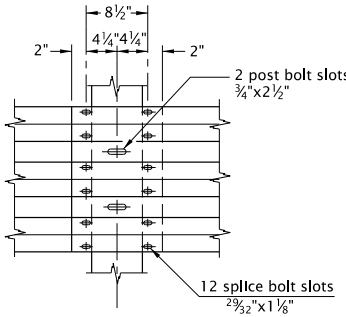


SECTION THRU RAIL ELEMENT



THRIE BEAM BACK-UP PLATE

For detail not shown, see "Section Thru Rail Element"



BEAM SPLICE

GENERAL NOTES FOR ALL DETAILS:

1. See appropriate guardrail standard drawing(s) for details not shown.
2. For locations, see appropriate bridge rail standard drawing(s).
3. Lap guardrail in direction of adjacent traffic.
4. Hole layout per manufacturer with appropriate post and block.

CALC. BOOK NO. N/A

BASELINE REPORT DATE 23-JAN-2017

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.

OREGON STANDARD DRAWINGS

GUARDRAIL PARTS (THRIE BEAM)

2018

DATE	REVISION DESCRIPTION

rd410.dgn 25-JUL-2017

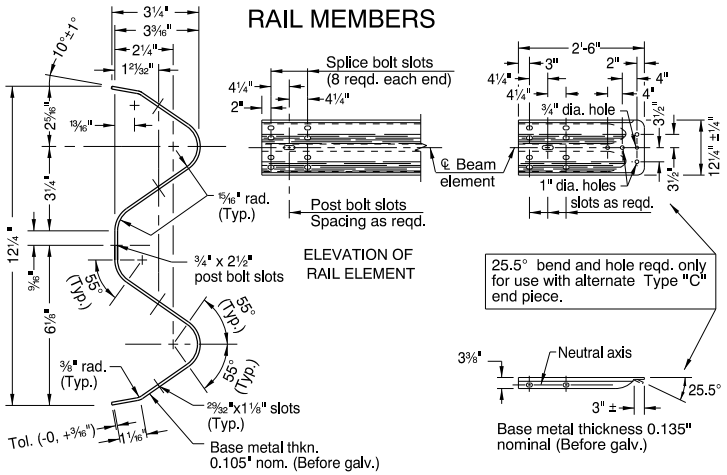
RD410

Effective Date: December 1, 2017 - May 31, 2018

rd415.dgn 25-JUL-2017

RD415

RAIL MEMBERS

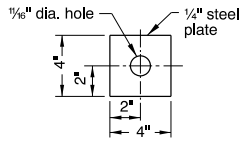


ELEVATION OF RAIL ELEMENT

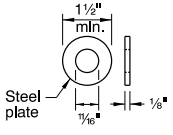
SECTION THRU RAIL ELEMENT

TERMINAL CONNECTOR

APPURTENANCES

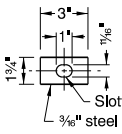


SNOW LOAD (OPTIONAL)
(In area of heavy snow, as directed by the engineer)



PLAIN ③

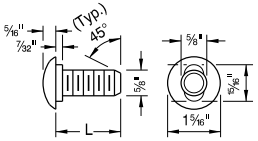
USE ON BACK OF POST



RECTANGULAR

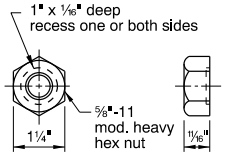
USE ON RAIL ELEMENT FACE ON TYPE C END PIECE ④

WASHERS



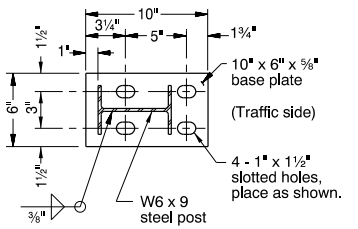
ALTERNATIVE No. 2

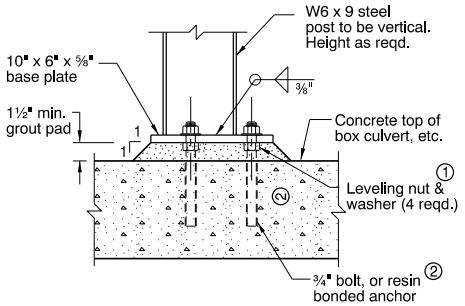
L (in.)	Thread Length (in.)
1¼	1⅛ min.
2	1¾ min.
10	4 min.
18	4 min.
25	4 min.



ALTERNATIVE No. 1

POST OR SPLICE BOLT AND NUT

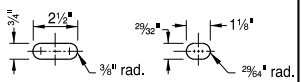




BASE PLATE DETAILS
(For additional details, see Std. Drg. BR266)
(Use when depth of cover is less than normal for post installation.)

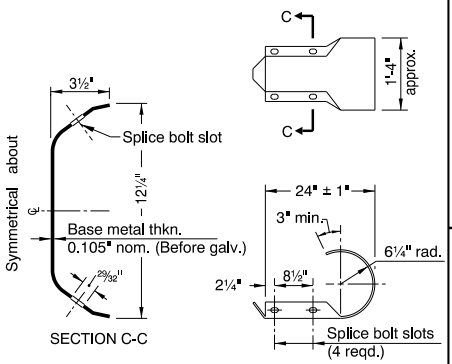
NOTES:

1. For guardrail installed on radii of 150' or less (5' min. radius) use rail elements pre-curved to industry standard. Install "Radius Identification Plate" (See detail right).
2. Effective length of rail sections shall be 12'-6".



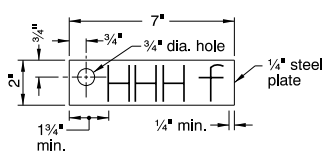
POST BOLT SLOT

SPLICE BOLT SLOT

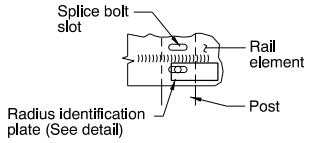


SECTION C-C

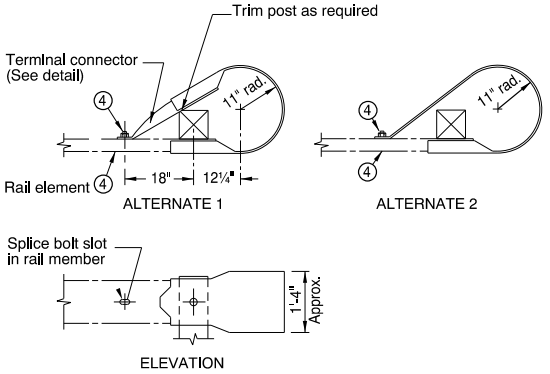
TYPE B END PIECE



RADIUS IDENTIFICATION PLATE
(See general note 4)



RADIUS IDENTIFICATION PLATE MOUNTING DETAIL
(See general note 5)



ALTERNATE 1

ALTERNATE 2

ELEVATION

TYPE C END PIECE
(For details not shown, see Type B End Piece)

NOTES:

① Furnished & installed by structure contractor when shown on structure plans.

② 6" min. penetration into concrete slabs other than bridge decks. Cast in place or core and install using approved resin bonding system.

③ Not required if "Snow Load" washer option is used.

④ Use rectangular washer under bolt head and nut on Type C End Piece as shown.

GENERAL NOTES FOR ALL DETAILS:

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 ¾" 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.

CALC. BOOK NO. N/A

BASELINE REPORT DATE 15-JAN-2016

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.

OREGON STANDARD DRAWINGS

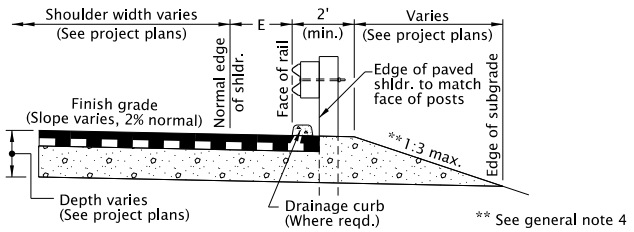
GUARDRAIL AND METAL MEDIAN BARRIER PARTS

2018

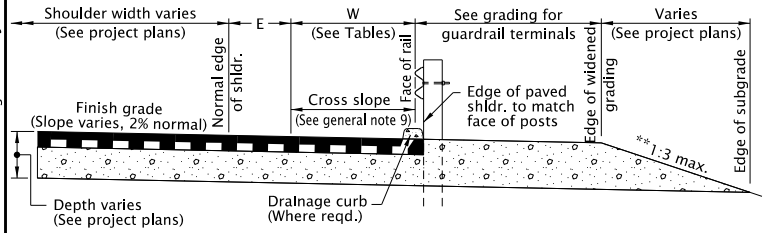
DATE	REVISION DESCRIPTION

Effective Date: December 1, 2017 - May 31, 2018

RD415



SECTION A-A

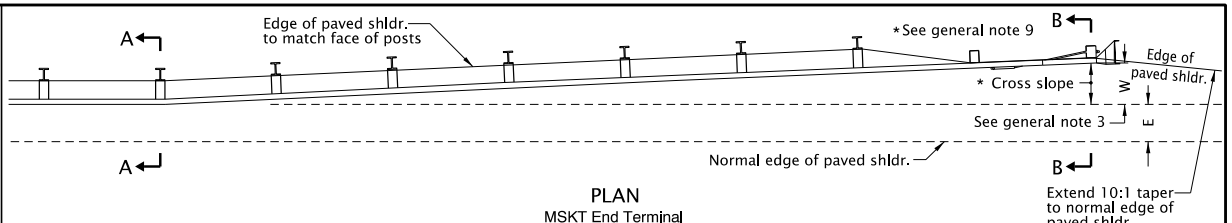


SECTION B-B

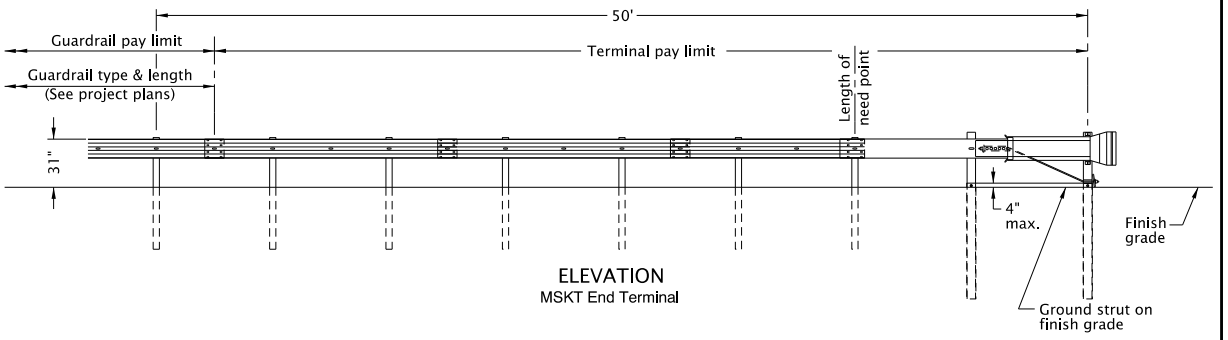
*** See general note 3

TEST LEVEL	X (ft)	W (ft)
1 (≤ 30 mph)	25'-9½"	1 ***
2 (≤ 45 mph)	38'-3½"	1 ***
3 (> 45 mph)	50'-9½"	1 or 2 ***

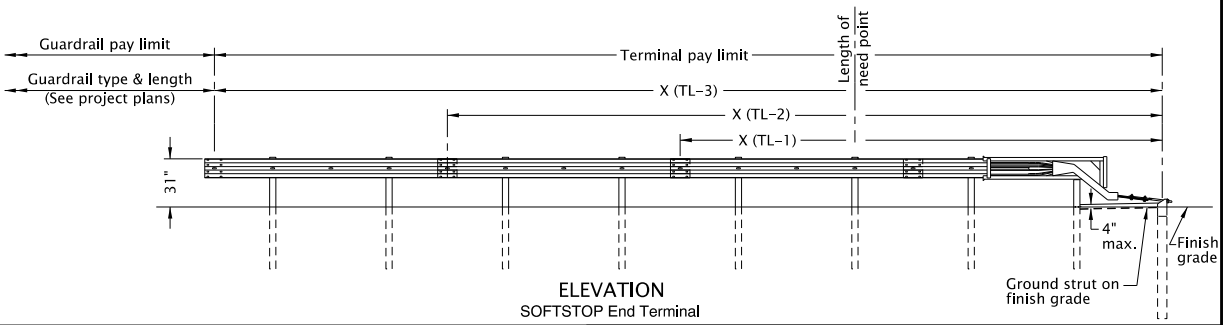
NOTES:
1. E=2', where shown on plans.
2. Drainage curb alignment same as face of guardrail. Modify alignment to match face of posts at terminal ends only, as shown.



PLAN
MSKT End Terminal
(Shown)



ELEVATION
MSKT End Terminal



ELEVATION
SOFTSTOP End Terminal

GENERAL NOTES FOR ALL DETAILS:

1. See appropriate guardrail standard drawing(s) for details not shown.
2. On two way two lane highways, both ends of guardrail runs shall be provided with a terminal flared or non-flared. Paving of widened shldr. to the face of posts on both ends of guardrail runs is required.
3. Non-flared terminal shall be installed with a min. 1 foot offset ensuring that the end piece is entirely off normal shldr.
4. 1:4 slope or flatter preferable, 1:3 max.
5. Provide terminal from ODOT's QPL. Install according to manufacturer's recommendations (post count varies). Provide shop drawings to Engineer.
6. Install fixed object marker on head of every terminal with "W" 4 feet or less.
7. "W" distance is measured to face of guardrail at end post, exclusive of end piece.
8. See Std. Dwg. RD701 for drainage curbs, where required.
9. Cross slope to match adjacent roadway cross slope (preferred). If required, maximum shoulder slope 10% for guardrail widening. If required, maximum grade break at normal edge of shoulder 8%.
10. See project plans for details not shown.

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.

CALC. BOOK NO. N/A

BASELINE REPORT DATE 23-JAN-2017

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

OREGON STANDARD DRAWINGS

TL-3 ENERGY-ABSORBING TERMINAL

2018

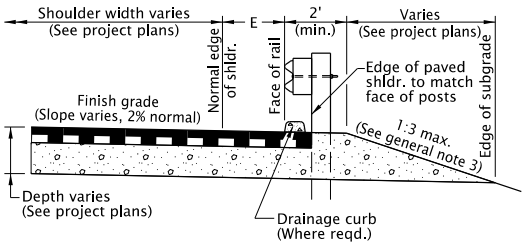
DATE	REVISION DESCRIPTION

Effective Date: December 1, 2017 - May 31, 2018

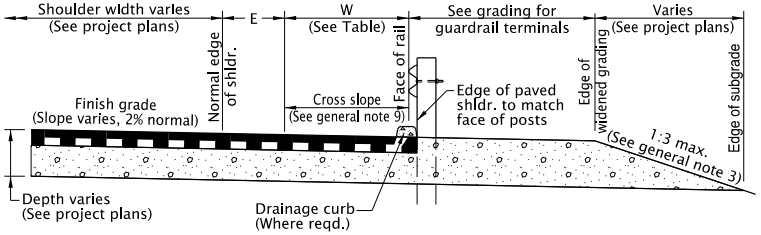
RD420

rd420.dgn 25-JUL-2017

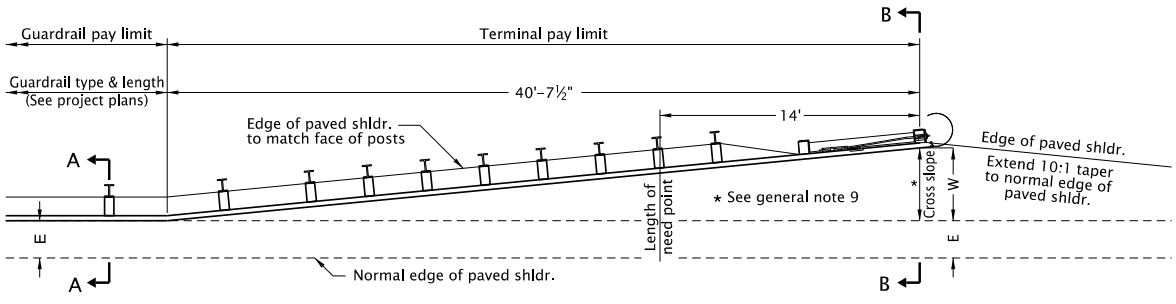
RD420



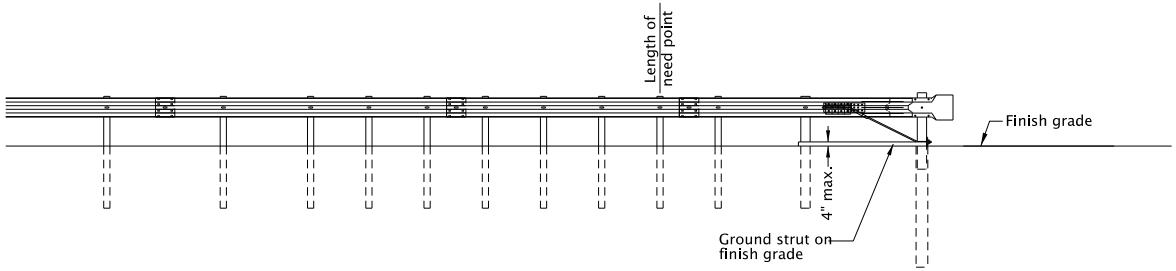
SECTION A–A



SECTION B–B



PLAN



ELEVATION

GENERAL NOTES FOR ALL DETAILS:

1. See appropriate guardrail standard drawing(s) for details not shown.
2. On two way two lane roads, both ends of guardrail runs shall be provided with a terminal. Paving of widened shldr. to the face of posts on both ends of guardrail runs is required.
3. 1:4 slope or flatter preferable, 1:3 max.
4. Provide terminal from ODOT's QPL. Install according to manufacturer's recommendations. Provide shop drawings to engineer.
5. Install fixed object marker on head of every terminal with "W" 4 feet or less.
6. This terminal may be used on state highway projects providing a reasonable recovery area exists behind the terminal or can be provided. See Highway Design Manual Section 4.6 Design Criteria/Establishment of Variable-Sized Recovery Areas for guidance.
7. "W" distance is measured to face of guardrail at end post, exclusive of end piece.
8. See Std. Dwg. RD701 for drainage curbs, where required.
9. Cross slope to match adjacent roadway cross slope (preferred). If required, maximum shoulder slope 10% for guardrail widening. If required, maximum grade break at normal edge of shoulder 8%.
10. See project plans for details not shown.

NOTES:
1. E=2', where shown on plans.
2. Drainage curb alignment same as face of guardrail. Modify alignment to match face of posts at terminal ends only, as shown.

TEST LEVEL	L (ft)	W (ft)
3 (> 45 mph)	40'-7½"	4.0

CALC. BOOK NO. N/A

BASELINE REPORT DATE 23-JAN-2017

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.

OREGON STANDARD DRAWINGS

NON ENERGY-ABSORBING TERMINAL 4' FLARE

2018

DATE	REVISION DESCRIPTION

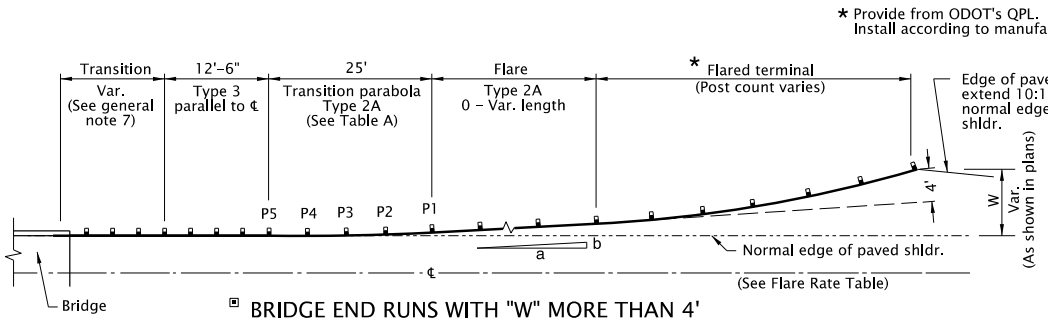
Effective Date: December 1, 2017 - May 31, 2018

RD425

rd425.dgn 25-JUL-2017

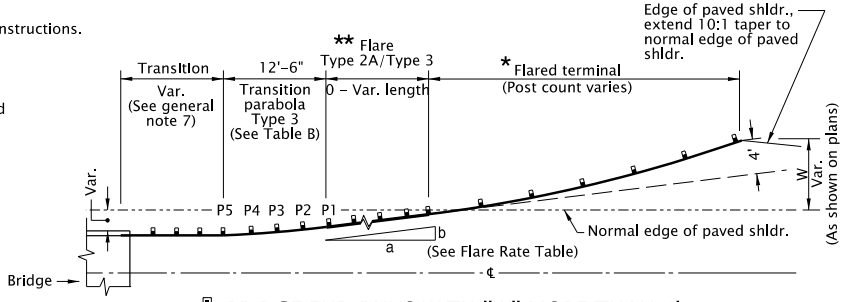
RD425

rd440.dgn 25-JUL-2017



▣ BRIDGE END RUNS WITH "W" MORE THAN 4'

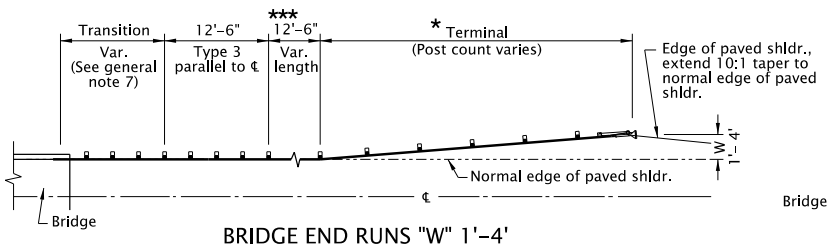
Additional Type 2A rail may be needed to meet length of need requirements



▣ BRIDGE END RUNS WITH "W" MORE THAN 4'
(NARROW BRIDGE SITUATION)

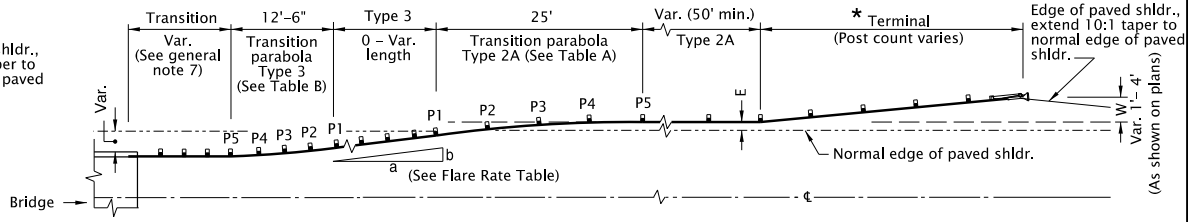
** Type 3 to edge of paved shldr./Type 2A beyond paved shldr.

▣ These details are retained for maintenance purposes. Do not use for new construction.

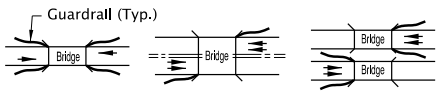


BRIDGE END RUNS "W" 1'-4"

*** Length of need calculation will determine quantity of Type 2A reqd.

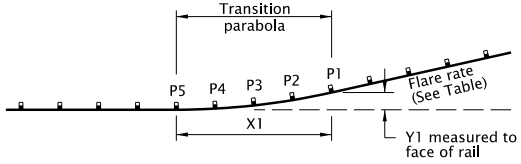


BRIDGE END RUNS CONNECTING TO GUARDRAIL INSTALLATION
(NARROW BRIDGE SITUATION)



TWO LANE MULTILANE MULTILANE

LOCATIONS AT BRIDGE ENDS
MINIMUM SHOWN



E= 2' where shown on plans.

FLARE RATE TABLE

FLARE RATE a:b	NORMAL FLARE LENGTH (ft)	NORMAL W (ft)
15:1	12.5	8.1

TABLE A
25' TRANSITION PARABOLA

	POST NUMBER				
	P5	P4	P3	P2	P1
X (ft)	0	6.25	12.49	18.72	24.92
Y (ft)	0	0.05	0.21	0.47	0.83

TABLE B
12.5' TRANSITION PARABOLA

	POST NUMBER				
	P5	P4	P3	P2	P1
X (ft)	0	3.125	6.25	9.375	12.49
Y (ft)	0	0.03	0.1	0.23	0.42

GENERAL NOTES FOR ALL DETAILS:

1. See appropriate guardrail standard drawing(s) for details not shown.
2. Types 3, & 2A guardrail shown. Face of rail to be in same location for Type 1.
3. Trailing ends (freeways, multilane and similar one-way facilities) not exposed to opposing traffic:
   (a) Guardrail terminals, use a Type 1 modified anchor, Type B end piece and do not flare.
   (b) At bridge ends, omit transition guardrail & Type 3 guardrail. Use bridge connection (Bridge Dwg. BR236) and guardrail as required in plans.
4. Rail expansion slots to be provided at bridge end connections. See details and notes "METAL MEDIAN BARRIER/SHOULDER GUARDRAIL INSTALLATION AT BRIDGE DECK EXPANSION JOINT".
5. Where bridges employ guardrail in lieu of handrail or vehicular barriers, adjacent connecting guardrail runs shall be the same type.
6. (a) All bolts except adjustment bolts shall be drawn tight on rails and components on initial installation.
   (b) Final tightness check on rail and components bolts and retightening as required to be done 30 days after initial installation.
7. For transition guardrail detail and installation limits at bridge ends, see applicable bridge drawings.
8. "W" distance is measured to face of guardrail at end post, exclusive of end piece.
9. Paving of widened shldr. to the face of posts on both ends of guardrail runs is required.

NOTES:

1. Guardrail at indicated positions is required for protection at bridge ends. Additional guardrail is to be installed as required by guardrail warrant and fastened to bridge.
2. Face of guardrail at locations shown above must match face of bridge curb or bridge rail on structures without curb.
3. See general note 3 for trailing end requirements.

CALC. BOOK NO. N/A

BASELINE REPORT DATE 22-JUL-2016

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.

OREGON STANDARD DRAWINGS

GUARDRAIL INSTALLATION AT BRIDGE ENDS

2018

DATE	REVISION DESCRIPTION

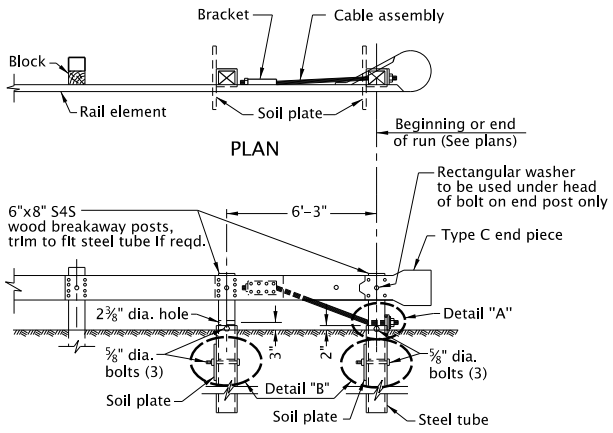
RD440

Effective Date: December 1, 2017 - May 31, 2018

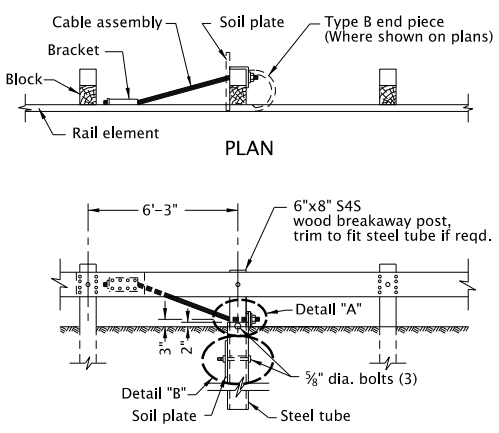
ANCHORS (Steel)

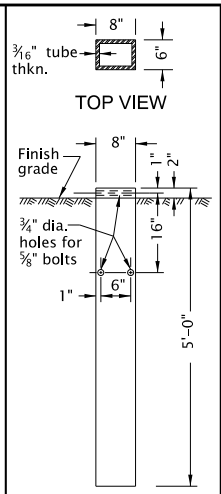
(Where shown on plans)

TYPE 1



TYPE 1 MODIFIED

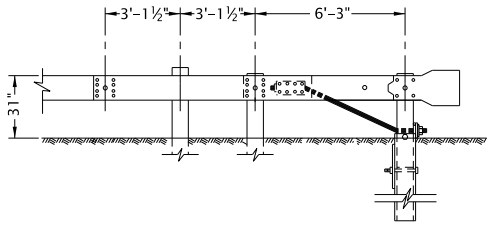




ANCHOR (Steel)

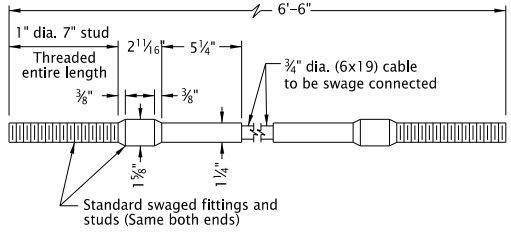
(Where shown on plans)

31" GUARDRAIL

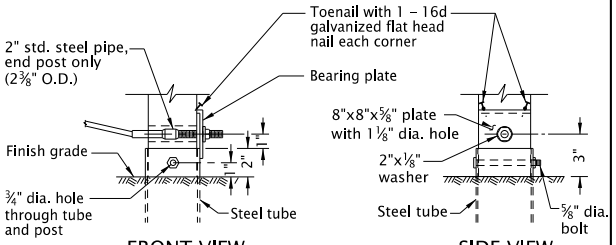


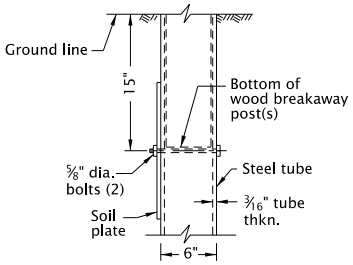
ELEVATION

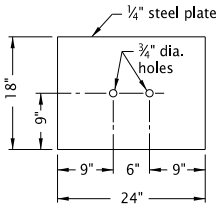
(For details not shown, see Type 1 Anchor)

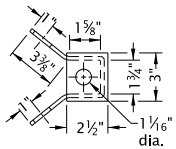


CABLE ASSEMBLY

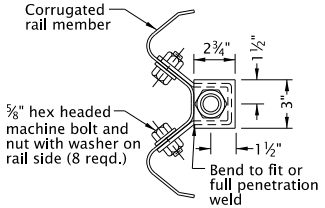




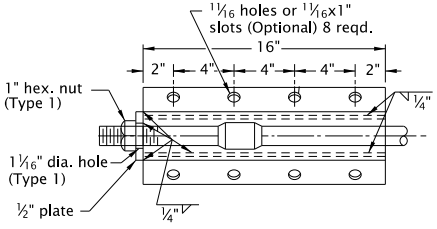




END VIEW
Alternate No. 1



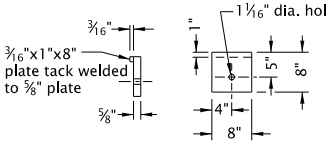
END VIEW
Alternate No. 2



BACK VIEW

NOTE:
All plate for bracket to be ¼" thick steel, unless otherwise noted.

BRACKET



BEARING PLATE

GENERAL NOTES FOR ALL DETAILS:

1. (a.) Cable assembly to be tightened to a taut condition on initial installation.

   (b.) Final tension check and tightening of cable assembly as required to be done 30 days following Initial Installation.

2. See appropriate guardrail standard drawing(s) for details not shown.

3. See Std. Dwg. RD451 for wood breakaway posts.

CALC. BOOK NO. N/A

BASELINE REPORT DATE 23-JAN-2017

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.

OREGON STANDARD DRAWINGS

GUARDRAIL ANCHORS (STEEL)

2018

DATE	REVISION DESCRIPTION

rd450.dgn 25-JUL-2017

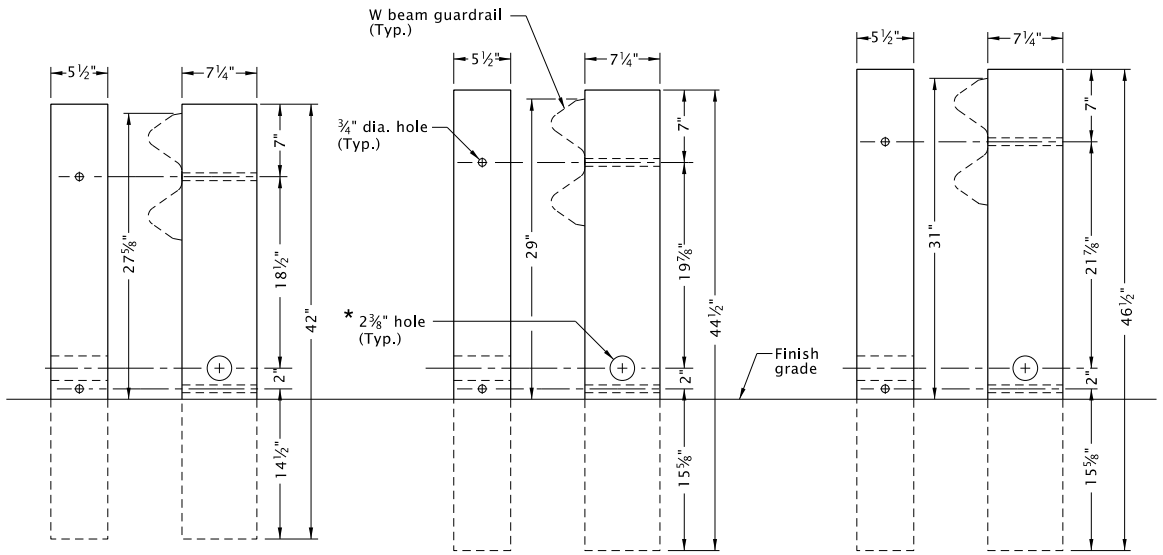
RD450

Effective Date: December 1, 2017 - May 31, 2018

RD450

rd451.dgn 25-JUL-2017

W BEAM



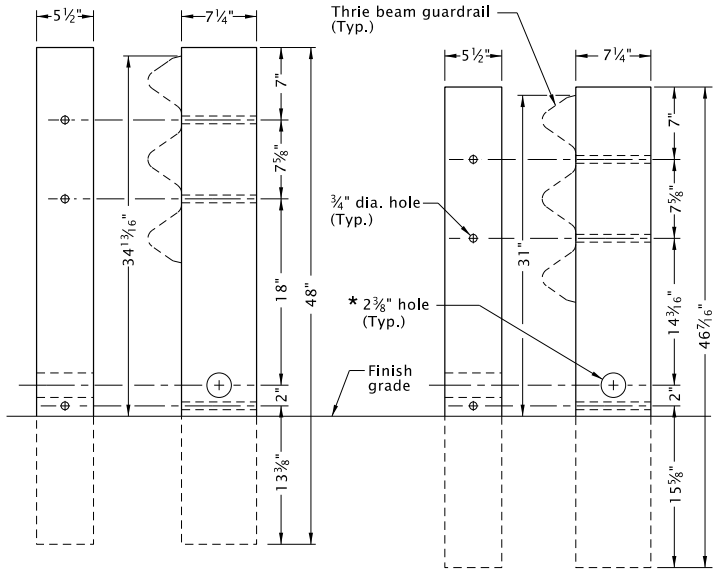
TOP OF RAIL HEIGHT 27⅝"

TOP OF RAIL HEIGHT 29"

TOP OF RAIL HEIGHT 31"

(This detail is retained for maintenance purposes. Do not use for new construction.)

THRIE BEAM



TOP OF RAIL HEIGHT 35" (Nom.)

TOP OF RAIL HEIGHT 31"

* 2" std. pipe in end post only, 2⅜" dia.hole

GENERAL NOTES FOR ALL DETAILS:

1. See appropriate guardrail standard drawing(s) for details not shown.
2. Use only 6" x 8" S4S wood posts, trim to fit steel tube if reqd.

CALC. BOOK NO. N/A

BASELINE REPORT DATE 22-JUL-2016

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.

OREGON STANDARD DRAWINGS

WOOD BREAKAWAY POSTS

2018

DATE	REVISION DESCRIPTION

Effective Date: December 1, 2017 - May 31, 2018

RD451

RD451

TAPER TYPES & FORMULAS	
TAPER	FORMULA
Merging (Lane Closure)	"L"
Shifting	"L"/2 or ½"L"
Shoulder Closure	"L"/3 or ⅓"L"
Flagging (See Drg. TM850)	50' - 100'
Downstream (Termination)	Varies (See Drawings)

★ Use Pre-Construction Posted Speed to select the Speed from the Tables below:

CONCRETE BARRIER FLARE RATE TABLE	
★ SPEED (mph)	MINIMUM FLARE RATE
≤ 30	8:1
35	9:1
40	10:1
45	12:1
50	14:1
55	16:1
60	18:1
65	19:1
70	20:1

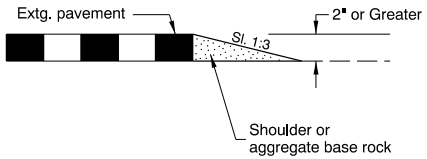
MINIMUM LENGTHS TABLE					
	"L" VALUE FOR TAPERS (ft)				BUFFER "B" (ft)
★ SPEED (mph)	W = Lane or Shoulder Width being closed or shifted				
	W ≤ 10	W = 12	W = 14	W = 16	
25	105	125	145	165	75
30	150	180	210	240	100
35	205	245	285	325	125
40	265	320	375	430	150
45	450	540	630	720	180
50	500	600	700	800	210
55	550	660	770	880	250
60	600	720	840	960	285
65	650	780	910	1000	325
70	700	840	980	1000	365
FREEWAYS					
55	1000	1000	1000	1000	250
60	1000	1000	1000	1000	285
65	1000	1000	1000	1000	325
70	1000	1000	1000	1000	365

NOTES:
- For Lane closures where W < 10', use "L" value for W = 10'.
- For Shoulder closures where W < 10', use "L" value for W = 10' or calculate "L" using formula, for Speeds ≥ 45: L = WS, Speeds < 45: L = S²W/60, S = Speed, W=Width

TRAFFIC CONTROL DEVICES (TCD) SPACING TABLE				
★ SPEED (mph)	Sign Spacing (ft)			Max. Channelizing Device Spacing (ft)
	A	B	C	
20 - 30	100	100	100	20
35 - 40	350	350	350	20
45 - 55	500	500	500	40
60 - 70	700	700	700	40
Freeway	1000	1500	2640	40

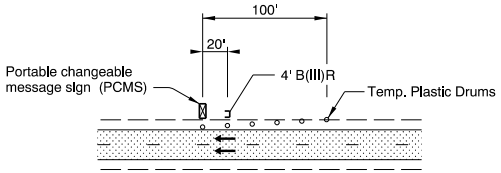
NOTES:
- Place traffic control devices on 10 ft. spacing for intersection and access radii.
- When necessary, sign spacing may be adjusted to fit site conditions. Limit spacing adjustments to 30% of the "A" dimension for all speeds.

NOTES:
- When paved shoulders adjacent to excavations are less than four feet wide protect longitudinal abrupt edge as shown.
- Use aggregate wedge when abrupt edge is 2 inches or greater.



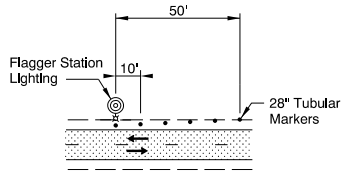
EXCAVATION ABRUPT EDGE

NOTES:
- Install PCMS beyond the outside shoulder, when possible.
- Use the appropriate type of barricade panels for PCMS location. Right shoulder, use Type B(III)R Left shoulder, use Type B(III)L
- Use six drums in shoulder taper on 20' spacing. The drums and barricade may be omitted when PCMS is placed behind a roadside barrier.
- Detail as shown is used for trailered and non-crashworthy components of:
  - Portable Traffic Signals
  - Smart Work Zone Systems



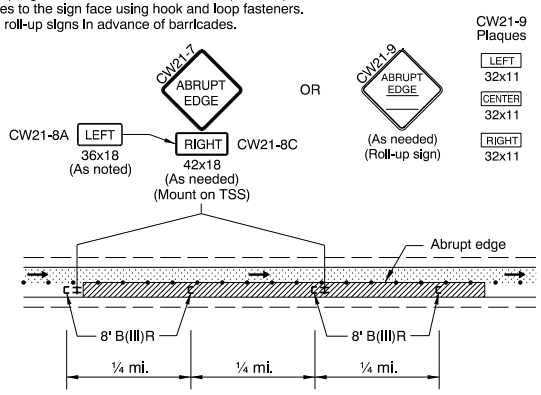
PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) INSTALLATION

NOTES:
- Install Flagger Station Lighting beyond the outside shoulder, where practical.
- Use six tubular markers in shoulder taper on 10' spacing.
- Place cart / generator / power supply off of the shoulder, as far as practical.



FLAGGER STATION LIGHTING DELINEATION

NOTES:
- Abrupt edges may be created by paving, operations, excavations or other roadway work. Use abrupt edge signing for longitudinal abrupt edges of 1 inch or greater.
- If the excavation is located on left side of traffic, replace the 8' B(III)R barricades with 8' B(III)L barricades and replace the "RIGHT" (CW21-8C) riders with "LEFT" (CW21-8A) riders.
- Continue signing and other traffic control devices throughout excavation area at spacings shown.
- If roll-up signs are used, attach the correct (CW21-9) plaques to the sign face using hook and loop fasteners. Place roll-up signs in advance of barricades.



TYPICAL ABRUPT EDGE DELINEATION

GENERAL NOTES FOR ALL TCP DRAWINGS:
- Signs and other Traffic Control Devices (TCD) shown are the minimum required.
- Place a barricade approx. 20' ahead of all sequential arrow boards.
- Arrows shown in roadway are directional arrows to indicate traffic movements.
- All signs are 48" x 48" unless otherwise shown. Use flourescent orange sheeting for the background of all temporary warning signs.
- All diamond shaped warning signs mounted on barrier sign supports shall be 36" by 36". All other signs mounted on barrier sign supports shall not exceed 12 sq. ft. in total sign area.
- Low speed highways have a pre-construction posted speed of 40 mph or less. High speed highways have a pre-construction posted speed of > 40 mph.
- Do not locate sign supports in locations designated for bicycle or pedestrian traffic.
- Combine drawing details to complete temporary traffic control for each work activity.

Temp. Plastic Drums See TCD Spacing Table for max. spacing.

28" Tubular Markers See TCD Spacing Table for max. spacing.

UNDER TRAFFIC

UNDER CONSTRUCTION

To be accompanied by Drg. Nos. TM820 & TM821

CALC. BOOK NO. TM09-01

BASELINE REPORT DATE 01-JUL-2017

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.

OREGON STANDARD DRAWINGS

TABLES, ABRUPT EDGE AND PCMS DETAILS

2018

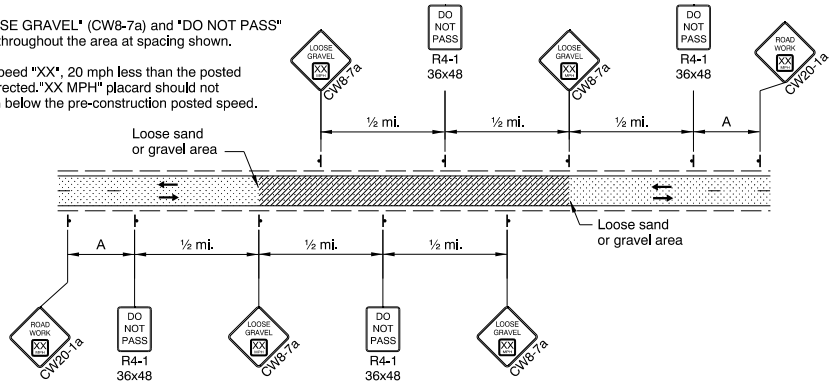
DATE	REVISION DESCRIPTION

tm800.dgn 01-JUL-2017

TM800

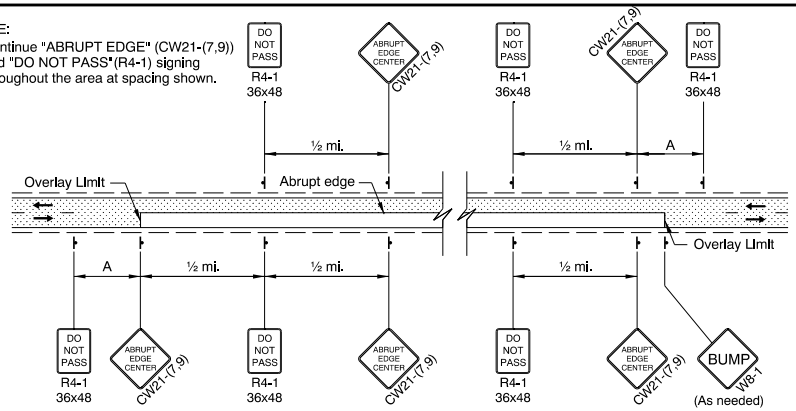
Effective Date: December 1, 2017 - May 31, 2018

NOTE:
- Continue "LOOSE GRAVEL" (CW8-7a) and "DO NOT PASS" (R4-1) signing throughout the area at spacing shown.
- Use advisory speed "XX", 20 mph less than the posted speed, or as directed."XX MPH" placard should not exceed 20 mph below the pre-construction posted speed.



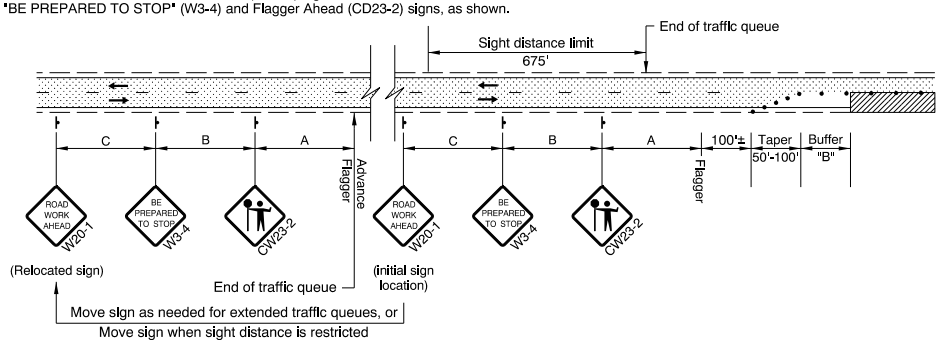
2-LANE, 2-WAY ROADWAY
LOOSE GRAVEL IN ROADWAY SIGNING

NOTE:
- Continue "ABRUPT EDGE" (CW21-(7,9)) and "DO NOT PASS"(R4-1) signing throughout the area at spacing shown.



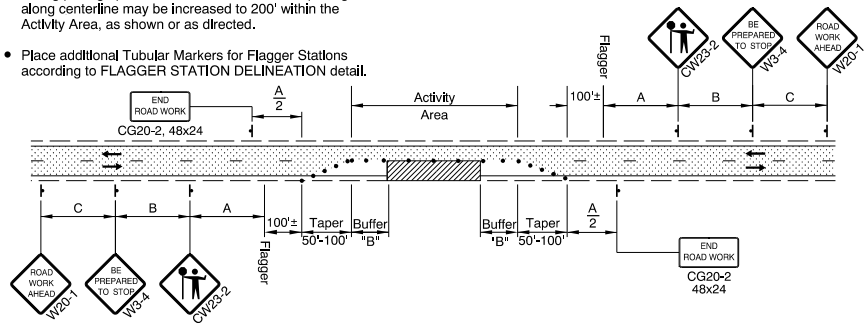
2-LANE, 2-WAY ROADWAY
OVERLAY AREA SIGNING

NOTES:
- Place Advance Flagger and additional signing when traffic queues extend beyond initial warning signing OR when sight distance is restricted.
- Relocate initial "ROAD WORK AHEAD" (W20-1) sign in advance of additional "BE PREPARED TO STOP" (W3-4) and Flagger Ahead (CD23-2) signs, as shown.
- Place additional Tubular Markers for Flagger and Advance Flagger Stations according to FLAGGER STATION DELINEATION detail.



ADVANCE FLAGGER FOR EXTENDED TRAFFIC QUEUES

NOTE:
- 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.
- Place additional Tubular Markers for Flagger Stations according to FLAGGER STATION DELINEATION detail.



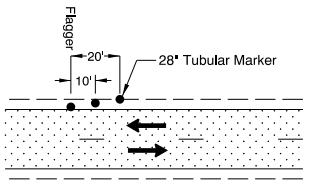
2-LANE, 2-WAY ROADWAY
ONE LANE CLOSURE

GENERAL NOTES FOR ALL DETAILS:
- The "FLAGGER" (CW23-2) symbol sign shall be used only in conjunction with the "BE PREPARED TO STOP" (W3-4) sign.
- Cover existing passing zone signing, as directed.
- Install temporary striping as required.
- To determine Taper Length ("L") and Buffer Length ("B"), use the "MINIMUM LENGTHS TABLE" shown on Drg. No. TM800.
- To determine sign spacing A, B, and C, use "TRAFFIC CONTROL DEVICES (TCD) SPACING TABLE" on Drg. No. TM800.
- Install a "BICYCLES ON ROADWAY" (CW11-1) sign in advance of the closure when a bike lane is closed, or when the shoulder is closed and bikes are expected.

- • • • • 28" Tubular Markers on 20' max. spacing for flagger tapers and stations
- • • 28" Tubular Markers See TCD Spacing Table on TM800 for max. spacing.
- UNDER TRAFFIC
- UNDER CONSTRUCTION
- CONSTRUCTION UNDER TRAFFIC

To be accompanied by Drg. Nos. TM821

NOTE:
- Use a minimum of 3 tubular markers in shoulder taper on 10' spacing for flagger station delineation.



FLAGGER STATION DELINEATION

CALC. BOOK NO. N/A

BASELINE REPORT DATE 01-JUL-2017

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.

OREGON STANDARD DRAWINGS

2-LANE, 2-WAY ROADWAYS

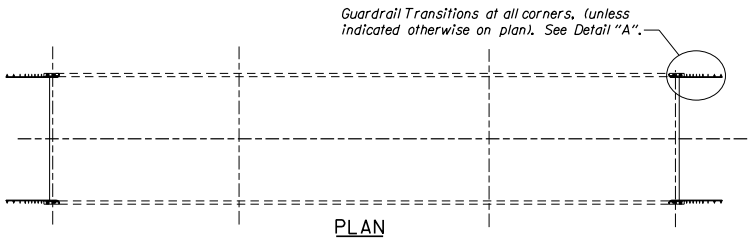
2018

DATE	REVISION DESCRIPTION

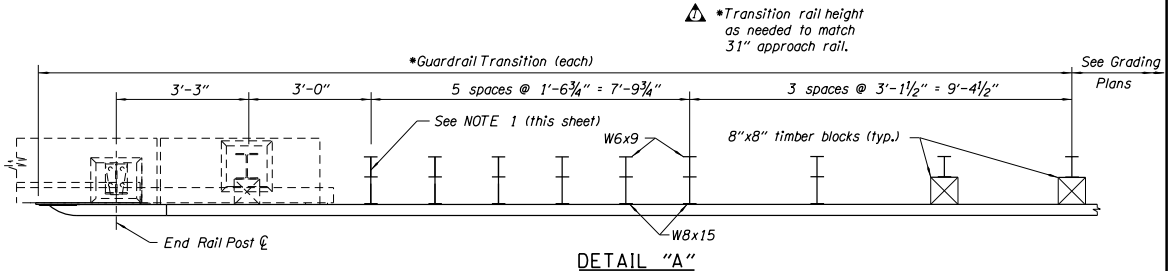
tm850.dgn 01-JUL-2017

TM850

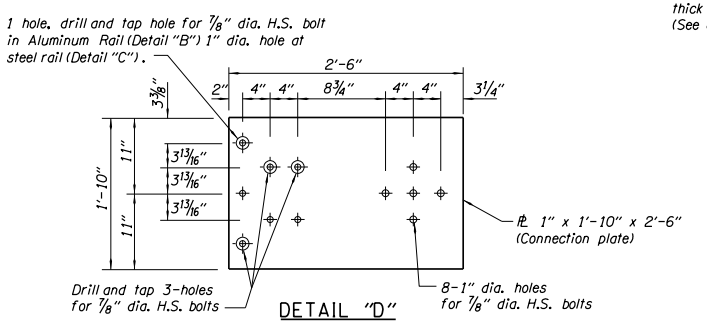
Effective Date: December 1, 2017 - May 31, 2018



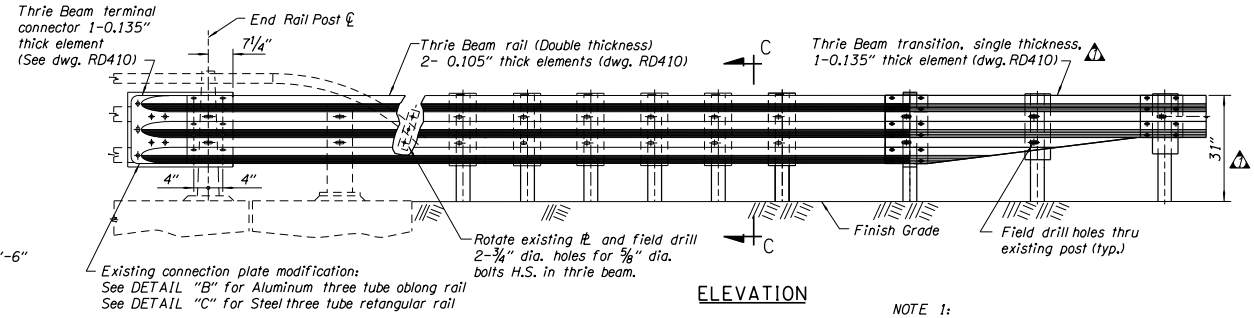
PLAN



DETAIL "A"

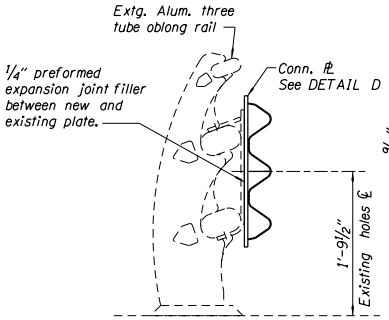


DETAIL "D"

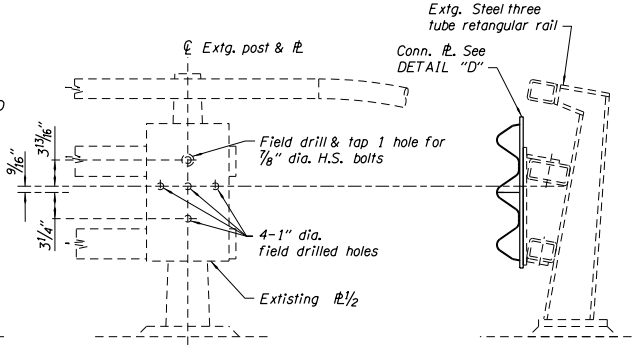


ELEVATION

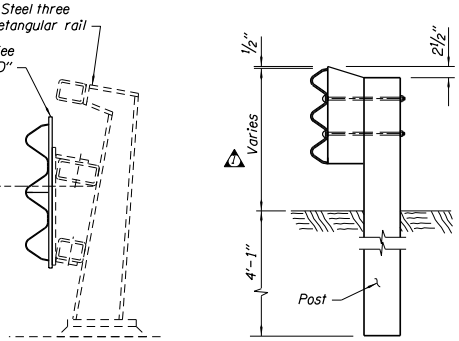
NOTE 1:
Transition posts may be steel W6x9 or timber 8" x 8". All posts to be of same material.



DETAIL "B"



ELEVATION



DETAIL "C"

NOTE:
Thrie beam, rails & Connection plate not shown on elevation for clarity.
Field drill holes in extisting plate.

SECTION C-C

GENERAL NOTES:

Provide all structural steel conforming to AASHTO Specification M183 (ASTM A36).
Hot-dip galvanize all plates, bolts, nuts and washers after fabrication.
Provide all H.S. bolts conforming to AASHTO M164 (ASTM A325).
Bolts in tapped holes are to be flush with back of plate.
Field verify all dimensions before fabrication.
After field drilling holes in steel, paint with two coats of inorganic zinc primer.

1 01-16 Exchanged 2 - 0.105" with 1 - 0.135" asymmetrical thrie beam. Changed 1'-9 1/2" to 31" and measured to top of rail. Added note and changed 2'-7 1/2" to varies. Moved to Std. Detail 01-01-2016.

Accompanied by dwgs. RD405, RD410

The selection and use of this detail, 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 DEPARTMENT OF TRANSPORTATION
TECHNICAL SERVICES
DETAILS

RAIL TRANSITION DETAILS
FLEX BEAM RAIL TO
THREE TUBE RAIL

DETAIL NO.
DET3276

det3276.dgn 05-2016

DET3276

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