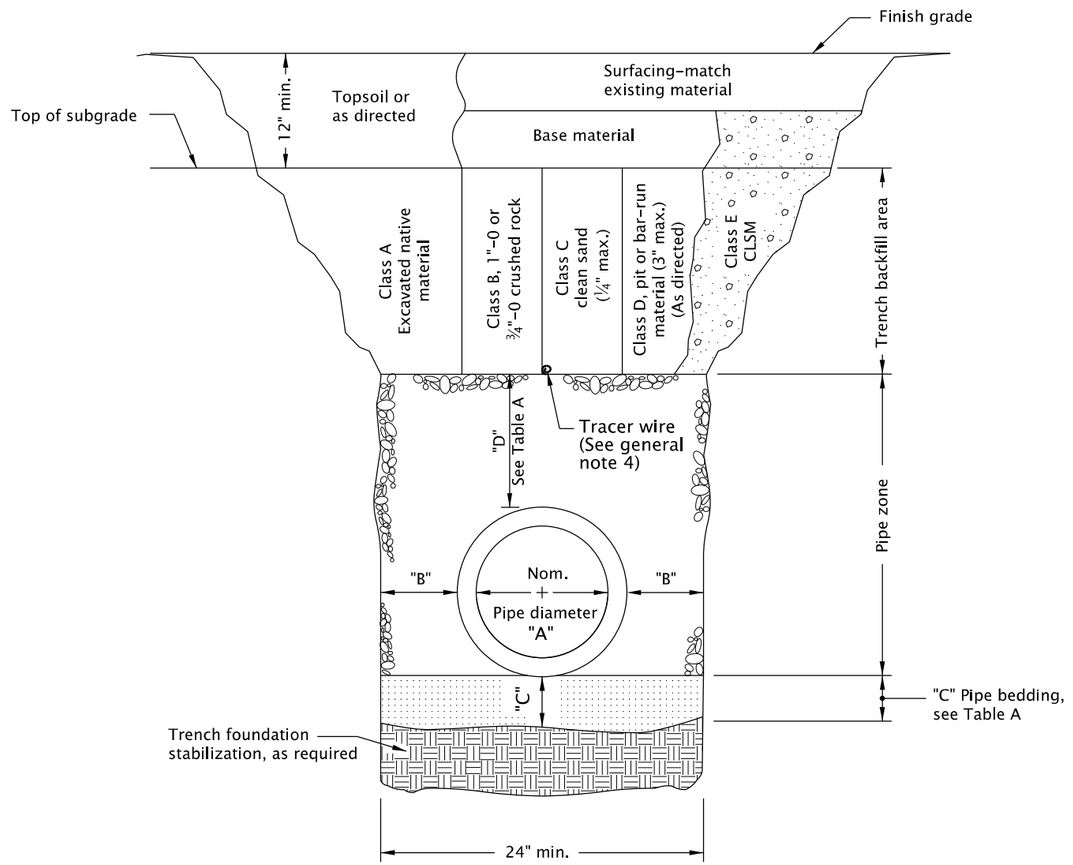
rd300.dgn 20-JUL-2020

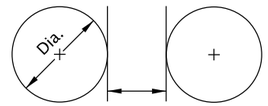
TABLE A

"A" (in)	"B" (in)	"C" (in)	"D" (in)
4	10	4	8
6	10	4	8
8	10	6	10
10	10	6	10
12	12	6	10
15	12	6	10
18	16	6	12
21	16	6	12
24	18	6	12
30	18	6	12
36	24	6	14
42	24	6	14
48	24	6	14
54	24	6	14
60	24	6	14
66	24	6	14
72	24	6	14

For pipes over 72" diameter, see general note 3.



MULTIPLE INSTALLATIONS



DIAMETER	MIN. SPACE BETWEEN PIPES
Up to 48"	24"
48" to 72"	One half (½) dia. of pipe

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Surfacing of paved areas shall comply with street cut Std. Dwg. RD302.
2. For pipe installation in embankment areas where the trench method will not be used and the pipe is ≥ 36" diameter, increase dimension "B" to nominal pipe diameter.
3. Pipes over 72" diameter are structures, and are not applicable to this drawing.
4. See Std. Dwg. RD336 for tracer wire details (When required).

CALC. BOOK NO. N/A

SDR DATE 14–JUL–2014

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.

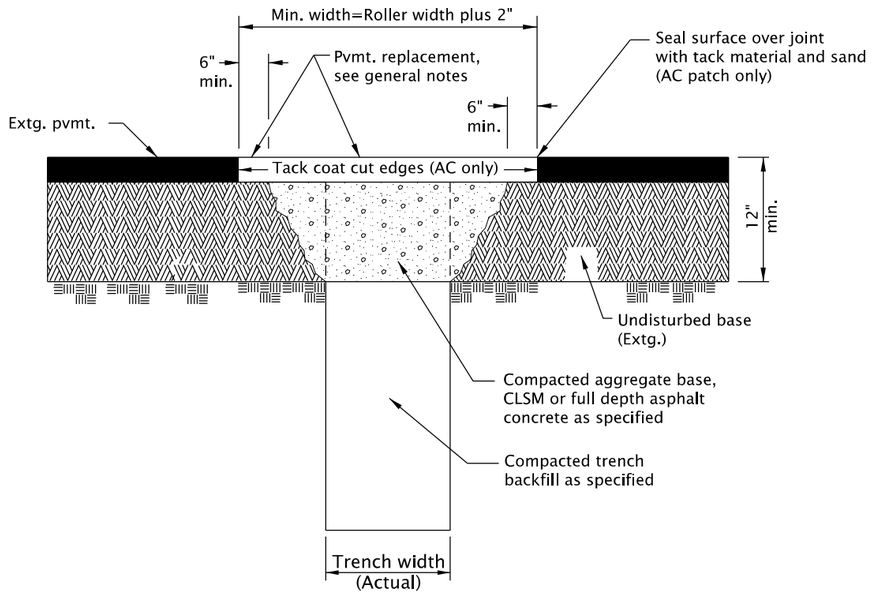
OREGON STANDARD DRAWINGS

TRENCH BACKFILL, BEDDING, PIPE ZONE AND MULTIPLE INSTALLATIONS

2021

DATE	REVISION DESCRIPTION

RD300



GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All existing AC or PCC pavement shall be sawcut prior to repaving.
2. Concrete pavement shall be replaced with concrete to a minimum thickness of 8" or to the thickness of removed pavement, whichever is greater.
3. For joining new concrete to existing concrete, see contract plans for sepecific details.
4. Place AC mix minimum thkn. of 6" or the thkn. of the removed pavement, whichever is greater. Compact as specified.

CALC. BOOK NO. N/A

SDR DATE 20-JUL-2020

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

STREET CUT

2021

DATE	REVISION DESCRIPTION

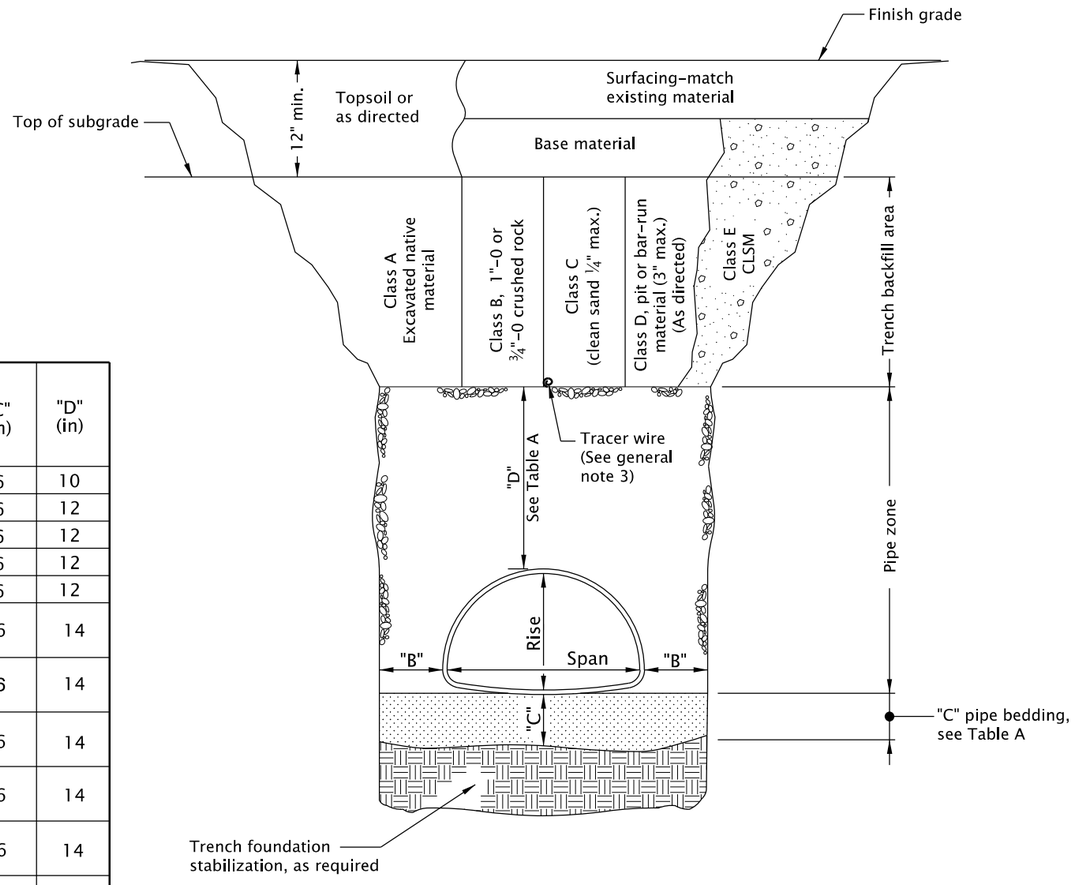
RD302

* See general note 5

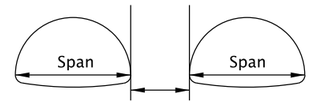
TABLE A

* SPAN x RISE (in)	EQUIVALENT ROUND DIAMETER (in)	"B" (in)	"C" (in)	"D" (in)
17x13	15	12	6	10
21x15	18	16	6	12
24x18	21	16	6	12
28x20	24	18	6	12
35x24	30	18	6	12
40x31	36	24	6	14
42x29				
46x36	42	24	6	14
49x33				
53x41	48	24	6	14
57x38				
60x46	54	24	6	14
64x43				
66x51	60	24	6	14
71x47				
73x55	66	24	6	14
77x52				
81x59	72	24	6	14
83x57				

For pipes over 72" equivalent round diameter, see general note 4.



MULTIPLE INSTALLATIONS



SPAN	MIN. SPACE BETWEEN PIPES
Up to 48"	24"
48" to 72"	One half (½) span of pipe

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Surfacing of paved areas shall comply with street cut Std. Dwg. RD302.
2. For pipe installation in embankment areas where the trench method will not be used and the pipe is ≥ 36" equivalent round diameter, increase dimension "B" to actual span.
3. See Std. Dwg. RD336 for tracer wire details (When required).
4. Pipes over 72" equivalent round diameter are structures, and are not applicable to this drawing.
5. Cross-sectional dimensions may vary with different materials.

CALC. BOOK NO. N/A

SDR DATE 14-JUL-2014

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

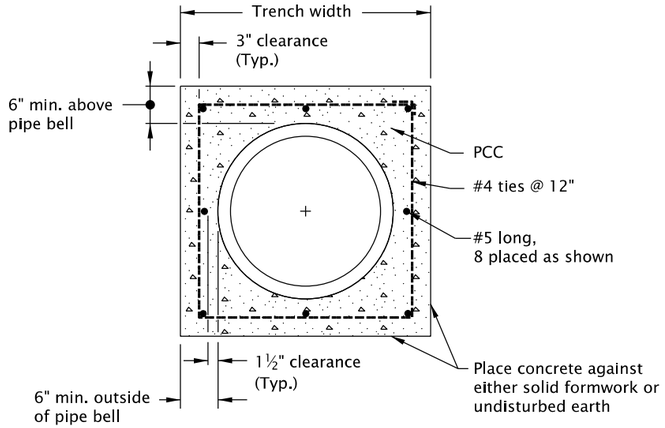
The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

OREGON STANDARD DRAWINGS

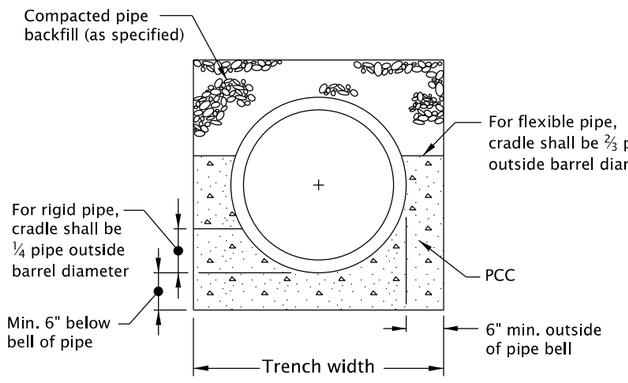
ARCH PIPE BACKFILL/COMPACTION

2021

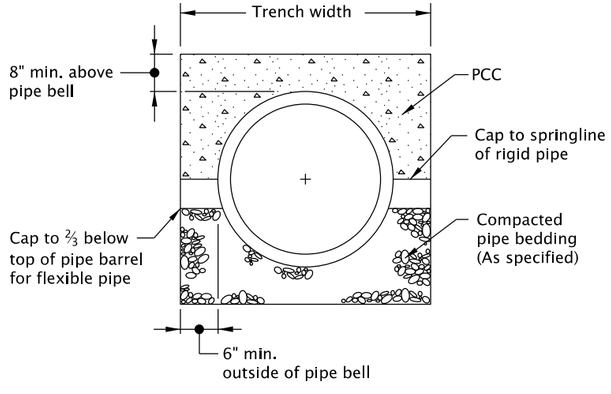
DATE	REVISION DESCRIPTION



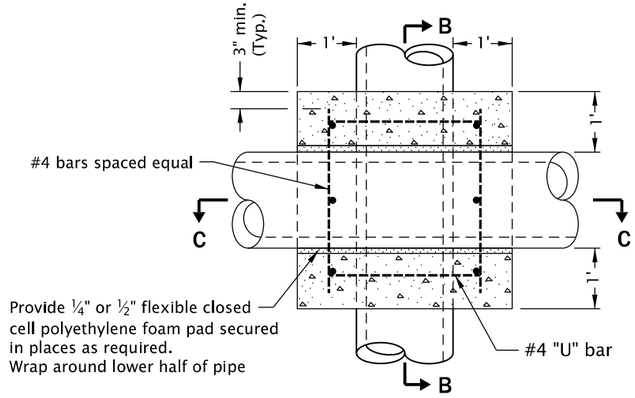
CONCRETE ENCASEMENT DETAIL



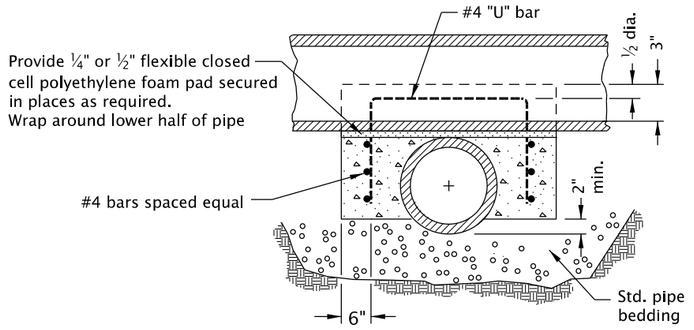
CRADLE DETAIL



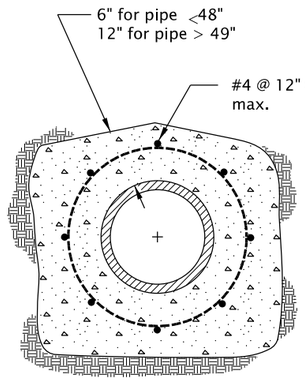
CAP DETAIL



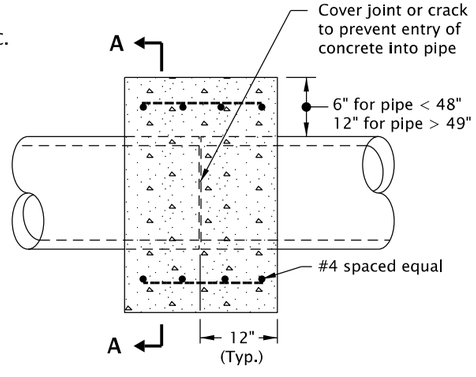
PLAN



SECTION C-C



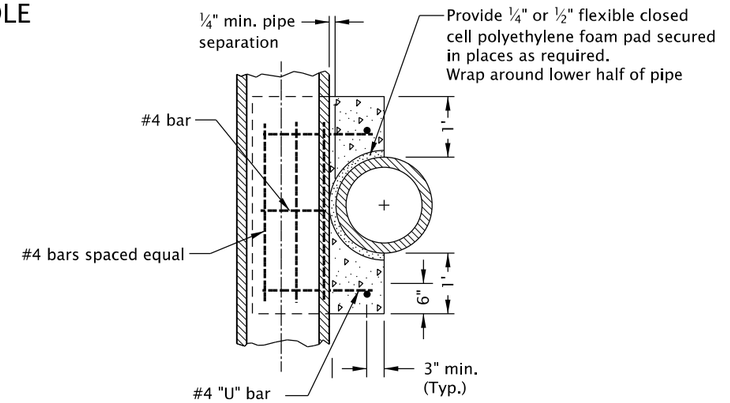
SECTION A-A



PLAN

REINFORCED CONCRETE COLLAR

SADDLE



SECTION B-B

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All concrete shall be commercial grade concrete.
2. End all reinforcing 3" clear of ground, forms or top surface, unless otherwise shown.
3. Trowel finish top surface of saddle, and cradle.
4. Reinforcement shall be # 4 vertical & horizontal bars as shown.
5. See Std. Dwg. RD300 for trench backfill, bedding, etc.
6. See Std. Dwg. RD336 for tracer wire details (When required).
7. Pipe over 72" diameter are structures, and are not applicable to this drawing.

CALC. BOOK NO. N/A

SDR DATE 14-JUL-2014

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

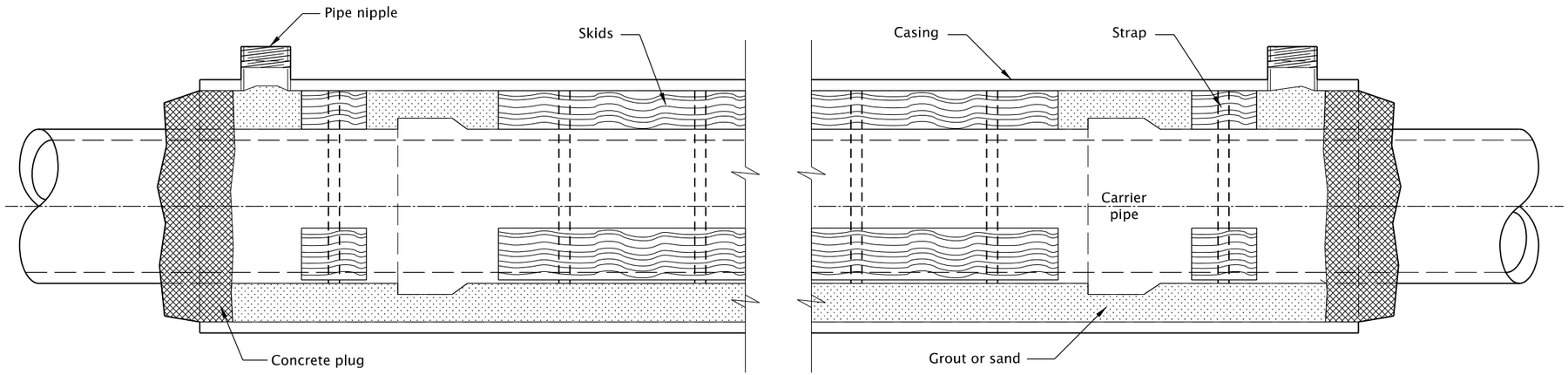
CONCRETE ENCASEMENT, CRADLE, AND CAP DETAILS

2021

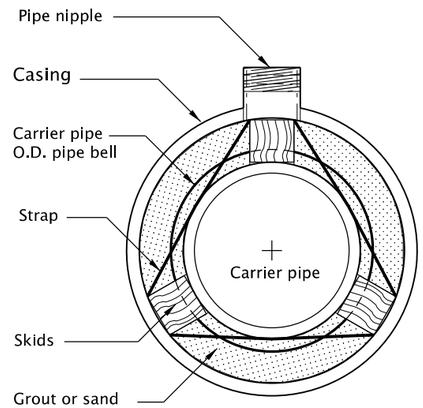
DATE	REVISION DESCRIPTION

rd306.dgn 20-JUL-2020

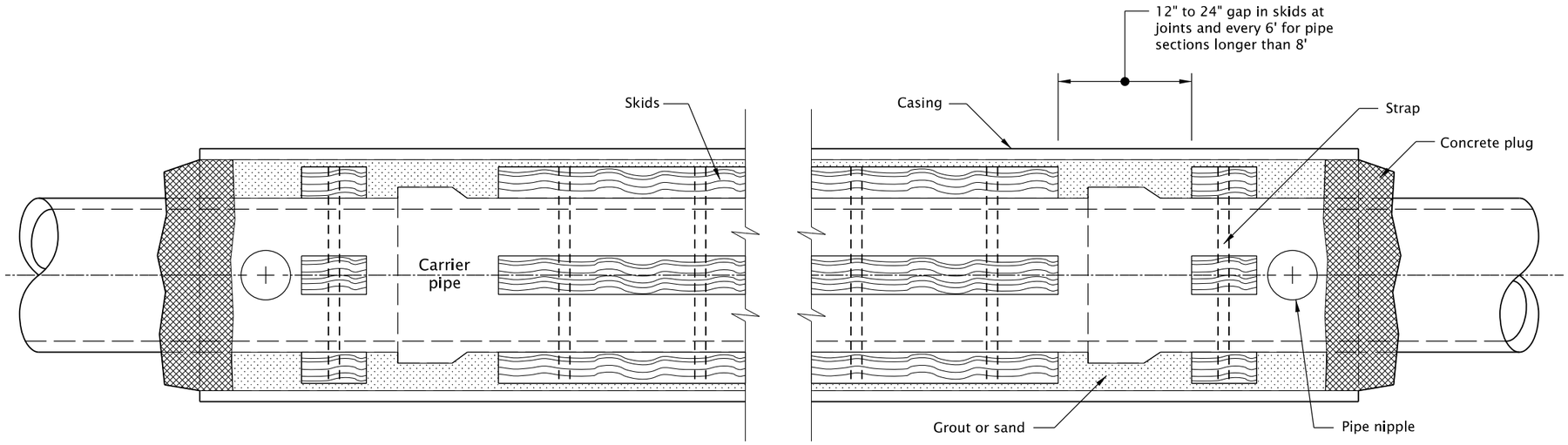
RD306



ELEVATION



END VIEW



PLAN

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Type, size, and location(s) of casing, carrier pipe, skids, straps, pipe nipples, etc., are as required by the Engineer to meet site conditions.
2. Plug ends of casing with commercial grade concrete.
3. Block carrier pipe down or flood to resist flotation when filling annular space.
4. Provide pipe nipple at top of casing at each end of casing, for filling and verifing filling operation. Size to accomodate volume of grout or sand and site conditions (4" diameter minimum).
5. Strap pressure treated wood or manufactured skids to pipe, 3 skids per pipe section. Skids to support full length of pipe except bell.
6. See Std. Dwg. RD336 for tracer wire details (When required).

CALC. BOOK NO. N/A

SDR DATE 07-JAN-2013

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

BORE CASING DETAIL

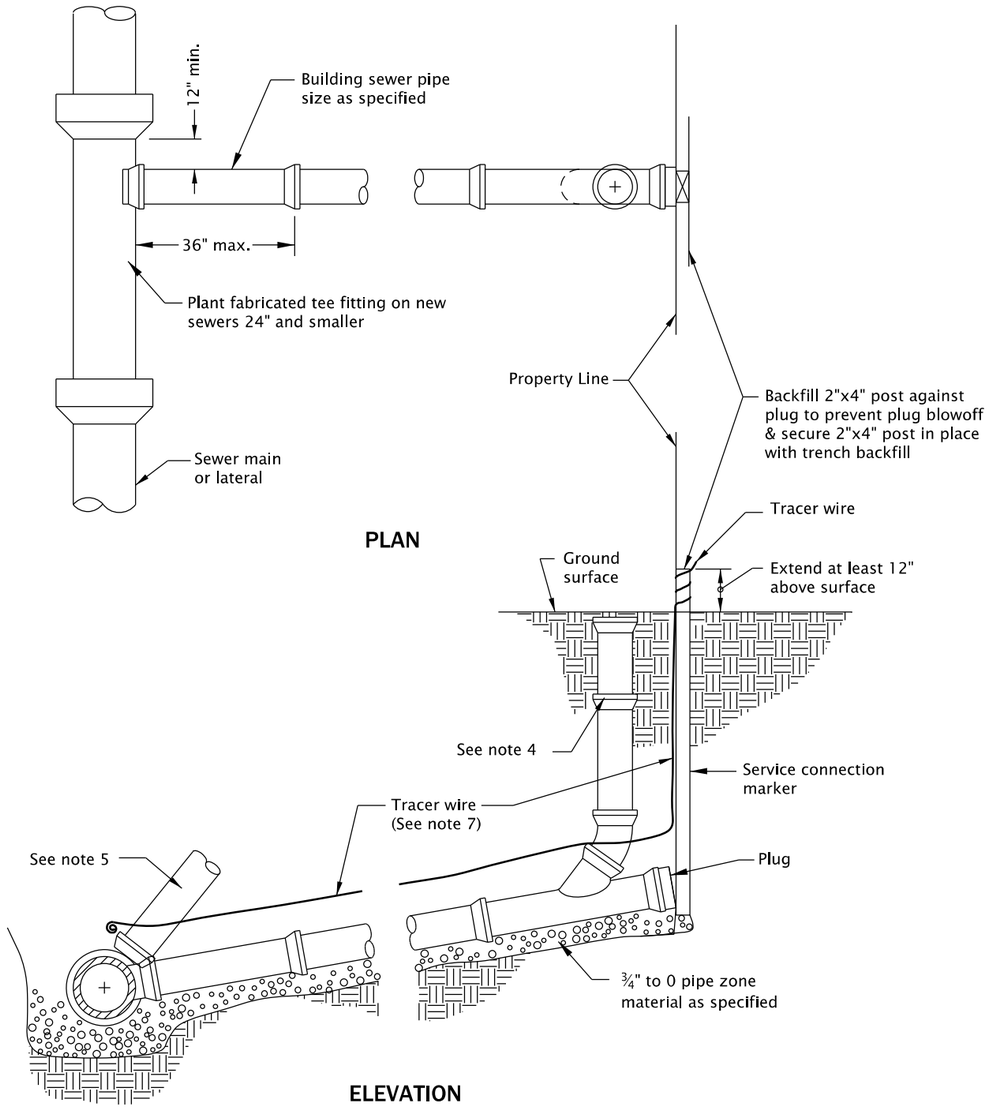
2021

DATE	REVISION DESCRIPTION

rd308.dgn 20-JUL-2020

RD308

rd310.dgn 20-JUL-2020



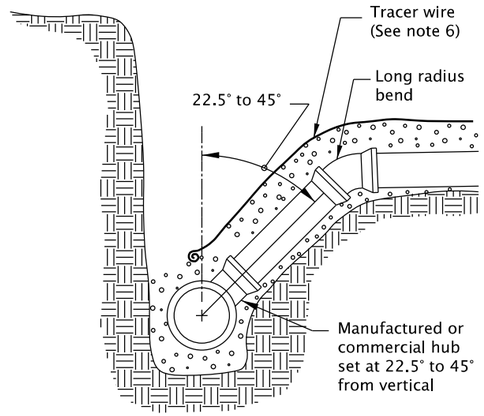
PLAN

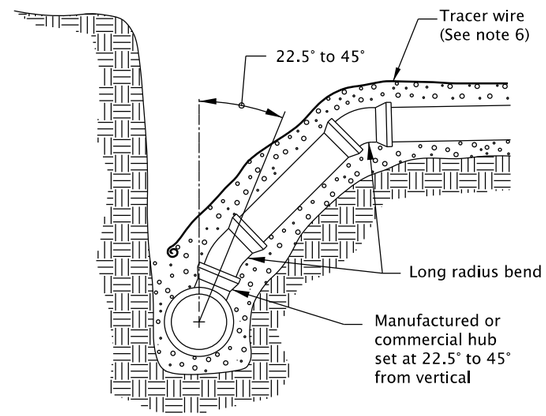
ELEVATION

SHALLOW TRENCH SERVICE

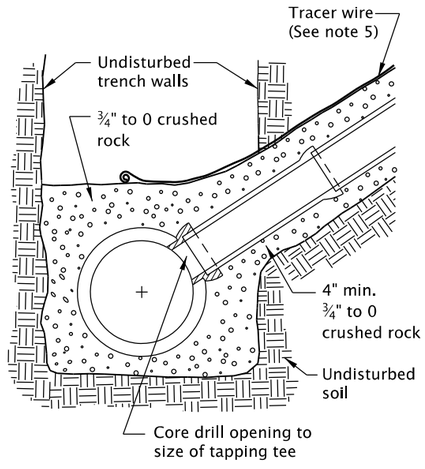
NOTES:

1. Pipe and fittings shall be compatible. Only manufactured fittings shall be used.
2. Minimum depth at right of way or easement line shall be 4'.
3. Marker posts and blocking shall be treated wood. Post shall be 2"x4" fir. Post to extend 12" minimum above finish grade and exposed area shall be painted green.
4. When required, a cleanout shall be installed where directed.
5. Lay building sewer at max. 45° from horizontal to achieve required depth at propertly line when minimum slope results in excessive depth.
6. For bedding and backfill see Std. Dwg. RD300.
7. See Std. Dwg. RD336 for tracer wire details.





DEEP TRENCH SERVICE



WASTEWATER SERVICE TAP

NOTES:

1. Seat tee in place to fit outside surface of carrier pipe and to form watertight seal.
2. Type of tapping tee shall be watertight and conform to standard specification requirements.
3. Tapping tee shall not protrude into pipe except as approved by the engineer.
4. For bedding and backfill, see Std. Dwg. RD300.
5. See Std. Dwg. RD336 for tracer wire details.

NOTES:

1. Pipe and fittings shall be compatible. Only manufactured fittings shall be used.
2. For details not shown see shallow trench service connection drawing.
3. Vertical trench walls are required. If it is not possible to maintain vertical trench walls, use alternate connection method to maintain 6" maximum distance between riser pipe and trench walls. Replace all excavated or disturbed material with full depth granular backfill compacted to 95% relative density.
4. Where deep connection is at an angle less than 45° from vertical, ductile iron pipe and fittings should be used.
5. For bedding and backfill, see Std. Dwg. RD300.
6. See Std. Dwg. RD336 for tracer wire details.

CALC. BOOK NO. N/A

SDR DATE 21-JUL-2015

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.

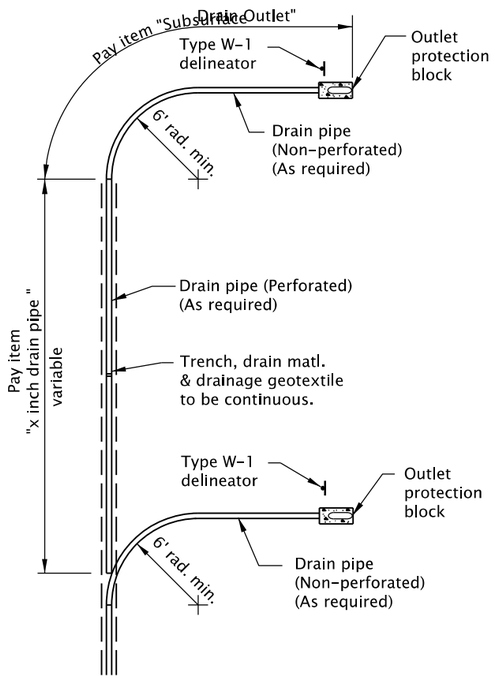
OREGON STANDARD DRAWINGS

SHALLOW/DEEP TRENCH SERVICE CONNECTION, BLOCKING AND MARKERS

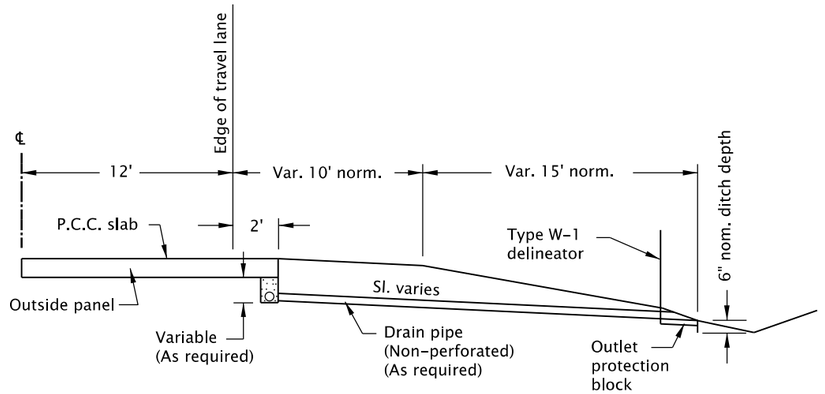
2021

DATE	REVISION DESCRIPTION

RD310

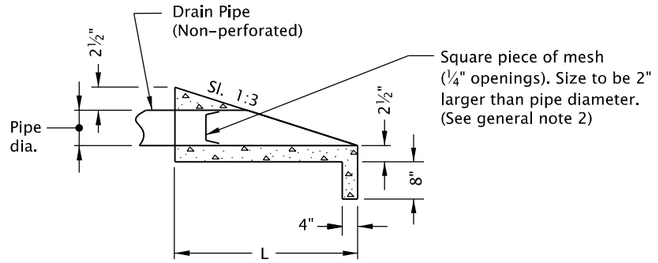


PLAN



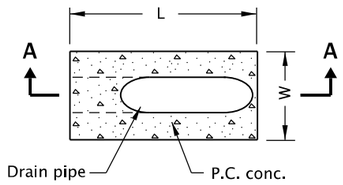
ELEVATION

SUBSURFACE DRAIN OUTLET



SECTION A-A

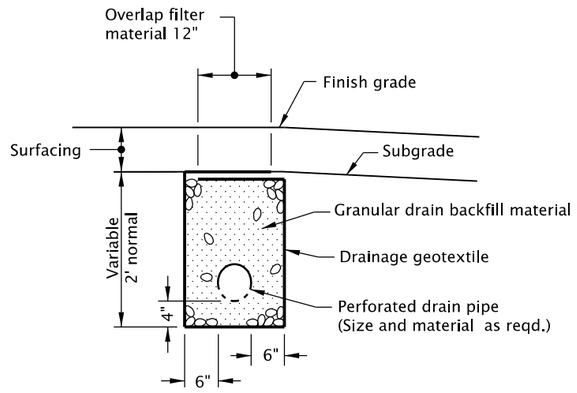
PIPE DIA. (in)	L NOM. (in)	W NOM. (in)
3	24	12
4	24	12
6	33	14
8	42	16



PLAN

OUTLET PROTECTION BLOCK

TYPE 1 SUBSURFACE DRAIN INSTALLATION



SECTION

SUBSURFACE DRAIN DETAIL

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. In guard rail areas extend outlet protection block to back of guard rail post min.
2. Mesh for rodent control to be galvanized wire or approved equal.

CALC. BOOK NO. N/A

SDR DATE 21-JUL-2015

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

SUBSURFACE DRAIN

2021

DATE	REVISION DESCRIPTION

RD312

ARCH PIPE

CORRUGATED STRUCTURAL PLATE (Dimension in inches)

SIZE		X	B1			SIZE		X	B1		
			SLOPES						SLOPES		
*** SPAN	*** RISE		1:1.5	1:2	1:3	*** SPAN	*** RISE		1:1.5	1:2	1:3
73	55	28	45	60	89	139	89	32	88	118	174
76	57	25	51	67	101	142	91	30	94	126	189
81	59	29	48	64	95	148	93	34	91	121	181
84	61	28	54	72	107	150	95	32	97	130	195
87	63	25	60	79	119	152	97	30	103	138	206
92	65	28	57	77	115	154	100	28	110	148	220
95	67	26	63	85	126	161	101	31	108	144	215
98	69	24	70	94	139	167	103	35	104	139	209
103	71	28	67	90	134	169	105	34	110	148	221
106	73	26	73	97	145	171	107	31	117	156	234
112	75	29	70	95	143	178	109	35	114	151	227
114	77	28	77	102	152	184	111	38	111	149	223
117	79	26	83	109	165	186	113	36	118	156	234
123	81	29	80	108	161	188	115	34	124	165	246
128	83	33	78	103	152	190	118	32	131	174	258
131	85	31	84	112	167	197	119	36	127	169	256
137	87	33	82	109	162	199	121	34	133	178	268

X dimensions are to top edge of corner plates on structural plate pipe.

CORRUGATED (Dimension in inches)

EQUIVALENT ROUND SIZE	*** SPAN	*** RISE	X
15	17	13	5¼
18	21	15	6
21	24	18	7¼
24	28	20	8
30	35	24	9½
36	42	29	10½
42	49	33	11½
48	57	38	13½
54	64	43	15
60	71	47	16½
66	77	52	18
72	83	57	20

Slopes as directed.

*** See general note 8

CIRCULAR OR ELLIPTICAL PIPE

CORRUGATED (Dimension in inches)

SIZE	X	Y
12 to 36	4 *	0
42	8 *	8 *
48	8 *	8 *
54	8 *	8 *
60	8 *	8 *
66	12	12
72	12	12
78	12	12
84	16	16

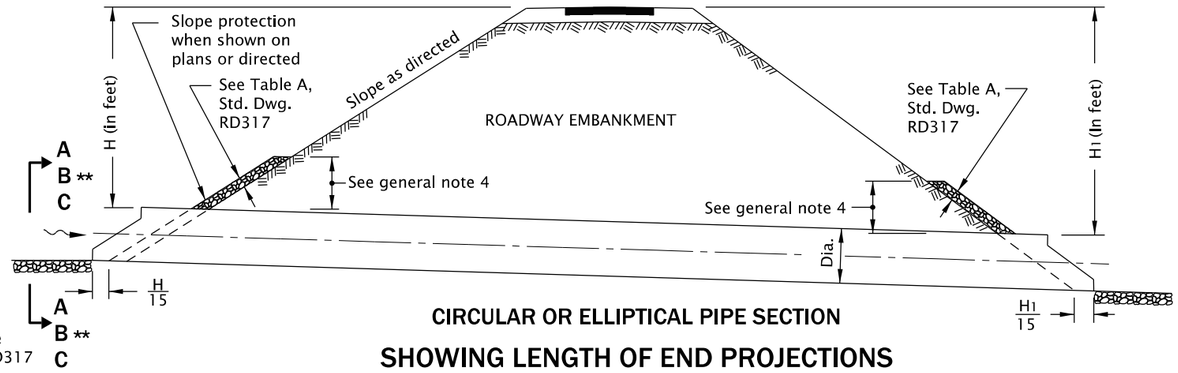
Slopes as directed.

* 0 when used with paved end slope.

CORRUGATED STRUCTURAL PLATE (Dimension in inches)

SIZE	B1			ALTERNATE – 1						ALTERNATE – 2		
				X			Y			X & Y		
	SLOPES			SLOPES			SLOPES			SLOPES		
	1:1.5	1:2	1:3	1:1.5	1:2	1:3	1:1.5	1:2	1:3	1:1.5	1:2	1:3
60	72	72	96	5	11	13	7	13	15	6	12	15
66	72	72	96	7	15	17	11	16	18	10	16	17
72	72	96	144	11	13	11	13	13	13	12	12	12
78	72	72	144	13	20	15	17	22	16	16	22	16
84	72	96	144	17	17	17	19	19	19	18	18	18
90	72	96	144	19	20	20	23	22	22	22	22	22
96	96	96	192	15	23	16	17	25	17	16	24	17
102	96	96	168	18	26	23	20	29	24	19	28	23
108	96	96	168	20	29	25	23	31	26	22	30	26
114	96	168	168	23	15	29	26	16	30	25	28	29
120	96	168	216	26	17	23	29	19	25	28	18	24
126	96	168	216	30	20	26	32	22	28	31	22	28
132	144	168	216	17	23	29	19	25	31	18	24	30
138	144	192	288	19	20	20	23	22	22	22	22	22
144	144	144	240	23	35	31	25	37	32	24	36	32
150	144	192	288	25	26	26	29	28	28	28	28	28
156	144	192	288	29	29	29	31	31	31	30	30	30
162	144	192	288	31	32	32	35	34	34	34	34	34
168	168	168	264	26	41	40	29	43	41	28	42	40
174	168	168	288	30	44	39	32	46	40	31	46	40
180	168	192	288	42	41	41	43	43	43	42	42	42

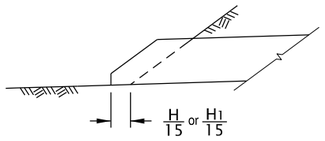
For elliptical pipe increase X and Y dimensions by percent of ellipse.



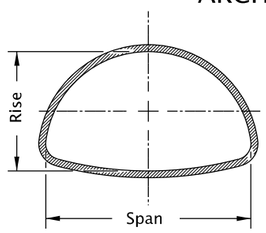
** Configuration varies, see sections on Std. Dwg. RD317

CIRCULAR OR ELLIPTICAL PIPE SECTION

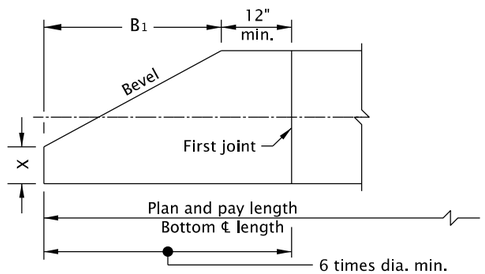
SHOWING LENGTH OF END PROJECTIONS



ARCH PIPE

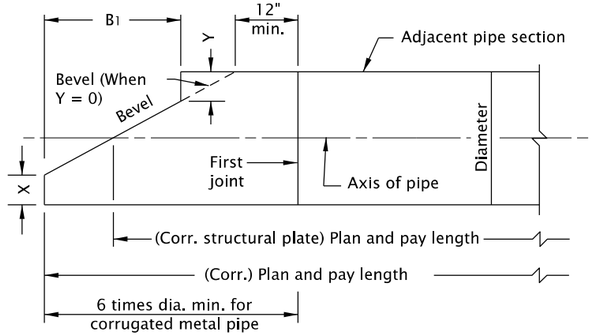


END VIEW



PARTIAL BEVEL LONGITUDINAL SECTION

ARCH PIPE



STEP BEVEL LONGITUDINAL SECTION

CIRCULAR OR ELLIPTICAL PIPE

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All dimensions are subject to necessary tolerances to meet manufacturer's requirements for plate arrangements.
2. See Std. Dwgs. RD300 or RD304 for installation details.
3. All embankment slopes to be warped where required to provide end projections as shown.
4. Minimum elevation of top of riprap at inlet and outlet is one diameter (D) or one foot higher than design headwater or tailwater elevation respectively whichever is greater.
5. Slope protection required for hydraulic installations. See Table A on Std. Dwg. RD317.
6. $\frac{H}{15}$ and $\frac{H1}{15}$ only applicable for non-hydraulic applications.
7. Open ends of pipes normally require a site specific design, and may require special treament (Slope ends, culvert embankment protection, paved end slopes, safety end sections, or other measures).
   See special details or Standard Drawings as called for on plans.
8. Cross-sectional dimensions may vary with different materials.
9. Full bevel cuts are not recommended for multiple radius shaped pipes.
10. For pipes with skew no.'s 50, 70, 110 or 130, omit the top step (Y).
    (For skew diagram, see Std. Dwg. RD319).
11. See Std. Dwg. RD317 for culvert embankment protection and riprap pads (When reqd.).

CALC. BOOK NO. N/A

SDR DATE 15-JAN-2016

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

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OREGON STANDARD DRAWINGS

SLOPED ENDS FOR METAL PIPE

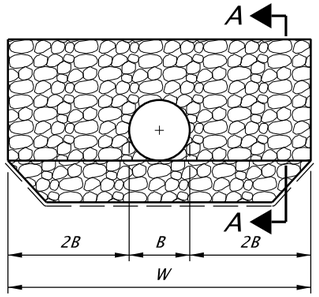
2021

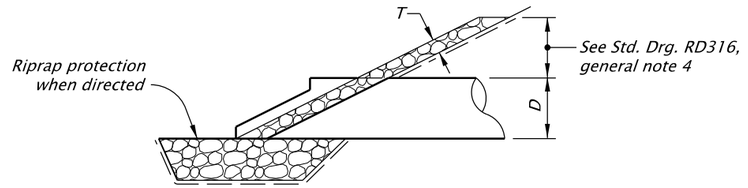
DATE	REVISION DESCRIPTION

rd316.dgn 20-JUL-2020

RD316

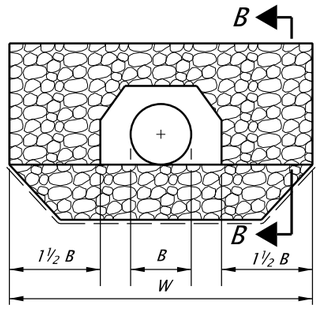
Effective Date: June 1, 2022 - November 30, 2022

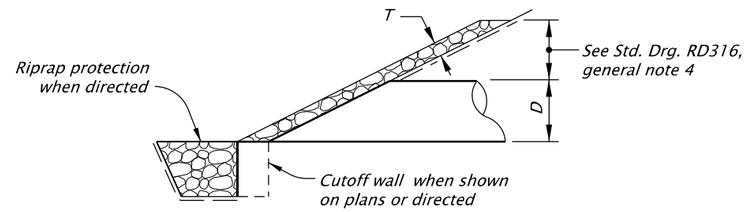




SECTION A-A

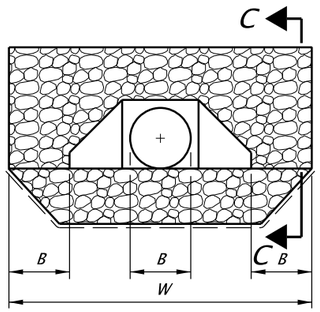
SLOPED OR PROJECTING END

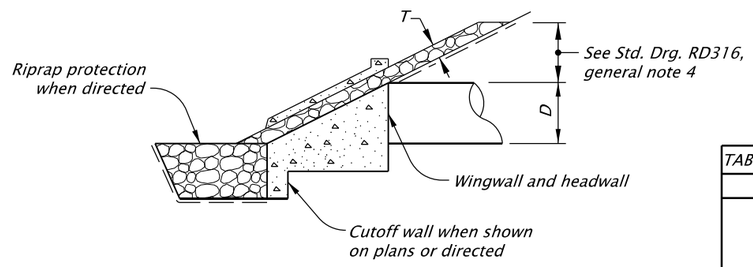




SECTION B-B

SLOPED END WITH SLOPE PAVING



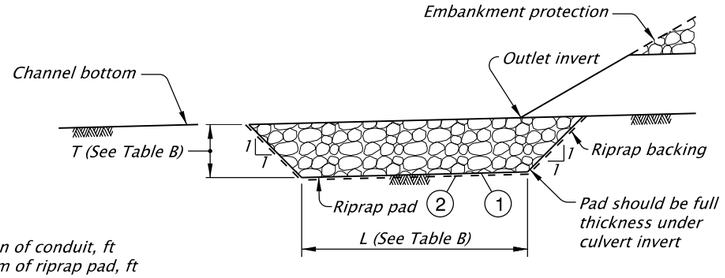


SECTION C-C

HEADWALL AND WINGWALLS

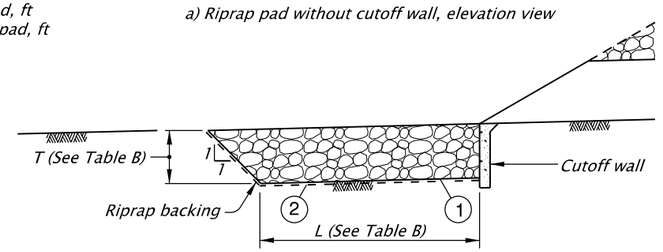
B = Diameter of circular barrel or span of arch pipe, box, or open-bottom arch.
D = Diameter of circular barrel or rise of arch pipe, box, or open-bottom arch.
T = Thickness of riprap blanket, see Table A.

EMBANKMENT PROTECTION



B = Diameter or span of conduit, ft
L = Length of bottom of riprap pad, ft
T = Thickness of riprap pad, ft
W= Width of top of riprap pad, ft

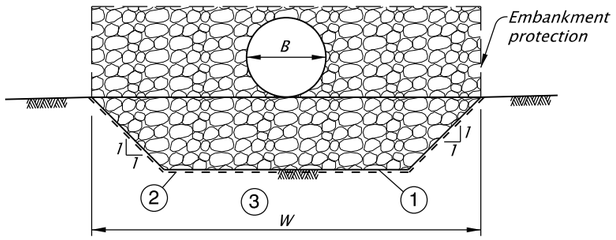
a) Riprap pad without cutoff wall, elevation view



b) Riprap pad with cutoff wall, elevation view

RIPRAP PAD NOTES:

1. *Do not excavate non-erodible rock in order to place riprap.*
2. *Use riprap backing under Class 200 and Class 700 loose riprap.*
3. *Top width (W) of the riprap pad is the larger of 5B or the width of the embankment slope protection.*



c) Riprap pad, end view

RIPRAP PADS

TABLE A - Embankment Slope Protection

Riprap Class	T Distance
50	12 Inches
100	18 Inches
200	24 Inches *
700	36 Inches *

** Riprap backing required between riprap and embankment*

TABLE B - Riprap Pad Dimensions

Riprap Class	L * (ft)	T (ft)
50	4B or 1.3	2.3
100	4B or 1.6	3.3
200	4B or 2.0	4.3
700	4B or 3.3	5.6

** L is the greater of 4B or the listed dimension.*

GENERAL NOTES FOR ALL DETAILS:

1. *See Std. Drg's. RD300 & RD304 for installation details.*
2. *Open ends of pipes normally require a site specific design, and may require special treatment (sloped ends, culvert embankment protection, paved end slopes, safety end sections, or other measures). See special details or Standard Drawings as called for on plans.*

CALC. BOOK NO. _ _ _ _ N/A _ _ _ _ _

SDR DATE _ _ _ _ _ _ _ _ 01-July-2020 _ _ _ _ _ _ _ _

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

CULVERT EMBANKMENT PROTECTION and RIPRAP PADS

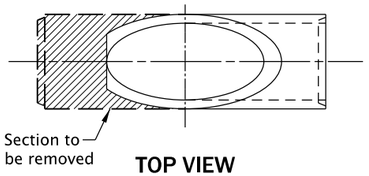
2021

DATE	REVISION DESCRIPTION

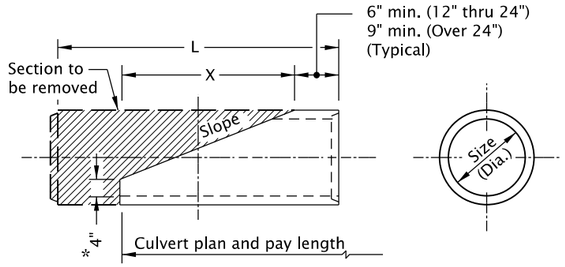
rd317.dgn 07-01-2020

RD317

CASE 1
SINGLE PIPE LENGTH



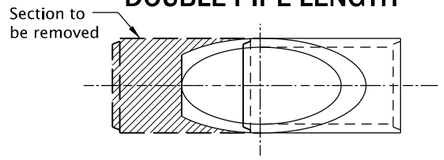
TOP VIEW



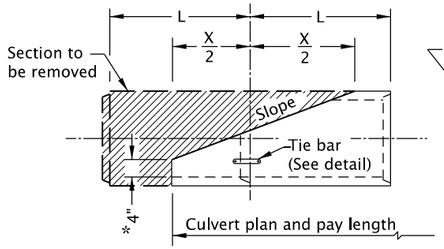
SIDE VIEW

END VIEW
(CASE 1)

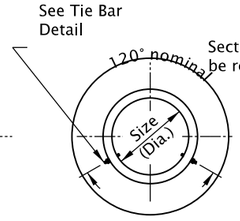
CASE 2
DOUBLE PIPE LENGTH



TOP VIEW

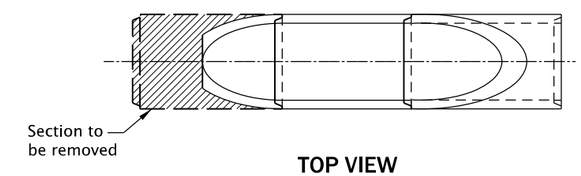


SIDE VIEW

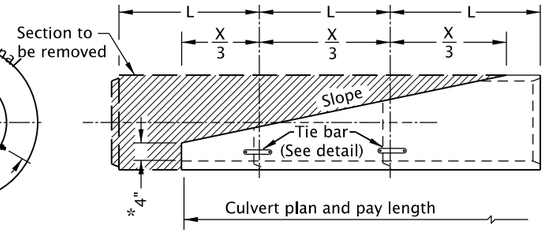


END VIEW
(CASE 2 & 3)

CASE 3
TRIPLE PIPE LENGTH



TOP VIEW



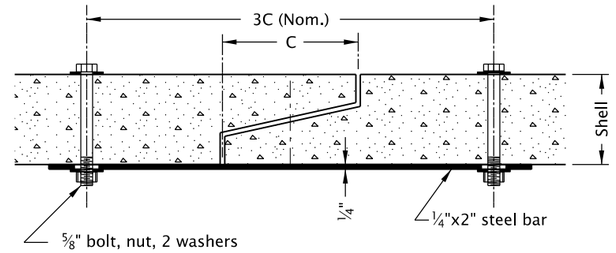
SIDE VIEW

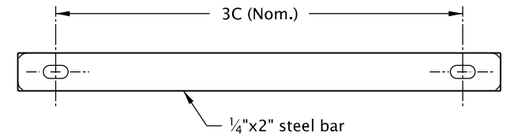
* 0 when used with paved end slope.

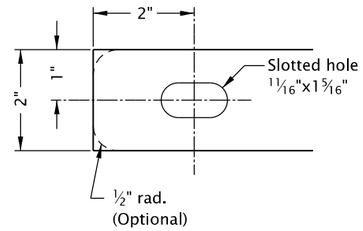
NOTE:
Sloped ends shall be made from minimum Class III concrete pipe.
"X" Values shown are for vertical dimension at bottom of sloped end = 0.

TABLE A

SIZE (Diameter)	SLOPE																				SIZE (Diameter)
	1:1.5			1:2			1:2.5			1:3			1:4				1:6				
	X	CASE 1 L (Min.)	CASE 2 L (Min.)	X	CASE 1 L (Min.)	CASE 2 L (Min.)	X	CASE 1 L (Min.)	CASE 2 L (Min.)	X	CASE 1 L (Min.)	CASE 2 L (Min.)	X	CASE 1 L (Min.)	CASE 2 L (Min.)	CASE 3 L (Min.)	X	CASE 1 L (Min.)	CASE 2 L (Min.)	CASE 3 L (Min.)	
DIMENSION IN INCHES																					
12	18	36	36	24	36	36	30	48	36	36	72	36	48	72	36		72	90	48		12
15	22.5	36	36	30	48	36	37.5	72	36	45	72	36	60	72	36		90		72		15
18	27	48	36	36	48	36	45	72	36	54	72	36	72	90	48		108		72		18
21	31.5	48	36	42	72	36	52.5	72	36	63	90	48	84		72		126		90		21
24	36	48	36	48	72	36	60	90	48	72	90	48	96		72		144		90		24
27	40.5	72	36	54	72	36	67.5	90	48	81		72	108		72		162			72	27
30	45	72	36	60	90	48	75		48	90		72	120		90		180			72	30
33	49.5	72	36	66	90	48	82.5		72	99		72	132		90		198			90	33
36	54	72	36	72	90	48	90		72	108		72	144		90		216			90	36
42	63	90	48	84		72	105		72	126		90	168			72	252			90	42
48	72	90	48	96		72	120		90	144		90	192			90	288				48
54	81		72	108		72	135		90				216			90	324				54







NOTES:

1. All bolts, nuts and washers to be galvanized.
2. Tie bar to be galvanized after fabrication.
3. "C" is tongue length.
4. Install 2 tie bars at each joint (See end view, Case 2 & 3).

TIE BAR DETAIL

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. For dimensions indicated by letter, see Table A.
2. Open ends of pipes normally require a site specific design, and may require special treament (Slope ends, culvert embankment protection, paved end slopes, safety end sections, or other measures).
   See special details or Standard Drawings as called for on plans.
3. See Std. Dwg. RD317 for culvert embankment protection and riprap pads (When reqd.).

CALC. BOOK NO. N/A

SDR DATE 15-JAN-2016

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OREGON STANDARD DRAWINGS

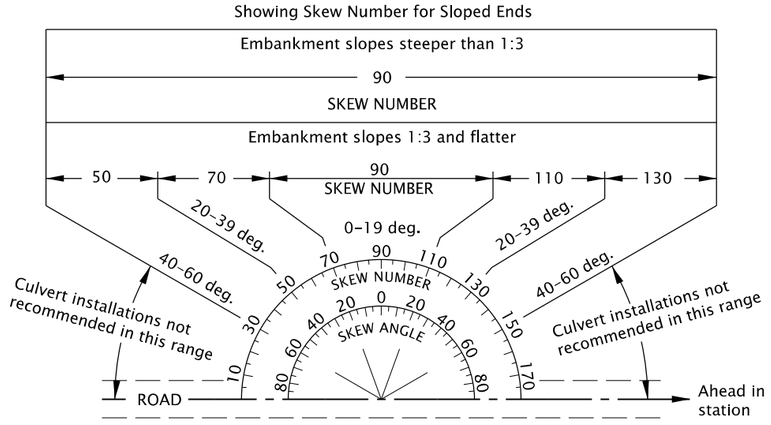
SLOPED ENDS FOR CONCRETE PIPE

2021

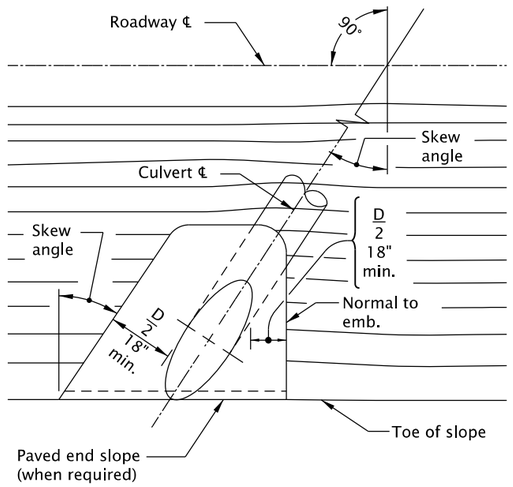
DATE	REVISION DESCRIPTION

rd318.dgn 20-JUL-2020

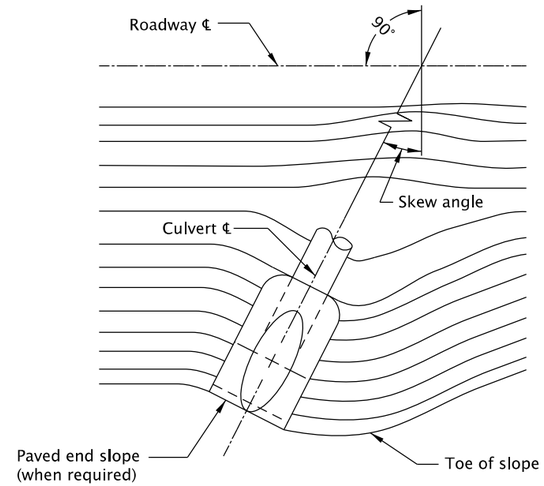
RD318



SKEW DIAGRAM



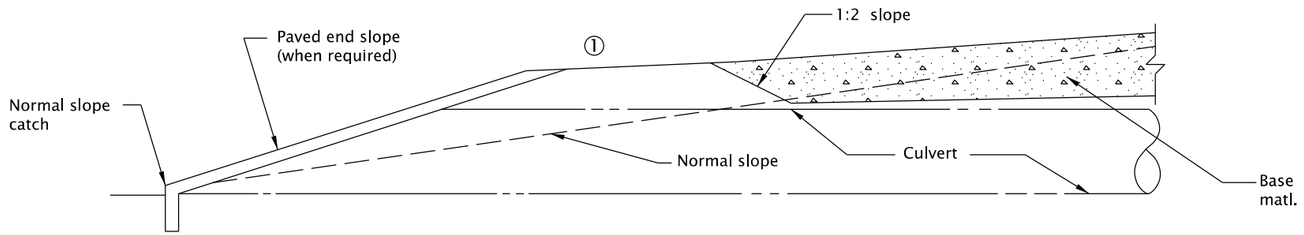
TYPICAL SKEW PLAN



(Where shown on plans)
Contour embankment slope to match paved end slope

ALTERNATE SKEW PLAN

① Modification when nature of installation would result in an adverse slope from subgrade to top of the paved end slope.



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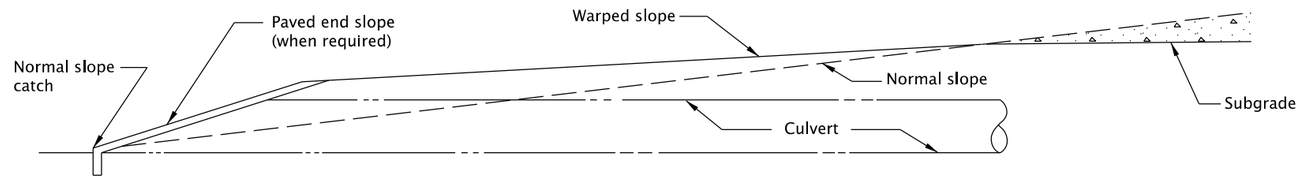

EMBANKMENT SLOPE WARPING DETAILS

(Warp 100' each side of culvert)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All embankment slopes to be warped where required to provide end projections as shown.
2. Open ends of pipes normally require a site specific design, and may require special treatment (Sloped ends, culvert embankment protection, paved end slopes, safety end sections, or other measures).
   See special details or Standard Drawings as called for on plans.
3. See Std. Dwg. RD317 for culvert embankment protection and riprap pads (When reqd.).

CALC. BOOK NO. N/A

SDR DATE 15-JAN-2016

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OREGON STANDARD DRAWINGS

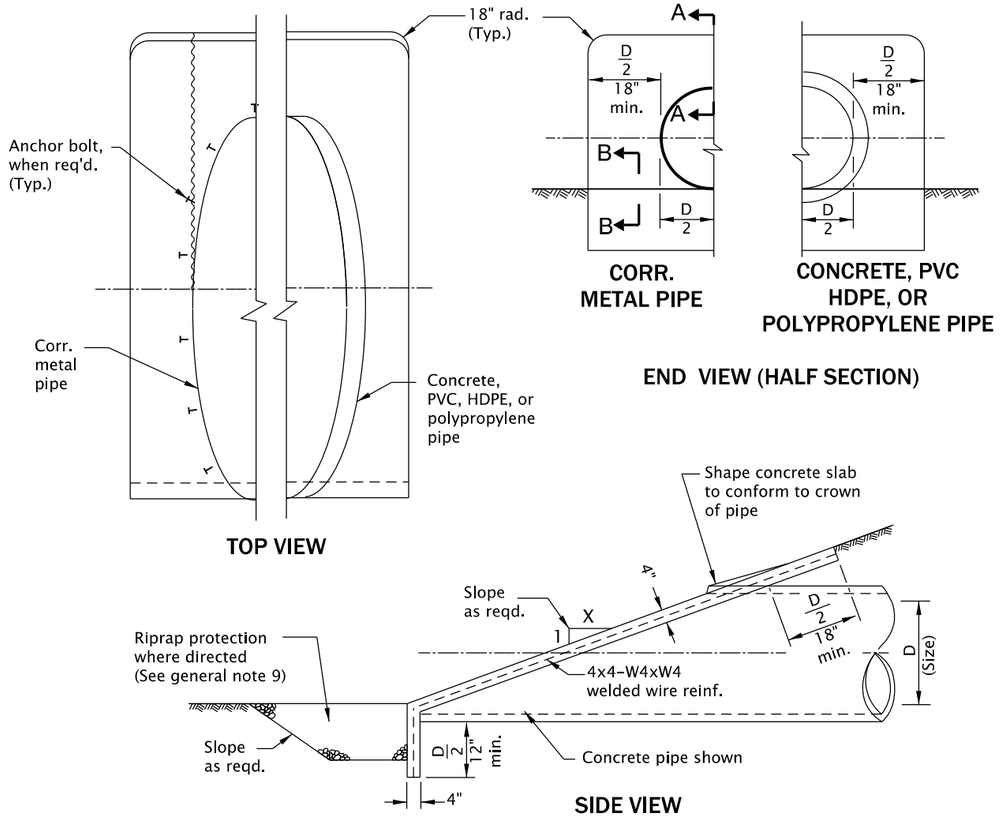
MISCELLANEOUS CULVERT DETAILS

2021

DATE	REVISION DESCRIPTION

RD300

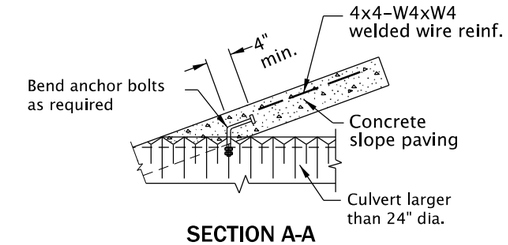
rd319.dgn 20-JUL-2020



CIRCULAR PIPE CULVERT

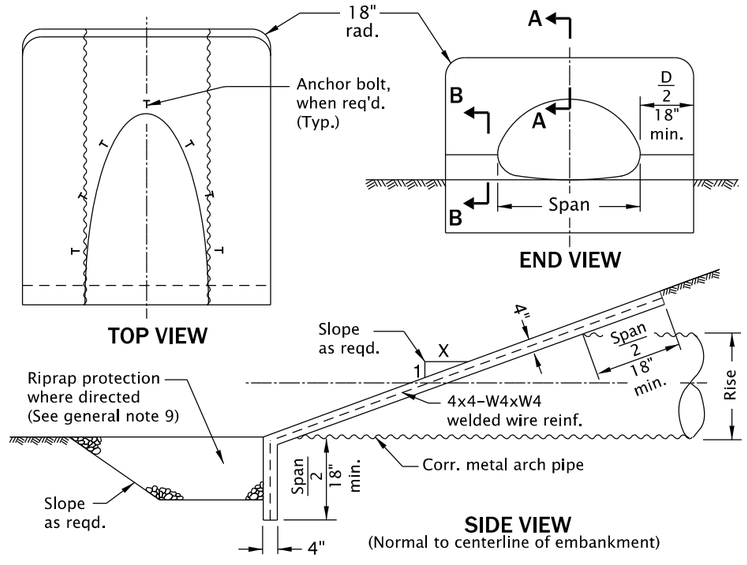
PAVED END SLOPE AREA TABLE						
Nominal Pipe Diameter (Inches)	PAVED END SLOPE AREA SQUARE FEET					
	1:3 SLOPE		1:4 SLOPE		1:6 SLOPE	
	Circular Pipe	Arch Pipe	Circular Pipe	Arch Pipe	Circular Pipe	Arch Pipe
12	23	--	26	--	32	--
15	26	23	32	27	41	34
18	30	26	35	30	44	38
21	33	30	39	35	51	45
24	37	33	44	39	57	51
30	47	39	55	46	72	61
36	56	53	67	63	88	83
42	76	67	90	80	119	107
48	98	90	117	108	155	144
54	124	114	148	137	196	184
60	164	137	197	165	264	221

(1) Areas for multiple installations are as shown on the plans.



ANCHOR BOLT DETAILS

Anchor bolts to be ASTM A307 galv., equally spaced at a max. of 18" centers around entire perimeter at end of pipes over 24" size. Not required for concrete pipe.



ARCH PIPE CULVERT

GENERAL NOTES FOR ALL DETAILS ONTHIS SHEET:

1. When rock is encountered, cut off wall depth $\frac{D}{2}$ or $\frac{span}{2}$ may be reduced to rock line but not less than 12".
2. When using pervious bedding and backfill, it is desirable to prevent seepage and piping by placing impervious material at the inlet. Cutoff collars may be used in lieu of impervious material.
3. For multiple pipe installations, see Std. Dwgs. RD300 & RD304.
4. All exposed conc. edges shall be chamfered ¾" unless noted otherwise. Slope paving surface variations shall not exceed ⅜" in 10' .
5. All metal reinforcement shall be placed 1½" clear of nearest face of concrete unless shown or noted otherwise.
6. All concrete shall be commercial grade concrete.
7. Open ends of pipes normally require a site specific design, and may require special treament (Slope ends, culvert embankment protection, paved end slopes, safety end sections, or other measures). See special details or Standard Drawings as called for on plans.
8. See Std. Dwg. RD321 for removable safety bars (When reqd.).
9. See Std. Dwg. RD317 for culvert embarkment protection and riprap pads (When reqd.).

CALC. BOOK NO. N/A

SDR DATE 15-JAN-2016

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

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OREGON STANDARD DRAWINGS

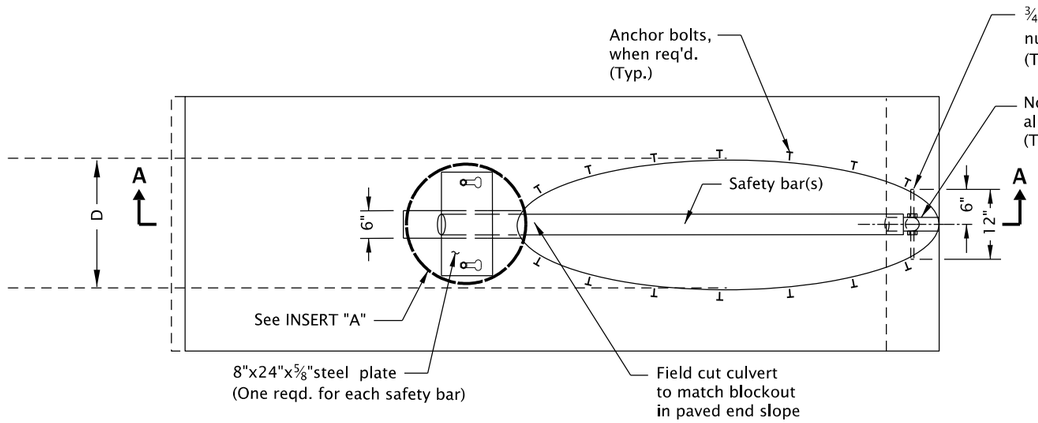
PAVED END SLOPE FOR CULVERTS 60" MAXIMUM PIPE SIZE

2021

DATE	REVISION DESCRIPTION

rd320.dgn 20-JUL-2020

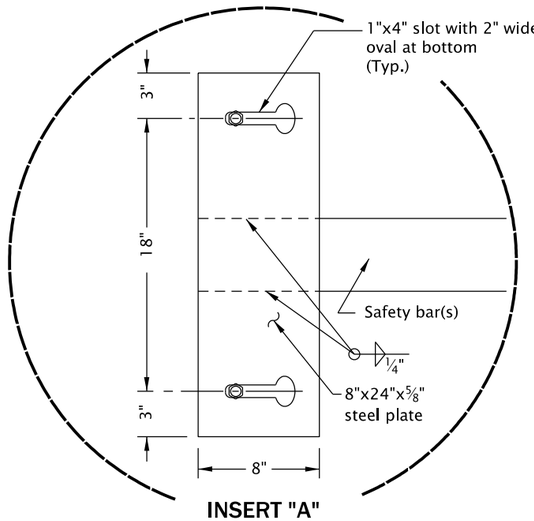
RD320



TOP VIEW

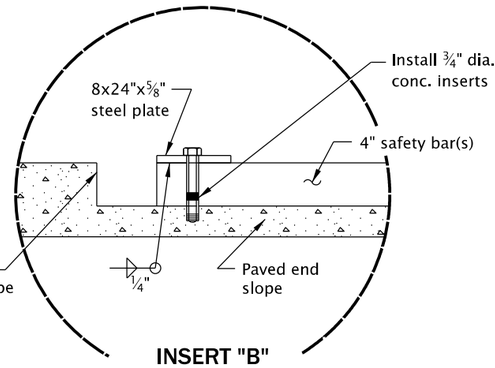
CULVERT DIAMETER (Inches)	REQUIRED NUMBER OF SAFETY BAR(S)
36 – 60 *	1
66 – 72	2

* Site specific design required for multiple safety bars

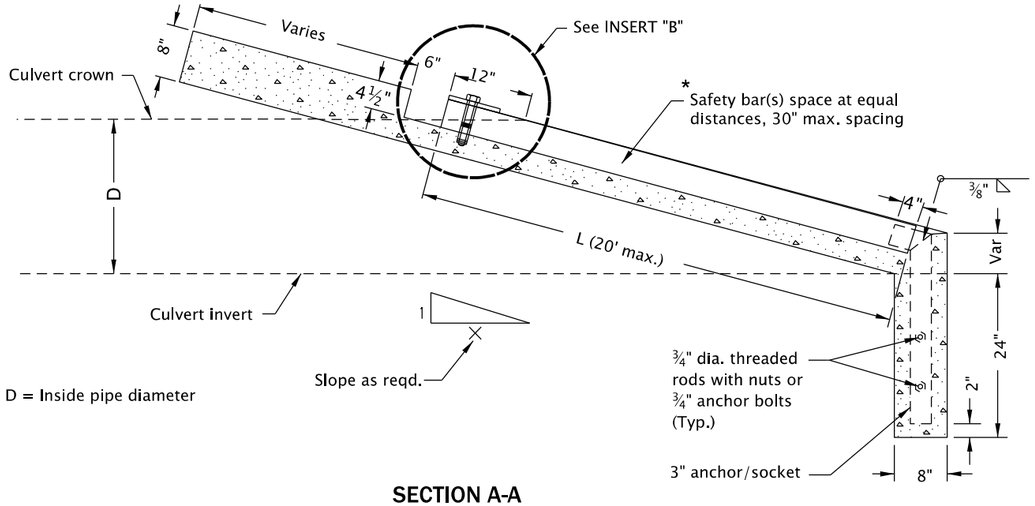


INSERT "A"

STEEL PLATE DETAIL

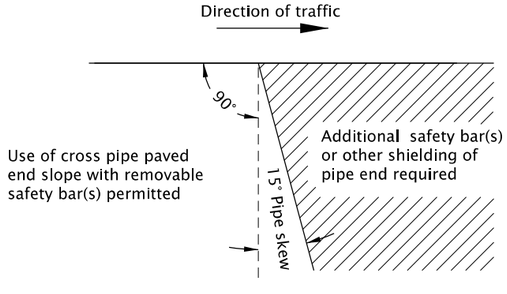


INSERT "B"



SECTION A-A

CROSS DRAINAGE STRUCTURE



LOCATION DIAGRAM

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. For details not shown see Std. Dwg. RD320.
2. Sockets are 3" extra strong (3.5" O.D.) steel pipe, sockets must be the proper angle to allow safety bar(s) to be easily removed.
3. Safety bar(s) are 4" extra strong (4.5" O.D.) steel pipe.
4. All structural steel including fasteners shall be hot-dip galvanized after fabrication.
5. Reinforcement shall be either 4x4W4xW4 welded wire reinforcement or #4 rebar spaced 18" center to center both directions. Center reinforcement in concrete section.
6. All concrete shall be commercial grade concrete.
7. Open ends of pipes normally require a site specific design, and may require special treament (Slope ends, culvert embankment protection, paved end slopes, safety end sections, or other measures).
   See special details or Standard Drawings as called for on plans.
8. See Std. Dwg. RD317 for culvert embankment protection and riprap pads (When reqd.).

CALC. BOOK NO. N/A

SDR 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

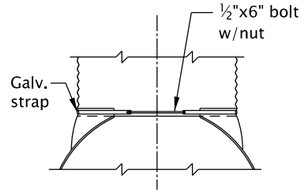
PAVED END SLOPE WITH REMOVABLE SAFETY BAR(S)

2021

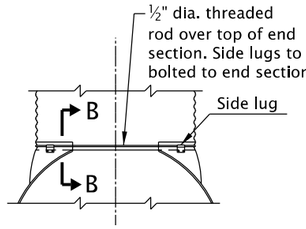
DATE	REVISION DESCRIPTION

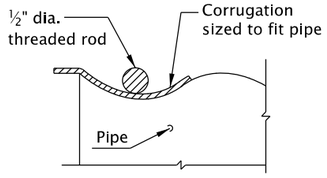
rd321.dgn 20-JUL-2020

RD321



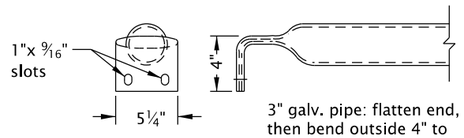
TYPE #1 CONNECTOR DETAIL





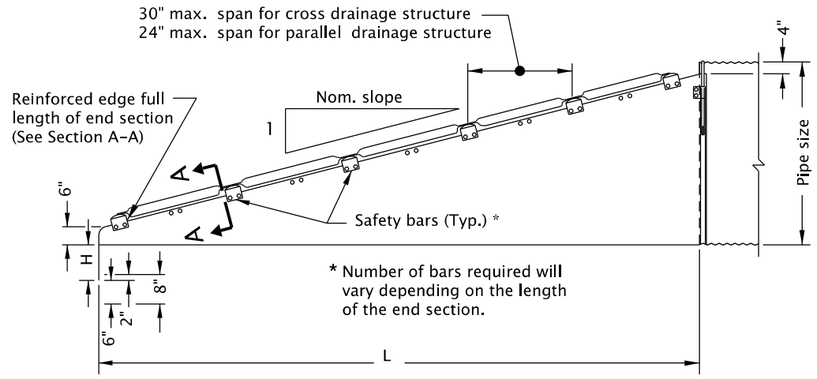
SECTION B-B

TYPE #2 CONNECTOR DETAILS

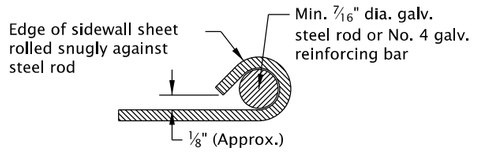


3" galv. pipe: flatten end, then bend outside 4" to match end section sides.

END TREATMENT OF SAFETY BARS DETAIL



SIDE VIEW



SECTION A-A

STEEL END SECTIONS FOR ROUND PIPE CULVERT

PIPE DIAMETER (In)	METAL THICK (MIN.) (In/Gage)	DIMENSIONS (Inches)					
		A	H	W	OVERALL WIDTH	L	
						Slope=4	Slope=6
18	0.064/16	8	6	24	40	32	47
24	0.064/16	8	6	30	46	55	83
30	0.109/12	12	9	36	60	79	118
36	0.109/12	12	9	42	66	102	154
42	0.109/12	16	12	48	80	126	189
48	0.109/12	16	12	54	86	150	224
54	0.109/12	16	12	60	92	173	260
60	0.109/12	16	12	66	98	197	295

*** See general note 5

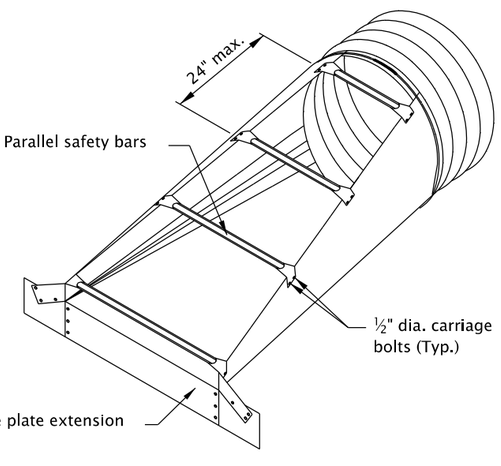
STEEL END SECTIONS FOR ARCH PIPE CULVERT

PIPE SIZE (Inches)			METAL THICK (MIN.) (In/Gage)	DIMENSIONS (Inches)					
EQUIVALENT ROUND DIAMETER	*** SPAN	*** RISE		A	H	W	OVERALL WIDTH	L	
								Slope=4	Slope=6
18	21	15	0.064/16	8	6	27	43	20	30
24	28	20	0.064/16	8	6	33	49	40	60
30	35	24	0.109/12	12	9	40	64	55	83
36	41	29	0.109/12	12	9	47	71	75	112
42	48	32	0.109/12	16	12	54	86	90	136
48	56	37	0.109/12	16	12	62	94	110	165
54**	63	42	0.109/12	16	12	69	101	130	195
60**	70	46	0.109/12	16	12	76	107	146	218
72**	82	56	0.109/12	16	12	88	120	185	278

** Requires 2 cross drainage bars.

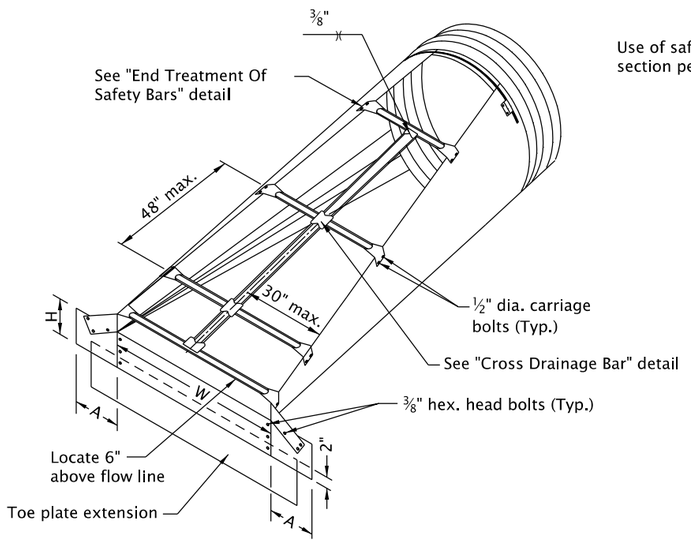
GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. For round pipes with diameters 24" or less use type #1 connector. All arch pipes equivalent round diameter, and round pipes over 24" diameter use Type #2 connector.
2. Toe plate extensions are to be the same min. thkn. as end section. Dimensions shall be overall width less 6" by 8" high.
3. Cross drainage and safety bars shall be 3" dia. Schedule 40 galv. steel pipe.
4. Slotted holes for safety bar attachment shall be provided for all end sections.
5. Cross-sectional dimensions of attaching pipe may vary with different materials.
6. Open ends of pipes normally require a site specific design, and may require special treament (Slope ends, culvert embankment protection, paved end slopes, safety end sections, or other measures). See special details or Standard Drawings as called for on plans.
7. See Std. Dwg. RD317 for culvert embankment protection and riprap pads (When reqd.).



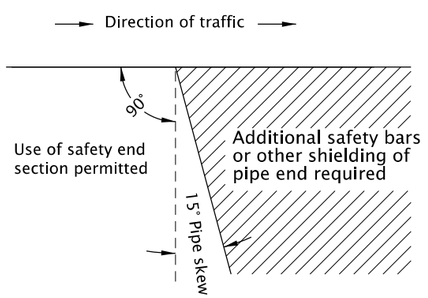
PARALLEL DRAINAGE STRUCTURE

Use with single pipe installations 30" dia. or larger
Use with multiple pipe installations 15" dia. or larger

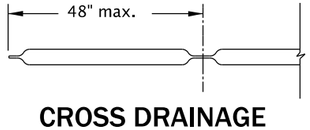


CROSS DRAINAGE STRUCTURE

Use with pipe installations 36" dia. and larger



LOCATION DIAGRAM



CROSS DRAINAGE BAR DETAIL

CALC. BOOK NO. N/A

SDR 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

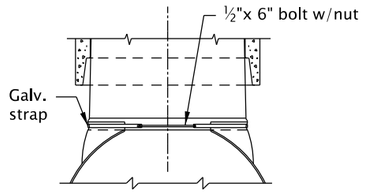
SAFETY END SECTION FOR METAL PIPE

2021

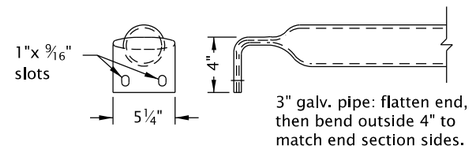
DATE	REVISION DESCRIPTION

RD322

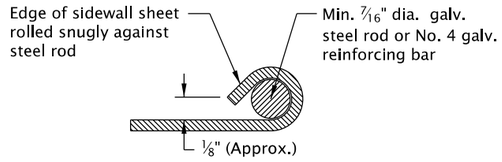
20-JUL-2020 rd322.dgn



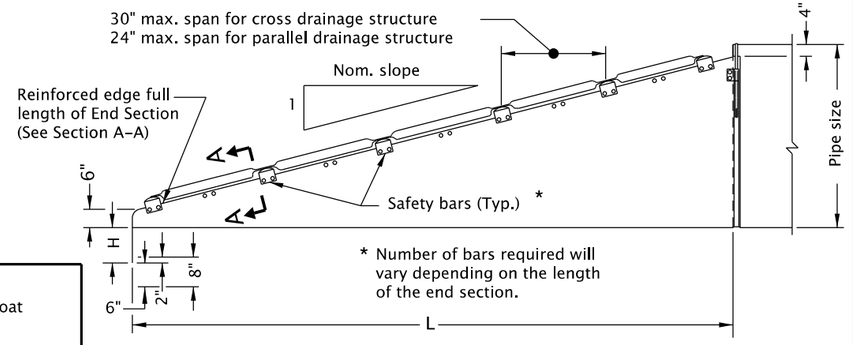
TYPE #1 CONNECTOR DETAIL



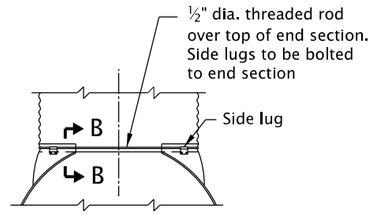
END TREATMENT OF SAFETY BARS DETAIL



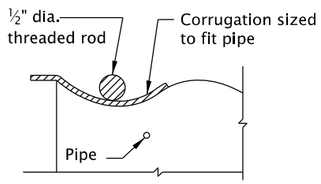
SECTION A-A



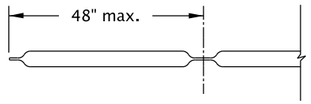
SIDE VIEW



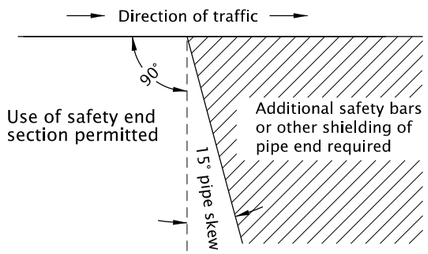
TYPE #2 CONNECTOR DETAILS



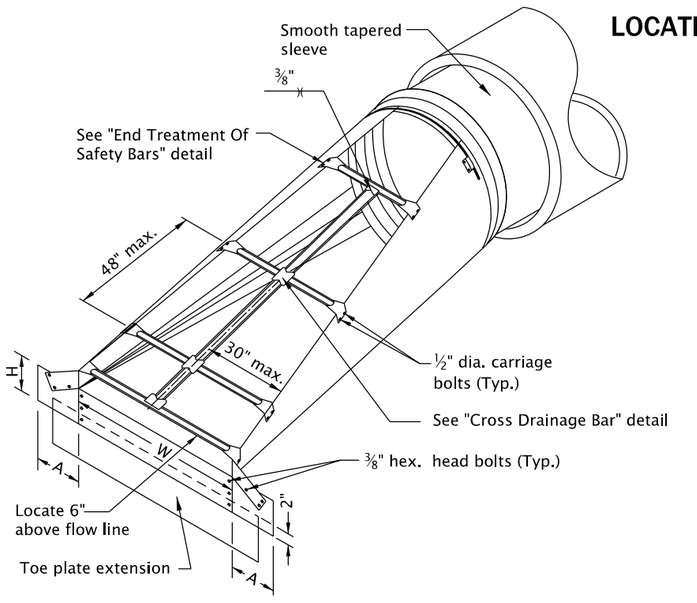
SECTION B-B



CROSS DRAINAGE BAR DETAIL

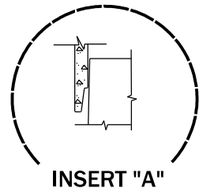


LOCATION DIAGRAM



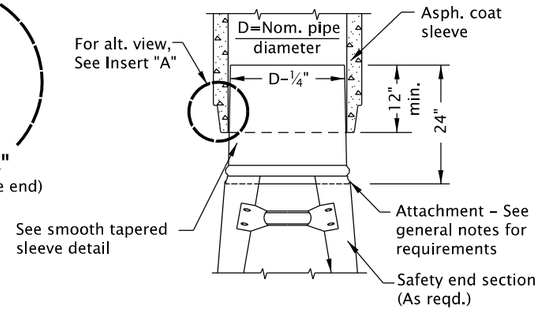
CROSS DRAINAGE STRUCTURE

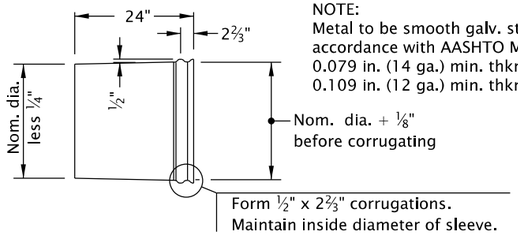
Use with pipe installations 36" dia. and larger



INSERT "A"

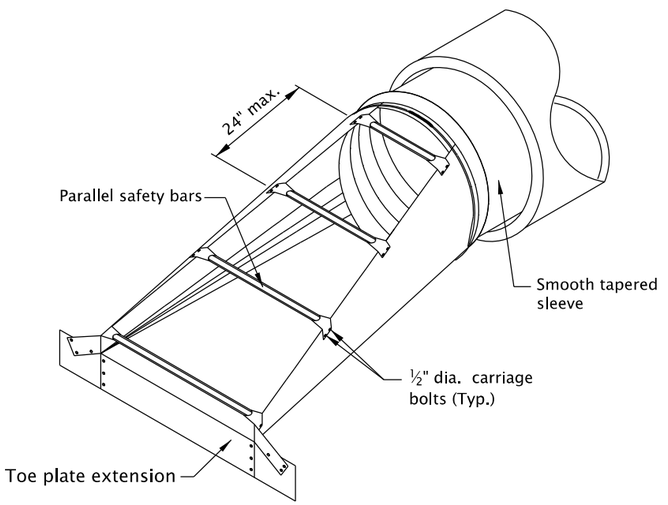
(Alt. view for female end)





NOTE:
Metal to be smooth galv. steel in accordance with AASHTO M218
0.079 in. (14 ga.) min. thkn. up to 18" dia.
0.109 in. (12 ga.) min. thkn. over 18" dia.

SMOOTH TAPERED SLEEVE FOR ATTACHING SAFETY END SECTIONS TO SMOOTH PIPE



PARALLEL DRAINAGE STRUCTURE

Use with single pipe installations 30" dia. or larger
Use with multiple pipe installations 15" dia. or larger

STEEL END SECTIONS FOR ROUND PIPE CULVERT

PIPE SIZE DIAMETER (Inches)	METAL THICK (MINIMUM) (In./ga.)	DIMENSIONS IN INCHES					
		A	H	W	OVERALL WIDTH	L	
						Slope=4	Slope=6
18	0.064/16	8	6	24	40	32	47
24	0.064/16	8	6	30	46	55	83
30	0.109/12	12	9	36	60	79	118
36	0.109/12	12	9	42	66	102	154
42	0.109/12	16	12	48	80	126	189
48	0.109/12	16	12	54	86	150	224
54	0.109/12	16	12	60	92	173	260
60	0.109/12	16	12	66	98	197	295

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. For round pipes with diameters 24" or less use Type # 1 connector. All arch pipes equivalent round diameter and round pipes over 24" diameter use Type # 2 connector.
2. Toe plate extensions are to be the same min. thkn. as end section. Dimensions shall be overall width less 6" by 8" high.
3. Cross drainage and safety bars shall be 3" dia. Schedule 40 galv. steel pipe.
4. Slotted holes for safety bar attachment shall be provided for all end sections.
5. Open ends of pipes normally require a site specific design, and may require special treament (Slope ends, culvert embankment protection, paved end slopes, safety end sections, or other measures). See special details or Standard Drawings as called for on plans.
6. See Std. Dwg. RD317 for culvert embankment protection and riprap pads (When reqd.).

CALC. BOOK NO. N/A

SDR DATE 16-JAN-2019

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

SAFETY END SECTION FOR CONCRETE, PVC, HDPE & POLYPROPYLENE PIPE

2021

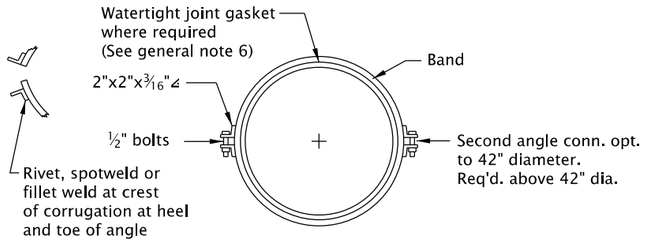
DATE	REVISION DESCRIPTION

rd324.dgn 20-JUL-2020

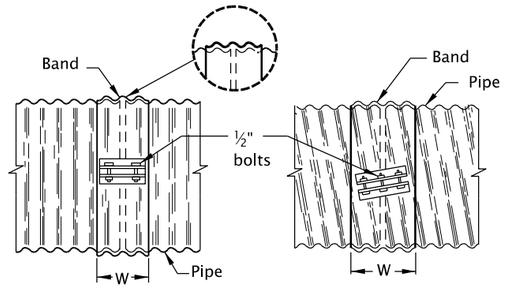
RD324

Effective Date: June 1, 2022 - November 30, 2022

2⅔"x½" Corrugations				3"x1" Corrugations			
Pipe Dia. (In)	W (In)		# Of ½" Bolts	Pipe Dia. (In)	W (in)		# Of ½" Bolts
	Ann.	Hel.			Ann.	Hel.	
6-10	7	7	2	36-84	14	14	3
12-15	7	12	2-3	36-120 ⑤	26	26	5
18-84 ⑤	12	12	3				
24-84	24	24	5				

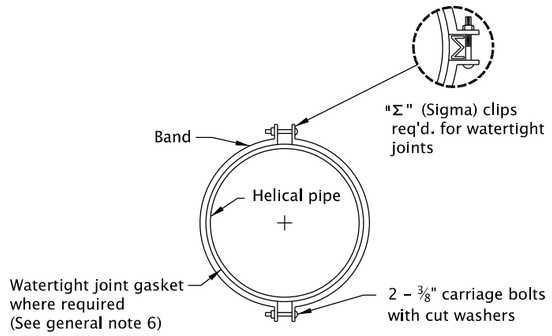


CONNECTION ANGLE DETAIL

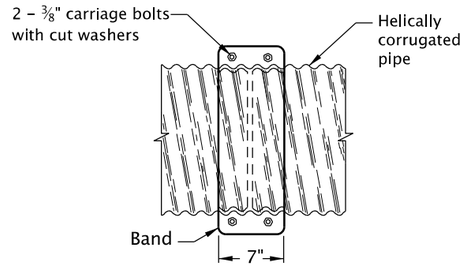


ANNULAR COUPLING **HELICAL COUPLING**

TYPE A



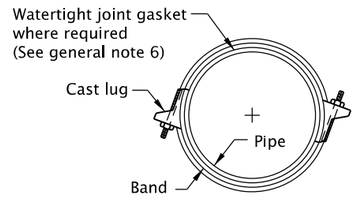
END VIEW



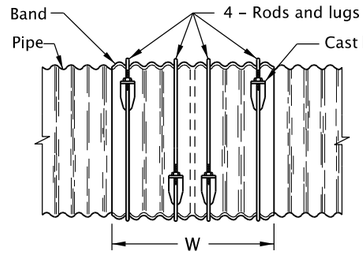
TOP VIEW

TYPE B
(For 6"-10" dia. pipes)

Corrugations	Pipe Dia. (In)	Rod Dia. (In)	Narrow Band W (in)	Narrow Band # Of Rods	Wide Band W (in)	Wide Band # Of Rods
2⅔"x½"	12-21	⅜	12	2		
	24-54 ⑤	½	12	2	24	4
	60-84 ⑤	⅝	12	2	24	4
3"x1"	36-54 ⑤	½	14	2	26	4
	60-84 ⑤	⅝	14	2	26	4
	84-120	⅝			26	4

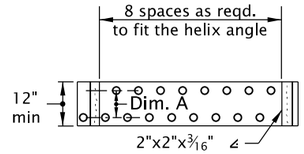


END VIEW

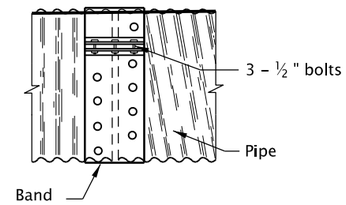


TYPE D

COUPLING BAND DIMPLE DETAIL



Dimension A: 7" min. between dimples as reqd. to fit the helix angle.



TYPE E
(For 12"-30" dia. pipes)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All steel coupling bands and connection hardware shall be galvanized or aluminum coated.
2. Coupling bands for corrugated iron and steel pipes may be two numerical thkn. lighter than that used for the pipe but not more than 0.109" nom. thkn. nor less than 0.052" nom. thkn. Coupling bands for corrugated aluminum pipe shall be of the same thickness as that used for the pipe.
3. Type F coupling bands shown for pipes 15" to 72" in diameter are typical to arch pipes of equal peripheral measurement.
4. Gaskets for the Type F coupling band shall be "O" rings conforming to ASTM C443 and a mastic sealant strip ⅛"x1½"wide by 5" (10½" band) or 8" (13⅛" band) or 9" (14¾" band) shall be placed in lap between bands. "O" ring gaskets shall be 13/16" min. dia. (10½" and 13⅛" bands) and 1⅜" min. dia. (14⅜" bands).
5. Under conditions where concrete pipe may be used as an acceptable alternate, the minimum width coupling band indicated for the band type, corrugation and pipe diameter shown may be used.
6. Watertight joints with gaskets are required for irrigation pipes, storm sewers, and other installations when shown on the plans. Gaskets for all coupling bands shall be (butt-cemented or vulcanized) synthetic, closed-cell sponge rubber ⅜" thick of a width equal to the band width and centering on the joint. For pipes 12" or less in diameter, the gasket thickness may be 3/16".
7. Joints for sanitary sewers and siphons are to be tested for water tightness in accordance with the Standard Specifications.
8. One or two piece coupling bands are optional for pipe diameters up to and including 42". Coupling bands of two or more pieces are required for pipe diameters over 42".
9. To prevent galvanic action when unlike metals are connected, the connecting band shall be used with a full width neoprene gasket or coated with asphalt or other insulating material as approved by the engineer.
10. See Std. Dwgs. RD330 & RD332 for pipe slope anchors, when required.

CALC. BOOK NO. N/A

SDR DATE 21-JUL-2015

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

COUPLING BANDS FOR CORRUGATED METAL PIPE

2021

DATE	REVISION DESCRIPTION

rd325.dgn 20-JUL-2020

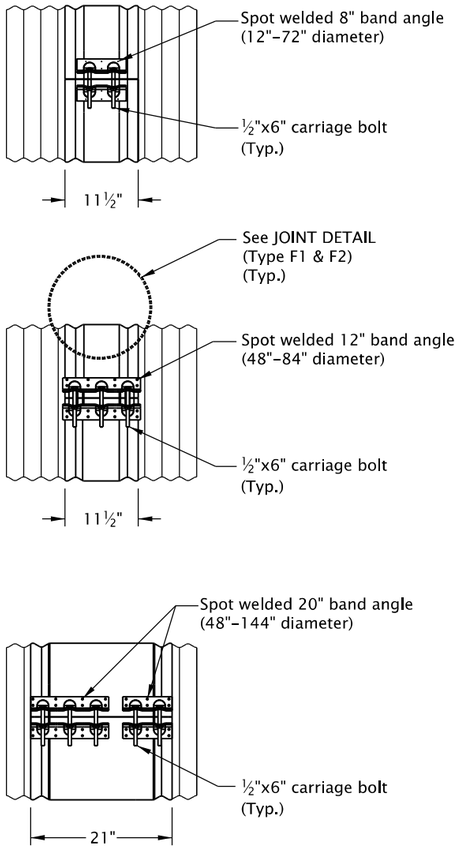
RD300

Effective Date: June 1, 2022 - November 30, 2022

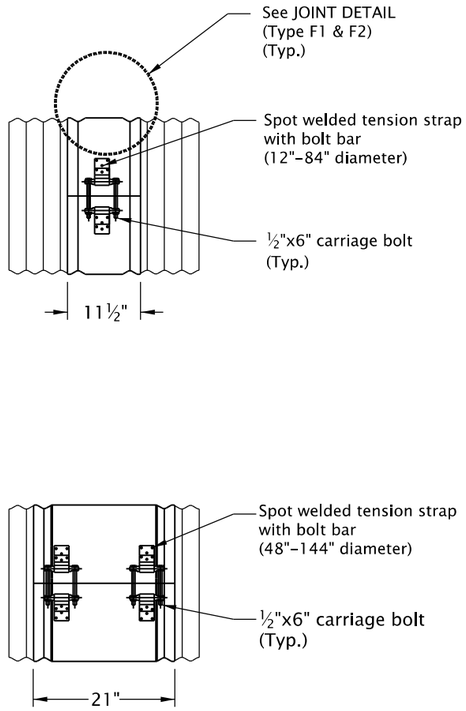
RD325

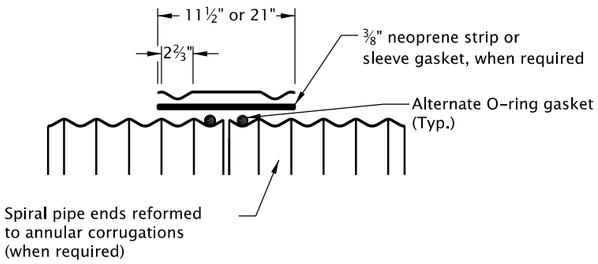
rd326.dgn 20-JUL-2020

TYPE F-1



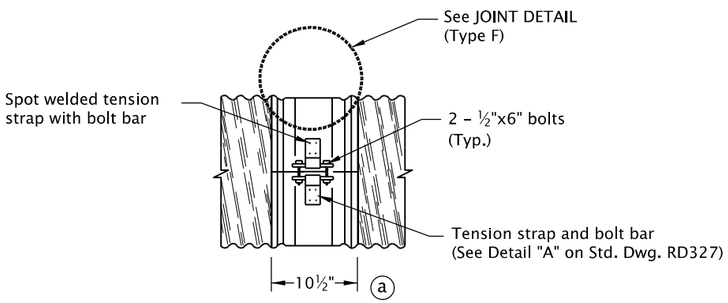
TYPE F-2





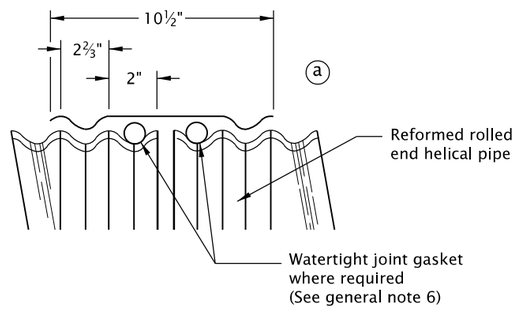
JOINT DETAIL (TYPE F1 & F2)

TYPE F



(a) For annular pipe with 2⅔"x½" corrugations width is 13⅛", with 3"x1" corrugations width is 14¾"

(a) For annular pipe with 2⅔"x½" corrugations width is 13⅛", with 3"x1" corrugations width is 14¾"



JOINT DETAIL (TYPE F)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. See Std. Dwg. RD325 for general notes, and details not shown.

CALC. BOOK NO. N/A

SDR DATE 12-JAN-2015

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

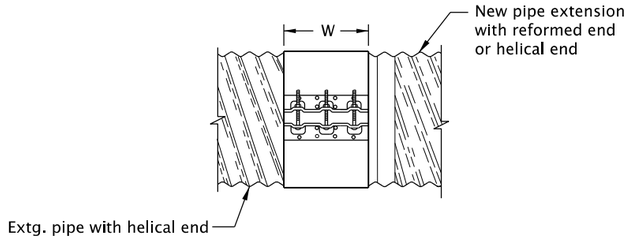
COUPLING BANDS FOR CORRUGATED METAL PIPE

2021

DATE	REVISION DESCRIPTION

RD326

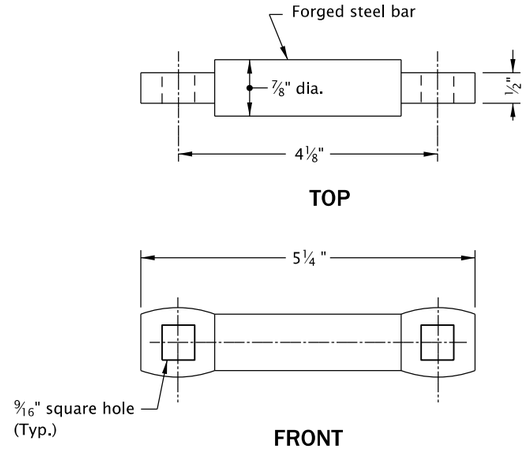
Effective Date: June 1, 2022 - November 30, 2022



TYPE K
FLAT BAND OR DIMPLE BAND

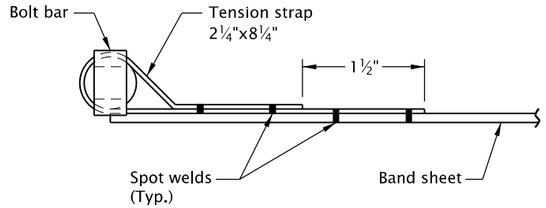
*** ARCH PIPE ONLY**

Band Type	Corrugations	Pipe Dia. (In)	Min. W (In)	Gasket Type
Steel	2⅔"x½ "	12-48	12	Sleeve
		54-84	24	
	* 3"x1" 5"x1"	54-144	24	
Aluminum	2⅔"x½ "	12-48	12	Sleeve
		54-84	24	
	* 3"x1" 5"x1"	54-96	24	



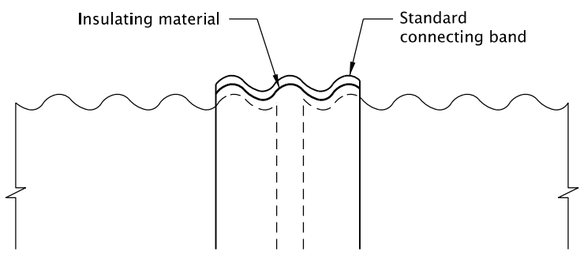
BOLT BAR

NOTE:
Design variations in fasteners (Straps, bars, & welds) which provide a tensile strength of 7500 lbs are permissible.



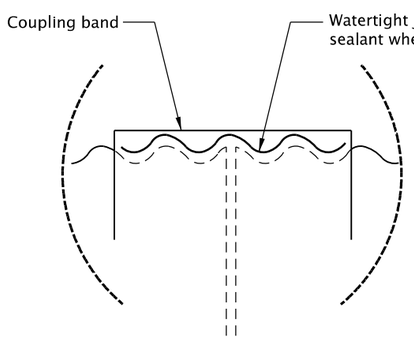
DETAIL "A"
TENSION STRAP

NOTE:
Design variations in fasteners (Straps, bars, & welds) which provide a tensile strength of 7500 lbs are permissible.



CONNECTION DETAILS

Extending existing pipe culvert
with pipe of unlike material
Type varies
(See general note 9 on Std. Dwg. RD325)



WATERTIGHT JOINT

Type varies
(See general note 6 on Std. Dwg. RD325)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. See Std. Dwg. RD325 for general notes, and details not shown.

CALC. BOOK NO. N/A

SDR DATE 12-JAN-2015

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

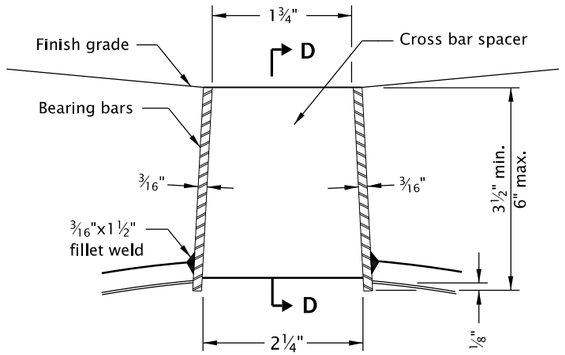
COUPLING BANDS FOR CORRUGATED METAL PIPE

2021

DATE	REVISION DESCRIPTION

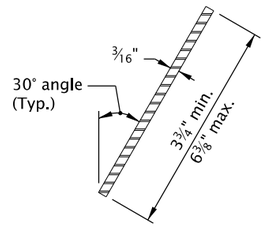
rd327.dgn 20-JUL-2020

RD327



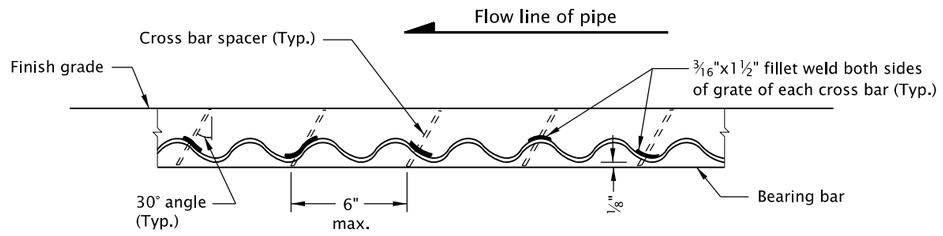
SECTION C-C

GRATE SLOT



SECTION D-D

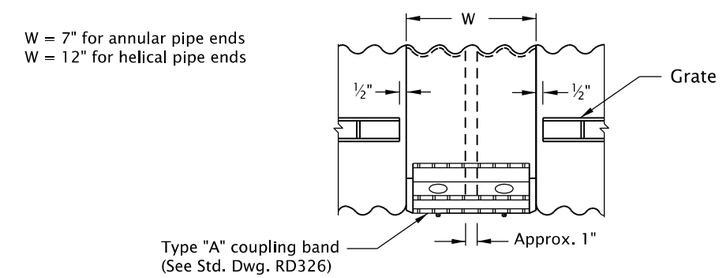
CROSS BAR SPACER



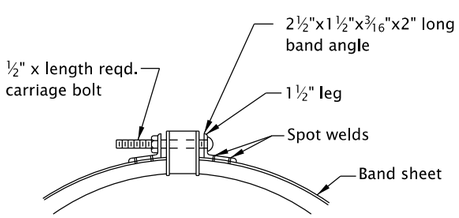
SIDE VIEW

(Normal to centerline of drain)

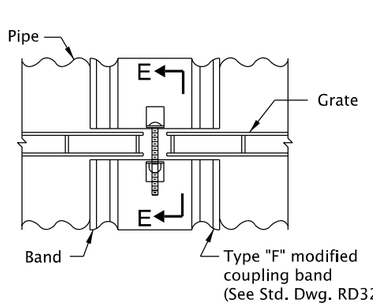
GRATE SLOT WELDING DETAIL



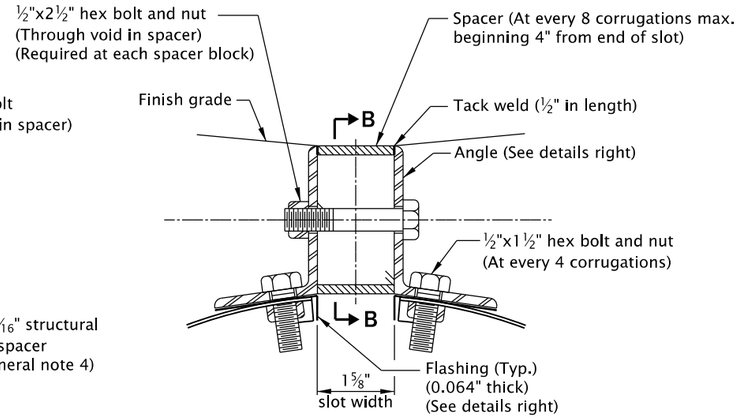
COUPLING BAND



SECTION E-E



ALTERNATE COUPLING BAND

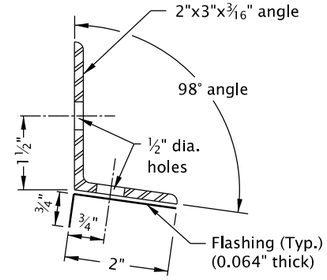


SECTION B-B

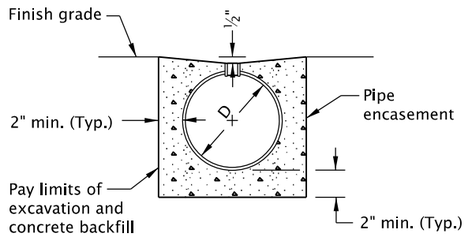
SPACER

SECTION A-A

ANGLE SLOT

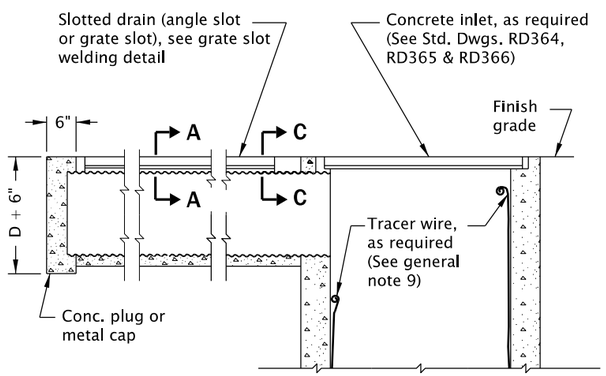


ANGLE DETAIL



END VIEW

CONCRETE ENCASEMENT



SIDE VIEW

INSTALLATION DETAIL

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Drain pipe seams may be continuous helical lock seam or helical weld seam.
2. Drain sections shall be assembled with either of the coupling bands shown.
3. Units of slotted CMP drains shall be fabricated and all nuts and bolts tightened prior to beginning field installation.
4. Structural tubing to be 5.5 lb/ft or heavier. Structural tubing shall conform to ASTM A501.
5. The cross bar spacer shall be welded to the bearing bars in such a manner as to develop a minimum tensile capacity of 12000 lbs normal to the longitudinal axis of the bearing bars.
6. The maximum variance from a straight line between the extreme top corners of the bearing bars shall be ½" in 20'.
7. Grate slot assemblies shall conform to the provisions of ASTM A36 and shall be galvanized after fabrication per ASTM A123. Corrugated pipe shall conform to AASHTO M36.
8. Concrete used in encasement shall be commercial grade concrete.
9. See Std. Dwg. RD336 for tracer wire details.
10. See ODOT's QPL for alternates.

CALC. BOOK NO. N/A

SDR DATE 21-JUN-2019

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

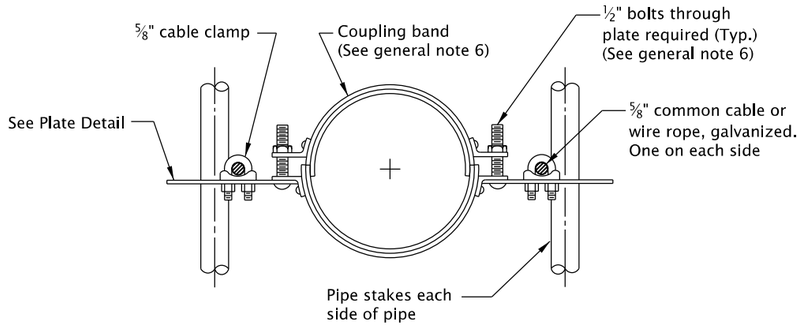
SLOTTED CMP DRAIN DETAILS

2021

DATE	REVISION DESCRIPTION

rd328.dgn 20-JUL-2020

RD328



ANCHOR ASSEMBLY ALTERNATE "A"

Cables and cable clamps to be used when specified.

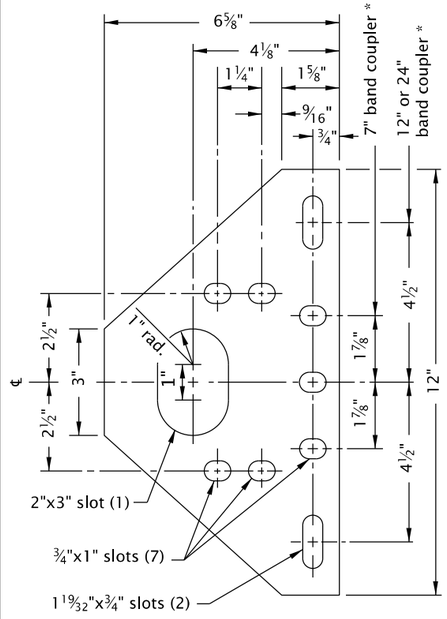


PLATE DETAIL 1A

* Length of band coupler measured parallel to the centerline of the pipe.

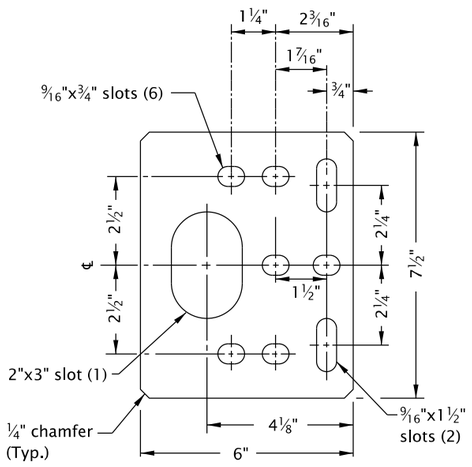
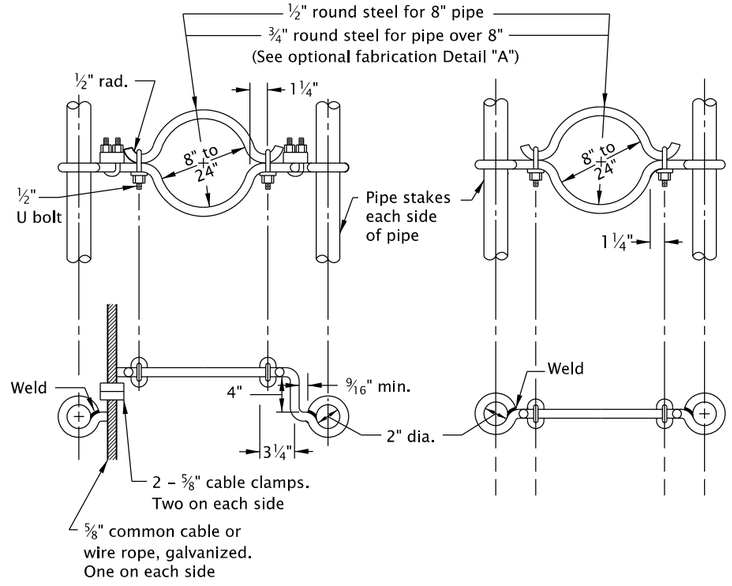


PLATE DETAIL 1B

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

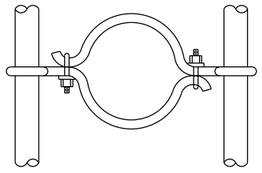
1. All pipe stakes and hardware to be hot-dip galvanized after fabrication.
2. Either Alternate "A" or Alternate "B" anchor assembly may be used at contractor's option for annularly corrugated pipe. Alternate "A" to be used with helically corrugated pipe.
3. Either Type 1 or Type 2 pipe stakes may be used with either anchor assembly alternate at the contractor's option. Pipe stakes to extend 6" above plate.
4. Place slope anchor assemblies on 20' max. centers on slopes 20% or greater.
5. Plate material to be ASTM A36 ¼". Hot-dip galvanize after fabrication.
6. Use 2 piece coupling bands with ½" bolts through plate with Anchor Assembly Alternate "A". See Std. Dwgs. RD326 and RD327.



WITH CABLE WITHOUT CABLE

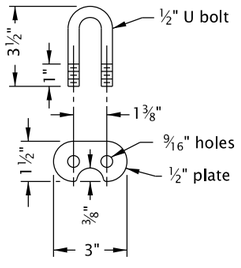
ANCHOR ASSEMBLY ALTERNATE "B"

(Cables and cable clamps to be used when specified.)

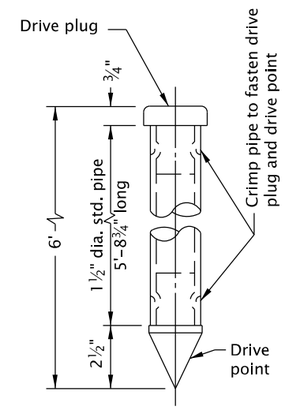


DETAIL "A"

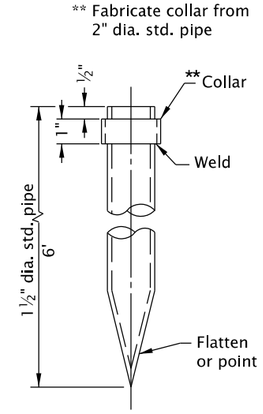
(Optional fabrication for identical upper and lower pipe clamp parts.)



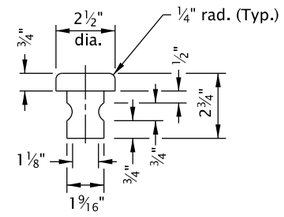
U BOLT



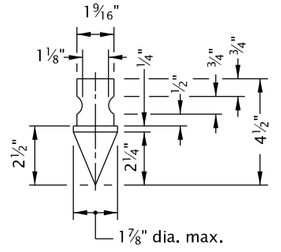
TYPE II



TYPE I



DRIVE PLUG (CAST IRON)



DRIVE POINT (CAST IRON)

PIPE STAKES

(See general note 3)

CALC. BOOK NO. N/A

SDR DATE 07-JAN-2013

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

PIPE SLOPE ANCHORS - METAL

2021

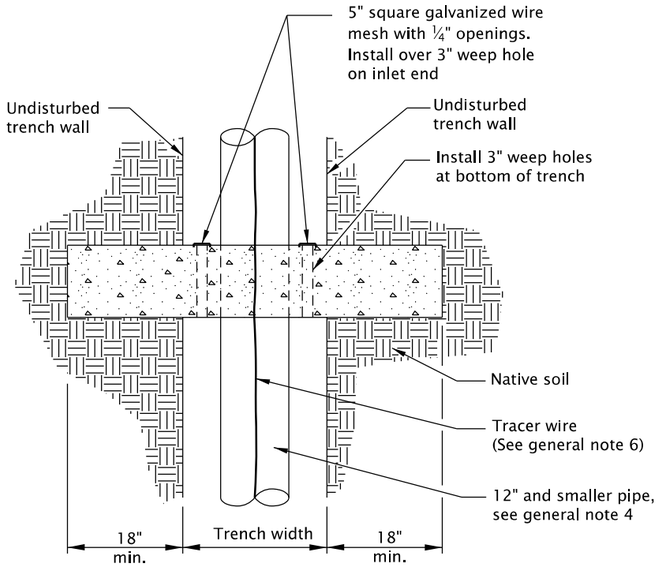
DATE	REVISION DESCRIPTION

rd330.dgn 20-JUL-2020

RD330

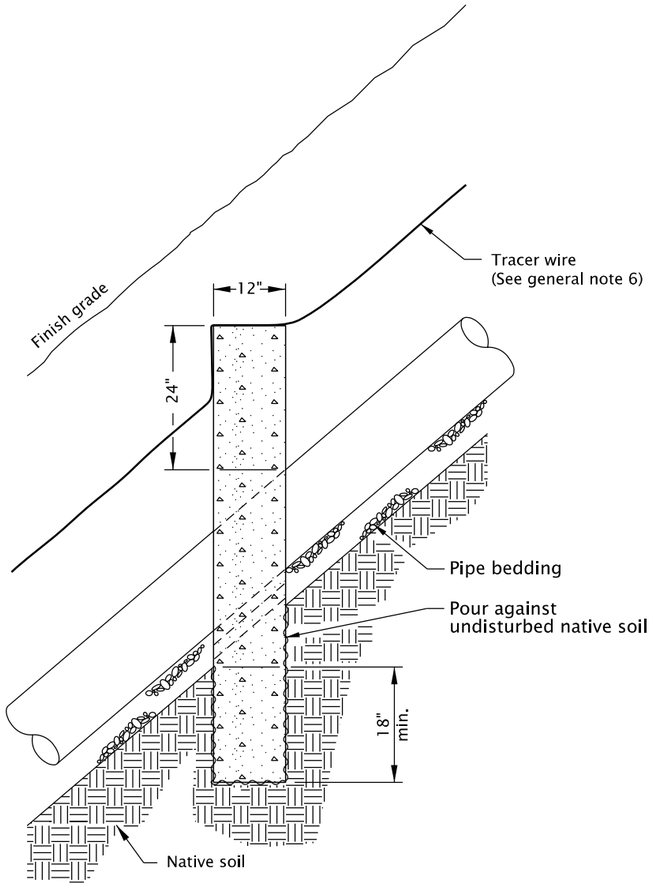
Effective Date: June 1, 2022 - November 30, 2022

rd332.dgn 20-JUL-2020



PLAN

Metal pipe requires polymeric coating when using slope anchors made with concrete.



ELEVATION

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Concrete pipe anchors shall be constructed using forms when sewers, storm drains and other pipelines are constructed with slopes 20% or greater. Remove forms prior to backfilling trench.
2. All concrete shall be commercial grade concrete.
3. Center to center max. spacing of concrete pipe anchors shall be:

SLOPE	SPACING (on slope)
20-34%	35'
35-50%	25'
50+ %	15' or concrete encasement

4. Dimensions for embedment for pipes larger than 12" shall be approved by the engineer.
5. See Std. Dwgs. RD300 & RD304 for pipe installation details.
6. See Std. Dwg. RD336 for tracer wire details (When required).

CALC. BOOK NO. N/A

SDR DATE 12-JAN-2015

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.

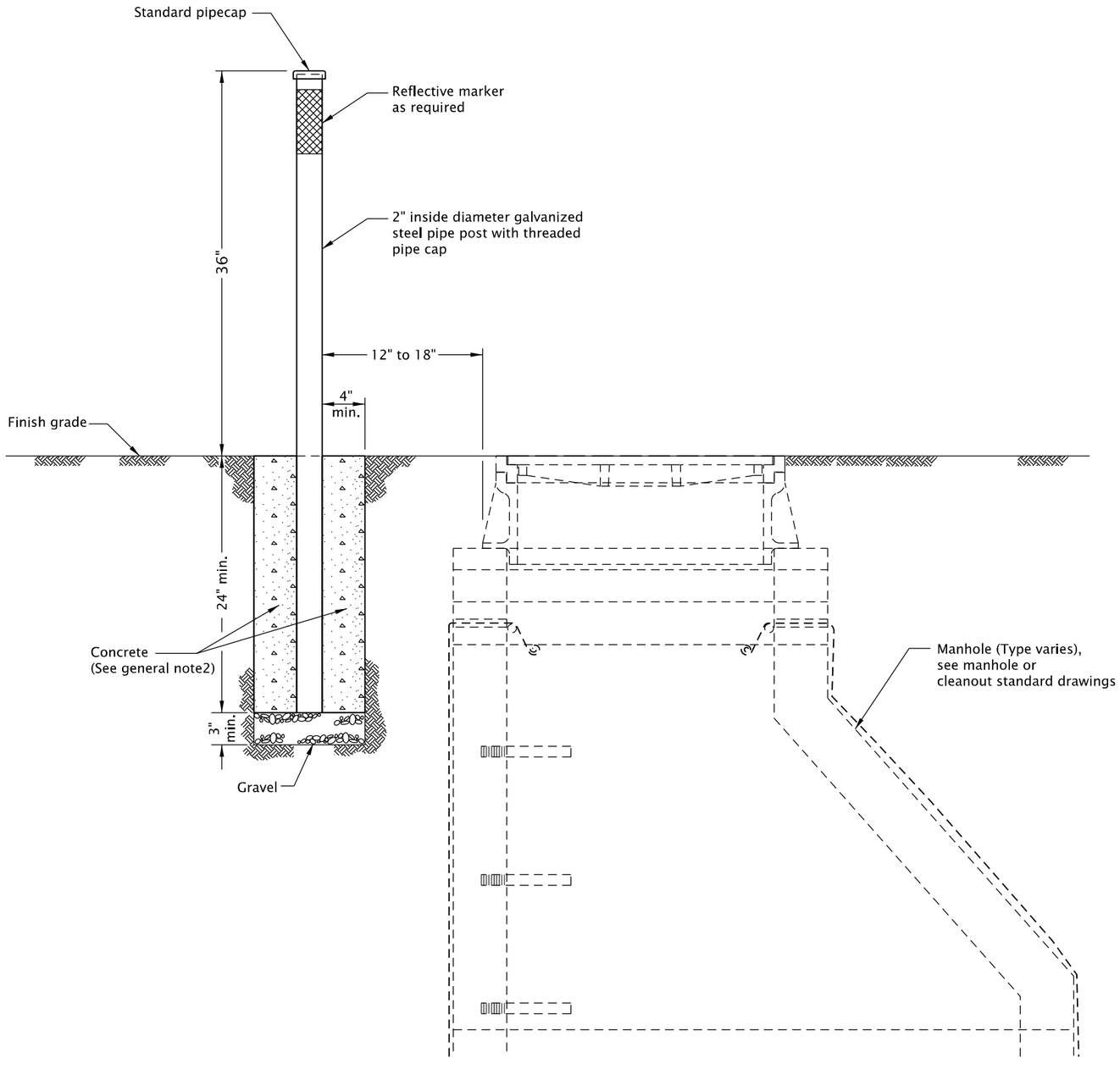
OREGON STANDARD DRAWINGS

PIPE SLOPE ANCHORS - CONCRETE

2021

DATE	REVISION DESCRIPTION

RD332



LOCATOR POST AT MANHOLE OR CLEANOUT

AMERICAN PUBLIC WORKS ASSOCIATION UNIFORM COLOR CODE	
RED	Electric power lines, cables or conduits, and lighting cables.
YELLOW	Gas, oil, steam, petroleum or other hazardous liquid or gaseous materials.
ORANGE	Communications, cable TV, alarm or signal lines, cables, or conduits.
BLUE	Water, irrigation, and slurry lines.
GREEN	Sewers, storm sewer facilities, or other drain lines.
WHITE	Proposed excavation
PINK	Temporary survey markings.
PURPLE	Reclaimed water, irrigation and slurry lines.

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. As directed the locator post shall be located on the straight side of manhole cone.
2. Posts shall be set in commercial grade concrete.
3. As an alternative, a 4" concrete filled PVC pipe locator post may be used, if approved.
4. As an alternative, a flexible, durable, plastic marker may be used, if approved.
5. Posts shall be painted color as directed.

CALC. BOOK NO. N/A

SDR DATE 16-JUL-2018

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

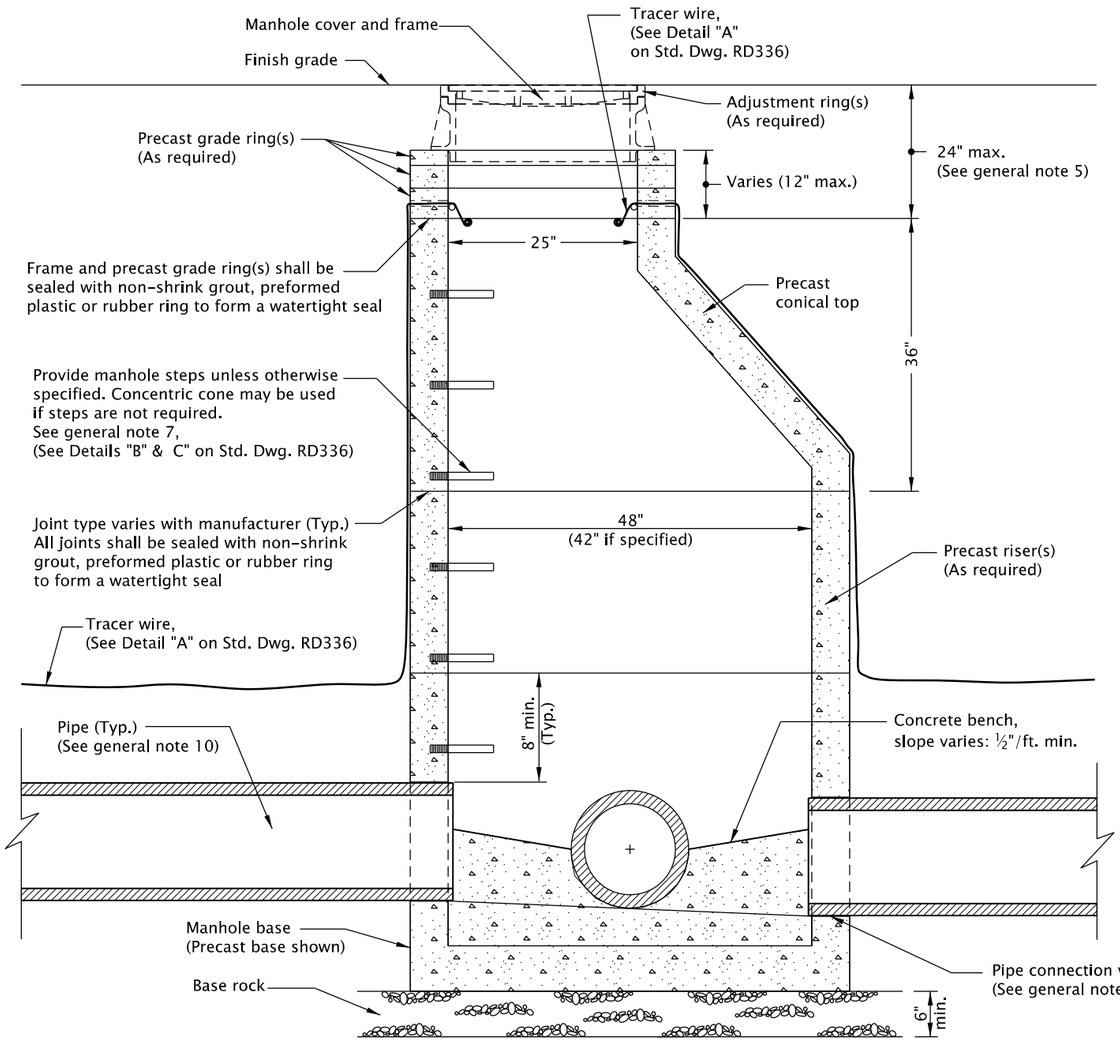
LOCATOR POST

2021

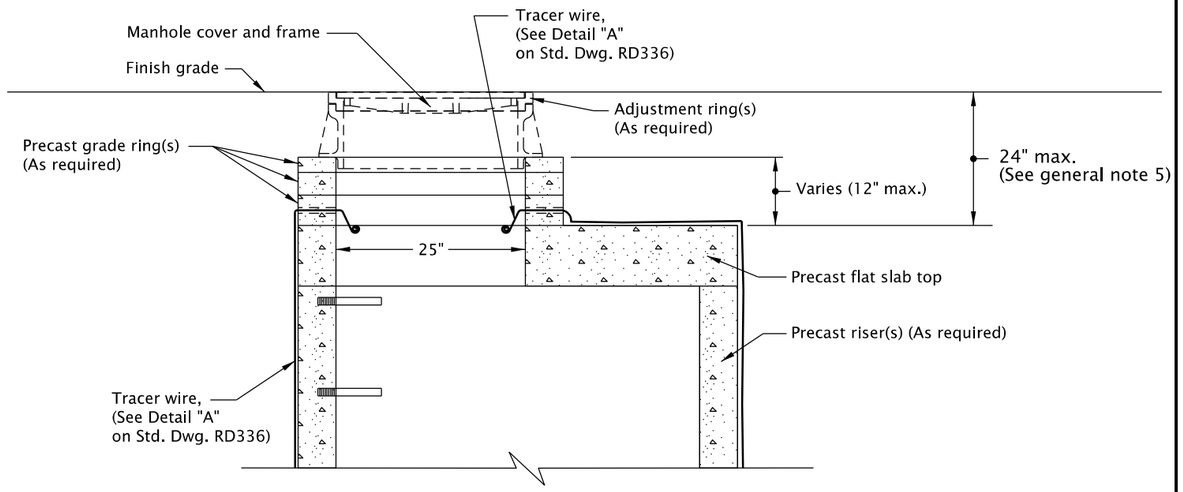
DATE	REVISION DESCRIPTION

rd334.dgn 20-JUL-2020

RD334



MANHOLE WITH PRECAST CONICAL TOP



MANHOLE WITH PRECAST FLAT SLAB TOP

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All precast products shall conform to requirements of ASTM C478.
2. Standard precast manhole section diameter shall be 48". Use 42" if specified by the Engineer.
3. See Std. Dwg. RD345 for pipe to manhole connections.
4. See Std. Dwg. RD344 for manhole base section.
5. Adjust 24" maximum.
6. All connecting pipes shall have a tracer wire, or approved alternate.
7. See Std. Dwg. RD336 for manhole steps.
8. See Std. Dwg. RD336 for details not shown.
9. See Std. Dwg. RD356 for manhole covers and frames, manhole adjustment rings, etc.
10. Max. pipe diameter varies with pipe material.
11. See Std. Dwg. RD342 for shallow manholes.
12. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.

CALC. BOOK NO. N/A

SDR DATE 21-JUN-2019

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

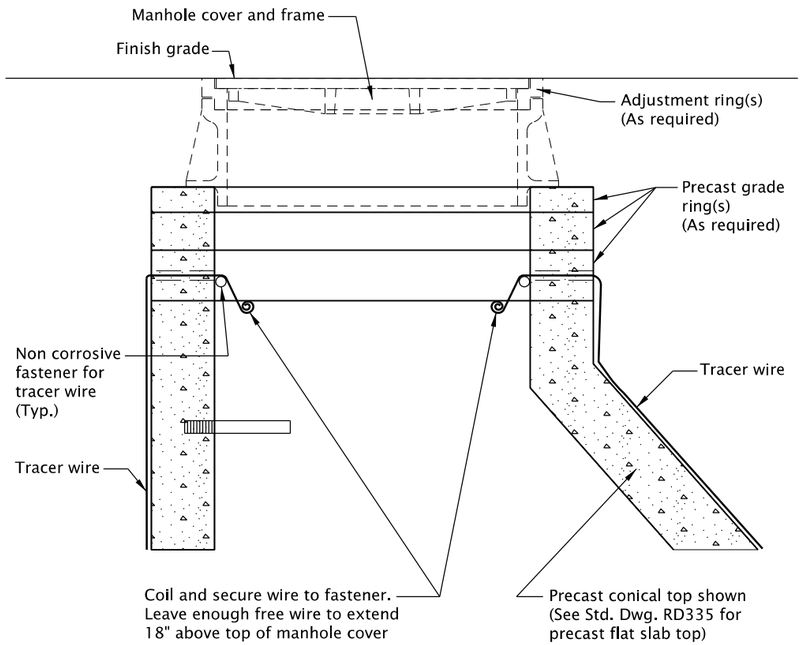
STANDARD STORM SEWER MANHOLE

2021

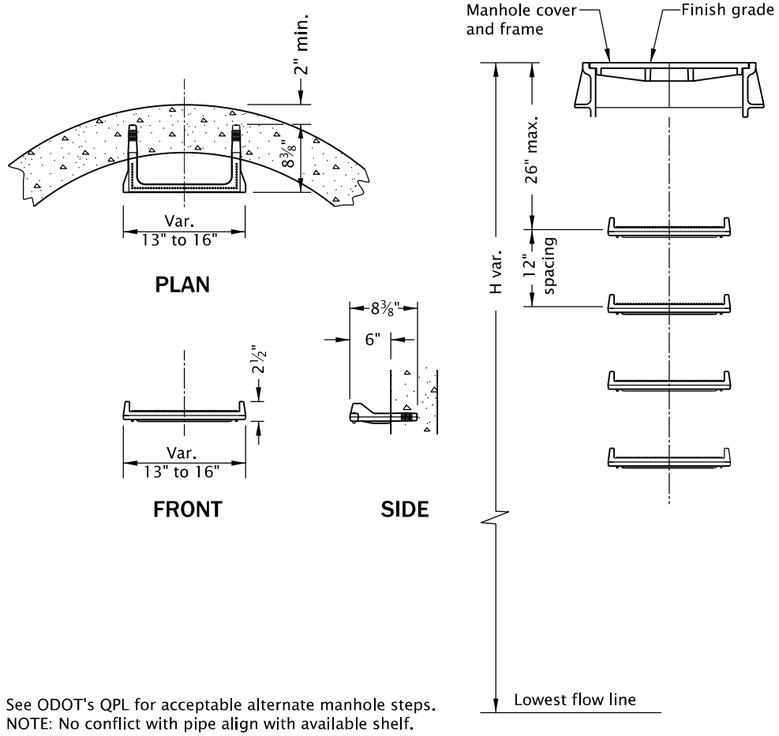
DATE	REVISION DESCRIPTION

rd335.dgn 20-JUL-2020

RD335

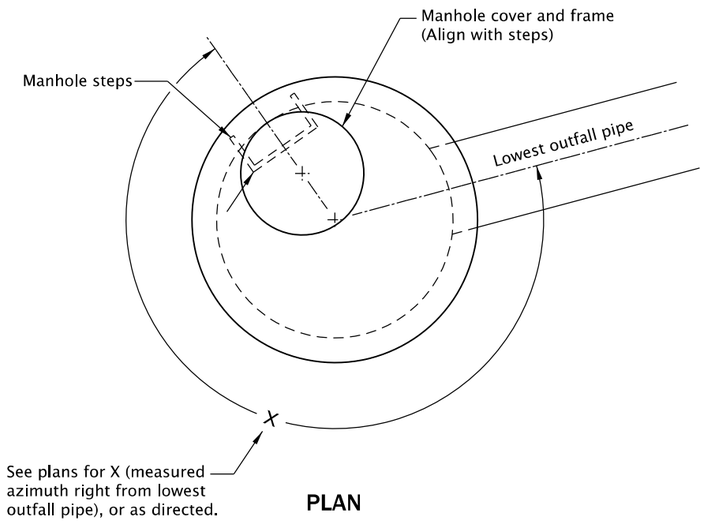


DETAIL "A"
TRACER WIRE
(See general note 6)



See ODOT's QPL for acceptable alternate manhole steps.
NOTE: No conflict with pipe align with available shelf.

DETAIL "B"
MANHOLE STEPS
(See general note 7)



DETAIL "C"
PRECAST CONICAL TOP
OR
PRECAST FLAT SLAB TOP
AND MANHOLE STEPS ORIENTATION
(See general note 7)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All precast products shall conform to requirements of ASTM C478.
2. Standard precast manhole section diameter shall be 48". Use 42" if specified by the Engineer.
3. See Std. Dwg. RD345 for pipe to manhole connections.
4. See Std. Dwg. RD344 for manhole base section.
5. Adjust 24" maximum.
6. All connecting pipes shall have a tracer wire, or approved alternate. Place tracer wire directly over pipe centerline and on top of the pipe zone material.
7. Steps shall conform to requirements of ASTM C478. When H=42" or less omit steps. See Detail "C" for alignment of steps, and manhole cover and frame.
8. See Std. Dwg. RD335 for details not shown.
9. See Std. Dwg. RD356 for manhole covers and frames, manhole adjustment rings, etc.
10. Max. pipe diameter varies with pipe material.
11. See Std. Dwg. RD342 for shallow manholes.
12. See project plans for details not shown.

CALC. BOOK NO. N/A

SDR DATE 16-JAN-2019

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.

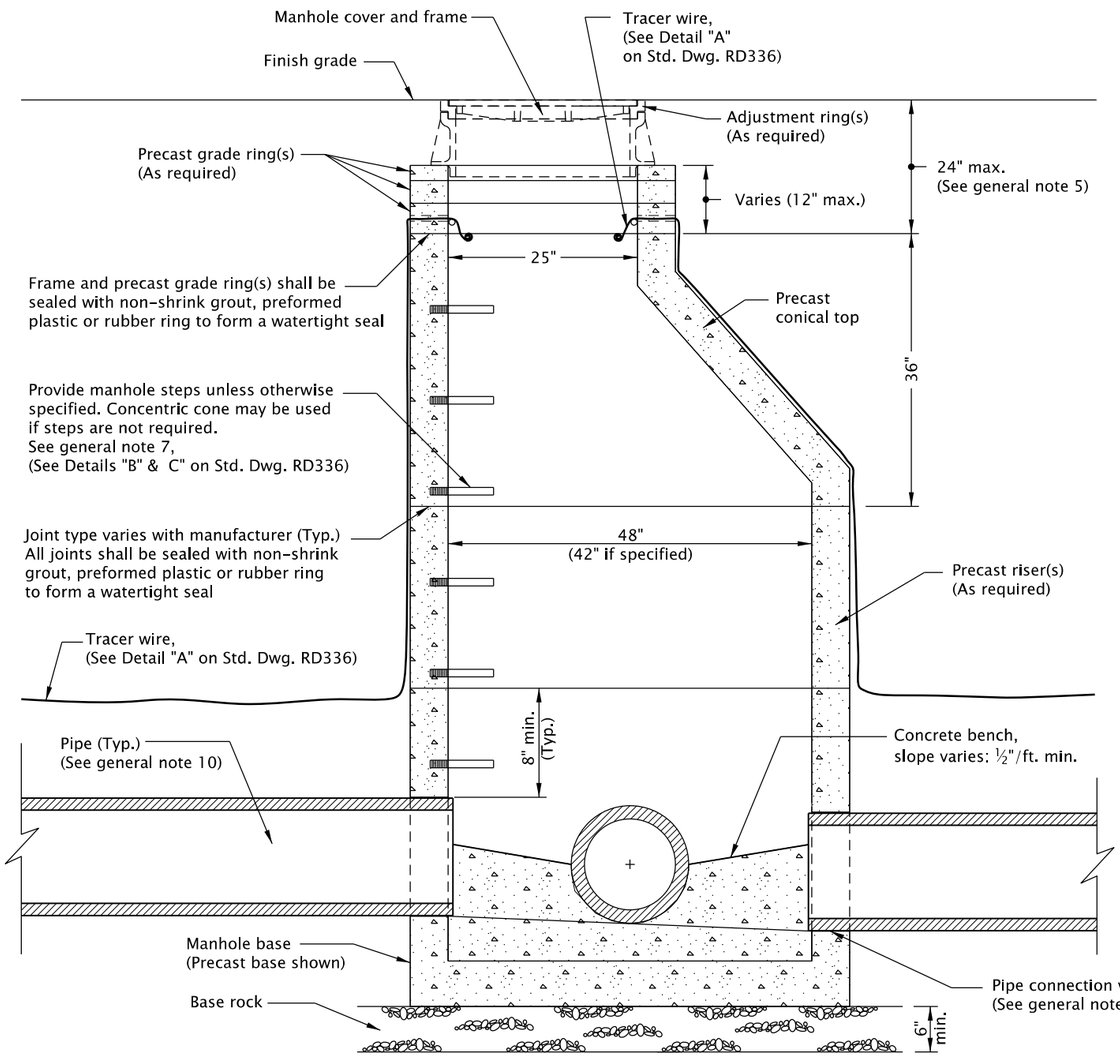
OREGON STANDARD DRAWINGS

STANDARD MANHOLE DETAILS

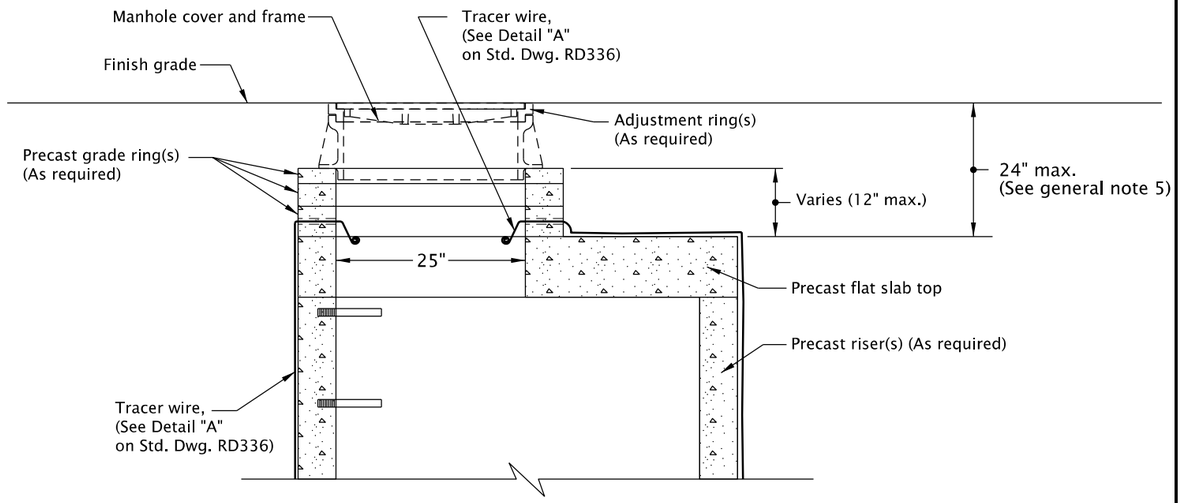
2021

DATE	REVISION DESCRIPTION

RD336



MANHOLE WITH PRECAST CONICAL TOP



MANHOLE WITH PRECAST FLAT SLAB TOP

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All precast products shall conform to requirements of ASTM C478.
2. Standard precast manhole section diameter shall be 48". Use 42" if specified by the Engineer.
3. See Std. Dwg. RD345 for pipe to manhole connections.
4. See Std. Dwg. RD344 for manhole base section.
5. Adjust 24" maximum.
6. All connecting pipes shall have a tracer wire, or approved alternate.
7. See Std. Dwg. RD336 for manhole steps.
8. See Std. Dwg. RD336 for details not shown.
9. See Std. Dwg. RD356 for manhole covers and frames, manhole adjustment rings, etc.
10. Max. pipe diameter varies with pipe material.
11. See Std. Dwg. RD342 for shallow manholes.
12. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.
13. This detail limited to interior drop of 24".
    See Std. Dwgs. RD350 or RD352 for drop manhole details for drops in excess of 24".

CALC. BOOK NO. N/A

SDR DATE 21-JUN-2019

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

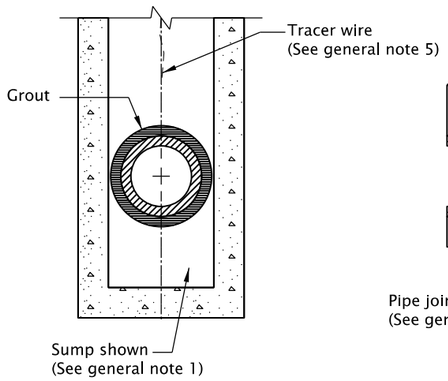
STANDARD SANITARY SEWER MANHOLE

2021

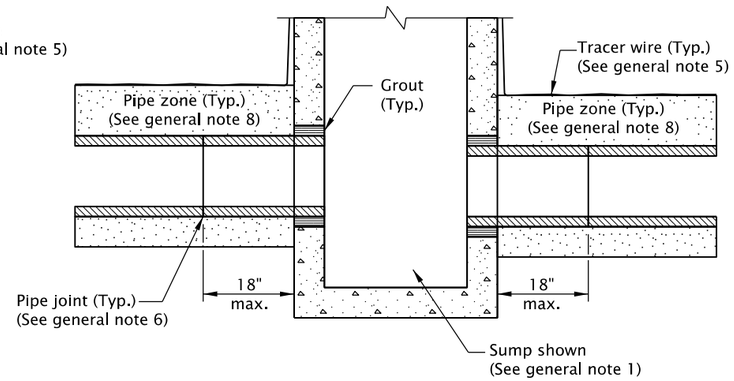
DATE	REVISION DESCRIPTION

RD338

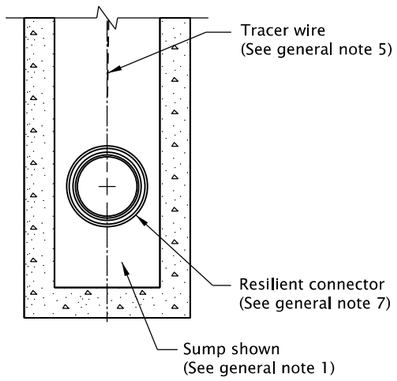
rd338.dgn 20-JUL-2020



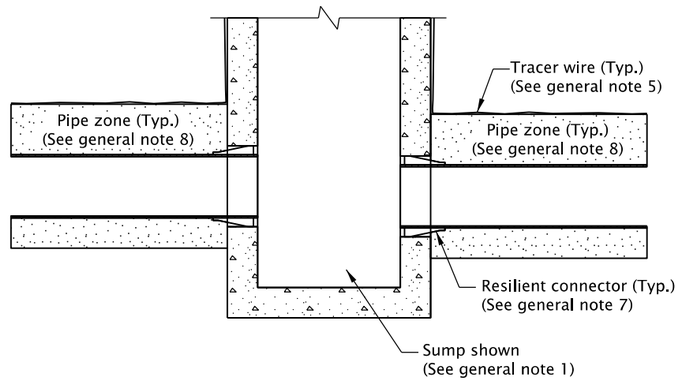
SECTION B-B



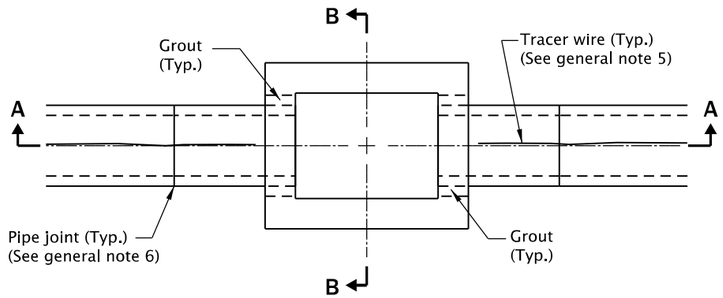
SECTION A-A



SECTION D-D

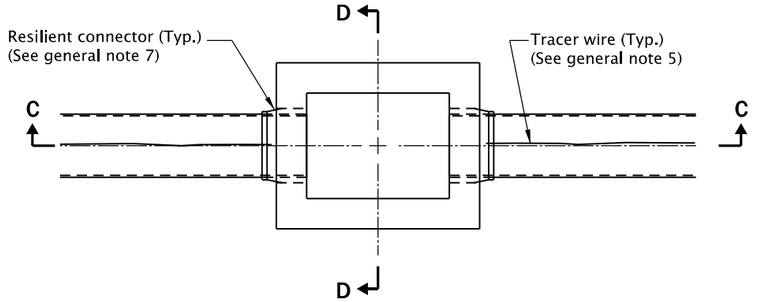


SECTION C-C



PLAN

CONNECTION OF RIGID PIPE TO STRUCTURE



PLAN

CONNECTION OF FLEXIBLE PIPE TO STRUCTURE

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. See Std. Dwgs. RD364, RD365, and RD366 for inlet details not shown.
2. See appropriate standard drawings or special project details for other similar structures.
3. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.
4. Maximum pipe diameter varies with pipe material.
5. All connecting pipes shall have a tracer wire, or approved alternate. See Std. Dwg. RD336 for tracer wire details.
6. When rigid pipe is used, the connecting pipe shall have a flexible, gasketted and unrestrained joint within 18" of structure wall. Joint type varies with manufacturer.
7. When flexible pipe is used, install resilient connectors conforming to requirements of ASTM C923.
8. Pipe zone varies, see Std. Dwg. RD300.

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.

OREGON STANDARD DRAWINGS

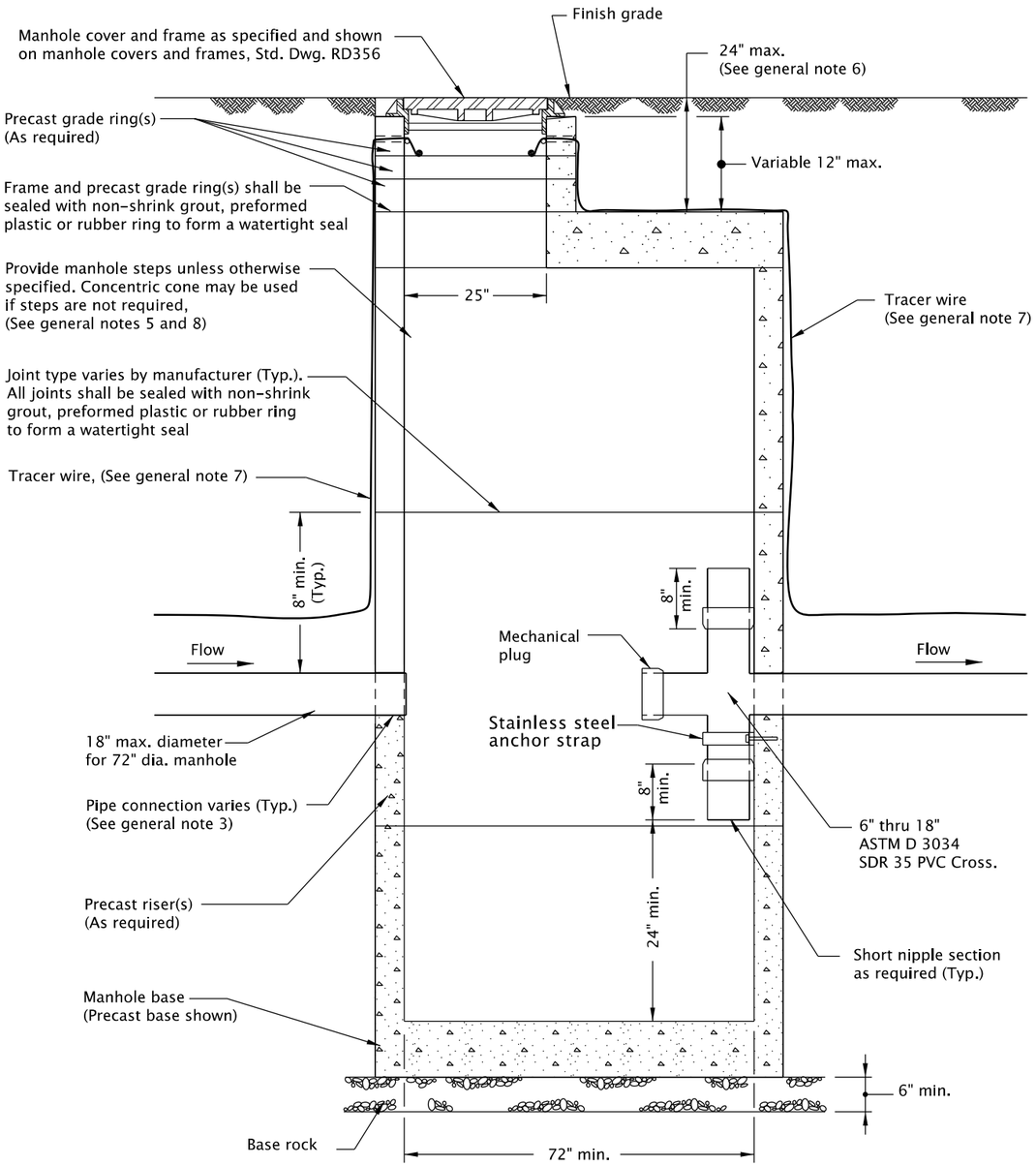
PIPE TO STRUCTURE CONNECTIONS

2021

DATE	REVISION DESCRIPTION
07-2021	REVISED NOTES

RD339

rd339.dgn 19-JUL-2021



GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All precast products shall conform to requirements of ASTM C478.
2. Standard precast manhole section diameter shall be 72".
3. See Std. Dwg. RD345 for pipe to manhole connections.
4. See Std. Dwg. RD344 for manhole base section, for details not shown.
5. See Std. Dwg. RD336 for manhole steps details, and flat slab top orientation.
6. Adjust 24" max.
7. See Std. Dwg. RD336 for tracer wire details.
8. See Std. Dwg. RD336 for manhole steps.
9. Max. pipe diameter varies with pipe material.
10. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.

CALC. BOOK NO. N/A

SDR DATE 16-JAN-2019

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.

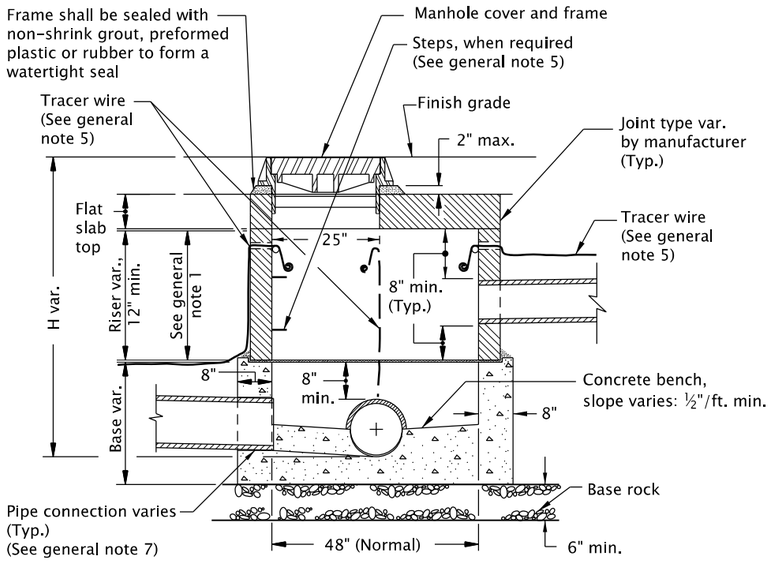
OREGON STANDARD DRAWINGS

STORM SEWER POLLUTION CONTROL MANHOLE

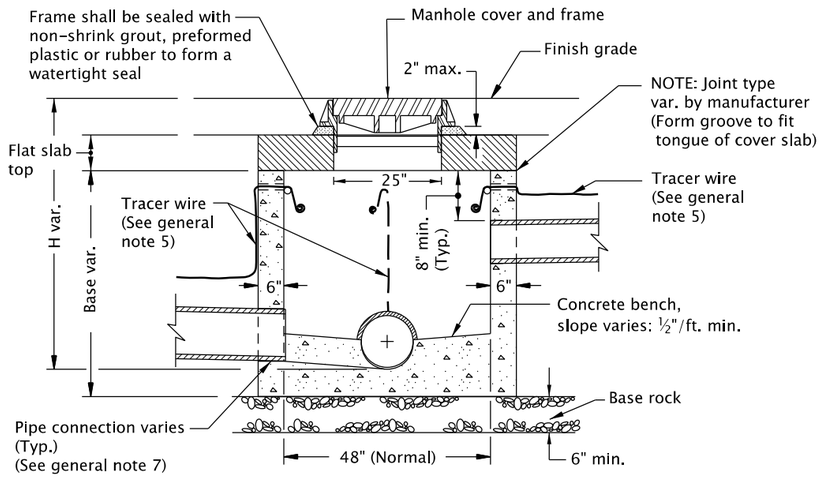
2021

DATE	REVISION DESCRIPTION

RD340



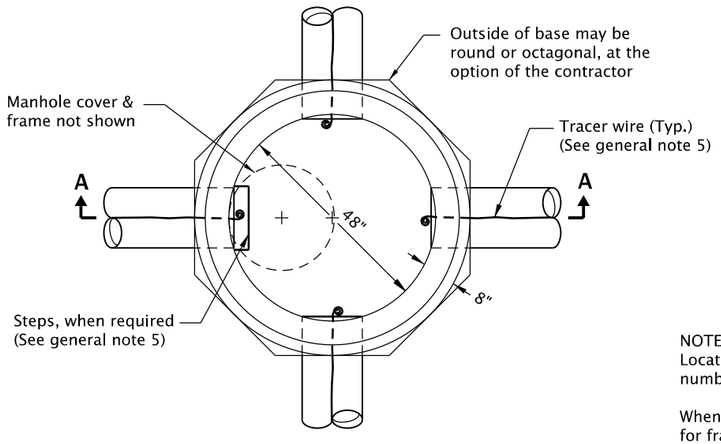
SECTION A-A
(Base, Riser & Flat Slab Top)



SECTION B-B
(Base, Riser & Flat Slab Top)

LEGEND
(See general note 3)

- Cast-in-Place concrete
- Precast concrete
- 1: 2 cement mortar
- Sewer pipe

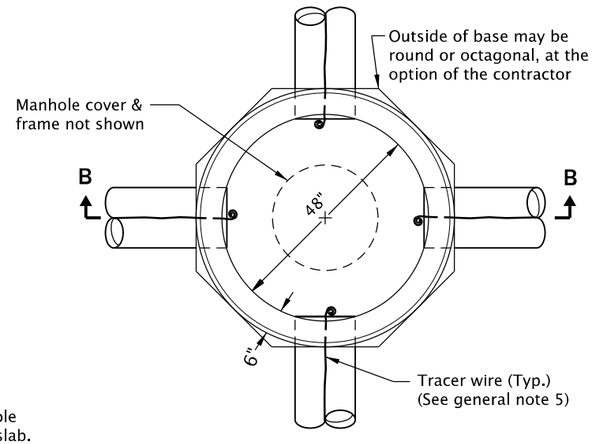


TOP VIEW
(Base, Riser & Flat Slab Top)

NOTES:
Location, elevation, and number of pipe(s) varies.

When H=42" or less make hole for frame in center of cover slab.

When H=42" or less omit steps.



TOP VIEW
(Base & Flat Slab Top)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Minimum length if laterals or connections are inserted: outside diameter of pipe + 17".
2. Use Section B-B when length of riser becomes less than minimum shown.
3. Base may be precast or cast-in-place.
4. All precast products shall conform to the requirements of ASTM C478.
5. See Std. Dwg. RD336 for details not shown.
6. See Std. Dwg. RD344 for manhole base section.
7. See Std. Dwg. RD345 for pipe to manhole connections.
8. See Std. Dwg. RD356 for manhole covers and frames.
9. All concrete shall be commercial grade concrete.
10. Max. pipe diameter varies with pipe material.
11. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.

CALC. BOOK NO. N/A

SDR DATE 21-JUL-2015

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

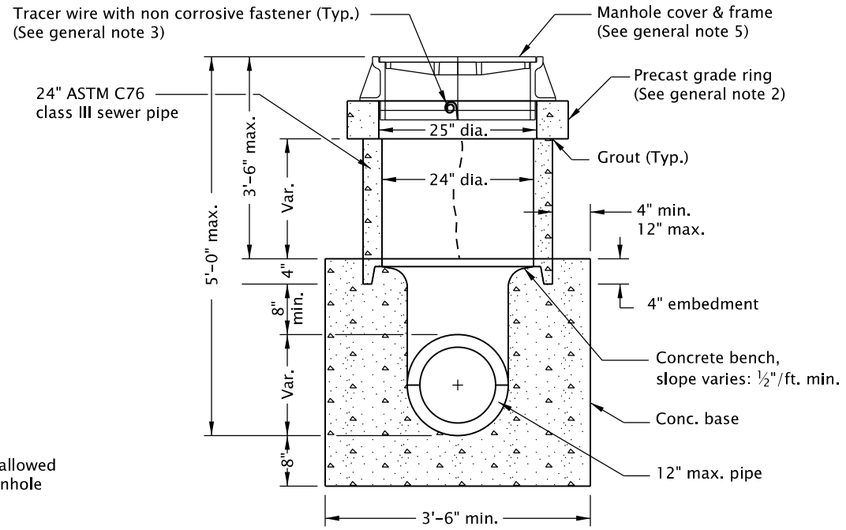
SHALLOW MANHOLES

2021

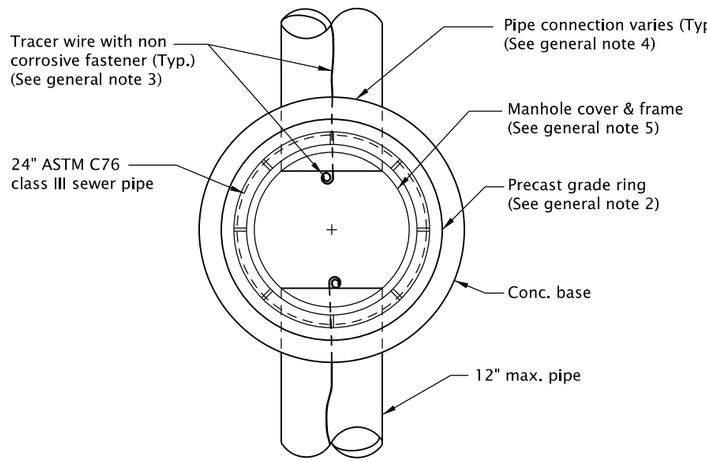
DATE	REVISION DESCRIPTION

rd342.dgn 20-JUL-2020

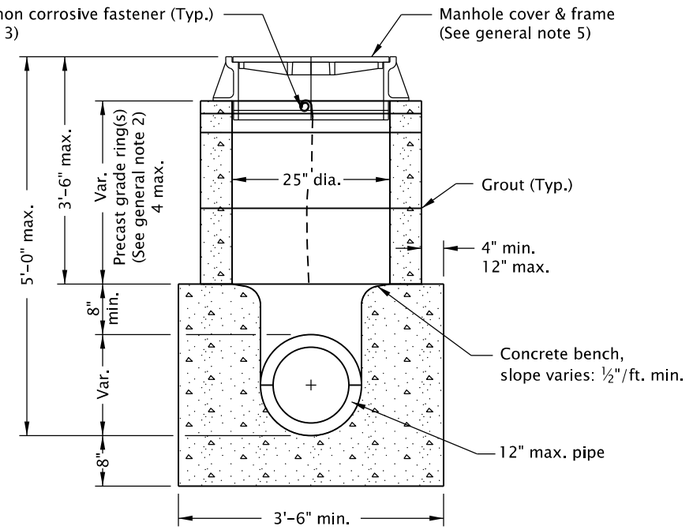
RD342



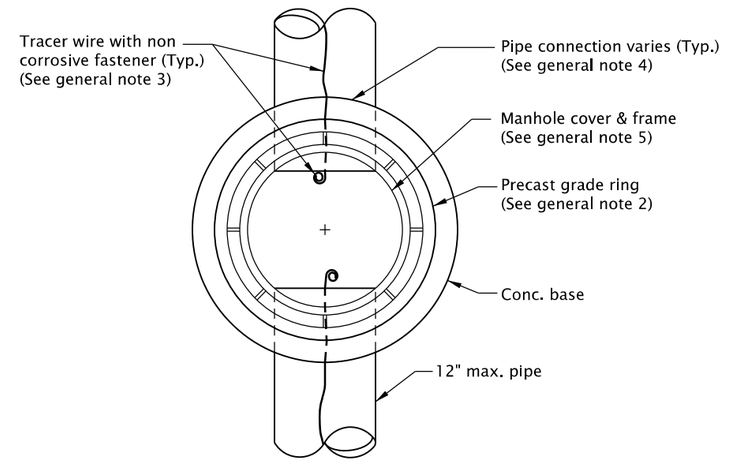
NOTE:
No steps allowed
in 24" manhole



ALTERNATE "A"



NOTE:
No steps allowed
in 24" manhole



ALTERNATE "B"

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Base may be precast or cast-in-place.
2. All precast products shall conform to the requirements of ASTM C478.
3. See Std. Dwg. RD336 for tracer wire details.
4. See Std. Dwg. RD345 for pipe to manhole connections.
5. See Std. Dwg. RD356 for manhole covers and frames.
6. All concrete shall be commercial grade concrete.
7. Max. pipe diameter varies with pipe material.
8. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.

CALC. BOOK NO. N/A

SDR DATE 14-JUL-2014

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

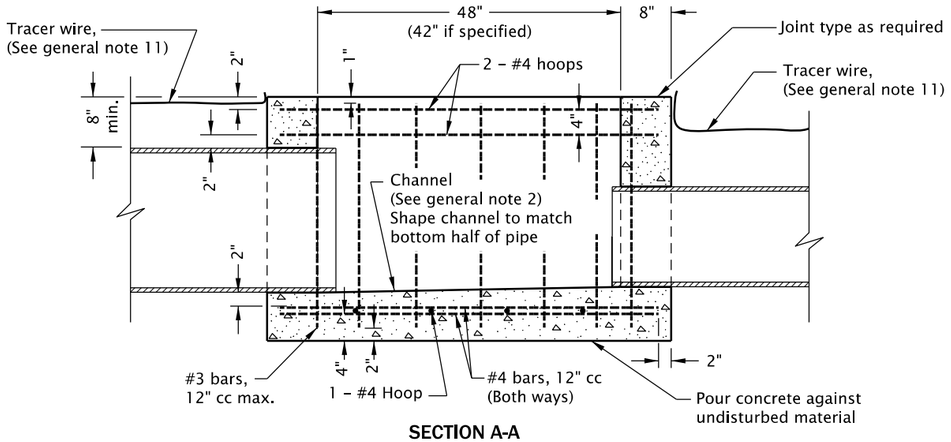
24" MANHOLES

2021

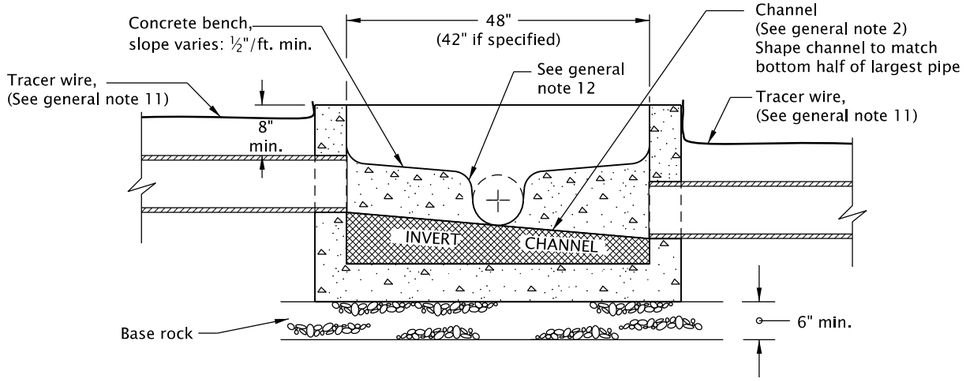
DATE	REVISION DESCRIPTION

RD343

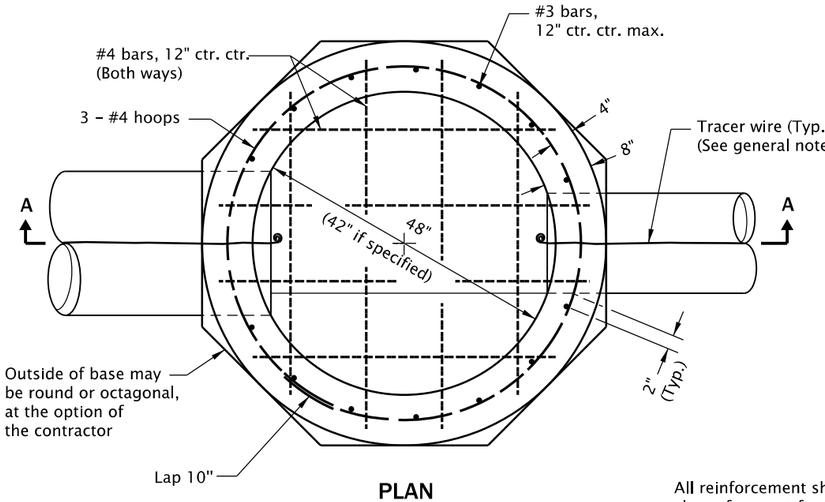
rd343.dgn 20-JUL-2020



SECTION A-A



SECTION B-B

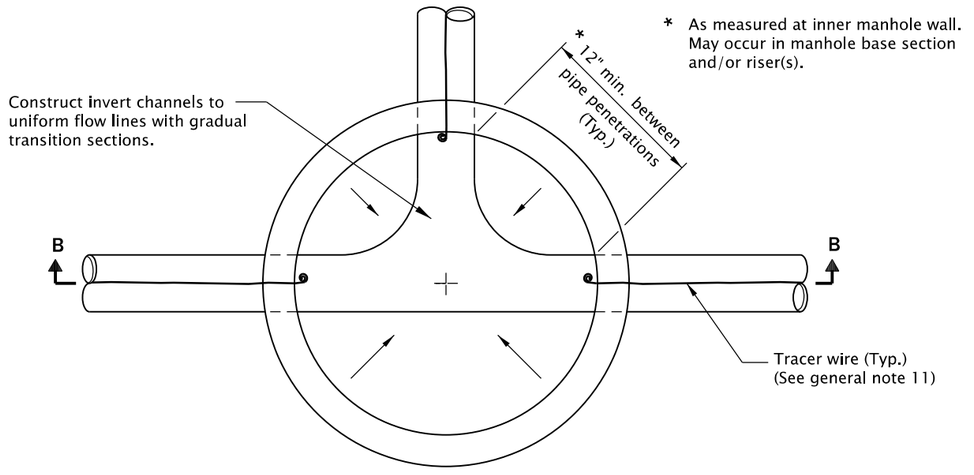


PLAN

All reinforcement shall be 2" clear of nearest face of conc., unless otherwise shown.

CAST IN PLACE MANHOLE BASE

(For invert channel details, see precast option at right)



PLAN

PRECAST MANHOLE BASE

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All concrete shall be commercial grade concrete.
2. Channels shall be constructed to provide smooth slopes and radii to outlet pipe.
3. Bases may be precast or cast in place.
4. Max. pipe diameter varies with pipe material.
5. Use on 42" and 48" diameter manhole.
6. Extend pipe into manhole and grout smooth.
   Pipe(s) may extend 2" max. beyond the interior manhole wall.
7. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.
8. All precast products shall conform to the requirements of ASTM C478.
9. See Std. Dwg. RD345 for pipe to manhole connections.
10. See Std. Dwg. RD336 for manhole steps details.
11. See Std. Dwg. RD336 for tracer wire details.
12. At spring line of pipe, extend channel up to crown line on 12:1 batter.

CALC. BOOK NO. N/A

SDR DATE 14-JUL-2014

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

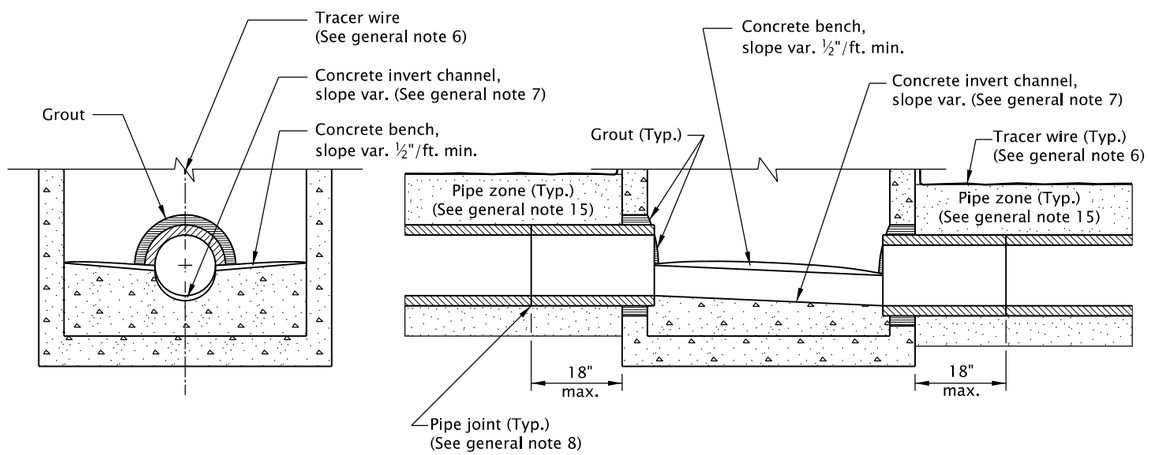
STANDARD MANHOLE BASE SECTION

2021

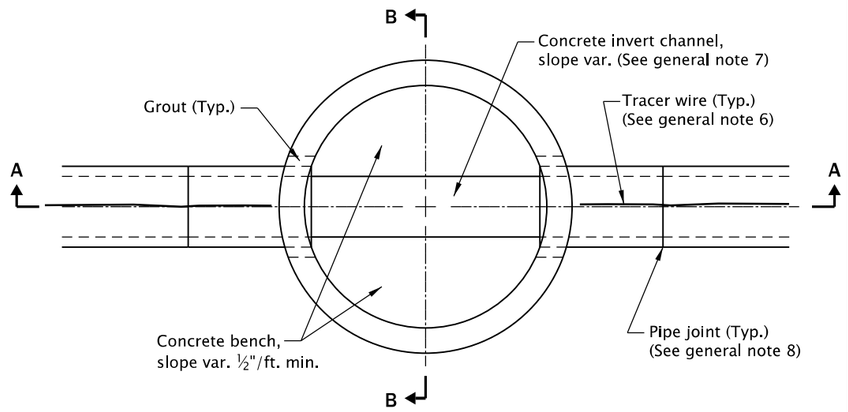
DATE	REVISION DESCRIPTION

rd344.dgn 20-JUL-2020

RD344

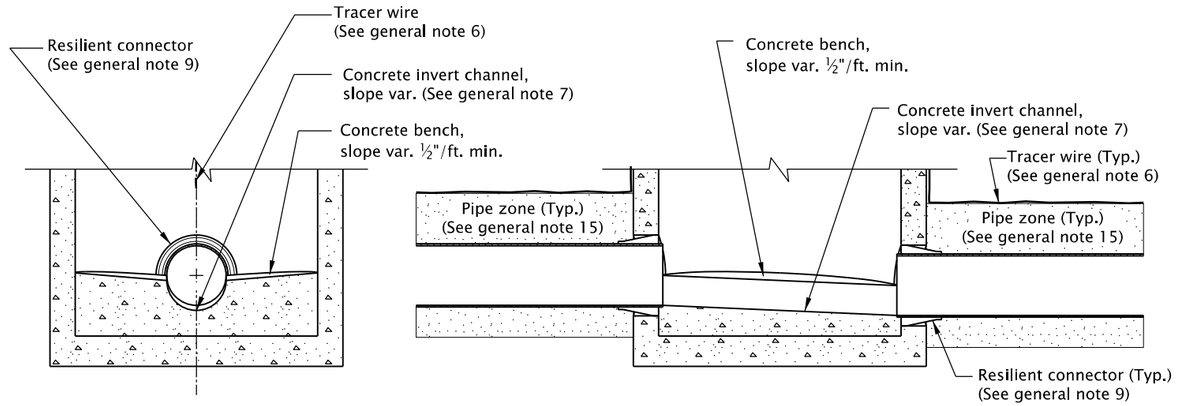


SECTION B-B **SECTION A-A**

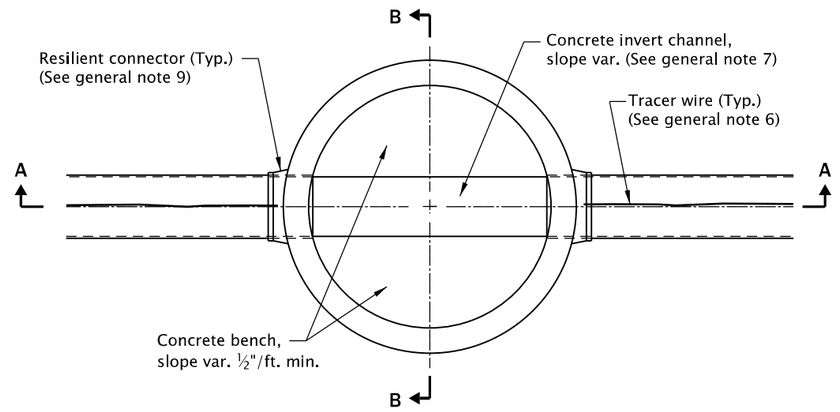


PLAN

CONNECTION OF RIGID PIPE TO MANHOLE



SECTION B-B **SECTION A-A**



PLAN

CONNECTION OF FLEXIBLE PIPE TO MANHOLE

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All precast sections shall conform to requirements of ASTM C478.
2. Manhole base sections may be precast or cast-in-place.
3. All concrete shall be commercial grade concrete.
4. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.
5. Max. pipe diameter varies with pipe material.
6. All connecting pipes shall have a tracer wire, or approved alternate. See Std. Dwg. RD336 for tracer wire details.
7. Invert channels shall be constructed to provide smooth slopes and radii to outlet pipe.
8. When rigid pipe is used, the connecting pipe shall have a flexible, gasketted and unrestrained joint within 18" of manhole wall. Joint type varies with manufacturer.
9. When flexible pipe is used, install resilient connectors conforming to requirements of ASTM C923.
10. See Std. Dwgs. RD335, RD336, and RD338 for details not shown.
11. See Std. Dwg. RD336 for manhole steps details.
12. See Std. Dwg. RD342 for shallow manholes.
13. See Std. Dwg. RD344 for manhole base section.
14. See Std. Dwg. RD356 for manhole covers and frames, manhole adjustment rings, etc.
15. Pipe zone varies, see Std. Dwg. RD300.

CALC. BOOK NO. N/A

SDR DATE 14-JUL-2014

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

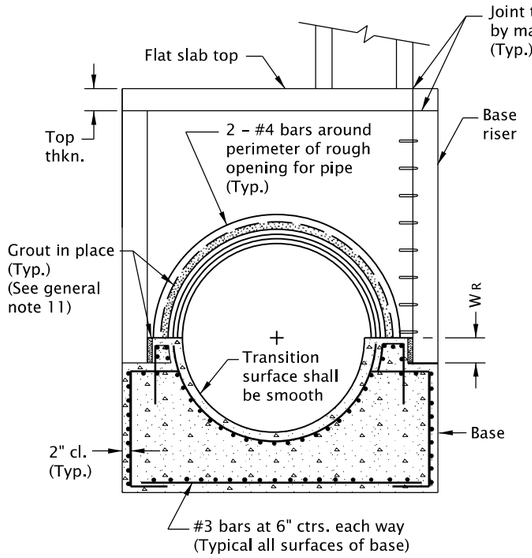
PIPE TO MANHOLE CONNECTIONS

2021

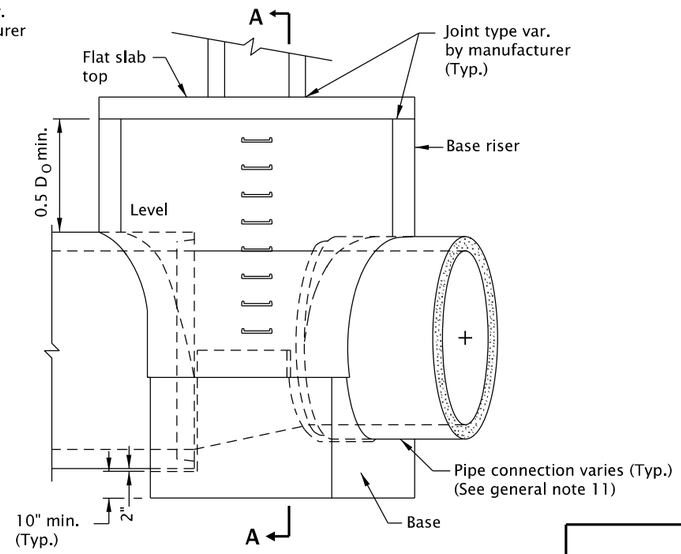
DATE	REVISION DESCRIPTION

RD345

rd345.dgn 20-JUL-2020



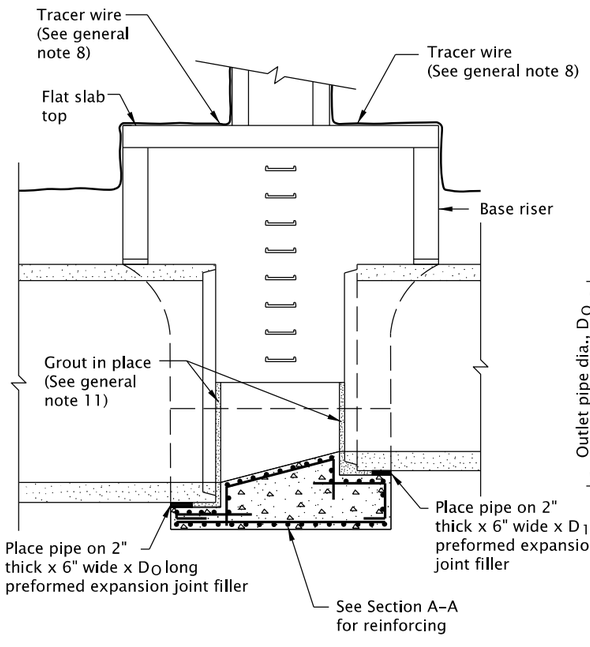
SECTION A-A



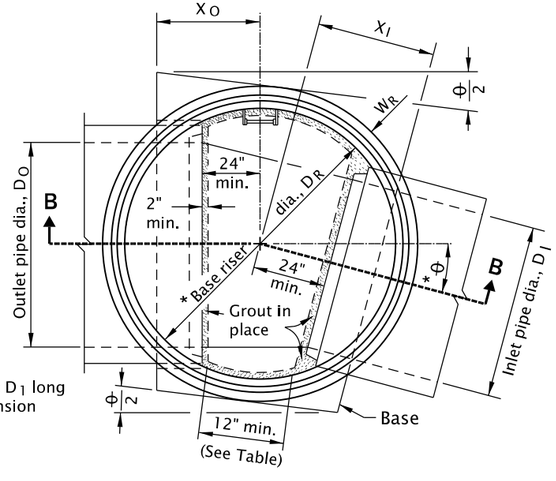
MANHOLE BASE ELEVATION

Dia. of largest pipe in manhole (Inch)	* Θ max when $D_I = D_O$	* Base Riser			Base X_O $X_I = X_O$ when $D_I = D_O$ (Feet)	Base X_I when $D_I < D_O$		
		D_R (Inch)	W_R (Inch)	Top Thkn. (Inch)		$D_I = (D_O - 6")$ (Feet)	$D_I = (D_O - 12")$ (Feet)	$D_I = (D_O - 18")$ (Feet)
30"	75°	60"	6"	10"	2.42	2.63	2.75	2.89
36"	67°	72"	7"	10"	2.75	2.97	3.15	3.29
42"	60°	72"	7"	10"	2.75	2.97	3.15	3.29
48"	54°	84"	8"	10"	3.02	3.27	3.48	3.66
54"	49°	84"	8"	10"	3.02	3.27	3.48	3.66
60"	45°	96"	9"	12"	3.25	3.54	3.78	3.99
66"	42°	96"	9"	12"	3.25	3.54	3.78	3.99
72"	39°	108"	10"	12"	3.48	3.79	4.06	4.29
78"	36°	108"	10"	12"	3.48	3.79	4.06	4.29
84"	34°	120"	11"	12"	3.69	4.03	4.32	4.57
90"	32°	120"	11"	12"	3.69	4.03	4.32	4.57
96"	30°	126"	11½"	12"	3.79	4.15	4.45	4.71

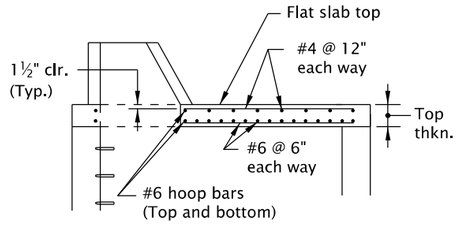
* A special design using a larger Base Riser diameter D_R may be required to obtain specified 12" min. dimension when Θ angle exceeds Θ max.



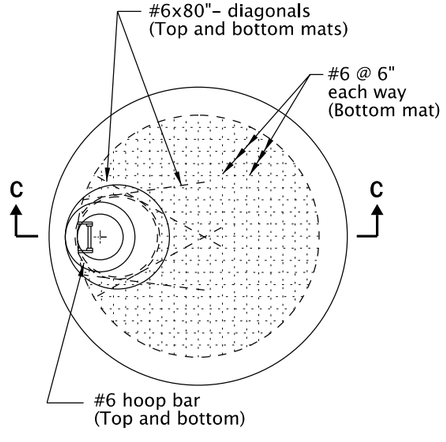
DEVELOPED SECTION B-B ALONG PIPE CENTERLINE



MANHOLE BASE PLAN



SECTION C-C



MANHOLE FLAT SLAB TOP PLAN
(Bottom reinf. mat shown)
(Manhole I.D. >4', <10' 6")

GENERAL NOTES FOR ALL DETAILS ON TIS SHEET:

1. All concrete shall be Class 4000. All precast products shall conform to requirements of ASTM C478.
2. All reinforcing steel shall conform to ASTM Specification A706 or AASHTO M31 (ASTM A615), Grade 60. The following splice lengths shall be used (unless shown otherwise):

Bar Size	4	5	6
Uncoated	16"	20"	24"

3. All reinforcement shall be placed 2" clear of the nearest face of the concrete unless shown otherwise.
4. Eccentric reducing cones or eccentric reducing flat slabs designed in accordance with AASHTO M199 shall be placed on top of the base riser as required by the contract plans. Eccentric reducing flat slabs shall be designed to support a load of 120 lb/ft in addition to the dead load of the slab, the risers above the slab, and the earth overburden above the slab.
5. Base riser to be pre-cast unless otherwise shown on the plans.
6. Cast-in-Place concrete, shown thus:
7. See Std. Dwg. RD336 for manhole steps details, and flat slab top orientation.
8. See Std. Dwg. RD336 for tracer wire details.
9. See Std. Dwg. RD336 for manhole steps.
10. Max. pipe diameter varies with pipe material.
11. See Std. Dwg. RD345 for pipe to manhole connections.
12. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.

CALC. BOOK NO. N/A

SDR DATE 25-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

LARGE PRECAST MANHOLE

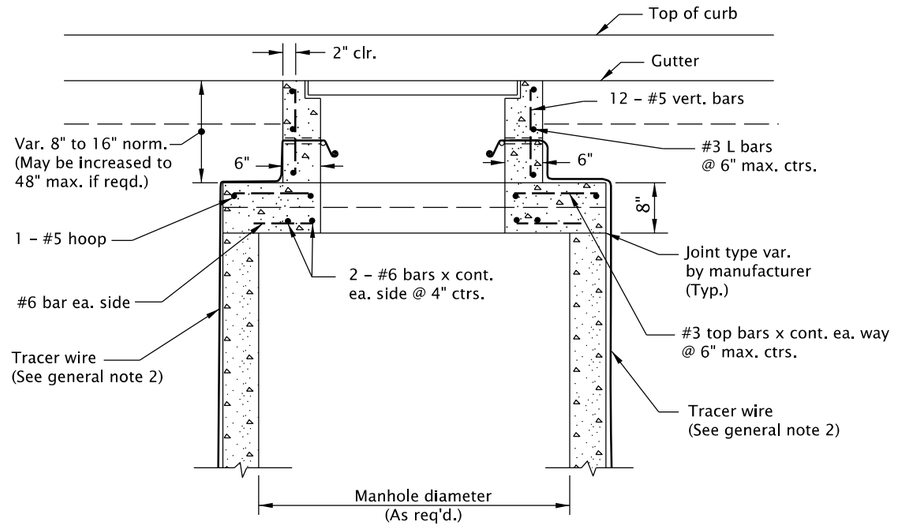
2021

DATE	REVISION DESCRIPTION

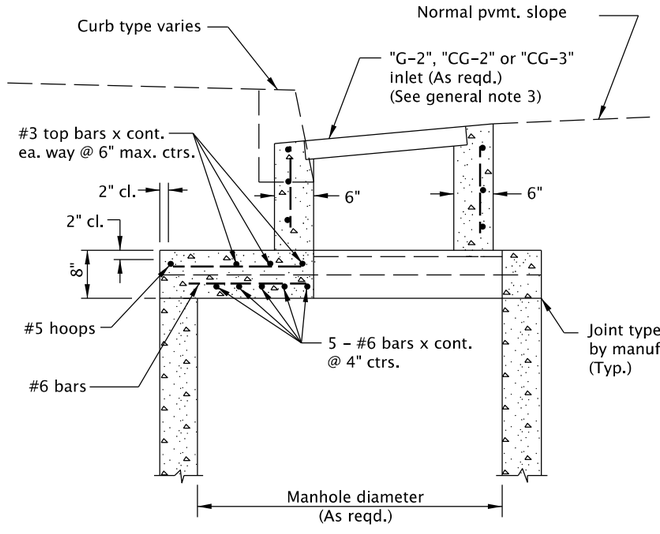
rd346.dgn 20-JUL-2020

RD346

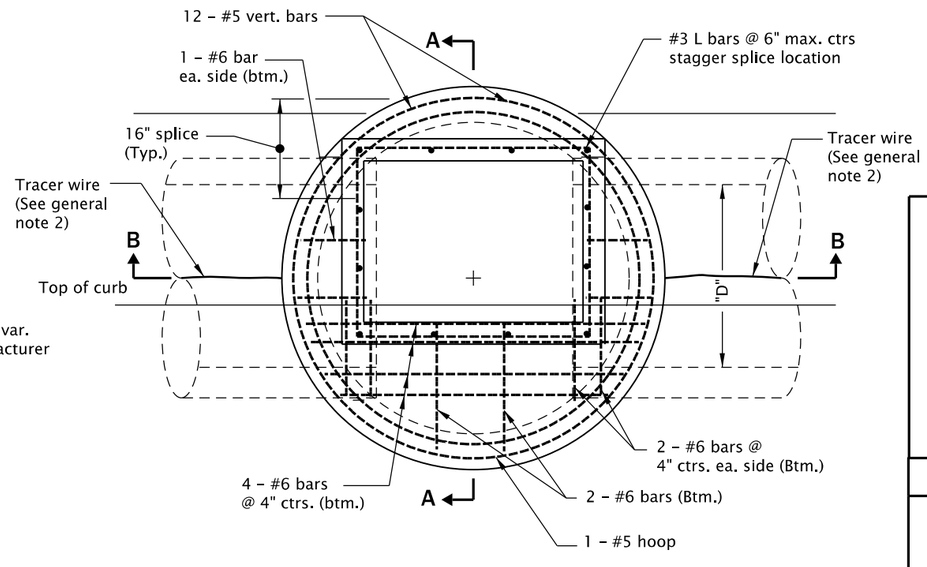
rd348.dgn 20-JUL-2020



SECTION B-B



SECTION A-A



"D" = Pipe dia.

PLAN

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All reinforcement to be placed a minimum of 2" clear of nearest face of concrete unless otherwise shown or noted.
2. See Std. Dwgs. RD335, RD336 & RD346 for manhole and related details.
3. See Std. Dwgs. RD364, RD366 & RD371 for inlet and related details.
4. All precast products shall conform to the requirements of ASTM C478.

CALC. BOOK NO. N/A

SDR DATE 21-JUN-2019

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

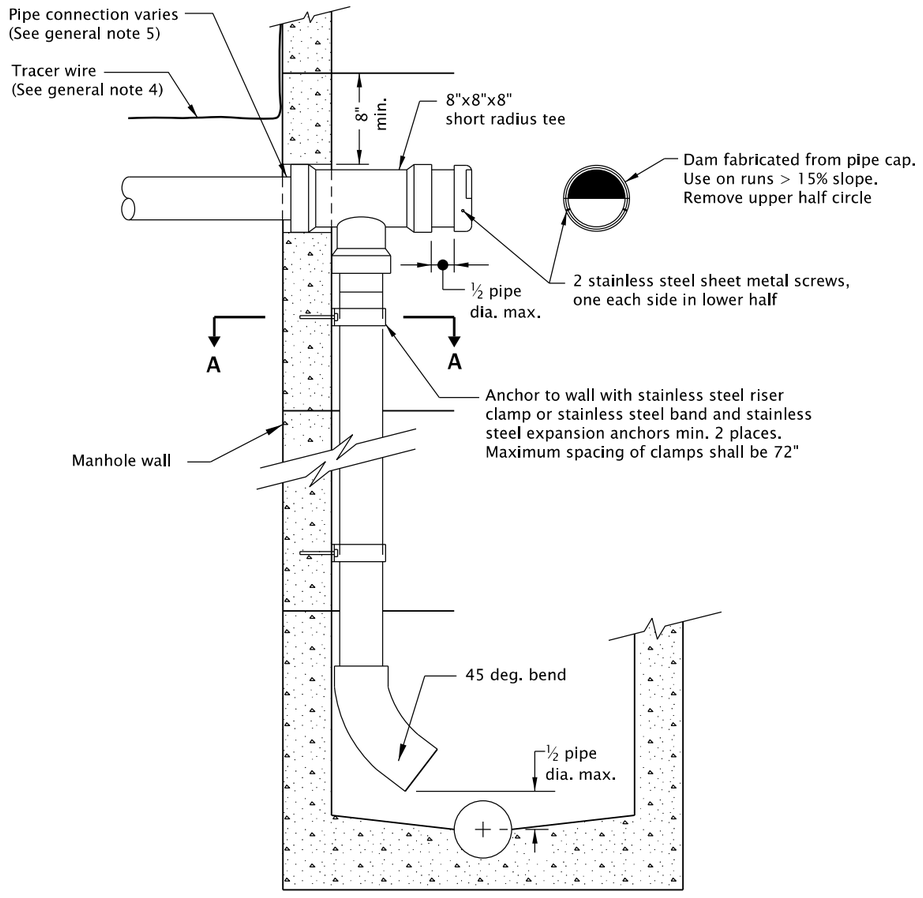
The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

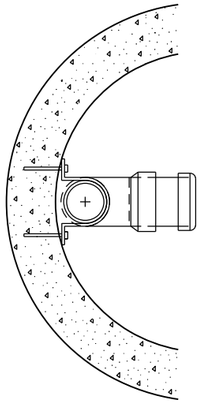
OREGON STANDARD DRAWINGS

MANHOLE WITH INLET

2021

DATE	REVISION DESCRIPTION





SECTION A-A

CLAMP DETAIL

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Only one inside drop per manhole.
2. PVC shall be ASTM D3034 SDR35.
3. See Std. Dwg. RD336 for manhole steps details.
4. See Std. Dwg. RD336 for tracer wire details.
5. See Std. Dwg. RD345 for pipe to manhole connections,
6. See appropriate manhole standard drawings for details not shown.
7. Max. incoming pipe diameter 8". Drop pipe and fittings shall match incoming pipe.
8. Location, elevation, diameter, and slope of incoming pipe varies, see project plans.

CALC. BOOK NO. N/A

SDR DATE 14-JUL-2014

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

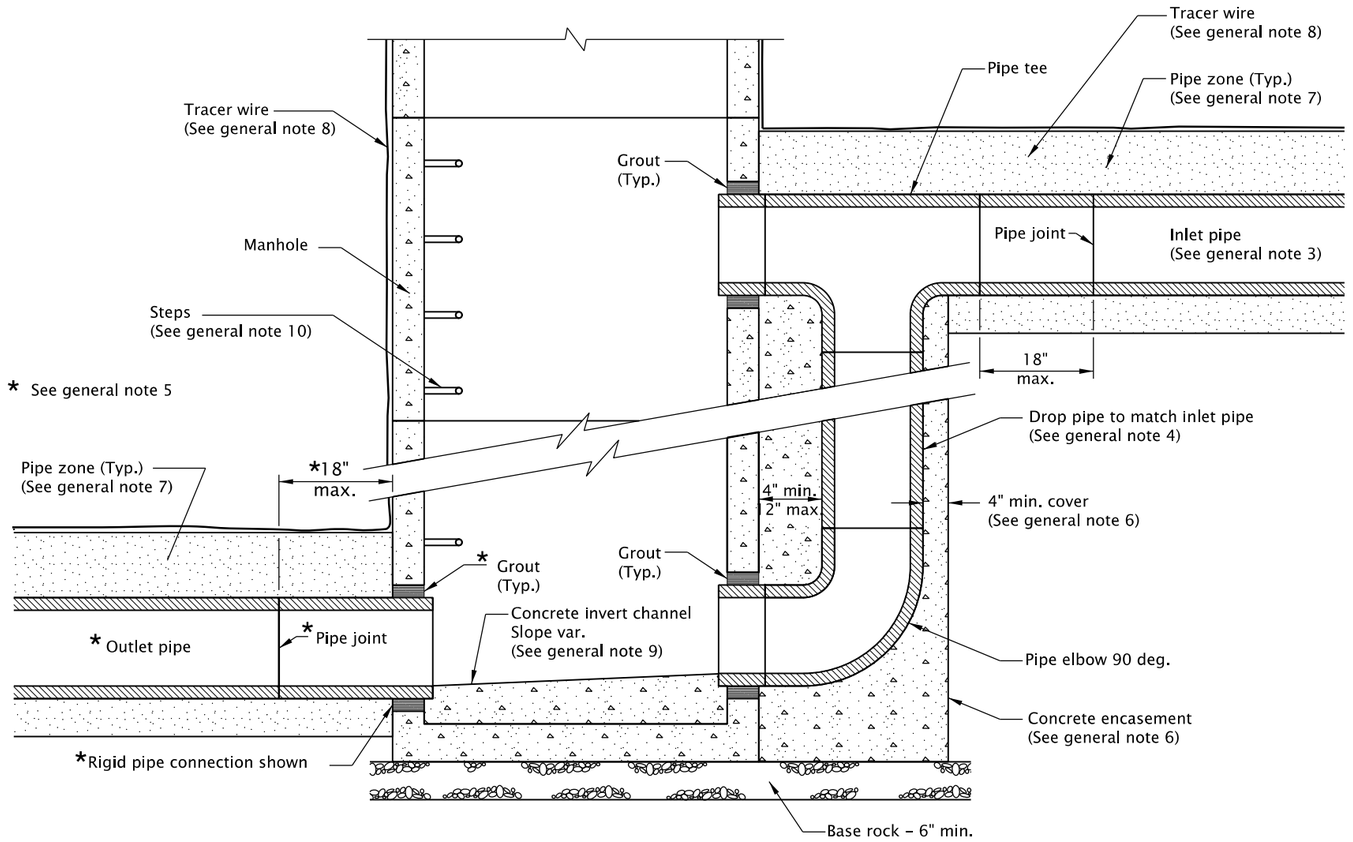
SANITARY SEWER PIPED INSIDE DROP CONNECTION FOR MANHOLES

2021

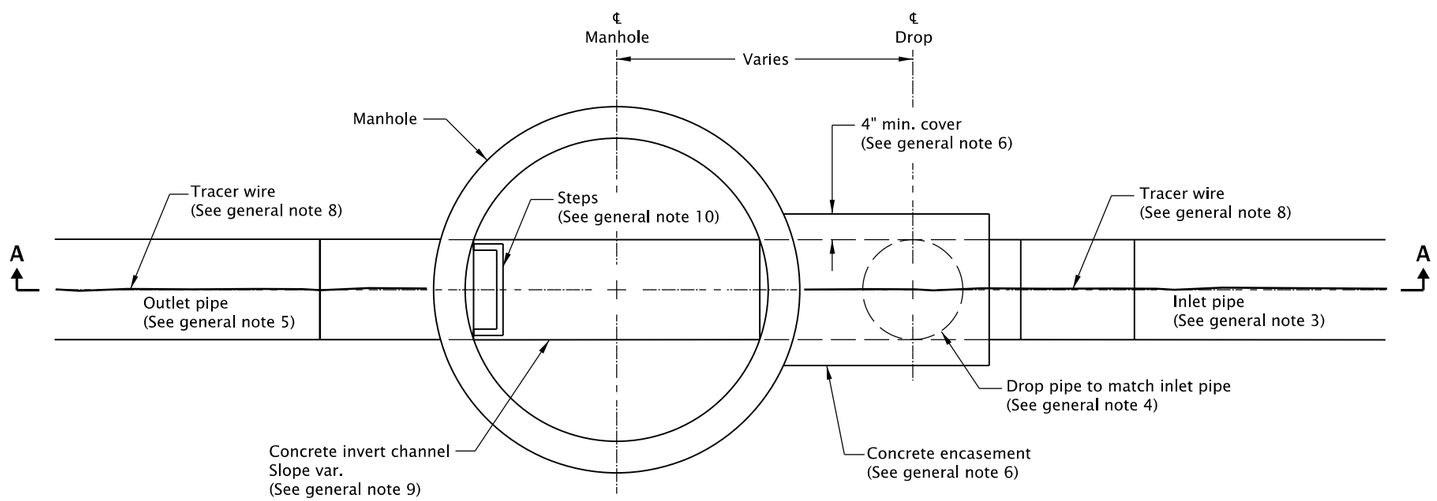
DATE	REVISION DESCRIPTION

rd350.dgn 20-JUL-2020

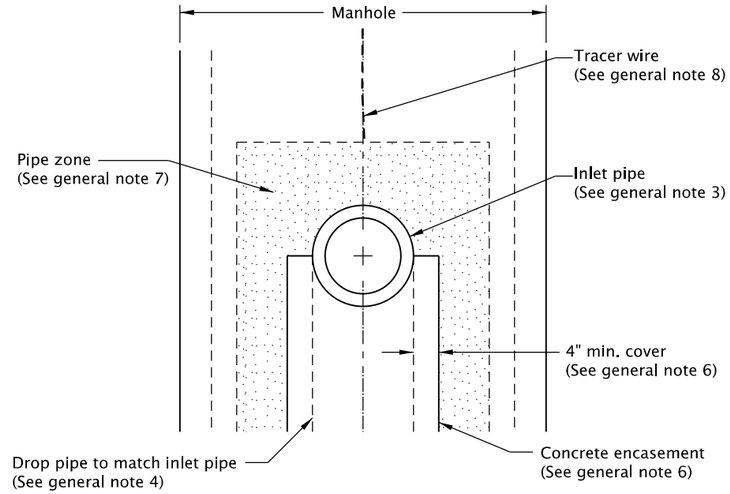
RD350



SECTION A-A



PLAN



END VIEW

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. See appropriate manhole standard drawings for details not shown.
2. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans. Only 1 outside drop pipe allowed per manhole. See project plans for pipe material.
3. Inlet pipe may be rigid or flexible, maximum diameter 18". The connecting pipe shall have a flexible, gasketted and unrestrained joint within 18" of pipe tee, as shown. Joint type varies with manufacturer.
4. Drop pipe, tee, and elbow to match inlet pipe.
5. Rigid pipe connection shown. Outlet pipe(s) may be rigid or flexible, see project plans. Max. outlet pipe diameter varies with pipe material. See Std. Dwg. RD345 for pipe to manhole connections.
6. Concrete encasement shall be commercial grade concrete. Provide 4" minimum cover over outer most parts of pipe and fittings.
7. Pipe zone varies, see Std. Dwg. RD300.
8. All connecting pipes shall have a tracer wire, or approved alternate. See Std. Dwg. RD336 for tracer wire details.
9. Invert channels shall be constructed to provide smooth slopes and radii to outlet pipe.
10. See Std. Dwg. RD336 for manhole steps details.

CALC. BOOK NO. N/A

SDR DATE 14-JUL-2014

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

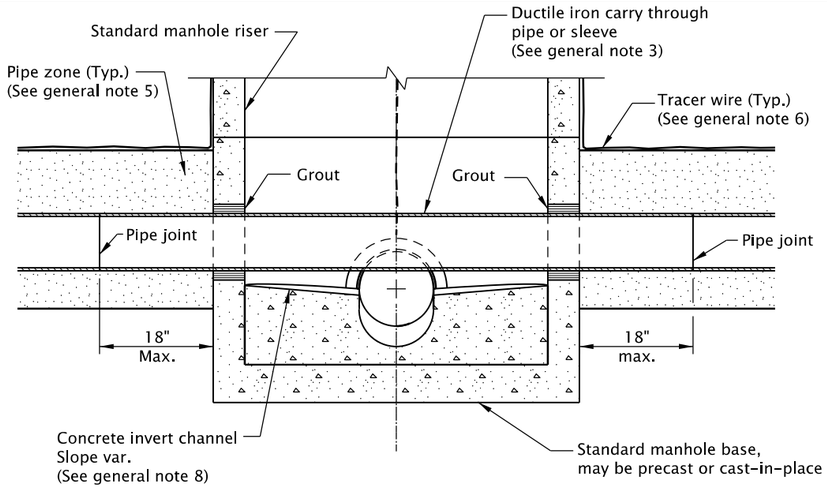
OUTSIDE DROP MANHOLES

2021

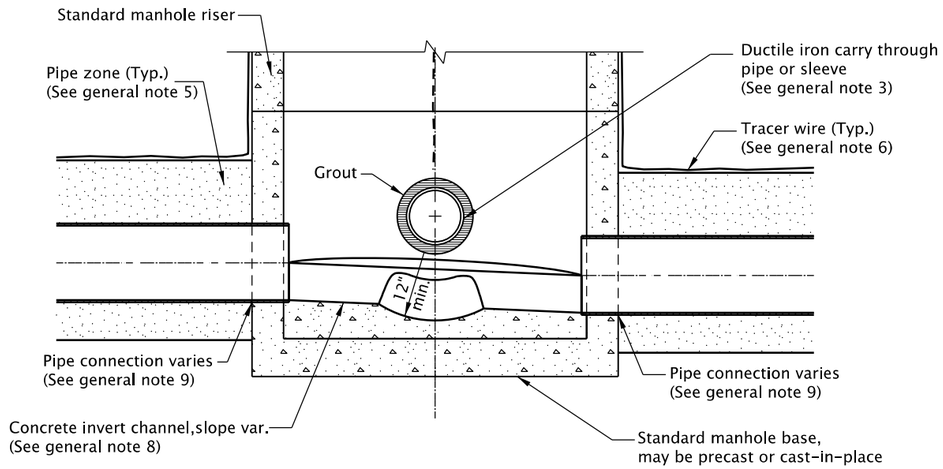
DATE	REVISION DESCRIPTION

rd352.dgn 20-JUL-2020

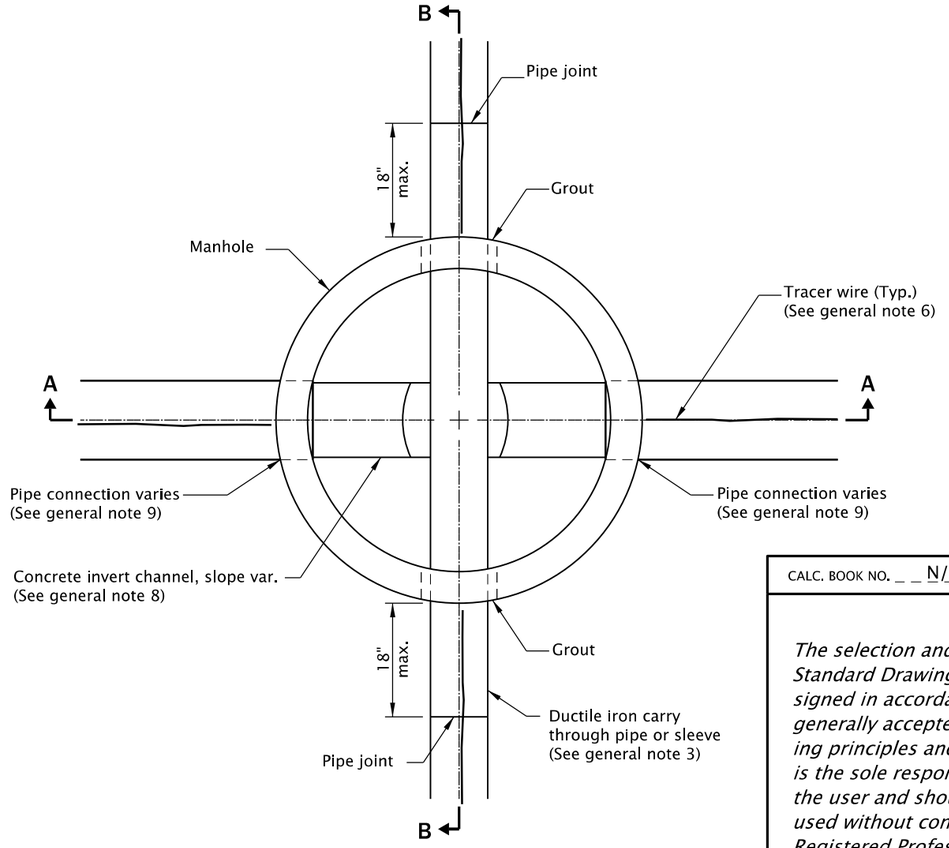
RD352



SECTION B-B



SECTION A-A



PLAN

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. See appropriate manhole standard drawings for details not shown.
2. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans. See project plans for pipe material.
3. Carry through pipe or sleeve shall be ductile iron, class as specified. No joints allowed on the carry through pipe or sleeve inside the manhole.
4. This manhole design shall be used only as directed by the engineer to mitigate unavoidable grade conflicts.
5. Pipe zone varies, see Std. Dwg. RD300.
6. All connecting pipes shall have a tracer wire, or approved alternate. See Std. Dwg. RD336 for tracer wire details.
7. See Std. Dwg. RD336 for manhole steps details.
8. Invert channels shall be constructed to provide smooth slopes and radii to outlet pipe.
9. See Std. Dwg. RD345 for pipe to manhole connections.

CALC. BOOK NO. N/A

SDR DATE 14-JUL-2014

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

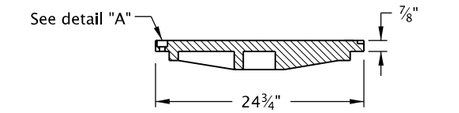
CARRY THROUGH MANHOLE - STORM

2021

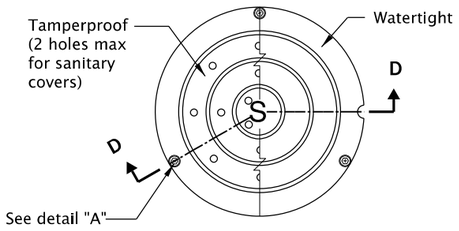
DATE	REVISION DESCRIPTION

rd354.dgn 20-JUL-2020

RD354



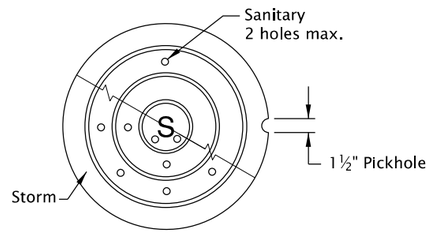
SECTION D-D



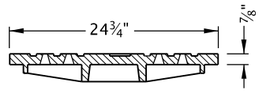
PLAN

CAST IRON TAMPERPROOF & WATERTIGHT COVER

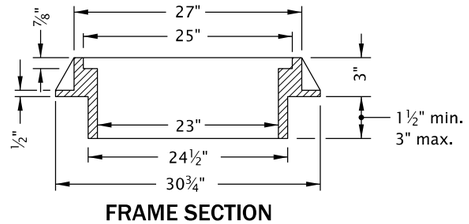
(Frames available in standard or suburban pattern)



COVER PLAN



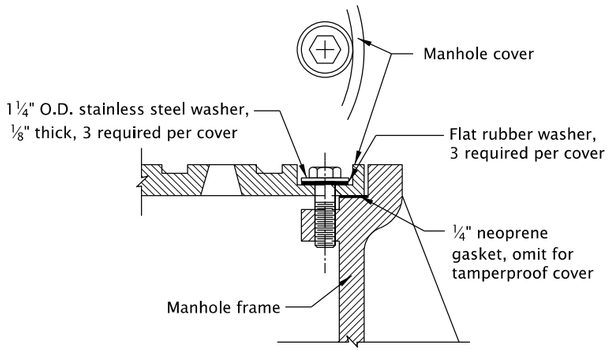
COVER SECTION



FRAME SECTION

CAST IRON SUBURBAN MANHOLE COVER & FRAME

For use on local streets only, as specified

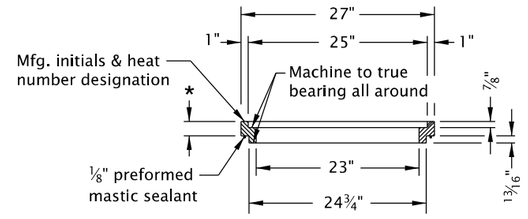


NOTE:
3 required, equally spaced, ½"x1½" pentagonal or hexagonal head, bronze or stainless steel. Install frame so that one bolt boss is located over the manhole steps (See general note 8).

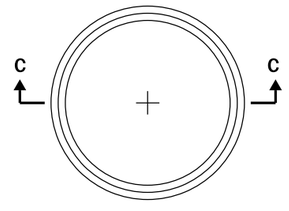
BOLT-DOWN (FOR TAMPERPROOF AND WATERTIGHT)

DETAIL "A"

* Std. depths 1½", 2", 2½" & 3"
Matl. to be grey cast iron ASTM A 48, Class 35B. Tolerance on non-machined surfaces to be |0.06", see general note 6



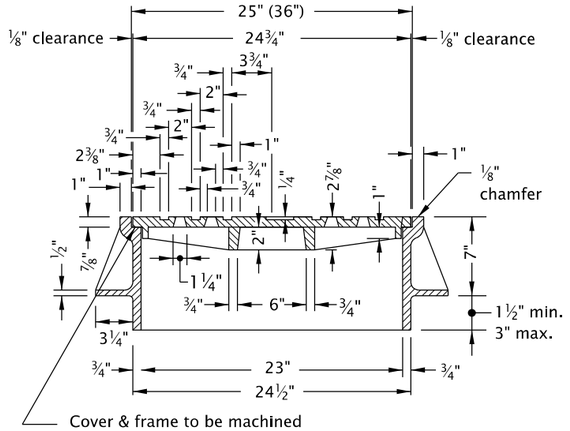
SECTION C-C



PLAN

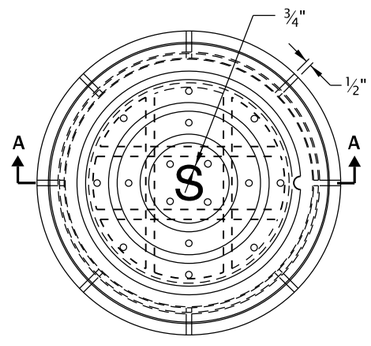
MANHOLE ADJUSTMENT RING

For use with Standard Manhole Frame



SECTION A-A

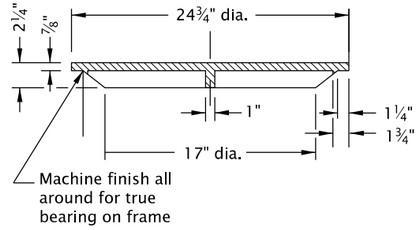
36" min. diameter cover is required for manholes with depths of 20' or greater. (See general note 4)



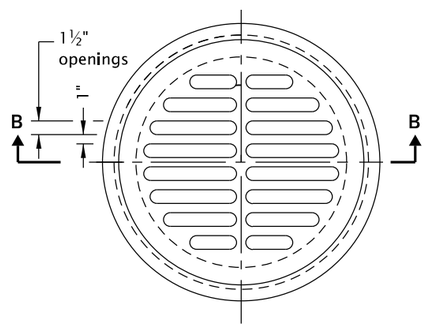
NOTE:
Coat outside of frame with asphalt, where frame is to be placed in conc. pvmt., conc. gutter, or walk.

PLAN

STANDARD MANHOLE COVER & FRAME



SECTION B-B



For use with Standard Manhole Frame
(See general note 7)

PLAN

STANDARD MANHOLE GRATE

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Tamperproof covers required on sanitary or storm drain manhole where located in pedestrian ways or easement areas. Covers for sanitary manholes shall have 2 holes maximum.
2. Watertight covers required if located where cover may be submerged (no holes).
3. Covers and frames shall be stamped with manufacturer's initials, heat number and point of origin.
4. See Std. Dwg. RD336 for manhole steps.
5. See Std. Dwg. RD360 for manhole frame adjustment.
6. See ODOT's QPL for alternate manhole adjustment rings.
7. Manhole grate allowed only in locations not subject to bicycle or pedestrian use.
8. See ODOT's QPL for alternate bolt-down products.

CALC. BOOK NO. N/A

SDR DATE 21-JUN-2019

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

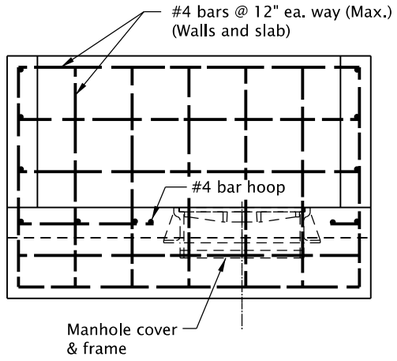
MANHOLE COVERS AND FRAMES

2021

DATE	REVISION DESCRIPTION

rd356.dgn 20-JUL-2020

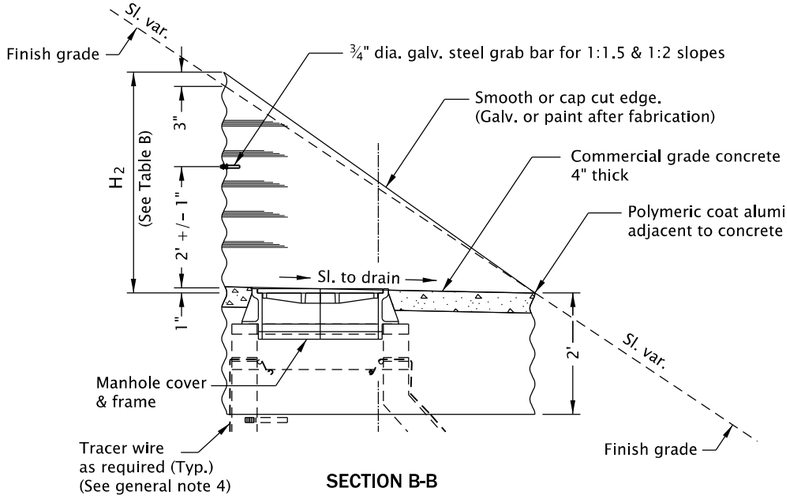
RD356



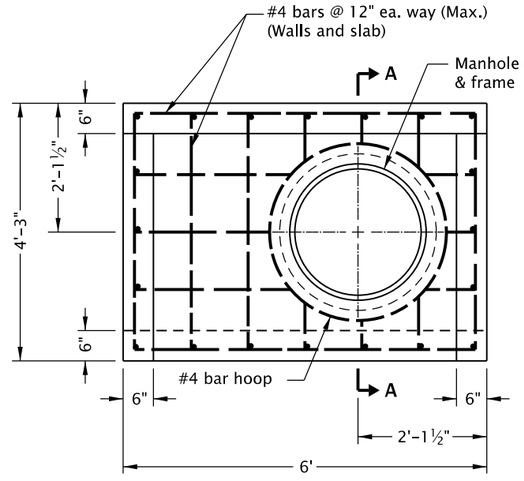
ELEVATION

TABLE A

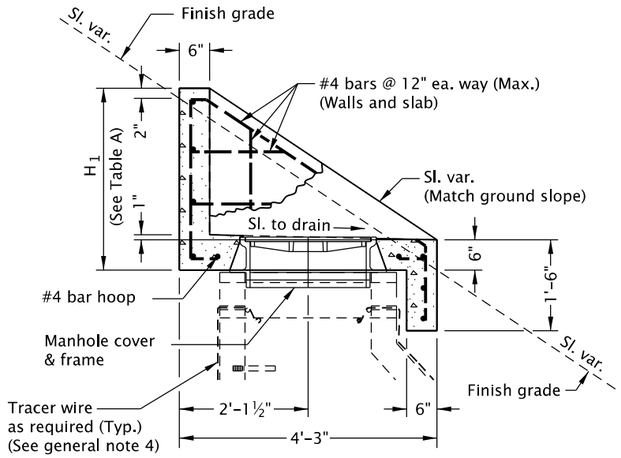
SLOPE	H_1	CONC. (Cubic yard)	REINFORCEMENT (lb)
1 : 1.5	3'-0"	1.00	92
1 : 2	2'-4"	0.88	79
1 : 3	1'-8"	0.76	74
1 : 4	1'-3"	0.68	66
1 : 6	1'-0"	0.64	63



SECTION B-B

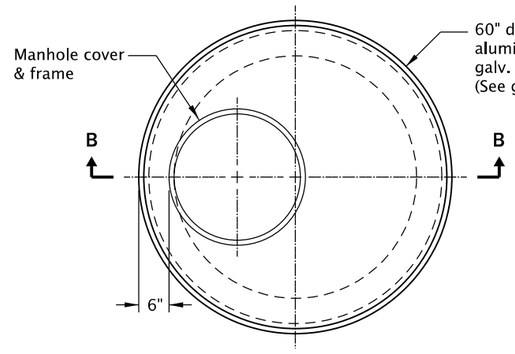


PLAN



SECTION A-A

CONCRETE SLOPE PROTECTOR



PLAN

TABLE B

SLOPE	H_2
1:1.5	3'-8"
1:2	2'-9"
1:3	2'-0"
1:4	1'-6"
1:6	1'-1"

METAL PIPE SLOPE PROTECTOR

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All reinforcing bars shall be placed 2" clear of nearest face of conc. unless shown or noted otherwise.
2. All reinforcing bar splices to be 20 times the bar dia.
3. See Std. Dwg. RD336 for manhole steps details.
4. See Std. Dwg. RD336 for tracer wire details.
5. See Std. Dwg. RD356 for manhole cover & frame.
6. See appropriate manhole standard drawings for details not shown.
7. All concrete shall be commercial grade concrete.
8. See Std. Dwg. RD380 for details not shown.

CALC. BOOK NO. N/A

SDR DATE 14-JUL-2014

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

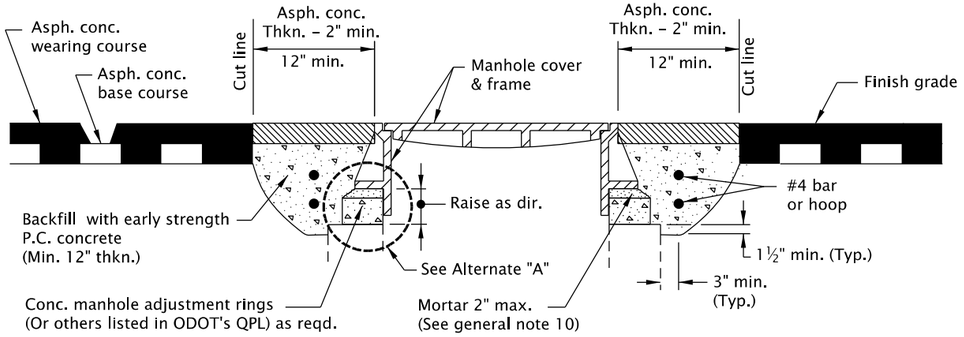
MANHOLE SLOPE PROTECTORS

2021

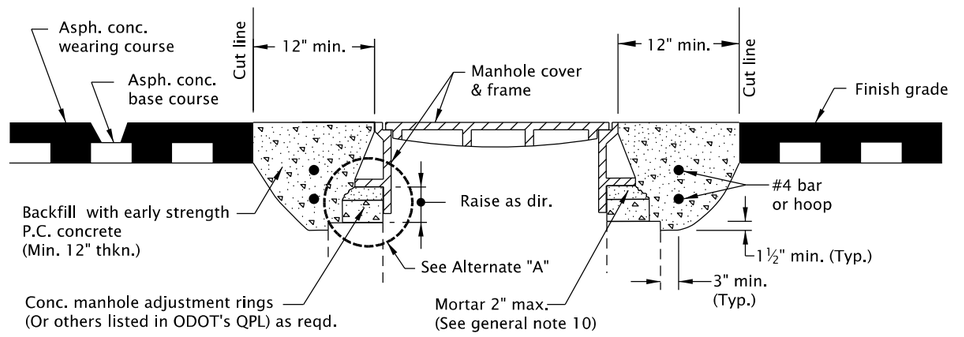
DATE	REVISION DESCRIPTION

rd358.dgn 20-JUL-2020

RD358



METHOD "A"



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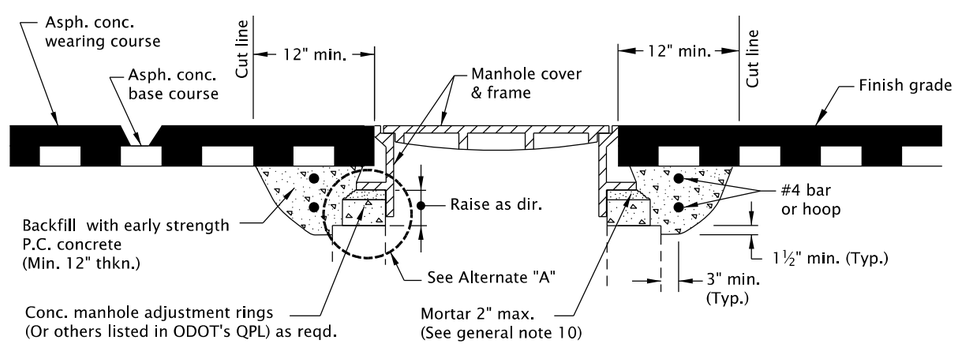

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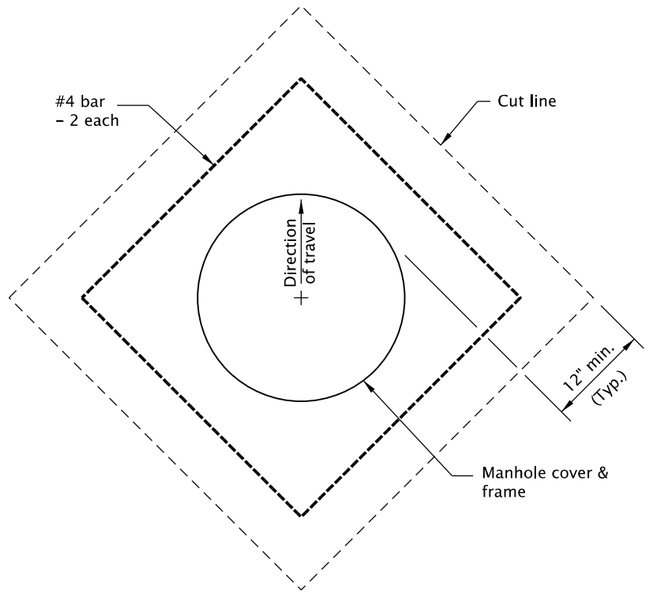
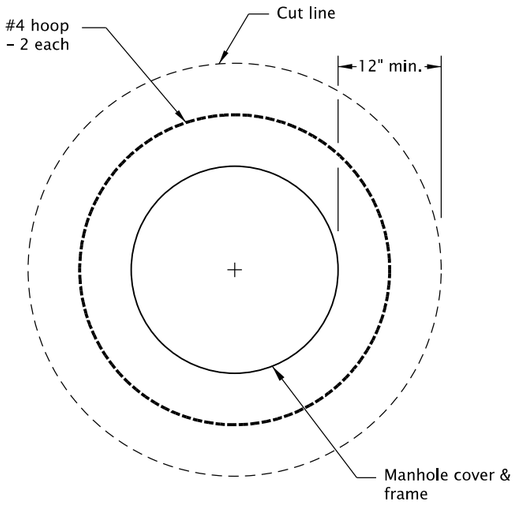
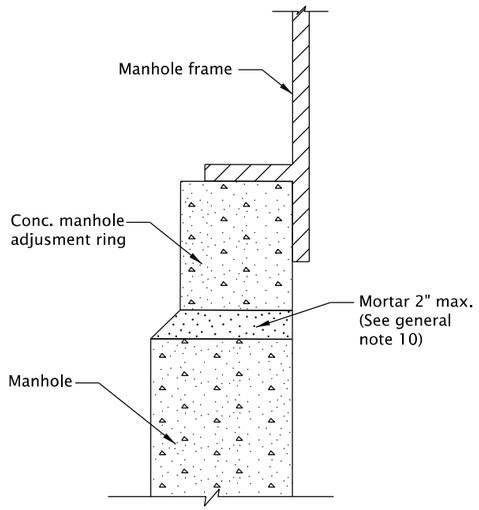


PLAN
SQUARE CUT



PLAN
CIRCULAR CUT



ALTERNATE "A"

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Cover manhole with building paper and const. asph. conc. base course and wearing courses.
2. Saw cut square or circular excavation around manhole 12" min. from manhole frame.
3. Raise manhole cover and frame to finish grade by installing conc. manhole adjustment rings and leveling mortar, as shown.
4. Backfill with early strength Portland Cement Concrete. All concrete shall be commercial grade concrete.
5. Protect from traffic loading until conc. has cured to 3000 psi.
6. Apply tack coat to edges of existing pavement before installing patch.
7. Finish joint with asphalt seal and sand.
8. See Std. Dwg. RD336 for manhole steps details.
9. See appropriate manhole standard drawings for details not shown.
10. Use epoxy for synthetic grade rings.
11. See Std. Dwg. RD336 for tracer wire details.
12. See Std. Dwg. RD356 for manhole covers and frames.

CALC. BOOK NO. N/A

SDR DATE 21-JUL-2015

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

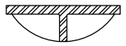
MANHOLE FRAME ADJUSTMENT

2021

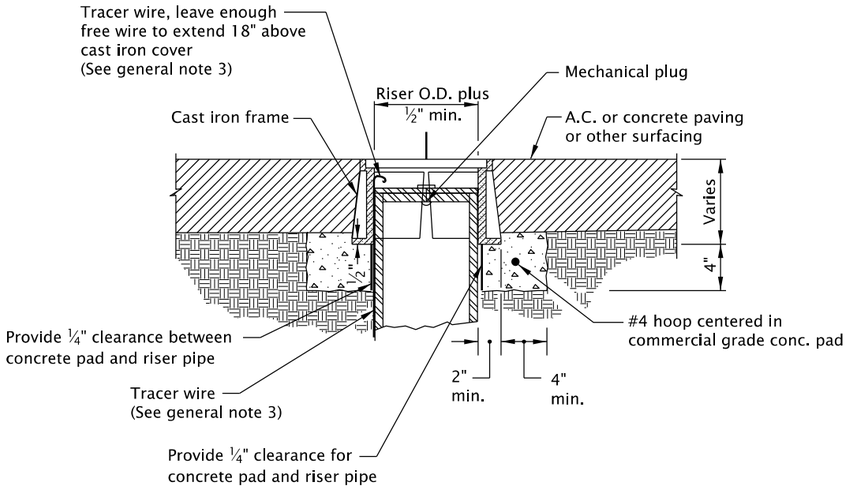
DATE	REVISION DESCRIPTION

rd360.dgn 20-JUL-2020

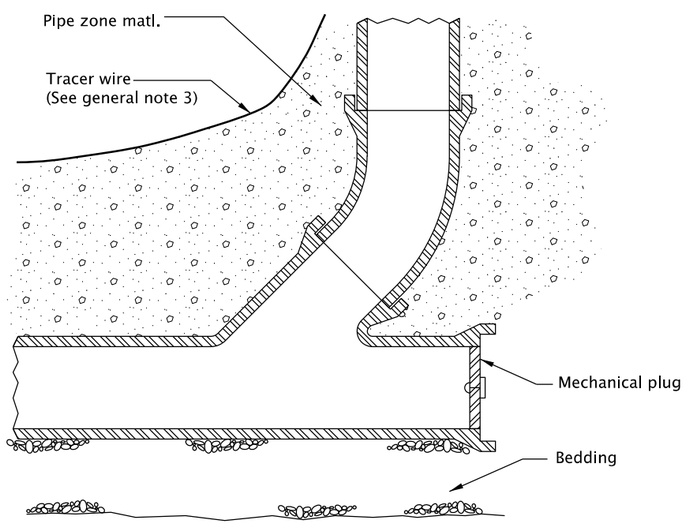
RD360



CAST IRON COVER



CAST IRON FRAME



CLEANOUT

CALC. BOOK NO. N/A	SDR DATE 14-JUL-2014
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.	NOTE: All material and workmanship shall be in accordance with the current Oregon Standard Specifications

OREGON STANDARD DRAWINGS

SANITARY CLEANOUT

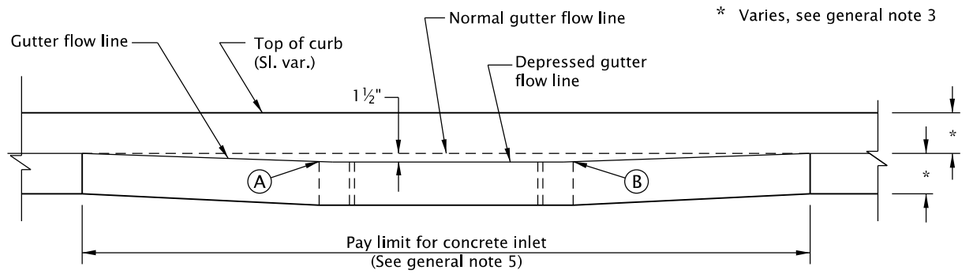
2021

DATE	REVISION DESCRIPTION

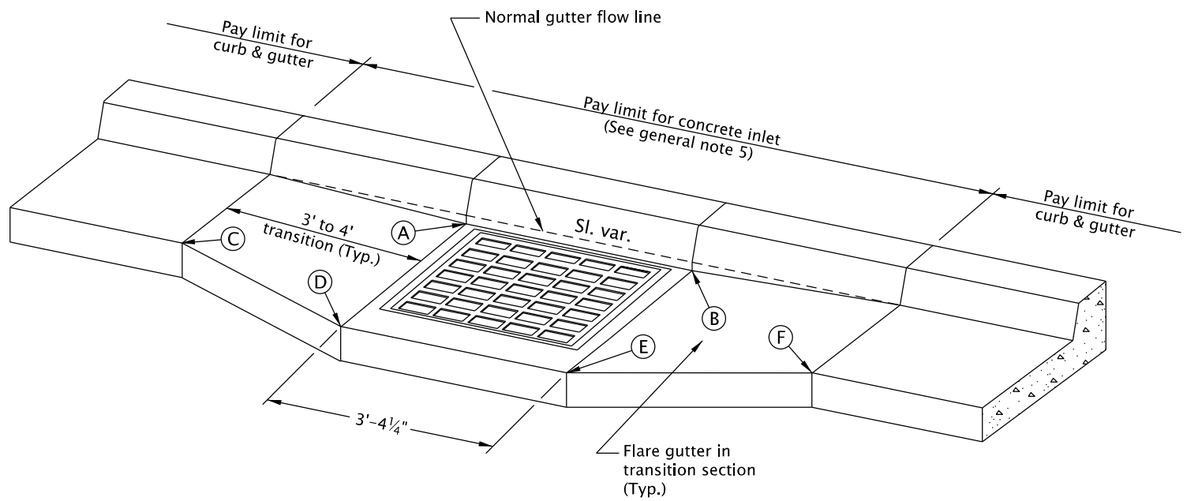
rd362.dgn 20-JUL-2020

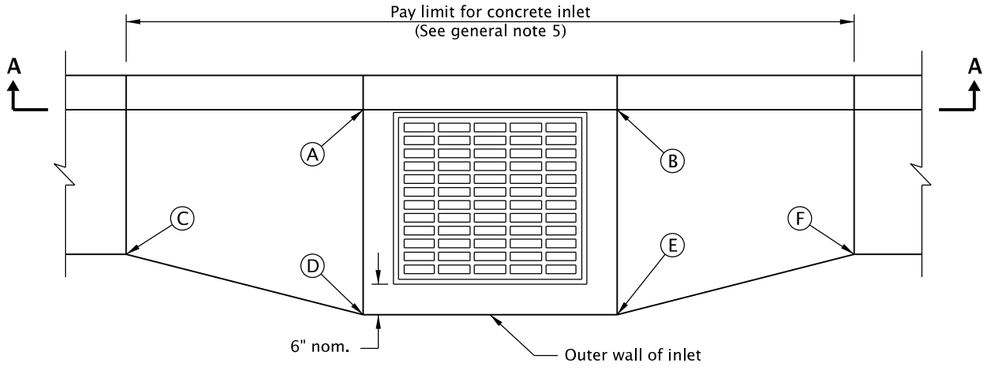
RD362

NOTES:
1. Provide 1½" local depression at points A & B.
2. Match normal pvmt. grade at points C, D, E & F.
3. Vary transition section slopes to match above points.



SECTION A-A





PLAN VIEW

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. For inlet details, see appropriate inlet standard drawing(s).
2. For frame and grate details, see Std. Dwg. RD365.
3. For curb details, see Std. Dwgs. RD700 & RD701.
4. All concrete shall be commercial grade concrete.
5. Pay limit for inlet is expanded when curb and gutter are monolithic.

CALC. BOOK NO. N/A

SDR DATE 21-JUL-2015

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

GUTTER TRANSITION AT INLET

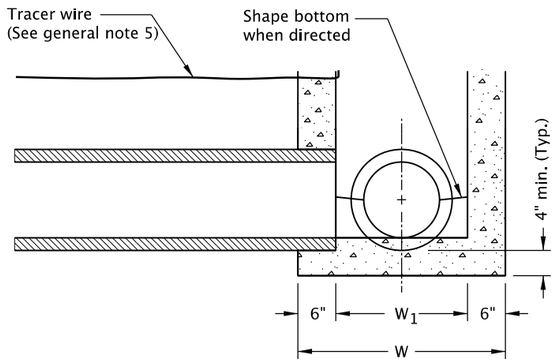
2021

DATE	REVISION DESCRIPTION

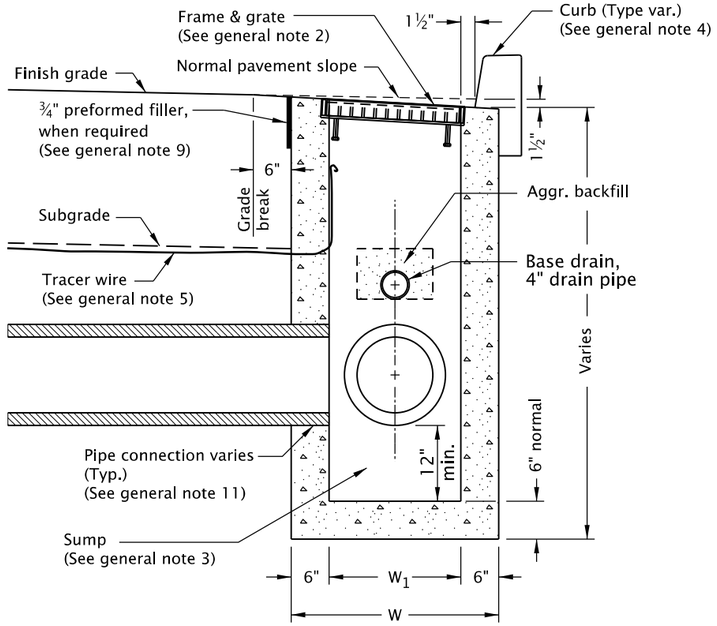
Effective Date: June 1, 2022 - November 30, 2022

RD363

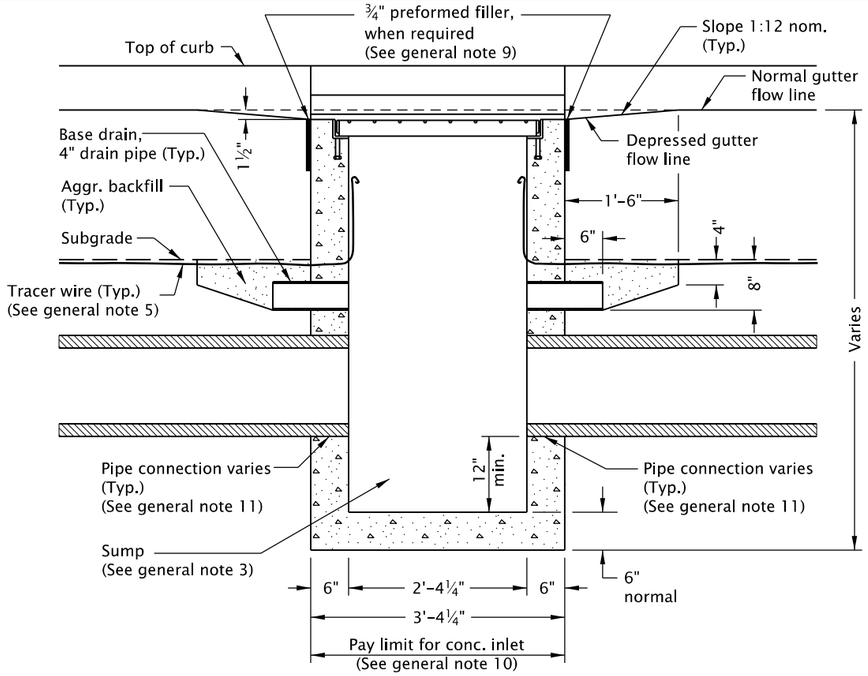
rd363.dgn 20-JUL-2020



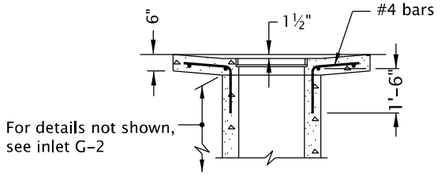
DETAIL A
WITHOUT SUMP



SECTION B - B



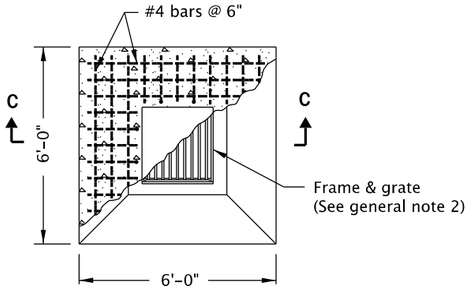
SECTION A - A



SECTION C-C

NOTE:

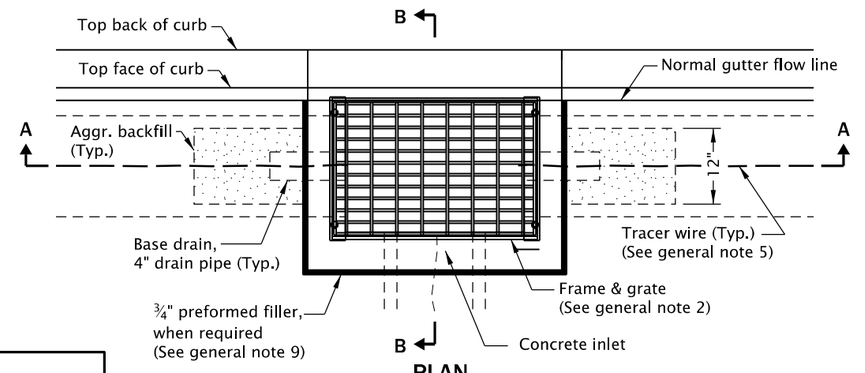
All reinforcement to be placed 2" clear of nearest face of concrete unless shown or noted otherwise



PLAN

TYPE G-2MA

TABLE A		
INLET TYPE	W	W_1
G-1	2'-8⅞"	1'-8⅞"
G-2, G-2M, G-2MA	3'-3⅜"	2'-3⅜"



PLAN

TYPE G-1, G-2, G-2M

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Where precast inlets are used as an alternate to cast-in-place inlets, a 4" compacted leveling bed of sand or ¼"-0 crushed aggregate shall be provided. All precast inlets shall conform to requirements of ASTM C913.
2. Graphics show G-1 inlet with Type 2 grate. See Table A for inlet dimensions.
   Type 1 grate allowed only in locations not subject to bicycle or pedestrian use.
   For frame and grate details, see Std. Dwg. RD365.
3. Provide sump only where shown on plans, and allowed by jurisdiction. See Detail A for inlet without sump.
4. For curb details, see Std. Dwgs. RD700 & RD701.
5. See Std. Dwg. RD336 for tracer wire details, or approved alternate.
6. Max. pipe diameter varies with pipe material.
7. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.
8. All concrete shall be commercial grade concrete.
9. ¾" preformed filler (in concrete pavement or gutter only) to extend through thickness of concrete.
10. See Std. Dwg. RD363 for gutter transition section, when curb and gutter are required.
11. See Std. Dwg. RD339 for pipe to structure connections.

CALC. BOOK NO. N/A

SDR DATE 21-JUL-2015

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

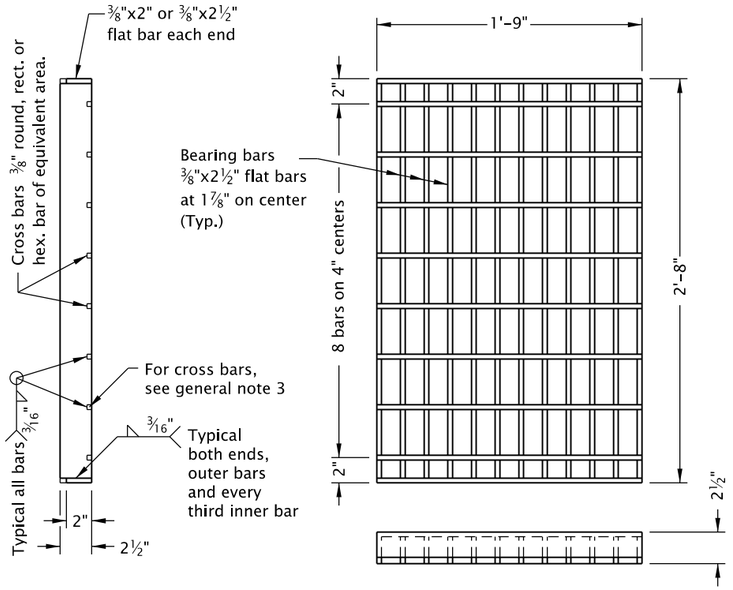
CONCRETE INLETS
TYPE G-1, G-2, G-2M, & G-2MA

2021

DATE	REVISION DESCRIPTION

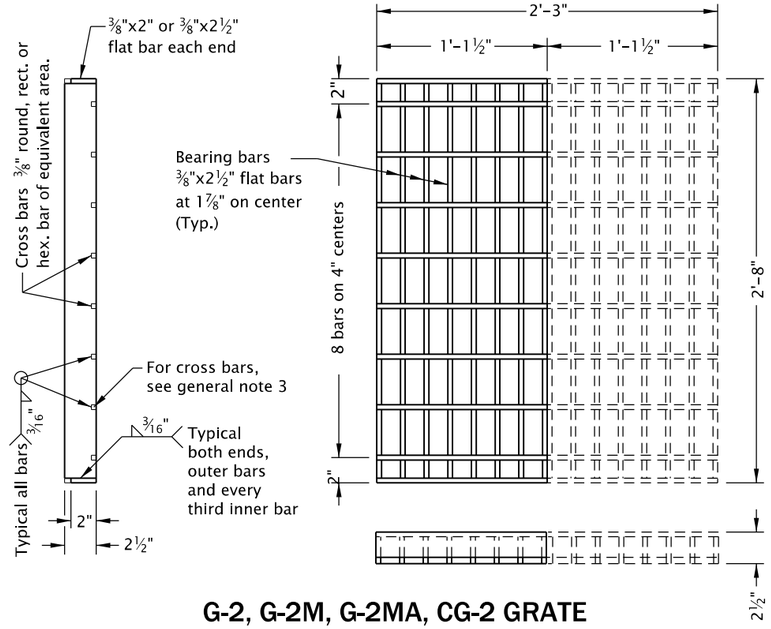
rd364.dgn 20-JUL-2020

RD364



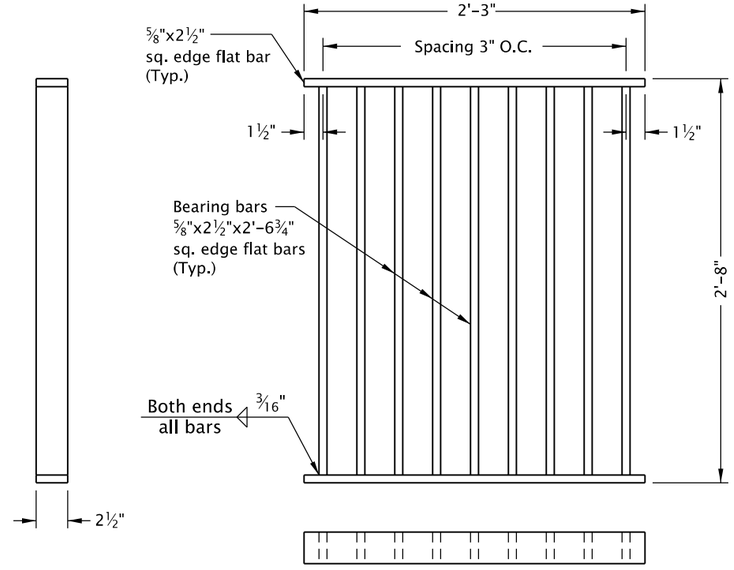
G-1, CG-1 GRATE (TYPE 2)

(Bicycle-safe)



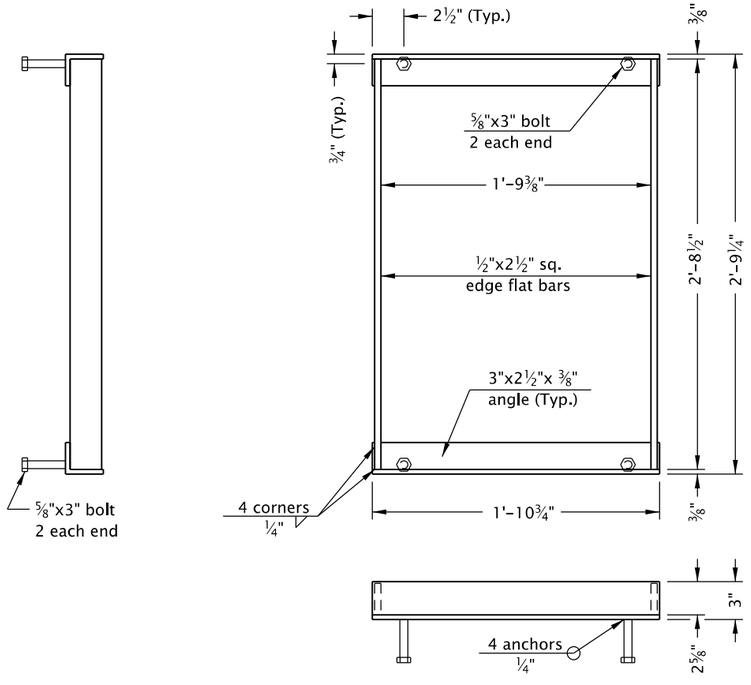
G-2, G-2M, G-2MA, CG-2 GRATE (TYPE 2)

(Bicycle-safe)
(2 grates required per inlet, as shown)

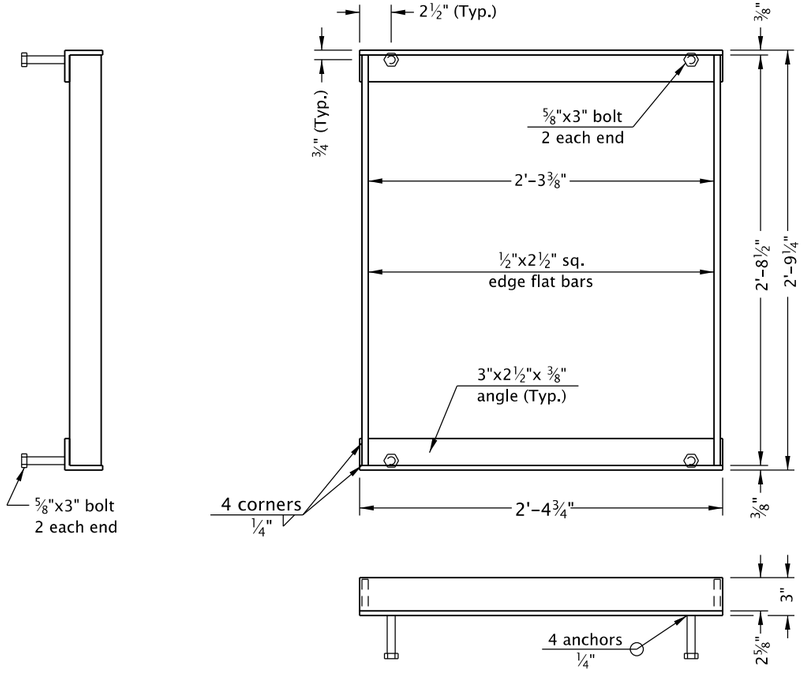


G-2, G-2M, G-2MA, CG-2 GRATE (TYPE 1)

(See general note 2)



G-1, CG-1 FRAME



G-2, G-2M, G-2MA, CG-2 FRAME

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. For inlet details, see appropriate inlet standard drawing(s).
2. Type 1 grate allowed only in locations not subject to bicycle or pedestrian use.
3. 3/8" cross bars shall be flush with the top of grate surface and may be fillet welded, resistance welded or electroforged to bearing bars.
4. Hot dip galvanize after fabrication.
5. Cast iron grate and frame are acceptable alternates. See ODOT's QPL.

CALC. BOOK NO. N/A

SDR DATE 14-JUL-2014

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

FRAMES & GRATES FOR CONCRETE INLETS

2021

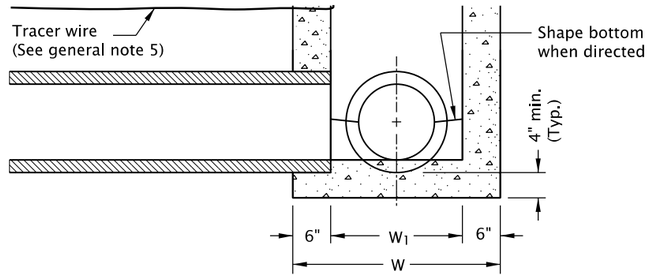
DATE	REVISION DESCRIPTION

rd365.dgn 20-JUL-2020

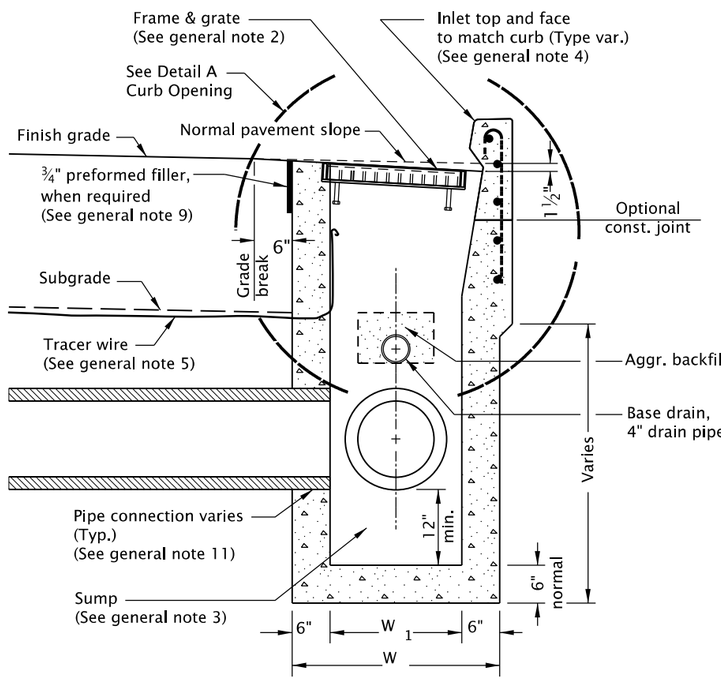
RD365

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

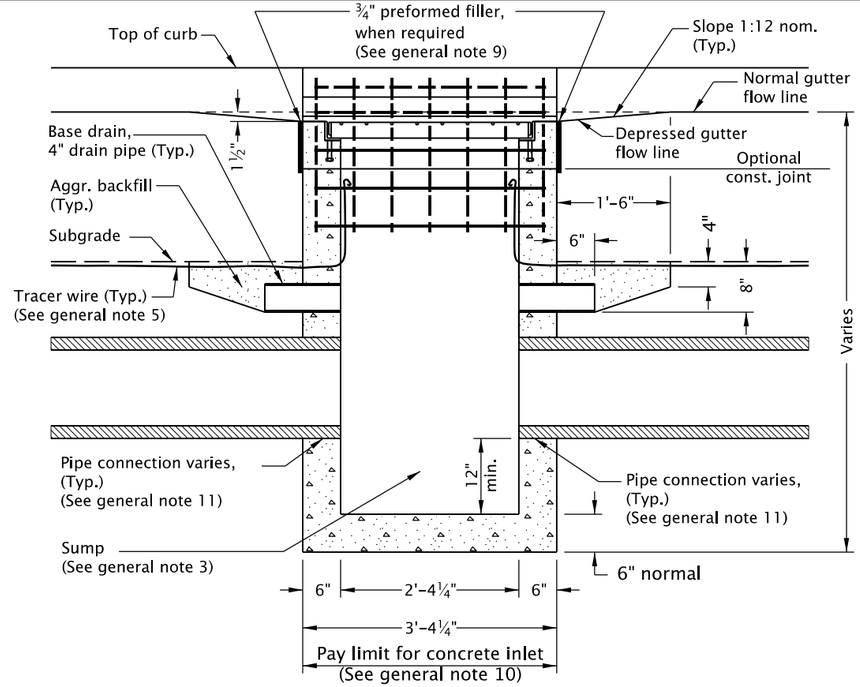
1. Where precast inlets are used as an alternate to cast-in-place inlets, a 4" compacted leveling bed of sand or ¼"-0 crushed aggregate shall be provided. All precast inlets shall conform to requirements of ASTM C913.
2. Graphics show CG-1 inlet with Type 2 grate. See Table A for inlet dimensions. Type 1 grate allowed only in locations not subject to bicycle or pedestrian use. For frame and grate details, see Std. Dwg. RD365.
3. Provide sump only where shown on plans, and allowed by jurisdiction. See Detail B for inlet without sump.
4. For curb details, see Std. Dwgs. RD700 & RD701.
5. See Std. Dwg. RD336 for tracer wire details, or approved alternate.
6. Max. pipe diameter varies with pipe material.
7. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.
8. All concrete shall be commercial grade concrete.
9. ¾" preformed filler (in concrete pavement or gutter only) to extend through thickness of concrete.
10. See Std. Dwg. RD363 for gutter transition section, when curb and gutter are required. (Pay limit for inlet is expanded when curb and gutter are monolithic)
11. See Std. Dwg. RD339 for pipe to structure connections.



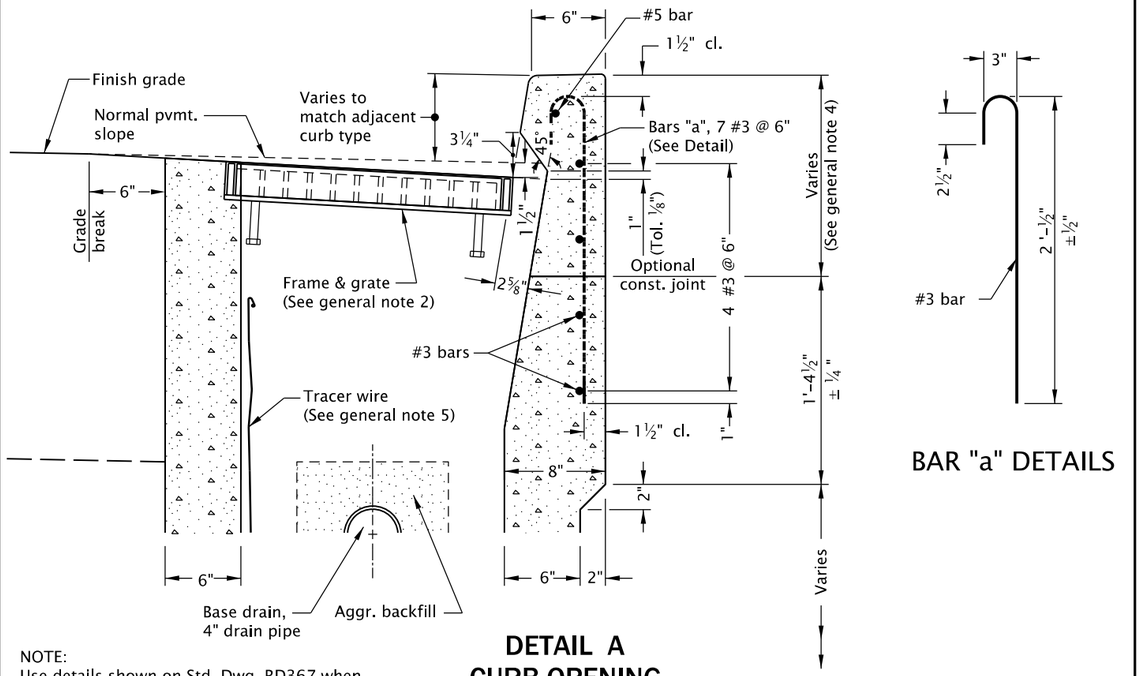
DETAIL B WITH-OUT SUMP



SECTION B - B



SECTION A - A



NOTE:
Use details shown on Std. Dwg. RD367 when curb inlet channels are used.

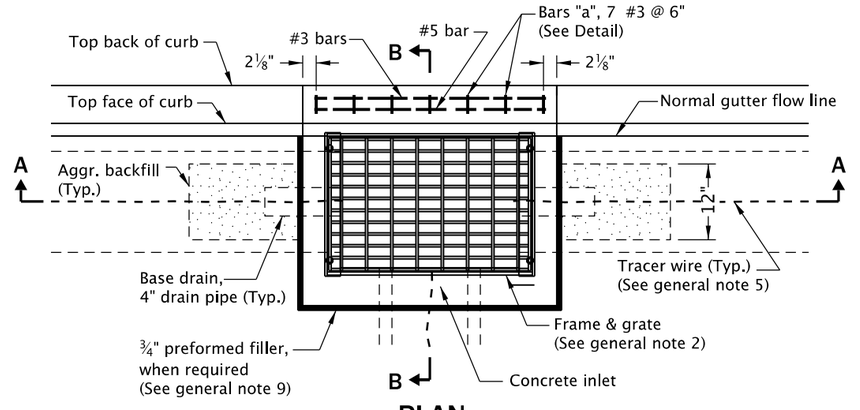
DETAIL A CURB OPENING

BAR "a" DETAILS

TABLE A		
INLET TYPE	W	W_1
CG-1	2'-8⅞"	1'-8⅞"
CG-2	3'-3⅜"	2'-3⅜"

NOTES:

1. #3 "a" bars to be placed during curb construction.
2. All bars to be placed 1½" clear of nearest face of concrete unless shown or noted otherwise.
3. All bars shall be full length.



PLAN

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

SDR DATE 20-JUL-2020

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

OREGON STANDARD DRAWINGS

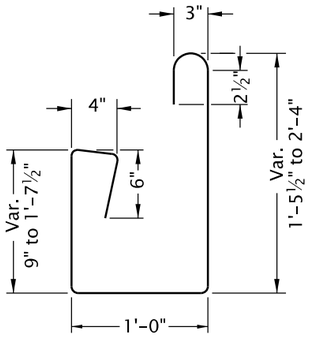
CONCRETE INLETS TYPE CG-1, CG-2

2021

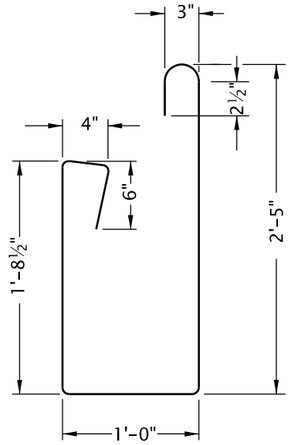
DATE	REVISION DESCRIPTION

rd366.dgn 20-JUL-2020

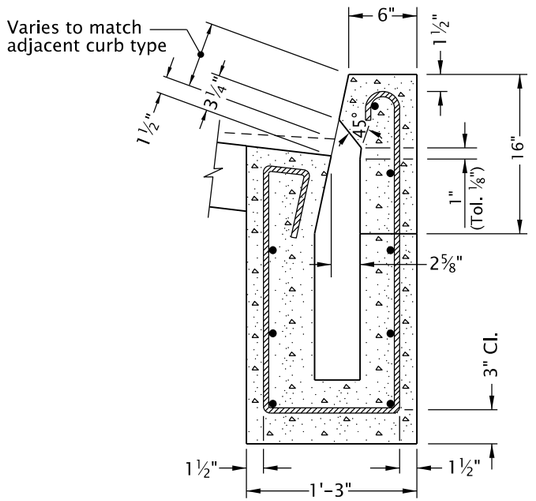
RD366



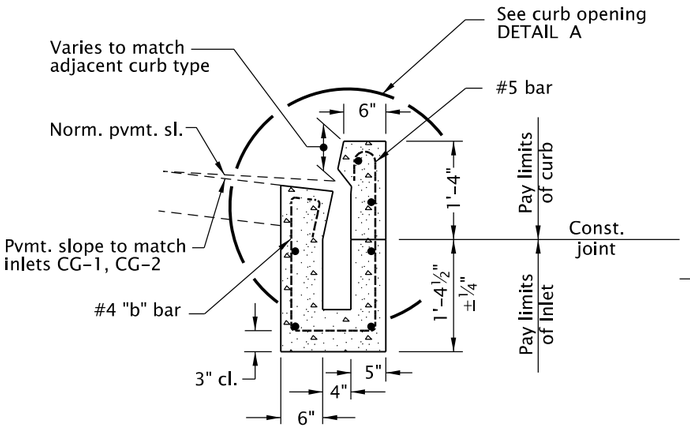
#3 "b" BAR



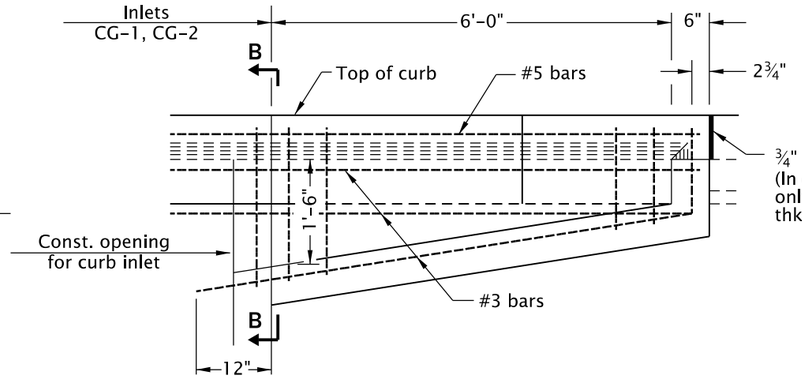
#4 "b" BAR



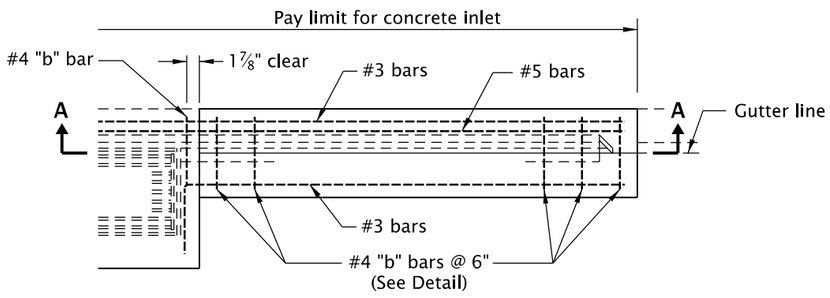
DETAIL A
CURB OPENING



SECTION B-B



SECTION A-A



PLAN

NOTES:
1. #4 "b" bar replaces #3 "a" bar of type CG-1 and CG-2 inlets.
2. #4 & #3 "b" bars to be placed during curb construction.
3. All bars to be placed 1½" clear of nearest face of concrete unless shown or noted otherwise.
4. All bar splices shall be 20 dia.

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. For inlet details, see appropriate inlet standard drawing(s).
2. For frame and grate details, see Std. Dwg. RD365.
3. For curb details, see Std. Dwgs. RD700 & RD701.
4. All concrete shall be commercial grade concrete.

CALC. BOOK NO. N/A

SDR DATE 20-JUL-2020

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

CURB INLET CHANNEL

2021

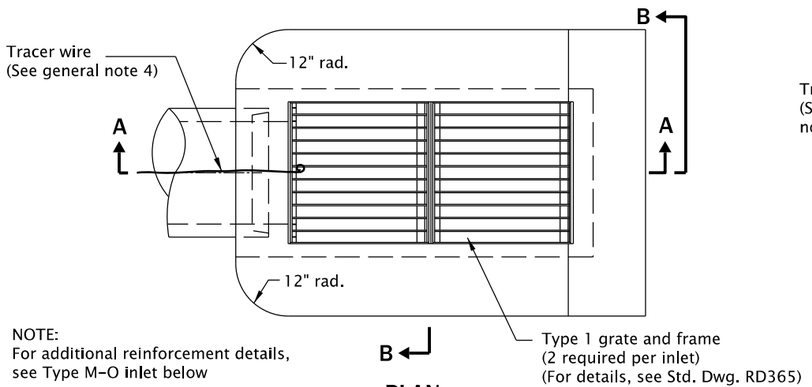
DATE	REVISION DESCRIPTION

rd367.dgn 20-JUL-2020

RD367

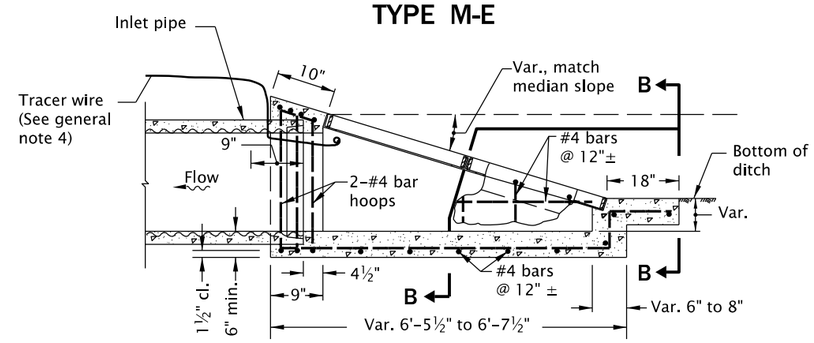
rd368.dgn 20-JUL-2020

TYPE M-E

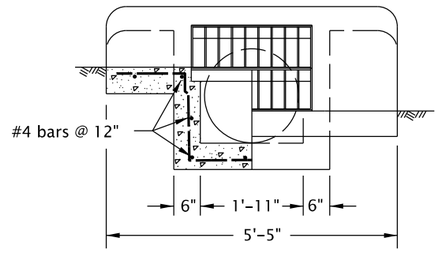


NOTE:
For additional reinforcement details, see Type M-O inlet below

PLAN

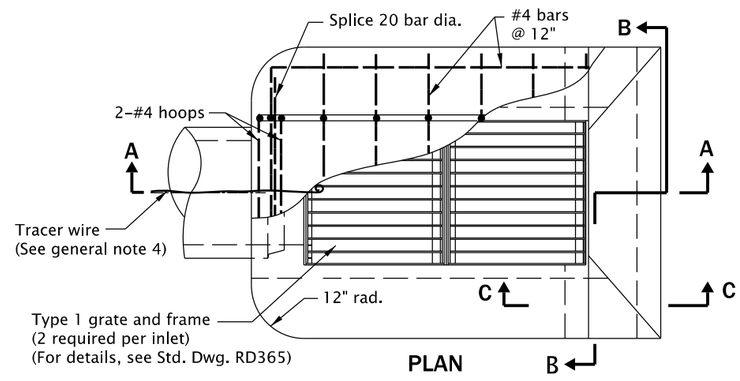


SECTION A-A

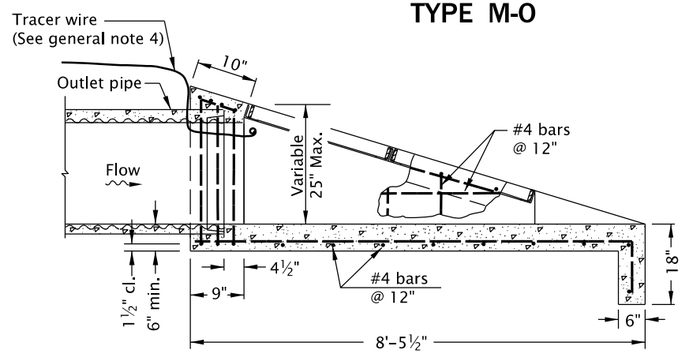


SECTION B-B

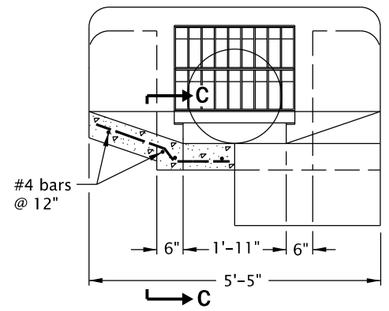
TYPE M-O



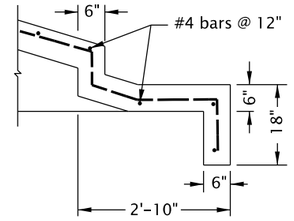
PLAN



SECTION A-A



SECTION B-B

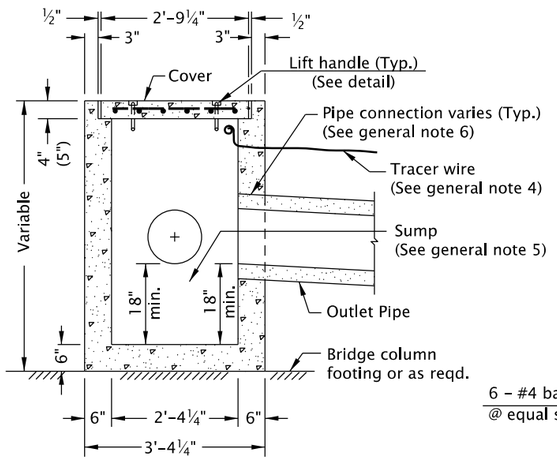


SECTION C-C

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Max. pipe diameter varies with pipe material.
2. All reinforcement to be placed a minimum of 2" clear of nearest face of concrete unless otherwise shown or noted. Reinforcement to be lapped 20 bar diameters at splices.
3. When uncoated metal pipe or arch pipe are used, an asphaltic or similar type protective coating shall be applied to the exterior surface.
4. See Std. Dwg. RD336 for tracer wire details, or approved alternate.
5. Provide sump only where shown on plans, and allowed by jurisdiction. For sump details, see Std. Dwg. RD364.
6. See Std. Dwg. RD339 for pipe to structure connections.
7. All precast inlets shall conform to requirements of ASTM C913.

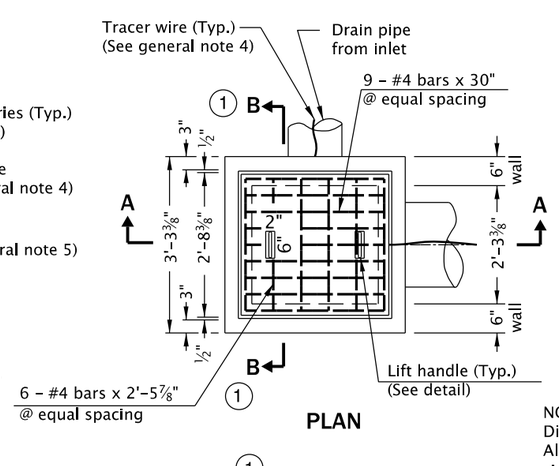
TYPE B



SECTION A-A

* All cover bars for Type B & B-SL inlets to be placed 1½" clear of nearest face of concrete unless shown or noted otherwise.

TYPE B-SL

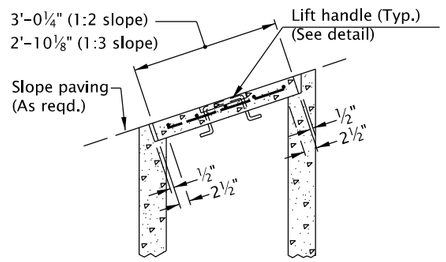


PLAN

1 See Type B-SL

SLOPE INSTALLATION

(For details not shown, see Type B)

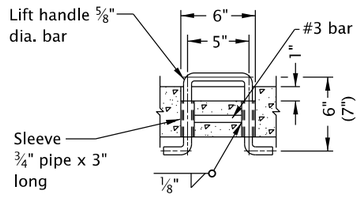


SECTION B-B

NOTE: ("TYPE B" MODIFIED INLET)
Dimensions shown in parenthesis are for Type B Modified inlet.
All cover bars for "Type B" Modified inlet are to be placed 1" min. clear of bottom face of concrete and 2½" min. clear of top face of concrete. "Type B" modified inlet to be used if B inlet is under traffic.

LIFT HANDLE

(Install loose in sleeve)



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

SDR DATE 22-JUL-2016

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

OREGON STANDARD DRAWINGS

CONCRETE INLETS
TYPE M-E, M-O, B AND B-SL

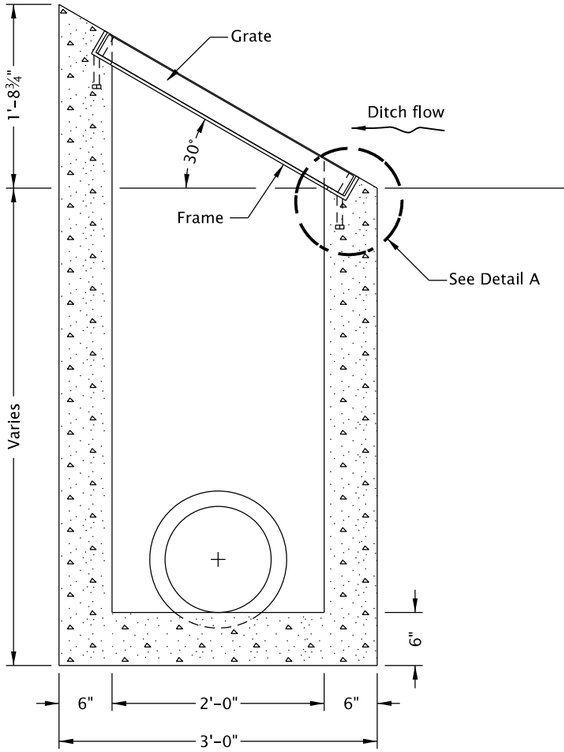
2021

DATE	REVISION DESCRIPTION

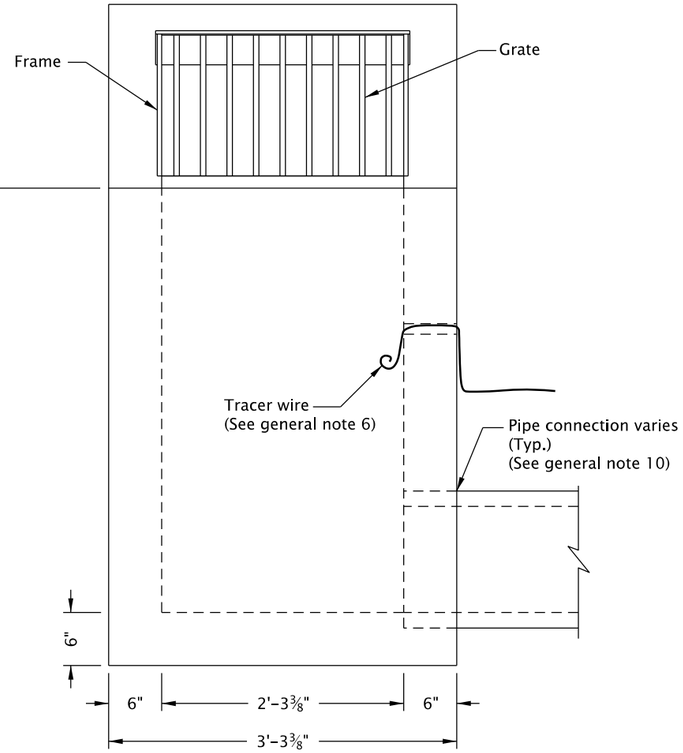
RD368

Effective Date: June 1, 2022 - November 30, 2022

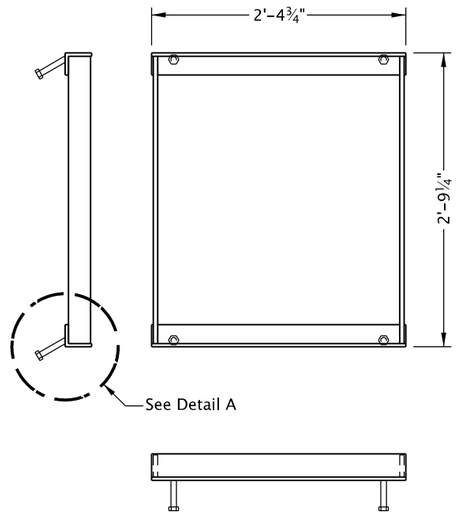
rd370.dgn 20-JUL-2020



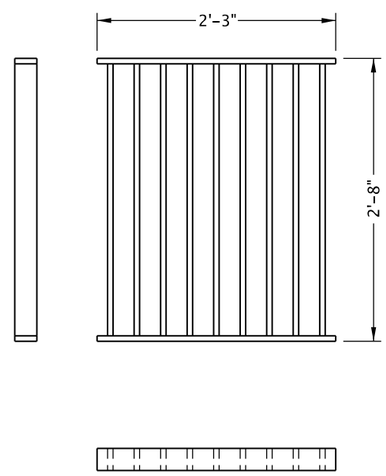
SECTION A - A



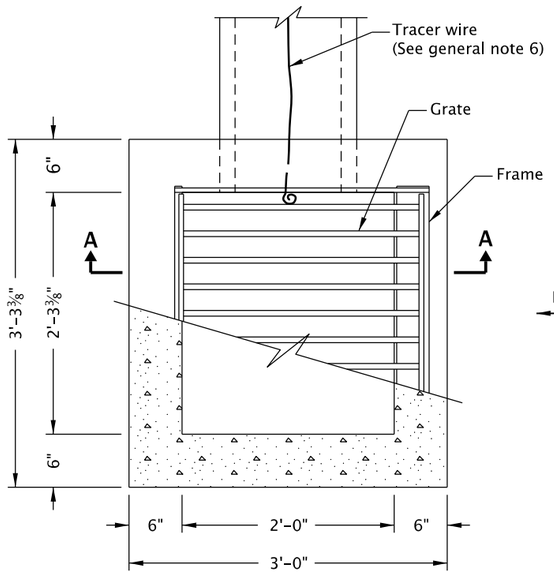
ELEVATION



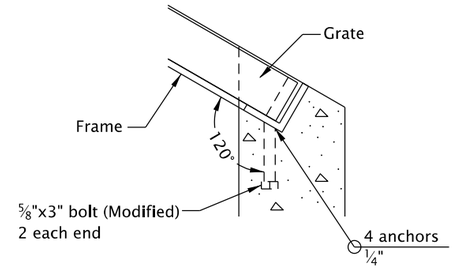
G-2 FRAME
(See general note 2)



G-2 GRATE (TYPE 1)
(See general note 2)



PLAN



DETAIL A
(Anchor bolt modication, see general note 2)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All concrete shall be commercial grade concrete.
2. For frame & grate details not shown, see Std. Dwg. RD365.
   Modify anchor bolt attachment to frame as shown in Detail A.
   G-2 (Type 2) grates may be used if approved by the engineer.
3. Catch basin, frame, and grates shall meet H20 loading.
4. Provide sump only when shown on plans, and allowed by jurisdiction. For sump details, see Std. Dwg. RD364.
5. ⅝" cross bars shall be flush with the grate surface and may be fillet welded, resistance welded or electroforged to bearing bars.
6. See Std. Dwg. RD336 for tracer wire details, or approved alternate.
7. Max. pipe diameter varies with pipe material.
8. Do not use in locations where inlet can be struck by an errant vehicle, or provide shielding of inlet.
9. Inlet base may be cast-in-place or precast. Where precast inlet base is used as an alternate, a 4" compacted leveling bed of sand or ¼"-0 crushed aggregate shall be provided.
   All precast inlets shall conform to requirements of ASTM C913.
10. See Std. Dwg. RD339 for pipe to structure connections.
11. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.

CALC. BOOK NO. N/A

SDR DATE 21-JUL-2015

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.

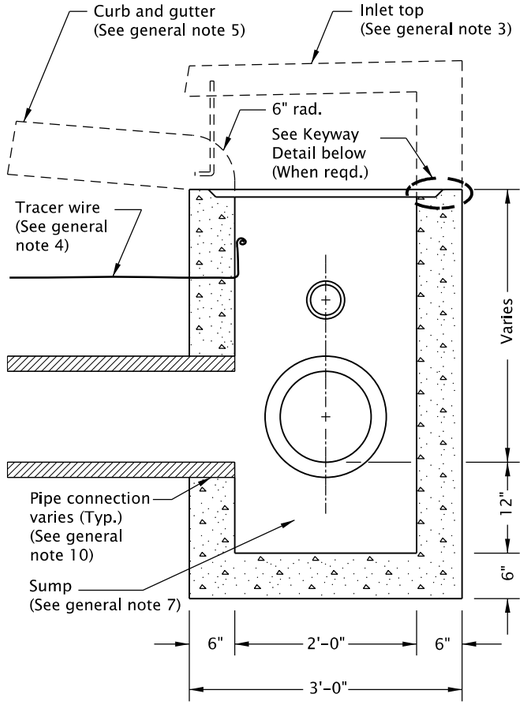
OREGON STANDARD DRAWINGS

DITCH INLET TYPE D

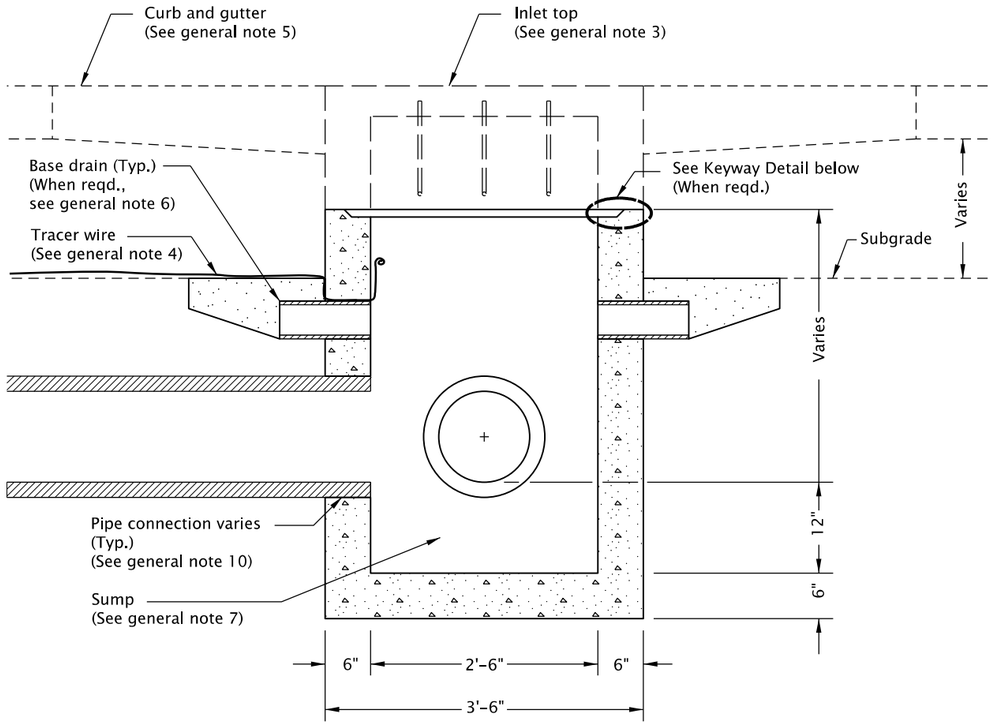
2021

DATE	REVISION DESCRIPTION

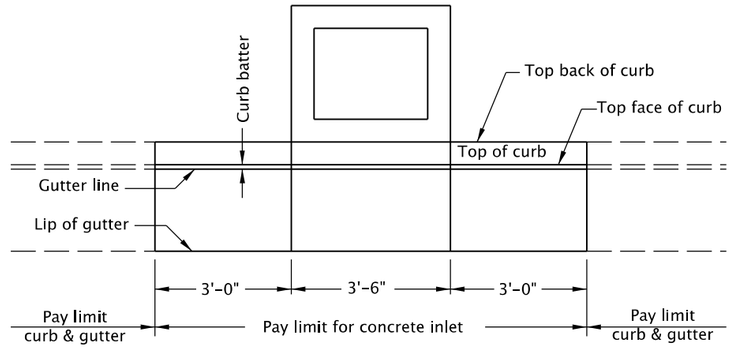
RD370



SECTION B - B



SECTION A - A

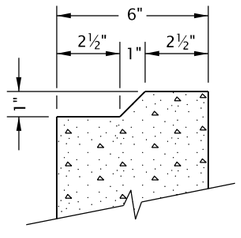


PLAN

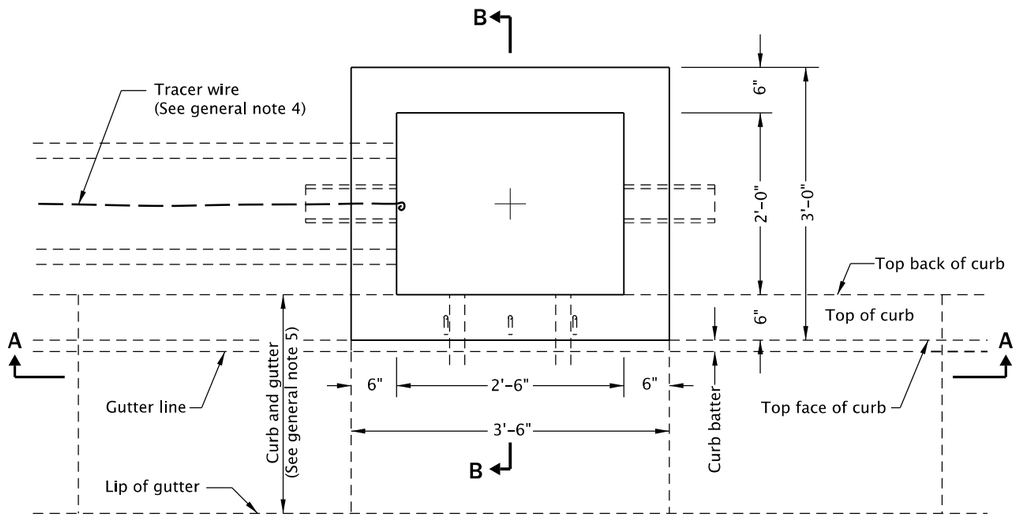
PAY LIMIT

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All concrete shall be commercial grade concrete.
2. Inlet base may be cast-in-place or precast. Where precast inlet base is used as an alternate, a 4" compacted leveling bed of sand or ¼"-0 crushed aggregate shall be provided. All precast inlets shall conform to requirements of ASTM C913.
3. See Std. Dwgs. RD372 & RD373 for inlet top details.
4. See Std. Dwg. RD336 for tracer wire details, or approved alternate.
5. See Std. Dwgs. RD700 & RD701 for curb and gutter details.
6. See Std. Dwg. RD364 for base drain details.
7. Provide sump only where shown on plans, and allowed by jurisdiction. For sump details, see Std. Dwg. RD364.
8. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.
9. Max. pipe diameter varies with pipe material.
10. See Std. Dwg. RD339 for pipe to structure connections.



KEYWAY DETAIL



PLAN

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

SDR DATE 21-JUL-2015

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

OREGON STANDARD DRAWINGS

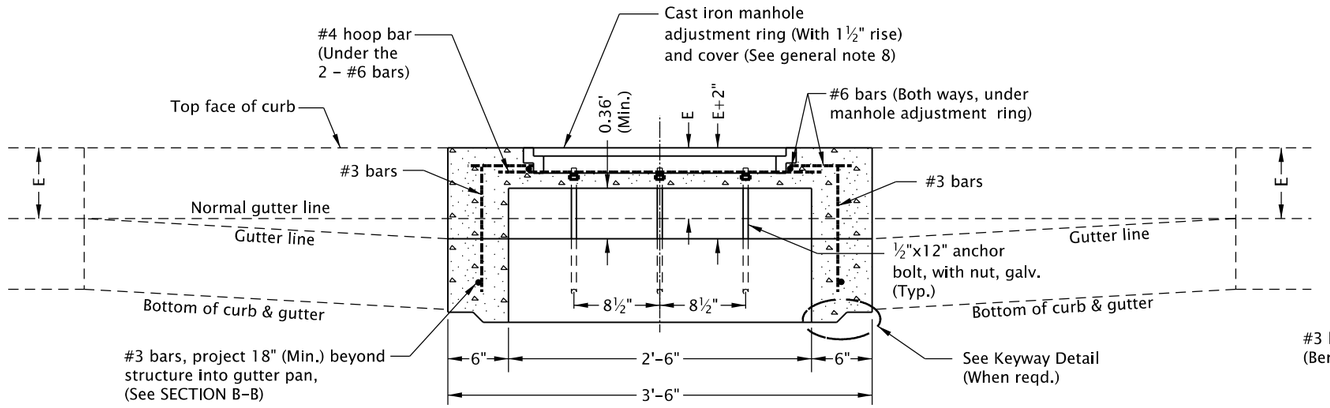
CONCRETE INLET BASE TYPE CG-3

2021

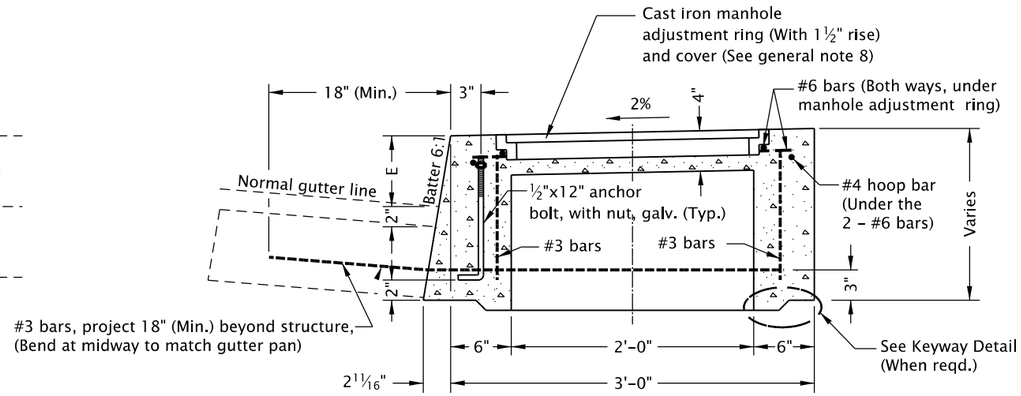
DATE	REVISION DESCRIPTION

rd371.dgn 20-JUL-2020

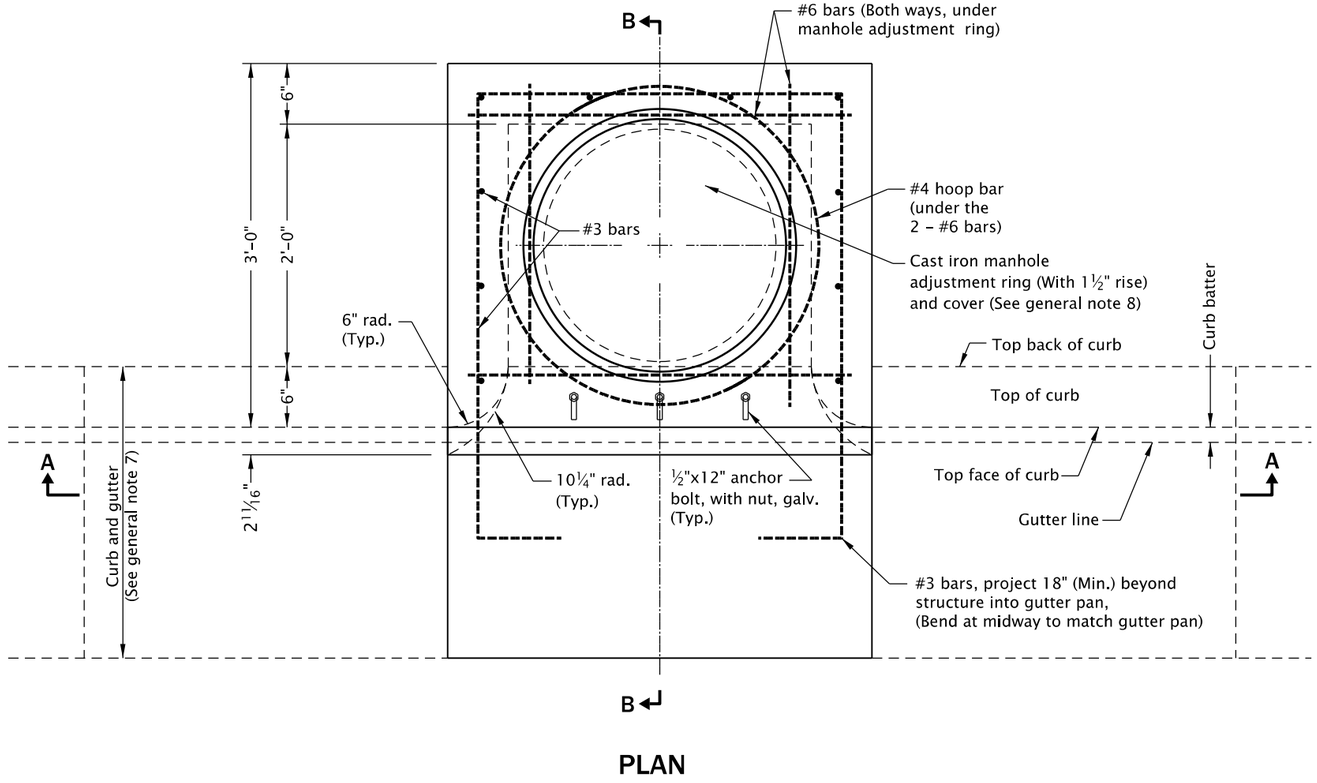
RD371



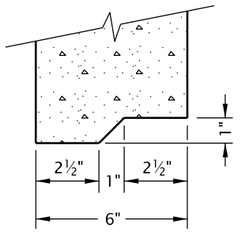
SECTION A - A



SECTION B - B



PLAN



KEYWAY DETAIL

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All concrete shall be commercial grade concrete.
2. Inlet top may be cast-in-place or precast. All precast inlets shall conform to requirements of ASTM C913.
3. All reinforcement shall be 2" clear of nearest face of conc., unless otherwise shown.
4. Vary anchor bolt length and reinforcing bar placement as required by curb exposure E (See note 7 below).
5. See Std. Dwg. RD371 for inlet base details.
6. See Std. Dwg. RD371 for inlet pay limit.
7. See Std. Dwg. RD700 & RD701 for curb and gutter details.
8. See Std. Dwg. RD356 for cast iron manhole adjustment ring and cover.

CALC. BOOK NO. N/A

SDR DATE 16-JAN-2019

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

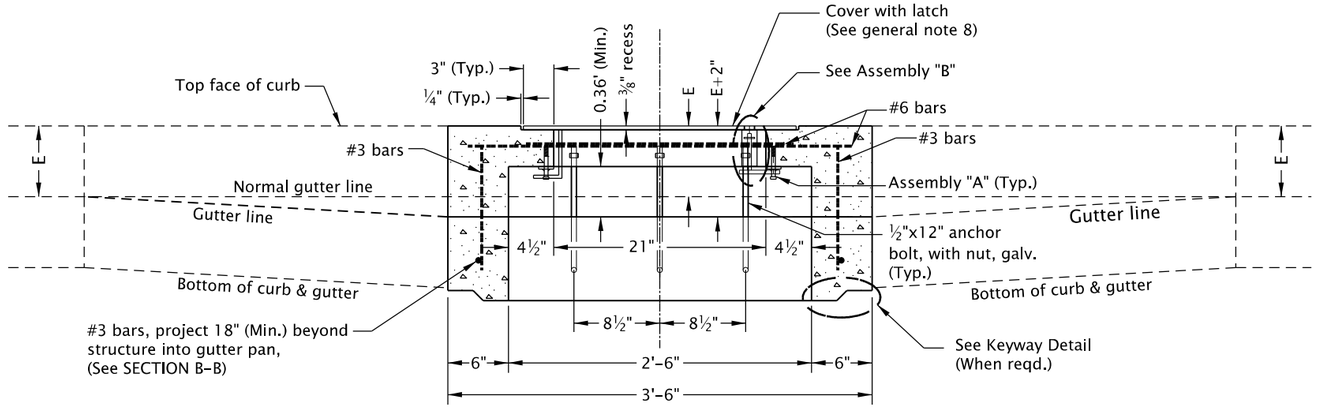
The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

OREGON STANDARD DRAWINGS

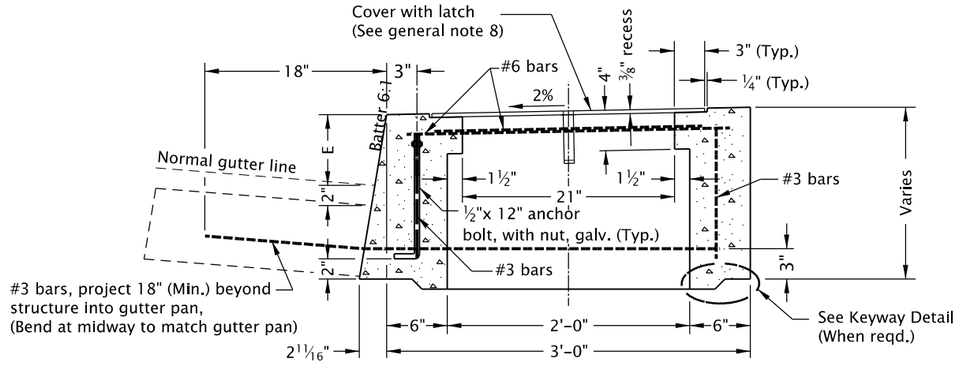
CONCRETE INLET TOP, OPTION 1 TYPE CG-3

2021

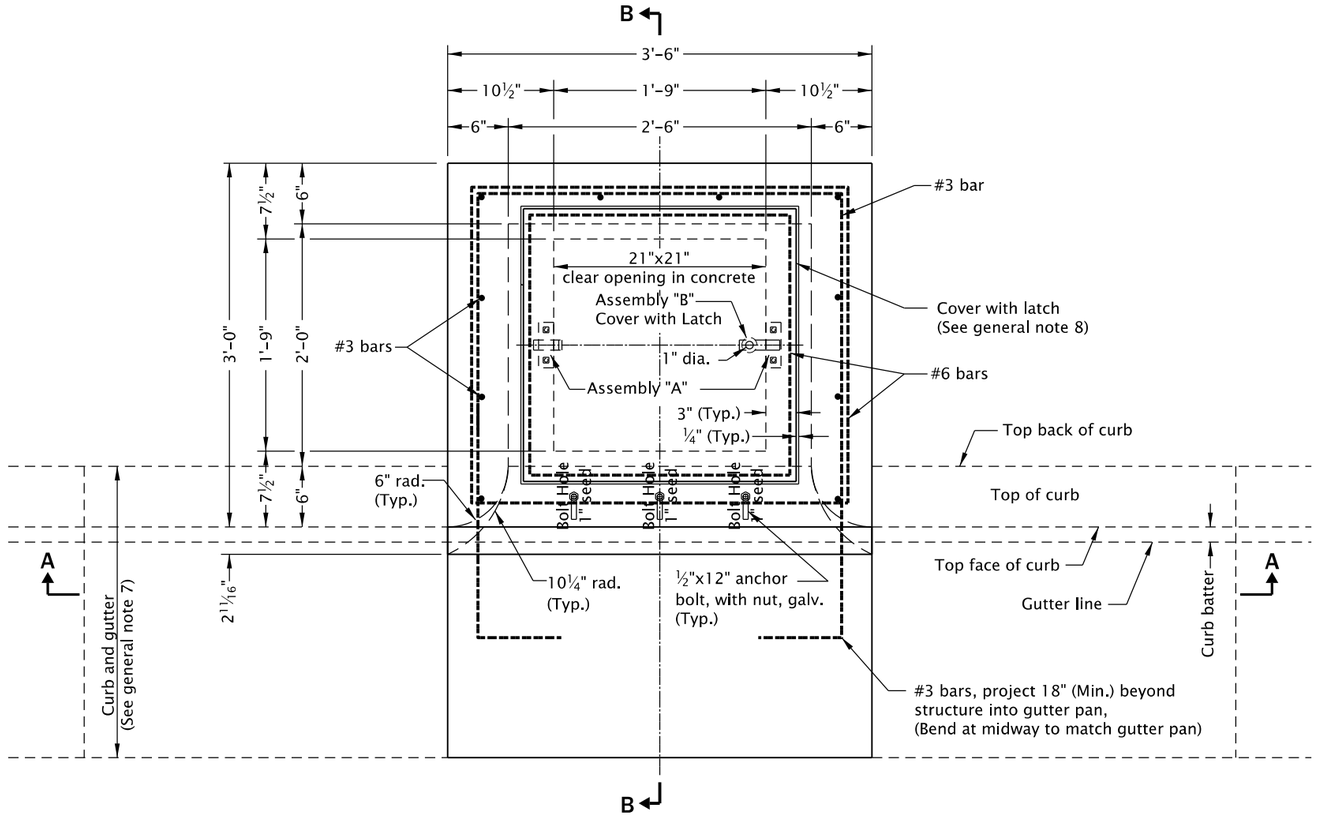
DATE	REVISION DESCRIPTION



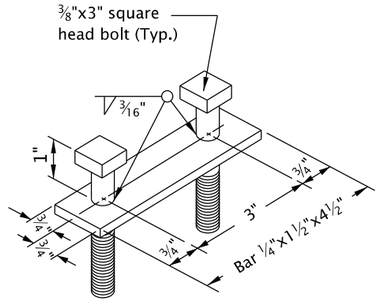
SECTION A - A



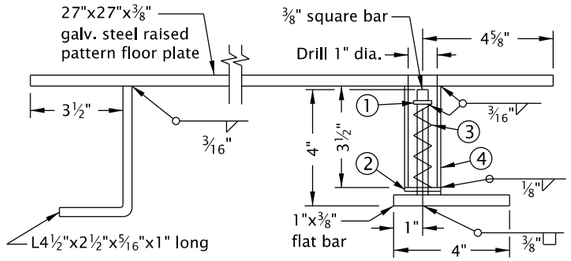
SECTION B - B



PLAN



ASSEMBLY "A"

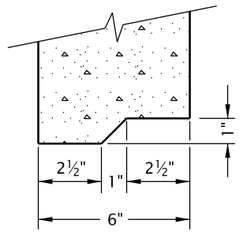


ASSEMBLY "B"
COVER WITH LATCH

1. Washer used as spring stop. Weld washer to ⅜" square bar, ⅜" from end.
2. 1¼" dia. washer used as a tube plug. Weld to tubing.
3. 90 lb comp. spring.
4. 1¼"x0.125 tubing.

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All concrete shall be commercial grade concrete.
2. Inlet top may be cast-in-place or precast. All precast inlets shall conform to requirements of ASTM C913.
3. All reinforcement shall be 2" clear of nearest face of conc., unless otherwise shown.
4. Vary anchor bolt length and reinforcing bar placement as required by curb exposure E (see note 7 below).
5. See Std. Dwg. RD371 for inlet base details.
6. See Std. Dwg. RD371 for inlet pay limit.
7. See Std. Dwgs. RD700 & RD701 for curb and gutter details.
8. Provide cover with latch per Assembly A & Assembly B, hot dip galvanize after fabrication. Mount cover with latch flush with finish grade, in ⅜" deep concrete recess, with ¼" horizontal clearance on all sides.



KEYWAY DETAIL

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

SDR DATE 16-JAN-2019

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

OREGON STANDARD DRAWINGS

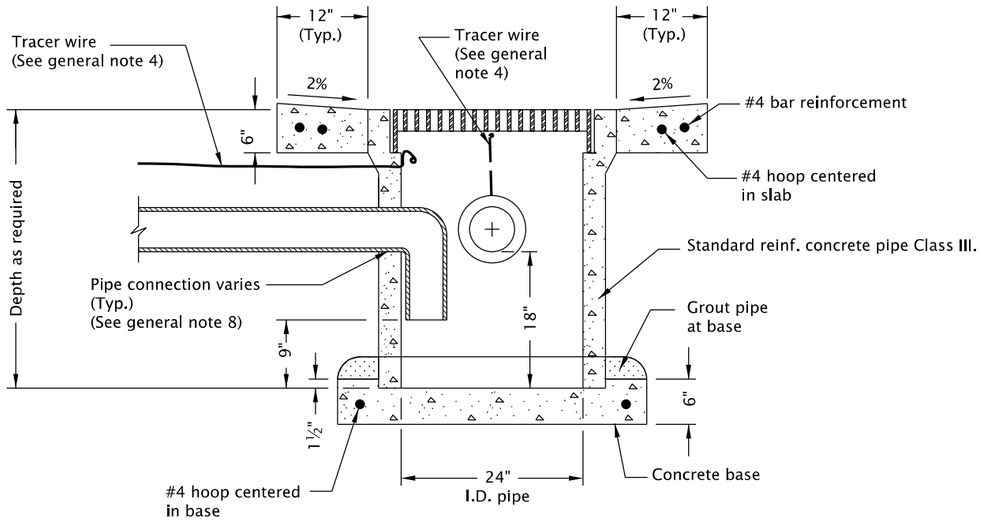
CONCRETE INLET TOP, OPTION 2 TYPE CG-3

2021

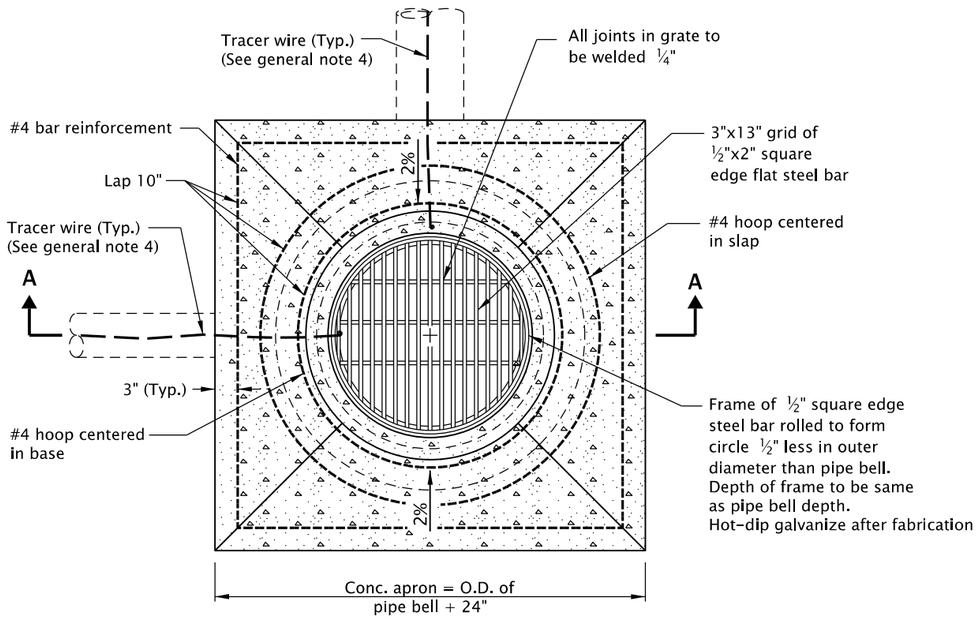
DATE	REVISION DESCRIPTION

rd373.dgn 20-JUL-2020

RD373



SECTION A-A



PLAN

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Grates shall be bicycle-safe.
2. Precast concrete inlets may be used when specified or approved. All precast inlets shall conform to requirements of ASTM C913.
3. Anchor vertical leg of inlet pipe if not a glued joint.
4. See Std. Dwg. RD336 for tracer wire details.
5. All reinforcement shall be 2" clear of nearest face of conc., unless otherwise shown.
6. Max. connecting pipe diameter varies with pipe material.
7. All concrete shall be commercial grade concrete.
8. See Std. Dwg. RD339 for pipe to structure connections.
9. Location, elevation, diameter, slope, and number of pipe(s) varies, see project plans.

CALC. BOOK NO. N/A

SDR DATE 14-JUL-2014

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

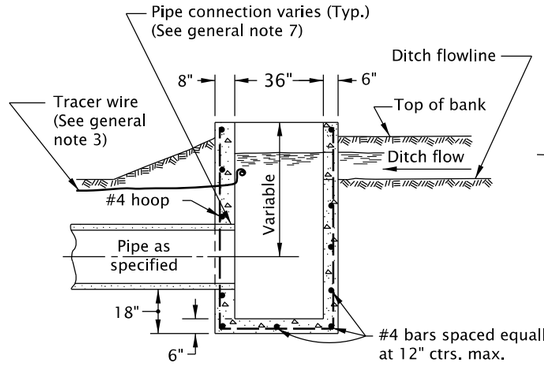
AREA DRAINAGE BASIN OR FIELD INLET

2021

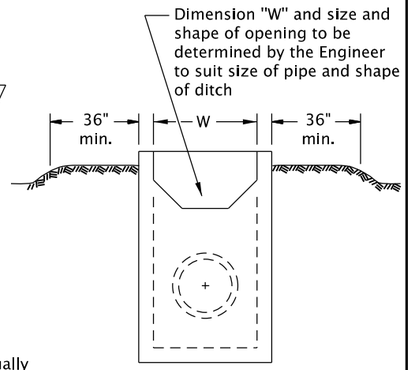
DATE	REVISION DESCRIPTION

rd374.dgn 20-JUL-2020

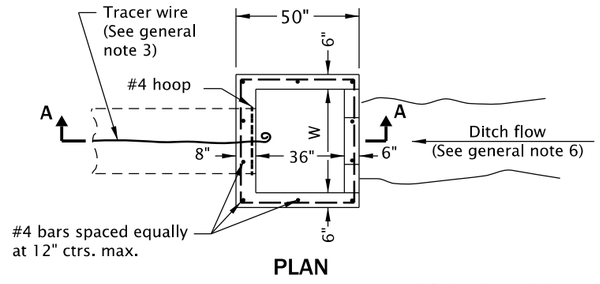
RD374



SECTION A-A



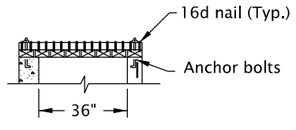
END VIEW



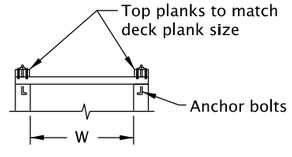
PLAN

SIPHON BOX

NOTE:
All reinforcement to be #4 bars at 12" ctrs. max.

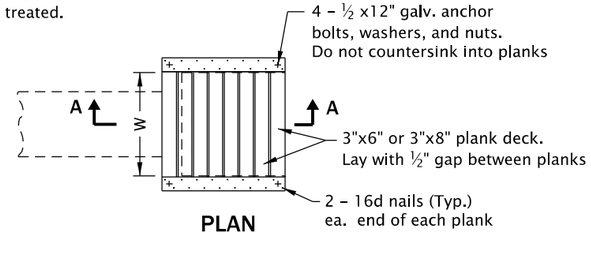


SECTION A-A



END VIEW

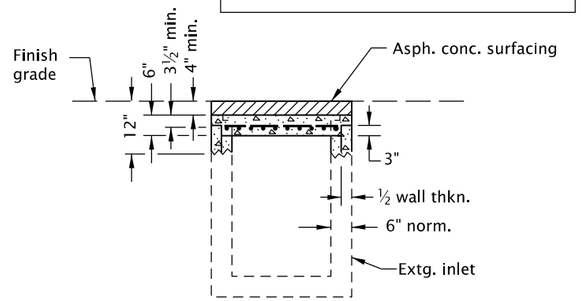
NOTE:
All wood shall be pressure treated.



PLAN

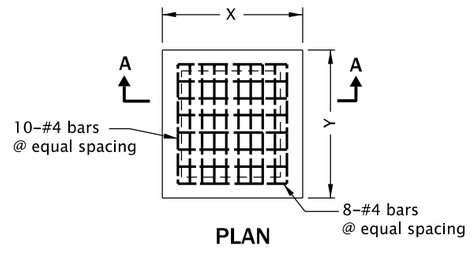
SIPHON BOX COVER
SIPHON BOX AND COVER

NOTE:
X & Y dimensions to be determined by field measurements.



SECTION A-A

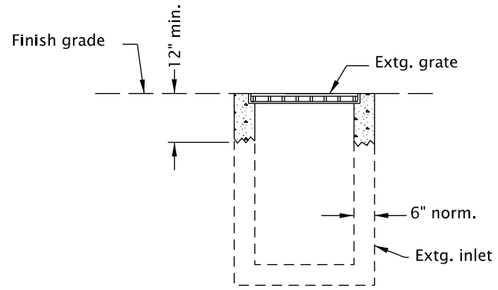
Place bars in concrete inlet cap 1½" min. clear of bottom face of concrete and 3½" min. clear of top face of concrete.



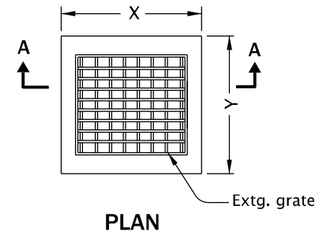
PLAN

CONCRETE INLET CAP

NOTE:
X & Y dimensions to be determined by field measurements.



SECTION A-A



PLAN

ADJUST EXISTING INLET
(For details not shown, see Std. Dwg. RD366)

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. All reinforcement to be placed a minimum of 2" clear of nearest face of concrete unless otherwise shown or noted.
2. If metal frame and grate is reqd. conform to details for Type 1grate. Size frame and grate to match dimensions of siphon box used, see Std. Dwg. RD364.
3. See Std. Dwg. RD336 for tracer wire details.
4. Max. pipe diameter varies with pipe material.
5. All precast products shall conform to requirements of ASTM C913.
6. Alignment of ditch, siphon box, and pipe varies, see project plans.
7. See Std. Dwg. RD339 for pipe to structure connections.

CALC. BOOK NO. N/A

SDR DATE 14-JUL-2014

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.

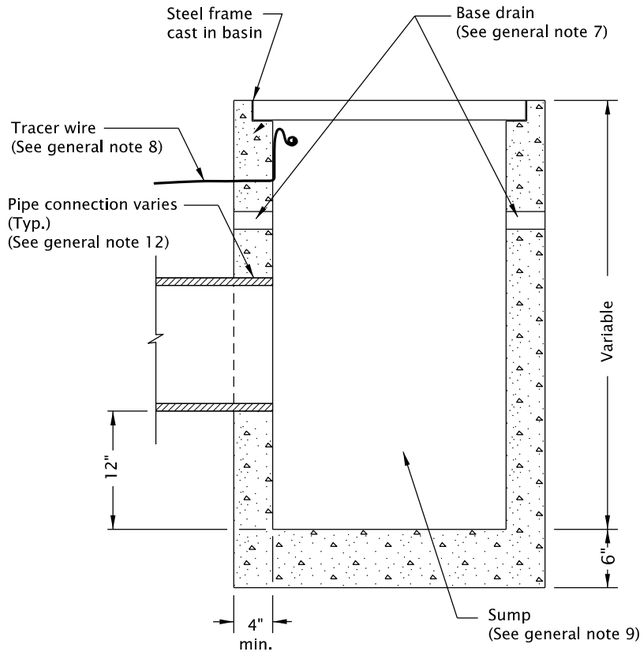
OREGON STANDARD DRAWINGS
MISCELLANEOUS DRAINAGE STRUCTURES
SIPHON BOX, INLET CAP & INLET ADJUSTMENT
2021

DATE	REVISION DESCRIPTION

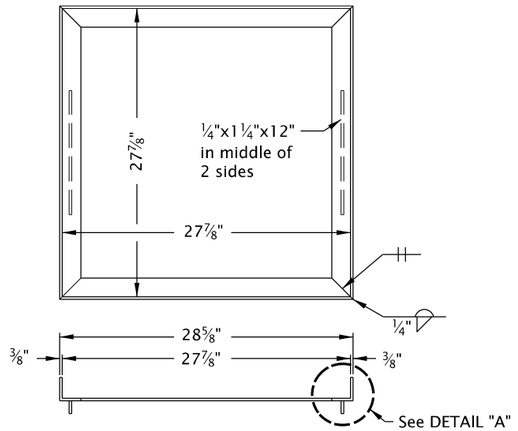
rd376.dgn 20-JUL-2020

RD376

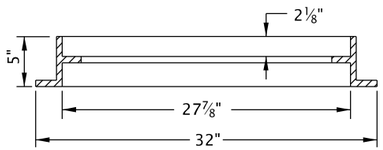
rd378.dgn 20-JUL-2020



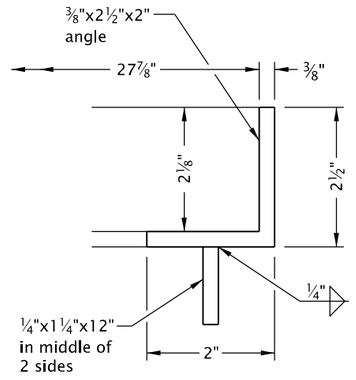
SECTION A-A



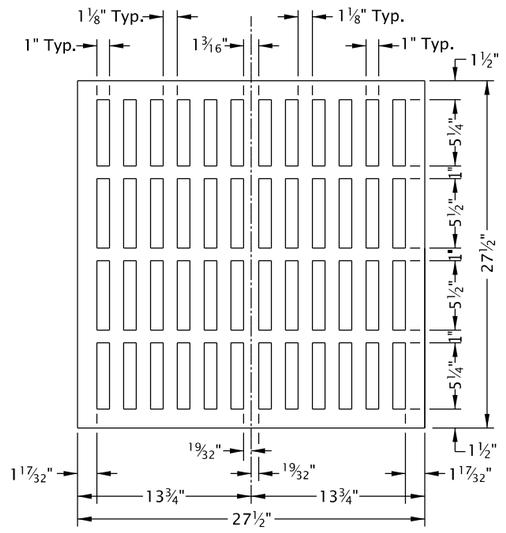
TYPE 3 FRAME - STEEL
(Hot-dip galvanize after fabrication)



OPTIONAL CAST IRON FRAME
FOR A MORTAR-ON TYPE 3 CATCH BASIN

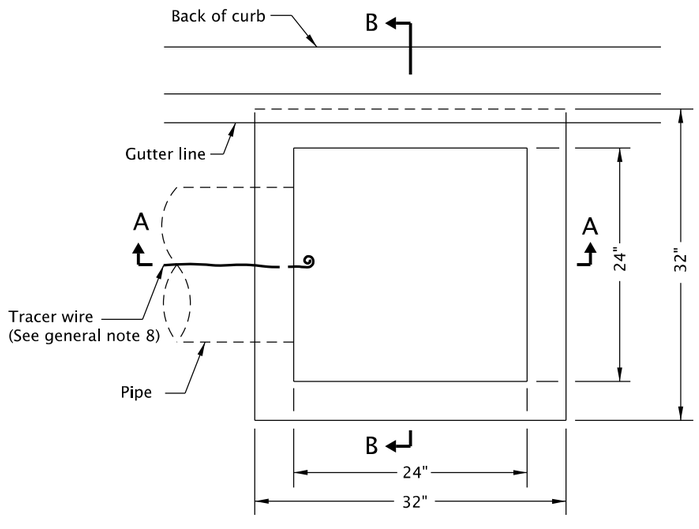


DETAIL "A"

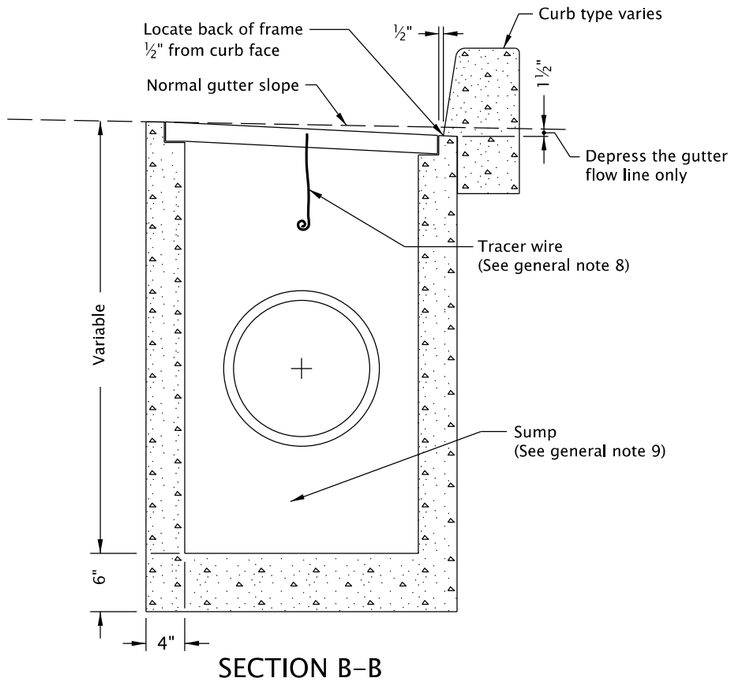


TYPE 3 CATCH BASIN GRATE

PRECAST RISER



PLAN



SECTION B-B

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Catch basin & grate shall meet H20 loading.
2. All concrete shall be commercial grade concrete.
3. Precast walls shall be a minimum of 4" thick.
4. For use by local agencies on low volume residental facilities as directed.
5. Depress gutter flowline and transition gutter as shown in Std. Dwg. RD366 perspective view.
6. Knockouts allowed for precast option.
7. If directed, install 3" dia. base drain with field installed mesh screen for subgrade drainage.
8. See Std. Dwg. RD336 for tracer wire details, or approved alternate.
9. Provide sump only where shown on plans, and allowed by jurisdiction.
   For sump details, see Std. Dwg. RD364.
10. Max. pipe diameter varies with pipe material.
11. All precast inlets shall conform to requirements of ASTM C913.
12. See Std. Dwg. RD339 for pipe to structure connections.
13. See project plans for details not shown.

CALC. BOOK NO. N/A

SDR DATE 21-JUL-2015

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

TYPE "3" CATCH BASIN, FRAME AND GRATE

2021

DATE	REVISION DESCRIPTION

RD378

Effective Date: June 1, 2022 - November 30, 2022

FILL HEIGHT TABLE FOR CORRUGATED CIRCULAR PIPE

ALUMINUM HELICAL

PIPE DIAMETER (In.)	1½"x¼" LOCK SEAM MINIMUM COVER (Ft.)	1½"x¼" LOCK SEAM SPECIFIED THICKNESS (In.) .060 MAXIMUM COVER (Ft.)	1½"x¼" LOCK SEAM SPECIFIED THICKNESS (In.) 0.075 MAXIMUM COVER (Ft.)	2⅔"x½" MINIMUM COVER (Ft.)	2⅔"x½" LOCK SEAM SPECIFIED THICKNESS (In.) .060 MAXIMUM COVER (Ft.)	.075	.105	.135	.164	2⅔"x½" MINIMUM COVER (Ft.)	3"x1" MINIMUM COVER (Ft.)	3"x1" LOCK SEAM SPECIFIED THICKNESS (In.) .060 MAXIMUM COVER (Ft.)	.075	.105	.135	.164	3"x1" MINIMUM COVER (Ft.)
6	1.0	100	100														
8	1.0	100	100														
10	1.0	100	100														
12				1.0	100	100	100			1.0							
15				1.0	100	100	100			1.0							
18				1.0	84	100	100			1.0							
21				1.0	72	90	100			1.0							
24				1.0	63	78	100	100	100	1.0							
30				1.0		63	88	100	100	1.0	1.0	57	72	100	100		1.0
36				1.0		52	73	94	100	1.0	1.5	48	60	84	100		1.0
42				1.5			63	81	99	1.0	1.5	41	52	72	97		1.0
48				1.5			55	71	86	1.0	1.5	36	45	63	84	100	1.0
54				1.5			48	63	77	1.0	1.5	32	40	56	75	88	1.0
60				1.5				52	65	1.0	1.5	28	36	50	67	80	1.0
66				1.5					53	1.5	1.5	26	33	46	61	72	1.0
72				1.5					43	1.5	1.5	24	30	42	56	66	1.0
78											1.5		28	39	52	61	1.0
84											1.5			36	48	57	1.0
90											1.5			33	45	53	1.0
96											1.5			31	42	50	1.5
102											1.5				39	47	1.5
108											1.5				37	44	1.5
114											1.5					40	1.5
120											1.5					36	1.5

STEEL HELICAL

PIPE DIAMETER (In.)	1½"x¼" LOCK SEAM MINIMUM COVER (Ft.)	1½"x¼" LOCK SEAM SPECIFIED THICKNESS (In.) .064 MAXIMUM COVER (Ft.)	2⅔"x½" WELDED OR LOCK SEAM MINIMUM COVER (Ft.)	2⅔"x½" WELDED OR LOCK SEAM SPECIFIED THICKNESS (In.) .064	.079	.109	.138	.168	2⅔"x½" MINIMUM COVER (Ft.)	3"x1" and 5"x1" WELDED OR LOCK SEAM MINIMUM COVER (Ft.)	3"x1" and 5"x1" WELDED OR LOCK SEAM SPECIFIED THICKNESS (In.) .064	.079	.109	.138	.168	3"x1" and 5"x1" MINIMUM COVER (Ft.)
6	1.0	100															
8	1.0	100															
10	1.0	100															
12			1.0	100	100	100											
15			1.0	100	100	100											
18			1.0	100	100	100											
21			1.0	100	100	100											
24			1.0	100	100	100											
30			1.0	83	100	100											
36			1.0	69	86	100	100	100	1.0	1.0	79	99	100			1.0	
42			1.5	59	74	100	100	100	1.0	1.0	68	85	100			1.0	
48			1.5	52	65	91	100	100	1.0	1.5	59	74	100	100		1.0	
54			1.5		57	80	100	100	1.0	1.5	53	66	93	100		1.0	
60						72	93	100	1.0	1.5	47	59	83	100		1.0	
66							85	100	1.0	1.5	43	54	76	98		1.0	
72							78	95	1.0	1.5	39	49	69	89	100	1.0	
78								84	1.0	1.5	36	45	64	82	100	1.0	
84								73	1.0	1.5	34	42	59	77	94	1.0	
90										1.5	31	39	55	71	88	1.0	
96										1.5		37	52	67	82	1.0	
102										1.5		35	49	63	77	1.5	
108										1.5			46	59	73	1.5	
114										1.5			44	56	69	1.5	
120										1.5			41	53	66	1.5	
126										2.0				51	62	2.0	
132										2.0				49	60	2.0	
138										2.0				46	57	2.0	
144										2.0					55	2.0	

5"x1", these values shown can be increased, (See general note 9)

GENERAL NOTES FOR ALL TABLES ON THIS SHEET:

1. Maximum height of cover is greatest vertical distance from top of pipe to finish grade.
2. Minimum height of cover is least vertical distance from top of pipe to subgrade.
3. For ODOT, pipes with diameters greater than 72" must be reviewed by the Geo-Environmental Section.
4. For ODOT, pipes with maximum cover greater than those shown in the Tables shall be approved by the Senior Standards Engineer.
5. For multiple pipe installations, see Std. Dwg. RD300.
6. Heavy solid line denotes boundary between minimum cover requirements.
7. Open ends of pipes normally require a site specific design, and may require special treatment (Sloped ends, culvert embankment protection, paved end slopes, safety end sections, or other measures). See special details or Standard Drawings as called for on plans.
8. For minimum thickness, see AASHTO M197, M218, and M274.
9. 5"x1" corrugation can be used as an alternate for 3"x1" corrugation. Maximum fill height for 3"x1" can be increased by up to 12% over values shown for pipe size 54" and larger.

CALC. BOOK NO. RD07-01

SDR DATE 08-JUL-2013

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

FILL HEIGHT TABLES FOR ALUMINUM & STEEL CORRUGATED PIPE

2021

DATE	REVISION DESCRIPTION

rd380.dgn 20-JUL-2020

RD380

Effective Date: June 1, 2022 - November 30, 2022

FILL HEIGHT TABLE

PIPE		ALUMINUM ARCH PIPE 2⅔"x½" HELICAL SEAM (LOCK)					STEEL ARCH PIPE 2⅔"x½" HELICAL SEAM (LOCK OR WELDED)				
EQUIVALENT ROUND DIAMETER (Inches)	ARCH PIPE * SIZE (Inches)	MINIMUM CORNER RADIUS (Inches)	SPECIFIED THICKNESS (Inches)	SPECIFIED THICKNESS (Gage)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)	MINIMUM CORNER RADIUS (Inches)	SPECIFIED THICKNESS (Inches)	SPECIFIED THICKNESS (Gage)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)
15	17x13	3	0.060	16	1.0	22	3	0.064	16	1.0	22
18	21x15	3	0.060	16	1.0	17	3	0.064	16	1.0	17
21	24x18	3	0.060	16	1.0	15	3	0.064	16	1.0	15
24	28x20	3	0.075	14	1.5	13	3	0.064	16	1.0	13
30	35x24	3	0.075	14	1.5	10	3	0.064	16	1.0	10
36	42x29	3.5	0.105	12	2.0	10	3.5	0.064	16	1.0	10
42	49x33	4	0.105	12	2.0	10	4	0.079	14	1.0	10
48	57x38	5	0.135	10	2.0	10	5	0.109	12	1.5	10
54	64x43	6	0.135	10	2.0	11	6	0.109	12	1.5	11
60	71x47	7	0.164	8	2.5	12	7	0.138	10	1.5	12
66	77x52						8	0.168	8	2.0	12
72	83x57						9	0.168	8	2.0	13

* See general note 9

FILL HEIGHT TABLE

PIPE		ALUMINUM ARCH PIPE 3"x1" HELICAL SEAM (LOCK)					STEEL ARCH PIPE 3"x1" HELICAL SEAM (LOCK OR WELDED)				5"x1" HELICAL SEAM (LOCK OR WELDED)			
EQUIVALENT ROUND DIAMETER (Inches)	ARCH PIPE * SIZE (Inches)	MINIMUM CORNER RADIUS (Inches)	SPECIFIED THICKNESS (Inches)	SPECIFIED THICKNESS (Gage)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)	MINIMUM CORNER RADIUS (Inches)	SPECIFIED THICKNESS (Inches)	SPECIFIED THICKNESS (Gage)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)	SPECIFIED THICKNESS (Inches)	SPECIFIED THICKNESS (Gage)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)
36	40x31	5	0.060	16	2.0	15	5	0.064	16	1.0	15				
42	46x36	6	0.060	16	2.0	16	6	0.064	16	1.0	16				
48	53x41	7	0.060	16	2.0	16	7	0.064	16	1.0	16	0.109	12	1.0	25
54	60x46	8	0.060	16	2.0	16	8	0.064	16	1.5	16	0.109	12	1.5	25
60	66x51	9	0.075	14	2.0	17	9	0.064	16	1.5	17	0.109	12	1.5	25
66	73x55	12	0.105	12	2.5	20	12	0.064	16	1.5	20	0.109	12	1.5	24
72	81x59	14	0.105	12	2.5	21	14	0.064	16	2.0	21	0.109	12	1.5	21
78	87x63	14	0.105	12	3.0	20	14	0.079	14	2.0	20	0.109	12	1.5	20
84	95x67	16	0.135	10	3.0	21	16	0.109	12	2.0	21	0.109	12	1.5	20
90	103x71	16	0.164	8	3.5	19	16	0.109	12	2.5	19	0.109	12	1.5	20
96	112x75	18	0.164	8	3.5	20	18	0.109	12	2.5	20	0.109	12	2.0	20
102	117x79						18	0.138	10	2.5	19	0.109	12	2.0	19
108	128x83						18	0.138	10	3.0	17	0.109	12	2.0	19
114	137x87						18	0.168	8	3.0	16	0.109	12	2.0	19
120	142x91						18					0.138	10	2.0	19

GENERAL NOTES FOR ALL TABLES ON THIS SHEET:

1. Maximum height of cover is greatest vertical distance from top of pipe to finish grade.
2. Minimum height of cover is least vertical distance from top of pipe to subgrade.
3. For ODOT, arch pipes with equivalent round diameter greater than 72" must be reviewed by the Geo-Environmental Section.
4. For ODOT, arch pipes with maximum cover greater than those shown in the Tables shall be approved by the Senior Standards Engineer.
5. For multiple pipe installations, see Std. Dwg. RD304.
6. Heavy solid line denotes boundary between minimum cover requirements.
7. Open ends of pipes normally require a site specific design, and may require special treatment (Sloped ends, culvert embankment protection, paved end slopes, safety end sections, or other measures).
   See special details or Standard Drawings as called for on plans.
8. For minimum thickness, see AASHTO M197, M218, and M274.
9. Cross-sectional dimensions may vary with different materials.

CALC. BOOK NO. RD07-01

SDR DATE 11-JUL-2011

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

FILL HEIGHT TABLES FOR ALUMINUM & STEEL ARCH PIPE

2021

DATE	REVISION DESCRIPTION

rd382.dgn 20-JUL-2020

RD382

MAXIMUM FILL HEIGHT TABLES
ALUMINUM SPIRAL RIB PIPE
(HS 25-44 Live Load)

ALUM. SRP = 11½"x¾"x1" CORRUGATION

DIAMETER (Inches)	MINIMUM COVER (Feet)	SPECIFIED THICKNESS (Inches)			
		.060 (16 ga.)	.075 (14 ga.)	.105 (12 ga.)	.135 (10 ga.)
		MAXIMUM COVER (Feet)			
24	1.0	25	34	56	82
30	1.5	20	27	45	65
36	1.5		23	37	54
42	2.0			32	46
48	2.0			28	41
54	2.0			25	36
60	2.0				32
66	2.0				29

ALUM. SRP = 7½"x¾"x¾" CORRUGATION

DIAMETER (Inches)	MINIMUM COVER (Feet)	SPECIFIED THICKNESS (Inches)			
		.060 (16 ga.)	.075 (14 ga.)	.105 (12 ga.)	.135 (10 ga.)
		MAXIMUM COVER (Feet)			
18	1.0	45	61	99	100
21	1.0	38	52	85	100
24	1.0	33	46	74	100
27	1.5	30	41	66	93
30	1.5	27	37	59	84
36	1.5		30	49	70
42	2.0			42	60
48	2.0			37	52
54	2.0			33	46
60	2.0				42
66	2.0				38

MAXIMUM FILL HEIGHT TABLES
STEEL SPIRAL RIB PIPE
(HS 25-44 Live Load)

STEEL SRP = 11½"x¾"x1" CORRUGATION

DIAMETER (Inches)	MINIMUM COVER (Feet)	SPECIFIED THICKNESS (Inches)		
		.064 (16 ga.)	.079 (14 ga.)	.109 (12 ga.)
		MAXIMUM COVER (Feet)		
24	1.0	50	70	100
30	1.0	40	56	94
36	1.0	33	46	79
42	1.0	28	40	67
48	1.0	25	35	59
54	1.5	22	31	52
60	1.5		28	47
66	1.5		25	43
72	1.5			39
78	2.0			36

STEEL SRP = 7½"x¾"x¾" CORRUGATION

DIAMETER (Inches)	MINIMUM COVER (Feet)	SPECIFIED THICKNESS (Inches)		
		.064 (16 ga.)	.079 (14 ga.)	.109 (12 ga.)
		MAXIMUM COVER (Feet)		
24	1.0	68	95	100
30	1.0	54	76	100
36	1.0	45	63	100
42	1.0	39	54	100
48	1.0	34	47	100
54	1.5		42	100
60	1.5		38	92
66	1.5			83
72	1.5			76

GENERAL NOTES FOR ALL TABLES ON THIS SHEET:

1. Maximum height of cover is greatest vertical distance from top of pipe to finish grade.
2. Minimum height of cover is least vertical distance from top of pipe to subgrade.
3. For ODOT, pipes with diameters greater than 72" must be reviewed by the Geo-Environmental Section.
4. For ODOT, pipes with maximum cover greater than those shown in the Tables shall be approved by the Senior Standards Engineer.
5. For multiple pipe installations, see Std. Dwg. RD300.
6. Open ends of pipes normally require a site specific design, and may require special treatment (Sloped ends, culvert embankment protection, paved end slopes, safety end sections, or other measures).
   See special details or Standard Drawings as called for on plans.
7. The use of Spiral Rib Pipe is limited to applications where both ends of the pipe run are enclosed in a structure (e.g. inlet, manhole, etc.).
8. For minimum thickness, see AASHTO M197, M218 and M274.
9. Heavy solid line denotes boundary between minimum cover requirements.

CALC. BOOK NO. RD07-01

SDR DATE 12-JUL-2011

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

FILL HEIGHT TABLES FOR ALUMINUM & STEEL SPIRAL RIB PIPE

2021

DATE	REVISION DESCRIPTION

rd384.dgn 20-JUL-2020

RD384

rd386.dgn 20-JUL-2020

ALLOWABLE FILL HEIGHTS FOR CIRCULAR CONCRETE PIPE

HS 25 - 44 LIVE LOAD

PIPE DIAMETER (INCHES)	REINFORCED PIPE					
	CLASS III		CLASS IV		CLASS V	
	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)
15	1.5	18	1.0	27	0.5	42
18	1.5	18	1.0	27	0.5	42
21	1.5	17	1.0	27	0.5	42
24	1.5	17	1.0	27	0.5	42
27	1.5	17	1.0	27	0.5	41
30	1.5	17	1.0	27	0.5	41
33	1.5	17	1.0	27	0.5	41
36	1.5	17	1.0	26	0.5	41
42	1.5	17	1.0	26	0.5	41
48	1.5	16	1.0	26	0.5	41
54	1.5	16	1.0	26		
60	1.5	16	1.0	26		
66	1.5	16	1.0	26		
72	1.5	16	1.0	25		

GENERAL NOTES FOR ALL TABLES ON THIS SHEET:

1. Maximum height of cover is greatest vertical distance from top of pipe to finish grade.
2. Minimum height of cover is least vertical distance from top of pipe to subgrade.
3. For ODOT, pipes with diameters greater than 72" must be reviewed by the Geo-Environmental Section.
4. For ODOT, pipes with maximum cover greater than those shown in the Tables shall be approved by the Senior Standards Engineer.
5. For multiple pipe installations, see Std. Dwg. RD300.
6. Open ends of pipes normally require a site specific design, and may require special treatment (Sloped ends, culvert embankment protection, paved end slopes, safety end sections, or other measures).
   See special details or Standard Drawings as called for on plans.

CALC. BOOK NO. RD07-02

SDR DATE 16-JAN-2019

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

FILL HEIGHT TABLE FOR CIRCULAR CONCRETE PIPE

2021

DATE	REVISION DESCRIPTION

RD386

PIPE	SOLID WALL PVC		
DIAMETER (Inches)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)	REMARKS
4	2.0	40	ASTM D 3034 SDR35 (46 psi stiffness)
6	2.0	40	
8	2.0	40	
10	2.0	40	
12	2.0	40	
15	2.0	40	
18	2.0	40	ASTM F 679 (46 psi stiffness)
21	2.0	40	
24	2.0	40	
27	2.0	40	
30	2.0	40	
33	2.0	40	
36	2.0	40	
42	2.0	40	
48	2.0	40	

PIPE	PROFILE WALL PVC		
DIAMETER (Inches)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)	REMARKS
4	2.0	40	ASTM F 794 Series 46 (46 psi stiffness)
6	2.0	40	
8	2.0	40	
10	2.0	40	
12	2.0	40	
15	2.0	40	
18	2.0	40	
21	2.0	40	
24	2.0	40	
27	2.0	40	
30	2.0	40	
33	2.0	40	
36	2.0	40	
39	2.0	40	
42	2.0	40	
45	2.0	40	
48	2.0	40	

GENERAL NOTES FOR ALL TABLES ON THIS SHEET:

1. Maximum height of cover is greatest vertical distance from top of pipe to finish grade.
2. Minimum height of cover is least vertical distance from top of pipe to subgrade.
3. For ODOT, pipes with maximum cover greater than those shown in the Tables shall be approved by the Senior Standards Engineer.
4. For multiple pipe installations, see Std. Dwg. RD300.
5. Open ends of pipes normally require a site specific design, and may require special treatment (Sloped ends, culvert embankment protection, paved end slopes, safety end sections, or other measures). See special details or Standard Drawings as called for on plans.

PIPE	SOLID WALL PVC		
DIAMETER (Inches)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)	REMARKS
14	2.0	41	AWWA C905 DR 32.5 (57 psi stiffness)
16	2.0	41	
18	2.0	41	
20	2.0	41	
24	2.0	41	
30	2.0	41	
36	2.0	41	
42	2.0	41	
48	2.0	41	

PIPE	SOLID WALL PVC		
DIAMETER (Inches)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)	REMARKS
14	1.0	46	AWWA C905 DR 26 (115 psi stiffness)
16	1.0	46	
18	1.0	46	
20	1.0	46	
24	1.0	46	
30	1.0	46	
36	1.0	46	

PIPE	SOLID WALL PVC		
DIAMETER (Inches)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)	REMARKS
14	1.0	48	AWWA C905 DR 25 (129 psi stiffness)
16	1.0	48	
18	1.0	48	
20	1.0	48	
24	1.0	48	
30	1.0	48	
36	1.0	48	
42	1.0	48	
48	1.0	48	

PIPE	SOLID WALL PVC		
DIAMETER (Inches)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)	REMARKS
14	1.0	61	AWWA C905 DR 21 (224 psi stiffness)
16	1.0	61	
18	1.0	61	
20	1.0	61	
24	1.0	61	
30	1.0	61	
36	1.0	61	

PIPE	SOLID WALL PVC		
DIAMETER (Inches)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)	REMARKS
4	1.0	48	AWWA C900 DR 25 (129 psi stiffness)
6	1.0	48	
8	1.0	48	
10	1.0	48	
12	1.0	48	

PIPE	SOLID WALL PVC		
DIAMETER (Inches)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)	REMARKS
4	1.0	69	AWWA C900 DR 18 (364 psi stiffness)
6	1.0	69	
8	1.0	69	
10	1.0	69	
12	1.0	69	

PIPE	SOLID WALL PVC		
DIAMETER (Inches)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)	REMARKS
4	1.0	109	AWWA C900 DR 14 (814 psi stiffness)
6	1.0	109	
8	1.0	109	
10	1.0	109	
12	1.0	109	

CALC. BOOK NO. RD11-02

SDR DATE 13-JUN-2011

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

FILL HEIGHT TABLES FOR PVC PIPE

2021

DATE	REVISION DESCRIPTION

rd388.dgn 20-JUL-2020

RD388

PIPE	CORRUGATED HDPE	
DIAMETER (Inches)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)
12	2.0	29
15	2.0	30
18	2.0	27
24	2.0	24
30	2.0	21
36	2.0	23
42	2.0	22
48	2.0	22
60	2.5	21

GENERAL NOTES FOR ALL TABLES ON THIS SHEET:

1. Maximum height of cover is greatest vertical distance from top of pipe to finish grade.
2. Minimum height of cover is least vertical distance from top of pipe to subgrade.
3. For ODOT, pipes with maximum cover greater than those shown in the Tables shall be approved by the Senior Standards Engineer.
4. For multiple pipe installations, see Std. Dwg. RD300.
5. Heavy solid line denotes boundary between minimum cover requirements.
6. Open ends of pipes normally require a site specific design, and may require special treatment (sloped ends, culvert embankment protection, paved end slopes, safety end sections, or other measures).
   See special details or Standard Drawings as called for on plans.

CALC. BOOK NO. RD07-02

SDR DATE 13-JUL-2011

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

FILL HEIGHT TABLE FOR CORRUGATED HDPE PIPE

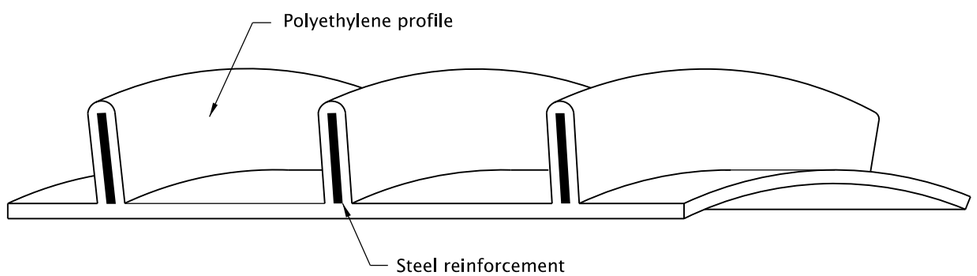
2021

DATE	REVISION DESCRIPTION

rd390.dgn 20-JUL-2020

RD390

PIPE	STEEL REINFORCED HDPE	
DIAMETER (Inches)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)
30	1.0	50
36	1.0	50
42	1.0	50
48	1.0	30
60	1.0	30
66	1.5	30
72	1.5	30



STEEL REINFORCED THERMOPLASTIC RIBBED PIPE PROFILE

GENERAL NOTES FOR ALL DETAILS ON THIS SHEET:

1. Maximum height of cover is greatest vertical distance from top of pipe to finish rade.
2. Minimum height of cover is least vertical distance from top of pipe to subgrade.
3. For ODOT, pipes with maximum cover greater than those shown in the Table shall be approved by the Senior Standards Engineer.
4. For multiple pipe installations, see Std. Dwg. RD300.
5. Heavy solid line denotes boundary between minimum cover requirements.
6. Open ends of pipes normally require a site specific design, and may require special treatment (sloped ends, culvert embankment protection, paved end slopes, safety end sections, or other measures).
   See special details or Standard Drawings as called for on plans.

CALC. BOOK NO. N/A

SDR DATE 13-JAN-2014

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

FILL HEIGHT TABLE FOR STEEL REINFORCED HDPE PIPE

2021

DATE	REVISION DESCRIPTION

rd391.dgn 20-JUL-2020

RD391

PIPE	DUAL WALL POLYPROPYLENE		
DIAMETER (Inches)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)	REMARKS
12	1.0	28	ASTM F 2736 & AASHTO M330
15	1.0	30	
18	1.0	26	
24	1.0	22	
30	1.0	22	
36	1.0	22	AASHTO M330
42	1.0	22	
48	1.0	21	
60	1.0	23	

PIPE	TRIPLE WALL POLYPROPYLENE		
DIAMETER (Inches)	MINIMUM COVER (Feet)	MAXIMUM COVER (Feet)	REMARKS
30	1.0	22	ASTM F 2764
36	1.0	19	
48	1.0	16	
60	2.0	22	

GENERAL NOTES FOR ALL TABLES ON THIS SHEET:

1. Maximum height of cover is greatest vertical distance from top of pipe to finish grade.
2. Minimum height of cover is least vertical distance from top of pipe to subgrade.
3. For ODOT, pipes with maximum cover greater than those shown in the Tables shall be approved by the Senior Standards Engineer.
4. For multiple pipe installations, see Std. Dwg. RD300.
5. Heavy solid line denotes boundary between minimum cover requirements.
6. Open ends of pipes normally require a site specific design, and may require special treatment (sloped ends, culvert embankment protection, paved end slopes, safety end sections, or other measures).
   See special details or Standard Drawings as called for on plans.

CALC. BOOK NO. RD11-01

SDR DATE 21-JUL-2015

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

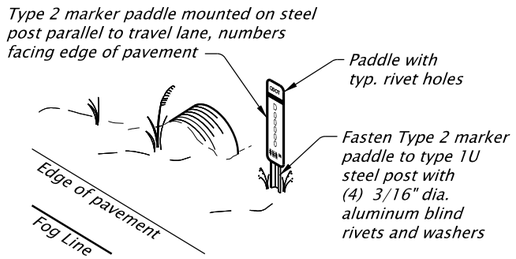
FILL HEIGHT TABLES FOR POLYPROPYLENE PIPE

2021

DATE	REVISION DESCRIPTION

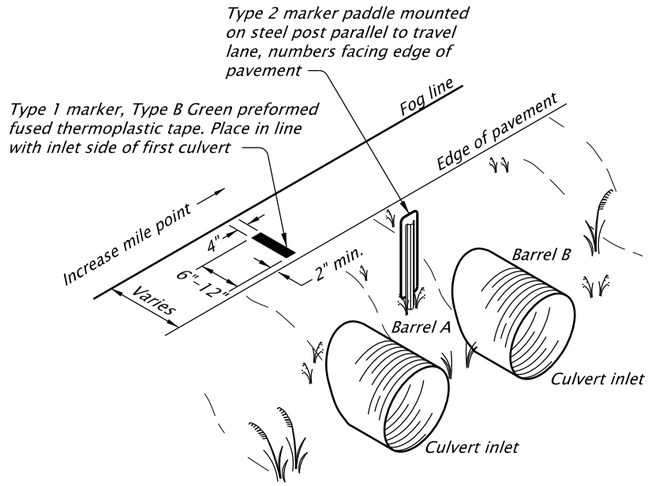
rd393.dgn 20-JUL-2020

RD393



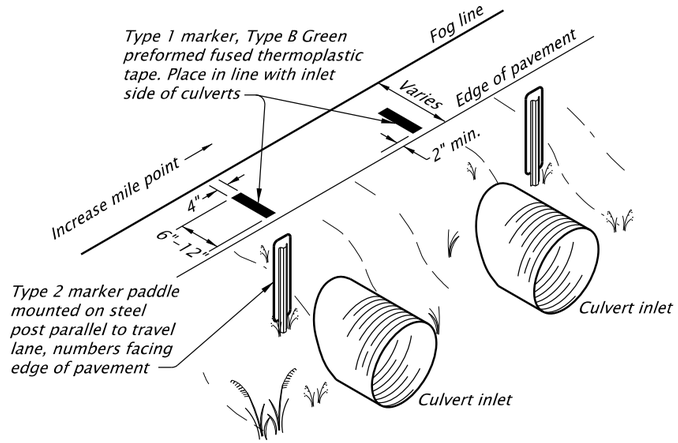
SINGLE DRAINAGE FACILITY SINGLE PIPE

(See Note 8)



SINGLE DRAINAGE FACILITY MULTIPLE PIPES

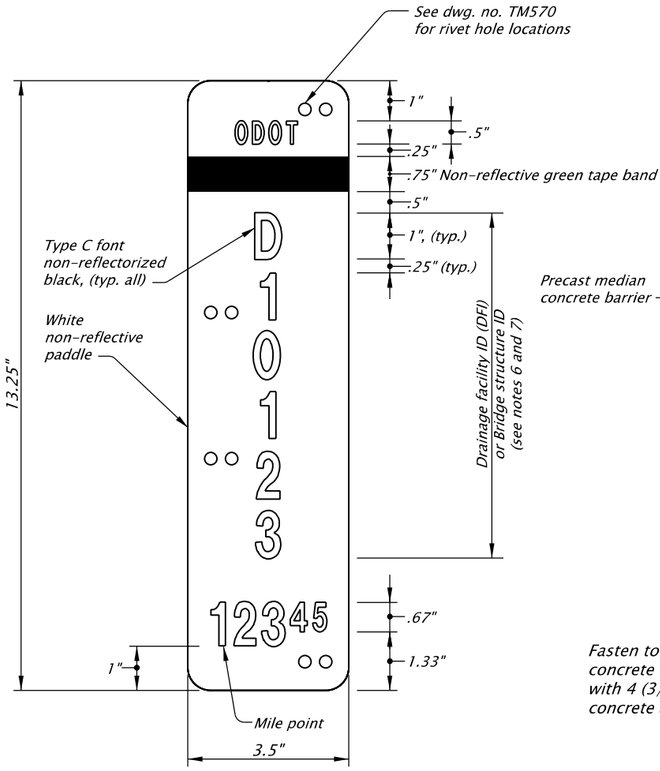
(See Note 8)



MULTIPLE DRAINAGE FACILITY

(See Note 8)

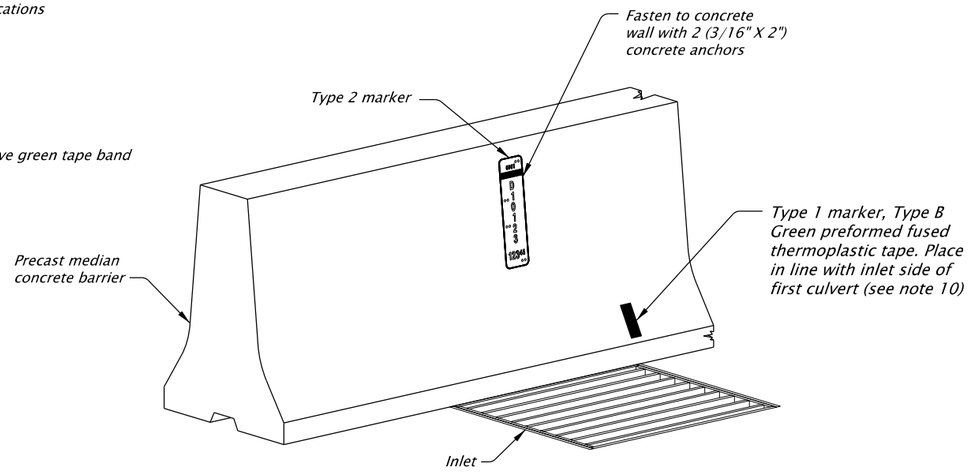
TYPE 2 MARKER INSTALLATION



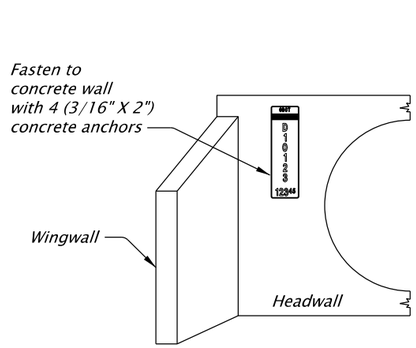
TYPE 2 MARKER

NOTES:

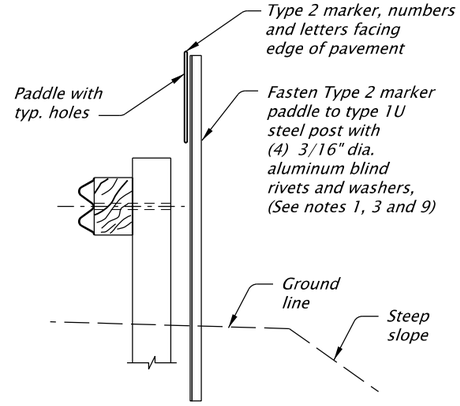
1. *See Standard Drawing TM571 for 'Type 1U Steel Post Dimensions' details.*
2. *Place Type 1 marker on inlet edge of the pavement directly in line with the inlet.*
3. *Install Type 2 culvert markers parallel to travel lane and inconspicuous to traffic.*
4. *On non-divided highways place markers only at the culvert inlet side of highway.*
5. *On divided highways placing markers on the outlet side is optional.*
6. *Drainage Facility ID: Place the assigned DFI number on the Type 2 marker when the culvert span is less than 6 feet. (Example D10123).*
7. *Bridge Structure ID: Place the assigned ID number on the Type 2 marker when a culvert has a span equal to or greater than 6 feet.*
8. *For more information on Single and Multiple Drainage Facilities, contact the Senior Culvert Hydraulic Engineer or the Senior Culvert Maintenance Hydraulic Engineer in the Hydraulic Unit of the Engineering Technical Services Branch.*
9. *Steep slopes where guardrail or concrete barrier are present, install Type 2 marker on slope side of barrier.*
10. *Install only a Type 1 marker or a Type 2 marker on concrete barrier.*



CONCRETE BARRIER INSTALLATION



CONCRETE HEADWALL INSTALLATION



GUARDRAIL INSTALLATION

CALC. BOOK NO. N/A

SDR DATE 01-July-2020

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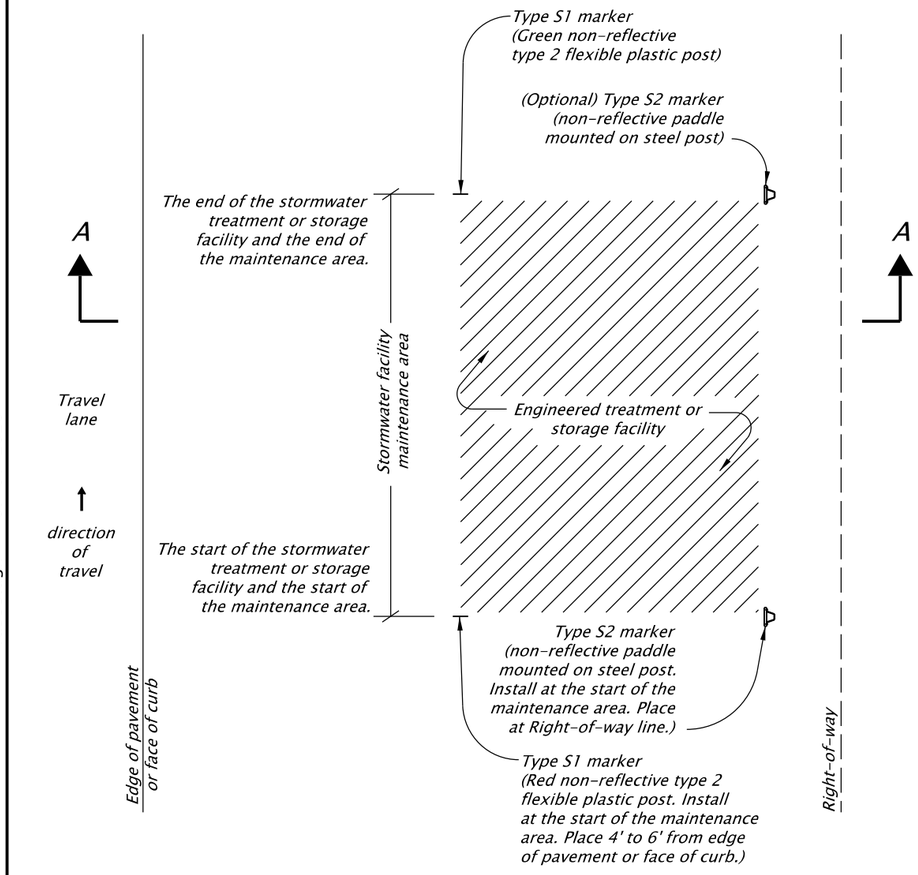
OREGON STANDARD DRAWINGS

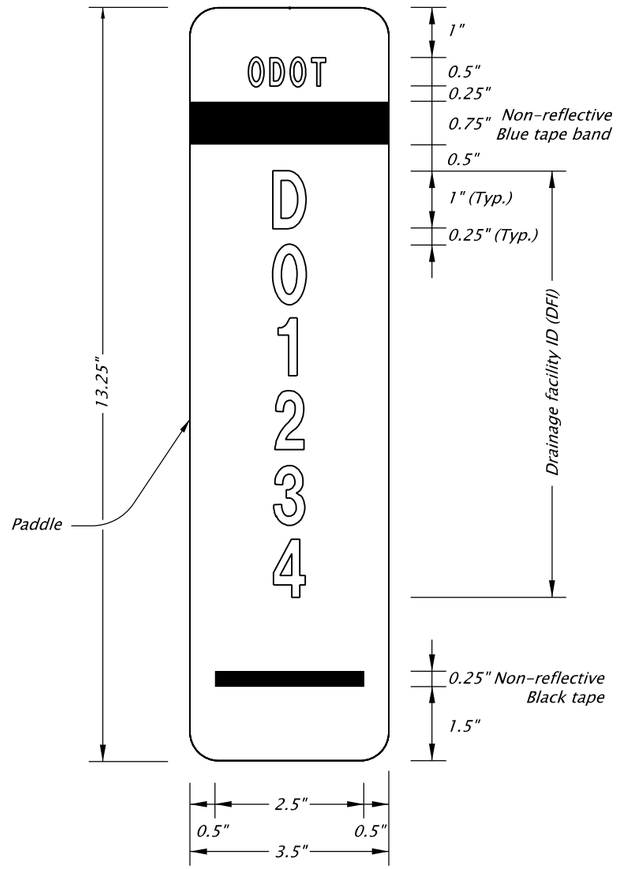
CULVERT ID MARKER

2021

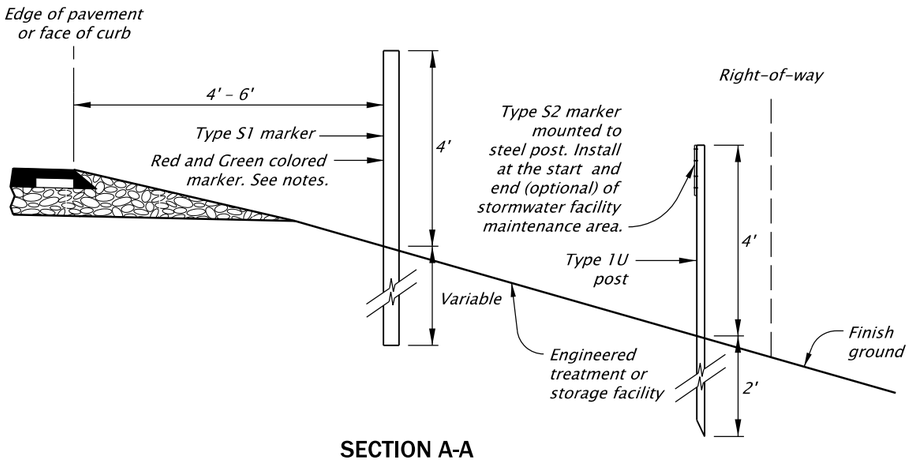
DATE	REVISION DESCRIPTION



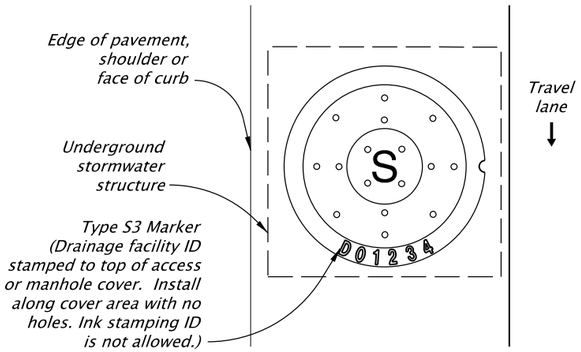
TYPE S1 & S2 MARKERS INSTALLATION DETAIL



TYPE S2 MARKER



SECTION A-A



TYPE S3 MARKER INSTALLATION DETAIL

NOTES:

Stormwater Facility Field Marker Type S1:

1. *See Standard Drawing TM570 for Type 2 flexible plastic post dimensions. Do not mount reflective sheeting to flexible plastic post.*
2. *A red Type S1 marker is used to mark the start of a stormwater facility maintenance area. A green Type S1 marker is used to mark the end of a stormwater facility maintenance area.*
3. *Place 4 to 6 feet from edge of pavement or face of curb.*
4. *See marker table for installation locations.*

Stormwater Facility Field Marker Type S2:

1. *Paddle:*
   - *Aluminum sheet, nominal thickness 0.050"*
   - *White non-reflective background*
   - *Mount paddle to one (1) Type 1U steel post using $^{3}/_{16}$" diameter aluminum blind rivets and washers. See Standard Drawing TM570 detail labeled "Steel Posts" for mounting a traffic target. Install paddle onto Type 1U steel post using the same hole pattern.*
   - *Text and numbers are Type C font in non-reflectorized black*
   - *Band is non-reflective blue tape*
   - *Do not mount paddle to other highway signing posts*
   - *Install paddle parallel to travel lane*
   - *Prepare paddle for each "DFI" noted in the marker table*
2. *Steel Posts:*
   - *See Standard Drawing TM571 for Type 1U steel post dimensions*

Stormwater Facility Field Marker Type S3:

1. *The top of access or manhole cover shall be stamped with the drainage facility ID. Ink stamping ID is not allowed.*

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CALC. BOOK NO. N/A

SDR DATE 01-July-2020

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

OREGON STANDARD DRAWINGS

STORMWATER TREATMENT AND STORAGE FACILITY FIELD MARKERS

2021

DATE	REVISION DESCRIPTION

rd399.dgn 07-01-2020

RD399

Effective Date: June 1, 2022 - November 30, 2022