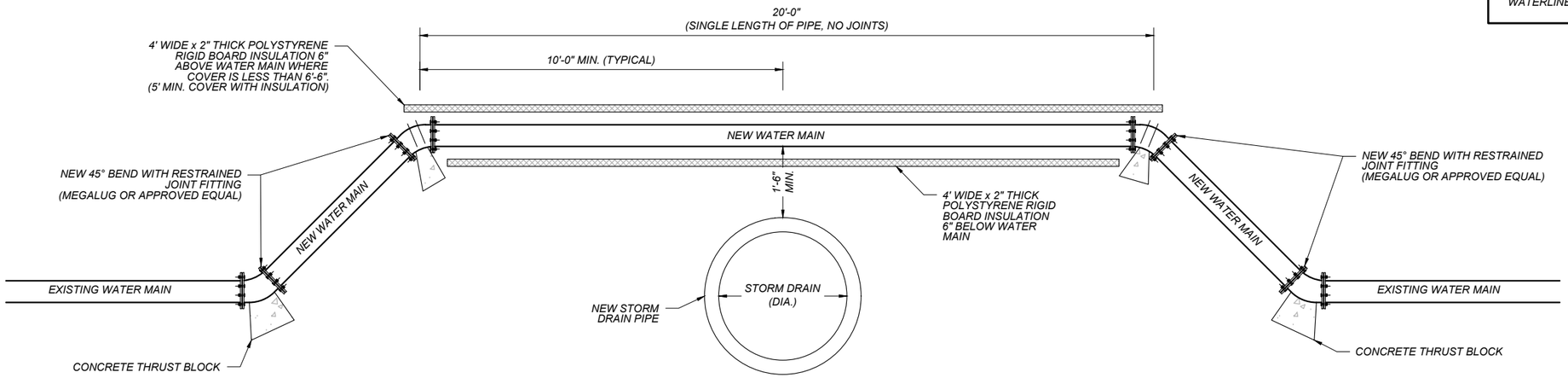
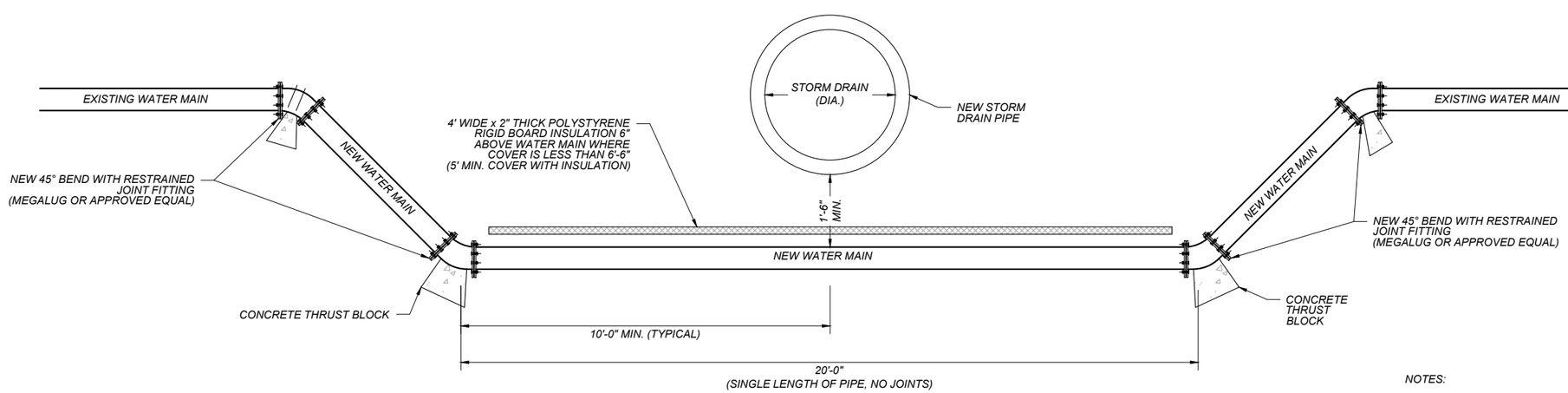
DETAIL

NOTE TO DESIGNER:
MODIFY DETAIL AS NEEDED TO MEET WATERLINE OWNER'S REQUIREMENTS.



WATER MAIN OVER STORM DRAIN



WATER MAIN UNDER STORM DRAIN

ADJUST WATER MAIN						
STATION	OFFSET	# FIELD INVESTIGATION	PIPE TYPE/SIZE (in.)	PIPE LENGTH (ft.)	*GRANULAR BEDDING MATERIAL (yd^3)	*TRENCH EXCAVATION (yd^2)
-	-	-	-	-	-	-
-	-	-	-	-	-	-

* FOR INFORMATIONAL PURPOSES ONLY. COST INCLUDED IN LENGTH OF PIPE.
\# WHEN REQUIRED, FIELD INVESTIGATE TO DETERMINE IF EXISTING WATER MAIN MEETS DEQ CLEARANCE ON NEW STORM DRAIN LINE. WHEN CLEARANCE IS NOT MET, DETERMINE EXISTING LINE SIZE AND ADJUST PER DETAIL.

NOTES:

1. MATCH SIZE OF NEW WATER MAIN TO EXISTING. TO MEET MONTANA PUBLIC WORKS OR MUNICIPALITY STANDARD SPECIFICATION.
2. WHEN REQUIRED, ENCASE NEW D.I. PIPE WITH 2-PLY POLYETHYLENE PIPE WRAPPING PER AWWA C105.
3. WHEN REQUIRED, THRUST BLOCKS TO MEET MONTANA PUBLIC WORKS OR THE MUNICIPALITY STANDARD SPECIFICATION.
4. WHEN REQUIRED, THRUST BLOCKS WILL NOT INTERFERE WITH ACCESS TO CONNECTION JOINT BOLTS.
5. WHEN REQUIRED, POLYSTYRENE RIGID BOARD INSULATION TO MEET ASTM C578, TYPE VI, WITH 60 P.S.I. COMPRESSION STRENGTH.
6. CLEAN, TEST, AND DISINFECT PER MONTANA PUBLIC WORKS.

SHEET NO.
####

ADJUST WATER MAIN DETAIL
NO SCALE

PROJECT NAME ####
COUNTY ####
PROJECT ID ####
UPN ####

DESIGNED BY ####
REVIEWED BY ####
CHECKED BY ####

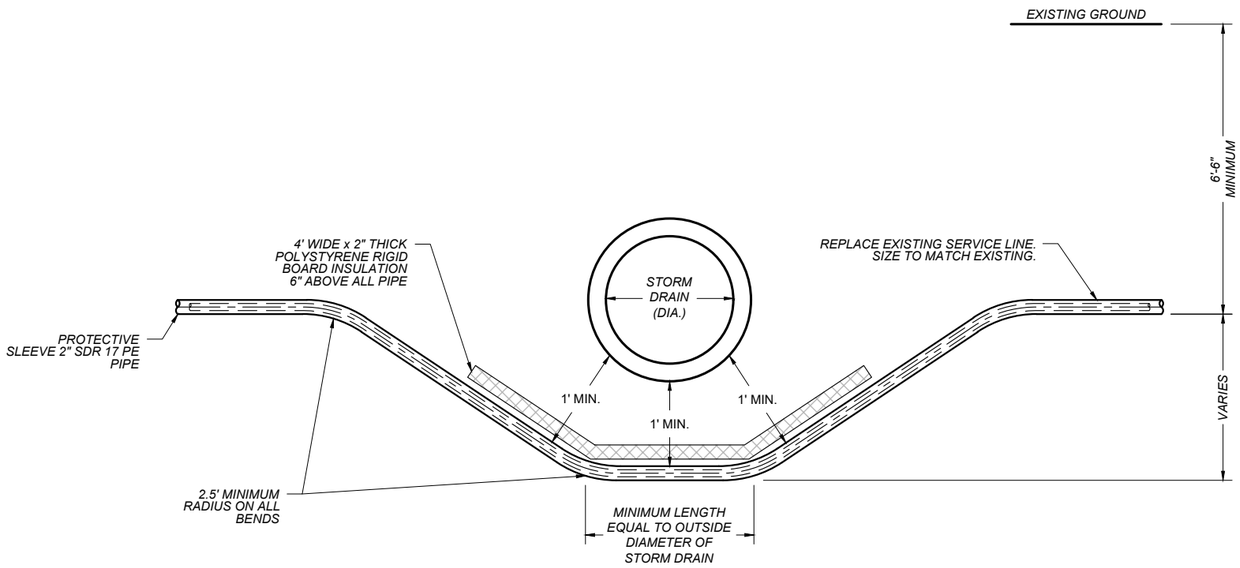
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Department of Transportation

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DETAIL

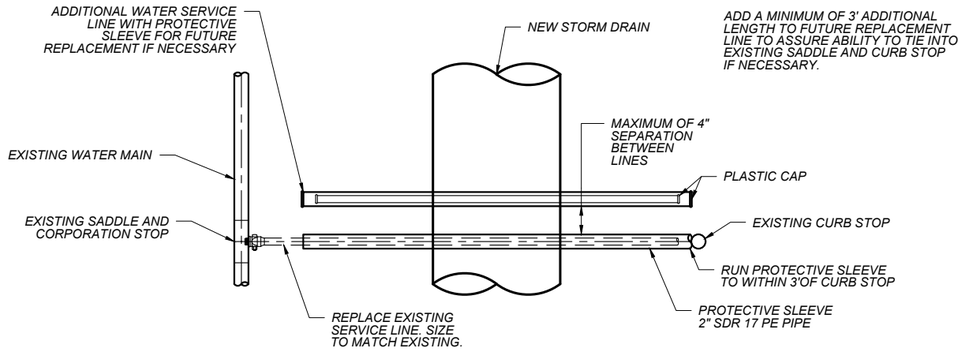
NOTE TO DESIGNER:
MODIFY DETAIL AS NEEDED TO MEET WATERLINE OWNER'S REQUIREMENTS.



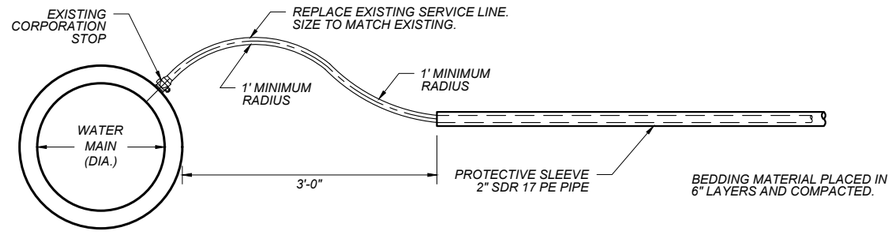
WATER SERVICE ADJUSTMENT DETAIL - PROFILE VIEW

NOTES:

1. MATCH SIZE OF NEW WATER MAIN TO EXISTING. TO MEET MONTANA PUBLIC WORKS OR MUNICIPALITY STANDARD SPECIFICATION.
2. CLEAN, TEST, AND DISINFECT WATER SERVICE AND FITTINGS PER MONTANA PUBLIC WORKS STANDARD SPECIFICATION.
3. WHEN REQUIRED, POLYSTYRENE RIGID BOARD INSULATION TO MEET ASTM C578, TYPE VI, WITH 60 P.S.I. COMPRESSION STRENGTH.



WATER SERVICE ADJUSTMENT DETAIL - PLAN VIEW



WATER SERVICE CONNECTION DETAIL

SHEET NO.
####

WATER SERVICE ADJUSTMENT DETAIL
NO SCALE

PROJECT NAME	###	###	###
COUNTY	###	###	###
PROJECT ID	###	###	###
UPN	###	###	###

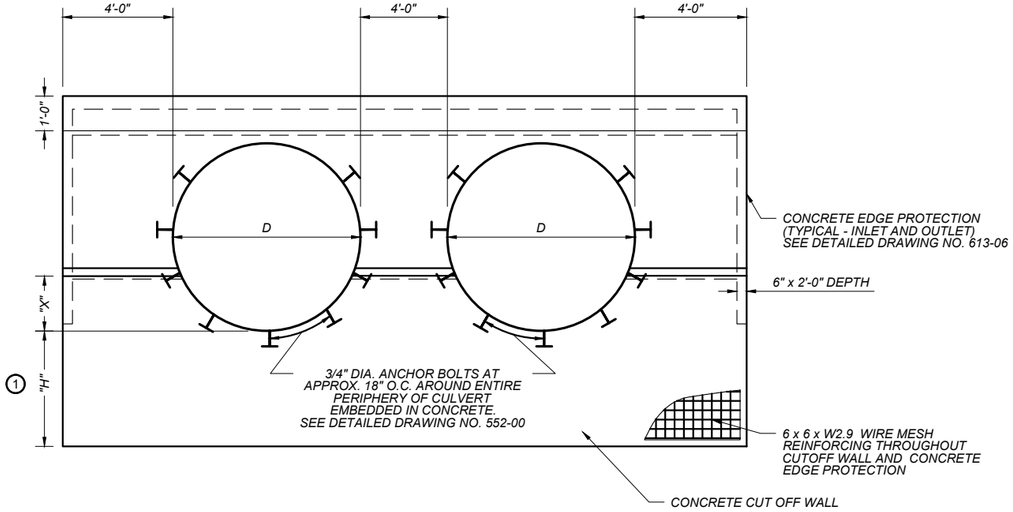
DESIGNED BY	####	####	####
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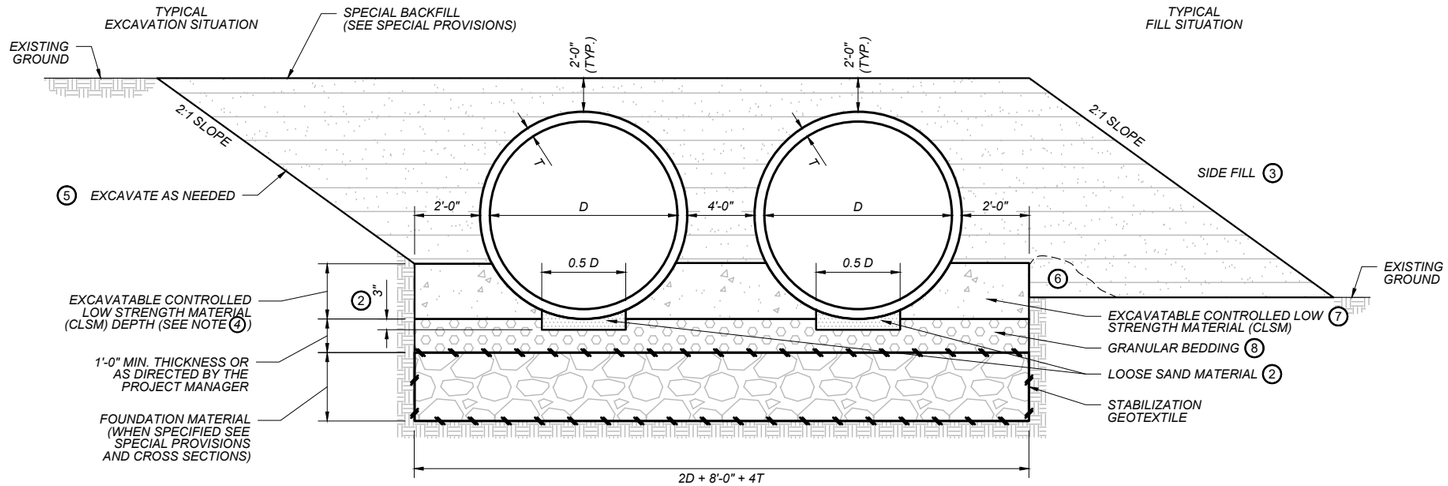
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DETAIL



FRONT ELEVATION



BEDDING DETAILS

(CUTOFF WALLS AND EDGE PROTECTION OMITTED FOR CLARITY)

DIMENSIONS					
STATION	D (ft.)	LENGTH (ft.)	"T" (in.)	"X" (ft.)	"H" (ft.)
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

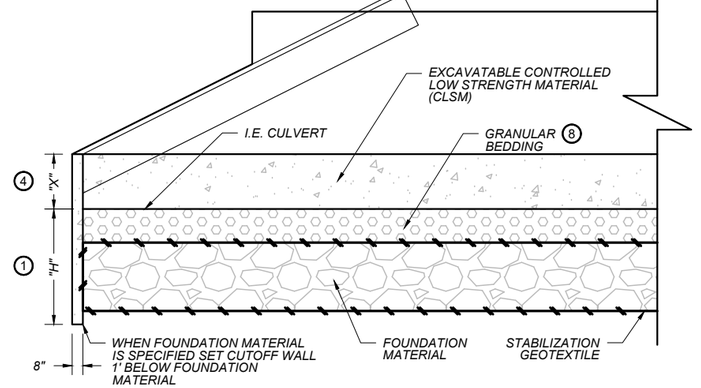
NOTES:
INCLUDE REINFORCING MATERIAL IN THE UNIT PRICE BID PER CUBIC YARD OF CLASS GENERAL CONCRETE.
INCLUDE ANCHOR BOLTS IN THE UNIT PRICE BID PER LINEAR FOOT OF CULVERT.
QUANTITIES ARE BASED ON THE DIMENSIONS IN THE TABLE.

KEY NOTES:

1. 3'-0" MIN. OR 1'-0" BELOW BOTTOM OF FOUNDATION MATERIAL IF SPECIFIED.
2. THE CONTRACTOR HAS THE OPTION OF USING A SAND CUSHION AS APPROVED BY THE PROJECT MANAGER TO FACILITATE CULVERT INSTALLATION. IF A SAND CUSHION IS USED, THAT MATERIAL WILL BE MEASURED AND PAID FOR AS GRANULAR BEDDING.
3. COMPACT AND PLACE SIDE FILL PER SECTION 603 AND 203 OF THE STANDARD SPECIFICATIONS.
4. THE EXCAVATABLE CONTROLLED LOW STRENGTH MATERIAL (CLSM) DEPTH FOR METAL PIPE IS "X" + "T". SEE DETAIL DRAWING NO. 603-32 FOR "X" DIMENSIONS OF CIRCULAR METAL PIPES.
5. EXCAVATE A SUFFICIENT AMOUNT TO PROVIDE A SAFE WORKING ENVIRONMENT AND TO ALLOW ACHIEVEMENT OF ALL CULVERT INSTALLATION AND COMPACTION REQUIREMENTS. SLOPE, BENCH OR PROVIDE SHORING FOR ALL EXCAVATIONS IN ACCORDANCE WITH THE U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION.
6. BUILD BERM WITH FILL MATERIAL AS NEEDED TO CONTAIN THE EXCAVATABLE CONTROLLED LOW STRENGTH MATERIAL (CLSM) BEDDING TO THE PROPER DEPTH.
7. PLACE EXCAVATABLE CONTROLLED LOW STRENGTH MATERIAL (CLSM) MEETING THE REQUIREMENTS OF SECTION 551 OF THE STANDARD SPECIFICATIONS.
8. COMPACT GRANULAR BEDDING BY PROOF ROLLING WITH A VIBRATORY COMPACTOR IN 12" LIFTS OR BY USING A METHOD APPROVED BY THE PROJECT MANAGER.

NOTES:

1. FURNISH GRANULAR BEDDING AND FOUNDATION MATERIAL PER SECTION 701 OF THE STANDARD SPECIFICATIONS.
DIMENSION "T" IS THE CORRUGATION DEPTH.
2. DIMENSION D THE INSIDE PIPE DIAMETER.



SIDE ELEVATION

SHEET NO.
####

BEDDING FOR DOUBLE STRUCTURAL STEEL PLATE PIPE CULVERTS
NO SCALE

PROJECT NAME	COUNTY	PROJECT ID	UPN
#####	#####	#####	#####

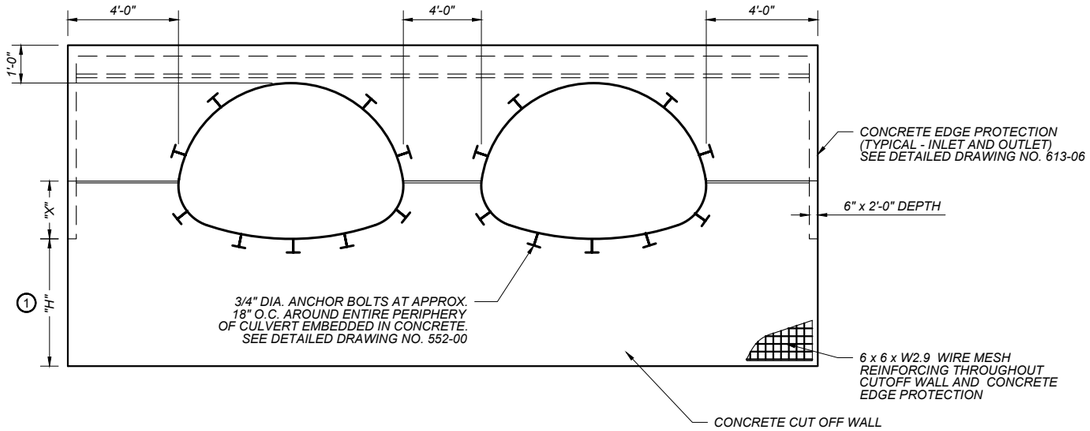
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MONTANA
Department of Transportation

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DETAIL



FRONT ELEVATION

KEY NOTES:

(1) 3'-0" MIN. OR 1'-0" BELOW BOTTOM OF FOUNDATION MATERIAL IF SPECIFIED.

(2) THE CONTRACTOR HAS THE OPTION OF USING A SAND CUSHION AS APPROVED BY THE PROJECT MANAGER TO FACILITATE CULVERT INSTALLATION. IF A SAND CUSHION IS USED, THAT MATERIAL WILL BE MEASURED AND PAID FOR AS GRANULAR BEDDING.

(3) COMPACT AND PLACE SIDE FILL PER SECTION 603 AND 203 OF THE STANDARD SPECIFICATIONS.

(4) THE EXCAVATABLE CONTROLLED LOW STRENGTH MATERIAL (CLSM) DEPTH FOR METAL PIPE IS "X" + "T". SEE DETAIL DRAWING NO. 603-32 FOR "X" DIMENSIONS OF CIRCULAR METAL PIPES.

(5) EXCAVATE A SUFFICIENT AMOUNT TO PROVIDE A SAFE WORKING ENVIRONMENT AND TO ALLOW ACHIEVEMENT OF ALL CULVERT INSTALLATION AND COMPACTION REQUIREMENTS. SLOPE, BENCH OR PROVIDE SHORING FOR ALL EXCAVATIONS IN ACCORDANCE WITH THE U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION.

(6) BUILD BERM WITH FILL MATERIAL AS NEEDED TO CONTAIN THE EXCAVATABLE CONTROLLED LOW STRENGTH MATERIAL (CLSM) BEDDING TO THE PROPER DEPTH.

(7) PLACE EXCAVATABLE CONTROLLED LOW STRENGTH MATERIAL (CLSM) MEETING THE REQUIREMENTS OF SECTION 551 OF THE STANDARD SPECIFICATIONS.

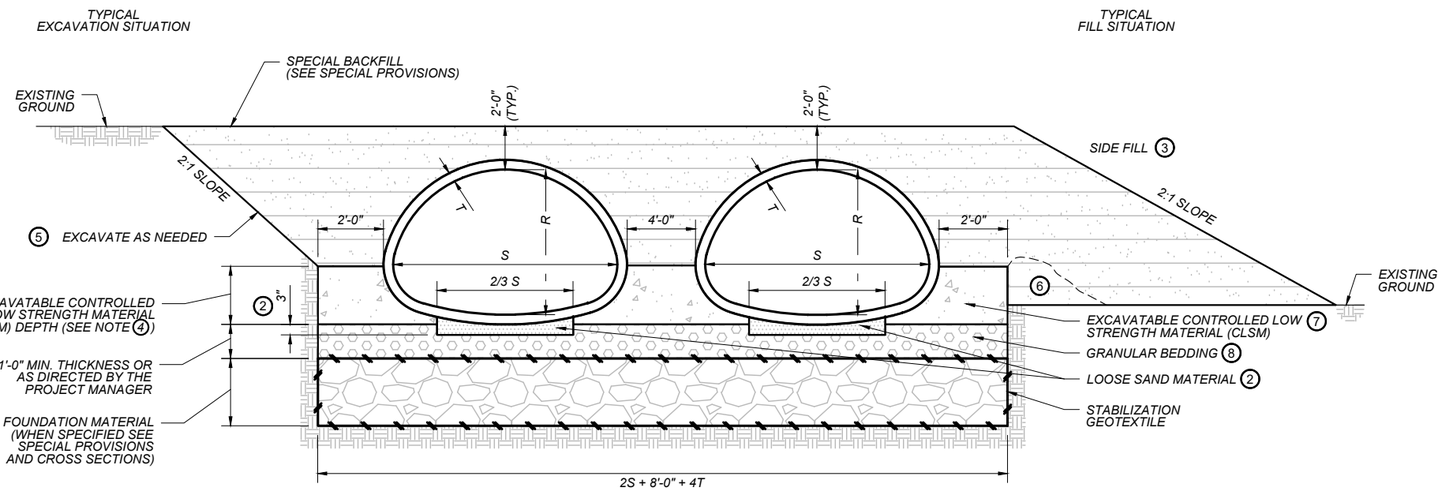
(8) COMPACT GRANULAR BEDDING BY PROOF ROLLING WITH A VIBRATORY COMPACTOR IN 12" LIFTS OR BY USING A METHOD APPROVED BY THE PROJECT MANAGER.

NOTES:

1. FURNISH GRANULAR BEDDING AND FOUNDATION MATERIAL PER SECTION 701 OF THE STANDARD SPECIFICATIONS.

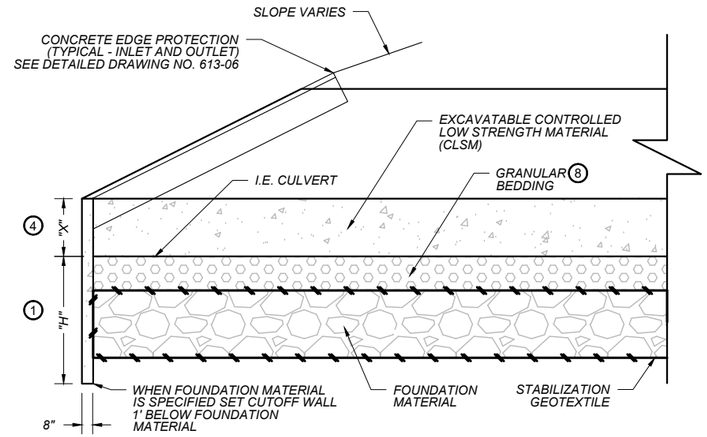
DIMENSION "T" IS THE CORRUGATION DEPTH.

2. DIMENSIONS S AND R ARE THE SPAN AND RISE.



BEDDING DETAILS

(CUTOFF WALLS AND EDGE PROTECTION OMITTED FOR CLARITY)



SIDE ELEVATION

DIMENSIONS						
STATION	SPAN (ft.)	RISE (ft.)	LENGTH (ft.)	"T" (in.)	"X" (ft.)	"H" (ft.)
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-

NOTES:
INCLUDE REINFORCING MATERIAL IN THE UNIT PRICE BID PER CUBIC YARD OF CLASS GENERAL CONCRETE.
INCLUDE ANCHOR BOLTS IN THE UNIT PRICE BID PER LINEAR FOOT OF CULVERT.
QUANTITIES ARE BASED ON THE DIMENSIONS IN THE TABLE.

SHEET NO.
####

BEDDING FOR DOUBLE STRUCTURAL STEEL PLATE PIPE ARCH CULVERTS
NO SCALE

PROJECT NAME	COUNTY	PROJECT ID	UPN
#####	#####	#####	#####

DESIGNED BY	REVIEWED BY	CHECKED BY	HYDRAULICS_STD_DWG.DWG
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MONTANA
Department of Transportation

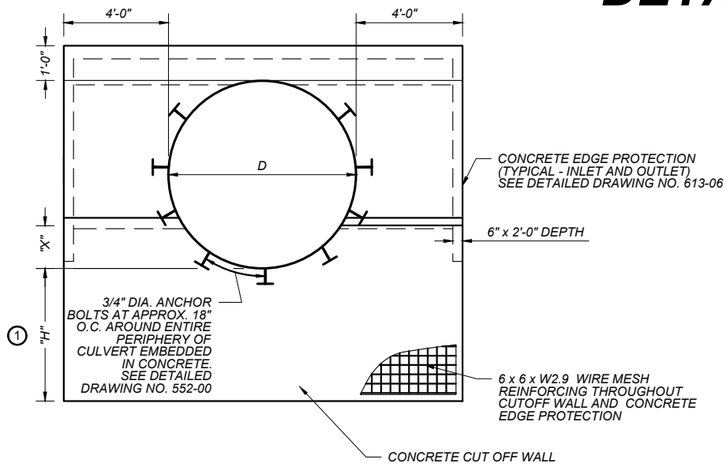
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DETAIL



FRONT ELEVATION

KEY NOTES:

(1) 3'-0" MIN. OR 1'-0" BELOW BOTTOM OF FOUNDATION MATERIAL IF SPECIFIED.

(2) THE CONTRACTOR HAS THE OPTION OF USING A SAND CUSHION AS APPROVED BY THE PROJECT MANAGER TO FACILITATE CULVERT INSTALLATION. IF A SAND CUSHION IS USED, THAT MATERIAL WILL BE MEASURED AND PAID FOR AS GRANULAR BEDDING.

(3) COMPACT AND PLACE SIDE FILL PER SECTION 603 AND 203 OF THE STANDARD SPECIFICATIONS.

(4) THE GRANULAR BEDDING DEPTH IS "X" + "T". SEE DETAIL DRAWING. NO. 603-32 FOR "X" DIMENSIONS OF CIRCULAR METAL CULVERTS. AFTER LAYING CULVERT, COMPACT GRANULAR BEDDING AT HAUNCHES AND SIDES.

(5) EXCAVATE A SUFFICIENT AMOUNT TO PROVIDE A SAFE WORKING ENVIRONMENT AND TO ALLOW ACHIEVEMENT OF ALL CULVERT INSTALLATION AND COMPACTION REQUIREMENTS. SLOPE, BENCH OR PROVIDE SHORING FOR ALL EXCAVATIONS IN ACCORDANCE WITH THE U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION.

(6) BUILD BERM WITH FILL MATERIAL AS NEEDED TO CONTAIN THE GRANULAR BEDDING TO THE PROPER DEPTH.

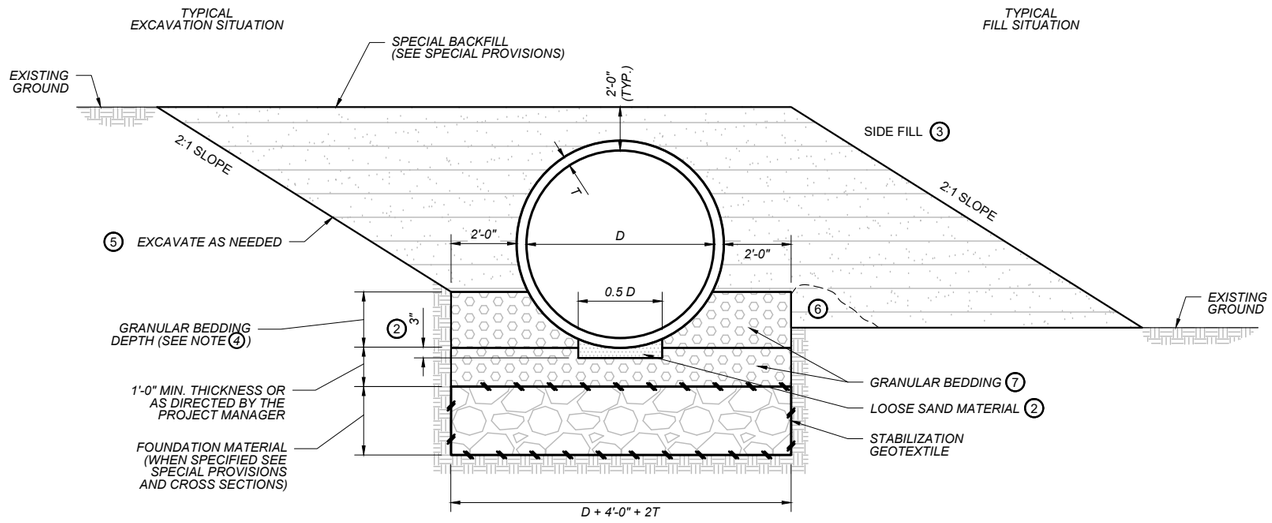
(7) COMPACT GRANULAR BEDDING BY PROOF ROLLING WITH A VIBRATORY COMPACTOR IN 12" LIFTS OR BY USING A METHOD APPROVED BY THE PROJECT MANAGER.

NOTES:

1. FURNISH GRANULAR BEDDING AND FOUNDATION MATERIAL PER SECTION 701 OF THE STANDARD SPECIFICATIONS.

DIMENSION "T" IS THE CORRUGATION DEPTH.

2. DIMENSION D THE INSIDE PIPE DIAMETER.

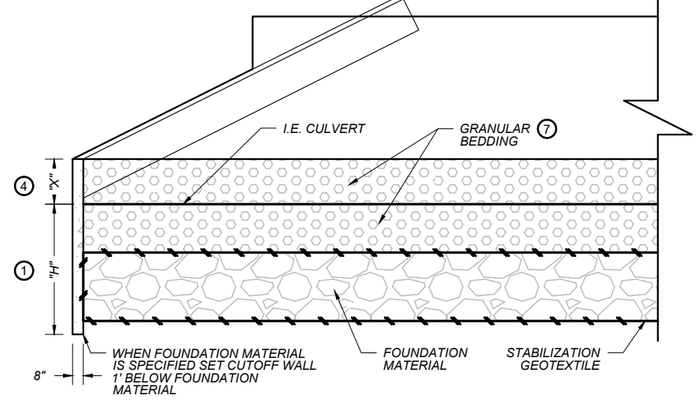


BEDDING DETAILS

(CUTOFF WALLS AND EDGE PROTECTION OMITTED FOR CLARITY)

DIMENSIONS					
STATION	D (ft.)	LENGTH (ft.)	"T" (in.)	"X" (ft.)	"H" (ft.)
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

NOTES:
INCLUDE REINFORCING MATERIAL IN THE UNIT PRICE BID PER CUBIC YARD OF CLASS GENERAL CONCRETE.
INCLUDE ANCHOR BOLTS IN THE UNIT PRICE BID PER LINEAR FOOT OF CULVERT.
QUANTITIES ARE BASED ON THE DIMENSIONS IN THE TABLE.



SIDE ELEVATION

SHEET NO.
####

BEDDING FOR STRUCTURAL STEEL PLATE PIPE CULVERT
NO SCALE

PROJECT NAME ####
COUNTY ####
PROJECT ID ####
UPN ####

DESIGNED BY ####
REVIEWED BY ####
CHECKED BY ####

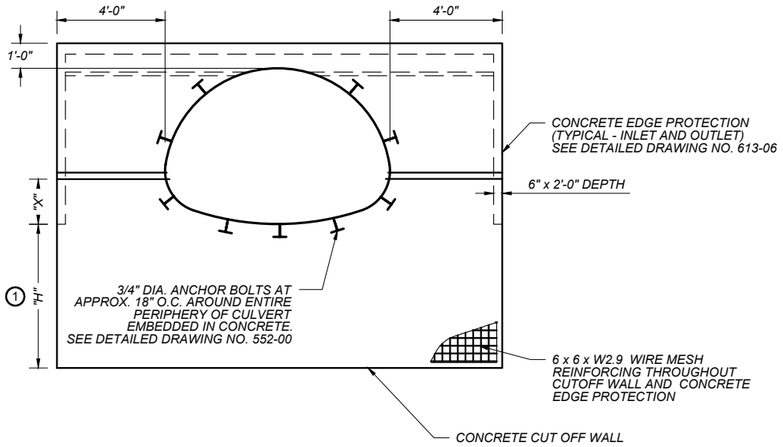
MONTANA
Department of Transportation

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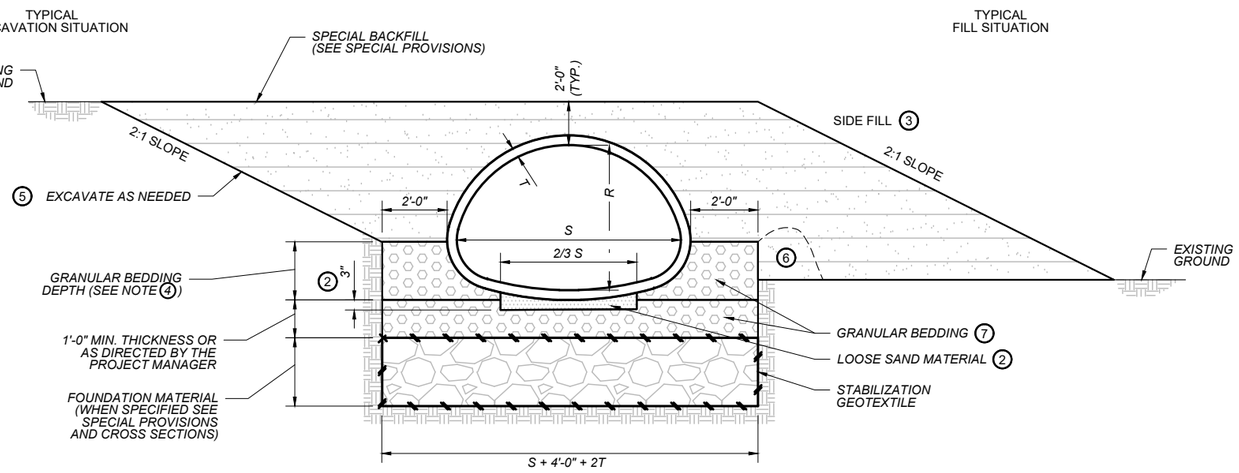
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DETAIL



FRONT ELEVATION



BEDDING DETAILS

(CUTOFF WALLS AND EDGE PROTECTION OMITTED FOR CLARITY)

DIMENSIONS						
STATION	SPAN (ft.)	RISE (ft.)	LENGTH (ft.)	"T" (in.)	"X" (ft.)	"H" (ft.)
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-

NOTES:
INCLUDE REINFORCING MATERIAL IN THE UNIT PRICE BID PER CUBIC YARD OF CLASS GENERAL CONCRETE.
INCLUDE ANCHOR BOLTS IN THE UNIT PRICE BID PER LINEAR FOOT OF CULVERT.
QUANTITIES ARE BASED ON THE DIMENSIONS IN THE TABLE.

KEY NOTES:

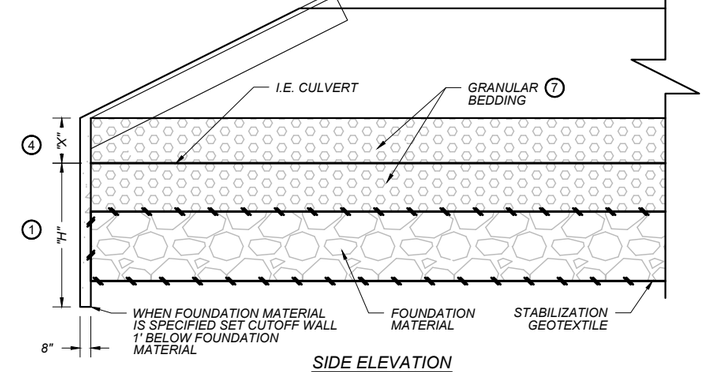
1. *3'-0" MIN. OR 1'-0" BELOW BOTTOM OF FOUNDATION MATERIAL IF SPECIFIED.*
2. *PLACE LOOSE SAND MATERIAL UNIFORMLY IN THE BOTTOM OF THE TRENCH AND SHAPE TO FIT BOTTOM OF PIPE. THE MINIMUM THICKNESS BEFORE PLACING PIPE IS 3". AFTER LAYING CULVERT, COMPACT GRANULAR BEDDING AT HAUNCHES AND SIDES OF PIPE. COMPACT GRANULAR BEDDING BY PROOF ROLLING WITH A VIBRATORY COMPACTOR IN 12 INCH LIFTS OR BY USING A METHOD APPROVED BY THE PROJECT MANAGER.*
3. *COMPACT AND PLACE SIDE FILL PER SECTION 603 AND 203 OF THE STANDARD SPECIFICATIONS.*
4. *THE GRANULAR BEDDING DEPTH IS "X" + "T". SEE DETAIL DRAWING. NO. 603-34 FOR "X" DIMENSIONS OF METAL ARCH CULVERTS.*
5. *EXCAVATE A SUFFICIENT AMOUNT TO PROVIDE A SAFE WORKING ENVIRONMENT AND TO ALLOW ACHIEVEMENT OF ALL CULVERT INSTALLATION AND COMPACTION REQUIREMENTS. SLOPE, BENCH OR PROVIDE SHORING FOR ALL EXCAVATIONS IN ACCORDANCE WITH THE U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION.*
6. *BUILD BERM WITH FILL MATERIAL AS NEEDED TO CONTAIN THE GRANULAR BEDDING TO THE PROPER DEPTH.*
7. *COMPACT GRANULAR BEDDING BY PROOF ROLLING WITH A VIBRATORY COMPACTOR IN 12" LIFTS OR BY USING A METHOD APPROVED BY THE PROJECT MANAGER.*

NOTES:

1. *SEE SECTION 701.04 OF THE STANDARD SPECIFICATIONS FOR BEDDING MATERIAL REQUIREMENTS.*

DIMENSION "T" IS THE CORRUGATION DEPTH.

2. *DIMENSIONS S AND R ARE THE SPAN AND RISE.*



SIDE ELEVATION

SHEET NO.
####

BEDDING FOR STRUCTURAL STEEL PLATE PIPE ARCH CULVERT
NO SCALE

PROJECT NAME #####
COUNTY #####
PROJECT ID #####
UPN #####

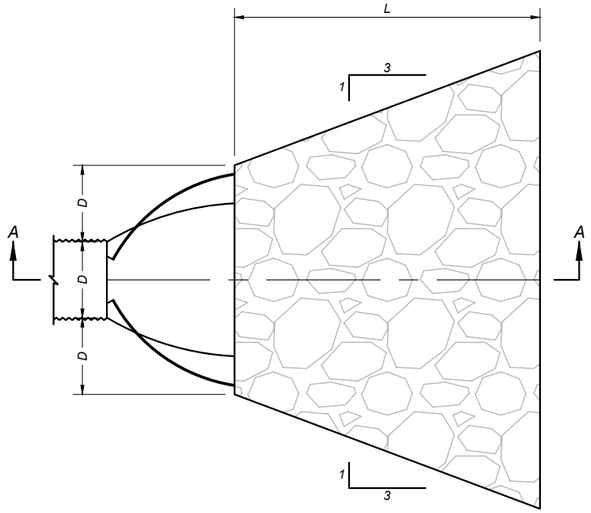
DESIGNED BY	REVIEWED BY	CHECKED BY
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MONTANA
Department of Transportation

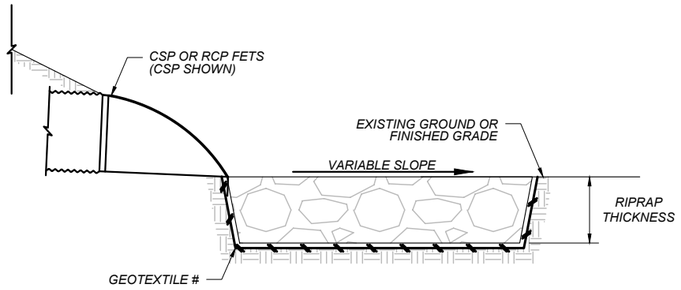
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DETAIL



PLAN VIEW



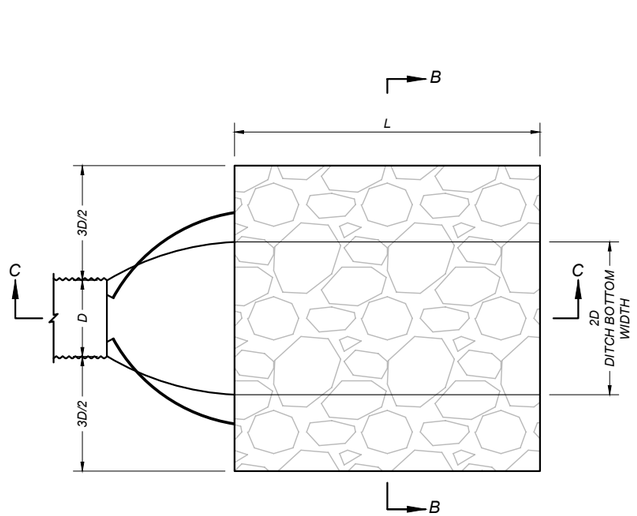
SECTION A-A

CULVERT OUTLET RIPRAP WITHOUT DITCH

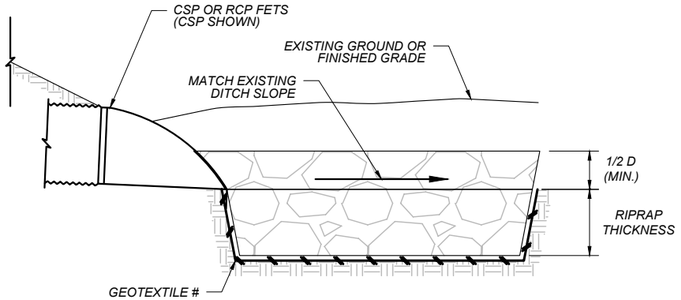
CULVERT OUTLET RIPRAP WITHOUT DITCH - DIMENSIONS AND ESTIMATED QUANTITIES

	CLASS I RIPRAP (2' THICK)			CLASS II RIPRAP (2.5' THICK)		
CULVERT DIA. OR SPAN D (in.)	LENGTH OF APRON L (ft.)	CLASS I RIPRAP (yd^3)	GEOTEXTILE # (yd^2)	LENGTH OF APRON L (ft.)	CLASS II RIPRAP (yd^3)	GEOTEXTILE # (yd^2)
12	4	1.3	2	6	2.8	3
18	6	2.9	4	9	6.3	8
21	7	3.9	6	11	9.1	11
22	8	4.8	7	11	9.3	11
24	8	5.1	8	12	11.1	13
26	9	6.3	10	13	13.0	16
28	10	7.7	11	14	15.1	18
28 1/2	10	7.7	12	15	16.8	20
30	10	8.0	12	15	17.4	21
35	12	11.3	17	18	24.6	30
36	12	11.6	17	18	25.0	30
36 1/4	13	12.9	19	19	27.1	33
42	14	15.7	24	21	34.0	41
43 3/4	15	17.7	27	22	37.2	45
48	16	20.5	31	24	44.4	53
49	17	22.6	34	25	47.6	57
51 1/8	18	25.0	38	26	51.6	62
53	18	25.7	39	27	55.6	67
57	19	29.0	43	29	64.2	77
58 1/2	20	31.5	47	30	68.4	82

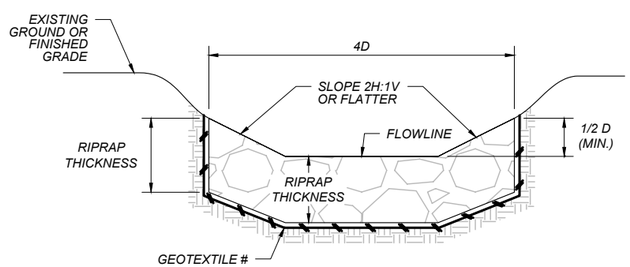
PERMANENT EROSION CONTROL GEOTEXTILE - HIGH SURVIVABILITY



PLAN VIEW



SECTION C-C



SECTION B-B

CULVERT OUTLET RIPRAP WITH DITCH

CULVERT OUTLET RIPRAP WITH DITCH - DIMENSIONS AND ESTIMATED QUANTITIES

	CLASS I RIPRAP (2' THICK)			CLASS II RIPRAP (2.5' THICK)		
CULVERT DIA. OR SPAN D (in.)	LENGTH OF APRON L (ft.)	CLASS I RIPRAP (yd^3)	GEOTEXTILE # (yd^2)	LENGTH OF APRON L (ft.)	CLASS II RIPRAP (yd^3)	GEOTEXTILE # (yd^2)
12	4	1.2	2	6	2.2	3
18	6	2.7	4	9	5.0	6
21	7	3.6	6	11	7.1	9
22	8	4.3	7	11	7.5	9
24	8	4.7	8	12	8.9	11
26	9	5.8	9	13	10.4	13
28	10	6.9	11	14	12.1	15
28 1/2	10	7.0	11	15	13.2	17
30	10	7.4	12	15	13.9	18
35	12	10.4	16	18	19.4	25
36	12	10.7	17	18	20.0	25
36 1/4	13	11.6	18	19	21.3	27
42	14	14.5	23	21	27.2	35
43 3/4	15	16.2	26	22	29.7	38
48	16	19.0	30	24	35.6	45
49	17	20.6	33	25	37.8	48
51 1/8	18	22.7	36	26	41.0	52
53	18	23.6	37	27	44.2	56
57	19	26.7	42	29	51.0	65
58 1/2	20	28.9	46	30	54.2	69

PERMANENT EROSION CONTROL GEOTEXTILE - HIGH SURVIVABILITY

CULVERT STATION	CULVERT DIA. OR SPAN D (in.)	OUTLET RIPRAP LOCATION (lt. or rt.)	WITH DITCH	WITHOUT DITCH
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

SHEET NO.
####

CULVERT OUTLET RIPRAP FOR CULVERTS WITH FETS (48" EQUIVALENT AND SMALLER)
NOT TO SCALE

PROJECT NAME ####
COUNTY ####
PROJECT ID ####
UPN ####

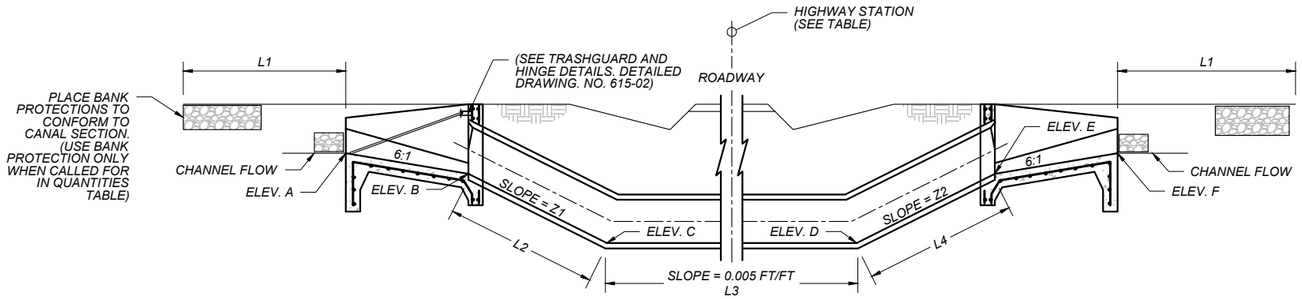
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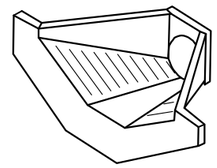
MONTANA
Department of Transportation

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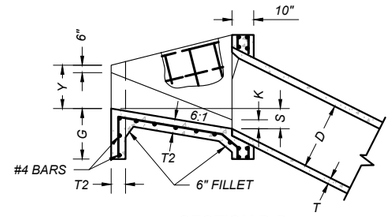
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DETAIL





ISO VIEW OF TRANSITION

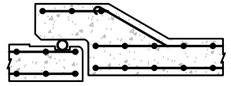


SECTION B-B

(SEE QUANTITIES TABLE, DETAILED DRAWING NO. 615-02)

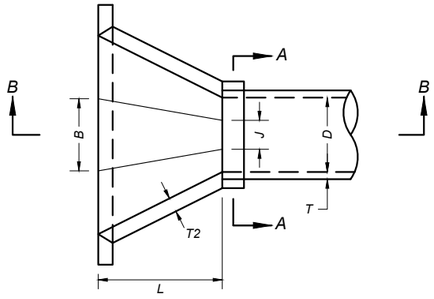
NOTES:

1. PROVIDE TRASHGUARDS WHERE REQUIRED.
2. PRE-CAST OR FIELD CAST BENDS AS SHOWN ON DETAILED DRAWING NO. 603-26. CONSTRUCT WATERTIGHT JOINTS. GASKETS TO MEET THE REQUIREMENTS OF SUB-SECTION 603.03 OF STANDARD SPECIFICATIONS.
3. MAXIMUM SLOPE FOR Z1 AND Z2 IS 2:1.
4. SEE CULVERT SUMMARY FOR ALLOWABLE OPTIONS.

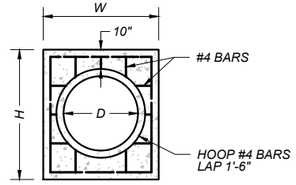


TYPE CX-4

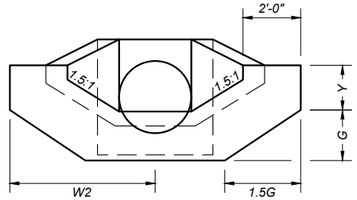
RUBBER GASKET JOINT



PLAN VIEW



SECTION A-A



ELEVATION

NOTE TO DESIGNER:
ASTM 361 - "REINFORCED LOW HEAD CONCRETE PRESSURE PIPE" SHOULD BE USED FOR SIPHONS THAT WILL HAVE A HEAD GREATER THAN 20 FEET.

SPACE REINFORCING BARS ABOUT 12" C-C
NOTE:

BOTH WAYS THROUGHOUT STRUCTURE. USE CONTINUOUS BARS IN FLOORS AND WALLS WHEN SPLICES ARE MADE. LAP REINFORCING BARS 1'-6". ALL EXPOSED EDGES TO BE CHAMFERED 1". PLACE REINFORCING BARS IN CENTER OF WALLS AND SLABS UNLESS OTHERWISE NOTED.

HIGHWAY ℄ STATION	DIAMETER & TYPE	DIMENSIONS (ft.in.)					INVERT ELEVATIONS						** QUANTITIES			
		* L5 **	B	L1	Z1	Z2	INLET A	B	C	D	E	OUTLET F	TRASHGUARD		TYPE 4 BANK PROTECTION (cu.yd.)	
													INLET	OUTLET	INLET	OUTLET
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*L5 = TOTAL PIPE LENGTH OR L2+L3+L4
** QUANTITIES INCLUDED IN CULVERT SUMMARY ARE FOR ESTIMATING PURPOSES ONLY.

INLET & OUTLET CONCRETE TRANSITIONS FOR R.C.P.																				
CULVERT		DIMENSIONS (ft.-in.)											QUANTITIES							
													B = d			B = d + 1'-0"			B = d + 2'-0"		
DIA. "d" (in.)	AREA (sq.ft.)	G	H	L	T	T2	W	Y	J	K	S	W2	B	CLASS GEN. CONC. (cu.yd.)	#4 BAR (lbs.)	B	CLASS GEN. CONC. (cu.yd.)	#4 BAR (lbs.)	B	CLASS GEN. CONC. (cu.yd.)	#4 BAR (lbs.)
18"	1.77	2.0	3-8	3-0	0-2 1/2	0-6	3-2	1-3	0-5	0-4	0-6	3-10 1/2	1-6	0.8	74	2-6	0.9	80	3-6	1.0	85
24"	3.14	2.0	4-3	4-0	0-3	0-6	3-9	1-6	0-7	0-5 1/2	0-8	4-6	2-0	1.2	100	3-0	1.3	106	4-0	1.4	112
30"	4.91	2.0	4-10	5-0	0-3 1/2	0-6	4-4	1-9	0-9	0-7	0-10	5-1 1/2	2-6	1.6	127	3-6	1.7	134	4-6	1.8	141
36"	7.07	2.6	5-6	6-0	0-4	0-6	4-11	2-0	0-11	0-8	1-0	5-9	3-0	2.2	174	4-0	2.3	181	5-0	2.4	191
42"	9.62	2.6	6-1	7-0	0-4 1/2	0-6	5-6	2-3	1-0	0-9 1/2	1-2	6-4 1/2	3-6	2.7	212	4-6	2.8	222	5-6	2.9	232
48"	12.57	2.6	6-8	8-0	0-5	0-8	6-1	2-6	1-2	0-11	1-4	7-0	4-0	4.2	267	5-0	4.4	277	6-0	4.6	287
54"	15.60	2.6	7-3	9-0	0-5 1/2	0-8	6-8	2-9	1-4	1-0 1/2	1-6	7-7 1/2	4-6	4.9	316	5-6	5.2	330	6-6	5.4	346
60"	19.63	2.6	7-10	10-0	0-6	0-8	7-3	3-0	1-6	1-2	1-8	8-3	5-0	5.9	366	6-0	6.0	382	7-0	6.3	398

REINFORCING STEEL TO BE INCLUDED IN THE UNIT PRICE BID FOR CLASS GENERAL CONCRETE.

SHEET NO.
####

IRRIGATION SIPHON DETAIL
NO SCALE

PROJECT NAME ####
COUNTY ####
PROJECT ID ####
UPN ####

DESIGNED BY ####
REVIEWED BY ####
CHECKED BY ####

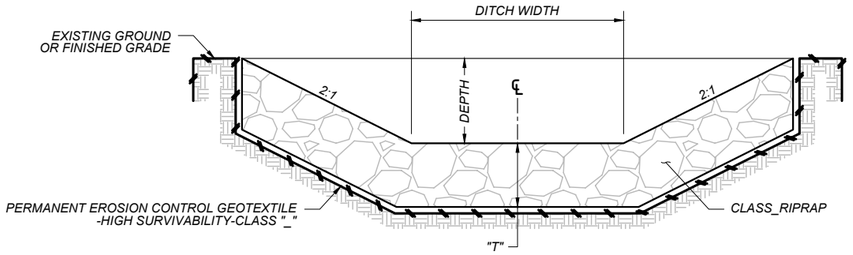
MONTANA
Department of Transportation

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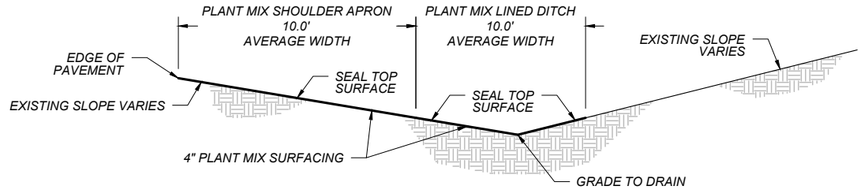
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DETAIL



RIPRAP LINED DITCH



PLANT MIX LINED DITCH

RESHAPE AND COMPACT EXISTING SLOPES AS NECESSARY TO PROVIDE SUITABLE PAVING SURFACE. COMPACTION REQUIREMENTS FOR PLANT MIX AND GROUND ARE WAIVED BUT SUBJECT TO ENGINEER'S APPROVAL. RESHAPING PAID FOR WITH GRADER HOURS. COMPACTION TO BE INCLUDED IN COST OF OTHER ITEMS.

SHEET NO.
####

PROJECT NAME
COUNTY
PROJECT ID
UPN

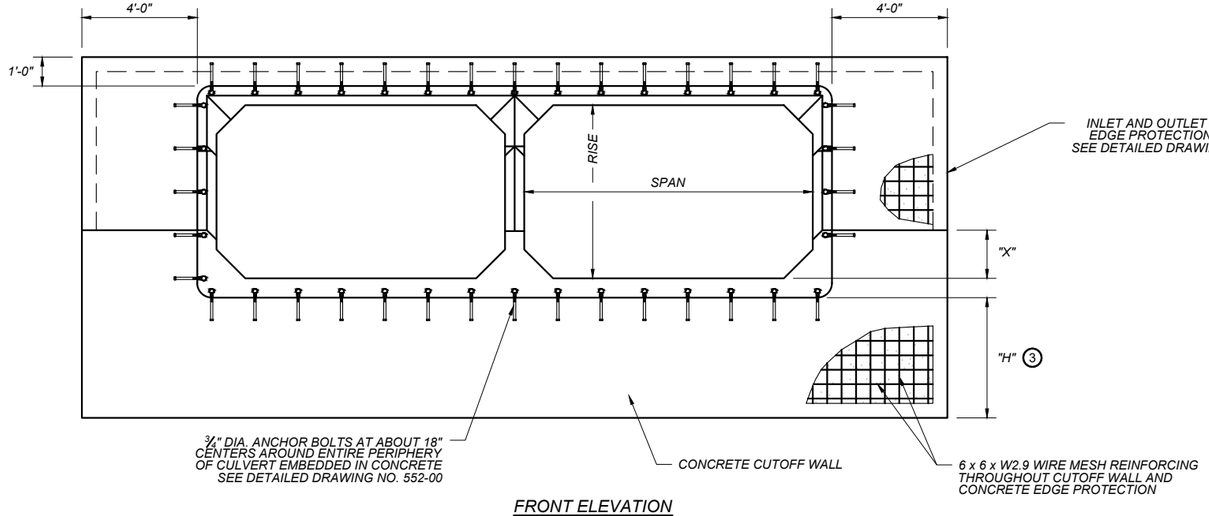
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REVIEWED BY ####
CHECKED BY ####

MONTANA
Department of Transportation

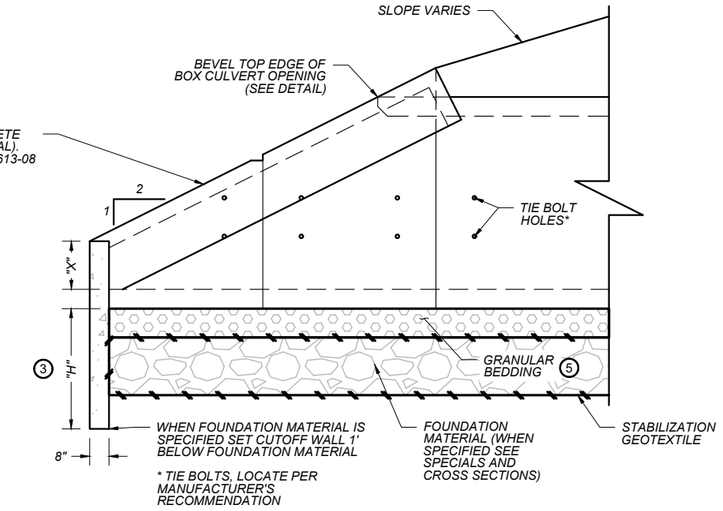
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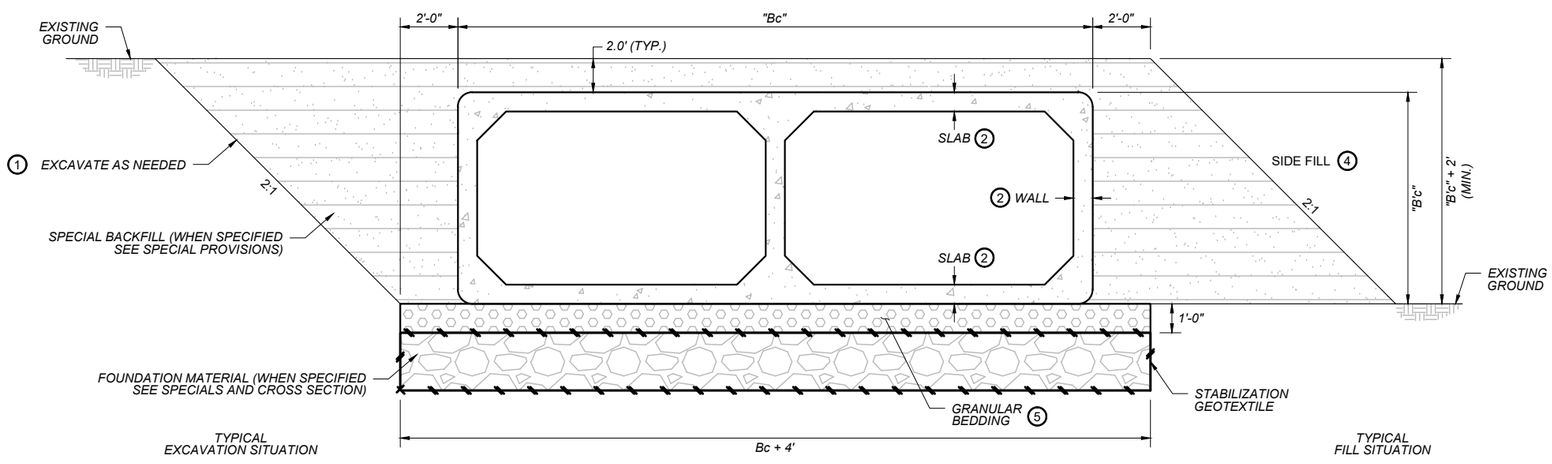
DETAIL



FRONT ELEVATION



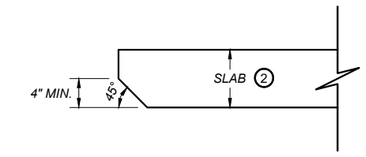
SIDE ELEVATION



BEDDING DETAIL

DIMENSIONS										
STATION	SPAN (ft.)	RISE (ft.)	LENGTH (ft.)	WALL (in.)	SLAB (in.)	"Bc" (ft.)	"x" (ft.)	"B'c" (ft.)	"H" (ft.)	COVER (ft.)
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-

NOTES:
INCLUDE REINFORCING, CUTOFF WALL, AND CONCRETE EDGE PROTECTION IN THE UNIT PRICE BID PER CUBIC YARD OF CLASS GENERAL CONCRETE.
INCLUDE ANCHOR BOLTS IN THE UNIT PRICE BID PER LINEAR FOOT OF CULVERT.
PROVIDE BOX CULVERTS MEETING ASTM C1577.
QUANTITIES ARE BASED ON THE DIMENSIONS IN THE TABLE.



TOP BEVEL DETAIL

NOTES:

(1) EXCAVATE A SUFFICIENT AMOUNT TO PROVIDE A SAFE WORKING ENVIRONMENT AND TO ALLOW ACHIEVEMENT OF ALL CULVERT INSTALLATION AND COMPACTION REQUIREMENTS. SLOPE, BENCH OR PROVIDE SHORING FOR ALL EXCAVATIONS IN ACCORDANCE WITH THE U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION.

(2) FOR ESTIMATING QUANTITIES ONLY. ACTUAL DIMENSION TO BE DETERMINED BY PRECAST MANUFACTURER.

(3) 3'-0" MIN.OR 1'-0" BELOW BOTTOM OF FOUNDATION MATERIAL IF SPECIFIED.

(4) COMPACT AND PLACE SIDE FILL PER SECTION 603 AND 203 OF THE STANDARD SPECIFICATIONS.

(5) SEE SECTION 701 OF THE STANDARD SPECIFICATIONS FOR GRANULAR BEDDING REQUIREMENTS. THE CONTRACTOR HAS THE OPTION OF USING A SAND CUSHION ABOVE THE GRANULAR BEDDING TO FACILITATE JOINING OF THE BOX CULVERT SECTIONS.

SHEET NO.
####

SLOPED END DOUBLE RCB DETAIL
NO SCALE

PROJECT NAME ####
COUNTY ####
PROJECT ID ####
UPN ####

DESIGNED BY ####
REVIEWED BY ####
CHECKED BY ####
HYDRAULICS_STD_DWG.DWG

MONTANA
Department of Transportation

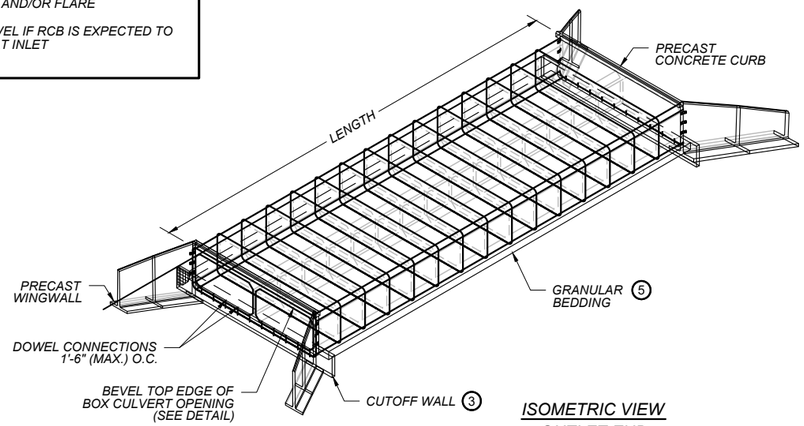
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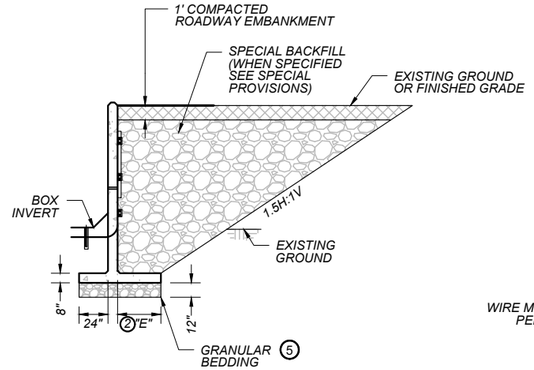
DETAIL

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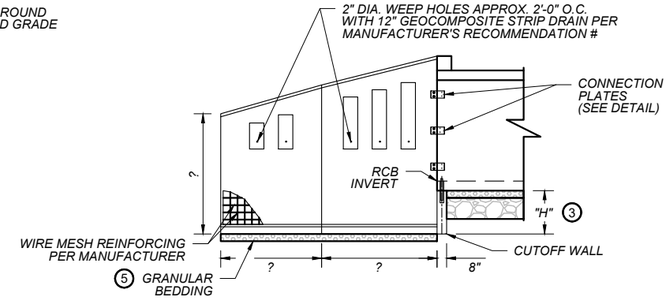
1. ADDITIONAL SHEETS MAY BE REQUIRED IF WINGWALLS ARE DIFFERENT DIMENSIONS AND/OR FLARE
2. ADD TOP BEVEL IF RCB IS EXPECTED TO FLOW FULL AT INLET



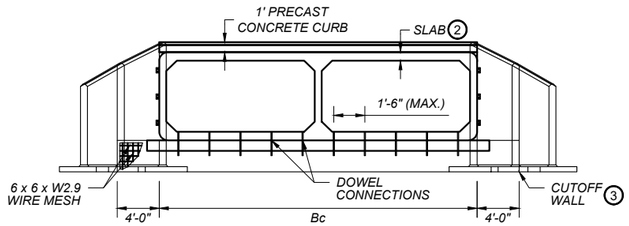
ISOMETRIC VIEW
OUTLET END



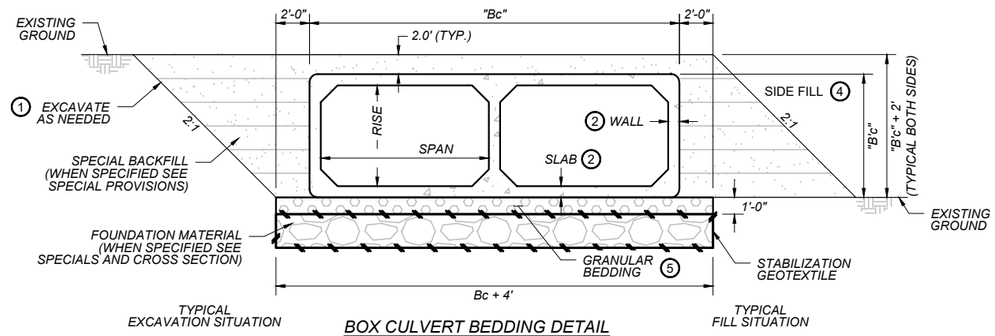
PRECAST TAPERED WINGWALL
BEDDING AND BACKFILL DETAIL



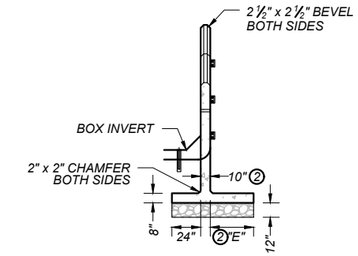
PRECAST TAPERED WINGWALL
DETAIL SIDE VIEW



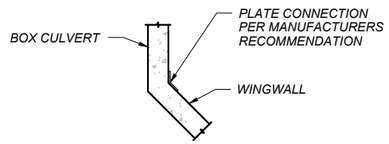
PRECAST TAPERED DOUBLE CELL BOX CULVERT
WITH CUTOFF WALL AND 45° PRECAST WINGWALLS



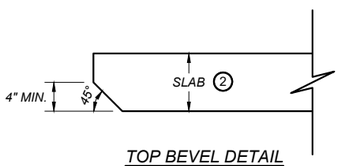
BOX CULVERT BEDDING DETAIL



PRECAST TAPERED WINGWALL
DETAIL END VIEW



CONNECTION
PLATE DETAIL



TOP BEVEL DETAIL

NOTES:

1. EXCAVATE A SUFFICIENT AMOUNT TO PROVIDE A SAFE WORKING ENVIRONMENT AND TO ALLOW ACHIEVEMENT OF ALL CULVERT INSTALLATION AND COMPACTION REQUIREMENTS. SLOPE, BENCH OR PROVIDE SHORING FOR ALL EXCAVATIONS IN ACCORDANCE WITH THE U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION.
2. FOR ESTIMATING QUANTITIES ONLY. ACTUAL DIMENSION TO BE DETERMINED BY PRECAST MANUFACTURER.
3. 3'-0" MIN.OR 1'-0" BELOW BOTTOM OF FOUNDATION MATERIAL IF SPECIFIED.
4. COMPACT AND PLACE SIDE FILL PER SECTION 603 AND 203 OF THE STANDARD SPECIFICATIONS.
5. SEE SECTION 701 OF THE STANDARD SPECIFICATIONS FOR GRANULAR BEDDING REQUIREMENTS. THE CONTRACTOR HAS THE OPTION OF USING A SAND CUSHION ABOVE THE GRANULAR BEDDING TO FACILITATE JOINING OF THE BOX CULVERT SECTIONS.

DIMENSIONS										
STATION	SPAN (ft.)	RISE (ft.)	LENGTH (ft.)	WALL (in.)	SLAB (in.)	"E" (in.)	"Bc" (ft.)	"B'c" (ft.)	"H" (ft.)	COVER (ft.)
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-

NOTE: QUANTITIES ARE BASED ON THE DIMENSIONS IN THE TABLE. PROVIDE BOX CULVERTS MEETING ASTM C1577. INCLUDE PRECAST TAPERED WINGWALLS, PRECAST CONCRETE CURBS, CUTOFF WALLS, SPECIAL BACKFILL BEHIND PRECAST TAPERED WINGWALLS, GEOCOMPOSITE STRIP DRAINS, AND GRANULAR BEDDING BENEATH THE PRECAST TAPERED WINGWALLS IN THE UNIT PRICE BID PER LINEAR FOOT OF RCB.

PROVIDE A GEOCOMPOSITE STRIP DRAIN CONSTRUCTED OF A HDPE DRAINAGE CORE WITH A MINIMUM COMPRESSIVE STRENGTH OF 9000 PSF PER ASTM D 1621 AND A MINIMUM FLOW CAPACITY OF 20 GPM PER ASTM D 4716. THE STRIP DRAIN MUST BE WRAPPED IN A SUBSURFACE DRAINAGE GEOTEXTILE FILTER MEETING THE REQUIREMENTS OF HIGH SURVIVABILITY, CLASS B OF SECTION 716.

SHEET NO.
####

DOUBLE RCB WITH TAPERED WINGWALLS DETAIL
NOT TO SCALE

PROJECT NAME ####
COUNTY ####
PROJECT ID ####
UPN ####

DESIGNED BY ####
REVIEWED BY ####
CHECKED BY ####

HYDRAULICS_STD_DWG.DWG

MONTANA
Department of Transportation

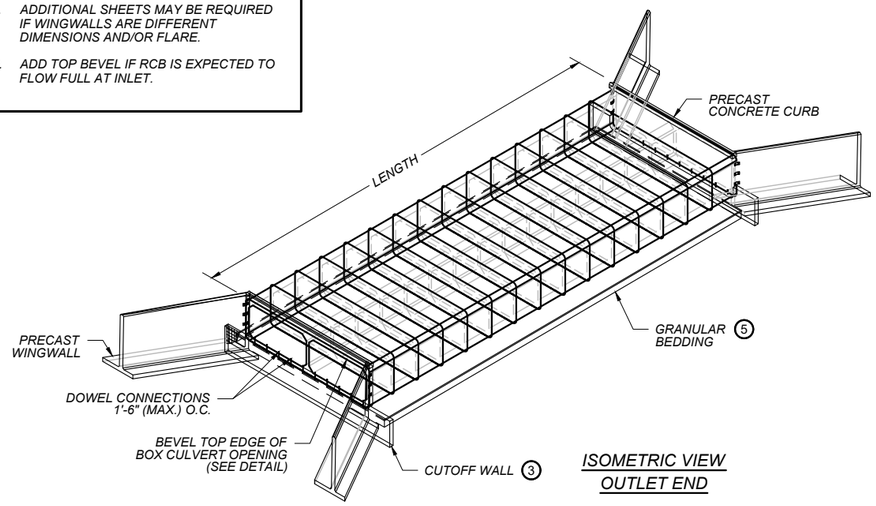
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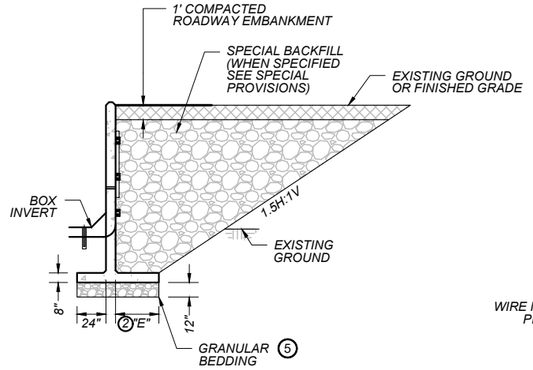
DETAIL

NOTES TO DESIGNER:

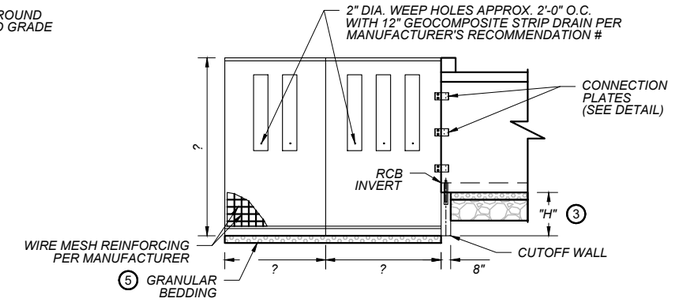
1. ADDITIONAL SHEETS MAY BE REQUIRED IF WINGWALLS ARE DIFFERENT DIMENSIONS AND/OR FLARE.
2. ADD TOP BEVEL IF RCB IS EXPECTED TO FLOW FULL AT INLET.



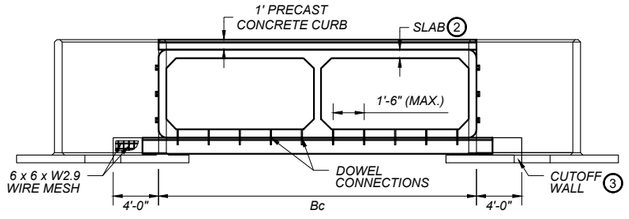
ISOMETRIC VIEW
OUTLET END



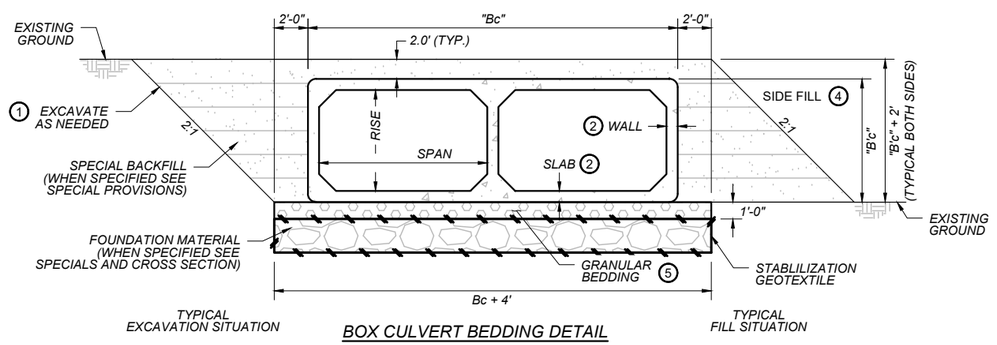
PRECAST WINGWALL
BEDDING AND BACKFILL DETAIL



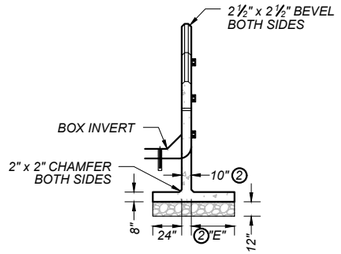
PRECAST WINGWALL
DETAIL SIDE VIEW



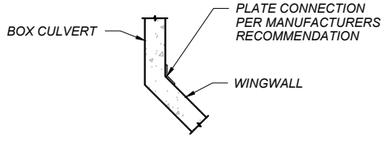
PRECAST DOUBLE CELL BOX CULVERT
WITH CUTOFF WALL AND 45° PRECAST WINGWALLS



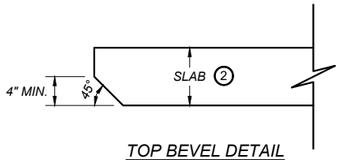
BOX CULVERT BEDDING DETAIL



PRECAST WINGWALL
DETAIL END VIEW



CONNECTION
PLATE DETAIL



TOP BEVEL DETAIL

NOTES:

1. EXCAVATE A SUFFICIENT AMOUNT TO PROVIDE A SAFE WORKING ENVIRONMENT AND TO ALLOW ACHIEVEMENT OF ALL CULVERT INSTALLATION AND COMPACTION REQUIREMENTS. SLOPE, BENCH OR PROVIDE SHORING FOR ALL EXCAVATIONS IN ACCORDANCE WITH THE U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION.
2. FOR ESTIMATING QUANTITIES ONLY. ACTUAL DIMENSION TO BE DETERMINED BY PRECAST MANUFACTURER.
3. 3'-0" MIN.OR 1'-0" BELOW BOTTOM OF FOUNDATION MATERIAL IF SPECIFIED.
4. COMPACT AND PLACE SIDE FILL PER SECTION 603 AND 203 OF THE STANDARD SPECIFICATIONS.
5. SEE SECTION 701 OF THE STANDARD SPECIFICATIONS FOR GRANULAR BEDDING REQUIREMENTS. THE CONTRACTOR HAS THE OPTION OF USING A SAND CUSHION ABOVE THE GRANULAR BEDDING TO FACILITATE JOINING OF THE BOX CULVERT SECTIONS.

DIMENSIONS										
STATION	SPAN (ft.)	RISE (ft.)	LENGTH (ft.)	WALL (in.)	SLAB (in.)	"E" (in.)	"Bc" (ft.)	"B'c" (ft.)	"H" (ft.)	COVER (ft.)
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-

NOTE: QUANTITIES ARE BASED ON THE DIMENSIONS IN THE TABLE. PROVIDE BOX CULVERTS MEETING ASTM C1577. INCLUDE PRECAST WINGWALLS, PRECAST CONCRETE CURBS, CUTOFF WALLS, SPECIAL BACKFILL BEHIND PRECAST WINGWALLS, GEOCOMPOSITE STRIP DRAINS, AND GRANULAR BEDDING BENEATH THE PRECAST WINGWALLS IN THE UNIT PRICE BID PER LINEAR FOOT OF RCB.

PROVIDE A GEOCOMPOSITE STRIP DRAIN CONSTRUCTED OF A HDPE DRAINAGE CORE WITH A MINIMUM COMPRESSIVE STRENGTH OF 9000 PSF PER ASTM D 1621 AND A MINIMUM FLOW CAPACITY OF 20 GPM PER ASTM D 4716. THE STRIP DRAIN MUST BE WRAPPED IN A SUBSURFACE DRAINAGE GEOTEXTILE FILTER MEETING THE REQUIREMENTS OF HIGH SURVIVABILITY, CLASS B OF SECTION 716.

SHEET NO.
####

DOUBLE RCB WITH WINGWALLS DETAIL
NOT TO SCALE

PROJECT NAME ####
COUNTY ####
PROJECT ID ####
UPN ####

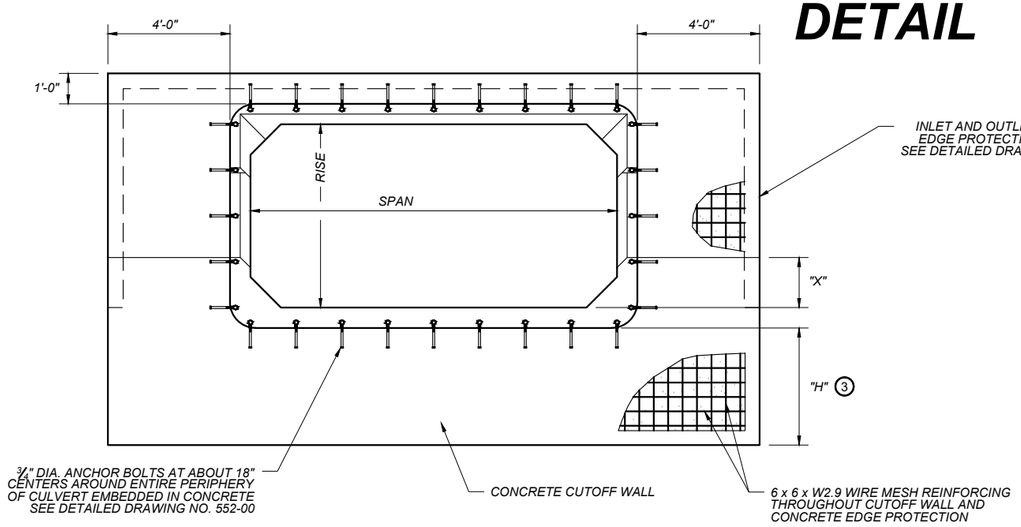
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REVIEWED BY ####
CHECKED BY ####
HYDRAULICS_STD_DWG.DWG

MONTANA
Department of Transportation

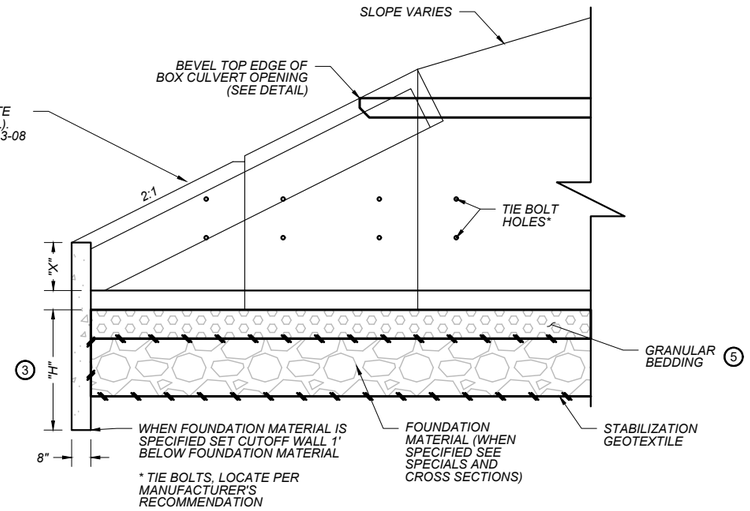
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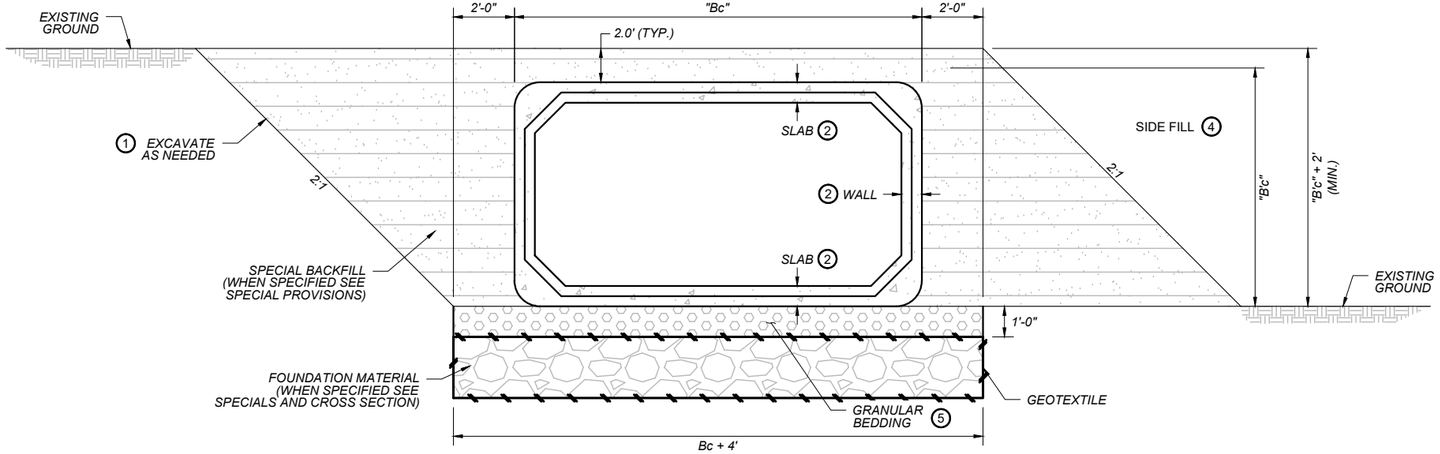
DETAIL



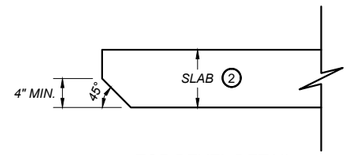
FRONT ELEVATION



SIDE ELEVATION



BEDDING DETAIL



TOP BEVEL DETAIL

DIMENSIONS										
STATION	SPAN (ft.)	RISE (ft.)	LENGTH (ft.)	WALL (in.)	SLAB (in.)	"E" (in.)	"Bc" (ft.)	"B'c" (ft.)	"H" (ft.)	COVER (ft.)
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-

NOTES:
INCLUDE REINFORCING, CUTOFF WALL, AND CONCRETE EDGE PROTECTION IN THE UNIT PRICE BID PER CUBIC YARD OF CLASS GENERAL CONCRETE.
INCLUDE ANCHOR BOLTS IN THE UNIT PRICE BID PER LINEAR FOOT OF CULVERT.
PROVIDE BOX CULVERTS MEETING ASTM C1577.
QUANTITIES ARE BASED ON THE DIMENSIONS IN THE TABLE.

NOTES:

(1) EXCAVATE A SUFFICIENT AMOUNT TO PROVIDE A SAFE WORKING ENVIRONMENT AND TO ALLOW ACHIEVEMENT OF ALL CULVERT INSTALLATION AND COMPACTION REQUIREMENTS. SLOPE, BENCH OR PROVIDE SHORING FOR ALL EXCAVATIONS IN ACCORDANCE WITH THE U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION.

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SHEET NO.
####

SLOPED END
RCB DETAIL
NO SCALE

PROJECT NAME ####
COUNTY ####
PROJECT ID ####
UPN ####

DESIGNED BY ####
####
REVIEWED BY ####
####
CHECKED BY ####
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MONTANA
Department of Transportation

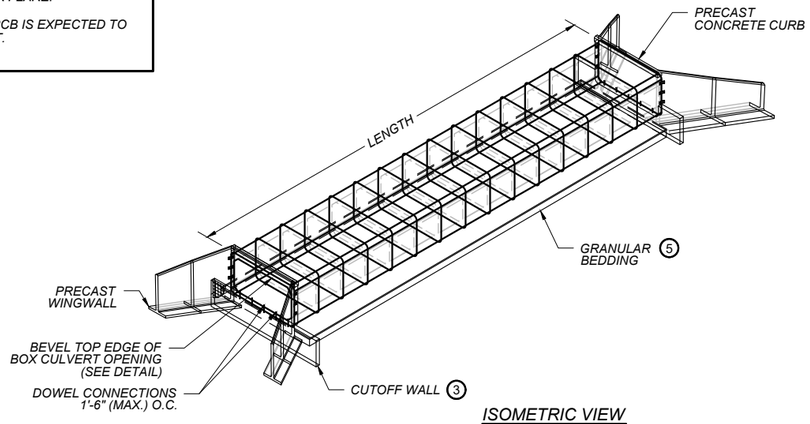
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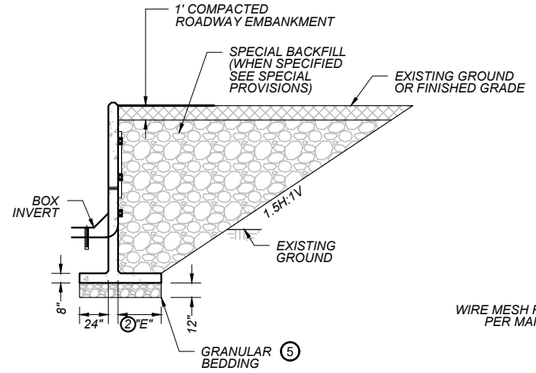
DETAIL

NOTES TO DESIGNER:

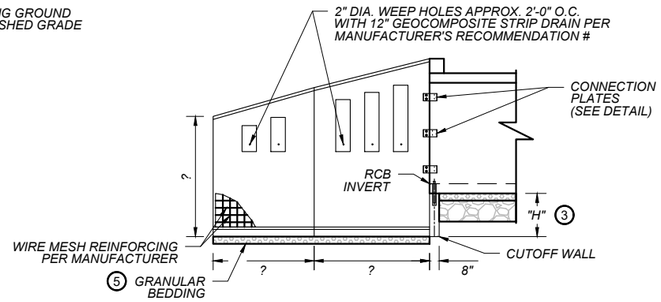
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2. ADD TOP BEVEL IF RCB IS EXPECTED TO FLOW FULL AT INLET.



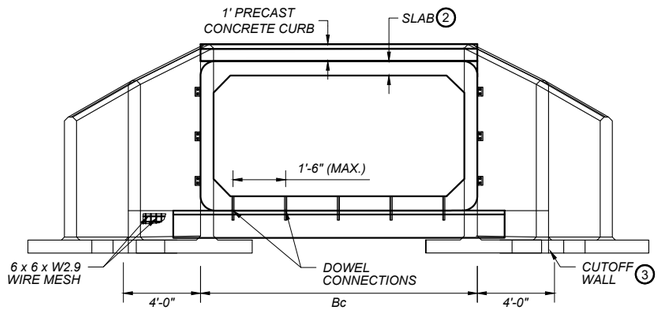
ISOMETRIC VIEW
OUTLET END



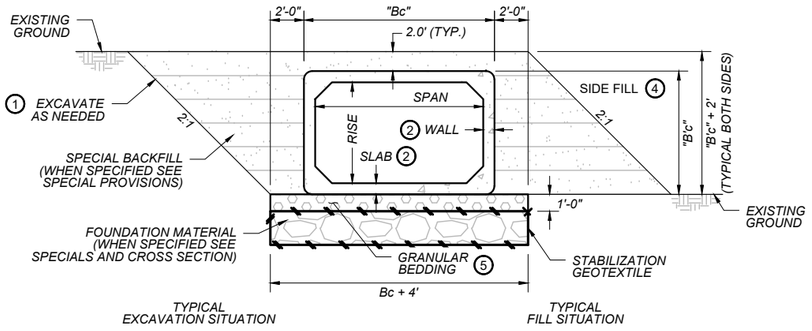
PRECAST TAPERED WINGWALL
BEDDING AND BACKFILL DETAIL



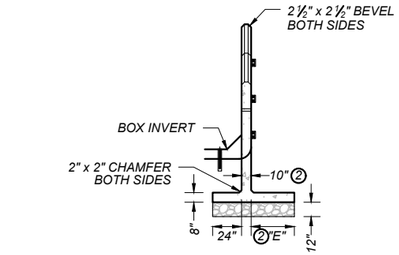
PRECAST TAPERED WINGWALL
DETAIL SIDE VIEW



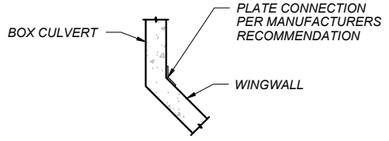
PRECAST TAPERED SINGLE CELL BOX CULVERT
WITH CUTOFF WALL AND 45° PRECAST WINGWALLS



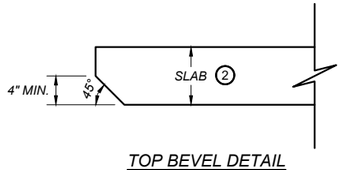
BOX CULVERT BEDDING DETAIL



PRECAST TAPERED WINGWALL
DETAIL END VIEW



CONNECTION
PLATE DETAIL



TOP BEVEL DETAIL

NOTES:

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-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-

NOTE: QUANTITIES ARE BASED ON THE DIMENSIONS IN THE TABLE. PROVIDE BOX CULVERTS MEETING ASTM C1577. INCLUDE PRECAST TAPERED WINGWALLS, PRECAST CONCRETE CURBS, CUTOFF WALLS, SPECIAL BACKFILL BEHIND PRECAST TAPERED WINGWALLS, GEOCOMPOSITE STRIP DRAINS, AND GRANULAR BEDDING BENEATH THE PRECAST TAPERED WINGWALLS IN THE UNIT PRICE BID PER LINEAR FOOT OF RCB.

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SHEET NO.
####

RCB WITH TAPERED WING WALLS DETAIL
NOT TO SCALE

PROJECT NAME ####
COUNTY ####
PROJECT ID ####
UPN ####

DESIGNED BY ####
REVIEWED BY ####
CHECKED BY ####
HYDRAULICS_STD_DWG.DWG

MONTANA
Department of Transportation

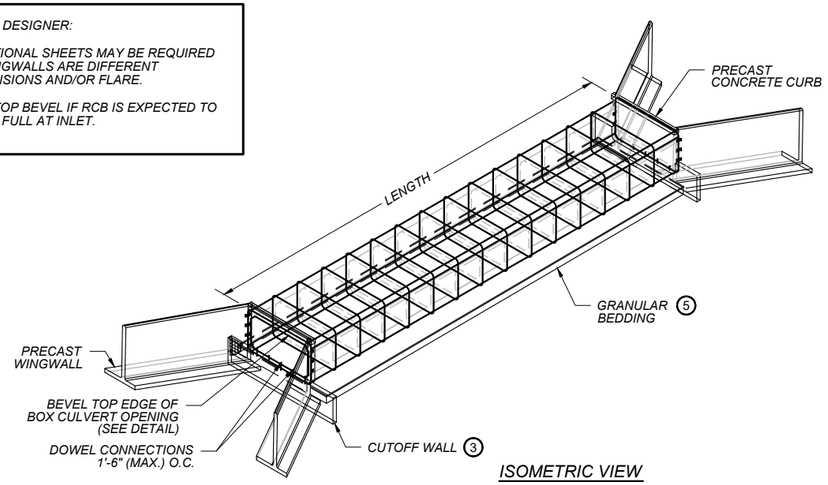
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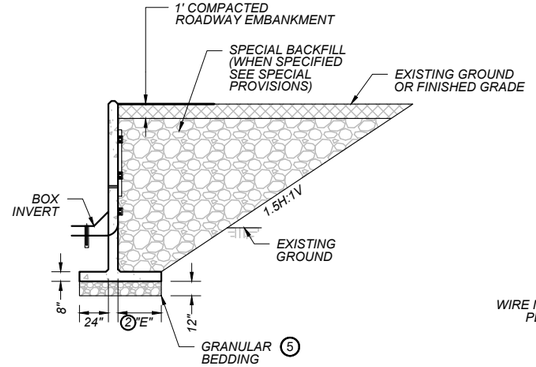
DETAIL

NOTES TO DESIGNER:

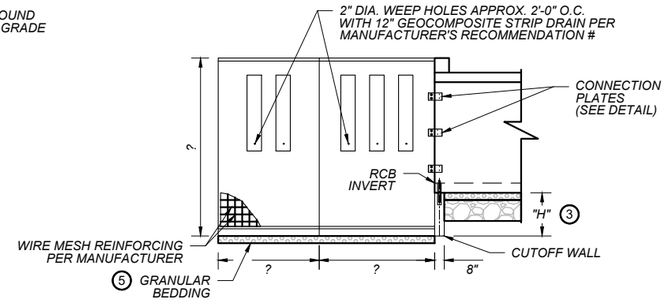
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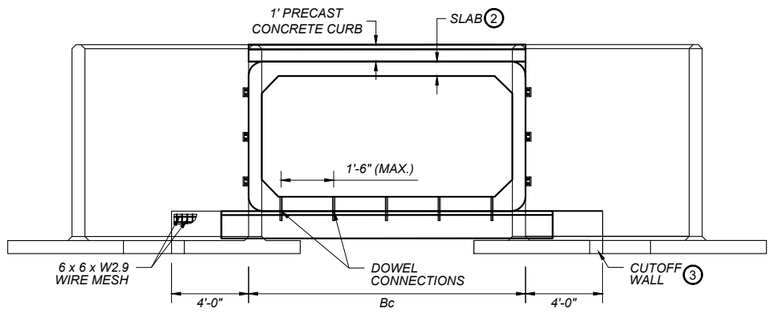
ISOMETRIC VIEW
OUTLET END



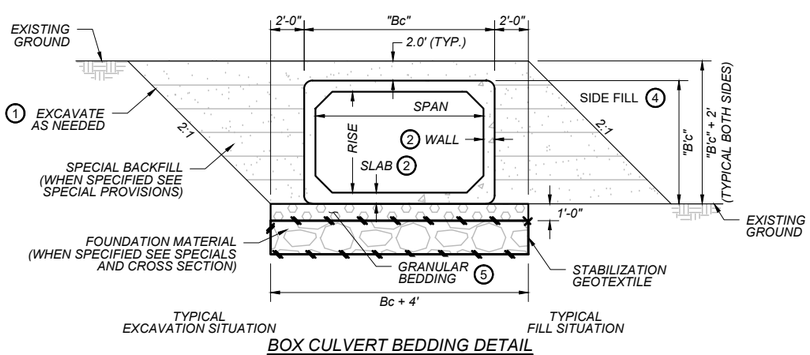
PRECAST WINGWALL
BEDDING AND BACKFILL DETAIL



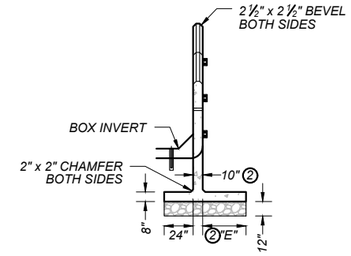
PRECAST WINGWALL
DETAIL SIDE VIEW



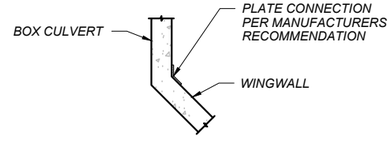
PRECAST SINGLE CELL BOX CULVERT
WITH CUTOFF WALL AND 45° PRECAST WINGWALLS



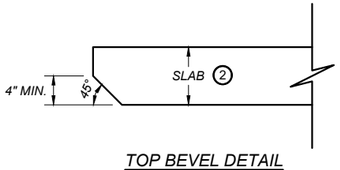
BOX CULVERT BEDDING DETAIL



PRECAST WINGWALL
DETAIL END VIEW



CONNECTION
PLATE DETAIL



TOP BEVEL DETAIL

NOTES:

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DIMENSIONS										
STATION	SPAN (ft.)	RISE (ft.)	LENGTH (ft.)	WALL (in.)	SLAB (in.)	"E" (in.)	"Bc" (ft.)	"B'c" (ft.)	"H" (ft.)	COVER (ft.)
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-

NOTE: QUANTITIES ARE BASED ON THE DIMENSIONS IN THE TABLE. PROVIDE BOX CULVERTS MEETING ASTM C1577. INCLUDE PRECAST WINGWALLS, PRECAST CONCRETE CURBS, CUTOFF WALLS, SPECIAL BACKFILL BEHIND PRECAST WINGWALLS, GEOCOMPOSITE STRIP DRAINS, AND GRANULAR BEDDING BENEATH THE PRECAST WINGWALLS IN THE UNIT PRICE BID PER LINEAR FOOT OF RCB.

PROVIDE A GEOCOMPOSITE STRIP DRAIN CONSTRUCTED OF A HDPE DRAINAGE CORE WITH A MINIMUM COMPRESSIVE STRENGTH OF 9000 PSF PER ASTM D 1621 AND A MINIMUM FLOW CAPACITY OF 20 GPM PER ASTM D 4716. THE STRIP DRAIN MUST BE WRAPPED IN A SUBSURFACE DRAINAGE GEOTEXTILE FILTER MEETING THE REQUIREMENTS OF HIGH SURVIVABILITY, CLASS B OF SECTION 716.

SHEET NO.
####

RCB WITH WING WALLS
DETAIL
NOT TO SCALE

PROJECT NAME ####
COUNTY ####
PROJECT ID ####
UPN ####

DESIGNED BY ####
REVIEWED BY ####
CHECKED BY ####

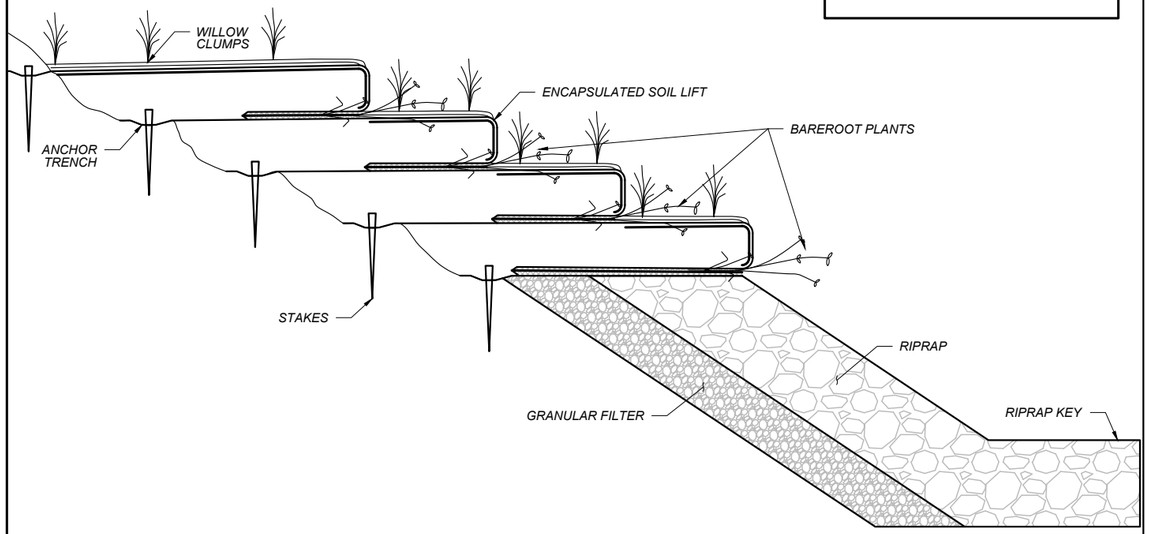
MONTANA
Department of Transportation

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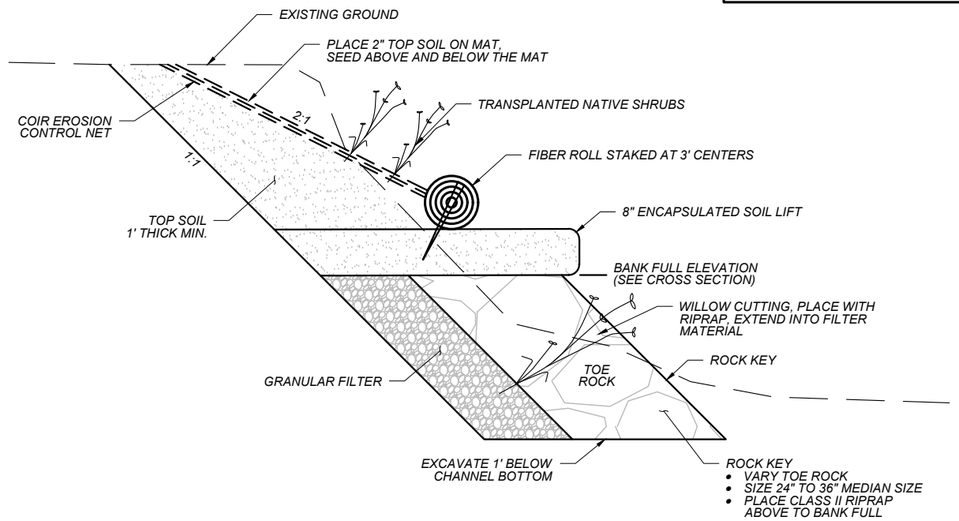
DETAIL

NOTE TO DESIGNER:
FINAL DESIGN BASED ON SITE CONDITIONS

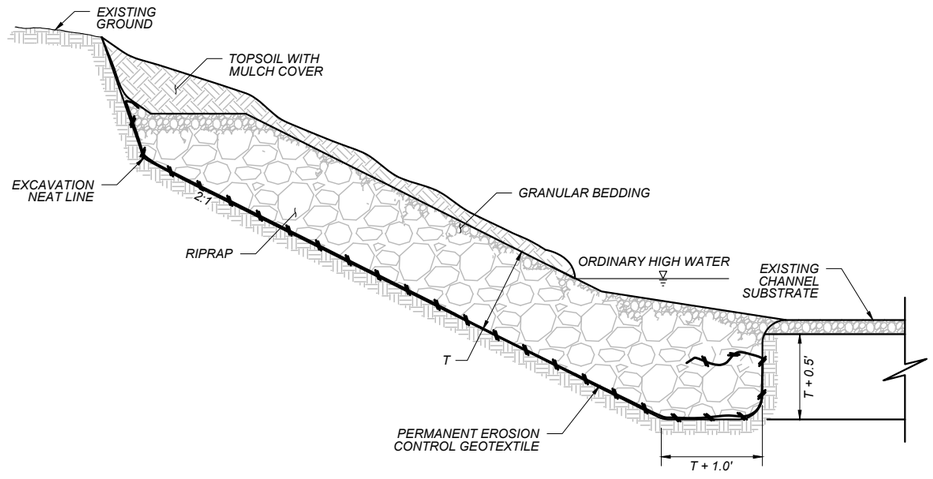


ENCAPSULATED SOIL WITH RIPRAP KEY

NOTE TO DESIGNER:
FINAL DESIGN BASED ON SITE CONDITIONS



REVEGETATION/SLOPE WITH ROCK TOE DETAIL



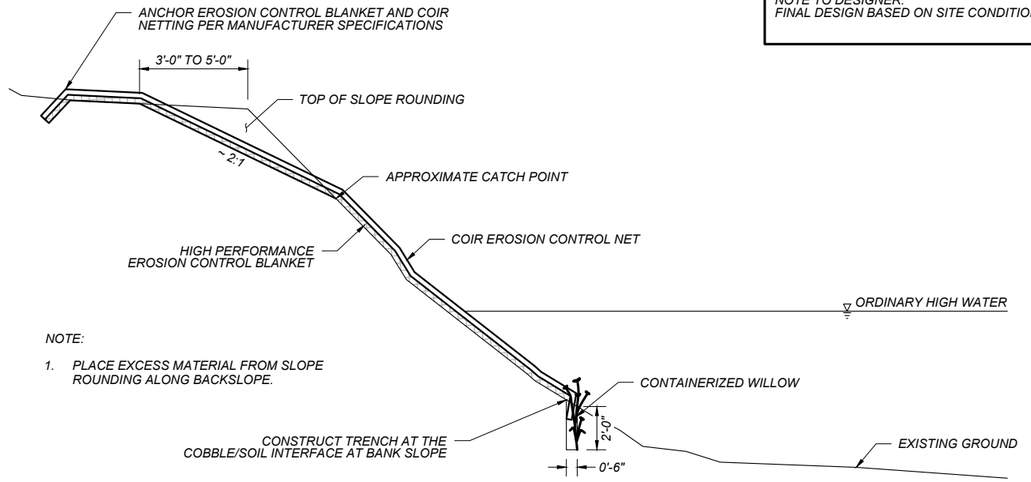
REVEGETATED RIPRAP EMBANKMENT PROTECTION

NOTES:

1. FILL RIPRAP VOIDS WITH GRANULAR BEDDING OR A MATERIAL OF SIMILAR GRADATION OBTAINED ON SITE TO PROVIDE A UNIFORM SURFACE FOR THE PLACEMENT OF TOPSOIL, AS APPROVED BY THE PROJECT MANAGER.
2. PLACE TOPSOIL WITH A MINIMUM THICKNESS OF 8".

MINIMUM T FOR:
CLASS I RIPRAP = 1'-6"
CLASS II RIPRAP = 2'-6"
CLASS III RIPRAP = 3'-0"

NOTE TO DESIGNER:
FINAL DESIGN BASED ON SITE CONDITIONS



BANK STABILIZATION AND REVEGETATION DETAIL

SHEET NO.
####

PROJECT NAME ####
COUNTY ####
PROJECT ID ####
UPN ####

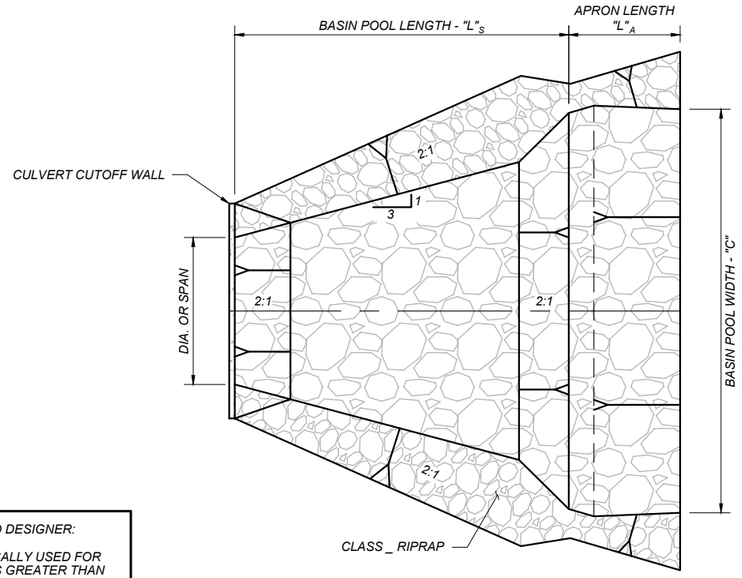
DESIGNED BY ####
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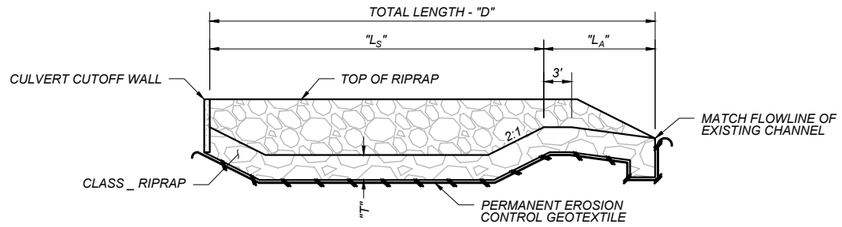
DETAIL



PLAN VIEW - RIPRAP BASIN

NOTES TO DESIGNER:

1. TYPICALLY USED FOR PIPES GREATER THAN 48" EQUIVALENT.
2. CONSIDER FILLING RIPRAP VOIDS WITH GRANULAR BEDDING.



PROFILE VIEW

STATION	"L_S" (ft.)	"L_A" (ft.)	"C" (ft.)	"T" (ft.)	CLASS_RIPRAP $(yd.)^3$	PERMANENT EROSION CONTROL GEOTEXTILE $(yd.)^2$
-	-	-	-	-	-	-

SHEET NO.
####

RIPRAP BASIN
NO SCALE

PROJECT NAME ####
COUNTY ####
PROJECT ID ####
UPN ####

DESIGNED BY ####
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REVIEWED BY ####
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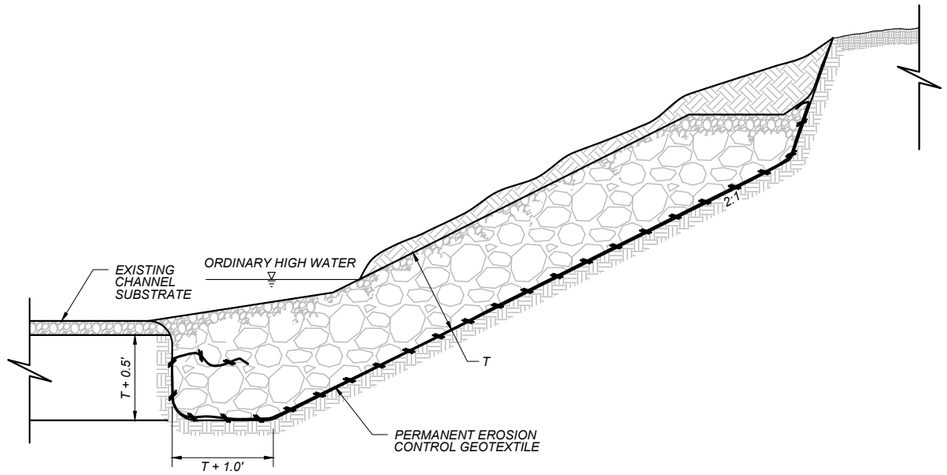
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DETAIL



RIPRAP REVEGETATION TYPICAL

NOTES:

1. FILL RIPRAP VOIDS WITH GRANULAR BEDDING OR A MATERIAL OF SIMILAR. GRADATION OBTAINED ON SITE TO PROVIDE A UNIFORM SURFACE FOR THE PLACEMENT OF TOPSOIL, AS APPROVED BY THE PROJECT MANAGER.
2. PLACE TOPSOIL WITH A MINIMUM THICKNESS OF 6".
3. THIS DETAIL IS TO BE USED AS A VISUAL GUIDE FOR RIPRAP REVEGETATION. REFER TO THE PLAN SHEETS AND CROSS SECTIONS FOR SPECIFIC ELEVATIONS AND GEOMETRIC CONFIGURATION OF THE RIPRAP LAYOUT.
4. REFER TO THE SPECIAL PROVISIONS FOR PLANTING AND SEEDING SPECIFICATIONS.

EMBANKMENT PROTECTION
MINIMUM T FOR:
CLASS I RIPRAP = 1'-6"
CLASS II RIPRAP = 2'-6"
CLASS III RIPRAP = 3'-0"

LEGEND

- TOPSOIL WITH EROSION CONTROL BLANKET/MULCH COVER
- RANDOM RIPRAP
- GRANULAR BEDDING
- EXISTING GROUND
- PERMANENT EROSION CONTROL GEOTEXTILE
- EXCAVATION

SHEET NO.
####

RIPRAP REVEGETATION DETAIL NO SCALE

PROJECT NAME	####	COUNTY	####
PROJECT ID	####	UPN	####

DESIGNED BY	REVIEWED BY	CHECKED BY
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####	####	####

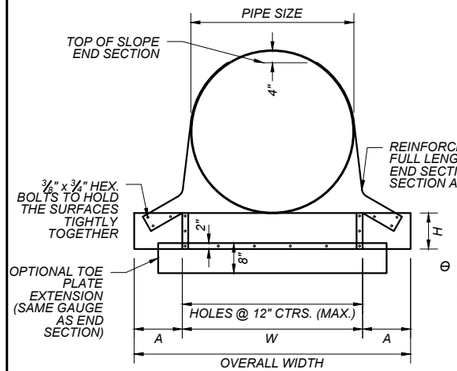
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DETAIL

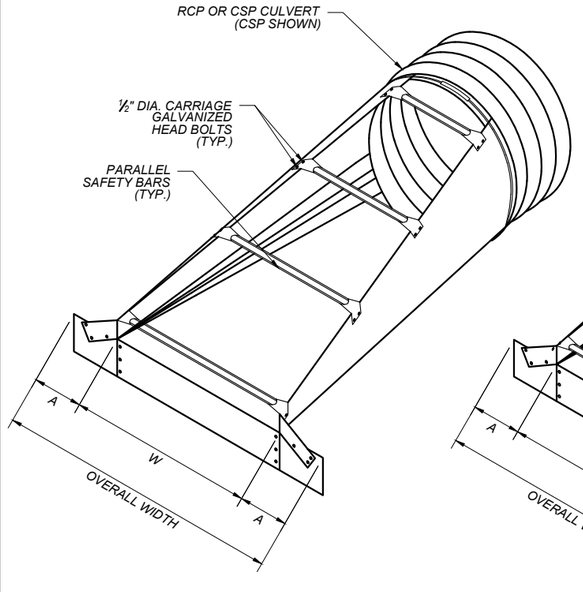


ROUND PIPE CULVERT

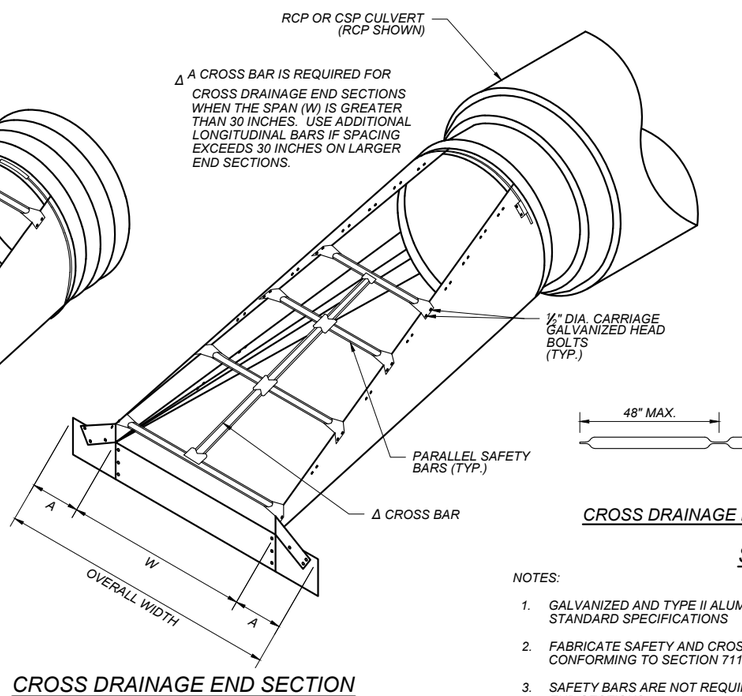
FRONT VIEW

PIPE ARCH CULVRT

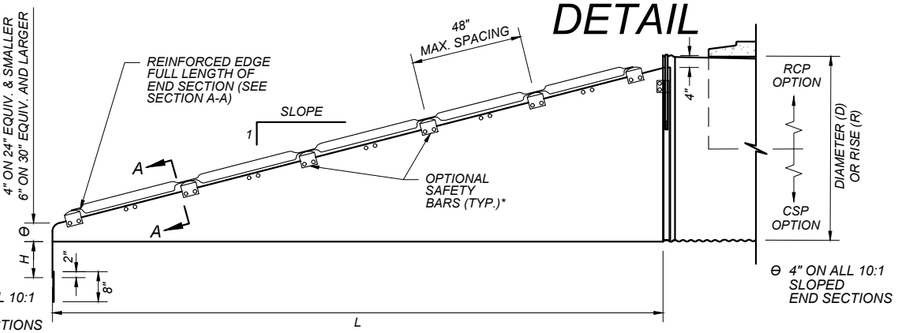
FRONT VIEW



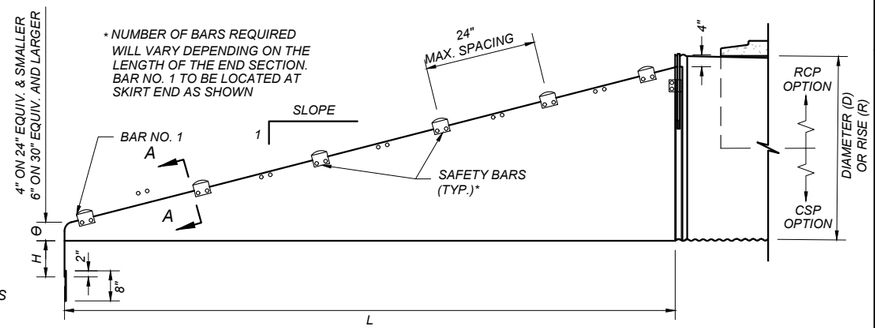
PARALLEL DRAINAGE END SECTION



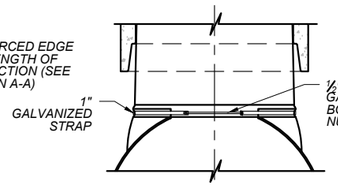
CROSS DRAINAGE END SECTION



ELEVATION

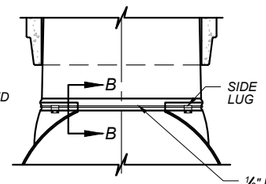


ELEVATION



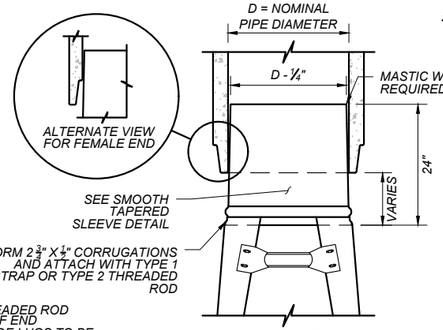
TYPE #1

ROUND PIPES THRU 24"



TYPE #2

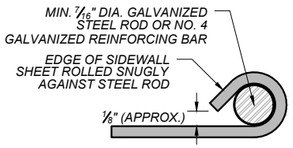
ROUND PIPES 30" AND LARGER FOR PIPE ARCHES 18" EQUIV. AND LARGER



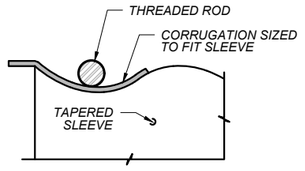
TYPE #3

ALL SIZES OF CONCRETE ROUND OR ARCH PIPES

CONNECTOR DETAILS

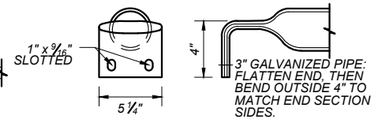


SECTION A-A



SECTION B-B

CROSS DRAINAGE BAR



PARALLEL BARS

SAFETY BAR DETAILS

NOTES:

1. GALVANIZED AND TYPE II ALUMINIZED STEEL MUST CONFORM TO SECTION 709 OF THE STANDARD SPECIFICATIONS
2. FABRICATE SAFETY AND CROSS BARS (SCHEDULE 40-ASTM A53) FROM STEEL PIPE CONFORMING TO SECTION 711 OF THE STANDARD SPECIFICATIONS.
3. SAFETY BARS ARE NOT REQUIRED ON 18 INCHES AND SMALLER PARALLEL DRAINAGE END SECTIONS.
4. USE TOE PLATE WHEN SPECIFIED IN PLANS. TOE PLATE EXTENSIONS DIMENSIONS ARE OVERALL WIDTH LESS 6 INCHES BY 8 INCHES HIGH.
5. PROVIDE SLOTTED HOLES FOR SAFETY BAR ATTACHMENT FOR ALL END SECTIONS.

SAFETY SLOPE END SECTION INFORMATION

STATION	CULVERT PIPE (in)	MATERIAL	CROSS BAR (Y/N)	TOE PLATE EXTENSION Δ	SLOPE	REMARKS
	in		(Y/N)	(Y/N)		
286+45	24	GALVANIZED	Y	N	6:1	LT.
286+45	24	TYPE II ALUM.	N	N	6:1	RT.

Δ PROVIDE TOE PLATE EXTENSIONS ON ALL 48" EQUIVALENT AND LARGER CULVERTS.

METAL END SECTIONS FOR RCP ARCH CULVERTS

EQUIV. DIA. (in) Φ	SPAN (in)	RISE (in)	MIN. THICK.	DIMENSIONS (INCHES)						
				A	H	W	OVERALL WIDTH	L		
			IN./GAUGE					SLOPE = 4	SLOPE = 6	SLOPE = 10 Ψ
18	23	14	0.064 / 16	8	6	29	45	16	24	60
24	30	19	0.064 / 16	8	6	36	52	36	54	110
30	38	24	0.079 / 14	12	9	44	68	56	84	160
36	45	29	0.109 / 12	16	12	51	83	76	114	210
42	53	34	0.109 / 12	16	12	59	91	96	144	
48	60	38	0.109 / 12	16	12	66	98	112	168	
54	68	43	0.109 / 12	16	12	74	106	132	198	
60	76	48	0.109 / 12	16	12	80	112	152	228	
72	90	58	0.109 / 12	16	12	89	121	188	282	

Φ VERIFY SPAN AND RISE DIMENSIONS FOR ALL ARCH PIPES 48" EQUIVALENT AND GREATER WITH SUPPLIER FOR PROPER CONNECTION TO A RCPA CULVERT.

Ψ MINIMUM THICKNESS FOR ALL 10:1 SLOPED END SECTIONS IS 0.109"-12 GAUGE.

METAL END SECTIONS FOR CMP ARCH CULVERTS

EQUIV. DIA. (in)	SPAN (in)	RISE (in)	MIN. THICK.	DIMENSIONS (INCHES)						
				A	H	W	OVERALL WIDTH	L		
			IN./GAUGE					SLOPE = 4	SLOPE = 6	SLOPE = 10 Ψ
18	21	15	0.064 / 16	8	6	27	43	20	30	70
24	28	20	0.064 / 16	8	6	34	50	40	60	120
30	35	24	0.079 / 14	12	9	41	65	56	84	160
36	42	29	0.109 / 12	12	9	48	72	76	114	210
42	49	33	0.109 / 12	16	12	55	87	92	138	
48	57	38	0.109 / 12	16	12	63	95	112	168	
54	64	43	0.109 / 12	16	12	70	102	132	198	
60	71	47	0.109 / 12	16	12	77	109	148	222	
72	83	57	0.109 / 12	16	12	89	121	188	282	

Ψ MINIMUM THICKNESS FOR ALL 10:1 SLOPED END SECTIONS IS 0.109"-12 GAUGE.

METAL END SECTIONS FOR ROUND PIPES

PIPE DIA. (in.)	MIN. THICK. (MIN.)	DIMENSIONS (INCHES)						
		A	H	W	OVERALL WIDTH	L		
	IN./GAUGE					SLOPE = 4	SLOPE = 6	SLOPE = 10 Ψ
15	0.064 / 16	8	6	21	37	20	30	70
18	0.064 / 16	8	6	24	40	32	48	100
24	0.064 / 16	8	6	30	46	56	84	160
30	0.109 / 12	12	9	36	60	80	120	220
36	0.109 / 12	12	9	42	66	104	156	280
42	0.109 / 12	16	12	48	80	128	192	
48	0.109 / 12	16	12	54	86	152	228	
54	0.109 / 12	16	12	60	92	176	264	
60	0.109 / 12	16	12	66	98	200	300	

Ψ MINIMUM THICKNESS FOR ALL 10:1 SLOPED END SECTIONS IS 0.109"-12 GAUGE.

SHEET NO.
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SAFETY SLOPE END SECTION FOR ROUND AND ARCH CULVERTS

PROJECT NAME ####
COUNTY ####
PROJECT ID ####
UPN ####

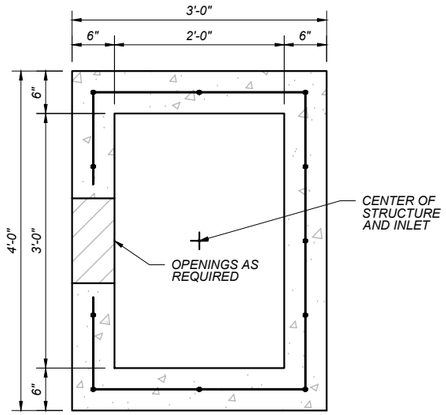
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REVIEWED BY ####
CHECKED BY ####
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MONTANA
Department of Transportation

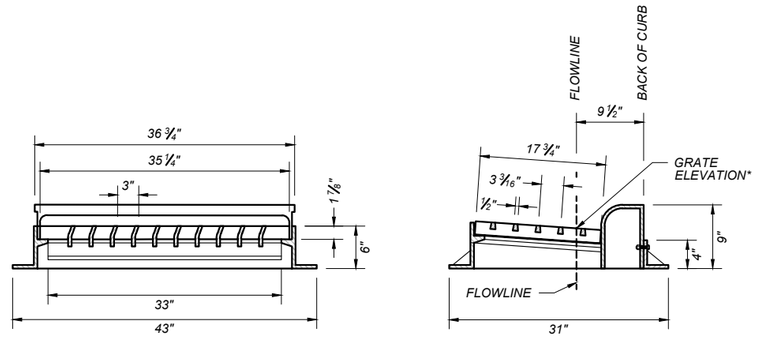
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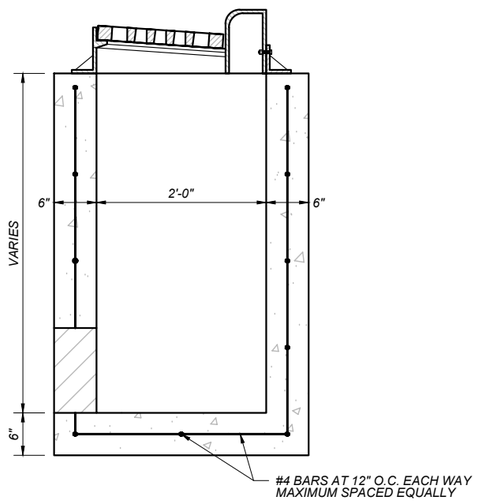
DETAIL



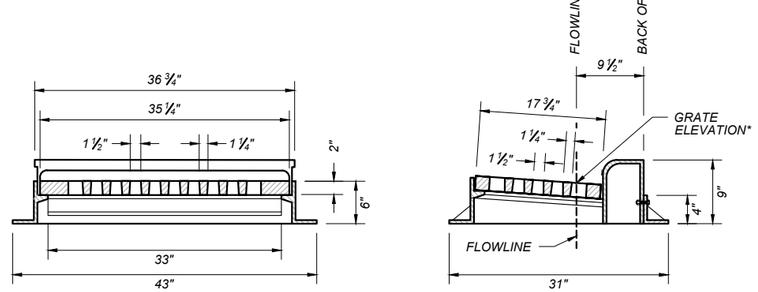
SPECIAL DESIGN CURB INLET - PLAN VIEW



CURVED VANE STYLE #



SPECIAL DESIGN CURB INLET - SECTION VIEW



STRAIGHT BAR STYLE #

PROVIDE SPECIAL DESIGN CURB INLETS WITH CURVED VANE UNLESS OTHERWISE NOTED IN THE PLANS.

* GRATE ELEVATIONS FOR SPECIAL DESIGN CURB INLETS SHOWN IN PLANS ARE 1" LESS THAN GUTTER FLOW LINE ELEVATION.

NOTES:

1. SEE PLANS FOR LOCATIONS AND QUANTITIES.
2. PLAN STATION AND OFFSET FOR SPECIAL DESIGN CURB INLET IS CENTER OF STRUCTURE.
3. STANDARD UNLESS OTHERWISE NOTED ON PLANS.
4. SET ALL FINAL INLET GRATE ELEVATIONS TO ENSURE THAT POSITIVE DRAINAGE IS PROVIDED.

SHEET NO.
####

SPECIAL DESIGN CURB
INLET DETAIL
NO SCALE

PROJECT NAME ####
COUNTY ####
PROJECT ID ####
UPN ####

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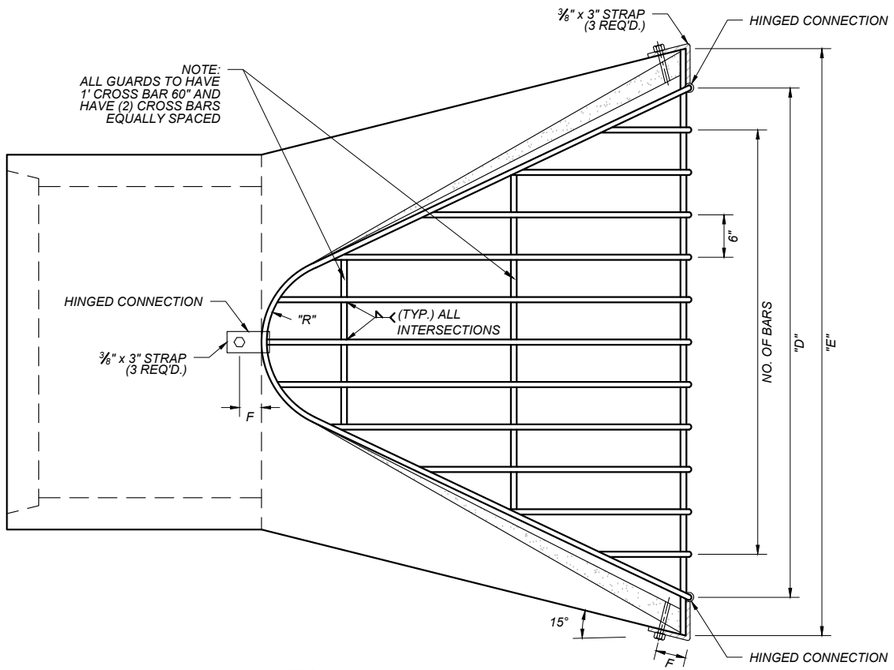
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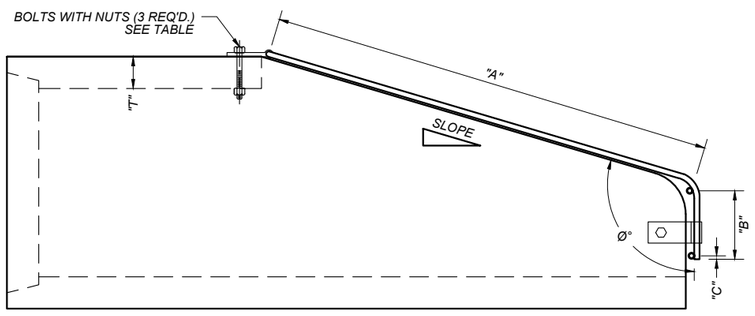
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DETAIL



TOP VIEW



SIDE VIEW

REINFORCED CONCRETE ROUND PIPE													
PIPE SIZE	T	BAR SIZE (dia.)	NO. OF BARS	BOLT SIZE & LENGTH	SLOPE	RADIUS "R"	"A"	"B"	"C"	"D"	"E"	"F"	Ø°
12"	2"	$\frac{5}{8}$"	3	$\frac{5}{8}$" x 4 $\frac{1}{2}$"	2.4:1	3 $\frac{1}{4}$"	27"	3"	1"	24"	30"	4"	113°
15"	2 $\frac{1}{4}$"	$\frac{5}{8}$"	4	$\frac{5}{8}$" x 4 $\frac{1}{2}$""	2.4:1	4 $\frac{1}{8}$"	29"	5"	1"	30"	36"	4"	113°
18"	2 $\frac{1}{2}$"	$\frac{5}{8}$"	5	$\frac{5}{8}$" x 5"	2.3:1	5"	31"	8"	1"	36"	42"	4"	113°
21"	2 $\frac{3}{4}$"	$\frac{5}{8}$"	6	$\frac{5}{8}$" x 5"	2.4:1	5 $\frac{5}{8}$"	40"	8"	2"	42"	48"	4"	113°
24"	3"	$\frac{5}{8}$"	7	$\frac{5}{8}$" x 5 $\frac{1}{2}$"	2.5:1	6 $\frac{1}{2}$"	48"	8 $\frac{1}{2}$"	2"	48"	56"	4"	112°
27"	3 $\frac{1}{4}$"	$\frac{3}{4}$"	8	$\frac{3}{4}$" x 5 $\frac{1}{2}$"	2.5:1	7 $\frac{3}{8}$"	55"	9 $\frac{1}{2}$"	2"	54"	62"	4"	112°
30"	3 $\frac{1}{2}$"	$\frac{3}{4}$"	9	$\frac{3}{4}$" x 6"	2.5:1	8 $\frac{1}{4}$"	58"	11"	2"	60"	69"	6"	112°
36"	4"	$\frac{3}{4}$"	11	$\frac{3}{4}$" x 6 $\frac{1}{2}$"	2.5:1	10"	68"	14"	2"	72"	82"	6"	112°
42"	4 $\frac{1}{2}$"	$\frac{3}{4}$"	12	$\frac{3}{4}$" x 7"	2.5:1	11 $\frac{3}{4}$"	68"	20"	2"	78"	90"	6"	112°
48"	5"	$\frac{3}{4}$"	13	$\frac{3}{4}$" x 7 $\frac{3}{4}$"	2.5:1	13 $\frac{3}{4}$"	74"	23"	2"	84"	96"	6"	112°
54"	5 $\frac{1}{2}$"	1"	14	1" x 8"	2.0:1	15"	72"	25"	4"	90"	103"	6"	116°
60"	6"	1"	15	1" x 8 $\frac{3}{4}$"	1.9:1	16 $\frac{3}{4}$"	69"	33"	4"	96"	108"	8"	118°
66"	6 $\frac{1}{2}$"	1"	16	1" x 9"	1.7:1	18 $\frac{1}{2}$"	83"	28"	4"	102"	115"	8"	121°
72"	7"	1"	17	1" x 9 $\frac{3}{4}$"	1.8:1	20 $\frac{1}{4}$"	91"	34"	4"	108"	122"	8"	119°
78"	7 $\frac{1}{2}$"	1"	18	1" x 10"	1.8:1	22"	105"	34"	4"	114"	129"	8"	119°
84"	8"	1"	19	1" x 10 $\frac{3}{4}$"	1.6:1	23 $\frac{3}{4}$"	109"	34"	4"	120"	135"	8"	122°
90"	8 $\frac{1}{2}$"	1"	21	1" x 11"	1.5:1	25 $\frac{1}{2}$"	107"	39"	4"	132"	147"	8"	124°

REINFORCED CONCRETE ARCH PIPE													
SPAN	RISE	T	BAR SIZE (dia.)	NO. OF BARS	BOLT SIZE & LENGTH	SLOPE	RADIUS "R"	"A"	"B"	"C"	"D"	"E"	"F"	Ø°
22"	14"	2 $\frac{1}{2}$"	$\frac{5}{8}$"	5	$\frac{5}{8}$" x 5 $\frac{1}{2}$"	3:1	5 $\frac{3}{4}$"	30"	6"	1"	36"	41"	4"	108°
29"	18"	3 $\frac{1}{2}$"	$\frac{5}{8}$"	7	$\frac{5}{8}$" x 6"	3:1	7 $\frac{7}{8}$"	43"	7 $\frac{1}{2}$"	1"	48"	58"	4"	108°
36"	23"	4"	$\frac{3}{4}$"	9	$\frac{3}{4}$" x 6 $\frac{1}{2}$"	3:1	10 $\frac{1}{16}$"	54"	8 $\frac{1}{2}$"	1"	60"	70"	6"	108°
44"	27"	4 $\frac{1}{2}$"	$\frac{3}{4}$"	11	$\frac{3}{4}$" x 7"	3:1	12 $\frac{9}{16}$"	62"	10 $\frac{1}{8}$"	1"	72"	83"	6"	108°
51"	32"	4 $\frac{1}{2}$"	$\frac{3}{4}$"	12	$\frac{3}{4}$" x 7"	3:1	14"	62"	14 $\frac{3}{4}$"	1"	78"	89"	6"	108°
58"	36"	5"	$\frac{3}{4}$"	13	1" x 7 $\frac{1}{2}$"	3:1	16 $\frac{1}{8}$"	62"	20"	1"	84"	96"	6"	108°
65"	40"	5 $\frac{1}{2}$"	1"	14	1" x 8"	3:1	17 $\frac{3}{4}$"	62"	23 $\frac{1}{2}$"	2"	90"	103"	8"	108°
73"	45"	6"	1"	15	1" x 8 $\frac{1}{2}$"	3:1	20"	65"	29"	2"	96"	110"	8"	108°
88"	54"	7"	1"	19	1" x 9 $\frac{1}{2}$"	3:1	24 $\frac{1}{4}$"	65"	29"	2"	120"	135"	8"	108°

NOTES:

1. ALL STRUCTURAL STEEL FOR TRASHGUARDS MUST CONFORM TO THE REQUIREMENTS FOR ASTM A-36 STRUCTURAL CARBON STEEL.
2. PAINT ONE COAT OF RED OXIDE PRIMER AND TWO COATS OF ALUMINUM PAINT.
3. BECAUSE OF VARIABLE FORMS BEING USED, TAKE FIELD MEASUREMENT OF FLARED ENDS BEFORE FABRICATING TRASHGUARD.

SHEET NO.
####

TRASHGUARD FOR PRECAST
RCP FLARED ENDS
NO SCALE

PROJECT NAME ####
COUNTY ####
PROJECT ID ####
UPN ####

DESIGNED BY ####
REVIEWED BY ####
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