

GENERAL NOTES

CORROSION PROTECTION:  
THE ENGINEER SHALL OBTAIN SITE SPECIFIC INFORMATION ON CORROSIVENESS OF THE SOIL WHICH MAY REQUIRE AN INCREASE IN MATERIAL THICKNESS OR PROTECTIVE COATINGS BASED ON LOCAL EXPERIENCE.

WELL COMPACTED FILL:

WELL COMPACTED FILL SHALL BE WELL GRADED GRANULAR SOIL FREE OF ANY ORGANIC MATERIAL, STONES LARGER THAN 1½ INCHES (3.8 CM), FROZEN LUMPS, DEBRIS OR EXCESSIVE MOISTURE. FILL SHALL BE COMPACTED TO 95% OF MAXIMUM DRY DENSITY AS DEFINED IN ASTM INTERNATIONAL D1557 (MODIFIED PROCTOR). FILL SHALL BE PLACED SIMULTANEOUSLY ON BOTH SIDES OF THE PIPE AND BETWEEN MULTIPLE PIPES. CLSM MAY BE USED IN LIEU OF WELL COMPACTED FILL.

CONTROLLED LOW-STRENGTH MATERIAL (CLSM) FILL:

CONTROLLED LOW-STRENGTH MATERIAL IS A SELF-COMPACTING, CEMENTITIOUS FILL MATERIAL WITH AN UNCONFINED COMPRESSIVE STRENGTH OF 50 TO 300 PSI. THE MIXTURE SHALL CONSIST OF WATER, PORTLAND CEMENT, FLY ASH, AND SOUND FINE OR COARSE AGGREGATE OR BOTH. THE MIX DESIGN SHALL ALLOW ADEQUATE FLOWABILITY WITHOUT SEGREGATION OF AGGREGATES. HARDENING TIME IS OF PRIME IMPORTANCE AND CLSM SHOULD DEVELOP 50 PSI IN ABOUT ONE HOUR. THE MAXIMUM LAYER OF THICKNESS FOR CLSM SHALL BE 3 FEET (0.9 M). ADDITIONAL LAYERS SHALL NOT BE PLACED UNTIL THE CLSM HAS LOST SUFFICIENT MOISTURE TO BE WALKED ON WITHOUT INDENTING MORE THAN TWO INCHES. PIPE SPACING MAY BE REDUCED WITH CLSM.

PIPE BEDDING:

PIPE BEDDING SHALL BE GRANULAR MATERIAL SUCH AS AGGREGATES ORDINARILY SPECIFIED AND USED IN THE CONSTRUCTION OF HIGHWAY BASE AND SUBBASE. THESE AGGREGATES INCLUDE CRUSHED STONE, NATURAL OR CRUSHED GRAVEL, NATURAL OR MANUFACTURED SANDS, CRUSHED SLAG OR A HOMOGENEOUS MIXTURE OF THESE MATERIALS. PIPE BEDDING SHALL BE COMPACTED TO 95% OF MAXIMUM DRY DENSITY AS DEFINED IN ASTM INTERNATIONAL D1557 (MODIFIED PROCTOR). RECOMMENDED GRADATION IS AS FOLLOWS:

SCREEN SIZE	% PASSING (BY WEIGHT)
1" INCH (25 MM)	100
½" INCH (13 MM)	60-90
¾" INCH (10 MM)	20-40
NO. 4 (5 MM)	10-20
NO. 200 (0.07 MM)	LESS THAN 5%

UTILITIES:

CONTACT GENESEE & WYOMING REGIONAL REAL ESTATE DEPARTMENT AND THE LOCAL "CALL BEFORE YOU DIG" NUMBER 90 DAYS (NO LESS THAN 60 DAYS) PRIOR TO THE PROPOSED CONSTRUCTION START DATE. PRIOR TO CONSTRUCTION, CONFIRM THAT ALL NECESSARY RELOCATIONS HAVE BEEN COMPLETED.

RIPRAP:

CLASS OF RIPRAP SHALL BE SPECIFIED BY THE ENGINEER. RIPRAP SHALL BE PLACED IN SUCH A MANNER AS TO AVOID SEGREGATION OF VARIOUS SIZES OF ROCK, AND DISTRIBUTED SO THAT THERE WILL BE NO LARGE ACCUMULATION OF EITHER THE LARGER OR SMALLER SIZES OF STONE. INDIVIDUAL ROCKS SHALL BE PLACED IN TIGHT CONTACT WITH ONE ANOTHER IN SUCH A WAY TO PRODUCE THE LEAST AMOUNT OF VOID SPACES. RIPRAP SHALL BE SOLID, UNFRACTURED ROCK, BULKY IN SHAPE WITH SHARP ANGULAR EDGES.

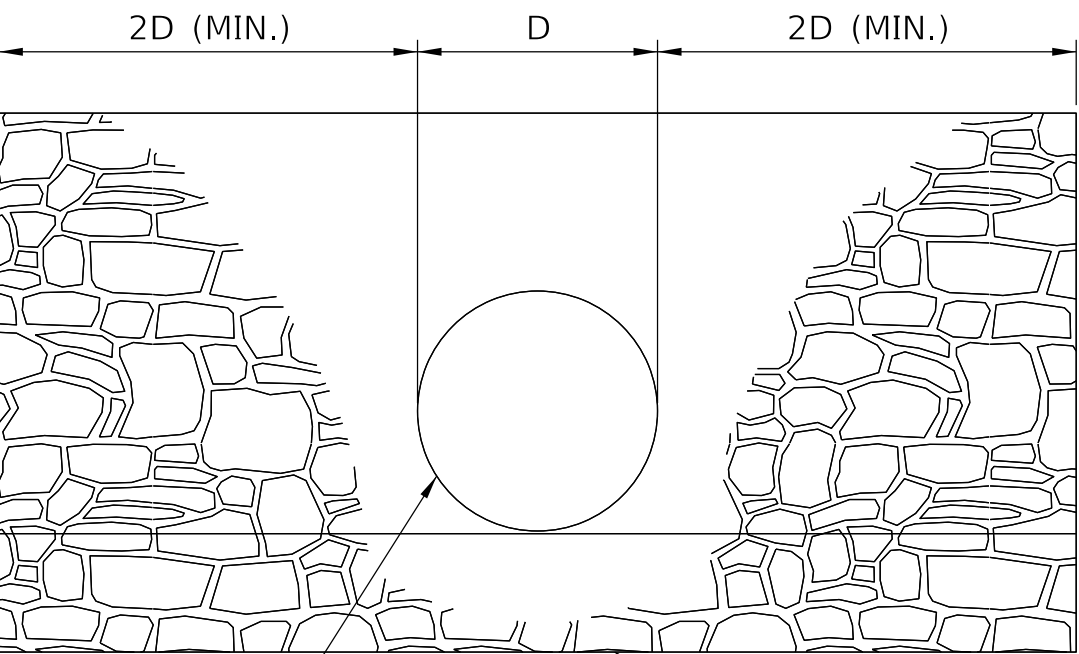
INDIVIDUAL ROCK SHALL VARY AS SHOWN:

RIPRAP CLASS	AVERAGE WEIGHT (US) PER STONE (LBS.)	DIMENSION (INCHES)	UNIT OF MEASURE	LAYER THICKNESS	TYPICAL VELOCITIES
I	50 TO 200	9 TO 14	TON	1'-6"	6 - 8 FPS
II	200 TO 1,000	14 TO 24	TON	2'-0"	8 - 12 FPS
III	1,000 TO 4,000	24 TO 38	TON	3'-0"	> 12 FPS
IV	> 4,000	> 38	TON	4'-0"	SPECIAL CASES

RIPRAP CLASS	AVERAGE WEIGHT (METRIC) PER STONE (KG.)	DIMENSION (CM)	UNIT OF MEASURE	LAYER THICKNESS	TYPICAL VELOCITIES
I	22.7 TO 90.7	22.9 TO 35.6	TONE	0.5 M	1.8 - 2.4 MPS
II	90.7 TO 453.6	35.6 TO 24	TONE	0.6 M	2.4 - 3.7 MPS
III	453.6 TO 1,814.4	61 TO 96.5	TONE	0.9 M	> 3.7 MPS
IV	> 1,814.4	> 96.5	TONE	1.2 M	SPECIAL CASES

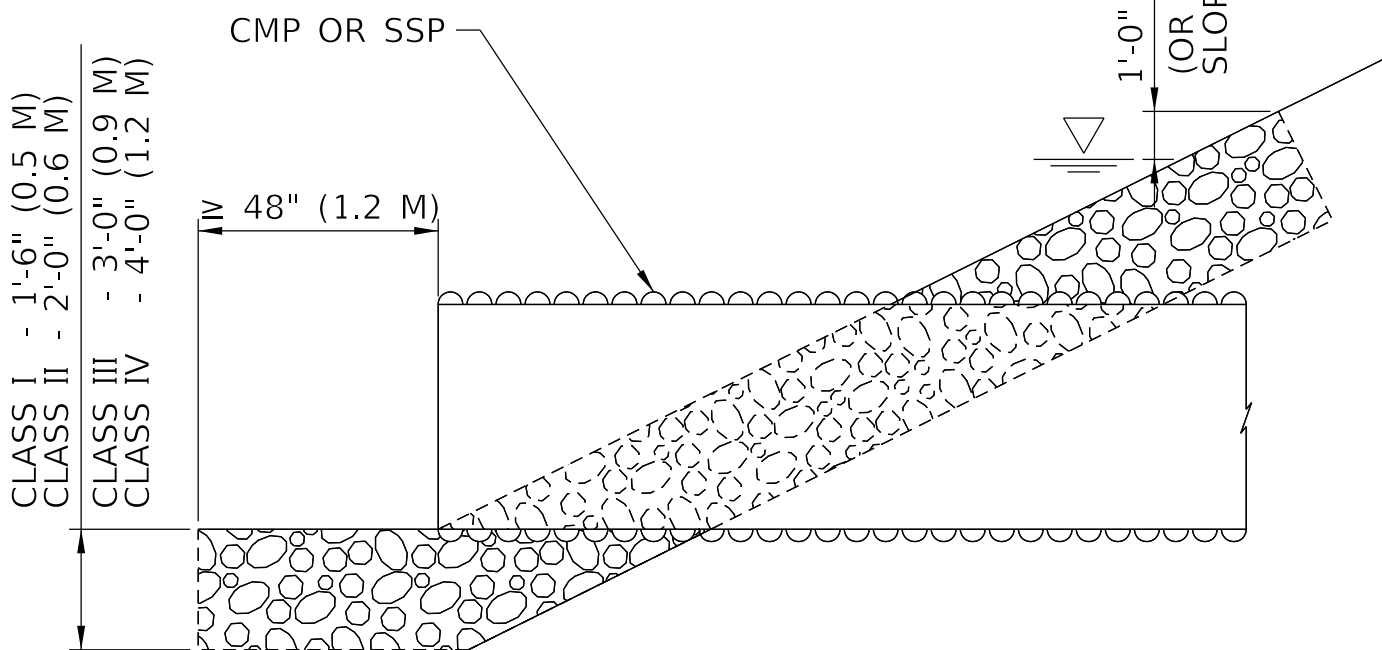
THE ENTIRE MASS OF RIPRAP SHALL BE WELL DISTRIBUTED WITHIN THE LIMITS SPECIFIED. HOWEVER, THE FOLLOWING ALLOWANCES SHALL BE ACCEPTABLE TO PRODUCE THE REQUIRED RIPRAP PROTECTION:

- RIPRAP CLASS I - NO ALLOWANCES ARE PERMITTED.  
RIPRAP CLASS II - 15% OR RIPRAP CLASS I.  
RIPRAP CLASS III - 15% OF RIPRAP CLASS I AND 15% OF RIPRAP CLASS II.  
RIPRAP CLASS IV - 15% OF RIPRAP CLASS I, 15% OF RIPRAP CLASS II, AND 15% OF RIPRAP CLASS III



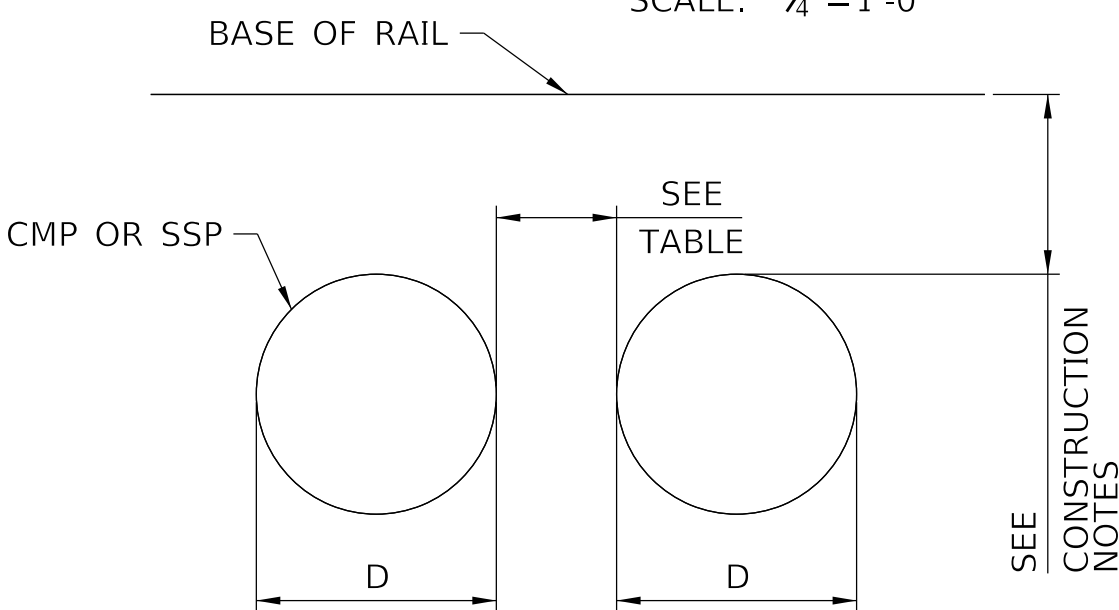
RIPRAP - ELEVATION

SCALE: ¼"=1'-0"



RIPRAP - SECTION

SCALE: ¼"=1'-0"



MINIMUM PIPE SPACING AND COVER

SCALE: ¼"=1'-0"

SPACING CHART	
PIPE DIAMETER (US)	MIN. SPACING BETWEEN PIPES (US)
12" TO 24"	12"
24" TO 96"	D/2
96" OR MORE	48"

SPACING CHART	
PIPE DIAMETER (CM)	MIN. SPACING BETWEEN PIPES (CM)
30.5 TO 61	30.5
61 TO 243.8	D/2
243.8 OR MORE	96.5

CULVERT PIPE LENGTH (PL) FOR STANDARD CROSS SECTIONS (US)										CULVERT PIPE LENGTH (PL) FOR STANDARD CROSS SECTIONS (METRIC)									
H - B/R TO FLOWLINE (FT.)	SINGLE TRACK			13' TRACK CENTERS			20' TRACK CENTERS			H - B/R TO FLOWLINE (M)	SINGLE TRACK			13' TRACK CENTERS			20' TRACK CENTERS		
	SLOPE			SLOPE			SLOPE				SLOPE			SLOPE			SLOPE		
	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	3:1	1.5:1	2:1	3:1	1.5:1	2:1	3:1
4	36	38	42	50	52	56	58	60	64	1.2	11.0	11.6	12.8	15.2	15.8	17.1	17.7	18.3	19.5
5	40	42	48	52	56	62	60	64	70	1.5	12.2	12.8	14.6	15.8	17.1	18.9	18.3	19.5	21.3
6	42	46	54	56	60	68	64	68	76	1.8	12.8	14.0	16.5	17.1	18.3	20.7	19.5	20.7	23.2
7	46	50	60	58	64	74	66	72	82	2.1	14.0	15.2	18.3	17.7	19.5	22.6	20.1	21.9	25.0
8	48	54	66	62	68	80	70	76	88	2.4	14.6	16.5	20.1	18.9	20.7	24.4	21.3	23.2	26.8
9	52	58	72	64	72	86	72	80	94	2.7	15.8	17.7	21.9	19.5	21.9	26.2	21.9	24.4	28.7
10	54	62	78	68	76	92	76	84	100	3.0	16.5	18.9	23.4	20.7	23.2	28.0	23.2	25.6	30.5
11	58	66	84	70	80	98	78	88	106	3.4	17.7	20.1	25.6	21.3	24.4	29.9	23.4	26.8	32.3
12	60	70	90	74	84	104	82	92	112	3.7	18.3	21.3	27.4	22.6	25.6	31.7	25.0	28.0	34.1
13	64	74	96	76	88	110	84	96	118	4.0	19.5	22.6	29.3	23.2	26.8	33.5	25.6	29.3	36.0
14	66	78	102	80	92	116	88	100	124	4.3	20.1	23.4	31.1	24.4	28.0	35.4	26.8	30.5	37.8
15	70	82	108	82	96	122	90	104	130	4.6	21.3	25.0	32.9	25.0	29.3	37.2	27.4	31.7	39.6
16	72	86	114	86	100	128	94	108	136	4.9	21.9	26.2	34.7	26.2	30.5	39.0	28.7	32.9	41.5
17	76	90	120	88	104	134	96	112	142	5.2	23.2	27.4	36.6	26.8	31.7	40.8	29.3	34.1	43.3
18	78	94	126	92	108	140	100	116	148	5.5	23.4	28.7	38.4	28.0	32.9	42.7	30.5	35.4	45.1
19	82	98	132	94	112	146	102	120	154	5.8	25.0	29.9	40.2	28.7	34.1	44.5	31.1	36.6	46.9
20	84	102	138	98	116	152	106	124	160	6.1	25.6	31.1	42.1	29.9	35.4	46.3	32.3	37.8	48.8
21	88	106	144	100	120	158	108	128	166	6.4	26.8	32.3	43.9	30.5	36.6	48.2	32.9	39.0	50.6
22	90	110	150	104	124	164	112	132	172	6.7	27.4	33.5	45.7	31.7	37.8	50.0	34.1	40.2	52.4
23	94	114	156	106	128	170	114	136	178	7.0	28.7	34.7	47.5	32.3	39.0	51.8	34.7	41.5	54.3
24	96	118	162	110	132	176	118	140	184	7.3	29.3	36.0	49.4	33.5	40.2	53.6	36.0	42.7	56.1
25	100	122	168	112	136	182	120	144	190	7.6	30.5	37.2	51.2	34.1	41.5	55.5	36.6	43.9	57.9
26	102	126	174	116	140	188	124	148	196	7.9	31.1	38.4	53.0	35.4	42.7	57.3	37.8	45.1	59.7

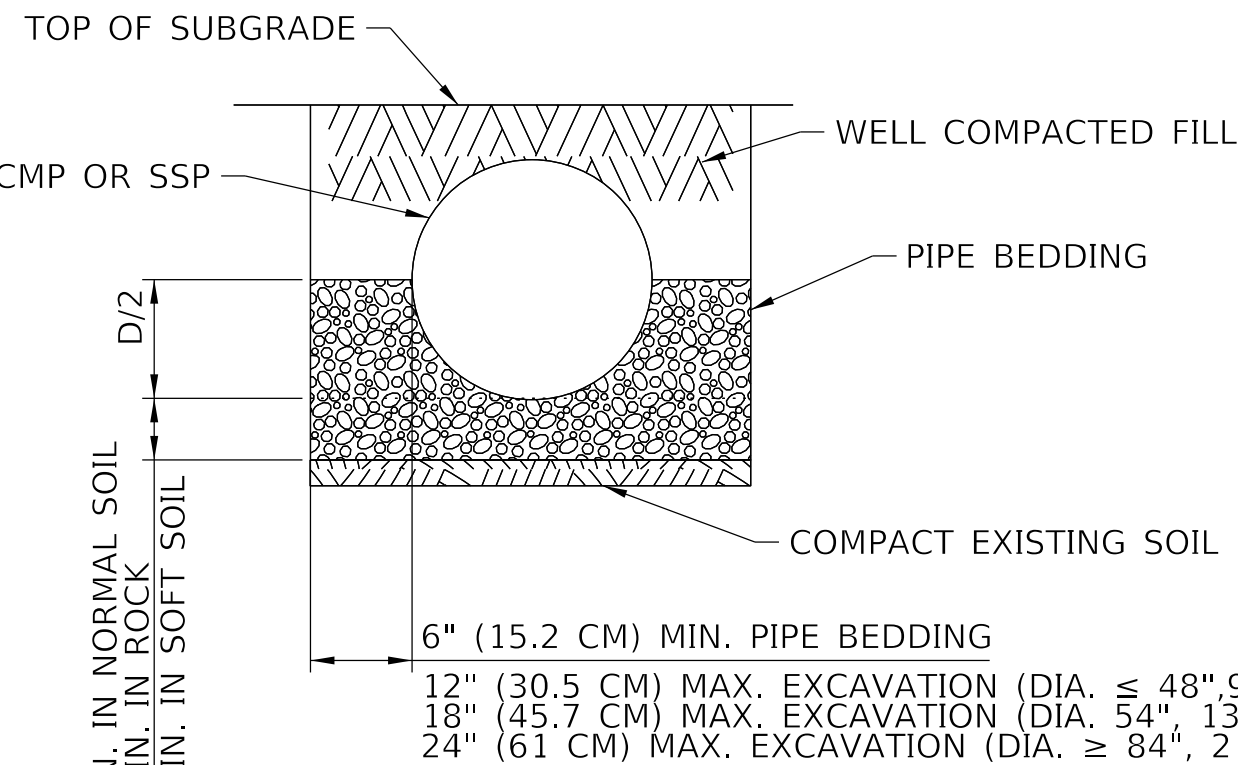
LENGTHS ARE ROUNDED TO THE NEAREST EVEN NUMBER OF FEET  
TABLE ASSUMES 15'-0" (4.6 M) SHOULDER FOR SINGLE TRACK AND 13' (4.0 M) CENTERS  
15'-6" (4.7 M) SHOULDER FOR 20' (6.1 M) TRACK CENTERS,  
ADD 10' (3.0 M) FOR EACH ACCESS ROAD.  
LENGTHS SHOWN ARE FOR STANDARD CROSS SECTIONS FOR TANGENT TRACK.  
ADD 2' (0.6 M) TO PIPE LENGTH (TO OUTSIDE OF CURVE) IF SUPER ELEVATION IS 2" (5.1 CM) OR GREATER.

CULVERT LENGTH EQUATION:

$$P = O + O = SG + (H - 2.0')S + (H - 2.0')S$$

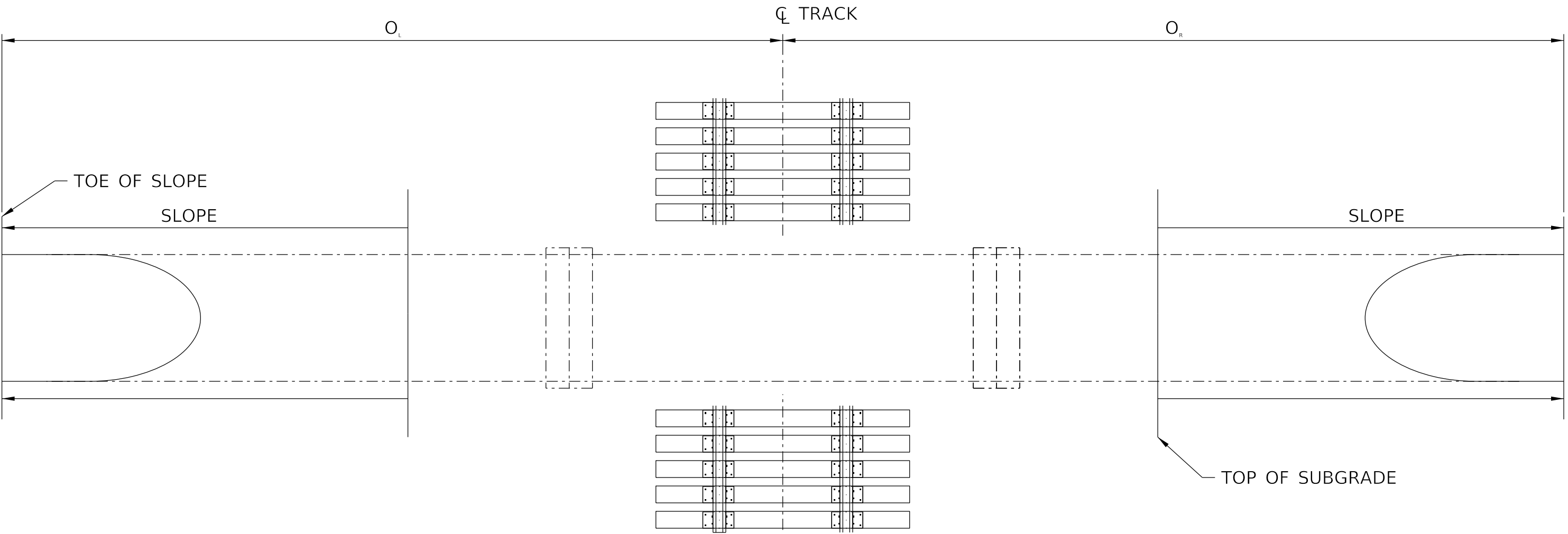
KEY:

- H = AVERAGE HEIGHT - BASE OF RAIL TO FLOWLINE  
H<sub>L</sub> = HEIGHT - BASE OF RAIL TO FLOWLINE LEFT OF TRACK  
H<sub>R</sub> = HEIGHT - BASE OF RAIL TO FLOWLINE RIGHT OF TRACK  
SG = WIDTH OF SUBGRADE = 2 SHOULDER + TRACK CENTER SPACING  
S<sub>L</sub> = SLOPE LEFT OF TRACK  
S<sub>R</sub> = SLOPE RIGHT OF TRACK  
P = SLOPE RIGHT OF TRACK  
O<sub>L</sub> = OFFSET LEFT  
O<sub>R</sub> = OFFSET RIGHT  
ASSUME SG = 30'-0" (9.1 M)



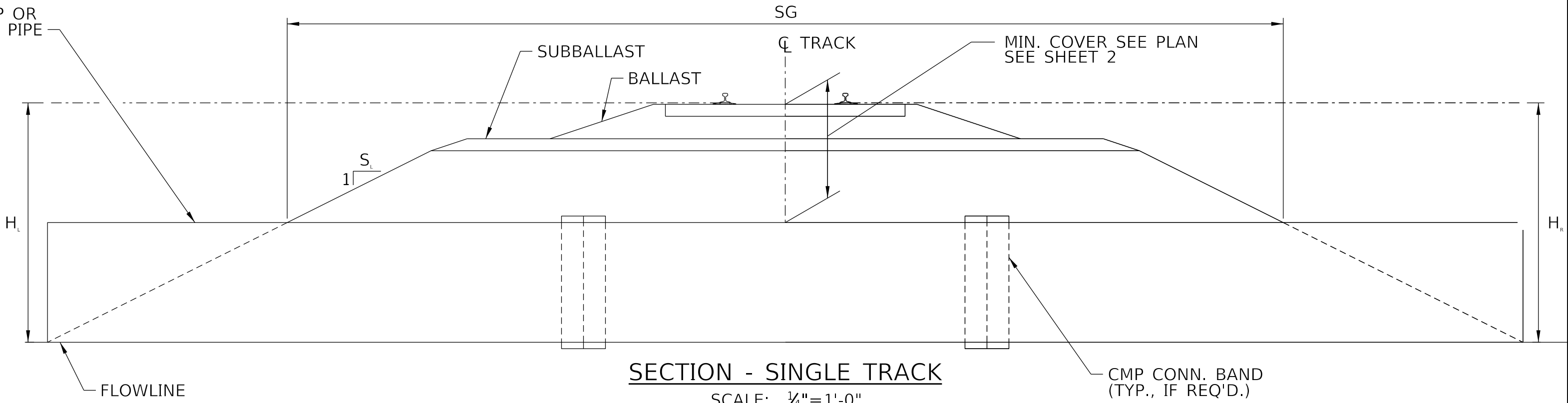
EXCAVATION AND FILL LIMITS

SCALE: ¼"=1'-0"



PLAN - SINGLE TRACK

SCALE: ¼"=1'-0"



SECTION - SINGLE TRACK

SCALE: ¼"=1'-0"



GENESEE & WYOMING  
BRIDGE SERVICES, INC.  
BRIDGE DEPARTMENT  
JACKSONVILLE FLORIDA

ISSUE DATE: \_\_\_\_\_  
AUTHORIZED: \_\_\_\_\_  
REVISED DATE: \_\_\_\_\_  
V.P. OF STRUCTURES

THE MATERIAL SHOWN HEREIN MUST MEET OR EXCEED ALL QUALITY REQUIREMENTS.  
ANY DEVIATION FROM THESE STANDARDS MUST BE SUBMITTED IN WRITING AND  
APPROVED BY THE DIRECTOR OF BRIDGE DESIGN PRIOR TO USE.

CULVERT STANDARD

CULVERT PLAN  
AND ELEVATION

DESIGN BY: KAB  
DRAWN BY: JWV  
CHECKED BY: KAB  
SCALE: AS NOTED

DRAWING NO.  
57001-1

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SPP CONSTRUCTION NOTES

GENERAL:  
THESE STRUCTURES ARE DESIGNED FOR COOPER E80 LIVE LOAD WITH IMPACT, AND COVER AS SHOWN IN TABLE 2.

TABLE 2 INDICATES THE MINIMUM REQUIRED THICKNESS FOR STRUCTURAL STABILITY BASED ON THE ASSUMPTIONS LISTED BELOW. THE REQUIRED GAGE THICKNESS FOR STRUCTURAL STEEL PLATE PIPE INCLUDES AN ALLOWANCE FOR CORROSION.

DESIGN ASSUMPTIONS:  
BACKFILL UNIT WEIGHT = 120 PCF.  
FACTORS OF SAFETY: SEAM STRENGTH = 3, WALL AREA = 2, BUCKLING = 2  
MINIMUM YIELD POINT: STEEL = 33 KSI.  
MODULUS OF ELASTICITY: STEEL = 29,000 KSI.  
MINIMUM TENSILE STRENGTH = 45 KSI.

- INSTALLATION:
1. INSTALLATION OF SPP SHALL CONFORM TO THE CURRENT AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA) MANUAL FOR RAILWAY ENGINEERING, CHAPTER 1, PART 4. CULVERT LENGTHS ARE TO BE BASED ON STANDARD MAINLINE ROADBED SECTIONS.
  2. THESE STANDARDS ARE FOR INSTALLATION IN SOIL WITH A pH OF 5-9 AND RESISTIVITY = 1,500 OHM-CM. PIPES LOCATED IN SOILS OUTSIDE THIS RANGE SHALL HAVE ADDITIONAL CORROSION PROTECTION AS SPECIFIED BY THE ENGINEER.
  3. WIRE OR TIMBER STRUTTING USED DURING INSTALLATION MUST BE REMOVED IMMEDIATELY AFTER INSTALLATION AND BACKFILL ARE COMPLETE.
  4. STRUCTURAL PLATE PIPE CULVERTS MUST BE PLACED WITH THE INSIDE CIRCUMFERENTIAL LAPS POINTING DOWNSTREAM.

- A. EMBANKMENTS UP TO 8 FEET HIGH (MEASURED BASE OF RAIL TO FLOWLINE) REQUIRE A 1½ INCH CAMBER.
- B. EMBANKMENTS 8 FEET TO 12 FEET HIGH REQUIRE A 2½ INCH CAMBER.
- C. EMBANKMENTS 12 FEET TO 24 FEET HIGH REQUIRE A 4 INCH CAMBER.
- D. EMBANKMENTS 24 FEET TO 36 FEET HIGH REQUIRE A 6 INCH CAMBER.

IN NO CASE SHALL THE CULVERT BE CAMBERED SO HIGH IN THE CENTER THAT WATER WILL BE POCKETED AT THE INLET OF THE PIPE.

- MATERIALS:
1. SPP MATERIAL AND CONNECTING MATERIAL SHALL BE IN ACCORDANCE WITH THE CURRENT AREMA MANUAL FOR RAILWAY ENGINEERING, CHAPTER 1, PART 4, SECTION 6.
  2. THE PIPE SHALL BE FABRICATED, ASSEMBLED INTO SECTIONS AND FURNISHED AS FOLLOWS:  
6" X 2" ANNULAR CORRUGATIONS.  
5% VERTICAL ELONGATION.  
A MINIMUM OF 4 STEEL BOLTS PER FOOT.
  3. PERMANENTLY ATTACH AN IDENTIFICATION PLATE INSIDE THE PIPE NEAR THE END OF EACH PIPE RUN. THE PLATE IS TO CONTAIN THE FOLLOWING INFORMATION IN AT LEAST ¼ INCH HIGH LETTERS:  
NAME OF MANUFACTURER AND PLANT LOCATION, DATE MANUFACTURED, GAGE, DIAMETER, AND LENGTH

SSP CONSTRUCTION NOTES

GENERAL:  
THESE STRUCTURES ARE DESIGNED FOR COOPER E80 LIVE LOAD WITH IMPACT, AND COVER AS SHOWN IN TABLE 3.

TABLE 3 INDICATES THE MINIMUM REQUIRED THICKNESS.

INSTALLATION:  
INSTALLATION OF SMOOTH STEEL PIPE (SSP) SHALL CONFORM TO THE CURRENT AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA) MANUAL FOR RAILWAY ENGINEERING, CHAPTER 1, PART 4. CULVERT LENGTHS ARE TO BE BASED ON STANDARD MAINLINE ROADBED SECTION.

JACKING:  
WHERE INDICATED, PIPE TO BE BORED AND JACKED INTO PLACE. BORE HOLE DIAMETER SHALL BE ESSENTIALLY THE SAME AS THE OUTSIDE DIAMETER OF THE PIPE. IF VOIDS SHOULD DEVELOP OR IF THE BORED HOLE DIAMETER IS GREATER THAN THE OUTSIDE DIAMETER OF THE PIPE BY MORE THAN 1 INCH, NOTIFY THE OFFICE OF AVP ENGINEERING DESIGN. BORING OPERATIONS SHALL NOT BE STOPPED IF SUCH A STOPPAGE WOULD BE DETRIMENTAL TO THE RAILROAD. A SURVEY CREW SHALL CONTINUALLY MONITOR THE ELEVATION AND ALIGNMENT OF THE RAILROAD TRACK(S) ABOVE DURING THE JACKING PROCEDURES. IF TRACK MOVEMENT OR LOSS OF BALLAST EXCEEDS ¼ INCH DURING JACKING OR BORING OPERATIONS, TAKE ANY ACTION NECESSARY TO ENSURE SAFE PASSAGE OF TRAINS. THE CONTRACTOR MUST IMMEDIATELY SUBMIT A CORRECTIVE PLAN OF ACTION TO THE RAILROAD FOR REVIEW AND APPROVAL. THE RAILROAD MUST REVIEW AND APPROVE THE PROPOSED REPAIR PROCEDURE. THE FINISHED REPAIR MUST BE INSPECTED BY THE RAILROAD BEFORE THE TRACK CAN BE PLACED BACK INTO SERVICE, AND THE CONSTRUCTION PROCEED.

BORED AND JACKED TOLERANCE:  
THE PERMITTED TOLERANCE OF A TRUE LINE IS +/- 2". ADJUSTMENT TO THE LINE AND LEVEL SHOULD BE GRADUAL TO ENSURE THAT THE PIPE MAUFACTURE'S STATED ANGULAR DEFLECTION IS NOT EXCEEDED AT ANY JOINT.

FIELD WELDING:  
WELDERS MUST POSSES VALID CERTIFICATION.

PIPE SHALL BE IN ACCORDANCE WITH ASTM INTERNATIONAL A139. PIPE TO BE GRADE B AND STEEL SHALL HAVE A MINIMUM YIELD STRENGTH OF 35 KSI. A HYDROSTATIC TEST IS NOT REQUIRED.

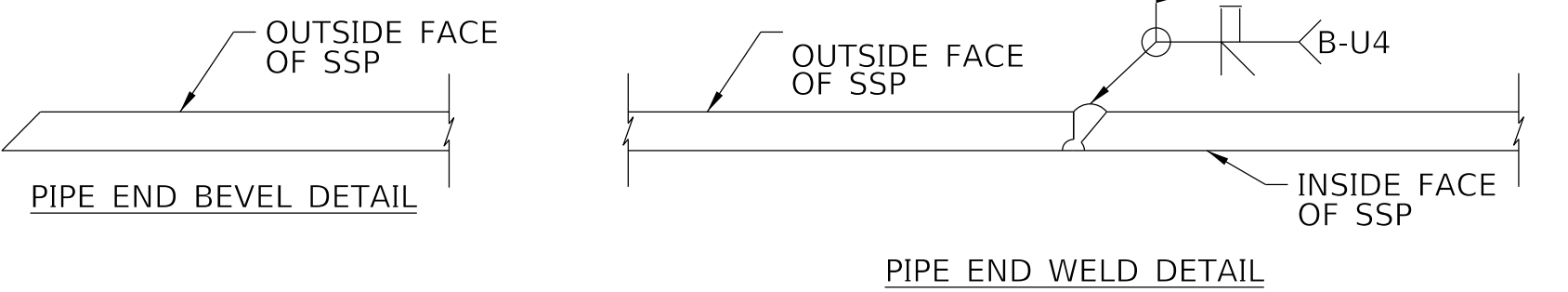
SMOOTH STEEL PIPE SHALL HAVE A WELDED STRAIGHT LONGITUDINAL SEAM. THE ENDS OF EACH SECTION OF PIPE SHALL BE SQUARE CUT. ONE END SHALL BE SUITABLY BEVELED FOR FIELD WELDING SECTIONS TOGETHER.

MATERIALS:  
PIPE SHALL BE IN ACCORDANCE WITH ASTM INTERNATIONAL A139. PIPE TO BE GRADE B AND STEEL SHALL HAVE A MINIMUM YIELD STRENGTH OF 35 KSI. A HYDROSTATIC TEST IS NOT REQUIRED.

SMOOTH STEEL PIPE SHALL HAVE A WELDED STRAIGHT LONGITUDINAL SEAM. THE ENDS OF EACH SECTION OF PIPE SHALL BE SQUARE CUT. ONE END SHALL BE SUITABLY BEVELED FOR FIELD WELDING SECTIONS TOGETHER.

HDPE CONSTRUCTION NOTES

HIGH DENSITY POLYETHYLENE PIPE CHALL BE FABRICATED PER AASHTO M252, M294 OR ASTM F2306 AND SHALL BE SMOOTH LINED.



CMP CONSTRUCTION NOTES

GENERAL:  
THESE STRUCTURES ARE DESIGNED FOR COOPER E80 LIVE LOAD WITH IMPACT AND COVER AS SHOWN IN TABLE 1.

GENERALLY, 30 INCH DIAMETER AND LARGER CORRUGATED METAL PIPE (CMP) IS PREFERRED FOR MAINLINE CULVERTS. SMALLER PIPES ARE TO BE USED FOR LOCAL DRAINAGE.

TABLE 1 INDICATES THE MINIMUM REQUIRED GAGE THICKNESS FOR STRUCTURAL STABILITY.

- INSTALLATION:
1. INSTALLATION OF CMP SHALL CONFORM TO THE CURRENT AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA) MANUAL FOR RAILWAY ENGINEERING, CHAPTER 1, PART 4. CULVERT LENGTHS ARE TO BE BASED ON STANDARD MAINLINE ROADBED SECTIONS.
  2. THESE STANDARDS ARE FOR INSTALLATION IN SOIL WITH A pH OF 5-9 AND RESISTIVITY ≥ 1,500 OHM-CM. PIPES LOCATED IN SOILS OUTSIDE THIS RANGE SHALL HAVE ADDITIONAL CORROSION PROTECTION AS SPECIFIED BY THE ENGINEER.
  3. WIRE OR TIMBER STRUTTING USED DURING INSTALLATION MUST BE REMOVED IMMEDIATELY AFTER INSTALLATION AND BACKFILL ARE COMPLETE.
  4. PIPE CULVERTS WILL GENERALLY BE JOINED USING 2 FOOT WIDE LOCKING CORRUGATED METAL CONNECTING BANDS. THE INSIDE OF CORRUGATED METAL CONNECTING BANDS AND THE OUTSIDE OF PIPE CULVERTS TO BE JOINED BY CORRUGATED CONNECTING BANDS SHALL BE KEPT CLEAN AND FREE OF ALL RUST, DIRT OR GRAVEL. THE CORRUGATIONS ON THE CONNECTING BANDS AND THE PIPE CULVERT SHALL FIT SNUGLY AS THE CONNECTING BANDS ARE TIGHTENED.
  5. CORRUGATED STEEL PIPE CULVERTS MUST BE PLACED WITH THE INSIDE CIRCUMFERENTIAL LAPS POINTING DOWNSTREAM.
  6. CULVERTS RESTING ON ROCK FOUNDATION NEED NOT BE CAMBERED, UNLESS OTHERWISE SPECIFIED BY THE ENGINEER ALL OTHER CMP CULVERTS SHALL BE CAMBERED IN ACCORDANCE WITH THE FOLLOWING:  
  
A. EMBANKMENTS UP TO 8 FEET HIGH (MEASURED BASE OF RAIL TO FLOWLINE) REQUIRE A 1½ INCH CAMBER.  
  
B. EMBANKMENTS 8 FEET TO 12 FEET HIGH REQUIRE A 2½ INCH CAMBER.  
  
C. EMBANKMENTS 12 FEET TO 18 FEET HIGH REQUIRE A 4 INCH CAMBER.

IN NO CASE SHALL THE CULVERT BE CAMBERED SO HIGH IN THE CENTER THAT WATER WILL BE POCKETED AT THE INLET OF THE PIPE.

- PIPE MATERIAL SPECIFICATIONS, FABRICATION AND TOLERANCE:
1. CMP MATERIAL SHALL BE IN ACCORDANCE WITH THE CURRENT AREMA MANUAL FOR RAILWAY ENGINEERING, CHAPTER 1, PART 4, SECTION 3.
  2. THE PIPE SHALL BE FABRICATED, ASSEMBLED INTO SECTIONS AND FURNISHED AS FOLLOWS:

12", 18", 21", AND 24" DIAMETER ONLY:  
CLASS 1 WITH 2½" X ½" ANNULAR CORRUGATIONS.  
SHAPE 1, VERTICAL ELONGATION IS NOT REQUIRED.  
SINGLE RIVETED LONGITUDINAL SEAMS.

30" DIAMETER AND GREATER:  
CLASS 1 WITH 3" X 1" ANNULAR CORRUGATIONS (30 INCH PIPES MAY HAVE 2½" X ½" ANNULAR CORRUGATIONS).  
SHAPE 2, FACTORY ELONGATED WITH VERTICAL LENGTH 5% GREATER THAN THE NOMINAL DIAMETER.  
DOUBLE RIVETED SEAMS.

TABLE 2 - STRUCTURAL PLATE PIPE - STEEL GAGE TABLE FOR E-80 LOADS																
DIA. (IN.)	HEIGHT OF COVER (FT.) - BASE OF RAIL TO TOP OF PIPE															
	3½-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70	71-75	
60	10	10	10	10	10	10	10	10	10	8	8	8	8	7	7	
66	10	10	10	10	10	10	10	10	10	8	8	8	8	7	7	
72	10	10	10	10	10	10	10	10	8	8	8	8	7	7	5	
78	10	10	10	10	10	10	10	10	8	8	8	7	7	7	5	
84	10	10	10	10	10	10	10	8	8	8	7	7	7	5	5	3
90	8	10	10	10	10	10	8	8	8	7	7	5	5	3	3	
96	8	10	10	10	10	8	8	8	7	7	7	5	3	3	1	
102	8	10	10	10	10	8	8	8	8	7	7	5	5	3	1	1
108	8	10	10	10	8	8	8	7	7	5	5	3	1	1		
114	8	8	10	10	8	8	8	7	7	5	3	3	1	1		
120	8	8	10	10	8	8	7	7	5	5	3	1	1			
126	7	8	10	8	8	8	7	7	5	3	3	1				
132	7	8	10	8	8	8	7	7	5	3	1	1				
138	7	8	10	8	8	7	7	5	3	3	1					
144	7	8	8	8	8	7	7	5	3	1	1					
150	7	8	8	8	8	7	7	3	3	1						
156	7	8	8	8	7	7	5	3	1	1						
162	5	7	8	8	7	7	5	3	1							
168	5	7	8	8	7	5	3	3	1							
174	5	7	8	7	7	5	3	1	1							
180	5	7	8	7	7	5	3	1								
186	3	7	8	7	7	5	3	1								
192	3	7	8	7	7	3	3	1								
198	3	7	8	7	5	3	1									
204	1	5	7	7	5	3	1									
210	1	5	7	7	3	1										
216		3	7	5	3	1										
222		3	7	5	3	1										
228		3	5	3	1											
234		1	5	3	1											
240		1	3	1												

TABLE 3 - ROUND SMOOTH STEEL PIPE (SSP)					
OUTSIDE PIPE DIAMETER	THICKNESS (IN.)	WEIGHT (LB./FT.)	COVER *		20'-0" LENGTH WEIGHT (LB.)
			MIN. (FT.)	MAX. (FT.)	
12"	⅜ <sub>16</sub>	24	1'-6"	18'-0"	480
18"	¼	48	1'-6"	18'-0"	960
21"	⅜ <sub>16</sub>	69	1'-6"	18'-0"	1,380
24"	⅜ <sub>16</sub>	80	1'-6"	18'-0"	1,600
30"	⅜	119	1'-6"	18'-0"	2,380
36"	½	190	1'-6"	18'-0"	3,800
42"	½	222	1'-6"	18'-0"	4,440
48"	⅝	317	1'-6"	18'-0"	6,340
60"	¾	475	1'-6"	18'-0"	9,500
72"	⅞	666	1'-6"	18'-0"	13,320
84"	1	888	1'-6"	18'-0"	17,760
96"	1¼	1,267	1'-6"	18'-0"	25,340
* COVER TO BE MEASURED FROM BASE OF RAIL TO TOP OF PILE					

TABLE 4 - HIGH DENSITY POLYETHYLENE PIPE (HDPE)					
NOMINAL PIPE DIAMETER	INSIDE PIPE DIAMETER	OUTSIDE PIPE DIAMETER	MINIMUM COVER (IN.)	BEDDING THICKNESS (IN.)	TRENCH WIDTH (IN.)
12"	12.2"	14.5"	54	4	30
15"	15.1"	17.6"	54	4	34
18"	18.2"	21.2"	54	4	39
24"	24.1"	27.7"	54	4	48
30"	30.2"	35.1"	54	6	56
36"	36.0"	41.1"	54	6	64
42"	42.0"	47.7"	54	6	72
48"	47.9"	53.7"	54	6	80
60"	59.9"	66.3"	66	6	96

TABLE 1 - ROUND CORRUGATED METAL PIPE (CMP)													
OUTSIDE PIPE DIAMETER	GAGE	THICKNESS (IN.)	WEIGHT (LB./FT.)	COVER *		10'-0" LENGTH	12'-0" LENGTH	14'-0" LENGTH	16'-0" LENGTH	18'-0" LENGTH	20'-0" LENGTH	22'-0" LENGTH	24'-0" LENGTH
				MIN. (FT.)	MAX. (FT.)	WEIGHT (LB.)	WEIGHT (LB.)	WEIGHT (LB.)	WEIGHT (LB.)	WEIGHT (LB.)	WEIGHT (LB.)	WEIGHT (LB.)	WEIGHT (LB.)
12"	14	0.079	12	1'-6"	18'-0"	120	144	168	192	216	240	264	288
18"	14	0.079	18	1'-6"	18'-0"	180	216	252	288	324	360	396	432
21"	14	0.079	21	1'-6"	18'-0"	210	252	294	336	378	420	462	504
24"	14	0.079	24	1'-6"	18'-0"	240	288	336	384	432	480	528	576
30"	14	0.079	30	1'-6"	18'-0"	300	360	420	480	540	600	660	720
36"	14	0.079	41	2'-6"	18'-0"	410	492	574	656	738	820	902	984
42"	14	0.079	47	2'-6"	18'-0"	470	564	658	752	846	940	1,034	1,128
48"	12	0.109	74	2'-6"	18'-0"	740	888	1,036	1,184	1,332	1,480	1,628	1,776
60"	12	0.109	92	2'-6"	18'-0"	920	1,104	1,288	1,472	1,656	1,840	2,024	2,208
72"	10	0.138	140	3'-6"	18'-0"	1,400	1,680	1,960	2,240	2,520	2,800	3,080	3,360
84"	10	0.138	164	3'-6"	18'-0"	1,640	1,968	2,296	2,624	2,952	3,280	3,608	3,936
96"	8	0.168	228	3'-6"	18'-0"	2,280	2,736	3,192	3,648	4,104	4,560	5,016	5,472
* COVER TO BE MEASURED FROM BASE OF RAIL TO TOP OF PILE													

GENESEE & WYOMING  
RAILROAD SERVICES, INC.  
BRIDGE DEPARTMENT

JACKSONVILLEFLORIDA

ISSUE DATE:  
AUTHORIZED:

REVISED DATE:

V.P. OF STRUCTURES

THE MATERIAL SHOWN HEREIN MUST MEET OR EXCEED ALL QUALITY REQUIREMENTS. ANY DEVIATION FROM THESE STANDARDS MUST BE SUBMITTED IN WRITING AND APPROVED BY THE DIRECTOR OF BRIDGE DESIGN PRIOR TO USE.

CULVERT STANDARD

CULVERT CONSTRUCTION NOTES

DESIGN BY: KAB  
DRAWN BY: JWW  
CHECKED BY: KAB  
SCALE: AS NOTED

DRAWING NO.  
57001-2