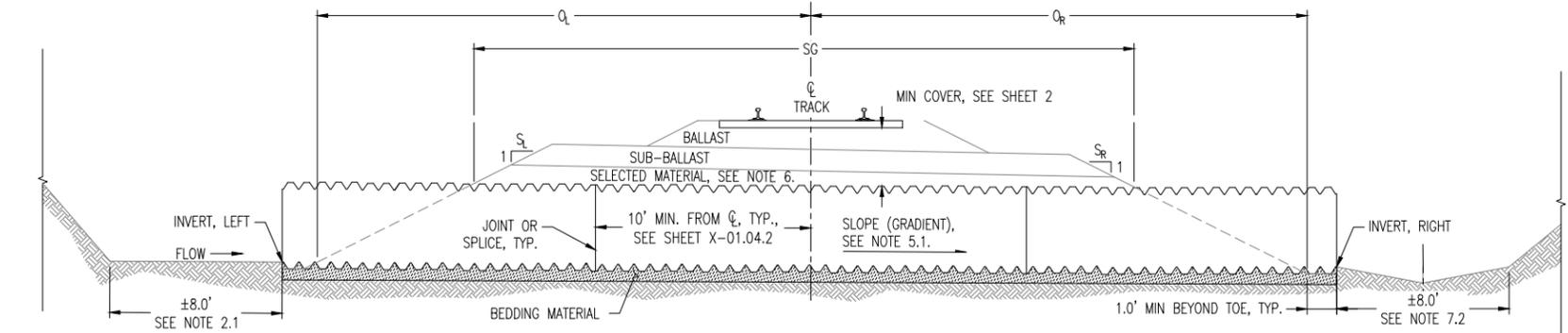
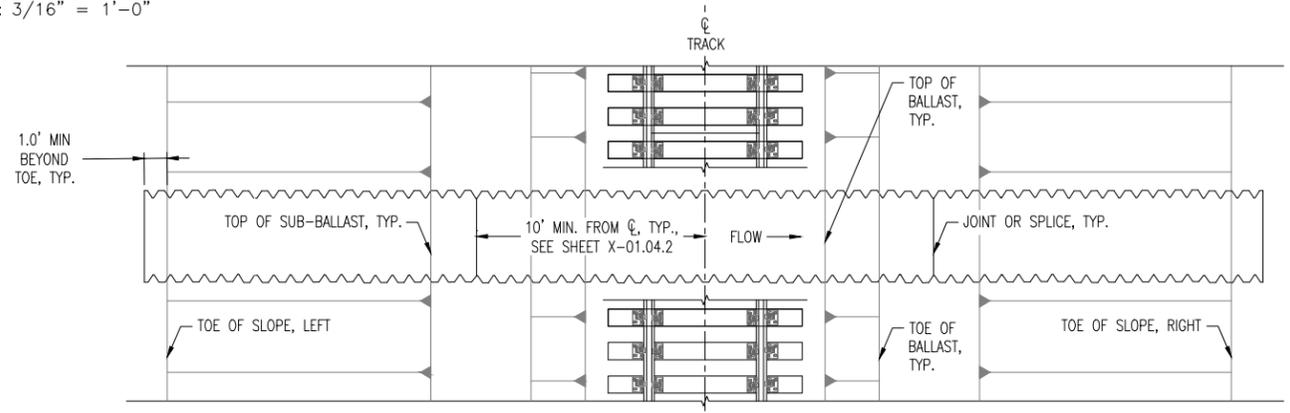


DRAWING LOCATION: P:\ENGINEERING\ARRC STANDARDS\2. STANDARD DRAWINGS\1. ROADWAY (X)\X-1 TYPICAL SECTIONS.DWG



**A SECTION - SINGLE TRACK**  
1 SCALE: 3/16" = 1'-0"



**B PLAN - SINGLE TRACK**  
1 SCALE: 3/16" = 1'-0"

**GENERAL:**

USE OF CULVERTS LESS THAN 36" IN DIAMETER MUST BE APPROVED BY THE CHIEF ENGINEER.

**AGGREGATE MATERIALS:**

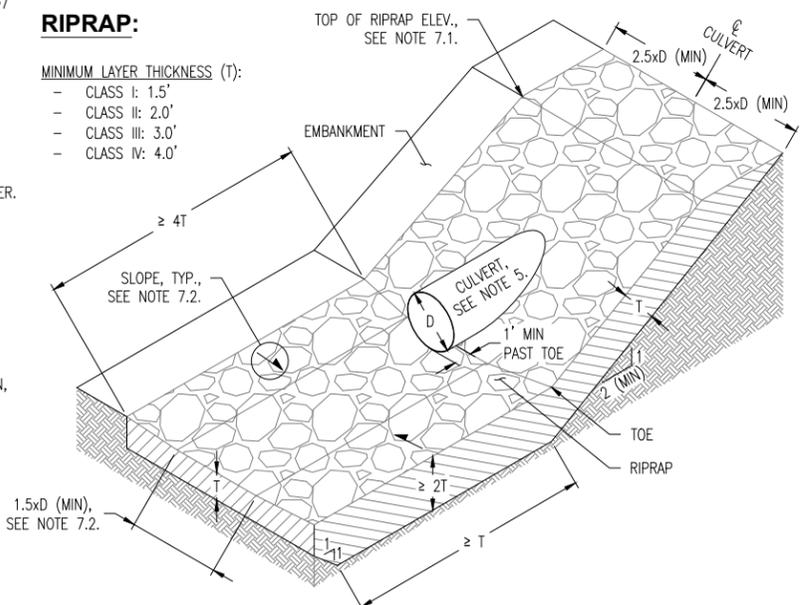
- BEDDING AND BACKFILL: SELECTED MATERIAL, TYPE A IN ACCORDANCE WITH SUBSECTION 703-2.07.
- EMBANKMENT: EXCAVATION (NATIVE MATERIAL) MAY BE USED IN THE EMBANKMENT WHEN ITS MEETS THE REQUIREMENTS OF SUBSECTION 703-2.07 FOR THE TYPE SPECIFIED, SEE NOTE 6 BELOW.
- CONTROLLED LOW STRENGTH MATERIAL (CLSM): 500-1,200psi IN ACCORDANCE WITH SUBSECTION 712-2.22.
- SUB-BALLAST: AGGREGATE BASE COURSE, GRADING C-1 IN ACCORDANCE WITH SUBSECTION 703-2.03.
- BALLAST: TYPE 3 OR 4A IN ACCORDANCE WITH SUBSECTION 703-2.17.
- RIPRAP: CLASS II, III, AND IV IN ACCORDANCE WITH SUBSECTION 611-2.01. CLASS I MAY BE USED IN LOW WATER VELOCITY INSTALLATIONS WITH THE APPROVAL OF ARRC'S CHIEF ENGINEER.

**NOTES:**

1. WHEN SHALLOW BEDROCK, OR OTHER RESTRICTIVE CONDITIONS, ARE ENCOUNTERED; SMALLER DIAMETER PIPE(S) MAY BE USED UPON APPROVAL FROM THE CHIEF ENGINEER. NOTE THAT THE USE OF SMALLER OR SHALLOWER CULVERTS MAY REQUIRE DESIGN DOCUMENTS FROM THE ENGINEER.
2. DITCHES:
  - 2.1. GRADE TO DRAIN TOWARDS THE INLET AND RE-ESTABLISH THE FLOWLINE TO DRAIN TO THE INLET.
  - 2.2. RE-ESTABLISH THE DITCHLINE WHEN APPLICABLE AND GRADE TO DRAIN AWAY FROM THE OUTLET.
3. MAXIMUM EXCAVATION LIMITS FOR PIPE TRENCHES ARE BASED ON THE FOLLOWING,
  - 3.1. BEDDING DEPTH: AS MEASURED FROM THE BOTTOM OF THE PIPE TO GROUND SURFACE, WHERE:
    - 3.1.1. CLSM IS USED AS BEDDING MATERIAL: 6" MAX
    - 3.1.2. PIPE DIAMETER ≤48": 12" MAX
    - 3.1.3. PIPE DIAMETER 48"≤78": 18" MAX
    - 3.1.4. PIPE DIAMETER ≥84": 24" MAX
  - 3.2. PIPE CLEARANCE: AS MEASURED FROM THE OUTSIDE FACE OF THE PIPE AT THE CENTERLINE TO TO THE NEAREST FACE OF THE EXCAVATION, WHERE:
    - 3.2.1. CLSM IS USED AS BEDDING MATERIAL: 12" MAX
    - 3.2.2. IN POOR SUBGRADE DEFINITIONS, AS DEFINED UNDER NOTE 4: 24" MAX
    - 3.2.3. IN ALL OTHER CONDITIONS, 18" MAX.
4. NOTIFY THE ENGINEER WHEN POOR SUBGRADE CONDITIONS ARE FOUND BELOW THE MAXIMUM EXCAVATION LIMITS AS ADDITIONAL INSTALLATION DETAILS UTILIZING GEOSYNTHETIC MATERIALS OR OTHER SOIL REINFORCING MATERIALS MAY BE REQUIRED. THE ENGINEER HAS THE FINAL DETERMINATION FOR CLASSIFYING SUBGRADE MATERIALS AS POOR.
  - 4.1. POOR SUBGRADE MATERIALS CONSISTS OF SOILS, MUCK, ORGANIC MATTER, AND OTHER MATERIAL NOT SUITABLE FOR FOUNDATION MATERIAL REGARDLESS OF MOISTURE CONTENT.
5. CULVERT(S): SMOOTH STEEL PIPE (SSP); CORRUGATED METAL PIPE (CMP), STEEL OR ALUMINUM; AND STRUCTURAL PLATE PIPE (SPP).
  - 5.1. MAINTAIN A MINIMUM GRADIENT (SLOPE) OF 0.5% TOWARDS THE OUTLET, UNLESS OTHERWISE NOTED.
  - 5.2. ADDITIONAL CULVERT TYPES MAY BE UTILIZED UPON APPROVAL FROM THE CHIEF ENGINEER. NOTE THAT PIPE TYPES AND SIZES NOT PRESCRIBED ON SHEET 2 WILL REQUIRE EVALUATION BY THE ENGINEER.
6. SELECTED MATERIAL (BASED ON ITS LOCATION RELATIVE TO THE BOTTOM OF TIE):
  - 6.1. -2.0' TO -4.0': TYPE A.
  - 6.2. -4.0' AND DEEPER: TYPE C.
7. RIPRAP (WHEN SITE CONDITIONS REQUIRE, FOR EITHER THE INLET OR OUTLET): KEY-IN MATERIAL IN ACCORDANCE WITH SECTION 611.
  - 7.1. PLACE RIPRAP TO AN ELEVATION NO LESS THAN 1.0' FEET ABOVE THE OHWM OR TO TOE OF THE EMBANKMENT, WHICHEVER IS SPECIFIED.
  - 7.2. WHEN RIPRAP IS PLACED WITHIN AN ESTABLISHED CHANNEL OR AS AN OUTFALL PROTECTION MEASURE, SLOPE RIPRAP OUTWARDS FROM THE LIMITS OF THE "1.5xD (MIN)" DIMENSION TO MATCH THE EXISTING CHANNEL BANKS OR AS SPECIFIED.
  - 7.3. WHEN PLACED WITHIN AN EXISTING DITCHLINE, REESTABLISH THE DITCHLINE WITH RIPRAP WITHIN THE "≥ 4T" DIMENSION AND NEGLECT NOTE 7.2.
  - 7.4. WHEN PLACED AS EMBANKMENT PROTECTION ALONG AN EXISTING SLOPE, REDUCE THE "≥ 4T" DIMENSION TO "≥ 2T" AND NEGLECT NOTE 7.2.

**RIPRAP:**

- MINIMUM LAYER THICKNESS (T):**
- CLASS I: 1.5'
  - CLASS II: 2.0'
  - CLASS III: 3.0'
  - CLASS IV: 4.0'



**D TYPICAL RIPRAP ISOMETRIC**  
1 SCALE: 3/16" = 1'-0"

**CULVERT LENGTH EQUATION:**

$$P_L = 2.0' + Q_L + Q_R = SG + (H_L - 2.0')S_L + (H_R - 2.0')S_R$$

**KEY:**

- H = AVERAGE HEIGHT - BASE OF TRAIL 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<sub>L</sub> = LENGTH OF PIPE REQUIRED
  - Q<sub>L</sub> = OFFSET FROM Q<sub>C</sub>, LEFT
  - Q<sub>R</sub> = OFFSET FROM Q<sub>C</sub>, RIGHT
- ASSUME S.G.=30'-0"

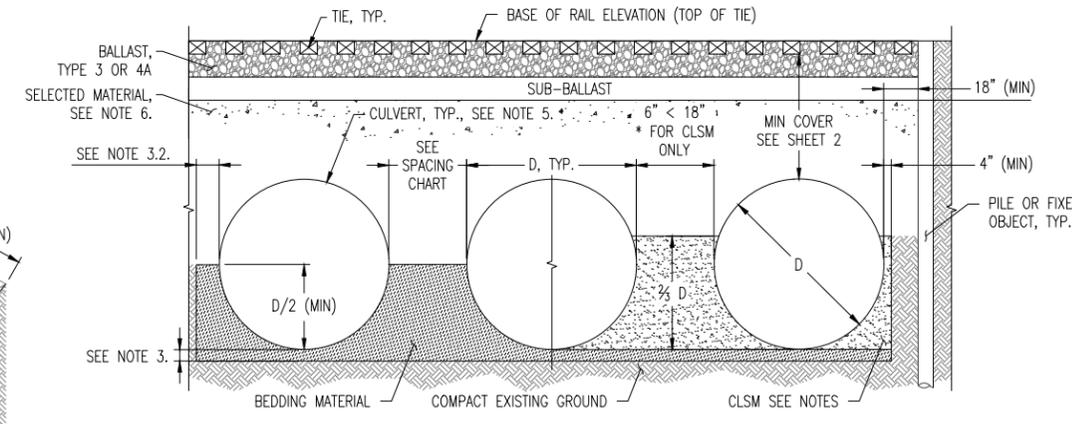
**UTILITIES:**

VERIFY ALL UNDERGROUND UTILITIES PRIOR TO DIGGING. LOCATE CALL CENTER OF ALASKA (811):  
 - FAIRBANKS .....1.907.459.6400  
 - STATEWIDE .....1.800.478.3121  
 CALL CENTER WILL NOTIFY SUBSCRIBED UTILITIES ONLY, OTHER UTILITIES NEED TO BE CONTACTED INDIVIDUALLY.



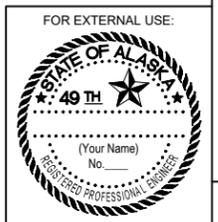
H - B/R TO FLOWLINE (FT)	CULVERT PIPE LENGTH (PL) FOR STANDARD CROSS SECTIONS								
	SINGLE TRACK			13' TRACK CENTERS			20' TRACK CENTERS		
	SLOPE	SLOPE	SLOPE	SLOPE	SLOPE	SLOPE	SLOPE	SLOPE	SLOPE
	1.5:1	2:1	3:1	1.5:1	2:1	3:1	1.5:1	2:1	3:1
4	36	38	42	50	52	56	58	60	64
5	40	42	48	52	56	62	60	64	70
6	42	46	54	56	60	68	64	68	76
7	46	50	60	58	64	74	66	72	82
8	48	54	66	62	68	80	70	76	88
9	52	58	72	64	72	86	72	80	94
10	54	62	78	68	76	92	76	84	100
11	58	66	84	70	80	98	78	88	106
12	60	70	90	74	84	104	82	92	112
13	64	74	96	76	88	110	84	96	118
14	66	78	102	80	92	116	88	100	124
15	70	82	108	82	96	122	90	104	130
16	72	86	114	86	100	128	94	108	136
17	76	90	120	88	104	134	96	112	142
18	78	94	126	92	108	140	100	116	148
19	82	98	132	94	112	146	102	120	154
20	84	102	138	98	116	152	106	124	160
21	88	106	144	100	120	158	108	128	166
22	90	110	150	104	124	164	112	132	172
23	94	114	156	106	128	170	114	136	178
24	96	118	162	110	132	176	118	140	184
25	100	122	168	112	136	182	120	144	190
26	102	126	174	116	140	188	124	148	196

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



**C MINIMUM PIPE SPACING, COVER; AND EXCAVATION AND FILL LIMITS**  
1 SCALE: 3/16" = 1'-0"

SPACING CHART	
PIPE DIAMETER (INCHES)	MIN SPACING BETWEEN PIPES (S)
12 TO 36	18
36 TO 96	D/2
96 OR GREATER	48



**ALASKA RAILROAD**

ADOPTED AS A STANDARD PLAN BY: Brian A. Lindamood, P.E., S.E., Chief Engineer

ADOPTION DATE: \_\_\_\_\_

LAST CODE AND STANDARDS REVIEW BY: \_\_\_\_\_ DATE: \_\_\_\_\_

X-01.04

DRAWING LOCATION: P:\ENGINEERING\ARRC STANDARDS\2. STANDARD DRAWINGS\1. ROADWAY (X)\X-1 TYPICAL SECTIONS.DWG

**DESIGN ASSUMPTIONS:**

PARAMETERS OUTSIDE THE LIMITS PROVIDED HEREIN, REQUIRE APPROVAL FROM ARRC'S CHIEF ENGINEER AND MAY REQUIRE ADDITIONAL ENGINEERING STUDIES.

1. LIVE LOAD (LL): COOPER E-80 WITH IMPACT AT 60MPH PER TABLE 1-4-25 FROM CHAPTER 1, ARTICLE 4.13.2.b OF THE AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION MANUAL FOR RAILWAY ENGINEERING, 2024 EDITION (AREMA MRE).
2. DEAD LOAD (DL): IN ADDITION TO SOIL LOADS, ADD 200 LBS/LF FOR EACH TRACK PER CHAPTER 15, SECTION 1.3.2 OF THE AREMA MRE.
3. FACTOR OF SAFETY (FS OR SF): FS=3.0 (MIN), AND:
  - a. FS=3.0 FOR SEAM STRENGTH WHEN APPLICABLE
  - b. FS=2.0 FOR WALL AREA WHEN APPLICABLE
  - c. FS=2.0 FOR BUCKLING
4. BUCKLING AND HANDLING LIMITS: PER CHAPTER 4 OF THE AMERICAN WATER WORKS ASSOCIATIONS M11, 5th EDITION (AWWA).
5. DEPTH OF COVER:
  - a. MEASURED FROM THE BOTTOM SURFACE OF THE TIE TO THE TOP OF THE CULVERT
  - b. WHERE CALCULATED, EVALUATED FROM 2.0' TO 18.0'.
6. CORRUGATED METAL PIPE:
  - a. CORRUGATION PROFILES, HELICAL: 3" x 1.000" OR 2-2/3" x 0.500" UPON APPROVAL FROM THE CHIEF ENGINEER.
  - b. GAGE (GA): 16 GA, 14 GA, 12 GA, AND 10 GA.
7. SOIL PARAMETER: CHAPTER 5, TABLE 5-3 OF AWWA
  - a. SOIL STIFFNESS CATEGORY (SC): SC-2 WITH A COMPACTION LEVEL OF 85%
  - b. IN-PLACE DENSITY: 130 PCF MIN / 152 PCF MAX
  - c. WHEN LOCAL GEOTECHNICAL DATA IS AVAILABLE, THE ENGINEER WILL RE-EVALUATE THE MINIMUM PARAMETERS FOR THE PROPOSED CULVERT.
8. CORROSION PROTECTION: THE SOIL IS ASSUMED TO HAVE A pH OF 5-9 AND RESISTIVITY <1,500 OHM-CM.
  - a. WHEN KNOWN; PIPES LOCATED IN SOILS OUTSIDE THIS RANGE SHALL HAVE ADDITIONAL CORROSION PROTECTION APPLIED AS DETERMINED BY THE ENGINEER.
  - b. WHEN UNKNOWN; THE CONTRACT MANAGER WILL OBTAIN AND PROVIDE TO THE ENGINEER SITE SPECIFIC INFORMATION ON THE CORROSIVENESS OF THE SOIL; WHICH MAY RESULT IN AN INCREASE OF MATERIAL THICKNESS OR THE ADDITION OF PROTECTIVE COATINGS.

**MATERIALS:**

USE MATERIALS THAT CONFORM TO THE FOLLOWING:

1. CORRUGATED PIPE AND COUPLING BANDS.
  - a. STEEL. SUBSECTION 707-2.01
  - b. ALUMINUM. SUBSECTION 707-2.03
    - i. UTILIZE ONLY IN AREAS WHERE THE SALINITY CONTENT OF THE ADJACENT WATERBODY IS GREATER THAN 0.5 ppt OR WHERE SPECIFIED.
2. CORRUGATED HIGH DENSITY POLYETHYLENE (HDPE) PIPE. SUBSECTION 706-2.07
  - a. REQUIRES APPROVAL FROM THE CHIEF ENGINEER WHEN INSTALLED UNDER MAINLINE TRACK.
3. STRUCTURAL PLATE PIPE (SPP). SUBSECTION 707-2.04
4. SMOOTH STEEL PIPE (SSP). SUBSECTION 715-2.02.2
  - a. ASTM A139, GRADE B (35KSI MIN) MAY BE UTILIZED UPON APPROVAL FROM THE CHIEF ENGINEER.
  - b. MINIMUM WALL THICKNESS: 0.500"t. VALUES LESS THAN 0.500"t REQUIRE APPROVAL FROM THE CHIEF ENGINEER AND EVALUATION BY THE ENGINEER.
  - c. MINIMUM YIELD STRENGTH: 36 KSI
  - d. MODULUS OF ELASTICITY: 3,000 KSI
5. END SECTIONS: WHEN REQUIRED, MUST BE OF THE SAME MATERIAL AS THE CULVERT.
6. GEOSYNTHETICS (WHEN SITE CONDITIONS REQUIRE):
  - a. GEOGRID. REINFORCEMENT, CLASS 1 IN ACCORDANCE WITH SUBSECTION 729-2.04.
  - b. GEOTEXTILE. SEPARATION, CLASS 3 IN ACCORDANCE WITH SUBSECTION 729-2.01.

**GENERAL ENVIRONMENTAL NOTES:**

1. LOCATION: THIS STANDARD DRAWING IS NOT INTENDED TO BE UTILIZED WITHIN A CATALOGED WATER BODY WITHOUT ADDITIONAL DETAILING FROM THE ENGINEER TO MEET PERMITTING STIPULATIONS.
2. PERMITTING: THE INSTALLER SHALL ACQUIRE ALL PERMITS IN ACCORDANCE WITH SUBSECTION 107-1.02, OTHER THAN THOSE PROVIDED BY ARRC, THAT ARE REQUIRED TO COMPLETE THE WORK.
  - a. AKDNR TEMPORARY WATER USE AUTHORIZATION (TWA) PERMIT(S) SHALL BE OBTAINED BY THE INSTALLER.
3. SWPPP: WHEN THE TOTAL LAND DISTURBANCE IS ≥1.0 ACRE, THE INSTALLER SHALL MEET AND COMPLY WITH THE REQUIREMENTS OF SECTION 641.
  - a. UNLESS OTHERWISE SPECIFIED, ARRC WILL NOT BE AN OPERATOR.

**GENERAL CONSTRUCTION NOTES:**

1. UTILITIES: THE INSTALLER IS RESPONSIBLE FOR COORDINATING WITH UTILITY OWNER'S IN ACCORDANCE WITH SUBSECTION 105-1.06.
  - a. THE CONTRACTOR WILL FIELD VERIFY THE LOCATION OF ALL UTILITIES PRIOR TO COMMENCING EXCAVATION WITHIN THE WORK LIMITS.
  - b. UTILITY LOCATIONS ARE TO BE DOCUMENTED ON RECORD DRAWINGS THAT ARE TO BE SUBMITTED TO THE ENGINEER BY THE INSTALLER.
2. CAMBER: ENSURE ALL CULVERTS HAVE A MINIMUM CAMBER EQUAL TO 1 PERCENT OF THE LENGTH OF THE PIPE, UNLESS OTHERWISE PRESCRIBED HEREIN OR BY THE ENGINEER.
  - a. IN NO CASE SHALL THE PIPE BE CAMBERED SUCH THAT WATER WILL BE IMPOUNDED AT THE INVERTS OF THE PIPE.
  - b. PIPE CULVERTS RESTING ON BEDROCK OR COMPETENT ROCK FOUNDATIONS DO NOT REQUIRE CAMBER.
3. WIRE OR TIMBER STRUTTING, OR ANY OTHER TYPE OF DUNNAGE: MAY BE USED TO FACILITATE THE INSTALLATION OF PIPE CULVERTS BUT WILL REQUIRE APPROVAL FROM THE ENGINEER PRIOR TO IMPLEMENTATION IN THE FIELD. IF APPROVED, MATERIALS WILL BE REMOVED IMMEDIATELY AFTER INSTALLATION OF THE PIPE CULVERT AND PRIOR TO COMMENCING BACKFILL OPERATIONS.

**CONSTRUCTION NOTES FOR OPEN CUT INSTALLATIONS:**

1. WHEN ESTABLISHED RAIL JOINTS ARE NOT WITHIN THE PROJECT LIMITS, COORDINATE WITH ARRC MOW FORCES, IN ACCORDANCE WITH SUBSECTION 107-1.08, FOR THE DETERMINATION OF THE CUTS.
  - a. CUT RAIL IN ACCORDANCE WITH SUBSECTION 802-3.05.3 AND JOINT IN ACCORDANCE WITH SUBSECTION 802-3.05.4.
2. REMOVE THE SECTION OF TRACK BETWEEN THE IDENTIFIED JOINTS IN A PANEL FOR REINSTALLATION.
3. EXCAVATION:
  - a. PERFORM EXCAVATION ACTIVITIES FOR CULVERTS IN ACCORDANCE WITH SECTION 204.
  - b. ALL EXCAVATED MATERIALS ARE TO BE CONSIDERED UNCLASSIFIED MATERIAL UNTIL CLASSIFIED.
  - c. SLOPES STEEPER THAN 4:1, WHEN MEASURED AT RIGHT ANGLES TO THE RAILWAY, ARE TO BE BENCHED IN ACCORDANCE WITH SUBSECTION 203-3.03.
4. REMOVE EXISTING CULVERTS IN ACCORDANCE WITH SECTION 202.
5. INSTALL CULVERTS IN ACCORDANCE WITH SECTION 603.
6. PLACE, GRADE, AND SHAPE ALL AGGREGATE MATERIALS BENEATH THE SUB-BALLAST LAYER IN ACCORDANCE WITH SUBSECTION 203-2.01 AND COMPACT TO 95 PERCENT OF THE MAXIMUM DENSITY IN ACCORDANCE WITH SUBSECTION 203-3.04.
  - a. SIDEFILL SHALL BE PLACED AND COMPACTED WITH CARE UNDER THE HAUNCHES OF THE PIPE AND SHALL BE BROUGHT UP EVENLY AND SIMULTANEOUSLY ON BOTH SIDES OF THE PIPE TO 1.0' ABOVE THE TOP OF THE PIPE OVER ITS FULL LENGTH.
7. PLACE SUB-BALLAST (AGGREGATE BASE COURSE, GRADING C-1) IN ACCORDANCE WITH SUBSECTION 301-3.01, SHAPE IN ACCORDANCE WITH SUBSECTION 301-3.01, AND COMPACT TO 98 PERCENT OF THE MAXIMUM DENSITY IN ACCORDANCE WITH THE AFOREMENTIONED.
8. BALLAST:
  - a. PLACE BALLAST IN ACCORDANCE WITH SUBSECTION 309-3.01.
  - b. SHAPE AND COMPACT THE INITIAL LAYER OF BALLAST BENEATH THE TIES IN ACCORDANCE WITH SUBSECTION 309-3.02.
9. REINSTALL THE REMOVED TRACK PANEL IN ACCORDANCE WITH SECTION 802. REPLACE ANY ITEMS DESTROYED DURING THE REMOVAL OR REINSTALLATION OF THE PANEL IN ACCORDANCE WITH THE SAME.
10. COMPLETE THE PLACEMENT OF BALLAST IN ACCORDANCE WITH SUBSECTION 309-3.02 AND THEN SHAPE AND COMPACT IT IN ACCORDANCE WITH SUBSECTION 802-3.06.

**CONSTRUCTION NOTES FOR DIRECT BORING, JACKING, OR MICROTUNNELING:**

1. THESE INSTALLATION METHODS ARE NOT COVERED UNDER THIS STANDARD DRAWING AND WILL REQUIRE APPROVAL FROM THE CHIEF ENGINEER.
2. WHEN SPECIFIED, THE DEPTH OF COVER TABLES PROVIDED HEREON FOR SSP CULVERTS ARE NOT APPLICABLE NOR ARE THEY REPRESENTATIVE OF THE WALL THICKNESS REQUIRED FOR THESE METHODS.
3. THE DESIGN PARAMETERS PRESCRIBED HEREIN TO EVALUATE THE PIPE'S MATERIAL PROPERTIES FOR OPEN CUT CONSTRUCTION METHODS ARE NOT APPLICABLE TO THESE CONSTRUCTION METHODS.

**CONSTRUCTION NOTES FOR SSP CULVERT INSTALLATIONS:**

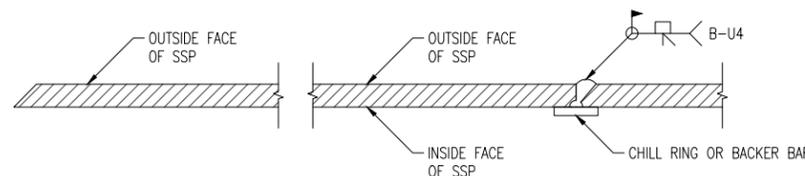
1. WELD PIPE AS DETAILED HEREON AND IN ACCORDANCE WITH SUBSECTIONS 504-3.01.7 AND DETAIL A-2 HEREON.
2. THE LOCATION OF THE SPLICE, IN RELATION TO THE CENTER OF THE TRACK, MUST BE APPROVED BY THE CHIEF ENGINEER.
  - a. NO PIECE UTILIZED SHALL BE LESS THAN 10.0' LONG.
3. INSPECTION FREQUENCY AND REQUIREMENTS FOR SPLICES ARE OUTLINED UNDER SUBSECTION 505-3.04.

**CONSTRUCTION NOTES FOR CORRUGATED CULVERT INSTALLATIONS:**

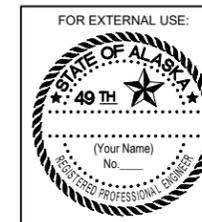
1. THE LOCATION OF THE BAND, IN RELATION TO THE CENTER OF THE TRACK, MUST BE APPROVED BY THE CHIEF ENGINEER.
  - a. HELICAL TO ANNULAR, OR HELICAL TO HELICAL, CONNECTIONS ARE NOT PERMITTED WITHOUT PRIOR APPROVAL FROM THE ENGINEER.
  - b. NO PIECE UTILIZED SHALL BE LESS THAN 10.0' LONG.
  - c. ORIENT SUCH THAT THE CENTER SECTION OF CULVERT IS UNDER THE CENTER OF THE TRACK SUCH THAT THE CULVERT JOINTS ARE EQUIDISTANCE FROM THE CENTERLINE OF THE TRACKS.
2. CAMBER CORRUGATED PIPES RELATIVE TO THE DEPTH OF COVER:
  - a. 2.0' < 8.0': 1.5"
  - b. 8.0' ≤ 12.0': 2.5"
  - c. 12.0' ≤ 18.0': 4.5"

**CONSTRUCTION NOTES FOR SPP CULVERT INSTALLATIONS:**

1. SUBMIT SHOP DRAWINGS FOR THE PROPOSED SPP CULVERT TO THE ENGINEER FOR APPROVAL PRIOR TO PROCUREMENT.
  - a. WHEN MATERIAL PROPERTIES DIFFER FROM THOSE PRESCRIBED HEREON, THE MANUFACTURER SHALL SUBMIT THEIR SIGNED AND SEALED STRUCTURAL CALCULATIONS FOR REVIEW AND APPROVAL BY THE ENGINEER.
2. SUBMIT THE MANUFACTURERS' RECOMMENDATIONS AND INSTRUCTIONS FOR INSTALLATION
3. INSTALL IN SPP CULVERTS IN ACCORDANCE WITH SECTION 603 AND THE MANUFACTURER'S RECOMMENDATIONS AND INSTALLATION INSTRUCTIONS.
4. PLACE SECTIONS SUCH THAT THE INSIDE CIRCUMFERENTIAL LAPS ARE POINTING IN THE DIRECTION OF FLOW.



**A** **SSP WELD - SECTION VIEW**  
2 SCALE: N.T.S.



**ALASKA RAILROAD**

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**CULVERT - GENERAL NOTES**

ADOPTED AS A STANDARD PLAN BY: \_\_\_\_\_  
 Brian A. Lindamood, P.E., S.E.  
 Chief Engineer

ADOPTION DATE: \_\_\_\_\_

LAST CODE AND STANDARDS REVIEW BY: \_\_\_\_\_ DATE: \_\_\_\_\_

X-01.04

GENERAL NOTES:

- \* MEASURED FROM TOP OF PIPE TO BOTTOM OF RAILWAY TIE.
- \*\* ADDITIONAL COVER IS REQUIRED FOR THE SPECIFIED GAGE (GA) OF PIPE; ADJUSTED MINIMUMS SHOWN IN PARENTHESES.

TABLE 1 - SMOOTH STEEL PIPE (SSP)					
OUTSIDE DIAMETER (IN.)	WALL THICKNESS, t (IN.)	WEIGHT (LB./FT.)	COVER*		
			MIN (FT.)	MAX (FT.)	
36	0.500	190	2.0	18	
	0.625	236	2.0	18	
	0.750	283	2.0	18	
42	0.500	222	2.0	18	
	0.625	276	2.0	18	
	0.750	331	2.0	18	
48	0.500	254	2.25	18	
	0.625	317	2.0	18	
	0.750	379	2.0	18	
60	0.500	318	4.0	18	
	0.625	397	2.25	18	
	0.750	475	2.0	18	
72	0.500	382	5.0	18	
	0.625	477	3.75	18	
	0.750	571	2.5	18	
84	0.500	446	5.0	18	
	0.625	557	5.0	18	
	0.750	667	3.75	18	
96	0.500	510	7.0	18	
	0.625	637	5.0	18	
	0.750	764	5.0	18	
108	0.500	575	9.25	18	
	0.625	717	5.5	18	
	0.750	860	5.00	18	

1. COVER VALUES CALCULATED BY ARRC ENGINEERING SERVICES.

TABLE 3 - CORRUGATED METAL PIPE (CMP), HELICAL ONLY					
OUTSIDE DIA. (IN.)	MIN COVER* (FT)	MAXIMUM HEIGHT OF COVER* (FT.)			
		16 GA	14 GA	12 GA	10 GA
36	2.0	71	88	124	159
42	2.0	60	76	106	137
48	2.0	53	66	93	119
54	2.0	54	67	94	123
60	2.0	48	61	85	110
66	2.0	44	55	77	100
72	2.0	40	50	71	91
78	2.0	37	46	65	84
84	2.0	**35 (3.0)	42	61	79
90	2.0	**29 (4.0)	40	56	73
96	2.0		38	53	68
102	2.5		36	49	64
108	2.5			47	61

3. PARAMETERS TAKEN FROM TABLES WITHIN CHAPTER 1, SECTION 4.3 OF THE AREMA MRE.

3.1 PIPES <math>\leq 54''</math>: TABLE 1-4-32.

3.1.1 COVER VALUES SHOWN FOR "2-2/3x1/2" HELICAL CORRUGATIONS.

3.1.2 FURTHER EVALUATION REQUIRED TO INCREASE COVER HEIGHTS FOR "3x1".

3.2. PIPES  $\geq 54''$ : TABLE 1-4-33.

3.2.1 "5x1" HELICAL CORRUGATION VALUES INCREASED BY 13% TO OBTAIN VALUES FOR "3x1" CORRUGATED PIPES.

TABLE 4 - CORRUGATED ALUMINUM PIPE (CAP), HELICAL ONLY					
OUTSIDE DIA. (IN.)	MIN COVER* (FT)	MAXIMUM HEIGHT OF COVER* (FT.)			
		16 GA	14 GA	12 GA	10 GA
36	2.0	49	61	86	116
42	2.0	42	53	74	99
48	2.0	37	46	64	87
54	2.0	**32 (2.5)	41	57	77
60	2.0	**28 (3.5)	37	52	69
66	2.0		33	47	63
72	2.0		**28 (3.0)	43	58
78	2.0		**26 (4.0)	40	53
84	2.0			37	49
90	2.0			34	46
96	2.0			32	43
102	2.5				40
108	2.5				38

4. PARAMETERS TAKEN FROM TABLE 1-4-35, CHAPTER 1, SECTION 4.3 OF THE AREMA MRE.

TABLE 5 - HIGH DENSITY POLYETHYLENE PIPE (HDPE)				
NOMINAL PIPE DIA. (IN.)	INSIDE PIPE DIA. (IN.)	OUTSIDE PIPE DIA. (IN.)	MIN COVER* (FT.)	MIN. TRENCH WIDTH (IN.)
36	36	41.1	4.5	64
42	42	47.7	4.5	72
48	47.9	53.7	4.5	80
60	59.9	66.3	5.5	96

5. FOR USE UNDER INDUSTRY OR YARD TRACKS ONLY, UNLESS OTHERWISE APPROVED BY THE CHIEF ENGINEER.

TABLE 2 - STRUCTURAL PLATE PIPE (SPP) - STEEL GAGE										
DIAMETER (IN.)	MIN COVER* (FT)	MAXIMUM HEIGHT OF COVER* (FT)								
		12 GA	10 GA	8 GA	7 GA	5 GA	3 GA	1 GA	5/16 GA	3/8 GA
60	2.0	46	68	90	103	124	146	160	256	308
72	2.0	38	57	75	86	103	122	133	214	257
84	2.0	33	49	64	73	88	104	114	183	220
96	2.0	**27(3.5)	43	56	64	77	91	100	160	192
108	2.0	**24(5.0)	38	50	57	69	81	88	142	171

2. COVER VALUES TAKEN FROM TABLE 1-4-51, CHAPTER 1, SECTION 4.3 OF THE AREMA MRE.

DRAWING LOCATION: P:\ENGINEERING\ARRC STANDARDS\2. STANDARD DRAWINGS\1. ROADWAY (X)\X-1 TYPICAL SECTIONS.DWG

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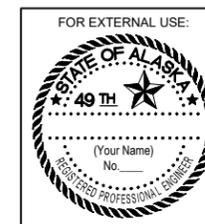
# ALASKA RAILROAD

## CULVERT - COVER TABLES

ADOPTED AS A STANDARD PLAN BY: Brian A. Lindamood, P.E., S.E. Chief Engineer

ADOPTION DATE: \_\_\_\_\_

LAST CODE AND STANDARDS REVIEW BY: \_\_\_\_\_ DATE: \_\_\_\_\_



X-01.04