STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	BRP 193(9)	51	135

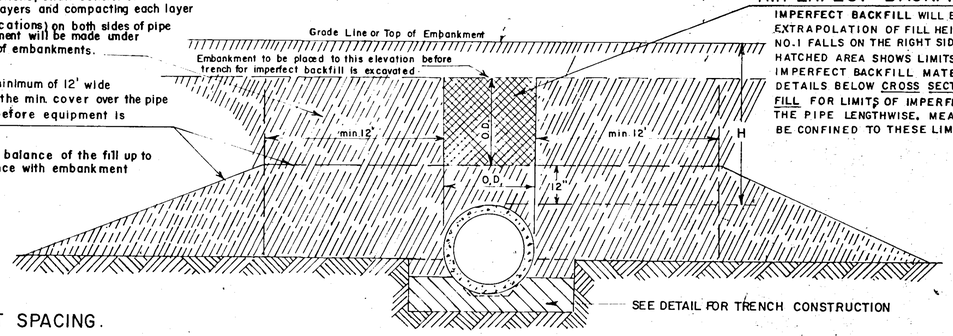
LONGITUDINAL SECTION OF IMPERFECT TRENCH BACKFILL AND BACKFILL METHODS

NORMAL BACKFILL

Backfill, as shown by the broken line sections, shall consist of placing compactable soil in 6" (Loose) layers and compacting each layer (according to Georgia Standard Specifications) on both sides of pipe for its full length. Measurement and payment will be made under Roadway Excavation items for formation of embankments.

Normal embankment shall be placed a minimum of 12' wide on each side of the pipe and at least the min. cover over the pipe and compacted to the required density before equipment is allowed to cross.

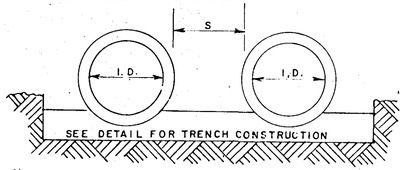
After backfill has been compacted, the balance of the fill up to grade line shall be constructed in accordance with embankment specifications.



IMPERFECT BACKFILL

IMPERFECT BACKFILL WILL BE USED WITH CONCRETE PIPE IF AN EXTRAPOLATION OF FILL HEIGHT AND PIPE DIAMETER IN TABLE NO.1 FALLS ON THE RIGHT SIDE OF THE HEAVY LINE. CROSS HATCHED AREA SHOWS LIMITS OF STRUCTURE EVACUATION AND IMPERFECT BACKFILL MATERIAL TYPE III IN THIS VIEW. SEE DETAILS BELOW CROSS SECTIONS OF IMPERFECT TRENCH BACKFILL FOR LIMITS OF IMPERFECT BACKFILL AS MEASURED OVER THE PIPE LENGTHWISE. MEASUREMENT AND PAYMENT WILL BE CONFINED TO THESE LIMITS.

MULTIPLE PIPE CULVERT SPACING.

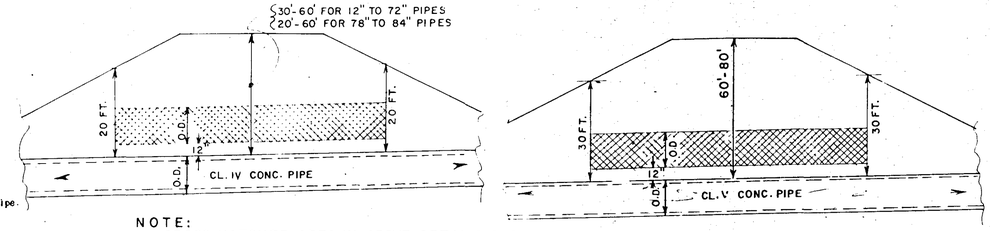


S=One inside diameter of pipe or 3 feet, whichever is smaller.
For pipe-arch culverts, substitute span for inside diameter.

NOTE:
For Multiple Lines of C.M. Pipe with metal Flared End Sections, S may be increased enough to avoid overlap of End Section wingtips. Location of metal End Section should be determined before placement of pipe.

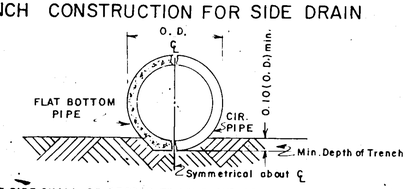
CROSS SECTIONS OF IMPERFECT TRENCH BACKFILL

{30'-60' FOR 12" TO 72" PIPES
{20'-60' FOR 78" TO 84" PIPES



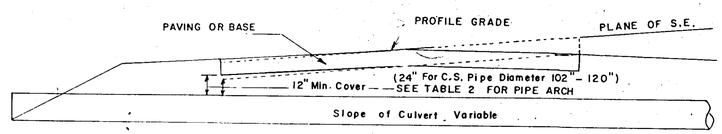
NOTE:
CROSS HATCHED AREA IN ABOVE DETAILS SHOWS LIMITS OF CONSTRUCTION AND MEASUREMENT, FOR STRUCTURE EXCAVATION AND IMPERFECT TRENCH BACKFILL MATERIAL, TYPE III.

TRENCH CONSTRUCTION FOR SIDE DRAIN

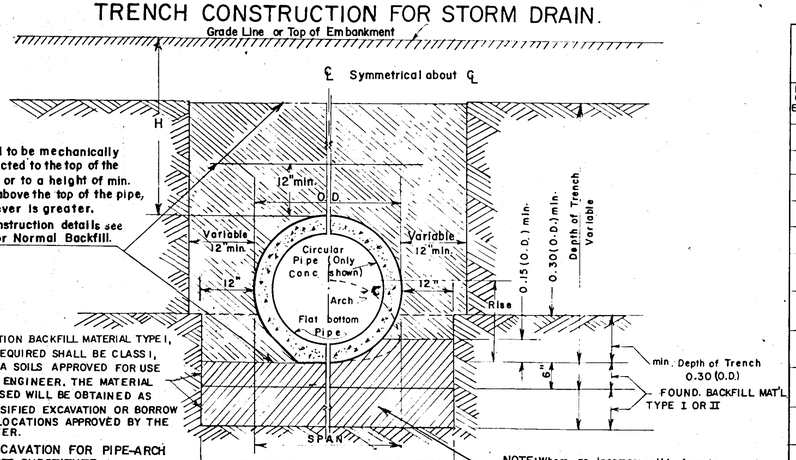


NOTE: THE PIPE SHALL BE BEDDED TO LINE AND GRADE IN A FIRM FOUNDATION SHAPED TO FIT THE LOWER PART OF THE PIPE EXTERIOR. WHERE ROCK EXISTS, EXCAVATE AND BACKFILL WITH COMPRESSABLE MATERIAL (Unclassified Excavation) A MINIMUM OF 6" BELOW THE PIPE.

DETAIL SHOWING MINIMUM COVER FOR PIPE CULVERTS



TRENCH CONSTRUCTION FOR STORM DRAIN.



Backfill to be mechanically compacted to the top of the trench or to a height of min. cover above the top of the pipe, whichever is greater.
For construction details see note for Normal Backfill.

FOUNDATION BACKFILL MATERIAL TYPE I, WHEN REQUIRED SHALL BE CLASS I, II OR III-A SOILS APPROVED FOR USE BY THE ENGINEER. THE MATERIAL TO BE USED WILL BE OBTAINED AS UNCLASSIFIED EXCAVATION OR BORROW FROM LOCATIONS APPROVED BY THE ENGINEER.

FOR EXCAVATION FOR PIPE-ARCH CULVERTS SUBSTITUTE SPAN AND RISE FOR OUTSIDE DIAMETER OF PIPE IN HORIZONTAL AND VERTICAL DIMENSIONS SPECIFIED IN DETAIL.

NOTE: PIPE SHALL BE BEDDED IN A FOUNDATION SHAPED TO FIT THE LOWER PART OF PIPE EXTERIOR.

NOTE: Where an incompressible foundation exists, excavate an additional 6". Where an unstable foundation material is encountered, excavate an additional depth as shown on Plans or as directed by the Engineer.

FORM EF3

TABLE NO. 2 (PIPE-ARCH)

TABLE SHOWING MINIMUM THICKNESS IN INCHES OF CORRUGATED STEEL AND CORRUGATED ALUMINUM PIPE-ARCH AND MAXIMUM HEIGHTS OF FILL ABOVE THE TOP OF THE PIPE-ARCH

Diameter Of Pipe Of Equal Periphery Inch	SPAN INCH	RISE INCH	MIN. THICKNESS (Inches) COR. STEEL ①	COR. STEEL ②	COR. ALUMINUM	MIN. COVER INCHES	MAX. HT FILL FT.
15	17	13	.064			18	13
					.060	18	15
18	21	15	.064			18	12
					.060	18	14
21	24	18	.064			18	10
					.060	18	13
24	28	20	.064			18	9
					.060	18	11
30	35	24	.064			18	9
					.060	18	9
36	42	29	.064			18	7
					.075	18	7
	40	31		.079		18	12
42	49	33	.079			18	7
					.105	18	7
	46	36	.079	.079		18	12
48	57	38	.109			18	7
					.135	18	7
	53	41		.079		18	12
54	64	43	.109			18	7
					.135	18	7
	60	46		.079		18	12
60	71	47	.138			18	7
					.164	18	7
	66	51		.079		18	12
66	77	52	.168			18	7
	73	55		.079		18	15
72	83	57	.168			18	8
	81	59		.079		18	15
78	87	63		.079		18	14
84	95	67		.109		18	12
90	103	71		.109		24	11

TABLE NO. 1.

TABLE SHOWING MIN. CLASSES OF CONCRETE PIPE AND THICKNESS IN INCHES OF CORRUGATED STEEL PIPE AND CORRUGATED ALUMINUM PIPE FOR VARIOUS HEIGHTS OF FILL ABOVE TOP OF PIPE

PIPE DIAMETER (Inches)	PIPE CHARACTERISTIC: CONCRETE	COR. ST. ①	COR. ST. ②	COR. AL.	**HEIGHT OF FILL IN FEET ABOVE TOP OF PIPE: 1-10	10-15	15-20	20-25	25-30	30-35	35-40	40-50	50-60	60-70	70-80	80-90
12	●	●			III .064	III .064	IV .064	V .064	V .064	IV .064	IV .064	IV .064	IV .064	V .064	V .064	.079
				●	.060	.060	.060	.060	.060	.060	.060	.105	.105			
15	●	●			III .064	III .064	IV .064	V .064	V .064	IV .064	IV .064	IV .064	IV .064	V .079	V .109	.109
				●	.060	.060	.060	.060	.060	.075	.105	.135	.164			
18	●	●			III .064	III .064	IV .064	V .064	V .064	IV .064	IV .064	IV .079	IV .109	V .109	V .138	
				●	.060	.060	.060	.060	.075	.105	.135	.164				
24	●	●			III .064	III .064	IV .064	V .064	V .064	IV .109	IV .109	IV .138	IV	V	V	
				●	.060	.060	.060	.105	.164							
30	●	●			III .064	III .064	IV .064	V .079-.064*	V .138-.064*	IV .168-.079*	IV .109*	IV .168*	IV	V	V	
				●	.060	.060	.075	.105*	.135*							
36	●	●			III .064	III .064	IV .064	V .138-.064*	V .079*	IV .109*	IV .138*	IV .168*	IV	V	V	
			●		.064	.064	.064	.064	.064	.079	.109-.079*	.138-.109*	.168-.109*	.138*		
				●	.060	.060	.135-.105*	.105*								
42	●	●			III .064	III .064	IV .079-.064*	V .064*	V .064*	IV .079*	IV .109*	IV .168*	IV	V	V	
			●		.064	.064	.064	.064	.079	.109-.079*	.138-.109*	.109*				
				●	.075	.075	.164-.075*	.075*	.105*	.105*	.164*					
48	●	●			III .064	III .064	IV .109-.064*	V .064*	V .079*	IV .079*	IV .109*	IV	V	V		
			●		.064	.064	.064	.079	.109-.079*	.168-.109*	.109*	.109*				
				●	.105	.105	.105*	.135*	.135*	.164*						
54	●	●			III .079	III .079	IV .138-.079*	V .079*	V .079*	IV .109*	IV .168*	IV	V	V		
			●		.064	.064	.064	.109-.079*	.168-.109*	.109*	.109*	.168*				
				●	.105	.105	.135*	.164*								
60	●	●			III .109	III .109	IV .168-.109*	V .109*	V .109*	IV .138*	IV .168*	IV	IV	V	V	
			●		.064	.064	.079	.138-.079*	.109*	.109*	.109*					
				●	.135	.135	.164*									
66	●	●			III .109	III .109	IV .109*	V .109*	V .138*	IV .138*	IV .168*	IV	IV	V	V	
			●		.064	.064	.079	.168-.109*	.109*	.109*						
				●	.135	.164										
72	●	●			III .138	III .138	IV .138*	V .138*	V .168*	IV .109*	IV	IV	IV	V	V	
			●		.079	.079	.079	.109*	.109*							
				●	.164											
78	●	●			III .168	III .168	IV .168*	IV .168*	IV .109*	IV .109*	IV .168*	IV	IV			
			●		.079	.079	.109-.079*	.109*								
84	●	●			III .168	III .168	IV .168*	IV .109*	IV .138*	IV	IV	IV	IV			
			●		.079	.079	.168-.109*									
90	●				III .079	III .079	.163-.109*	.109*	.168*							
			●													
96	●				III .109	III .109	.168-.109*	.109*								
			●													
102	●				III .109	III .109	.109*	.138*								
			●													
108	●				III .109	III .109	.109*	.168*								
			●													
114					.138	.138	.138*									
			●													
120					.138	.138	.138*									
			●													

IMPERFECT BACKFILL REQUIRED FOR CONCRETE PIPE (this side of HEAVY line). SEE LONGITUDINAL SECTION AND CROSS SECTION OF IMPERFECT TRENCH BACKFILL AT LEFT.

① Denotes 2 2/3" x ½" Corrugation
② Denotes 3" x 1" Corrugation — OR 125 mm x 25 mm Corrugation.
* Denotes Circular Cross Section Factory Elongated on Vertical Axis 5% ± Nominal Diameter.
**1. All Concrete Side Drain Pipe for fills to 10 ft. shall be Class II Pipe. Class II Pipe for Side Drains may be non-reinforced for diameters of 12" through 24". For fills over 10 ft use Class of pipe shown in TABLE NO.1.
2. Only one Class or Thickness of Pipe will be specified for each individual location. The Class or Thickness will be determined by the maximum height of fill.
3. Where Concrete Pipe is specified see note relative to "Imperfect Backfill."

TABLE NO. 3 - (INFORMATION ONLY)

	Cor. Metal Thickness	Equivalent Gage
STEEL	0.064	16
	0.079	14
	0.109	12
	0.138	10
	0.168	8
ALUMINUM	0.060	16
	0.075	14
	0.105	12
	0.135	10
	0.164	8

NOTE FOR TABLE NO. 2.
Alternate Span - Rise Combinations for pipe-arches, having equal periphery, to that shown, may be substituted if listed in AASHTO M-36 or AASHTO M-196.

R.M.U.	ADD TABLE #3	2-4-81	

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

STANDARD

PIPE CULVERTS

NO SCALE — REV. & REDP: DECEMBER, 1979

DES. FEB. '71 — RETRACED G.M.E. 12-79 R.M.U. — CHK.
(SUBMITTED) Floyd E. Hardy — STATE ROAD & AIRPORT DEP. ENGR.
(APPROVED) Thomas D. Moseley — STATE HIGHWAY ENGINEER

NUMBER 1030D