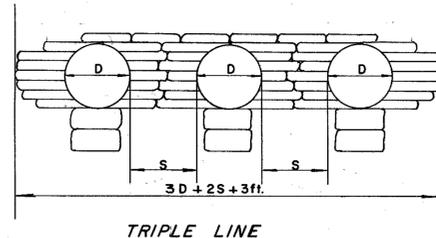
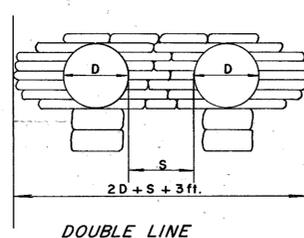
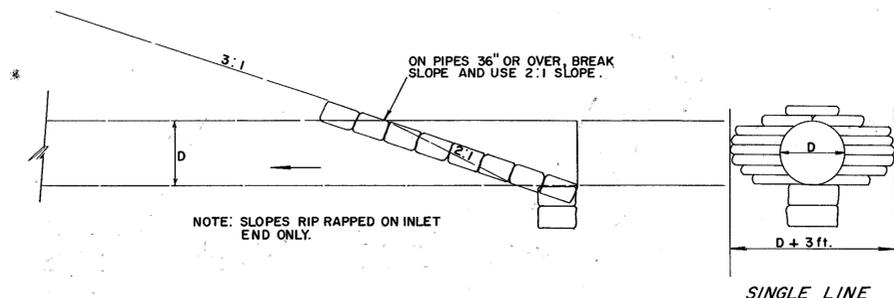
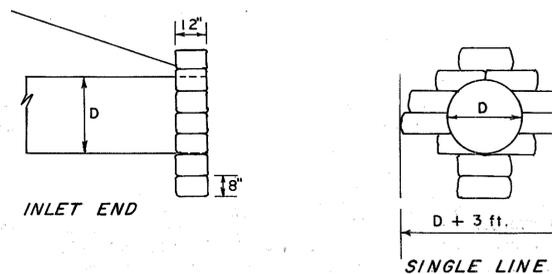


STRAIGHT END WALL TYPE 1



STRAIGHT END WALL TYPE 3

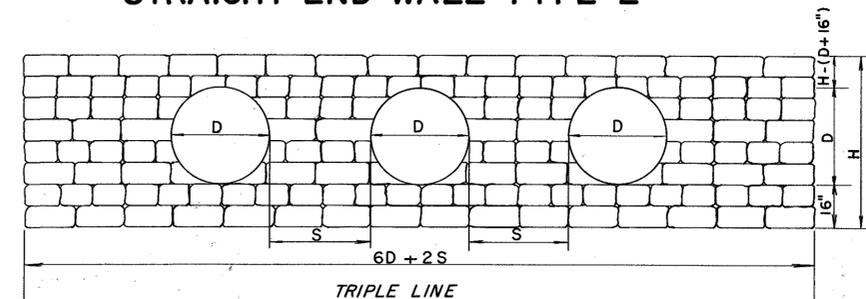


NOTE: SINGLE LINE SHOWN ABOVE. TYPE 3 STRAIGHT END WALL MAY UTILIZE MULTIPLE LINES WITH 2D + S + 3 ft. = WIDTH FOR DOUBLE LINES AND 3D + 2S + 3 ft. = WIDTH FOR TRIPLE LINES.

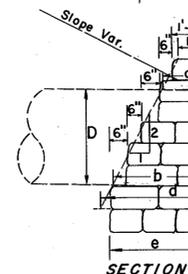
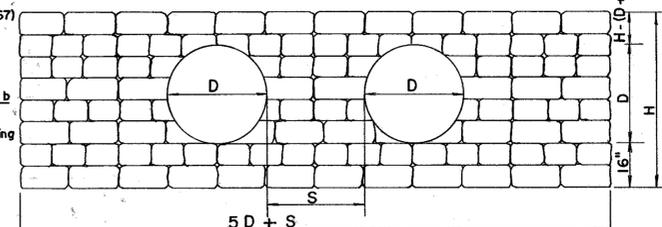
DIAMETER OF PIPE INCHES	AREA OF OPENING SQ. FT.	SAND CEMENT BAG RIP RAP SQ. YDS.	ADDT'L RIP RAP FOR EACH ADDT'L PIPE SQ. YDS.
18	1.767	1.5	1.0
24	3.142	1.8	1.7
30	4.909	2.2	2.5
36	7.069	2.5	3.5
42	9.621	2.8	4.2
48	12.566	3.2	4.9

NOTE: FOR APRON QUANTITIES SEE CHART BELOW.

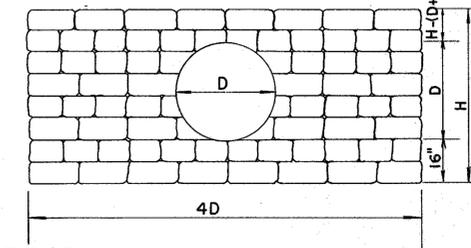
STRAIGHT END WALL TYPE 2



End Area = $\frac{.8333+d}{2} \times (H-.6667) + e \times .667 = \frac{1}{2} \times (H-.6667) \times (.8333 + d) + e \times .667$
 Total Volume = End Area in Sq. Ft. x 4 D in Ft.
 Pay Volume = Total Volume - Volume of C. D.
 Volume of C. D. = $\pi \times \frac{D^2}{4} \times L$
 Convert Cu. Ft. into Sq. Yds. of 8" bag courses by multiplying Cu. Ft. by $\frac{1.5}{9} = 0.1666$

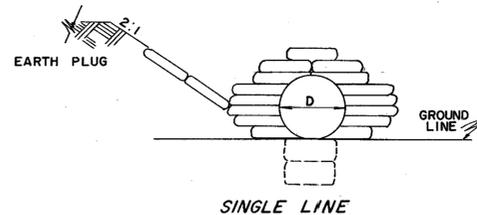
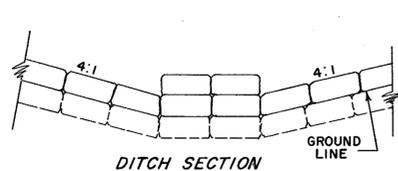


DOUBLE LINE

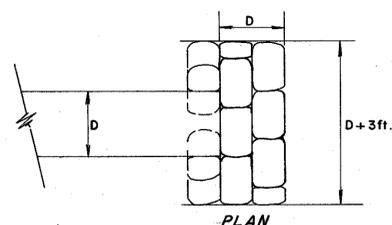


SINGLE LINE

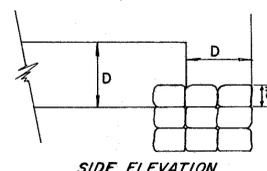
"L" TYPE END WALL - TYPE I



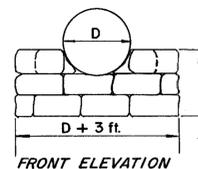
D = INSIDE DIAMETER OF PIPE
 S = ONE INSIDE DIAMETER OF PIPE OR 3 FT. WHICHEVER IS SMALLER.



PLAN



SIDE ELEVATION



FRONT ELEVATION

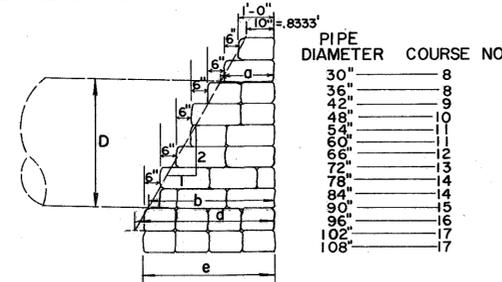
APRON FOR OUTLET END

SPECIAL NOTE:

IN GENERAL, SAND CEMENT BAG RIP RAP ENDWALLS TYPE 1 ARE TO BE USED ONLY ON 18" AND 24" CROSS DRAIN PIPE. IN SPECIAL SITUATIONS, TYPE 2 ENDWALLS MAY BE USED ON 30" AND LARGER CROSS DRAIN PIPE IN LIEU OF THE DESIRED CLASS B CONCRETE HEADWALLS. NORMAL USAGE OF THIS STANDARD IS ON LOW TRAFFIC STATE AID AND F A S PROJECTS.
 SAND CEMENT BAG RIP RAP TO BE IN ACCORDANCE WITH SECTION 603 OF THE STANDARD SPECIFICATIONS, EXCEPT THAT THE BAGS WILL BE 8" THICK. NORMAL SIZE OF SAND CEMENT BAG TO BE APPROXIMATELY 18" x 12" x 8" EACH COURSE OF BAGS TO BE WETTED SUFFICIENTLY TO ALLOW THE PROPER CEMENT REACTION.
 METHOD OF MEASUREMENT: WHERE TYPE 1, 2 OR 3 SAND CEMENT BAG ENDWALLS ARE CONSTRUCTED ACCORDING TO DIMENSIONS AS SHOWN ON THE STANDARD, PAYMENT WILL BE MADE BASED ON THE NUMBER OF SQ. YDS. SHOWN ON THE STANDARD FOR THAT SIZE PIPE AND CONDITION. QUANTITIES SHOWN ARE BASED ON THE INSIDE DIAMETER OF PIPE. NO DEDUCTION SHALL BE MADE FOR SHELL THICKNESS OF PIPE IN COMPUTING PAY QUANTITIES.
 WHERE DIMENSIONS VARY FROM THOSE SHOWN, PAY QUANTITIES WILL BE COMPUTED ACCORDING TO THE DETAIL AS SHOWN.
 QUANTITIES SHOWN FOR APRON AT OUTLET AND "L" TYPE ENDWALLS ARE FOR ESTIMATING PURPOSES ONLY. PAYMENT FOR APRON AT OUTLET AND "L" TYPE ENDWALLS IS TO BE MADE ACCORDING TO QUANTITIES MEASURED AS ACTUALLY PLACED.
 IN GENERAL TYPE 3 ENDWALLS SHOULD BE USED ON 18", 24" OR 30" PIPES WHERE THE RESULTANT LENGTH OF THE CROSS DRAIN PIPE WILL BE LESS THAN IF TYPE 1 ENDWALLS WERE USED, HOWEVER IN SPECIAL SITUATIONS TYPE 3 ENDWALLS MAY BE USED ON PIPES UP TO 48" IN DIAMETER OR WHERE LONGER LENGTHS OF PIPE ARE REQUIRED.

DIAMETER OF PIPE INCHES	TYPE 1 STRAIGHT END WALL QUANTITIES - ONE WALL		"L" TYPE END WALL QUANTITIES - ONE WALL		TYPE 2 STRAIGHT END WALL QUANTITIES - ONE WALL						APRON AT OUTLET				
	AREA OF OPENING SQ. FT.	SAND CEMENT BAG RIP RAP SQ. YDS.	ADDT'L RIP RAP FOR EACH ADDT'L PIPE SQ. YDS.	SAND CEMENT BAG RIP RAP SQ. YDS.	4D LENGTH IN FEET	a	b	d	e	H HEIGHT IN FT. & IN.	HEIGHT IN BAG COURSE NO.	SAND CEMENT BAG RIP RAP SQ. YDS.	ADDT'L RIP RAP FOR EACH ADDT'L PIPE SQ. YDS.	NORMAL SAND CEMENT BAG RIP RAP SQ. YDS.	ADDT'L RIP RAP FOR EACH ADDT'L PIPE SQ. YDS.
18	1.767	2.5	2.1	8.4	10	1.58	2.83	3.17	3.0	5'-4"	8	17.1	7.6	6.0	4.0
24	3.142	2.8	3.1	11.3	12	1.33	2.83	3.17	3.0	5'-4"	8	20.2	8.9	6.0	5.3
30	4.909	3.5	4.4	14.4	14	1.42	3.17	3.50	3.5	6'-0"	9	29.8	11.8	9.2	5.0
36	7.069	3.8	4.8	17.7	16	1.50	3.50	3.83	4.0	6'-8"	10	41.9	15.4	9.2	6.6
42	9.621	3.5	5.5	20.8	18	1.58	3.83	4.17	4.0	7'-4"	11	50.8	17.0	11.0	10.0
48	12.566	3.8	6.3	24.9	20	1.33	3.83	4.17	4.0	7'-4"	11	56.0	17.3	13.0	10.0
54	15.904	4.2	7.1	29.4	22	1.42	4.16	4.50	4.5	8'-0"	12	73.9	21.8	15.2	14.0
60	19.635	4.5	7.9	34.3	24	1.50	4.50	4.83	5.0	8'-8"	13	95.2	26.9	15.2	14.0
66	23.758	4.8	8.7		26	1.58	4.83	5.17	5.0	9'-4"	14	109.3	28.7	20.0	16.0
72	28.274	5.2	9.6		28	1.33	4.83	5.17	5.0	9'-4"	14	117.1	29.1	20.0	18.7
78	33.183	5.8	10.0		30	1.42	5.17	5.50	5.5	10'-0"	15	145.8	35.3	22.5	24.0
84	38.485	6.2	11.3		32	1.50	5.50	5.83	6.0	10'-8"	16	178.7	42.2	25.5	24.0
90	44.179	6.5	12.3		34	1.58	5.83	6.17	6.0	11'-4"	17	199.1	44.1	28.3	30.0
96	50.266	6.8	13.2		36	1.33	5.83	6.17	6.0	11'-4"	17	210.0	44.7	28.3	30.0
102	56.745	7.2	14.2												
108	63.617	7.5	15.2												

DETAIL OF COURSE NUMBER & ARRANGEMENT



DEPARTMENT OF TRANSPORTATION STATE OF GEORGIA STANDARD SAND CEMENT BAG RIP RAP FOR END WALL & APRON		SCALE: 3/8" = 1 FT. MAY, 1968
DATE 7-28-72 REVISIONS 1. Add. Ty. 3 Str. End Wall 2. Spec. Note Rev.	DESIGNED R.B.S. DRAWN AVS TRACED AVS CHECKED R.B.S.	SUBMITTED STATE ROAD DESIGN ENGINEER APPROVED STATE HIGHWAY ENGINEER
NUMBER 1018 B		