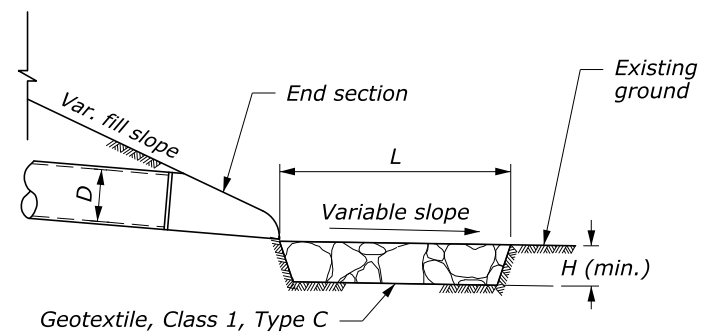
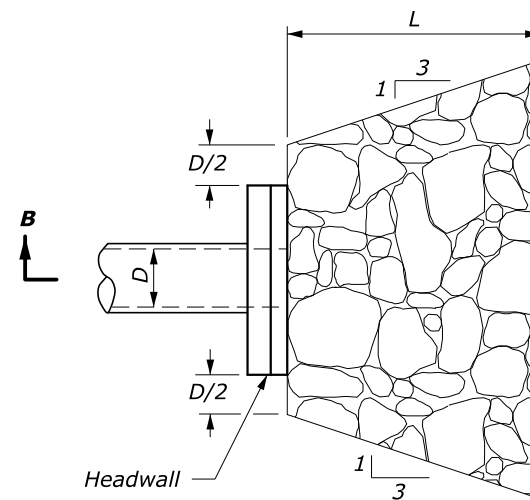


PLAN VIEW

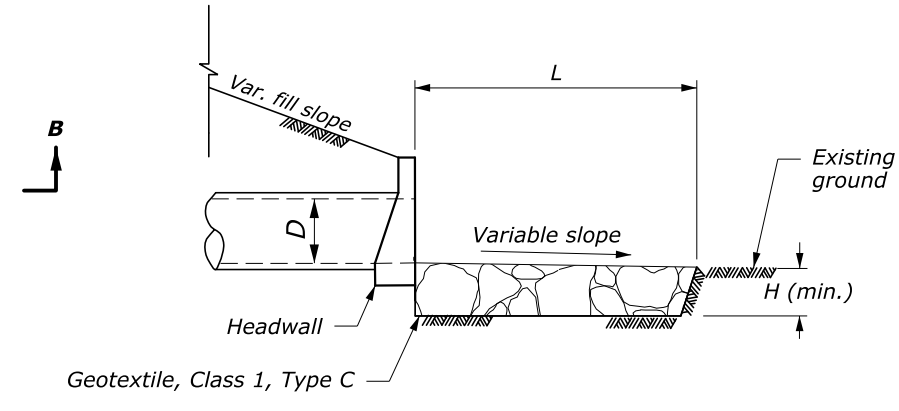


SECTION A-A

CULVERT WITH END SECTION



PLAN VIEW



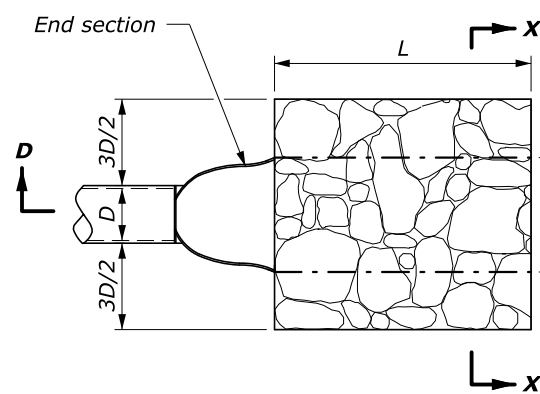
SECTION B-B

CULVERT WITH HEADWALL

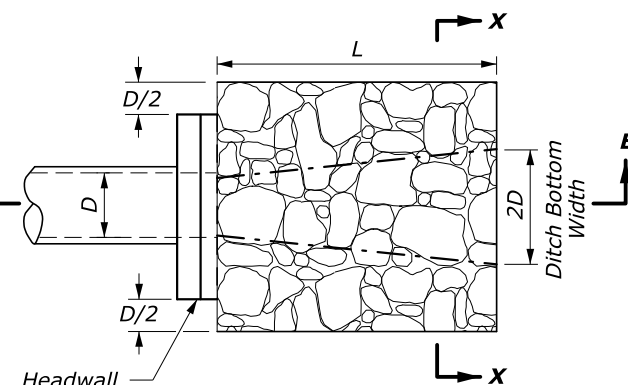
PROTECTIVE APRON AT CULVERT OUTLET WITHOUT DITCH

NOTES:

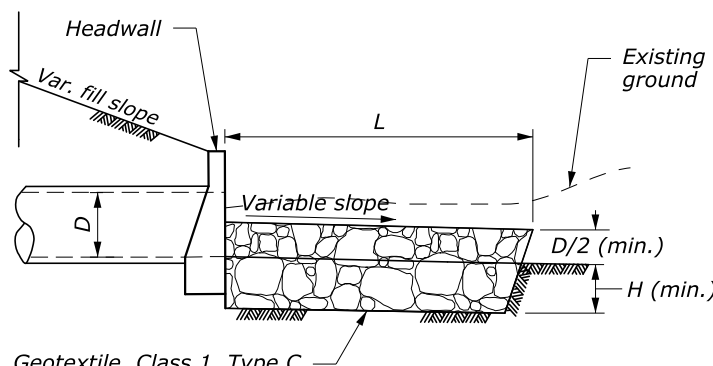
1. Use for aprons serving culverts with slopes of less than 10%.
2. For arch or elliptical pipes, use equivalent diameter for (D) dimension.
3. See Sheet 2 of 2 for dimensions and estimated quantities.



PLAN VIEW

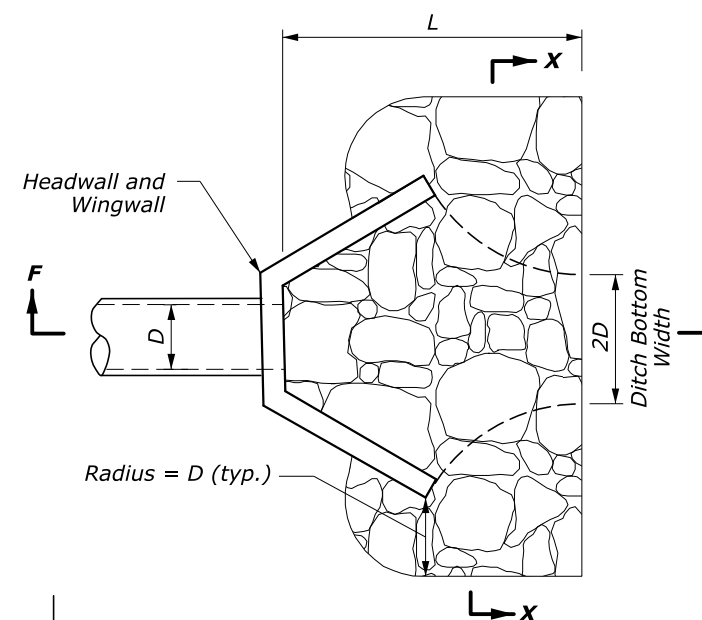


PLAN VIEW

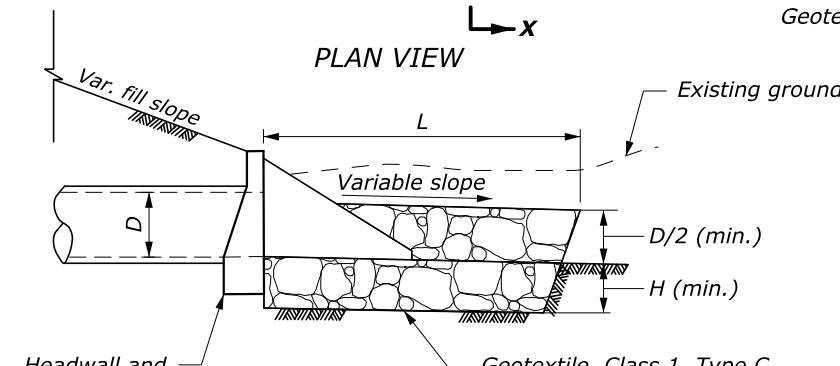


SECTION E-E

CULVERT WITH HEADWALL

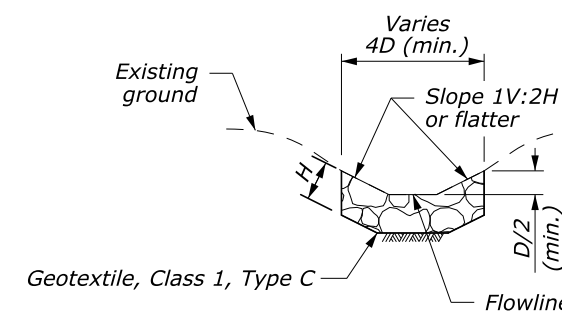


PLAN VIEW

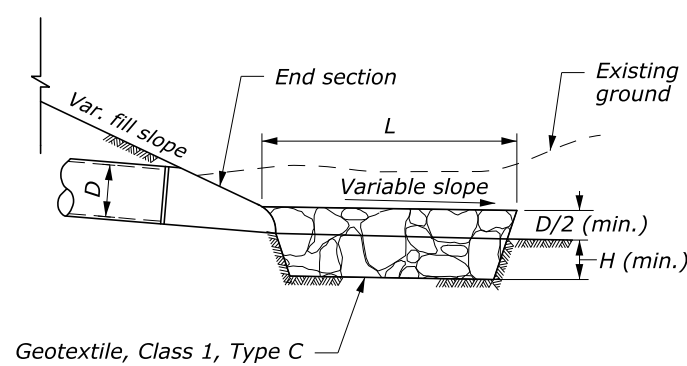


SECTION F-F

CULVERT WITH HEADWALL AND WINGWALL



SECTION X-X



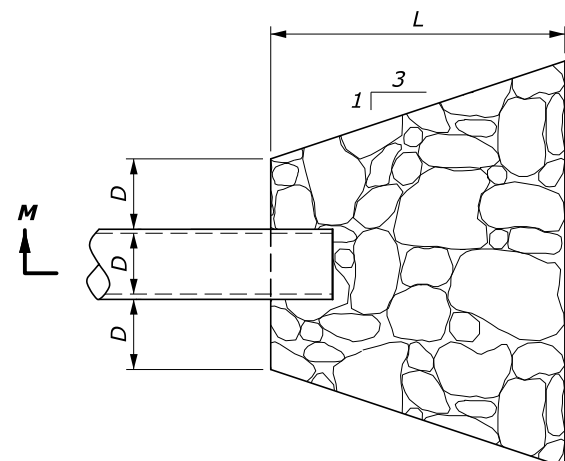
SECTION D-D

CULVERT WITH END SECTION

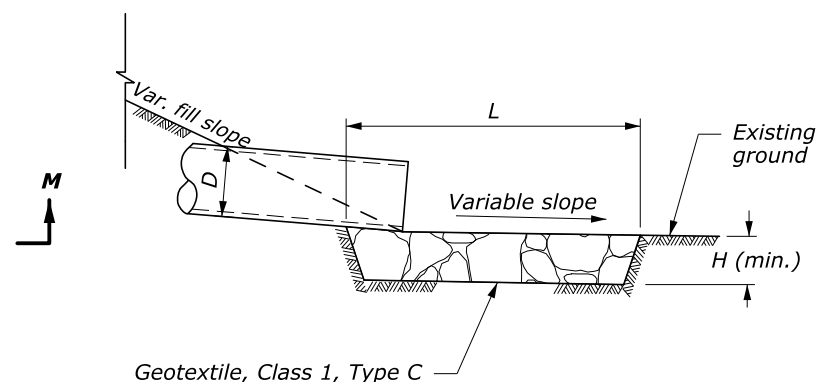
PROTECTIVE APRON AT CULVERT OUTLET WITH DITCH

NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION EASTERN FEDERAL LANDS HIGHWAY DIVISION	
U.S. CUSTOMARY DETAIL PLACED RIPRAP AT CULVERT OUTLETS Sheet 1 of 2	
DETAIL APPROVED FOR USE APPROVED: MAY 2017 REVISED: OCTOBER 2021	DETAIL E251-01

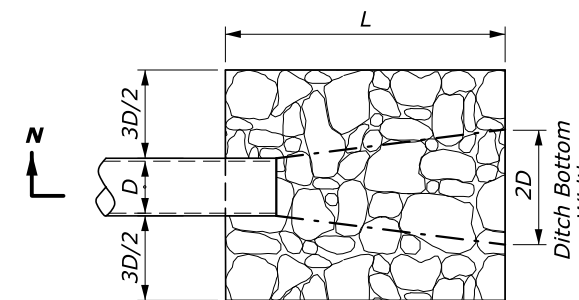


PLAN VIEW

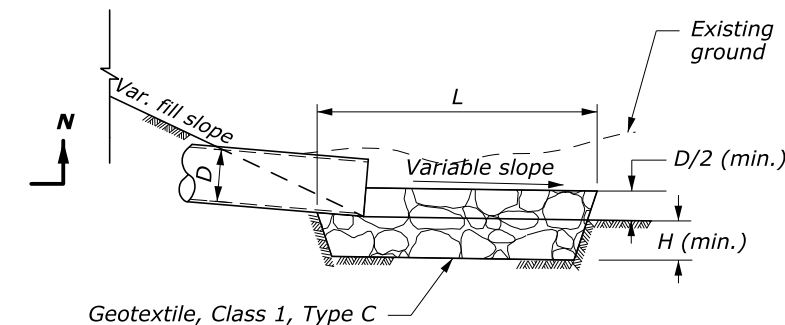


SECTION M-M

CULVERT OUTLET WITHOUT DITCH



PLAN VIEW



SECTION N-N

CULVERT OUTLET WITH DITCH

PROTECTIVE APRON AT CULVERT OUTLET WITH NO END TREATMENT

PROTECTIVE APRON DIMENSIONS AND ESTIMATED QUANTITIES

	CULVERT SIZE (D) INCHES	RIPRAP CLASS	LENGTH OF APRON (L) LNFT	DEPTH OF APRON (H) LNFT	OUTLET WITHOUT DITCH		OUTLET WITH DITCH	
					ESTIMATED RIPRAP QUANTITY CUYD	ESTIMATED GEOTEXTILE QUANTITY SQYD	ESTIMATED RIPRAP QUANTITY CUYD	ESTIMATED GEOTEXTILE QUANTITY SQYD
WITH END SECTION	12	2	4	1.5	1	5	0.9	4
	18	2	6	1.5	2.2	9	2	8
	24	2	8	1.5	3.9	13	3.6	12
	30	3	12.5	2	10.8	27	9.3	24
	36	3	15	2	15.6	37	13.3	32
	42	4	21	2.5	34	63	27.2	52
WITH HEADWALL	12	2	4	1.5	1.6	6	1.1	5
	18	2	6	1.5	3	10	2	8
	24	2	8	1.5	5.3	16	3.6	12
	30	3	12.5	2	15	32	9.3	24
	36	3	15	2	21.7	43	13.3	32
	42	4	21	2.5	47.6	73	27.2	52
WITH HEADWALL AND WINGWALL	12	2	4	1.5	1.6	6	1.1	6.3
	18	2	6	1.5	3	10	2.5	11.1
	24	2	8	1.5	5.3	16	4.5	17
	30	3	12.5	2	15	32	11.6	32
	36	3	15	2	21.7	43	16.7	42.6
	42	4	21	2.5	47.6	73	34.1	68.4
WITH NO END TREATMENT	12	2	6	1.5	1.7	7	1.3	6
	18	2	8	1.5	3.2	12	2.7	10
	24	2	10	1.5	5.2	17	4.4	15
	30	3	14.5	2	13.2	32	10.7	27
	36	3	17	2	18.5	42	15.1	36
	42	4	23	2.5	38.7	70	29.8	56
	48	4	26	2.5	49.8	86	38.5	70

NOTES:

1. Use for aprons serving culverts with slopes of less than 10%.
2. For arch or elliptical pipes, use equivalent diameter for (D) dimension.

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NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION EASTERN FEDERAL LANDS HIGHWAY DIVISION	
U.S. CUSTOMARY DETAIL PLACED RIPRAP AT CULVERT OUTLETS Sheet 2 of 2	
DETAIL APPROVED FOR USE APPROVED: MAY 2017 REVISED: OCTOBER 2021	DETAIL E251-01