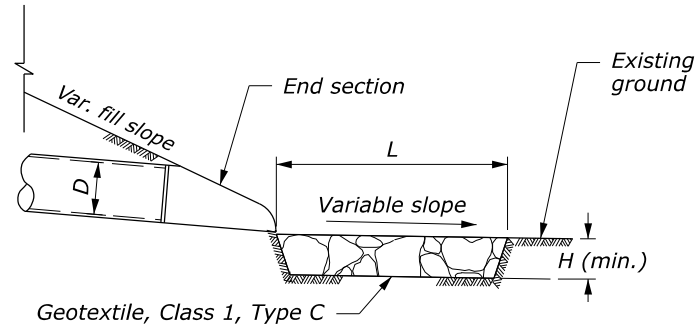
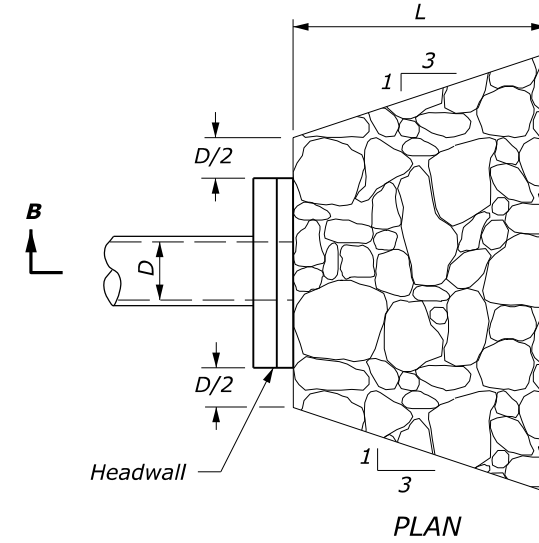


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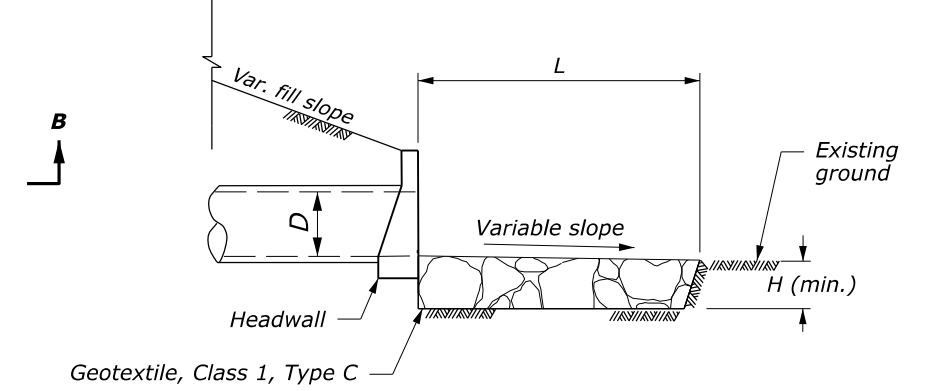


SECTION A-A

CULVERT WITH END SECTION



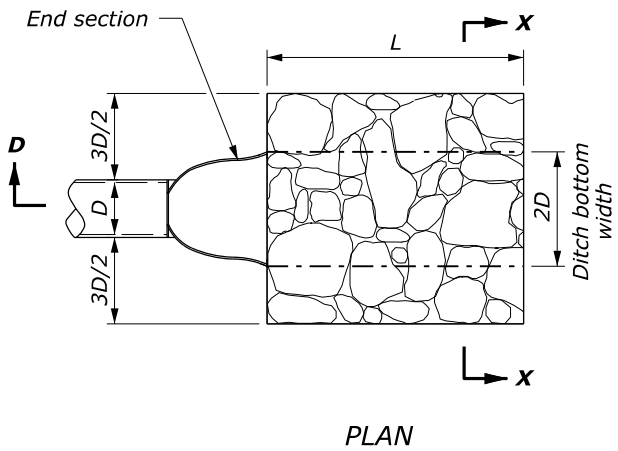
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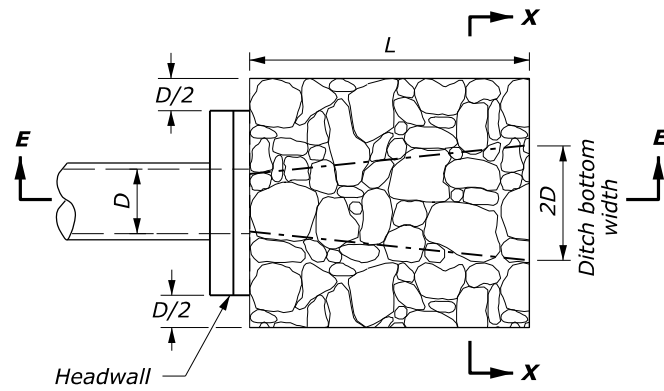
SECTION B-B

CULVERT WITH HEADWALL

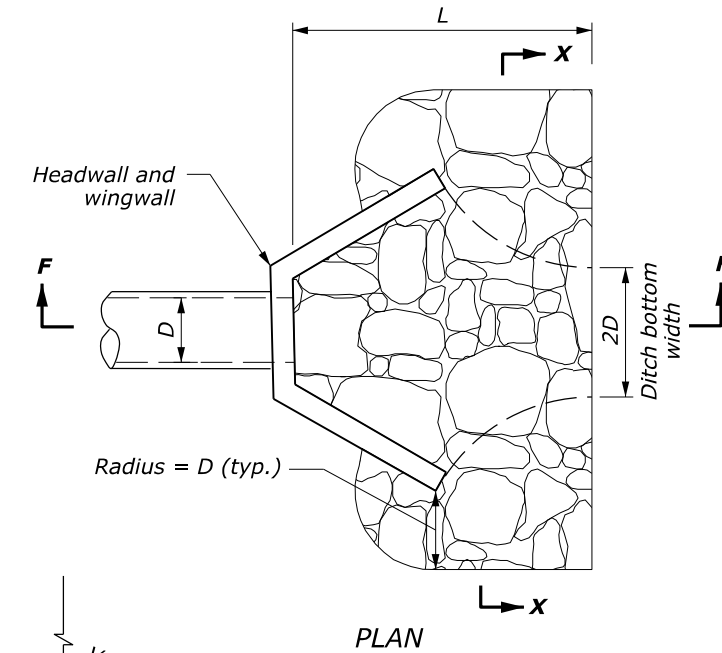
**PROTECTIVE APRON AT CULVERT OUTLET WITHOUT DITCH**



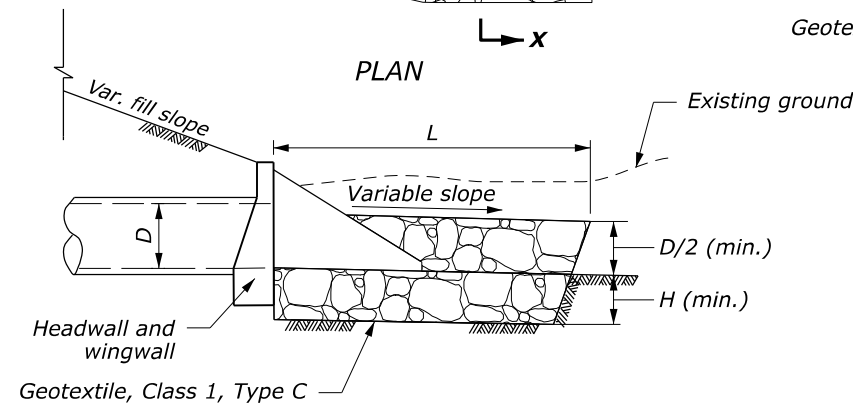
PLAN



SECTION D-D  
CULVERT WITH END SECTION



PLAN

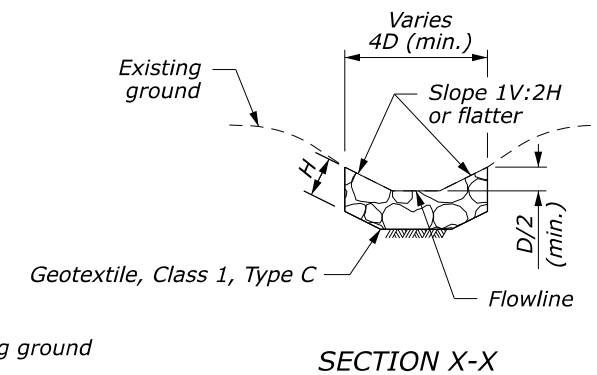


SECTION F-F  
CULVERT WITH HEADWALL AND WINGWALL

**PROTECTIVE APRON AT CULVERT OUTLET WITH 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.



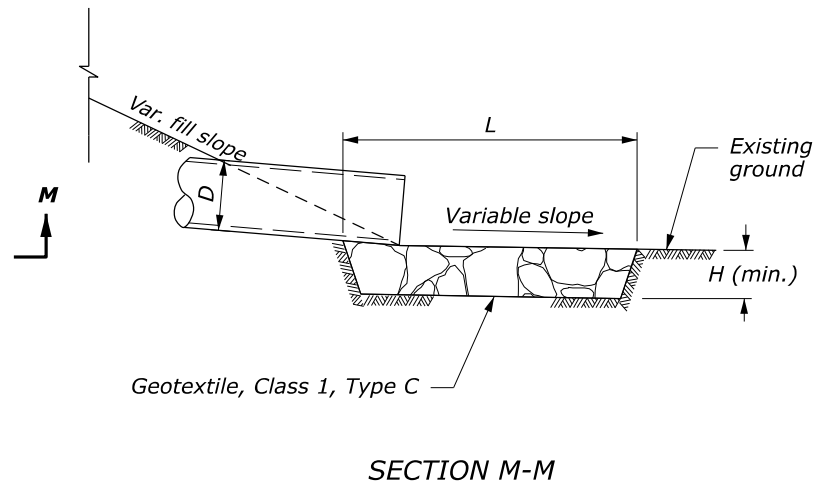
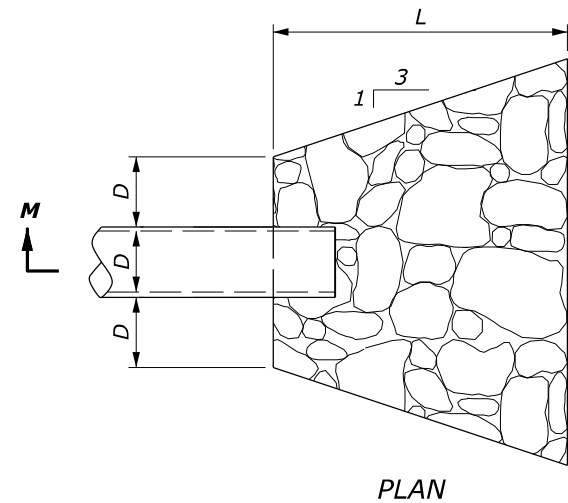
SECTION X-X

NO SCALE

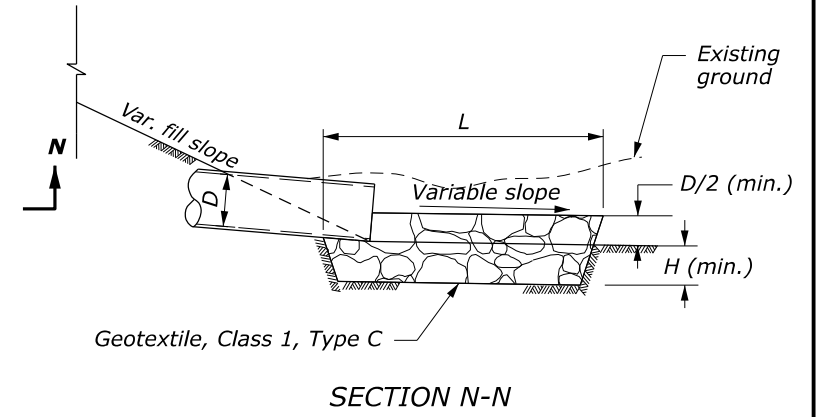
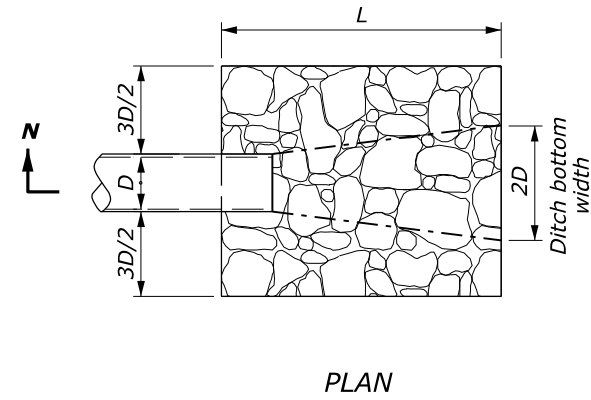
U.S. DEPARTMENT OF TRANSPORTATION, FHWA  
OFFICE OF FEDERAL LANDS HIGHWAY

**E251-01**  
**PLACED RIPRAP AT**  
**CULVERT OUTLETS**  
Sheet 1 of 2

EFLHD DETAIL  
E251-01  
SPECIFICATION  
FP-24, FP-14  
APPROVED FOR USE  
05/2024



CULVERT OUTLET WITHOUT DITCH



CULVERT OUTLET WITH DITCH

**PROTECTIVE APRON AT CULVERT OUTLET WITH NO END TREATMENT**

**PROTECTIVE APRON DIMENSIONS AND ESTIMATED QUANTITIES**

	CULVERT SIZE (D) INCH	RIPRAP CLASS	LENGTH OF APRON (L) FT	DEPTH OF APRON (H) FT	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.

NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	EFLHD DETAIL E251-01
<b>PLACED RIPRAP AT CULVERT OUTLETS</b>	SPECIFICATION FP-24, FP-14
Sheet 2 of 2	APPROVED FOR USE 05/2024