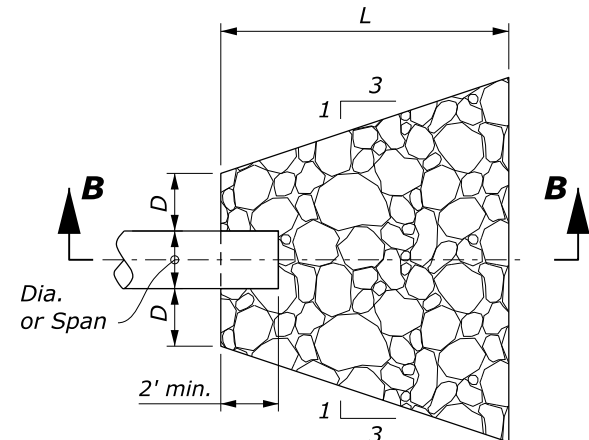
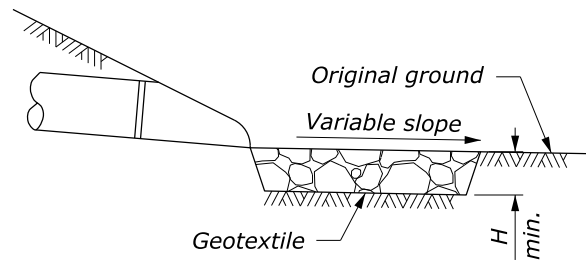


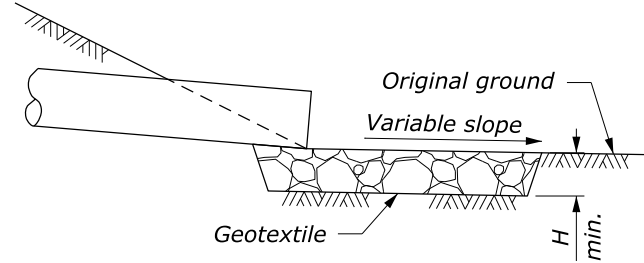
PLAN VIEW  
CULVERT WITH STANDARD  
END SECTION



PLAN VIEW  
CULVERT WITHOUT STANDARD  
END SECTION

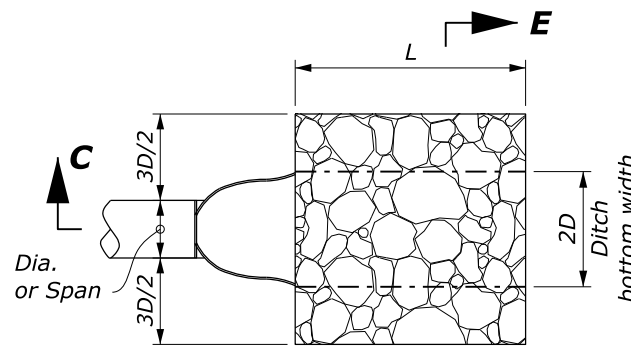


SECTION A-A

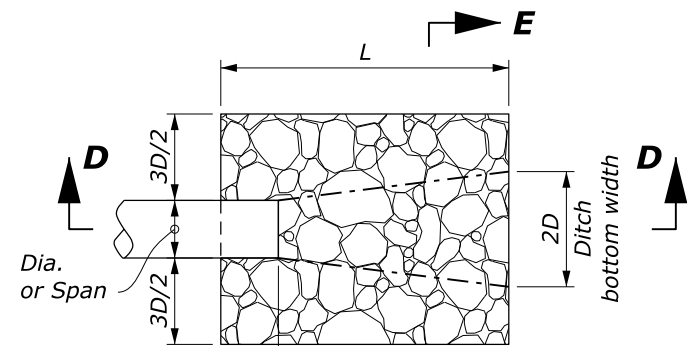


SECTION B-B

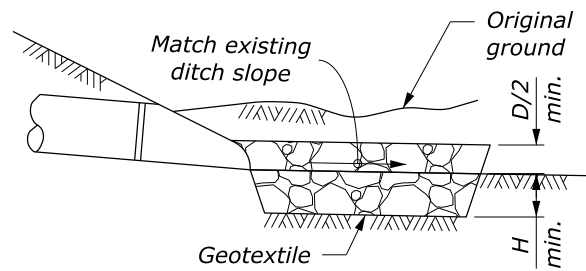
**PROTECTIVE APRON AT CULVERT OUTLET WITHOUT DITCH**



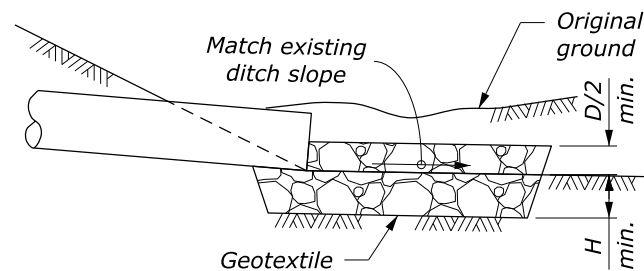
PLAN VIEW  
CULVERT WITH STANDARD  
END SECTION



PLAN VIEW  
CULVERT WITHOUT STANDARD  
END SECTION



SECTION C-C



SECTION D-D

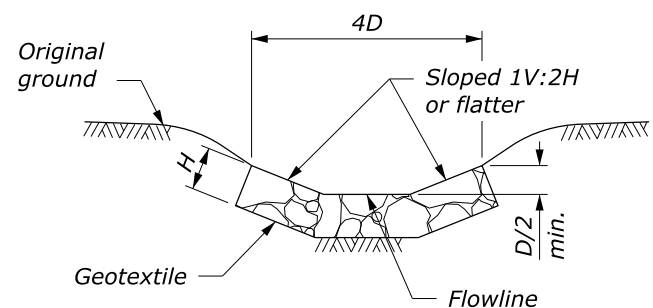
**PROTECTIVE APRON AT CULVERT OUTLET WITH DITCH**

**OUTLET WITHOUT DITCH  
PROTECTIVE APRON DIMENSIONS AND QUANTITIES  
FOR INFORMATION ONLY**

	CULVERT SIZE D (INCHES)	RIPAP CLASS	APRON LENGTH L (FEET)	APRON DEPTH H (INCHES)	ESTIMATED RIPRAP QUANTITY (CUYD)	ESTIMATED GEOTEXTILE QUANTITY (SQYD)
WITH END SECTION	12	2	4	18	1.0	5
	18	2	6	18	2.2	9
	24	2	8	18	3.9	13
	30	3	12.5	24	10.8	27
	36	3	15	24	15.6	37
	42	4	21	30	34.0	63
WITHOUT END SECTION	12	2	6	18	1.7	7
	18	2	8	18	3.2	12
	24	2	10	18	5.2	17
	30	3	14.5	24	13.2	32
	36	3	17	24	18.5	42
	42	4	23	30	38.7	70
48	4	26	30	49.8	86	

**OUTLET WITH DITCH  
PROTECTIVE APRON DIMENSIONS AND QUANTITIES  
FOR INFORMATION ONLY**

	CULVERT SIZE D (INCHES)	RIPAP CLASS	APRON LENGTH L (FEET)	APRON DEPTH H (INCHES)	ESTIMATED RIPRAP QUANTITY (CUYD)	ESTIMATED GEOTEXTILE QUANTITY (SQYD)
WITH END SECTION	12	2	4	18	0.9	4
	18	2	6	18	2.0	8
	24	2	8	18	3.6	12
	30	3	12.5	24	9.3	24
	36	3	15	24	13.3	32
	42	4	21	30	27.2	52
WITHOUT END SECTION	12	2	6	18	1.3	6
	18	2	8	18	2.7	10
	24	2	10	18	4.4	15
	30	3	14.5	24	10.7	27
	36	3	17	24	15.1	36
	42	4	23	30	29.8	56
48	4	26	30	38.5	70	



SECTION E-E

**NOTE:**

1. Use for aprons serving culverts with slopes less than 10%.
2. Furnish separation and stabilization geotextile.
3. Do not measure riprap placement excavation for payment.

U.S. DEPARTMENT OF TRANSPORTATION, FHWA  
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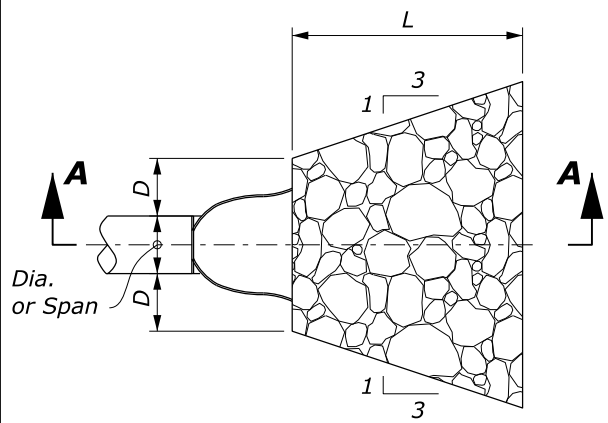
**PLACED RIPRAP AT  
CULVERT OUTLETS**

WFL STANDARD  
W251-1

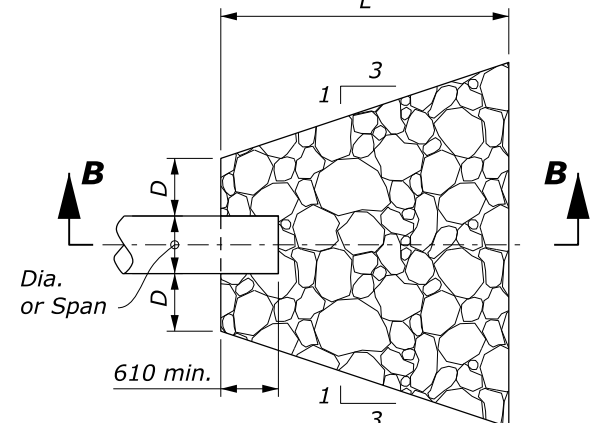
SPECIFICATION  
FP-24, FP-14

APPROVED FOR USE  
8/2016

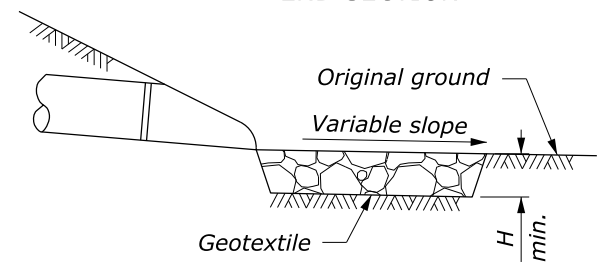
NO SCALE



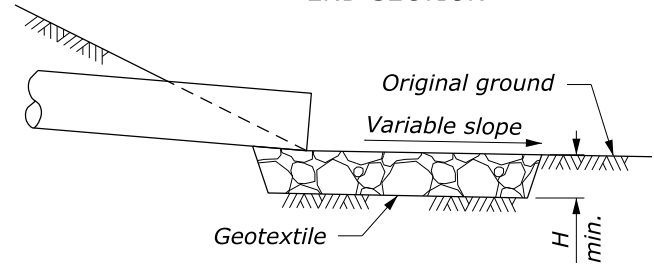
PLAN VIEW  
CULVERT WITH STANDARD  
END SECTION



PLAN VIEW  
CULVERT WITHOUT STANDARD  
END SECTION

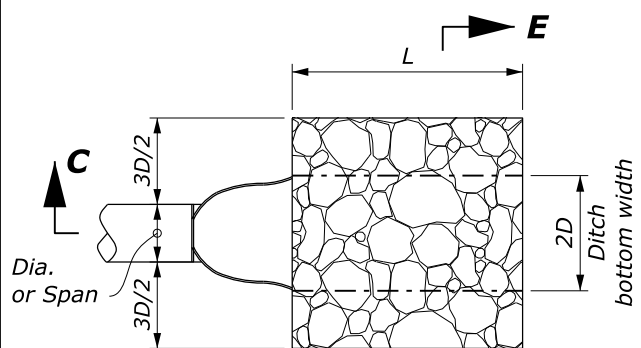


SECTION A-A

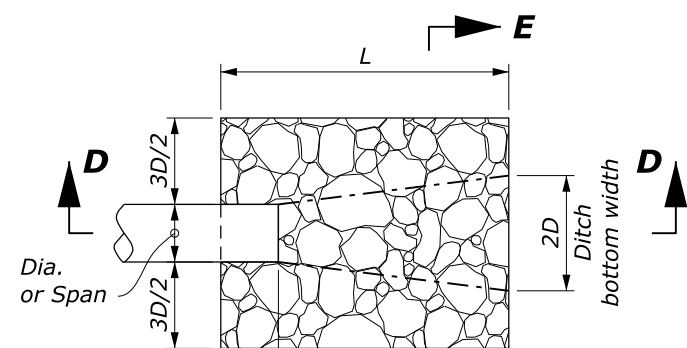


SECTION B-B

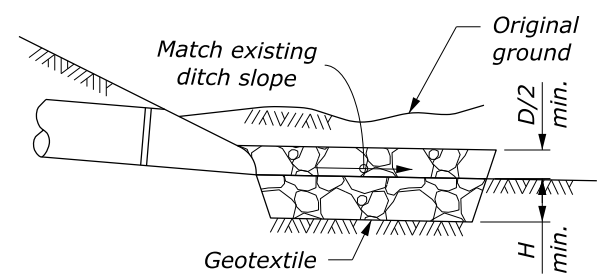
**PROTECTIVE APRON AT CULVERT OUTLET WITHOUT DITCH**



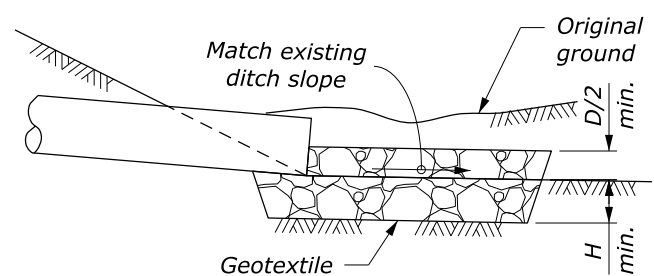
PLAN VIEW  
CULVERT WITH STANDARD  
END SECTION



PLAN VIEW  
CULVERT WITHOUT STANDARD  
END SECTION



SECTION C-C



SECTION D-D

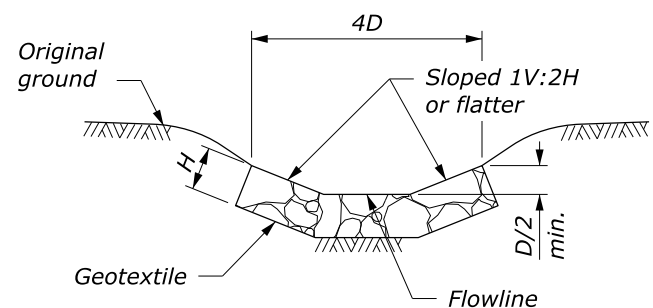
**PROTECTIVE APRON AT CULVERT OUTLET WITH DITCH**

**OUTLET WITHOUT DITCH  
PROTECTIVE APRON DIMENSIONS AND QUANTITIES  
FOR INFORMATION ONLY**

	CULVERT SIZE D (mm)	RIPAP CLASS	APRON LENGTH L (mm)	APRON DEPTH H (mm)	ESTIMATED RIPRAP QUANTITY (m3)	ESTIMATED GEOTEXTILE QUANTITY (m2)
WITH END SECTION	300	2	1200	460	0.7	4
	450	2	1800	460	1.6	7
	600	2	2400	460	2.9	11
	750	3	3750	610	8.0	22
	900	3	4500	610	11.5	30
	1050	4	6300	760	25.1	51
WITHOUT END SECTION	300	2	1800	460	1.2	6
	450	2	2400	460	2.4	9
	600	2	3000	460	3.9	14
	750	3	4350	610	9.8	26
	900	3	5100	610	13.7	34
	1050	4	6900	760	28.6	57
1200	4	7800	760	36.8	70	

**OUTLET WITH DITCH  
PROTECTIVE APRON DIMENSIONS AND QUANTITIES  
FOR INFORMATION ONLY**

	CULVERT SIZE D (mm)	RIPAP CLASS	APRON LENGTH L (mm)	APRON DEPTH H (mm)	ESTIMATED RIPRAP QUANTITY (m3)	ESTIMATED GEOTEXTILE QUANTITY (m2)
WITH END SECTION	300	2	1200	460	0.7	4
	450	2	1800	460	1.5	7
	600	2	2400	460	2.6	10
	750	3	3750	610	6.9	19
	900	3	4500	610	9.9	26
	1050	4	6300	760	20.1	42
WITHOUT END SECTION	300	2	1800	460	1.0	5
	450	2	2400	460	2.0	8
	600	2	3000	460	3.3	12
	750	3	4350	610	8.0	22
	900	3	5100	610	11.2	29
	1050	4	6900	760	22.0	46
1200	4	7800	760	28.5	57	



SECTION E-E

**NOTE:**

1. Use for aprons serving culverts with slopes less than 10%.
2. Furnish separation and stabilization geotextile.
3. Do not measure riprap placement excavation for payment.

This drawing contains **Metric** units of measure. Dimensions without units are millimeters.

U.S. DEPARTMENT OF TRANSPORTATION, FHWA OFFICE OF FEDERAL LANDS HIGHWAY	WFL STANDARD WM251-1
<b>PLACED RIPRAP AT CULVERT OUTLETS</b>	SPECIFICATION FP-24, FP-14
	APPROVED FOR USE 8/2016

NO SCALE