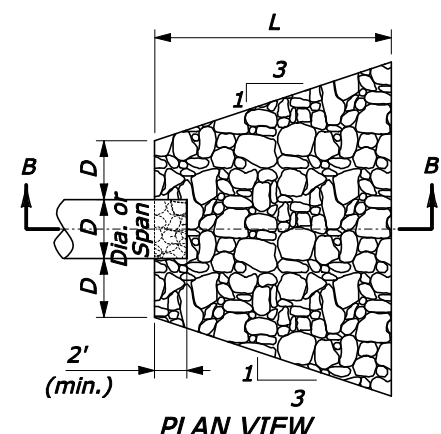
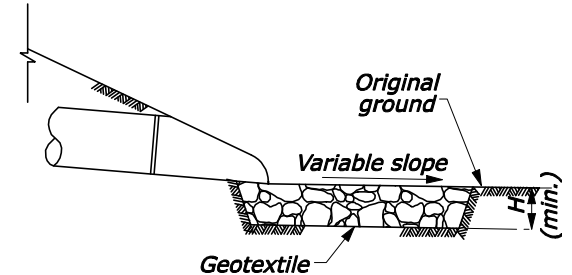


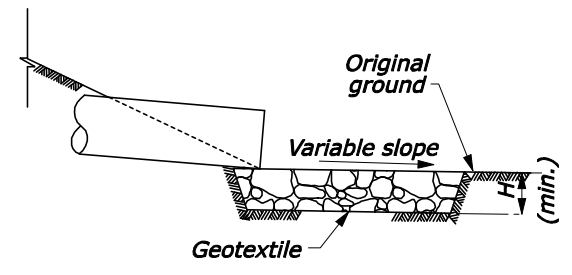
PLAN VIEW  
CULVERT WITH STANDARD END SECTION



PLAN VIEW  
CULVERT WITHOUT STANDARD END SECTION

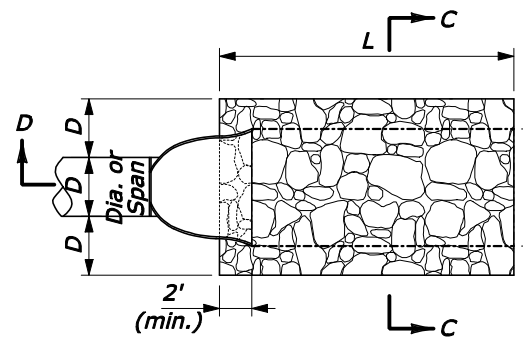


SECTION A-A

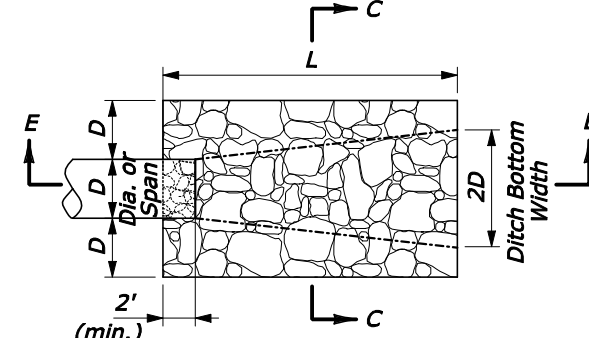


SECTION B-B

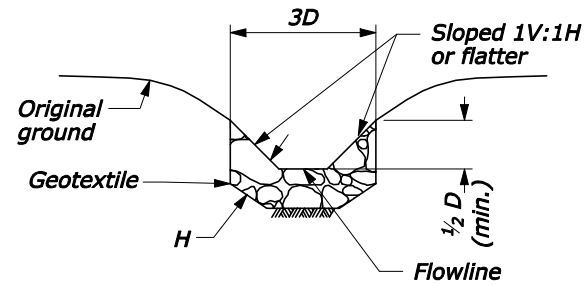
**PROTECTIVE APRON AT CULVERT OUTLET WITHOUT DITCH**



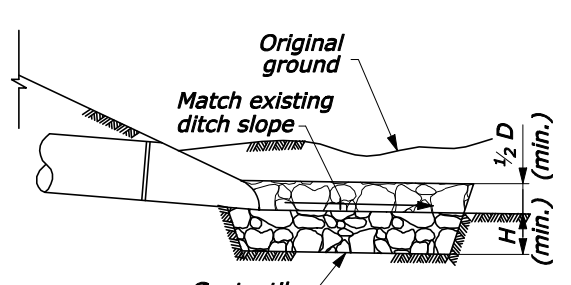
PLAN VIEW  
CULVERT WITH STANDARD END SECTION



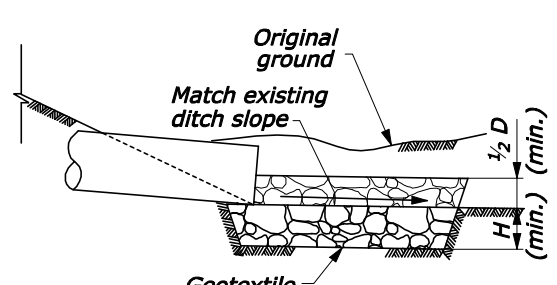
PLAN VIEW  
CULVERT WITHOUT STANDARD END SECTION



SECTION C-C



SECTION D-D



SECTION E-E

**PROTECTIVE APRON AT CULVERT OUTLET WITH DITCH**

**OUTLET WITHOUT DITCH  
PROTECTIVE APRON DIMENSIONS AND ESTIMATED QUANTITIES**

	CULVERT SIZE D (inches)	RIPRAP CLASS	LENGTH OF APRON L (feet)	DEPTH OF APRON H (feet)	ESTIMATED RIPRAP QUANTITY (CY)	ESTIMATED GEOTEXTILE QUANTITY (SY)
WITH END SECTION	12	2	5	1.5	1.3	6
	18	2	7	1.5	2.7	11
	24	2	9	1.5	4.5	16
	30	3	13.5	2	12	30
	36	3	16	2	17	40
	42	4	22	2.5	36.4	67
WITHOUT END SECTION	12	2	8	1.5	2.6	10
	18	2	10	1.5	4.4	15
	24	2	12	1.5	6.7	21
	30	3	16.5	2	15.9	38
	36	3	19	2	21.6	49
	42	4	25	2.5	43.6	78
48	4	28	2.5	55.4	95	

**OUTLET WITH DITCH  
PROTECTIVE APRON DIMENSIONS AND ESTIMATED QUANTITIES**

	CULVERT SIZE D (inches)	RIPRAP CLASS	LENGTH OF APRON L (feet)	DEPTH OF APRON H (feet)	ESTIMATED RIPRAP QUANTITY (CY)	ESTIMATED GEOTEXTILE QUANTITY (SY)
WITH END SECTION	12	2	5	1.5	0.9	5
	18	2	7	1.5	1.8	8
	24	2	9	1.5	3	11
	30	3	13.5	2	7.5	21
	36	3	16	2	10.7	28
	42	4	22	2.5	21.4	44
WITHOUT END SECTION	12	2	8	1.5	1.4	7
	18	2	10	1.5	2.5	10
	24	2	12	1.5	4	14
	30	3	16.5	2	9.2	25
	36	3	19	2	12.7	32
	42	4	25	2.5	24.4	49
48	4	28	2.5	31.2	60	

**NOTE:**

1. Use for aprons serving culverts with slopes of less than 10%.
2. Furnish geotextile conforming to Subsection 714.01(a).
3. Excavation for placement of riprap will not be measured for payment.

U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION  
CENTRAL FEDERAL LANDS HIGHWAY DIVISION

U.S. CUSTOMARY DETAIL

**PLACED RIPRAP  
AT CULVERT OUTLETS**

NO SCALE

DETAIL APPROVED FOR USE 07/2004  
REVISED: 08/2006 03/2009

DETAIL  
C251-50



## NOTES TO THE DESIGNER

Last Updated: March 2009

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### General Information

1. **Maximum slope.** Riprap aprons shown in this drawing can be used for culvert outlets with slopes up to 10%. For steeper applications, use alternate protective aprons, such as revet mattresses.
2. **Riprap classes.** Use these drawings with either the FP-03 riprap classifications or the NCHRP classifications (See the Section 251 SCRs on the LOS).

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### Applicable SCRs

1. Section 251:  
[http://www.cflhd.gov/design/\\_documents/construction/scr\\_03/S251-03E.doc](http://www.cflhd.gov/design/_documents/construction/scr_03/S251-03E.doc)
2. Section 602:  
[http://www.cflhd.gov/design/\\_documents/construction/scr\\_03/S602-03E.doc](http://www.cflhd.gov/design/_documents/construction/scr_03/S602-03E.doc)
3. Section 705:  
[http://www.cflhd.gov/design/\\_documents/construction/scr\\_03/S705-03E.doc](http://www.cflhd.gov/design/_documents/construction/scr_03/S705-03E.doc)

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### Typical Pay Items Used

- 25101-2000 Placed riprap, class 2 and/or
- 25101-3000 Placed riprap, class 3 and/or
- 25101-4000 Placed riprap, class 4
  
- 60201-0700 [12-inch to 48-inch] pipe culvert
- 60210-0700 End section for [12-inch to 48-inch] pipe culvert
- Geotextile quantity is shown for information only

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### Updates

October 16, 2000

- Updated border to FLH Standard

February 2, 2005

- Updated to MicroStation V8

March 2009

- Added drawings of aprons in ditches
- Added quantity tables
- Moved riprap rundown at culvert inlet to template drawing