

Kentucky Erosion Prevention and Sediment Control Guide

A guide to preventing erosion and controlling sediment from construction activities in Kentucky

Protecting Culverts and Ditch Outlets

Culverts and ditches are designed to carry moderate and large flows of stormwater. They can transport a lot of sediment to streams, rivers, wetlands, and lakes if they are not properly protected. In addition, culvert and ditch outlets can become severely eroded if high velocity flows are not controlled.

Outlet protection methods

Outlets for storm drains, culverts, and paved channels that discharge into natural or constructed channels must be lined with rock or other armoring to prevent downstream bank and channel erosion when flow velocities are high.

The rock-lined “apron” at the outlet must be straight (lined up with the discharging pipe or channel) and laid in flat. Bring the sides up around outlet to prevent erosion, and up the banks a little to prevent scouring. The apron is shaped like a long triangle, with the narrow end located at the outlet and sized about 3 times the diameter of the outlet pipe. The width of the downstream end of the apron will be wider, tied into the channel, and vary according to the shape of the channel it empties into.

The table below provides general information for sizing rock and outlet aprons for various sized pipes. Outlets that discharge high flows must follow the maximum suggested sizing criteria.

Sizing for flow dissipaters at culvert outlet

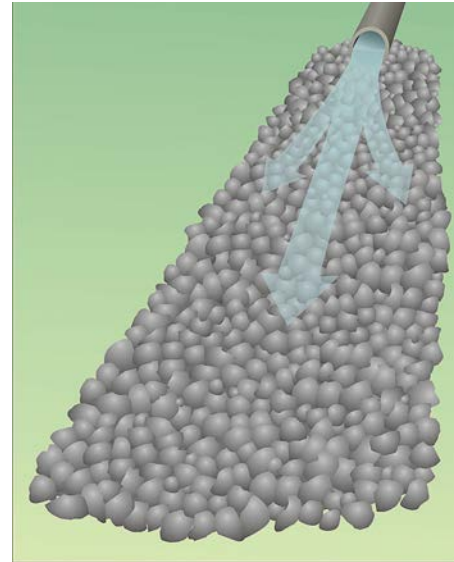
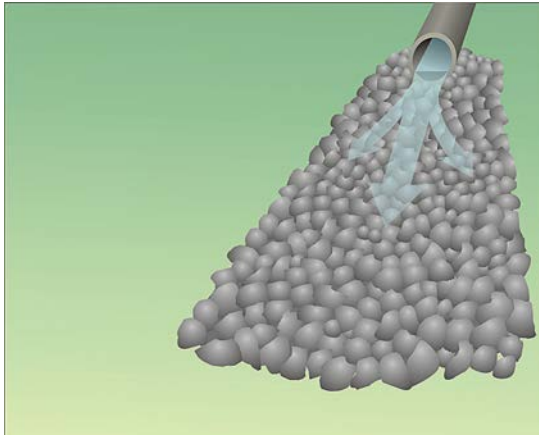
Culvert size	Avg. rock diameter	Apron width*	Apron length**	Apron length***
8"	3"	2-3 ft.	3-5 ft.	5-7 ft.
12"	5"	3-4 ft.	4-6 ft.	8-12 ft.
18"	8"	4-6 ft.	6-8 ft.	12-18 ft.
24"	10"	6-8 ft.	8-12 ft.	18-22 ft.
30"	12"	8-10 ft.	12-14 ft.	22-28 ft.
36"	14"	10-12 ft.	14-16 ft.	28-32 ft.
42"	16"	12-14 ft.	16-18 ft.	32-38 ft.
48"	20"	14-16 ft.	18-25 ft.	38-44 ft.

*Apron width at the narrow end (pipe or channel outlet)

** Apron length for slow-flow (no pressure head) culverts

*** Apron length for high-flow (pressure head) culverts

If the culvert outlet and receiving channel do not line up straight, the channel bank receiving the brunt of the outlet flow must be lined or it will erode quickly. If rock will be used, double the average diameter when sizing rock needed. Gabion baskets – galvanized wire mesh boxes filled with rock – are often used in this situation and can be stacked to form a wall if necessary. Mulch and soil can be mixed with the rock in the baskets to promote growth of stabilizing vegetation if desired.



Low-flow energy dissipaters are shorter (above) than those for high-flow outlets (right).



Good placement and construction of rock apron at high-flow culvert outlet. If flow from culvert enters a channel, make sure channel is lined with grass, and blankets or mats, if necessary, to prevent erosion.



Culvert outlet with no rock apron or flow dissipaters. It is unclear if this line of rock was meant to be a check dam or if it is supposed to direct flow in another direction, but it isn't functioning in either case.



Excellent placement and construction of rock apron to dissipate flows from culvert outlet. Area needs seeding and mulching.



Good silt fence installation, fair seeding and mulching on slopes. Poor placement and construction of flow dissipater apron at culvert outlet.



Poor slope protection, no rock apron or flow dissipater at culvert outlet. Silt fence must not be used across ditches or channels; do not put sediment traps at culvert outlets.



Poor seed and mulch application, slopes badly eroding. No rock apron or flow dissipater at culvert outlet. Culverts clogged with sediment and rock.

Resources

[Hamilton, Tennessee Outlet Protection](#)

[FEMA Drainage and Culverts](#)