



Forestry Note:

HOW TO INSTALL A FOREST ROAD CULVERT

Introduction

Poorly designed and improperly constructed stream crossings and cross-drainage on forest roads are important causes for road failure, high maintenance costs and damage to forest streams.



Figure 1. Properly installed culvert

Pipe culverts are often used for small stream crossings and road cross-drainage (Figure 1).

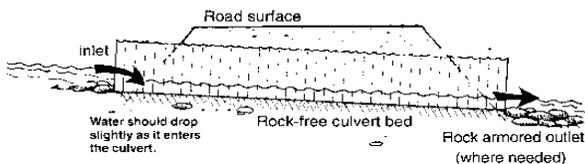
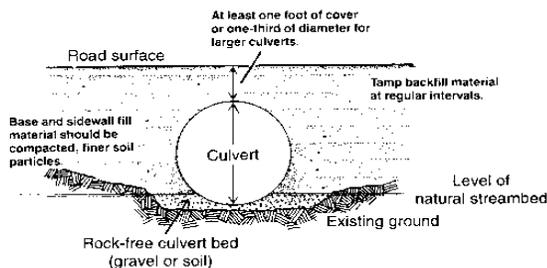


Figure 2. Provide proper inlet, slope, fill and protection



A good culvert stream-crossing or cross-drain depends on sound installation procedures, as well as proper culvert type, size, length and location (Figure 2).

Poor choices in these factors often cause culvert failure, resulting in an unusable road, costly replacement, soil loss and damage to water quality (Figure 3).



Figure 3. Insufficient fill leads to a flattened culvert.

Installing a Culvert Stream-Crossing

1) Excavating and Shaping the Bed

Pipe culverts can be easily installed using a small dozer or backhoe. A log skidder or farm tractor with earth-moving attachments can also be used. The first steps in preparing the channel in which the culvert is to be placed is to remove surface soil where needed and to shape the culvert bed. Rocks should be removed from the bed. The depth of the bed should be at least 1/2 of the diameter of the culvert but not below the water runoff channel. Installing the culvert lower than the runoff channel will tend to cause soil to accumulate and plug the culvert.

Care must be taken to insure that the culvert is higher at the water inlet than at the water outlet. Slope the culvert using at least a 3% grade. At a 3% slope, the water flowing through the culvert will help prevent soil buildup in the culvert.

Slope can be measured using a gauge made of 1-by-2 lumber and a hand level (Figure 4). Refer to the Forestry Services Forestry Note: *A Handy Gauge for Forest and Farm Road Construction Measurements*.



Figure 4. Using the shop-made Handy Gauge to measure a culvert bed slope of 3%

2) Culvert Placement and Backfill

The fill of soil next to and over the culvert should be placed carefully. Tamp the fill by running the tractor along the sides of the culvert (Figure 5), not over the top.



Figure 5. Tamping the fill using a dozer

Large rocks should be removed from the fill soil. Cover the culvert with soil to a depth of at least 12 inches, or at least 1/2 of the diameter for larger culverts (Figure 6). For example, a 36-inch culvert should have a soil cover at least 18 inches in depth.

Where considerable runoff flow and velocity are expected, the road fill at the inlet should be protected by rock (Figure 7). If the channel is not naturally armored, place a rock apron below the outlet to protect the channel (Figure 8).



Figure 6. Depth of soil cover over the culvert is important to prevent damage



Figure 7. Where fast runoff water is expected, protect the inlet with larger rock.



Figure 8. Where needed, place a rock apron below the outlet to prevent erosion.

Installing a Cross-drain Culvert

Installation steps on a cross-drain (ditch-relief) culvert are the same as for a stream-crossing culvert, except for the need to angle the culvert on a sloping road (Figure 9).

On a sloping road, place the culvert at a downhill angle, generally in the range of 15 to 30 degrees depending on the steepness of the road. On a steep road, a larger angle is needed for the culvert to carry fast-flowing runoff water.

To complete the installation on a sloping road, a ditch berm or block is needed below the culvert inlet (Figure 9). This block forces runoff water into the culvert and prevents water from continuing down the ditch.

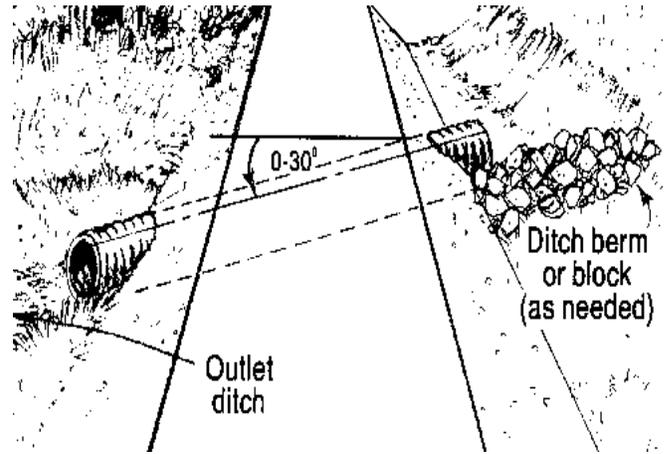


Figure 9. A properly installed cross-drain culvert with ditch block



Other Information Sources

How to Install a Forest Road Culvert is part of a series of Forestry Notes on stream crossings and forest road Best Management Practices (BMPs) produced by the Oklahoma Department of Agriculture, Food, & Forestry - Forestry Services Division.

.Additional Forestry Notes in this series include:

- Introduction to Road Stream Crossings
- Designing and Constructing Large Rocked Fords on Forest Streams
- Constructing Small Rocked Fords on Forest and Farm Roads in Oklahoma
- A Handy Gauge for Forest and Farm Road Construction Measurements

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Additional information on this and other forest road BMPs is available in the other fact sheets of this series, in videos produced by Forestry Services and in the OSU Extension handbook *Best Management Practices for Forest Road Construction and Harvesting Operations in Oklahoma* and a publication by the USDA Natural Resources Conservation Service, *Woods Roads*. These materials may be available at local offices of Forestry Services, the OSU Cooperative Extension Service and the Conservation Districts.

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