3.3.2.6 Temporary Construction Ford

Source: TNWRRC

Definition and Purpose

A temporary construction ford is a short-term erosion control measure designed to facilitate the movement of construction vehicles and equipment across ditches, swales, or shallow watercourses without causing damage to the channel or increasing sediment transport. Typically, it consists of a layer of stone placed over geotextile fabric to create a stable crossing while minimizing erosion and sediment disturbance. This method ensures that intermittent flows are not obstructed or contaminated while providing a durable access point for construction activities.

Appropriate Applications

Temporary construction fords are ideal for short-term crossings where wide, shallow depressions, side ditches, or intermittent swales must be traversed during construction. They are most applicable in areas where alternative access routes are impractical, construction activities are expected to last less than a year, crossings are relatively infrequent, and channel banks do not exceed five feet in height (TDOT). These fords provide a stable and efficient solution for moving light-duty construction vehicles across drainage features. Crossing with heavy-duty equipment may be appropriate, depending on the size of the stream.

Limitations and Maintenance

Temporary construction fords must be designed to allow unimpeded water flow, minimizing the risk of upstream ponding. It is best if the accumulation of water does not exceed 12 inches or half the height of existing banks, whichever is smaller (TDOT). Regular inspections, particularly after runoff producing events, are essential to identify and address blockages, erosion, riprap displacement, or other structural issues. Further, inspections after runoff producing events are critical to ensure that upgradient EPSC measures are effective in keeping sediment away from the ford. Prompt repairs are necessary to prevent further degradation and full effectiveness of the ford.

Because construction fords are not suitable for use in larger streams, wetlands, jurisdictional water bodies, or water bodies with ecological significance, it is unlikely an ARAP will be required. Additionally, other permits, such as a Section 404 permit from USACE or a TVA 26a permit, are likely not necessary. However, it is best practice to refer to the CGP to understand if the watercourse meets the criteria of a stream. Any additional permits and their conditions are to be considered during the planning stages of the EPSC plans.

Planning and Design Considerations

When planning and designing a temporary construction ford, it is best for the construction to take during periods of dry conditions to minimize disturbance. The ford is to be positioned perpendicular to the watercourse whenever possible, with any necessary skew limited to 15 degrees. The location chosen for crossing is to minimize disruption to the channel banks , bottom, and riparian area. To ensure stability and accessibility, the approach slopes are not to exceed 5H:1V, and any excavated materials are to be removed by pulling it back rather than pushing it into the watercourse. The crossing width ranges between 12 and 20 feet, with side slopes no steeper than 2H:1V (TDOT).

Erosion control measures are to be incorporated to prevent surface runoff from construction roads from entering the watercourse, such as low berms or diversions placed along the channel. The ford itself consists of a 12-inch layer of Class A-3 conventional riprap placed over Type III geotextile fabric to provide stability.

Once the ford is no longer needed, all materials will be removed, and the channel banks restored to their original dimensions. Exposed soil must be stabilized with appropriate erosion control methods, such as seeding with mulch or erosion control blankets. Properly designed and installed temporary fords allow for safe, short-term vehicle crossings while minimizing sedimentation and hydrologic impacts.

Example Application

-Example courtesy of TDOT-

Given:

A temporary construction ford is to be constructed across a roadway side ditch. The ditch has a bottom width of 4 feet, side slopes are 3.5 feet high at slopes of 3H:1V and is grass-lined.

Determine:

The required quantities and dimensions for the crossing include:

a.) Length of the excavation along the bank
b.) Volume of the excavation along the bank
c.) Volume to be excavated on the ditch bottom
d.) Total excavation volume
e.) Area and volume to be covered by riprap as well as the total amount of conventional riprap.

Solution:

a.) Since the ditch has a grassed lining, the bottom will be excavated to a depth of 12 inches in order to provide a firm base for the stone layer and to ensure that it will not cause an obstruction to flow. Thus, the total height from the bottom of the excavation to the point where the excavated slope meets the existing grade will be 4.5 feet. Since the approaches will be excavated to a 5H:1V slope, the length of the excavation on one side will be:

$$L = H \times Slope = 4.5 \times 5 = 22.5 \text{ ft; use } 23 \text{ ft}$$

b.) The volume within the excavated area on one bank will be equal to the length of the excavation times the average cross sectional area of the excavation. Since the proposed ford will have a width of 12 feet, and the side slopes of the excavation will be 2H:1V, the cross sectional area adjacent to the channel may be computed as a trapezoid:

$$Area_{channel} = b \times H + Slope \times H^2 = 12 \times 4.5 + 2 \times 4.5^2 = 94.5 \text{ ft}^2$$

Since the cross sectional area is zero where the excavated slope meets the existing grade, the average cross sectional area may be computed as half of the area adjacent to the channel, or 47.3 SF. Thus, the total volume of excavation for one side of the channel is:

$$V = L \times A_{avg} = 23 \times 47.3 = 1087.9 \text{ ft}^3$$

However, a large portion of this volume is “empty air” above the exiting ditch side slope. As stated above, the height of the channel is 3.5 feet. Thus, the length along the 3H:1V slope is:

$$L = H \times Slope = 3.5 \times 3 = 10.5 \text{ ft}$$

Using similar logic as was employed above, the volume of "empty air" above the channel side slope may be computed as:

$$Air_{empty} = ½ \times (12 \times 3.5 + 2 \times 3.5^2) \times 10.5 = 349.1 \text{ ft}^3$$

The net volume to be excavated on one side of the channel may then be computed as:

$$V_{side} = V - Air_{empty} = 1087.9 - 349.1 = 738.8 \text{ ft}^3$$

c.) The volume to be excavated on the ditch bottom may be computed as:

$$V_{bottom} = H \times b \times W = 1 \times 12 \times 4 = 48 \text{ ft}^3$$

d.) The total volume to be excavated is thus:

$$V_{total} = V_{side.1} + V_{side.2} + V_{bottom} = 738.8 + 738.8 + 48 = 1525.6 \text{ ft}^3 = 56.5 \text{ yard}^3$$

e.) The total length of the ford is 50 feet (23 feet on each side plus the 4 foot width of the ditch). Since the width of the ford will be 12 feet, the area covered by riprap will be:

$$A_{riprap} = W \times L_{total} = 12 \times 50 = 600 \text{ ft}^2$$

Since the depth of the riprap will be 1 foot, the volume will be 600 ft^3, which is equal to 22.2 yard^3. If the weight of riprap is 1.75 tons per cubic yard, the final quantity of riprap is 38.9 tons.

References

TDOT. *Drainage Manual Ch10*. Retrieved from https://www.tn.gov/tdot/engineering-division/engineering-production-support/design-standards/drainage-manual.html