

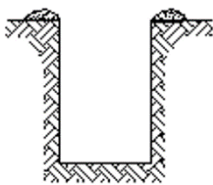
Technical Bulletin

Constructed Stone Underdrains

INSTALLATION SEQUENCE

The following details the installation of a constructed stone underdrain in an upslope road ditch. Here, the underdrain was installed to collect flow from bank springs and to intercept subsurface flow before it could saturate the road bed. The depth of the excavated trench should allow for the height of the constructed drain and at least 12" of cover over the drain to reach the bottom of the finished road ditch. When excavating for the drain, ensure continuous fall in the trench to the outlet.

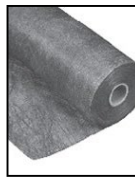
- 1 Place geotextile fabric in the excavated drain trench, leaving enough material to form a double layer on the drain top.



Excavate Trench

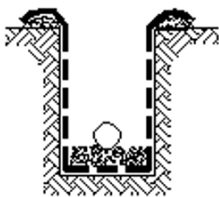


Place Geo-textile



geotextile fabric

- 2 Fill lined trench with clean stone. If desired, embed perforated in the clean stone.



Add pipe and clean fill to bed pipe



Add clean fill to surround pipe



perforated pipe

- 3 Wrap the fabric around the stone to fully encase the drain.



Overlap geo-textile on top of drain

and



Cover geo-textile with min. 12" stone

- 4 Place at least 12" of fill over the underdrain. This can be native fill removed during trench excavation. However, if the underdrain is beneath a ditch (as in this example), and there is a possibility that the native fill will perch water above the drain, consider topping the drain with a porous rock that is resistant to erosion. Correctly shape the ditch.



WHY USE UNDERDRAINS?

A lot of road stability problems can be traced to subsurface drainage issues. When the ground under a road is super-saturated, or a road bed is waterlogged through freeze-thaw cycles, the road integrity is compromised.

WHY CONSTRUCTED STONE UNDERDRAINS?

Constructed underdrains typically consist of clean, free-draining stone wrapped in separation fabric. They are used in many applications and are often referred to as French Drains. These drains are very versatile, as the size and shape can be altered to match site characteristics. Capacity can be increased by embedding a perforated pipe in the clean stone. The additional time and material costs of a constructed underdrain, versus a pre-fab underdrain, are more often than not offset by the ability to customize the drain to site conditions.

Specific Advantages of a Constructed Stone Underdrain over a Pre-fabricated Drain:

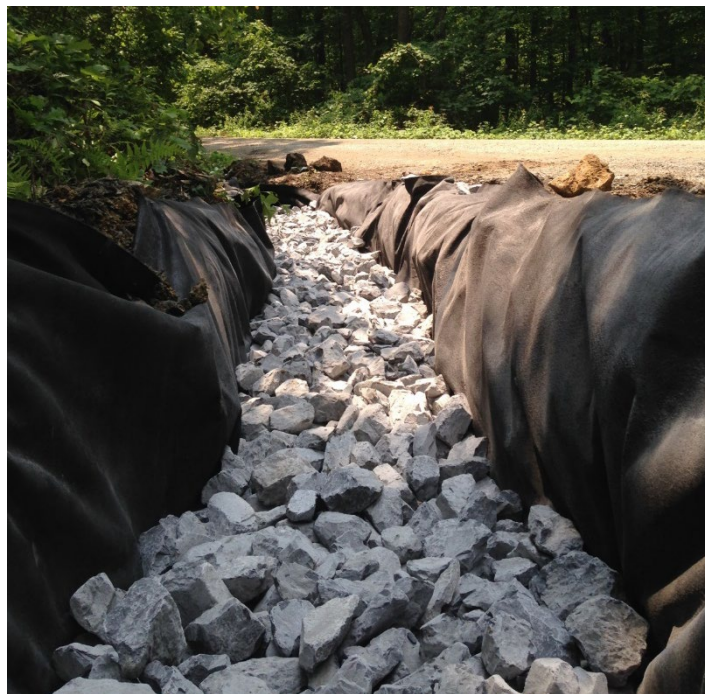
- Can be sized to handle any anticipated flow
- Adjustable size and shape for site conditions
- Perform better and longer in clay soils due to the larger surface area of the drain
- More likely to intercept subsurface flows due to generally larger surface area
- Allow for more “wiggle room” when estimating underground and seasonal flow volumes

Considerations:

- More expensive and time consuming to install
- May change job from DIY to contracted

CDGRS Suggestions for Constructed Stone Underdrains:

- Use 2” to 4” diameter clean stone (AASHTO 1)
- Use lightweight non-woven geotextile (Class 1)
- When possible and practical, outlet underdrains separately from storm drains
- When an underdrain will outlet to a crosspipe, pull the underdrain to daylight far enough from the pipe to allow cleaning of the pipe inlet. Consider installing a short section of crush resistant drain pipe to the perforated pipe where to pipe will be exposed.
- To discourage unwelcome guests, and potential plugging of the pipe, consider installing a critter guard at the underdrain pipe outlet.
- When stone is used to cover an underdrain, rip-rap will interlock better than AASHTO 1 and will provide more protection for the embedded pipe.



This in-progress underdrain clearly shows clean 4” stone ready to be wrapped in non-woven geotextile fabric. The drain will be covered and directed to a stable surface outlet, or “daylighted.”



The underdrain outlet pictured above uses crush resistant drain pipe where the perforated drain pipe comes to the surface. The “critter guard” on the end of the pipe can reduce plugging by deterring small animals from nesting in the pipe during no flow conditions. Here, the road crew has also placed large rocks and posts around the outlet to keep vehicles from damaging the pipe.