

Technical Bulletin

Grade Break



PennState

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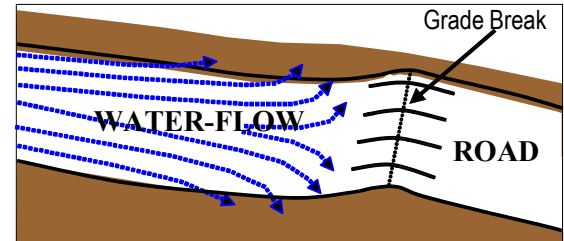


Center for Dirt and Gravel Road Studies

GRADE BREAK – An intentional rise in road elevation on a downhill slope, which causes water to flow to both sides of the road, where it can be collected in ditches or dispersed at a stable outlet.

HOW DOES A GRADE BREAK WORK?

An intentional increase in road surface elevation, or a “hump” in the road, slows water flowing on the road (in wheel tracks or in erosion rills) and allows established cross-slope to drain the surface. The linear grade on the upslope end of the hump must be less than the established crown, or side-slope for the grade break to be effective. A grade break that creates a reverse grade on the road surface is optimal.



NO GRADE BREAK – Water flows on road causing excess erosion and aggregate loss.



WITH GRADE BREAK (and associated crosspipe) – Interruption in slope redirects flow and guides water to a pipe inlet and a turnout.

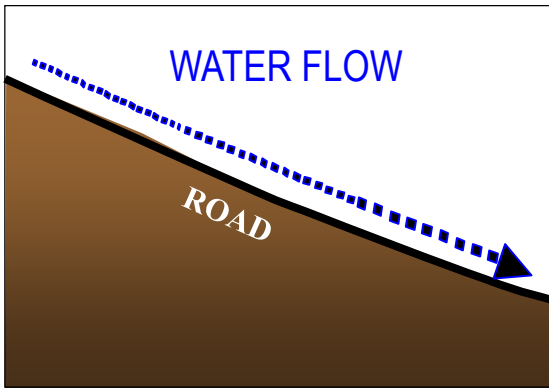
BENEFITS OF GRADE BREAKS

- *Grade Breaks* prevent loss of purchased aggregate and associated sediment
- *Grade Breaks* reduce road maintenance expenses
- *Grade Breaks* provide a measure of insurance against road washouts
- *Grade Breaks* can calm traffic by inducing lower driving speeds
- *Grade Breaks* can provide necessary pipe cover where shallow pipes are desired or required

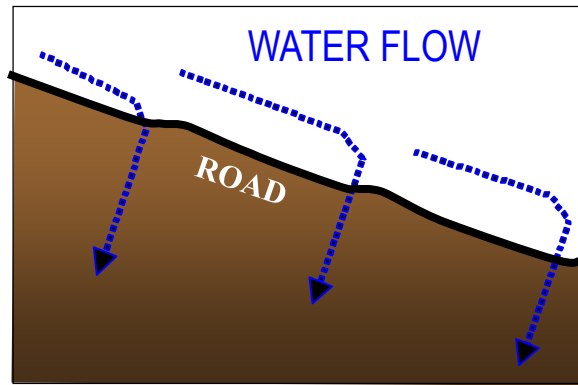
WHERE TO USE GRADE BREAKS

- On a sloping section of road where crown cannot be adequately maintained.
- Prior to stream crossings to force surface drainage into turnouts or vegetative filters.
- At frequent enough intervals to prevent the build up of concentrated water on the road surface.
- Prior to cross pipes to cause water to flow into the inlet side ditch.
- On unpaved access roads that intersect the main road from upslope, to reduce run-on flow.
- *Grade Breaks* may not be appropriate on roads with a slope of greater than 10%.

Grade Breaks are easy to build with common construction equipment. They are inexpensive, but highly effective structures to reduce and prevent erosion of dirt and gravel roads. When installed on access roads, grade breaks can also be a very effective way to reduce problematic run-on flow.



NO GRADE BREAKS – When a road lacks effective crown, water can flow on the road, in wheel tracks, ruts, etc., causing aggregate loss and generating sediment pollution.



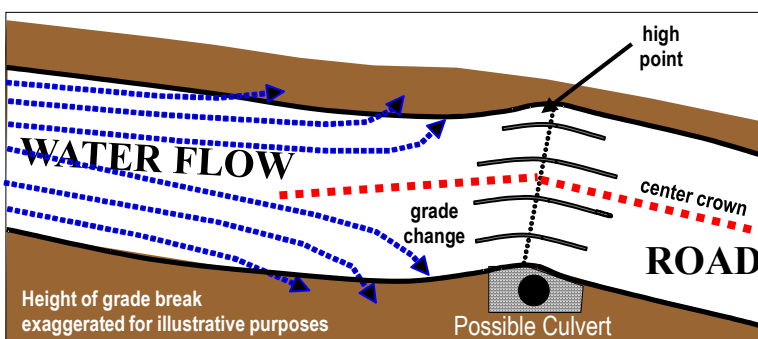
GRADE BREAKS – Intentional grade changes on the road forces water to leave the road surface. Road slope and site conditions influence the practicality and number of grade breaks possible.

IMPORTANT CONSIDERATIONS:

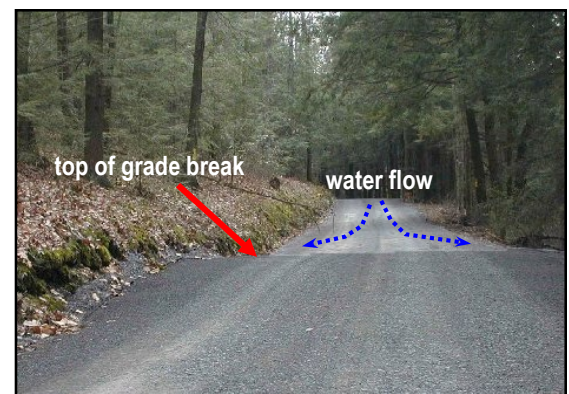
Spacing: On a long sloped road, multiple *grade breaks* may be used in succession to bleed water from the road and prevent the buildup of erosive volume and velocity. The degree of slope is the main determining factor in *grade break* spacing. Steeper slopes require *grade breaks* at closer intervals. However, site characteristics, such as available outlets and curves, will often influence the actual number and location of the grade breaks.

Transitions: It is important to gradually taper a *grade break* back into the main road. A *grade break* on a public road should not hinder traffic, yet should still function to divert water off of the road. A smooth *grade break* can be attained by lengthening the transitions away from the high point of the hump. However, be careful to maintain enough of a grade change to force water to leave the road surface. Generally, aggressive *grade breaks* will function longer, but they cannot be so aggressive that anticipated traffic bottoms out.

Maintenance: Grader operators must be instructed to maintain crown through a *grade break* without eliminating the crown or the *grade break*. Since grading operations traditionally strive to eliminate surface deviations, an uninformed operator may see a *grade break* as a surface irregularity or a source of road material for use in other areas. Mark grade breaks as you would other drainage features such as pipes.



Compressed illustration showing road surface water drainage patterns at *grade break*. Maintaining crown through the *grade break* sheds flow to the road sides.



GRADE BREAK- Notice the rise in the road and ditch along the upslope (left) side of the picture. A *grade break* in this terrain pairs well with a crosspipe.

BROAD BASED DIPS:

A *broad based dip* is similar to a *grade break*, but instead conveys water across the road surface to a discharge area. *Broad based dips* are also effective road surface drainage structures and are covered in a separate technical bulletin.