

Technical Bulletin

Broad Based Dips

BROAD BASED DIP – An intentional watercourse and associated high spot created across a roadway that conveys water from the uphill ditch over the road surface to a discharge area.

PURPOSE

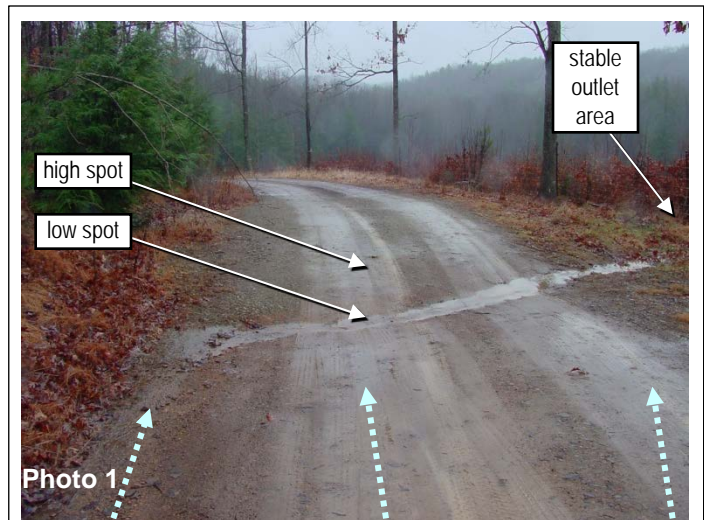
The main function of a *broad based dip* is to collect flowing water from the road surface and ditches, directing it across the road to a stable outlet. *Broad based dips* can be used in place of crosspipes in certain situations to outlet water from the uphill ditch across the road. *Broad based dips* also act as gradebreaks or water bars to prevent drainage from flowing down the wheel tracks on the road surface.

BENEFITS

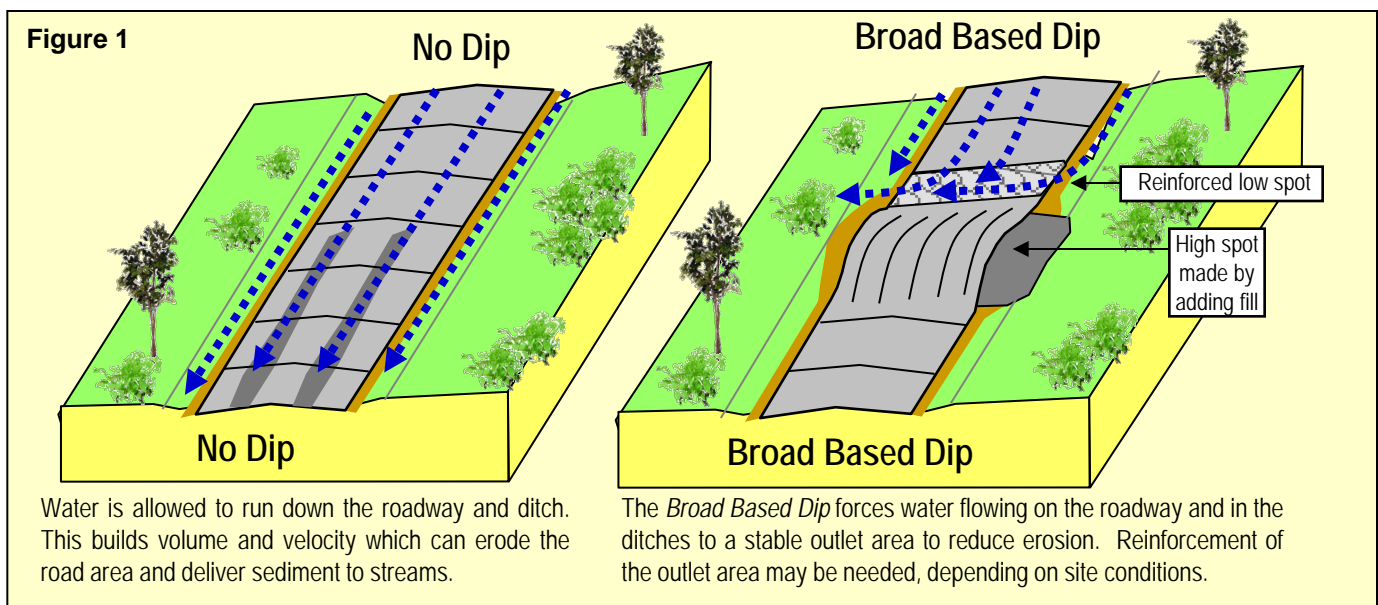
- prevents erosion caused by water flowing down road
- acts as a crosspipe to outlet drainage from the uphill side of the road, reducing potential for erosion and stream pollution from long ditch runs
- cheap, easy, and effective on low volume roads

CONSIDERATIONS

- Use discretion when considering broad based dips. They are only appropriate for use on low-traffic roads. Roads with high vehicle traffic and oversized loads may not be appropriate for *broad based dips*.
- Broad based dips should not be used on roads with a slope of greater than 10%.
- A broad based dip is designed to carry runoff across the surface of the road. It may be necessary to reinforce the bottom of the dip and dip outlet to prevent erosion, depending on site conditions.
- Broad based dips are not designed to accommodate continually flowing water such as springs or streams.



This *broad based dip* in Huntingdon County is located on an access road that is only open to the public for hunting season. This low-use road is ideal for *broad based dips* instead of crosspipes to reduce long term maintenance. The dip pictured here collects road and ditch water and directs it from left to right across the road.



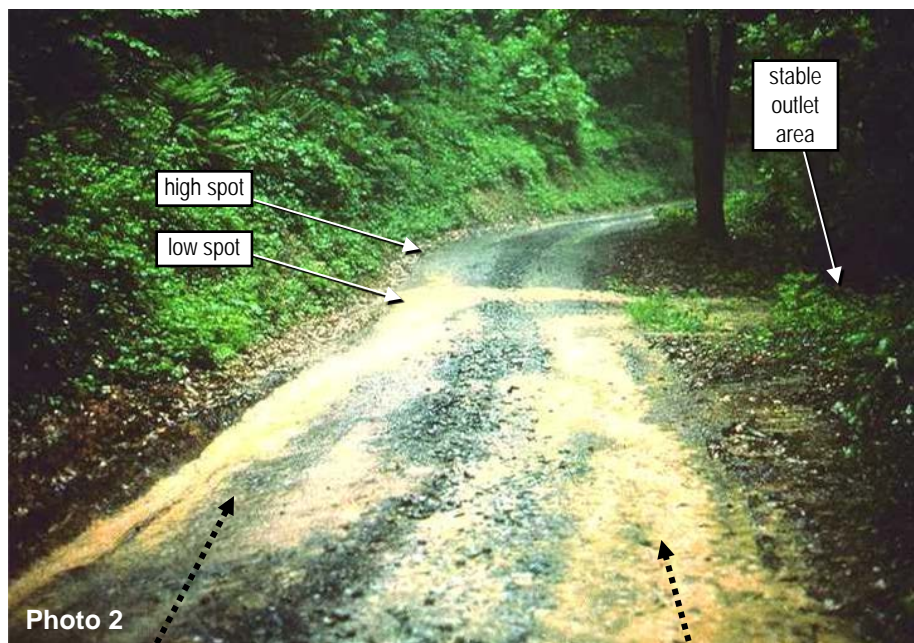


Photo 2

A broad based dip is pictured here during a heavy rainstorm. Notice how gradual the dip would be to vehicles, yet how effectively road and ditch flow is directed across the road. Without the dip, road and ditch drainage would continue to build erosive force around the corner.

Broad Based Dip – side view

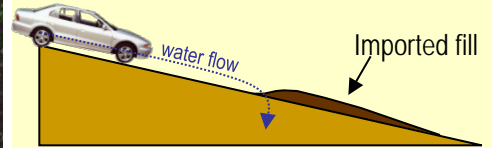
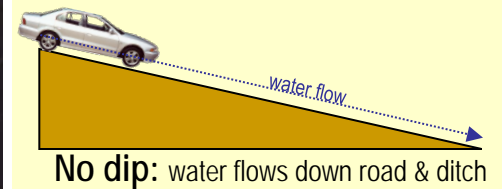


Figure 2

CONSTRUCTION CONSIDERATIONS

- **SPACING:** Multiple broad based dips can be used in sequence, similar to crosspipes, to drain a long stretch of road. Spacing for broad based dips depends on a variety of site-specific conditions including road slope, native soils, and hydrologic conditions.
- **SIZE & SHAPE:** Sizing for broad based dips will vary widely depending mostly on road slope and anticipated traffic. Dips constructed on flat roads may be relatively small (fill transitions as short as 12 feet and as low as 6 inches). Dips installed on steeper sections of road will require more “approach fill” to ease the transition into and out of the structure (fill transitions over 100 feet long and up to 18 inches deep). Be sure to take anticipated traffic into account. The dip pictured on the front of this document is on a gated access road and is much more abrupt. The dip pictured above has much smoother transitions to accommodate cars and log trucks. A relatively wide dip bottom is recommended to accommodate water and ease vehicle transitions. The upslope end of the dip should be tied into the uphill bank to insure water does not bypass the structure and continue flowing down the ditch.
- **ANGLE:** Broad based dips should be angled across the road at approximately 20-40 degrees, not placed at 90 degrees perpendicular to the road like a speed bump. The angle will facilitate the flow of water across the road. A dip placed straight across the road will be much more likely to fail because it forces water to turn at a right angle to flow across the roadway.
- **SLOPE:** Similar to crosspipes, the bottom of a broad based dip should have an elevation drop towards the outlet end. A 3% slope is recommended across the bottom of the dip
- **DIP REINFORCEMENT:** Because a broad based dip is designed to carry concentrated flow on the surface of the road, reinforcement of the dip bottom is recommended. Hard stone and even geosynthetic materials can be used to reinforce the bottom of the dip to resist erosion.
- **OUTLET REINFORCEMENT:** Because a broad based dip outlets water similar to a crosspipe, similar outlet stability concerns apply. When possible, outlet dips into a vegetated buffer area. Depending on the amount of water and slope of the land, additional outlet stabilization with stone may be required.
- **MAINTENANCE:** A properly constructed broad based dip will function for years with minimal maintenance. Care must be taken not to remove the dip during any future maintenance activity.

Broad based dips are a cheap and effective means of drainage control on low volume roads. Farm lanes, camp roads, gated access roads, and other low use roads are ideal candidates for these structures. Always try to discharge dips to a stable outlet away from streams.

*A **Gradebreak** is a related surface drainage structure designed to divert water off the road surface, but not to carry flowing water across the road. For details about gradebreaks, see the Center’s related technical bulletin at www.dirtandgravelroads.org.