

Technical Bulletin

Surface Drainage Practices

Surface Drainage Practices – Road maintenance features designed to shed water from the travelway, including crown and cross-slope, grade breaks, and broad-based dips.



Grade Break - A small increase in road elevation on a downhill slope, which forces surface flow off the road.



Broad-Based Dip - A small increase in road elevation that directs all road drainage across the road to an outlet.

PURPOSE – To quickly move water from the travelway. To prevent linear flow and standing water on the road. To lengthen time between grading and re-graveling and reduce pollution

BENEFITS OF GOOD SURFACE DRAINAGE:

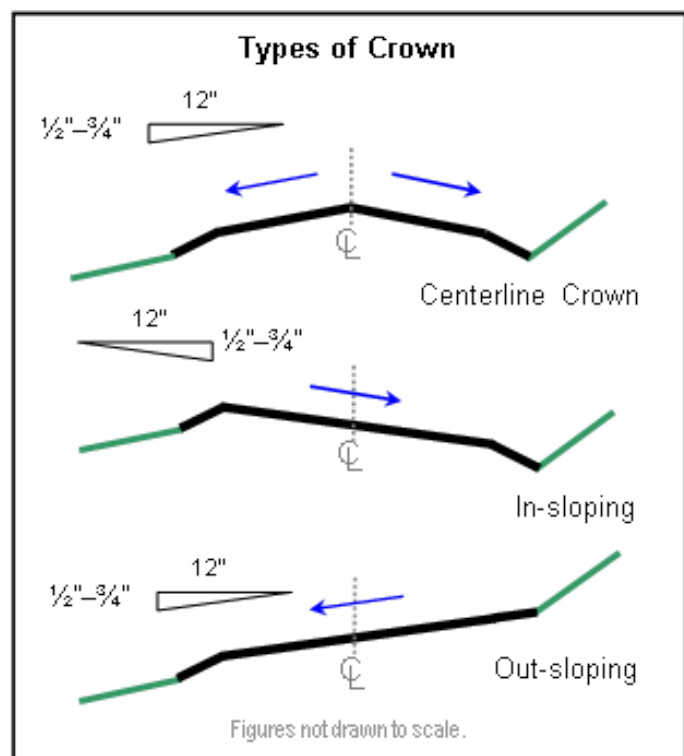
- Improves drivability and ride quality
- Sheds water from road surface into ditches
- Reduces surface material loss
- Reduces base saturation, improving stability
- Reduces long term maintenance cost and pollution of nearby surface water

WHERE TO USE –

- Use crown and cross-slope on all roads
- Use grade breaks (GB) and broad-based dips (BBD) where road grade, topography, traffic, and ability to maintain are applicable

CONSIDERATIONS –

- Crown and cross-slope is the road's first line of drainage defense and is a must
- Maintenance of surface features is necessary
- Grade Breaks and Broad-Based Dips have slope limitations. A road can be too steep to use these practices
- Traffic and vehicle type must be taken into account when considering a GB or BBD
- Mark GBs and BBDs to alert grader operator
- Cross-slope is the same 4% to 6% for roads with center-crown, in-slope, or out-slope



Center Crown – High point on road centerline with 4% to 6% slope to road edge ($\frac{1}{2}$ " to $\frac{3}{4}$ " fall per 1' lane width)

COMMON APPLICATIONS OF SURFACE SHAPES AND SURFACE FEATURES–

- Center Crown
 - Most common road shape. Used on most roads
- Inslope
 - Consider where steep downslope bank exists
- Outslope
 - Consider on low traffic/low speed roads
 - Use to avoid concentrated drainage outlets
- Grade Break
 - On low traffic and low maintenance public roads
 - To provide cover for shallow crosspipes
 - For access roads to prevent run-on flow
- Broad-Based Dip
 - Limited use on public roads
 - Consider where shallow bedrock exists
 - For access roads to prevent run-on flow

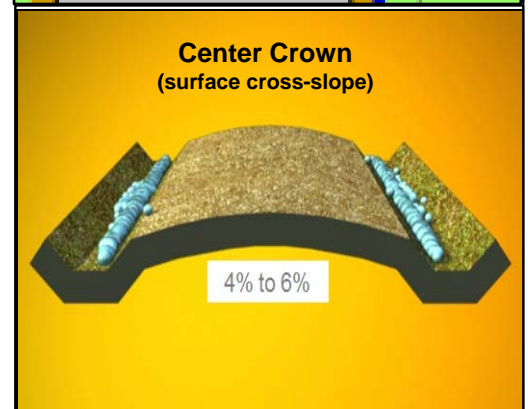
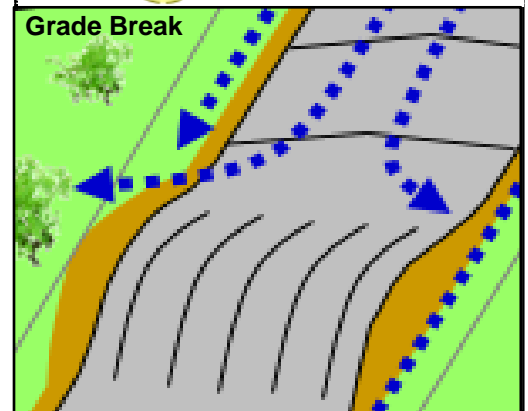
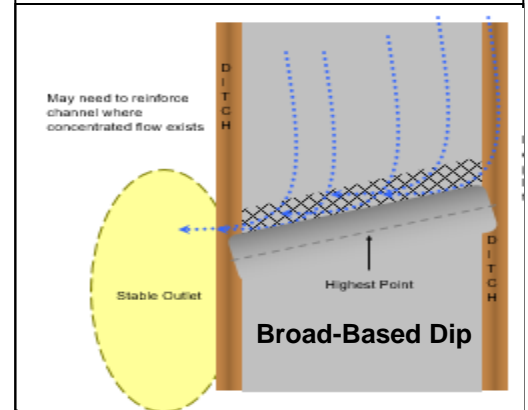
CONSTRUCTION AND MAINTENANCE NOTES –

- Surface drainage practices vary in methods of maintenance
- The use of a motor grader is the most common way to establish and maintain surface crown and/or cross-slope
- Adequate material is a must to effectively create the desired shape in the road
- Unpaved roads need 2X-3X more crown than paved roads
- A paver may be employed to replenish gravel to establish the initial crown and/or cross-slope
- Imported material is required to establish Grade breaks and broad-based dips
- In general, Grade breaks and broad-based dips are installed using earthmoving equipment other than a motor grader
- Construct GBs and BBDs to accommodate intended vehicles, so as not to cause ground clearance issues
- Mark locations of grade breaks and broad-based dips, to avoid removing them when grading or snowplowing

INFORMATION WORTH KNOWING –

- All practices are used to shed water from the road surface
- All practices are driven out over time and must be maintained
- All practices can be used on public roads and access roads
- All roads require crown and/or cross-slope
- Construct GBs and BBDs to create a reverse linear grade
- GBs and BBDs may calm traffic and extend surface life
- Grade breaks can be used with an associated crosspipe
- Broad-Based Dips may require a hardened flow channel
- Effective compaction extends the life of all surface features
- Roads with inslope and outslope shape suffer less surface damage during snowplowing than does a center crown road

Common Surface Practices



Top to bottom – Sketch of broad-based dip, illustration of grade break, proper slope for center crown

