DRAINAGE
AND
EROSION CONTROL

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Part 1

PHYSICAL FACTORS CONTROLLING EROSION
**Slope profile** is proportional to imposed runoff, distance to point of debris removal, and material properties of the slope.

When an embankment is constructed with an **abrupt change** in slope at its toe, eroded material will tend to infill the transition area during low flow, depositing material to create a more gradual transition.

The farther the trunk stream strays from a ridgeline, the less steep its slopes become.
Physical factors controlling erosion include:

- Slope height and inclination, material type (cohesion and friction), distance to controlling base level (nearest drainage course)
Rounding Slopes

- Suggested standards taken from a general civil engineering text for highway engineering in 1900.
- Note 4 to 6 inch crowning of embankment to promote good drainage; and
- Suggested transition at base of embankment with the native ground surface; with a radius of 15 to 20 ft.
- This transition is important for reducing unnecessary erosion at the base of the fill slope.
Hillsides that are out-of-equilibrium will generally experience sporadic erosion problems, generally during periods of sustained intense precipitation, when more water infiltrates the slope than is able to percolate through the weathered regolith.
Unnatural concentration of surface runoff often causes severe erosion, usually emanating from hardened surfaces, such as streets, parking lots, roofs and paved drainage ditches.
This erosion gully was created from concentrated runoff spilling off the upper parking lot. Simple grass cover cannot always prevent erosion.
Silt fences are used as temporary catchment devices, usually during construction and months thereafter, until a healthy cover of vegetation can take root.

Silt fences are now made of geotextiles, but can be reinforced with welded wire mesh.
This view shows a typical application of a silt fence below a construction site. The fence is intended to restrict migration of eroded sediment into drainage improvements of natural watercourses.
A series of six silt fences were overwhelmed by intense rainfall that befell a job site over a weekend, rendering it unworkable. This is what happens if you don’t reinforce the silt fences with welded wire mesh and pipe posts.
- Silt fences cannot prevent rill erosion
- Long slopes allow concentration of runoff, even on gradual inclinations (e.g. 3:1)
- Concave shaped slopes, like that shown here, tend to concentrate runoff by areal accretion
The effectiveness of a silt fence is tied to how well it is anchored to the slope.

This slope was hydroseeded and supported a lush growth of fescue grass; and the silt fence was embedded into the slope.

Despite these precautions, rill erosion occurred.
Silt fences that are placed on slopes or intended to be placed in use for more than a month should be reinforced with welded wire mesh and either steel fence posts or steel pipe posts.
Temporary siltation ponds provide a mechanism for catching and holding eroded sediment. The pond should be equipped with a perforated riser and armored spillway.
Left unchecked, erosion of the weathered slope mantle may continue until such a time that mass movements initiate, as shown here.
A 5% cross slope is a wise precaution on hillside roads, especially when constructed on cut-fill prisms, which are subject to long-term settlement.
A strong cross slope trains runoff to the inboard side of the road and promotes self-cleaning through supercritical flow along the gutter line, as shown here. The drop inlet needs to be provided with debris catchment so it won’t easily clog.
Drop inlets for storm drains are always subject to clogging by organic debris, especially during the first few storms of the rainy season or after prolonged droughts.