

EROSION PROBLEMS ON CUT SLOPES AND EMBANKMENTS

The growing attention to the problems of environmental impact has allowed a fast development of the use of Geosynthetics for erosion control on vegetation of arid areas, slopes and road embankments, etc.

Erosion has always been one of the major sources of damage to both the natural environment and to man-made structures. It is caused by different factors and can be avoided only if protection measures are properly selected according to its cause.

When the vegetative cover of a slope is removed or is temporarily missing, the remaining exposed soil is exposed and is vulnerable to the erosive action of atmospheric agents, mainly of rain. In such conditions, in order to protect a slope against erosion, the target should be the development, in the least possible time, of an ecosystem which allows the fast growth of natural vegetation and/or which provides a suitable protection against erosion.

The erosive action of the rain develops mainly through two mechanisms:

- detachment and transport of soil particles by the impact of raindrops on the soil surface;
- detachment and transport of soil particles by surface runoff.

Impact of raindrops

When raindrops impact the slope surface, the impacted soil particles get kinetic energy and they get displaced from their original position. In this way, the geometry of the soil surface is modified with the formation of small valleys and craters, which in turn increases the surface roughness.

The detachment of soil particles due to raindrops is the most important cause of erosion before the runoff starts, which causes a further detachment of soil particles and the subsequent downward transport of soils.

Transportation by surface runoff

When the surface is intersected by high surface runoff, erosion takes place progressively. Initially, the runoff is in the form of sheet flow and it mainly transports the detached soil particles by the rainfall; then preferential paths for the water flow appear and the runoff starts to excavate water rills. This channelled flow greatly increases the local water speed and its ability to create further erosive. As a consequence the

rills quickly degenerate into deep and wide gullies (see as in Figure 1). The latter stages of erosion may take the form of small soil failures or even of landslides.



Figure 1: Natural development of water rills on embankments

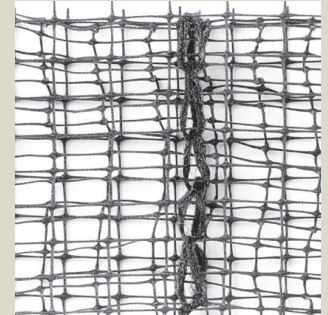


Figure 2: TENAX Multimatt Geomat on embankments

The severity of erosion depends on several factors, such as rain intensity and duration, slope geometry, type of soil, slope exposition, type of vegetative cover.

Therefore the role played by vegetation in protecting the soil against erosion is fundamental as it influences: the water exchange between the soil and atmosphere; the consolidation and reinforcement of the surface soil layer, and the protection of soil against the impact of raindrops. Furthermore, vegetation reduces the volume and speed of runoff, thereby decreasing its capacity to transport solids.

We can therefore say that an erosion control system reaches its maximum efficiency when the vegetation is dense and well established.

Role of Geomats

TENAX Geomats as shown in Figure 2, are purposely engineered for trapping a layer of topsoil, thus avoiding rainfall erosion by both sheltering the surface against the impact of raindrops and by restricting the movement of the soil particles.

The stability of the surface layer of topsoil allows the seeds to germinate quickly and the vegetation to uniformly cover the slope. While growing, the roots are able to intertwine with the matrix of the geomats, thus creating a natural-synthetic network with a much higher resistance to shear forces than the roots alone.

