

## **SLOPE FAILURES IN LATERITE – AN INDIAN EXPERIENCE**

R.Nagarajan, Center of Studies in Resources Engineering, Indian Institute of Technology, Bombay, Powai, MUMBAI 400 076 INDIA

Rainfall induced failures from the natural and man-made slopes are common in monsoon regions. Spatial distribution of these failures from rock and soil mass depends not only rainfall intensity but also their heterogeneous nature. The behavior of in-situ weathered material and lateritic mass under saturated conditions is not well understood as that of any other materials. Failure of man-made slopes is frequent during monsoon in the west coast of India.

An attempt has been made in understanding slope failures based the geological and engineering properties of in-situ laterite profile and their behavior under dry and saturated conditions.

The thickness of laterite in the west coast of India varies between 2 to 20 meters and is found at different elevations ranging from 100 to 600 m above mean sea level. Some of these deposits are aluminous in nature. They exhibit indications of in-situ weathering profile viz. hard ferruginous, aluminous laterite, lithomarge clay, and weathered and fresh metamorphic rocks, from the top to bottom. In certain places the fracture patterns are preserved on the top. Man-made slopes (near vertical) developed for surface transport by way cutting had exposed 1 to 8 meters of said profile. Atmospheric exposure of these slopes failed at several places during high rainfall intensity of 20 cm /day or on the successive periods blocking the movement. They had occurred from the mass that contains more clay fractions (with or without montmorillonite clay). Saturation of these materials was aided from the percolation through the cracks (preserved original rock) from the surface and also from the exposed the cut surface. The bearing capacity of these layers / cavities was weakened, leading to toppling of the overburden. The cohesive nature weathered cracks coated with clayey materials was reduced on water saturation leading to downward movement of the blocks.

Representative samples from the lateritic profiles were collected and analyzed for the physical, mineralogical and engineering properties under dry and saturated conditions. Rate of infiltration from different surfaces were measured using the double-ring infiltrometer. Based on the infiltration rate through the layers, the saturation time and pressure on the lateritic mass was calculated for given rainfall event containing single near homogenous layer and also for multiple layers. Based on the Factor safety, the individual cuttings were rated for its unstable condition during rainfall. Slope protection methods were suggested.