

# **Geotechnical Instrumentations and its implications in Dams, Slopes, and Tunnels: An Experience from Middle Marsyangdi HEP.**

**Tika Ram Paudel**

*Nepal Electricity Authority  
Engineering Service Directorate  
Soil, Rock and Concrete Laboratory  
trpaudel123@hotmail.com*

Geotechnical Engineering in construction projects is becoming a precise design tool through its approach to modern equipments and instrumentation in underground explorations. The inability of surface investigations to detect in advance all potential significant properties and conditions in natural form require designers to make assumptions and generalization that may vary with actual field condition. Visual observations and field tests combined with instrument data can provide realistic basis for design parameters.

The design parameters obtained through the interpretation of field data will also help to for back calculation, and ultimately results in economical and perfect size of concrete structures. Analysis of data obtained from geotechnical instrumentation can be utilized to verify design parameters, design assumptions, and construction techniques, analyze adverse events and verify apparent satisfactory performance.

Construction of hydropower involves a number of heavy structures to be founded on weak soil to hard rock, excavations of large underground caverns and excavation of soil and rock slope. Most of the structures are designed to be in underground caverns while the semi-underground structures require excavation of high slopes in soil and rock. The stability analysis of such slopes and underground caverns require continuous monitoring of the movements throughout the construction period and afterwards too. Such movements and internal pressures obtained through geotechnical instruments are very important for the safety of the existing structures and criteria for future designs.

A number of geotechnical instruments viz. Inclinometers, Extensometers, Piezometers, load cells, Strain gages, Tilt meters, Survey monuments, Seismic accelerometers etc. are the mostly used at Hydropower sites. Every instrument at the site are selected and installed to assist with answering a specific question and it is intended to provide data for evaluation.

This paper deals with the installation, monitoring and interpretation of data obtained from various instruments from Middle Marsyangdi Hydropower Projects, Lamjung. The results obtained from geotechnical instruments are very outstanding in modifying the design criteria and geotechnical parameters.