

Geological and Geotechnical Approach for Stabilization of Cut-Slopes in Power House Area of Luhri HEP Stage-I (210 MW), India

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Abstract : Luhri Hydroelectric Project Stage-I (210 MW) is a run of the river type development with a dam toe surface powerhouse (122m long, 50.50m wide, and 65.50m high) on the right bank of river Satluj in Himachal Pradesh, India. The project is located in the inner lesser Himalaya between Dhauladhar Range in the south and higher Himalaya in the north in the seismically active region. At the project, the location river is confined within narrow V-shaped valleys with little or no flat areas close to the river bed. Nearly 120m high cut slopes behind the powerhouse are proposed from the powerhouse foundation level of 795m to \pm 915m to accommodate the surface powerhouse. The stability of 120m high cut slopes is a prime concern for the reason of risk involved. The slopes behind the powerhouse will be excavated in mainly in augen gneiss, fresh to weathered in nature, and biotite rich at places. The foliation joints are favorable and dipping inside the hill. Two valleys dipping steeper joints will be encountered on the slopes, which can cause instability during excavation. Geological exploration plays a vital role in designing and optimization of cut slopes. SWEDGE software has been used to analyze the geometry and stability of surface wedges in cut slopes. The slopes behind powerhouse have been analyzed in three zones for stability analysis by providing a break in the continuity of cut slopes, which shall provide quite substantial relief for slope stabilization measure. Pseudo static analysis has been carried out for the stabilization of wedges. The results indicate that many large wedges are forming, which have a factor of safety less than 1. The stability measures (support system, bench width, slopes) have been planned so that no wedge failure may occur in the future.

Keywords : cut slopes, geotechnical investigations, Himalayan geology, surface powerhouse, wedge failure

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