

Coping with Geological Hazards during Construction of Hydroelectric Projects in Himalaya

Authors : B. D. Patni, Ashwani Jain, Arindom Chakraborty

Abstract : The world's highest mountain range has been forming since the collision of Indian Plate with Asian Plate 40-50 million years ago. The Indian subcontinent has been deeper and deeper in to the rest of Asia resulting upliftment of Himalaya & Tibetan Plateau. The complex domain has become a major challenge for construction of hydro electric projects. The Himalayas are geologically complex & seismically active. Shifting of Indian Plate northwardly and increasing the amount of stresses in the fragile domain which leads to deformation in the form of several fold, faults and upliftment. It is difficult to undergo extensive geological investigation to ascertain the geological problems to be encountered during construction. Inaccessibility of the terrain, high rock cover, unpredictable ground water condition etc. are the main constraints. The hydroelectric projects located in Himalayas have faced many geological and geo-hydrological problems while construction of surface and subsurface works. Based on the experience, efforts have been made to identify the expected geological problems during and after construction of the projects. These have been classified into surface and subsurface problems which include existence of inhomogeneous deep overburden in the river bed or buried valley, abrupt change in bed rock profile, Occurrences of fault zones/shear zones/fractured rock in dam foundation and slope instability in the abutments. The tunneling difficulties are many such as squeezing ground condition, popping, rock bursting, high temperature gradient, heavy ingress of water, existence of shear seams/shear zones and emission of obnoxious gases. However, these problems were mitigated by adopting suitable remedial measures as per site requirement. The support system includes shotcrete, wire mesh, rock bolts, steel ribs, fore-poling, pre-grouting, pipe-roofing, MAI anchors, toe wall, retaining walls, reinforced concrete dowels, drainage drifts, anchorage cum drainage shafts, soil nails, concrete cladding and shear keys. Controlled drilling & blasting, heading & benching, proper drainage network and ventilation system are other remedial measures adopted to overcome such adverse situations. The paper highlights the geological uncertainties and its remedial measures in Himalaya, based on the analysis and evaluation of 20 hydroelectric projects during construction.

Keywords : geological problems, shear seams, slope, drilling & blasting, shear zones

Conference Title : ICEG 2015 : International Conference on Engineering Geology

Conference Location : Singapore, Singapore

Conference Dates : March 29-30, 2015