

Seismotectonic and seismic hazard studies of Diamer Basha Dam Project

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Abstract

The Diamer-Basha Dam (DBD) with its 272 meters height is situated in seismically active Kohistan Island Arc (Chillas Complex Boundary Faults), bounded in the North by Main Karakorum Thrust (MKT) and in the south by Main Mantle Thrust (MMT), During the past many macro seismic events have originated due to stress accumulation along MKT and MMT. The structure is inclined at a steep angle near the surface but the dip is thought to decrease with depth, as interpreted for other thrusts in the region. As such, it is possible that this fault may pass under the site at some depth. Auxiliary structures associated with MMT come closer together east of Chillas, and merge along the flanks of the Nanga Parbat-Haramosh Massif (NPHM). In this area, between Chillas and Bunji, the Raikot fault zone and associated structures exhibit remarkable neotectonic features including over thrusting of NPHM gneisses over the MMT.

Keeping in view the ICOLD recommendations, WAPDA has established a 29 station (including ten around DBDP) Micro Seismic Monitoring System (MSMS) in Northern Pakistan to identify possible active seismotectonic structures in the vicinity of various proposed Dam sites. The MSMS stations are transmitting round the clock data to its Central Recording Station (CRS) located at Tarbela through satellite link. At CRS, the seismic data is Online/Offline processed and analyzed through latest state of art Antelope Software. Since September 2007 through December 2015, the MSMS of DBDP in an investigation area of 250 km radial distance has located as many as 5985 seismic events with b value of 0.8 ± 0.02 . In its network area of around 50 km radius there are a total of 855 seismic events with maximum $ML = 4.7$ and b value 0.7 ± 0.02 . In this area field investigations and seismotectonic map confirms the presence of seismic sub zones and an active fault zone close to NW direction of Dam site. Through three detailed Seismotectonic & Seismic Hazard Studies it has been concluded that horizontal Peak Ground Acceleration (PGA) for Operating Basis Earthquake (OBE) = 0.37 'g' and Maximum Credible Earthquake (MCE) = 0.46 'g' .