Seismic studies of Indus-Darband fault near Tarbela Dam Project

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Abstract

Tarbela Dam is a multipurpose Project located on the Indus River about 70 km. NW off Islamabad. It consists of a Main Embankment Dam (MED), two Auxiliary Dams, two Spillways, and a Power Station. Its MED has a crest length of 2.75 km and maximum height of 143 meters. Tarbela Reservoir has an area of about 100 sq. km., with a maximum depth of around 130 meters and gross capacity of 13.7 km^3. The Tarbela Dam is located in a seismically active region associated with the convergence of the Indian and Eurasian crustal plates along the Himalayan mountain ranges. The general tectonic structure of the continental margins at the Himalayan Arc is inferred from various regional seismotectonic studies and data from Micro Seismic Monitoring System (MSMS) of Tarbela operating since August 1973. There are three distinct groups of active faults controlling the seismicity of Damsite and surrounding area of Hazara Arc: (1) basement faults, (2) Detachment, and (3) faults within the sedimentary wedge.

The Indus Darband Fault is one of the steeply dipping faults in the Indus Valley System. It passes below the Tarbela Main Embankment Dam on the right side of the valley, where it forms a 215 meters near vertical escarpment in the Dam foundation, and continues more than thirty km. North of Tarbela. Its direction of relative displacement is left-lateral strike-slip. Tarbela MSMS data indicates that 12 % of total seismic activity of Tarbela Seismic Zone is contributed by the Indus-Darband Fault. Micro seismic activity (M ≤ 3.0) is dominant (93 %) while mostly the seismic events (70 %) are concentrated within a shallow zone of thirty km. Two earthquakes generated along the Indus Darband Fault (ML = 5.1 and 5.2) have been attributed to the Reservoir Induced Seismicity (RIS) due to Tarbela Reservoir. Maximum acceleration value recorded at Tarbela Dam Project ('g' = 0.27) was also due to an earthquake generated by Indus Darband Fault.