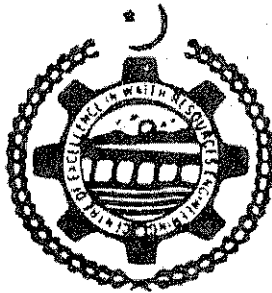


THESIS

**CALIBRATION AND DEVELOPMENT OF SCOUR DEPTH  
RELATIONSHIP BY ANALYZING NEELUM JHELUM PHYSICAL MODEL  
STUDY RESULTS FOR DIFFERENT ENERGY DISSIPATION SCHEMES**



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By

ANJUM RIAZ  
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## ABSTRACT

The Neelum Jhelum Hydro Power Project is located in the vicinity of Muzaffarabad (AJ&K). It will divert the Neelum River water into River Jhelum through a tunnel. The installed capacity of Neelum Jhelum Hydro Power Project is 969 MW.

The release of water controlled by a hydraulic structure causes scouring downstream the structure which is dangerous for the structure stability. To avoid the structural destability, energy dissipaters are constructed downstream the hydraulic structures that dissipate the extra energy carried by the released water.

To check the suitability of an energy dissipation structure for Neelum Jhelum Hydro Power Project, physical model study was performed at Hydraulic Research Station, Nandipur. Three energy dissipaters i.e. Stilling Basin, Roller Bucket and Flip Bucket were checked during this study.

The stilling basin was 66.60 m in length from the toe of the spillway chute. Chute blocks of 2.06 m height were provided at the upstream end of the stilling basin with 3.33 m high dentated end sill at its tail end. The Roller Bucket of 20 m radius ending in downstream lip at elevation of 973.0 m.a.s.l with lip angle of 29.3 degree was proposed for NJHPP. The Flip Bucket consisted of a circular arc of 40 m radius with invert level of 973.59 m.a.s.l and lip angle 20 degree. The end of the Flip Bucket was at elevation of 976 m.a.s.l.

The objectives of the study were to compare the observed and calculated scour depth by different scour formulae for proposed energy dissipation schemes and to develop a suitable relationship to calculate the scour depth for NJHPP. To achieve the objectives of the study, tail water levels, bed levels and bed material size for the three

energy dissipation schemes were used as input data for in different scour equations. The results so obtained were compared with the observed value during NJ physical model study. None of the used equations showed the exact results as were observed. Then a new modified equation was developed by using simple regression method i.e.  $D = 0.54(q^{0.49}H^{0.49})$ . The study concludes that the Damle (A) equation results are comparatively close to the observed scour value. The modified equation gave results very close to the observed values. The authenticity of the modified equation can be analyzed by applying it to such another physical model.