

**THESIS**

**STUDY FOR HYDRAULIC JUMP FORMATION, ENERGY DISSIPATION  
AND RESIDUAL PRESSURES AT TAUNSA BARRAGE IN POST  
REHABILITATION SCENARIO**



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## ABSTRACT

Taunsa barrage was conceived in mid-thirties to provide weir controlled supplies to inundation canals in Muzaffargarh and D.G. Khan Districts and was constructed in 1954-58 across Indus River about 40 km south of Taunsa Town and about 16 km north on west of KotAddu Town with designed capacity of 1,000,000 cusecs.

It is in-fact a multipurpose barrage, providing irrigation facilities to 2.35 million acres in Muzzafargarh, DG Khan and Rajanpur districts, and feeds the TP link canal for supplementary supplies at Pajnadheadworks.

The barrage soon after its construction in 1958 started experiencing the multiple problems like ripping off skin concrete of the downstream floor (stilling basin), damage to friction blocks thereby adversely affecting the efficiency of the structure, retrogression of levels on the downstream and resulting problem of unsatisfactory jump formation and energy dissipation and limitation of head across; and malfunctioning of large number of pressure pipes, i.e. breakdown of monitoring system.

Barrage was rehabilitated by constructing a subsidiary weir at 925 ft d/s of the barrage, strengthening of stilling basin floor and replacement of old erratic piezometers with new ones.

This study focuses on verification and assessment whether Construction of a subsidiary weir raises the tail water levels adequately and results in satisfactory jump formation, the energy dissipation d/s of existing Barrage has improved, the performance of newly installed Vibrating (electronic) Piezometers and the comparison of designed residual pressure values and actually exhibited.

Necessary available data, literature and previous study reports were collected and analysed. To find the location of hydraulic jump, a grid of 2' x 2' was made on one of the pier of bay no. 61. The location of jump was physically observed at different gate openings for various discharges. The tail water levels for the year 2003 and 2010 was drawn on graph and obtained minimum retrogressed levels. Froude No. for different discharges was calculated to find out the efficiency of hydraulic jump and ultimately dissipation of energy. The residual pressure at each pile was calculated by taking present values from newly installed piezometers.

This study concludes that the sub-weir has raised the water levels in the stilling basin, d/s of the barrage to an extent that the jump formation is contained at or above the toe of the glacis which was the main objective for construction of the sub-weir.

The energy dissipation in the jump is related to the Froude no. of the super critical flow just before the jump. Before rehabilitation, the energy dissipation in the jump was limited to 19% but after rehabilitation, the value of Froude no. observed was 6.52 with an energy dissipation of 60%.

The observations for water levels shown by the piezometers and the calculation for residual pressures indicated by the piezometers with the designed values, showed that piezometer A (Exterior end of sheet pile at d/s end of u/s floor) has the residual pressure at  $\pm 52\%$  and piezometer F (Interior end of sheet pile at d/s end of d/s floor) has the residual pressure at  $\pm 2.7\%$  which indicate satisfactorily performance of newly installed piezometer.