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## Modeling the Mangla Dam Spillway for Cavitation and Aerators Optimization

PDF (Size: 872KB) PP. 1051-1060 DOI: 10.4236/jwarp.2012.412121

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### ABSTRACT

This study evaluated the effects of increased reservoir conservation level by 40 ft (12.2 m), on spillway velocities; its discharging capacity and associated cavitation risk. The study optimized the aerators size and shape to avoid cavitations. The mathematical model was used to estimate the flow velocities and cavitation risk, when scale model study assessed the spillway discharging capacity and optimized the performance of the aerators for modified conditions. The mathematical model simulations showed increased flow velocities and damage index for modified conditions. The damage potential was 2 - 3 times higher with modifications and falls within the major to catastrophic region. The scale model study showed that discharging capacity of the spillway can effectively be restricted to original design by raising spillway crest by 5.0 ft (1.52 m). The scale model study also showed that the two aerators near sluice and at the chute with an air duct pipe of 3.0 ft diameter can improve the free surface flow profile reducing the risks of cavitation. Simulations for several configurations demonstrated clearer affect of aerators ramps on flow trajectory and gate opening. It also depicted that the height of the ramp of sluice aerator has a positive effect on the flow performance to about 7.5 inches (19 cm), when further increase in the ramp height reduced the flow performance.

### KEYWORDS

Spillway; Model Studies; Discharging Capacity; Cavitation Risk; Aerators Optimization

### Cite this paper

M. Rafi, A. Ali, G. Qadir and R. Ali, "Modeling the Mangla Dam Spillway for Cavitation and Aerators Optimization," *Journal of Water Resource and Protection*, Vol. 4 No. 12, 2012, pp. 1051-1060. doi: 10.4236/jwarp.2012.412121.

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