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**AFTER 1973 FLOODS**

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## **PUNJNAD HEADWORKS AFTER 1973 FLOODS**

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Punjnad Headworks was constructed at a cost of Rs. 1.93 crores during the year 1928-32 below the confluence point of Chenab and Sutlej and was originally designed for discharge of 4.50 lac cfs. A higher discharge of 5,49,106 cfs in 1929 necessitated remodelling of the Headworks. An annex weir of 14 bays of 60 ft span each was added on the right to increase the design capacity to 7 lacs cfs. In August 1973, a highest ever recorded flood of 8,02,516 cfs was experienced due to combined high flood conditions in all the three rivers: the Ravi, Chenab and Sutlej. It caused breaches in the left and right marginal bunds at various locations which was mainly responsible for immense losses to human life and property, irrigation system, roads and railways. To save the important city of Rahimyar Khan, cuts were made in the main railway line, Sadiqia branch and other distributaries to spread the flood water in comparatively less developed areas. The flood water damaged the entire d/s floor of Abbasia canal regulator, the divide wall and bays No. 9 to 12 of Punjnad canal head regulator due to the swirling action of backflow.

The failure of the protection bunds was caused by many factors. Flood levels at the barrage exceeded the design levels due to accretion in the river bed. the modularity of Annex weir (bays 34-47) was poor due to river approach and it passed 163000 Cs against the designed capacity of 250,000 Cs. Shifting of the Sutlej and Chenab confluence close to the weir made the left half of the weir relatively more active while it caused masking of the Annex weir on the right. An exceptional rate of rise of flood water along bunds, their inadequate sections to cater for hydraulic gradient, and inherent weaknesses like clods and insufficient

compaction common to bunds constructed by donkey labour contributed to initiation of leakages at a discharge of 5 lacs Cs. The bunds had also remained dry and unsoaked for a decade. Severe wind & rain storm almost for the entire duration of the peak flood stage generated wave action, produced radial cracks along the bund slopes, and hampered the watching and repair operations. After the floods, various remedial measures were considered. To prevent shrinkage cracks, wetting channel along the downstream side of the bund was proposed. A board of chief engineers decided that the existing bunds having numerous weaknesses should be used as one bank of the wetting channel while the main flood embankment should be constructed afresh on the landside by properly compacting the earth at optimum moisture content. The section of the bund should have stable slopes and should fully cover the hydraulic gradient line rather than following the practice of fixed upstream and downstream slopes regardless of the type of soil. A second defence bund behind the left marginal bund was also proposed, with the area between the two embankments suitably divided into compartments by cross bunds.

Additional waterway is required to pass a 9 lacs cfs flood for a probability of 100 years. Unsatisfactory performance of existing annex was against providing yet another annex. The only alternative is the provision of a spillway regulator between RD 5-9 of the Right marginal bund. Further, during floods of 1955 and 1956 a deep channel alongside the junction groyne and close to the barrage had formed due to short length of about 300 ft of this groyne. A slight error in regulation could cause damage to the weir. Irrigation Research Institute proposed correction of the river approach by construction of two "Y" shaped spurs along with the extension of junction groyne. This proposal was not workable due to large river depths and consequent very heavy cost of spurs.

The primary task after the floods was to restore the irrigation supply in the Punjnad and Abbasia canals. The only option was to utilize the undamaged bays 1-8 of Punjnad regulator to pass limited supplies to both canals. The damaged regulator portion was cordoned off by stone bund. In October, with a low pond level, the two regulators were segregated with an earthen bund to permit improved independent working of these canals. Repairing the head regulators by construction of coffer dam to cordon the working area was found to be impracticable