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THESIS

STUDY OF SCOUR PHENOMENA UPSTREAM & DOWNSTREAM
OF V.R. BRIDGES OF B.S. LINK-I CANAL



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ABSTRACT

Pakistan is basically an agricultural country and all its resources depend upon the agricultural output. Water is evidently the most vital element in the plant life. The major part of Pakistan lies in the arid zone with scanty rainfall. For good agriculture it is essential that adequate quantity of water is made available at appropriate sowing, growing and maturing periods of crops, hence irrigation of agricultural crops is very necessary for the sound economy of Pakistan.

Pakistan's perennial irrigation system is the World's third largest system, irrigating 33 million acres with a total canal mileage of 58,500 km and discharge of 230000 cusecs. In addition a vast system of link canals had been constructed in 1960's, under Indus Basin Treaty, for transferring the water of western rivers to the canal systems which were used to feed by Eastern rivers.

Among the link canals B.S. Link-I Canal, off-taking from Balloki Headworks feeds the Sutlej Valley Project canals - Fordwah, Eastern Sadiqia, and Pakpatan Canal. Study area of B.S. Link-I canal lies in District Kasur from 30°-40' to 31°-20' North latitudes and 73°- 38' to 74° - 41' East longitudes and in District Okara from 30°-18' to 31°- 08' North Latitude and 73°-14' to 74° - 09' East Longitudes.

Scouring is the phenomena that occurs in the channel bed particularly where bridges or other hydraulic structures are constructed. This scour occurs because the

contraction in the bed width is made and flow area becomes smaller due to which velocity of flow increases that causes turbulence and eddies around the pier and abutment causing bed material to be transported away from the contracted section.

As B.S. Link-I canal from R.D. 0 – 73 + 250 is an earthen channel, the bridges between this reach are under scour. The present study is to observe the scour u/s & d/s of the selected five bridges. Existing scour u/s & d/s of these bridges are calculated with the help of the sounding plans for the last four years. Then the design scour u/s & d/s of the bridges is calculated with the following Design approaches:

- Lacey method (1930) Regime approach
- U.S.B.R. method (Expanded 1984) Regime approach
- Blench equation (1969) Recommended by U.S.B.R. (Regime approach)

This design scour u/s & d/s of the bridges mentioned above is compared with the existing scour and it is observed that:

- i) Lacey method (1930) is valid for the scour u/s & d/s of the structure in the earthen bed portion. The method is not only applicable but it is very safe for predicting the scour, giving higher value of scour depth than the anticipated scour value.
- ii) Blench equation is also valid for scour depth calculation as the Lacey method, Blench equation gives the value much more than the existing scour u/s & d/s of the bridges in the earthen bed portion. The reason is that Blench equation is developed for zero sediment flow (clean water). But B.S. Link-I canal has

sediment laden water and it gives less scour. So Blench equation does not give the results close to reality.

- iii) U.S.B.R. method (expanded 1984) gives the design scour depth very close to the existing scour u/s & d/s of the bridges of B.S. Link-I Canal.

So far as the existing scour of the channel B.S. Link-I u/s or d/s of all the bridges under study are concerned, U.S.B.R. method gives the results which are closer to the existing values. It is recommended that U.S.B.R. method may be used to calculate local scour in the B.S.Link-I canal, u/s and d/s of the bridges.