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**CONSTRUCTION OF RIVER
TRAINING WORKS ON THE
LEFT BANK OF RIVER
RAVI FROM BABU SABU
TO CHUNG, NEAR LAHORE**

S. MANSOOB ALI ZAIDI

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Sinuuous course traversed by the river Ravi in plains from Madhopur to Sidhnai Head Works keeps changing and new loops and short circuiting of the old ones takes place. According to Ingles and others meandering is triggered due to slope being either more or less than regime slope, sediment charge being in excess of its carrying capacity, and the irregularities in the channel section. It is generally accepted that meanders mover downstream the river maintains a limiting length of channal and width of Khadir for a particular alluvium. If certain conditions are stable the river is likely to attain a permanent regime; but since hydraulic conditions in river channels are never stable the permanent regime is never achieved.

A loop threatening an important salient is not to be left to itself lest it should erode the salient much before a natural cut off develops. Such a situation calls for providing an assisted cut off to afford protection to the important salient. Also earthen protrusions into the river belt with a protected leading nose called spurs can arrest erosion. Later Mole Head spur, Tee Head spur, Hockey spur and sloping spur developed. The J Spur developed by IRI in recent years is quite effective for most of the locations. A bund constructed in 1959-61 to protect Sharakpur Town on the right side of Ravi was extended in 1972 to tie it with Shahdara Distributary. During 1973 floods, due to breach in the extension the river flows entered the rear of the bund. Sharakpur Town was once more under threat. In 1974 and 1975 the river was

diverted to its pre 1973 course and two spurs were constructed without model tests, to hold the river away from the bund. But in 1976 the river started eroding its left bank opposite the villages from Jhuggian to Chung. The off shore plains opposite many villages were completely eroded off. Part of Meharpura and Manowal were washed away in the 1973 floods and developments of embayments towards Multan Road and erosion of fertile cropped land and properties continued. This posed a threat to the National High Way, important industries and developing townships. A fresh river survey and model studies were ordered to evolve training works required to hold the river in its prescribed course. A model was setup according to the fresh surveys on 1 : 200 horizontal scale and 1 : 25 vertical scale at Field Research Station Nandipur. River stretch between 1.5 miles upstream and 18 miles downstream of Shahdara bridge including existing works was represented on the model. The training measures as indicated by the model study include;

- (i) Cunnette No.1 (5500' long, 100' wide and 10' deep) across the neck of the river v. bend facing Kharak and Meharpura
- (ii) Bye pass road cum flood embankment connecting the existing bund road with Muridwal and Multan road
- (iii) J spur No.1 with 4363' length of shank tied to RD 5500 of the new extension bund road
- (iv) L bund (mole spur) tied to new extension bund road near RD 10600
- (v) J spur No.2 with length of shank 4562', abutted to river bluff near Niazbeg after development of the proposed cunnette and shift of the river towards Multan Road

The measures constituted a package solution for providing adequate protection against floods. If these works were not to be completed in one season, the cunnettes and J spur near Niazbeg may be constructed in the 1st season and the remaining works in the 2nd season. The works required to protect Multan Road and villages comprise cunnettes No.2 and 3, J Spur No. 3 crossing the river and abutted to the high

bluff of the river near Chung and a mole spur tied to the downstream side of this J spur. These measures also formed a package solution to be constructed in one season. The design of apron for J spurs catered for the maximum scour likely to occur on training works constructed along river Ravi. After these recommendations, detailed survey was conducted for various training works and the estimated cost came to Rs. 75.66 million.

The project was taken up by the Lahore Development Authority under a Directorate established with staff from Irrigation Department. Tenders for execution of 1st phase were received and after evaluation the work was allotted to Mechanized Construction of Pakistan (MCP). The 1st phase included construction of 6500' long Tie Bund in extension to Lahore Protection Bund from Babu Sabu to the edge of the first channel of the main river, a J spur anchored to Tie Bund and an assisted cut-off across the neck of first loop of the river.

The construction of Tie Bund, shank of J-spur No.1 and excavation of cunnette NO.1 were started. The intake of the cunnette was bell mouthed and its width reduced from 300' to 100' in 500' length. The average depth of 11' of the cunnette was based upon winter water level. The cunnette was completed in May while the other two works in July, 1979. The cunnette developed rapidly and took about 90% of the river discharge in June. As a result of execution of above works, Mian Mir storm water drains No. 1 and 2 and regulating structure at Banu Sabu were re-located. A bridge and a culvert had to be constructed.

After flood season of 1979 the work on the first component of Phase II i.e. J spur No.2 was started. Cunnetts No.2 and 3 were completed before December, 1979. The work on J spur NO.2 and the remaining portion of Tie Bund were completed in May next year. The Diversion Bund in the Main River Channel and two small bunds were constructed in the old river creek. River discharge of 1200 Cs was diverted into cunnette No.2 by closing the final gap of 70' in the Diversion bund. Within 4 weeks of commissioning, these cunnettes enlarged to about 2.5 times the initial capacity. Due to diversion the deep channel near chung was abandoned by the river and was later closed to complete the work of J spur No. 3. The mole head spur emanating from RD 2500 of this J spur was also completed simultaneously. The mose of L Bund at RD 10600 of Tie Bund was converted into a stone protected mole.

These works were completed in time and stood the high flood on 17.7.80. All the cunnettes developed to the desired extent to carry the discharge. During the construction of these works compaction and soil testing was done by a soil Laboratory set up at site.

Apart from protection afforded to villages Kharak, Meharpura, Shadiwal, Hanjarwal, Niazbeg, Mohlanwal and Chung 8000 acres of fertile land was saved from floods. Lahore, Multan Highway, industries along side, developing townships and future housing colonies between the Road and the Tie Bund also stood protected.

Note :

Paper No 456 appears in the Proceedings of the Engineering Congress, Vol. LVIII, 1982, at pages 324 to 371. There are 4 tables, 10 photographs and 9 figures. The interested reader for further details may refer to the original paper.