M.TECH (HYDRAULICS AND WATER RESOURCES ENGIEERING) DEVESH TYAGI 2018

STUDY OF SCOURING USING DIFFERENT CONFIGURATION OF L-SHAPED GROYNES IN OPEN CHANNELS

A DISSERTATION

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OF

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IN
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CANDIDATE'S DECLARATION

I Devesh Tyagi, Roll no.2K16/HFE/07, student of M.Tech (Hydraulics and Water Resources Engineering) hereby declare that the project dissertation titled "Study of Scouring Using Different Configuration of L-shaped Groynes in Open Channels" which is submitted by me to the Department of Civil Engineering, Delhi Technological University, Delhi in partial fulfillment of the requirement for the award of the degree of Master of Technology, is original and not copied from any source without proper citation. This work has not previously formed the basis for the award of any Degree, Diploma Associateship, Fellowship or other similar title or recognition.

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CERTIFICATE

I hereby certify that the Project Dissertation titled "Study of Scouring Using Different Configuration of L-shaped Groynes in Open Channels" which is submitted by Devesh Tyagi, Roll no.2K16/HFE/07, Department of Civil Engineering, Delhi Technological University, Delhi in partial fulfillment of the requirement for the award of the degree of Master of Technology, is a record of the project work carried out by the student under my supervision. To the best of my knowledge this work has not been submitted in part or full for any Degree or Diploma to this University or elsewhere.

Place : Delhi

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ABSTRACT

Groynes are the hydraulic structures extended laterally from banks of the river channel in to the main flow. The principal uses of groynes are as river training structures to centralize the main channel and providing protection from erosion to stabilize the river bank. They deflect or attract the flow away from the bank or toward the bank depending upon the concerned direction of their installation. Based on the shape of spur dikes in plan, different kinds of spur dikes can be recognized for eg. “straight”, “T-shaped” and “L-shaped”. So far a good number of works have been devoted to the study of “straight” spur dikes mainly aimed at investigating sediment erosion around them. There is however an absence of sufficient published works about the study of sediment transport around the “T-shaped” and “L-shaped” groynes specially when they are provided in a series. This study was aimed at better understanding of the applicability of the L-shaped groynes in providing protection from local scour in the channel and to distinguish the pattern of sediment uplift and deposition due to variation in flange portion of the groynes.

A physical model of a river channel was constructed in the Hydraulics Laboratory of Delhi Technological University. The model consisted of a sand bed laid out in a hydraulic flume and a series of groynes models made up of wood, placed to determine the trend in scour pattern around them. Three different forms of L-shaped groynes were used in the study with the basic difference in the projection of flange portion only. Spacing and projection length of groynes were taken as per Indian Standard-8408:1999 as they play an important role in the uplift of sediment particles in groyne field.

A digital velocity meter was used to measure the velocity during the test runs. Sand used for imitating the river was analyzed for its particle size distribution and a subcritical flow was maintained through out the test run. It was observed that keeping the flange centrally symmetric with the web protects both the upstream and downstream portion of the channel and only the region at the tip of groynes faces a threat of the scouring.

For the groynes with flange portion completely towards upstream direction, the upper reaches of the channel will face the erosive action of the flow and latter part of the channel will be quite stable against the scour. Lastly with the flange portion in downstream direction the scour will be higher towards the downstream direction and the upper reaches of the channel will remain protected. One more important point was observed that magnitude of scour was highest for the groynes in which the flange portion was towards the downstream direction and lowest for the upstream ones.

Conclusively it is stated that configuration of flange does affects the scour and creates obstruction for the flow which results in the increased scour along the direction of flange in the channel. It has been concluded that positioning of flange plays major role in scouring pattern. For protecting the upper reaches of channel, flanges should be provided towards downstream direction and vice versa.

By the use of the data of the present experimental work a basic outline has been formulated for providing the L-shaped groynes in open channel which is satisfactory as per the earlier works.

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ABBREVIATIONS AND SYMBOLS

TG - Groynes with Flange portion in center

LU - Groynes with flange portion towards upstream

LD - Groynes with flange portion towards downstream

Fr - Froude's number