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Advancement in Scour Protection with Flexible Solutions: Interpretation of Hydraulic Tests Data for Reno Mattresses in Open Channel Flow

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Abstract : Water hazards are consistently identified as among the highest global risks in terms of impact. Riverbank protection plays a key role in flood risk management. For erosion control and scour protection, flexible solutions like gabions & mattresses are being used since quite some time now. The efficacy of erosion control systems depends both on the ability to prevent soil loss underneath, as well as to maintain their integrity under the effects of the water flow. The paper presents the results of a research carried out at the Colorado State University on the performance of double twisted wire mesh products, known as Reno Mattresses, used as soil erosion control system. Mattresses were subjected to various flow conditions on a 10m long flume where they were placed on a 0.30 m thick soil layer. The performance against erosion was evaluated by assessing the effect of the stone motion inside the mattress combined with the condition of incipient soil erosion underneath, in relationship to the mattress thickness, the filling stone properties and under variable hydraulic flow regimes. While confirming the stability obtained using a conventional design approach (commonly referred to tractive force theories), the results of the research allowed to introduce a new performance limit based on incipient soil erosion underneath the revetment. Based on the research results, the authors propose to express the shear resistance of mattresses used as soil erosion control system as a function of the size of the filling stones, their uniformity, their unit weight, the thickness of the mattress, and the presence of vertical connecting elements between the mattress lid and bottom.

Keywords : Reno Mattress, riverbank protection, hydraulics, full scale tests
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