

ENHANCED METHOD OF PARTICLE IMAGE VELOCIMETRY APPLIED TO MEASURE THE SCOUR PHENOMENA IN BRIDGE PIERS

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ABSTRACT

In this work is reported an enhanced methodology of the particle image velocimetry (PIV) developed to measure the velocity of soil particles in real time with the purpose to study and analyze in high detail the phenomenon of scour in piers of bridges. It was used a lab model representing a pier of bridge by using a cylindrical bar inside of a rectangular water channel with transparent walls, provided with an electric pump to create a controlled water flux. A layer of selected white sand was deposited on the bottom of the water channel in order to simulate a flow of a mixture of water and soil impacting over the cylindrical bar representing the pier of bridge. The movements of particle in the flux of fluid lit by a sheet of light layer was recording in video format using a high resolution camera with an acquisition velocity of 164 images per second and caption of 404 x 244 pixels. From the videos acquired were obtained the velocity vectors of soil particles in the water flow which originate the scour effect in the bridge pier using specialized software. These velocity vectors of soil particles were used to represent graphically in real time the scour velocity distribution that occurs at the moment of erosion of soil at the bottom of pier. One of the remarkable results of this research shows the presence of an oscillatory movement of water flux around the cylindrical bar, representing the pier of bridge, which originates fatigue to the soil particles in direct contact with the water flux leading in this way to erosion.

KEYWORDS: Bridge Piers, Erosion, Scour, Particles Image Velocimetry