Study on Structural Characteristics Changes on the Irregular Wave Transmission Thorough Reshaping Breakwaters

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Abstract

In this research the irregular wave transmission from reshaping rubble–mound breakwaters have been investigated. Reshaping breakwaters are recent development in breakwater design, which their initial profiles are changed to a (s) shaped after wave impact. Therefore, the usual relations for transmission coefficients on conventional breakwaters cannot be used for this type of structure.

A comprehensive experimental research was carried out for many sections of reshaping breakwaters with three different slopes in SCWMRI wave flume equipped with a DHI wave generation system.

The hydraulic responses of wave transmissions were investigated by changing the wave parameters such as significant wave height, mean and peak wave period and storm duration on three seaward slopes (respectively 1:1.25, 1:2.0, 1:2.5). JONSWAP wave spectrum was used in all experiments. The armor layer materials were used in three grading class (D_{n85A}/D_{n15A}=1.14, 1.44, 1.82) and a range of structural permeability, P_e $(1 \le D_{n50A}/D_{n50C} \le 20)$. In order to change structural geometry, wave properties and other variables, 100 tests were carried out with 1000 to 6000 waves.

The experimental results showed the relation between transmission coefficients and the new parameter R*. An improved and new relation was achieved using multiple linear regressions.

Keywords: Experimental modeling, Irregular waves, Reshaping breakwaters, Rubble mound, Wave transmission.

Experimental Study on Some of Design Parameters Affecting the Hydraulic Behavior of Three-Sided U-shaped Spillways

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Abstract

Three-sided spillways are used in dams as well as in irrigation networks, and water and wastewater treatment plants. In this study, the effect of some major parameters on hydraulic behavior of flow in a three-sided U-shaped spillway and its side channel was evaluated using a physical model. The effect of changes in the end-sill height, the distance of the end-sill from the beginning of the side channel, and the side channel slope with different discharges were studied. Flow pattern and pressure fluctuations in the channel were considered as an indication of the flow behavior. Results showed that the end-sill height had the greatest influence on the intensity of pressure fluctuations and flow behavior in the side channel and increase in the end-sill height, decreased pressure fluctuations. Results also indicated that the location of end-sill from the beginning of the side channel, did not have considerable influence on pressure fluctuations. Moreover, increase in side channel slope up to about 3 percent decreased pressure fluctuations. However in slopes beyond 5 percent, pressure fluctuations increased again. Negative bed slopes decreased pressure fluctuations in the side channel considerably. It was also concluded that increase in flow discharge improved the flow condition in the side channel.

Keywords: Spatially Varied Flow, Three-Sided Spillway, Pressure Fluctuations, U-Shape Spillways, Hydraulic Performance.