



Effect of breakwater geometry on wave reflection from perforated-wall caisson breakwaters

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Abstract

This paper describes results of numerical study on wave reflection from perforated-wall caisson breakwaters. There are basic parameters defining the geometry and shape of a perforated-wall caisson breakwater such as: wave chamber width, thickness of perforated wall, and the degree of porosity.

In this study the effect of geometry of caisson structure on reflection of irregular waves are presented. A numerical code was developed to model wave reflection from perforated breakwater in MATLAB. Small-amplitude wave theory has been used to simulate the behavior of irregular waves reflected from caisson breakwaters having different geometries. The results show that shape and size of slits have great role on damping and absorbing of incident wave energy.

Introduction

Breakwaters are used in the harbors to prevent propagation of high energy waves into the basin in order to make a calm area for wharfing of ships and beach protection. Perforated-wall caisson breakwater is a kind of precast breakwater widely used for this reason. They are classified into one or multi perforated vertical walls each of which has its own advantages and disadvantages. Conventional caisson breakwaters are less effective regarding to wave reflection. In other words, the reflected waves have high energy and therefore the breakwater must resist under high impact loads due to impulsive wave forces. Overtopping is also a common phenomenon that leads wave transmission in conventional breakwaters.

Fig. 1-a shows the scheme of a complex type breakwater with conventionally non-perforated wall caisson. A typical fully perforated wall caisson breakwater is also depicted in Fig. 1-b.

A caisson breakwater consists of a front wave chamber and a rigid back wall. The water has the same depth inside the wave chamber and in the bedding layer in front of caisson. The geometry of wave chamber and slots has great effect on wave reflection and the corresponding wave force on the breakwater. In this study the effect of geometry on reflection behavior of irregular waves is investigated.