ABSTRACT

Physical model tests of wave pressures on sloped perforated seawall were carried out. The hydrodynamic performance of sloped perforated seawall were investigated. Waves of wide range of heights and periods and seawall with different inclinations were used. Tests were carried out for a constant water depth of 0.5 m. The dynamic pressures due to waves exerted on a sloped perforated seawall model are measured. In addition, the wave run-up on the model are measured in the test. The effect of porosity on the above stated variables were analyzed in this paper. The results on the variation of the frequency pressure spectra are reported.

KEY WORDS: seawall; porosity; wave run-up; wave pressure.

INTRODUCTION

Sloped seawalls are mostly designed for coastal protection by withstanding the attack of waves and dissipate the wave energy. In seawall design, the maximum wave run-up height significantly affects the design of seawall crest. The effective wave dissipation on the sloped face is of considerable interest to coastal engineers since it determines the construction and the investment of seawall. Several efforts have been spent to properly design and construct seawalls. Different modifications of seawall design have been proposed. The porous structures is one such modification which is first introduced by Jarlan (1961). Marks and Jarlan (1969) demonstrates that a perforated caisson gives less reflection and wave overtopping compared to classical caisson. This kind of structures involving wave energy dissipation by porous body have been developed and studied by number of researchers. Much research has been carried out on hydrodynamic characteristics on these structure. Some researchers performed a series of laboratory experiments to investigate hydrodynamic performances of perforated structures (Jamieson and Mansard, 1987; Neelamani et al., 2000; Tabet-Aoul and Lambert, 2003; Liu et al., 2008). Takahashi and Shimosako (1994) confirmed the effect of a perforated face on reduction in pressures exerting on the structure. Neelamani and Sandhya (2003) introduced dentated and serrated face. There is few studies carried out on wave run-up and wave pressure exerted on a perforated sloped seawall. The frontface of the proposed structure is given in Fig. 1. This new structure is tested by means of a physical model and the resulting positive dynamic wave pressures and wave run-up are evaluated in terms of dimensionless parameters. In this paper, laboratory experiments were carried out in wave flume to examine the effect of porosity on wave energy dissipation for the given wave condition. The results are discussed in comparison with a plain-faced ordinary sloped seawall.

MODEL SET-UP AND TEST PROGRAMME

The wave experimental investigations were carried out in the wave flume of 80m long, 0.8m wide, 1.2m deep, the effective width of test section is 0.5m. The effective test part was equipped with structure section; another part was employed to diffuse the second reflection wave energy. Waves were generated by a piston-type paddle at one end of the flume. In order to mitigate wave reflection on boundaries, mild slope were laid at two end of the flume. Water depth at the seawall model was 0.5m. The slope of seawall in test is described as m of 1:1.5, 1:2, 1:3. The test covered a range of wave conditions (JONSWAP Spectra, significant incident wave height 0.08m, 0.1m,0.12m, 0.14m, 0.16m, mean incident wave period 1.2s, 1.4s,1.6s, 1.8s). The porosity of the slope face were 0, 15%, 25%, 35% . Each group of tests was repeated 3 times so that the reliability of the measured data could be guaranteed.

The positioning of the pressure transducers are shown in Fig.3. The wave pressure analyzed in this paper is positive dynamic pressure recorded by positive pressure transducer. The sampling time interval of data acquisition was 1/125s. The capacitance type wave run-up meters were used to measure the water level oscillation along the slope of the structure; the measured data were collected, recorded and analyzed by computer and the sampling time interval of data acquisition was 0.05s. The materials of seawall are quarried rock. The armour layer of the seawall were made of concret plate with different porosities.