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A Study for Wave Absorbing Effect of Submerged Breakwater

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ABSTRACT

The land reclamation area of Saemangeum in Korea is located between 126°10′E ~ 126°50′E and 35°35′N ~ 36°05′N at the western coast of the Korea. The 33 km sea dike and 40,100 ha reclamation area is being constructed in the Saemangeum area in Korea. Such large-scale coastal land reclamation project will certainly influence the marine environment and ecosystem in this area.
It is necessary that the submerged breakwater could minimize and compensate the negative impacts in the marine environment and ecosystem caused by the marine construction. The submerged breakwater can function as a artificial fish reef and disaster prevention of the coast.
The purpose of the study is to investigate hydraulic characteristics by change in the crest width, wave transmission, and porosity in case of permeable, impermeable, and horizontal plate submerged breakwater.

Keywords : Submerged breakwater, porosity, transmitted wave height, horizontal plates , artificial fish reef.

INTRODUCTION

Recently, the importance of the preservation of natural environments and the development of Water-Front has been emphasized. However, coastal structures, i.e., conventional breakwaters, which were constructed from the sea bottom to the sea surface, could deteriorate water quality by blocking the exchange of seawater. Therefore, the submerged breakwater, which has better performance for coastal environments and ecosystem conservations, has been preferred and researched. The reclamation area of Saemangeum has a range of 5.6m spring tide and the maximum tidal current speed is about 1.41m/sce in ordinary spring tide. Most of the sediments deposited on the tidal flats are transported from the Geum river, the Mankyung river and the Dongjin river. The soil in this area consists of silt sand with the depth of 10m to 30m**.** The wind in winter is strong from the direction of northwest. In the past twenty years, land reclamation projects for agricultural purpose or industrial complex have been mostly implemented along the western coast of Korea.
Shin (1999) introduced the on mitigation for the anti-function of development in caused by Saemangeum reclamation in korea. The temperature of sea surfaces is rising by global warming, which makes the typhoon strengthened and the risk of the typhoon disaster is also being enlarged. For example, typhoon Maemi in 2003, which caused storm surge and did high damage to the coast at Busan and Masan.
Saemangum sea land reclamation project is being executed. The length of sea dike is 33 km and the area is 40,100 ha. This big project increases the probability of the collapse of a sea dike by natural disasters of typhoon and storms Reducing the natural disaster and the reverse function of the development became the new topics to challenge for coastal engineers.

In this study, we propose the submerged breakwater as the alternative wave decrease structure which overcome the disaster and the reverse function. We examined the transmitted wave height for several porosity of the submerged breakwater. We also examined the transmitted wave height for multiple horizontal plates. The purpose of this study is to investigate the energy-reducing efficiency corresponding to the porosity and the shape of the submerged breakwater. We also developed the submerged breakwater which can be utilized as a wave dissipating structure and artificial fish reef.

Wave Dissipating Characteristics by Porosity

Experiments

In order to consider the porosity which affect the permeability of the submerged breakwater, we used glass beads which have diameters (porosities) of 1.6 cm (36.2%), 3.0 cm (44.2%) and 6.0 cm (50.9%), TTP of which porosity is 50.6%, the fishing bank and the submerged breakwater of horizontal plates of which porosities are 65.0% and 75.0%.

Wave Generator

The experimental tests were conducted in the wave basin at the coastal engineering laboratory in Kunsan National University, Korea. Specifications of wave basin were given by table 1. The wave generator is operated as to absorb the reflected wave.