

Harbor Tranquillity Analysis for Cheonha Harbor, Korea

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ABSTRACT

Harbor tranquillity analysis is performed in order to suggest a counterplan to reduce the average wave height around the Quay-11 in Cheonha harbor, Korea, to less than 0.5m. For this analysis, a short period wave analysis program based on the Boussinesq equation is used. The shoaling, refraction, diffraction and partial reflection, of irregular finite-amplitude waves propagating over complex bathymetry are considered. From the results of numerical simulation, it is found that the effect of reclaimed land is almost not appeared. However, a new breakwater in front of the reclaimed land as the counterplan in this study makes the average wave heights on the sea area around the Quay-11 to be less than 0.45m. Therefore, it may guarantee the safety of vessels and improve the work efficiency.

KEY WORDS : harbor tranquillity, irregular, porosity, sponge layers
Boussinesq equation, average wave height

INTRODUCTION

Wave disturbances in harbors are important for ship berthing and cargo loading and must be considered when harbor designers are to select construction sites and determine the optimum harbor layout. Guaranteed harbor tranquillity is not only essential for safe anchorage, but it is also important for efficient port operation. Generally, most hydraulic model tests of harbor tranquillity are still performed by measuring the distribution of wave height in a given harbor layout and comparing various harbor layouts by means of either the absolute magnitude of wave height or its ratio to the incident wave height. A small vessel may be violently moved by even small wave height whereas a large ship may not feel wave agitation. Thus a basin for small crafts must be given maximum protection against incoming waves. Thus harbor tranquillity needs to be judged from the viewpoint of ship motions.

The purpose of this study is to provide a counterplan that the average wave height on the sea area around the Quay-11 for small vessels can be reduced to less than 0.5m. Short period wave simulation for harbor tranquillity analysis is carried out using MIKE 21 BW (DHI,

1995) which is based on Boussinesq equation. The results of wave height distribution in harbor are compared between with and without reclaimed land. Furthermore, the influence of a new breakwater as a counterpane suggested in this study to reduce wave disturbance on the sea area around the Quay-11 is also included.

CHEONHA HARBOR

The harbor of Cheonha, where wave simulations were performed in this study, is situated in the HHI (Hyundai Heavy Industries), the South East coast of Korea. Fig.1 shows the topography of Cheonha harbor whose average water depth is about 10m and area is about 430,000 square meters. It consists of six quays and five dry docks. Most of quay walls are vertical walls of cell or concrete block type. There were north breakwater (200m long) and south breakwater (70m long) as outer breakwaters. At present, however, the area in front of the north breakwater has reclaimed. Except the Quay-11 for small vessels, large vessels are moored at most quays for a series of works for outfitting.

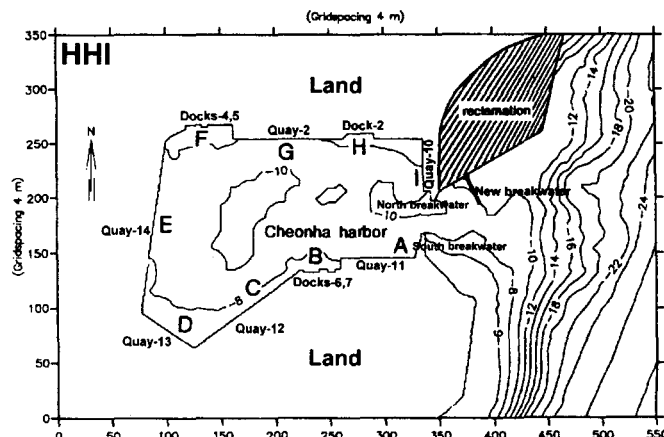


Fig. 1 Topography of Cheonha harbor