

ANALYSIS ON FAILURE CAUSES OF DOCK DUE TO ABNORMAL WIND WAVES

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INTRODUCTION

In a coastal area where the water depth changes rapidly, waves developed in the offshore propagate to the coast, with a massive energy without any dissipation. Particular attention should be paid to the occurrence of damage in an island, where the land is open towards the ocean, in the event of abnormal wind wave, and design of structures in such region requires thorough examination.

FIELD INVESTIGATION

The southern and northern coasts of Hongdo Island located in the western coast of South Korea face the ocean side, and are directly affected when a typhoon or a high wave occurs. Therefore, structural damage due to wave generation frequently occurred in the coasts, and repair and reinforcement work were carried out several times. In particular, the high wind wave generated in August 2016 caused large-scale damage to the dock located in the north side of the island (Fig.1).



Figure 1 - Scene of Wave Action (L) and Damage Occurrence (R) at Hong-Do Island, Korea

HISTORY OF REINFORCEMENT WORK

The dock constructed in 1995 has the block-type structure. Several repair works were carried out to repair damage by high waves and typhoon attacks. In particular, large-scale reinforcement work was carried out due to the damage caused by the typhoon that occurred in 2015. However, additional damage occurred due to the high wind wave generation within less than 6 months after the reinforcement work.

HYDRAULIC CHARACTERISTIC INVESTIGATION

Various methods were attempted in order to investigate the mechanism of structure destruction due to wind wave attack. At first, in order to estimate the wave at the time of the damage, the wave in the past was hindcasted through the wave observation data obtained from wave

buoy and through a correlation analysis. The wave field and damage status in the shallow water were reproduced through the hydraulic model test. In the 2D model test, the wave pressure and structural stability under the condition at the time of the damage were examined. The damage characteristics were also investigated with the topography, wave direction, and structure installation condition as parameters, through the 3D model test (Fig.2).

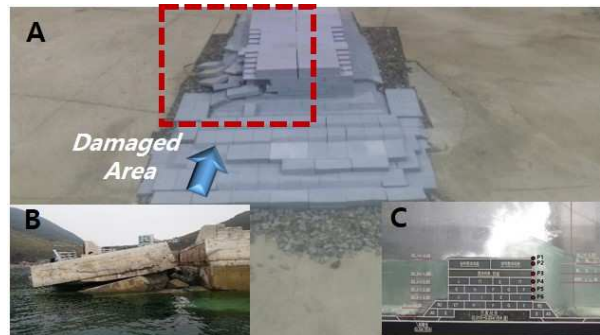


Figure 2 - Analysis of Damage Causes (A: Stability test in the 3D- wave basin, B: Damage section in the real site C: Wave pressure test in the 2D-wave flume)

FAILURE MECHANISM ANALYSIS

The failure mechanism of the dock structure was confirmed by 2D and 3D hydraulic model tests. The exfoliation and reduction of frictional force due to reinforcement work repeated over the years were also found to affect block displacement.

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