

Research Trends and Results

Main Points of Experiment Manual for Hydraulic Model of Artificial Reef Armor Blocks

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1. Relationship with "Artificial Reef Design Guide"

Artificial reef is a submerged mound-type structure that applied the phenomenon that waves are broken when the depth of water is shallow and wave height is lowered. Although "Artificial Reef Design Guide" (the "Guide") was published, there was no manual that described the standard experiment method concerning the stability of armor blocks. Then, we decided to create this manual to supplement the items of stability review for armor blocks described in the Guide.

2. Characteristics of "Armor block hydraulic model experiment manual"

(1) Provision of disaster criteria for artificial reef armor blocks

If even a single armor block constituting an artificial reef is dispersed, adjacent blocks and mound material may also be dispersed in a chain reaction, and the target performance of artificial reef is highly likely to be lost immediately. Then, we defined the disaster standard for "armor block works" of artificial reef as disaster to a single armor block. Further, we decided to create a chain of damage diagram as shown in Figure 1 for each type of block by observation from side and above. This will serve as a useful material in on-site inspection to be conducted when hit by high wave.

(2) Conditioning for final positioning of hydraulic model experiment

The Guide recommends checking stability by hydraulic model experiment.

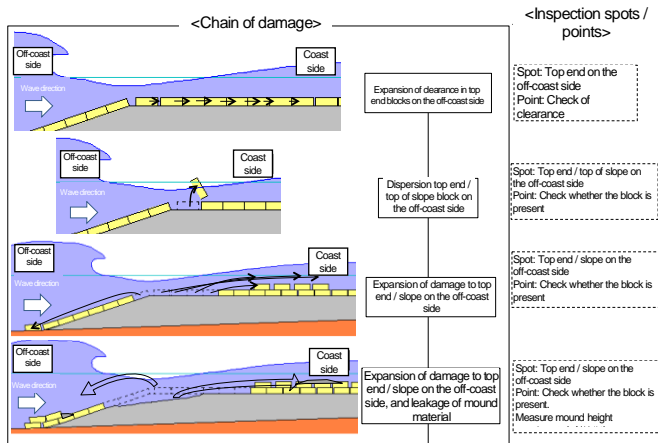


Figure 1. Example of Chain of Damage Diagram Prepared According to Blocks

The design using the weight calculation formula can be interpreted as advanced implementation of this hydraulic model experiment. Based on this, we defined experiment conditions that can generally cover site conditions. The depth of installation was defined to be within the breaker zone, which is close to actual condition, since artificial reef is often installed with the depth at which a complicated hydraulic phenomenon, i.e. breaking waves off the artificial reef (Figure 2). This is also included in the scope of application of this manual. The sea bottom slope is set to 1/30 as the representative value for the coast of Japan. For the wave height and cycle, which are external force conditions, wave steepness is set based on the design wave of the coast facing an open sea.

Further, in order to position hydraulic model experiment as precursor experiment, we improved accountability by showing the conditions validated in the experiment, calculation line of stability factor, and experiment results so that block selectors may be able to confirm the experiment.

3. Aiming at artificial reef hard to suffer damage

This manual is to be published as Technical Note of NILIM in fiscal 2015. Actually, some artificial reefs have suffered damage, so we expect this manual to contribute to elimination of disaster.

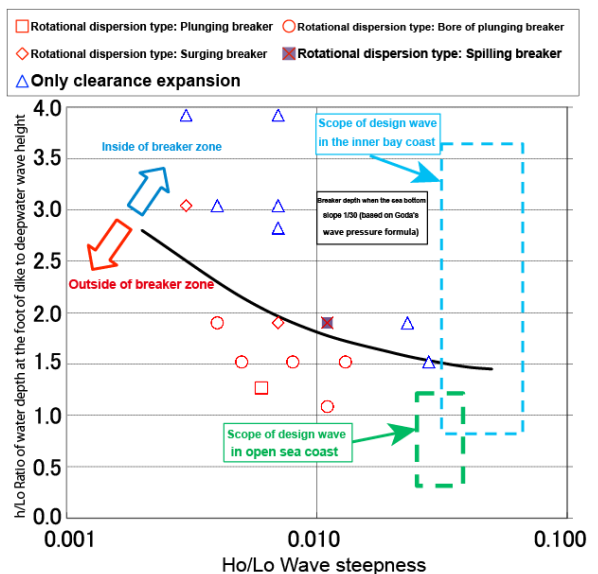


Figure 2. Relationship between Block Damage Form and Wave Breaking