Aiming to Prevent Scattering of Armor Blocks in Artificial Reef

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Key words: artificial reef, armor block, necessary weight, hydraulic model experiment, irregular wave

1. Potential stability problem with the armor blocks of artificial reefs

Artificial reef consists of mound works, which constitute the main part of the levee section, and armor, which prevents deformation of the levee, and is designed in accordance with the "Artificial Reef Design Guide" (revised version)" [1)] ("Guide" (revised version)". However, there are cases where the concrete armor blocks are scattered by waves smaller than the design wave. This would be caused by waves with high flow rate generated when long period waves are broken, which scatter the blocks. For this reason, it has become necessary to check the stability to long period waves.

In addition, when the shape of armor blocks differs, stability against scattering also differs. Accordingly, the weight of blocks required also differs according to the shape of blocks. The designer calculates necessary weight by applying the stability number provided by the designer for each block shape following the procedure shown in Figure 1 to the formula. However, the Guide (revised version) provides neither the experiment method for calculating "stability number" nor standard movement of blocks on which damage is determined (damage judgment criteria), experimenters have different ideas. In such circumstances, it has been an issue to standardize experiment methods in order to enhance the reasonableness of explanations well.

2. Aiming that anyone can conduct a reasonable experiment

Aiming to solve the foregoing issue, we published "Hydraulic Experiment Manual for Wave Stability Evaluation of Artificial Reef Armor Blocks." [2)] This Manual introduced the following three experimental conditions. 1) Use "irregular waves" modeled with local sea waves (Fig. 2a). 2) Cover long period waves based on the condition of local site (Fig. 2b). 3) Experiment under the same settings without using experiment sand (Fig. 2c). In addition, the Guide provided for the specification of damage judgment criteria, entry of experiment results in the stability number calculation chart, etc. Provision of these items is expected to improve the reliability in selecting block shape.

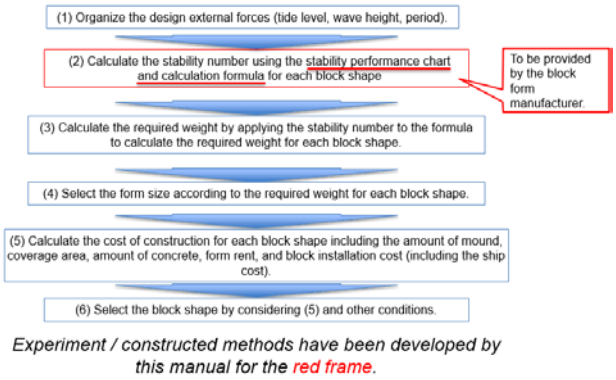

Figure 1: General procedure for block shape selection

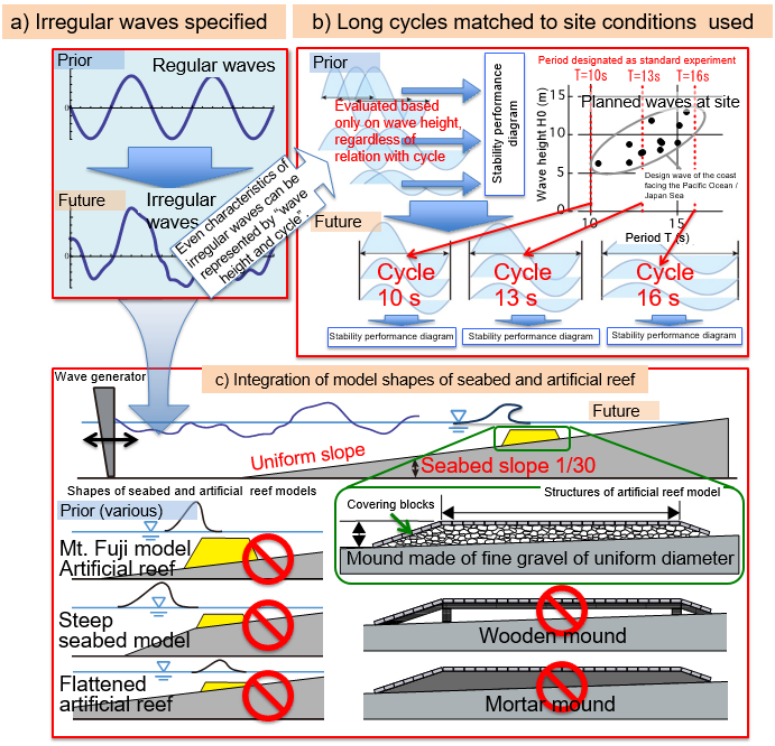

Figure 2: Three experimental conditions designated by this Manual

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☞**See the following for details.**

1) "Artificial Reef Design Guide" (revised version), 2004, supervised by Seacoast Division, River Bureau, MLIT and Coast Division, NILIM

2) SUWA Yoshio, NOGUCHI Kenji, NAKAMURA Eisuke (2016) "Manual on Hydraulic Experiments to Evaluate the Stability of Artificial Reef Blocks against Waves" Technical Note of NILIM, No. 927, http://www.nilim.go.jp/lab/bcg/siryou/tnn/tnn0927.htm