

## Design and Verification of High Stability Wave Dissipating Block

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### Introduction

Larger size blocks or more stable blocks are required because design wave heights may become larger in future due to stormy condition by climate change. But, blocks whose weights are larger than 100 tons are not realistic from the viewpoint of safety and so on. Therefore, higher stable wave dissipating block is required to reduce its weight and size.

This study designed a new shape block with high stability. In the design of block, “space occupancy ratio in a cuboid (SOR)” was taken into account to categorize characteristic shape of block (Fig.1). The stability number of new block was examined and formulated by hydraulic experiments, and the economic efficiency of using the block was evaluated.

### Method

The SOR of several existing blocks was calculated, and the relations among shape, number of leg and so on were examined. By this examination, the desirable shape of block was obtained, and a new block model was proposed here.

Hydraulic experiments were conducted in a wave flume at Ujigawa O.L. A caisson breakwater model, covered with 5 to 6 layers’ blocks with rubble stone filling, was set up on a flat sea bed. The input waves were random waves with the Bretschneider-Mitsuyasu spectrum.

### Conclusion

Based on the considerations, 3-3 type block was designed with three legs at the end of the axis (Fig.2). Results of experiments, it was found that the stability

of 3-3 type block is quite large compared with existing wave dissipating blocks. The stability number  $K_D$  is 20.6. The required block weight can be reduced proportionally by using large  $K_D$  value block when it is applied to the high wave regions. Since the void ratio of new block is also large (63.5%), the total install number of blocks can be decreased compared with the Dolos ( $K_D=20$ ). It contributes to the resource saving and economical efficiency (Fig.3).

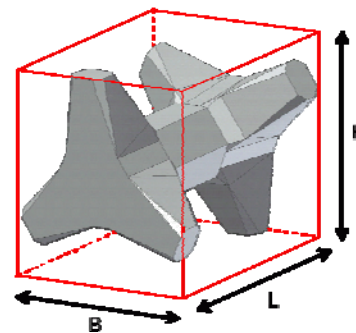


Fig.1 The space occupancy ratio of block in a cuboid (SOR)



Fig.2 Newly designed block (3-3 type block)

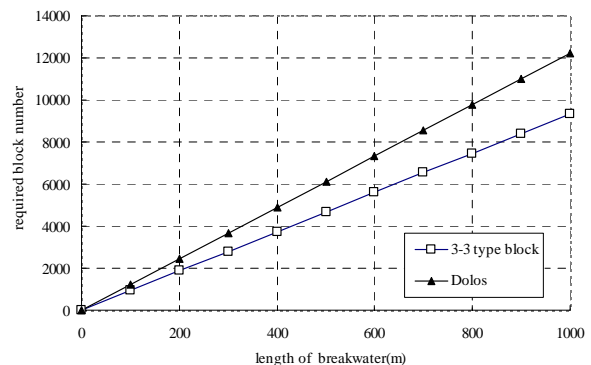


Fig.3 Necessary amount of blocks