LARGE SCALE MODEL TESTS ON WAVE RUN-UP AND OVERTOPPING ON RUBBLE MOUND BREAKWATERS

Introduction

The main objectives of the present project are firstly to investigate the influence of rock density on the armour layer stability and secondly to collect large scale data on wave run-up and wave overtopping for comparison with small scale model test results.

By using high density rock for coastal protection measures, the required size and volume of rock can be reduced. The filter layer also benefits from this reduction and sections of a breakwater suffering severe wave attack can be protected more effectively with high density rock without changing the rock size used in other sections. The disadvantage of using high density rock may be higher wave run-up and increased wave overtopping discharges.

Laboratory wave run-up results differ from field or large scale measurement results, especially for ´very rough´ (rubble mound breakwaters armoured with artificial armour units) slopes. These differences are due to scale effects and modelling effects. This project allows to verify wave run-up on a slope with an ´intermediate roughness´ by providing large scale data to compare with small scale model test results.

Fig. 1. *Construction of the rubble mound breakwater in the wave flume.*

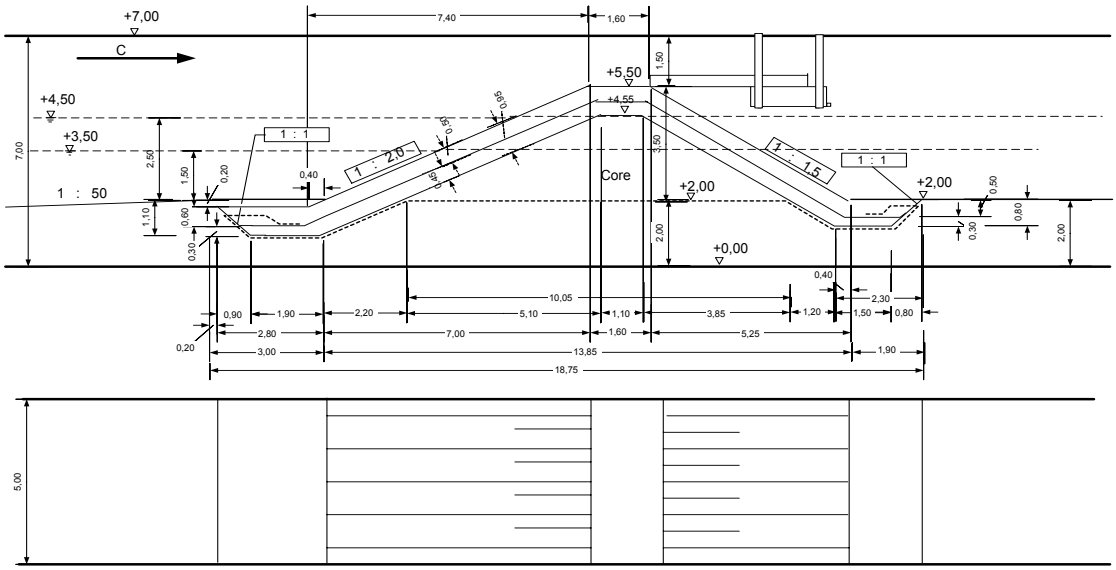

Fig. 2. *Cross section of the rubble mound breakwater in the wave flume.*

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Methodology

The research is carried out in the Grossen Wellenkanal (Large Wave Flume) of the Forschungszentrum Küste in Hannover (Germany). The wave flume measures 307 m long, 7 m deep and 5 m wide. The installed power of the piston type wave generator is about 900 kW.

The tested structure is a conventional rubble mound breakwater armoured with quarry rock (Fig. 1 and 2). Parametric tests (JONSWAP spectra) are performed and measured field spectra (double peaked, narrow and broad spectra) are reproduced at three different water levels (water depth at toe of structure: 1.5; 2.0 and 2.5 m).Two different rock densities ($\rho_{a,1}$ = 3050 kg/m^3 and $\rho_{a,2}$ = 2650 kg/m^3) are tested.

The measuring equipment consists of 22 wave height meters, 19 pressure sensors in the core and in the interfaces between the different layers, a wave run-up gauge and a wave overtopping tank. The wave run-up gauge is constructed at Ghent University (Fig. 3).

Results

The data from the test programme are now analysed in detail. Results will be available soon.

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Fig. 3. *The run-up gauge (designed and constructed at Ghent University) mounted on the seaward (1:2) slope of the breakwater.*

Fig. 4. *Testing of the breakwater using an irregular wave train (JONSWAP spectrum) in the GWK.*