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Overtopping physical model tests for the rehabilitation of Sines west breakwater

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ABSTRACT

1. INTRODUCTION

The Port of Sines is located on the west coast of Portugal. It is sheltered by two breakwaters: the west and the east breakwaters. Originally, the armour of the west breakwater was made of two layers of 400 kN dolosse on a 1:1.5 slope. In February 1978, immediately after breakwater construction, a storm, with a significant wave height of 8 m, damaged quite significantly the breakwater armour layer in four different areas. One year later, a more severe storm caused failure of almost the entire armour layer and superstructure, leading to urgent repair works during the 1980s. The last rehabilitation works were concluded in 1992 and the final rehabilitation works are currently being studied (Figure 1).

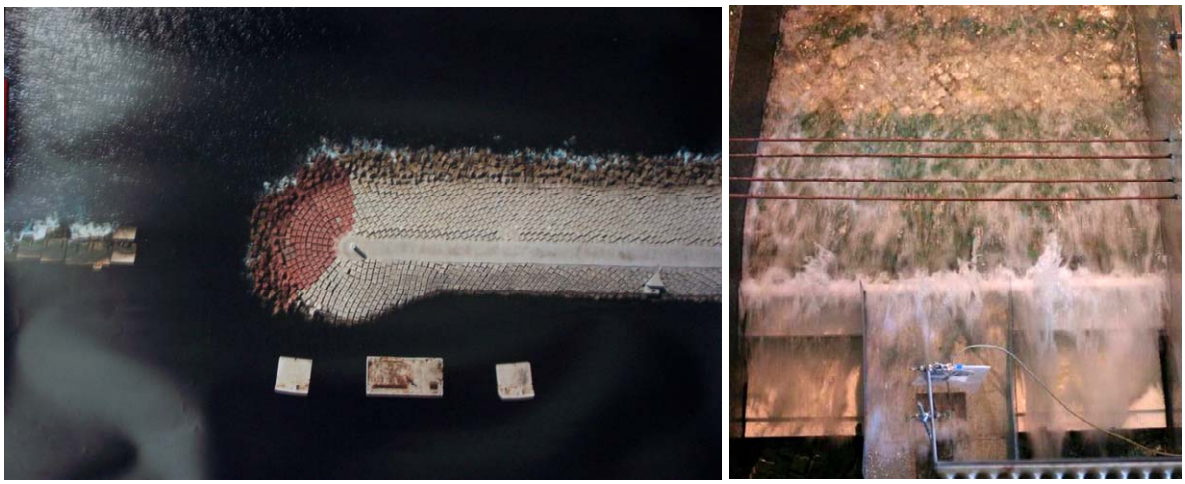

Figure 1: Sines west breakwater: layout after last rehabilitation works (left); 2D overtopping tests carried out at LNEC for the final rehabilitation (right).

2. OVERTOPPING TESTS

Since 1979, a number of two-dimensional physical model studies have been carried out to analyse the stability and overtopping of different proposed solutions for the rehabilitation of the west breakwater. These studies included tests in Delft Hydraulics and at LNEC's experimental facilities and they have been undertaken for geometrical scales from 1:60 to 1:85. Some tests included wind effect.

The tests performed in 1979 at LNEC, following the damage to the breakwater, reproduced the characteristics of the 1978 storm. The other tests were performed for incident irregular waves based on a pre-defined spectrum. Different solutions and cross-sections of the breakwater were tested.

3. RESULTS

In the final paper, the physical model tests undertaken for the final rehabilitation will be described and their results presented and discussed. Additionally, a comparison will be made between selected and revised physical model overtopping data and corresponding results obtained from empirical formulae and from the CLASH Neural Network. Finally, an overall discussion of the overtopping results will be presented using all the information available since the first tests carried out during the 1970s.

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