Downloaded from ascelibrary.org by SEOUL NATIONAL UNIVERSITY LIB on 05/21/13. Copyright ASCE. For personal use only; all rights reserved.

Crown Wall Parapet Failure after a Severe Wave Storm. Isle of Alboran, Mediterranean Sea

Vicente Negro[1], Ovidio Varela[2], Javier Díez[3] & Gregorio Iglesias[4]

Introduction

In 2000 a vertical breakwater was completed to shelter the small army harbour on the Isle of Alborán (fig. 1), a small island in the Sea of the same name, halfway between Southeastern Spain and Morocco (figs. 2 and 3).

Figure 1. Isle of Alborán

[1]Assist. Prof., E.T.S. Ingenieros de Caminos, Universidad Politecnica de Madrid, Spain. Phone: 34.91.336.66.91. Fax: 34.91.336.67.57; vnegro@caminos.upm.es
[2]Assist. Prof., E.T.S. Ingenieros de Caminos, Universidad Politecnica de Madrid, Spain; ovarela@caminos.upm.es
[3]Prof., E.T.S. Ingenieros de Caminos, Universidad Politecnica de Madrid, Spain.; ur18@caminos.upm.es
4Assist. Prof., E.T.S. Ingenieros de Caminos, Universidad de A Coruña; iglesias@iccp.udc.es

Copyright ASCE 2004 This is a preview. Click here to purchase the full publication. Coastal Structures 2003

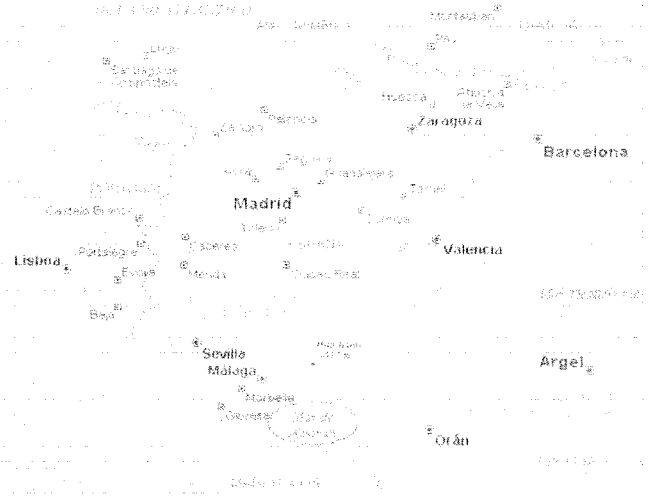

Figure 2. Alborán Sea occupies the westernmost part of the Mediterranean Sea

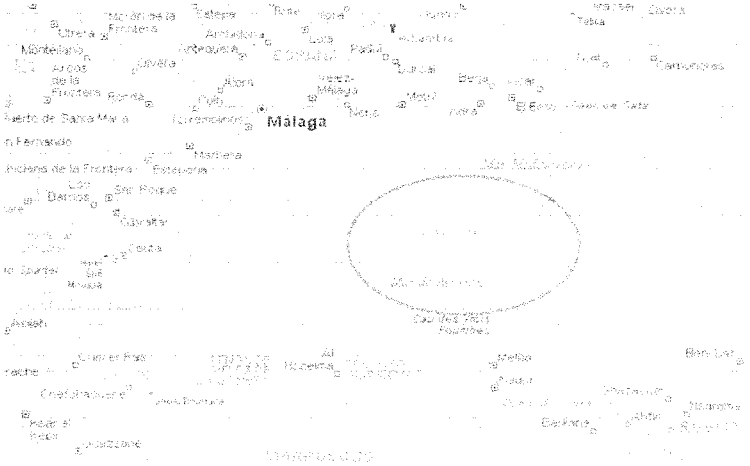

Figure 3. The tiny Isle of Alborán is located halfway between Spain and Morocco

The vertical breakwater is located within the breaker zone, in 7 m of water. It consists of three steel caissons, 15 m wide, founded at the - 5 m mark on a rubble mound. This is crowned by a berm at the - 4 m mark, with concrete guard blocks (fig. 4).

Downloaded from ascelibrary.org by SEOUL NATIONAL UNIVERSITY LIB on 05/21/13. Copyright ASCE. For personal use only; all rights reserved.

Copyright ASCE 2004 This is a preview. Click here to purchase the full publication. Coastal Structures 2003

Downloaded from ascelibrary.org by SEOUL NATIONAL UNIVERSITY LIB on 05/21/13. Copyright ASCE. For personal use only; all rights reserved.

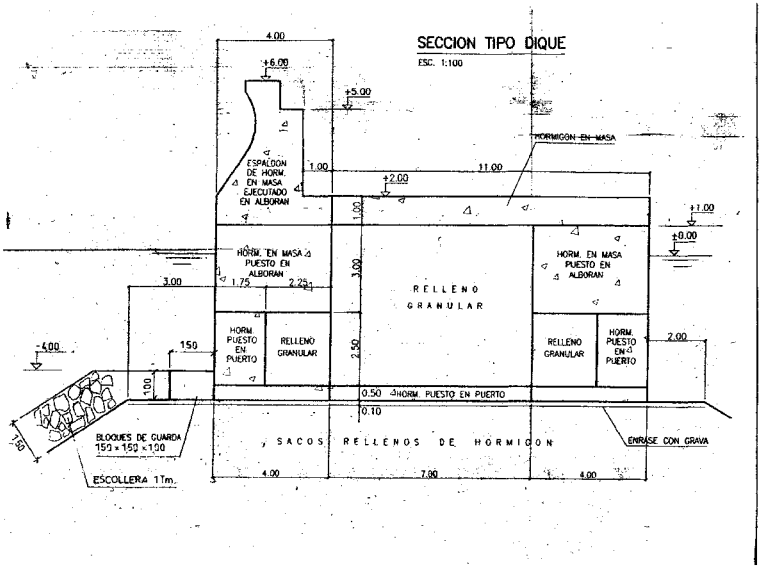

Figure 4. Cross section of vertical breakwater.

This design was intended to avoid impulsive pressures due to breaking waves, thus warranting the caisson stability against the East - Southeast storms, the most energetic in the Alborán Sea. The sea side of the crown wall is curved to reduce overtopping.

In November 2001, a severe storm swept the Alborán Sea. During the night from November 10 to 11 a shear breach occurred in the parapet, as a result of the high pressures brought about by the breaking waves. The underlying structure remained in place, showing a remarkable performance of the caissons in front of a high return period storm.

This paper deals with the effects of the storm, the behaviour of the vertical breakwater, the damage to the parapet and the proposed solutions.

Historical and Technical Review

During the twenties and in the early thirties, different researchers analysed the effects of the wave attack on a vertical wall, and the two types of impulsive pressures,

Copyright ASCE 2004 This is a preview. Click here to purchase the full publication. Coastal Structures 2003