

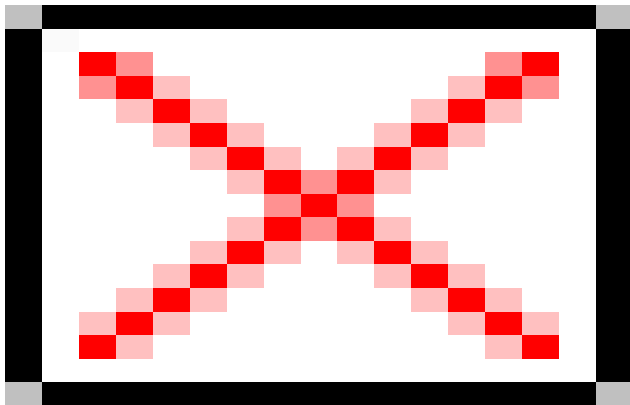
IMDC  
Harbour dams

Location:

Elmina, Ghana

Client:

Ministry of Works & Housing of the Government of Ghana



## Project Contact Information

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# Elmina Breakwater

## Introduction

IMDC is the engineering partner in a design and build contract for the execution of the restoration project of the Elmina Fishing Harbour and the Benya Lagoon.

## Scope

Due to several causes, an increasing siltation of the lagoon and its entrance channel is observed. This process resulted in very poor conditions for mooring. To improve this situation, dredging of the site area to a sufficient depth is necessary.

Furthermore, the existing 200m long breakwater has been severely damaged. Large damage is observed at the crest and the rear-slope of the structure. Detailed analysis was necessary to get an idea of the failure processes and re-design of the structure is needed.

IMDC is charged with the conceptual and detailed design of the restoration works as well Environmental Impact analysis and the quality control and supervision on behalf of the Ministry during the execution of the project.

## Wave analysis

Extreme wave analysis was based on wave observations made by ships in the period from 1949 to 1992 offshore of Ghana. A SWAN wave model was used to translate wave characteristics in front of the breakwater.

## Stability and hydraulic design of the structure

Wave conditions with a return period of 100 years are used to evaluate the stability of the armour layer. In present condition, an adequate filter layer between the core material and the armour layer is missing. A correct filter layer was determined according to the granular filter rules. Impact of the crest level on the mean overtopping volumes during design wave conditions was examined in order to reduce the risk of damage on the rear-side of the structures. A detailed engineering study regarding the reparation scheme was performed.

## **Wave flume test**

In order to check the stability of the final cross-section and to analyse the impact of large overtopping volumes (overtopping waves) on the crest and rear-side stability of the structure, several wave flume tests were performed in the laboratory of the University of Ghent. The wave flume tests were performed with a scale factor of 1/35.

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