



Structural response due to wave impacts on a coastal protection

Hans DE BACKER

Professor
Dept. of Civil Engineering
Ghent University
Ghent Belgium
Hans.DeBacker@UGent.be

Hans De Backer, born 1978, received his civil engineering degree from Ghent University in 2002, and obtained his doctorate in 2006. He is currently working as professor of the Bridges, Roads and Tunnels Research Group of Ghent University.

Amelie OUTTIER

Post-doctoral fellow
Dept. of Civil Engineering
Ghent University
Ghent Belgium
Amelie.Outtier@UGent.be

Amelie Outtier, born 1980, received her civil engineering degree from Ghent University in 2004 and obtained her doctorate in 2008. She is currently still attached to Ghent University and working as a design engineer with TUC Rail Ltd.

Ken SCHOTTE

Doctoral fellow
Dept. of Civil Engineering
Ghent University
Ghent Belgium
Philippe.VanBogaert@UGent.be

Ken Schotte, born 1986, received his civil engineering degree from Ghent University in 2009, and is currently finishing his doctorate at the Bridges, Roads and Tunnels Research Group of Ghent University.

Summary

Because of a new Master plan for Coastal Protection, most of the Belgian coastal cities are planning new protective measures for their beaches and coastal promenades. One of the first locations where these new measures are implemented is the coastal town of Wenduine. Three separate new constructions have to be designed with the perspective of protecting the town as well as coastal region for the following 50 years.

As opposed to purely vertical or horizontal surface type structures, structures consisting of both vertical parapets and horizontal slabs have rarely been considered. The behaviour of these structures is more similar to bridge conduct, since the incident loads vary with time and space, then to classic coastal structures.

The effect of wave impact on these structures results in local patch loading on a swaying system, introducing local deformations, stresses and accelerations, whose peak values are not necessarily relevant for the entire structural behaviour. This patch loading, moving rapidly with time, as an upward pressure front, acting on the lower side of the structure may cause local deformations, but does not necessarily cause collapse or endanger neither structural equilibrium nor stability. The pressure wave is a frontally moving load, limited in time and space. Fundamental insight in the structural response of these coastal protection structures necessitates a detailed calculation of the dynamic as well as static structural response because of the wave impact.

The main objective of this article is the study of the structural response of the monolithic concrete coastal protection structures. The focus is on the structural response of the structure, comfort conditions for use and structural safety. This is analysed by numerical modelling of the structural response based on recently proposed design values for such wave loading. These models include the actual structure as well as the influence of foundations and ground layers.

Keywords: coastal protection, dynamic calculation, FEM, horizontal and vertical wave loads

1. Introduction

Because of a new and integrated Master plan for Coastal Protection, most of the Belgian coastal cities are planning new protective measures for their beaches and coastal promenades. One of the first locations where these new measures are implemented is the coastal town of Wenduine, which is part of the larger town De Haan. Based on the principles within the Masterplan, a number of solutions have to be combined: strand suppletion as a low impact measure and the construction of a storm wall as a high impact solution. It was decided to widen the existing seawall with about 10 m in the western part and 3 m in the eastern part.

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