Ain Shams University

Improving the Coastal Groins Functional Design

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Irrigation and Hydraulics Department

"Improving the Coastal Groins Functional Design"

A Thesis Submitted for the Fulfillment of the Requirements of
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In Civil Engineer

By
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Abstract

Coastal processes are too complex to understand. Coastal areas are naturally stable (natural equilibrium). Any human interference with the coastal system disturbs its natural equilibrium, causing erosion for the shoreline.

Coastal protection structures and shore stabilizing structures pops up as measures to counteract the resulting problems of the human interaction with the coastal area. There are different types of these coastal protection structures, some of these structures are used to counteract the cross-shore and long-shore erosion problem.

The coastal groin structure is used to face the alongshore erosion problems. It is known as a shore stabilizing structure, which is set perpendicular to the shoreline and is connected to it (attached groins). This groin has negative impacts at its down-drift; erosion takes place till a non eroding point. This puts a limitation to the groin structure in practice. Different types of groins according to the construction material and the shape are available.

The design process of the coastal groins is divided into two steps, the functional design and structural designs (which depends on the forces applied on the groin).

The functional design of the coastal groins is not defined with mathematical equations, its designed based on experience. The design process does not take into consideration the climate of the area. This Research was thus initiated to:

1. propose a new groin alignment (detached groin)
2. reduce the down-drift erosion
3. improve the functional design using a physical model in order to formulate reliable design equations to determine the groin length (L), the groin spacing (X), and the distance from shoreline (Y).

The results showed that the new proposed groin alignment (detached groin) gives better results than the normal groin from the hydrodynamical point of view. The proposed alignment reduced the down-drift erosion. The case, where the wave angle of approach equals to 30º using a groin length of 110m with groin spacing of 330m and offshore distance of 44m, reduced wave height at up and down-drift, so as in between the groins.

This alignment produced an acceptable current pattern relative to other tested alignment. The short term morphological changes showed that the detached groins system performs better than the attached groins system. Also three mathematical equations were formulated to be used in the groins functional design to determine the groins parameters, and these equations connect the design process to the wave climate in the project area.

Keywords:

Coastal groins, Functional design, Groins alignment, alongshore protection.

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