

A Study on The Use of Semi-Open Groin System for Protecting The North-West Coast of Egypt Along The Mediterranean Sea

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ABSTRACT

This paper presents groins with a clear opening in their cross section as a tool for protecting the shore area. The opening allows water circulation and flushing in the near shore zone while protecting the swimmers from direct exposure to wave attack. The possible impact of the opening size and the internal properties of the groin on the shore line changes and water circulation have been investigated. The dominant wave/current conditions along the North-West coast of Egypt have been considered for various possible configurations of the semi-open groin to identify the appropriate design. Wind and wave data of Al-Daba Meteorological Station (DMS) have been adopted for the period 2000-2005. Attention has been given to the Egyptian Environmental Law 4/1994 and bathymetric survey of the bed contours has been prepared for Ras Al-Daba zone in the North-West coast of Egypt. A numerical model, namely known as Surface water Modeling System (SMS) ver.10, has been adopted in the simulation. The results of the model have been presented in convenient graphical formats and analyzed to select the appropriate configuration of the semi-open groin suitable. The results and analysis provide general guidelines for the use of semi-open groins in coastal resorts that can be applied to wide range of wave climate. It has also been found that semi-open groins can be of good help to provide safe swimming conditions with minimum impact on the shoreline if groins were properly studied. Wide gap spacing and permeable groins generally reduce the shoreline changes.

KEY WORDS: Groin; shoreline changes; coastal hydro-dynamics; Al-Daba Meteorological Station; Egyptian coast, safe swimming conditions.

INTRODUCTION

Coastal zones in many countries in the world are of major concern by the virtue of being multi-functional regions. Their use as harbors, fisheries, recreational areas, source of minerals, water supply and excess water disposal gives them a very special interest. The northern coast of Egypt along the Mediterranean Sea extends for approximately 1000 km from Rafah at the east to El-Sallum at the west. This study focuses on one of the most attractive summer resorts along the North-West coast of Egypt namely, Al-Daba – Ras Al-Hekma zone, as a pilot

study for the use of new shore protection structures. A chain of tourist resorts, beautiful recreational beaches and many major projects have been recently constructed in this area. The coastline in this area faces several problems; one of the major problems facing the development in this area is continuous shoreline changes under the effect of sea waves and currents. Rip currents are also of major concern to swimmers due to the frequent drowning cases. Some resorts used surface piercing detached breakwaters for protecting the shoreline and swimmers, e.g., Marabella and Al-Nakhil resort of Egypt. In the latter cases, accretion was developed shortly after the construction of the breakwaters and the down drift zones suffered from shoreline erosion. The erosion has been dramatically increasing causing demolition of large parts of the down drift beaches. Moreover, floats and debris are usually trapped behind surface piercing breakwaters while eddies are evident at the end sections. It is noteworthy that the latter cases violate the environmental laws of Egypt, but they could somewhat protect the swimmers from the risk of drowning.

Due to the increasing demand for safe swimming conditions with minimum impact on the shoreline while keeping acceptable water quality, new studies have been conducted to meet these requirements using appropriate coastal structures. The Shore Protection Authority of Egypt (SPA) conducted a study in 2002 for the development of the North-West coast of Egypt and introduced the use of perched beach as a possible alternative for providing safe swimming conditions along Al-Arab bay zone, located from Alexandria to Al-Alamin city (at station 120 Km along Alexandria-Matrouh road). However, none of the perched beach designs have been constructed to date. Only one design was approved by the Egyptian Environmental Affairs Agency (EEAA) at station 30 Km along Alexandria-Matrouh road, but it has not been constructed. Thus, the actual field effect of the perched beach is not well-known yet.

The Ministry Of Housing (MOH, 2000) in Egypt studied morphological and water components in El-Alemein marina resort using UNIBEST model for shoreline changes and DELFT2D-WAQ for water quality studies. It studied the use of groins, detached breakwaters and sand bypass / nourishment as protection measures for the erosion problems encountered. It was recommended to protect the shoreline using a system of groins combined with an initial amount of nourishment.