

INNOVATIVE SHUTTER CONCEPT FOR COASTAL PROTECTION

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Abstract: In this study a new concept for protecting the coastal areas is proposed. The shutter concept, an environmentally friendly structural approach will combine advances in materials, designs and construction in developing this new technology.

1. Introduction

The coastal zone is a dynamic region of natural and man-made changes. The coastal zone is about 15% of the of earth's land surface (200 km wide) but accommodate 50% of the world population. Hence there is a need to protect the valuable coastal zone from natural and manmade disasters.

Extreme hurricane events in recent years have, with an increasing sense of urgency, reinforced the proposition that the affected states and the nation must continue to work on, but also move beyond weather prediction and evacuation to achieve significant damage reduction. Against this background, increasing population and urban development in coastal areas highlight the dynamic nature of our vulnerability to hurricanes and the urgency of the problem. Hurricanes are the most devastating and damaging natural hazards impacting the Gulf Coast region in the United States. Hurricanes cause not only human deaths but also over \$5 billion in property damage per year in the United States. In 2005, the Gulf Coast region had one of its worst experiences with the hurricanes and millions of people in Texas were affected. In 2008, Hurricane IKE had significant storm surge effects in and around Galveston, Texas. Mitigation offers the best alternative for reducing the potential coastal damages and coastal erosions from hurricanes.

2. Objective

The objective of this study was to develop a new shutter concept to protect the coastal regions from storm surge and other disaster's like oil spills. Evaluate the concept using model studies.

3. Concept Development

Recent advances in materials and construction technologies will be used in developing a system of innovative break water shutters to protect the coastal region (mitigate loss of beach and coastal erosion) against high waves and storm surges as needed. The new generation of smart buoyancy driven vertical break water shutters will not obstruct the traffic of ships or interfere with the tidal current. These shutters will deploy rapidly to protect the harbor and coastal regions and will be easy to maintain. The new break water shutter will have a wall structure that is formed by a telescopic configuration. The shutters will rest inside piles that are easily installed in the sea bottom or behind existing break water walls. When there is a high wave or storm surge due to hurricane the shutters will be deployed to block the waves. Non-corrosive light weight smart materials will be used in the design of the shutters which will be subjected to hurricane winds and storm surge almost simultaneously. Compressed air, instead of electric motors, will be used to raise the shutters and when the air is expelled the shutters go back into the piles. The shutters will be designed as

cantilever beams supported by the piles and tested with appropriate connections. Preliminary model test results showed excellent potential for the new break water shutter concept.

4. Discussions

In order to verify the concept, model studies are underway at the Texas Hurricane Center for Innovative Technology at the University of Houston. Also CFD modeling is done to verify the forces on the shutter during various storm surge events.

5. Conclusions

The shutter concept is being tested and modeled.

6. Acknowledgement

The study was supported by the Texas Hurricane Center for Innovative Technology (THC-IT).