# FAILURE MODES AND STABILITY MODELLING FOR DESIGN OF SAND FILLED GEOSYNTHETIC UNITS IN COASTAL STRUCTURES

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## BACKGROUND

Sand filled containers and tubes are being increasingly used as an alternative to rock and concrete to construct coastal structures. However, as they are flexible with a lower SG than rock and concrete armor units, they behave differently and established design guidelines for rock are not suitable.

Testing has been undertaken in wave flumes by a number of different researchers, but the results to date vary significantly and there has not been good correlation between models and observed real world real failure modes and behavior. A number of factors could be responsible:

- Container sizes and wall designs used in the testing has varied greatly.
- There are a number of parameters that need to be modeled and scaled appropriately:
  - geotextile for container fabrication (stiffness, tensile strength, friction, permeability,..), and
  - container fill (SG, porosity, ..).

## METHODOLOGY

Full scale data has been collected from different full scale structures constructed using sand filled geosynthetic containers and compared to the results of existing physical modelling.

A number of failures have been recorded [Figures 1 & 2]. This data has been compared with the laboratory tests of the main researchers. The key parameters were determined for each mode of failure for each type of structure and the impacts for design and physical modeling considered. Additionally, physical model testing was undertaken using a range of different fabrics and fill materials. A comparison was undertaken to determine the influence of material and fill selection on container behavior and stability.

## RESULTS

The stability of sand-filled geotextile units is more complex than a single relationship, particularly given the number of potential failure modes.

Use of physical modeling of these types of structures to determine stability also has inherent complications. There are a number of factors that contribute to the behavior and stability of sand-filled geotextile structures, many of which are not fully understood. These need to be carefully considered when undertaking this type of testing to ensure that the behavior is representative and the final results are valid.

This paper also provides comment on effective construction methodology and its impact on stability evaluation. Particularly, it addresses the importance of adequate compaction and placement in construction. It also introduces construction details that may be utilized to minimize the threat of toe scour to the integrity of the structure.

Figure 1: Removal of Top Container by overtoppingl

Figure 2: Pop out of mid slope containers

## REFERENCES

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