

# Abstract

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## **Semi-submersible stability Based columns preliminary design**

The rapidly expanding offshore industry worldwide and the introduction of dry towing since 1975, lead to an increase in demand for heavy lift transport. The fleet of semi-submersible ships/barges expanded through an addition of 19 newly built converted ships/barges during 2006 to 2012. Although, the design of stability columns (Caissons) represents the corner stone that affects the intact and damage stability specially at submerging processes, there is no sufficient data available in the literature. Therefore, the aim of the present study is to introduce a new tool for columns conceptual designs to achieve the stability standards specified by the regulation authorities for intact stability. A mathematical model was developed using (MATLAB) to determine the columns preliminary dimensions for any barge based on its particulars, required submerged depth and the required initial stability. Furthermore, the model was validated through a different cases studies for a same 100 m barge and submerged depth of 7 m, using a computer package (MAXSURF). The model results were found to meet the required initial stability standard specified as input to the mathematical model. Moreover, another code have been developed to calculate the stability at large angle in the submerging condition only, by calculating the righting moment arm (GZ) curve, by using the inputs used in the mathematical model with the calculated columns dimensions output form the mathematical model. The result have been verified by six different cases with a computer package (MAXSURF) results. The mathematical model code and righting moment code are merged in a simple graphical user interface (GUI) to introduce a new and user friendly innovative tool, used in stability columns conceptual design for any barge based on the required initial stability requirements and large angle stability analysis (comparison with the required classification society's criteria requirements). Finally, a parametric analysis have been done using the proposed tool to find the effect of different parameters on the stability columns and large angle stability parameters.