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PRELIMINARY DESIGN OF FLOATING DRY DOCK

Jagadish Kari[1], Ayyappa Satish Manda[2], Purnima Malla[3], Balaram Krishnam Raju Nadimpalli[4]

[1]MTech, Naval Architecture and Marine Engineering, B.E Mechanical Engineering, Andhra University, Visakhapatnam, India
[2]MTech Naval Architecture & Marine Engineering, Andhra University | Operations Manager, Win Marine Consultancy Services
[3]MTech Naval Architecture & Marine Engineering, Andhra University | Sr. Design Engineer, Win Marine Consultancy Services
[4]MTech Naval Architecture and Marine Engineering, Andhra University | Design Engineer, Win Marine Consultancy Services

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Abstract - *The aim of the paper is to draft a Floating dry dock by using AutoCAD Design Software. A floating dry-dock is a type of structure that it can be submerged under water for docking the ship and will rise again from the water surface after the required vessel or ship is docked and thereafter it can go for the repairs and maintenance process. The Main Features of the Floating dry docks are that they can be towed to the required locations in a short time and way more economical in construction as compared to Conventional dry docks.*

Key Words: Floating Dry Dock, Design, Marine Structures, Water Ballast, Pontoons, Ship Repair & Maintenance

1. INTRODUCTION

This design report describes the preliminary design of a 20,000 TLC floating dry dock for docking Ships or Dredgers.

The design consists of the following

- General arrangement plan
- Design criteria for dock dimensions
- Machinery selection
- Stability reports

However, despite advances in technology ship-repair remains a labour intensive business, as virtually every job will be unique in some respect (e.g. the amount, nature and location of steel replacement) so automation is not always an available solution. It is accepted that labour and steelwork related costs are the two main components of ship repair costs, and that labour accounts for between 50%-70% of total costs. This labour intensity means that facilities that have access to ample skilled, low cost labour will have a cost advantage for less complex repair/maintenance work over their competitors in higher cost centers usually located in the mainland, even if they cannot match them in terms of technology. However, a certain degree of reliability and technical sophistication is essential as the modern ships are more technologically advanced. Therefore, a new ship repair yard should have the shops and facilities to undertake more technology oriented repair activities. A modern ship repair yard though labour intensive, should be planned properly, meeting the technological issues and statutory regulations. In most of the traditional ship repair facilities impetus is put only on hull plating renewal. However, because of change in Classification and IMO rules many aspects relating to stability, structural and machinery failure, ballast water management etc. have become very important.

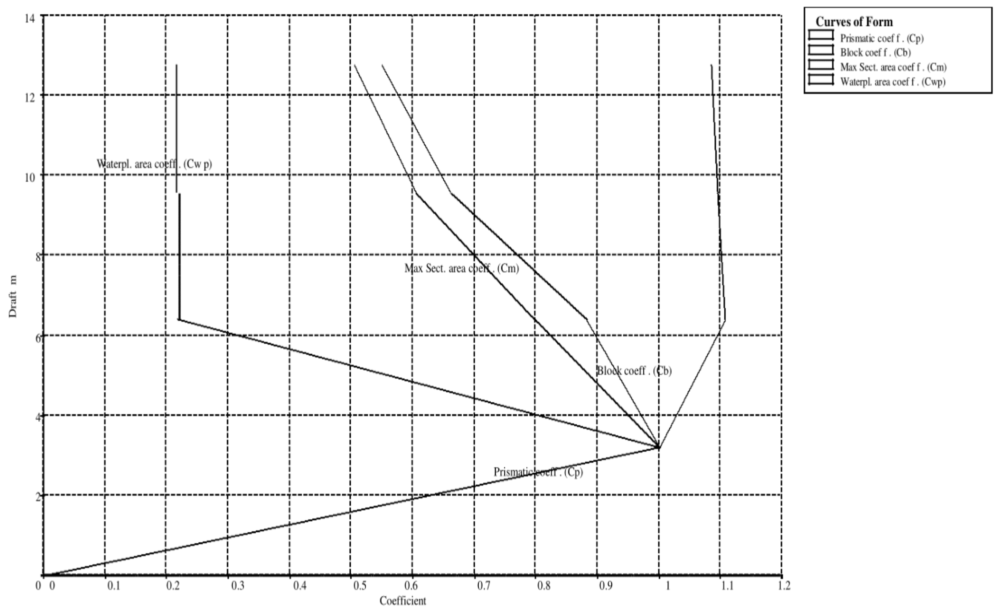
2. LITERATURE REVIEW :

The length of the floating dock can be determined from the length of the longest ship to be docked using classification societies' rules for construction of floating docks. Other dimensions like the breadth between the wing walls are calculated depending on the clearance between the ship's sides and the wing walls to facilitate the access to the ship's sides for the repairs. These clearances are generally determined by the experiences of the people working with these kinds of docks. The depth of the pontoon is determined by the lifting capacity and the freeboard required according to the rules. The height of the top deck and the safety deck are determined depending on the freeboard requirements when all decks below the safety deck are flooded.

Weight of the dock is estimated and deadweights are considered and different loading conditions of the dock are considered for stability calculations. The dock should meet the minimum stability requirements specified by the classification societies.

2.1 HYDROSTATIC PROPERTIES

Hydrostatic tables, Curves of form and hydrostatic curves are given for the dock below. All calculations are made for moulded dimensions



Chart– 1 : Curves of Form (Draft Vs Coefficient)

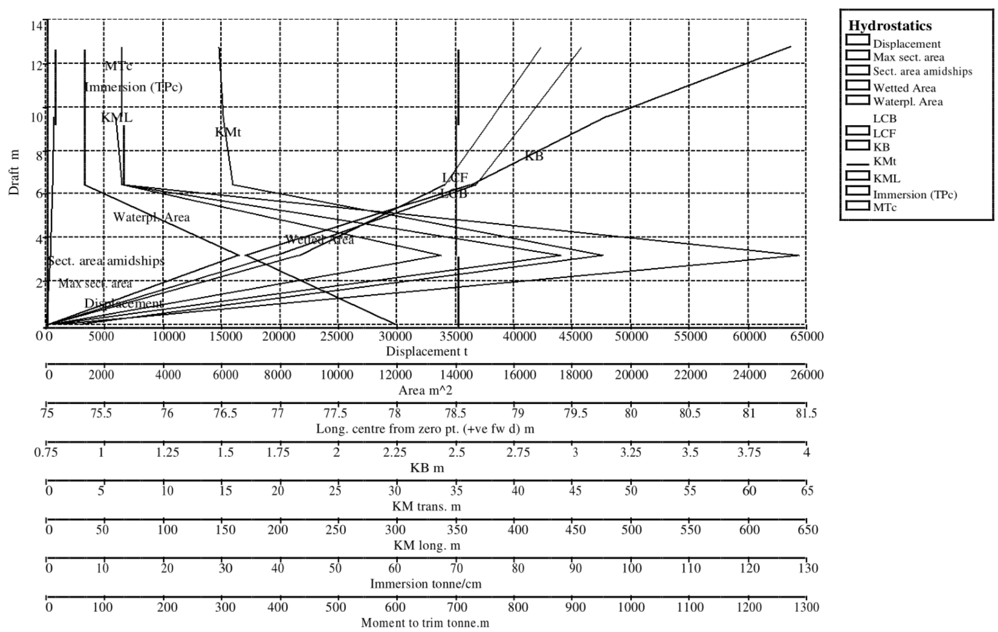


Chart – 2: Hydrostatic Curves - Draft (m) Vs Displacement (t)

2.2 FREEBOARD

When dock is submerged to the maximum draft of 13.2 m, the freeboard to top deck is 3.8 m. Since the wing walls are water tight to the top deck, this freeboard is more than the freeboard required (1 m) by the classification societies. When dock is supporting the ship of rated capacity (12,000 t), the freeboard to the pontoon deck in worst case without ballast water adjusting trim is 1.24 m. This freeboard is more than that required by DNV, IRS and ABS.

2.3 TRANSVERSE STABILITY

According to ABS rules for classification of dry docks, docks with lifting capacity of 10,200 t should have a minimum transverse metacentric height of 1.525 for vessel docked with keel blocks breaking out of water and for vessel docked with top of pontoon at water 47 levels. Those with a lifting capacity of 51,000 t should have a minimum transverse metacentric height of 1 m. All the docks with lifting capacities in between can determine their minimum transverse metacentric height by linear interpolation.

3. GENERAL ARRANGEMENT

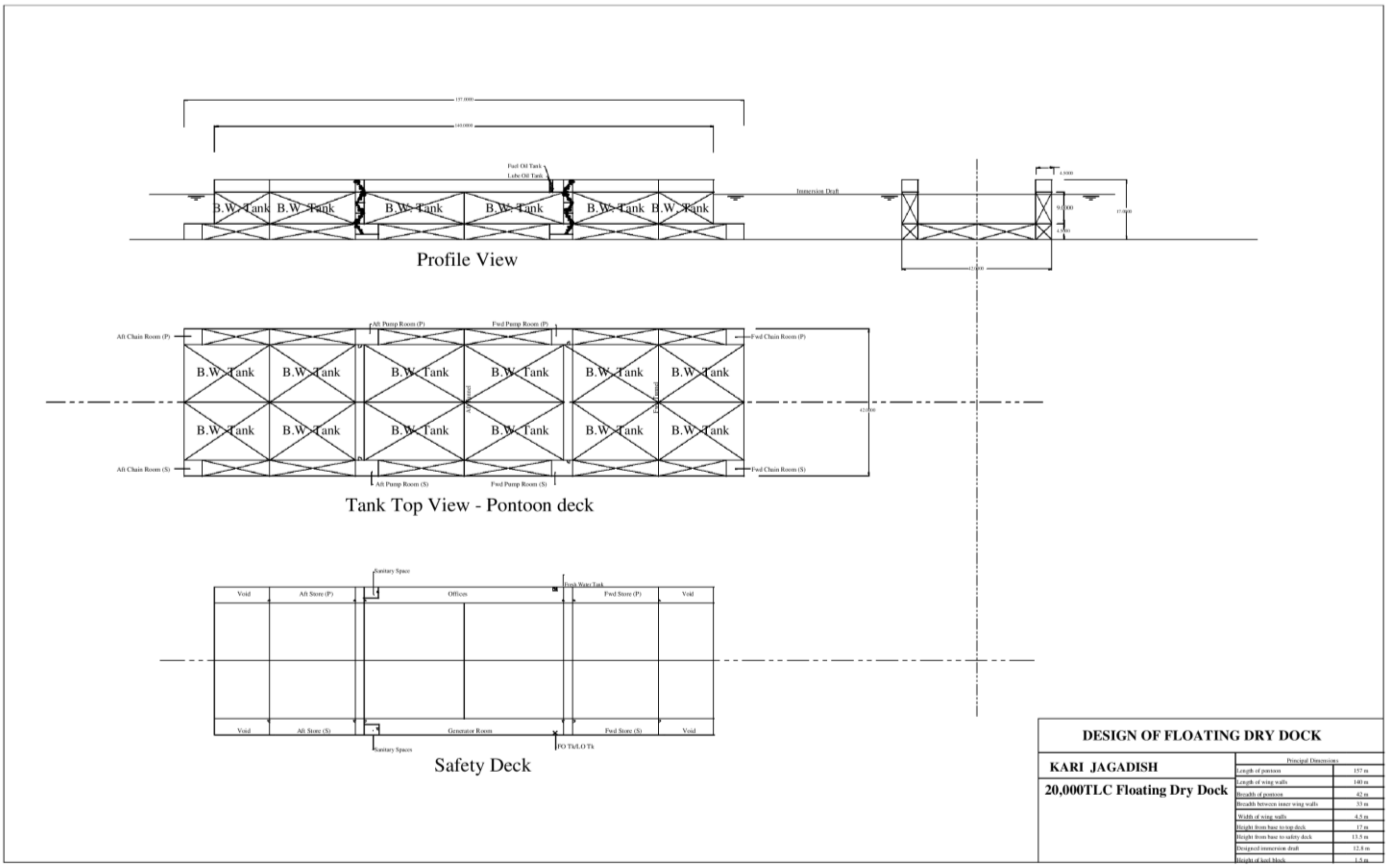


Fig – 1: General Arrangement of Floating Dry Dock

4. CONCLUSIONS

The bathymetry available at the site makes the floating dry dock out of the docking facility choices, the most suitable option. A larger vessel likely to join the DCI's fleet is considered as the design vessel, so as to; meet the docking requirements of DCI in near future.

The dimensions of the floating dock are determined by the rules of the classification societies and the clearances maintained between the dock and the vessel. Vessel is designed with all equipment enough to work in port. Weight of the dock and center of gravity are calculated by determining the weight of individual shell plates and ship components and calculating moments about keel, centerline and amidships Vessel loading is calculated depending on the hydrostatic data of the vessel and docking plan. Trim in dock due to various loading conditions are adjusted by adjusting ballast water and trim is reduced.

The dock satisfies all freeboard requirements and transverse stability requirements specified by the classification societies. Although the dock is designed for a 12,000 t vessel the dock at the minimum freeboard requirements of the classification societies, has a capacity of lifting 20,000 t. But all the stability calculation are carried out considering a 12000 t vessel.

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AUTHORS

Jagadish Kari
Master of Technology (Naval Architecture and Marine Engineering), Andhra University

Ayyappa Satish Manda
Operations Manager in Win Marine Consultancy/Engineering Services

Purnima Malla
Senior Design Engineer in WinMarine Consultancy / Engineering Services

Balaram Krishnam Raju Nadimpalli
Design Engineer in Win Marine Consultancy/Engineering Services