A STUDY ON CORRUGATED BULKHEADS FOR BULK CARRIERS

Balaram Krishnam Raju Nadimpalli[1], Jagadish Kari[2], Purnima Malla[3]

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

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Abstract - *The aim of the paper is to analyze that the corrugated bulkhead is ideal for the bulk carriers as compared to stiffener bulkhead. In general, bulk carriers are used to carry raw materials (ore, coal, wheat, cement, etc) during unloading those materials, some are left remained at narrow portions of the stiffener bulkheads which it is difficult to extract the material from those narrow portions. So, here we can introduce the corrugated bulkhead especially in cargo holds for easy retrieval of the cargo and also gives extra features like Strengthening and for easy maintenance. By the design particulars here we are show the corrugated bulkhead is optimum for the Cargo holds in bulk carriers.*

***Key Words*: Corrugated Bulkheads, Stiffener Bulkheads, Bulk Carriers, Cargo Holds, Structural Strengthening.**

1. INTRODUCTION

The Main function of the bulkheads is to divide a ship into a number of compartments. Though most bulkheads are transverse in orientation, some ships also have longitudinal bulkheads within a compartment for longitudinal compartmentalization within a compartment the transverse bulkheads also add to the transverse strength of the ship.

The bulkhead plate itself is not resistant enough against large scale transverse forces like shear forces. So they are stiffened, either vertically or horizontally. But we usually go for the vertical stiffening instead of the horizontal. The reason is that horizontal stiffening in ships with high beam would require stiffeners of long span, which would also increase the scantling and weight of the stiffener, affecting usable cargo volume. However, with vertical stiffening, the span (and hence, the scantling) of the stiffener can be kept low by introducing a stringer at mid-depth (a stringer acts as a fixed end, therefore reducing the span). The Ship safety in damaged condition is majorly dependent on the strength and integrity on the bulkheads. There are a lot of factors that come into consideration for positioning the bulkheads in a ship, and designing them structurally.

Watertight bulkheads are vertically designed watertight divisions/walls within the ship's structure to avoid ingress of water in the compartment if the adjacent compartment is flooded due to damage in ship's hull.

2. DESIGN ASPECTS

Bulk carriers are provided with transverse watertight bulkheads between holds that divide the ship into watertight compartments. The secondary purpose of these bulkheads is to provide additional transverse strength to the ship structure. The most common type of bulkhead used today is the corrugated transverse bulkhead, as illustrated in Figure 2 and Figure 3. Corrugations eliminate the need for the bulkhead plating to be additionally stiffened, and also have a higher strength to weight ratio than typical stiffened bulkhead panels.

The Stiffener bulkhead has been illustrated in 3-D model from Rhino Software.

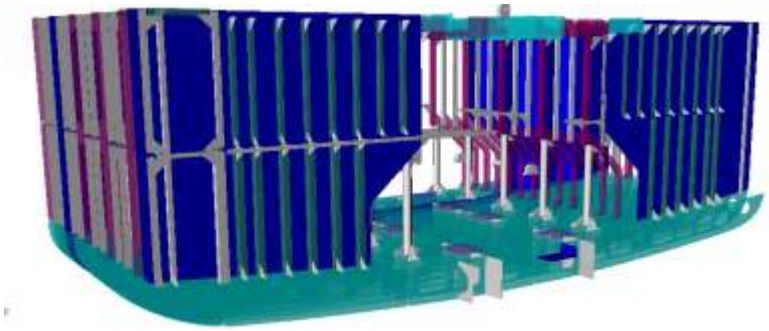

Fig – 1 : Stiffener bulkhead

The Corrugated bulkhead has been illustrated in 3-D model from Rhino Software.

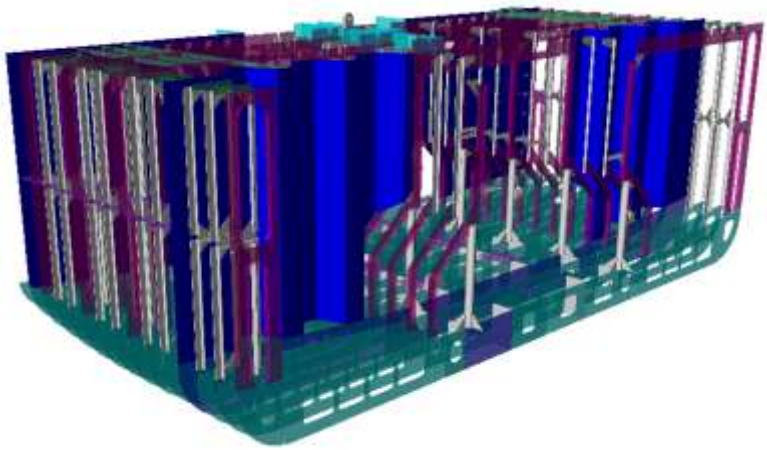

Fig – 2 : Corrugated bulkhead

The base of the bulkhead is provided with a sloping plate called the shredder plate, and the corrugated bulkhead is mounted on a bulkhead stool which transfers the weight onto the solid plate floors below. The shredder plate prevents accumulation of cargo at the base of the corrugations.

Fig – 3 : Watertight corrugated bulkhead

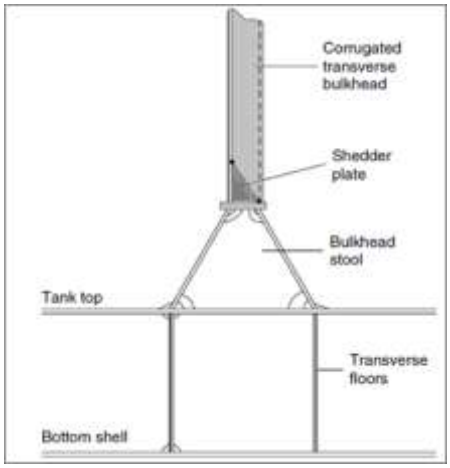

Fig – 4 : Weld Detail of the corrugated bulkhead

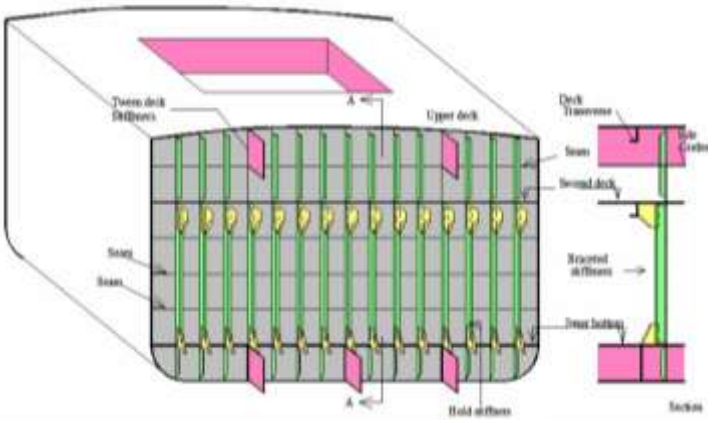

Fig – 5 : Transverse Watertight Stiffener bulkhead

Here the Stiffener watertight bulkhead is used for the cargo hold such that during raw materials handling, some deposits are left at the narrow corners which are hard to remove and also the maintenance will be difficult compared to Corrugated Bulkhead.

3. CONCLUSIONS

The stiffener bulkhead are prone to some problems at the cargo holds and also cause damages to the interior structure and increases the weight of the structural members by the more arrangement of Scantlings (Stiffeners & web plates) where as the corrugated bulkhead design is more efficient results.

There is no need to say regarding safety regulations in the design of corrugated bulkheads, which plays a key role in maintaining satisfactory structural integrity without any failures leading to cargo contamination, while at the same time retaining plane surfaces that better facilitate complete cargo hold cleaning.

Corrugated bulkheads are essential structures for Bulk Carriers and product / chemical tankers and sufficient service records have proved the advantage. The Fabrication complexity and various types of operations have been customized by the design of corrugated bulkhead and based on satisfactory service experience together with feedback recent design technologies using Rhinoceros 3-D Modelling Software.

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BIOGRAPHIES

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

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

Purnima Malla
Senior Design Engineer in WinMarine Consultancy / Engineering Services