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STUDY ON FE ANALYSIS OF MEMBRANE TYPE LNG CARRIER'S AFT TRANSITION AREA

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ABSTRACT

A membrane type LNGC includes major difference compare with other ships due to arrangement of trunk deck structure on the cargo hold area. This special structural feature requires a careful engineering attention for the assessment of the ship's structural strength and arrangement considering the transition effect of the trunk deck to the after upper deck structure and deckhouse.

This paper concentrates on verification of the strength sufficiency of the trunk deck scarfing structure in way of the deckhouse and engine room area for LNGC. In the analysis, a new loading scheme was introduced to come out with more realistic loads and obtain more reasonable results. The scheme satisfies the two load requirements, The shear force and bending moment distribution.

KEY WORDS: Scarfing arrangement; fatigue strength; buckling; LNGC (Liquefied Natural Gas Carrier); FDA (Fatigue Design Assessment); SDA (Structural Design Assessment);

INTRODUCTION

Structural analysis has been carried out to verify structural strength of trunk deck scarfing arrangement, deckhouse and engine room for an LNG carrier. Yield and buckling strength have been reviewed in accordance with ShipRight SDA procedure of LNG carriers. Fatigue strength has been evaluated according to ShipRight SDA procedure for Primary Structure of Passenger Ships.
Two 3-D finite element models of the aft end with full breadth – one is for yield and buckling strength evaluation and the other for fatigue strength evaluation – were prepared, extending from the transom to the middle of cargo hold No.4. Three types of elements – elastic shell, 3-D elastic beam and rod element – were used to represent structural members to be evaluated. In addition, line elements with small sectional area – so called, fictitious truss elements – were employed at free edge corners in way to openings as a means to obtain local stress for the fatigue strength evaluation. The extent of a FE model is shown in Fig.1. The FE modeling and analyses were carried out using MSC/PATRAN and MSC/NASTRAN respectively.

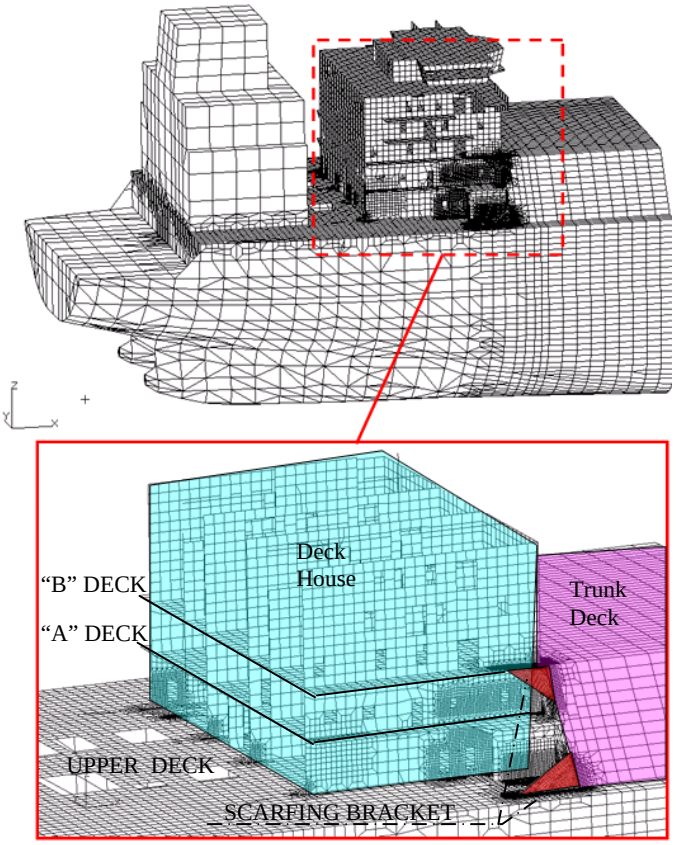

Fig. 1 FE Model for the Structural Analyses

STRUCTURAL MODELING

The dimension of structural members, include plate thickness and sectional properties, is reflected into the FE models as appropriate. For yield and buckling check, the size of meshes for structural details subjected to high stress is approximately 150 mm. These areas include the scarfing brackets and "B"deck level above the trunk deck as shown in Fig.1. Subsequent evaluations were carried out based on the averaged stress of area sized by 150x150 mm.