Impact Study on the new IACS Longitudinal Strength Standard for Containerships (UR S11A)

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Abstract

Following the major structural failures of large containerships in recent years, a review of existing requirements with focus on the structural performance of large containerships was initiated by IACS. IACS established a project team to conduct this review of the existing UR S11 and propose improvements to this unified requirement. The now published UR S11A, coming into force on 1st July 2016, is the main outcome of this team.

This paper presents the results obtained by the project team using the newly developed loads and strength assessment procedures in the UR S11A for a number of existing Containerships, and discusses the impact of the proposed changes. The paper especially focuses on the impact of the proposed buckling assessment procedure and the new requirement of hull girder bending capacity assessment.

In addition, the newly introduced functional requirement is also discussed.

Keywords

Containership; Longitudinal Strength; Uniform Requirements; Ultimate bending capacity.

Introduction

Major structural failures of large container ships took place in recent years. The UK Marine Accident Investigation Branch (MAIB) investigated one of the accidents and released a report in which, among other items, it was concluded that the IACS Unified Requirement (UR) S11 (Longitudinal Strength Standard) has lagged behind the development of containership design and operation and requires immediate revision, and that buckling strength must be assessed along the entire length of the hull based on global hull stress. IACS immediately established an Expert Group on Container Ships to review the state of the art of hull structural design, construction and operation of large containerships including the existing technical requirements and to identify needs for additional studies and / or improvements of existing requirements. The Final report produced by this expert group, the reports issued by the Japanese Committee on Large Container Ship Safety, and the Investigation Report on Structural Safety of Large Container Ships by Class NK were considered in the work of the project team reviewing the IACS UR S11.

Overview of Strength Assessment Requirements

The new requirements were developed following as far as possible the philosophy of the IACS (2015a) “IACS Common Structural Rules for Oil Tanker and Bulk Carrier” (CSR).

The wave load definitions were revised based on the results of non-linear wave load computations of more than 120 ships with two loading conditions each as described in detail in IACS (2015b).

Considerable changes of the strength requirements were made compared to the UR S11 requirements. The reason was to follow a technically sound and transparent concept (based on the CSR philosophy) by applying general and harmonized methods to the strength assessment. In particular the following requirements listed in Table 1 are different from the UR S11 requirements.

Table 1: Overview of the main differences between unified requirements UR S11 and UR S11A

<table>
<thead>
<tr>
<th></th>
<th>UR S11 Rev. 7</th>
<th>UR S11A (2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>All ships</td>
<td>Containerships only</td>
</tr>
<tr>
<td></td>
<td>Gross scantling (except buckling)</td>
<td>Net scantling concept</td>
</tr>
<tr>
<td>Still water loads</td>
<td>Defined for all ships</td>
<td>Reference to UR S1</td>
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