

## **BULK CARRIER SAFETY**

### **Update on IACS actions to improve the safety regime for bulk carriers**

#### **Submitted by the International Association of Classification Societies (IACS)**

#### **SUMMARY**

<i>Executive Summary:-</i>	This paper advises the Committee of progress with respect to the actions taken by IACS to improve the safety regime for bulk carriers announced in MSC 75/INF.23
<i>Action to be taken:-</i>	See paragraph 4.
<i>Related Documents:-</i>	MSC 75/INF.23

1. The 75 session of the Committee was informed of the actions taken by IACS (MSC 75/INF.23) to improve the safety regime for bulk carriers and provided the background for these actions.

1.1 The new classification requirements fall into two sets of actions. The first set covers 3 measures that were adopted by IACS prior to MSC 75 (for details please refer to MSC 75/INF.23). The second set covers 5 measures that were under development at the time of submission of MSC 75/INF.23.

2. Considerable progress on formulation of classification requirements for the remaining 5 measures has been made since MSC 75. The purpose of this document is to keep the Committee advised about the state of development of Unified Requirements (URs) covering these 5 measures.

2.1 Those measures and the technical considerations together with details that were placed in the foundation of the drafts for requirements are submitted below.

2.1.1 *Evaluation of scantlings of hatch covers and hatch coamings of bulk carrier cargo holds, New ships - UR S21 REVISION 2.*

The requirements will apply to all bulk carriers defined in UR Z 11.2.2 and are for hatch covers and hatch forward and side coamings on exposed decks forward

of 0.25L from the forward end of the ship. The load model formulation now to be used has been derived from analysis of the extensive model tests carried out consequent to the recommendations made in the report of the Derbyshire RFI. When calculating the pressure on the hatch covers, flooding of the fore peak space is taken into account for No. 1 hatch and flooding of hold No. 1 for the hatch covers of hold No. 2.

#### *2.1.2 Requirements for hatch covers and coamings of existing bulk carrier cargo holds*

(1) The requirements will apply to all bulk carriers as defined in UR Z11.2.2 that were not built in accordance with UR S21 (pre-UR S21) and are for hatch covers and transverse hatch coamings on exposed decks forward of 0.25L from the forward perpendicular.

With respect to the hatch cover load model, based on considerations of FSA studies, the strength criteria need not take into consideration the effect of forward spaces flooded conditions. This is compensated, partially, by the additions made to the net thickness, which do not take into consideration the reduced life of the ship. For the intact condition, the same load formulation as UR S21 is used.

With respect to the hatch cover strength criteria, in the formula for the required net plate thickness, the factor  $F_P$  for combined membrane and bending response has a minimum value of 1.35 instead of 1.50 as adopted in UR S21. This minimum value is significant in areas of the hatch cover plate subjected to low in-plane stresses from bending of primary supporting members. Therefore, the overall safety is not significantly reduced, as these areas are not susceptible to plate buckling. The safety factor,  $F_S$ , in the formula for the required minimum section modulus of secondary stiffeners depends on the stress level, so that  $F_S$  ranges between 1.2 and 1.5. This allows more specific requirements to be included for the minimum section modulus of stiffeners on the basis of their location and the corresponding stress level.

(2) The requirements for all bulk carriers built in accordance with UR S21 (1997) and not built in accordance with UR S21 Rev.2 will be based on assessment against the requirements of UR S21 Rev.2. Hatch cover built in accordance with UR S 21 (1997) will be required to be assessed at the first survey when steel renewal of hatch covers or hatch coaming structures is required due to damage or for compliance with S21.5 of UR S21 (1997).

(3) The schedule for compliance with these requirements for bulk carriers with hatch covers not built in accordance with UR S21 (pre-UR S21) is under discussion but has not been yet decided.

#### *2.1.3 Requirements for the fitting of a forecastle for new bulk carriers.*

A forecastle is considered to give protection to the forward coaming and closing arrangements of hatch cover No. 1 against horizontal loads. This effect has been taken into account in the definition of the horizontal pressure loads in UR S21 Rev.2 for the strength checks of hatch coamings and closing arrangements.

The forecastle is to be closed in order to achieve increased buoyancy in the forward area. The height of the forecastle is not to be more than 2.0 m greater than the hatch coaming height. As an additional measure to avoid increased vertical loads on the No. 1 hatch cover, which could be caused by the presence of a breakwater close to the aft edge of the forecastle deck, the minimum distance for a breakwater, if fitted, forward of the aft edge of the forecastle deck is specified.

#### *2.1.4 Requirements for the fitting of a breakwater for existing bulk carriers.*

The requirements apply to breakwaters being fitted as an alternative to strengthening the No. 1 forward transverse hatch coaming of existing bulk carriers which were not built in accordance with UR S21 (1997). The strength requirements are applicable to breakwaters of stiffened plate construction. The secondary stiffeners are continuous over the breadth of breakwaters.

The location and dimension requirements are established with the intention of providing protection to the No. 1 transverse forward hatch coaming. Cognizance has been taken of studies highlighting that the presence of a very high breakwater, in relation to the hatch cover it is protecting, increases the extreme vertical loads on the hatch cover. A limit on the breakwater height of not more than 1.5 m above the hatch cover is specified.

Limits on the angle of inclination of the breakwater are also being prescribed in order to avoid increasing vertical loads on hatch covers and to achieve adequate water run-off. The transverse extent of the breakwater is not to be less than that of No.1 hatch coaming in order to provide a complete protection to the foremost hatch coaming.

The load model considered for the scantlings of the breakwater is consistent with that adopted for hatch coamings in UR S21 Rev.2 (new ships) and new UR for hatch coamings for existing ships. The strength criteria are the same as those adopted for the hatch coamings in the above mentioned URs.

#### *2.1.5 Strength requirements for fore deck fittings and equipment. Strength and securing of small hatches on the exposed fore deck*

Two new URs have been developed to provide strength requirements to resist green sea forces for air pipes, vent pipes and their closing devices, windlasses and small hatches on exposed fore decks over the forward 0.25L. For new ships they are applicable to all ship types of seagoing service of 80 m length or more where the height of the exposed deck on which the item is mounted is less than

0.1L or 22 m above the full load water line, whichever is the lesser. For existing ships they are applicable only to ventilators, air pipes and small hatches on the exposed deck serving spaces forward of the collision bulkhead and to spaces which extend over this line aft-wards on bulk carriers, general dry cargo ships and derivatives of 100 m length or more.

The UR for fore deck fittings addresses recommendations 10 and 17 of the report of the Derbyshire RFI which identified the loss of rotating type ventilator heads on the fore deck as being one of the first events to have occurred in the ship loss sequence. Damage to air and vent pipes leading to further water ingress was also considered to have occurred. Evidence from the wreck further showed that the port windlass had been lost.

IACS has determined that increasing air or vent pipe thickness for the smaller sizes did not in general yield sufficient strength. Hence it was decided to require additional brackets, which allows the continuance in the main of current pipe thickness standards.

For vents, the forces acting on the closing device should be sustainable with the head in any open or closed position. The combination of horizontal forces, vertical forces and tilting moments acting on a rotating type mushroom vent head are such as to render this device unsuitable for application in the areas defined in the UR.

Measured forces on the windlasses were obtained directly from the above sea keeping model tests. The pressure to be applied to the windlass perpendicular to its shaft was obtained from the maximum measured force in this direction divided by the projected area. It was also found from comparing significant values of forces that differences between intact and flooded conditions were not large.

Structural requirements for small hatch covers are based on a design pressure obtained from the seakeeping model tests and corresponding to a position of about 0.04L from the forward perpendicular. With respect to securing devices, it is considered that there is room for improvement in existing industry standards and a requirement has been introduced such that butterfly nuts should not be dislodged by being loosened due to the effect of extra compression to the gasket from green sea forces. Metal to metal contact has been introduced to achieve this level of security. The method has also been made applicable to other preferred securing devices such as quick acting cleats and central wheel locking devices.

#### *2.1.6 Renewal criteria for the webs and side shell frames in existing single side skin bulk carriers.*

The requirements apply to the webs and side shell frames of cargo holds bounded by the single side shell of bulk carriers constructed with single deck, topside tanks and hopper tanks in cargo spaces which were not built in

accordance with UR S12 or subsequent revisions. The objective is to establish steel renewal criteria for the side frames of pre-S12 bulk carriers that are generally equivalent to the application of the renewal criteria of UR S12.

Two thickness values are defined: one for the purpose of establishing the steel renewal criteria for the side frames of existing bulk carriers and the other for taking measures consisting of the following:

- sand blasting, or equivalent, and coating,
- fitting tripping brackets,
- maintaining the coating in “as-new” condition or equivalent (i.e. without breakdown or rusting), at Special or Intermediate surveys.

Application of the steel renewal criteria may be waived if the structure and coating are in “as-new” condition. The steel renewal criteria aim to ensure adequate strength of the side frames of pre-S12 ships when their measured thickness is lower than the corresponding renewal thickness of S12 ships. Additionally in such cases simple yield strength and buckling checks are applied. The yielding strength checks are explicitly defined.

The effectiveness of steel renewal or alternative measures relies on an adequate extent of the structure being treated. Measures to be adopted for the lower and upper brackets are individually required to extend over at least 25% of the overall span. Different renewal thicknesses are defined for the span and upper bracket and for the lower bracket.

Reinforcing measures involve the fitting of tripping brackets at the lower part and at midspan of side frames. Frame tripping is considered as being one of the major causes of side frame collapse and the efficiency of tripping brackets in preventing catastrophic failures has been demonstrated in some near miss cases. The criteria for dealing with pitting and grooving are the same as in UR S12.

3. The technical details of these URs are in the process of completion and, once adopted, will be found on IACS web site: [www.iacs.org.uk](http://www.iacs.org.uk) .

#### **Action requested of the Committee**

4. The Committee is invited to take note of this information

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