GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

GUIDANCE

Part U Intact Stability

2009 AMENDMENT NO.1

Notice No.18 15th April 2009

Resolved by Technical Committee on 4th February 2009

Notice No.18 15th April 2009
AMENDMENT TO THE GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

"Guidance for the survey and construction of steel ships" has been partly amended as follows:

Part U INTACT STABILITY

Annex U1.2.1 GUIDANCE FOR STABILITY INFORMATION FOR MASTER

1.3 The Details of each Content

Paragraph 1.3.2 has been amended as follows.

1.3.2 Notices on Ship Operation

1 The following statement is to be described in the information.

This stability information shows that the ship complies with definite intact stability requirements in all designed conditions and gives the data deemed necessary for the calculation and evaluation of stability to the master in order that he can take suitable measures for securing the stability in any service condition.

2 For a ship intended to load ballast during navigation in any particular loading condition, notices on the reason, timing, method, etc. of loading are to be described. In this case the results of a series calculation from the condition at the start of ballasting to the condition at the finish of ballasting are to be included in the data for **1.3.9-3(6)**.

3 If any special operation for keeping ample stability is required during cargo handling (for an example, a particular compartment selected from compartments for cargo, fuel oil or fresh water is fully or partly loaded), the procedure is to be stated.

4 If the buoyancy of superstructures of car carriers, etc. having bow doors, side doors and/or stern doors is included in stability calculation, statement is to be made that those doors must be closed in watertight or weathertight condition before departure and that the stability curve is prepared under the condition with those doors closed.

5 Notices on loading cargoes (*e.g.* designed maximum weight and height of cargoes), if any, are to be described.

6 Where the ships are loaded with timber deck cargoes and are applied to the requirements of **2.2.1-2, Part U** of the Rules and **U2.3.1-3**, the condition that such cargo is stowed in accordance with the provisions of Chapter 3 of the *CODE OF SAFE PRACTICE FOR SHIPS CARRYING TIMBER DECK CARGOES, 1991* (resolution *A*.715(17)) are to be described.

7 Where the ships are loaded with timber deck cargoes, notices of paying attention to keep the stability of the ship positive at all times including during the process of loading and unloading, and that metacentric height should preferably not exceed 3% of the ships' breadth in order to prevent excessive accelerations in rolling, are to be stated.

8 Where the ships carrying oil-based pollutants in bulk, notices of paying attention that the stability criteria given in **2.2.1, Part U** of the Rules should be maintained during all loading and ballasting operations, are to be described.

9 It is essential to keep the ship upright at all times by a symmetrical distribution of masses. A general warning is to be given of any reduction of stability by a steady angle of heel of the ship.

10 If applicable, the preferred compensation of asymmetrical light ship mass by ballast,

consumables or cargo is to be explained. A warning against compensation by solid bulk cargo is to be given.

11 All relevant operating limits, including allowable values for longitudinal strength and allowable cargo mass, with regard to loading and distribution of cargo and ballasting are indicated. Reference is to be made to the loading manual, the damage control plan and the cargo securing manual, if applicable.

~~**9**~~**12** Any other notices deemed necessary for stability are to be described.

Paragraph 1.3.3 has been amended as follows.

1.3.3 Principal Particulars

The following items are to be listed in general.

(1) Name of ship
(2) Builder and yard number of ship
(3) Date of build (keel lay, launch, deliver) or conversion
(4) Purpose of ship
(5) Classification character and notations
(6) Nationality, port of registry, official number and signal letters
(7) Principal dimensions (length, breadth and depth)
(8) Tonnage descriptions
(9) Designed draught and corresponding deadweight
(10) Limitation of draught at bow or stern, if any.
(11) Output of main engine and ship speed.
(12) When load line is assigned, the data stated in **(9)** may be omitted subject to following data being added.
    (a) Convention or rules applied
    (b) Type of freeboard (A, B, etc.)
    (c) List of freeboard, draught, displacement and deadweight corresponding to load line of each season (This list may be attached to a deadweight scale.)
(13) IMO number

Paragraph 1.3.7 has been amended as follows.

1.3.7 Method of Utilizing Information

Explanations for following items are to be stated. In order that the master calculates stability curves (hereinafter referred to as "*GZ*-curve" in this guidance) and evaluates the stability of ship, examples of calculations are to be added and the basis of all data are to be clarified. Examples of calculations are to include a loading condition which is considered with at least one fuel or fresh water tank partly filled. Blank forms for calculation are to be attached.

(1) Calculation for displacement and location of centre of gravity.
(2) Calculation for draught and trim.
(3) Method of preparation for *GZ*-curve.
(4) Method of correction due to free-surface effect on *GZ*-curve and *GM*.
(5) Method of estimating the effect of wind and waves (For an example, method of preparing wind-heeling moment lever curves is to be given.)
(6) Method of evaluation for *GZ*-curve, etc. under the applicable stability requirements.
(7) Method of utilizing the diagram required in **1.3.10-8**.
(8) Other items deemed necessary (for an example, when anti-rolling devices, heeling tanks, etc.

are installed, the service procedures for them and operational restrictions thereto are to be explained. In case of ships to which the requirements in **Chapter 4, Part C** of the Rules apply, instructions concerning the operation of means, if fitted, to ensure the stability of the ship after flooding e.g. crossflooding are to be added.)

Paragraph 1.3.10 has been amended as follows.

1.3.10 General Data

1 As a general data, various data stated in following **-2** to **-8** are to be presented in numerical tables or curves to give required values with sufficient accuracy. If any change in trim has a large effect on the values of various data, additional tables or curves for suitable range of trim is to be prepared or the method of correction to cope with the change in trim is to be given.

2 Capacity and centre of capacity of compartments

Capacity and the location of the centre of capacity (in longitudinal and vertical directions, and also transverse direction, if required) of all compartments such as cargo holds, fuel oil tanks, fresh water tanks and ballast tanks are to be expressed as the functions of the ~~depth~~ liquid level or ullage of each compartment. When functions of ullage are used, reference point for ullage and the lowest point of that compartment are to be given. For deep tanks, side tanks, peak tanks and other tanks with unusual shape where the change of liquid level or ullage has a large effect on capacity or center of capacity, holding more than 0.1% of the ship's summer displacement, intervals of the liquid level or ullage are to be not more than 0.1*m*. In the range of liquid level or ullage where capacity and center of capacity vary linearly depending on the tank shape, larger intervals may be adopted. It is preferable that the moment of inertia of free surface is additionally given for all compartments which may be partly filled with liquied. For car carriers and car ferries, the location of centre of gravity of a car stowing compartment may be based on the location of centre of gravity of cars rather than the centre of the capacity.

3 Effect of free surface

For cargo holds and tanks which are partly filled with ~~liquied~~ liquid and are also deep tanks, side tanks, peak tanks or other tanks with unusual shape where the change of liquid level or ullage has a large effect on capacity or center of capacity, holding more than 0.1% of the ship's summer displacement, the effect given by the free surface on the stability is to be given as the function of the volume or the ~~depth of the liquied.~~ liquid level. Intervals of the liquid level or ullage are to be not more than 0.1*m*. For tanks with a width of 0.6*B* or more, to indicate corrections to the righting lever in **(2)(b)**, the angle of heel (θ) is to be in the range from 10° to 80° and in intervals not more than 10°.

(1) Compartments where free surface is taken into account;

(a) For compartments containing liquid which may be consumed or discharged during navigation, or for tanks, such as anti-rolling devices and heeling tanks containing liquid which may be transferred to and from other tanks, the expected maximum moment of free surface is to be given.

(b) When liquid in a cargo hold or deep tank is maintained constant at partly filled condition during navigation, the moment of free surface may be calculated on the basis of actual quantity of the liquid.

(2) Free surface moment

(a) Correction to initial metacentric height;

Vertical ascend of centre of gravity is calculated by the following formula:

$$GG_0 = \frac{\Sigma \gamma i}{W}$$

where:

Symbol Σ means that the values are to be summed up on all compartments having free surface inside. The same is applied to the subsequent formula **(b)**.

γ : Specific weight of liquid (t/m^3).

i : Transverse moment of inertia of free surface (m^4)

W : Displacement (t).

(b) Correction to righting lever;

i) The righting lever is reduced by the amount obtained from the following formula:

$$\Delta GZ = \frac{\Sigma M_{fs}}{W}$$

$$M_{fs} = \gamma \upsilon b K \sqrt{\delta}$$

Since above-mentioned formula for M_{fs} is prepared for the case where liquid is half filled in a compartment of approximately rectangular section, direct calculation is required separately for each compartment if the above condition is not met. For the cases where deemed necessary by the Society, however, other suitable methods may be applied.

$$\delta = \frac{\upsilon}{b \ell h}$$

υ : Total volume of tanks (m^3)

b, ℓ, h : Maximum length (m), maximum breadth (m), and maximum depth (m) of the tank, respectively

K : Value determined by following formulae according to cot θ and b/h;

In case of $\cot\theta \geq b/h$:

$$K = \frac{\sin\theta}{12}\left(1 + \frac{\tan^2\theta}{2}\right)\frac{b}{h}$$

In case of cot $\theta < b/h$:

$$K = \frac{\cos\theta}{8}\left(1 + \frac{\tan\theta}{b/h}\right) - \frac{\cot\theta}{12(b/h)^2}\left(1 + \frac{\cot^2\theta}{2}\right)$$

θ : Angle of heel (°)

γ, W : As given in above **(a)**

ii) In the case of tanks, of which M_{fs} specified in above **i)** complies with following at when angle of heel (θ) is 30°, the correction to righting lever may be omitted.

$$M_{fs} < 0.01 W_{min}$$

where:

W_{min} : Displacement (t) in light condition, in general.

4 Hydrostatic values

Hydrostatic values in the range of light draught to 115% of the maximum draught in intervals not more than 5*cm* are to be presented on the basis of mean draught above underside of keel in the designed trim condition. Stability information is to show the influence of various trims on hydrostatic values for a suitable range of trim in cases where the operational trim range exceeds +/- 0.5% of L_S specified in **4.1.2(6) Part C** of the Rules. The following items are to be included:

(1) Mould displacement and displacement including shell platings, etc. (Specific gravity of sea water is to be ~~specified~~ 1.025(t/m^3). Lower specific gravity may be adopted subject to the approval by the Administration.)

(2) ***TPC, MTC***

(3) *TKM* (*LKM* to be included, if necessary)

(4) ℓ_{cb}, ℓ_{cf} (*KB* to be included, if necessary)

(5) C_b

(6) Thickness of keel plates

5 Cross curves

Cross curves showing the relationship between righting lever, angle of heel and displacement or draft is to be presented in the design trim condition.

When structures and cargoes on the upper deck accepted as reserve buoyancy are included in calculations, data showing their particulars are to be added. Where the design trim condition, the ship form or the arrangement are such that any change in trim has an appreciable effect on righting arms, additional cross curve tables are to be included for a suitable range of trim. Cross curves may be indicated as tables.

The cross curves are to cover the following range;

(1) Full range of displacement or draft extending from light draft to 115% of the maximum draught in intervals not more than 5*cm*.

(2) ~~The range of inclination corresponding to the stability requirements applied, the type of ship.~~ The range of the angle of heel extending from 10° to 80° in intervals not more than 10°. (~~Below 50°interval of the angle of inclination is to be not more than 10°.~~ However, closer spacing may be required according to the ship form and proportions.)

6 Curve of downflooding angle

The angle of heel, ranging up to which the lower edge of an opening without weathertight closing means reaches water surface, is to be specified as a function of displacement or draft. A diagram showing the position of the said opening is to be attached.

Curve of downflooding angle may be indicated as tables.

7 Projected lateral windage area

Projected lateral area of hull structure, deck cargoes, etc. above water line receiving wind pressure and the vertical distance between the centre of its area and the centre underwater projected lateral area are to be given as the functions of the draught. The centre of underwater projected lateral area may be approximately assumed to locate at half the draught.

8 Maximum permissible height of centre of gravity, etc.

The diagram by which the master is able to confirm easily that the stability of his ship complies with the requirements in **1.3.8** in any loading condition, given in the functions and format deemed adequate by the Society taking ship type and service area into account are to be supplied.

For an example, it is to be of the curve of minimum permissible G_0M (or maximum permissible KG_0) in which draught and G_0M (or KG_0) are respectively used as ordinate and abscissa. Where the minimum permissible G_0M (or maximum permissible KG_0) is determined from considerations related to the requirements in **Chapter 4, Part C** of the Rules, the minimum permissible G_0M between the deepest subdivision draught and the partial subdivision draught and between the partial subdivision draught and light service draught is to be linearly varied respectively and, for intermediate draughts, values to be used is to be obtained by linear interpolation applied to such G_0M value. Where the subdivision index is calculated for different trims, the minimum permissible G_0M (or maximum permissible KG_0) curves are to be established in the same way.

9 Influence of Trims

The stability information is to show the influence of various trims in cases where the operational trim range exceeds +/- 0.5% of L_s specified in **4.1.2(6) Part C** of the Rules.

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 15 April 2009.

2. Notwithstanding the amendments to the Guidance, the current requirements may apply to ships for which the date of contract for construction* is before the effective date.
*"contract for construction" is defined in the latest version of IACS Procedural Requirement(PR) No.29.

IACS PR No.29 (Rev.4)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.
For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:
(1) such alterations do not affect matters related to classification, or
(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.
The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Notes:
1. This Procedural Requirement applies to all IACS Members and Associates.
2. This Procedural Requirement is effective for ships "contracted for construction" on or after 1 January 2005.
3. Revision 2 of this Procedural Requirement is effective for ships "contracted for construction" on or after 1 April 2006.
4. Revision 3 of this Procedural Requirement was approved on 5 January 2007 with immediate effect.
5. Revision 4 of this Procedural Requirement was adopted on 21 June 2007 with immediate effect.