RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part U **Intact Stability**

2011   AMENDMENT NO.1

Rule No.27   30th June 2011

Resolved by Technical Committee on 3rd February 2011

Approved by Board of Directors on 25th February 2011

Rule No.27   30th June 2011
AMENDMENT TO THE RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL
SHIPS

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

Part U   INTACT STABILITY

Chapter 1   GENERAL

1.1   General

Paragraph 1.1.4 has been amended as follows.

1.1.4   Definitions
For the purpose of the application of this part, the following definitions apply.
(1)   The definition of "downflooding angle" refers to the angle of heel at which openings in the hull, superstructures or deckhouses which cannot be closed weathertight, immerse.
(2)   The definition~~s~~ of "mobile offshore drilling unit" ~~and "work-ship" are~~is according to **Part P**.
(3)   "Timber deck cargo" means a cargo of timber carried on an uncovered part of a freeboard or superstructure deck. The term does not include wood pulp or similar cargo.

Chapter 2   STABILITY REQUIREMENTS

2.1   General

2.1.1   General

Sub-paragraph -7 has been deleted.

~~7   Work-ships are to be in accordance with requirements given in this **Part**. In addition, special consideration is to be paid to stability during designated operations.~~

Paragraph 2.1.2 has been amended as follows.

2.1.2   Calculation on Stability
Stability is to be calculated under the following conditions.
(1) In preparing stability curves, the position centre of gravity is to be determined on the basis of

the data obtained at inclining test required in **2.3.2, Part B of the Rules**.

(2) Free surface effects of liquid in tanks are to be of what the stability during navigation under all loading condition is most severely affected.

(3) ~~In work-ships, the heeling lever resulting from designated operations is to be considered the one considered to be the most unfavorable for stability.~~

(~~4~~3) Where anti-rolling devices are installed in a ship, the requirements in **2.2** are to be satisfied whether the devices are in operation or not.

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 30 December 2011.

2. Notwithstanding the amendments to the Rules, the current requirements may apply to ships for which the date of contract for construction is before the effective date.

3. Notwithstanding the provision of preceding **2.**, the amendments to the Rules may apply to ships for which the application is submitted to the Society before the effective date upon request by the owner.

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part U   Intact Stability

2011 AMENDMENT NO.1

Notice No.41   30th June 2011

Resolved by Technical Committee on 3rd February 2011

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

U1   GENERAL

U1.1   General

U1.1.1   Applications

Sub-paragraph -1 has been deleted and -2 and -3 have been renumbered to -1 and -2 respectively.

~~1   With respect to work-ships, special consideration is to be paid to intact stability under operation in addition to the requirements in **Part U of the Rules**.~~
~~2~~**1**   With respect to sailing ships and multihull crafts, special requirements deemed necessary by the Society may apply in addition to the requirements in **Part U of the Rules**.
~~3~~**2**   With respect to ship stability, consideration is to be given to the dynamic stability phenomena effects in waves.
(1) Excessive stability may produce undesirable effects in ships.
(2) Any ship exhibiting large stability righting lever variations between wave trough and wave crest conditions may experience parametric roll or pure loss of stability or combinations thereof.
(3) Ships without propulsion or steering ability may be endangered by resonant roll while drifting freely.
(4) Ships in following and quartering seas may not be able to keep constant course despite maximum steering efforts which may lead to extreme angles of heel.

Paragraph U1.1.2 has been amended as follows.

U1.1.2   Special Cases in Application
1   For certain ships which have comparatively wider beams and smaller depths than typical ships (about $B/D \geq 2.5$), notwithstanding the provisions of **2.2.1-1, Chapter 2, Part U** of the Rules, stability curves may comply with the following requirements in cases where deemed acceptable by the Society.
(1) Stability curves are to be comply with the requirements given in **2.2.1-1(1)** to **(4)** and **(6), Chapter 2, Part U**.
(2) θ_{max} is to be comply with the following requirements:
   (a) θ_{max} is not to be less than 15°.
   (b)   With respect to the requirements given in **Fig. U2.1, Part U** of the Rules, the area under a stability curve between 0° and θ_{max} ($m \cdot rad$) is to be not less than:
   $$0.055 + 0.001(30° - \theta_{max})$$

where θ_{max} is as given in **2.2.1-1, Chapter 2, Part U** of the Rules.

2 Intact stability (hereinafter referred to as "stability" in this Part) of steel barges, which are 24 *metres* in length and over and registered for unrestricted service according to **Part Q** of the Rules, is to be as follows;

(1) The requirements of **Chapter 2, Part U** of the Rules are to apply.
(2) Notwithstanding above **(1)**, in the case of the steel barges complying with the requirement in **1.1.1-2(2), Part Q** of the Rules and following **(a)** to **(d)** (hereinafter referred to as "the pontoon barge" in this Part), the requirements of **U2.2.1-2** and **U2.3.1-5** may apply.
  (a) To be non self-propelled and unmanned during navigation
  (b) Block coefficient (C_b) is to be not less than 0.9.
  (c) The ratio *B/D* is to be greater than 3.0.
  (d) No opening except small manholes fitted with watertight steel covers is to be provided in deck.

~~**3** For offshore supply vessels, notwithstanding the provisions of **2.2, Chapter 2, Part U** of the Rules, Chapter 2.4, Part B of *IMO Res. MSC.267(85) "International Code on Intact Stability 2008 (2008 IS Code)"* may apply. In addition, offshore supply vessels do not need to comply with **2.3, Chapter 2, Part U** of the Rules.~~

4̶3 For container ships of 100m in length and over, notwithstanding the provisions of **2.2, Chapter 2, Part U** of the Rules, Chapter 2.3, Part B of *IMO Res. MSC.267(85) "International Code on Intact Stability 2008 (2008 IS Code)"* may apply.

5̶4 In applying the provision of **2.3.1-1, Chapter 2, Part U** of the Rules, the value of l_{w1} may be determined by model tests using the procedure described in *MSC.1/Circ.1200* in cases where deemed acceptable by the Society.

6̶5 In applying the provision of **2.3.1-1, Chapter 2, Part U** of the Rules, in cases where a ship corresponds to any of the following **(1)** to **(4)**, the value of θ_1 may be determined by model tests using the procedure described in *MSC.1/Circ.1200*.

(1) the ratio *B/D* is not less than 3.5.
(2) *KG/d-1* is equal to or less than -0.3, or equal to or greater than 0.5.
(3) *T* is not less than 20 (seconds).
(4) Other deemed appropriate by the Society.

U2 STABILITY REQUIREMENTS

U2.2 General Stability Requirements

Paragraph U2.2.1 has been amended as follows.

U2.2.1 Stability Curves

1 For ships applying **2.1.1-2, Chapter 2, Part U** of the Rules, stability may be calculated under following conditions, provided that the requirements in Regulation 44, *ILLC* are complied with and timber cargoes are stowed in full breadth of ships. However, when the ship has a rounded gunnel, allowance not exceeding 4 per cent of the breadth of ships for loading may be given.

(1) 75% of the volume occupied by timber may be added to buoyancy.

(2) In arrival condition, timber weight is to be considered a 10% increase over departure condition due to absorption of water. However, attention is to be paid to the rate of increase determined by the flag state which ships are flying.

2 Stability curves of the pontoon barge are to comply with the following requirements in **Fig. U2.2.1-2**.

(1) A is to be not less than 0.08 $m \cdot rad$.

(2) Range of stability is to be not less than following value according to length of pontoon (L).

In case of $L \le 100$ m :20°

In case of $L \ge 150$ m :15°

In case that L becomes intermediate, the value is to be determined by interpolation.

where

A : Area under stability curve between 0° and θ_{max} ($m \cdot rad$)

θ_{max} : An angle at which righting lever reaches maximum (°)

GZ_{max} : Maximum righting lever (m)

~~**3** Ships intended towing operation are to comply with the following requirements, in addition to the requirements of **2.2.1, Part U** of the Rules.~~

~~(1) The initial transverse metacentric height (G_0M) is not to be less than 0.15 m.~~

~~(2) The stability curves are to comply with the following **(a)** or **(b)**.~~

~~(a) The residual area between a righting lever curve and a heeling lever curve developed from the bollard pull force is not to be less than 0.09 $m \cdot rad$. The area is to be determined between the first interception of the two curves and the second interception or the angle of down flooding whichever is less. (The area as specified by "A" in **Fig. U2.2.1-4**)~~

~~(b) The area under a righting lever curve ("A" + "B" in **Fig. U2.2.1-4**) is not to be less than 1.4 *times* the area under a heeling lever curve developed from the bollard pull force ("B" + "C" in **Fig. U2.2.1-4**). The areas are to be determined between 0 *degree* and the 2nd interception or the angle of down flooding whichever is less.~~

~~In the application of the above requirements, the heeling lever (l_h) curve developed from the bollard pull force is to be derived by using the following formula. For ships intended for towing astern, such lever is to be that for towing ahead or that for towing astern, whichever is larger.~~

~~$$l_h = \frac{\kappa \cdot T \cdot h \cdot \cos\theta}{9.81 \cdot \Delta} \quad (m)$$~~

~~where:~~

~~κ : Coefficient relating to type of propulsion, is to be taken equal to 0.7 for ships with azimuth thruster(s) and 0.5 for other ships.~~

~~*T* : Maximum bollard pull (*kN*). In principle, maximum bollard pull is to be derived from the actual test at the maximum continuous output of engine(s). However, a nominal bollard pull specified by constructor of the considered ship may be accepted, provided that such value is not less than value given by **Table U2.2.1** as a standard, unless records of bollard pull tests in similar ships or sufficient information provided by the constructor.~~

~~*h* : Vertical distance (*m*) between the towing hook and the centre of the propeller.~~

~~Δ : Displacement (*ton*)~~

~~(3) Maximum bollard pull used in the application of **(2)** above is to be clearly stated in the ship's stability information and drawings relating to ship's towing arrangements. Such maximum bollard pull is also to be indicated at an appropriate position on each of the ship's towing arrangements.~~

~~(4) In principle, ships are to be provided with an appropriate device being capable of releasing the towing cable in an instant. Notwithstanding the above, ships only engaged in coasting service or equivalent, such device may be dispensed with, provided that appropriate safety procedures for emergency are to be stated in the ship's stability information.~~

~~**4** Fire fighting vessels are to comply with following requirements in addition to the requirements given in **2.2.1**, **Part U of the Rules**.~~

~~(1) Stability curves are to comply with the following **(a)** and **(b)**:~~

~~(a) The residual area between a righting lever curve and a heeling lever curve of monitors for fire fighting and propulsion machinery such as thrusters for ship positioning is not to be less than 0.09*m-rad*. The area is to be determined between the first intercept of the two curves and the angle up to an angle of heel of 40 *degrees* beyond the angle of the first intercept or the downflooding angle, whichever is less.~~

~~(b) The residual area between a righting lever curve and a heeling lever curve of monitors for fire fighting and propulsion machinery such as thrusters for ship positioning is not to be less than 0.09*m-rad*. The area is to be determined between the first intercept of the two curves and the downflooding angle or the immersing angle of the deck edge, whichever is less. In such cases, the immersing angle of the deck edge is to be according to U2.3.1-1(2).~~

~~**5** Work-ships, except for those work-ships listed in **3** and **4** above, are to at least comply with the following requirements corresponding to their designated operations in addition to the requirements given in **2.2.1**, **Part U of the Rules**. However, in cases where other stability requirements deemed appropriate by the Society are in effect, this requirement may be dispensed with.~~

~~Stability curves are to comply with the following:~~

~~The residual area between a righting lever curve and a heeling lever curve due to designated operations is not to be less than 0.09*m-rad*. The area is to be determined between the first intercept of the two curves and the second intercept or the angle of down flooding, whichever is less.~~

Fig.U2.2.1-4 has been deleted.

Fig. U2.2.1-4   Heeling lever curve developed from the bollard pull force

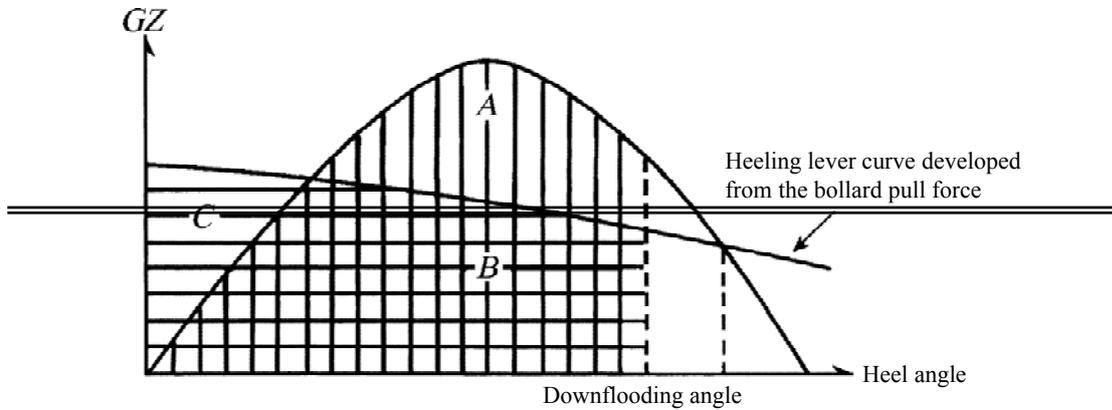Fig.U2.2.1-5 has been deleted.

Fig. U2.2.1-5   Heeling lever curve of monitors for fire fighting and propulsion machinery
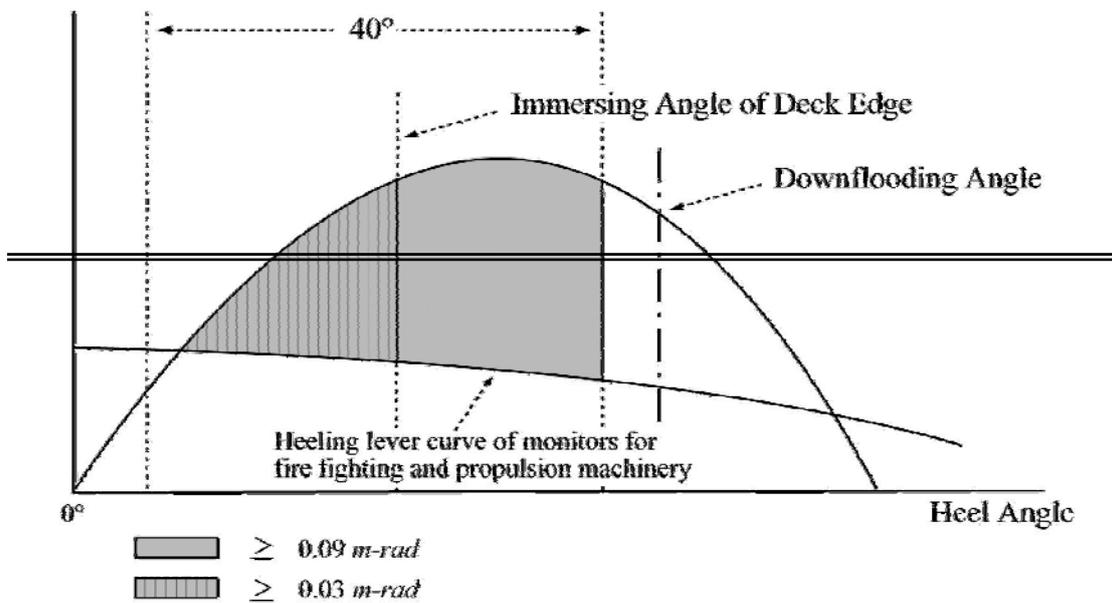

Table U2.2.1 has been deleted.

Table U2.2.1   Maximum bollard pull (*kN*)

	Towing ahead	Towing astern	
		For azimuth thruster(s)	For others
For propeller(s) not fitted with nozzles	0.16*H*	0.14*H*	0.08*H*
For propeller(s) fitted with nozzles	0.19*H*	0.17*H*	0.10*H*

H :   Maximum continuous output of engine(s) (*kW*)
(Note) For ships other than conventional ships having propulsion(s) in the aft end, a special consideration is to be given for each ship.

Annex U1.2.1   GUIDANCE FOR STABILITY INFORMATION FOR MASTER

1.3   The Details of each Content

Paragraph 1.3.9 has been amended as follows.

1.3.9   Stability in Standard Loading Condition
1   Standard loading condition
    The undermentioned conditions are to be at least included in standard loading conditions unless they are clearly inappropriate. A departure condition means a condition in which provisions and fuel are fully loaded and an arrival condition means a condition in which 90% thereof are consumed. In full load departure conditions, it is to be assumed that the ship is loaded to its subdivision load line used for damage stability calculations according to **Chapter 4, Part U** of the Rules or summer load line or if intended to carry a timber deck cargo, to the summer timber load line with water ballast tanks empty. In all cases, the cargo in holds is assumed to be fully homogeneous unless this condition is inconsistent with the practical service of the ship.
(1) Light condition
(2) Docking condition
(3) Ballast departure condition and ballast arrival condition
(4) Full load departure condition and full load arrival condition as following.
    (a)   In principle, all designed loading conditions are to be included; for example, such special loading conditions as loading cargoes on decks or in alternate holds, etc.
    (b)   ~~For offshore supply vessels, the condition is to be as a vessel with cargo distributed below deck and with cargo specified by position and weight on deck, corresponding to the worst service condition.~~
    (e~~b~~) If a dry cargo ship ~~or an offshore supply vessel~~ has tanks for liquid cargo, the effective deadweight in the loading conditions therein described is be distributed according to the following two assumptions:**(1)** with cargo tanks full and **(2)** with cargo tanks empty.
    (d)   ~~For offshore supply vessels, in cases where pipes are carried on deck, a quantity of trapped water equal to a certain percentage of the net volume of the pipe deck cargo is to be assumed in and around the pipes. The net volume is to be taken as the internal volume of the pipes, plus the volume between the pipes. This percentage is to be:~~
           ~~i)   30 if the freeboard amidships is equal to or less than 0.015L; and~~
           ~~ii)   10 if the freeboard amidships is equal to or greater than 0.03L.~~
           ~~iii)   For intermediate values of the freeboard amidships, the percentage may be obtained by linear interpolation.~~
           ~~However, if the effects of sheer aft, actual trim and area of operation are taken into account, these requirements may be waived.~~
(5) Loading condition in which the parameters of stability are liable to be changed on a large scale (e.g. ballasting during navigation, possible icing, etc.)
(6) Where the ships are loaded with timber deck cargoes, the loading condition with the summer timber load line (if the timber summer draught is not assigned to the ships, summer load line) with cargoes homogeneously distributed in the holds and with cargoes specified in extension and mass on deck.
(7) ~~For offshore supply vessels, vessel in the worst anticipated operating condition.~~
2   Following items are to be stated concerning each loading condition. If there are any limitations placed upon loading, they are to be included.
(1) Arrangement in suitable scale showing distribution of all components constituting deadweight
(2) Light weight, and weight, location of centre of gravity (longitudinal direction, vertical direction,

and also transverse direction, if necessary), and weight moment of all components of deadweight together with displacement and location of centre of gravity of whole ship as a sum of each component.

(3) Effect of free surface within all compartments which are liable to be partly filled.

(4) Mean draught, positions of centre of buoyancy and centre of gravity (directions in longitudinal, vertical, and also transverse, if necessary), position of centre of floatation, MTC, trim, draughts at forward and aft perpendiculars (also at draught marks, as needed), GG_0, KG_0 and G_0M.

(5) GZ-curves taking effect of free surface and changes in trim during heeling into account
Values of downflooding angle, maximum righting lever and corresponding angle of heel, and vanishing angle of stability are also to be entered. Heeling moment lever curve due to external forces such as wind is to be superposed on the stability curve to verify that applicable stability requirements are complied with. Scale of these curves are to be the same as far as practicable in all loading condition.

(6) If in any loading condition water ballast is necessary, the quantity and disposition of water ballast.

(7) In all cases, in cases where deck cargo is carried, a realistic stowage mass and the height of the cargo.

(8) For offshore supply vessels, a realistic stowage weight, the height of the cargo and its centre of gravity.

3 The following items are to be made into a list for convenience of use.

(1) Displacement
(2) Corresponding draught
(3) Draught at fore perpendicular, aft perpendicular and midship
(4) Draught at the position of fore and aft draught marks, if necessary
(5) Trim
(6) l_{cf}, l_{cb}, l_{cg}
(7) MTC, TPC and TKM (LKM to be included, if necessary)
(8) KG and GM (KB to be included, if necessary)
(9) GG_0, KG_0 and G_0M
(10) Maximum righting lever and corresponding angle of heel and vanishing angle of stability
(11) Downflooding angle
(12) Evaluation of conformity with stability requirements
(13) Others

where

ℓ_{cf} : Longitudinal centre of floatation

ℓ_{cb} : Longitudinal centre of buoyancy

ℓ_{cg} : Longitudinal centre of gravity

MTC : Moment to change trim one centimeter

TPC : Tons per centimeter immersion

TKM : Transverse metacentric height above base line

LKM : Longitudinal metacentric height above base line

KG_0 : Apparent vertical centre of gravity above base line

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 30 December 2011.

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.

3. Notwithstanding the provision of preceding **2.**, the amendments to the Guidance may apply to ships for which the application is submitted to the Society before the effective date upon request by the owner.