RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

RULES

Part U Intact Stability

2010 AMENDMENT NO.1

Rule No.24 15th April 2010

Resolved by Technical Committee on 5th February 2010

Approved by Board of Directors on 23rd February 2010

Rule No.24 15th April 2010
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.

(~~1~~2) The definitions of "mobile offshore drilling unit" and "work-ship" are according to **Part P**.

(~~2~~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

Paragraph 2.1.1 has been amended as follows.

2.1.1 General

1 Stability curves and heeling moment curves are to be prepared by the method deemed appropriate by the Society for all designed loading conditions and they are to be verified to comply with the requirements in **2.2** and **2.3**.

~~**2** Excessive stability is to be avoided, since it may produce a greater acceleration which may have adverse effects in hull structures, cargoes, etc.~~

~~**3** For the ships navigating in the areas where icing is expected to occur, it is to be considered that the projected area against wind is increased and the position of centre of gravity is heightened due to icing on the structures.~~

2 Free surface effects are to be accounted for in all conditions of loading.

3 In cases where anti-rolling devices are installed in a ship, the requirements given in **2.2** and **2.3** are to be satisfied when such devices are in operation and when there is either a failure of power supply to the device(s) or a failure of the device(s)

4 Influences such as the icing of topsides, water trapped on deck, etc., adversely affect stability and the Administration is advised to take these into account, so far as is deemed necessary.

5 Provisions are to be made for a safe margin of stability at all stages of the voyage, regard being given to additions of weight, such as those due to the absorption of water and icing as well as to losses of weight such as those due to the consumption of fuel and stores..

6 Curves or tables of minimum operational metacentric height (GM) or maximum centre of gravity (VCG) are to extend over the full range of operational trims.

~~**4**~~**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 ~~the relevant design~~ 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) 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.

2.2 General Stability Requirements

Paragraph 2.2.1 has been amended as follows.

2.2.1 Stability Curves

1 ~~For ships without timber deck cargoes, t~~The stability curves are to comply with the following requirements in **Fig. U2.1**.

(1) A_1 is not to be less than $0.055m \cdot rad$.

(2) A_2 is not to be less than $0.03m \cdot rad$.

(3) $(A_1 + A_2)$ is not to be less than $0.09m \cdot rad$.

(4) GZ is to be at least $0.20m$ at an angle of heel equal to or greater than 30° .

(5) θ_{max} is not to be less than 25°.

(6) G_0M is not to be less than $0.15m$.

where

A_1: Area under stability curve between 0° and 30° ($m \cdot rad$).

A_2: Area under stability curve between 30° and θ_u ($m \cdot rad$).

θ_u : Heeling angle (*degree*) to be taken of whichever is less, downlooding angle in the relevant loading condition or 40°.

GZ_{max}: Maximum righting lever (m).

θ_{max} : Heeling angle at which the righting arm reaches maximum (*degree*).

G_0M: Initial metacentric height corrected by free surface effect (m).

2 For ships loaded with timber deck cargoes, notwithstanding the provisions of the preceding **-1**, the stability curves ~~are~~ may comply with the following requirements in **Fig. U2.1** in cases where deemed acceptable by the Society.

(1) $(A_1 + A_2)$ is not to be less than $0.08m \cdot rad$.

(2) GZ_{max} is not to be less than $0.25m$.

(3) G_0M is not to be less than $0.10m$ during navigation taking into account the absorption of water by deck cargo and/or ice accretion on exposed surfaces.

(4) The value of all symbols in this Part is to be one in relevant loading condition except the case that it is particularly specified.

~~where:~~

~~A_1: Area under stability curve between 0° and 30° ($m \cdot rad$).~~

~~A_2: Area under stability curve between 30° and θ_u ($m \cdot rad$).~~

~~θ_u :Heeling angle (*degree*) to be taken of whichever is less, downlooding angle in relevant loading condition or 40°.~~

~~GZ_{max}: Maximum righting lever (m).~~

~~θ_{max} : Heeling angle at which righting arm reaches maximum (*degree*).~~

~~G_0M: Initial metacentric height corrected by free surface effect (m).~~

A_1, A_2, θ_u , GZ_{max}, θ_{max} and G_0M : As given in **(1)** above.

2.3 Stability Requirements in Wind and Waves

Paragraph 2.3.1 has been amended as follows.

2.3.1 Stability Curves and Wind-heeling Moment Lever Curves

1 Stability curves and wind-heeling moment lever curves of ships are to comply with the following requirements in **Fig. U2.2**.

(1) Heeling angle caused by steady wind is to be less than 16° or an angle corresponding to 80% of immersing angle of deck edge, whichever is less.

(2) Area "*b*" is not to be less than area "*a*".

where:

l_{w1}: Heeling moment lever caused by steady wind (*m*) given by the following formula:

$$\frac{0.0514AZ}{W'}$$

A: Projected lateral area of hull and cargoes on deck above waterline (m^2).

Z: Vertical distance between the centre of "*A*" and the centre of underwater projected lateral area of hull (*m*). In general, the centre of underwater projected lateral area may be approximated to locate at half the draught.

W': Displacement (*t*).

l_{w2}: Heeling moment lever caused by gust (*m*) given by the following formula:

$1.5l_{w1}$

a: Area encircled by stability curve, l_{w2} and θ_r ($m \cdot rad$).

b: Area encircled by stability curve, l_{w2} and θ_2 ($m \cdot rad$).

θ_r: Angle of rolling stop motion (*degree*). In general, it may be given by the formula $(\theta_0 - \theta_1)$.

θ_c: Heeling angle at the second intersection between heeling moment lever and stability curve (*degree*).

θ_2: Heeling angle (*degree*) to be taken of whichever is the least, downflooding angle, θ_c or 50°.

θ_0: Angle of heel under action of steady wind (*degree*).

θ_1: Angle of roll to windward due to wave action (*degree*) given by the following formula:

$$109x_1x_2k\sqrt{rs}$$

x_1: Values obtained from **Table U2.1** according to the value of *B*/*d*' In case the value of *B*/*d*' becomes intermediate, values are to be determined by interpolation.

B: Moulded breadth of the ship (*m*).

d': Mean moulded draught of the ship (*m*).

x_2: Values obtained from **Table U2.2** according to C_b. In case C_b becomes intermediate, values are to be determined by interpolation.

C_b: Block coefficient given by the following formula:

$$\frac{W'}{1.025L'Bd'}$$

L': Length of the ship at waterline (*m*).

k: Values determined as follows;

For round-bilged ships having neither bilge keels nor bar keels: 1.0

For ships with sharp bilges: 0.7

For ships with bilge keel and/or bar keels: Values obtained from **Table U2.3**

according to the value of $100A_k/L'B$. In case $100A_k/L'B$ becomes intermediate, values are to be determined by interpolation.

A_k: Total area of bilge keels, projected lateral area of bar keels or sum of those areas (m^2).

r: Values obtained from the following formula. However, the value of r need not be taken over 1.0.

$$0.73 + 0.6\frac{OG}{d'}$$

OG: Distance between the centre of gravity and the waterline (m), and is taken as positive when the centre of gravity is above waterline.

s: Values obtained from **Table U 2.4** according to the value of T. In case T becomes intermediate, values are to be determined by interpolation.

T: Rolling period (seconds) obtained from the following formula. However, value of T based on information considered sufficient may be used instead.

$$\frac{2B}{\sqrt{G_0M}}\left(0.373 + 0.023\frac{B}{d'} - 0.043\frac{L'}{100}\right)$$

G_0M: As specified in **2.2.1**

2 For ships loaded with timber deck cargo, notwithstanding the provisions of the preceding **-1**, stability curves may comply with the following requirements in **Fig. U2.2** in cases where deemed acceptable by the Society.

(1) θ_0 is to be less than 16°.

(2) Stability curves and wind-heeling moment lever curves of ships are to comply with **-1(2)** above.

~~2~~**3** Where the requirements specified in above **-1** and **-2** apply to the ships registered as restricted service, the values of l_{w1} ~~and s~~ may be ~~modified by the Society~~ reduced when deemed acceptable by the Society.

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 1 July 2010.

2. Notwithstanding the amendments to the Rules, the current requirements may apply to ships the keels of which were laid or which were at *a similar stage of construction* before the effective date.

(Note) The term "*a similar stage of construction*" means the stage at which the construction identifiable with a specific ship begins and the assembly of that ship has commenced comprising at least 50 *tonnes* or 1%* of the estimated mass of all structural material, whichever is the less.

* For high speed craft, "1%" is to be read as "3%".

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part U Intact Stability

GUIDANCE

2010 AMENDMENT NO.1

Notice No.42 15th April 2010

Resolved by Technical Committee on 5th February 2010

Notice No.42 15th April 2010
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

Paragraph U1.1.1 has been amended as follows.

U1.1.1 Applications

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 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 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.

~~1~~**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 ~~not less~~ greater than 3.0.

(d) No opening except small manholes fitted with watertight steel covers is to be provided in deck.

~~2~~**3** For offshore supply vessels, ~~Chapters 3.2 and 4.5 of *IMO Res. A*.749(18) *"Code on Intact Stability for All Types of Ships covered by IMO Instruments"*, as amended by *MSC Res*.75(69)~~ are 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

4 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.

5 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.

6 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.

U1.2 Stability Information

Paragraph U1.2.1 has been amended as follows.

U1.2.1 Stability Information Booklet

The stability information booklet specified in **1.2.1, Part U** of the Rules is to be prepared in accordance with **Annex U1.2.1 "GUIDANCE FOR STABILITY INFORMATION FOR MASTER"**. Notwithstanding the above, for ships applied **1.1.2, Part U** of the Rules, the requirements for the booklet may be modified. In cases where deemed appropriate by the Society, as an alternative to the stability information booklet, a simplified booklet containing sufficient information to enable the master to safety operate the ship.

U2 STABILITY REQUIREMENTS

U2.1 General

Paragraph U2.1.1 has been amended as follows.

U2.1.1 General

1 With respect to preparing the stability curves and heeling moment curves specified in **2.1.1-1, Chapter 2, Part U** of the Rules, the effects of changes in trim during heeling are to be taken into account.

2 All designed loading conditions specified in **2.1.1-1, Chapter 2, Part U** of the Rules are to contain the standard loading condition described in **Annex U1.2.1 "GUIDANCE FOR STABILITY INFORMATION FOR MASTER"** besides loading conditions expected throughout the duration of the voyage.

3 ~~In case of ships carrying liquefied gases in bulk, etc.~~ For all loading conditions throughout the duration of the voyage, stability is to comply with **2.2** and **2.3, Chapter 2, Part U** of the Rules. For the conditions other than those during voyage (for example, during cargo loading), G_0M is to be always kept positive~~ even during cargo loading~~.

U2.1.2 Calculation on Stability

Sub-paragraph -3 has been amended as follows.

3 The free surface effect is to be assessed as follows.

(1) For tanks with fixed filling levels (e.g. liquid cargo, water ballast), the free surface correction is to be determined using the actual filling level of each tank.

(2) For tanks with variable filling levels (e.g. consumable liquids such as fuel oil, diesel oil, and fresh water, and also liquid cargo and water ballast during liquid transfer operations), except as permitted in **(4)** and **(5)**, the free surface correction is to be determined using the maximum value attainable between the filling limits envisaged for each tank, consistent with any operating instructions.

(3) In calculating the free surface effects in tanks containing consumable liquids, it is to be assumed that for each type of liquid at least one transverse pair or a single centreline tank has a free surface and the tank or combination of tanks taken into account is to be those where the effect of free surfaces is the greatest.

(4) Where water ballast tanks, including anti-rolling tanks and anti-heeling tanks, are to be filled or discharged during the course of a voyage, the free surface effects are to be calculated taking into account the most onerous transitory stage relating to such operations.

(5) For ships engaged in liquid transfer operations, the free surface corrections at any stage of the liquid transfer operations may be determined in accordance with the filling level in each tank at that stage of the transfer operation.

(6) Free surface effects are to be considered whenever the filling level in a tank is less than 98% full. Free surface effects need not be considered in cases where a tank is nominally full, i.e. the filling level is 98% or above. However, nominally full cargo tanks are to be corrected for free surface effects at a 98% filling level. In doing so, the correction to initial metacentric height is to be based on the inertia moment of the liquid surface at a 5° heeling angle divided by displacement, and the correction to righting lever is suggested to be on the basis of the real shifting moment of cargo liquids.

(7) Free surface effects for small tanks may be ignored under the conditions specified in **1.3.10-3(2)(b)ii), Annex U1.2.1 "GUIDANCE FOR STABILITY INFORMATION FOR MASTER"**.

(8) The corrections to the initial metacentric height and to the righting lever curve are to be addressed separately according to the following **(a)** to **(c)**.

(a) In determining the correction to initial metacentric height, the transverse moments of the inertia of the tanks are to be calculated at a 0° angle of heel according to **(1)** and **(2)** above.

(b) The righting lever curve may be corrected by any of the following methods in cases where deemed appropriate by the Society:

i) correction based on the actual moment of fluid transfer for each angle of heel calculated; or.

ii) correction based on the moment of inertia, calculated at a 0° angle of heel, modified at each angle of heel calculated.

(c) The corrections **(a)** and **(b)** above may be calculated according to **(6)** above.

(9) Whichever method is selected for correcting the righting lever curve is to be clearly specified in the ship stability booklet. However, in cases where an alternative method for manually calculated loading conditions is specified, an explanation of the differences which may be found in the results as well as an example correction for each alternative are to be included..

(10) The usual remainder of liquids in empty tanks need not be taken into account in calculating corrections in cases where the total of such residual liquids does not constitute a significant free surface effect.

Sub-paragraph -5 has been amended as follows.

5 ~~For the application of **2.1.1-3, Part U of the Rules**~~ With respect to icing, reference is to be made to the provisions of ~~Chapter 5 of *IMO Res. A.749*(18)~~ Chapter 6, Part B of *IMO Res. MSC.*267(85) *"International Code on Intact Stability 2008 (2008 IS Code)"*.

U2.2 General Stability Requirements

U2.2.1 Stability Curves

Sub-paragraph -1 has been amended as follows.

1 For ships ~~loading with timber deck cargoes~~applying **2.1.1-2, Chapter 2, Part U** of the Rules, stability ~~is to~~ 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.

U2.3 Stability Requirements in Wind and Waves

Paragraph U2.3.1 has been amended as follows.

U2.3.1 Stability Curves and Wind-heeling Moment Lever Curves

1 In applying the requirements in **2.3.1-1, Part U** of the Rules, Z, θ_r, B, d' and immersing angle of deck edge may be as follows:

(1) With the lower end of Z, the centre of underwater projected lateral area of hull is to be half of the draught.

(2) θ_r is generally to be (θ_0 - θ_1).

(3) B is constant unless the ship has inclined sides.

(~~1~~4) d' is to be of a corresponding moulded draught.

(~~2~~5) An immersing angle of deck edge is to be of the angle between the waterline in un-inclined condition of ship and the line linked deck edge to the point of intersection between the centre line and waterline in un-inclined condition of ship. Where, deck edge means the point of intersection between the continuation of top of freeboard deck at ship's side of lowest point of freeboard deck and the outside of side shell, in general. However, in cases where there are any openings under the deck edge, the lower edge of the opening is to be treated as the deck edge. In addition, in case of ships having superstructure decks of entire length, deck edge may be either of the following points.

(a) Where side shells in way of superstructures have no opening or all openings are kept watertight closing devices:
The point of intersection between the continuation of top of superstructure deck at ship's side of lowest point of superstructure deck and the outside of side shell

(b) Where side shells in way of superstructures have openings with weathertight covers:
The lowest point of such openings

2 Concerning the area between the stability curve and l_{w1}, if portions within the range of $\pm\theta_1$ on both sides of θ_0 are significantly different from each other, angle of rolling stop motion is to be determined so that both areas will be equal. Even in this case, full rolling angle is to be kept to $2\theta_1$.

~~**3** For the application of **2.3.1-1, Part U** of the Rules to ships loaded with timber deck cargo, provisions in **2.3.1-1(1), Part U** of the Rules may apply reading that heeling angle caused by steady wind is to be less than 16°.~~

~~**4** Where the requirements specified in **2.3.1-1, Part U** of the Rules apply to the ships registered as restricted service, the values of l_{w1} and s may be modified as the following formula respectively.~~

~~(1) Ships registered for "*Coasting Service*":~~

$$l_{w1} = \frac{0.0274AZ}{W} \cdot s \ (m)$$

~~Table U2.3.1-3(1) The value of s ("*Coasting Service*")~~

~~T~~	~~≤ 4.5~~	~~5.5~~	~~6.0~~	~~7.0~~	~~9.0~~	~~11.0~~	~~12.0~~	~~13.0~~	~~≥ 14.0~~
~~s~~	~~0.100~~	~~0.0988~~	~~0.0925~~	~~0.083~~	~~0.063~~	~~0.046~~	~~0.041~~	~~0.0368~~	~~0.035~~

~~(2) Ships registered for "*Smooth Water Service*":~~

$$l_{w1} = \frac{0.0171AZ}{W} \cdot s \ (m)$$

~~Table U2.3.1-3(2) The value of *s* ("*Smooth Water Service*")~~

~~*T*~~	~~≤ 3.5~~	~~4.0~~	~~4.5~~	~~5.0~~	~~7.0~~	~~9.0~~	~~9.5~~	~~10.0~~	~~≥ 10.5~~
~~*s*~~	~~0.100~~	~~0.099~~	~~0.0962~~	~~0.090~~	~~0.064~~	~~0.042~~	~~0.038~~	~~0.0367~~	~~0.035~~

~~5~~**3** For the pontoon barge, the angle of heel caused by steady wind is to be less than the angle corresponding to a half of freeboard in relevant loading condition. In this case, lever of heeling moment is obtained from following formula;

$0.0551AZ/W \quad (m)$

where:

A, *Z* and *W*: Value specified in **2.3.1-1, Part U** of the Rules.

Annex U1.2.1 GUIDANCE FOR STABILITY INFORMATION FOR MASTER

Section 1.1 has been amended as follows.

1.1 General

(1) This guidance gives the standardized form and the items to be mentioned for preparation of Stability Information for Master (hereinafter referred to as "the information" in this guidance) of ships which are intended to be built to the classification with the Society and to which the requirements in **Part U** of the Rules are applied. The information for ships registered after construction, etc. is recommended to meet the requirements of this guidance as far as possible, even if satisfactory data are not available.

(2) The information is to be ~~written in a language understandable to Master~~ written in the working language of the ship and any other language which is deemed necessary by the Society. Reference is also made to *IMO Res. A*.741(18) If a language other than English is used, English version is to be attached.

(3) Items deemed necessary for special operating configuration, etc. are to be added.

(4) It is considered beneficial that a computer for calculation of parameters of stability is provided on board. However, omission of the information is not permitted even in the such case.

(5) Attention is to be paid to the tact that a certain government of flag states may impose additional requirements.

(6) For combination carriers to which **3.2.2-7 of Rules for Marine Pollution Prevention Systems** apply, in addition to the relevant requirements in this Guidance, the information for intact stability during the liquid transfer operations specified in **3.2.2-9 of Guidance for Marine Pollution Prevention Systems** are to be added.

(7) For ships loaded with timber deck cargo:

(a) comprehensive stability information is to be supplied which takes into account the timber deck cargo. Such information is to enable the master, rapidly and easily, to obtain accurate guidance as to the stability of the ship under varying conditions of service;

(b) the master is to be given information setting out the changes in deck cargo from that shown in the loading conditions, in cases where the permeability of the deck cargo is significantly different from 25% and deemed necessary by the Society; and

(c) conditions are to be shown indicating the maximum permissible amount of deck cargo in consideration of the lightest stowage rate likely during service.

1.3 The Details of each Content

1.3.2 Notices on Ship Operation

Sub-paragraph -12 has been renumbered to -15 and sub-paragraphs -12 to -14 have been added as follows.

12 Guidance for the safe operation of the ship under normal and emergency conditions is to be described.

13 General precautions for preventing unintentional flooding are to be described.

14 For ships in operation, that attention is to be paid so that an inclining test may be carried out according to the provisions of *SOLAS* regulation II-1/5 to confirm their stability is to be described.
1~~2~~5 Any other notices deemed necessary for stability are to be described.

1.3.5 Data for Cargoes, Stowages, etc.

Sub-paragraph -2 has been amended as follows.

2 General arrangement

Drawings in a suitable scale, which show the arrangement of cargo spaces, tanks, lockers and stores, machinery spaces ~~and~~, accommodation spaces, compartments, closing apparatuses and vents together with their name, downflooding angles, permanent ballast, allowable deck loadings and freeboard, are to be attached.

In case of ships to which the requirements in **Chapter 4, Part C** of the Rules apply, the plans showing clearly the boundaries of each compartment (shells, decks and bulkheads), the openings therein with the control positions of closing apparatuses ~~and their control positions~~, and the arrangements of means, if fitted, to ensure the stability of the ship after flooding are to be attached in addition to above. However, if these plans are permanently posted on the bridge, these requirements may be waived.

Paragraph 1.3.6 has been amended as follows.

1.3.6 Results of Stability Experiments

1 The results of inclining tests are to include the undermentioned data. If inclining test has been omitted, the reason is to be stated. When the data are based on the record of a sister ship, the inclining test report, the builder and yard number of the ship are to be added to the undermentioned data. If the values different from a sister ship are used, the reason and a summary of the method used to determine those particulars ~~is~~are to be explained. When any permanent ballasts are included in light condition, the material, weight and arrangement of them are to be described by the drawing.

(1) Light weight and location of centre of gravity (in longitudinal direction, vertical direction and, if necessary, transverse direction).
(2) Place and date of inclining test.

2 When oscillation tests were carried out, the details of test procedures are to be included in the test results. And an explanation of the relation between rolling period and G_0M is to be attached.

Paragraph 1.3.7 has been amended as follows.

1.3.7 Method of Utilizing Information

Explanations for following items are to be stated. For calculations, assumptions are to be added to explanations. 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. In cases where a computer for stability calculations is not on board ship, ~~B~~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, i~~Instructions concerning the operation of means with descriptions of damage conditions which may require it, if fitted, to ensure the stability of the ship after flooding e.g. crossflooding are to be added.)

Paragraph 1.3.8 has been amended as follows.

1.3.8 Applied Stability Requirements

It is to be described that the ship complies with the requirements in **Part U** of the Rules which meet the requirements in ~~Chapters 3.1, 3.2 and 4.1 of *IMO Res. A.*749(18), as amended by *MSC Res.*75(69)~~ *IMO Res. MSC.*267(85) *"International Code on Intact Stability 2008 (2008 IS Code)"*. If any special requirements are made by the flag state other than the above-mentioned requirements, excerpts or summary of relevant provisions are given. For ships intended to navigate in area where icing is liable to occur, details of assumed icing are to be given together with location, weight and centre of gravity of icing.

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. ~~(In principle, all designed loading conditions are to be included, for instance, such special loading condition as loading cargoes on decks or in alternate holds, etc.)~~
    (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.
    (c) 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 0.015*L*; and
ii) 10 if the freeboard amidships is equal to or greater than 0.03*L*.
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 limitation 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 is to be made in the 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

1.3.10 General Data

Sub-paragraph -1 has been amended as follows.

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. With respect to hydrostatic curves or tables and cross curves of stability, each displacement and the effects of changes in trim during heeling are to be taken into account.

Sub-paragraph -2 has been amended as follows.

2 Capacity ~~and~~, centre of capacity of compartments and centre of gravity

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 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. Capacity plans or tables showing capacities and centres of gravity for each cargo stowage space are to be included. Tank sounding tables showing capacities, centres of gravity, and free surface data for each tank are to be included.

Sub-paragraph -5 has been amended as follows.

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~~ considering trim.

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 the angle of heel extending from 10° to 80° in intervals not more than 10°. (However, closer spacing may be required according to the ship form and proportions.)

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 1 July 2010.

2. Notwithstanding the amendments to the Guidance, the current requirements may apply to ships the keels of which were laid or which were at *a similar stage of construction* before the effective date.

(Note) The term "*a similar stage of construction*" means the stage at which the construction identifiable with a specific ship begins and the assembly of that ship has commenced comprising at least 50 *tonnes* or 1%* of the estimated mass of all structural material, whichever is the less.

* For high speed craft, "1%" is to be read as "3%".