**CỤC ĐĂNG KIỂM VIỆT NAM**
**VIETNAM REGISTER**

*ĐỊA CHỈ: 18 PHẠM HÙNG, HÀ NỘI*
*ADDRESS: 18 PHAM HUNG ROAD, HA NOI*
*ĐIỆN THOẠI/ TEL: +84 4 3 7684701*
*FAX: +84 4 3 7684779*
*EMAIL: vr-id@vr.org.vn*
*WEB SITE: www.vr.org.vn*

# THÔNG BÁO KỸ THUẬT TÀU BIỂN
TECHNICAL INFORMATION ON SEA-GOING SHIPS

**Ngày 12 tháng 02 năm 2015**
**Số thông báo: 009TI/15TB**

*Nội dung: Quy định về trang bị máy tính kiểm tra ổn định hư hỏng (Damage Stability Instrument) cho tàu chở hàng lỏng.*

Kính gửi: Các chủ tàu/ công ty quản lý tàu biển
Các công ty thiết kế tàu biển
Các nhà máy đóng tàu
Các chi cục Đăng kiểm tàu biển

1. Ủy ban An toàn hàng hải (MSC) của Tổ chức Hàng hải quốc tế (IMO), tại khóa họp thứ 93 (tháng 05 năm 2014), và Ủy ban Bảo vệ môi trường biển (MEPC) của IMO, tại khóa họp thứ 66 (tháng 04 năm 2014), đã thông qua sửa đổi, bổ sung đối với các Bộ luật và Công ước sau đây, dự kiến có hiệu lực từ ngày 01 tháng 01 năm 2016, đưa ra yêu cầu bắt buộc về trang bị máy tính kiểm tra ổn định hư hỏng (Damage Stability Instrument) cho tàu chở hàng lỏng:

(1) Sửa đổi, bổ sung đối với Bộ luật quốc tế về kết cấu và trang thiết bị của tàu chở xô khí hóa lỏng (IGC Code) (Nghị quyết MSC.370(93)).

(2) Sửa đổi, bổ sung đối với Bộ luật quốc tế về kết cấu và trang thiết bị của tàu chở xô hóa chất nguy hiểm (IBC Code) (Nghị quyết MSC.369(93) và MEPC.250(66)).

(3) Sửa đổi, bổ sung đối với Bộ luật về kết cấu và trang thiết bị của tàu chở xô hóa chất nguy hiểm (BCH Code) (Nghị quyết MSC.376(93) và MEPC.249(66)).

(4) Sửa đổi, bổ sung đối với Bộ luật về kết cấu và trang thiết bị của tàu chở xô khí hóa lỏng (GC Code) (Nghị quyết MSC.377(93)).

(5) Sửa đổi, bổ sung đối với Phụ lục I của Công ước quốc tế về ngăn ngừa ô nhiễm do tàu gây ra (MARPOL) (Nghị quyết MEPC.248(66)).

2. Theo quy định của sửa đổi, bổ sung đối với các Bộ luật và Công ước nêu tại 1., tất cả các tàu chở xô khí hóa lỏng, tàu chở xô hóa chất nguy hiểm và tàu chở dầu phải được trang bị máy tính kiểm tra ổn định (Stability Instrument) có khả năng kiểm tra xác

nhận sự tuân thủ với các quy định về ổn định nguyên vẹn và ổn định hư hỏng. Máy tính kiểm tra ổn định phải được phê duyệt và phải phù hợp với các tiêu chuẩn nêu tại:

- Phần B, Chương 4 của Bộ luật quốc tế về ổn định nguyên vẹn năm 2008 (2008 IS Code).
- Thông tư MSC.1/Circ.1229 - Hướng dẫn phê duyệt máy tính kiểm tra ổn định.
- Thông tư MSC.1/Circ.1461 - Hướng dẫn kiểm tra xác nhận các yêu cầu về ổn định hư hỏng đối với tàu chở hàng lỏng.

3. Cơ quan có thẩm quyền của quốc gia tàu mang cờ quốc tịch cấp tài liệu phê duyệt máy tính kiểm tra ổn định cho các tàu thuộc phạm vi áp dụng.

4. Các tàu chở xô khí hóa lỏng, tàu chở xô hóa chất nguy hiểm và tàu chở dầu được đóng trước ngày 01 tháng 01 năm 2016 phải được trang bị máy tính kiểm tra ổn định tại đợt kiểm tra cấp mới (Renewal Survey) đầu tiên của tàu vào hoặc sau ngày 01 tháng 01 năm 2016, nhưng không được muộn hơn ngày 01 tháng 01 năm 2021. Mặc dù quy định như vậy, nhưng máy tính kiểm tra ổn định được trang bị cho tàu hiện có trước ngày 01 tháng 01 năm 2016 không cần phải thay thế, với điều kiện máy tính này có thể kiểm tra xác nhận sự tuân thủ các quy định về ổn định nguyên vẹn và ổn định hư hỏng thỏa mãn yêu cầu của chính quyền tàu mang cờ quốc tịch.

5. Những tàu sau có thể được miễn trang bị máy tính kiểm tra ổn định:

(1) Tàu hoạt động chuyên dụng (dedicated service) với một số lượng hạn chế sự thay đổi tải trọng sao cho tất cả các điều kiện dự kiến đều đã được phê duyệt trong thông báo ổn định cho thuyền trưởng.

(2) Tàu mà việc kiểm tra xác nhận ổn định được thực hiện từ xa bằng phương tiện được chính quyền tàu mang cờ quốc tịch phê duyệt.

(3) Tàu được xếp tải trong phạm vi phê duyệt của các trạng thái tải trọng.

(4) Tàu được đóng trước ngày 01 tháng 01 năm 2016, với điều kiện đường cong KG/GM giới hạn được phê duyệt bao gồm tất cả các yêu cầu áp dụng liên quan đến ổn định nguyên vẹn và ổn định hư hỏng.

6. Việc miễn trang bị máy tính kiểm tra ổn định nêu tại 5. phải được ghi vào giấy chứng nhận phù hợp để chở xô khí hóa lỏng, giấy chứng nhận phù hợp để chở xô hóa chất nguy hiểm; hoặc giấy chứng nhận quốc tế về ngăn ngừa ô nhiễm do dầu và phụ bản đính kèm giấy chứng nhận này (đối với tàu chở dầu).

Chúng tôi xin gửi kèm theo Thông báo kỹ thuật này các phần liên quan đến nội dung đề cập ở trên của:

(1) Nghị quyết MSC.370(93) - Sửa đổi, bổ sung đối với Bộ luật quốc tế về kết cấu và trang thiết bị của tàu chở xô khí hóa lỏng (IGC Code).

(2) Nghị quyết MSC.369(93) và MEPC.250(66) - Sửa đổi, bổ sung đối với Bộ luật quốc tế về kết cấu và trang thiết bị của tàu chở xô hóa chất nguy hiểm (IBC Code).

(3) Nghị quyết MSC.376(93) và MEPC.249(66) - Sửa đổi, bổ sung đối với Bộ luật về kết cấu và trang thiết bị của tàu chở xô hóa chất nguy hiểm (BCH Code).

(4) Nghị quyết MSC.377(93) - Sửa đổi, bổ sung đối với Bộ luật về kết cấu và trang thiết bị của tàu chở xô khí hóa lỏng (GC Code).

(5) Nghị quyết MEPC.248(66) - Sửa đổi, bổ sung đối với Phụ lục I của Công ước quốc tế về ngăn ngừa ô nhiễm do tàu gây ra (MARPOL).

(6) Thông tư MSC.1/Circ.1229 - Hướng dẫn phê duyệt máy tính kiểm tra ổn định.

(7) Thông tư MSC.1/Circ.1461 - Hướng dẫn kiểm tra xác nhận các yêu cầu về ổn định hư hỏng đối với tàu chở hàng lỏng.

Đề nghị các Quý Đơn vị lưu ý áp dụng theo đúng quy định.

Thông báo kỹ thuật này được nêu trong mục: *Thông báo của VR/ Thông báo kỹ thuật TB* của trang tin điện tử Cục Đăng kiểm Việt Nam: *http://www.vr.org.vn*.

Nếu Quý cơ quan cần thêm thông tin về vấn đề nêu trên, đề nghị vui lòng liên hệ:

*Cục Đăng kiểm Việt Nam,*
*Phòng Quy phạm (QP)*
*Địa chỉ: 18 Phạm Hùng, Phường Mỹ Đình 2, Quận Nam Từ Liêm, Hà Nội*
*Điện thoại: + 4 37684701 (số máy lẻ: 501)*
*Fax: +4 37684770*
*Thư điện tử: vietnh@vr.org.vn*

Xin gửi đến các Quý Đơn vị lời chào trân trọng./.

***Nơi nhận:***
- Như trên;
- TB, QP, CN, CTB, VRQC, TTTH;
- Lưu QP./.

**ANNEX 6**

**RESOLUTION MSC.370(93)**
**(adopted on 22 May 2014)**

**AMENDMENTS TO THE INTERNATIONAL CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING LIQUEFIED GASES IN BULK (IGC CODE)**

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

NOTING resolution MSC.5(48), by which it adopted the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (hereinafter referred to as "the IGC Code"), which has become mandatory under chapter VII of the International Convention for the Safety of Life at Sea (SOLAS), 1974 (hereinafter referred to as "the Convention"),

NOTING ALSO article VIII(b) and regulation VII/11.1 of the Convention concerning the procedure for amending the IGC Code,

HAVING CONSIDERED, at its ninety-third session, amendments to the IGC Code proposed and circulated in accordance with article VIII(b)(i) of the Convention,

1 ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the IGC Code, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the amendments shall be deemed to have been accepted on 1 July 2015 unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have notified their objections to the amendments;

3 INVITES Contracting Governments to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 January 2016 upon their acceptance in accordance with paragraph 2 above;

4 REQUESTS the Secretary-General, in conformity with article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Contracting Governments to the Convention;

5 ALSO REQUESTS the Secretary-General to transmit copies of this resolution and its annex to Members of the Organization, which are not Contracting Governments to the Convention.

ANNEX

**AMENDMENTS TO THE INTERNATIONAL CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING LIQUEFIED GASES IN BULK (IGC CODE)**

The complete text of the IGC Code is replaced by the following:

**"Contents**

2.2.5 The master of the ship shall be supplied with a loading and stability information booklet. This booklet shall contain details of typical service conditions, loading, unloading and ballasting operations, provisions for evaluating other conditions of loading and a summary of the ship's survival capabilities. The booklet shall also contain sufficient information to enable the master to load and operate the ship in a safe and seaworthy manner.

2.2.6 All ships, subject to the Code shall be fitted with a stability instrument, capable of verifying compliance with intact and damage stability requirements, approved by the Administration having regard to the performance standards recommended by the Organization[3].

.1 ships constructed before 1 July 2016 shall comply with this paragraph at the first scheduled renewal survey of the ship after 1 July 2016 but not later than 1 July 2021;

.2 notwithstanding the requirements of paragraph 2.2.6.1 a stability instrument installed on a ship constructed before 1 July 2016 need not be replaced provided it is capable of verifying compliance with intact and damage stability, to the satisfaction of the Administration; and

.3 for the purposes of control under SOLAS regulation XI-1/4, the Administration shall issue a document of approval for the stability instrument.

2.2.7 The Administration may waive the requirements of paragraph 2.2.6 for the following ships, provided the procedures employed for intact and damage stability verification maintain the same degree of safety, as being loaded in accordance with the approved conditions[4]. Any such waiver shall be duly noted on the International Certificate of Fitness referred to in paragraph 1.4.4:

.1 ships which are on a dedicated service, with a limited number of permutations of loading such that all anticipated conditions have been approved in the stability information provided to the master in accordance with the requirements of paragraph 2.2.5;

.2 ships where stability verification is made remotely by a means approved by the Administration;

.3 ships which are loaded within an approved range of loading conditions; or

.4 ships constructed before 1 July 2016 provided with approved limiting KG/GM curves covering all applicable intact and damage stability requirements.

2.2.8 ***Conditions of loading***

Damage survival capability shall be investigated on the basis of loading information submitted to the Administration for all anticipated conditions of loading and variations in draught and trim. This shall include ballast and, where applicable, cargo heel.

---

[3] Refer to part B, chapter 4, of the International Code on Intact Stability, 2008 (2008 IS Code), as amended; the *Guidelines for the Approval of Stability Instruments* (MSC.1/Circ.1229), annex, section 4, as amended; and the technical standards defined in part 1 of the *Guidelines for verification of damage stability requirements for tankers* (MSC.1/Circ.1461).

[4] Refer to operational guidance provided in part 2 of the *Guidelines for verification of damage stability requirements for tankers* (MSC.1/Circ.1461).

**ANNEX 5**

**RESOLUTION MSC.369(93)**
**(adopted on 22 May 2014)**

**AMENDMENTS TO THE INTERNATIONAL CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING DANGEROUS CHEMICALS IN BULK (IBC CODE)**

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

NOTING resolution MSC.4(48), by which it adopted the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (hereinafter referred to as "the IBC Code"), which has become mandatory under chapter VII of the International Convention for the Safety of Life at Sea (SOLAS), 1974 (hereinafter referred to as "the Convention"),

NOTING ALSO article VIII(b) and regulation VII/8.1 of the Convention concerning the procedure for amending the IBC Code,

HAVING CONSIDERED, at its ninety-third session, amendments to the IBC Code proposed and circulated in accordance with article VIII(b)(i) of the Convention,

1 ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the IBC Code, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the amendments shall be deemed to have been accepted on 1 July 2015 unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have notified their objections to the amendments;

3 INVITES Contracting Governments to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 January 2016 upon their acceptance in accordance with paragraph 2 above;

4 REQUESTS the Secretary-General, in conformity with article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Contracting Governments to the Convention;

5 ALSO REQUESTS the Secretary-General to transmit copies of this resolution and its annex to Members of the Organization, which are not Contracting Governments to the Convention.

ANNEX

**AMENDMENTS TO THE INTERNATIONAL CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING DANGEROUS CHEMICALS IN BULK (IBC CODE)**

## Chapter 1 – General

1 New paragraphs 1.3.37 and 1.3.38 are added as follows:

"1.3.37 *Purging* means the introduction of inert gas into a tank which is already in an inert condition with the object of further reducing the oxygen content; and/or reducing the existing hydrocarbon or other flammable vapours content to a level below which combustion cannot be supported if air is subsequently introduced into the tank.

1.3.38 *Gas-freeing* means the process where a portable or fixed ventilation system is used to introduce fresh air into a tank in order to reduce the concentration of hazardous gases or vapours to a level safe for tank entry."

## Chapter 2 – Ship survival capability and location of cargo tanks

### 2.2 – Freeboard and intact stability

2 The title of section 2.2 is amended to read:

"Freeboard and stability"

3 A new subparagraph 2.2.6 is added as follows:

"2.2.6 All ships, subject to the Code, shall be fitted with a stability instrument, capable of verifying compliance with intact and damage stability requirements, approved by the Administration having regard to the performance standards recommended by the Organization*:

.1 ships constructed before 1 January 2016 shall comply with this requirement at the first scheduled renewal survey of the ship on or after 1 January 2016 but not later than 1 January 2021;

.2 notwithstanding the requirements of 2.2.6.1, a stability instrument fitted on a ship constructed before 1 January 2016 need not be replaced provided it is capable of verifying compliance with intact and damage stability, to the satisfaction of the Administration; and

.3 for the purposes of control under regulation 16 of MARPOL Annex II, the Administration shall issue a document of approval for the stability instrument.

* Refer to part B, chapter 4, of the International Code on Intact Stability, 2008 (2008 IS Code),

4 A new subparagraph 2.2.7 is added as follows:

"2.2.7 The Administration may waive the requirements of paragraph 2.2.6 for the following ships provided the procedures employed for intact and damage stability verification maintain the same degree of safety, as being loaded in accordance with the approved conditions*. Any such waiver shall be duly noted on the International Certificate of Fitness referred to in paragraph 1.5.4:

.1 ships which are on a dedicated service, with a limited number of permutations of loading such that all anticipated conditions have been approved in the stability information provided to the master in accordance with the requirements of paragraph 2.2.5;

.2 ships where stability verification is made remotely by a means approved by the Administration;

.3 ships which are loaded within an approved range of loading conditions; or

.4 ships constructed before 1 January 2016 provided with approved limiting KG/GM curves covering all applicable intact and damage stability requirements.

* Refer to operational guidance provided in part 2 of the *Guidelines for verification of damage stability requirements for tankers* (MSC.1/Circ.1461)."

**Chapter 8 – Cargo tank venting and gas-freeing arrangements**

5 In paragraph 8.1.5, the references to "SOLAS regulations II-2/4.5.3 and 4.5.6" are replaced by references to "SOLAS regulations II-2/4.5.3, 4.5.6 and 16.3.2".

6 A new paragraph 8.5 is inserted as follows:

"8.5 Cargo tank purging

When the application of inert gas is required by 11.1.1, before gas-freeing, the cargo tanks shall be purged with inert gas through outlet pipes with cross-sectional area such that an exit velocity of at least 20 m/s can be maintained when any three tanks are being simultaneously supplied with inert gas. The outlets shall extend not less than 2 m above the deck level. Purging shall continue until the concentration of hydrocarbon or other flammable vapours in the cargo tanks has been reduced to less than 2% by volume."

7 The existing paragraph 8.5 and subparagraphs 8.5.1, 8.5.2 and 8.5.3 are renumbered as paragraph 8.6 and subparagraphs 8.6.1, 8.6.2 and 8.6.3, respectively, and, in the renumbered paragraphs 8.6.2 and 8.6.3 the referenced paragraph numbers "8.5.1", "8.5.1.2" and "8.5.1.3" are replaced with "8.6.1", "8.6.1.2" and "8.6.1.3", respectively.

**ANNEX 11**

**RESOLUTION MEPC.250(66)**
**Adopted on 4 April 2014**

**AMENDMENTS TO THE INTERNATIONAL CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING DANGEROUS CHEMICALS IN BULK (IBC CODE)**

**(General, Ship survival capability and location of cargo tanks, Cargo tank venting and gas-freeing arrangements, Environmental control, Fire protection and fire extinction, Special requirements, Summary of minimum requirements, and Form of Certificate of Fitness)**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee (the Committee) conferred upon it by international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO resolution MEPC.19(22) by which the Committee adopted the *International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code)*,

NOTING article 16 of the International Convention for the Prevention of Pollution from Ships, 1973 (hereinafter referred to as the "1973 Convention") and article VI of the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973 (hereinafter referred to as the "1978 Protocol") which together specify the amendment procedure of the 1978 Protocol and confer upon the appropriate body of the Organization the function of considering and adopting amendments to the 1973 Convention, as modified by the 1978 Protocol (MARPOL),

CONSIDERING that it is highly desirable for the provisions of the IBC Code, which are mandatory under both MARPOL and the 1974 SOLAS Convention, to remain identical,

HAVING CONSIDERED proposed amendments to the IBC Code,

1. ADOPTS, in accordance with article 16(2)(b), (c) and (d) of the 1973 Convention, the amendments to the IBC Code, the text of which is set out in the annex to the present resolution;

2. DETERMINES, in accordance with article 16(2)(f)(iii) of the 1973 Convention, that the amendments to the IBC Code shall be deemed to have been accepted on 1 July 2015 unless, prior to that date, not less than one third of the Parties or Parties, the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have communicated to the Organization their objection to the amendments;

3. INVITES the Parties to note that, in accordance with article 16(2)(g)(ii) of the 1973 Convention, the amendments to the IBC Code shall enter into force on 1 January 2016 upon their acceptance in accordance with paragraph 2 above;

4. REQUESTS the Secretary-General, in conformity with article 16(2)(e) of the 1973 Convention, to transmit to all Parties to MARPOL, certified copies of the present resolution and the text of the amendments to the IBC Code contained in the annex; and

5. REQUESTS FURTHER the Secretary-General to transmit copies of the present resolution and its annex to the Members of the Organization which are not Parties to MARPOL.

ANNEX

# AMENDMENTS TO THE INTERNATIONAL CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING DANGEROUS CHEMICALS IN BULK (IBC CODE)

## Chapter 1 – General

1 New paragraphs 1.3.37 and 1.3.38 are added as follows:

"1.3.37 *Purging* means the introduction of inert gas into a tank which is already in an inert condition with the object of further reducing the oxygen content; and/or reducing the existing hydrocarbon or other flammable vapours content to a level below which combustion cannot be supported if air is subsequently introduced into the tank.

1.3.38 *Gas-freeing* means the process where a portable or fixed ventilation system is used to introduce fresh air into a tank in order to reduce the concentration of hazardous gases or vapours to a level safe for tank entry."

## Chapter 2 – Ship survival capability and location of cargo tanks

### 2.2 – Freeboard and intact stability

2 The title of section 2.2 is amended to read:

"Freeboard and stability"

3 A new subparagraph 2.2.6 is added as follows:

"2.2.6 All ships, subject to the Code, shall be fitted with a stability instrument, capable of verifying compliance with intact and damage stability requirements, approved by the Administration having regard to the performance standards recommended by the Organization*:

.1 ships constructed before 1 January 2016 shall comply with this requirement at the first scheduled renewal survey of the ship after 1 January 2016 but not later than 1 January 2021;

.2 notwithstanding the requirements of 2.2.6.1, a stability instrument fitted on a ship constructed before 1 January 2016 need not be replaced provided it is capable of verifying compliance with intact and damage stability, to the satisfaction of the Administration; and

.3 for the purposes of control under regulation 16 of MARPOL Annex II, the Administration shall issue a document of approval for the stability instrument.

* Refer to part B, chapter 4, of the International Code on Intact Stability, 2008 (2008 IS Code),

4 A new subparagraph 2.2.7 is added as follows:

"2.2.7 The Administration may waive the requirements of paragraph 2.2.6 for the following ships provided the procedures employed for intact and damage stability verification maintain the same degree of safety, as being loaded in accordance with the approved conditions*. Any such waiver shall be duly noted on the International Certificate of Fitness referred to in paragraph 1.5.4:

.1 ships which are on a dedicated service, with a limited number of permutations of loading such that all anticipated conditions have been approved in the stability information provided to the master in accordance with the requirements of paragraph 2.2.5;

.2 ships where stability verification is made remotely by a means approved by the Administration;

.3 ships which are loaded within an approved range of loading conditions; or

.4 ships constructed before 1 January 2016 provided with approved limiting KG/GM curves covering all applicable intact and damage stability requirements.

---

* Refer to operational guidance provided in part 2 of the *Guidelines for verification of damage stability requirements for tankers* (MSC.1/Circ.1461)."

**Chapter 8 – Cargo tank venting and gas-freeing arrangements**

5 In paragraph 8.1.5, the references to "SOLAS regulations II-2/4.5.3 and 4.5.6" are replaced by references to "SOLAS regulations II-2/4.5.3, 4.5.6 and 16.3.2".

6 A new paragraph 8.5 is inserted as follows:

"8.5 Cargo tank purging

When the application of inert gas is required by 11.1.1, before gas-freeing, the cargo tanks shall be purged with inert gas through outlet pipes with cross-sectional area such that an exit velocity of at least 20 m/s can be maintained when any three tanks are being simultaneously supplied with inert gas. The outlets shall extend not less than 2 m above the deck level. Purging shall continue until the concentration of hydrocarbon or other flammable vapours in the cargo tanks has been reduced to less than 2% by volume."

7 The existing paragraph 8.5 and subparagraphs 8.5.1, 8.5.2 and 8.5.3 are renumbered as paragraph 8.6 and subparagraphs 8.6.1, 8.6.2 and 8.6.3, respectively.

**Chapter 9 – Environmental control**

8 The chapeau of paragraph 9.1.3 is replaced by the following:

"9.1.3 Where inerting or padding of cargo tanks is required by this Code in column "h" of chapter 17:"

**ANNEX 12**

**RESOLUTION MSC.376(93)**
**(adopted on 22 May 2014)**

**AMENDMENTS TO THE CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING DANGEROUS CHEMICALS IN BULK (BCH CODE)**

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING ALSO resolution A.212(VII) by which the Assembly, at its seventh session, adopted the *Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk* (BCH Code), which provides safety requirements for chemical tankers supplementary to the provisions of the International Convention for the Safety of Life at Sea, 1974, as amended,

RECALLING FURTHER resolution MEPC.20(22) by which the Marine Environment Protection Committee adopted the BCH Code to make it mandatory under MARPOL,

NOTING resolution MSC.29(61) by which, at its sixty-first session, it adopted the revised BCH Code,

NOTING ALSO resolutions MSC.369(93) and MEPC.250(66), respectively, by which it, and the Marine Environment Protection Committee, adopted corresponding amendments to the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code),

NOTING FURTHER resolution MEPC.249(66) by which the MEPC, at its sixty-sixth session, adopted amendments to the BCH Code,

CONSIDERING that it is highly desirable for the provisions of the BCH Code which are mandatory under MARPOL and recommendatory from a safety standpoint, to remain identical when adopted by the Marine Environment Protection Committee and the Maritime Safety Committee,

HAVING CONSIDERED, at its ninety-third session, amendments to the BCH Code proposed by the Sub-Committee on Stability and Load Lines and Fishing Vessels Safety, at its fifty-fifth session, which were approved by the Committee at its ninety-second session,

RECOGNIZING the need to bring the approved amendments to the BCH Code into force on the date on which corresponding amendments to the IBC Code enter into force,

1 ADOPTS amendments to the Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (BCH Code), as amended, the text of which is set out in the annex to the present resolution;

2 DETERMINES that the said amendments shall become effective on 1 January 2016 upon acceptance and entry into force of the corresponding amendments to the IBC Code adopted by resolution MSC.369(93).

ANNEX

**AMENDMENTS TO THE CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING DANGEROUS CHEMICALS IN BULK (BCH CODE)**

**Chapter II – Cargo containment**

**Part A – Physical protection (Siting of cargo tanks; ship stability)**

1 Existing subparagraph 2.2.1 is replaced by the following:

"2.2.1 General: Ships subject to this Code may be assigned the minimum freeboard permitted by the International Convention on Load Lines, 1966. The additional requirements in paragraph 2.2.4, taking into account any empty or partially filled tank as well as the specific gravities of cargoes to be carried, however, should govern the allowed operating draught for any actual condition of loading.

2.2.1.1 All ships engaged in the transport of chemicals in bulk should be supplied with loading and stability manuals for the information and guidance of the master. These manuals should contain details concerning the loaded conditions of full and empty or partially empty tanks, the position of these tanks in the ship, the specific gravities of the various parcels of cargoes carried, and any ballast arrangements in critical conditions of loading. Provisions for evaluating other conditions of loading should be contained in the manuals.

2.2.1.2 All ships subject to the Code, shall be fitted with a stability instrument, capable of verifying compliance with intact and damage stability requirements approved by the Administration, at the first scheduled renewal survey of the ship on or after 1 January 2016, but not later than 1 January 2021, having regard to the performance standards recommended by the Organization*:

.1 notwithstanding the above, a stability instrument fitted on a ship before 1 January 2016 need not be replaced provided it is capable of verifying compliance with intact and damage stability, to the satisfaction of the Administration; and

.2 for the purposes of control under regulation 16 of MARPOL Annex II, the Administration shall issue a document of approval for the stability instrument.

* Refer to part B, chapter 4, of the International Code on Intact Stability, 2008 (2008 IS Code), as amended; the *Guidelines for the Approval of Stability Instruments* (MSC.1/Circ.1229), annex, section 4, as amended; and the technical standards defined in part 1 of the *Guidelines for verification of damage stability requirements for tankers* (MSC.1/Circ.1461).

2.2.1.3 The Administration may waive the requirements of paragraph 2.2.1.2 for the following ships provided the procedures employed for intact and damage stability verification maintain the same degree of safety as being loaded in accordance with the approved conditions**. Any such waiver shall be duly noted on the Certificate of Fitness referred to in paragraph 1.6.3:

.1 ships which are on a dedicated service, with a limited number of permutations of loading such that all anticipated conditions have

been approved in the stability information provided to the master in accordance with the requirements of paragraph 2.2.1.1;

.2 ships where stability verification is made remotely by a means approved by the Administration;

.3 ships which are loaded within an approved range of loading conditions; or

.4 ships provided with approved limiting KG/GM curves covering all applicable intact and damage stability requirements.

---

** Refer to operational guidance provided in part 2 of the *Guidelines for verification of damage stability requirements for tankers* (MSC.1/Circ.1461).

**Certificate of Fitness**

2 Paragraph 6 is replaced with the following:

"6 That the ship must be loaded:

.1*** only in accordance with loading conditions verified compliant with intact and damage stability requirements using the approved stability instrument fitted in accordance with paragraph 2.2.1.2 of the Code;

.2*** where a waiver permitted by paragraph 2.2.1.3 of the Code is granted and the approved stability instrument required by paragraph 2.2.1.2 of the Code is not fitted, loading shall be made in accordance with one or more of the following approved methods:

(i)*** in accordance with the loading conditions provided in the approved loading manual, stamped and dated ..... and signed by a responsible officer of the Administration, or of an organization recognized by the Administration; or

(ii)*** in accordance with loading conditions verified remotely using an approved means ……..……; or

(iii)*** in accordance with a loading condition which lies within an approved range of conditions defined in the approved loading manual referred to in (i) above; or

(iv)*** in accordance with a loading condition verified using approved critical KG/GM data defined in the approved loading manual referred to in (i) above;

.3*** in accordance with the loading limitations appended to this Certificate.

Where it is required to load the ship other than in accordance with the above instruction, then the necessary calculations to justify the proposed loading conditions shall be communicated to the certifying Administration who may authorize in writing the adoption of the proposed loading condition.

---

*** Delete as appropriate."

***

**ANNEX 10**

**RESOLUTION MEPC.249(66)**
**Adopted on 4 April 2014**

**AMENDMENTS TO THE CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING DANGEROUS CHEMICALS IN BULK (BCH CODE)**

**(Cargo containment and Form of Certificate of Fitness)**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee (the Committee) conferred upon it by international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO resolution MEPC.20(22) by which the Committee adopted the *Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (BCH Code)*,

NOTING article 16 of the International Convention for the Prevention of Pollution from Ships, 1973 (hereinafter referred to as the "1973 Convention") and article VI of the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973 (hereinafter referred to as the "1978 Protocol") which together specify the amendment procedure of the 1978 Protocol and confer upon the appropriate body of the Organization the function of considering and adopting amendments to the 1973 Convention, as modified by the 1978 Protocol (MARPOL),

CONSIDERING that it is highly desirable for the provisions of the BCH Code which are mandatory under MARPOL and recommendatory from a safety standpoint, to remain identical, when adopted by the Marine Environment Protection Committee and the Maritime Safety Committee,

HAVING CONSIDERED proposed amendments to the BCH Code, developed by the Sub-Committee on Stability and Load Lines and on Fishing Vessels Safety, at its fifty-fifth session,

1. ADOPTS, in accordance with article 16(2)(b), (c) and (d) of the 1973 Convention, amendments to the BCH Code, the text of which is set out in the annex to the present resolution;

2. DETERMINES, in accordance with article 16(2)(f)(iii) of the 1973 Convention, that the amendments to the BCH Code shall be deemed to have been accepted on 1 July 2015 unless, prior to that date, not less than one third of the Parties or Parties, the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have communicated to the Organization their objection to the amendments;

3. INVITES the Parties to note that, in accordance with article 16(2)(g)(ii) of the 1973 Convention, the amendments to the BCH Code shall enter into force on 1 January 2016 upon their acceptance in accordance with paragraph 2 above;

4. INVITES ALSO the Maritime Safety Committee to note this resolution and take action as appropriate;

5. REQUESTS the Secretary-General, in conformity with article 16(2)(e) of the 1973 Convention, to transmit to all Parties to MARPOL, certified copies of the present resolution and the text of the amendments to the BCH Code contained in the annex;

6. REQUESTS FURTHER the Secretary-General to transmit copies of the present resolution and its annex to the Members of the Organization which are not Parties to MARPOL.

ANNEX

# AMENDMENTS TO THE CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING DANGEROUS CHEMICALS IN BULK (BCH CODE)

## Chapter II – Cargo containment

### Part A – Physical protection (Siting of cargo tanks; ship stability)

1 Existing subparagraph 2.2.1 is replaced by the following:

"2.2.1 General: Ships subject to this Code may be assigned the minimum freeboard permitted by the International Convention on Load Lines, 1966. The additional requirements in paragraph 2.2.4, taking into account any empty or partially filled tank as well as the specific gravities of cargoes to be carried, however, should govern the allowed operating draught for any actual condition of loading.

2.2.1.1 All ships engaged in the transport of chemicals in bulk should be supplied with loading and stability manuals for the information and guidance of the master. These manuals should contain details concerning the loaded conditions of full and empty or partially empty tanks, the position of these tanks in the ship, the specific gravities of the various parcels of cargoes carried, and any ballast arrangements in critical conditions of loading. Provisions for evaluating other conditions of loading should be contained in the manuals.

2.2.1.2 All ships subject to the Code, shall be fitted with a stability instrument, capable of verifying compliance with intact and damage stability requirements approved by the Administration, at the first scheduled renewal survey of the ship after 1 January 2016, but not later than 1 January 2021, having regard to the performance standards recommended by the Organization*:

.1 notwithstanding the above, a stability instrument fitted on a ship before 1 January 2016 need not be replaced provided it is capable of verifying compliance with intact and damage stability, to the satisfaction of the Administration; and

.2 for the purposes of control under regulation 16 of MARPOL Annex II, the Administration shall issue a document of approval for the stability instrument.

* Refer to part B, chapter 4, of the International Code on Intact Stability, 2008 (2008 IS Code), as amended; the *Guidelines for the Approval of Stability Instruments* (MSC.1/Circ.1229), annex, section 4, as amended; and the technical standards defined in part 1 of the *Guidelines for verification of damage stability requirements for tankers* (MSC.1/Circ.1461).

2.2.1.3 The Administration may waive the requirements of paragraph 2.2.1.2 for

.1 ships which are on a dedicated service, with a limited number of permutations of loading such that all anticipated conditions have been approved in the stability information provided to the master in accordance with the requirements of paragraph 2.2.1.1;

.2 ships where stability verification is made remotely by a means approved by the Administration;

.3 ships which are loaded within an approved range of loading conditions; or

.4 ships provided with approved limiting KG/GM curves covering all applicable intact and damage stability requirements.

---

** Refer to operational guidance provided in part 2 of the *Guidelines for verification of damage stability requirements for tankers* (MSC.1/Circ.1461).

**Certificate of Fitness**

2 Paragraph 6 is replaced with the following:

"6 That the ship must be loaded:

.1*** only in accordance with loading conditions verified compliant with intact and damage stability requirements using the approved stability instrument fitted in accordance with paragraph 2.2.1.2 of the Code;

.2*** where a waiver permitted by paragraph 2.2.1.3 of the Code is granted and the approved stability instrument required by paragraph 2.2.1.2 of the Code is not fitted, loading shall be made in accordance with the following approved methods:

(i) in accordance with the loading conditions provided in the approved loading manual, stamped and dated ..... and signed by a responsible officer of the Administration, or of an organization recognized by the Administration; or

(ii) in accordance with loading conditions verified remotely using an approved means ……..……; or

(iii) in accordance with a loading condition which lies within an approved range of conditions defined in the approved loading manual referred to in (i) above; or

(iv) in accordance with a loading condition verified using approved critical KG/GM data defined in the approved loading manual referred to in (i) above;

**ANNEX 14**

**RESOLUTION MSC.377(93)**
**(adopted on 22 May 2014)**

**AMENDMENTS TO THE CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING LIQUEFIED GASES IN BULK (GC CODE)**

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING ALSO resolution A.328(IX) by which the Assembly, at its ninth session, adopted the *Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* (GC Code),

NOTING resolution MSC.370(93), by which it adopted amendments to the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code),

HAVING CONSIDERED, at its ninety-third session, amendments to the GC Code proposed by the Sub-Committee on Stability and Load Lines and Fishing Vessels Safety, at its fifty-fifth session, which were approved by the Committee at its ninety-second session,

RECOGNIZING the need for the amendments to the GC Code to become effective on the date on which the corresponding amendments to the IGC Code enter into force,

1 ADOPTS amendments to the Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (GC Code), as amended, the text of which is set out in the annex to the present resolution;

2 DETERMINES that the said amendments shall become effective on 1 January 2016* upon acceptance and entry into force of the corresponding amendments to the IGC Code adopted by resolution MSC.370(93).

* Date of entry into force of the aforementioned amendments to the IGC Code.

ANNEX

# AMENDMENTS TO THE CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING LIQUEFIED GASES IN BULK (GC CODE)

## CHAPTER II
## SHIP SURVIVAL CAPABILITY AND CARGO TANK LOCATION

### Paragraph 2.2 – Freeboard and stability

1 A new subparagraph 2.2.4 is added as follows:

"2.2.4 All ships, subject to the Code, should be fitted with a stability instrument, capable of verifying compliance with intact and damage stability requirements, approved by the Administration, at the first scheduled periodical survey of the ship on or after 1 January 2016, but not later than 1 January 2021, having regard to the performance standards recommended by the Organization*:

.1 notwithstanding the requirements above, a stability instrument fitted on a ship before 1 January 2016 need not be replaced provided it is capable of verifying compliance with intact and damage stability, to the satisfaction of the Administration; and

.2 the Administration should issue a document of approval for the stability instrument.

---

* Refer to part B, chapter 4, of the International Code on Intact Stability, 2008 (2008 IS Code), as amended; the *Guidelines for the Approval of Stability Instruments* (MSC.1/Circ.1229), annex, section 4, as amended; and the technical standards defined in part 1 of the *Guidelines for verification of damage stability requirements for tankers* (MSC.1/Circ.1461)."

2 A new subparagraph 2.2.5 is added as follows:

"2.2.5 The Administration may waive the requirements of paragraph 2.2.4 for the following ships, provided the procedures employed for intact and damage stability verification maintain the same degree of safety as being loaded in accordance with the approved conditions*. Any such waiver should be duly noted on the Certificate of Fitness referred to in paragraph 1.6.4:

.1 ships which are on a dedicated service, with a limited number of permutations of loading such that all anticipated conditions have been approved in the stability information provided to the master in accordance with the requirements of paragraph 2.2.3;

.2 ships where stability verification is made remotely by a means approved by the Administration;

.3 ships which are loaded within an approved range of loading conditions; or

.4 ships provided with approved limiting KG/GM curves covering all

* Refer to operational guidance provided in part 2 of the *Guidelines for verification of damage stability requirements for tankers* (MSC.1/Circ.1461)."

**Certificate of Fitness**

3 The existing paragraph 6 is replaced by the following:

"6 That the ship must be loaded:

.1* only in accordance with loading conditions verified compliant with intact and damage stability requirements using the approved stability instrument fitted in accordance with paragraph 2.2.4 of the Code;

.2* where a waiver permitted by paragraph 2.2.5 of the Code is granted and the approved stability instrument required by paragraph 2.2.4 of the Code is not fitted, loading shall be made in accordance with one or more of the following approved methods:

(i)* in accordance with the loading conditions provided in the approved loading manual, stamped and dated ..... and signed by a responsible officer of the Administration, or of an organization recognized by the Administration; or

(ii)* in accordance with loading conditions verified remotely using an approved means……; or

(iii)* in accordance with a loading condition which lies within an approved range of conditions defined in the approved loading manual referred to in (i) above; or

(iv)* in accordance with a loading condition verified using approved critical KG/GM data defined in the approved loading manual referred to in (i) above;

.3* in accordance with the loading limitations appended to this Certificate.

Where it is required to load the ship other than in accordance with the above instruction, then the necessary calculations to justify the proposed loading conditions should be communicated to the certifying Administration who may authorize in writing the adoption of the proposed loading condition.

* Delete as appropriate."

***

**ANNEX 9**

**RESOLUTION MEPC.248(66)**
**Adopted on 4 April 2014**

**AMENDMENTS TO THE ANNEX OF THE PROTOCOL OF 1978 RELATING TO THE INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS, 1973**

**Amendments to MARPOL Annex I**
**(Mandatory carriage requirements for a stability instrument)**

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee conferred upon it by international conventions for the prevention and control of marine pollution from ships,

NOTING article 16 of the International Convention for the Prevention of Pollution from Ships, 1973 (hereinafter referred to as the "1973 Convention") and article VI of the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973 (hereinafter referred to as the "1978 Protocol") which together specify the amendment procedure of the 1978 Protocol and confer upon the appropriate body of the Organization the function of considering and adopting amendments to the 1973 Convention, as modified by the 1978 Protocol (MARPOL),

HAVING CONSIDERED proposed amendments to Annex I of MARPOL, developed by the Sub-Committee on Stability and Load Lines and on Fishing Vessels Safety, at its fifty-fifth session,

1. ADOPTS, in accordance with article 16(2)(d) of the 1973 Convention, amendments to Annex I of MARPOL, the text of which is set out in the annex to the present resolution;

2. DETERMINES, in accordance with article 16(2)(f)(iii) of the 1973 Convention, that the amendments shall be deemed to have been accepted on 1 July 2015 unless, prior to that date, not less than one third of the Parties or Parties, the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have communicated to the Organization their objection to the amendments;

3. INVITES the Parties to note that, in accordance with article 16(2)(g)(ii) of the 1973 Convention, the said amendments shall enter into force on 1 January 2016 upon their acceptance in accordance with paragraph 2 above;

4. REQUESTS the Secretary-General, in conformity with article 16(2)(e) of the 1973 Convention, to transmit to all Parties to MARPOL, certified copies of the present resolution and the text of the amendments contained in the annex;

5. REQUESTS FURTHER the Secretary-General to transmit to the Members of the Organization which are not Parties to MARPOL, copies of the present resolution and its annex.

ANNEX

**AMENDMENTS TO MARPOL ANNEX I**

**Chapter 1 – General**

**Regulation 3 – Exemptions and waivers**

1 A new paragraph 6 is inserted, as follows:

"6 The Administration may waive the requirements of regulation 28(6) for the following oil tankers if loaded in accordance with the conditions approved by the Administration taking into account the guidelines developed by the Organization*:

.1 oil tankers which are on a dedicated service, with a limited number of permutations of loading such that all anticipated conditions have been approved in the stability information provided to the master in accordance with regulation 28(5);

.2 oil tankers where stability verification is made remotely by a means approved by the Administration;

.3 oil tankers which are loaded within an approved range of loading conditions; or

.4 oil tankers constructed before 1 January 2016 provided with approved limiting KG/GM curves covering all applicable intact and damage stability requirements.

* Refer to operational guidance provided in part 2 of the *Guidelines for verification of damage stability requirements for tankers* (MSC.1/Circ.1461)."

**Chapter 4 – Requirements for the cargo area of oil tankers**

**Regulation 28 – Subdivision and damage stability**

2 The existing paragraph 6 is renumbered as paragraph 7.

3 A new paragraph 6 is inserted, as follows:

"6 All oil tankers shall be fitted with a stability instrument, capable of verifying compliance with intact and damage stability requirements approved by the Administration having regard to the performance standards recommended by the Organization*:

.1 oil tankers constructed before 1 January 2016 shall comply with this regulation at the first scheduled renewal survey of the ship after 1 January 2016 but not later than 1 January 2021;

.2 notwithstanding the requirements of subparagraph .1 a stability instrument fitted on an oil tanker constructed before 1 January 2016 need not be replaced provided it is capable of verifying compliance with intact and damage stability, to the satisfaction of the Administration; and

.3 for the purposes of control under regulation 11, the Administration shall issue a document of approval for the stability instrument.

---

* Refer to part B, chapter 4, of the International Code on Intact Stability, 2008 (2008 IS Code), as amended; the *Guidelines for the Approval of Stability Instruments* (MSC.1/Circ.1229), annex, section 4, as amended; and the technical standards defined in part 1 of the *Guidelines for verification of damage stability requirements for tankers* (MSC.1/Circ.1461)."

**Appendix II – Form of IOPP Certificate and Supplements, Form B**

4 The following new paragraphs 5.7.5 and 5.7.6 are inserted:

"5.7.5 The ship is provided with an Approved Stability Instrument in accordance with regulation 28(6)..... ☐

5.7.6 The requirements of regulation 28(6) are waived in respect of the ship in accordance with regulation 3.6. Stability is verified by the following means:

.1 loading only to approved conditions defined in the stability information provided to the master in accordance with regulation 28(5)..... ☐

.2 verification is made remotely by a means approved by the Administration:..... ☐

.3 loading within an approved range of loading conditions defined in the stability information provided to the master in accordance with regulation 28(5)..... ☐

.4 loading in accordance with approved limiting KG/GM curves covering all applicable intact and damage stability requirements defined in the stability information provided to the master in accordance with regulation 28(5) ..... ☐"

***

**INTERNATIONAL MARITIME ORGANIZATION**
4 ALBERT EMBANKMENT
LONDON SE1 7SR

Telephone: 020 7735 7611
Fax: 020 7587 3210

**IMO**

***E***

Ref. T1/2.04

MSC.1/Circ.1229
11 January 2007

# GUIDELINES FOR THE APPROVAL OF STABILITY INSTRUMENTS

1 The Maritime Safety Committee, at its eighty-second session (29 November to 8 December 2006), approved the Guidelines for the approval of stability instruments, set out in the annex, aiming at providing additional guidance on approval procedures of stability instruments supporting the safe operation of ships.

2 Member Governments are invited to bring the annexed Guidelines for the approval of stability instruments to the attention of interested parties as they deem appropriate.

***

# ANNEX

# GUIDELINES FOR THE APPROVAL OF STABILITY INSTRUMENTS

## 1 Purpose

The aim of this document is to provide additional guidance on approval procedures of stability instruments supporting the safe operation of ships.

## 2 Definition

A s*tability instrument* is an instrument installed on board a particular ship by means of which it can be ascertained that stability requirements specified for the ship in Stability Booklet are met in any operational loading condition. A stability instrument comprises hardware and software.

## 3 Software approval

The accuracy of the computational results and actual ship data used by the programmes should be verified for the particular ship on which the programmes will be installed. This ship specific approval of on-board loading instruments is required for all ships equipped with a stability instrument.

## 4 Acceptable tolerances

4.1 Depending on the type and scope of programmes, the acceptable tolerances should be determined differently, according to 4.5 or 4.6. Excess from these tolerances should not be accepted unless the Administration considers that there is a satisfactory explanation for the difference and that there will be no adverse effect on the safety of the ship.

4.2 Examples of pre-programmed input data include the following:

.1 Hydrostatic data: displacement, LCB, LCF, VCB, $KM_t$ and MCT versus draught.

.2 Stability data: KN or MS values at appropriate heel/trim angles versus displacement, stability limits.

.3 Compartment data: volume, LCG, VCG, TCG and FSM/grain heeling moments versus level of the compartment's contents.

4.3 Examples of output data include the following:

.1 Hydrostatic data: displacement, LCB, LCF, VCB, $KM_t$ and MCT versus draught as well as actual draughts, trim.

.2 Stability data: FSC (free surface correction), GZ-values, VCG, GM, VCG/GM limits, allowable grain heeling moments, derived stability criteria, e.g. areas under the GZ curve, weather criteria.

.3 Compartment data: calculated volume, LCG, VCG, TCG and FSM/grain heeling moments versus level of the compartment's contents.

4.4 The computational accuracy of the calculation program results should be within the acceptable tolerances specified in 4.5 or 4.6, of the results using an independent program or the approved stability information with identical input.

4.5 Programmes which use only pre-programmed data from the approved stability information as the basis for stability calculations should have zero tolerances for the printouts of input data. Output data tolerances should be close to zero, however, small differences associated with calculation rounding or abridged input data are acceptable. Additionally differences associated with the use of hydrostatic and stability data for trims that differ from those in the approved stability information are acceptable subject to review by the Administration.

4.6 Programmes which use hull form models as their basis for stability calculations may have tolerances for the printouts of basic calculated data established against either data from the approved stability information or data obtained using the authority's approval model. Acceptable tolerances should be in accordance with the table below.

| | |
|---|---|
| **Hull Form Dependent** | |
| Displacement | 2% |
| Longitudinal center of buoyancy, from AP | 1% / 50 cm max |
| Vertical center of bouyancy | 1% / 5 cm max |
| Transverse center of bouyancy | 0.5% of B / 5 cm max |
| Longitudinal center of flotation, from AP | 1% / 50 cm max |
| Moment to trim 1 cm | 2% |
| Transverse metacentric height | 1% / 5 cm max |
| Longitudinal metacentric height | 1% / 50cm max |
| Cross curves of stability | 50mm |
| **Compartment dependent** | |
| Volume or deadweight | 2% |
| Longitudinal center of gravity, from AP | 1% / 50 cm max |
| Vertical centre of gravity | 1% / 5 cm max |
| Transverse center of gravity | 0.5% of B / 5 cm max |
| Free surface moment | 2% |
| Shifting moment | 5% |
| Level of contents | 2% |
| **Trim and stability** | |
| Draughts (forward, aft, mean) | 1% / 5 cm max |
| GMt | 1% / 5 cm max |
| GZ values | 5% / 5 cm max |
| FS correction | 2% |
| Downflooding angle | 2° |
| Equilibrium angles | 1° |
| Distance to unprotected openings or margin line from WL, if applicable | +/- 5% / 50 mm |
| Areas under righting arm curve | 5% or 0,0012mrad |

Deviation in % = {(base value - applicant's value)/base value} ×100
The "base value" may be taken from the approved stability information.

INTERNATIONAL MARITIME ORGANIZATION

E

4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

MSC.1/Circ.1461
8 July 2013

# GUIDELINES FOR VERIFICATION OF DAMAGE STABILITY REQUIREMENTS FOR TANKERS

1 The Maritime Safety Committee, at its ninety-second session (12 to 21 June 2013), having considered the proposal of the Sub-Committee on Stability and Load Lines and on Fishing Vessels Safety, at its fifty-fifth session (18 to 22 February 2013), approved the *Guidelines for verification of damage stability requirements for tankers*, as set out in the annex.

2 The Guidelines consist of two parts, as follows:

.1 part 1: *Guidelines for preparation and approval of tanker damage stability calculations*. This part should be applied to oil tankers, chemical tankers and gas carriers constructed on or after 14 June 2013.

.2 part 2: *Guidelines for operation and demonstration of damage stability compliance*. This part should be applied to all oil tankers, chemical tankers and gas carriers.

3 Member Governments are invited to bring the annexed Guidelines to the attention of all parties concerned.

***

**ANNEX**

# GUIDELINES FOR VERIFICATION OF DAMAGE STABILITY REQUIREMENTS FOR TANKERS

## PART 1

## GUIDELINES FOR PREPARATION AND APPROVAL OF TANKER DAMAGE STABILITY CALCULATIONS

### Guideline for scope of damage stability verification on new oil tankers, chemical tankers and gas carriers[1]

## 1 APPLICATION

These Guidelines are intended for oil tankers, chemical tankers and gas carriers constructed on or after 14 June 2013.

## 2 REFERENCE

### 2.1 IMO general instruments

.1 SOLAS chapter II-1, regulations 4.1, 4.2, 5-1 and 19;

.2 Part B, chapter 4 of the International Code on Intact Stability, 2008 (2008 IS Code), adopted by resolution MSC.267(85), as amended;

.3 Adoption of amendments to the Protocol of 1988 relating to the International Convention on Load Lines, 1966 (resolution MSC.143(77)), regulations 27(2), 27(3), 27(11), 27(12) and 27(13)[1];

.4 Explanatory notes to SOLAS chapter II-1 subdivision and damage stability regulations (resolution MSC.281(85));

.5 *Recommendation on a standard method for evaluating cross-flooding arrangements* (resolution MSC.245(83));

.6 *Revised Recommendation on a standard method for evaluating cross-flooding arrangements* (resolution MSC.362(92));

.7 Guidelines on interpretation of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) and the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) and Guidelines for the uniform application of the survival requirements of the IBC and IGC Codes (MSC/Circ.406/Rev.1);

.8 Guidelines for damage control plans and information to the master (MSC.1/Circ.1245); and

.9 Guidelines for the approval of stability instruments (annex, section 4) (MSC.1/Circ.1229).

[1] The application of regulation 27 of the 1988 Load Lines Protocol is explained in appendix 1.

### 2.2 Instrument applicable to oil tankers

MARPOL Annex I, regulation 28.

### 2.3 Instruments applicable to gas carriers

.1 International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), chapter 2, paragraphs 2.1, 2.4, 2.5, 2.6.2, 2.6.3, 2.7, 2.8 and 2.9; and

.2 Guidelines on Interpretation of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) and the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) and Guidelines for the Uniform Application of the Survival Requirements of the IBC and IGC Codes (MSC/Circ.406/Rev.1).

### 2.4 Instruments applicable to chemical tankers

.1 International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code), chapter 2, paragraphs 2.1, 2.4, 2.5, 2.6.2, 2.7, 2.8 and 2.9; and

.2 Guidelines on Interpretation of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) and the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) and Guidelines for the Uniform Application of the Survival Requirements of the IBC and IGC Codes (MSC/Circ.406/Rev.1).

## 3 GENERAL

### 3.1 Education and training

3.1.1 Plan approval of staff engaged in damage stability verification of new oil tankers, chemical tankers and gas carriers should have as minimum the following formal educational background:

.1 a degree or equivalent from a tertiary institution recognized within the field of marine engineering or naval architecture; and

.2 competent in the English language commensurate with their work.

3.1.2 Plan approval of staff engaged in damage stability verification of new oil tankers, chemical tankers and gas carriers should be trained according to theoretical and practical modules defined by the Administration or recognized organization (RO) acting on its behalf, to acquire and develop general knowledge and understanding applicable to the above-mentioned types of ship and stability assessment according to the IMO instruments referred to in section 2 above.

3.1.3 Methods of training may include monitoring, testing, etc. on a regular basis according to the Administration or RO's system. Evidence of training provided should be documented.

3.1.4 Updating of qualification may be done through the following methods:

.1 self-study;

.2 extraordinary seminars in case of significant changes in the international conventions, codes, etc.; and

.3 special training on specific work, which is determined by a long absence of practical experience.

3.1.5 Maintenance of qualification should be verified at annual performance review.

### 3.2 Scope of stability verification

3.2.1 The scope of damage stability verification is determined by the required damage stability standards (applicable damage stability criteria) and aims at providing the ship's master with a sufficient number of approved loading conditions to be used for the loading of the ship. In general, for non-approved loading conditions (by the Administration or RO acting on its behalf), approved KG/GM limit curve(s) or approved stability instrument software satisfying the stability requirements (intact and damage) for the draught range to be covered, should be used to verify compliance on board.

3.2.2 Within the scope of the verification determined as per the above, all damage scenarios specified by the relevant regulations should be determined and assessed, taking into account the damage stability criteria.

3.2.3 Damage stability verification and approval requires a review of submitted calculations and supporting documentation with independent check calculations to confirm that damage stability calculation results comply with relevant stability criteria.

3.2.4 Examination and approval of the stability instrument software installed on board (and to be used for assessing intact and damage stability) should also be carried out. A stability instrument comprises hardware and software. The accuracy of the computation results and actual ship data used by the software is to be verified.

### 3.3 Assumptions

3.3.1 For all loading conditions, the initial metacentric height and the righting lever curve should be corrected for the effect of free surfaces of liquids in tanks.

3.3.2 Superstructures and deckhouses not regarded as enclosed can be taken into account in stability calculations up to the angle at which their openings are flooded. Flooding points (including windows) incapable of weathertight closure are to be included in any list determined in accordance with paragraph 3.4.2.6. Full compliance with residual stability criteria must be achieved before any such point becomes immersed.

3.3.3 When determining the righting lever (GZ) of the residual stability curve, the constant displacement (lost buoyancy) method of calculation should be used (see section 6.1).

3.3.4 Conditions of loading and instructions provided by the submitter for use of the applicable KG/GM limit curve(s) and variation of loading patterns and representative cargoes are taken to be representative of how the ship will be operated.

### 3.4 Documentation to be submitted for review

#### 3.4.1 *Presentation of documents*

The documentation should begin with the following details: principal dimensions, ship type, designation of intact conditions, designation of damage conditions and pertinent damaged compartments, KG/GM limit curve(s).

#### 3.4.2 *General documents and supporting information*

.1 lines plan, plotted or numerically;

.2 hydrostatic data and cross curves of stability (including drawing of the buoyant hull);

.3 definition of watertight compartments with moulded volumes, centres of gravity and permeability;

.4 layout plan (watertight integrity plan) for the watertight compartments with all internal and external opening points including their connected sub-compartments, and particulars used in measuring the spaces, such as general arrangement plan and tank plan;

.5 Stability Booklet/Loading Manual including at least fully loaded homogeneous condition at summer load line draught (departure and arrival) and other intended operational conditions[2];

.6 coordinates of opening points with their level of tightness (e.g. weathertight, unprotected)[2], including reference to the compartment that the opening is connected to;

.7 watertight door location;

.8 cross- and down-flooding devices and the calculations thereof according to resolution MSC.245(83) or MSC.362(92), as appropriate, with information about diameter, valves, pipe lengths and coordinates of inlet/outlet. Cross- and down-flooding should not be considered for the purpose of achieving compliance with the stability criteria (see also section 9.2);

.9 pipes in damaged area when the breaching of these pipes results in progressive flooding (see section 10.1);

.10 damage extents and definition of damage cases; and

.11 any initial conditions or restrictions which have been assumed in the derivation of critical KG or GM data, and which must therefore be met in service.

---

[2] For the purpose of making a submission of stability information for approval, the minimum number of loading conditions which should be submitted for approval is a function of the mode of operation intended for the ship. MSC/Circ.406/Rev.1 offers guidance in this respect, and identifies the concepts of the "dedicated service tanker" and "parcel tanker" for the purpose of undertaking stability approval of ships certified under the IBC and IGC Codes and the appropriate treatment of ships assigned tropical freeboards.

[3] Details of watertight, weathertight and unprotected openings should be included in the Damage Control Plan and Damage Control Booklet in accordance with MSC.1/Circ.1245.

The cases and extent of progressive flooding assumed in the damage stability analysis should be indicated in the Damage Control Booklet and the Documents for Submission in accordance with the annex to resolution MSC.281(85). Arrangements to prevent further flooding are to be indicated on the Damage Control Plan and in the Damage Control Booklet.

### 3.4.3 *Special documents*

3.4.3.1 *Documentation*

.1 Design documentation: damage stability calculations (including residual stability curves), the arrangements, configuration and contents of the damaged compartments, and the distribution, relative densities and the free surface effect of liquids.

.2 Operational documentation: loading and stability information booklet (stability booklet), Damage Control Plan; and Damage Control Booklet.

3.4.3.2 *Special consideration*

For intermediate flooding stages before cross-flooding (see sections 6.8 and 9.2) or before progressive flooding (see section 6.9), an appropriate scope of the documentation covering the aforementioned items is needed in addition. The intermediate stages for cargo outflow and seawater inflow should be checked. If any stability criteria during intermediate stages shows more severe values than in the final stage of flooding, these intermediate stages should also be submitted.

## 4 OPERATING LIMITS – DESCRIPTIONS/ASSUMPTIONS

In considering the scope of the verification to be conducted, consideration of the operating limits is needed.

The following loading options should be permitted:

.1 service loading conditions identical to the approved loading conditions of the stability booklet (see section 4.2); or

.2 service loading conditions complying with the approved intact and damage stability limiting curves (where provided) (see section 4.3); or

.3 service loading conditions which have been checked with an approved stability instrument with the capability to perform damage stability calculations (Type 2 or Type 3 of the IS Code and MSC.1/Circ.1229) either based on KG/GM limit curve(s) or based on direct damage stability assessment (see section 4.5).

If the above-mentioned proof of compliance is not possible, then the intended loading conditions should be either prohibited or be submitted for specific approval to the Administration or RO acting on its behalf. Suitable instructions to this effect should be included in the stability booklet/loading manual.

An approved loading condition is one which has been specifically examined and endorsed by the Administration/RO.

### 4.1 Specific loading patterns

4.1.1 Ship-specific design loading patterns and loading restrictions should be clearly presented in the stability booklet. The following items should be included:

.1 any required and intended loading conditions (including the ones corresponding to multiple freeboards when so assigned to the ship), i.e. symmetrical/ unsymmetrical, homogeneous/alternating or ballast/ partial/full;

.2 types (e.g. oil, noxious liquid substances and LNG) of liquid cargo allowed to be carried;

.3 restrictions to different liquid loads to be carried simultaneously;

.4 range of permissible densities of liquid loads to be carried; and

.5 minimum tank filling levels required to achieve compliance with the applicable stability criteria.

4.1.2 For the verification of damage stability all loading conditions presented in the stability booklet except for ballast, light ship and docking conditions are to be examined.

### 4.2 Range of permissible loading conditions

In the absence of stability software and KG/GM limit curve(s), in lieu of approved specific loading conditions, a matrix clearly defining any allowable ranges of loading parameters (draught, trim, KG, cargo loading pattern and SG) that the ship is allowed to load whilst remaining in compliance with the applicable intact and damage stability criteria can be developed for the stability booklet when a greater degree of flexibility than that afforded by approved specific loading conditions is needed. If this information is to be used, it should be in an approved form.

### 4.3 KG/GM Limit curve(s)[4]

4.3.1 Where KG/GM limit curves are provided, a systematic investigation of damage survival characteristics should be undertaken by making calculations to obtain the minimum required GM or maximum allowable KG at a sufficient number of draughts within the operating range to permit the construction of a series of curves of "required GM" or "allowable KG" in relation to draught and cargo tank content in way of the damage. The curves must be sufficiently comprehensive to cover operational trim requirements.

4.3.2 The verification of KG/GM limit curves should be conducted without any free surface correction. The actual loading condition uses the free surface correction (see section 6.5) when comparing actual and allowable KG values.

4.3.3 It is to be noted that any change of filling level, draught, trim, or cargo density might have a major influence to the results of a damage case; therefore the following items should be considered carefully for the calculation of the KG/GM limit curves:

.1 intact and damage stability criteria applicable to the ship;

.2 the maximum required damage extent and lesser extents of damage which provide the most severe damage cases;

[4] To avoid difficulties associated with developing suitable KG/GM limit curves and their restriction on operational capacity, it is recommended that an approved Type 3 stability software is fitted on board.

.3 draught range of the ship (up to tropical freeboard if required);

.4 trim range of the ship (see section 6.6);

.5 full and empty cargo tanks;

.6 partially filled cargo tanks (consideration of increments as necessary);

.7 minimum tank fillings in tonnes if required;

.8 maximum/minimum densities of cargoes; and

.9 ballast tank filling levels as necessary to achieve compliance.

4.3.4 Damage stability calculations, on which the KG/GM limit curve(s) is(are) based, should be performed at the design stage. The KG/GM limit curve(s) drawn out taking stability criteria (intact and damage) into account should be inserted in the stability booklet.

### 4.4 Initial heel

The stability booklet should contain a note for the master to avoid initial heel greater than 1 degree. A steady heeling angle may have a major influence on the stability of the ship especially in the case of damage.

### 4.5 Direct calculation on board (stability instrument)

4.5.1 Any stability software installed on board should cover all stability requirements (intact and damage) applicable to the ship.

4.5.2 The following types of stability softwares, if approved by an Administration or RO acting on its behalf (according to the 2008 IS Code and MSC.1/Circ.1229), are applicable for the calculation of service-loading conditions for tank ships:

.1 Type 2: Checking intact and damage stability on basis of a KG/GM limit curve(s) or previously approved loading conditions; and

.2 Type 3: Checking intact and damage stability by direct application of pre-programmed damage cases for each loading condition, including capability for calculation of intermediate damage stages.

4.5.3 The software should be approved by the Administration or RO acting on its behalf. The stability instrument is not a substitute for the approved stability documentation, but used as a supplement to facilitate stability calculations.

4.5.4 Sufficient damages, taking into account lesser damages, and variation of draft, cargo density, tank-loading patterns and extents of tank filling should be performed to ensure that for any possible loading condition the most onerous damages have been examined according to relevant stability criteria.

4.5.5 The methodologies for determining compliance with relevant stability criteria should be as set out in these Guidelines.

## 5 Hull and compartment modelling tolerances

5.1 Acceptable tolerances should be in accordance with table 1. Where two values are provided for the permissible tolerances, the per cent deviation is allowable as long as it does not exceed the following linear value for the particular hull form dependent parameter.

5.2 Deviation from these tolerances should not be accepted unless the Administration or RO acting on its behalf considers that there is a satisfactory explanation for the difference and that there will be no adverse effect on the capability of the ship to comply with the stability criteria.

5.3 No deviation is generally allowed for input data; however, small differences associated with calculation rounding or abridged input data are acceptable.

**Table 1 (relevant parts of MSC.1/Circ.1229 are reproduced)**

| **Hull form dependent** | **Tolerances** |
|---|---|
| Displacement | 2% |
| Longitudinal centre of buoyancy, from AP | 1%/50 cm max |
| Vertical centre of buoyancy | 1%/5 cm max |
| Transverse centre of buoyancy | 0.5% of B/5 cm max |
| Longitudinal centre of flotation, from AP | 1%/50 cm max |
| Moment to trim 1 cm | 2% |
| Transverse metacentric height | 1%/5 cm max |
| Longitudinal metacentric height | 1%/50 cm max |
| Cross curves of stability | 5 cm |
| **Compartment dependent** | **Tolerances** |
| Volume or deadweight | 2% |
| Longitudinal centre of gravity, from AP | 1%/50 cm max |
| Vertical centre of gravity | 1%/5 cm max |
| Transverse centre of gravity | 0.5% of B/5 cm max |
| Free surface moment | 2% |
| Level of contents | 2% |

Deviation in % = [(base value – applicant's value)/base value] x 100

where the "base value" may be taken from the approved stability information or the computer model.

## 6 Methodology

### 6.1 Method of analysis

6.1.1 Independent analysis uses the "constant displacement"/"lost buoyancy" method.

6.1.2 Within the scope of damage stability analysis with the deterministic approach, depending on the subdivision of the ship, the result of applying the standard of damage as specified in the applicable requirements is the creation of a number of damage cases, where one or more compartments are open to sea.

6.1.3 The compartment(s), once damaged, are not considered as contributing to the buoyancy of the ship. Consequently, a new condition of equilibrium occurs. In order to define the new equilibrium condition and to assess the stability of the ship after damage the lost buoyancy/constant displacement method is used.

6.1.4 The new floating position can be determined by assuming that the damaged displacement is equal to the intact displacement (constant displacement) minus the weight of liquids which were contained in the damaged compartments.

6.1.5 Due to the lost buoyancy of the damaged compartment(s), the remaining intact ship has to compensate by sinkage, heel and trim until the damaged displacement is reached. Once the equilibrium has been reached and the final waterline is determined, the metacentric height (GM), the righting lever curves (GZ) and the centre of gravity positions (KG), can be calculated in order to verify the stability of the ship against the applicable requirements.

6.1.6 For the intermediate stages of flooding and the equalization with compartments cross-connected by small ducts, i.e. not opened to the sea directly, the added weight method is used.

### 6.2 Arguments used in calculations

The arguments used in the calculation for the verification of damage stability are the following:

.1 trim: The calculation should be done for the ship freely trimming;

.2 heel angle at equilibrium: The heel angle at equilibrium, due to unsymmetrical flooding, should not exceed the maximum values as indicated in the applicable requirements. Concerning the range of positive righting levers (GZ), this should be calculated beyond the position of equilibrium to the extent as so required by the applicable requirements;

.3 free surface of liquid: For the calculation of the position of the centre of gravity (KG), the metacentric height (GM) and the righting lever curves (GZ), the effect of the free surfaces of liquids (see section 6.5) should be taken into account;

.4 immersion of weathertight and unprotected openings (see sections 6.7 and 10.1)

Unprotected openings:

The positive range of righting levers is calculated from the angle of equilibrium until the angle of immersion of the unprotected openings leading to intact spaces;

Weathertight points: see paragraph 10.1.2;

.5 progressive flooding through internal pipes: in case of damage of an internal pipe which is connected to an undamaged compartment, the undamaged compartment should also be flooded, unless arrangements are fitted (e.g. check valves or valves with remote means of control), which can prevent further flooding of the undamaged compartments;

.6 permeabilities: care should be taken to apply the permeabilities as specified in the applicable regulations. Special attention should be paid in case compartments which are separated by weathertight boundaries are modeled

as one compartment. This simplified method of modeling the compartments should apply only to compartments belonging to the same category (same permeability); and

.7 heel angles for the calculation of the GZ curve: evaluation of damage stability criteria should generally be determined from data calculated over a range of angles from 0 to 60 degrees. It is recommended to use an increment not exceeding 5 degrees.

### 6.3 Adjustments for cargo run-off

6.3.1 In cases where the damage involves the cargo hold, it is assumed that cargo is flowing out and that water ingress starts. During the intermediate stages of flooding it is considered that both cargo and seawater are existing in the damaged tank (see section 9.3).

6.3.2 At the final stage it is assumed that the cargo is completely lost and that the tank is filled with seawater up to the level of the waterline.

6.3.3 The impact on the stability of the ship, due to the inflow and outflow of liquid cargo is also dependent on the following parameters:

.1 the density of the cargo: liquid cargo with density greater than 0.95 $t/m^3$ should be considered as heavy liquid cargo. In case of lesser vertical extent of damage, i.e. damage above the tank top (see appendix 4), the release of heavy liquid cargo might lead to large angle of heel on the intact side of the ship. Depending on intact draught and cargo tank filling level, outflow of cargo of lesser density may also cause heel to the opposite side; and

.2 the permeability of the cargo space, taking into account that permeabilities smaller than those specified in the applicable rules can be applied, if justified.

### 6.4 Handling of permeabilities

6.4.1 Permeability of a space means the ratio of the volume within that space, which should be assumed to be occupied by water to the total volume of that space. The total volume should be calculated to moulded lines, and no reduction in total volume should be taken into account due to structural members (i.e. stiffeners, etc.). Account of structural members is taken in the applicable permeabilities (see also MSC/Circ.406/Rev.1, paragraph 3.11).

6.4.2 Depending on the applicable requirements, the permeabilities assumed for spaces flooded as a result of damage should be as shown in table 2.

**Table 2**

| Spaces | Permeabilities | | | |
|---|---|---|---|---|
| | MARPOL | ICLL [1)] | IBC | IGC |
| Appropriated to stores | 0.6 | 0.95 | 0.6 | 0.6 |
| Occupied by accommodation | 0.95 | 0.95 | 0.95 | 0.95 |
| Occupied by machinery | 0.85 | 0.85 | 0.85 | 0.85 |
| Voids | 0.95 | 0.95 | 0.95 | 0.95 |
| Intended for consumable liquids | 0 to 0.95* | 0.95 | 0 to 0.95* | 0 to 0.95* |
| Intended for other liquids | 0 to 0.95* | 0.95 | 0 to 0.95* | 0 to 0.95* |

* The permeability of partially filled compartments should be consistent with the amount of liquid carried in the compartment.

1) Regarding application of ICLL damage stability requirements refer to appendix 1.

6.4.3 Whenever damage penetrates a tank containing liquids, it should be assumed that the contents are completely lost from that compartment and replaced by seawater up to the level of the final plane of equilibrium.

6.4.4 Other figures for permeability may be used for the damaged case both during cargo run-off and the final equilibrium condition under the following provisions:

.1 the detailed calculations and the arguments used for determining the permeability of the compartment(s) in question, is to be included in the damage stability booklet;

.2 the water tightness/resistance to water pressure and the means by which internal fittings/material are secured to the tank should substantiate the use of such fittings/material in reducing the permeability of a compartment. Where a ship is fitted with significant quantities of cargo insulation, the permeabilities of the relevant cargo spaces and/or the void spaces surrounding such cargo spaces may be calculated by excluding the volume of insulation material in those spaces from the flooded volume, provided that the insulating material is shown to comply with the following conditions:

.1 it is impermeable to water under hydrostatic pressure at least corresponding to the pressure caused by the assumed flooding;

.2 it will not crush or break up due to hydrostatic pressure at least corresponding to the pressure caused by the assumed flooding;

.3 it will not deteriorate or change its properties over the long term in the environment anticipated in the space it is installed;

.4 it is highly resistant to the action of hydrocarbons, where relevant; and

.5 it will be adequately secured so that it will remain in position if subjected to collision damage and consequent displacement, distortion of its supporting and retaining structure, repeated rapid ingress and outflow of seawater and the buoyant forces caused by immersion following flooding;

.3 the applied permeability should reflect the general conditions of the ship throughout its service life, rather than specific loading conditions; and

.4 permeabilities other than those indicated in table 2 should be considered only in cases, where it is evident that there is a significant discrepancy between the values shown in the regulations and the actual values (i.e. due to specific tank structure or insulating material).

**6.5 Free surface calculation** (upright, as ship heels and after cargo run-off)

With respect to the approval of actual loading conditions the following should be applied:

6.5.1 The free surfaces of liquids lead to the increase of the centre of gravity (KG) and the reduction of the metacentric height (GM) and the righting arm (GZ curve) of the ship. Therefore corrections should be made, taking into account the change of the centre of gravity of the ship due to the moving of the centre of gravity of the liquids. Depending on the filling level, free surfaces can exist in tanks with consumable liquids, seawater ballast and liquid cargo.

6.5.1.1 For consumable liquids account on the free surfaces should be taken whenever the filling level is equal to or less than 98 per cent:

.1 In calculating the free surface effects in tanks containing consumable liquids, it should 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 should be those where the effect of free surfaces is the greatest.

.2 Taking into account subparagraph .1, the free surfaces should correspond to the maximum value attainable between the filling levels envisaged.

6.5.1.2 During ballasting between departure and arrival condition, the correction for the free surfaces should correspond to the maximum value attainable between the filling levels envisaged. This applies also for the situation where in the departure condition the filling level of a ballast tank is 0 per cent and in the arrival 100 per cent (or the opposite).

6.5.1.3 For the category of liquids referred to under paragraphs 6.5.1.1 and 6.5.1.2, intermediate loading conditions may be considered as an alternative, as deemed necessary, covering the stage where the free surfaces are the greatest. It may be calculated with varying free surface moments (i.e. actual liquid transfer moments), taking into account actual heel and trim, depending on the interval angles of the GZ curve. This is a more accurate method.

6.5.1.4 Except as indicated in regulation 27(11)(v) of the 1988 Load Lines Protocol, for liquid cargo the effect of free surface should be taken into account for the filling level equal to or smaller than 98 per cent. If the filling level is fixed actual free surfaces can be applied. The following two methods can be used for the calculation of the GZ curve, taking into account the effect of the free surface moments for the intact compartments:

.1 Calculation with constant effect of free surfaces, without taking into account the change in heel and trim, for the interval angles of the GZ curve.

.2 Calculation with varying free surface moments, actual liquid transfer moments, taking into account actual heel and trim, depending on the interval angles of the GZ curve (see appendix 2).

6.5.2 For the damaged compartments, whenever the damage is involving cargo tanks, account should be taken of the following:

.1 the impact on the stability of the ship due to the outflow of cargo and ingress of seawater can be verified with the calculation of the intermediate stages of flooding (see section 9); and

.2 at the final equilibrium the free surface correction should exclude the free surface moment of the lost cargo.

6.5.3 The free surface effect should be calculated at an angle of heel of 5° for each individual compartment or as per paragraph 6.5.1.3.

### 6.6 Treatment of operational trim

6.6.1 For the assumed damage and the resultant damage cases, the damage stability should be assessed for all anticipated conditions of loading and variations in draught and trim.

6.6.2 Significant trim values (greater than 1% $L_{pp}$) can appear in the aft/fore part of the ship in the departure and arrival condition. In that case, damage cases involving the aft/fore part of the ship might be critical for achieving compliance with the applicable criteria. In order to limit the trim, ballast water is used during the voyage, as deemed necessary. Under the provision of paragraphs 6.5.1.2 and 6.5.1.3, for taking account of the free surface effect during ballasting, if intermediate stages of the voyage are considered, then the loading conditions representing these stages should be also calculated for damage stability.

### 6.7 Down-flooding points

6.7.1 Down-flooding point is the lower edge of any opening through which progressive flooding may take place. Such openings should include air pipes, ventilators and those which are closed by means of weathertight doors or hatch covers and may exclude those openings closed by means of watertight manhole covers and flush scuttles, small watertight cargo tank hatch covers which maintain the high integrity of the deck, remotely operated watertight sliding doors, and sidescuttles of non-opening type.

6.7.2 All openings through which progressive flooding may take place should be defined: both weathertight and unprotected. As an alternative, it might be accepted to consider only the most critical openings, which are considered to be the openings with the lowest vertical position and close to the side shell. Concerning the longitudinal position it depends on the aft or fore trim of the initial condition and the trim after damage at equilibrium. Unprotected openings should not be immersed within the minimum range of righting-lever curve required for the ship. Within this range, the immersion of any of the openings capable of being closed weathertight may be permitted.

### 6.8 Cross-flooding time

6.8.1 Cross-flooding time should be calculated in accordance with the *Recommendation on a standard method for evaluating cross-flooding arrangements* (resolutions MSC.245(83) or MSC.362(92), as appropriate).

6.8.2 If complete fluid equalization occurs in 60 s or less, the equalized tank should be assumed flooded with the tanks initially to be flooded and no further calculations need to be carried out. Otherwise, the flooding of tanks assumed to be initially damaged and equalized tank should be carried out in accordance with section 9.2. Only passive open cross-flooding arrangements without valves should be considered for instantaneous cases.

6.8.3 Where cross-flooding devices are fitted, the safety of the ship should be demonstrated in all stages of flooding (see sections 9.2 and 10). Cross-flooding equipment, if installed, should have the capacity to ensure that the equalization takes place within 10 min.

6.8.4 Tanks and compartments taking part in such equalization should be fitted with air pipes or equivalent means of sufficient cross-section to ensure that the flow of water into the equalization compartments is not delayed.

6.8.5 Spaces which are linked by ducts of a large cross-sectional area may be considered to be common, i.e. the flooding of these spaces should be interpreted as instantaneous flooding with the equalization of duration of less than 60 s.

**6.9 Progressive flooding** (internal/external) (see also sections 10.1 and 10.2)

6.9.1 Progressive flooding is the flooding of compartments situated outside of the assumed extent of damage. Progressive flooding may extend to compartments, other than those assumed flooded, through down-flooding points (i.e. unprotected and weathertight openings), pipes, ducts, tunnels, etc.

6.9.2 The flooding of compartment(s) due to progressive flooding occurring in a predictable and sequential manner through a down-flooding point which is submerged below the damage waterline may be permitted provided all intermediate stages and the final stage of flooding meet the required stability criteria.

6.9.3 Minor progressive flooding through the pipes situated within the assumed extent of damage may be permitted by the Administration, provided the pipes penetrating a watertight subdivision have a total cross-sectional area of not more than 710 $mm^2$ between any two watertight compartments.

6.9.4 If the opening (unprotected or fitted with a weathertight means of closure) connects two spaces, this opening should not be taken into account if the two connected spaces are flooded or none of these spaces are flooded. If the opening is connected to the outside, it should not be taken into account only if the connected compartment is flooded.

## 7 EXTENTS OF DAMAGE CONSIDERED

### 7.1 Maximum extents

The following provisions regarding the maximum extent and the character of the assumed damage should be applied:

**Table 3**

| | | | |
|---|---|---|---|
| **.1** | **Side damage:** | MARPOL/IBC/IGC | ICLL (Type A ships) |
| .1.1 | Longitudinal extent: | 1/3 $L^{2/3}$ or 14.5 m, whichever is less | Single compartment between adjacent transverse bulkheads as specified in ICLL paragraph 12(d) [1)] |
| .1.2 | Transverse extent: | B/5 or 11.5 m, whichever is less (measured inboard from the ship's side at right angles to the centreline at the level of the summer load line) | B/5 or 11.5, whichever is the lesser (measured inboard from the side of the ship perpendicularly to the centreline at the level of the summer load waterline) [1)] |
| .1.3 | Vertical extent: | upwards without limit (measured from the moulded line of the bottom shell plating at centreline) | From baseline upwards without limit |
| **.2** | **Bottom damage [2)]:** | MARPOL/IBC/IGC | |
| | | **For 0.3 L from the forward perpendicular of the ship** | **Any other part of the ship** |
| .2.1 | Longitudinal extent: | 1/3 $L^{2/3}$ or 14.5 m, whichever is less | 1/3 $L^{2/3}$ or 5 m, whichever is less |
| .2.2 | Transverse extent: | B/6 or 10 m, whichever is less | B/6 or 5 m, whichever is less |
| .2.3 | Vertical extent: | MARPOL/IBC:<br>B/15 or 6 m, whichever is less (measured from the moulded line of the bottom shell plating at centreline)<br><br>IGC:<br>B/15 or 2 m, whichever is less (measured from the moulded line of the bottom shell plating at centreline) | MARPOL/IBC:<br>B/15 or 6 m, whichever is less (measured from the moulded line of the bottom shell plating at centreline)<br><br>IGC:<br>B/15 or 2 m, whichever is less (measured from the moulded line of the bottom shell plating at centreline) |
| **.3** | **Bottom raking damage [3)]:** | MARPOL | |
| .3.1 | Longitudinal extent: | in tankers of 75,000 tonnes deadweight and above:<br>0.6 L(m) measured from the forward perpendicular of the ship | |
| | | in tankers of less than 75,000 tonnes deadweight:<br>0.4 L(m) measured from the forward perpendicular of the ship | |
| .3.2 | Transverse extent: | B/3 anywhere in the bottom | |
| .3.3 | Vertical extent: | Breach of the outer hull | |

1) See appendix 3.

2) Bottom damage is not required in the ICLL.

3) Bottom raking damage is required only for oil tankers of 20,000 tonnes deadweight and above.

### 7.2 Lesser extents

7.2.1 If any damage of a lesser extent than the maximum damage specified in table 3 would result in a more severe condition, such damage should be considered (see section 4.5.4).

7.2.2 In the case of a gas carrier, local side damage anywhere in the cargo area extending inboard 760 mm measured normal to the hull shell should be considered, and transverse bulkheads should be assumed damaged when also required by the applicable subparagraphs of section 2.8.1 of the IGC Code.

### 7.3 Rationale for reviewing lesser extents including symmetrical vs. unsymmetrical tank arrangement/geometry – Calculation on weakest side

7.3.1 For a given loading condition, the following examples of damages of a lesser extent may result in a more severe situation than that caused by the maximum damage specified in table 3:

.1 Example of damage on double bottom tanks with watertight centre girder:

.1 Damage of a lesser extent which could occur at the bottom plate of the ship, without damaging the centre girder, will lead to flooding of the double bottom tank on one side of the ship only. This is the case of unsymmetrical flooding. For the same location, damage of a maximum extent would cause damage on the centre girder and therefore flooding of the double bottom tanks on both sides. This is the case of symmetrical flooding (see appendix 4).

.2 Compared to the symmetrical flooding in the case of maximum damage extent, unsymmetrical flooding of spaces, caused by damage of a lesser extent might lead to a more severe situation. Of course, in case of non-watertight centre girder, the effect of damage of lesser and maximum extent would be the same.

.2 Example of damage with lesser vertical extents:

Damage starting from above a tank top would flood the spaces only above the double bottom (see appendix 4). This may result in a more onerous residual stability or heeling angle.

7.3.2 Taking into account the above examples, it is necessary to review damages of lesser extents considering the symmetrical or unsymmetrical nature of tank arrangements of the ship and geometry of the ship. The ship's damage stability is to be ensured, in the most severe or weakest case of damage of lesser extents.

## 8 RATIONALE APPLIED FOR LOADING PATTERN EVALUATION

For damage stability calculations of tank ships the following effects due to different loading methods should be taken into account in determining the scope of verification and specific cases of damage to be investigated.

### 8.1 Homogeneous vs. alternate/partial loading

8.1.1 For homogeneous loading conditions, the damage to cargo tanks may have a major effect on residual stability. Outflow of the loaded cargo liquids (and less inflow of seawater) may reduce the ships' displacement and cause heel to opposite side of the damage. For alternate loading conditions the residual stability depends on the damaged cargo tank. Damage to a fully loaded cargo tank might cause reduction of the initial displacement and heel to the opposite side, but damage on an empty cargo tank might cause the opposite effect. For the damage to two adjacent cargo tanks, one filled and one empty, the total effect might be less severe due to two (partly) neutralizing effects.

8.1.2 Partial loading of liquid cargo tanks will cause a high free surface moment when the surface does not intersect with the tank overhead and will increase the heel in case of damage. However, reductions of the initial displacement and heel to the opposite side may not be as significant. Trim to the ship as a consequence of damage can be significant due to many partially-filled cargo tanks.

### 8.2 Symmetrical and unsymmetrical loading pattern

In general damage stability calculations should be performed for both ship sides. However, the damage stability calculation for one side of the ship may be accepted for symmetrical load (alternate, homogeneous, full, partial or empty), if the ship and all openings are also symmetrical and initial heel to portside or starboard is zero.

### 8.3 MSC/Circ.406/Rev.1

Additional information regarding intact and damage stability matters for tank ships can be found in MSC/Circ.406/Rev.1, which also recommends application of the *Guidelines for the Uniform Application of the Survival Requirements of the Bulk Chemical Code* (BCH Code) and the Gas Carrier Code (GC Code) to the IBC and IGC Codes.

## 9 INTERMEDIATE STAGES OF FLOODING INCLUDING EQUALIZATION, IF ANY, AND CARGO RUN-OFF

Intermediate stages of flooding cover the flooding process from the commencement of flooding up to but excluding the final equilibrium damage condition (see also paragraph 3.4.3.2). Intermediate stages should be comprehensively checked for all ships at the design appraisal stage.

### 9.1 Basis for checking intermediate stages of flooding and minimum stability criteria applied

The stability criteria applicable to the final equilibrium stage should also be satisfied for all intermediate stages. If any stability criteria during intermediate stages shows more severe values than in the final stage of flooding, these intermediate stages should also be submitted.

### 9.2 Number of intermediate stages considered

9.2.1 A sufficient number of intermediate stages should be examined for all damage cases. It is generally recommended to apply 5 intermediate stages of flooding (see also sections 6.8, 6.9 and 10.1).

9.2.2 If the ship is equipped with non-instantaneous (greater than 60 s) passive equalization arrangements or non-passive equalization arrangements of any size, the following procedure is to be used:

.1 compliance with the relevant criteria should be demonstrated without using equalization arrangements for intermediate and final stages; and

.2 for subsequent equalization, additional two intermediate stages and final stages the compliance should also be demonstrated.

### 9.3 Cargo outflow and flood water inflow

9.3.1 During intermediate flooding stages a practical method of calculating the floating position and residual righting moments is the added weight method where the intact condition is corrected for the weights of inflowing floodwater and outflowing cargo.

9.3.2 During each stage an assumed amount of added floodwater and/or cargo outflow should be used. The following method is recommended:

.1 for a loaded tank, an equal loss of liquid cargo mass and equal inflow of floodwater mass at each stage resulting in a total loss of liquid cargo at and total inflow of floodwater to the final damage equilibrium waterline; and

.2 for an empty tank, an equal inflow of floodwater mass at each stage resulting in total inflow of floodwater to the final damage equilibrium waterline.

See appendix 5 for example calculation.

9.3.3 Alternative methods may be accepted, for example:

.1 For a loaded tank the loss of liquid cargo mass and inflow of floodwater mass is based on a linear change of total tank content density over each intermediate stage from pure cargo at the intact condition to pure floodwater at the final damage equilibrium waterline.

.2 For an empty tank an increasing depth of water at each stage based on the difference between the depth of water in the tank and the depth to the waterline in way of the tank, divided by the number of remaining stages, resulting in total inflow of floodwater to the final damage equilibrium waterline.

9.3.4 Noting that calculation of stability in the final damage condition assumes both the liquid cargo and the buoyancy of the damaged spaces to be lost, it is therefore considered both reasonable and consistent to base the residual GZ curve at each intermediate stage on the intact displacement minus total liquid cargo loss at each stage.

### 9.4 Treatment of free surface and KG adjustment

9.4.1 Taking due account of the requirements of paragraph 6.5.1.1, it is generally recommended to apply actual liquid transfer moments for all tank-filling levels in determining compliance with the relevant damage stability criteria through direct calculations of actual loading conditions.

9.4.2 With regard to the treatment of free surfaces of flooded spaces and, noting that there will be combinations of empty and loaded tanks within the damaged extent, all damaged compartments should be considered individually flooded during the intermediate stages – i.e. individual free surfaces. (The compartments are considered open to the sea in the final damage condition.)

## 10 FINAL STAGE OF FLOODING*

### 10.1 Watertight and weathertight integrity

10.1.1 The mandatory instruments referenced in section 2 require the final waterline, taking into account sinkage, heel and trim, to be below the lower edge of any opening through which progressive flooding may take place. Such openings shall include air pipes (irrespective of closing devices) and those which are closed by means of weathertight doors or hatch covers and may exclude those openings closed by means of watertight manhole covers and flush scuttles, small watertight cargo tank hatch covers which maintain the high integrity of the deck, remotely operated watertight sliding doors, and sidescuttles of the non-opening type.

10.1.2 Within the required range of residual stability, the immersion of any of the openings listed above and other openings capable of being closed weathertight may be permitted.

10.1.3 In the final equilibrium condition watertight escape hatches should not be submerged below the equilibrium damage waterline and should be treated as weathertight openings[5].

10.1.4 For an emergency generator room the lowest point of the room should remain above the final equilibrium damage waterline. Any opening leading to this room should be treated as unprotected or weathertight, as applicable.

10.1.5 The following principles apply:

.1 Watertight doors under the final waterline after flooding

All watertight doors under the final waterline after flooding should be remotely operated sliding watertight doors. Installation of a hinged watertight door (e.g. between the steering gear compartment and engine room) is subject to acceptance by the Administration.

.2 Progressive flooding due to damage or submersion of air pipes

Progressive flooding may be accepted subject to the air pipes leading to relatively small compartments which are progressively flooded in a predictable and sequential manner in which all intermediate stages of flooding (with the exception on no progressive flooding) and the final stage of flooding meet the required stability criteria.

.3 Watertight doors on the aft wall of forecastle under the final waterline after flooding.

10.1.6 Hinged watertight doors at the aft bulkhead of a forecastle space are permitted to be submerged after damage only when possible progressive flooding is limited to one relatively small compartment which is progressively flooded in a predictable and sequential manner in which all intermediate stages of flooding (with the exception of no progressive flooding) and the final stage of flooding meet the required stability criteria. No further progressive flooding is permitted beyond the initial flooding of the forecastle. This approach is only permitted after all other options, such as increasing the sill height, relocating the door, only providing access from above, have been shown to be unworkable in practice.

---

* Refer to the Explanatory notes to the SOLAS chapter II-1 subdivision and damage stability regulations (resolution MSC.281(85)).

5 This specification applies only to the escapes from spaces other than tanks.

### 10.2 Unprotected openings

Residual GZ curves should be terminated at the lowest angle of submersion of an unprotected opening.

* * *

## Appendix 1

## DAMAGE STABILITY REQUIREMENTS APPLICABLE TO NEW OIL TANKERS, CHEMICAL TANKERS AND GAS CARRIERS

| SHIP TYPE | ASSIGNED FREEBOARD | LENGTH | RULES |
|---|---|---|---|
| OIL TANKER [1)] | Type "A" ship with assigned freeboard less than type "B" | L ≤ 150 m | MARPOL, ANNEX I |
| | | L > 150 m | MARPOL, ANNEX I + ICLL, reg.27 |
| | Not less than type "B" | Regardless of length | MARPOL, ANNEX I |
| LIQUEFIED GAS CARRIER [1)] | Type "A" ship with assigned freeboard less than type "B" | L ≤ 150 m | IGC |
| | | L > 150 m | IGC + ICLL, reg.27 |
| | Not less than type "B" | Regardless of length | IGC |
| CHEMICAL TANKER [1)] | Type "A" ship with assigned freeboard less than type "B" | L ≤ 150 m | IBC |
| | | L > 150 m | IBC + ICLL, reg.27 |
| | Not less than type "B" | Regardless of length | IBC |

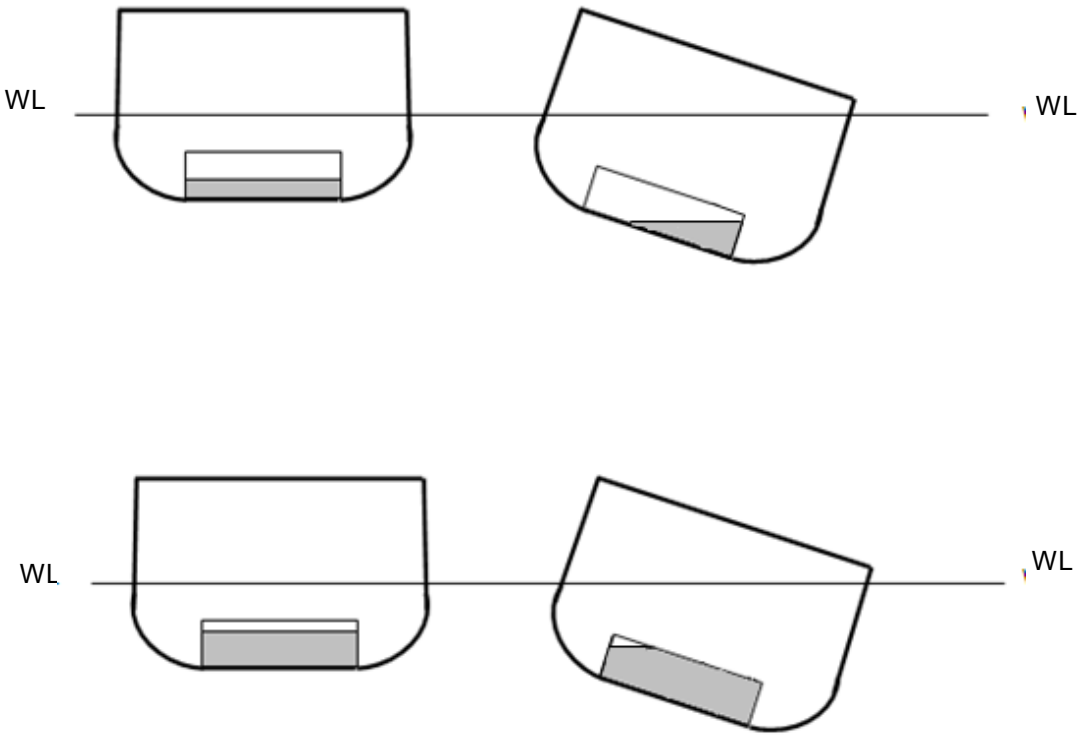
[1)] Ships complying with the above regulations do not need to comply with the damage stability requirements of SOLAS chapter II-1, part B-1.

* * *

## Appendix 2

## EXPLANATORY NOTES TO THE FREE SURFACE CALCULATION WITH VARYING FREE SURFACE MOMENTS, ACTUAL LIQUID TRANSFER MOMENTS, TAKING INTO ACCOUNT ACTUAL HEEL AND TRIM, DEPENDING ON THE INTERVAL ANGLES OF THE GZ CURVE

In the figure below it is shown that the free surface moments can be reduced significantly, depending on the filling level and on the heel. Therefore calculations according to the actual liquid transfer moment represent a more realistic situation. In cases where the effect of free surfaces has a significant impact (i.e. large tanks) this method provides a more realistic account and can be used for the calculations of damage stability.




* * *

## Appendix 3

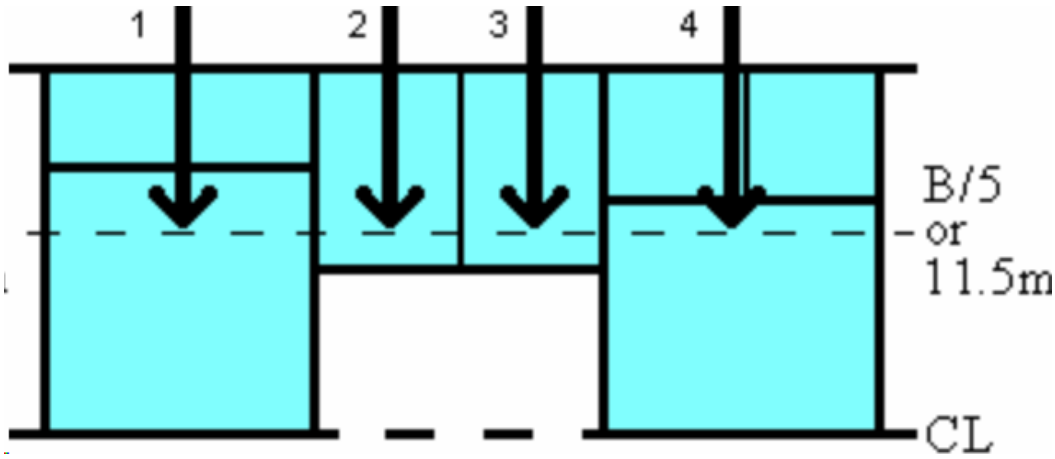
## DESCRIPTION OF THE LONGITUDINAL EXTENT OF DAMAGE ACCORDING TO ICLL PROTOCOL 1988, REGULATION 27(12)(d)

The longitudinal extent of one compartment may vary depending on whether transversal wing tank bulkheads exceed B/5 (or 11.5 m, whichever is less) or not, see the damages of sketch below.

1. Normal B/5 or 11.5 m damage;

2. and 3. Transverse bulkhead exceeding B/5 or 11.5 m undamaged (two single one compartment damage cases); and

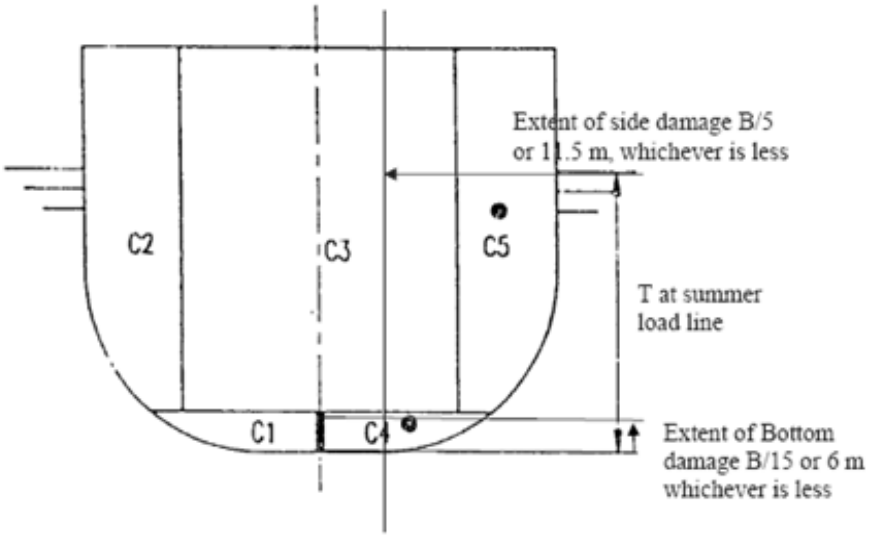
4. Transverse bulkhead not exceeding B/5 or 11.5 m damaged (one single one compartment damage case).




* * *

## Appendix 4

## EXAMPLE ON HOW TO DEFINE DAMAGES OF LESSER EXTENT




1. SIDE DAMAGE
1.1 Damaged compartments for maximum extent:

1.1.1 C5, C3, C4

1.2 Damaged compartments for lesser extent:
1.2.1 C5
1.2.2 C5, C4
1.2.3 C3, C5

2. BOTTOM DAMAGE
2.1 Damaged compartments for maximum extent:

2.1.1 C4, C1

2.2 Damaged compartments for lesser extent:

2.2.1 C4

* * *

## Appendix 5

## EXAMPLE CALCULATION OF THE LOSS OF LIQUID CARGO MASS AND INFLOW OF FLOODWATER MASS

Initial filling = 540 tonnes at SG = 1.800

Final filling at equilibrium = 240 tonnes at SG = 1.025

| Stage | Assumed total mass in compartment | Assumed mass at original SG | Assumed mass of sea water | Total volume assumed in compartment | SG assumed in compartment |
|---|---|---|---|---|---|
| 0 | 540 | 540 | 0 | 300.0 | 1.800 |
| 1 | 490 | 450 | 40 | 289.0 | 1.695 |
| 2 | 440 | 360 | 80 | 278.0 | 1.583 |
| 3 | 390 | 270 | 120 | 267.1 | 1.460 |
| 4 | 340 | 180 | 160 | 256.1 | 1.328 |
| 5 | 290 | 90 | 200 | 245.1 | 1.183 |
| 6 | 240 | 0 | 240 | 234.1 | 1.025 |

## GUIDELINES FOR VERIFICATION OF DAMAGE STABILITY FOR TANKERS

## PART 2

## GUIDELINES FOR OPERATION AND DEMONSTRATION OF DAMAGE STABILITY COMPLIANCE

### Compliance with damage stability regulations

### 1 APPLICATION

These Guidelines are intended for oil tankers, chemical tankers and gas carriers.

### 2 BACKGROUND

### 2.1 Scope of Guidelines

2.1.1 These Guidelines have been developed primarily to provide tanker masters, the Company, owners, managers, operators, etc. with information and guidance on compliance with the requirements of damage stability and on providing verification of such compliance to relevant authorities.

2.1.2 The master should be supplied with information appertaining to the stability of the tanker under various conditions of service. The basic requirements for provision of stability information under SOLAS, MARPOL and the IBC and IGC Codes are shown in table 1 below.

**Table 1**

| Ship type | Regulation |
|---|---|
| Cargo ships of 80 m in length and upwards*, keel laid on or after 1 January 2009 | SOLAS 2009, chapter II-1, regulation 5-1 |
| Cargo ships over 100 m in length*, constructed on or after 1 February 1992 and cargo ships 80 m in length and up, but not over 100 m*, constructed on or after 1 July 1998 | SOLAS 90, chapter II-1, regulation 25-1 |
| Oil tankers of 150 gross tonnage and above, delivered after 31 December 1979 | MARPOL, Annex I, regulation 28 |
| Ships carrying dangerous chemicals or noxious liquid substances in bulk, keel laid on or after 1 July 1986 | IBC Code, chapter 2, regulation 2.2.5 |
| Ships carrying liquefied gases in bulk, constructed on or after 1 October 1994 | IGC Code, chapter 2, regulation 2.2.5 |

2.1.3 References to "approved loading conditions" made within this document include those as defined in the annex.

2.1.4 However, the provision of limiting operational GM or KG data is not always practicable for tankers and such data may not be provided. In this case the advice at SOLAS chapter II-1, regulation 5-1(5), applies.

2.1.5 Considerations on the scope and type of stability information are given in the annex.

## 2.2 Introduction

### *2.2.1 Responsibility*

2.2.1.1 It is required under MARPOL and SOLAS to ensure that the ship is loaded in accordance with all relevant stability criteria, prior to proceeding to sea. This responsibility is identified in the relevant provisions of SOLAS and MARPOL. There are additional provisions and requirements for certificates issued under the IBC and IGC Codes.

2.2.1.2 It is a requirement of paragraph 1.2.3 of the ISM Code that all ships to which the SOLAS Convention applies shall be operated in a manner which ensures compliance with all international instruments, national and other legislation which applies to them.

2.2.1.3 This provision covers the need for tankers to be operated in a manner which ensures compliance with the damage stability requirements of MARPOL Annex I, or the IBC and IGC Codes, as applicable.

2.2.1.4 Section 7 of the ISM Code further obliges the operating company to ensure there are adequate procedures in place to ensure compliance with these requirements, including the use of checklists as appropriate, and that any task is only undertaken by duly qualified personnel.

2.2.1.5 Such operating procedures should include the maintenance of adequate records to demonstrate to internal and external ISM auditors and to PSC inspectors, that all relevant mandatory requirements are being met during service of the ship.

2.2.1.6 These Guidelines are also relevant to ships to which chapter IX of the SOLAS Convention does not apply, and it is recommended that operational guidance on board should be to an equivalent standard to that provided for such ships, having regard to the extension of MARPOL Annex I and the IBC and IGC Codes to ships of less than SOLAS Convention size.

2.2.1.7 Tankers carrying oil and chemicals are assessed against different damage stability criteria, and therefore the verification should be confirmed against the appropriate criteria.

2.2.1.8 In order to understand this issue, the terms Intact Stability, Damage Stability and Stability in the Damaged Condition should be understood and are explained below.

### *2.2.2 Compliance with intact stability*

2.2.2.1 The International Code on Intact Stability, 2008 (2008 IS Code), adopted by resolution MSC.267(85), provides information and criteria which must be complied with by cargo and passenger ships. This Intact Stability information is provided to the master as per SOLAS chapter II-1, regulation 5-1.

2.2.2.2 During normal operations the intact stability of a ship is assessed by either using an intact stability function attached to a loading or stability instrument or by manual calculations.

2.2.2.3 Compliance with intact stability shall be demonstrated before proceeding to sea and evidence of this documented.

### *2.2.3 Compliance with damage stability*

2.2.3.1 Damage stability requirements in SOLAS chapter II-1, parts B-1 to B-4, as applicable, must be complied with, where applicable, by all cargo ships above 80 m length other than those which are required to comply with subdivision and damage stability regulations in other IMO instruments.

2.2.3.2 Oil tankers, chemical tankers and gas carriers complying with the damage stability provisions of MARPOL Annex I, the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) and the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), are not required to comply with the damage stability requirements of SOLAS chapter II-1, part B-1.

2.2.3.3 Information provided to the master in the form of a stability booklet contains loading conditions (including ballast conditions) which have been verified to ensure compliance with both intact and damage stability requirements relative to its ship type. When the tanker is in an operational condition which is not covered by one of the loading conditions contained in the stability booklet, then compliance with damage stability must be verified prior to proceeding to sea and evidence of this documented (refer to the 2008 IS Code).

### *2.2.4 Stability of the ship in the damaged condition*

2.2.4.1 This is the residual stability of the ship after an actual damage to its structure, and consequent flooding, has occurred. Damages of varying size and layout are evaluated during approval of stability information, up to the damage of maximum extent, as defined within the regulations which apply to a particular ship.

2.2.4.2 Compliance with basic intact stability criteria does not necessarily ensure compliance with damage stability requirements and intact stability characteristics well in excess of the statutory minimum may be necessary for a particular loading condition to ensure compliance with damage stability.

2.2.4.3 Compliance with damage stability requirements should always be verified prior to sailing, and is required to ensure a ship shall survive a damage of any extent up to the maximum extent required by the regulations which apply to it, should such a damage occur. Use of a shore side contractor, retained to provide emergency evaluation and assistance in the event that a damage does occur in service, is not an accepted means to make such pre-departure verification.

2.2.4.4 It is important to note that in the event of **any** damage occurring to the ship which requires reporting to the flag Administration, port State and recognized organization (RO), specialist advice should always be sought to verify the continued structural integrity.

## 3 COMPLIANCE

It is the responsibility of the master to ensure the ship is loaded in accordance with the applicable intact and damaged stability criteria during all operational cargo conditions. The master may also be required to demonstrate compliance with these stability criteria to different surveying and inspecting authorities. Regulations governing damage stability requirements are contained in various instruments developed by the IMO (refer to the annex for further detail).

### 3.1 Compliance with regulations

The master will need to be provided with sufficient information to demonstrate the ship is loaded in a manner which will ensure compliance with the relevant regulations which apply to its type, size and age. Information to be provided should include:

.1 Load Line information;

.2 shear force and bending moments information;

.3 KG, draught and trim information;

.4 intact stability information; and

.5 damage stability information.

## 4 METHODS TO DEMONSTRATE VERIFICATION OF COMPLIANCE

There are various methods available to the master which can be used to demonstrate compliance with the regulations, as follows:

.1 to load the ship only in accordance with the approved loading conditions as given in the approved Stability Information Booklet (refer to the annex); or

.2 where the ship is not loaded in accordance with an approved loading condition from the approved Stability Information Booklet, obtain approval from the Administration or RO acting on its behalf for the proposed loading condition. It is recommended in this case that the accuracy of the verified loading condition is validated by cross-checking the predicted floating position with the observed condition by recording of actual draught readings; or

.3 where the ship is not loaded in accordance with an approved loading condition from the approved Stability Information Booklet, when authorized by the Administration (or RO acting on its behalf), obtain confirmation from the shore-based operating company that the proposed loading condition complies. It is recommended in this case that the accuracy of the verified loading condition is validated by cross-checking the predicted floating position with the observed condition by recording of actual draught readings; or

.4 where the 2008 IS Code, chapter 4, or MSC.1/Circ.1229 Type 2 (or equivalent) stability software is employed to verify damage stability compliance, this may be undertaken on board the ship or at an authorized shore location;

.5 to use an approved stability instrument or other acceptable method to verify that intact stability and damage stability criteria are satisfied for this operating condition. When an approved stability instrument is used for such verification, then use of this programme must be authorized by the Administration or RO acting on its behalf. Approved stability programmes may be approved as the 2008 IS Code and MSC.1/Circ.1229 damage stability software of Type 2 or Type 3; or

.6 the use of simplified stability data, for example, an approved range of loading conditions, curves of maximum KG or minimum allowable GM, to demonstrate compliance, noting that where such simplified data are used it is necessary to ensure that any restrictions applied in their development are also fulfilled in the actual loading condition being assessed. Use of simplified intact stability data for this purpose is not sufficient and verification must also be made against approved damage stability data.

## 5 WHEN COMPLIANCE IS NOT INITIALLY DEMONSTRATED

The master should not sail until the ship is in full compliance with all stability requirements. In a situation where it has not been possible to demonstrate compliance by any of the previously mentioned methods, there are a number of choices available, as follows:

.1 to adjust the loading of the ship so that it complies with an approved condition from the ship's approved Stability Information Booklet (refer to the annex); or

.2 to adjust the loading of the ship until the stability instrument shows that compliance has been achieved, whilst ensuring that all other requirements of the voyage such as load line and strength requirements are met; or

.3 to contact the shore-based operating company when authorized by the Administration (or RO acting on its behalf) and request assistance in the calculation of the intact and damage stability for an adjusted loading condition to ensure compliance with the regulations. It is recommended in this case that the accuracy of the verified loading condition is validated by cross-checking the predicted floating position with the observed condition by recording of actual draught readings; or

.4 to contact the RO acting on behalf of the Administration and request assistance in the calculation of the intact and damage stability for an adjusted loading condition to ensure compliance with the regulations. It is recommended in this case that the accuracy of the verified loading condition is validated by cross-checking the predicted floating position with the observed condition by recording of actual draught readings.

## 6 DOCUMENTATION WHICH MAY BE USED TO DEMONSTRATE VERIFICATION OF COMPLIANCE WITH DAMAGE STABILITY REQUIREMENTS

This section of the Guidelines is intended to assist all parties interested in verifying compliance with damage stability requirements.

6.1 Verification of compliance with damage stability requirements should be documented in accordance with the company's operating procedures and the company's safety management system. This should include a method of retaining manual calculations and/or stability instrument printouts used to verify compliance, so that this information can be provided to third parties, such as company auditors, surveyors or port State control inspectors. It is recommended that records are retained on board for a minimum of three years to ensure they are available at the next Safety Management Certificate (SMC) audit.

6.2 The following documentation may be used to demonstrate compliance with damage stability requirements when available on board the ship:

6.2.1 In the case where the ship is loaded in accordance with an approved loading condition from the approved stability information.

.1 Approved stability information (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.2 Approved damage stability calculations (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.3 The actual recorded loading condition.

.4 Confirmation of the approved loading condition upon which compliance is based.

Comparison of the two conditions should confirm that the live loading condition lies within the acceptable tolerances defined by the Administration; refer to the annex, paragraph 4.

6.2.2 In the case where a ship is loaded to a condition which is not an approved loading condition, and the verification is made on board using a manual check of critical GM/KG data.

.1 Approved stability information (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.2 Approved damage stability calculations which incorporate critical damage GM/KG data, where these critical data clearly indicate if their derivation is dependent upon any initial assumptions or restrictions in the loading condition (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.3 The actual recorded loading condition.

.4 Confirmation that the recorded loading condition complies with any initial assumptions or restrictions used to simplify derivation of the critical damaged GM/KG data.

.5 Check calculation or record sheets confirming the GM/KG of the recorded loading condition meets the approved critical damage GM/KG data for all relevant damage cases, including lesser cases (such as one compartment damage cases for two compartment ships), where relevant.

6.2.3 In the case where a ship is loaded to a condition which is not an approved loading condition, and the verification is made ashore using a manual check of critical GM/KG data.

.1 Approved stability information (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.2 Approved damage stability calculations which incorporate critical damage GM/KG data, where these critical data clearly indicate if their derivation is dependent upon any initial assumptions or restrictions in the loading condition (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.3 Authorization from the Administration or RO acting on its behalf accepting the use of critical GM/KG data at the shore office to verify damage stability.

.4 The actual recorded loading condition and evidence of transmission of this loading condition to the shore office for approval.

.5 Confirmation that the recorded loading condition complies with any initial assumptions or restrictions used to simplify derivation of the critical damaged GM/KG data. This check may not be made by the stability software and a manual check must be made in this case.

.6 Check calculation or record sheets confirming the GM/KG of the recorded loading condition meets the approved critical damage GM/KG data for all relevant damage cases, including lesser cases (such as one compartment damage cases for two compartment ships) where relevant.

6.2.4 In the case where a ship is loaded to a condition which is not an approved loading condition, and the verification is made on board against critical GM/KG data using a stability instrument of the 2008 IS Code and MSC.1/Circ.1229 Type 2 (or an equivalent standard specified by the Administration or RO acting on its behalf).

.1 Approved stability information (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.2 Approved damage stability calculations which incorporate critical damage GM/KG data, where these critical data clearly indicate if their derivation is dependent upon any initial assumptions or restrictions in the loading condition (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.3 The actual recorded loading condition.

.4 Confirmation that the actual recorded loading condition complies with any initial assumptions or restrictions used to simplify derivation of the critical damaged GM/KG data. This check may not be made by a stability instrument and a manual check must be made in this case.

.5 Authorization from the Administration or RO acting on its behalf accepting the use of a stability instrument to verify conditions of loading on board the ship.

.6 Copy of any approval for the stability instrument specified in the authorization issued by the Administration or RO acting on its behalf.

.7 Evidence of any check calculations specified in the authorization issued by the Administration or RO acting on its behalf to demonstrate that the stability instrument remains accurate.

.8 Output data from the stability instrument confirming the GM/KG of the recorded loading condition meets the approved critical damage GM/KG data for all relevant damage cases, including lesser cases (such as one compartment damage cases for two compartment ships), where relevant.

6.2.5 In the case where a ship is loaded to a condition which is not an approved loading condition, and the verification is made ashore against critical GM/KG data using a stability instrument of the 2008 IS Code and MSC.1/Circ.1229 Type 2 (or an equivalent standard specified by the Administration or RO acting on its behalf).

.1 Approved stability information (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.2 Approved damage stability calculations which incorporate critical damage GM/KG data, where these critical data clearly indicate if their derivation is dependent upon any initial assumptions or restrictions in the loading condition (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.3 The recorded loading condition and evidence of transmission of this loading condition to the shore office for approval.

.4 Confirmation that the recorded loading condition complies with any initial assumptions or restrictions used to simplify derivation of the critical damaged GM/KG data. This check may not be made by the stability instrument and a manual check must be made in this case.

.5 Authorization from the Administration or RO acting on its behalf accepting the use of the stability instrument to verify conditions of loading on board the ship.

.6 Copy of any approval for the stability instrument specified in the authorization issued by the flag State or RO.

.7 Output data from the stability instrument confirming the GM/KG of the recorded loading condition meets the approved critical damage GM/KG data for all relevant damage cases, including lesser cases (such as one compartment damage cases for two compartment ships) where relevant.

6.3 In the case where a ship is loaded to a condition which is not an approved loading condition, and the verification is made by submission of this loading condition directly to the Administration or RO acting on its behalf for approval.

.1 Approved stability information (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.2 Approved damage stability calculations (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.3 The recorded loading condition and evidence of transmission of this loading condition to the Administration or RO acting on its behalf for approval.

.4 Response from the Administration or RO acting on its behalf confirming that the loading condition has been verified for compliance with damage stability and is approved for departure.

6.4 In the case where a ship is loaded to a condition which is not an approved loading condition, and the verification is made on board using stability instrument of the 2008 IS Code and MSC.1/Circ.1229 Type 3 (or an equivalent standard specified by the flag State or RO).

.1 Approved stability information (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.2 Approved damage stability calculations (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.3 The actual recorded loading condition.

.4 Authorization from the Administration or RO acting on its behalf accepting the use of the stability instrument to verify conditions of loading on board the ship, and a copy of any documentation referred to by the authorization.

.5 Evidence of any check calculations specified in the authorization issued by the Administration or RO acting on its behalf to demonstrate that the stability instrument remains accurate.

.6 Output data from the stability instrument confirming the loading condition meets intact and damage stability. All relevant damage cases should be considered.

6.5 In the case where a ship is loaded to a condition which is not an approved loading condition, and the verification is made ashore using stability software of the 2008 IS Code and MSC.1/Circ.1229, Type 3 (or an equivalent standard specified by the Administration or RO acting on its behalf).

.1 Approved stability information (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.2 Approved damage stability calculations (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.3 The recorded loading condition and evidence of transmission of this loading condition to the shore office for approval.

.4 Authorization from the Administration or RO acting on its behalf accepting the use of the stability instrument at the shore office to verify conditions of loading on board the ship.

.5 Copy of any approval for the stability software specified in the authorization issued by the Administration or RO acting on its behalf.

.6 Output data from the stability software confirming the loading condition meets intact and damaged stability. All relevant damage cases should be considered.

6.6 In the case where a ship is loaded to a condition which is within an approved range of loading conditions:

.1 Approved stability information (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.2 Approved damage stability calculations (if approval is subject to conditions given by letter or in a design appraisal document, a copy of this letter or document in addition).

.3 The actual recorded loading condition.

.4 Confirmation of the approved range of loading conditions being applied and that all parameters of loading defined within this range fall within the prescribed limits.

* * *

## Appendix

## DEFINITIONS AND INTERPRETATIONS

1 A *stability instrument* is an instrument installed on board a particular ship by means of which it can be ascertained that stability requirements specified for the ship in the Stability Booklet are met in any operational loading condition. A stability instrument comprises hardware and software.

2 There are three types of stability software, details of which are provided in chapter 4 of part B of the 2008 IS Code and MSC.1/Circ.1229. A brief description of the three types is as follows. Three types of calculations performed by stability software are acceptable depending upon a ship's stability requirements:

**Type 1:** Software calculating intact stability only (for ships not required to meet a damage stability criterion);

**Type 2:** Software calculating intact stability and checking damage stability on the basis of a limit curve (e.g. for ships which apply to SOLAS chapter II-1, part B-1 damage stability calculations, etc.) or previously approved loading conditions; and

**Type 3:** Software calculating intact stability and damage stability by direct application of pre-programmed damage cases for each loading condition (for some tankers, etc.).

### 3 Approved loading condition

3.1 In relation to a tanker certified under MARPOL Annex I or the IBC or IGC Codes, an approved loading condition is a unique individual condition of loading, taking account of the combination of lightship and all individual deadweight items, which has been verified by the Administration or RO acting on its behalf as complying with both intact and damage stability criteria, and is approved for use in the service of the ship.

3.2 The approval of an individual loading condition is granted for the purpose of loading to that unique condition and cannot be taken to confer any acceptance or approval of other loading conditions which vary from it, given that the margin of compliance against the applicable intact or damage stability criteria may be zero.

3.3 Loading conditions which are verified in service and shown to lie within the boundary of an approved range of loading conditions or approved limiting KG/GM curves shall also be regarded as approved loading conditions.

3.4 Loading conditions which are verified using an approved stability instrument authorized by the Administration or RO acting on its behalf should also be regarded as approved loading conditions.

### 4 Loading "in accordance with", "closely to" or "not significantly different from" an approved loading condition

4.1 For tankers which do not have an approved stability instrument, an approved range of loading conditions or critical GM or KG data, which enable damage stability verification of the live loading condition to be made on board prior to departure, loading should always be made strictly in accordance with an approved loading condition unless the loading condition is first verified as compliant by the Administration or RO acting on its behalf prior to departure.

4.2 However, to permit practical operation of such tankers, having regard to small variations in cargo SG, stores and minor tank fillings, it is considered necessary to permit some variation in loading from an approved condition.

4.3 In this respect, it is recommended that a vessel which loads within the boundary provided by an approved pair of departure and arrival conditions, derived from a fixed distribution of cargo and ballast, may be considered to be loaded in accordance with these conditions.

4.4 To satisfy this recommendation, the live loading condition should fall within the following limits:

.1 displacement, to fall within the range of displacements of the approved departure and arrival conditions;

.2 KG/GM (corrected for free surface) to fall below a value determined by linear interpolation at the live condition displacement between the approved departure and arrival conditions used to verify damage stability compliance; and

.3 trim, to fall within the range of trims described by those of the approved departure and arrival conditions.

4.5 No further relaxations or deviation should be allowed, unless specifically approved by the Administration.

## 5 Approved range of loading conditions

5.1 It is acceptable to load to a condition of loading which is defined within a range of approved loading conditions.

5.2 For an approved range of loading conditions to be valid it must offer a clear indication how cargoes and ballast are to be loaded.

5.3 In this respect, all parameters of loading defined within an approved range of loading conditions must be fully complied with for a vessel to be considered correctly loaded within it.

_____