

The Swedish Maritime Administration's code



**SJÖFS 2006:1
Translation of
Annex 9**

**The Swedish Maritime Administration's regulations
and general advice (SJÖFS 2006:1)
on hull construction, stability and freeboard**

Translation

In the event of disagreement concerning the interpretation and content of this text, the printed Swedish version shall have priority.

Annex 9

Documentation and verification

Regulation 1

General

1 This annex contains regulations applicable to stability and freeboard documentation and regulations applicable to the verification of light-ship weight and centre of gravity.

Regulation 2

Definitions

In this annex the definitions stated in Chapter 2, Section 1 are used.

Regulation 3

General provisions

Stability documentation consists of stability booklet, freeboard plan and supplementary information for the approval of the stability booklet. Stability documentation shall be drawn up and verified in accordance with the following:

1 Stability documentation shall be drawn up for a Swedish ship constructed or modified in such a way that its carrying capacity or stability characteristics are affected and for ships purchased abroad.

2 The documentation shall be presented in duplicate (2) or more to the Swedish Maritime Administration for approval. It shall be drawn up in the working language of the ship and in Swedish and English or English only. For ships engaged merely in domestic voyages, the documentation may be drawn up in Swedish only.

3 For ships purchased abroad, existing stability documentation can be accepted by the Swedish Maritime Administration, provided that the structure and contents of the documentation comply with the principles of these provisions. The language used in such documentation may, in addition to English, be Danish or Norwegian.

4 Stability and freeboard documentation shall be drawn up in accordance with regulations 4–6. The Swedish Administration may, however, accept that some information of clearly insignificant nature is be omitted. The documentation shall be submitted to the Swedish Maritime Administration not later than three months before the delivery of a new ship. For a ship to be modified, the documentation shall be submitted before the modification is started.

- 5** For a newly constructed, modified or purchased ship to be allowed to be used for navigation, the information in the stability documentation shall be verified through a weighing and inclining test or equivalent examination, which can be approved by the Swedish Maritime Administration.
- 6** Inclining test with weighing shall be carried out in accordance with regulation 10 and in the presence of the Swedish Maritime Administration's representative, unless granted otherwise. Where practicable, a rolling test shall be carried out in conjunction with the inclining test.
- 7** A weighing and inclining report shall be submitted to and approved by the Swedish Maritime Administration before delivery of a newly constructed ship or before a modified or purchased ship is used for navigation.
- 8** Before a newly constructed, modified or purchased ship is used for navigation, the stability documentation shall be updated after the inclining test and submitted to and approved by the Swedish Maritime Administration. The Swedish Maritime Administration may, however, allow the ship to be used for navigation for a maximum of three months before the stability documentation is updated after the inclining test.
- 9** For ships applying simplified stability examinations, stability documentation can be drawn up in accordance with regulations 4.9 and 5 as an alternative to item 4. A simplified stability examination is approved as equivalent to an inclining test in accordance with item 5. For simplified stability examinations, documentation shall be submitted to and approved by the Swedish Maritime Administration before the ship is used for navigation.
- 10** Once stability documentation is received by the Swedish Maritime Administration, an assessment is made on whether the stability characteristics of the ship can be approved and a decision is given stating the conditions applicable for the ship to be used as regards stability and floatability.
- 11** If information in the stability documentation is amended and this refers to conditions vital to the stability characteristics of the ship, new documentation shall be submitted as soon as possible.
- 12** Approved stability documentation shall be stored onboard.
- 13** A ship, which has been modified or otherwise altered so its stability and floatability are significantly affected, shall undergo a new inclining test.
- 14** Passenger ships shall be weighed at regular intervals not exceeding five years, to determine whether the weight of the ship itself or the longitudinal centre of gravity has changed. If the weighing should show that the weight of the ship itself has changed by more than 2 % or the longitudinal centre of gravity has shifted by more than 1 % of the ship's length compared with what is stated in the report from the inclining test, a new inclining test shall be carried out. For ships of a length less than 24 metres, a new inclining test need not be carried out if the draught for light-ship has changed by less than two centimetres.

15 Fishing vessels with a length over 24 m shall be weighed at least every ten years. A new inclining test shall be carried out when the weight of the ship itself or the longitudinal centre of gravity has changed in accordance with item 14.

16 Where an loading and stability computer is used onboard, it may only be used as a complement to the stability booklet. Pre-defined standard loading conditions for checking the computer shall correspond to the loading conditions in the stability booklet. Printouts from these checks shall be stored onboard for future reference.

General advice

Loading and stability computer and its software should be of an approved type and certified by a recognized organisation and be compliant with and inspected in accordance with MSC/Circ.836, Recommendations on Loading Instruments and MSC/Circ.891, Guidelines for the On-board Use and Application of Computers.

Contents

Regulation 4

Stability booklet

The stability booklet shall provide the ship's officers with a summary of information as regards the ship's stability characteristics so that the stability of the ship can be determined for any conceivable operating condition. All information shall be formulated in such a way that it helps the crew to facilitate operation and loading of the ship.

For information which is calculated electronically, software and version shall be specified in the documentation. Input data as well as printed results shall be documented and the comparison of input data and results to the stability booklet shall be made as simple as possible, so that the information is easily recognizable.

The stability booklet shall contain a table of contents, date and signature of the issuer as well as information in accordance with items 1–8 below. In order to increase user-friendliness, the Swedish Maritime Administration can permit information to be documented as supplements to the stability booklet together with information in accordance with regulation 6. Information intended to be omitted from the stability documentation entirely shall be appended to the stability booklet.

1 Summary

The stability booklet shall contain an introductory summary in order to facilitate operation and loading of the ship by the crew. The summary shall briefly describe the maximum loading capacity, load conditions and other limitations for the ship to fulfil the applicable stability and structural requirements as well as providing tabulated loading conditions. Other factors critical to the stability and freeboard conditions of the ship shall also be described.

2 Basic data

2.1 Name of ship, shipyard, yard number, year of construction, ship type, class notation, register notation, gross tonnage, main dimensions as well as maximum permissible draught and deadweight.

2.2 General arrangement.

2.3 Tank plan.

2.4 Scale drawing showing function and location of all spaces.

2.5 Weight, type and location of all permanent ballast in accordance with regulation 3.9.2 of *Annex 3*.

2.6 Drawing or sketch showing draught marks or reference points as well as their positions in relation to the baseline and perpendiculars.

2.7 Table stating the capacity and centres of gravity for each tank and space intended for cargo, fuel, fresh water, water ballast and other stores as well as the maximum transverse moment of inertia for all tanks.

2.8 Tables or curves for each tank and cargo space of significant size, showing the volume, centres of gravity and transverse moment of inertia as a function of filling height.

2.9 Light-ship weight distribution for ships of length 100 m or more or other ships where the global loads are important for the construction of the ship.

2.10 Hydrostatic data showing at least the following quantities as a function of draught:

- 1 moulded volume in m^3 and total displacement in tonnes with clear note on which density is used, e.g. 1.025 tonnes/ m^3 for salt water.
- 2 transverse metacentric height above the baseline (*KM*)
- 3 longitudinal centre of buoyancy (*LCB*)
- 4 longitudinal centre of flotation (*LCF*)
- 5 moment to change trim (*MCT*)
- 6 tonnes per 1 cm immersion (*TP cm*)

The thickness of the keel plate and shell shall be given in the hydrostatic data. Displacement, *KM* and *LCB* shall be documented for different trims within the trim range the ship is assumed to be used.

Hydrostatic data shall be documented at suitable draught intervals up to weather deck.

2.11 *KN* or *MS* data for at least the angles of heel 5°, 10° (for ships intended for transporting loose grain also 12°), 15°, 20°, 30°, 40° and 60° in accordance with regulation 8.

2.12 Definition of coordinate system used to describe the position of the baseline, to which draught and trim are related in the stability calculations as well as location of the perpendiculars.

2.13 Computer-plotted body plan and drawing describing the ship including those superstructures and deckhouses assumed displaced in the stability calculations, complying with regulation 8. Openings that are actual flooding points shall be marked.

3 Intact stability

3.1 Loading conditions in accordance with regulation 7 shall be presented. A summary table of all loading conditions containing draught, trim, *GM*, *KG* *KG_{max}* and limiting criterion shall be presented. For fishing vessels the bow height shall also be stated. All loading conditions included in the stability documentation shall contain the following information:

Annex

- 1 Clear sketch of the ship showing the location of cargo, ballast, bunkers and stores, as well as flooding points.
- 2 An array of data showing the light-ship weight, the location, distribution and weight of all components included in the deadweight, with longitudinal and vertical centres of gravity, longitudinal and vertical moments and resulting information for the actual condition. This array of data shall also show the free surface moment of those tanks where a correction is applicable. Free surface correction shall be carried out in accordance with regulation 11.
- 3 The actual and highest permissible bending moment and shear forces shall be documented for cargo ships of length 100 meters or more or other ships where the global loading is important in the construction of the ship.
- 4 Mean draught, displacement, longitudinal centre of gravity, trim and draught at the perpendiculars. It shall state clearly whether these draughts are moulded or to the lower edge of the keel.
- 5 Calculation of GM_0 with consideration to free surface correction in accordance with regulation 11.
- 6 A diagram showing the righting lever (GZ) as a function of the angle of heel, calculated in accordance with regulation 8 and corrected for free surface in accordance with regulation 11. This diagram shall also state the angle of flooding and the significance of this as regards the stability shall be clearly explained (see regulation 8).
- 7 The value of the GZ curve at the angles of heel of 5°, 10° (for ships intended for transporting loose grain also 12°), 15°, 20°, 30°, 40° and 60° in accordance with regulation 8 and corrected for free surface in accordance with regulation 11.
- 8 Calculations showing applicable intact stability criteria in *Annex 4* are met.
- 9 Ships used in areas where icing is likely to occur, shall document calculations showing the stability of the ship on the assumption of ice accretion in accordance with regulation 12.

3.2 A KG -limit curve comprising the envelope to the KG -limit curves of each applicable stability criterion, documented in accordance with regulation 9. Alternatively, GM -limit curves can be accepted.

3.3 Information on any equipment or system significantly affecting the stability of the ship.

4 Damage stability

For ships, which in accordance with these provisions shall be compliant with special requirements on floatability and damage stability, the following documentation, which can be documented in a separate damage stability booklet, shall also be drawn up and submitted:

- 1 summary of damage conditions.
- 2 scale drawings showing the location with measurements and size of internal and external openings, e.g. weather-tight doors and hatches as well as openings through which progressive flooding can occur. Type of closing device shall be stated for each opening.
- 3 drawings showing the pipe systems, which if damaged can lead to the flooding of undamaged spaces.
- 4 scale drawings showing the location with measurements of water-tight bulkheads and doors and stating the types of doors and their operating devices.
- 5 coordinates of spaces and tanks flooded when damaged and information on assumed permeabilities.
- 6 calculations for each assumed instance of damage shall be documented in accordance with the following:
 - a) sketches indicating damaged spaces and their location on the ship,
 - b) curves for the righting lever (*GZ* curves) representing the final position after flooding. For passenger ships subject to Annex 1 or Part 1 of Annex 6, the heeling moment as a result of passengers crowding to one side of the ship; as a result of launching fully loaded lifeboats and as a result of wind pressure, shall be documented as a function of the angle of heel. For drilling rigs, the heeling moment as a result of wind pressure shall be documented as a function of the angle of heel,
 - c) the draught and trim of the ship before and after damage., and
 - d) information on the position of the openings stated in item 4.2 in relation to the waterline at equilibrium, and for passenger ships, also the position of the margin line in relation to this waterline.
- 7 limit curve showing the highest value of *KG* to be compliant with the applicable stability criteria for damaged ships in accordance with regulation 9.
- 8 for passenger ships operating in service area D or wider as well as dry cargo ships operating in service areas A and B, damage control plans and damage control manuals shall be drawn up in accordance with regulation 15. Gas and chemical tankers shall have a damage control plan showing the position of essential closing devices and arrangements for correcting any list as well as information on how these are to be used.
- 9 information concerning the use of cross-flooding arrangements and descriptions of those instances of damage where these arrangements shall be used.

5 Weighing and inclining report

The stability booklet shall include at least a summary of the weighing and heeling report containing the following:

- 1 location and date.
- 2 weather and wave conditions.
- 3 those present at the test.
- 4 measured draughts and water density.
- 5 calculation of displacement.
- 6 inclining tests with heeling moments and measured heeling angles.
- 7 calculated weight of ship.
- 8 detailed definition of light-ship weight.

The weighing and inclining report shall be structured in accordance with regulation 10. The report shall be signed by the person responsible for carrying out the test and it shall be clearly stated on which documentation (draught marks drawing, tank tables, hydrostatic data, etc.) the report is based.

If the stability is based on the weighing and inclining report of another ship, the motivation behind this and a summary of the actual weighing and inclining report shall be appended.

6 Calculation of the stability of the ship

The additional information required to enable the crew to determine the stability characteristics of the ship under different operating conditions shall also be included. The information shall especially contain an example on how to calculate a loading condition. The example shall also contain instructions and formulae for calculating:

- 1 displacement and centres of gravity,
- 2 trim and draught,
- 3 free surface corrections, and
- 4 corrected *KG*, or *GM*.

7 General information to the master

7.1 General measures to preclude capsizing, in accordance with regulation 12.

7.2 Instructions on how the ship shall be handled from the stability point of view when lifting with cranes, under the effects of trawling pull and loading or unloading operations, which can effect the stability of the ship significantly in port or at sea.

7.3 Instructions on how free tank surface affects the stability of the ship and how it shall be limited so that stability does not fall below the stipulated values when loading cargo or ballast.

7.4 Instructions on how icing affects the stability of the ship in accordance with regulation 12 and preventative measures.

7.5 Information on how the stability characteristics of the ship can be affected by rough seas.

General advice

IMO circular MSC/Circ.707: "Guidance to the Master for Avoiding Dangerous Situations in Following and Quartering Seas" should be used when providing information to the master on the stability of the ship in accordance with 7.5.

8 Other information

The following points shall be included in the stability booklet, where applicable:

- 8.1** Drawings and description of static and/or dynamic anti-heeling system as well as any restrictions on its use.
- 8.2** Restrictions on the location and stowage of cargo.
- 8.3** For ships arranged to carry units of load with a recognised shifting risk, an account of the ship's survivability in the event of maximum cargo shifting shall be appended to the stability documentation.
- 8.4** Ships with timber deck cargo shall have comprehensive stability information taking into account timber deck cargo.

General advice

Tables and diagrams for rolling periods can be helpful when providing information to the master concerning timber deck cargo.

- 8.5** Passenger ships shall have information on any watertight doors permitted to be open at sea.
- 8.6** Ro-ro passenger ships shall have information stating the importance of all openings being capable of closing watertight, since water on ro-ro decks can cause sudden deterioration in stability and risk of capsizing.
- 8.7** Effects of lifting with cranes. If the angle of static heel exceeds 5° as a result of lifting with cranes, the righting lever during the lifting shall be documented in the *GZ* curve for the most critical load arrangements.
- 8.8** A description of drainage capabilities in cargo spaces and on decks.
- 8.9** For ships arranged for carrying fish in bulk or in tanks, or which have special ballast tanks, instructions on how tanks for fish, bulk cargo spaces and ballast tanks are to be used shall be appended to the stability booklet.
- 8.10** A description and dimensioning of grain bulkheads and other safety devices for grain.
- 8.11** Ships transporting grain as bulk cargo on international voyages in service areas A, B and C without weather restrictions, shall be supplied with separate grain stability documentation in accordance with that stipulated in the International Grain Code.

8.12 Ships transporting bulk cargo other than grain on international voyages in service areas A, B and C, shall document the following information:

- 1 ballast capacity as well as loading and discharging speed of ballast.
- 2 maximum permissible load per unit areas on tank top plating.
- 3 maximum permissible load in each cargo hold.
- 4 general instructions concerning loading and unloading as regards the strength of the ship's structure, as well as any restrictions in the most adverse operating conditions during loading, unloading, ballast handling and ship navigation.
- 5 special restrictions, such as those stipulated by the Swedish Maritime Administration for the most adverse operational conditions.
- 6 maximum permissible forces and moments on the hull of the ship during loading, unloading and at sea shall be included for ships, which shall document strength calculations.

8.13 Oil tankers may, in accordance with the Swedish Maritime Administration's regulations and general advice (SJÖFS 2005:8) on measures for the prevention of water pollution from ships, be required to document operational procedures in accordance with MARPOL, Annex I, regulation 27.3.

8.14 For sailing ships, information enabling the master to quickly and easily determine the ship's margins for flooding in gusty winds shall be documented.

8.15 For ships arranged to carry solid bulk cargoes that might involve certain risks, instructions on how the cargo is to be handled shall be appended to the stability booklet.

General advice

In application of 8.15, the BC Code and the Swedish Maritime Administration's regulations (SJÖFS 2003:10) on loading and unloading of bulk carriers; (Directive 2001/96/EC on establishing harmonised requirements and procedures for the safe loading and unloading of bulk carriers) should be taken into consideration.

8.17 When deemed necessary as regards the requirements of the Swedish Maritime Administration's regulations and general advice (SJÖFS 2003:4) on Finnish-Swedish ice classes or the Swedish Maritime Administration's regulations and general advice (SJÖFS 2003:16) on Swedish ice classes for traffic on Lake Vänern, additional information shall be supplied, e.g. draughts in ballast condition.

With consideration to the type and function of the ship the Swedish Maritime Administration can, where necessary, request additional information on such specific characteristics of the ship assumed to affect its stability.

9 Simplified documentation

For ships applying simplified stability examinations, the stability booklet shall contain the following information.

- 1 a summary in accordance with item 1.
- 2 basic data in accordance with items 2.1 – 2.6.
- 3 the location and capacity of tanks.
- 4 a report from the simplified stability examination containing:
 - location and date.
 - weather and wave conditions.
 - those present at the test.
 - measured draughts and freeboards.
 - a description of the loading test and the resulting heel.
 - a description of the rolling test or inclining test and the calculated GM_0 .
 - documentation on the loading condition of the ship during the loading test.

Regulation 5

Freeboard plan

A freeboard plan shall show the technical freeboard conditions of the ship and contain the following documentation attached to a deck plan.

- 1** Information on dimensions in connection with the freeboard regulations, e.g. length (L_{LL}), freeboard perpendiculars, freeboard depth ($D_{freeboard}$), bow height and freeboard. The minimum permissible freeboard and bow height shall also be included.
- 2** The position and size of side-scuttles including the type of glass, securing devices, attachment/frame, deadlights/repair hatches and any standard approval certificate or individual approval certificate as well as the regulations according to which they are dimensioned.
- 3** The position and size of doors and companion-ways including their tightness (weather-tight, spray-tight etc.), material, hinges (construction and quantity), handles/locks, seals, sill heights, whether they are equipped for battening down or equivalent in rough seas and any standard approval certificate or individual approval certificate as well as the regulations according to which they are dimensioned.
- 4** The position and size of hatches, including their tightness (weather-tight, spray-tight etc.), material, securing devices, batten down arrangements, seals and coaming heights.
- 5** The position and dimensions of ventilators and air pipes including their closing appliances and the spaces to which they lead.

- 6 The longitudinal position, area and construction of freeing ports.
- 7 The type of scuppers, inlets and discharges, the diameter, thickness and material of the connecting pipes, the vertical distance from the keel to the hull opening and uppermost valve, the vertical distance from inboard end to the deepest load waterline, the vertical distance from inlets to the deepest load waterline, quantity, type, material and operating location of discharge valves.

General advice

Illustrations are a suitable addition to descriptions.

See also International Convention on Load Lines, Part 6 Form of record of conditions of assignment of load lines.

Regulation 6

Additional information

The following documentation need not be included in the stability booklet but shall supplement it and be submitted to the Swedish Maritime Administration for examination:

- 1 Lines and body plan.
- 2 Data for computer-plotted body plan and drawing or description of the ship.

General advice

If calculating models are available digitally, these should be included.

- 3 Weighing and inclining report, where the report in its entirety is not included in the stability booklet, as drawn up in accordance with regulation 10.
- 4 Sounding tables for all tanks.

Accomplishment and reporting

Regulation 7

Loading conditions

Loading conditions shall be reported to the extent that corresponds to the operation of the ship. The documented draughts and water density in loading conditions shall comply with the hydrostatic data, on which they are based. For all loading conditions, the curve of the righting lever (*GZ*-curve) and the initial metacentric height (*GM₀*) shall be corrected for free surfaces in accordance with regulation 11. Ice accretion shall be documented in accordance with regulation 12.

1 All ships

For all ships, unless clearly unnecessary or otherwise stated in items 2 to 10, the following loading conditions shall be documented:

- 1 light-ship
- 2 ballast condition with 100 % bunkers and stores.
- 3 ballast condition with 10 % bunkers and stores.
- 4 special loading conditions, such as those most often expected to occur. In particular:
 - non-homogenously loaded ship
 - departure conditions with reduced bunker quantity.

No loading condition may imply a non-negligible initial list.

2 Cargo ships

In addition to the aforementioned, loading conditions with the ship in a fully loaded condition with homogenous cargo in all cargo holds shall be documented with 100 % bunkers and stores as well as with 10 % bunkers and stores.

Grain cargo

2.1 Should the cargo comprise loose grain or cargo with similar characteristics, the following shall also be stated:

- 1 The heeling moment as a result of cargo shifting, for each cargo hold as well as for the ship as a whole.
- 2 The maximum permissible heeling moment for the actual draught and *KG*.
- 3 The curve for the heeling moment that occurred as a result of cargo shifting. The curve shall be added to the *GZ*-curve.
- 4 The residual area between the two curves up to an angle of heel of 40°, or the down-flooding angle, if this is less.

- 5 The angle of heel of the ship as a result of cargo shifting and the angle of heel at which the weather deck reaches the surface of the water.
- 6 The loading conditions for at least 4 stowage factors.

Ore concentrates or similar

2.2 Should the cargo comprise ore concentrates or similar substances, the following shall also be stated:

- 1 The heeling moment as a result of cargo shifting.
- 2 The maximum permissible heeling moment for the actual draught and *KG*.
- 3 The curve for the heeling moment that occurred as a result of cargo shifting. The curve shall be added to the *GZ*-curve.
- 4 The residual area between the two curves up to an angle 30° greater than the heeled equilibrium position or up to the down-flooding angle, if this is less.
- 5 The heeled equilibrium position of the ship as a result of cargo shifting and the angle of heel at which the weather deck reaches the surface of the water.

Fish in bulk

2.3 Should the cargo comprise fish in bulk, the cargo shall be regarded as a liquid. The effect of free surfaces shall be documented in accordance with regulation 11. Representative loading arrangements for bulk cargo shall be documented and special instructions on how the ship is to be loaded and ballasted shall be appended to the stability documentation. There shall be instructions for handling portable bulkheads.

Deck cargo

2.4 The ship in fully loaded condition with homogenous cargo in all cargo holds, deck cargo, and with 100 % bunkers and stores as well as 10 % bunkers and stores. The stowage factor for deck cargo, its centre of gravity above the baseline, transverse centre of gravity and its extension (length, breadth and height) shall be stated. For ships with timber deck cargo, the weight of the deck cargo in arrival condition shall be increased in accordance with regulation 8.5.

3 Passenger ships and ro-ro passenger ships

In addition to what is stated in item 1, the following loading conditions shall be documented:

3.1 The ship in fully loaded condition with a full complement of passengers including baggage. This shall take into consideration 100 % bunkers and stores, as well as 10 % bunkers and stores.

3.2 The ship without cargo, but with a full complement of passengers including baggage. This shall take into consideration 100 % bunkers and stores, as well as 10 % bunkers and stores.

Moreover, the angle of heel as a result of maximum passenger moment and turning shall be stated for actual loading conditions, refer to regulation 13.

4 Fishing vessels

The effects of lifting and pull from fishing gear shall be documented for all loading conditions.

In addition to what is stated in item 1, the following loading conditions shall be documented, in which fishing gear shall be taken into account in its entirety.

4.1 The ship in a homogeneously fully loaded condition with 100, 40 and 10 % bunkers and stores. The maximum deck cargo shall be included at all times.

4.2 The ship loaded with maximum deck cargo, empty cargo holds and 10 % bunkers and stores.

4.3 The ship with minimum catch, usually pertaining to 20 of a full catch but can be up to 40 %, provided that the Swedish Maritime Administration accepts that the operation justifies such a value, as well as 10 % bunkers and stores.

4.4 For ships also constructed for transporting fish in bulk, representative loading conditions for this shall be documented.

4.5 For ships of a length less than 15 metres, only the following loading conditions need to be documented, in which fishing gear shall be taken into account in its entirety:

- 1 fully equipped ship, most unfavourable bunker condition.
- 2 maximum load including maximum deck cargo, 100 % bunkers and stores.
- 3 maximum load including maximum deck cargo, 10 % bunkers and stores.
- 4 maximum deck cargo only, most unfavourable bunker condition.

If the ship is operated in service area C or on more extended voyages, the waterline at 60° heel shall be documented for loading condition according to item 4.5.2. In the event of trim deviations greater than $0.05L_{LL}$, the waterline at 60° heel shall also be documented for other loading conditions. There must be no risk of the ship flooding from this. All openings which cannot possibly be kept permanently closed in a satisfactory water-tight manner at sea, shall be considered open.

4.6 The following shall be taken into consideration for a ship's loading conditions:

Margins for the weight of wet fishing gear on deck..

Even distribution of the catch, provided this does not conflict with the normal handling of the ship.

- a) Catch on deck, if expected, for those loading conditions where this is

applicable. The loading condition shall be calculated for the maximum deck cargo that the ship is intended to carry, which shall be assumed to be at least $L_{LL}B/20$ tonnes. However, the Swedish Maritime Administration can, in individual cases, permit the deck cargo to be further restricted considering the type of fishing. The maximum deck cargo shall, therefore, be signposted on decks and steering positions and the restriction shall be clearly stated in the trim and stability booklet.

- b) Margins for the effect of free surfaces from carried catch, if applicable.

5 Supply vessels

In addition to what is stated in items 1 and 2, the ship loaded with full deck cargo of pipes and with 50 % bunkers and stores, shall be documented. Consideration shall be given to the water trapped in and between pipes in accordance with the following:

5.1 For ships with freeboard equal to or less than $0.015L_{LL}$, the trapped volume of water shall be assumed to amount to 30 % of the volume in and between the pipes.

5.2 For ships with freeboard equal to or more than $0.03L_{LL}$, the corresponding volume of water shall be assumed to be 10 %.

5.3 For intermediate values of freeboard, the volume of water is calculated using linear interpolation.

The centre of gravity of the trapped water shall be assumed to be the same as for the deck cargo.

6 Barges

For barges transporting deck cargo only, the stability in homogeneously fully loaded condition with maximum cargo height, shall be documented in addition to what is stated in item 1.

For barges without weather-tight cargo hatches, the stability in fully loaded condition with fully developed free surface in the cargo hold shall be documented in addition to what is stated in item 1.

7 Oil tankers

In addition to what is stated in items 1 and 2 the stability for oil tankers with a dead-weight of 5000 tonnes or more shall be documented for the combination of cargo and ballast most unfavourable as regards stability.

General advice

In application of Chapter 6, Section 30 (MARPOL, Annex I, regulation 27) of the Swedish Maritime Administration's regulations (SJÖFS 2005:8) on measures for the prevention of water

pollution from ships, one of the following two loading conditions should be taken into consideration:

(a) Each cargo tank in the ship is filled to the level, which at a 0° angle of heel results in the largest vertical volume moment, with consideration to free surface. The density of the cargo should be selected so that the minimum KM is maintained, provided full bunkers and stores and 1 % of the total water ballast capacity. Maximum effect of free surface should be assumed in all ballast tanks. In the correction of initial metacentric height (GM_0), the transverse moment of inertia for the tanks shall be calculated at a 0° angle of heel.

Correction of the heeling righting arm should be carried out by calculating the true effect of free surface at each angle of heel.

(b) The most critical real loading condition, with correction of the true effect from free surface at each angle of heel, provided it is documented how the most critical loading condition has been determined.

For oil tankers with a dead-weight of less than 5000 tonnes, the corresponding documentation as for oil tankers over 5000 dwt is recommended.

8 Gas and chemical tankers

For ships subject to the IGC or IBC Code, the stability shall, in addition to what is stated in items 1 and 2, be documented for the least favourable loading and ballast conditions at all possible operating draughts.

9 Miscellaneous

Where deemed necessary further information shall be submitted, as regards the type and loading of the ship, e.g. volumetric moment curve or table for grain.

Regulation 8

Calculation of stability data (KN or MS data)

1 For ships, for which the trim has considerable effect on the stability, the stability shall be documented for different trim values in the trim range within which the ship is assumed to operate. The ship shall be assumed to trim freely during heeling.

2 The minimum down-flooding angle for each draught shall be stated in a diagram or table of *KN* or *MS* data.

3 For angles greater than the down-flooding angle, the ship is assumed to have lost all stability; alternatively, the static stability curve can show one or more stages where the flooded spaces are no longer regarded as displacing.

4 For the calculation of KN or MS data, superstructures, deckhouses and trunks capable of being closed weather-tight may be included in addition to the ship's hull, in accordance with the following:

4.1 Closed superstructures up to the second deck above the freeboard deck and deckhouses on the freeboard deck may be included in the stability curves, provided they and their openings are compliant with the tightness and strength requirements in accordance with the freeboard regulations. To be assumed compliant with these tightness requirements, there shall be internal escape routes to upper decks, with the following alternatives:

- 1 For ships operating in service areas C and D, alternative escape routes from superstructures and deckhouses that reach the surface of the water at an angle of heel of at least 40° may be accepted.
- 2 For ships operating in service area E, alternative escape routes from superstructures and deckhouses that reach the surface of the water at an angle of heel of at least 30° may be accepted.

4.2 Non-weather-tight superstructures and deckhouses may be included in the stability curves up to the angle at which the openings are flooded for open ships operating in service area E or more restricted service, provided the space is drained to the keel. No escape route may reach the surface of the water at an angle of heel of less than 40° in service area D or less than 30° in service area E.

5 For ships carrying timber deck cargo such as stated in regulation 44 of *Annex 2* and in the Code of Safe Practice for Ships Carrying Timber Deck Cargoes, the contribution of the deck cargo to the reserve displacement is permitted to be included in accordance with MSC/Circ.998, IACS Unified Interpretation Regarding Timber Deck Cargo in the Context of Damage Stability Requirements. Where timber deck cargo is included in the calculation of stability data, the applicable deck cargo height shall also be stated. The weight of the deck cargo shall be assumed to increase by 10 % as a result of water absorption.

Regulation 9

Limit curves for stability (KG_{max} or GM_{min})

1 The KG -limit curve represents the largest permissible values for the centre of gravity of the ship over the baseline, corrected for free surfaces and shall be documented as a function of draught or displacement. Specific limit curves shall be documented for ships where trim has a considerable effect on the stability.

2 Ships required to comply with special requirements on floatability and damage stability shall document a KG -limit curve comprising the envelope to the KG -limit curves as mentioned in items 4.3.2 and 4.4.7. Alternatively, GM -limit curves can be accepted.

Annex 9

3 For ships transporting only deck cargo, the limit curve shall show the highest centre of gravity of the cargo above deck as a function of the cargo weight or draught of the ship.

4 If the ship has several specified service function, a limit curve for each service can be permitted. The use of the curves shall be explained with instructions and examples. The stability criteria forming the basis of the curves shall be stated.

Regulation 10

Weighing and inclining

1 Individual inclining tests shall be carried out for all ships included in a construction series. The Swedish Maritime Administration can, however, in individual cases, grant exemptions from this requirement from and including the third ship in the series, provided weighing shows the light-ship weight itself does not differ by more than 2 % or the longitudinal centre of gravity has not moved by more than 1 % of the length of the ship, compared with previous sister ships.

2 For a ship purchased abroad, existing reports on inclining tests can be accepted in individual cases, provided the ship has not modified so as to affect the stability and floatability of the ship. The ship shall be weighed in conjunction with the purchase. If the weighing shows that the light-ship weight has changed by more than 2 % or the longitudinal centre of gravity has moved by more than 1 % of length of the ship compared with what is stated in the report from the inclining test, a new inclining test shall be carried out.

3 For individual ships transporting liquids or ore in bulk, where it is impractical to heel the ship with weights or using a provisional pumping system, the Swedish Maritime Administration can grant exemptions from individual heeling tests provided references to similar ships clearly indicate that there will be sufficient metacentric height in all anticipated loading conditions.

4 For barges and road ferries, the Swedish Maritime Administration can permit inclining tests to be replaced by detailed calculations of the vertical centre of gravity.

5 The Swedish Maritime Administration can decide that an inclining test shall be postponed under circumstances deemed to affect the inclining test so that it is not possible to obtain sufficient accuracy.

During an inclining test, the following shall be observed:

6 The weather conditions shall be good and the ship shall be free from the quay on slack moorings.

7 The ship shall be as ready as practicable and as free as practicable from any weight not belonging to the ship.

Annex

- 8** The density and temperature of the sea water during the test shall be determined. The density shall be established using a method where any specific density layers in the water are observed.
- 9** Draughts shall be determined by readings amidships, SB and P as well as fore and aft, SB and P, at the minimum. The documentation shall be such that the determination of the draughts can be repeated and the readings should be taken using a method requiring any motion in the surface of the sea water to be reduced.
- 10** Tanks should be empty or full. The use of full tanks shall be verified. For partially filled tanks a correction for free surface can be permitted, provided thorough calculations of the correction are presented. The degree of filling for all tanks, dry tanks and other spaces that are sounded shall be documented. Reliable tank/sounding or ullage tables shall be available.
- 11** A thorough inventory of deducted and added weights with determination of size and position of centres of gravity shall be carried out.
- 12** Inclining weights shall be checked weighed and marked with its weight or supplied with an actual weight certificate. The Swedish Maritime Administration can, where the use of inclining weights is not practicable, permit the ship's tanks to be used for the inclining test.
- 13** If the ship is more than 50 metres in length, the angles of heel shall be measured with at least two angle measuring devices. At least one of these shall be a pendulum, where practicable.
- 14** The length of the pendulum shall be as large as possible.
- 15** At least four distinct weight movements shall be carried out to each side, where each shift in weight shall result in a change in heel of at least 1° and at most 3°, simultaneously; the maximum angle of heel may not exceed 3° calculated from the upright position.

General advice

The initial list should not exceed 0.5°.

As an aid to the weighing and inclining tests, Chapter 7 and Annex 1 of the Intact Stability Code can be used.

Regulation 11

Free surfaces

When taking free surfaces into account the following shall be applied:

1 Free surfaces shall be accounted for in tanks of considerable size with a filling degree of less than 98 %.

2 Tanks to be accounted for can be of the two following categories:

2.1 Tanks with constant filling factor, e.g. cargo and ballast tanks. Correction for free surface shall be calculated for the actual filling factor in each tank.

2.2 Tanks with variable filling factor, e.g. fuel and fresh water tanks. With the exception of that stated in items 4 and 5, the correction for free surface shall be calculated for the least favourable filling degree within the limits of each tank in accordance with operational instructions.

3 When calculating the effect of free surface of consumable liquids, it shall be assumed that, for each type of liquid, there is a free surface in at least one centreline tank or one pair of side tanks located on each side of the ship. The tank or combination of tanks to be taken into account shall be the one where the effect of free surfaces is greatest.

4 If water ballast tanks, including anti-rolling and anti-heeling tanks, are assumed to be filled or empty at sea, the effect of the free surfaces shall be calculated for the least favourable filling factor.

5 For ships engaged in loading and unloading, correction for free surfaces during liquid transfer can be done for actual filling factors in each tank during liquid transfer.

6 The correction for free surfaces of the initial metacentric height and the righting lever shall be calculated separately in accordance with the categories stated in item 2 as follows:

6.1 For the correction of initial metacentric height, transverse moment of inertia for the tanks shall be calculated at a 0° angle of heel.

6.2 Correction of the righting lever shall be carried out in accordance with one of the following alternatives:

- 1 by calculating the actual effect of free surface at each angle of heel, or
- 2 by correction based on transverse moment of inertia as adjusted for each calculated angle of heel.

6.3 For oil tankers subject to the stability regulations in accordance with the Swedish Maritime Administration's regulations and general advice (SJÖFS 2005:8) on measures for the prevention of water pollution from ships (i.e. MARPOL), the effect of free surface shall be calculated for each individual tank at an angle of heel of 5°. For partially filled tanks, the Swedish Maritime Administration can require or permit the effect of free surface to be calculated for an angle of heel greater than 5°.

Regulation 12

Ice accretion

For ships used in areas where ice accretion is probable, the effect of icing on the stability characteristics shall be documented for the least favourable condition, e.g. fully loaded at maximum draught.

General advice

All ships should document the effect of ice accretion, with the exception of those ships that as a result of their service and operating area are not at risk of sustaining heavy seas in combination with low temperatures.

Ice accretion shall be calculated in accordance with the following:

- 1** 30 kg/m² on exposed weather decks and passageways.
- 2** 7.5 kg/m² of the projected lateral area over the waterline on each side of the ship, which means a list as a result of ice accretion need not be taken into account.
- 3** The projected side area of discontinuous surfaces on rail, sundry booms, spars (except masts) and rigging on ships without sails and the projected lateral area of other small objects shall be computed by increasing the total projected area of continuous surfaces by 5 % and the static moments of this area by 10 %.

General advice

For larger passenger ships, ro-ro passenger ships and supply ships, the front of the forward superstructure should be assumed to be covered with ice 30 kg/m².

Regulation 13

Passenger moment for intact stability

The passenger moment shall be calculated for different numbers of passengers and presented as a function of the total number of passengers. In calculation of the passenger moment, the following is applicable:

- 1** The passenger moment shall always consider that passengers are on one side of the centreline.
- 2** The passenger moment is calculated for each deck plan/space with the passengers located outboard to give the maximum moment. Distribution between decks/spaces shall be done so as to give the maximum angle of heel.
- 3** Each passenger shall be assumed to weigh 75 kg.
- 4** For the calculations four passengers per m² are used for free deck surface.

Annex 9

- 5** A seated passenger takes up 0.6 m of the length of a bench/sofa. The number of passengers on fixed benches and sofas is calculated per running metre.
- 6** The centre of gravity of a standing passenger is located 1.0 m above deck, with consideration to deck camber and sheer. For seated passengers the centre of gravity is located 0.3 m above the seat.
- 7** Deck surfaces occupied by fixed furniture with the exception of passenger seating, need not be accounted for. Loose chairs and benches are regarded as free deck surface. Deductions for 0.15 m legroom at benches/sofas can be accepted. Benches, whose backrests are less than 0.2 m from barriers/railings do not provide intermediate deck surface that is included in the moment. The projected deck surface is calculated for leaning barriers or railings.
- 8** Areas closed off by a chain and sign "EJ TILLTRÄDE" ("no entry") are not regarded as surfaces accessible to passengers.
- 9** If the accessible deck surface is unsymmetrical, both deck sides shall be taken into account to establish the maximum moment.
- 10** If the maximum angle of heel can be obtained with a lower number of passengers, this shall be documented instead.

Regulation 14

General information to the master

The stability information shall contain a notification to the master as regards general measures for reducing the risk of capsizing and for maintaining acceptable stability characteristics in all operating conditions.

General advice

Example of information to the master:

The compliance of the ship with the general stability criteria and approved stability documentation is no guarantee that the ship, irrespective of circumstances, cannot capsize and sink. Neither does this release the ship's master from any responsibility in connection with loading, unloading and navigation of the ship. The master shall handle his ship with sound judgement and seamanship as regards weather, weather forecasts and geographic conditions, etc. and take suitable measures as regards course and speed with consideration to prevailing conditions.

The ship shall be loaded and ballasted such that the requirements on stability, buoyancy and strength are met throughout the entire voyage.

Before the voyage begins, measures shall be taken to prevent cargo shifting. Necessary trimming shall be done and bulkheads shall be erected in cargo spaces, where applicable. Necessary cargo lashing shall be carried out.

The stability booklet contains a number of typical loading conditions for the ship and further information that makes it possible for the ship's master to calculate the stability characteristics of the ship under all conceivable loading conditions.

Regulation 15

Damage control plans and manuals

Plans shall be permanently exhibited for the guidance of ship's officers, showing clearly for each deck and cargo hold, the boundaries of watertight compartments, any openings in them and their closing devices, as well as the location of their operating controls and arrangements for correction of any list as a result of flooding. Moreover, manuals containing the aforementioned information shall be available to the ship's officers. Damage control plans and manuals shall be drawn up in accordance with MSC/Circ.919 "Guidelines for damage control plans".

For dry cargo ships the manuals shall also be drawn up in accordance with MSC/Circ.434 "Guidelines for the Preparation of Information on the Effect of Flooding to be Provided to Masters of Dry Cargo Ships".

General advice

A summary of all damage cases that clearly shows the survivability of the ship for each damage should be presented, with reference to where further information on each damage case can be found. In this summary, more extensive damages than those required by the regulations should be taken into consideration.