INTERNATIONAL MARITIME ORGANIZATION

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SUB-COMMITTEE ON STABILITY AND LOAD LINES AND ON FISHING VESSELS SAFETY
55th session
Agenda item 17

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REPORT TO THE MARITIME SAFETY COMMITTEE

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LIST OF ANNEXES

1 GENERAL

1.1 The Sub-Committee on Stability and Load Lines and on Fishing Vessels Safety (SLF) held its fifty-fifth session from 18 to 22 February 2013 under the chairmanship of Mr. K. Hunter (United Kingdom), who was unanimously elected as Chairman for 2013 at the opening of the session. The Vice-Chairman, Capt. N. Campbell (South Africa), who was unanimously elected as Vice-Chairman for 2013 at the opening of the session, was also present.

1.2 The session was attended by delegations from Member States and observers from international organizations and non-governmental organizations in consultative status as listed in document SLF 55/INF.1.

Opening address

1.3 The Assistant Secretary-General/Director of the Maritime Safety Division, on behalf of the Secretary-General, welcomed participants and delivered the opening address, the full text of which can be downloaded from the IMO website at the following link: http://www.imo.org/MediaCentre/SecretaryGeneral/Secretary-GeneralsSpeechesToMeetingsPages/Default.aspx.

Chairman's remarks

1.4 In responding, the Chairman thanked the Assistant Secretary-General for his words of guidance and encouragement and assured him that the Secretary-General's advice and requests would be given every consideration in the deliberations of the Sub-Committee.

Adoption of the agenda and related matters

1.5 The Sub-Committee adopted the agenda (SLF 55/1) and agreed to be guided in its work, in general, by the annotations contained in document SLF 55/1/1. The agenda, as adopted, together with the list of documents considered under each agenda item, is set out in document SLF 55/INF.16.

2 DECISIONS OF OTHER IMO BODIES

2.1 The Sub-Committee noted the decisions and comments pertaining to its work made by BLG 16, DE 56, STW 43, MSC 90, C 108, NAV 58, C 109 and MSC 91, as reported in documents SLF 55/2 and SLF 55/2/1 (Secretariat), including the outcome of BLG 17 as reported verbally by the Secretariat, and took them into account in its deliberations when dealing with the relevant agenda items.

2.2 The Sub-Committee further noted that MEPC 63 and MSC 90 had approved *Revised Guidelines on the organization and method of work of the Maritime Safety Committee and the Marine Environment Protection Committee and their subsidiary bodies*, circulated as MSC-MEPC.1/Circ.4/Rev.2, and urged all parties concerned to strictly adhere to the Revised Committees' Guidelines.

3 DEVELOPMENT OF SECOND GENERATION INTACT STABILITY CRITERIA

General

3.1 The Sub-Committee recalled that SLF 54 had re-established the Correspondence Group on Intact Stability (IS) (SLF 54/17, paragraph 3.21) to continue to work on the items contained in the updated plan of action for matters related to the second generation intact stability criteria (SGISC) (SLF 54/WP.3, annex 4) and instructed it to submit a report to SLF 55.

Report (part 2) of the working group established at SLF 54

3.2 The Sub-Committee considered part 2 of the report of the Working Group on Intact Stability established at SLF 54 (SLF 55/3, submitted by the Chairman of the group) and, having approved it in general, noted that the group's report had been considered in detail by the IS Correspondence Group (SLF 55/3/1, SLF 55/3/1/Add.1 and SLF 55/INF.15) established at SLF 54.

Report of the correspondence group and related submissions

3.3 The Sub-Committee considered the report of the correspondence group (SLF 55/3/1, SLF 55/3/1/Add.1 and SLF 55/INF.15) and noted that the group had continued its work on the development of second generation intact stability criteria (SLF 55/3/1), including the collection of relevant technical information (SLF 55/INF.15), and had also, as instructed, considered other stability matters (SLF 55/3/1/Add.1), including guidance for ships carrying timber cargoes regarding the increased weight of ice, safety issues related to the very serious casualty on board the containership **Chicago**, and the possible effect of fire-fighting water on intact stability and on freeing port area requirements.

3.4 In the context of the above, the Sub-Committee considered the following documents:

.1 SLF 55/3/2 and SLF 55/INF.3 (China), presenting the sample verification for 52 ships, analysing the calculated results, and providing a proposal for the Level 1 vulnerability criteria according to the draft Level 1 vulnerability criteria on parametric roll, pure loss of stability and surf-riding/broaching proposed by SLF 54 and updated by the IS Correspondence Group. The complete results of the verification and analyses of data are contained in document SLF 55/INF.3. China noted that the results of the verification for the relevant Level 1 vulnerability criteria have a large variation in relation to types of ship, loading condition and wave steepness and suggested that an appropriate threshold be considered in accordance with the actual situation of the real ship's operation;

.2 SLF 55/3/3 (China), providing proposals for amendments to some requirements of the 2008 IS Code, based on the application of the Code and the development of criteria for certain types of ships (such as those identified in chapter 2 of part B of the Code), including ships for which compliance with requirements of paragraph 2.2.3 of part A of the Code may not be practicable;

.3 SLF 55/3/4 (China), commenting on the standard values and incident wave conditions in the criterion based on sample calculations of Level 2 criteria of pure loss of stability for 22 ships with 32 load conditions, under different wave conditions proposed by IS Correspondence Group, and the rationality of the standard value in the draft criteria;

.4 SLF 55/3/5 (China), commenting on the standard values and incident wave conditions in the criterion based on sample calculations for Level 2 criteria of parametric rolling for 22 ships with 32 load conditions, under different wave conditions proposed by IS Correspondence Group, and the rationality of the standard value in the draft criteria;

.5 SLF 55/3/6 (China), providing the calculation of parametric rolling for three containerships, based on four calculation methods. According to the results, as set out in the annex, different calculation methods of roll moment of inertia have a significant effect on the assessment of criteria of parametric rolling. China was of the view that a harmonized calculation method for the roll moment of inertia of a containership in the parametric rolling criteria should be developed and proposed to adopt method D as an option for the approximate calculation method of roll moment of inertia for containerships;

.6 SLF 55/3/7 (Italy), commenting on the present status of development of SGISC and suggesting that, with regard to the application of the criteria, it is not necessary to go through all calculation levels, for each failure mode, before developing suitable operational guidance as an equivalent alternative risk control option; and that it is important to have a common understanding of "countermeasures", "operational guidance" and "operational limitations", in order to avoid possible misunderstandings;

.7 SLF 55/3/8 (United States), commenting on part 2 of the report of the correspondence group (SLF 55/3/1/Add.1) and, while agreeing in general with the IACS proposal set out in the annex to that document for a new formula for calculating the ice accretion weight and load cases, with sample calculation results, for timber deck carriers, suggesting that the proposal may be improved and simplified;

.8 SLF 55/3/9 (United States), commenting on part 1 of the report of the correspondence group (SLF 55/3/1 and SLF 55/INF.15, annex 24) on sample calculation of parametric roll vulnerability Level 1 using each of the three reference wave options performed by IACS. The United States performed similar calculations which did not indicate possible vulnerability to parametric roll, and stressed the need to determine the reason why the results appear to contradict some of the outcomes reported by IACS;

.9 SLF 55/3/10 (Poland), commenting on the guidance for ships carrying timber deck cargoes regarding the increased weight of ice (SLF 55/3/1/Add.1), noting that paragraph 4.6 of the Code of Safe Practice for Ships Carrying Timber Deck Cargoes, 2011 (2011 TDC Code) refers to section 6.2 of the 2008 IS Code, and suggesting that requirements regarding icing should be identical to those for fishing vessels included in section 6.3.1 of the Code, which in the opinion of Poland is not a good solution, as there are important differences between ice accretion on fishing vessels and on ships carrying timber deck cargoes;

.10 SLF 55/3/11 (Italy and Japan), providing the report of a comparison study of the draft Level 2 vulnerability criteria for stability under dead ship condition, utilizing two different calculation methods of failure. Both methods are based on the calculation of total stability failure probability for a ship in irregular beam wind and waves on the basis of the same underlying 1-DOF model, but with slightly different calculation details;

.11 SLF 55/3/12 (Japan), commenting on draft Level 2 vulnerability criteria for broaching and advising that Japan executed sample calculations for quantifying the effect of different formulae on the surf-riding probability using the C11 class containership in the North Atlantic. The results of the

comparison study clearly demonstrate that the effect of different formulae on surf-riding probability is negligibly small;

.12 SLF 55/3/13 (Japan), providing a response to comments on sample calculation results of draft vulnerability criteria for parametric rolling and pure loss of stability performed by Japan, using 19 ships under full load conditions and 16 ships under lightest conditions (SLF 55/INF.15, annex 20);

.13 SLF 55/3/14 (Japan), commenting on sample calculation results of draft Level 2 vulnerability criteria for pure loss of stability performed by the United States using 20 ships, together with a new criterion proposal for the correspondence group (SLF 55/INF.15, annex 22);

.14 SLF 55/3/15 (Poland), providing comments and proposals for a revision of the structure of the SGISC and further steps aiming at inclusion of the future SGISC in part B of the 2008 IS Code, stating that in their opinion, considering the present status of Levels 1 and 2 criteria, it would be premature to include the criteria in part B of the Code;

.15 SLF 55/3/16 (Japan), providing additional comments on the direct stability assessment procedures submitted by the United States (SLF 55/INF.15, annex 32) and stating that, while direct stability assessment would not be frequently used in the future, due to the cost and time involved, it would be indispensable for developing innovative new ships; and that, therefore, direct stability assessment procedures should be ready for practical use when the vulnerability criteria are adopted;

.16 SLF 55/INF.5 (Germany), presenting sample calculations for Levels 1 and 2 vulnerability criteria for the failure modes "pure loss of stability" and "parametric roll" for passenger ships, including a comparison with some cargo ships; and

.17 SLF 55/INF.14 (IACS), containing information on the verification of the draft Levels 1 and 2 vulnerability criteria for parametric rolling and pure loss of stability utilizing a direct stability assessment procedure, with the results verifying the consistency of each tier in the SGISC.

3.5 In considering the report of the IS Correspondence Group and the above-related documents, the Sub-Committee noted, in particular, the following views:

.1 with respect to the wave spectra and the boundary limits proposed for parametric roll and excessive accelerations, concerns were raised regarding the consequences of the calculations for relatively small general cargo ships and it was noted that such ships were hardly represented in the sample calculations considered by the correspondence group;

.2 further sample calculations for other ship types should be performed in the intersessional period;

.3 ice accretion criteria should be further developed, based on document SLF 55/3/8 and taking into account document SLF 55/3/10;

.4 suitable operational limitations should be discussed as a matter of priority before embarking on the direct assessment;

.5 the proposals for amendments to some requirements of the 2008 IS Code, based on the application of the Code and the development of criteria for certain types of ships (SLF 55/3/3), were outside of the scope of this output;

.6 concerns were expressed with regard to the long period of time that this output has been on the agenda of the Sub-Committee and the complexity of the issues involved; and

.7 an expansion of the output, as proposed in document SLF 55/3/15, was not appropriate and a final completion year for the output should be set.

3.6 Having considered the views expressed, the Sub-Committee agreed as follows:

.1 the proposals in document SLF 55/3/3 were outside the scope of the agenda item and would therefore not be considered;

.2 ice accretion issues should be further discussed, based on document SLF 55/3/8, and operational criteria should be developed as a matter of priority; and

.3 the completion of the current work is a priority, therefore, proposals for expanding the work (SLF 55/3/15) should not be further considered.

Review of action plan for intact stability work

3.7 The Sub-Committee further instructed the IS Working Group to review the plan of action for intact stability work (SLF 54/WP.3, annex 4) and to prepare a revised plan, identifying priorities, time frames and objectives for the work to be accomplished.

Establishment of the IS Working Group

3.8 The Sub-Committee re-established the Intact Stability Working Group and instructed it, taking into account comments made and decisions taken in plenary, to:

.1 further develop the second generation intact stability criteria on the basis of the report of the correspondence group (SLF 55/3/1, SLF 55/3/1/Add.1 and SLF 55/INF.15) and part 2 of the report of the working group established at SLF 54 (SLF 55/3), taking into account documents SLF 55/3/2, SLF 55/3/4, SLF 55/3/5, SLF 55/3/6, SLF 55/3/7, SLF 55/3/8, SLF 55/3/9, SLF 55/3/10, SLF 55/3/11, SLF 55/3/12, SLF 55/3/13, SLF 55/3/14, SLF 55/3/15, SLF 55/INF.3, SLF 55/INF.5 and SLF 55/INF.14;

.2 review the plan of action contained in annex 4 to document SLF 54/WP.3, taking into account the progress made during the session, and prepare a revised plan, identifying the priorities, time frames and objectives for the work to be accomplished;

.3 consider whether it is necessary to re-establish a correspondence group and, if so, prepare terms of reference for consideration by the Sub-Committee; and

.4 submit a written report (part 1), by Thursday, 21 February 2013, continue working through the week and submit part 2 of the report to SLF 56, as soon as possible after this session, so that it can be taken into account by the correspondence group, if established.

Report of the IS Working Group

3.9 Having considered the part of the report of the working group (part 1) (SLF 55/WP.3) dealing with the agenda item, the Sub-Committee approved it in general and took action as outlined hereunder.

Second generation intact stability criteria

3.10 The Sub-Committee noted the progress made by the group on the development of the second generation intact stability criteria.

Draft vulnerability criteria of levels 1 and 2 for the failure mode parametric roll

3.11 The Sub-Committee noted that the group had agreed to the selection of a wave environment for the application of the first level vulnerability criteria for pure loss of stability in waves (SLF 55/WP.3, annex 2) in the tables on waves; however, it could not reach consensus on the selection of a wave environment for the second level vulnerability criteria for pure loss of stability in waves.

3.12 In this context, the Sub-Committee noted that the delegation of Greece and the observer from RINA expressed their reservation regarding the scatter diagrams used for the selection of a wave environment, because more recent data might show differences that are influential for the result of the application of the assessment.

Review of the plan of action

3.13 The Sub-Committee endorsed the revised plan of action for this output (SLF 55/WP.3, annex 3), prepared by the group based on the progress made during the session.

Establishment of the IS Correspondence Group

3.14 The Sub-Committee, taking into account the progress made at this session, agreed to re-establish the Correspondence Group on Intact Stability, under the coordination of Japan*, with the assistance of Norway*, for matters concerning ice accretion, draft Polar Code (agenda item 13) and towing, anchor-handling and lifting (agenda item 10), and instructed it, under this agenda item, to (see also paragraphs 10.8 and 13.6):

.1 continue to work on the items contained in the updated plan of action for the second generation intact stability criteria (SLF 55/WP.3, annex 3), based on part 1 of the report of the IS Working Group (SLF 55/WP.3) and part 2 of the working group's report, to be submitted to SLF 56, also taking into account relevant documents from previous sessions;

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.2 consider the development of draft guidance for ships carrying timber deck cargoes regarding the increased weight of ice, based on document SLF 55/3/8, and taking into account document SLF 55/3/10, as appropriate;

.3 prepare a working version of Explanatory Notes to facilitate the accumulation of experience of application of the draft second generation intact stability criteria (SLF 55/WP.3, annex 3, section 1.3) for matters related to intact stability; and

.4 submit a report to SLF 56.

4 DEVELOPMENT OF GUIDELINES ON SAFE RETURN TO PORT FOR PASSENGER SHIPS

General

4.1 The Sub-Committee recalled that SLF 54 re-established the SDS Correspondence Group with terms of reference as set out in paragraph 4.11 of document SLF 54/17, and instructed the group to submit a report to SLF 55.

Report of the correspondence group and related submissions

4.2 The Sub-Committee considered the report of the correspondence group (SLF 55/4) and noted the group's consideration of the development of guidelines for the approval of damage stability modules for safe return to port and also the proposed amendments to the *Recommendation on a standard method for evaluating cross-flooding arrangements* (resolution MSC.245(83)) (the Recommendation), as set out in the annex to the report. The Sub-Committee noted in particular the group's view that a significant number of decisions to be taken under the output on revision of SOLAS chapter II-1 subdivision and damage stability regulations (agenda item 8) will have an impact on issues to be resolved under this output.

4.3 In the context of the above, the Sub-Committee also considered the following documents:

.1 SLF 55/4/1 (Finland), containing findings, based on the research project FLOODSTAND (SLF 54/4), providing further background on the use of flow reduction (i.e. discharge) coefficients to model the losses in the flow through the cross-flooding device, and proposing modifications to the Recommendation;

.2 SLF 55/4/2 (Japan), presenting a detailed technical background for the revised regression formulae for cross-flooding through a series of structural ducts with one and two manholes in the Recommendation; and

.3 SLF 55/4/3 (France), commenting on document SLF 55/4/1, and proposing amendments to paragraphs 2.4 and 2.5 of the Recommendation and clearer explanatory notes than the existing ones, with justifications for the notes based on the physical laws relating to the cross-flooding calculations.

4.4 In considering the report of the correspondence group and the above documents, the Sub-Committee noted, in particular, the following views:

.1 with regard to the handling of the "outlet" effect (SLF 55/4/1, paragraph 4), there was strong support for option 1;

.2 the revised regression formulae for cross-flooding (SLF 55/4/2) should be further considered by the SDS Working Group; and

.3 the Recommendation contains discrepancies in time to cross-flood, which should be solved as a high-priority.

4.5 The Sub-Committee also noted the query in the report of the correspondence group (SLF 55/4, annex, Q6) regarding the application of the guidelines for the approval of damage stability modules for all types of ships, on which the opinion of the members of the group was fairly evenly divided. In this context, some delegations expressed the view that this output dealt with matters related to passenger ships, and should it be considered to apply these proposals to other types of ships, then this would necessarily be an expansion of the output, which would need suitable justification.

4.6 Subsequently, the Sub-Committee noted the views of a number of delegations that this output was dealing with two matters, namely, the development of guidelines for the approval of damage stability modules for safe return to port, solely for passenger ships; and proposed amendments to the *Recommendation on a standard method for evaluating cross-flooding arrangements* (resolution MSC.245(83)), for all types of ships. In light of the above, the Sub-Committee agreed that there was no need for an expansion of this output.

Instructions to the SDS Working Group

4.7 Having considered the above views, the Sub-Committee instructed the SDS Working Group, established under agenda item 7 (Review of the damage stability regulations for ro-ro passenger ships), taking into account comments and decisions made in plenary, to:

.1 finalize the revision of the *Recommendation on a standard method for evaluating cross-flooding arrangements* (resolution MSC.245(83)), taking into account the report of the correspondence group (SLF 55/4) and documents SLF 55/4/1, SLF 55/4/2 and SLF 55/4/3; and

.2 further consider the development of guidelines for the approval of damage stability modules for safe return to port, taking into account the report of the correspondence group (SLF 55/4).

Report of the SDS Working Group

4.8 Having considered the part of the report of the SDS Working Group (SLF 55/WP.4) dealing with the agenda item, the Sub-Committee approved it in general and took action as outlined hereunder.

Recommendation on a standard method for evaluating cross-flooding arrangements

4.9 The Sub-Committee agreed to the draft *Revised Recommendation on a standard method for evaluating cross-flooding arrangements*, as set out in annex 1, including an associated draft MSC resolution developed by the Secretariat, in consultation with the

Chairman of the group, for submission to MSC 92 for adoption. In light of the above decision, the Sub-Committee noted that calculations to evaluate cross-flooding arrangements performed before the adoption of the Revised Recommendation remain valid, and that calculations for ships constructed on or after the date of the adoption of the Revised Recommendation should follow the latter.

4.10 In this context, the Sub-Committee noted that the delegation of France considered it essential to add further explanatory text and modifications to the revised provisions prepared by the group to the discharge factor F and its related k-factor. The Sub-Committee also noted that the delegation was of the view that it was not clear in the revised text that the formulae of paragraph 2.5 of the Revised Recommendation was only valid for flooding devices within a cross-flooding duct.

Development of guidelines for the approval of damage stability modules for safe return to port

4.11 The Sub-Committee noted that, due to time constraints, the group did not consider matters related to approval of damage stability modules for safe return to port. In this connection, the Sub-Committee agreed to include the issue in the terms of reference for the SDS Correspondence Group (see paragraph 4.13).

Extension of target completion year

4.12 Having noted that the group, during its deliberations, could not finalize all the outstanding issues related to this output, the Sub-Committee invited the Committee to extend the target completion year for this output to 2014.

Establishment of the SDS Correspondence Group

4.13 The Sub-Committee agreed to re-establish the SDS Correspondence Group, under the coordination of the United Kingdom*, and instructed the group, with regard to this agenda item, to (see also paragraphs 8.20 and 13.6):

.1 further develop the guidelines for the approval of damage stability modules for safe return to port; and

.2 submit a report to SLF 56.

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5 DEVELOPMENT OF GUIDELINES FOR VERIFICATION OF DAMAGE STABILITY REQUIREMENTS FOR TANKERS

General

5.1 The Sub-Committee recalled that SLF 54 had agreed, in principle, to draft *Guidelines for verification of damage stability requirements for tankers* (SLF 54/WP.4, annex 1), with a view to submission to the Committee for approval, together with draft amendments to IMO instruments regarding the mandatory carriage of stability instruments on board tankers, once those amendments have been finalized. In this context, the Sub-Committee noted that the aforementioned draft amendments will be considered under agenda item 6 (Development of mandatory carriage requirements for stability instruments on board tankers).

Damage stability verification for tankers with assigned freeboards less than summer load line

5.2 The Sub-Committee had for its consideration document SLF 55/5 (China, Germany, Italy and IACS), providing comments on the uniform application of damage stability verification for tankers with assigned freeboards less than summer load line, especially in relation to the required performance standards relating to the mandatory carriage of stability instruments on board tankers. The Sub-Committee noted the view of the co-sponsors that it is necessary to clarify whether damage stability verification is to be carried out up to draughts that exceed the summer load line (e.g. tropical freeboard draught) for ships to which a freeboard less than the summer freeboard is assigned.

5.3 Having considered the above document, the Sub-Committee noted that there were divergent views on the matter. Some delegations considered the proposals in document SLF 55/5 to be outside the scope of this output, as it concerned all ships and not solely tankers and, therefore, the matter should not be further considered. Other delegations were of the opinion that the document addressed very relevant safety concerns and that the matter was part of the ongoing work.

5.4 Having clarified that any consideration of the proposals in document SLF 55/5 should not have an impact on the finalization of the ongoing work regarding the carriage requirements for stability instruments on board tankers and the draft *Guidelines for verification of damage stability requirements for tankers*, the Sub-Committee referred document SLF 55/5 to the drafting group and requested the group to identify possible issues concerning the proposals and advise the Sub-Committee accordingly.

Instructions to the drafting group

5.5 Having considered the above views, the Sub-Committee instructed the Drafting Group on Development of mandatory carriage requirements for stability instruments on board tankers, established under agenda item 6 (see paragraph 6.4), taking into account comments and decisions made in plenary, to:

.1 further consider the draft *Guidelines for verification of damage stability requirements for tankers*, based on the report of the working group established at SLF 54 (SLF 54/WP.4, annex 1), for possible consequential modifications which may arise in the context of the development of mandatory carriage requirements for stability instruments; and

.2 consider document SLF 55/5 with a view to identifying possible substantial issues, and advise the Sub-Committee accordingly.

Report of the drafting group

5.6 Having considered the part of the report of the drafting group (SLF 55/WP.6) dealing with the agenda item, the Sub-Committee approved it in general and took action as outlined hereunder.

Draft Guidelines for verification of damage stability requirements for tankers

5.7 The Sub-Committee agreed to the draft *Guidelines for verification of damage stability requirements for tankers*, and the associated draft MSC circular, as set out in annex 2, for submission to MSC 92 for approval.

Damage stability verification for tankers with assigned freeboards less than summer load line

5.8 The Sub-Committee endorsed the group's recommendation that the harmonization of the wording referred to in paragraphs 2.2, 2.3 and 2.6 of document SLF 55/5 (see also paragraph 5.2 above) should be referred to the SDS Working Group at a future session for further consideration.

5.9 In this connection, the Sub-Committee noted that the delegation of the Republic of Korea expressed its concern regarding the application of the harmonized draught for existing ships and the possible consequences, such as modification of subdivision or re-assignment of freeboard. The Sub-Committee also noted the suggestion by the delegation that the SDS Working Group, at a future session, should consider the practical problems that may arise with the application to existing ships while harmonizing the draught.

5.10 Additionally, the Sub-Committee concurred with the group's recommendation that potential amendments to the Load Lines Convention and the 2008 IS Code would need to be considered under a new planned output, in accordance with the *Guidelines on the methods of work of the MSC and the MEPC and their subsidiary bodies* (MSC-MEPC.1/Circ.4/Rev.2), as they may have wide-ranging consequences affecting ship types other than tankers.

Completion of the work on the output

5.11 The Sub-Committee invited the Committee to note that the work on the output had been completed.

6 DEVELOPMENT OF MANDATORY CARRIAGE REQUIREMENTS FOR STABILITY INSTRUMENTS ON BOARD TANKERS

6.1 The Sub-Committee recalled that MSC 90 had considered a proposal by SLF 54 (SLF 54/17, annex 1) to expand the scope of the output on "Development of guidelines for verification of damage stability requirements for tankers" to include the development of mandatory carriage requirements for stability instruments on board tankers and extend the target completion year for this output to 2013, together with document MSC 90/13/3 (China, et al.), also addressing the issue. Consequently, MSC 90 included in the 2012-2013 biennial agenda of the SLF Sub-Committee and in the provisional agenda for SLF 55 an unplanned output on "Development of mandatory carriage requirements for stability instruments on board tankers" (target completion year 2013), to be developed as a single

package together with the associated guidelines for verification of damage stability requirements for tankers, considered under agenda item 5.

6.2 The Sub-Committee had for its consideration the following documents:

.1 SLF 55/6 (United Kingdom), providing a detailed proposal for draft amendments to MARPOL Annex I (annex 1), the BCH Code (annex 2), the IBC Code (annex 3), the EGC Code (annex 4), the GC Code (annex 5), the IGC Code (annex 6) and the 2011 HSSC Guidelines (annex 7), to include mandatory carriage requirements for stability instruments on tankers, including oil tankers, chemical tankers and gas carriers;

.2 SLF 55/6/1 (United States), proposing amendments to MARPOL Annex I and the IBC and IGC Codes to introduce mandatory carriage requirements for stability instruments carried on board tankers; and

.3 MSC 90/13/3 (China, et al.), proposing amendments to MARPOL and the IBC and IGC Codes to ensure adequate provisions are made to enable ships' officers to verify that intact and damage stability requirements applicable to tankers are complied with in any service loading condition; and for Administrations to accept continued application of existing intact and damage stability verification measures where these are demonstrated to be of an acceptable standard.

6.3 In considering the above documents, and taking into account the views expressed, the Sub-Committee agreed as follows:

.1 the proposals contained in documents SLF 55/6 and SLF 55/6/1 are very similar and could be combined by a drafting group;

.2 Type 2 or Type 3 stability instruments are acceptable (SLF 55/6/1) in order to provide flexibility;

.3 an approved onboard stability instrument would not replace the approved Stability Booklet;

.4 stability software should be approved, but the same should not apply to the hardware which could be covered by national standards;

.5 where vague expressions such as "acceptable standard" or "to the satisfaction of the Administration" were used, they should reference the *Guidelines for the approval of stability instruments* (MSC.1/Circ.1229);

.6 where reference was made to the first scheduled dry-docking after [date], this should instead refer to the renewal survey; and

.7 the word "[date]" should be replaced by the words "[date of entry into force]", and the words "after [date] but not later than [date]" should be replaced by the words "after [date of entry into force] but not later than [five years after the date of entry into force]", as appropriate.

Establishment of a drafting group

6.4 Following discussion, and recalling its relevant decision at SLF 54, the Sub-Committee established a Drafting Group on Development of Mandatory Carriage Requirements for Stability Instruments on board Tankers and instructed it, taking into account the comments made in plenary and based on the relevant annexes to document SLF 55/6, to finalize the draft amendments to:

.1 Annex I of the MARPOL Convention, taking into account documents MSC 90/13/3 and SLF 55/6/1;

.2 the Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (BCH Code);

.3 the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code), taking into account documents MSC 90/13/3 and SLF 55/6/1;

.4 the Code for Existing Ships Carrying Liquefied Gases in Bulk (EGC Code);

.5 the Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (GC Code);

.6 the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), taking into account documents MSC 90/13/3 and SLF 55/6/1; and

.7 the Survey Guidelines under the Harmonized System of Survey and Certification (HSSC), 2011.

Report of the drafting group

6.5 Having considered the report of the drafting group (SLF 55/WP.6), the Sub-Committee approved it in general and took action as outlined hereunder.

Approval of software for stability instruments

6.6 Having considered the text in square brackets concerning the approval of the software for stability instruments, as contained in subparagraph .3 of the draft amendments to international instruments for the mandatory carriage requirements of stability instruments on tankers (SLF 55/WP.6, annexes 1 to 6), the Sub-Committee agreed to delete the subparagraph throughout the text of the draft amendments to mandatory instruments (see also paragraphs 6.8 to 6.13).

6.7 In light of the above decision, the Sub-Committee noted that some delegations were concerned about the deletion of the subparagraph regarding approval of the software, as this could raise ambiguities with regard to the need for approval of hardware. However, the Sub-Committee also noted that in paragraph 4.1 (Stability instruments) of chapter 4 of part B of the 2008 IS Code reference is made to active and passive systems, which includes hardware, therefore, there would be no ambiguities regarding the approval of stability instruments.

Draft amendments to MARPOL Annex I

6.8 The Sub-Committee agreed to the draft amendments to MARPOL Annex I, as set out in annex 3, for submission to MEPC 65 for approval, with a view to subsequent adoption.

Draft amendments to the BCH Code

6.9 The Sub-Committee agreed to the draft amendments to the Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (BCH Code), as set out in annex 4, for submission to MEPC 65 and MSC 92 for approval, with a view to subsequent adoption.

Draft amendments to the IBC Code

6.10 The Sub-Committee agreed to the draft amendments to the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code), as set out in annex 5, for submission to MEPC 65 and MSC 92 for approval, with a view to subsequent adoption.

Draft amendments to the EGC Code

6.11 The Sub-Committee agreed to the draft amendments to the Code for Existing Ships Carrying Liquefied Gases in Bulk (EGC Code), as set out in annex 6, for submission to MSC 92 for approval, with a view to subsequent adoption.

Draft amendments to the GC Code

6.12 The Sub-Committee agreed to the draft amendments to the Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (GC Code), as set out in annex 7, for submission to MSC 92 for approval, with a view to subsequent adoption.

Draft amendments to the IGC Code

6.13 The Sub-Committee agreed to the draft amendments to the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), as set out in annex 8, for submission to MSC 92 for approval, with a view to subsequent adoption.

Draft amendments to the 2011 HSSC Guidelines

6.14 The Sub-Committee agreed to the draft amendments to the *Survey Guidelines under the Harmonized System of Survey and Certification (HSSC), 2011* (resolution A.1053(27)), as set out in annex 9, for submission to MEPC 65 and MSC 92 for approval, with a view to subsequent adoption, for referral to the FSI Sub-Committee for inclusion in the appropriate revision of the HSSC Guidelines once the associated amendments to mandatory instruments have entered into force.

Completion of the work on the output

6.15 The Sub-Committee invited the Committee to note that the work on the output had been completed.

7 REVIEW OF DAMAGE STABILITY REGULATIONS FOR RO-RO PASSENGER SHIPS

General

7.1 The Sub-Committee recalled that SLF 54 re-established the SDS Correspondence Group with terms of reference as set out in paragraph 6.9 of document SLF 54/17 and had instructed the group to submit a report to this session.

Report of the correspondence group and related submissions

7.2 In considering the report of the correspondence group (SLF 55/7), the Sub-Committee noted that the work of the group relied on the findings of the EC research projects EMSA(2), GOALDS, RP625 and FLOODSTAND; however, owing to time constraints, as some of the projects were not finalized until late in the second half of 2012, the group could not prepare concrete proposals related to damage stability regulations for ro-ro passenger ships. With regard to the development of a new SOLAS regulation II-1/7-2.5.2.3 concerning the s_i factor for ro-ro passenger ships, the Sub-Committee endorsed the group's recommendation that no further action should be taken and that the outcome of the research projects should be awaited before deciding on how best to allow for the water-on-deck issue probabilistically. The Sub-Committee also noted that the group could not reach consensus on matters related to potential inconsistency between SOLAS regulations II-1/13-1.4 and II-1/17-1.1.2 in which the former regulation requires watertight ramps in cargo ships, whereas the latter only requires weathertight ramps in ro-ro passenger ships, and that the issue should be further considered at this session.

7.3 In this connection, the Sub-Committee considered the following documents:

.1 SLF 55/7/1 (Austria et al.), proposing changes to the s_i formulation to estimate the effect of water-on-deck when it occurs on ro-ro passenger ships and proposing to discuss residual freeboard as an alternative in relation to the s_i formulation;

.2 SLF 55/7/2 (RINA), commenting on the report of the correspondence group (SLF 55/7), and presenting a review of the proposals contained in document SLF 53/10 on draft amendments to SOLAS regulations II-1/8 and II-1/9, in particular concerning the extension of the level of double-bottom protection provided in regulation 9.9 for passenger ships with large lower holds (LLH) to cargo ships other than tankers with LLH;

.3 SLF 55/INF.6 (EC), providing information on a second study, commissioned by the European Maritime Safety Agency (EMSA), at the request of the European Commission, on the specific damage stability parameters of ro-ro passenger ships according to SOLAS 2009 amendments including water-on-deck calculation;

.4 SLF 55/INF.7 (Denmark and United Kingdom), providing information on the results of the "Goal-based Damage Stability" project (GOALDS) on derivation of updated probability distributions of collision and grounding-damage characteristics for passenger ships. With regard to collision data, the non-negligible level of uncertainty in the statistical estimators due to the limited number of data, and the average quality of the database suggest that any modification of present SOLAS assumptions concerning the damage length is premature and not strongly supportable from the statistical point of view. With regard to grounding data, on the

basis of the findings from the analyses carried out, the fully probabilistic approach to bottom damages for regulatory purposes is, at this stage, not possible; however, the deterministic approach could be more robust than the fully probabilistic approach and less affected by the problems identified in the analyses;

.5 SLF 55/INF.8 (Denmark and United Kingdom), providing information on the results of the GOALDS project on probability of survival (s_i factor) for passenger ships. The derived formulation, which is supported by findings, regarding the impact of water-on-deck on ship's damage stability, is simple, rational and calculable, consistent with the safe return to port philosophy and accounts for the ship scale. The new GOALDS s_i factor introduces new ship design parameters when compared to SOLAS 2009 requirements;

.6 SLF 55/INF.9 (Denmark and United Kingdom), providing information on the results of the GOALDS project on the development of a new risk-based damage stability requirement for passenger ships based on cost-benefit assessment and concluding that, potentially, commercially viable passenger ships (of ro-pax and cruise type) could be built to a significantly higher Attained Index than set forth by current requirements;

.7 SLF 55/INF.10 (United Kingdom), presenting an approach for the evaluation of ro-ro damage stability, which includes consideration of the accumulation of water-on-deck and incorporates both stability and residual freeboard within the existing probabilistic damage stability framework; and

.8 SLF 55/INF.13 (Germany and CESA), presenting a concept for addressing water-on-deck for ro-ro passenger ships, developed by Germany based on experience gained in applying the provisions of SOLAS 2009, to be accounted for in the probabilistic damage stability requirements.

7.4 During its consideration of the report of the correspondence group and the above documents, the Sub-Committee noted the following views:

.1 this output has been on the agenda of the Sub-Committee for over three years, and considering the target completion year of 2013, this work should be finalized, based on the information received by the Sub-Committee at this session;

.2 with regard to the s_i formulation to estimate the effect of water-on-deck when it occurs on ro-ro passenger ships, there was some support for alternative 2 contained in paragraph 11 of document SLF 55/7/1 (Austria et al.);

.3 with regard to an approach for the evaluation of ro-ro passenger ship damage stability which includes the consideration of the accumulation of water-on-deck (SLF 55/INF.10), a minimum residual freeboard should be assigned; and

.4 the working group should further consider the technical aspects of the correspondence group report and the related documents (see paragraph 7.3).

Establishment of the SDS Working Group

7.5 Having noted the above views, and recalling its relevant decision at SLF 54, the Sub-Committee established the SDS Working Group and instructed it, taking into account the comments made in plenary, to:

.1 finalize the damage stability regulations for ro-ro passenger ships, taking into account the report of the correspondence group (SLF 55/7) and documents SLF 55/7/1, SLF 55/7/2, SLF 55/INF.6, SLF 55/INF.7, SLF 55/INF.8, SLF 55/INF.9, SLF 55/INF.10 and SLF 55/INF.13; and

.2 time permitting, further consider the potential inconsistency between SOLAS regulations II-1/13-1.4 and II-1/17-1.1.2 and advise the Sub-Committee as appropriate.

Report of the SDS Working Group

7.6 Having considered the part of the report of the SDS Working Group (SLF 55/WP.4) dealing with the agenda item, the Sub-Committee approved it in general and took action as outlined hereunder.

Residual freeboard

7.7 The Sub-Committee noted the group's decision on excluding the residual freeboard option as part of the new requirements to account for water-on-deck effects.

7.8 In this connection, the Sub-Committee noted that the observer from RINA considered the decision to remove the residual freeboard after damage as detrimental to the survivability of ro-ro passenger ships. It was argued that if there was damage to a ro-ro passenger ship then there was also a strong probability that there may be more water on the ro-ro deck than would be expected for a ro-ro passenger ship complying with the Stockholm Agreement.

7.9 Additionally, the Sub-Committee noted that the delegation of the United Kingdom was of the view that the currently chosen option requires a ship to be designed with an increased residual stability to overcome the effect of significant water-on-deck, whereas the incorporation of a residual freeboard within the probabilistic framework would allow ships to be designed to prevent the accumulation of water-on-deck following damage, offering a potentially safer solution, which is preventative as opposed to reactive. In this context, the Sub-Committee also noted that the delegation stated that the solution put forward for the inclusion of residual freeboard reflects the outcome of validated research accounted for in a long-established regional ro-ro stability requirement permitted under Conference Resolution 14, adopted at the SOLAS Conference of 1995. Therefore, the delegation was of the opinion that the decision of the SDS Working Group not to include a residual freeboard alternative to the stability criteria significantly limits the stability design parameters available to designers and operators.

7.10 In light of the above, and having noted that views were divided on matters related to the residual freeboard option as part of the new requirements to account for water-on-deck effects, the Sub-Committee decided that this issue should be further considered at SLF 56.

Draft amendments to SOLAS regulation II-1/7-2.3

7.11 The Sub-Committee agreed, in principle, to the draft amendments to SOLAS regulation II-1/7-2.3 and the related Explanatory Notes prepared by the group (SLF 55/WP.4, annexes 3 and 4, respectively), for submission to the Committee, in due course, for approval with a view to subsequent adoption in conjunction with the adoption of the revised SOLAS chapter II-1.

7.12 In this connection, having noted that the group considered three options for a s_{WoD} requirement and that a clear majority of the group supported option 2 (GZ_{max} = 0.20 m and range = 20 degrees), the Sub-Committee noted the views of the delegation of the United Kingdom that to date, many research projects have been conducted on the matter of ro-ro damage stability, and that they have sought to establish a GZ value necessary to resist the effects of water-on-deck; the HARDER project and, more recently, the EMSA 1 and EMSA 2 projects, each conducted by different research bodies, in different model testing tanks, all came to the same conclusion that the GZ max value should be 0.25 m. The delegation stated that there is overwhelming and consistent evidence from research conducted over many years supporting a GZ max value of 0.25 m, yet on this occasion all this evidence has been rejected in favour of an inappropriate standard taken from the 2008 IS Code, a standard not designed to reflect the behaviour of a damaged ship with perhaps 1,000 tonnes of sea water on a ro-ro deck.

Special category spaces

7.13 The Sub-Committee noted that the group had an extensive discussion on whether the existing definitions of ro-ro spaces and special category spaces in SOLAS chapter II-2 were appropriate to be used for the applicability of the new damage stability requirement, and that it was perceived by some members of the group that the existing definitions did not sufficiently clarify those terms. In light of the above, the Sub-Committee also noted that the group had decided to exclude special category spaces from damage cases to be considered due to the uncertainty that this might include unintended spaces.

7.14 In this context, the Sub-Committee noted that the observer from RINA considered that the exclusion of special category spaces would lead to confusion in the application of this regulation, as it could be interpreted that special category spaces would not need to have water-on-deck calculations carried out. The Sub-Committee also noted that the observer had requested that the special category spaces should be reintroduced in this regulation.

Extension of target completion year

7.15 Taking into account the need for further work related to residual freeboard (see paragraphs 7.7 to 7.10), the Sub-Committee invited the Committee to extend the target completion year for this output to 2014 in order to consider this matter.

8 REVISION OF SOLAS CHAPTER II-1 SUBDIVISION AND DAMAGE STABILITY REGULATIONS

8.1 The Sub-Committee recalled that SLF 54 had re-established the SDS Correspondence Group with terms of reference as set out in paragraph 8.15 of document SLF 54/17 and had instructed the group to submit a report to this session.

Report (part 2) of the working group established at SLF 54

8.2 The Sub-Committee considered part 2 of the report of the SDS Working Group at SLF 54 (SLF 55/8) and, having approved it in general, noted that the group's report had been considered in detail by the SDS Correspondence Group (SLF 55/8/2 and Add.1) established at SLF 54.

Application of SOLAS subdivision standards to cargo ships which are complying with the subdivision standards of other IMO instruments

8.3 The Sub-Committee had for its consideration the following documents on matters related to SOLAS regulation II-1/4 regarding the applicability of subdivision and stability requirements in SOLAS, chapter II-1, parts B-1 to B-4:

.1 SLF 55/8/1 (Germany), providing proposed amendments to SOLAS regulation II-1/4 in order to clarify the application of SOLAS subdivision standards to cargo ships which are complying with the subdivision standards of other IMO instruments;

.2 SLF 55/8/6 (United States), commenting on document SLF 55/8/1 and the proposed amendments to SOLAS regulation II-1/4; expressing concern that the proposed text does not fully resolve the existing vagueness in SOLAS regulation II-1/4.1 regarding what is considered a "damage stability requirement" in parts B-1 to B-4; and agreeing with the suggestion to refer to the OSV Guidelines and the SPS Code in a footnote in order to accommodate their current non-mandatory status; and

.3 SLF 55/8/8 (Liberia and IADC), commenting on the amendments to SOLAS regulation II-1/4, in particular the proposal by Germany (SLF 55/8/1) and the report of the correspondence group (SLF 55/8/2 and Add.1) and, in agreeing that the MODU Code should be considered in its entirety as an equivalent standard to SOLAS as stipulated in the preamble of the Code, expressing concern that not including the MODU Code in the list of alternative damage stability standards could result in uncertainty regarding its application in the future.

8.4 In considering the above documents, the Sub-Committee noted that the majority of those who spoke supported the proposed amendments to SOLAS regulation II-1/4 contained in document SLF 55/8/6, and agreed that it should be used as the base document for the preparation of the draft amendments, with document SLF 55/8/1 also to be taken into account. With regard to the proposal in document SLF 55/8/8 to include the MODU Code as an alternative damage stability standard under the regulation, the Sub-Committee reiterated its decision at SLF 54 that the MODU Code should not be included (SLF 54/17, paragraph 13.7).

8.5 Subsequently, the Sub-Committee referred documents SLF 55/8/6 and SLF 55/8/1 to the SDS Working Group for further consideration, with a view to finalizing the draft amendments to SOLAS regulation II-1/4 and the associated footnote in the context of the revision of SOLAS chapter II-1 subdivision and damage stability regulations.

Report of the correspondence group and related submissions

8.6 The Sub-Committee considered the report of the correspondence group (SLF 55/8/2 and Add.1) and, having approved it in general, noted that the group had progressed the work on the revision of SOLAS chapter II-1 subdivision and damage stability regulations and the associated Explanatory Notes considerably, as set out in the annexes to the report, but a vast amount of work still remained.

8.7 In this context, the Sub-Committee also considered the following documents:

.1 SLF 55/8/3 (Republic of Korea), providing proposals for the revision of the Explanatory Notes to regulation II-1/9 for cargo ships of less than 80 m in length, which did not gain sufficient support in the SDS Correspondence Group, amending only the Explanatory Notes according to the decision of SLF 54, in order to demonstrate a safety level satisfactory to the Administration;

.2 SLF 55/8/4 (United States), providing several proposals for amendments to SOLAS chapter II-1, in an effort to improve the regulations and also aid efficiency in finalizing the draft amendments at this session;

.3 SLF 55/8/5 (United States), commenting on passenger ship safety matters, in particular the current survivability level of passenger ships in the event of grounding, collision or flooding, pointing out that with the passenger ship safety initiative in 2000, the regulatory regime for the design, construction and operation of passenger ships shifted focus to prevention and the philosophy that the "ship is its own best lifeboat", and expressing the view that the survivability level reflected in the required subdivision index R merits further consideration in order to determine an appropriate level of safety; and

.4 SLF 55/8/7 (United States), commenting on the report of the correspondence group (SLF 55/8/2 and Add.1) regarding the application of amendments to SOLAS chapter II-1, pointing out that the scope of application of amendments to SOLAS, particularly chapters II-2 and III, is currently under consideration by the Committee, and that MSC 91 agreed to establish a relevant Working Group during FSI 21. Since there is currently no specific guidance from that work that can be applied in the context of SOLAS chapter II-1, the United States recommended that this issue be considered in plenary so that appropriate guidance can be provided to the SDS Working Group when finalizing the draft amendments to SOLAS chapter II-1.

8.8 With regard to document SLF 55/INF.12 (Germany and Norway), containing the results of a safety assessment for collisions relating to the penetration of LNG tanks for tankers and containerships using LNG as fuel, the Sub-Committee decided to consider the matter under the agenda item "Any other business" (see paragraphs 16.16 and 16.17).

8.9 Following an in-depth discussion of the above documents, the Sub-Committee:

.1 having noted that the correspondence group had identified amendments already agreed at SLF 53 and SLF 54 for which no further action was considered necessary (SLF 55/8/2/Add.1, annex 2), agreed that these amendments be referred to the Committee, in due course, for approval and subsequent adoption;

.2 did not support the proposal by the Republic of Korea (SLF 55/8/3) for the revision of the Explanatory Notes to regulation II-1/9 for cargo ships of less than 80 m in length, recalling that the matter had already been discussed at SLF 54;

.3 having noted the decision of MSC 91 (MSC 91/22, paragraphs 3.33 to 3.35) to establish an Ad Hoc Working Group on Application of Amendments to SOLAS and Related Codes, to meet during FSI 21, agreed that the working group should not have lengthy discussions on the scope of application of the draft amendments to SOLAS chapter II-1, pending any decisions of the Committee, but that the group should indicate whether amendments should apply to new ships only or also to existing ships; and

.4 with regard to the current survivability level of passenger ships in the event of grounding, collision or flooding (SLF 55/8/5), the majority of the delegations agreed that the subdivision index R should be further considered in order to determine an appropriate level of safety.

Instructions to the SDS Working Group

8.10 In light of the above, the Sub-Committee instructed the SDS Working Group, established under agenda item 7 (see paragraph 7.5), taking into account the comments and decisions made in plenary, to:

.1 further develop the draft amendments to SOLAS chapter II-1 and the associated Explanatory Notes (resolution MSC.281(85)), based on part 2 of the report of the working group at SLF 54 (SLF 55/8) and the report of the correspondence group (SLF 55/8/2 and Add.1), taking into account documents SLF 55/8/4, SLF 55/8/5 and SLF 55/8/7; and

.2 prepare draft amendments to SOLAS regulation II-1/4, regarding the applicability of subdivision and stability requirements in SOLAS, chapter II-1, parts B-1 to B-4, based on document SLF 55/8/6, and taking into account document SLF 55/8/1.

Report of the SDS Working Group

8.11 Having considered the part of the report of the SDS Working Group (SLF 55/WP.4) dealing with the agenda item, the Sub-Committee approved it in general and took action as outlined hereunder.

Improving the survivability level of passenger ships after damage

8.12 The Sub-Committee noted that the group supported a review of the current damage stability regulations with particular focus on parameters such as the required index R, the survivability factor "s" and any other elements that may emerge after having conducted sound and detailed research analysis of the matter.

8.13 Having considered the group's views on involving the FSA Experts Group on the EMSA and GOALDS research related to survivability of passenger ships, the Sub-Committee decided to refer the views of the group to MSC 92 for consideration and action, as appropriate.

8.14 In this context, the Sub-Committee endorsed the group's view that there is a need for a review of the survivability level of passenger ships after damage within this output, and invited Member Governments and international organizations to submit proposals on how to proceed to SLF 56.

8.15 Subsequently, the Sub-Committee agreed to instruct the correspondence group (see paragraph 8.20) to develop a work plan for a review on the level of survivability of passenger ships after damage, taking into account the current research results such as those, but not limited to, from GOALDS and EMSA (2), including proposed risk control options and cost-benefit analysis contained therein.

Draft amendments to SOLAS chapter II-1 and the related Explanatory Notes

8.16 The Sub-Committee noted the group's view that the draft amendments to SOLAS chapter II-1 should only apply to new ships.

8.17 Subsequently, the Sub-Committee agreed, in principle, to the proposed amendments to SOLAS chapter II-1 and its related Explanatory Notes (SLF 55/WP.4, annex 4), taking into account that the correspondence group (see paragraph 8.20) will further consider them.

8.18 In the context of the above, the Sub-Committee endorsed the group's decision to continue working on the draft amendments to SOLAS chapter II-1 and the related Explanatory Notes after finalizing part 1 of the group's report, with the results to be included in part 2 of the report of the group, to be submitted to SLF 56 immediately after this session, for consideration by the SDS Correspondence Group.

Extension of target completion year

8.19 The Sub-Committee noted that the group could not finalize all the outstanding issues related to the revision of SOLAS chapter II-1 subdivision and damage stability regulations and, therefore, invited the Committee to extend the target completion year for this output to 2014.

Instructions to the SDS Correspondence Group

8.20 Consequently, the Sub-Committee instructed the SDS Correspondence Group established under agenda item 4 (see also paragraphs 4.13 and 13.6), taking into account comments made and decisions taken in plenary during SLF 55 and the outcome of the SDS Working Group (SLF 55/WP.4), to:

.1 finalize the draft amendments to SOLAS chapter II-1 and the related Explanatory Notes;

.2 produce a clean text of the draft amendments to SOLAS chapter II-1, where all agreed changes, including those agreed at SLF 55, are shown as shaded and strike-through text, with the draft amendments separated from the Explanatory Notes;

.3 develop a work plan for a review on the level of survivability of passenger ships after damage, taking into account current research results such as those, but not limited to, from GOALDS and EMSA (2), including proposed risk control options and the cost-benefit analysis contained therein; and

.4 prepare a plan of action, taking into account the progress made during the session, identifying the priorities, time frames and objectives, for the remaining work to be accomplished.

9 DEVELOPMENT OF PROVISIONS TO ENSURE THE INTEGRITY AND UNIFORM IMPLEMENTATION OF THE 1969 TM CONVENTION

9.1 The Sub-Committee recalled that SLF 54 had established a correspondence group on the matter with terms of reference as set out in paragraph 9.8 of document SLF 54/17 and had instructed it to submit a report to this session.

Report of the correspondence group and related submissions

9.2 The Sub-Committee considered the report of the correspondence group (SLF 55/9 and SLF 55/INF.2) and, having approved it in general, noted that the group prepared a very detailed report, including draft unified interpretations to supersede those contained in TM.5/Circ.5 (SLF 55/9, annex 2); a draft Assembly resolution to replace the *Application of recommendation 2 of the International Conference on Tonnage Measurement of Ships, 1969* (resolution A.758(18)) and the *Application of the International Conference on Tonnage Measurement of Ships, 1969, to existing ships* (resolution A.791(19)) (SLF 55/9, annex 3); and a draft Assembly resolution on Reduced gross tonnage for crew and trainee accommodation spaces (SLF 55/INF.2, annex 5). The Sub-Committee agreed with the group's conclusions that:

.1 no further work is necessary to identify areas for improving the existing measurement system of the 1969 TM Convention;

.2 no amendments to the 1969 TM Convention are necessary or appropriate; and

.3 the draft unified interpretations and the draft Assembly resolution provided in annexes 2 and 3 of the group's report (SLF 55/9) should be further developed.

9.3 In this context, the Sub-Committee also considered the following documents:

.1 SLF 55/9/1 (Italy), commenting on the report of the correspondence group and suggesting solutions to ensure the integrity and uniform implementation of the 1969 TM Convention;

.2 SLF 55/9/2 (IACS), commenting on the report of the correspondence group and proposing solutions to issues related to rails and fashion plating for side openings;

.3 SLF 55/9/3 (Germany, India, United States and ITF), proposing further development and implementation of a reduced gross tonnage parameter for accommodation spaces that meet certain minimum requirements and, taking into account the insufficient support for the draft Assembly resolution on Reduced gross tonnage for crew and trainee accommodation spaces (SLF 55/INF.2, annex 5) prepared by the correspondence group, and also taking into account that it lacked important specifics, proposing an amended draft Assembly resolution, drawing on elements of previous proposals in an effort to simplify the identification of eligible accommodation spaces and enhance the overall viability of the parameter;

.4 SLF 55/9/4 (United States), commenting on the report of the correspondence group and, in particular, on the criterion for use of "existing" tonnage, concerning provisions of the TM Convention that allow owners of qualifying existing ships to apply older tonnage breakpoints in international conventions using the ships' pre-existing national gross tonnages, often expressed in terms of gross register tons (GRT);

.5 SLF 55/9/5 (Japan), commenting on the report of the correspondence group, in particular on matters related to the fitting of grates over side/end openings and over deck openings; and

.6 SLF 55/INF.11 (IACS), providing nine explanatory diagrams for inclusion in the draft Unified Interpretations of the 1969 TM Convention, with the aim of further clarifying the interpretations.

9.4 In considering the report of the correspondence group and the above documents, the Sub-Committee noted the following views:

.1 with regard to the draft Assembly resolution on Reduced gross tonnage for crew and trainee accommodation spaces (SLF 55/INF.2, annex 5, and SLF 55/9/3), the following concerns were expressed:

.1 the Assembly resolution would not be of a mandatory character and many ports would not take into account recommendatory measures;

.2 the 1969 TM Convention, as a purely technical instrument, was not the appropriate instrument for consideration of this matter, which primarily addresses crew well-being;

.3 whilst there is a need to ensure adequate provisions for accommodation spaces, including accommodation for trainees and cadets, the size of the space may not be a criterion for quality;

.4 the draft resolution was considered to contain vague expressions, which needed to be addressed; and

.5 the 1969 TM Convention has no definition of "accommodation spaces"; and

.2 a specific quantitative criterion for "substantial" alterations would need to be included in the draft Unified interpretations; however, the working group should discuss the appropriate range for this criterion.

9.5 Subsequently, the Sub-Committee agreed to reconsider the existing criterion in the draft Unified Interpretations of the 1969 TM Convention for "substantial" alterations (SLF 55/9/4), and instructed the working group to consider, as an alternative, introducing a graduated scale. The Sub-Committee also requested the working group to consider the explanatory diagrams contained in document SLF 55/INF.11 for possible inclusion in the draft interpretations.

Establishment of a working group

9.6 Recalling its relevant decision at SLF 54, the Sub-Committee established a Working Group on Development of Provisions to Ensure the Integrity and Uniform Implementation of the 1969 TM Convention and instructed it, taking into account the comments and decisions made in plenary, to:

.1 further develop the draft Unified Interpretations to the 1969 TM Convention, based on annex 2 to document SLF 55/9, taking into account documents SLF 55/9/1, SLF 55/9/2, SLF 55/9/4, SLF 55/9/5, SLF 55/INF.2 and SLF 55/INF.11, and develop a covering draft TM.5 circular;

.2 further develop the draft Recommendation on the use of national tonnage in applying international conventions, and the associated draft Assembly resolution, based on annex 3 to document SLF 55/9;

.3 further consider matters related to reduced gross tonnage for crew and trainee accommodation spaces, taking into account documents SLF 55/9/3 and SLF 55/INF.2, annex 5; and

.4 consider whether there is a need to re-establish the correspondence group and, if so, prepare terms of reference for consideration by the Sub-Committee.

Report of the working group

9.7 Having considered the report of the working group (SLF 55/WP.5), the Sub-Committee approved it in general and took action as outlined hereunder.

Draft Unified Interpretations to the 1969 TM Convention

9.8 The Sub-Committee noted the progress made by the group on the development of draft Unified Interpretations to the 1969 TM Convention (SLF 55/WP.5, annexes 1 and 2).

9.9 In this context, the Sub-Committee noted that the delegation of India, while agreeing with the report of the working group, in its technical content, expressed their concern about certain legal issues related to the development of some of the interpretations. The delegation was of the opinion that any interpretations should be within boundaries set by the text in the international instrument, and, in any case, should not nullify or override the provisions of the instrument. In this context, the Sub-Committee also noted that the delegation was of the view that there are a number of situations with respect to the TM Convention, where the gross tonnage (GT) or the net tonnage (NT) do not realistically depict the physical size of a ship, or its cargo capacity, respectively, as for certain types of ships, or certain modern designs, substantial volumes are likely to be left out of the GT and NT computation, when the rules of the Convention, in its current form, are applied.

9.10 Subsequently, the Sub-Committee noted that, while some agreement was reached in the group on a number of draft Unified Interpretations, they still require further consideration (SLF 55/WP.5, annex 2).

Alterations or modifications which affect the tonnage of existing ships

9.11 The Sub-Committee noted that some members of the group were in favour of establishing a graduated approach involving application of a more restrictive criterion

(e.g. 1%) to larger ships, while applying less restrictive criteria to smaller ships; however, others were of the opinion that the 1 per cent criterion was an adequate option irrespective of the ship's size. The Sub-Committee also noted that the group had discussed approaches that would not result in a large disparity in treatment of nearly identical ships that are close to established breakpoints, such as approaches involving the use of a continuous linear scale, and had concluded that all approaches offered require further investigation and might be developed intersessionally, to enable the gathering and evaluation of more specific information upon which to base an informed recommendation.

Draft Recommendation on the use of national tonnage in applying international conventions

9.12 The Sub-Committee agreed to the draft Assembly resolution on Use of national tonnage in applying international conventions, set out in annex 10, for submission to MSC 92 and MEPC 65, as with a view to approval for submission to A 28 for adoption.

Reduced gross tonnage parameter for accommodation spaces

9.13 The Sub-Committee noted that there was general support in the group for the proposals contained in document SLF 55/9/3 concerning a reduced gross tonnage parameter for accommodation spaces. In this context, the Sub-Committee also noted that there were divergent views in the group regarding the details of implementing such a parameter (SLF 55/WP.5, paragraph 21).

9.14 Subsequently, the Sub-Committee agreed that the Organization's work on matters related to the implementation of a reduced gross tonnage parameter for accommodation spaces should be pursued further.

9.15 Having noted the group's recommendations on how to proceed with the development of a reduced gross tonnage parameter (SLF 55/WP.5, paragraph 22) and views expressed that the matter should be broad, not excluding any possible options; and having noted also that the Maritime Labour Convention (MLC), 2006, only provides minimum standards for new ships, which would be irrelevant to this work, the Sub-Committee invited Member Governments and international organizations to submit comments and proposals on the matter to SLF 56.

Establishment of a correspondence group

9.16 The Sub-Committee, taking into account the progress made at this session, agreed to re-establish the Correspondence Group on the Development of Provisions to Ensure the Integrity and Uniform Implementation of the 1969 TM Convention, under the coordination of Japan and the United States*, and instructed it to:

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.1 further develop draft unified interpretations to the 1969 TM Convention, based on annex 2 to document SLF 55/WP.5 and annexes 1 and 2 to document SLF 55/9 (draft interpretations not covered by document SLF 55/WP.5), and develop a covering draft TM.5 circular;

.2 further consider matters related to the possible implementation of a reduced gross tonnage parameter for accommodation spaces, taking into account documents SLF 55/WP.5 and SLF 55/9/3;

.3 further consider approaches to tonnage implications of alterations and modifications to existing ships which affect gross tonnage, as referred to in document SLF 55/WP.5; and

.4 submit a report to SLF 56.

10 DEVELOPMENT OF AMENDMENTS TO PART B OF THE 2008 IS CODE ON TOWING AND ANCHOR-HANDLING OPERATIONS

10.1 The Sub-Committee recalled that SLF 54, having considered documents SLF 54/10 and SLF 54/INF.5 (Norway) and SLF 54/INF.17 (Finland), had invited Member Governments and international organizations to submit comments and proposals, based on the draft amendments set out in the annex to document SLF 54/10, to this session.

Proposed amendments to the 2008 IS Code

10.2 The Sub-Committee had for its consideration the following documents:

.1 SLF 55/10 (Denmark, Norway, United States, Vanuatu, IMCA), presenting the outcome of their work on the draft amendments to part B of the 2008 IS Code concerning towing and anchor-handling operations, further refining and developing the draft amendments contained in document SLF 54/10 and including considerations on lifting operations; and

.2 SLF 55/INF.4 (Norway), providing background information on the principles for unified stability criteria and operational guidance for ships engaged in anchor-handling operations, proposed to be incorporated in part B of the 2008 IS Code.

10.3 In considering the above documents, the Sub-Committee noted, in particular, the following views:

.1 the recommendations on lifting appliances should also cover lifting in other modes than just lifting over the A-frame;

.2 the guidance on anchor-handling should also apply to other operations that have a similar effect on the ship;

.3 the identification by name of particular operations should be carefully considered. Some of the operations included in the draft definition of "anchor-handling", for example, could be carried out using different types of equipment, which in many cases will not exert the same force on the ship as an anchor-handling operation; and

.4 the scope of application of the draft amendments should be carefully considered, since the proposed amendments are to paragraphs of the recommendatory part B of the Code which are referred to in part A, making those amendments, in effect, mandatory.

Instructions to the IS Working Group

10.4 Having considered the above views, the Sub-Committee instructed the IS Working Group, established under agenda item 3, to further consider the proposed amendments to the 2008 IS Code, as contained in the annexes to document SLF 55/10, taking into account the comments made in plenary and document SLF 55/INF.4, and advise the Sub-Committee accordingly.

Report of the IS Working Group

10.5 Having considered the part of the report of the IS Working Group (SLF 55/WP.3) dealing with this agenda item, the Sub-Committee approved it in general and took action as outlined hereunder.

10.6 The Sub-Committee noted the deliberations of the group regarding the proposed amendments to part B of the 2008 IS Code; agreed, in principle, to the additional draft amendments prepared by the group on towing, lifting and anchor-handling operations (SLF 55/WP.3, annexes 4 to 7); and further endorsed the recommendation by the group to refer pending issues to the correspondence group, if established.

10.7 In this connection, the Sub-Committee also endorsed the group's recommendation to revise the title of this output to include lifting operations, as follows: "Development of amendments to part B of the 2008 IS Code on towing, lifting and anchor-handling operations".

Instructions to the IS Correspondence Group

10.8 Consequently, the Sub-Committee instructed the IS Correspondence Group established under agenda item 3 (see also paragraphs 3.14 and 13.6), taking into account comments made and decisions taken in plenary during SLF 55 and the outcome of the IS Working Group (SLF 55/WP.3), to further consider the proposed amendments to the 2008 IS Code concerning towing, lifting and anchor-handling operations.

11 CONSIDERATION OF IACS UNIFIED INTERPRETATIONS

11.1 The Sub-Committee recalled that MSC 78 had instructed the sub-committees to consider any submitted IACS unified interpretations with a view to developing appropriate IMO interpretations, if deemed necessary.

Application of the 1988 Load Lines Protocol, regulation 36(6) relating to trunks

11.2 The Sub-Committee considered document SLF 55/11 (IACS), seeking clarification on the correct interpretation of the words "continuous hatchways" in regulation 36(6) of the 1988 Load Lines Protocol, as amended by resolution MSC.143(77). IACS was of the view that a uniform approach should be developed, taking into account that where more than one hatchway is fitted, there may be different approaches in applying the requirements of the regulation.

11.3 In this context, the Sub-Committee agreed that of the three illustrated arrangements, only figure 3 clearly qualified as a continuous hatchway, noting that the methods proposed to evaluate the arrangements shown in figures 1 and 2 appeared to be based on an equivalency approach, where the effective lengths of the individual hatchways were summed together to give a single length value. Since no explanations of the basis for equivalency of the figures 1 and 2 methods were given, there was no assurance that the summation of individual hatchway lengths, with exposed cross-deck areas between them, was as effective in reducing boarding seas as the continuous length of a single trunk.

11.4 Following discussion, the Sub-Committee invited IACS to consider developing a unified interpretation of the words "continuous hatchways" in regulation 36(6) of the 1988 Load Lines Protocol, as amended by resolution MSC.143(77), taking into account the comments made.

12 DEVELOPMENT OF AMENDMENTS TO THE CRITERION FOR MAXIMUM ANGLE OF HEEL IN TURNS OF THE 2008 IS CODE

12.1 The Sub-Committee recalled that SLF 54 had considered document SLF 54/12 (RINA), proposing amendments to chapter 3 of part A of the 2008 IS Code, based on the view that the criterion for the angle of heel in turns in the Code takes no account of the ship's turning ability and appears to assume a turning diameter that is double of that recommended by the *Standards for ship manoeuvrability* (resolution MSC.137(76)). SLF 54 also noted RINA's view that the formula required to be employed is not valid for some hull types, that the criterion conflicts with the requirements of the 2000 HSC Code, and that it guarantees no minimum stability margin in full-helm turns.

12.2 The Sub-Committee also recalled that SLF 54, while noting that the proposed amendments were supported in principle, was of the view that further thorough study of the matter was necessary, and had invited Member Governments and international organizations to submit comments and proposals on the draft amendments set out in annex 1 to document SLF 54/12 to this session.

Proposed amendments to the 2008 IS Code

12.3 The Sub-Committee had for its consideration document SLF 55/12 (RINA), containing revised proposals for amendments to chapter 3 of part A of the 2008 IS Code, which took into account the views expressed at SLF 54, and inviting the Sub-Committee to consider whether limits should be applied to both the initial transient maximum and/or the "steady-state" heel angle. RINA was of the opinion that the current formula was intended to address the steady-state heel angle and included an implicit assumption regarding the reduction in speed from the approach speed; and that only in this way the existing criterion could be reconciled with the standards for ship manoeuvrability.

12.4 In considering the proposed amendments, the Sub-Committee noted with appreciation information provided by the delegation of Japan on actual trial data of a cruise ship and of ro-pax ships they had used to examine the RINA proposal. These showed that the measured steady heel angle due to turning is usually about 4°, which is much smaller than 10°, meaning the current empirical formula used in the 2008 IS Code works well and there was no need for additional requirements. On the other hand, the maximum roll angle due to turning ranges from 10° to 14°, meaning that the requirement of 15° could be critical to cruise ship and ro-pax designs. In the case of ro-pax ships, sea trials are not normally executed under full load condition, making it essential to extrapolate the maximum roll angle under full load condition from that not under the full load condition. Since the maximum roll angle cannot be determined with the balance of heeling moment and GZ, the use of a manoeuvring simulation model is required. Normally, data for manoeuvring simulation

models are not available for these ships, because they are directionally stable. In addition, the maximum roll angle occurs with instantaneous roll moments like wave-induced roll moments so that the critical heel angle value for this situation should be the angle of vanishing stability in place of the angle of maximum stability and thus the acceptable value for the maximum roll angle is much larger than 15°. This indicates that these ships are in no danger of capsizing due to turning. In conclusion, the delegation was of the opinion that the revision of the requirement of the heel angle due to turning for passenger ships is not necessary and could simply increase the costs and time for their design.

12.5 The Sub-Committee also noted the concerns of some delegations that the proposal may not be practical for sea trials under full load and that the proposed figure of 15° for the maximum transient outward heel angle was too large.

Instructions to the IS Working Group

12.6 Having considered the above views, the Sub-Committee instructed the IS Working Group, established under agenda item 3, taking into account the comments made in plenary, to further consider the draft amendments to chapter 3 of part A of the 2008 IS Code, based on the annex to document SLF 55/12.

Report of the IS Working Group

12.7 Having considered the part of the report of the IS Working Group (SLF 55/WP.3) dealing with the agenda item, and having noted that, due to time constraints, the group was unable to consider the draft amendments to chapter 3 of part A of the 2008 IS Code, based on the annex to document SLF 55/12, the Sub-Committee invited Member Governments and international organizations to submit comments and proposals on the draft amendments set out in the annex to document SLF 55/12 to SLF 56.

13 DEVELOPMENT OF A MANDATORY CODE FOR SHIPS OPERATING IN POLAR WATERS

13.1 The Sub-Committee noted that DE 56 had referred the corresponding chapters of the draft International Code of safety for ships operating in polar waters (Polar Code) to COMSAR 16, FP 56, NAV 58, SLF 55 and STW 43 for review, together with relevant explanatory comments (DE 56/WP.4, annex 2), for advice to DE 57. In this context, document DE 57/11 was also referred to SLF 55, as it provides additional information regarding the proposed categorization of ships operating in polar waters. The Sub-Committee also noted that MSC 90 had concurred with the actions taken by the DE Sub-Committee.

13.2 The Sub-Committee had for its consideration the following documents:

.1 SLF 55/13 (Secretariat), reporting on the outcome of DE 56 and MSC 90 with regard to the development of the mandatory Polar Code and including in the annex extracts from the explanatory comments and chapters 3 and 4 of the draft Code prepared by DE 56; and

.2 SLF 55/13/1 (United States), providing comments on document SLF 55/13, in particular concerning ice accretion, intact stability, stability in damaged condition and subdivision.

13.3 Having considered the above documents, the Sub-Committee noted, in particular, the following views:

.1 requirements concerning ice accretion should be included in the draft Polar Code, without the need for amendments to the 2008 IS Code. Consideration should also be given to the fact that ice accretion depends on operational and environmental conditions and would, therefore, be voyage-specific. It was noted that ice accretion is dealt with in part B of the IS Code, and that the matter should be further considered by the IS Working Group; and

.2 regarding double bottom requirements, the draft Code should only cover any requirements above and beyond those contained in the SOLAS Convention.

Instructions to the IS and SDS Working Groups

13.4 Having considered the above views, the Sub-Committee instructed the IS and SDS Working Groups, established under agenda items 3 and 7, respectively, taking into account the comments made in plenary, to consider the proposed text of chapters 3 and 4 of the draft Polar Code, as contained in the annex to documents SLF 55/13 and DE 57/11, taking into account document SLF 55/13/1, and advise the Sub-Committee accordingly. In this context, the Chairmen of the working groups were authorized to exchange information, in case issues were identified falling under the other group's purview, as appropriate.

Report of the working groups

13.5 Having considered the parts of the report of the IS and SDS Working Groups (SLF 55/WP.3 and SLF 55/WP.4) dealing with the agenda item, and having noted that, due to time constraints, the groups were unable to consider the proposed text of chapters 3 and 4 of the draft Polar Code, as contained in the annex to document SLF 55/13, the Sub-Committee agreed to refer the matter to the IS and SDS Correspondence Groups.

Instructions to the IS and SDS Correspondence Groups

13.6 Subsequently, the Sub-Committee instructed the IS and SDS Correspondence Groups, established under agenda items 3 and 4 (see also paragraphs 3.14 and 4.13), respectively, to consider the proposed text of chapters 3 and 4 of the draft Polar Code, as contained in the annex to documents SLF 55/13 and DE 57/11, taking into account document SLF 55/13/1, and advise the Sub-Committee accordingly. In this context, the coordinators of the correspondence groups were authorized to exchange information, in case issues were identified falling under the other group's purview, as appropriate.

14 BIENNIAL AGENDA AND PROVISIONAL AGENDA FOR SLF 56

14.1 In considering matters related to the biennial agenda, provisional agenda and arrangements for its next session, the Sub-Committee recalled that:

.1 MSC 91 requested all sub-committees to prepare their respective proposals for the High-level Action Plan for the coming biennium, for consideration by MSC 92, for inclusion in the Committee's proposals to C 110 for the High-level Action Plan for 2014-2015; and

.2 with regard to the proposed Sub-Committee restructuring, the Sub-Committee should still prepare its biennial and provisional agendas accordingly, bearing in mind that they are subject to change pending the decisions of MEPC 65, MSC 92 and C 110.

Proposals for the biennial agenda for 2014-2015 and provisional agenda for SLF 56

14.2 Taking into account the progress made at the session and the instructions of MSC 91, the Sub-Committee prepared its proposed biennial agenda for 2014-2015 (SLF 55/WP.2, annex 1) and the provisional agenda for SLF 56 (SLF 55/WP.2, annex 2), as set out in annexes 11 and 12, respectively, for consideration by MSC 92.

Arrangements for the next session

14.3 The Sub-Committee agreed to establish at its next session working groups on the following subjects:

.1 intact stability;

.2 subdivision and damage stability; and

.3 development of provisions to ensure the integrity and uniform implementation of the 1969 TM Convention.

14.4 The Sub-Committee established correspondence groups on the following subjects, due to report to SLF 56:

.1 intact stability;

.2 development of provisions to ensure the integrity and uniform implementation of the 1969 TM Convention; and

.3 subdivision and damage stability, including:

.1 revision of SOLAS chapter II-1 subdivision and damage stability regulations; and

.2 development of guidelines on safe return to port for passenger ships.

Status of planned outputs in the High-level Action Plan

14.5 The Sub-Committee, noting that the status of planned outputs will no longer be produced as part of a working paper during the session in order to avoid a duplication of work, invited MSC 92 to note the status of planned outputs, as set out in annex 13.

Date of next session

14.6 The Sub-Committee noted the information provided by the Assistant Secretary-General that the date of the next meeting will be announced in due course, pending the decisions by MSC 92 and C 110 on the proposed Sub-Committee restructuring*.

15 ELECTION OF CHAIRMAN AND VICE-CHAIRMAN FOR 2014

15.1 In light of the decisions of C 109 and MSC 91 regarding the potential Sub-Committee restructuring, the Sub-Committee did not elect a Chairman and Vice-Chairman for 2014.

* Whenever a reference to SLF 56 appears in this report, it should be construed as a reference to the first session of the new appropriate Sub-Committee, if approved by the Committees and the Council.

16 ANY OTHER BUSINESS

Performance standards for electronic inclinometers

16.1 The Sub-Committee considered document SLF 55/16 (Secretariat), reporting on the outcome of NAV 58 on matters related to the draft Performance standards for electronic inclinometers, and noted that NAV 58 had recalled that NAV 57 had agreed that further consideration was needed on whether an electronic inclinometer:

.1 should provide an indication of the acceleration forces due to rolling that could be expected at the place of installation;

.2 might optionally provide a warning for parametric and/or synchronous roll detection;

.3 might optionally provide a warning for indicating that a set heel angle had been exceeded; and

.4 should also be capable of operating from the ship's main and emergency source of electrical power.

16.2 The Sub-Committee also noted that NAV 58 had endorsed the draft Performance standards and the associated draft MSC resolution, and forwarded it to the Sub-Committee for any advice on appropriate criteria for alarming functionality of inclinometers. Subsequently, NAV 58 had requested SLF 55 to review the draft Performance standards and the associated draft MSC resolution, and submit them directly to MSC 92 for adoption.

16.3 Following an in-depth discussion, the Sub-Committee agreed that there was no need for an alarm function of inclinometers concerning parametric roll and/or synchronous rolling detection and, therefore, decided that paragraph 8.1 of the draft Performance standard should be deleted. Subsequently, the Sub-Committee agreed to the draft Performance standards for electronic inclinometers, and the associated draft MSC resolution, as set out in annex 14, for submission to MSC 92 for adoption.

2012 Cape Town Agreement – Procedure for calculating the number of fishing vessels

16.4 The Sub-Committee noted that MSC 91 had noted with appreciation the successful outcome of the 2012 International Conference on the Safety of Fishing Vessels held from 9 to 11 October 2012 in Cape Town, South Africa (MSC 91/2/3), in particular the adoption of the 2012 Cape Town Agreement, and with reference to Conference resolution 5:

.1 had instructed SLF 55 to develop a procedure for calculating the number of fishing vessels of each Contracting State of the 2012 Cape Town Agreement, as a matter of high-priority under its agenda item on "Any other business", for submission to MSC 92 for approval; and

.2 had invited Member Governments and international organizations to urgently consider the matter and submit relevant comments and proposals to SLF 55.

16.5 In this connection, the Sub-Committee had for its consideration the following documents:

.1 SLF 55/16/1 (South Africa), proposing a procedure for calculating the number of fishing vessels of 24 m in length and over of each Contracting State of the 2012 Cape Town Agreement;

.2 SLF 55/16/2 (Secretariat), reporting on the outcome of MSC 91 and providing a draft procedure for calculating the number of fishing vessels of each Contracting State of the 2012 Cape Town Agreement, in order to facilitate the discussion on the matter;

.3 SLF 55/16/5 (FAO), providing information on records of fishing vessels that are maintained by FAO or Regional Fisheries Bodies (RFBs); and

.4 SLF 55/16/6 (Japan), providing comments on the procedure for calculating the number of fishing vessels of each Contracting State of the 2012 Cape Town Agreement by the Depositary, and proposing that the procedure should be developed taking into account the number of fishing vessels of Member States already reported to the Organization, as listed in table 4 of document SFV-P/CONF.1/7.

16.6 Having considered the above documents, the Sub-Committee noted that many delegations supported the use of the procedure proposed by the Secretariat (SLF 55/16/2) as the basis for the discussions.

16.7 The subsequent considerations centred on the question of how the number of fishing vessels of existing Parties to the 1993 Torremolinos Protocol which utilized the simplified accession procedure in Article 3 of the Agreement (paragraph 3.2 of the draft procedure) should be determined, and the Sub-Committee noted that:

.1 some delegations were not in favour of paragraph 3.2 (SLF 55/16/2, annex), as they considered the information provided to the Depositary by Parties to the 1993 Torremolinos Protocol at the time of accession was not applicable to the 2012 Cape Town Agreement, due to the fact that the information was out of date and did not address ships operating on the high seas. They were of the view that any Member Government, when expressing their consent to be bound by the Agreement, may communicate to the Depositary the number of fishing vessels of 24 m in length and over under their flag, operating on the high seas; and

.2 other delegations were of the view that the information provided by Parties to the Protocol at the time of accession should be utilized for determining the figure.

16.8 In light of the above, the Sub-Committee agreed that paragraph 3.2 of the draft Procedure should be re-drafted to take the above views into account. The Sub-Committee also urged Member Governments to submit, when signing the Agreement, to the Depositary the number of fishing vessels of 24 m in length and over under their flag, authorized to operate on the high seas.

Establishment of a drafting group

16.9 Following discussion, and recalling the relevant instruction of MSC 91, the Sub-Committee established a drafting group and instructed it, taking into account the comments and decisions made in plenary, to develop a procedure for calculating the number of fishing vessels of each Party to the 2012 Cape Town Agreement and an associated draft MSC resolution, based on document SLF 55/16/2 and taking into account documents SLF 55/16/1, SLF 55/16/5 and SLF 55/16/6.

Report of the drafting group

16.10 Having considered the report of the drafting group (SLF 55/WP.7), the Sub-Committee agreed to a draft MSC resolution on Procedure for calculating the number of fishing vessels of each Contracting State to the Cape Town Agreement of 2012 on the Implementation of the Provisions of the Torremolinos Protocol of 1993 relating to the Torremolinos International Convention for the Safety of Fishing Vessels, 1977, by the Depositary, as set out in annex 15, for submission to MSC 92 for adoption.

Outcome of BLG 16

Damage stability standard for offshore support vessels (OSVs) that carry limited amounts of hazardous and noxious liquid substances in bulk

16.11 The Sub-Committee considered the part of document SLF 55/2 (Secretariat) reporting on the outcome of BLG 16 on matters related to the damage stability standard for OSVs carrying limited amounts of hazardous and noxious liquid substances in bulk and noted that BLG 16 had noted that SLF 54, having considered document SLF 54/7/1 (United States) dealing with the matter, had agreed to await a request from the BLG Sub-Committee seeking advice on damage stability criteria for such vessels. Subsequently, BLG 16 invited the Sub-Committee to consider the issue further and advice BLG 18 accordingly.

16.12 The Sub-Committee considered document SLF 55/16/3 (United States), proposing a damage stability standard for OSVs carrying limited amounts of hazardous and noxious liquid substances in bulk and stressing the importance of compatibility and alignment between the damage stability standards in the *Adoption of the Guidelines for the design and construction of offshore supply vessels, 2006* (resolution MSC.235(82), as amended) and the future OSV Chemical Code for the carriage of limited amounts of hazardous and noxious liquid substances in bulk on OSVs, currently under development in the BLG Sub-Committee.

16.13 In this context, the Sub-Committee noted the views of the delegation of Norway that the draft OSV Chemical Code would allow the carriage of products with more severe carriage requirements on board OSVs than is allowed by the *Guidelines for the transport and handling of limited amounts of hazardous and noxious liquid substances in bulk on offshore support vessels* (resolution A.673(16)). In this context, the delegation was of the opinion that the damage stability requirements should account for the additional risk. Therefore, they were concerned that the damage extents given in document SLF 55/16/3 were minor, especially for carriage of larger amounts and carriage of products with more severe carriage requirements than those products covered by the Guidelines. Compared to the current Guidelines and the IBC Code, the safety level for the carriage of these products on board OSVs would be reduced.

16.14 Notwithstanding the above, and following an in-depth discussion, the Sub-Committee agreed to accept the proposal by the United States and requested the Secretariat to make the necessary editorial modifications to the tables set out in the annex to document SLF 55/16/3 and convert them into text, as set out in annex 16, and inform BLG 18 accordingly.

Harmonizing distance criteria for gas fuel tanks and assumed penetration depth providing appropriate collision protection and damage stability

16.15 The Sub-Committee considered the part of document SLF 55/2 (Secretariat) reporting on the outcome of BLG 16 on matters related to harmonizing distance criteria for gas fuel tanks and assumed penetration depth providing appropriate collision protection and damage stability, and noted that BLG 16 had noted the view of the Working Group on

Development of Provisions for Gas-fuelled Ships on possible requirements for distance from shell plating to fuel tank in chapter 10 of the draft Code and had agreed to request SLF 55 to evaluate the data contained in documents BLG 16/6/5 and BLG 16/6/6 and provide guidance on the application of these and other relevant data in determining appropriate distance criteria. The Sub-Committee also noted that BLG 17 had referred the related documents BLG 17/8/7 (CESA) and BLG 17/INF.14 (Germany) to SLF 55 for comment and advice, as appropriate.

16.16 The Sub-Committee had for its consideration the following documents:

.1 SLF 55/16/4 (CESA), presenting a proposal to harmonize the damage assumptions and subdivision according to SOLAS regulation II-1/8 with regulation 5.3.4.1 of the draft IGF Code (BLG 17/8/1), under development in the BLG Sub-Committee, providing both protection and flexibility and taking into account that the location criteria for gas fuel tanks in the draft IGF Code are based on the IGC Code damage assumptions; and

.2 SLF 55/INF.12 (Germany, Norway), providing the results of a safety assessment for collisions relating to the penetration of LNG tanks, addressing the issue of LNG tank location and the impact this will have on the risk to tankers and containerships using LNG as fuel.

16.17 Following discussion, the Sub-Committee agreed to instruct the SDS Working Group, established under agenda item 7, assigning the lowest priority to this specific task and taking into account comments and decisions made in plenary, to consider appropriate risk-based distance criteria for gas fuel tanks providing appropriate collision protection, taking into account documents SLF 55/16/4, SLF 55/INF.12, BLG 16/6/5, BLG 16/6/6, BLG 17/8/7 and BLG 17/INF.14, and advise the Sub-Committee accordingly.

16.18 Having considered the part of the report of the SDS Working Group (SLF 55/WP.4) related to this matter, and noting that, due to time constraints and the volume of the outstanding items with regard to the revision of SOLAS chapter II-1, the group did not consider this issue, the Sub-Committee invited Member Governments and international organizations to submit comments and proposals on appropriate risk-based distance criteria for gas fuel tanks providing appropriate collision protection to SLF 56.

Development of the revised IGC Code

16.19 The Sub-Committee considered document SLF 55/16/7 (Secretariat) reporting on the outcome of BLG 16 regarding the development of the revised IGC Code and noted that BLG 16, in considering the report of the Drafting Group on Development of the Revised IGC Code (BLG 16/WP.7), had endorsed a list of sections of the draft Code to be considered by other IMO bodies for their input (BLG 16/7, annex 2) and had forwarded sections 2.2 to 2.7 of chapter 2 of the draft revised Code, as set out in the annex to document BLG 17/9, to SLF 55 for review and advice.

16.20 Following discussion, the Sub-Committee agreed to instruct the Drafting Group on Development of mandatory carriage requirements for stability instruments on board tankers, established under agenda item 6, taking into account comments and decisions made in plenary, to consider sections 2.2 to 2.7 of chapter 2 of the draft IGC Code, as set out in the annex to document BLG 17/9, and advise the Sub-Committee accordingly.

16.21 Having considered the part of the report of the drafting group (SLF 55/WP.6) related to this matter, the Sub-Committee agreed to the draft modifications to sections 2.2 to 2.7 of chapter 2 of the draft IGC Code, as set out in annex 17, for submission to MSC 92 for consideration in conjunction with the approval of the draft revised Code.

Review and reform of the Organization – restructuring of the sub-committees

16.22 The Sub-Committee, having noted the information provided by the Secretariat regarding the discussions at C 109 and MSC 91 on matters related to the review and reform of the Organization (C 109/D and MSC 91/22), was invited by the Assistant Secretary-General to comment on the proposed amalgamation of the DE, FP and SLF Sub-Committees into two new technical Sub-Committees (MSC 91/19/9).

16.23 The views expressed were noted with appreciation by the Assistant Secretary-General and he informed the Sub-Committee that they would be taken into account when preparing the detailed proposal requested by MSC 91 regarding the proposed names, terms of reference, provisional agendas, biennial agendas, cost-benefit analysis and meeting dates for each body, for consideration at MEPC 65 and MSC 92.

Statement by the delegation of Indonesia concerning lifeboat casualty

16.24 The Sub-Committee noted information provided by the delegation of Indonesia on a very recent incident of a passenger cruise ship involving one of its lifeboats which accidentally fell into the sea during an emergency drill operation, causing five crew members to lose their lives, three of them Indonesians, and three others being injured in the accident. The delegation expressed deepest condolences and sympathy to all of the victims of the accident and to their families and highly appreciated the work of those who were involved in the rescue operation and the ongoing casualty investigation. The delegation was of the opinion that, following this accident, operational procedures for lifeboat drills and exercises should be evaluated and strengthened to the highest standard, with consideration of good seamanship, as well as practicability in the future. Finally, the delegation expressed its gratitude to all relevant parties for the necessary actions taken with regard to safety-related matters.

17 ACTION REQUESTED OF THE COMMITTEES

17.1 The Maritime Safety Committee, at its ninety-second session, is invited to:

.1 adopt the draft MSC resolution on Revised Recommendation on a standard method for evaluating cross-flooding arrangements, and note that calculations to evaluate cross-flooding arrangements performed before the adoption of the Revised Recommendation remain valid, and that calculations for ships constructed on or after the date of the adoption of the Revised Recommendation should follow the latter (paragraph 4.9 and annex 1);

.2 approve the draft MSC circular on Guidelines for verification of damage stability requirements for tankers (paragraph 5.7 and annex 2);

.3 approve the draft amendments to the Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (BCH Code) with a view to adoption at MSC 93 (paragraph 6.9 and annex 4);

.4 approve the draft amendments to the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code), with a view to adoption at MSC 93 (paragraph 6.10 and annex 5);

.5 approve the draft amendments to the Code for Existing Ships Carrying Liquefied Gases in Bulk (EGC Code), with a view to adoption at MSC 93 (paragraph 6.11 and annex 6);

.6 approve the draft amendments to the Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (GC Code), with a view to adoption at MSC 93 (paragraph 6.12 and annex 7);

.7 approve the draft amendments to the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), with a view to adoption at MSC 93 (paragraph 6.13 and annex 8);

.8 approve the draft amendments to the *Survey Guidelines under the Harmonized System of Survey and Certification (HSSC), 2011* (resolution A.1053(27)), with a view to subsequent adoption, for referral to the FSI Sub-Committee for inclusion in the appropriate revision of the HSSC Guidelines once the associated amendments to mandatory instruments have entered into force (paragraph 6.14 and annex 9);

.9 consider the referral of the EMSA and GOALDS research related to the survivability level of passenger ships after damage to the FSA Experts Group, and take action as appropriate (paragraphs 8.12 to 8.15);

.10 approve the draft Assembly resolution on Use of national tonnage in applying international conventions, with a view to adoption at A 28 (paragraph 9.12 and annex 10);

.11 note that matters related to the proposed text of chapters 3 and 4 of the draft Polar Code were forwarded to the IS and SDS Correspondence Groups for further consideration and reporting to SLF 56 (paragraph 13.6);

.12 approve the updated biennial agenda of the Sub-Committee for the 2014-2015 biennium and note the items on the Committee's post-biennial agenda that fall under the purview of the Sub-Committee (paragraph 14.2 and annex 11);

.13 approve the draft provisional agenda for SLF 56 (paragraph 14.2 and annex 12);

.14 note the report on the status of the Sub-Committee's planned outputs for the 2012-2013 biennium and take action as appropriate (paragraph 14.5 and annex 13);

.15 adopt the draft MSC resolution on Performance standards for electronic inclinometers (paragraph 16.3 and annex 14);

.16 adopt the draft MSC resolution on Procedure for calculating the number of fishing vessels of each Contracting State to the Cape Town Agreement of 2012 on the Implementation of the Provisions of the Torremolinos Protocol of 1993 relating to the Torremolinos International Convention for the Safety of Fishing Vessels, 1977, by the Depositary (paragraph 16.10 and annex 15);

.17 endorse the action taken by the Sub-Committee on matters related to a proposed damage stability standard for OSVs carrying limited amounts of hazardous and noxious liquid substances in bulk, and note the text referred to BLG 18 for consideration (paragraph 16.14 and annex 16);

.18 note that due to time constraints the SDS Working Group did not consider matters related to appropriate risk-based distance criteria for gas fuel tanks providing appropriate collision protection, which was referred to the Sub-Committee by BLG 16 and BLG 17; and also note that the Sub-Committee invited Member Governments and international organizations to submit comments and proposal on this matter to SLF 56 (paragraph 16.18);

.19 consider the proposed modifications to sections 2.2 to 2.7 of chapter 2 of the draft IGC Code, in conjunction with the approval of the draft revised IGC Code (paragraph 16.21 and annex 17); and

.20 approve the report in general.

17.2 The Marine Environment Protection Committee, at its sixty-fifth session, is invited to:

.1 approve the draft amendments to MARPOL Annex I, with a view to adoption at MEPC 66 (paragraph 6.8 and annex 3);

.2 approve the draft amendments to the Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (BCH Code) with a view to adoption at MEPC 66 (paragraph 6.9 and annex 4);

.3 approve the draft amendments to the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code), with a view to adoption at MEPC 66 (paragraph 6.10 and annex 5);

.4 approve the draft amendments to the Survey Guidelines under the Harmonized System of Survey and Certification (HSSC), 2011 (resolution A.1053(27)), with a view to subsequent adoption, for referral to the FSI Sub-Committee for inclusion in the appropriate revision of the HSSC Guidelines once the associated amendments to mandatory instruments have entered into force (paragraph 6.14 and annex 9); and

.5 approve the draft Assembly resolution on Use of national tonnage in applying international conventions, with a view to adoption at A 28 (paragraph 9.12 and annex 10).

***

ANNEX 1

DRAFT MSC RESOLUTION

ADOPTION OF THE REVISED RECOMMENDATION ON A STANDARD METHOD FOR EVALUATING CROSS-FLOODING ARRANGEMENTS

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.266(VIII), by which the Assembly, at its eighth session, adopted the *Recommendation on a standard method for establishing compliance with the requirements for cross-flooding arrangements* in passenger ships,

RECALLING FURTHER resolution MSC.245(83), by which it, at its eighty-third session, adopted the *Recommendation on a standard method for evaluating cross-flooding arrangements*,

NOTING that the above *Recommendation on a standard method for evaluating cross-flooding arrangements* needed to be revised and improved, based on recent research results regarding cross-flooding,

RECOGNIZING the need to establish a methodology for evaluating cross-flooding arrangements on ships subject to the applicable subdivision and damage stability requirements of SOLAS chapter II-1 to ensure uniform treatment of cross-flooding and equalization arrangements,

HAVING CONSIDERED, at its [ninety-second session], the *Revised Recommendation on a standard method for evaluating cross-flooding arrangements*, prepared by the Sub-Committee on Stability and Load Lines and on Fishing Vessels Safety, at its fifty-fifth session,

1. ADOPTS the *Revised Recommendation on a standard method for evaluating cross-flooding arrangements*, the text of which is set out in the annex to the present resolution;

2. INVITES Governments to apply the annexed Revised Recommendation to ships constructed on or after [*date of adoption*] and to bring it to the attention of all parties concerned.

***

ANNEX

REVISED RECOMMENDATION ON A STANDARD METHOD FOR EVALUATING CROSS-FLOODING ARRANGEMENTS

Table of contents

1 Definitions

$\sum \boldsymbol{k}$: Sum of friction coefficients in the considered cross-flooding arrangement.

s (m^2): Cross-section area of the cross-flooding pipe or duct. If the cross-section area is not circular, then:

$$s_{equiv} = \frac{\pi \cdot D_{equiv}^2}{4}$$

where:

$$D_{equiv} = \frac{4 \cdot 4}{p}$$

A = actual cross-section area
p = actual cross-section perimeter

$\boldsymbol{\theta_0}(°)$: Angle before commencement of cross-flooding. This assumes that the cross-flooding device is fully flooded but that no water has entered into the equalizing compartment on the opposite side of the damage (see appendix 1).

$\boldsymbol{\theta_f}(°)$: Heel angle at final equilibrium ($\boldsymbol{\theta_f} \leq \boldsymbol{\theta}$).

$\boldsymbol{\theta}(°)$: Any angle of heel between the commencement of cross-flooding and the final equilibrium at a given time.

$\boldsymbol{W_f}(\boldsymbol{m^3})$: Volume of water which is used to bring the ship from commencement of cross-flooding $\boldsymbol{\theta_0}$ to final equilibrium $\boldsymbol{\theta_f}$.

$\boldsymbol{W_\theta}(\boldsymbol{m^3})$: Volume of water which is used to bring the ship from any angle of heel θ to the final equilibrium $\boldsymbol{\theta_f}$.

$\boldsymbol{H_0}(\boldsymbol{m})$: Head of water before commencement of cross-flooding, with the same assumption as for $\boldsymbol{\theta_0}$.

$\boldsymbol{H_\theta}(\boldsymbol{m})$: Head of water when any angle of heel θ is achieved.

$\boldsymbol{h_f}(\boldsymbol{m})$: Final head of water after cross-flooding ($\boldsymbol{h_f} = \boldsymbol{0}$, when the level inside the equalizing compartment is equal to the free level of the sea).

***g* (m/s²)**: The acceleration due to gravity (9.81 m/s²).

2 Formulae

2.1 Time required from commencement of cross-flooding $\boldsymbol{\theta_0}$ to the final equilibrium $\boldsymbol{\theta_f}$:

$$T_f = \frac{2W_f}{S \cdot F} \cdot \frac{1}{\sqrt{2gH_0}} \cdot \frac{1}{\left(1 + \sqrt{\frac{h_f}{H_0}}\right)}$$

2.2 Time required to bring the ship from any angle of heel θ to the final equilibrium $\boldsymbol{\theta_f}$:

$$T_\theta = \frac{2W_\theta}{S \cdot F} \cdot \frac{1}{\sqrt{2gH_\theta}} \cdot \frac{1}{\left(1+\sqrt{\frac{h_f}{H_\theta}}\right)}$$

2.3 Time required from commencement of cross-flooding $\boldsymbol{\theta_0}$ until any angle of heel θ is achieved:

$$T = T_f - T_\theta$$

2.4 Dimensionless factor of reduction of speed through an equalization device, being a function of bends, valves, etc. in the cross-flooding system:

$$F = \frac{1}{\sqrt{(\sum k_i)+1}}$$

where F is not to be taken as more than 1.

Values for k can be obtained from appendix 2 or other appropriate sources such as computational fluid dynamics (CFD) or model testing. If other appropriate sources are used, then the +1 factor in the formulae may not be appropriate. CFD can also be used to evaluate the discharge coefficient for the whole cross-flooding duct.

2.5 Cross-flooding through successive devices of different cross-section:

If the same flow crosses successive flooding devices of cross-section S_1, S_2, S_3... having corresponding friction coefficients k_1, k_2, k_3..., then the total k coefficient referred to S_1 is:

$$\sum \boldsymbol{k} = \boldsymbol{k_1} + \boldsymbol{k_2} \cdot \boldsymbol{S_1^2/S_2^2} + \boldsymbol{k_3} \cdot \boldsymbol{S_1^2/S_3^2} \ldots$$

2.6 If different flooding devices are not crossed by the same volume, each k coefficient should be multiplied by the square of the ratio of the volume crossing the device and the volume crossing the reference section (which will be used for the time calculation):

$$\Sigma k = k_1 + k_2 \cdot S_1^2/S_2^2 \cdot W_2^2/W_1^2 + k_3 \cdot S_1^2/S_3^2 \cdot W_3^2/W_1^2 \ldots$$

2.7 For cross-flooding through devices in parallel that lead to the same space, equalization time should be calculated assuming that:

$$S \cdot F = S_1 \cdot F_1 + S_2 \cdot F_2 + \ldots$$

With $F = \frac{1}{\sqrt{(\sum k_i)+1}}$ for each device of cross-section S_i

3 Air pipe venting criteria

3.1 In arrangements where the total air pipe sectional area is 10 per cent or more of the cross-flooding sectional area, the restrictive effect of any air back pressure may be neglected in the cross-flooding calculations. The air pipe sectional area should be taken as the minimum or the net sectional area of any automatic closing devices, if that is less.

3.2 In arrangements where the total air pipe sectional area is less than 10 per cent of the cross-flooding sectional area, the restrictive effect of air back pressure should be considered in the cross-flooding calculations. The following method may be used for this purpose:

The k coefficient used in the calculation of cross-flooding time should take into account the drop of head in the air pipe. This can be done using an equivalent coefficient k_e, which is calculated according to the following formula:

$$k_e = k_w + k_a \cdot (\rho_a/\rho_w) \cdot (S_w/S_a)^2$$

where:

k_w = k coefficient for the cross-flooding arrangement (water)

k_a = k coefficient for the air pipe

ρ_a = air density

ρ_w = water density

S_w = cross-section area of the cross-flooding device (water)

S_a = cross-section of air pipe

4 Alternatives

As an alternative to the provisions in sections 2 and 3, and for arrangements other than those shown in appendix 2, direct calculation using computational fluid dynamics (CFD), time-domain simulations or model testing may also be used.

APPENDIX 1

EXAMPLES FOR TREATMENT OF HEEL ANGLES AND WATER HEADS AT DIFFERENT STAGES OF CROSS-FLOODING

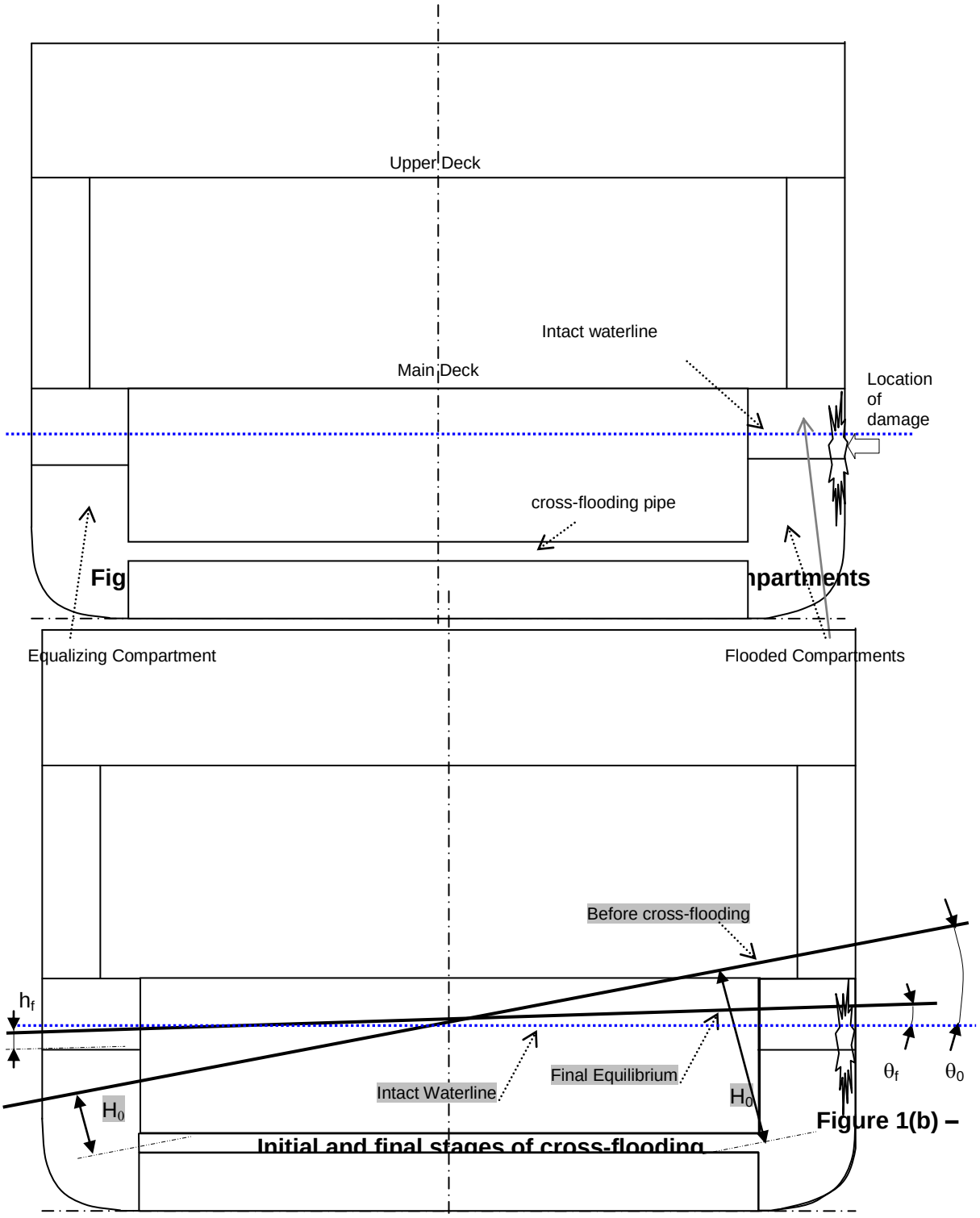
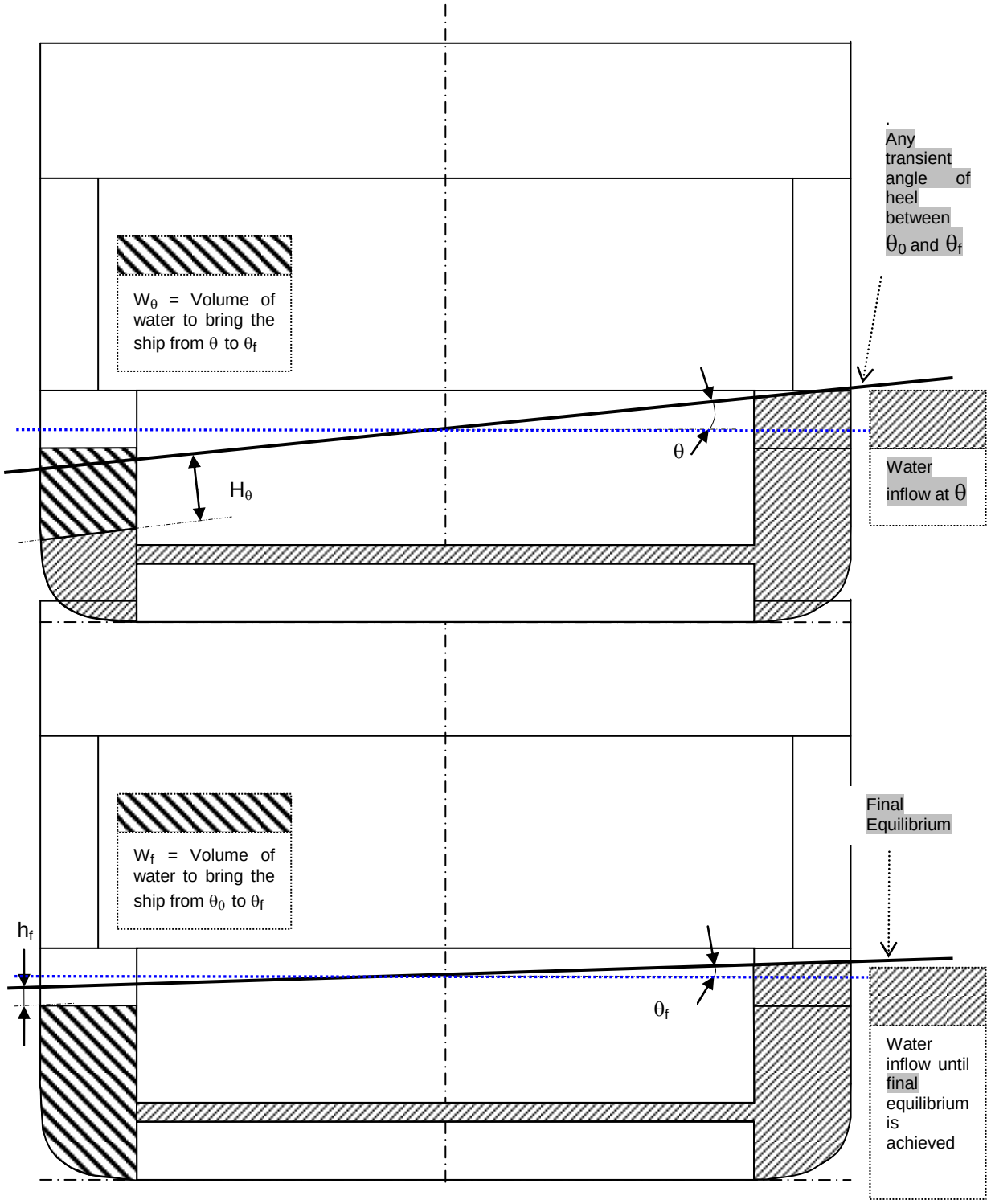


Fig … mpartments

Figure 1(b) – Initial and final stages of cross-flooding

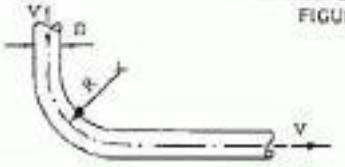
Note: H_0 on the left side of figure 1(b) depicts the head of water if the cross-flooding device was assumed full, whereas H_0 on the right side of figure 1(b) shows the head of water if the cross-flooding device was assumed empty.


Any transient angle of heel between θ_0 and θ_f
W_θ = Volume of water to bring the ship from θ to θ_f
H_θ
θ
Water inflow at θ
Final Equilibrium
W_f = Volume of water to bring the ship from θ_0 to θ_f
h_f
θ_f
Water inflow until final equilibrium is achieved

APPENDIX 2

FRICTION COEFFICIENTS IN CROSS-FLOODING ARRANGEMENTS

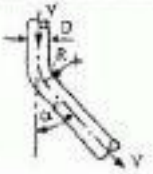
FIGURE 2



R/D	1	3	4	5	6	7
k	.30	.26	.23	.20	.18	.17

90° CIRCULAR BEND

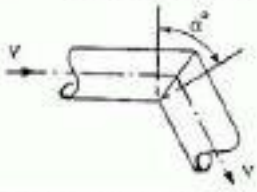
FIGURE 3



α°	15	30	45	60	75	90
k	.06	.12	.18	.24	.27	.30

RADIUS BEND R/D = 2

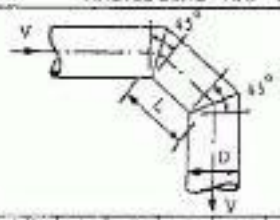
FIGURE 4



α°	5	15	30	45	60	90
k	.02	.06	.17	.32	.68	1.26

MITRE BEND

FIGURE 5



L/D	1	2	3	4	5	6
k	.41	.40	.43	.46	.46	.44

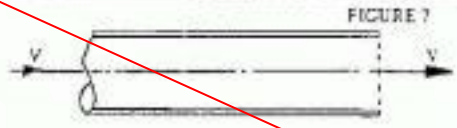
90° DOUBLE MITRE BEND

FIGURE 6

t/D	.01	.02	.03	.04	.05	≥ .05
k	.83	.68	.53	.46	.44	.43

PIPE INLET

FIGURE 7



k = 1.0

PIPE OUTLET

FIGURE 8

k = 0.5

The value of k actually increases with decrease in Froude number, particularly below speeds of 2 m/sec.

NON-RETURN VALVE

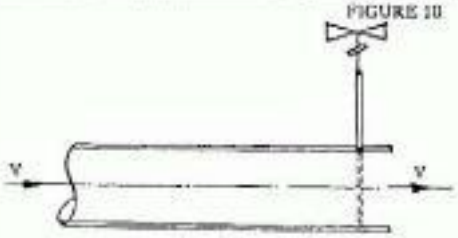
FIGURE 9

$$k = \frac{0.02}{D} \text{ per unit length}$$

The coefficient above is a mean value and does in fact vary as Reynold's number (i.e. varies with V for constant D and μ) as well as with relative roughness.

PIPE FRICTION LOSSES

FIGURE 10



k = 0.3

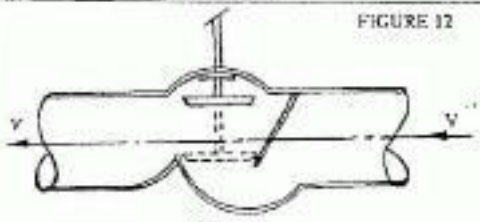
GATE VALVE

FIGURE 11

k = 0.8

BUTTERFLY VALVE

FIGURE 12



k = 5.0

DISC VALVE

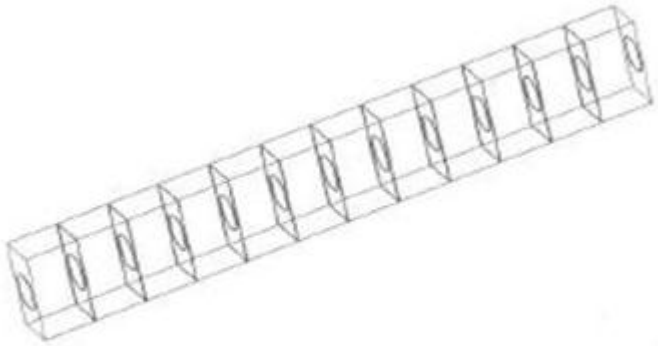


Figure 11
Cross-flooding through a series of structural ducts with 1 manhole

$$k = 0.6718 \times L_i^{\,0.119} \qquad (0 < L_i < 12)$$
$$k = 0.903 \qquad (12 \le L_i)$$

where:

k	friction coefficient related to each space between two adjacent girders
Li	Length of the duct in meters

Note: *k* is evaluated with effective cross-section area therefore in calculations use the real cross-section area A and not S_{equiv}. The pressure loss for entrance in the first manhole is already computed in the calculation.

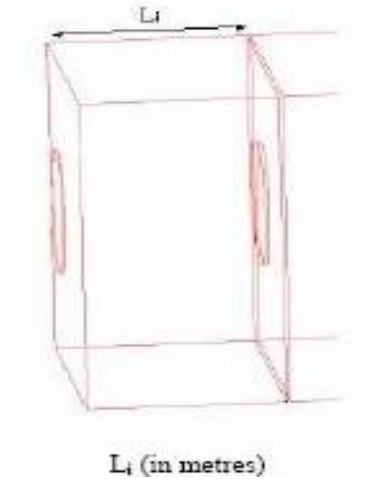


Figure 12

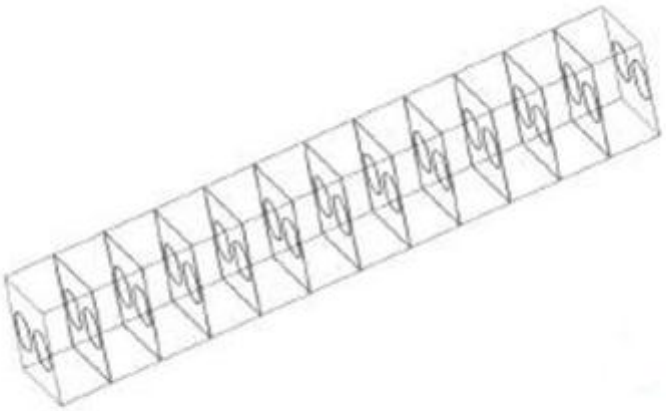


Figure 13
Cross-flooding through a series of structural ducts with 2 manholes

$$k = 1.7968 \times L_i^{-0.026} \quad (0 < L_i < 12)$$
$$k = 1.684 \quad (12 \le L_i)$$

where:

k	friction coefficient related to each space between two adjacent girders
Li	Length of the duct in meters

Note: *k* is evaluated with effective cross-section area therefore in calculations use the real cross-section area A and not S_{equiv}. The pressure loss for entrance in the first manhole is already computed in the calculation.

APPENDIX 3

EXAMPLE USING FIGURES FOR A PASSENGER SHIP

Dimension of the considered cross-flooding pipe:

Diameter	D = 0.39 m
Length	l = 21.0 m
Cross-section area	S = 0.12 m2
Wall thickness	t = 17.5 mm

k-values for the considered cross-flooding system:

Inlet	0.45
Pipe friction $(\frac{0.02l}{D})$	1.08
2 radius bends (α = 45°)	0.36
Non-return valve	0.50

Sufficient air venting is assumed to be in place.

From this follows:

$$F = \frac{1}{\sqrt{(\sum k_i) + 1}} \qquad F = \frac{1}{\sqrt{3.39}} = 0.54$$

Time required from commencement of cross-flooding θ_0 to the final equilibrium condition θ_f:

$$T_f = \frac{2W_f}{S \cdot F} \cdot \frac{1}{\sqrt{2gH_0}} \frac{1}{\left(1 + \sqrt{\frac{h_f}{H_0}}\right)}$$

Head of water before commencement of cross-flooding:

$$H_0 = 5.3m$$

Volume of water which is used to bring the ship from commencement of cross-flooding to the final equilibrium condition:

$$W_f = 365m^3$$

Final head of water after cross-flooding:

$$h_f = 1.5m$$

$$T_f = \frac{2 \cdot 365m^3}{0.12m^2 \cdot 0.54} \cdot \frac{1}{\sqrt{2 \cdot 9.81 m/s^2 \cdot 5.3m}} \cdot \frac{1}{\left(1+\sqrt{\frac{1.5m}{5.3m}}\right)}$$

$$T_f = 721s$$

Calculation of any transient situation of cross-flooding:

The purpose is to find the situation after 600s.

Assumed transient situation:

Cross-flooded volume: 265 m^3

Volume of water which is used to bring the vessel from the transient situation to the final equilibrium : W_θ = 365 m^3 – 265 m^3 = 100 m^3

Corresponding head of water: H_θ = 2.8 m

Time required to bring the vessel from any transient situation to the final equilibrium condition

$$T_\theta = \frac{2W_\theta}{S \cdot F} \cdot \frac{1}{\sqrt{2gH_\theta}} \cdot \frac{1}{\left(1+\sqrt{\frac{h_f}{H_\theta}}\right)}$$

$$T\theta = \frac{2 \cdot 100}{0.12 \cdot 0.54} \cdot \frac{1}{\sqrt{2*9.81*2.8}} \cdot \frac{1}{\left(1+\sqrt{\frac{1.5}{2.8}}\right)}$$

$$T_\theta = \frac{2 \cdot 100m^3}{0.12m^2 \cdot 0.54} \cdot \frac{1}{\sqrt{2 \cdot 9.81 m/s^2 \cdot 5.3m}} \cdot \frac{1}{\left(1+\sqrt{\frac{1.5m}{5.3m}}\right)}$$

T_θ = 240 s

Time between commencement of cross-flooding and assumed transient situation:

$T = T_f – T_\theta$ = 721 s – 240 s = 481 s

As T is less than 600 s, further transient situations with larger cross-flooded volume may be calculated in the same way.

On the reverse, if T was of more than 600 s, further transient situation with smaller cross-flooded volume may be calculated.

Situation after 600 s may be found by successive iterations.

***

ANNEX 2

DRAFT MSC CIRCULAR

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 [date to be decided].

.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 [date to be decided].

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), 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 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);

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

.8 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 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.[…](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

[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.

.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.

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] 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.

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;

.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 .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.[…](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: B/15 or 6 m, whichever is less (measured from the moulded line of the bottom shell plating at centreline) IGC: B/15 or 2 m, whichever is less (measured from the moulded line of the bottom shell plating at centreline)	MARPOL/IBC: B/15 or 6 m, whichever is less (measured from the moulded line of the bottom shell plating at centreline) IGC: 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: 0.6 L(m) measured from the forward perpendicular of the ship	
		in tankers of less than 75,000 tonnes deadweight: 0.4 L(m) measured from the forward perpendicular of the ship	

.1	**Side damage:**	MARPOL/IBC/IGC	ICLL (Type A ships)
.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 (resolution MSC.281(85) to be referred to)

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

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

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.

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

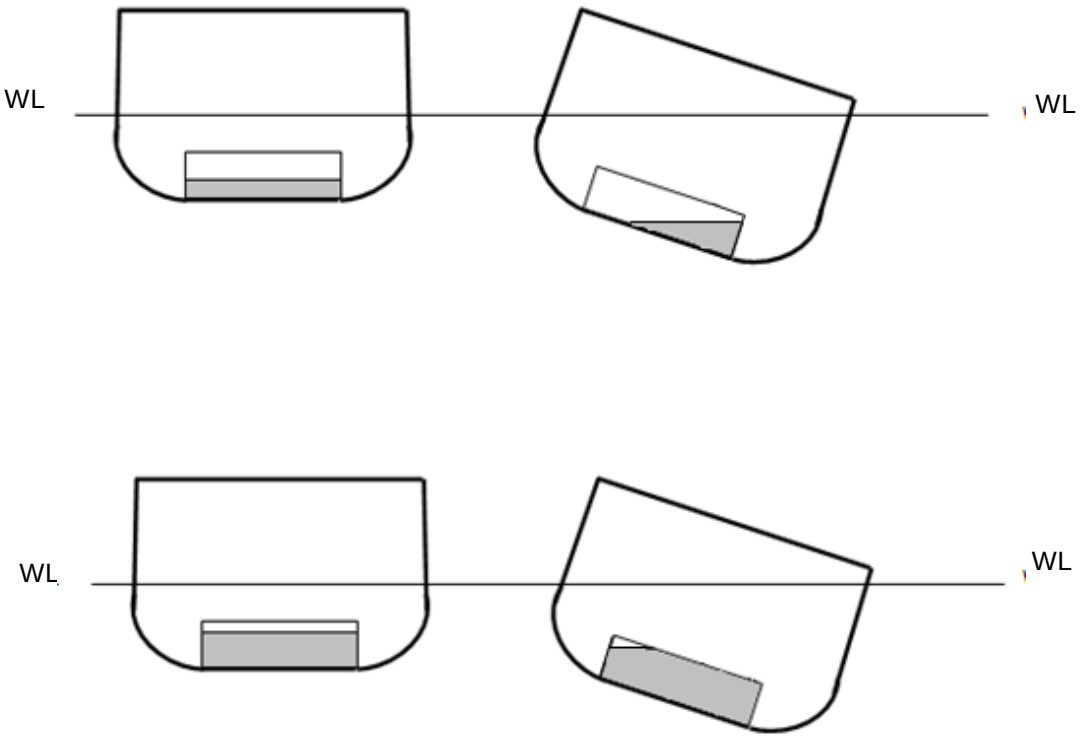
SHIP TYPE	ASSIGNED FREEBOARD	LENGTH	RULES
OIL TANKER [1)]	Type "A" ship with assigned freeboard less than type "B"	L ≤ 150 m	MARPOL, ANNEX I
		L > 150 m	MARPOL, ANNEX I + ICLL, reg.27
	Not less than type "B"	Regardless of length	MARPOL, ANNEX I
LIQUEFIED GAS CARRIER [1)]	Type "A" ship with assigned freeboard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

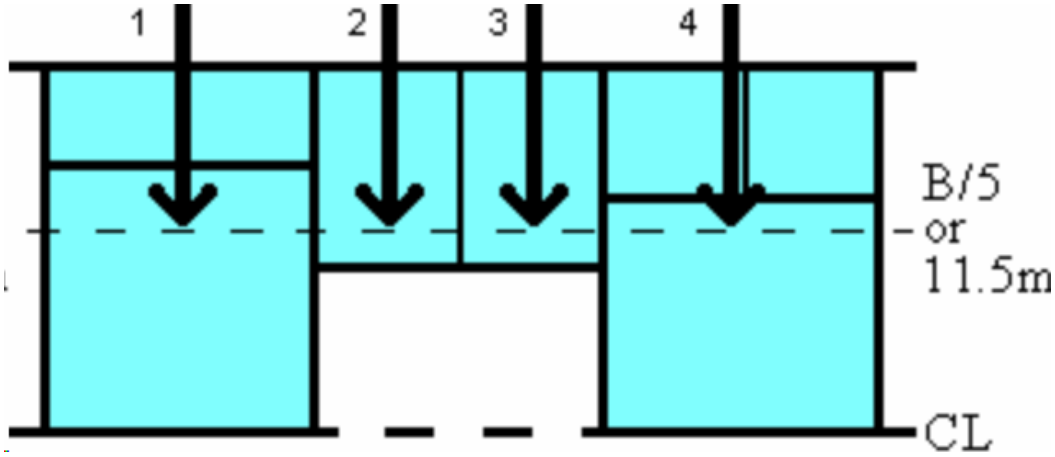
DESCRIPTION OF THE LONGITUDINAL EXTENT OF DAMAGE ACCORDING TO ICLL PROTOCOL 1988, REGULATION 27(12)(d)

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;

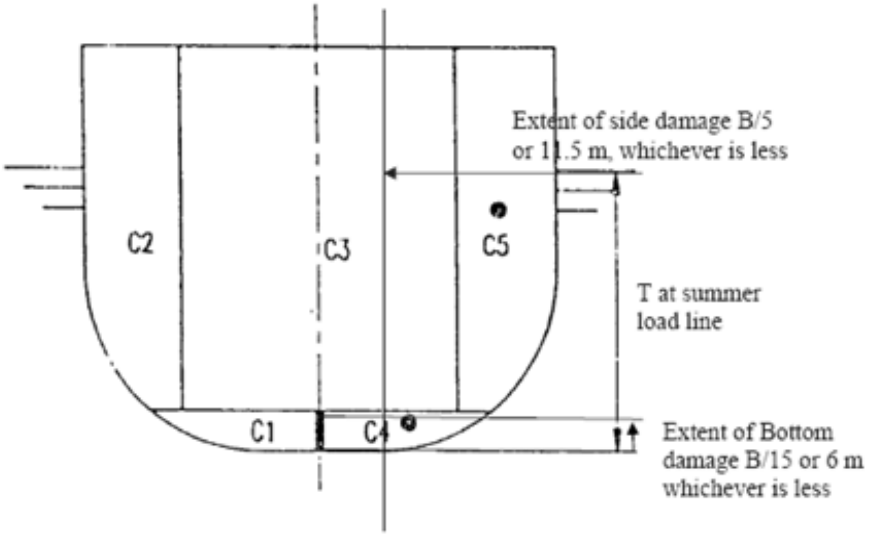
2. and 3. Transverse bulkhead exceeding B/5 or 11.5 m undamaged (two single one compartment damage cases); and

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 2008 IS Code 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 International Code on Intact Stability, 2008 (2008 IS Code), adopted by resolution MSC.267(85)).

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 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 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 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 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 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**

.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.

.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 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.

.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**

.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.

.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.

.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 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.

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

5 **Approved range of loading conditions**

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

.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.

.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.

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ANNEX 3

DRAFT AMENDMENTS TO MARPOL ANNEX I

Chapter 1 – General

Regulation 1 – Definitions

1 A new paragraph 28.10 is inserted, as follows:

"28.10 Oil tanker delivered on or after [date of entry into force] means an oil tanker:

.1 for which the building contract is placed on or after [date of entry into force]; or

.2 in the absence of a building contract, the keel of which is laid or which is at a similar stage of construction on or after [date of entry into force]; or

.3 the delivery of which is on or after [date of entry into force]; or

.4 which has undergone a major conversion:

.1 for which the contract is placed on or after [date of entry into force]; or

.2 in the absence of a contract, the construction work of which is begun on or after [date of entry into force]; or

.3 which is completed on or after [date of entry into force]."

Regulation 2 – Application

2 A new paragraph 3(6) is inserted, as follows:

"The Administration may waive the requirements of regulation 28(6) for the following oil tankers if loaded in accordance with the approved conditions*:

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

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

.4 tankers constructed before [date of entry into force] provided with approved limiting KG/GM curves covering all applicable intact and damage stability requirements.

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

Chapter 4 – Requirements for the cargo area of oil tankers

Regulation 28 – Subdivision and damage stability

3 The current paragraph 28(6) is renumbered as 28(7).

4 A new paragraph 28(6) is inserted, as follows:

"28(6) Oil tankers, as defined in regulation 1.28.10, to which this regulation applies, 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 [date of entry into force] shall comply with this regulation at the first scheduled renewal survey of the ship after [date of entry into force] but not later than [five years after date of entry into force];

.2 notwithstanding the requirements of regulation 28(6).1 a stability instrument installed on a ship constructed before [date of entry into force] 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.

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* 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.…)]."

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

5 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) .....☐"

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ANNEX 4

DRAFT 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, having regard to the performance standards recommended by the Organization*:

.1 ships constructed before [date of entry into force] shall comply with this paragraph at the first scheduled renewal survey of the ship after [date of entry into force] but not later than [five years after date of entry into force];

.2 notwithstanding the requirements of 2.2.1.2.1, a stability instrument installed on a ship constructed before [date of entry into force] 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.

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* 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.….)].

2.2.1.3 The Administration may give special dispensation to the following ships from the requirements of paragraph 2.2.1.2 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 dispensation 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.

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

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 dispensation permitted by paragraph 2.2.1.3 of the Code applies 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;

.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.

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* Delete as appropriate."

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ANNEX 5

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

Chapter 2 – Ship survival capability and location of cargo tanks

2.2 – Freeboard and intact stability

1 The title of section 2.2 is amended to read:

"Freeboard and stability"

2 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 [date of entry into force] shall comply with this requirement at the first scheduled renewal survey of the ship after [date of entry into force] but not later than [five years after date of entry into force];

.2 notwithstanding the requirements of 2.2.6.1, a stability instrument installed on a tanker constructed before [date of entry into force] 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.

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* 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.…)]."

3 A new subparagraph 2.2.7 is added as follows:

"2.2.7 The Administration may give special dispensation to the following ships from the requirements of paragraph 2.2.6 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 dispensation 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 [date of entry into force] 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.…)]."

Certificate of Fitness

4 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 2.2.6 of the Code;

.2* where a dispensation permitted by paragraph 2.2.7 of the Code applies and the approved stability instrument required by paragraph 2.2.6 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;

.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.

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* Delete as appropriate."

***

ANNEX 6

DRAFT AMENDMENTS TO THE CODE FOR EXISTING SHIPS CARRYING LIQUIFIED GASES IN BULK (EGC CODE)

Chapter II – Freeboard and stability

1 A new paragraph 2.3 is added as follows:

"2.3 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 [date of entry into force] shall comply with this paragraph at the first scheduled renewal survey of the ship after [date of entry into force] but not later than [five years after date of entry into force];

.2 notwithstanding the requirements of 2.3.1, a stability instrument installed on a ship constructed before [date of entry into force] 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.

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* 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.…)]."

2 A new paragraph 2.4 is added as follows:

"2.4 The Administration may give special dispensation to the following ships from the requirements of paragraph 2.3, 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 dispensation shall be duly noted on the Certificate of Fitness referred to in paragraph 1.6.1:

.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;

.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.…)]."

Certificate of Fitness

3 A new paragraph 6 is added as follows:

"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 2.3 of the Code;

.2* where a dispensation permitted by paragraph 2.4 of the Code applies and the approved stability instrument required by paragraph 2.3 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;

.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.

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* Delete as appropriate."

***

ANNEX 7

DRAFT 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, 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 [date of entry into force] shall comply with this requirement at the first scheduled renewal survey of the ship after [date of entry into force] but not later than [five years after date of entry into force];

.2 notwithstanding the requirements of 2.2.4.1, a stability instrument installed on a ship constructed before [date of entry into force] 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.…)]."

2 A new subparagraph 2.2.5 is added as follows:

"2.2.5 The Administration may give special dispensation to the following ships from the requirements of paragraph 2.2.4 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 dispensation shall 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 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.…)]."

Certificate of Fitness

3 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 2.2.4 of the Code;

.2* where a dispensation permitted by paragraph 2.2.5 of the Code applies and the approved stability instrument required by paragraph 2.2.4 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;

.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.

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* Delete as appropriate."

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ANNEX 8

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

CHAPTER 2 – Ship survival capability and location of cargo tanks

2.2 – Shipside discharges below the freeboard deck

1 The title of section 2.2 is amended to read:

"Freeboard and intact stability"

2 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 [date of entry into force] shall comply with this paragraph at the first scheduled renewal survey of the ship after [date of entry into force] but not later than [five years after date of entry into force];

.2 notwithstanding the requirements of 2.2.6.1, a stability instrument installed on a ship constructed before [date of entry into force] 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.

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* 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.…)]."

3 A new subparagraph 2.2.7 is added as follows:

"2.2.7 The Administration may give special dispensation to the following ships from the requirements of paragraph 2.2.6 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 dispensation 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 [date of entry into force] 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.…)]."

Certificate of Fitness

4 Paragraph 6 is replaced with the following:

"6 That the ship shall 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 2.2.6 of the Code;

.2* where a dispensation permitted by paragraph 2.2.7 of the Code applies and the approved stability instrument required by paragraph 2.2.6 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;

.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.

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* Delete as appropriate."

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ANNEX 9

DRAFT AMENDMENTS TO THE SURVEY GUIDELINES UNDER THE HARMONIZED SYSTEM OF SURVEY AND CERTIFICATION (HSSC), 2011 (RESOLUTION A.1053(27))

Annex 3 – Survey Guidelines under the MARPOL Convention

Guidelines for Surveys for the International Oil Pollution Prevention Certificate

1 New paragraphs (OI) 1.1.2.14 and 1.1.2.15 under paragraph (OI) 1.1 Initial surveys, are added as follows:

"(OI) 1.1.2.14. examining, where applicable, the stability instrument (MARPOL 90/04, Annex 1, regulation 28).

(OI) 1.1.2.15. examining, when carriage of a stability instrument is waived, the alternative means of verification for intact and damage stability (MARPOL 90/04, Annex 1, regulation 3)."

2 New paragraphs (OI) 1.1.6.10 and 1.1.6.11 under paragraph (OI) 1.1 Initial surveys, are added as follows:

"(OI) 1.1.6.10. confirming, where applicable, the stability instrument has been approved and is operating satisfactorily (MARPOL 90/04, Annex 1, regulation 28).

(OI) 1.1.6.11. confirming, when carriage of a stability instrument is waived, the alternative means of verification for intact and damage stability is recorded on Form B attached to the IOPP Certificate and is being applied effectively (MARPOL 90/04, Annex 1, regulation 3)."

3 New paragraphs (OA) 1.2.2.11 and 1.2.2.12 under paragraph (OA) 1.2 Annual surveys, are added as follows:

"(OA) 1.2.2.11. confirming, where applicable, the approved stability instrument is available on board and operating satisfactorily (MARPOL 90/04, Annex 1, regulation 28).

(OA) 1.2.2.12. confirming, when carriage of a stability instrument is waived, the alternative means of verification for intact and damage stability recorded on Form B attached to the IOPP Certificate is available on board and is being applied effectively (MARPOL 90/04, Annex 1, regulation 3)."

Annex 4 – Survey Guidelines under mandatory codes

Guidelines for the Surveys for the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk and Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk

4 New paragraphs (DI) 1.1.1.8 and 1.1.1.9 under paragraph (DI) 1.1 Initial surveys, are added as follows:

"(DI) 1.1.1.8. examining, where applicable, the stability instrument (IBC Code 83/90/00, chapter 2).

(DI) 1.1.1.9. examining, when a dispensation from carriage of a stability instrument applies, the alternative means of verification for intact and damage stability (IBC Code 83/90/00, chapter 2)."

5 New paragraphs (DI) 1.1.3.9 and 1.1.3.10 under paragraph (DI) 1.1 Initial surveys, are added as follows:

"(DI) 1.1.3.9. confirming, where applicable, the stability instrument has been approved and is operating satisfactorily (IBC Code 83/90/00, chapter 2).

(DI) 1.1.3.10. confirming, when a dispensation from carriage of a stability instrument applies, the alternative means of verification for intact and damage stability is recorded on the Certificate of Fitness and is being applied effectively (IBC Code 83/90/00, chapter 2)."

6 New paragraphs (DA) 1.2.1.24 and 1.2.1.25 under paragraph (DA) 1.2 Annual surveys, are added as follows:

"(DA) 1.2.1.24. confirming, where applicable, the approved stability instrument is available on board and operating satisfactorily (IBC Code 83/90/00, chapter 2).

(DA) 1.2.1.25. confirming, when a dispensation from carriage of a stability instrument applies, the alternative means of verification for intact and damage stability recorded on the Certificate of Fitness is available on board and being applied effectively (IBC Code 83/90/00, chapter 2)."

Guidelines for the Surveys for the International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk

7 New paragraphs (GI) 2.1.1.14 and 2.1.1.15 under paragraph (GI) 2.1 Initial surveys, are added as follows:

"(GI) 2.1.1.14. examining, where applicable, the stability instrument (IGC Code 83/90/00, chapter 2).

(GI) 2.1.1.15. examining, when a dispensation from carriage of a stability instrument applies, the alternative means of verification for intact and damage stability (IGC Code 83/90/00, chapter 2)."

8 New paragraphs (GI) 2.1.3.5 and 2.1.3.6 under paragraph (GI) 2.1 Initial surveys, are added as follows:

"(GI) 2.1.3.5. confirming, where applicable, the stability instrument has been approved and is operating satisfactorily (IBC Code 83/90/00, chapter 2).

(GI) 2.1.3.6. confirming, when a dispensation from carriage of a stability instrument applies, the alternative means of verification for intact and damage stability is recorded on the Certificate of Fitness and is being applied effectively (IBC Code 83/90/00, chapter 2).

9 New paragraphs (GA) 2.2.1.19 and 2.2.1.20 under paragraph (GA) 2.2 Annual surveys, are added as follows:

"(GA) 2.2.1.19. confirming, where applicable, the approved stability instrument is available on board and operating satisfactorily (IGC Code 83/90/00, chapter 2).

(GA) 2.2.1.20. confirming, when a dispensation from carriage of a stability instrument applies, the alternative means of verification for intact and damage stability recorded on the Certificate of Fitness is available on board and being applied effectively (IGC Code 83/90/00, chapter 2)."

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ANNEX 10

DRAFT ASSEMBLY RESOLUTION

USE OF NATIONAL TONNAGE IN APPLYING INTERNATIONAL CONVENTIONS

THE ASSEMBLY,

RECALLING Article 15(j) of the Convention on the International Maritime Organization concerning the functions of the Assembly in relation to regulations and guidelines concerning maritime safety and the prevention and control of marine pollution from ships,

RECALLING ALSO that the International Convention on Tonnage Measurement of Ships, 1969 (1969 Tonnage Convention) introduced a new measurement system and that the tonnages measured under this system could be different from those measured under national tonnage rules,

RECALLING FURTHER that recommendation 2 of the International Conference on Tonnage Measurement of Ships, 1969, recommended the acceptance of the tonnages measured under this new system as the parameters referred to where those terms are used in conventions, laws, and regulations, while recognizing that transition to this new system should cause the least possible impact on the economics of merchant shipping and port operations,

NOTING that article 3(2)(d) of the 1969 Tonnage Convention provides for certain ships to retain their national tonnages for the purpose of applying relevant requirements under other existing international conventions, if they do not undergo alterations or modifications which the Administration deems to be a substantial variation in their existing gross tonnage,

NOTING ALSO that the Interim Schemes for Tonnage Measurement of resolutions A.494(XII), A.540(13) and A.541(13) effectively extended this use of national tonnages to certain other ships, for the purpose of applying relevant requirements, respectively, of the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, the International Convention on Training, Certification and Watchkeeping for Seafarers (STCW), 1978, and the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78),

NOTING FURTHER that resolutions A.758(18) (Application of recommendation 2 of the International Conference on Tonnage Measurement of Ships, 1969) and A.791(19) (Application of the International Convention on Tonnage Measurement of Ships, 1969, to existing ships) were adopted to address identification of national tonnages on International Tonnage Certificates (1969) and other pertinent certificates, including Ship Safety Certificates and International Oil Pollution Prevention Certificates,

BEING AWARE that amendments to the SOLAS, STCW and MARPOL 73/78 Conventions made subsequent to the adoption of resolutions A.494(XII), A.540(13) and A.541(13) have led to misunderstandings over the use of national tonnage when applying newly established tonnage-based requirements for ships measured in accordance with the provisions of the 1969 Tonnage Convention and the Interim Schemes for Tonnage Measurement, highlighting the need for updated recommendations on this matter,

BEARING IN MIND the decisions of the Maritime Safety Committee to apply newly established tonnage-based requirements of the International Ship and Port Facility and Security (ISPS) and International Safety Management (ISM) Codes using a ship's tonnage as measured under the rules of the 1969 Tonnage Convention,

RECOGNIZING the necessity of uniform implementation of the 1969 Tonnage Convention with regard to national tonnages,

HAVING CONSIDERED the recommendations made by the Maritime Safety Committee, [at its ninety-second session (12 to 21 June 2013)], and the Marine Environment Protection Committee, [at its sixty-fifth session (13 to 17 May 2013)],

1. ADOPTS the Recommendation on the use of national tonnage in applying international conventions, as set out in the annex to the present resolution;

2. AGREES that Governments which are Contracting Governments to the 1969 Tonnage Convention should use this Recommendation when applying the provisions of the 1969 Tonnage Convention and Interim Schemes for Tonnage Measurement;

3. REVOKES resolutions A.758(18) and A.791(19).

ANNEX

RECOMMENDATION ON THE USE OF NATIONAL TONNAGE IN APPLYING INTERNATIONAL CONVENTIONS

1 In order to ensure consistency when using national tonnage to apply relevant requirements under international conventions, in accordance with article 3(2)(d) of the International Convention on Tonnage Measurement of Ships, 1969 (1969 Tonnage Convention) (TM 69) and Interim Schemes for Tonnage Measurement, as set forth in the Revised Interim Scheme for tonnage measurement for certain ships (resolution A.494(XII) for SOLAS), and the Interim Scheme for tonnage measurement for certain ships for the purposes of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (resolution A.541(13)), Administrations are recommended to accept the following.

National tonnage versus convention tonnage

2 National tonnage refers to the tonnage measurement of a ship under the Administration's national tonnage rules that predated the adoption of the measurement rules of the 1969 Tonnage Convention. National gross tonnage is often expressed in terms of gross register tons (GRT). In contrast, the unitless gross tonnage measurement under the rules of the 1969 Tonnage Convention is expressed in terms of gross tonnage (GT).

Eligibility to use national tonnage

3 The 1969 Tonnage Convention and the Interim Schemes for Tonnage Measurement provide for the use of national tonnage in applying relevant requirements under international conventions to certain ships with keel laid dates on or before 18 July 1994[1]. Further, a ship which undergoes an alteration or modification which the Administration deems to be a substantial variation in its "existing" tonnage as described in article 3(2)(b) of the 1969 Tonnage Convention is treated as if the date on which the alterations or modifications commenced was the keel laid date for this purpose. The following table lists the basis for use of national tonnages as a function of a ship's keel laid/substantial alteration date and its national gross tonnage.

Basis for Using National Tonnage to Apply International Conventions*

Ship's Keel Laid Date / Substantial Alteration Date	**Ship's National Gross Tonnage**		
	GRT < 400	**400 ≤ GRT < 1600**	**GRT ≥ 1600**
Before 18 July 1982	TM69 Art.3(2)(d)	TM69 Art.3(2)(d)	TM69 Art.3(2)(d)
18 July 1982 - 31 December 1985	A.494(Xll) / A.541(13)	A.494(Xll)	A.494(Xll)
1 January 1986 - 18 July 1994	A.494(Xll) / A.541(13)	A.494(Xll)	Not Eligible
After 18 July 1994	Not Eligible	Not Eligible	Not Eligible

* Unless otherwise provided for in an International Convention or other instrument.

[1] The Interim Schemes for Tonnage Measurement do not apply to ships covered by article 3(2)(d) of the 1969 Tonnage Convention, and may be applied to an eligible ship for the life of the ship under interpretations established at MSC 50 (MSC 50/27). A third Interim Scheme for Tonnage Measurement, resolution A.540(13) for the STCW Convention, is no longer applicable as a result of the 1995 amendments to the Convention.

Relevant requirements under international conventions

4 The term "relevant requirements under" in article 3(2)(d) of the 1969 Tonnage Convention and throughout this Recommendation refers to tonnage-based requirements for which a tonnage threshold was in effect on or before 18 July 1994, the date when the 1969 Tonnage Convention came fully into force. As such, national tonnage may not be used when applying newer tonnage thresholds in international conventions, unless otherwise provided in an international convention or other instrument. For example, for eligible ships, national tonnages may be used to apply the 500 gross tonnage cargo ship exemption threshold of regulation I/3 of SOLAS, which predates 18 July 1994. However, national tonnages may not similarly be used to apply the 500 gross tonnage threshold of SOLAS regulation XI-2/2.1.1.2, which came into effect after this date[2].

Remarks on International Tonnage Certificates (1969)

5 Notwithstanding the provisions of resolutions A.494(XII) and A.541(13), which state that gross tonnage measured under the national tonnage rules shall not be shown on the International Tonnage Certificate (1969), an entry may be made under "Remarks" on the International Tonnage Certificate (1969), to reflect the shipowner's decision to use national tonnages, as follows:

.1 For ships covered by article 3(2)(d) of the 1969 Tonnage Convention,

"The ship is remeasured according to article 3(2)(d) of the 1969 Tonnage Convention. The GROSS TONNAGE according to the measurement system previously in force to the measurement system of the International Convention on Tonnage Measurement of Ships, 1969, is: . . . *(insert GRT tonnage)* . . . RT, according to the regulations of . . . *(insert country name)* . . ."

.2 For ships covered by resolution A.494(XII) and/or resolution A.541(13),

"The ship is additionally measured according to resolution(s) . . . *(insert A.494(XII) and/or A.541(13), as applicable)* . . . The GROSS TONNAGE according to the measurement system previously in force to the measurement system of the International Convention on Tonnage Measurement of Ships, 1969, is: . . .*(insert GRT tonnage)* . . . RT, according to the regulations of . . . *(insert country name)* . . ."

Remarks on other international certificates (1969)

6 For ships for which the International Tonnage Certificate (1969) includes a "Remarks" entry on national tonnage as described in paragraph 5 of this Recommendation, the appropriate box in the appropriate Ship Safety Certificate, the International Oil Pollution Prevention Certificate or other such official certificates issued by the Administration may show only that national gross tonnage with one of the following footnotes:

[2] Refer to the Interim Scheme for the compliance of certain cargo ships with the special measures to enhance maritime security (MSC/Circ.1157) for additional details. The Interim Scheme for the compliance of certain cargo ships and special purpose ships with the management for the safe operation of ships (MSC.1/Circ.1231) similarly addresses use of national tonnages in applying the SOLAS ISM Code.

"The above gross tonnage has been determined by the tonnage authorities of the Administration in accordance with the national tonnage rules which were in force prior to the coming into force of the International Convention on Tonnage Measurement of Ships, 1969"; or

"See REMARKS column of the valid International Tonnage Certificate (1969)."

Removal of remarks

7 Should a ship lose eligibility for using national tonnage to apply relevant requirements under international conventions by undergoing alterations or modifications which the Administration deems to be a substantial variation in its existing tonnage as described in article 3(2)(b) of the 1969 Tonnage Convention, the Administration should ensure associated certificates described in paragraphs 5 and 6 of this Recommendation are reissued or otherwise amended to delete reference to the ship's national tonnage.

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ANNEX 11

PROPOSED BIENNIAL AGENDA OF THE SUB-COMMITTEE FOR THE 2014-2015 BIENNIUM AND ITEMS ON THE COMMITTEE'S POST-BIENNIAL AGENDA THAT FALL UNDER THE PURVIEW OF THE SUB-COMMITTEE

PROPOSED BIENNIAL AGENDA FOR THE 2014-2015 BIENNIUM*

Number	Description	Parent organ(s)	Coordinating organ(s)	Associated organ(s)	Target completion year
1.1.2.2	**Consideration of IACS unified interpretations**	MSC/MEPC		BLG/DE/FP/FSI/NAV/ SLF	Continuous
~~2.0.1.3~~	~~Development of guidelines for verification of damage stability requirements for tankers~~	~~MSC~~	~~SLF~~	~~DE STW~~	~~2013~~
2.0.1.5	**Development of provisions to ensure the integrity and uniform implementation of the 1969 TM Convention**	MSC	SLF	DE/STW	~~2013~~ 2014
~~2.0.1.25 (UO)~~	~~Development of mandatory carriage requirements for stability instruments on board tankers~~	~~MSC~~	~~SLF~~		~~2013~~
5.1.1.1	**Development of guidelines on safe return to port for passenger ships**	MSC	SLF		~~2013~~ 2014

* Proposed modifications to the Sub-Committee's 2012-2013 biennial agenda, as set out in annex 36 to document MSC 91/22. Outputs printed in bold have been selected for the draft provisional agenda for SLF 56, as shown in annex 2. Struck-out text indicates proposed deletions and shaded text indicates proposed changes. Deleted outputs will be maintained in the report on the status of planned outputs. Output numbers subject to change by A 28.

Number	Description	Parent organ(s)	Coordinating organ(s)	Associated organ(s)	Target completion year
5.1.1.2	**Review of damage stability regulations for ro-ro passenger ships**	MSC	SLF		~~2013~~ 2014
5.2.1.1	**Development of amendments to the criterion for maximum angle of heel in turns of the 2008 IS Code**	MSC	SLF		~~2013~~ 2014
5.2.1.14	**Development of second generation intact stability criteria**	MSC	SLF		~~2013~~ 2015
5.2.1.15	**Revision of SOLAS chapter II-1 subdivision and damage stability regulations**	MSC	SLF		~~2012~~ 2014
5.2.1.17	**Development of a mandatory Code of ships operating in polar waters**	MSC/MEPC	DE	COMSAR/FP/NAV/ SLF/STW	2014
5.2.1.26	**Development of amendments to part B of the 2008 IS Code on towing, lifting and anchor-handling operations**	MSC	SLF		~~2013~~ 2014

ITEMS ON THE COMMITTEE'S POST-BIENNIAL AGENDA THAT FALL UNDER THE PURVIEW OF THE SUB-COMMITTEE*

MARITIME SAFETY COMMITTEE								
ACCEPTED POST-BIENNIAL OUTPUTS				Parent organ(s)	Coordinating organ(s)	Associated organ(s)	Timescale (sessions)	Remarks
No.	Reference to Strategic Directions	Reference to High-level Actions	Description					
1	5.2.1	5.2.1.14	~~Development~~ Finalization of second generation intact stability criteria	MSC	SLF		~~2014~~ 2017	SLF 55/17, paragraph 3.13

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* The target completion year of the items on the Committee's post-biennial agenda is beyond the 2014-2015 biennium.

ANNEX 12

DRAFT PROVISIONAL AGENDA FOR SLF 56

Opening of the session and election of Chairman and Vice-Chairman for 2014

1 Adoption of the agenda

2 Decisions of other IMO bodies

3 Development of second generation intact stability criteria

4 Development of guidelines on safe return to port for passenger ships

5 Review of the damage stability regulations for ro-ro passenger ships

6 Revision of SOLAS chapter II-1 subdivision and damage stability regulations

7 Development of provisions to ensure the integrity and uniform implementation of the 1969 TM Convention

8 Development of amendments to the criterion for maximum angle of heel in turns of the 2008 IS Code

9 Development of amendments to part B of the 2008 IS Code on towing, lifting and anchor-handling operations

10 Consideration of IACS unified interpretations

11 Development of a mandatory Code for ships operating in polar waters

12 Biennial agenda and provisional agenda for SLF 57

13 Election of Chairman and Vice-Chairman for 2015

14 Any other business

15 Report to the Maritime Safety Committee

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ANNEX 13

REPORT ON THE STATUS OF PLANNED OUTPUTS OF THE HIGH-LEVEL ACTION PLAN OF THE ORGANIZATION AND PRIORITIES FOR THE 2012-2013 BIENNIUM RELEVANT TO THE SUB-COMMITTEE

Stability and Load Lines and Fishing Vessels Safety (SLF)								
Planned output number in the High-level Action Plan for 2012-2013	**Description**	**Target completion year**	**Parent organ(s)**	**Coordinating organ(s)**	**Associated organ(s)**	**Status of output for Year 1**	**Status of output for Year 2**	**References**
1.1.2.2	Consideration of IACS unified interpretations	Continuous	MSC / MEPC		SLF	Ongoing		MSC 78/26, paragraph 22.12; SLF 55/17, section 11
2.0.1.3	Development of guidelines for verification of damage stability requirements for tankers	2013	MSC	SLF	DE / STW	In progress	Completed	MSC 83/28, paragraphs 25.50 to 25.52; SLF 55/17, section 5
2.0.1.5	Development of provisions to ensure the integrity and uniform implementation of the 1969 TM Convention	2013	MSC	SLF	DE / STW	In progress	In progress	MSC 89/25, paragraph 22.34; SLF 55/17, section 9
2.0.1.25 (UO)	Development of mandatory carriage requirements for stability instruments on board tankers	2013	MSC	SLF		In progress	Completed	MSC 90/28, paragraph 25.37 SLF 55/17, section 6

Stability and Load Lines and Fishing Vessels Safety (SLF)								
Planned output number in the High-level Action Plan for 2012-2013	**Description**	**Target completion year**	**Parent organ(s)**	**Coordinating organ(s)**	**Associated organ(s)**	**Status of output for Year 1**	**Status of output for Year 2**	**References**
5.1.1.1	Development of guidelines on safe return to port for passenger ships	~~2013~~ 2014	MSC	SLF		In progress	In progress	MSC 81/25, paragraph 23.54; SLF 55/17, section 4
5.1.1.2	Review of damage stability regulations for ro-ro passenger ships	~~2013~~ 2014	MSC	SLF		In progress	In progress	MSC 84/24, paragraph 22.59; SLF 55/17, section 7
5.2.1.1	Development of amendments to the criterion for maximum angle of heel in turns of the 2008 IS Code	~~2013~~ 2014	MSC	SLF		In progress	In progress	MSC 89/25, paragraph 22.32; SLF 55/17, section 12
5.2.1.14	Development of second generation intact stability criteria	~~2013~~ 2014	MSC	SLF		In progress	In progress	MSC 85/26, paragraph 12.7; SLF 55/17, section 3
5.2.1.15	Revision of SOLAS chapter II-1 subdivision and damage stability regulations	~~2013~~ 2014	MSC	SLF		In progress	In progress	MSC 85/26, paragraph 23.35; SLF 55/17, section 8
5.2.1.17	Development of a mandatory Code of ships operating in polar waters	2014	MSC / MEPC	DE	COMSAR / FP / NAV / SLF / STW	In progress	In progress	MSC 86/26, paragraph 23.32; SLF 55/17, section 13
5.2.1.26	Development of amendments to part B of the 2008 IS Code on towing, lifting and anchor-handling operations	2014	MSC	SLF		In progress	In progress	MSC 88/26, paragraph 23.36; SLF 55/17, section 10

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ANNEX 14

DRAFT MSC RESOLUTION

ADOPTION OF THE PERFORMANCE STANDARDS FOR ELECTRONIC INCLINOMETERS

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.886(21), by which the Assembly resolved that the function of adopting performance standards and technical specifications, as well as amendments thereto, shall be performed by the Maritime Safety Committee and/or the Marine Environment Protection Committee, as appropriate, on behalf of the Organization,

NOTING that in the Revised guidance to the master for avoiding dangerous situations in adverse weather and sea conditions (MSC.1/Circ.1228), information about heel angle and roll period is regarded as relevant for assessment of the ship's stability situation in adverse weather and sea conditions,

NOTING ALSO that, at its ninetieth session, it had adopted resolution MSC.333(90) on Revised Performance standards for shipborne voyage data recorders (VDRs), including the recommendation that, with regard to the rolling motion, a VDR should be connected to an electronic inclinometer or, if not installed, be equipped with or connected to a suitable motion sensor with an equivalent measurement performance,

NOTING FURTHER that, at its eighty-eighth session, instead of adding the requirement for an electronic inclinometer to the performance standards for VDRs, it had decided to develop dedicated performance standards for inclinometers,

RECOGNIZING the need to define minimum requirements for a heel angle and roll period measurement device to ensure that heeling information is provided in a reliable manner on board ships to be used by the crew to assess the dynamic situation of the ship and to be available for marine casualty investigation,

HAVING CONSIDERED, at its [ninety-second] session, the draft Performance standards for electronic inclinometers prepared by the Sub-Committee on Safety of Navigation, at its fifty-eighth session,

1. ADOPTS the Performance standards for electronic inclinometers, set out in the annex to the present resolution;

2. RECOMMENDS Governments ensure that electronic inclinometers installed on or after [1 July 2015], conform to performance standards not inferior to those specified in the annex to the present resolution.

ANNEX

PERFORMANCE STANDARDS FOR ELECTRONIC INCLINOMETERS

1 SCOPE

1.1 Electronic inclinometers are intended to support the decision-making process on board in order to avoid dangerous situations as well as assist in and facilitate maritime casualty investigations by providing information about the roll period and the heel angle of the ship.

1.2 Electronic inclinometers should, in a reliable form:

.1 determine the actual heel angle with the required accuracy;

.2 determine the roll amplitude with the required accuracy;

.3 determine the roll period with the required accuracy;

.4 present the information on a bridge display; and

.5 provide a standardized interface to instantaneous heel angle to the voyage data recorder (VDR).

2 APPLICATION OF THESE STANDARDS

2.1 These Performance standards should apply to all electronic inclinometers intended to support the decision-making process on board in order to avoid dangerous situations as well as to assist in maritime casualty investigations, if carried, on all ships[1].

2.2 In addition to the general requirements set out in the General requirements for shipborne radio equipment forming part of the Global Maritime Distress and Safety System (GMDSS) and for electronic navigation aids (resolution A.694(17)[2]) and the presentation requirements set out in the Performance standards for the presentation of navigation-related information on shipborne navigational displays (resolution MSC.191(79)), electronic inclinometers should meet the requirements of these standards and follow the relevant guidelines on ergonomic principles[3] adopted by the Organization.

3 DEFINITIONS

For the purpose of these Performance standards, the following definitions apply:

.1 *Rolling* is the motion around the longitudinal axis of the ship;

.2 *Actual heel angle* is the momentary angle of roll referenced to a levelled ship to port or starboard side;

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1 These Performance standards do not apply to electronic inclinometers installed for purposes which are outside the scope of these guidelines, e.g. monitoring of cargo status.

2 Refer to IEC Publication 60945 – Maritime navigation and radiocommunication equipment and systems – General requirements.

3 Refer to the *Guidelines on ergonomic criteria for bridge equipment and layout* (MSC/Circ.982).

.3 *Roll period* is the time between two successive maximum values of heel angle on the same side of the ship; and

.4 *Roll amplitude* is the maximum values of heel angle to port or starboard side.

MODULE A – SENSOR

4 MEASUREMENT OF ACTUAL HEEL ANGLE

Electronic inclinometers should be capable of measuring the actual heel angle and determining the amplitude of the rolling oscillation of the ship over a range of ± 90 degrees.

5 MEASUREMENT OF ROLL PERIOD

Electronic inclinometers should be capable of measuring the time between the maximum values of the rolling oscillation and determining the roll period over a minimum range of 4 to 40 s.

6 ACCURACY

6.1 Electronic inclinometers should provide the data with sufficient accuracy for a proper assessment of the ship's dynamic situation. Minimum accuracy of the measurements should be 5 per cent of reading or ± 1 degree, whichever is the greater for angle measurements and 5 per cent of reading or ± 1 s, whichever is the greater for time measurements.

6.2 Actual heel angle and time measurement accuracy should not be unduly affected by other linear or rotational movements of the ship (e.g. surging, swaying, heaving, pitching, yawing) or by transverse acceleration ranging from -0.8 g to +0.8 g.

MODULE B – OPERATIONAL AND FUNCTIONAL REQUIREMENTS

7 DISPLAY REQUIREMENTS

7.1 Electronic inclinometers should display:

.1 the roll period with a minimum resolution of 1 s; and

.2 the roll amplitude to both port and starboard side with a minimum resolution of 1 degree.

7.2 The actual heel angle to port or starboard should be indicated in an analogue form between the limits of ± 45 degrees.

7.3 The display may be implemented as a dedicated display or integrated into other bridge systems.

8 OPERATIONAL ALERTS

Electronic inclinometers may optionally provide a warning for indicating that a set heel angle had been exceeded.

9 PERFORMANCE TESTS, MALFUNCTIONS AND INDICATIONS

Electronic inclinometers should internally check and indicate to the user if all components are operative and if the information provided is valid or not.

MODULE C – INTERFACING AND INTEGRATION

10 CONNECTIONS TO OTHER EQUIPMENT

10.1 Electronic inclinometers should comprise a digital interface providing actual heel angle information to other systems like, e.g. VDR, with an update rate of at least 5 Hz. Electronic inclinometers should also comprise a digital interface providing the displayed information of roll period and roll amplitude (see paragraph 7.1).

10.2 Electronic inclinometers should have a bidirectional interface to facilitate communication, to transfer alerts from inclinometers to external systems and to acknowledge and silence alerts from external systems.

10.3 The digital interface should comply with the relevant international standards[5].

11 INSTALLATION POSITION

The installation position of the sensors of the electronic inclinometer should be recorded and made available for the configuration of the VDR.

12 POWER SUPPLY

Electronic inclinometers should be powered from the ship's main source of electrical energy. In addition, it should be possible to operate the electronic inclinometers from the ship's emergency source of electrical energy.

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[5] Refer to standard IEC 61162 – Maritime navigation and radiocommunication equipment and systems – Digital interfaces.

ANNEX 15

DRAFT MSC RESOLUTION

ADOPTION OF A PROCEDURE FOR CALCULATING THE NUMBER OF FISHING VESSELS OF EACH CONTRACTING STATE TO THE CAPE TOWN AGREEMENT OF 2012 ON THE IMPLEMENTATION OF THE PROVISIONS OF THE TORREMOLINOS PROTOCOL OF 1993 RELATING TO THE TORREMOLINOS INTERNATIONAL CONVENTION FOR THE SAFETY OF FISHING VESSELS, 1977, BY THE DEPOSITARY

THE MARITIME SAFETY COMMITTEE,

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

NOTING WITH APPRECIATION the adoption, on 11 October 2012, of the Cape Town Agreement of 2012 on the Implementation of the Provisions of the Torremolinos Protocol of 1993 relating to the Torremolinos International Convention for the Safety of Fishing Vessels, 1977 (hereinafter referred to as "the Agreement"), by the 2012 International Conference on the Safety of Fishing Vessels, held in Cape Town, South Africa, from 9 to 11 October 2012,

RECOGNIZING the significant contribution to maritime safety in general and to that of fishing vessels in particular which can be made by implementation of the provisions of the Agreement,

NOTING that the Agreement, in accordance with article 4(1), shall enter into force 12 months after the date on which not less than 22 States, the aggregate number of whose fishing vessels of 24 m in length and over operating on the high seas is not less than 3,600, have expressed their consent to be bound by it,

NOTING ALSO Conference resolution 5, which requests the Maritime Safety Committee to develop a procedure for calculating the number of fishing vessels of each Contracting State to the Agreement by the Depositary at the earliest opportunity, but not later than 1 January 2014,

HAVING CONSIDERED, at its [ninety-second session (12 to 21 June 2013)], a Procedure for calculating the number of fishing vessels of each Contracting State to the Agreement by the Depositary, proposed by the Sub-Committee on Stability and Load Lines and on Fishing Vessels Safety, at its fifty-fifth session,

1. ADOPTS the Procedure for calculating the number of fishing vessels of each Contracting State to the 2012 Cape Town Agreement by the Depositary, the text of which is set out in the annex to the present resolution;

2. URGES States, when expressing their consent to be bound by the Agreement, to communicate to the Depositary the number of fishing vessels of 24 m in length and over (as defined in the 1993 Torremolinos Protocol) under their flag authorized to operate on the high seas;

3. ALSO URGES States to become a Contracting State to the Agreement as soon as possible to facilitate its early entry into force and cooperate with each other to achieve this end.

ANNEX

PROCEDURE FOR CALCULATING THE NUMBER OF FISHING VESSELS OF EACH CONTRACTING STATE TO THE 2012 CAPE TOWN AGREEMENT

General

1 In order for the Depositary to calculate the number of fishing vessels of each Contracting State to the 2012 Cape Town Agreement, the procedure below is to be followed:

.1 States, when expressing their consent to be bound by the Agreement, would be requested to communicate to the Depositary (the Secretary-General), the number of fishing vessels of 24 m in length and over (as defined in the 1993 Torremolinos Protocol) under their flag, authorized to operate on the high seas;

.2 if the information in subparagraph .1 above is unavailable at the time of the expression of consent, the Depositary will contact the FAO Secretariat to request the numbers of fishing vessels of 24 m in length and over provided to FAO by a Contracting State which is Party to the FAO Agreement to promote compliance with international conservation and management measures by fishing vessels on the high seas (the Compliance Agreement); and

.3 if the information in subparagraph .2 above is unavailable, the Depositary will obtain information from databases of Regional Fisheries Bodies (RFBs) or other international maritime databases, as appropriate, for the purpose of obtaining the number of fishing vessels of 24 m in length and over, authorized to operate on the high seas flying the flag of the Contracting State.

Simplified procedure for Parties to the 1993 Torremolinos Protocol

2 Article 3(4) of the 2012 Cape Town Agreement provides a simplified procedure for signature of the Agreement by Parties to the 1993 Torremolinos Protocol, whereby such States, having signed the Agreement in accordance with paragraph (2)(c) of article 3, shall be deemed to have expressed their consent to be bound by it 12 months after the day of its adoption.

3 For States using the simplified procedure, the Depositary will request them to confirm whether the number of fishing vessels reported to the Organization when that State expressed its consent to be bound by the 1993 Torremolinos Protocol meets the criteria of article 4(1) of the Agreement. In the event of no reply, the Depositary will use the procedures in paragraph 1.2 or 1.3 above for the purpose of article 4(1) of the Agreement.

Confirmation and final determination of data

4 In cases where the procedures in paragraph 1.2 or 1.3 above apply, the Depositary shall contact the Contracting State to the Agreement to confirm the number of fishing vessels obtained by the Depositary. The Contracting State will have a period of 60 days to confirm the number or to provide a more accurate number. In the event of no reply, the Depositary will use the number derived from the above procedures for the purpose of article 4(1) of the Agreement.

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ANNEX 16

PROPOSED DAMAGE STABILITY STANDARD FOR OFFSHORE SUPPLY VESSELS (OSVs) THAT CARRY LIMITED AMOUNTS OF HAZARDOUS AND NOXIOUS LIQUID SUBSTANCES IN BULK (I.E. FUTURE OSV CHEMICAL CODE STANDARD)

Damage stability

1 Offshore support vessels of not more than 100 m in length that carry not more than [liquid threshold amount to be established by the BLG Sub-Committee] should be designed to meet the damage stability requirements contained in the *Guidelines for the design and construction of offshore supply vessels, 2006* (resolution MSC.235(82), as amended by resolution MSC.335(90)).

2 Offshore support vessels of not more than 100 m in length that carry more than [liquid threshold amount to be established by the BLG Sub-Committee] should be designed to meet the damage stability requirements contained in the *Guidelines for the design and construction of offshore supply vessels, 2006* (resolution MSC.235(82), as amended by resolution MSC.335(90)). However, the damage location in paragraph 3.2.1 of those Guidelines should be assumed to occur anywhere along the vessel's length.

3 Offshore support vessels of more than 100 m in length should be designed to meet the damage stability requirements in SOLAS chapter II-1, part B-1. In addition, these vessels should also be designed to meet the damage stability requirements contained in the *Guidelines for the design and construction of offshore supply vessels, 2006* (resolution MSC.235(82), as amended by resolution MSC.335(90)), but with the following modifications:

.1 the damage location in paragraph 3.2.1 of those Guidelines should be assumed to occur anywhere along the vessel's length;

.2 the assumed extent of damage in paragraph 3.2.2 of those Guidelines should be as follows:

.1 longitudinal extent: $1/3L^{2/3}$;

.2 transverse extent: B/15, but not less than 760 mm; and

.3 vertical extent: upward without limit; and

.3 a transverse watertight bulkhead extending from the vessel's side to a distance inboard of B/15 or more (but not less than 760 mm) at the level of the summer load line joining longitudinal watertight bulkheads may be considered as a transverse watertight bulkhead for the purpose of the damage calculations (paragraph 3.2.3 of the Guidelines).

The table below shows the proposed damage stability standard for OSVs that carry limited amounts of hazardous and noxious liquid substances in bulk (i.e. future OSV Chemical Code standard), as contained in paragraphs 1 to 3 above (user-friendly version).

Ship length (L)	**Longitudinal damage extent**	**Transverse damage extent**	**Vertical damage extent**	**Damage location**	**Survival criteria**
24 ≤ L ≤ 43 m	0.1L	760 mm	from the underside of the cargo deck, or the continuation thereof, downward for the full depth of the vessel	Below a liquid threshold amount to be established by BLG: anywhere along the length between transverse watertight bulkheads* Above a liquid threshold amount to be established by BLG: anywhere along the length	MSC.235(82) section 3.3
43 < L < 80 m	3 m + 0.03L	760 mm	from the underside of the cargo deck, or the continuation thereof, downward for the full depth of the vessel	Below a liquid threshold amount to be established by BLG: anywhere along the length between transverse watertight bulkheads* Above a liquid threshold amount to be established by BLG: anywhere along the length	MSC.235(82) section 3.3
80 ≤ L ≤ 100 m	$1/3L^{2/3}$	B/20 but not less than 760 mm	from the underside of the cargo deck, or the continuation thereof, downward for the full depth of the vessel	Below a liquid threshold amount to be established by BLG: anywhere along the length between transverse watertight bulkheads* Above a liquid threshold amount to be established by BLG: anywhere along the length	MSC.235(82) section 3.3
100 m < L	SOLAS chapter II-1 probabilistic damage stability standard for a cargo ship - - and - -				
	$1/3L^{2/3}$	B/15 but not less than 760 mm	upward without limit	anywhere along the length	MSC.235(82) section 3.3

* If the distance between adjacent transverse watertight bulkheads or the distance between the transverse planes passing through the nearest stepped portions of the bulkheads is less than the longitudinal extent of damage, only one of these bulkheads should be regarded as effective.

Note: The general damage stability calculation assumptions in resolution MSC.235(82), section 3.4, as well as in paragraphs 3.2.3 to 3.2.7 would apply.

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ANNEX 17

PROPOSED MODIFICATIONS TO THE DRAFT REVISED INTERNATIONAL CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING LIQUEFIED GASES IN BULK (IGC CODE)

CHAPTER 2

SHIP SURVIVAL CAPABILITY AND LOCATION OF CARGO TANKS

2.2 Freeboard and stability

2.2.1 Ships subject to the Code may be assigned the minimum freeboard permitted by the International Convention on Load Lines in force. However, the draught associated with the assignment shall not be greater than the maximum draught otherwise permitted by this Code.

2.2.2 The stability of the ship, in all seagoing conditions and during loading and unloading cargo, shall comply with the requirements of the *International Code on Intact Stability*. This includes partial filling and loading and unloading at sea, when applicable. Stability during ballast water operations shall fulfil stability criteria.

2.2.3 When calculating the effect of free surfaces of consumable liquids for loading conditions, it shall be assumed that, for each type of liquid, at least one transverse pair or a single centre tank has a free surface. The tank or combination of tanks to be taken into account shall be those where the effect of free surfaces is the greatest. The free surface effect in undamaged compartments shall be calculated by a method according to the *International Code on Intact Stability*.

2.2.4 Solid ballast shall not normally be used in double bottom spaces in the cargo area. Where, however, because of stability considerations, the fitting of solid ballast in such spaces becomes unavoidable, its disposition shall be governed by the need to enable access for inspection and to ensure that the impact loads resulting from bottom damage are not directly transmitted to the cargo tank structure.

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. In addition, the booklet shall contain sufficient information to enable the master to load and operate the ship in a safe and seaworthy manner.

~~In addition, the master shall be given an approved stability instrument to assess:~~

~~.1 the intact stability;~~

~~.2 the damage stability condition according to the standard damage cases and the actual damage condition of the ship; and~~

~~.3 bending moment and shear force in intact condition.~~

~~The stability instrument input data and output results shall be approved by the Administration.~~

2.2.6 All ~~[~~ships~~]~~ ~~[tankers]~~, 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~~]~~ ~~[tankers]~~ constructed before [date of entry into force] shall comply with this paragraph at the first scheduled renewal survey of the ship after [date of entry into force] but not later than [five years after date of entry into force];

.2 notwithstanding the requirements of 2.2.6.1 a stability instrument installed on a ~~[~~ship~~]~~ ~~[tanker]~~constructed before [date of entry into force] 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.…)]."

2.2.7 The Administration may give special dispensation to the following ships from the requirements of paragraph 2.2.6 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 dispensation 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 [date of entry into force] 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.…)]."

2.2.~~6~~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.

2.3 Damage assumptions

2.3.1 The assumed maximum extent of damage shall be:

.1	*Side damage*		
.1.1	Longitudinal extent:	1/3 $L^{2/3}$ or 14.5 m, whichever is less	
.1.2	Transverse extent: measured inboard from the moulded line of the outer shell at right angles to the centreline at the level of the summer waterline	B/5 or 11.5m, whichever is less	
.1.3	Vertical extent: from the moulded line of the outer shell at right angles to the centreline at the level of the summer load line	Upwards, without limit	
.2	*Bottom damage*:	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 14.5 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:	*B*/15 or 2 m, whichever is less, measured from the moulded line of the bottom shell plating at centreline (see 2.4.3)	*B*/15 or 2 m, whichever is less measured from the moulded line of the bottom shell plating at centreline (see 2.4.3)

2.3.2 *Other damage*

2.3.2.1 If any damage of a lesser extent than the maximum damage specified in 2.3.1 would result in a more severe condition, such damage shall be assumed.

2.3.2.2 Local damage anywhere in the cargo area extending inboard distance "*d*" as defined in 2.4.1, measured normal to the moulded line of the outer shell shall be considered. Bulkheads shall be assumed damaged when the relevant subparagraphs of 2.6.1 apply. If a damage of a lesser extent than "*d*" would result in a more severe condition, such damage shall be assumed.

2.4 Location of cargo tanks

2.4.1 Cargo tanks shall be located at the following distances inboard:

.1 Type 1G ships: from the moulded line of the outer shell, not less than the transverse extent of damage specified in 2.3.1.1.2 and, from the moulded line of the bottom shell at centreline, not less than the vertical extent of damage specified in 2.3.1.2.3, and nowhere less than "*d*" where "*d*" is as follows:

(i) for Vc below or equal 1,000 m^3, d = 0.80 m;
(ii) for 1,000 m^3 < Vc < 5,000 m^3, d = (0.75+ Vc x 0.20/4,000) m;
(iii) for 5,000 m^3 ≤ Vc < 30,000 m^3, d = (0.8 + Vc/25,000) m; and
(iv) for Vc ≥ 30,000 m^3, d = 2 m,

where Vc corresponds to 100 per cent of the gross design volume of the individual cargo tank at 20°C, including domes and appendages. See figures 2.1 and 2.2. For the purpose of cargo tank protective distances, the cargo tank volume is the aggregate volume of all the parts of tank that have a common bulkhead(s).

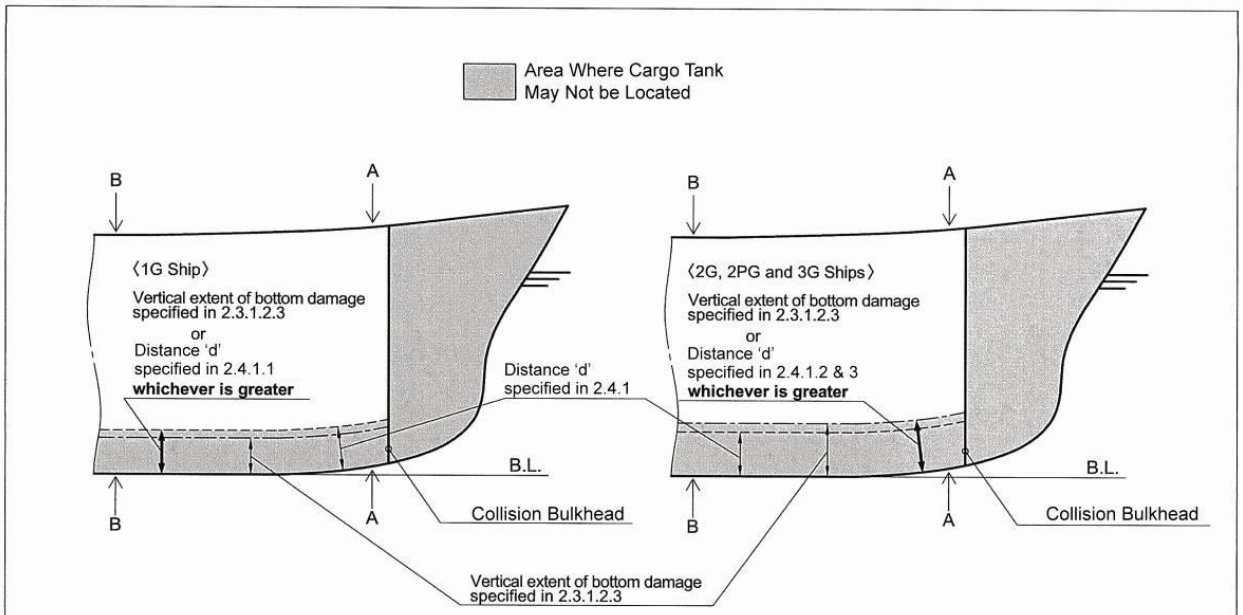
Note: "*d*" is measured at any cross section at a right angle from the moulded line of outer shell.

Tank size limitations may apply to type 1G ship cargoes in accordance with chapter 17.

.2 Types 2G/2PG: from the moulded line of the bottom shell at centreline not less than the vertical extent of damage specified in 2.3.1.2.3 and nowhere less than "*d*" as indicated in 2.4.1.1. See figures 2.1 and 2.3.

.3 Type 3G ships: from the moulded line of the bottom shell at centreline not less than the vertical extent of damage specified in 2.3.1.2.3 and nowhere less than "*d*", where "*d*" = 0.80 m from the moulded line of outer shell. See figures 2.1 and 2.4.

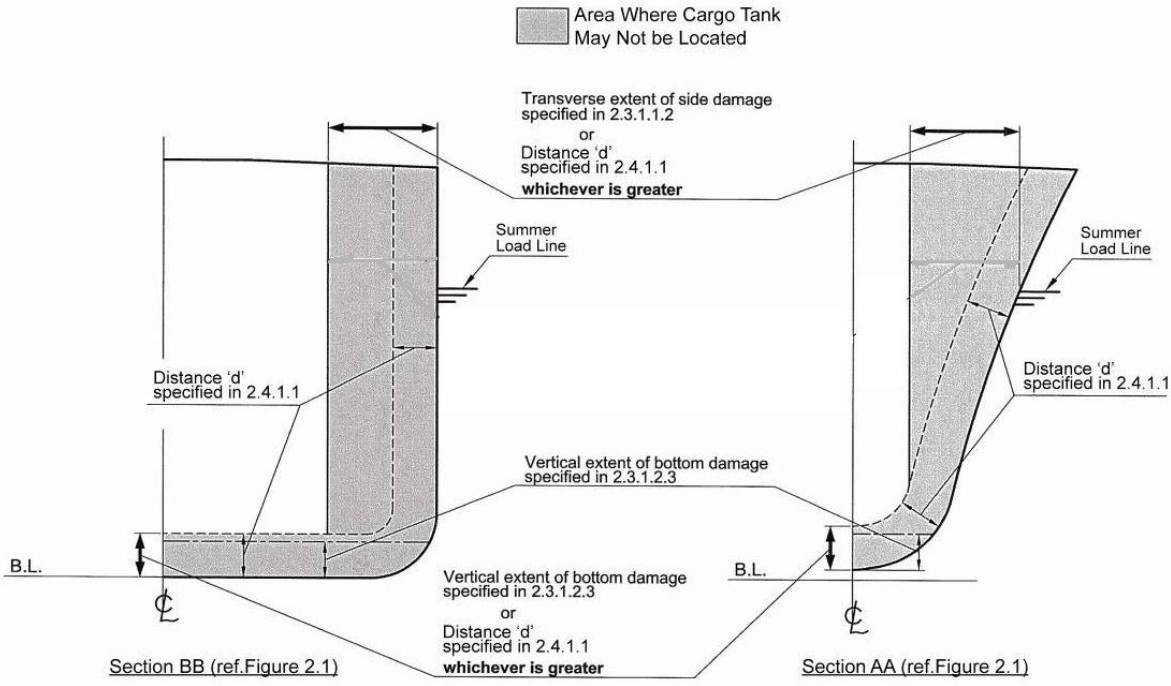
2.4.2 For the purpose of tank location, the vertical extent of bottom damage shall be measured to the inner bottom when membrane or semi-membrane tanks are used, otherwise to the bottom of the cargo tanks. The transverse extent of side damage shall be measured to the longitudinal bulkhead when membrane or semi-membrane tanks are used, otherwise to the side of the cargo tanks. The distances indicated in 2.3 and 2.4 shall be applied as in figures 2.5(a) to (e). These distances shall be measured plate to plate, from the moulded line to the moulded line, excluding insulation.



Centreline Profile - Type 1G, 2G, 2PG and 3G Ships

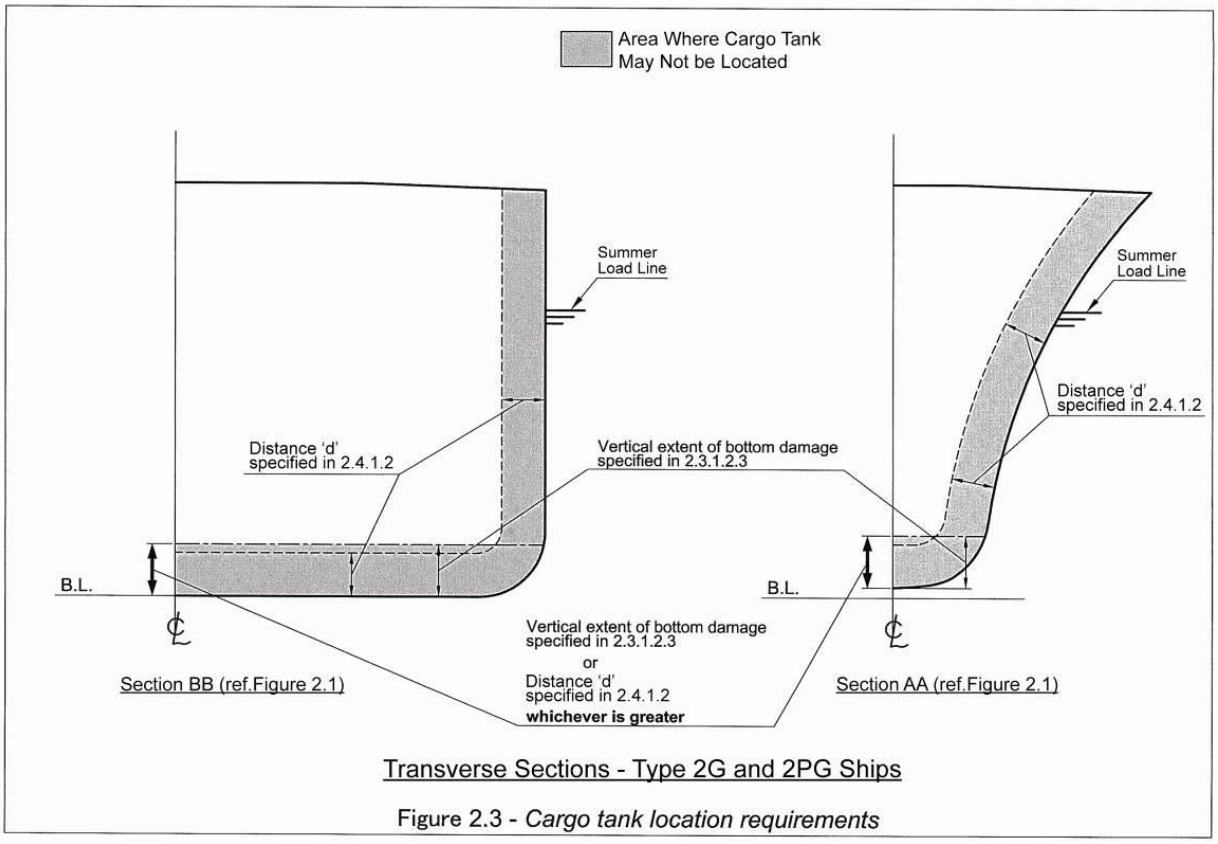
Figure 2.1 - *Cargo tank location requirements*

Insert "Summer Load Line" inscription twice in the above figure 2.1 similarly as in figures 2.2 to 2.4.



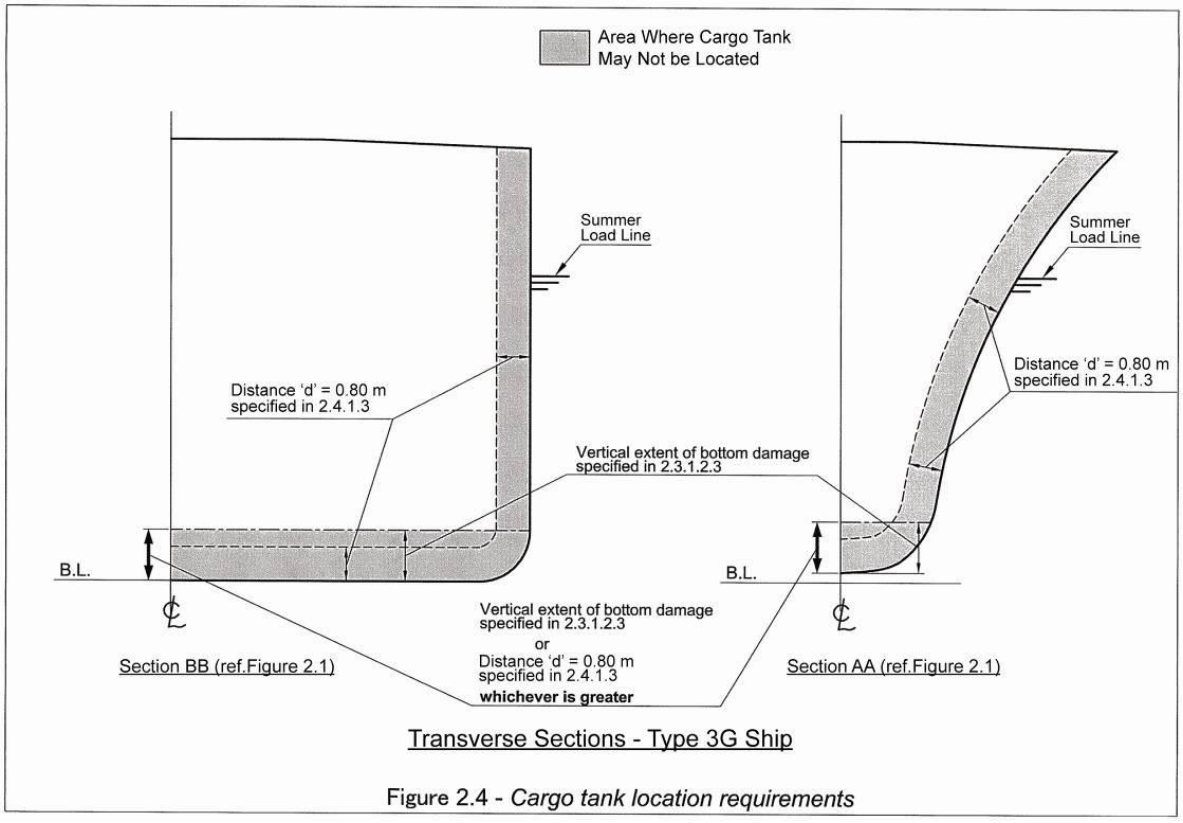
Transverse Sections - Type 1G Ship

Figure 2.2 - *Cargo tank location requirements*



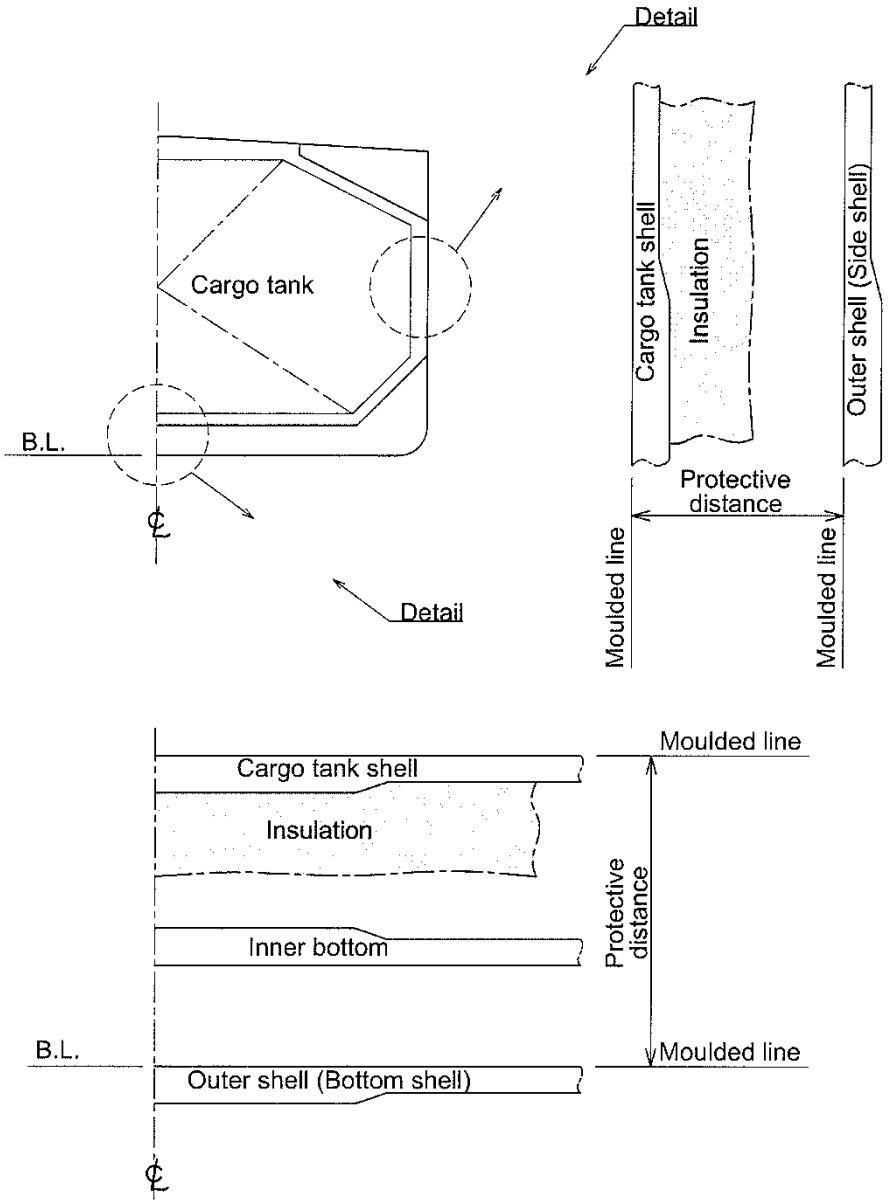
Transverse Sections - Type 2G and 2PG Ships

Figure 2.3 - *Cargo tank location requirements*



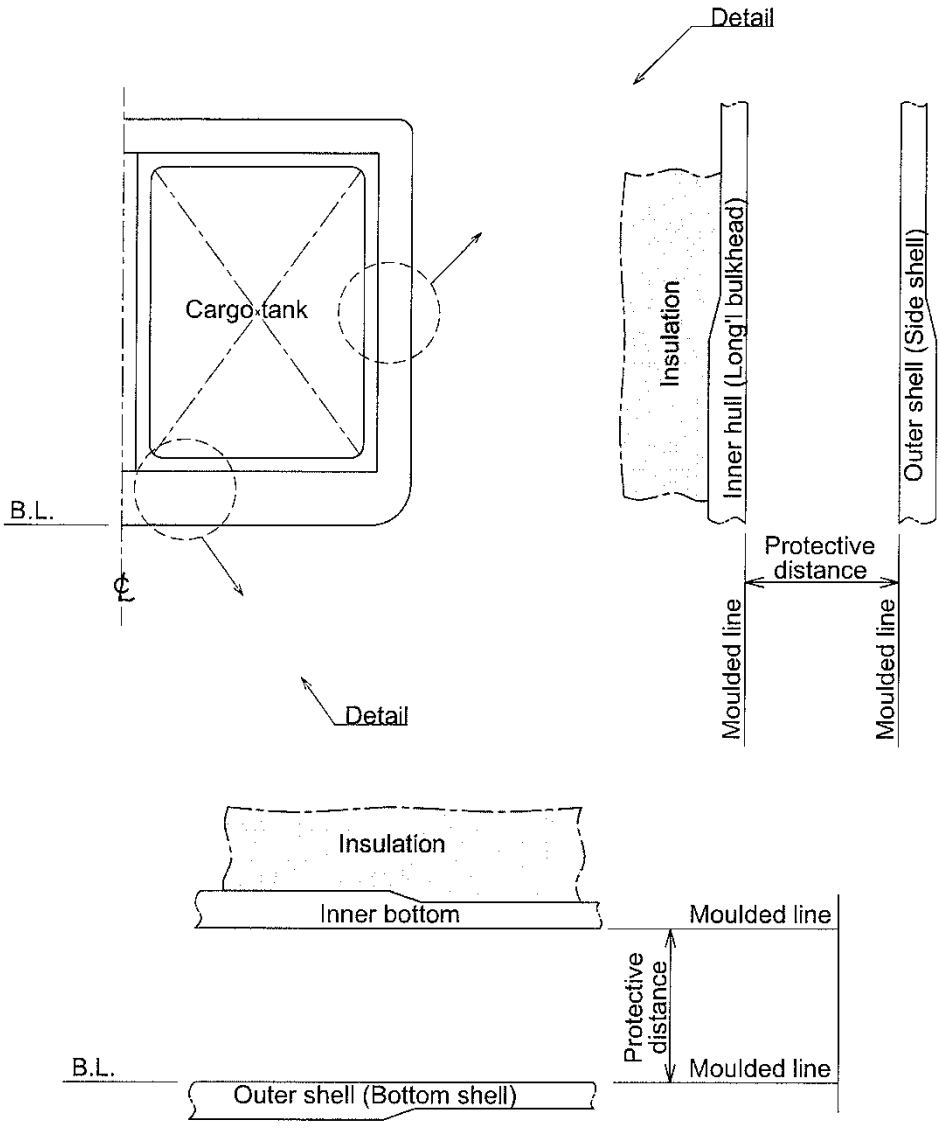
Transverse Sections - Type 3G Ship

Figure 2.4 - *Cargo tank location requirements*



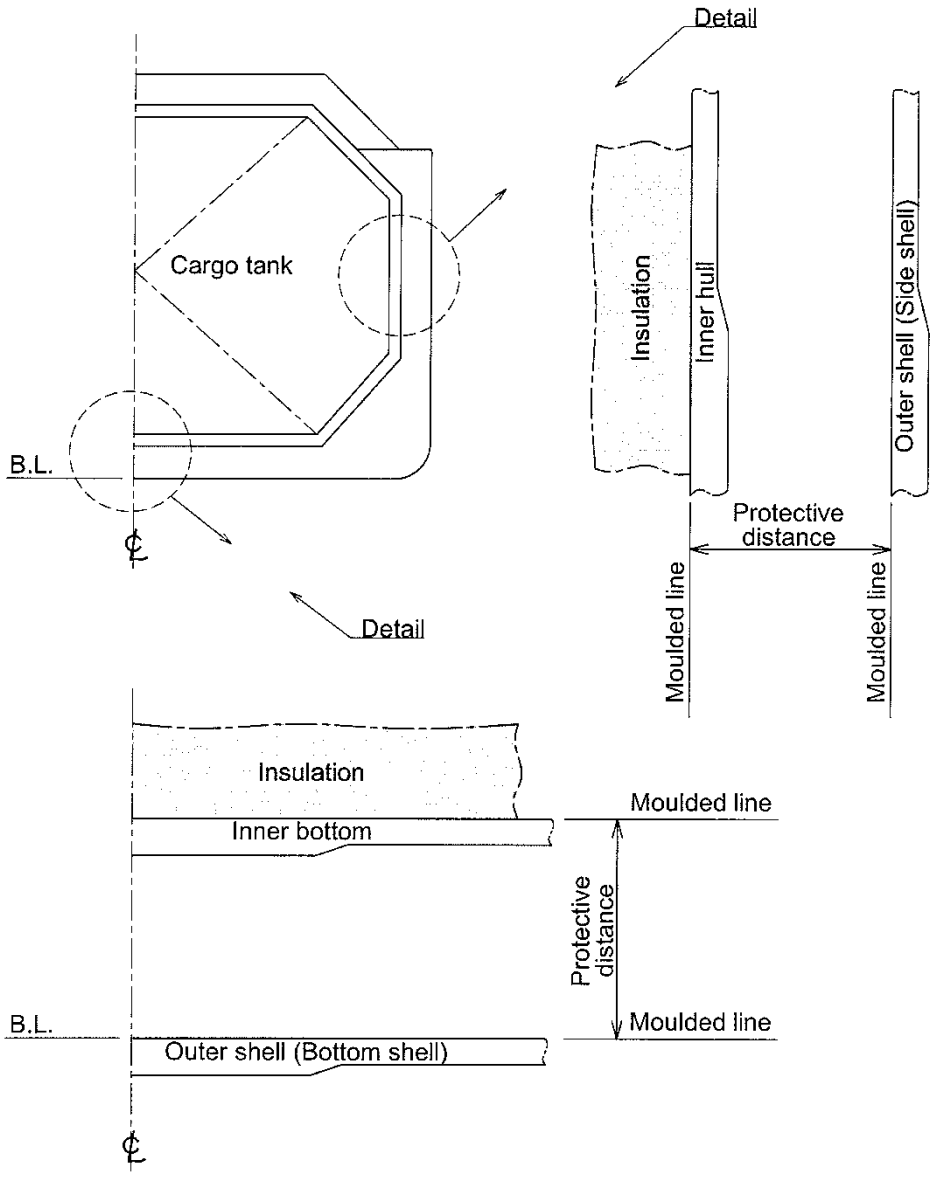
Independent prismatic tank

Figure 2.5(a) - *Protective distance*



Semi-membrane tank

Figure 2.5(b) - *Protective distance*



Membrane tank

Figure 2.5(c) - *Protective distance*

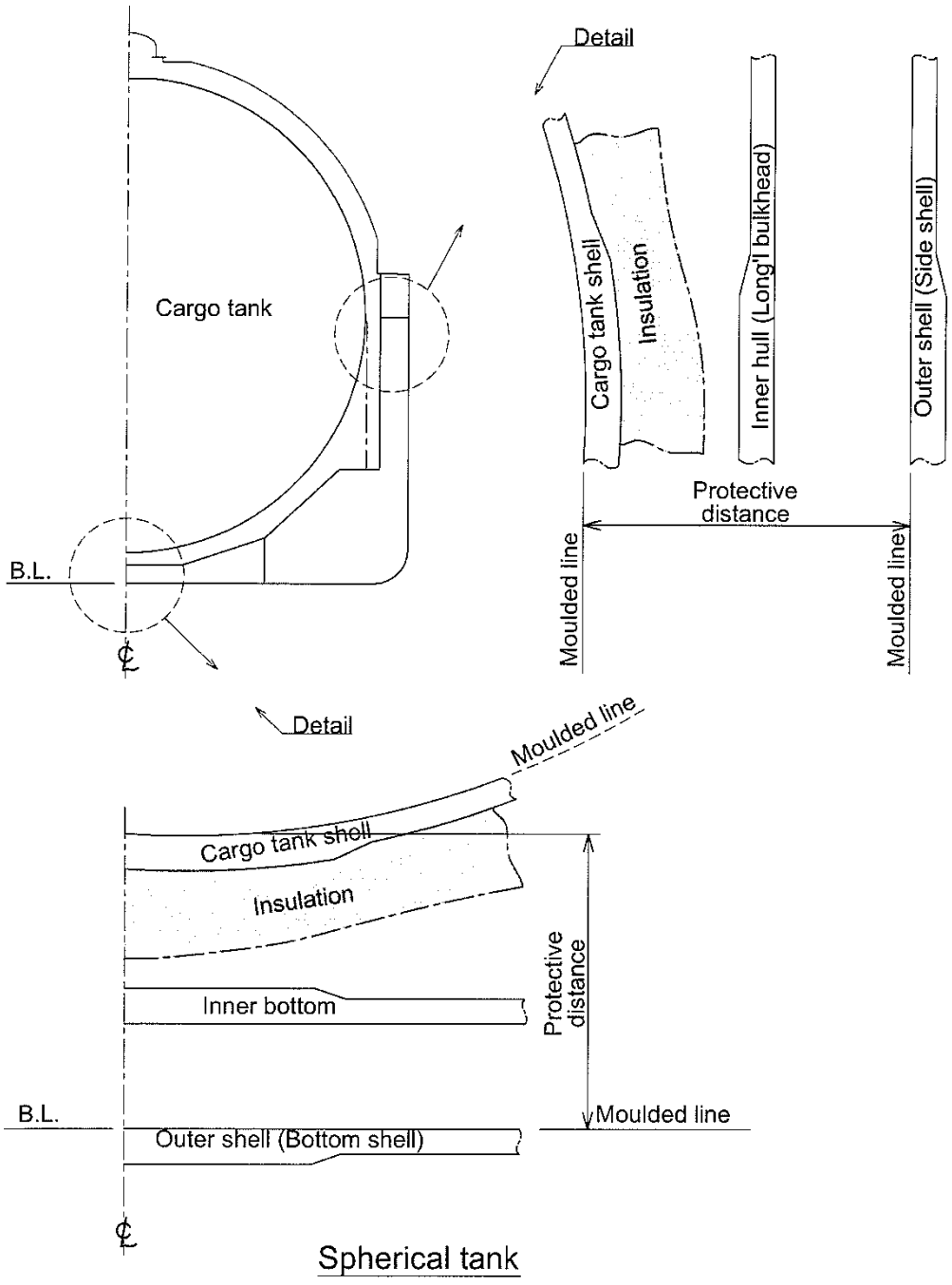
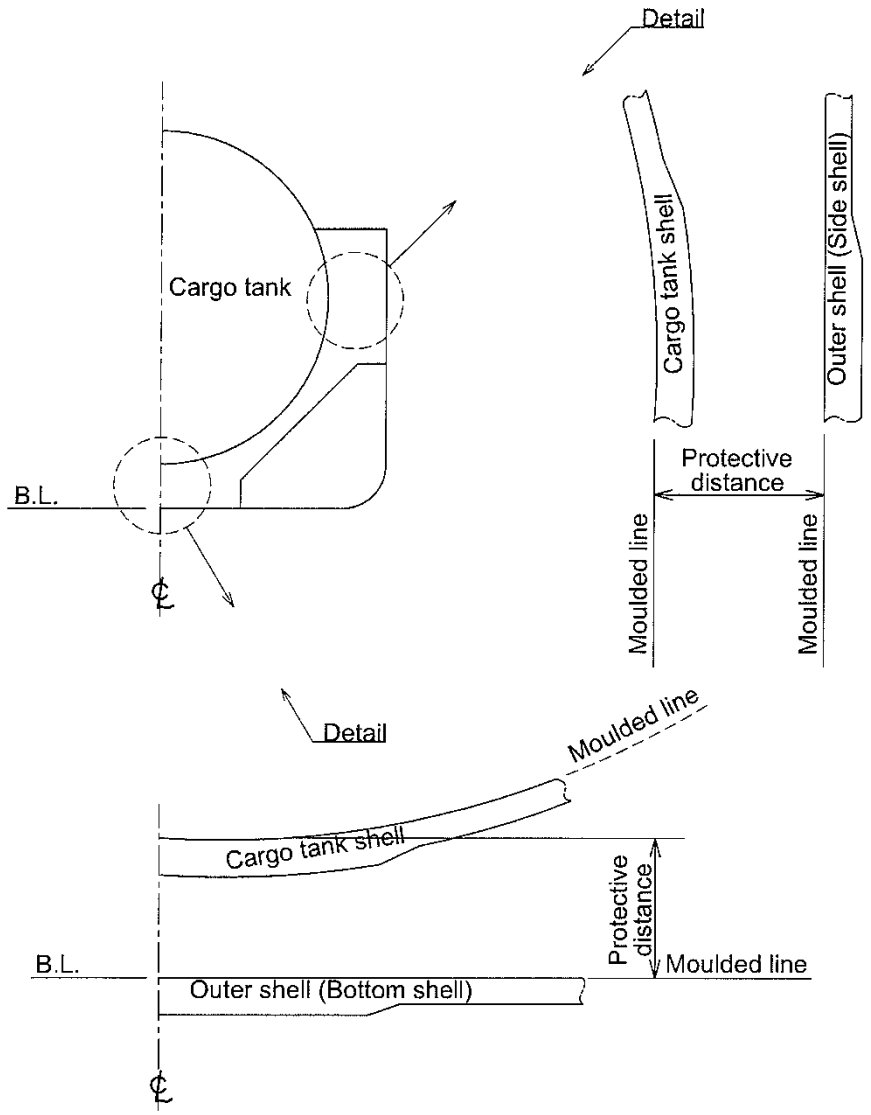


Figure 2.5(d) - *Protective distance*



Pressure type tank

Figure 2.5(e) - *Protective distance*

2.4.3 Except for type 1G ships, suction wells installed in cargo tanks may protrude into the vertical extent of bottom damage specified in 2.3.1.2.3, provided that such wells are as small as practicable and the protrusion below the inner bottom plating does not exceed 25 per cent of the depth of the double bottom or 350 mm, whichever is less. Where there is no double bottom, the protrusion below the upper limit of bottom damage shall not exceed 350 mm. Suction wells installed in accordance with this paragraph may be ignored when determining the compartments affected by damage.

2.4.4 Cargo tanks shall not be located forward of the collision bulkhead.

2.5 Flood assumptions

2.5.1 The requirements of 2.7 shall be confirmed by calculations that take into consideration the design characteristics of the ship, the arrangements, configuration and contents of the damaged compartments, the distribution, relative densities and the free surface effects of liquids and the draught and trim for all conditions of loading.

2.5.2 The permeabilities of spaces assumed to be damaged shall be as follows:

Spaces	Permeabilities
Stores	0.6
Accommodation	0.95
Machinery	0.85
Voids	0.95
Hold spaces	0.95 (*)
Consumable liquids	0 to 0.95 (**)
Other liquids	0 to 0.95 (**)

Notes:

(*) Other values of permeability can be considered based on the detailed calculations; refer to MSC/Circ.651 "Interpretations of regulations of part B-1 of SOLAS chapter II-1".

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

2.5.3 Wherever damage penetrates a tank containing liquids, it shall be assumed that the contents are completely lost from that compartment and replaced by saltwater up to the level of the final plane of equilibrium.

2.5.4 Where the damage between transverse watertight bulkheads is envisaged, as specified in 2.6.1.4, 2.6.1.5, and 2.6.1.6, transverse bulkheads shall be spaced at least at a distance equal to the longitudinal extent of damage specified in 2.3.1.1.1 in order to be considered effective. Where transverse bulkheads are spaced at a lesser distance, one or more of these bulkheads within such extent of damage shall be assumed as non-existent for the purpose of determining flooded compartments. Further, any portion of a transverse bulkhead bounding side compartments or double bottom compartments shall be assumed damaged if the watertight bulkhead boundaries are within the extent of vertical or horizontal penetrated required by 2.3. Also, any transverse bulkhead shall be assumed damaged if it contains a step or recess of more than 3 m in length located within the extent of penetration of assumed damage. The step formed by the after-peak bulkhead and the after-peak tank top shall not be regarded as a step for the purpose of this paragraph.

2.5.5 The ship shall be designed to keep unsymmetrical flooding to the minimum consistent with efficient arrangements.

2.5.6 Equalization arrangements requiring mechanical aids such as valves or cross-levelling pipes, if fitted, shall not be considered for the purpose of reducing an angle of heel or attaining the minimum range of residual stability to meet the requirements of 2.7.1, and sufficient residual stability shall be maintained during all stages where equalization is used. Spaces linked by ducts of large cross-sectional area may be considered to be common.

2.5.7 If pipes, ducts, trunks or tunnels are situated within the assumed extent of damage penetration, as defined in 2.3, arrangements shall be such that progressive flooding cannot thereby extend to compartments other than those assumed to be flooded for each case of damage.

2.5.8 The buoyancy of any superstructure directly above the side damage shall be disregarded. However, the unflooded parts of superstructures beyond the extent of damage may be taken into consideration provided that:

.1 they are separated from the damaged space by watertight divisions and the requirements of 2.7.1.1 in respect of these intact spaces are complied with; and

.2 openings in such divisions are capable of being closed by remotely operated sliding watertight doors and unprotected openings are not immersed within the minimum range of residual stability required in 2.7.2.1. However, the immersion of any other openings capable of being closed weathertight may be permitted.

2.6 Standard of damage

2.6.1 Ships shall be capable of surviving the damage indicated in 2.3 with the flood assumptions in 2.5, to the extent determined by the ship's type, according to the following standards:

.1 a type 1G ship shall be assumed to sustain damage anywhere in its length;

.2 a type 2G ship of more than 150 m in length shall be assumed to sustain damage anywhere in its length;

.3 a type 2G ship of 150 m in length or less shall be assumed to sustain damage anywhere in its length, except involving either of the bulkheads bounding a machinery space located aft;

.4 a type 2PG ship shall be assumed to sustain damage anywhere in its length except involving transverse bulkheads spaced further apart than the longitudinal extent of damage as specified in 2.3.1.1.1;

.5 a type 3G ship of 80 m in length or more shall be assumed to sustain damage anywhere in its length, except involving transverse bulkheads spaced further apart than the longitudinal extent of damage specified in 2.3.1.1.1; and

.6 a type 3G ship less than 80 m in length shall be assumed to sustain damage anywhere in its length, except involving transverse bulkheads spaced further apart than the longitudinal extent of damage specified in 2.3.1.1.1 and except damage involving the machinery space when located aft.

2.6.2 In the case of small type 2G/2PG and 3G ships that do not comply in all respects with the appropriate requirements of 2.6.1.3, 2.6.1.4, and 2.6.1.6, special dispensations may only be considered by the Administration provided that alternative measures can be taken which maintain the same degree of safety. The nature of the alternative measures shall be approved and clearly stated and be available to the port Administration. Any such dispensation shall be duly noted on the International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk, referred to in 1.4.4.

2.7 Survival requirements

Ships subject to the Code shall be capable of surviving the assumed damage specified in 2.3, to the standard provided in 2.6, in a condition of stable equilibrium and shall satisfy the following criteria.

2.7.1 In any stage of flooding:

.1 the waterline, taking into account sinkage, heel and trim, shall be below the lower edge of any opening through which progressive flooding or downflooding may take place. Such openings shall include air pipes and openings that are closed by means of weathertight doors or hatch covers and may exclude those openings closed by means of watertight manhole covers and watertight flush scuttles, small watertight cargo tank hatch covers that maintain the high integrity of the deck, remotely operated watertight sliding doors and sidescuttles of the non-opening type;

.2 the maximum angle of heel due to unsymmetrical flooding shall not exceed 30°; and

.3 the residual stability during intermediate stages of flooding shall not be ~~significantly~~ less than that required by 2.7.2.1.

2.7.2 At final equilibrium after flooding:

.1 the righting lever curve shall have a minimum range of 20° beyond the position of equilibrium in association with a maximum residual righting lever of at least 0.1 m within the 20° range; the area under the curve within this range shall not be less than 0.0175 m-radians. The 20° range may be measured from any angle commencing between the position of equilibrium and the angle of 25° (or 30° if no deck immersion occurs). Unprotected openings shall not be immersed within this range unless the space concerned is assumed to be flooded. Within this range, the immersion of any of the openings listed in 2.7.1.1 and other openings capable of being closed weathertight may be permitted; and

.2 the emergency source of power shall be capable of operating.

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