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SUB-COMMITTEE ON STABILITY AND
LOAD LINES AND ON FISHING
VESSELS SAFETY - 37th session
Agenda item 25

REPORT TO THE MARITIME SAFETY COMMITTEE

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W/2192N/EWP

LIST OF ANNEXES

1 GENERAL

1.1 The Sub-Committee held its thirty-seventh session from 11 to 15 January 1993 under the chairmanship of Mr. H. Hormann (Germany).

1.2 The session was attended by representatives from the following countries:

ARGENTINA
AUSTRALIA
BAHAMAS
BELGIUM
BRAZIL
CANADA
CHILE
CHINA
CROATIA
CYPRUS
DENMARK
EGYPT
FINLAND
FRANCE
GERMANY
GREECE
ICELAND
INDIA
IRELAND
ITALY
JAPAN
LIBERIA
MEXICO
NETHERLANDS
NORWAY
PERU
PHILIPPINES
POLAND
PORTUGAL
REPUBLIC OF KOREA
ROMANIA
RUSSIAN FEDERATION
SPAIN
SWEDEN
UNITED KINGDOM
UNITED STATES
VENEZUELA

the following Associate Member of IMO:

HONG KONG

an observer from the following intergovernmental organization:

COMMISSION OF THE EUROPEAN COMMUNITIES (EEC)

and observers from the following non-governmental organizations:

INTERNATIONAL CHAMBER OF SHIPPING (ICS)
INTERNATIONAL CONFEDERATION OF FREE TRADE UNIONS (ICFTU)
INTERNATIONAL ASSOCIATION OF CLASSIFICATION SOCIETIES (IACS)
OIL COMPANIES INTERNATIONAL MARINE FORUM (OCIMF)
INTERNATIONAL FEDERATION OF SHIPMASTERS' ASSOCIATION (IFSMA)
OIL INDUSTRY INTERNATIONAL EXPLORATION AND PRODUCTION FORUM (E & P FORUM)

1.3 In his opening address the Secretary-General stressed that safety in world shipping largely depends on the successful implementation of the various relevant international instruments. This was endorsed by the Council, when it adopted the theme for World Maritime Day 1993 of "Implementation of IMO standards - the key to success". He expressed confidence that, with the establishment of the new Sub-Committee on Flag State Implementation (FSI), IMO would be in a much better position to improve its services to the maritime community from the maritime safety and pollution prevention points of view.

1.4 The Secretary-General, referring to the grounding of the tanker Braer off the southern coast of the Shetland Islands on 5 January 1993, expressed sympathy to the Government of the United Kingdom and all those who have suffered as a result of the accident, particularly to the residents of the islands. He then commended the United Kingdom SAR authorities for their successful operation in rescuing the crew of the tanker in question. The delegation of Liberia and the Chairman on behalf of the Sub-Committee associated themselves with the above statement.

1.5 The Secretary-General expressed appreciation for the work carried out by the Sub-Committee, as the lead sub-committee, in the development of the Protocol to the 1977 Torremolinos Convention and confirmed that a Conference to adopt a Protocol would be held, at the kind invitation of the Government of Spain, in Torremolinos, in March/April of this year. He emphasized that the adoption of this instrument would be a milestone in IMO's efforts to develop a globally acceptable instrument regulating the safety of fishing vessels and fishermen by providing a much-needed safety standard in this important area of maritime activity and filling a major gap in existing maritime legislation.

1.6 Referring to the work of the Sub-Committee, the Secretary-General pointed out that the agenda of the meeting included a number of important issues for consideration and invited the Sub-Committee, in following the policy to review the grandfather clauses in IMO instruments with a view to reducing the difference in safety standards between new and existing ships, to consider the existing passenger ship damage stability in the same manner as it did for existing ro-ro passenger ships.

1.7 The Secretary-General also referred to the work of the Sub-Committee on the revision of the technical regulations of the 1966 Load Line Convention which, based on the concept of safety and performance criteria recognized as sufficient in the sixties, has successfully served the world maritime community for 25 years. However, there are now indications that modern complex technology in the transportation of cargoes and new developments in ship design are no longer effectively dealt with in the existing Convention and that a revision is necessary.

1.8 The Secretary-General drew the Sub-Committee's attention to the need to keep its report and the reports of its working groups as brief and concise as possible so that no undue strain is put on IMO's financial, administrative and translation resources.

<u>Adoption of the agenda</u>

1.9 The Sub-Committee considered its provisional agenda (SLF 37/1/Rev.1), annotations thereto (SLF 37/1/1) and timetable (SLF 37/1/1/Add.1) and adopted the agenda which together with the list of documents considered is given in annex 1.

2 DECISIONS OF OTHER IMO BODIES

2.1 The Sub-Committee considered notes by the Secretariat regarding the decisions of the MSC at its sixtieth and sixty-first sessions (SLF 37/2/15, SLF 37/2/15/Add.1 and SLF 37/2/19), the LSR Sub-Committee at its twenty-third session (SLF 37/2/13), the DE Sub-Committee at its thirty-fifth session (SLF 37/2/14), the FP Sub-Committee at its thirty-seventh session (SLF 37/2/17) and the CDG Sub-Committee at its forty-fourth session (SLF 37/2/18). The Sub-Committee also considered the outcome of the meeting of the working group on the development of the Protocol to the 1977 SFV Convention (SLF 37/2/16) as reflected in paragraphs 2.7 and 2.8 below.

2.2 The Sub-Committee noted the actions and decisions taken by the Committee at its last two sessions and, in particular, the Committee's instructions for the Sub-Committee to:

.1 develop requirements for the application of SOLAS 90 standard to existing passenger ships other than ro-ro passenger ships, as a matter of high priority at this session;

.2 provide an indication of the degree of subdivision of the ship in the damage stability information to be provided to the master, when developing requirements referred to in .1 above;

.3 review the hypothetical oil outflow parameters as a matter of a high priority;

.4 consider the United Kingdom's proposal (MSC 60/10/1) on the application of regulation II-1/1.3 of SOLAS 74 to the amendments adopted by resolution MSC.19(58);

.5 include in the work programme of the Sub-Committee and give consideration to items on tonnage measurement of new oil tanker designs, extension of Seasonal Tropical Zones, and role of the human element in maritime casualties;

.6 consider a draft action plan on structural integrity of large ships in MSC 60/20/15 prepared by the DE Sub-Committee;

.7 consider documents by Norway (MSC 61/10/7) and Germany (MSC 61/10/11) on tonnage certification;

.8 consider regulation III/2(1)(c) of the draft SFV Protocol and develop amendments to the regulation, if possible (SLF 37/2/19, paragraph 10.74.1);

.9 review the list of references to the requirements in the draft SFV Protocol left "to the discretion of the Administration" as given in document SLF 37/INF.2 (SLF 37/2/19, paragraph 10.74.2);

.10 review the recommendation entitled "Guidance on a method of calculation of bow height" to be included in the attachment to the Final Act of the 1993 SFV Conference (SLF 37/2/19, paragraph 10.74.3);

.11 consider the safety aspects of alternative methods for existing tankers contained in the draft guidelines for the approval of alternative tanker designs under regulation 13G(7) of Annex I to MARPOL 73/78 (SLF 37/2/19, paragraphs 14.2 and 14.3);

.12 consider the interpretations of, and recommendations for, application of the provisions of resolution MSC.26(60) and MSC/Circ.574 (MSC 61/20/6);

.13 consider a submission by Norway (MSC 61/20/8) concerning implementation of resolution A.722(17) aimed at deducting the tonnage of segregated ballast tanks (SBT) from the ship's gross tonnage; and

.14 note the approval of the work programme proposed by the Sub-Committee as contained in SLF 37/2/15, annex and SLF 37/2/19, annex.

2.3 The Sub-Committee noted the instruction for the Secretariat to identify, before the preparation of a composite text of SFV 77/93 as an IMO publication, those IMO recommendations (Assembly resolutions, etc.) and other sources of relevant information, which may be inserted in that publication and submit a list of such recommendations to the Committee for consideration and approval in due course.

2.4 The Sub-Committee noted the LSR Sub-Committee's recommendation to the Committee (SLF 37/2/13) that the work relating to the review of chapter VIII of Part B of the Code of Safety for Fishermen and Fishing Vessels or updating of cross-references should be suspended until the development of the Protocol to the 1977 SFV Convention has been finalized.

2.5 The Sub-Committee noted that the DE Sub-Committee (SLF 37/2/14) recommended to the Committee the approval of the final draft Code for the Safe Carriage of Irradiated Nuclear Fuel in Flasks on Board Ships. The Sub-Committee further noted that this Code was currently under revision by a joint IMO/IAEA/UNEP working group as decided by the Committee.

2.6 It was also noted that the revised Code of Safety for Dynamically Supported Craft should be a stand alone document to be completed in 1993 in time for submission to the Assembly at its eighteenth session for adoption.

2.7 The Sub-Committee noted that the intersessional meeting of the working group on the development of the Protocol to the 1977 SFV Convention (SLF 37/2/16) was held in Reykjavík from 1 to 5 June 1992. The group had for its consideration documents submitted under this agenda item which included the basic document (SLF 37/2), containing the updated text of the Protocol to the 1977 SFV Convention, comments thereon by China (SLF 37/2/8), Germany (SLF 37/2/7), Japan (SLF 37/2/9 and SLF 37/INF.2), the Republic of Korea (SLF 37/2/11), ICFTU (SLF 37/2/6) and documents prepared by the Secretariat (SLF 37/2/1, SLF 37/2/2, SLF 37/2/2/Corr.1, SLF 37/2/3, SLF 37/2/4, SLF 37/2/5, SLF 37/2/10 and SLF 37/2/12). As the documents were dealt with by the working group at its meeting in Reykjavík and specific decisions were already taken thereat, there was no need for the Sub-Committee to further review the documents except those for which the Sub-Committee's consideration had been requested.

2.8 Pursuant to the request of the Committee at its sixtieth session the text of the draft Protocol, which took account of amendments agreed by the working group, was transmitted for the information and necessary action of Governments and interested organizations by Circular letter No.1598 of 14 July 1992.

2.9 The Sub-Committee decided to deal with the instructions and requests of other IMO bodies, with due regard being given to the decisions and comments provided in the documents submitted to the session, when considering the relevant agenda items.

3 INTACT STABILITY

3.1 The Sub-Committee had for its consideration under this agenda item documents submitted by Australia (SLF 37/3/1), Japan (SLF 37/3/2 and SLF 37/INF.7), the Netherlands (SLF 37/3/4), the Russian Federation (SLF 37/3/5, SLF 37/3/6, SLF 37/3/7 and SLF 37/INF.10), the United States (SLF 37/3/3 and SLF 37/INF.15) and the Secretariat (SLF 37/3). A document by Japan (SLF 37/23/2) was also dealt with under this agenda item.

3.2 As decided at its previous session the Sub-Committee established an ad hoc working group on intact stability under the chairmanship of Dr. J.S. Spencer (United States), referred the documents to the working group for consideration and instructed the group:

.1 to finalize the draft Code of Intact Stability for All Types of Ships Covered by IMO Instruments contained in the annex to SLF 37/3 taking into account comments by Japan and the Secretariat at this session;

.2 to develop possible amendments to regulation III/2(1)(c) of the draft Protocol to the 1977 SFV Convention (SLF 37/2/19, paragraph 10.74.1);

.3 to review the recommendation entitled "Guidance on a method of calculation of bow height" of Attachment 3 to the Final Act of the 1977 SFV Conference (SLF 37/2/19, paragraph 10.74.3);

.4 to provide comments on the proposed definition of the term "positive stability" used in regulation III/41.1.1 of SOLAS 74 for inclusion in the draft amendments to SOLAS chapter III, as requested by LSR 23 (SLF 37/2/13, paragraph 3.15);

.5 to continue the development of the draft operational manual for safety of ships in following and quartering seas.

3.3 Having received the report of the working group (SLF 37/WP.3), the Sub-Committee approved it in general, and took specific decisions as outlined in the following paragraphs.

Draft Code of Intact Stability for All Types of Ships Covered by IMO Instruments

3.4 The Sub-Committee considered the draft Code (SLF 37/3) together with comments and proposals submitted to the session and agreed with the amendments to the draft Code prepared by the group as contained in the annex to SLF 37/WP.3. The Sub-Committee decided to add paragraph 2.5.10bis to the Code referring to the use of operational guidelines or an on-board computer to assist the master in avoiding dangerous situations in heavy weather. The Secretariat was requested to prepare a consolidated text incorporating the above amendments, which is set out in annex 2 for submission to MSC 62 for approval and subsequent transmission to the eighteenth Assembly for adoption.

3.5 With regard to questions raised by the delegation of Japan as to the inclusion of current work on the Code of Safety for Dynamically Supported Craft (DSC) and the Protocol to the 1977 SFV Convention in the Intact Stability Code, the Sub-Committee agreed that the sections of the draft Code relating to the DSC Code and to the Protocol to the 1977 SFV Convention be retained within square brackets in the finalized draft Code and later substituted with agreed texts when these two instruments have been adopted.

3.6 The Sub-Committee noted that the Code was intended to supersede a number of Assembly resolutions which have different application requirements and that no clear reference as to the applicability of the Code itself had been made.

3.7 The Sub-Committee concurred with the views of the United States (SLF 37/3/3) that the Intact Stability Code must be considered a "living document" subject to changes in the context of the Sub-Committee's future work on the development or updating of standards for different ship types.

Possible amendments to regulation III/2(1)(c)

3.8 The Sub-Committee noted that possible amendments to regulation III/2(1)(c) of the draft Protocol to the 1977 SFV Convention were proposed to be developed by Denmark at the meeting of the working group on the development of the Protocol, as certain Danish fishing vessels had difficulties in complying with this regulation (SLF 37/2/16, paragraph 41). However, in the absence of any further documents or verbal presentations at this session, the Sub-Committee was unable to discuss and decide on this matter. The Sub-Committee invited Denmark and other Member States who have similar experience to submit proposals for amendments directly to the 1993 Torremolinos Conference for the adoption of the Protocol to be held in March/April 1993.

Guidance of a method of calculation of bow height of fishing vessels

3.9 The Sub-Committee considered the document by the Secretariat (SLF 37/2/16, paragraphs 86 to 89) relating to this item and proposals by Canada, Japan and the Republic of Korea at the meeting. After detailed discussion on sea conditions, areas of operation and related aspects, the Sub-Committee agreed to recommend the following for calculation of bow height:

.1 "The bow height" is defined as the minimum vertical distance from the deepest waterline to the top of the highest exposed deck measured at the forward perpendicular.

.2 The determination of the bow height (H_B) required, may be based upon the following formula:

$$H_B = K_1 L \left(1 + \frac{L}{K_2}\right) ,$$

where:

L is the length of the vessel in metres as defined in regulation I/2(5); and

K_1 and K_2 are the coefficients depending upon areas of operation and L as follows:

Area of operation	L	K_1	K_2
Extreme conditions with significant wave height of up to and including 8 m	24 m ≤ L < 110 m	0.09	-270
	L ≥ 110 m	4.959/L	600
Extreme conditions with significant wave height above 8 m	24 m ≤ L < 110 m	0.117	-220
	L ≥ 110 m	5.991/L	1484

.3 The Administration should stipulate either of the above or other standard, considering expected sea and weather conditions in particular fishing areas.

The Secretariat was instructed to bring this matter to the attention of the 1993 Torremolinos Conference.

Definition of the term "positive stability"

3.10 The Sub-Committee noted that the group considered the definition proposed by the LSR Sub-Committee (SLF 37/2/13, paragraph 3.15) and a few alternative definitions proposed by Members during the discussion. The Sub-Committee agreed to recommend the following definition for inclusion in SOLAS draft regulation III/3.12bis:

"Positive stability is the ability of a craft to return to its original position after the removal of a heeling moment."

and instructed the Secretariat to inform the LSR Sub-Committee accordingly.

Draft safety operation manual in following and quartering seas

3.11 The Sub-Committee considered documents by Japan (SLF 37/3/2 and SLF 37/INF.7), the Netherlands (SLF 37/3/4), the Russian Federation (SLF 37/3/5) and also an additional paper by the Russian Federation which elaborated SLF 37/3/5.

3.12 The Sub-Committee felt that the proposal by Japan could be developed further by incorporating specific items from the proposal of the Russian Federation. After discussing various aspects of the manual, the Sub-Committee felt that the safety operation manual may more appropriately be called "Guidance to the master for avoiding dangerous situations in following and quartering seas" and be developed accordingly, and requested Members to pay particular attention to the following issues:

.1 to prepare the text of a draft resolution to which the Guidance will be an annex;

.2 to develop the Guidance based on the proposal by Japan (SLF 37/3/2), incorporating relevant items from the proposal by the Russian Federation (SLF 37/3/5) and take into consideration the comments at the meeting of this working group;

.3 to specify indications of dangerous situations in the Guidance;

.4 to identify any training for master and officers for ensuring proper use of the Guidance.

Future revision of the Intact Stability Code

3.13 The Sub-Committee noted the information provided in the United States paper (SLF 37/INF.15) on future refinement of the hull form factor for large containerships that is contained in section 4.9 of the draft Intact Stability Code. The Sub-Committee further noted the United States intention to pursue this issue and provide the results of this work to the Sub-Committee when it is available.

3.14 In addition the Sub-Committee agreed to a list of other issues for consideration for future improvement of the Intact Stability Code at the next session, including:

.1 finalization of the guidance to the master for avoiding dangerous situations in following and quartering seas;

.2 development of guidelines for performing operational inclining tests, as discussed in the Russian Federation paper (SLF 37/3/7);

.3 investigation of procedures for determining acceptable weight movements during inclining tests, as discussed in the Australian paper (SLF 37/3/1);

.4 evaluation of wind forces used in the severe wind and rolling criteria for small vessels;

.5 development of new criteria for tugs and tow boats; and

.6 improvement of the intact stability requirements for grain ships.

3.15 Members were invited to submit comments and proposals on the future revision of the Code for consideration by the Sub-Committee at its next session. In the light of the response by Members, the Sub-Committee will decide on the re-establishment of the working group on intact stability at the next session.

3.16 The Sub-Committee recognized the need to keep the Code under review on a periodical basis and agreed to maintain the item in the work programme under the heading "Review of the Code of Intact Stability for All Types of Ships Covered by IMO Instruments" with a target completion date of 1995. The Committee is invited to agree with the above decision.

3.17 The delegation of Chile informed the Sub-Committee that they had submitted a document with certain proposals for consideration by the Sub-Committee under the Intact Stability Code but unfortunately could not reach this session in time. Consequently they would resubmit that paper to the next session in the context of the review of the Intact Stability Code.

3.18 The Secretariat informed the Sub-Committee that similarly Poland had submitted documents too late for this session which would be resubmitted for consideration at the next session of the Sub-Committee.

4 SUBDIVISION AND DAMAGE STABILITY

4.1 Under this agenda item the Sub-Committee considered documents submitted by Canada (SLF 37/4/17), China (SLF 37/4/2), Japan (SLF 37/4/4 and SLF 37/4/16), the Netherlands (SLF 37/INF.8), Poland (SLF 37/4/6, SLF 37/4/7, SLF 37/4/8 and SLF 37/4/9), Spain (SLF 37/4/3), the United States (SLF 37/4/1 and SLF 37/4/10), a joint submission by Germany, Norway and the United States (SLF 37/4/5), IACS (SLF 37/4/11, SLF 37/4/12, SLF 37/4/13, SLF 37/4/14 and SLF 37/4/15) and a joint submission by Denmark, Finland, Germany, Norway, Poland and Sweden (MSC 61/20/6).

4.2 The Sub-Committee also considered the final report on the work carried out by the SDS working group at the thirty-sixth session of the Sub-Committee (SLF 37/4) and took note of the outcome of the discussion within the working group on the following items on which actions were deferred by the Sub-Committee to this session:

.1 subdivision and damage stability requirements for dry cargo ships of less than 100 metres in length;

.2 definition of the maximum number of passengers permitted to be carried on one-compartment ships; and

.3 interpretations of SOLAS chapter II-1 regulations.

<u>Ad hoc working group (SDS) and its terms of reference</u>

4.3 The Sub-Committee instructed the <u>ad hoc</u> working group on subdivision and damage stability (SDS), which was established under the chairmanship of Mr. A. Graham (United Kingdom), to deal with the items listed below, and report the progress made on the priority issues:

.1 retroactive application of the SOLAS 90 standard to all existing passenger ships;

.2 interpretations of and recommendations for application of resolution MSC.26(60) and MSC/Circ.574;

.3 interpretations of SOLAS chapter II-1 and, in particular, SOLAS regulations II-1/6.5.2, 8.5 and 8.7;

.4 definition of the number of passengers permitted to be carried on one-compartment ships;

.5 subdivision and damage stability requirements for dry cargo ships of less than 100 metres in length; and

.6 review of hypothetical oil outflow parameters.

Having received the report of the working group (SLF 37/WP.9), the Sub-Committee approved the report in general and took specific decisions and actions as outlined in the following paragraphs.

Retroactive application of the SOLAS 90 standard to all existing passenger ships

4.4 The Sub-Committee was of the view that in order to effectively apply the SOLAS 90 standard to all existing passenger ships, an exercise similar to that carried out for existing ro-ro passenger ships would have to be made. That would mean using the calculation method outlined in MSC/Circ.574, together with any appropriate interpretations that the Sub-Committee might find necessary.

4.5 At this stage, noting the proposal made by Sweden at the last session (SLF 36/25, paragraph 4.42) on the starting date for the schedule, the Sub-Committee was of the opinion that this should be done when enough statistical information becomes available. This information should be ready by the next session, and to that extent Sweden* kindly offered to collate the results of calculations sent by interested parties. Members were invited to send their contributions to the address below by 1 October 1993 at the latest.

4.6 The Secretariat was requested to prepare, in co-operation with the Chairman of the SDS working group, a document outlining a calculation method for consideration at the next session. Members were invited to use the calculation method contained in that document for calculation exercise in order that the results of calculations could be collated as referred to in paragraph 4.5.

4.7 With regard to the document by Japan (SLF 37/4/16) the Sub-Committee considered in depth the formula proposed therein for calculating the A/A_{max} ratio, namely:

$$\frac{A_1 + A_2}{A_{max}1 + A_2}$$

4.8 On the other hand note was taken that, according to MSC/Circ.574, the A/A_{max} ratio to be used is:

$$\frac{A_1 + A_2}{A_{max}1 + A_{max}2}.$$

4.9 The Sub-Committee noted that, after the A/A_{max} exercise was completed, the application of this ratio penalizes one-compartment standard ships and agreed that this formulation should no longer be used for one-compartment ships.

4.10 Some delegations were in favour of adopting the Japanese proposal, whilst others preferred the use of the ratio $A1/A_{max}1$. Further investigation in regard to the relative values of this and the Japanese proposals suggested quite strongly that either ratio could be adopted with little error.

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* Mr. Joakim Heimdahl
National Maritime Administration
Slottsgatan 82, S-601 78 Norrköping, Sweden
Tel +46 11 19 12 89
Telefax +46 11 23 99 34

4.11 After some delegations emphasized the need for a definite formula, the matter was referred back to the Chairman of the SDS working group who reconvened part of the group in order to find an acceptable solution on the matter.

4.12 Having discussed the relative merits of both formulae, the Sub-Committee agreed that Administrations should calculate both values of A/A_{max} ratio according to the two formulae. In this respect the Sub-Committee was advised that the extra work involved would not be of any significance.

The use of the residual stability lever curve in applying SOLAS chapter II-1 regulations and in particular MSC/Circ.574 and the provisions of MSC.26(60)

4.13 The Sub-Committee had before it the documents submitted by Spain (SLF 37/4/3) and Germany, Norway and the United States (SLF 37/4/5).

4.14 There was a general consensus that the issues raised in both documents should be discussed together, as they were interrelated. The Sub-Committee decided also that the actual wording of the regulations should not be amended at this stage and that it would suffice to draft the appropriate interpretation.

4.15 During consideration of the documents a detailed discussion ensued on which interpretation should be adopted. The Sub-Committee agreed in principle that the required GZ can be taken anywhere within the range of positive stability. The Sub-Committee also agreed that internal doors situated above both final and intermediate stage waterlines and which are required to maintain residual buoyancy should not be required to be strictly watertight.

4.16 Some delegations considered that, where a point of progressive flooding was reached before a positive range of stability of at least 15° was attained, then the range of stability would not comply with the regulations and the point, through which progressive flooding could occur, should be dealt with. However, if the space affected at this angle of progressive flooding is assumed to be flooded from the beginning, then the stability lever curve should be re-calculated and, provided that all criteria are met, the regulations would be complied with.

4.17 However, other delegations considered that a curve produced in the manner described above would seriously misrepresent the survivability characteristics of a flooded ship, and its ability to avoid capsize. Up to the angle of progressive flooding, the initial part of the positive righting arm curve would be accepted, for the purposes of the area and GZ requirements, as that appropriate to the flooding only within the immediate region of the damage. Beyond this heel angle, the remainder of the curve would drop down at this progressive flooding angle to a GZ value appropriate to the damage scenario where the space affected by progressive flooding was damaged from the beginning.

4.18 The Sub-Committee concurred with the observation made by the delegation of the United States that the flooding discussed in paragraphs 4.16 and 4.17 refers to situations where the extent of flooding was of a limited nature that would not continue unabated.

Interpretation of MSC/Circ.574 and resolution MSC.26(60)

4.19 The Sub-Committee considered documents submitted by Japan (SLF 37/4/16), the United States (SLF 37/4/10), IACS (SLF 37/4/15) and a joint document by Denmark, Finland, Germany, Norway, Poland and Sweden (MSC 61/20/6).

4.20 Some delegations agreed fully with the views expressed in document SLF 37/4/10, that the ratio A/A_{max} should not be taken as a standard in itself. Therefore, these delegations felt that after harmonization, it may be necessary to upgrade those ships having inadequate A values, since there were some ro-ro passenger ships in the A/A_{max} exercise which had A values lower than the corresponding R for new cargo ships of the same length.

4.21 With respect to the joint document MSC 61/20/6, the Sub-Committee generally agreed with the interpretations therein regarding calculation of A/A_{max} ratio (resolution MSC.26(60) and MSC/Circ.574, annex), factor of survival "s" (MSC/Circ.574, annex, paragraph 2.3), upgrading to the modified SOLAS 90 criteria (resolution MSC.26(60)), downflooding openings (resolution MSC.26(60)), A/A_{max} values (resolution MSC.26(60), regulation II-1/8.9), ships approved using resolution A.265(VIII), submission of A/A_{max} calculations (resolution MSC.26(60), sponsons (SLF 36/25, annex 5, paragraph 14), alterations (resolution MSC.26(60)), regulation II-1/1.3.2), permeability (SOLAS, regulation II-1/8.3), and damage cases contributing to the A and A_{max} values (MSC/Circ.574). Referring to downflooding openings, it was further stated that the apparent relaxation about closing of watertight doors was purely intended for the A/A_{max} exercise.

4.22 On considering document SLF 37/4/15 by IACS, which offers three further interpretations, the Sub-Committee could not agree on that related to the factor of survival "s", as it reintroduced the contentious issue described in paragraph 4.17 above.

4.23 The Sub-Committee agreed that the value of permeability to be used in connection with freight cargo spaces in any future regulations should be some significantly higher figure than that prescribed by SOLAS, i.e. 0.60. In this connection, it was noted that a value of 0.90 was used in the calculation method outlined in the annex to MSC/Circ.574. The other interpretations were agreed upon.

4.24 The Secretariat was requested to prepare, in co-operation with the Chairman of the SDS working group, a draft MSC circular containing interpretations of, and recommendations for, application of resolution MSC.26(60) and MSC/Circ.574 for consideration at the next session.

Information to the master

4.25 After some explanation was provided by the Chairman of the SDS working group, the Sub-Committee concurred with the IACS view (SLF 37/4/11) concerning paragraph 3 of regulation II-1/25-8, that it was never intended to use linear interpolation for KG values but rather for GM values only.

Position indicators for cargo doors (regulation II-1/25-9)

4.26 While considering a document submitted by IACS (SLF 37/4/12), the Chairman of the SDS working group explained the background of regulation II-1/25-9, and subsequently the Sub-Committee agreed that a log entry of having secured the closures in question offered an equivalent level of safety to that provided by a position indicator display at the bridge control position.

Permeability of spaces with insulation (regulation II-1/25-7)

4.27 After introduction by IACS of its paper SLF 37/4/14 the Sub-Committee agreed that the volume of insulation may be used in the calculation of the actual permeability of the space concerned, provided that the insulation material complies with the conditions stated in paragraph 5 of the said document, except that referred to in subparagraph 5.3.

Interpretation of SOLAS chapter II-1, regulations 6.5.2, 8.5 and 8.7

4.28 The Sub-Committee considered a document submitted by the United Kingdom at the last session (SLF 36/4/8) that deals with the "cargo clause" and the stability information that might be required to have available on board.

4.29 Given that no papers on the subject had been submitted at this session, the Sub-Committee invited Members to submit comments and proposals on the issue to the next session of the Sub-Committee.

Alteration or modification of a major character

4.30 The Sub-Committee had for its consideration documents submitted by Germany (SLF 36/4/23), IACS (SLF 37/4/13) and the United Kingdom (MSC 60/10/1).

4.31 The Sub-Committee, based on the submission by Germany (SLF 36/4/23), encouraged discussion on three issues:

.1 parameters to be considered (deadweight, length, freeboard/depth, etc.);

.2 the expression "reasonable and practicable"; and

.3 levels of safety "before" versus "after" an alteration or modification of a major character.

4.32 Regarding the issue referred to in 4.31.1, the Sub-Committee agreed that one parameter only (e.g. deadweight) would not suffice as sole criterion, given that a modification that could be deemed as "minor" (the removal or perforation of a bulkhead, for instance) could seriously impair the level of safety of the ship after alteration, a fact of which all Administrations should be made aware.

4.33 One delegation proposed to qualify the "major" character of a modification or alteration by determining whether it represented a significant change in subdivision standards.

4.34 When dealing with the expression "reasonable and practicable", the Sub-Committee felt that this should be explained on the basis of decisions taken with regard to 4.31.1 and 4.31.3 above.

4.35 The Sub-Committee considered the level of safety of a modified ship compared with that before modification. The proposals outlined in the document by Germany (SLF 36/4/23), i.e.,

.1 (A/R) modified ≥ (A/R) old; and

.2 A modified ≥ [0.8]R_{new},

where R_{new} refers to a new cargo ship of the same length, were examined.

4.36 The Sub-Committee was in agreement that in cases of modifications of a major character A/R for the modified ship should in no case be less than A/R for the ship before modification (paragraph 4.35.1, above).

4.37 There were differing opinions in the Sub-Committee as to the need for a formula as given in 4.35.2. Some delegations preferred such a formula to be used, others considered that a formula on the lines of the German proposal was necessary, whilst two delegations indicated that their Administrations would insist on full compliance as if for a new ship.

4.38 The Sub-Committee, while not in disagreement with the proposals, generally felt that the issues raised in document SLF 36/4/23 should be further discussed, in order to obtain a decision on the matter, bearing in mind that ships vary greatly in size and arrangement characteristics.

Maximum number of passengers permitted to be carried on one-compartment standard ships

4.39 The Sub-Committee noted that this item was included in its work programme as a deterministic issue but agreed that it should also be considered in the harmonization work that would ensue in future sessions.

Subdivision and damage stability requirements for dry cargo ships of less than 100 metres in length

4.40 Upon examining a document submitted by China (SLF 37/4/2), the Sub-Committee agreed that, for dry cargo ships less than 100 metres in length, the attained subdivision index "A" may still be calculated in accordance with the requirements set forth in SOLAS chapter II-1, part B-1 regulations.

4.41 The Sub-Committee considered documents submitted by Japan (SLF 37/4/4), Poland (SLF 37/5/4), the United States (SLF 37/4/1) and the United Kingdom (SLF 36/4/9).

4.42 With regard to the Polish proposal in SLF 37/5/4, the Sub-Committee agreed that this was the preferred solution because of its greater flexibility when the impending harmonization process begins.

4.43 Since the SDS working group at the last session of the Sub-Committee agreed that the proposals by Poland and the United Kingdom represented approximately the same safety level, (with the United Kingdom line being slightly lower), a small number of delegations considered that the United Kingdom proposal should be used for cargo ships less than 100 metres in length.

4.44 Some delegations considered that there was as yet insufficient information to establish the required safety level for such ships and considered that more test calculations should be made before deciding the index 'R'.

4.45 One delegation considered that the available evidence suggested that it becomes extremely difficult to provide meaningful levels of subdivision to ships less than 80 metres in length, and also considered that further work needs to be done in this regard.

4.46 In view of the diverging opinions, the Sub-Committee agreed to further consider this issue at its next session. Members were invited to carry out test calculations for cargo ships less than 100 m in length and submit the results of the test calculations to the next session when the final decision is expected to be taken based on the information provided.

4.47 In the opinion of Poland, waiting for additional results of the (attained) indices A (of subdivision) for ships with the length less than 100 m cannot help much in selecting a formula for the (required) index R for those ships. Attained indices for existing ships show very big scatter. In this situation, judging numerical values only is not sufficient unless a certain philosophy is chosen for this selection, which is the case for the Polish formula. Marginal differences with respect to the United Kingdom proposal proves that this philosophy has been chosen properly. Bearing in mind that the indices calculated relate to existing ships designed with no regard to subdivision, a slight increase in the required indices, as proposed by the Polish formula, is fully justified as can cause no technical problems for newly built ships.

5 HARMONIZATION OF DAMAGE STABILITY PROVISIONS IN IMO INSTRUMENTS BASED ON THE PROBABILISTIC CONCEPT OF SURVIVAL

5.1 The Sub-Committee had for its consideration documents submitted by the Netherlands (SLF 37/5/2), Poland (SLF 37/5/3 and SLF 37/5/4), the United Kingdom (SLF 37/5) and the United States (SLF 37/5/1 and SLF 37/INF.13).

5.2 The Sub-Committee recalled that at the previous session it was unable to consider the substance of the issue. However, as this agenda item was entirely covered by the item "Development of new SOLAS parts A and B of chapter II-1 based on a single probabilistic method for all types of ships" the Sub-Committee decided to amalgamate both items under the heading of this agenda item for the purpose of its work programme.

5.3 The Sub-Committee considered the outcome of discussion on the issue within the SDS working group at the thirty-sixth session of the Sub-Committee (SLF 37/4, section 12) and noted the views of the group on the matter and comments on documents considered by the group.

5.4 As instructed by the Chairman of the Sub-Committee at this session, the SDS working group discussed which basic approach should be made in harmonizing the two sets of probabilistic regulations, and, eventually, in extending the harmonization process to other ship types. The outcome of the discussion of the item was orally reported to the Sub-Committee by the Chairman of the group as outlined in the following paragraphs.

5.5 Papers by the United Kingdom (SLF 37/5) and the United States (SLF 37/5/1) were used as the basis for the ensuing general discussions.

5.6 In respect of the paper SLF 37/5/1, the group discussed the two approaches which might be taken in the harmonization process. There appeared to be general agreement that every effort should be made to use the same calculation procedure for the attained index 'A', irrespective of ship type.

5.7 While the basic objective of adopting the same calculation procedure was desirable, it was recognized that considerations other than that of subdivision are involved in the 's' factor (e.g. it would be unreasonable to expect an equilibrium angle of more than 7°, say, in the case of a passenger ship).

5.8 The United Kingdom paper SLF 37/5/1 was outlined briefly by the Chairman of the SDS group. The Chairman informed the group that the harmonization process should proceed in three distinct stages. These are a consideration of:

.1 elements which relate to the assumed damage extent (i.e. the factor 'p' and associated factor 'r'),

.2 the estimation of the probability of survival (i.e. the factor 's' and associated factor 'v'), and

.3 the required level of safety for various ship types (i.e. the required subdivision index 'R').

5.9 A general discussion then took place on the topics raised in the two papers.

5.10 A delegate described how, in the development of resolution A.265(VIII), the effect of ship speed, (that of the ramming ship and the ship rammed) was considered. The 'p' factors in this sort of regulations were considered appropriate for passenger ships because of their higher speed, on average, than cargo ships. However, the delegate considered that, for cargo ships, further studies may be conducted.

5.11 Delegates expressed the view that if regulation 5 of resolution A.265(VIII), or its agreed equivalent, should form part of future probabilistic regulations, then this regulation itself should be based essentially on probabilistic principles.

5.12 It was agreed that, when developing probabilistic regulations, every effort should be made to remove reference to "one-" or "two-compartment" standard, whilst ensuring that the required safety level guards against the presence of 'weak spots' throughout the ship length. In this regard, proposals by Poland (SLF 37/4/9) and the Netherlands (SLF 36/4/5) could be used as a basis for establishing 'local' subdivision indices.

5.13 A delegate pointed out that Professor Wendel showed some 20 years ago that two ships, similar in size, but having differing internal bulkhead arrangements and draughts, could be judged objectively (as to their respective safety levels) by comparing their attained indices and that this was sufficient.

5.14 The group generally concurred with this reasoning as far as the assessment of risk is concerned. However, it was pointed out by the Chairman of the group that unless the question of "weak spots" was properly addressed, there was little chance of progress in harmonizing the probabilistic regulations, at least as far as ships carrying large numbers of passengers are concerned.

5.15 In a short discussion, the group considered that the potential advantages in carrying out 'A' calculations for a minimum of three draughts, (rather than two as with the present dry cargo ship regulations), should be studied. A delegate described how the use of only two draughts can lead to wide variations in safety level as measured by 'A'. These variations are significantly reduced when three draughts are used.

5.16 The Sub-Committee, in view of the great importance it attaches to the subject, agreed that more detailed discussions were needed on all the matters referred to above in future sessions.

5.17 The delegation of Sweden informed the Sub-Committee that on the initiative of the Swedish Shipowners' Association a nordic project aiming at drafting a harmonized probabilistic damage stability standard for passenger ships had been launched. Based on resolution MSC.19(58) and resolution A.265(VIII) the intention of the project is to formulate an up-to-date proposal for damage stability regulations for passenger ships that will overcome the inconsistencies in SOLAS chapter II-1 versus resolution A.265(VIII) and at the same time be a more flexible and foresighted set of rules based on the probabilistic concept. A group of experts from the nordic countries has been assigned to the project and their work will be presented at SLF 38 and the Swedish delegation* would welcome other interested delegations to participate as observers in a reference group to be formed.

6 COLLECTION AND ANALYSIS OF DAMAGE CARDS

6.1 The Sub-Committee recalled that the collection of information on damaged ships, their design features, data on damages sustained and circumstances associated with casualties was considered to be of importance for future updating of subdivision and damage stability requirements based on probabilistic concept of survival. In this respect, the Sub-Committee noted that 42 damage cards had been received since its thirty-fourth session, when the collection of damage cards was reinstated.

6.2 The Sub-Committee had before it papers with attached completed damage cards submitted by Germany (SLF 37/INF.4) and Spain (SLF 37/6) and, having taken note of the information contained, expressed its appreciation to Germany and Spain for their contribution to the database.

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* Mr. B-O. Jansson
Vice President Marketing
SSPA Maritime Consulting
Chalmers Tvärgata 10
P.O. Box 24001
S-400 22 Göteborg
Sweden
Telephone +46 31 63 95 00
Fax +46 31 63 96 24

6.3 The Sub-Committee noted that the analysis of damage data and conclusions therefrom required to undertake further work on this agenda item can be made when a sufficient number of damage cards is available and in order to assist Members in identifying ship casualty information which could be submitted in damage cards instructed the Secretariat to prepare a list of ships, extracted from information available in the Organization, which were involved in collisions or strandings.

6.4 The Sub-Committee urged its Members to further submit damage cards, bearing in mind the procedure agreed at SLF 36 that dates and locations of ship casualties should always be indicated, in order to avoid double entries of damage data.

7 COLLECTION AND ANALYSIS OF CASUALTY STATISTICS OF FISHING VESSELS AND FISHERMEN

7.1 The Sub-Committee recalled that, in order to improve the safety of fishing vessels and fishermen at sea, a reporting system for the collecting of casualty data was agreed to be established to assess the areas of gravest concern for the safety of fishing vessels and fishermen at sea. Consequently, an annual collection of data pertaining to casualties involving fishermen and fishing vessels was initiated by disseminating circulars MSC/Circ.539 and MSC/Circ.539/Add.1.

7.2 The Sub-Committee noted that the information on casualties collated for 1990 was considered by MSC 60 and referred to the IMO Steering Group on Casualty Statistics, which was instructed to also deal with fishing vessels, for its review. Subsequently, the Sub-Committee had for its consideration a document by the United States (SLF 37/7) and the outcome of the review of casualty statistics of fishing vessels by the Steering Group at its twentieth and twenty-first sessions (SLF 37/7/1).

7.3 The Sub-Committee further noted that MSC 61 approved the report of the Steering Group in general, and, in particular, the analysis of serious casualties to fishing vessels of 100 gross tonnage and above for the period from 1982 to 1991 and also approved the publication of the analysis in accordance with previous practice.

7.4 The Sub-Committee noted that the Committee recognized that the current work under the casualty statistics scheme would be improved if an analysis was also made of the causes of accidents, including the role of the human element therein, fatigue etc., besides any analysis of structural or equipment failures and that the optimum use of available data was essential. The Committee instructed the Steering Group to consider technical and economic aspects necessary for a better use, within IMO, of existing and future data to be collected, including statistics of seafarer and passenger loss of life and serious injuries to persons.

7.5 The Sub-Committee took note of the information on casualties to fishing vessels provided in SLF 37/7/1 which showed that a total of 1,580 serious casualties to fishing vessels over 100 gross tonnage was reported to Lloyds over the 10-year period from 1982 to 1991 inclusive and that 1,186 lives were lost/missing and 756 fishing vessels reported as totally lost over the same period. However a general trend to an overall reduction in serious casualties and lives lost was acknowledged.

7.6 The Sub-Committee considered a proposal by the United States (SLF 37/7) to amend the tables in reports on loss of fishing vessels and on losses of lives to fishermen of fishing vessels attached to MSC/Circ.539/Add.1. In this context the Sub-Committee noted that the document on the review of the Steering Group's work (SLF 37/7/1) contained also amended tables for the same reports revised by the Steering Group as shown in the annex to SLF 37/7/1. Having agreed to some of the above amendments to the reports as set out in the draft MSC circular in annex 3, the Sub-Committee requested the Secretariat to refer the revised format of reports to the Steering Group for its consideration prior to further consideration by the Committee.

7.7 Recognizing the difficulties in obtaining the necessary information the Sub-Committee was not in a position to concur with the proposal by the United States that collection of casualty data should also include information on injuries to fishermen or casualties to vessels that result in other than total loss of the vessels.

7.8 The Committee is invited to approve the draft MSC circular enclosing the new format of reports for casualty statistics concerning fishing vessels and fishermen at sea, as given in annex 3, for dissemination to Member Governments after the new format of reports is agreed by the Steering Group on Casualty Statistics.

7.9 The Sub-Committee agreed that clarification of the terms "collision" and "contact" was required and invited the Steering Group to consider this matter.

7.10 The delegation of the United Kingdom felt that the term "primary cause" in tables B and F of the new format of reports may be difficult to be ascertained and suggested replacing this term by "major causative factors". The Secretariat was requested to inform the Steering Group accordingly.

7.11 In the meantime, in view of the importance of collecting information on casualties, the Sub-Committee urged Members to provide the IMO Secretariat with data on casualties pertaining to their national fishing fleets in accordance with MSC/Circ.539/Add.1.

8 REVISION OF TECHNICAL REGULATIONS OF THE 1966 LL CONVENTION

8.1 The Sub-Committee had before it documents submitted by China (SLF 37/8/1, SLF 37/8/2, SLF 37/INF.5 and SLF 37/INF.6), the United States (SLF 37/8/3, SLF 37/INF.12 and SLF 37/INF.14) and by the Secretariat (SLF 37/8) containing a list of background documents considered at previous sessions of the Sub-Committee.

8.2 The Sub-Committee considered the above documents and convened, as agreed at its thirty-sixth session, an _ad hoc_ working group on the revision of regulations of the 1966 LL Convention under the chairmanship of Mr. R.H. Spence (United Kingdom). The group was instructed to, initially, consider the setting up of a programme for the revision and establishing a time-scale of tasks including actions and target completion dates.

8.3 The delegation of the United Kingdom proposed that, in the context of revision of the 1966 LL Convention, the Sub-Committee should also consider the possibility of incorporating the text of this Convention as part of the 1974 SOLAS Convention as amended in the form of an amalgamated SOLAS 74/LL 66 instrument. It further agreed to submit a document on this issue to the next session of the Sub-Committee. While supporting this proposal the delegation of Poland drew the attention of the Sub-Committee to certain legal and technical problems which precluded in the past achievement of progress on the amalgamated instrument. The Sub-Committee agreed that the advantages and disadvantages of the above amalgamation should be further considered.

8.4 The Sub-Committee, in noting the request of the Committee that when preparing amendments to conventions, it should thoroughly discuss their application to existing ships so as to ensure that they meet satisfactory safety standards, requested the group to consider, when reviewing the 1966 LL Convention, the instances where expressions such as "to the satisfaction of the Administration" and other vague expressions appear with a view to improving the text as requested by the Committee.

8.5 Having received the report of the working group (SLF 37/WP.1), the Sub-Committee took actions and decisions as follows.

Basic elements of the LL Convention

8.6 The Sub-Committee considered the current technical regulations of the 1966 LL Convention and agreed that the following elements should be considered as basic elements of the Convention which need to be retained in the future LL Convention:

.1 deck wetness,

.2 intact reserve buoyancy,

.3 intact stability and damage stability,

.4 watertight integrity,

.5 structural strength,

.6 crew protection.

8.7 With respect to 8.6.5 above, the Canadian delegation noted that the item on structural strength was currently addressed in the 1966 LL Convention and would thus appear to be the responsibility of this Sub-Committee. The Sub-Committee felt this was an item to be considered further, and noted in this context that structural strength was also under the responsibility of the DE Sub-Committee and should also be considered by that Sub-Committee.

8.8 The Sub-Committee further considered that deck wetness and intact reserve buoyancy were the primary elements and other items were the secondary elements which compose the whole structure of the LL Convention.

Reasons for revision of the 1966 LL Convention

8.9 The Sub-Committee reviewed the discussion history including the outcome of the consideration at the last session of the Sub-Committee and reaffirmed the view that the LL Convention should be up-dated.

8.10 Among several reasons for amendments to the 1966 LL Convention, the Sub-Committee agreed to emphasize the following points which necessitate the revision of the Convention:

.1 Progress in marine engineering

Development in modern seakeeping theory and climatology since 1966 would enable to assign freeboard through direct calculation or model experiments; and

.2 Appearance of new types of conventional ships and novel craft

Changes of circumstances of international shipping require ships of new type, e.g. high speed craft, open-top containerships, and it is necessary to provide unified international standards for freeboard assignment for such novel and new types of ships, rather than leaving them to the decisions of the Administration under the provisions of article 6(2) of the 1966 LL Convention.

Basic elements or principles of reviewing the LL Convention

8.11 The Sub-Committee generally agreed that the following were the basic elements for reviewing the LL Convention:

.1 to provide performance criteria for conventional ships and novel craft;

.2 to define climatology criteria;

.3 to retain freeboard tables for conventional ships, but to review and modify them, as appropriate;

.4 to simplify the procedure for freeboard assignment;

.5 to allow direct calculation and/or model experiment methods for assignment of freeboard for conventional ships and novel craft;

.6 to harmonize the damage stability requirements with the probabilistic concept, with other damage stability requirements in IMO instruments, e.g. MARPOL 73/78;

.7 to deal with other improvements already proposed to the SLF Sub-Committee.

8.12 The Sub-Committee noted the proposed concept for the future LL Convention contained in figure 5 of SLF 37/INF.12, and generally agreed with the idea. The revised structure of the future LL Convention was illustrated in annex 3 to SLF 37/WP.1, and Members were invited to submit any comments on the structure.

8.13 The Sub-Committee noted the draft action plan aiming at the development of a draft text of the future legal instrument, as contained in annex 4 of SLF 37/WP.1.

8.14 In order to facilitate the discussion at the next session, the Sub-Committee agreed to establish two correspondence groups on:

.1 review of requirements for conventional ships; and

.2 establishment of requirements for novel type vessels.

8.15 The Sub-Committee noted that Mr. P. Alman* of the United States showed his readiness to lead the correspondence group on conventional ships and Mr. J. Archibald** of Canada was ready to take the leader's role for the correspondence group on novel type vessels.

8.16 The tasks for these two correspondence groups were agreed to be as follows:

<u>Conventional ships</u>

.1 to collect calculation results in order to evaluate the current freeboard table, based on SLF 32/WP.10;

.2 to propose a simplified method for freeboard assignment;

.3 to consider what calculation or model experiments should be required for the direct freeboard assignment;

.4 to consider formula for bow height proposed by China (SLF 37/8/1 and SLF 37/8/2) and other countries; and

.5 to categorize wave conditions liaising with the other correspondence group.

<u>Novel type vessels</u>

.1 to identify types of vessels;

.2 to attempt to develop criteria for each type of vessel including the categorization of wave condition liaising with the other correspondence group; and

.3 to consider what kinds of calculations or model experiments method should be required.

8.17 Having discussed the outcome of the working group, the Sub-Committee invited Members to submit comments on the tasks given to the correspondence groups as reflected in paragraph 8.16.

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* Mr. P. Alman
Structures and Load Line Section
U.S. Coast Guard (G-MTH)
2100 Second Street S.W.
Washington, DC 20593-0001
United States

** Mr. J. Archibald
Ship Safety Directorate
Canadian Coast Guard
Canada Building
344 Slater Street
Ottawa, Ontario K1A 0N7,
Canada

8.18 The Sub-Committee recognized that the successful revision of the LL Convention largely depends on the availability of the latest knowledge and information on climatology, and in this context, the Sub-Committee invited Members to submit any information on climatology, and requested participation of their experts in the coming sessions.

8.19 The Sub-Committee noted that, with the coming into force of the 1969 Tonnage Convention, an underdeck volume of every ship would be available for setting parameters such as reserve buoyancy, and agreed to take this point as well in the revision of the technical regulations.

9 FURTHER DEVELOPMENT OF SAFETY GUIDELINES AND SAFETY TRAINING GUIDELINES FOR FISHERMEN OF SMALL FISHING VESSELS

9.1 The Sub-Committee had noted at its thirty-sixth session that the instruments which would need to be reviewed under this agenda item were FAO/ILO/IMO Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels, the Code of Safety for Fishermen and Fishing Vessels, parts A and B and the Document for Guidance on Fishermen's Training and Certification. The Sub-Committee further noted that, whereas the revision of part B of the Code of Safety for Fishermen and Fishing Vessels and the Voluntary Guidelines would depend on the outcome of the 1993 Conference to adopt the SFV Protocol, the revision of part A of the Code of Safety for Fishermen and Fishing Vessels and the Document for Guidance on Fishermen's Training and Certification would cover the operational aspects not dealt with by the SFV Protocol, and could therefore be undertaken irrespective of the development of the draft SFV Protocol.

9.2 The Sub-Committee considered the document SLF 37/9 submitted by the Secretariat, in pursuance of the instruction by the Sub-Committee, and took action as outlined in the following paragraphs.

9.3 The Sub-Committee noted that the STW Sub-Committee was carrying out the work on the development of amendments to the 1978 STCW Convention to include the standards of training, certification and watchkeeping of skippers, officers and radio operators on board fishing vessels. MSC 59 agreed that the STW Sub-Committee should prepare a Protocol to the 1978 STCW Convention for adoption by a Diplomatic Conference and made a suggestion which was noted by the Council at its sixty-sixth session, that the Conference could be held in the 1994-1995 biennium.

9.4 The Sub-Committee further noted that for this work the working group of the STW Sub-Committee used resolutions A.484(XII), A.539(13), A.576(14) and A.623(15) and the Document for Guidance on Fishermen's Training and Certification.

9.5 Having recognized that the draft Protocol to the 1978 STCW Convention would refer to or include in part the above documents and would also make reference to part A of the Code of Safety for Fishermen and Fishing Vessels and to the 1977 Torremolinos Convention, the Sub-Committee agreed that any revision of part A of the Code of Safety for Fishermen and Fishing Vessels and the Document for Guidance on Fishermen's Training and Certification should be undertaken after the Protocol to the STCW Convention has been adopted. The Sub-Committee noted that this work would primarily be carried out by the STW Sub-Committee, but this Sub-Committee might be called upon to co-operate as necessary.

9.6 In this context the Sub-Committee recalled that the above Voluntary Guidelines, Code of Safety and Document for Guidance were prepared by a joint FAO/ILO/IMO working group and approved by the governing bodies of FAO and ILO and the Maritime Safety Committee and that therefore any future revision of the documents should be undertaken in close co-operation with these organizations. The Secretariat was requested to invite, in due course, these organizations to participate in the revision of these documents.

9.7 The Sub-Committee further discussed possible tasks and time-scale of the work on the revision of the Voluntary Guidelines and part B of the Code of Safety for Fishermen and Fishing Vessels, which was decided to be undertaken after the adoption of the SFV Protocol, and agreed that an outline of scope of amendments to be developed should be made. The Secretariat was requested to prepare a draft outline and to identify the chapters, both in the Voluntary Guidelines and in the Code of Safety, part B, which should be reviewed by the relevant sub-committees, for initial submission to the next session of the Sub-Committee.

9.8 Members were invited to submit comments and proposals on the amendments to the above documents and for instructions to the sub-committees for future consideration in the light of the document to be submitted by the Secretariat.

10 REVISION OF THE ALTERNATIVE INTACT AND DAMAGE STABILITY CRITERIA FOR MODUs

10.1 The Sub-Committee recalled that MSC 57 concurred with the proposal of the Sub-Committee that the alternative intact and damage stability criteria set out in resolutions A.650(16) and A.651(16) should be reviewed after some experience of their application is gained and that it approved the inclusion of the item in the work programme of the Sub-Committee with the target completion date of 1991 which was later extended to 1995.

10.2 The Sub-Committee noted that no papers were submitted under this agenda item. In the absence of further information on the application of those alternative intact and damage stability criteria for MODUs, the Sub-Committee reiterated the invitation to Members to submit information on their experience in the application of those criteria.

10.3 In the meantime the Sub-Committee agreed not to include this item in the agenda for the next session but keep it in its work programme and resume consideration of the matter when sufficient information on the application of these resolutions is available. The target completion date for this item may need to be revised in accordance with submissions from Members to future sessions of the Sub-Committee.

11 OPEN-TOP CONTAINERSHIPS

11.1 Under this agenda item the Sub-Committee had before it documents submitted by the Netherlands (SLF 37/INF.9), the United States (SLF 37/11) and IACS (SLF 37/11/1) containing comments on the draft requirements for open-top containerships prepared by the drafting group at the thirty-sixth session of the Sub-Committee (annex 6 to SLF 36/25), and the Secretariat (SLF 37/2/14, SLF 37/2/17 and SLF 37/2/18) containing outcome of the work on the matter by the CDG, DE and FP Sub-Committees.

11.2 Having considered the above documents the Sub-Committee established a drafting group to finalize the matter at this session.

11.3 The Sub-Committee referred the tonnage measurement issue relating to open-top containerships to the drafting group of tonnage experts established under agenda item 12. The outcome of consideration of the issue is outlined in paragraph 12.13.

11.4 The Sub-Committee noted the view of the FP Sub-Committee (SLF 37/2/17) that the fire protection requirements would need further review at its thirty-eighth session and the view of the CDG Sub-Committee (SLF 37/2/18) that the stowage and segregation of dangerous goods requirements should be of an interim nature and further reviewed by the Sub-Committee by 1995. Particular note was taken of the opinion of the DE Sub-Committee (SLF 37/2/14) that the requirements for open-top containerships should eventually be incorporated in the SOLAS Convention.

11.5 In view of the above the Sub-Committee agreed that the requirements for open-top containerships should be disseminated as an interim measure by an MSC circular which can be revised after the CDG and FP Sub-Committees finalize the review of their requirements as necessary.

11.6 Having received the report of the drafting group (SLF 37/WP.6) the Sub-Committee approved the report of the group in general and agreed to the draft interim guidelines for open-top containerships as set out in annex 4. The Committee is invited to approve dissemination by an MSC circular of the interim guidelines for open-top containerships to Member Governments for their application, as appropriate. The Secretariat was requested to prepare a draft MSC circular for consideration by MSC 62.

11.7 The Netherlands delegation made an observation in respect of paragraphs in section 10 of the draft guidelines. Paragraph 10.2 of the draft guidelines deals with cargoes vis-à-vis liquids, gases or vapours heavier than air for which "on deck only" stowage is specified in the IMDG Code. Vapours heavier than air are never transported commercially and are consequently not cargoes. This results in an unclear understanding of the meaning of this requirement. Furthermore, in the opinion of the Netherlands delegation the general requirement about containers not to be carried within one containerspace from the boundary of the open hold is too restrictive, e.g. in cases where decks are stepped. This comment can also be made to paragraph 10.4 of the draft guidelines. The delegation of the Netherlands was of the view that the CDG Sub-Committee should reconsider the contents of paragraphs 10.2 and 10.4. While not in disagreement with submitting the draft interim guidelines for the Committee's approval, the Netherlands reserved their position in relation to the above paragraphs. The Netherlands delegation informed the Sub-Committee of their intention to submit a paper on the matter to the CDG Sub-Committee for consideration.

11.8 With regard to paragraph 6.5 of the draft guidelines regarding investigation of intermediate conditions of hold flooding the delegation of Norway felt that specific criteria for the intermediate conditions should be developed.

11.9 Having concluded its work on this item, the Sub-Committee deleted it from its work programme.

12 LIVESTOCK CARRIERS AND OTHER SHIPS REQUIRING INTERPRETATIONS OF THEIR TONNAGE MEASUREMENT ASPECTS

12.1 The Sub-Committee had for its consideration under this agenda item documents submitted by Australia (SLF 37/12), Denmark (SLF 37/INF.11), Germany (SLF 37/12/1 and SLF 37/12/3) and the Netherlands (SLF 37/12/2). The Sub-Committee noted that the Committee at its sixty-first session instructed the Sub-Committee to also deal with documents by Germany (MSC 61/10/11) and Norway (MSC 61/10/7) on the practical application of resolutions A.494(XII), A.540(13) and A.541(13) in relation to tonnage by 18 July 1994.

12.2 The Sub-Committee recalled that at its previous session it established a drafting group to deal with tonnage measurement aspects and that it also established a correspondence group to expedite the work on the subject.

12.3 Having considered the documents submitted to this session, the Sub-Committee agreed to reconvene the drafting group of tonnage experts and, having referred the above documents to the group, instructed it to draft the necessary texts relating to:

.1 tonnage measurement provisions for open-top containerships;

.2 practical application of resolutions A.494(XII), A.540(13) and A.541(13) in relation to tonnage by 18 July 1994;

.3 application of the 1969 TM Convention to livestock carriers and dockships;

.4 interpretations of the provisions of the 1969 TM Convention;

.5 difference in gross tonnage between containerships with hatchcovers and open-top containerships with a carrying capacity of the same number of containers;

.6 draft Assembly resolution on application of recommendation 2 of the 1969 TM Conference to reduce possible impact on the economics of merchant shipping and port operations; and

.7 possibility to develop a draft consolidated TM.5 circular to include newly developed interpretations and uniform application of provisions of the 1969 TM Convention with those contained in TM.5/Circ.1, TM.5/Circ.1/Corr.1 and TM.5/Circ.3 to supersede them.

12.4 With reference to paragraph 12.3.2 the Sub-Committee, as instructed by MSC 61, considered papers by Germany (MSC 61/10/11) and Norway (MSC 61/10/7) together with a document by Germany (SLF 37/12/3) regarding practical application of resolutions A.494(XII), A.540(13) and A.541(13) after 18 July 1994, when all existing ships should be remeasured and issued certificates in accordance with the 1969 TM Convention, in view of the interpretation agreed by MSC 50 that all ships to which the above resolutions apply may retain their tonnage value for the purpose of the application of the relevant Conventions for the life of the ship.

12.5 The delegation of Germany (MSC 61/10/1 and SLF 37/12/3) was of the opinion that it would not be sufficient to only state in a safety certificate the old tonnage, but an additional certificate should be issued which would, in order to obtain the international recognition, correspond in terms of both the format and contents to the certificate issued under provisions of the 1969 TM Convention. At the same time the safety certificate may bear an endorsement for entry of a ship's old tonnage value.

12.6 The delegation of Norway (MSC 61/10/7) was of the opinion that it should not be necessary to verify the old tonnage by a separate tonnage certificate, and the old tonnage should be valid for safety purposes even if that tonnage is based on tonnage regulations which are not applied in a state to which the ship might be transferred. Any tonnage certificate issued in accordance with national regulations should cease to be valid, but in lieu of a separate tonnage certificate a declaration may be entered in the safety certificate to refer to the old tonnage for the application of the relevant Convention. Norway was also of the view that in case the gross tonnage of the ship calculated according to the 1969 TM Convention is increased after 18 July 1994 compared with the old gross tonnage then the old tonnage should no longer apply for the purposes established by the 1969 TM Convention.

12.7 Having received the report of the drafting group (SLF 37/WP.2 and SLF 37/WP.2/Corr.1) the Sub-Committee considered proposals made by the group on the above matters and agreed to the following.

<u>Practical application of resolutions A.494(XII), A.540(13) and A.541(13) in relation to tonnage by 18 July 1994, as well as Article 3(2)(d) of the 1969 TM Convention</u>

12.8 The Sub-Committee concluded that due to the fact of the full coming into force of the 1969 Tonnage Convention on 18 July 1994 it is necessary to agree on a unified statement referring to the old national tonnage. In order not to have different statements on tonnage the Sub-Committee agreed that a unified statement of that old tonnage should be made in the "Remarks" column of the International Tonnage Certificate (1969) for "existing" ships (article 3(2)(d)) as well as for ships covered by resolution A.494(XII). It was considered necessary to add information about the "regulations" upon which the old tonnage calculation is based.

12.9 In this respect the Sub-Committee agreed on the remarks for insertion in the certificate as contained in the annex to a draft Assembly resolution set out in annex 5. The Committee was invited to approve the draft Assembly resolution for submission to the eighteenth Assembly for adoption.

12.10 The Sub-Committee noted the view of the group that where a vessel undergoes alterations or modifications and is consequently remeasured after 18 July 1994, the old tonnage figure, if any, is invalid.

12.11 The Japanese delegation stated that the matter would require careful consideration since existing ships which undergo minor alteration or modification, including the reduction of the tonnage, would have to be measured under the 1969 TM Convention for the purpose of SOLAS and other Conventions.

12.12 The Sub-Committee considered the group's view that there was no need for a separate certificate to verify the old tonnage but, instead, the old national tonnage as mentioned in article 3(2)(d) of the Convention should be inserted in the SOLAS certificate with the following remark:

> "The above gross tonnage was valid up to 17 July 1994.
> Reference is made to article 3(2)(d) of the International Convention on Tonnage Measurement of Ships, 1969"

and that for STCW and MARPOL requirements to which resolutions A.540(13) and A.541(13) apply the above remark should be used accordingly. The Sub-Committee agreed that the matter should be further considered by the correspondence group.

<u>Tonnage measurement for open-top containerships</u>

12.13 The Sub-Committee confirmed that the tonnage measurement of open-top containerships should be carried out as per TM.5/Circ.3.

12.14 With regard to economic consequences for open-top containerships the Sub-Committee took note of the documents concerned submitted to the session by Australia (SLF 37/12) and Denmark (SLF 37/INF.11) and agreed that:

.1 the consequences of the economic difference caused by the greater gross tonnage (GT) in comparison with conventional containerships could be reduced if a reduced GT can be calculated and stated in a special entry on the International Tonnage Certificate (1969) in the "Remarks" column;

.2 the provisional formula to calculate this reduced GT should primarily be based on the information given in SLF 37/12 and "A" is assumed to be 30000 whilst "B" may be about 0.007;

.3 before a final decision on the formula is made Administrations be requested to use the mentioned figures and to inform the Organization about the relevant data;

.4 the formula should be further developed following availability of more information concerning new open-top containership designs;

.5 Members be invited to submit information on this item to the next session of the Sub-Committee.

12.15 Until the final decision on the formula to calculate the reduced gross tonnage of the open-top containerships has been made, a draft TM circular was prepared as contained in annex 6. The Committee is invited to approve the draft TM circular for its dissemination to Member Governments.

12.16 The Sub-Committee noted that in the case of open-top containerships having movable non load-bearing covers of light construction above the container stacks, the space above the hatch coamings up to the cover did not qualify as an excluded space according to regulation 2(5) of the Convention. However, for this particular design the Sub-Committee was of the opinion that an exception can be made in accordance with regulation 1(3). The space can be excluded, accordingly, if this type of vessel meets the requirements of TM.5/Circ.3 and can be compared with similar open-top containerships without such covers.

Future work and establishment of the correspondence group

12.17 The Sub-Committee noted the view of the drafting group that possible modification may be made to the provisional formula for calculation of the reduced tonnage of open-top containerships and its intention to prepare a combined TM circular on interpretation of the requirements of the 1969 TM Convention and decided to establish a correspondence group to deal with the matters referred to in paragraphs 12.12 and 12.14 as well as the development of the above combined TM circular. The delegation of Germany kindly offered to co-ordinate the work of the correspondence group. Members were invited to forward their comments and proposals, with a copy to the Secretariat, to the German Federal Maritime and Hydrographic Agency* by the end of November 1993.

12.18 The Sub-Committee agreed to maintain the agenda item in the work programme under the heading "Interpretation of tonnage measurement requirements" with the target completion date of 1994.

Statements

12.19 The United States stated that they did not support approval of annexes 5 and 6 and strongly disagreed that open-top containerships, livestock carriers, etc., should be given special tonnage reduction based on their designs. Economic considerations are not the immediate purview of this Sub-Committee, nor of the Committee. Even if the goal of some Member Administrations were to be achieved - reduced port fees, the port will continue to levy fees as they see are appropriate. In general, the United States supported annex 9 and reiterated that segregated ballast tank spaces, required by MARPOL 73/78, are not analogous to the special tonnage proposals contained in annexes 5 and 6.

12.20 The Greek delegation stated that it would like to reserve its position on certain matters concerning tonnage measurement for the purpose of calculation of dues. The matters discussed in the related paragraphs of the report were not foreseen and the delegation had no instructions in this regard.

13 HULL CRACKING IN LARGE SHIPS

13.1 The Sub-Committee recalled that in pursuance of the instructions of the Committee for investigation of the causes of cracking, survey requirements and analysis of information on hull cracking incidents in tankers, bulk carriers and combination carriers, it exchanged views and information on the developments in these areas. In particular, the Sub-Committee had noted information on the action taken by IACS in respect of implementation of new rules to help in resolving the difficulties.

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* Mr. K.J. Klüver
Vice-President, Head of Tonnage Measurement Division
Federal Maritime and Hydrographic Agency
Bernhard-Nocht-Str. 78
Postfach 30 12 20
D-2000 Hamburg 36
Germany

Tel. (040) 3190-6000
Fax. (040) 3190-5000

13.2 The Sub-Committee noted that MSC 60, in considering the development of the requirements for the design, construction, operation, maintenance and survey of ships carrying solid bulk cargoes as a follow-up action of resolution A.713(17), took note of a draft action plan for hull structural integrity of large ships, with particular reference to tankers and bulk carriers as given in the annex to MSC 60/20/15 which was prepared by the DE Sub-Committee with a view to receiving comments and any guidance for its future work on this matter. The Committee referred the document MSC 60/20/15 to this Sub-Committee and the BC Sub-Committee for consideration and necessary action.

13.3 In considering document MSC 60/20/15, the Sub-Committee recalled that the reference to structural requirements was contained in regulation 1 of chapter I of the 1966 LL Convention and therefore related work on this item falls under the mandate of the Sub-Committee. The Sub-Committee also recalled that the Committee assigned the DE Sub-Committee as the lead sub-committee to deal with this issue.

13.4 Having reviewed the draft action plan contained in the annex to MSC 60/20/15, the Sub-Committee was of the opinion that, while the issues listed generally fall outside the expertise and scope of work of the Sub-Committee, there are some aspects where the Sub-Committee can usefully contribute to the work on this item of other sub-committees such as the DE and BC Sub-Committees as deemed necessary. In particular, the Sub-Committee identified the following three subitems as possible subjects for action and/or co-operation:

.1 development of mandatory requirements for a loading manual and/or a loading instrument to be available on board;

.2 voyage data recorders and operational response monitors (in co-operation with the DE and BC Sub-Committees); and

.3 cargo loading and unloading operations for bulk carriers (in co-operation with the BC Sub-Committee).

13.5 With regard to paragraph 13.4.2 above the delegations of Germany and the United States intervened to clarify the terminology for operational response monitoring systems which have been developed by Germany, Norway, the United Kingdom and the United States. An operational hull response monitor (ORM) uses various sensors, micro-processors and human factor oriented display techniques to display real-time information to the navigating officer of the motions and loads the ship experiences while navigating in heavy weather. A voyage data recorder is considered to be a storage media for certain motions and loads which can be used in investigations after a ship casualty. Technical literature as well as full-scale installations have included two forms of data recordings: limited data contained in a float-up module, and a greater amount of data in a recorder on the navigating bridge. Reference papers submitted to the Organization pertaining to these subjects include: the United Kingdom (MSC 57/INF.3, DE 35/28 and DE 35/INF.8); the United States (MSC 59/14/1, DE 35/28/1 and SLF 36/17); MSC 59/WP.5 and DE 35/WP.12. The Sub-Committee noted that in the light of the above the United States delegation suggested that in future the term "Operational Hull Response Monitor (ORM) including voyage data recorder" should be used.

13.6 Members were invited to submit comments and proposals to the next session and the Secretariat was instructed to inform the BC and DE Sub-Committees accordingly.

13.7 In order to make the work of the Sub-Committee more effective, the Sub-Committee agreed to amalgamate this agenda item and agenda item 14 "Investigations into the loss of bulk carriers" under a single item entitled "Hull structural integrity of tankers and bulk carriers" and give consideration to those areas of hull integrity which fall within the scope of work of the Sub-Committee.

13.8 The Committee is invited to note the above information and decide as appropriate.

14 INVESTIGATIONS INTO THE LOSS OF BULK CARRIERS

14.1 The Sub-Committee recalled that at its previous session this agenda item was dealt with in conjunction with agenda item "Hull cracking in large ships" in pursuance of instructions of the Committee to investigate issues referred to in paragraph 13.1.

14.2 The Sub-Committee noted a paper submitted by the United States on analysis of a typical 63,000 dwt bulk carrier (SLF 37/14). The objective of the study was to determine the vulnerability of dry bulk carriers to cargo hold flooding in storm conditions, i.e. capsizing, loss of buoyancy or excessive longitudinal bending moment.

14.3 The Sub-Committee noted that in their paper the United States urged it to consider relevant provisions of their earlier paper SLF 35/12 in order to prevent recurrence of the high casualty rates. In this context the Sub-Committee reiterated its decision, as referred to in paragraph 13.7, to amalgamate this agenda item with the agenda item "Hull cracking in large ships" under a single item "Hull structural integrity of tankers and bulk carriers".

14.4 The Sub-Committee invited Members to submit any comments and pertinent information on the subject to the next session.

15 REVISION OF STABILITY REQUIREMENTS IN THE CODE OF SAFETY FOR DYNAMICALLY SUPPORTED CRAFT (RESOLUTION A.373(X))

15.1 The Sub-Committee recalled that at its previous session it considered stability requirements for the revised Code of Safety for Dynamically Supported Craft (DSC Code), approved on an interim basis the draft revised chapter 2 of the Code as set out in annex 7 to SLF 36/25 and invited Members to submit comments to this session for finalizing chapter 2 and appendices I and III. In order to expedite the work a correspondence group was established to further progress the review of the requirements.

15.2 The Sub-Committee had for its consideration documents submitted by Australia (SLF 37/15/1) containing the results of the work of the correspondence group and further comments on the subject by China (SLF 37/15), Japan (SLF 37/15/3) and the Russian Federation (SLF 37/15/2).

15.3 The Sub-Committee noted the developments by the correspondence group and by other sub-committees on this matter, in particular that MSC 61, noting the progress made by the DE Sub-Committee, decided that the Code should be developed as a stand alone document, scheduled to be finalized at DE 36 with a view to its approval by MSC 62.

15.4 Having briefly reviewed the above documents the Sub-Committee established a drafting group and instructed it to prepare final draft requirements for inclusion in the revised DSC Code.

15.5 The Sub-Committee noted that the document by the Russian Federation (SLF 37/15/2) also contained proposals relating to chapter 1 of the Code and, having noted that the DE Sub-Committee would welcome any comments by other sub-committees on chapters other than those under their purview, agreed that the group should also, if possible, comment on provisions of that chapter in the above document for consideration by the DE Sub-Committee.

15.6 Having received the report of the drafting group (SLF 37/WP.10) the Sub-Committee approved the report in general and agreed to the draft chapter 2 - "Buoyancy, stability and subdivision" and appendices III - "Stability of multihull craft" and IV - "Passenger loading" (former appendix III) as set out in annex 7 for inclusion in the revised DSC Code. It further concurred with the view of the group that appendices I and II of resolution A.373(X) did not require any amendments and should be incorporated in the revised Code.

15.7 The Sub-Committee further agreed that in order to achieve consistency with the definition of "breadth" in chapter 2, the words "with no machinery active" should be appended to the definition of "Length (L)" in chapter 1.

15.8 It was also concluded that, from the perspective of stability, there was no need to re-introduce a definition of "dynamically supported craft" into chapter 1 of the draft Code, provided the following definitions are inserted:

.1 "Displacement mode" means the regime, whether at rest or in motion, where the weight of the craft is fully or predominantly supported by hydrostatic forces;

.2 "Non-displacement mode" means the normal operational regime of a craft when non-hydrostatic forces substantially or predominantly support the weight of the craft;

.3 "Transient mode" means the transitional regime between displacement and non-displacement modes.

15.9 The Sub-Committee noted that after considering issues of uncontrolled movement of cargo, the group agreed that, in view of the provision of chapter 17 requiring adequate operational instructions to be provided for the loading and securing of cargo, no specific requirements on this subject were necessary in chapter 2.

15.10 The Sub-Committee, while noting that further research was required on the development of intact stability criteria relating to "tripping" of air cushion vehicles while turning, took note of the group's view that the insertion of clauses relating to stability of flexible skirts and turning in following wind and sea conditions should adequately cover this aspect for the interim.

15.11 The Sub-Committee noted that the group could not agree on the transverse extent of bottom damage to be assumed for damage stability purposes in relation to multihull craft. Some countries were concerned at the damage which may occur should such a craft collide with a submerged 40 ft container and therefore strongly supported an assumed extent of 12 metres. Other delegations were concerned at the onerous nature of such a requirement in comparison with the corresponding provision of resolution A.373(X) for an assumption of 0.2B or 5 metres, whichever is the least. Support was evenly divided between these proposals and a compromise suggestion of 7 m (corresponding to the largest dimension of a 20 ft container). After consideration of the matter, the Sub-Committee agreed that a compromise value of 7 m should be inserted in paragraph 2.6.7(b) of the revised chapter 2.

15.12 Some delegations were of the view that it should be possible to develop a single set of intact and damage stability criteria for each group of craft (i.e. passenger and cargo) and that references to individual types (e.g. multihulls, hydrofoils) should not be necessary. The Sub-Committee agreed that, while such harmonization was desirable, the current status of research would not permit the stability provisions of the revised Code to be framed in such a matter.

15.13 In considering the proposal by Canada included as paragraph 2.6.4 of the revised chapter 2, the Sub-Committee noted that the proposal may have significant fire protection implications, and suggested that this clause should be reviewed from the fire protection aspect by the DE/FP working group.

15.14 On the issue of the maximum permissible heel angle for passenger craft, many Members were of the view that public and industry concerns about the safety of these craft after damage should be reflected by reduction in this angle. The Sub-Committee agreed that the value of 12° in the existing Code could be reduced to 10°, but was not satisfied that the angle could be further reduced to 8° as had been proposed in annex 7 to SLF 36/25.

15.15 The Sub-Committee noted that the review of the requirements in appendix III may be necessary following completion of a research project by the United Kingdom in July 1993 and prior to the final consideration of the Code by the Organization.

15.16 The Sub-Committee, considering that the work on this matter had been completed decided to delete this item from its work programme. The Committee is invited to note action taken on the development of the revised stability requirements in the DSC Code. The Secretariat was requested to inform the DE Sub-Committee accordingly.

16 REVIEW OF EXISTING SHIPS' STANDARDS

16.1 The Sub-Committee recalled that MSC 59 agreed that there was a need to reduce the ever increasing gap between standards of safety requirements for new ships and those for existing ships and recognized that it was not possible to apply the same level of requirements for new ships to existing ships. Accordingly, the Committee instructed all sub-committees when preparing amendments to conventions, codes and recommendations to thoroughly discuss their application to existing ships so as to ensure that they meet satisfactory safety standards, and to review the existing ship safety standards. The Committee also requested the Sub-Committee to report on the extent of any significant differences between requirements for new and existing ships and to recommend, as appropriate, whether action could readily be taken to reduce such differences by upgrading the safety standards of existing ships. In addition the Committee instructed all sub-committees to look into the matter left "to the discretion of the Administration" with a view to determining whether explicit requirements could be devised in such cases.

16.2 The Sub-Committee had for its consideration a list of regulations of the 1974 SOLAS Convention, as amended (chapter II-1), the 1966 LL Convention and the 1969 TM Convention containing the expression "at the discretion of the Administration" or similar wording (SLF 37/16, annex) which also included regulations of the above IMO instruments where other wording, as left to the discretion of the Administration, appear which may also need consideration with a view to establishing explicit requirements.

16.3 The Sub-Committee noted the above list of the regulations and invited Members to submit their proposals for amendments to any regulations in the list, as they deem necessary, for further consideration. The Sub-Committee also noted the request of the Committee to report any significant differences found between requirements for new and existing ships which may be readily upgraded. In the absence of submissions on this subject the Sub-Committee requested Members to submit proposals for consideration at the next session.

16.4 The Sub-Committee considered a document by Japan (SLF 37/INF.2) which was referred by MSC 61 to this Sub-Committee for reviewing the list of references to requirements in the draft SFV Protocol, left to the satisfaction of the Administration. The Sub-Committee noted the explanation by Japan that the intention of preparation of the list was to identify for port State control purposes what relaxations have been approved by the Administrations and agreed that no action was required at this stage, pending the consideration of the corresponding list relating to SOLAS 74.

16.5 The Sub-Committee recalled its intention at the previous session to discuss an interpretation of expression "alteration and modification of a major character" and an interpretation on the exemption originating from the nature and conditions of intended voyages and noted that the interpretation of expression "alteration and modification of a major character" was under consideration by the SDS working group under agenda item 4 (paragraphs 4.30 to 4.38). In respect of the interpretation on the exemption originating from the nature and conditions of intended voyages the Sub-Committee noted that no proposal was submitted to this session and invited Members to submit their comments and proposals on the subject for consideration at the next session.

Application of regulation II-1/1.3 of SOLAS 74 to the requirements concerning subdivision and damage stability adopted by resolution MSC.19(58)

16.6 As instructed by MSC 60 the Sub-Committee considered a document by the United Kingdom (MSC 60/10/1) where concern was expressed by the fact that the amendments to chapter II-1 of the 1974 SOLAS Convention concerning subdivision and damage stability of cargo ships adopted by resolution MSC.19(58) only apply to ships constructed on or after 1 February 1992 and are thereby disconnected from the general application of regulation II-1/1.3 of the 1974 SOLAS Convention, as amended. The United Kingdom considered that a situation could arise where Administrations should have the option of applying resolution MSC.19(58), at least in part, to existing ships, and that ship lengthening or major structural alterations are such situations where the opportunity to upgrade the standard of subdivision could occur.

16.7 In considering the matter the Sub-Committee recognized that two issues could be identified:

.1 general application of regulation II-1/1.3; and

.2 the extent to which amendments adopted by resolution MSC.19(58) should apply to existing ships.

16.8 With regard to the general application of regulation II-1/1.3 the Sub-Committee noted an opinion offered by the IMO Legal Office that it is a general, uncontested principle of treaty law, that in the case of partial amendments to treaties, those provisions which have not been amended or derogated by the amendments remain in force. No provision contained in resolution MSC.19(58) indicates that regulation II-1/1.3 should not be applied. Accordingly, no provision contained in resolution MSC.19(58) can, therefore, be interpreted as a legal obstacle for the Administration to make use of the option contained in regulation II-1/1.3. In general it can be stated that the general regulations contained in part A of chapter II-1 always apply to any amendment unless the very text of the amendment indicates otherwise.

16.9 In this context the Sub-Committee noted that the existing text of regulation II-1/1.3 which refers to the application date of 1 July 1986 was valid only with respect to the 1983 amendments which entered into force on 1 July 1986, but did not appear to cater for satisfactorily subsequent amendments adopted by the Committee. In this respect the Sub-Committee considered the following text prepared by the delegation of Japan concerning expanded interpretation of regulation II-1/1.3 to cover the application to existing ships of SOLAS amendments in general:

"Unless expressly provided otherwise, an amendment to this chapter shall apply to ships constructed on or after the date on which the amendment enters into force. All ships which undergo repairs, alterations, modifications and outfitting related thereto shall continue to comply with at least the requirements previously applicable to such ships. Such ships, if constructed before the date on which the amendment enters into force, shall, as a rule, comply with the requirements for ships constructed on or after that date to at least the same extent as they did before undergoing such repairs, alterations, modifications or outfitting. Repairs, alterations and modifications of a major character and outfitting related thereto shall meet the requirements for ships constructed on or after the date on which the amendment enters into force, in so far as the Administration deems reasonable and practicable."

16.10 The Sub-Committee felt that the above text, when finalized, would have to be included in the SOLAS Convention as an amendment, but in the interim period it could be treated as interpretation of regulation II-1/1.3 and disseminated to Member Governments as an MSC circular. The Sub-Committee noted, however, that this issue was not only related to chapter II-1 but that this was a matter of general application of the grandfather clause and requested the guidance of the Committee on how to deal with the above text in SOLAS chapter II-1 and other chapters.

16.11 With regard to the extent to which the amendments adopted by resolution MSC.19(58) should apply to existing ships referred to in paragraph 16.7.2, the Sub-Committee noted that the issue was dealt with by the SDS working group under agenda item 4 and outlined in paragraphs 4.30 to 4.38.

16.12 The Committee is invited to note the above and take action as appropriate.

17 REVIEW OF HYPOTHETICAL OIL OUTFLOW PARAMETERS

17.1 The Sub-Committee recalled that at its previous session it gave consideration to the issue in pursuance of instructions of the Committee to review hypothetical oil outflow parameters in regulations 22 to 24 of Annex I to MARPOL 73/78 in the light of the probabilistic approach developed by the Sub-Committee in connection with the subdivision of ships. The Sub-Committee generally supported the application of probabilistic concept of assessing oil outflow, and in order to expedite investigations in this area established a correspondence group under the chairmanship of Mr. H. Vermeer (Netherlands).

17.2 The Sub-Committee had for its consideration documents submitted by the Netherlands (SLF 37/17/2), the Russian Federation (SLF 37/17) and the United States (SLF 37/17/1). The Sub-Committee noted that MSC 60 instructed the Sub-Committee to give high priority to the issue.

17.3 The Sub-Committee noted the MEPC 33 request to the Committee (MSC 61/14) to evaluate the safety aspects of the alternative methods contained in the appendix to the guidelines under regulation 13(G)(7) of Annex I to MARPOL 73/78, i.e.:

.1 the under-pressure method;

.2 hydrostatic balance loading; and

.3 rapid emergency transfer of cargo,

and that the Committee instructed it and the DE Sub-Committee accordingly to report to MSC 62.

17.4 The Sub-Committee reviewed the documents and agreed to refer them to the _ad hoc_ working group on subdivision and damage stability (SDS) to consider and develop a method for calculation of oil outflow parameters and provide its views on alternative methods referred to in 17.3. Having received the report of that group (SLF 37/WP.8) the Sub-Committee took specific decisions as outlined in the following paragraphs.

17.5 The Sub-Committee confirmed that oil outflow should be treated in a probabilistic manner, but took note that the nature of the problem did not permit to make at this time any firm conclusion by the group on the calculation method, the probabilistic oil outflow parameters and the probabilistic model for the hypothetical oil outflow, nor had the group time to address, as instructed, the safety aspects of the alternative methods referred to in paragraph 17.3.

17.6 Time restraints likewise did not permit a point-by-point review of the hypothetical oil outflow methodology contained in MEPC 33/WP.3/Add.2. However, the essential elements, the measures of merit (oil outflow parameters) were extensively discussed. The group, as mentioned above, could not reach any firm conclusion on which parameters were required.

17.7 Having considered the recommendation by the group to establish a correspondence group on this issue, the work of which should be co-ordinated with that of the two correspondence groups already set up by the MEPC, instead the Sub-Committee decided to suggest to the Committee that delegations were provided with expertise on probability within this Sub-Committee to participate in the work of the MEPC.

17.8 The Committee is requested to invite the MEPC to send the outcome of its correspondence group directly to the next session of this Sub-Committee for consideration of those parts which are probability related.

18 USE OF COMPRESSED AIR SYSTEMS FOR BUOYANCY

18.1 The Sub-Committee recalled that at its thirty-sixth session following the request of the Committee to determine the necessity and possible uses of compressed air systems for bringing air into a breached lower cargo tank to minimize flooding and to refloat the ship after damage, the Sub-Committee preliminarily exchanged views on the subject. The Sub-Committee agreed that further development of compressed air systems for buoyancy would be useful and invited the Committee to refer the proposal to the DE Sub-Committee for further consideration and possible development of specific system design.

18.2 The Sub-Committee noted that no papers were submitted to this session and while feeling that this work should primarily be carried out by the DE Sub-Committee with the assistance of this Sub-Committee as necessary, invited the Committee to refer this matter to the DE Sub-Committee for consideration. The Sub-Committee agreed to review this item upon the specific request of the DE Sub-Committee and any comments by Members at a future session. The Secretariat was instructed to inform the DE Sub-Committee accordingly. In the light of the foregoing the Sub-Committee deleted this item from its work programme.

18.3 The Committee is invited to note the above and decide as appropriate.

19 EXTENSION OF SEASONAL TROPICAL ZONES

19.1 The Sub-Committee recalled that this agenda item was established by MSC 60 at the request of Australia and the Sub-Committee was requested to consider the matter.

19.2 The Sub-Committee had before it a document submitted by Australia (SLF 37/19) containing a proposed amendment to the 1966 LL Convention on extension of Seasonal Tropical Area (STA) in the waters off the north east coast of Australia to include the port of Gladstone and supporting meteorological background information.

19.3 Before proposing the amendment to the STA the Government of Australia had satisfied itself that, in the event of any adverse weather in the area, there are sufficient navigational charts based on recent surveys, adequate aids to navigation, and high quality weather forecasts, available to the mariners to permit them to take any appropriate action.

19.4 The Sub-Committee considered the proposed amendment to the 1966 LL Convention and supporting meteorological background information and agreed to a draft amendment to the Convention and a draft Assembly resolution as set out in annex 8. The Committee is invited to adopt, in accordance with article 29(3) of the 1966 LL Convention, the draft amendment to the 1966 LL Convention together with the draft Assembly resolution prior to their submission to the Assembly for adoption.

19.5 The Sub-Committee considered that the work on this item had been completed for the time being and decided to delete the item from its work programme.

20 TONNAGE MEASUREMENT OF NEW OIL TANKERS

20.1 The Sub-Committee recalled that resolution A.388(X) was revoked by resolution A.722(17) "Application of tonnage measurement of ballast spaces in segregated ballast oil tankers", whereby Governments were invited to advise port and harbour authorities to apply the recommendation attached to the resolution for the purpose of deducting the tonnage of segregated ballast tanks (SBT) from the gross tonnage shown on the International Tonnage Certificate (1969).

20.2 The Sub-Committee recalled further that MSC 60, in the light of the recent developments regarding oil tanker design, included this item in the work programme of the Sub-Committee with the target completion date of 1994.

20.3 The Sub-Committee noted that MSC 61 in considering a submission by Norway (MSC 61/20/8) where concern was expressed over the slow implementation of resolution A.722(17), noted the decision taken by MEPC 33 to request its Members to submit reports on compliance with resolution A.722(17) and also to request the Secretary-General to approach the International Association of Ports and Harbors (IAPH) inviting its co-operation in resolving the problem of implementation of the resolution. The Committee instructed this Sub-Committee to deal with the matter at this session and report to MSC 62.

20.4 In accordance with the instruction of the Committee the Sub-Committee considered the document by Norway (MSC 61/20/8) together with a document by Germany (SLF 37/20) which also addressed the problem outlined in the Norwegian document.

20.5 The delegation of Greece referred to the efforts by the industry to give effect to resolution A.722(17) and to the slow progress in implementation of that resolution and felt that the best way to proceed would be to continue discussing and persuading respective authorities in order to convince them of more fair methods of charging dues.

20.6 The Sub-Committee referred the documents to the drafting group of tonnage experts established under item 12 for consideration and preparation of proposals. Having received the report of the drafting group (SLF 37/WP.2 and SLF 37/WP.2/Corr.1), the Sub-Committee considered the report and took the following decisions and action.

20.7 The Sub-Committee considered the necessity of an additional certificate for the purposes of reducing the gross tonnage of tankers with segregated ballast tanks (SBT) and agreed that it was not necessary nor desirable to issue a separate tonnage certificate as the necessary information may be shown on the International Tonnage Certificate (1969).

20.8 It was recognized that after the coming into force of the 1969 Tonnage Convention for all ships of all Contracting Governments, the use of one uniform International Tonnage Certificate (1969) would contribute to minimize unfair competition and to the acceptance of the tonnage parameter by port authorities and all other agencies. This would also stimulate the application of resolution A.722(17).

20.9 The Sub-Committee agreed that in addition to the remark to be shown on the International Tonnage Certificate (1969) referring to SBT as given in resolution A.722(17), the words "The reduced Gross Tonnage which may be used for the calculation of tonnage based fees is ...." should be added for clarification.

20.10 In view of the above the Sub-Committee decided that resolution A.722(17) should be amended and agreed to a draft Assembly resolution as set out in annex 9.

20.11 The Sub-Committee noted the decision taken by MEPC 33 in respect of implementation of resolution A.722(17) and was of the opinion that appropriate IMO bodies should advise port and harbour authorities to accept the reduced gross tonnage as shown in the "Remarks" column of the International Tonnage Certificate (1969) and take further action in this respect.

20.12 The Sub-Committee, having discussed the problem of new tanker design, was of the opinion that it would be fair to take into consideration "void" spaces necessary as a consequence of new MARPOL regulation 13F adopted by resolution MEPC.52(32) in the same way as SBT.

20.13 The Committee is invited to note the outcome of the work on the matter and to approve the draft Assembly resolution as given in annex 9 for submission, subject to the MEPC's subsequent approval, to the eighteenth Assembly for adoption.

20.14 The Sub-Committee considered that the work on this item had been completed and decided to delete the item from its work programme.

21 ROLE OF THE HUMAN ELEMENT IN MARITIME CASUALTIES

21.1 The Sub-Committee was informed by the Secretariat (SLF 37/2/15 and SLF 37/2/15/Add.1) of the outcome of the consideration by the Committee at its sixtieth session of issues regarding the role of the human element in maritime casualties.

21.2 The Sub-Committee noted that the Joint MSC/MEPC Working Group on the Human Element was established during MSC 60 and that in considering annex 5 of the report of the Joint MSC/MEPC Working Group (MSC 60/WP.9/Add.1) the Committee instructed all its sub-committees, in the context of the human element, to:

.1 review the adequacy of requirements and recommendations for equipment and operating manuals and operational guidelines on board ships;

.2 consider the simplification and standardization of terminology in operating manuals and symbols and signs used on board ships;

.3 identify words and phrases used in IMO instruments (including conventions, codes and resolutions) relating to human performance criteria and determine the extent to which they can be more specifically defined. Members should be invited to submit information on the interpretations they may have given to these terms in their national rules and regulations;

.4 give appropriate consideration to the questions listed in annex 6 to MSC 60/WP.9/Add.1 during the preliminary examination of subjects relating to human factors;

.5 report to the Maritime Safety Committee on their progress and on their plans for future work under each agenda item for which the Joint MSC/MEPC Working Group has developed terms of reference. These reports to be made available to the Joint MSC/MEPC Working Group for any consideration it deems appropriate;

.6 report where possible to the sixty-third session of the Committee preliminary views for each of the above matters. These preliminary views should be used by the Joint MSC/MEPC Working Group as the basis for recommending target completion dates to the two Committees.

21.3 The Committee specifically requested this Sub-Committee to consider in the context of the human element:

.1 review of SOLAS 74 and ICLL 66 regarding language and format of stability information;

.2 application of computers in determining ships stability; and

.3 guidelines for the use and application of computers, including software security, validation of accuracy of output and manual operations in the event of computer aided system failure (in co-operation with the DE Sub-Committee).

21.4 The United States informed the Sub-Committee of the approach being taken in the United States to address the issues of the human element in the conventions and codes of the Organization. Their delegates to the various sub-committees have met and, using the check-off list provided by the Committee (annex to SLF 37/2/15/Add.1), developed the following plan:

.1 to review the STW Convention and either the IBC or IGC Code for regulations which have human factor aspects;

.2 to examine each of the regulations identified to determine possible actions of the Organization to take regard of human factors;

.3 to prepare papers to the relevant sub-committee;

.4 the sub-committees would then report the results to the Joint MSC/MEPC Working Group on the Human Element; and

.5 with the experience gained from this exercise, the work on other codes and conventions could then become easier.

The sharing of information and co-operation within the countries among the delegates to various sub-committees has been felt to be essential for effective use of the "lessons learned", and to assist in these endeavours a "Human Factors Co-ordinating Committee" has been established in the United States.

21.5 Following the discussion in the Sub-Committee, Norway and the United States volunteered to jointly co-ordinate the work of a correspondence group. Comments, with a copy to the Secretariat, should be forwarded to the United States Coast Guard*.

21.6 The Sub-Committee, bearing in mind that the report on the item, where possible, should be made to MSC 63 (spring 1994), invited Members to submit comments and proposals for the improvement, as deemed necessary, of operational aspects in regulations of IMO instruments under the Sub-Committee's purview, which may be incorporated therein in due course, as well as comments on the questions listed in paragraphs 21.2 and 21.3 and in the annex to SLF 37/2/15/Add.1 for consideration at the next session.

22 WORK PROGRAMME

22.1 The Sub-Committee reviewed its work programme, as revised by the Committee at its sixty-first session (SLF 37/2/19, annex), deleted items on which work had been completed, relocated subitems as necessary and adjusted the target completion dates as a consequence of the progress made at this session.

22.2 In particular, the Sub-Committee reviewed items in its work programme relating to subdivision and damage stability. In accordance with its decision that in future subdivision and damage stability requirements for all ships should be based on the probabilistic approach the Sub-Committee agreed that the work on harmonization of the damage stability provisions in all IMO instruments should take prevalence over the attempt to develop such regulations for individual types of ships in isolation. In view of the above, the Sub-Committee agreed to rearrange all items in the work programme relating to probabilistic stability regulations under the heading "Harmonization of damage stability provisions in IMO instruments based on the probabilistic method for all types of ships", as shown in annex 10. At the same time overlaps and inconsistencies between the work programme items were eliminated. The Committee is invited to note the action taken and decide as appropriate.

22.3 The Sub-Committee further emphasized the complexity and various repercussions of the task to introduce harmonized probabilistic subdivision and damage stability provisions in <u>all</u> related IMO instruments. The Sub-Committee invited the attention of the Committee and also the MEPC through the Committee, to the fact that this task would result in major amendments to the SOLAS, LL and MARPOL Conventions, as well as the IBC, IGC and other Codes.

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* Mr. H. Paul Cojeen
U.S. Coast Guard (G-MTH-3)
2100 Second Street, S.W.
Washington, DC 20593
Telephone: (01)(202)267 2988
Telex: 892427
Facsimile: (01)(202)267 4816

22.4 With regard to the item "Amendments to SOLAS regulations II-1/8 and II-1/20" the Sub-Committee recalled that at its thirty-fourth session it considered draft amendments to SOLAS regulations II-1/8 and II-1/20 which were intended to better reflect the intent of regulation II-1/8 as amended by resolution MSC.12(56). While agreeing on the text of such amendments the Sub-Committee at that session agreed that, in the interest of uniform application, the substance should be introduced into practice in the form of an MSC circular as an interim guidance to Administrations pending adoption of amendments to the 1974 SOLAS Convention at a future time (SLF 34/15, paragraph 6.15). On the basis of the draft provided by the Sub-Committee, the Committee at its fifty-eighth session developed and approved guidance notes for proper application of regulations II-1/8 and II-1/20, paragraph 1 of which included the contents of the amendments proposed by the Sub-Committee (MSC/Circ.541). In view of the fact that respective amendments might still be needed the Sub-Committee decided to keep in the work programme the reference to regulation II-1/20 together with II-1/8 under which the requirements for existing passenger ships other than ro-ro passenger ships were currently dealt with.

22.5 The proposed work programme and the list of items to be included in the agenda for the next session are shown in annexes 10 and 11 and the Committee is invited to approve the work programme as proposed by the Sub-Committee.

<u>Arrangements for the next session</u>

22.6 The Sub-Committee agreed to establish, at its next session, working groups on the following items:

.1 subdivision and damage stability; and

.2 revision of technical regulations of the 1966 LL Convention.

<u>Date of the next session</u>

22.7 The Sub-Committee noted that its thirty-eighth session has been scheduled from 14 to 18 February 1994.

23 ANY OTHER BUSINESS

23.1 The Sub-Committee had for its consideration documents submitted by Chile (SLF 37/INF.3), Japan (SLF 37/23/2) and the Secretariat (SLF 37/23, SLF 37/23/Add.1 and SLF 37/23/1). It was noted that the document by Japan (SLF 37/23/2) on a method of calculation of bow height of fishing vessels for the purpose of the SFV Protocol had been dealt with by the working group on intact stability under agenda item 3.

<u>Indexing of recommendations and guidelines</u>

23.2 The Sub-Committee recalled that at its thirty-sixth session it instructed the Secretariat to update the list of guidelines and recommendations pertaining to the Sub-Committee's work set out in SLF 34/13. That list had been developed in response to the Committee's instruction to all sub-committees to review IMO resolutions and circulars containing valid guidelines and recommendations relating to maritime safety for the benefit of Administrations, industry and seafarers (MSC 56/9, paragraph 8.8).

23.3 The Sub-Committee considered documents SLF 37/23 and SLF 37/23/Add.1 and reviewed the updated list of guidelines and recommendations pertaining to the work of the Sub-Committee as shown in annex 12. The Sub-Committee noted that the intention of the Committee's instruction to sub-committees to develop the list of guidelines and recommendations was to provide information on valid IMO instruments for the benefit of Administrations, industry and seafarers and requested the Committee to note the list of guidelines and recommendations, as set out in annex 12, and decide on further action as appropriate.

Status of implementation of IMO instruments related to the work of the Sub-Committee

23.4 The Sub-Committee noted an updated status of implementation by Member Governments of IMO instruments related to the work of the Sub-Committee as provided in the document by the Secretariat (SLF 37/23/1).

23.5 It was further noted that the summary provided in the annex to SLF 37/23/1 contained only data received by the Secretariat in written form, and that the absence of information in blank boxes may not necessarily indicate non-implementation.

23.6 The Sub-Committee agreed that the Assembly resolution A.685(17) "Weather criterion for fishing vessels of 24 metres in length and over" should be included in the above list of IMO instruments and instructed the Secretariat to act accordingly.

23.7 The Sub-Committee, in realizing that only a limited number of Members had so far provided relevant information, urged Members to submit information on the implementation of the instruments listed in the annex to SLF 37/23/1 in their countries.

Implementation of the provisions of the 1969 TM Convention on the Chilean ships

23.8 The Sub-Committee was informed by the delegation of Chile on the status of implementation of the provisions of the 1969 TM Convention on the Chilean ships (SLF 37/INF.3). The Chilean Administration further informed that they can provide assistance to other maritime administrations in order to cope with the remeasurement work before 18 July 1994 by carrying out tonnage calculations in accordance with the 1969 TM Convention and, therefore, contribute to the widest application of that Convention.

23.9 The Sub-Committee expressed its appreciation to the delegation of Chile for the information provided and to the Chilean Administration for their willingness to assist other parties in implementing the 1969 TM Convention.

Translation of documents

23.10 The delegate of Mexico drew the attention of the Sub-Committee to the difficulties experienced by his delegation in approving texts, as those contained in various working papers considered by the Sub-Committee, when they appear in languages other than Spanish. While recognizing the effort made by the Sub-Committee in reducing the volume of such working papers as indicated by the Secretary-General in his opening address, he proposed that the Sub-Committee should delay decisions until such time when the documents are available in all working languages or, alternatively, to note those documents and leave them for approval at the next session of the Sub-Committee.

23.11 The Chairman of the Sub-Committee recognizing these needs thanked the Mexican delegation for their understanding and explained in turn the difficulties experienced by the Sub-Committee when presented with an aggregate heavy volume of texts requiring translation in a short period of time and sought the understanding and co-operation of all concerned to proceed with the business of the Sub-Committee in a pragmatic way. He further noted that any decisions taken would be included in the report of the Sub-Committee and would be available in all working languages prior to their eventual consideration and approval by the Committee and other relevant bodies of the Organization.

Loss of m.s. Jan Heweliusz

23.12 The Director of the Maritime Safety Division, Mr. E.E. Mitropoulos, referring to the tragic accident with high loss of life suffered by the Polish ship Jan Heweliusz in the Baltic Sea, expressed, on behalf of the Secretary-General and the IMO Secretariat his condolences to the Government of Poland and to the bereaved families affected by the accident. The representative of Poland thanked Mr. Mitropoulos for the words of sympathy and undertook to convey his condolences to the Government of Poland and to the bereaved families.

24 ELECTION OF CHAIRMAN AND VICE-CHAIRMAN FOR 1994

24.1 In accordance with the rules of procedure adopted by the MSC for the election of Chairman and Vice-Chairman of the MSC and its subsidiary bodies, the Sub-Committee unanimously re-elected its Chairman, Mr. H. Hormann (Germany) and Vice-Chairman, Professor L. Kobylinski (Poland).

Expression of appreciation

24.2 The Sub-Committee noted that Mr. A. Graham (United Kingdom), Chairman of the working group on subdivision and damage stability for several years, would retire soon after the session. The Sub-Committee, having appraised Mr. Graham's dedication to its work over many years, expressed its deep appreciation for his excellent work and contribution to the activities of the Sub-Committee and wished him a long and happy retirement.

25 ACTION REQUESTED OF THE COMMITTEE

25.1 The Committee is invited:

.1 to approve the draft Code of Intact Stability for All Types of Ships Covered by IMO Instruments together with the associated draft Assembly resolution for submission to the eighteenth Assembly for adoption (paragraph 3.4 and annex 2);

.2 to retain the sections of the Intact Stability Code relating to the DSC Code and the Protocol to the 1977 SFV Convention in square brackets noting they may have to be substituted with agreed texts after the two instruments have been adopted (paragraph 3.5);

.3 to note the Sub-Committee's view that, subject to changes in the Sub-Committee's future work on the development or updating of standards for different ship types, the Intact Stability Code should be considered a "living document" and should be kept under review on a periodical basis (paragraphs 3.7 and 3.14 to 3.16);

.4 to note the recommendation on the definition of the term "positive stability" developed by the Sub-Committee for inclusion in draft SOLAS regulation III/3.12 bis (paragraph 3.10);

.5 to note the progress on the work regarding retroactive application of the SOLAS 90 standard to all existing passenger ships (paragraphs 4.4 to 4.12);

.6 to note the progress on the development of an interpretation of, and recommendations for, the application of resolution MSC.26(60) and MSC/Circ.574 concerning damage stability requirements for existing ro-ro passenger ships (paragraphs 4.19 to 4.24);

.7 to approve the draft MSC circular on reports on casualty statistics concerning fishing vessels and fishermen at sea (MSC/Circ.539/Add.2) for circulation after the new format of reports is agreed by the Steering Group on Casualty Statistics (paragraph 7.8 and annex 3);

.8 to note the progress made in the work on the revision of technical regulations of the 1966 LL Convention (section 8);

.9 to endorse the Sub-Committee's opinion that the revision of part A of the Code of Safety for Fishermen and Fishing Vessels and the Document for Guidance on Fishermen's Training and Certification should be undertaken after the relevant Protocol to the 1978 STCW Convention has been adopted (paragraph 9.5);

.10 to approve dissemination by an MSC circular of the interim guidelines for open-top containerships (paragraph 11.6 and annex 4);

.11 to approve the draft Assembly resolution on application of recommendation 2 of the International Conference on Tonnage Measurement of Ships, 1969, for submission to the eighteenth Assembly for adoption (paragraph 12.9 and annex 5);

.12 to approve the draft TM circular (TM.5/Circ.4) on unified application of the provisional formula to calculate a reduced gross tonnage of an open-top containership (paragraph 12.15 and annex 6);

.13 to note the outcome of consideration of the draft action plan for hull structural integrity of large ships, with particular reference to tankers and bulk carriers, prepared by the DE Sub-Committee (paragraphs 13.4 to 13.6);

.14 to note the outcome of consideration of the issue on the application of SOLAS regulation II-1/1.3 to the requirements for subdivision and damage stability adopted by resolution MSC.19(58). In particular, to note the interpretation of regulation II-1/1.3 to cover the application of SOLAS amendments to existing ships in general and provide guidance on how to deal with the text of the interpretation in SOLAS chapter II-1 and other chapters (paragraphs 16.6 to 16.12);

.15 to note the outcome of consideration of issues on hypothetical oil outflow parameters and on evaluation of safety aspects of the alternative methods contained in the guidelines under regulation 13G(7) of annex I to MARPOL 73/78 and the Sub-Committee's proposal to invite the MEPC to convey the outcome of its correspondence group directly to the next session of the Sub-Committee for consideration of those parts, which are probability-related and take action as appropriate (paragraphs 17.4 to 17.8);

.16 to take note of the discussion on the issue concerning use of compressed air systems for buoyancy and decide whether to refer the matter to the DE Sub-Committee for consideration (paragraphs 18.1 to 18.3);

.17 to adopt, in accordance with article 29(3) of the 1966 LL Convention, the draft amendments to the 1966 LL Convention together with the associated draft Assembly resolution prior to their submission to the Assembly for adoption (paragraph 19.4 and annex 8);

.18 approve the draft Assembly resolution on application of tonnage measurement of ballast spaces in segregated ballast oil tankers, for submission, subject to the MEPC's subsequent approval, to the eighteenth Assembly for adoption (paragraph 20.13 and annex 9);

.19 to note that introduction of the harmonized probabilistic subdivision and damage stability provisions in all related IMO instruments would result in major amendments to the SOLAS, LL and MARPOL Conventions, as well as the IBC, IGC and other Codes and invite the MEPC to note the above (paragraph 22.3);

.20 to note the list of guidelines and recommendations pertaining to the work of the Sub-Committee developed to provide information on valid IMO instruments for the benefit of Administrations, industry and seafarers and decide on further action, as appropriate (paragraph 23.3 and annex 12); and

.21 to approve the report in general.

25.2 In reviewing the work programme of the Sub-Committee (annex 10), the Committee is invited to:

1. to concur in the proposed rearrangement of items relating to subdivision and damage stability made under item 1 "Harmonization of damage stability provisions in IMO instruments based on the probabilistic method for all types of ships" and item 2 "Subdivision and damage stability of passenger ships" and with target completion dates as proposed (paragraphs 22.2 and 22.4);

.2 to retain in the Sub-Committee's work programme item 3.1 under the heading "Review of the Code of Intact Stability for All Types of Ships Covered by IMO Instruments", with a target completion date of 1995 (paragraph 3.16);

.3 to extend the target completion date for item 6 "Revision of technical regulations of the 1966 LL Convention" to 1996 (paragraph 8.13);

.4 to extend the target completion date for item 7 "Safety guidelines and safety training guidelines for fishermen of small fishing vessels" to 1996 pending adoption of the STCW Protocol (paragraph 9.5);

.5 to delete item 9 "Open-top containerships" from the Sub-Committee's work programme, as the work is completed;

.6 to retain the item "Livestock carriers and other ships requiring interpretations of their tonnage measurement aspects" under a new heading "Interpretation of tonnage measurement requirements" (item 10), with a target completion date of 1994 (paragraph 12.18);

.7 to amalgamate the item "Hull cracking in large ships" and the item "Investigations into the loss of bulk carriers" under a single item 11 "Hull structural integrity of tankers and bulk carriers", with a target completion date of 1995 (paragraph 13.7 and 14.3);

.8 to delete item 12 "Revision of stability requirements in the Code of Safety for Dynamically Supported Craft" from the Sub-Committee's work programme, as the work is completed;

.9 to extend the target completion date for item 14 "Review of hypothetical oil outflow parameters" to 1994 pending the outcome of the MEPC correspondence group on the subject (paragraph 17.8);

.10 to delete item 15 "Use of compressed air systems for buoyancy" from the Sub-Committee's work programme and to have the item reviewed upon a specific request of the DE Sub-Committee and/or any comments by Members at a future session (paragraph 18.2);

.11 to delete item 16 "Extension of Seasonal Tropical Zones" from the Sub-Committee's work programme, as the work is completed;

.12 to delete item 17 "Tonnage measurement of new oil tankers" from the Sub-Committee's work programme, as the work is completed;

.13 to agree to a target completion date of 1995 for sub-item 18.4 "Guidelines for the use and application of onboard computers"; and

.14 to approve the Sub-Committee's revised work programme (annex 10).

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ANNEX 1

AGENDA FOR THE THIRTY-SEVENTH SESSION AND LIST OF DOCUMENTS

1 Adoption of the agenda

SLF 37/1/Rev.1	Secretariat
SLF 37/1/1	Secretariat
SLF 37/1/1/Add.1	Secretariat

2 Decisions of other IMO bodies

SLF 37/2	Secretariat
SLF 37/2/1	Secretariat
SLF 37/2/2	Secretariat
SLF 37/2/2/Corr.1	Secretariat
SLF 37/2/3	Secretariat
SLF 37/2/4	Secretariat
SLF 37/2/5	Secretariat
SLF 37/2/6	ICFTU
SLF 37/2/7	Germany
SLF 37/2/8	China
SLF 37/2/9	Japan
SLF 37/2/10	Secretariat
SLF 37/2/11	Republic of Korea
SLF 37/2/12	Secretariat
SLF 37/2/13	Secretariat
SLF 37/2/14	Secretariat
SLF 37/2/15	Secretariat
SLF 37/2/15/Add.1	Secretariat
SLF 37/2/16	Secretariat
SLF 37/2/17	Secretariat
SLF 37/2/18	Secretariat
SLF 37/2/19	Secretariat
SLF 37/INF.2	Japan

3 Intact stability

SLF 37/3	Secretariat
SLF 37/3/1	Australia
SLF 37/3/2	Japan
SLF 37/3/3	United States
SLF 37/3/4	Netherlands
SLF 37/3/5	Russian Federation
SLF 37/3/6	Russian Federation
SLF 37/3/7	Russian Federation
SLF 37/2/13	Secretariat
SLF 37/2/16	Secretariat
SLF 37/INF.7	Japan
SLF 37/INF.10	Russian Federation
SLF 37/INF.15	United States
SLF 37/WP.3	*Ad hoc* working group

4 Subdivision and damage stability

SLF 37/4	Chairman of SDS working group
SLF 37/4/1	United States
SLF 37/4/2	China
SLF 37/4/3	Spain
SLF 37/4/4	Japan
SLF 37/4/5	Germany, Norway, United States
SLF 37/4/6	Poland
SLF 37/4/7	Poland
SLF 37/4/8	Poland
SLF 37/4/9	Poland
SLF 37/4/10	United States
SLF 37/4/11	IACS
SLF 37/4/12	IACS
SLF 37/4/13	IACS
SLF 37/4/14	IACS
SLF 37/4/15	IACS
SLF 37/4/16	Japan
SLF 37/4/17	Canada
SLF 37/INF.8	Netherlands
MSC 61/20/6	Denmark, Finland, Germany, Norway, Poland, Sweden
SLF 37/WP.9	*Ad hoc* working group

5 Harmonization of damage stability provisions in IMO instruments based on the probabilistic concept of survival

SLF 37/5	United Kingdom
SLF 37/5/1	United States
SLF 37/5/2	Netherlands
SLF 37/5/3	Poland
SLF 37/5/4	Poland
SLF 37/4	Chairman of SDS working group
SLF 37/INF.13	United States

6 Collection and analysis of damage cards

SLF 37/6	Spain
SLF 37/INF.4	Germany

7 Collection and analysis of casualty statistics of fishing vessels and fishermen

SLF 37/7	United States
SLF 37/7/1	Secretariat
SLF 37/WP.4	Drafting group

8 Revision of technical regulations of the 1966 LL Convention

SLF 37/8	Secretariat
SLF 37/8/1	China
SLF 37/8/2	China
SLF 37/8/3	United States
SLF 37/INF.5	China
SLF 37/INF.6	China
SLF 37/INF.12	United States
SLF 37/INF.14	United States
SLF 37/WP.1	*Ad hoc* working group

9 Further development of safety guidelines and safety training guidelines for fishermen of small fishing vessels

SLF 37/9	Secretariat

10 Revision of the alternative intact and damage stability criteria for MODUs

No documents submitted to this session.

11 Open-top containerships

SLF 37/11	United States
SLF 37/11/1	IACS
SLF 37/2/14	Secretariat
SLF 37/2/17	Secretariat
SLF 37/2/18	Secretariat
SLF 37/INF.9	Netherlands
SLF 37/WP.6	Drafting group

12 Livestock carriers and other ships requiring interpretations of their tonnage measurement aspects

SLF 37/12	Australia
SLF 37/12/1	Germany
SLF 37/12/2	Netherlands
SLF 37/12/3	Germany
SLF 37/INF.11	Denmark
MSC 61/10/7	Norway
MSC 61/10/11	Germany
SLF 37/WP.2	Drafting group
SLF 37/WP.2/Corr.1	Drafting group

13 Hull cracking in large ships

MSC 60/20/15	Secretariat

14 Investigations into the loss of bulk carriers

SLF 37/14	United States

15 Revision of stability requirements in the Code of Safety for Dynamically Supported Craft (resolution A.373(X))

SLF 37/15	China
SLF 37/15/1	Australia
SLF 37/15/2	Russian Federation
SLF 37/15/3	Japan
DE 36/5/13	Norway
SLF 37/WP.10	Drafting group

16 Review of existing ship's safety standards

SLF 37/16	Secretariat
MSC 60/10/1	United Kingdom

17 Review of hypothetical oil outflow parameters

SLF 37/17	Russian Federation
SLF 37/17/1	United States
SLF 37/17/2	Netherlands
MSC 61/14	Secretariat
MEPC 33/WP.3 and Add.1, 2 and 3	Working group
SLF 37/WP.8	*Ad hoc* working group

18 Use of compressed air systems for buoyancy

No documents submitted to this session

19 Extension of Seasonal Tropical Zones

SLF 37/19	Australia

20 Tonnage measurement of new oil tankers

SLF 37/20	Germany
MSC 61/20/8	Norway
SLF 37/WP.2	Drafting group
SLF 37/WP.2/Corr.1	Drafting group

21 Role of the human element in maritime casualties

SLF 37/2/15	Secretariat
SLF 37/2/15/Add.1	Secretariat

22 Work programme

SLF 37/WP.5	Secretariat

23 Any other business

SLF 37/23	Secretariat
SLF 37/23/Add.1	Secretariat
SLF 37/23/1	Secretariat
SLF 37/23/2	Japan
SLF 37/INF.3	Chile

24 Election of Chairman and Vice-Chairman for 1994

25 Report to the Maritime Safety Committee

SLF 37/WP.7	Draft report to the Maritime Safety Committee
SLF 37/WP.7/Add.1	Draft report to the Maritime Safety Committee
SLF 37/25	Report to the Maritime Safety Committee

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ANNEX 2

DRAFT CODE OF INTACT STABILITY FOR ALL TYPES OF SHIPS COVERED BY IMO INSTRUMENTS

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,

RECOGNIZING the need for the development of an internationally agreed code of intact stability for all types of ships covered by IMO instruments, which would summarize the work carried out by the Organization so far,

HAVING CONSIDERED the recommendations made by the Maritime Safety Committee at its [ ] session,

1. ADOPTS the Code of Intact Stability for All Types of Ships Covered by IMO Instruments, the text of which is contained in the Annex to this resolution, and which supersedes the following recommendations:

(a) Recommendation on intact stability for passenger and cargo ships under 100 metres in length (resolution A.167(ES.IV));

(b) Amendments to the recommendation on intact stability for passenger and cargo ships under 100 metres in length (resolution A.167(ES.IV)) with respect to ships carrying deck cargoes (resolution A.206(VII));

(c) Recommendation on intact stability of fishing vessels (resolution A.168(ES.IV));

(d) Recommendation on a severe wind and rolling criterion (weather criterion) for the intact stability of passenger and cargo ships of 24 metres in length and over (resolution A.562(14));

2. INVITES all Governments concerned to take steps to give effect to the provisions of the Code as a minimum basis for standards of safety, unless their national stability requirements are at least equivalent;

3. RECOMMENDS Governments concerned to ensure that inclining tests are conducted in accordance with the guidelines specified in the annex to this resolution;

4. AUTHORIZES the Maritime Safety Committee to amend the Code as necessary in the light of further studies and experience gained from the provisions contained therein.

CODE OF INTACT STABILITY FOR ALL TYPES OF SHIPS COVERED BY IMO INSTRUMENTS

CONTENTS

PREAMBLE

1 This Code has been assembled to provide, in a single document, recommended provisions relating to intact stability, based primarily on existing IMO instruments. Where recommendations in this Code appear to differ with other IMO Codes, such as the MODU Code or DSC Code, the other Codes should be taken as the prevailing instrument. For the sake of completeness and for the convenience of the user, this Code also contains relevant provisions from mandatory IMO instruments. Such requirements have been identified with an asterisk. However, in all cases, the authoritative text for requirements is contained in the mandatory instruments.

2 Criteria included in the Code are based on the best "state of art" concepts taking into account sound design and engineering principles and experience gained from operating such ships. Furthermore, design technology for modern ships is rapidly evolving and the Code should not remain static but be re-evaluated and revised, as necessary. To this end, the Organization will periodically review the Code taking into consideration both experience and further development.

3 Throughout the development of the Code it was recognized that in view of a wide variety of types, sizes of ships and their operating and environmental conditions, problems of safety against accidents related to stability have generally not yet been solved. In particular, the safety of a ship in a seaway involves complex hydrodynamic phenomena which up to now have not been adequately investigated and understood. Ships in a seaway should be treated as a dynamical system and relationships between ship and environment conditions like wave and wind excitations are recognized as extremely important elements. It is recognized that development of stability criteria, based on hydrodynamic aspects and stability analysis of a ship in a seaway, poses, at present, complex problems which require further research.

CODE OF INTACT STABILITY FOR ALL TYPES OF SHIPS COVERED BY IMO INSTRUMENTS

CHAPTER 1 - GENERAL

1.1 Purpose

The purpose of the Code of Intact Stability for All Types of Ships Covered by IMO Instruments, hereinafter referred to as the Code, is to recommend stability criteria and other measures for ensuring the safe operation of all ships to minimize the risk to such ships, to the personnel on board and to the environment. The Code is not intended to prohibit the use of an existing ship simply because its design does not conform to the requirements of this Code. Any such ship, however, should comply with safety requirements which, in the opinion of the Administration, are adequate for the service intended and are such as to ensure overall safety of the ship.

1.2 Application

1.2.1 This Code contains intact stability criteria for the following types of ships and other marine vehicles of 24 m in length and above unless otherwise stated:

- cargo ships
- cargo ships carrying timber deck cargo
- cargo ships carrying grain in bulk
- passenger ships
- fishing vessels
- special purpose ships
- offshore supply vessels
- mobile offshore drilling units
- pontoons
- [- dynamically supported craft]
- containerships

1.2.2 The coastal State may impose additional requirements regarding the design aspects of ships of novel design or ships not otherwise covered by the Code.

1.3 Definitions

For the purpose of this Code the definitions given hereunder apply. For terms used, but not defined in this Code, the definitions as given in the 1974 SOLAS Convention apply.

1.3.1 Administration means the Government of the State whose flag the ship is entitled to fly.

1.3.2 A passenger ship is a ship which carries more than twelve passengers as defined in regulation I/2 of the 1974 SOLAS Convention, as amended.

1.3.3 A cargo ship is any ship which is not a passenger ship.

1.3.4 A fishing vessel is a vessel used for catching fish, whales, seals, walrus or other living resources of the sea.

1.3.5 A special purpose ship means a mechanically self-propelled ship which, by reason of its function, carries on board more than 12 special personnel as defined in paragraph 1.3.3 of the IMO Code of Safety for Special Purpose Ships (resolution A.534(13)), including passengers (ships engaged in research, expeditions and survey; ships for training of marine personnel; whale and fish factory ships not engaged in catching; ships processing other living resources) of the sea, not engaged in catching or other ships with design features and modes of operation similar to ships mentioned above which, in the opinion of the Administration may be referred to this group).

1.3.6 An offshore supply vessel means a vessel which is engaged primarily in the transport of stores, materials and equipment to offshore installations and designed with accommodation and bridge erections in the forward part of the vessel and an exposed cargo deck in the after part for the handling of cargo at sea.

1.3.7 A mobile offshore drilling unit (MODU) or unit is a ship capable of engaging in drilling operations for the exploration or exploitation of resources beneath the sea-bed such as liquid or gaseous hydrocarbons, sulphur or salt:

.1 a column-stabilized unit is a unit with the main deck connected to the underwater hull or footings by columns or caissons;

.2 a surface unit is a unit with a ship or barge-type displacement hull of single or multiple hull construction intended for operation in the floating condition;

.3 a self-elevating unit is a unit with moveable legs capable of raising its hull above the surface of the sea.

[1.3.8 A dynamically supported craft (DSC) is a craft which is operable on or above water and which has characteristics so different from those of conventional displacement ships, to which the existing international conventions, particularly SOLAS and Load Line, apply, that alternative measures should be used in order to achieve an equivalent level of safety. Within the aforementioned generality, a craft which complies with either of the following characteristics would be considered a DSC:

.1 if the weight, or a significant part thereof, is balanced in one mode of operation by other than hydrostatic forces;

.2 if the craft is able to operate at speeds such that the Froude number is equal to or greater than 0.9.

1.3.9 An air-cushion vehicle is a craft such that the whole or a significant part of its weight can be supported, whether at rest or in motion, by a continuously generated cushion of air dependent for its effectiveness on the proximity of the surface over which the craft operates.

1.3.10 A hydrofoil boat is a craft which is supported above the water surface in normal operating conditions by hydrodynamic forces generated on foils.

1.3.11 A side wall craft is an air-cushion vehicle whose walls extending along the sides are permanently immersed hard structures.]

1.3.12 A containership means a ship which is used primarily for the transport of marine containers.

1.3.13 Freeboard is the distance between the assigned loadline and freeboard deck*.

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* For the purposes of application of chapters I and II of Annex I of the 1966 LL Convention to open-top containerships, "freeboard deck" is the freeboard deck according to the 1966 LL Convention as if hatch covers are fitted on top of the hatch cargo coamings.

CHAPTER 2 - GENERAL PROVISIONS AGAINST CAPSIZING AND INFORMATION FOR THE MASTER

2.1 Stability booklet

2.1.1 Stability data and associated plans should be drawn up in the official language or languages of the issuing country and the language of the master. If the languages used are neither English nor French the text should include a translation into one of these languages.

2.1.2 Each ship must be provided with a stability booklet, approved by the Administration, which contains sufficient information to enable the master to operate the ship in compliance with the applicable requirements contained in the Code. On a mobile offshore drilling unit, the stability booklet is referred to as an operating manual.

2.1.3 The format of the stability booklet and the information included will vary dependent on the ship type and operation. In developing the stability booklet, consideration should be given to including the following information:

.1 a general description of the ship;

.2 instructions on the use of the booklet;

.3 general arrangement plans showing watertight compartments, closures, vents, downflooding angles, permanent ballast, allowable deck loadings and freeboard diagrams;

.4 hydrostatic curves or tables and cross curves of stability calculated on a free-trimming basis, for the ranges of displacement and trim anticipated in normal operating conditions;

.5 capacity plan or tables showing capacities and centres of gravity for each cargo stowage space;

.6 tank sounding tables showing capacities, centres of gravity, and free surface data for each tank;

.7 information on loading restrictions, such as maximum KG or minimum GM curve or table that can be used to determine compliance with the applicable stability criteria;

.8 standard operating conditions and examples for developing other acceptable loading conditions using the information contained in the stability booklet;

.9 a brief description of the stability calculations done including assumptions;

.10 general precautions for preventing unintentional flooding;

.11 information concerning the use of any special cross-flooding fittings with descriptions of damage conditions which may require cross-flooding;

.12 any other necessary guidance for the safe operation of the ship under normal and emergency conditions;

.13 a table of contents and index for each booklet;

.14 inclining test report for the ship, or:

.1 where the stability data is based on a sister ship, the inclining test report of that sister ship along with the lightship measurement report for the ship in question; or

.2 where lightship particulars are determined by other methods than from inclining of the ship or its sister, a summary of the method used to determine those particulars;

.15 recommendation for determination of ship's stability by means of an in-service inclining test.

2.1.4 As an alternative to the stability booklet mentioned in 2.1.2, a simplified booklet in an approved form containing sufficient information to enable the master to operate the ship in compliance with the applicable provisions of the Code may be provided at the discretion of the authority concerned.

2.1.5 As a supplement to the approved stability booklet, a loading computer may be used to facilitate the stability calculations mentioned in paragraph 2.1.3.9.

2.1.6 It is desirable that the input/output form in the computer and screen presentation be similar to the one in the stability booklet so that the operators will easily gain familiarity with the use of the stability booklet.

2.1.7 A simple and straightforward instruction manual written as per sound marine practice and in a language common to all officers should be provided with the loading computer.

2.1.8 In order to validate the proper functioning of the computer program, four loading conditions taken from the stability booklet (final) should be run in the computer periodically and the print-outs should be maintained on board as check conditions for future reference.

2.2 Operating booklets for certain ships

Special purpose ships, dynamically supported craft and novel craft, should be provided with additional information in the stability booklet such as design limitations, maximum speed, worst intended weather conditions or other information regarding the handling of the craft that the master needs to operate the ship safely.

2.3 General precautions against capsizing

2.3.1 Compliance with the stability criteria does not ensure immunity against capsizing, regardless of the circumstances, or absolve the master from his responsibilities. Masters should therefore exercise prudence and good seamanship having regard to the season of the year, weather forecasts and the navigational zone and should take the appropriate action as to speed and course warranted by the prevailing circumstances.

2.3.2 Care should be taken that the cargo allocated to the ship is capable of being stowed so that compliance with the criteria can be achieved. If necessary, the amount should be limited to the extent that ballast weight may be required.

2.3.3 Before a voyage commences, care should be taken to ensure that the cargo and sizeable pieces of equipment have been properly stowed or lashed so as to minimize the possibility of both longitudinal and lateral shifting, while at sea, under the effect of acceleration caused by rolling and pitching.

2.3.4 A ship, when engaged in towing operations, should not carry deck cargo, except that a limited amount, properly secured, which would neither endanger the safe working of the crew on deck nor impede the proper functioning of the towing equipment, may be accepted.

2.3.5 The number of partially filled or slack tanks should be kept to a minimum because of their adverse effect on stability.

2.3.6 The stability criteria contained in chapter 3 set minimum values, but no maximum values are recommended. It is advisable to avoid excessive values of metacentric height, since these might lead to acceleration forces which could be prejudicial to the ship, its complement, its equipment and to safe carriage of the cargo.

2.3.7 Regard should be paid to the possible adverse effects on stability where certain bulk cargoes are carried. In this connection, attention should be paid to the IMO Code of Safe Practice for Solid Bulk Cargoes.

2.4 Fixed ballast

If used, fixed ballast should be installed under the supervision of the Administration and in a manner that prevents shifting of position. Fixed ballast should not be removed from the vessel or relocated within the ship without the approval of the Administration.

2.5 Operational procedures related to weather conditions

2.5.1 All doorways and other openings through which water can enter into the hull or deckhouses, forecastle, etc., should be suitably closed in adverse weather conditions and accordingly all appliances for this purpose should be maintained on board and in good condition.

2.5.2 Weathertight and watertight hatches, doors, etc., should be kept closed during navigation, except when necessarily opened for the working of the ship and should always be ready for immediate closure and be clearly marked to indicate that these fittings are to be kept closed except for access. Hatch covers and flush deck scuttles in fishing vessels should be kept properly secured when not in use during fishing operations. All portable deadlights should be maintained in good condition and securely closed in bad weather.

2.5.3 Any closing devices provided for vent pipes to fuel tanks should be secured in bad weather.

2.5.4 Fish should never be carried in bulk without first being sure that the portable divisions in the holds are properly installed.

2.5.5 Reliance on automatic steering may be dangerous as this prevents ready changes to course which may be needed in bad weather.

2.5.6 In all conditions of loading necessary care should be taken to maintain a seaworthy freeboard.

2.5.7 In severe weather, the speed of the ship should be reduced if excessive rolling, propeller emergency, shipping of water on deck or heavy slamming occurs. Six heavy slammings or 25 propeller emergences during 100 pitching motions should be considered dangerous.

2.5.8 Special attention should be paid when a ship is sailing in following or quartering seas because dangerous phenomena such as parametric resonance, broaching to, reduction of stability on the wave crest, and excessive rolling may occur singularly, in sequence or simultaneously in a multiple combination, creating a threat of capsize. Particularly dangerous is the situation when the wave length is of the order of 1.0 - 1.5 ship's length. A ship's speed and/or course should be altered appropriately to avoid the above-mentioned phenomena.

2.5.9 Water trapping in deck wells should be avoided. If freeing ports are not sufficient for the drainage of the well, the speed of the ship should be reduced or course changed, or both. Freeing ports provided with closing appliances should always be capable of functioning and are not to be locked.

2.5.10 Masters should be aware that steep or breaking waves may occur in certain areas, or in certain wind and current combinations (river estuaries, shallow water areas, funnel shaped bays, etc.). These waves are particularly dangerous, especially for small vessels.

2.5.11 Use of operational guidelines for avoiding dangerous situations in severe weather conditions or an on-board computer based system is recommended. The method should be simple to use.

[2.5.12 Dynamically supported craft should not be intentionally operated outside the worst intended conditions and limitations specified in the Dynamically Supported Craft Permit to Operate, in the Dynamically Supported Craft Construction and Equipment Certificate, or in documents referred to therein.]

CHAPTER 3 - DESIGN CRITERIA APPLICABLE TO ALL SHIPS

3.1 General intact stability criteria for all ships

3.1.1 Scope

The following criteria are recommended for passenger and cargo ships.

3.1.2 Recommended general criteria

3.1.2.1 The area under the righting lever curve (GZ curve) should not be less than 0.055 metre-radians up to θ = 30° angle of heel and not less than 0.09 metre-radians up to θ = 40° or the angle of flooding θ_f* if this angle is less than 40°. Additionally, the area under the righting lever curve (GZ curve) between the angles of heel of 30° and 40° or between 30° and θ_f, if this angle is less than 40°, should not be less than 0.03 metre-radians.

3.1.2.2 The righting lever GZ should be at least 0.20 m at an angle of heel equal to or greater than 30°.

3.1.2.3 The maximum righting arm should occur at an angle of heel preferably exceeding 30° but not less than 25°.

3.1.2.4 The initial metacentric height GM_o should not be less than 0.15 m.

3.1.2.5 In addition for passenger ships, the angle of heel on account of crowding of passengers to one side as defined in paragraphs 3.5.2.6 to 3.5.2.9 should not exceed 10°.

3.1.2.6 In addition for passenger ships, the angle of heel on account of turning should not exceed 10° when calculated using the following formula:

$$M_R = 0.02 \frac{V_o^2}{L} \Delta (KG - d/2)$$

M_R = heeling moment in metre-tonnes
V_o = service speed in m/s
L = length of ship at waterline in m
Δ = displacement in tonnes
d = mean draught in m
KG = height of centre of gravity above keel in m

3.1.2.7 Where anti-rolling devices are installed in a ship, the Administration should be satisfied that the above criteria can be maintained when the devices are in operation.

3.1.2.8 A number of influences such as beam wind on ships with large windage area, icing of topsides, water trapped on deck, rolling characteristics, following seas, etc., adversely affect stability and the Administration is advised to take these into account, so far as is deemed necessary.

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* θ_f is an angle of heel at which openings in the hull, superstructures or deckhouses which cannot be closed weathertight immerse. In applying this criterion, small openings through which progressive flooding cannot take place need not be considered as open.

3.1.2.9 Provisions should be made for a safe margin of stability at all stages of the voyage, regard being given to additions of weight, such as those due to absorption of water and icing (details regarding ice accretion are given in chapter 5) and to losses of weight such as those due to consumption of fuel and stores.

3.1.2.10 For ships carrying oil-based pollutants in bulk, the Administration should be satisfied that the criteria given in 3.1.2 can be maintained during all loading and ballasting operations.

3.1.2.11 See also general recommendations of an operational nature given in section 2.5 above.

3.2 Severe wind and rolling criterion (weather criterion)

3.2.1 Scope

This criterion supplements the stability criteria given in section 3.1. The more stringent criteria of section 3.1 given above and the weather criterion should govern the minimum requirements for passenger or cargo ships of 24 m in length and over.

3.2.2 Recommended weather criterion

3.2.2.1 The ability of a ship to withstand the combined effects of beam wind and rolling should be demonstrated for each standard condition of loading, with reference to the figure as follows:

.1 the ship is subjected to a steady wind pressure acting perpendicular to the ship's centreline which results in a steady wind heeling lever (lw_1).

.2 from the resultant angle of equilibrium (θ_0), the ship is assumed to roll owing to wave action to an angle of roll (θ_1) to windward. Attention should be paid to the effect of steady wind so that excessive resultant angles of heel are avoided*;

.3 the ship is then subjected to a gust wind pressure which results in a gust wind heeling lever (lw_2);

.4 under these circumstances, area "b" should be equal to or greater than area "a";

.5 free surface effects (section 3.3) should be accounted for in the standard conditions of loading as set out in section 3.5;

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* The angle of heel under action of steady wind (θ_0) should be limited to a certain angle to the satisfaction of the Administration. As a guide, 16° or 80% of the angle of deck edge immersion, whichever is less, is suggested.

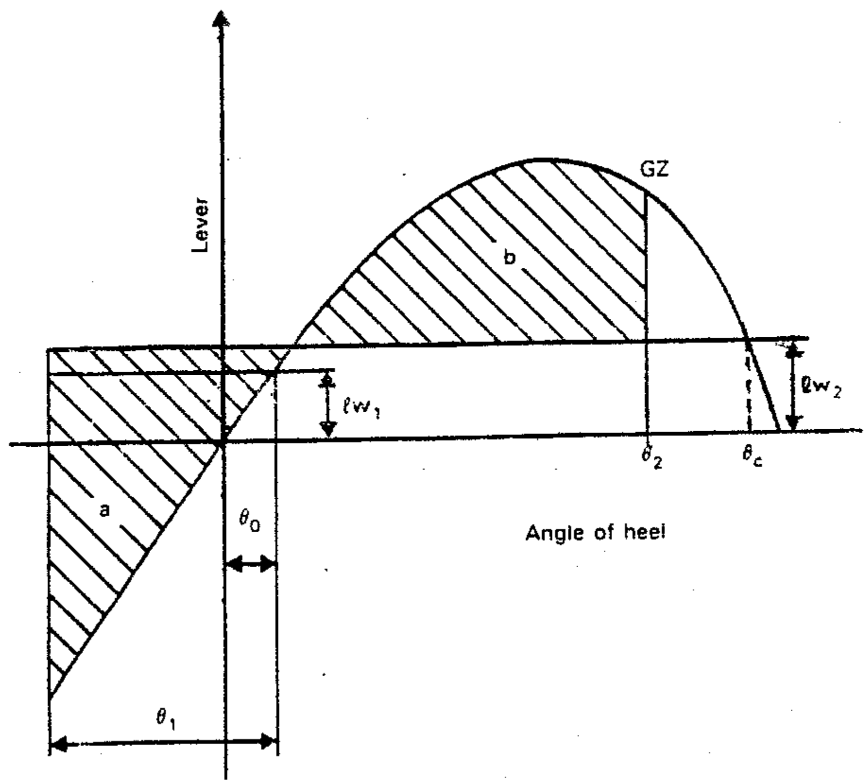

Figure - Severe wind and rolling

The angles in the above figure are defined as follows:

θ_o = angle of heel under action of steady wind (see 3.2.2.1.2 and footnote)

θ_1 = angle of roll to windward due to wave action

θ_2 = angle of downflooding (θ_f) or 50° or θ_c, whichever is less,

where:

θ_f = angle of heel at which openings in the hull, superstructures or deckhouses which cannot be closed weathertight immerse. In applying this criterion, small openings through which progressive flooding cannot take place and need not be considered as open.

θ_c = angle of second intercept between wind heeling lever lw_2 and GZ curves.

3.2.2.2 The wind heeling levers lw_1 and lw_2 referred to in 3.2.2.1.1 and 3.2.2.1.3 are constant values at all angles of inclination and should be calculated as follows:

$$lw_1 = \frac{P.A.Z}{1000g\Delta} \text{ (m) and}$$

$$lw_2 = 1.5\ lw_1 \text{ (m)}$$

where:

P = 504 N/m^2. The value of P used for ships in restricted service may be reduced subject to the approval of the Administration;

A = projected lateral area of the portion of the ship and deck cargo above the waterline (m^2);

Z = vertical distance from the centre of A to the centre of the underwater lateral area or approximately to a point at one half the draught (m);

Δ = displacement (t)

$g = 9.81\ m/s^2$

3.2.2.3 The angle of roll (θ_1)* referred to in 3.2.2.1.2 should be calculated as follows:

$$\theta_1 = 109k.X_1.X_2\sqrt{r.s} \text{ (degrees)}$$

where:

X_1 = factor as shown in table 1
X_2 = factor as shown in table 2
k = factor as follows:

k = 1.0 for round-bilged ship having no bilge or bar keels
k = 0.7 for a ship having sharp bilges
k = as shown in table 3 for a ship having bilge keels, a bar keel or both

$r = 0.73 \pm 0.6\ OG/d$

with : OG = distance between the centre of gravity and the waterline (m) (+ if centre of gravity is above the waterline, - if it is below)

d = mean moulded draught of the ship (m)

s = factor as shown in table 4.

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* The angle of roll for ships with anti-rolling devices should be determined without taking into account the operation of these devices.

Table 1
Values of factor X_1

B/d	X_1
≤2.4	1.0
2.5	0.98
2.6	0.96
2.7	0.95
2.8	0.93
2.9	0.91
3.0	0.90
3.1	0.88
3.2	0.86
3.3	0.84
3.4	0.82
≥3.5	0.80

Table 2
Values of factor X_2

C_B	X_2
≤0.45	0.75
0.50	0.82
0.55	0.89
0.60	0.95
0.65	0.97
≥0.70	1.0

Table 3
Values of factor k

$\frac{Ak.100}{L \cdot B}$	k
0	1.0
1.0	0.98
1.5	0.95
2.0	0.88
2.5	0.79
3.0	0.74
3.5	0.72
≥4.0	0.70

Table 4
Values of factor s

T	s
≤6	0.100
7	0.098
8	0.093
12	0.065
14	0.053
16	0.044
18	0.038
≥20	0.035

(Intermediate values in tables 1-4 should be obtained by linear interpolation.)

Rolling period $T = \frac{2\ C \cdot B}{\sqrt{GM}}$ (seconds)

where: $C = 0.373 + 0.023\ (B/d) - 0.043\ (L/100)$.

The symbols in the above tables and formula for the rolling period are defined as follows:

L = waterline length of the ship (m)

B = moulded breadth of the ship (m)

d = mean moulded draught of the ship (m)

C_B = block coefficient

A_k = total overall area of bilge keels, or area of the lateral projection of the bar keel, or sum of these areas (m^2)

GM = metacentric height corrected for free surface effect (m).

3.3 Effect of free surface of liquids in tanks

For all conditions, the initial metacentric height and the stability curves should be corrected for the effect of free surfaces of liquids in tanks in accordance with the following assumptions:

3.3.1 Tanks which are taken into consideration when determining the effect of liquids on the stability at all angles of inclination should include single tanks or combinations of tanks for each kind of liquid (including those for water ballast) which according to the service conditions can simultaneously have free surfaces.

3.3.2 For the purpose of determining this free surface correction, the tanks assumed slack should be those which develop the greatest free surface moment, $M_{f.s.}$ at a 30° inclination when in the 50 per cent full condition.

3.3.3 The values of $M_{f.s.}$ for each tank may be derived from the formula:

$$M_{f.s.} = vb\gamma k\sqrt{\delta}$$

where:

$M_{f.s.}$ is the free surface moment at any inclination in metre-tonnes
v is the tank total capacity in cubic metres
b is the tank maximum breadth in metres
γ is the specific weight of liquid in the tank in cubic metre-tonnes
δ is equal to $\frac{v}{blh}$ (the tank block coefficient)
h is the tank maximum height in metres
l is the tank maximum length in metres
k is the dimensionless coefficient to be determined from the following table according to the ratio b/h. The intermediate values are determined by interpolation.

3.3.4 Small tanks, which satisfy the following condition using the value of k corresponding to the angle of inclination of 30°, need not be included in computation:

$$\frac{vb\gamma k\sqrt{\delta}}{\Delta \min} < 0.01m$$

where:

Δmin = minimum ship displacement in tonnes (metric tonnes).

3.3.5 The usual remainder of liquids in the empty tanks is not taken into account in computation.

Table of values for coefficient "k" for calculating free surface corrections

$k = \frac{\sin\theta}{12}\left(1 + \frac{\tan^2\theta}{2}\right) \times b/h$ where $\cot\theta \geq b/h$								$k = \frac{\cos\theta}{8}\left(1 + \frac{\tan\theta}{b/h}\right) - \frac{\cos\theta}{12(b/h)^2}\left(1 + \frac{\cot^2\theta}{2}\right)$ where $\cot\theta \leq b/h$						
b/h \ θ	5°	10°	15°	20°	30°	40°	45°	50°	60°	70°	75°	80°	90°	θ / b/h
20	0.11	0.12	0.12	0.12	0.11	0.10	0.09	0.09	0.07	0.05	0.04	0.03	0.01	20
10	0.07	0.11	0.12	0.12	0.11	0.10	0.10	0.09	0.07	0.05	0.04	0.03	0.01	10
5	0.04	0.07	0.10	0.11	0.11	0.11	0.10	0.10	0.08	0.07	0.06	0.05	0.03	5
3	0.02	0.04	0.07	0.09	0.11	0.11	0.11	0.10	0.09	0.08	0.07	0.06	0.04	3
2	0.01	0.03	0.04	0.06	0.09	0.11	0.11	0.11	0.10	0.09	0.09	0.08	0.06	2
1.5	0.01	0.02	0.03	0.05	0.07	0.10	0.11	0.11	0.11	0.11	0.10	0.10	0.08	1.5
1	0.01	0.01	0.02	0.03	0.05	0.07	0.09	0.10	0.12	0.13	0.13	0.13	0.13	1
0.75	0.01	0.01	0.02	0.02	0.04	0.05	0.07	0.08	0.12	0.15	0.16	0.16	0.17	0.75
0.5	0.00	0.01	0.01	0.02	0.02	0.04	0.04	0.05	0.09	0.15	0.18	0.21	0.25	0.5
0.3	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.03	0.05	0.11	0.19	0.27	0.42	0.3
0.2	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.04	0.07	0.13	0.27	0.63	0.2
0.1	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.04	0.06	0.14	1.25	0.1

3.4 Assessment of compliance with stability criteria

.1 For the purpose of assessing in general whether the stability criteria are met, stability curves should be drawn for the main loading conditions intended by the owner in respect of the vessel's operations.

.2 If the owner of the ship does not supply sufficiently detailed information regarding such loading conditions, calculations should be made for the standard loading conditions.

3.5 Standard conditions of loading to be examined

3.5.1 Loading conditions

The standard loading conditions referred to in the text of the present Code are as follows.

3.5.1.1 For a passenger ship:

.1 ship in the fully loaded departure condition with full stores and fuel and with the full number of passengers with their luggage;

.2 ship in the fully loaded arrival condition, with the full number of passengers and their luggage but with only 10 per cent stores and fuel remaining;

.3 ship without cargo, but with full stores and fuel and the full number of passengers and their luggage;

.4 ship in the same condition as at .3 above with only 10 per cent stores and fuel remaining.

3.5.1.2 For a cargo ship:

.1 ship in the fully loaded departure condition, with cargo homogeneously distributed throughout all cargo spaces and with full stores and fuel;

.2 ship in the fully loaded arrival condition with cargo homogeneously distributed throughout all cargo spaces and with 10 per cent stores and fuel remaining;

.3 ship in ballast in the departure condition, without cargo but with full stores and fuel;

.4 ship in ballast in the arrival condition, without cargo and with 10 per cent stores and fuel remaining.

3.5.1.3 For a cargo ship intended to carry deck cargoes:

.1 ship in the fully loaded departure condition with cargo homogeneously distributed in the holds and with cargo specified in extension and weight on deck, with full stores and fuel;

.2 ship in the fully loaded arrival condition with cargo homogeneously distributed in holds and with a cargo specified in extension and weight on deck, with 10 per cent stores and fuel.

3.5.2 Assumptions for calculating loading conditions

3.5.2.1 For the fully loaded conditions mentioned in 3.5.1.2.1, 3.5.1.2.2, 3.5.1.3.1 and 3.5.1.3.2 if a dry cargo ship has tanks for liquid cargo, the effective deadweight in the loading conditions therein described should be distributed according to two assumptions, i.e. with cargo tanks full, and with cargo tanks empty.

3.5.2.2 In the conditions mentioned in 3.5.1.1.1, 3.5.1.2.1 and 3.5.1.3.1 it should be assumed that the ship is loaded to its subdivision load line or summer load line or if intended to carry a timber deck cargo, to the summer timber load line with water ballast tanks empty.

3.5.2.3 If in any loading condition water ballast is necessary, additional diagrams should be calculated taking into account the water ballast. Its quantity and disposition should be stated.

3.5.2.4 In all cases, the cargo in holds is assumed to be fully homogeneous unless this condition is inconsistent with the practical service of the ship.

3.5.2.5 In all cases, when deck cargo is carried, a realistic stowage weight should be assumed and stated, including the height of the cargo.

3.5.2.6 A weight of 75 kg should be assumed for each passenger except that this value may be reduced to not less than 60 kg where this can be justified. In addition, the weight and distribution of the luggage should be determined by the Administration.

3.5.2.7 The height of the centre of gravity for passengers should be assumed equal to:

.1 1.0 m above deck level for passengers standing upright. Account may be taken, if necessary, of camber and sheer of deck;

.2 0.30 m above the seat in respect of seated passengers.

3.5.2.8 Passengers and luggage should be considered to be in the spaces normally at their disposal, when assessing compliance with the criteria given in 3.1.2.1 to 3.1.2.4.

3.5.2.9 Passengers without luggage should be considered as distributed to produce the most unfavourable combination of passenger heeling moment and/or initial metacentric height, which may be obtained in practice, when assessing compliance with the criteria given in 3.1.2.5 and 3.1.2.6, respectively. In this connection, it is anticipated that a value higher than four persons per square metre will not be necessary.

3.6 Calculation of stability curves

3.6.1 General

3.6.1.1 Hydrostatic and stability curves should normally be prepared on a designed trim basis. However, where the operating trim or the form and arrangement of the ship are such that change in trim has an appreciable effect on righting arms, such change in trim should be taken into account.

3.6.1.2 The calculations should take into account the volume to the upper surface of the deck sheathing. In the case of wood ships, the dimensions should be taken to the outside of the hull planking.

3.6.2 Superstructures, deckhouses, etc., which may be taken into account

3.6.2.1 Enclosed superstructures complying with regulation 3(10)(b) of the 1966 Load Line Convention may be taken into account.

3.6.2.2 The second tier of similarly enclosed superstructures may also be taken into account.

3.6.2.3 Deckhouses on the freeboard deck may be taken into account, provided that they comply with the conditions for enclosed superstructures laid down in regulation 3(10)(b) of the 1966 Load Line Convention.

3.6.2.4 Where deckhouses comply with the above conditions, except that no additional exit is provided to a deck above, such deckhouses should not be taken into account; however, any deck openings inside such deckhouses should be considered as closed even where no means of closure are provided.

3.6.2.5 Deckhouses, the doors of which do not comply with the requirements of regulation 12 of the 1966 Load Line Convention should not be taken into account; however, any deck openings inside the deckhouse are regarded as closed where their means of closure comply with the requirements of regulations 15, 17 or 18 of the 1966 Load Line Convention.

3.6.2.6 Deckhouses on decks above the freeboard deck should not be taken into account, but openings within them may be regarded as closed.

3.6.2.7 Superstructures and deckhouses not regarded as enclosed can, however, be taken into account in stability calculations up to the angle at which their openings are flooded (at this angle, the static stability curve should show one or more steps, and in subsequent computations the flooded space should be considered non-existent).

3.6.2.8 In cases where the ship would sink due to flooding through any openings, the stability curve should be cut short at the corresponding angle of flooding and the ship should be considered to have entirely lost its stability.

3.6.2.9 Small openings such as those for passing wires or chains, tackle and anchors, and also holes of scuppers, discharge and sanitary pipes should not be considered as open if they submerge at an angle of inclination more than 30°. If they submerge at an angle of 30° or less, these openings should be assumed open if the Administration considers this to be a source of significant flooding.

3.6.2.10 Trunks may be taken into account. Hatchways may also be taken into account having regard to the effectiveness of their closures.

CHAPTER 4 - SPECIAL CRITERIA FOR CERTAIN TYPES OF SHIPS

4.1 Cargo ships carrying timber deck cargoes

4.1.1* Scope

The provisions given hereunder apply to all ships of 24 m in length and over engaged in the carriage of timber deck cargoes. Ships that are provided with and make use of their timber load line should also comply with the requirements of the regulations 41 to 45 of the Load Line Convention.

4.1.2* Definitions

The following definitions apply for the purposes of the present section:

.1 timber means sawn wood or lumber, cants, logs, poles, pulpwood and all other types of timber in loose or packaged forms. The term does not include wood pulp or similar cargo;

.2 timber deck cargo means a cargo of timber carried on an uncovered part of a freeboard or superstructure deck. The term does not include wood pulp or similar cargo;

.3 timber load line means a special load line assigned to ships complying with certain conditions related to their construction set out in the International Convention on Load Lines and used when the cargo complies with the stowage and securing conditions of this Code.

4.1.3 Recommended stability criteria

For ships loaded with timber deck cargoes and provided that the cargo extends longitudinally between superstructures (where there is no limiting superstructure at the after end, the timber deck cargo shall extend at least to the after end of the aftermost hatchway) transversely for the full beam of ship after due allowance for a rounded gunwale not exceeding 4 per cent of the breadth of the ship and/or securing the supporting uprights and which remains securely fixed at large angles of heel, the Administration may apply the following criteria which substitute those given in 3.1.2.1 to 3.1.2.4:

.1 The area under the righting level (GZ curve) should not be less than 0.08 metre-radians up to $\theta = 40°$ or the angle of flooding if this angle is less than 40°.

.2 The maximum value of the righting level (GZ) should be at least 0.25 m.

.3 At all times during a voyage, the metacentric height GM_0 should be positive after correction for the free surface effects of liquid tanks and, where appropriate, the absorption of water by the deck cargo and/or ice accretion on the exposed surfaces. (Details regarding ice accretion are given in chapter 5). Additionally, in the departure condition the metacentric height should be not less than 0.10 m.

4.1.4 Stability booklet

4.1.4.1* The ship should be supplied with comprehensive stability information which takes into account timber deck cargo. Such information should enable the master, rapidly and simply, to obtain accurate guidance as to the stability of the ship under carrying conditions of service. Comprehensive rolling period tables or diagrams have proved to be very useful aids in verifying the actual stability conditions.

4.1.4.2 For ships carrying timber deck cargoes, the Administration may deem it necessary that the master be given information setting out the changes in deck cargo from that shown in the loading conditions, when the permeability of the deck cargo is significantly different from 25 per cent (see 4.1.6 below).

4.1.4.3 For ships carrying timber deck cargoes, conditions should be shown indicating the maximum permissible amount of deck cargo having regard to the lightest stowage rate likely to be met in service.

4.1.5 Operational measures

4.1.5.1 The stability of the ship at all times, including during the process of loading and unloading timber deck cargo, should be positive and to a standard acceptable to the Administration. It should be calculated having regard to:

.1 the increased weight of the timber deck cargo due to:

.1.1 absorption of water in dried or seasoned timber, and

.1.2 ice accretion, if applicable (chapter 5);

.2 variations in consumables;

.3 the free surface effect of liquid in tanks; and

.4 weight of water trapped in broken spaces within the timber deck cargo and especially logs.

4.1.5.2 The master should:

.1 cease all loading operations if a list develops for which there is no satisfactory explanation and it would be imprudent to continue loading;

.2 before proceeding to sea, ensure that:

.2.1 the ship is upright;

.2.2 the ship has an adequate metacentric height; and

.2.3 the ship meets the required stability criteria.

4.1.5.3 The masters of ships having a length less than 100 m should also:

.1 exercise good judgement to ensure that a ship which carries stowed logs on deck should have sufficient additional buoyancy so as to avoid overloading and loss of stability at sea;

.2 be aware that the calculated GM_0 in the departure condition may decrease continuously owing to water absorption by the deck cargo of logs, consumption of fuel, water and stores and ensure that the ship has adequate GM_0 throughout the voyage;

.3 be aware that ballasting after departure may cause the ship's operating draught to exceed the timber load line. Ballasting and deballasting should be carried out in accordance with the guidance provided in the Code of Safe Practice for Ships Carrying Timber Deck Cargoes (resolution A.715(17)).

4.1.5.4 Ships carrying timber deck cargoes should operate, as far as possible, with a safe margin of stability and with a metacentric height which is consistent with safety requirements but such metacentric height should not be allowed to fall below the recommended minimum, as specified in 4.1.3.

4.1.5.5 However, excessive initial stability should be avoided as it will result in rapid and violent motion in heavy seas which will impose large sliding and racking forces on the cargo causing high stresses on the lashings. Operational experience indicates that metacentric height should preferably not exceed 3 per cent of the breadth in order to prevent excessive accelerations in rolling provided that the relevant stability criteria given in 4.1.3 are satisfied. This recommendation may not apply to all ships and the master should take into consideration the stability information obtained from the ship's stability booklet.

4.1.6 <u>Calculation of stability curves</u>

In addition to the provisions given in 3.6, the Administration may allow account to be taken of the buoyancy of the deck cargo assuming that such cargo has a permeability of 25 per cent of the volume occupied by the cargo. Additional curves of stability may be required if the Administration considers it necessary to investigate the influence of different permeabilities and/or assumed effective height of the deck cargo.

4.1.7 <u>Loading conditions to be considered</u>

The loading conditions which should be considered for ships carrying timber deck cargoes are specified in 3.5.1.3. For the purpose of these loading conditions, the ship is assumed to be loaded to the summer timber load line with water ballast tanks empty.

4.1.8 <u>Assumptions for calculating loading conditions</u>

The following assumptions are to be made for calculating the loading conditions referred to in 4.1.7: the amount of cargo and ballast should correspond to the worst service condition in which all the relevant stability criteria of 3.1.2.1 to 3.1.2.4 or the optional criteria given in 4.1.3, are met. In the arrival condition, it should be assumed that the weight of the deck cargo has increased by 10 per cent due to water absorption.

4.1.9 Stowage of timber deck cargoes

The stowage of timber deck cargoes should comply with the provisions of chapter 3 of the Code of Safe Practice for Ships Carrying Timber Deck Cargoes (1991).

4.2 Fishing vessels

4.2.1 Scope

The provisions given hereunder apply to decked seagoing fishing vessels as defined in 1.3.4. The stability criteria given in 4.2.3 and 4.2.4 below should be complied with for all conditions of loading as specified in 4.2.5, unless the Administration is satisfied that operating experience justifies departures therefrom.

4.2.2 General precautions against capsizing

Apart from general precautions referred to in sections 2.3 and 2.5, the following measures should be considered as preliminary guidance on matters influencing safety as related to stability.

.1 all fishing gear and other large weights should be properly stowed and placed as low as possible;

.2 particular care should be taken when pull from fishing gear might have a bad effect on stability, e.g., when nets are hauled by power-block or the trawl catches obstructions on the sea-bed;

.3 gear for releasing deck load in fishing vessels carrying catch on deck, e.g., herring, should be kept in good working condition for use when necessary;

.4 when the main deck is prepared for the carriage of deck load by division with pound boards, there should be slots between them of suitable size to allow easy flow of water to freeing ports to prevent trapping of water;

.5 fish should never be carried in bulk without first being sure that the portable divisions in the holds are properly installed;

.6 reliance on automatic steering may be dangerous as this prevents changes to course which may be needed in bad weather;

.7 in all conditions of loading necessary care should be taken to maintain a seaworthy freeboard.

.8 particular care should be taken when the pull from fishing gear results in dangerous heel angles. This may occur when fishing gear fastens onto an underwater obstacle or when handling fishing gear, particularly on purse seiners, or when one of the trawl wires tears off. The heel angles caused by the fishing gear in these situations may be eliminated by employing devices which can relieve or remove excessive forces applied through the fishing gear. Such devices should not impose a danger to the vessel through operating in circumstances other than those for which they were intended.

4.2.3 Recommended general criteria

4.2.3.1 The general intact stability criteria given in section 3.1.2 (paragraphs 3.1.2.1 to 3.1.2.3) should apply to fishing vessels having a length of 24 m and over, with the exception of requirements on the initial metacentric height GM_0 (paragraph 3.1.2.4) which, for fishing vessels, should not be less than 0.35 m for single deck vessels. In vessels with complete superstructure or vessels of 70 m in length and over the metacentric height may be reduced to the satisfaction of the Administration but in no case shall be less than 0.15 m.

4.2.3.2 The adoption by individual countries of simplified criteria which apply such basic stability values to their own types and classes of vessels is recognized as a practical and valuable method of economically judging the stability.

4.2.3.3 Where arrangements other than bilge keels are provided to limit the angle of roll, the Administration shall be satisfied that the stability criteria referred to in 4.2.3.1 are maintained in all operating conditions.

4.2.4 Severe wind and rolling criterion (weather criterion) for fishing vessels

4.2.4.1 Fishing vessels of 45 m in length and over having large windage area should comply with the provisions of section 3.2 of the Code.

4.2.4.2 For fishing vessels in the length range between 24 m and 45 m the values of wind pressure (see 3.2.2.2) is to be taken from the following table:

h(m)	1	2	3	4	5	6 and over
P(N/m^2)	316	386	429	460	485	504

where h is the vertical distance from the centre of the projected vertical area of the ship above waterline, to the waterline.

4.2.5 Loading conditions to be considered

4.2.5.1 The standard loading conditions referred to in 4.2.1 are as follows:

.1 departure conditions for the fishing grounds with full fuel, stores, ice, fishing gear, etc;

.2 departure from the fishing grounds with full catch;

.3 arrival at home port with 10 per cent stores, fuel, etc., remaining and full catch;

.4 arrival at home port with 10 per cent stores, fuel, etc., remaining and with 20% of full catch.

4.2.5.2 Assumptions for calculating loading conditions are to be as follows:

.1 allowance is to be made for the weight of the wet fishing nets and tackle, etc., on deck;

.2 allowance for icing, where this is anticipated to occur should be made in accordance with the provisions of section 5.3;

.3 in all cases the cargo should be assumed to be homogenous unless this is inconsistent with practice;

.4 in conditions referred to in 4.2.5.1.2 and 4.2.5.1.3 deck cargo should be included if such a practice is anticipated;

.5 water ballast should normally only be included if carried in tanks which are specially provided for this purpose.

4.2.6 <u>Recommendation for an interim simplified stability criterion for decked fishing vessels under 24 m in length</u>

4.2.6.1 For decked vessels with a length less than 30 m, the following approximate formula for the minimum metacentric height GM_{min} (in metres) for all operating conditions should be used as the criterion:

$$GM_{min} = 0.53 + 2B\ [0.075-0.37(\frac{f}{B})+0.82(\frac{f}{B})^2-0.014(\frac{B}{D})-0.032(\frac{l_s}{L})]$$

where:

L is the length of the vessel on the waterline in maximum load condition (in metres)

l_s is the actual length of enclosed superstructure extending from side to side of the vessel (in metres)

B is the extreme breadth of the vessel on the waterline in maximum load condition (in metres)

D is the depth of the vessel measured vertically amidships from the base line to the top of the upper deck at side (in metres)

f is the smallest freeboard measured vertically from the top of the upper deck at side to the actual waterline (in metres)

The formula is applicable for vessels having:

.1 f/B between 0.02 and 0.20;

.2 l_s/L smaller than 0.60;

.3 B/D between 1.75 and 2.15;

.4 sheer fore and aft at least equal to or exceeding the standard sheer prescribed in regulation 38(8) of the International Convention on Load Lines, 1966;

.5 height of superstructure included in the calculation not less than 1.8 m.

For ships with parameters outside of the above limits the formula should be applied with special care.

4.2.6.2 The above formula is not intended as a replacement for the basic criteria given in 4.2.3 and 4.2.4 but is to be used only if circumstances are such that cross curves of stability, KM curve and subsequent GZ curves are not and cannot be made available for judging a particular vessel's stability.

4.2.6.3 The calculated value of GM_{min} should be compared with actual GM values of the vessel in all loading conditions. If a rolling test (see section 7.6), an inclining experiment based on estimated displacement or another approximate method of determining the actual GM is used, a safety margin should be added to the calculated GM_{min}.

4.3 Special purpose ships

4.3.1 Application

The provisions given hereunder apply to special purpose ships, as defined in 1.3.5, of not less than 500 tons gross tonnage. The Administration may also apply these provisions as far as reasonable and practicable to special purpose ships of less than 500 tons gross tonnage.

4.3.2 Stability criteria

The intact stability of special purpose ships should comply with the provisions given in 3.1.2 except that the alternative criteria given in 4.5.6.2 which apply to offshore supply vessels may be used for special purpose ships of less than 100 m in length of similar design and characteristics.

4.4* Cargo ships carrying grain in bulk

The intact stability of ships engaged in the carriage of grain shall comply with the requirements of the International Code for the Safe Carriage of Grain in Bulk adopted by resolution MSC.23(59).

4.5 Offshore supply vessels

4.5.1 Application

.1 The provisions given hereunder apply to offshore supply vessels, as defined in 1.3.6, of 24 m in length and over. The alternative stability criteria contained in 4.5.6 apply to vessels of not more than 100 m in length.

.2 For a vessel engaged in near-coastal voyages, as defined in 4.5.2, the principles given in 4.5.3 should guide the Administration in the development of its national standards. Relaxations from the requirements of the Code may be permitted by an Administration for vessels engaged in near-coastal voyages off its own coasts provided the operating conditions are, in the opinion of that Administration, such as to render compliance with the provisions of the Code unreasonable or unnecessary.

.3 Where a ship other than an offshore supply vessel, as defined in 1.3.6, is employed on a similar service, the Administration should determine the extent to which compliance with the provisions of the Code is required.

4.5.2 Definitions

Near-coastal voyage means a voyage in the vicinity of the coast of a State as defined by the Administration of that State.

4.5.3 Principles governing near-coastal voyages

.1 The Administration defining near-coastal voyages for the purpose of the present Code should not impose design and construction for a vessel entitled to fly the flag of another State and engaged in such voyages in a manner resulting in a more stringent standard for such a vessel than for a vessel entitled to fly its own flag. In no case should the Administration impose, in respect of a vessel entitled to fly the flag of another State, standards in excess of the Code for a vessel not engaged in near-coastal voyages.

.2 With respect to a vessel regularly engaged in near-coastal voyages off the coast of another State the Administration should prescribe design and construction standards for such a vessel at least equal to those prescribed by the Government of the State off whose coast the vessel is engaged, provided such standards do not exceed the Code in respect of a vessel not engaged in near-coastal voyages.

.3 A vessel which extends its voyages beyond a near-coastal voyage should comply with the present Code.

4.5.4 Constructional precautions against capsizing

.1 Access to the machinery space should, if possible, be arranged within the forecastle. Any access to the machinery space from the exposed cargo deck should be provided with two weathertight closures.

Access to spaces below the exposed cargo deck should preferably be from a position within or above the superstructure deck.

.2 The area of freeing ports in the side bulwarks of the cargo deck should at least meet the requirements of regulation 27 of the International Convention on Load Lines, 1966. The disposition of the freeing ports should be carefully considered to ensure the most effective drainage of water trapped in pipe deck cargoes or in recesses at the after end of the forecastle. In vessels operating in areas where icing is likely to occur, no shutters should be fitted in the freeing ports.

.3 The Administration should give special atttention to adequate drainage of pipe stowage positions having regard to the individual characteristics of the vessel. However, the area provided for drainage of the pipe stowage positions should be in excess of the required freeing port area in the cargo deck bulwarks and should not be fitted with shutters.

.4 A vessel engaged in towing operations should be provided with means for quick release of the towing hawser.

4.5.5 Operational procedures against capsizing

.1 The arrangement of cargo stowed on deck should be such as to avoid any obstruction of the freeing ports or of the areas necessary for the drainage of pipe stowage positions to the freeing ports.

.2 A minimum freeboard at the stern of at least 0.005 L should be maintained in all operating conditions.

4.5.6 Stability criteria

.1 The stability criteria given in 3.1.2 should apply to all offshore supply vessels except those having characteristics which render compliance with 3.1.2 impracticable.

.2 The following equivalent criteria are recommended where a vessel's characteristics render compliance with 3.1.2 impracticable:

.2.1 The area under the curve of righting levers (GZ curve) should not be less than 0.070 metre-radians up to an angle of 15° when the maximum righting level (GZ) occurs at 15° and 0.055 metre-radians up to an angle of 30° when the maximum righting level (GZ) occurs at 30° or above. Where the maximum righting level (GZ) occurs at angles of between 15° and 30°, the corresponding area under the righting lever curve should be:

$$0.055 + 0.001\ (30° - \theta_{max})\ \text{metre-radians}^*$$

.2.2 The area under the righting lever curve (GZ curve) between the angles of heel of 30° and 40°, or between 30° and θ_f if this angle is less than 40°, should be not less than 0.03 metre-radians.

.2.3 The righting lever (GZ) should be at least 0.20 m at an angle of heel equal to or greater than 30°.

.2.4 The maximum righting lever (GZ) should occur at an angle of heel not less than 15°.

.2.5 The initial transverse metacentric height (GM_o) should not be less than 0.15 m.

.3 Reference is made also to recommendations contained in section 2.3 and paragraphs 3.1.2.7 to 3.1.2.9.

4.5.7 Loading conditions

The standard loading conditions should be as follows:

.1 Vessel in fully loaded departure condition with cargo distributed below deck and with cargo specified by position and weight on deck,

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* θ_{max} is the angle of heel in degrees at which the righting lever curve reaches its maximum.

with full stores and fuel, corresponding to the worst service condition in which all the relevant stability criteria are met.

.2 Vessel in fully loaded arrival condition with cargo as specified in .1, but with 10 per cent stores and fuel.

.3 Vessel in ballast departure condition, without cargo but with full stores and fuel.

.4 Vessel in ballast arrival condition, without cargo and with 10 per cent stores and fuel remaining.

.5 Vessel in the worst anticipated operating condition.

4.5.8 <u>Assumptions for calculating loading conditions</u>

The assumptions for calculating loading conditions should be as follows:

.1 If a vessel is fitted with cargo tanks, the fully loaded conditions of 4.5.7.1 and 4.5.7.2 should be modified, assuming first the cargo tanks full and then the cargo tanks empty.

.2 If in any loading condition water ballast is necessary, additional diagrams should be calculated, taking into account the water ballast, the quantity and disposition of which should be stated in the stability information.

.3 In all cases when deck cargo is carried a realistic stowage weight should be assumed and stated in the stability information, including the height of the cargo and its centre of gravity.

.4 Where pipes are carried on deck, a quantity of trapped water equal to a certain percentage of the net volume of the pipe deck cargo should be assumed in and around the pipes. The net volume should be taken as the internal volume of the pipes, plus the volume between the pipes. This percentage should be 30 if the freeboard amidships is equal to or less than 0.015 L and 10 if the freeboard amidships is equal to or greater than 0.03 L. For intermediate values of the freeboard amidships the percentage may be obtained by linear interpolation. In assessing the quantity of trapped water, the Administration may take into account positive or negative sheer aft, actual trim and area of operation.

.5 If a vessel operates in zones where ice accretion is likely to occur, allowance for icing should be made in accordance with the provisions of chapter 5.

4.6 <u>Mobile offshore drilling units</u>

4.6.1 <u>Application</u>

.1 The provisions given hereunder apply to mobile offshore drilling units as defined in 1.3.7, the keels of which are laid or which are at a similar stage of construction on or after 1 May 1991. For MODUs constructed before that date, the corresponding provisions of chapter 3 of resolution A.414(XI) should apply.

.2 The coastal State may permit any unit designed to a lesser standard than that of this chapter to engage in operations having taken account of the local environmental conditions. Any such unit should, however, comply with safety requirements which in the opinion of the coastal State are adequate for the intended operation and ensure the overall safety of the unit and the personnel on board.

4.6.2 <u>Definitions</u>

For the purposes of this section, the terms used herein have the meanings defined in the following paragraphs:

.1 <u>coastal State</u> means the Government of the State exercising administrative control over the drilling operations of the unit;

.2 <u>mode of operation</u> means a condition or manner in which a unit may operate or function while on location or in transit. The modes of operation of a unit include the following:

.2.1 <u>operating conditions</u> - conditions wherein a unit is on location for the purpose of conducting drilling operations, and combined environmental and operational loadings are within the appropriate design limits established for such operations. The unit may be either afloat or supported on the seabed, as applicable;

.2.2 <u>severe storm conditions</u> - conditions wherein a unit may be subjected to the most severe environmental loadings for which the unit is designed. Drilling operations are assumed to have been discontinued due to the severity of the environmental loadings, the unit may be either afloat or supported on the seabed, as applicable;

.2.3 <u>transit conditions</u> - conditions wherein a unit is moving from one geographical location to another.

4.6.3 <u>Righting moment and heeling moment curves</u>

4.6.3.1 Curves of righting moments and of wind heeling moments similar to figure 4.6-1 with supporting calculations should be prepared covering the full range of operating draughts including those in transit conditions, taking into account the maximum deck cargo and equipment in the most unfavourable position applicable. The righting moment curves and wind heeling moment curves should be related to the most critical axes. Account should be taken of the free surface of liquids in tanks.

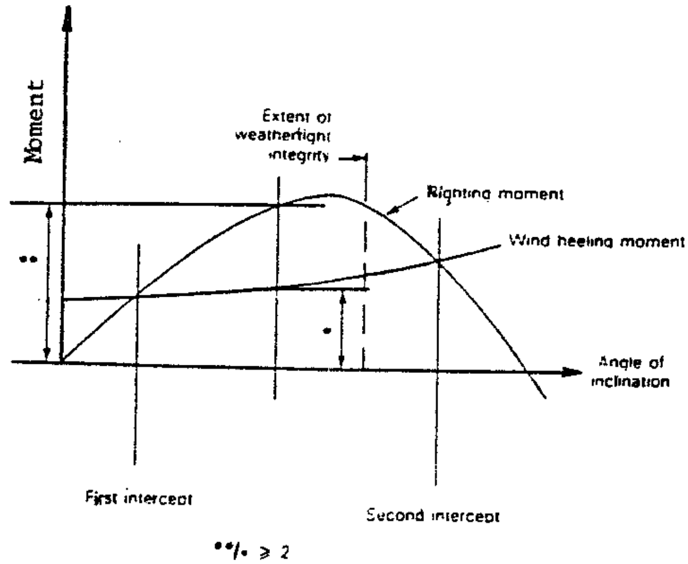


Figure 4.6-1 - Righting moment and wind heeling moment curves

4.6.3.2 Where equipment is of such a nature that it can be lowered and stowed, additional wind heeling moment curves may be required and such data should clearly indicate the position of such equipment.

4.6.3.3 The curves of wind heeling moment should be drawn for wind forces calculated by the following formula:

$$F = 0.5 C_S C_H \rho V^2 A \text{ (Newtons)}$$

where:

- F is the wind force (Newtons)
- C_S is the shape coefficient depending on the shape of the structural member exposed to the wind (see table 4.6-1)
- C_H is the height coefficient depending on the height above sea level of the structural member exposed to wind (see table 4.6-2)
- ρ is the air mass density (1.222 kilogrammes per cubic metre)
- V is the wind velocity (metres per second)
- A is the projected area of all exposed surfaces in either the upright or the heeled condition (square metres)

Table 4.6-1

Values of the coefficient C_S

Shape	C_S
Spherical	0.4
Cylindrical	0.5
Large flat surface (hull, deckhouse, smooth under-deck areas)	1.0
Drilling derrick	1.25
Wires	1.2
Exposed beams and girders under deck	1.3
Small parts	1.4
Isolated shapes (crane, beam, etc.)	1.5
Clustered deckhouses or similar structures	1.1

Table 4.6-2

Values of the coefficient C_H

Height above sea level (metres)	C_H
0 - 15.3	1.00
15.3- 30.5	1.10
30.5- 46.0	1.20
46.0- 61.0	1.30
61.0- 76.0	1.37
76.0- 91.5	1.43
91.5-106.5	1.48
106.5-122.0	1.52
122.0-137.0	1.56
137.0-152.5	1.60
152.5-167.5	1.63
167.5-183.0	1.67
183.0-198.0	1.70
198.0-213.5	1.72
213.5-228.5	1.75
228.5-244.0	1.77
244.0-256.0	1.79
above 256	1.80

4.6.3.4 Wind forces should be considered from any direction relative to the unit and the value of the wind velocity should be as follows:

.1 In general a minimum wind velocity of 36 m/s (70 knots) for offshore service should be used for normal operating conditions and a minimum wind velocity of 51.5 m/s (100 knots) should be used for the severe storm conditions.

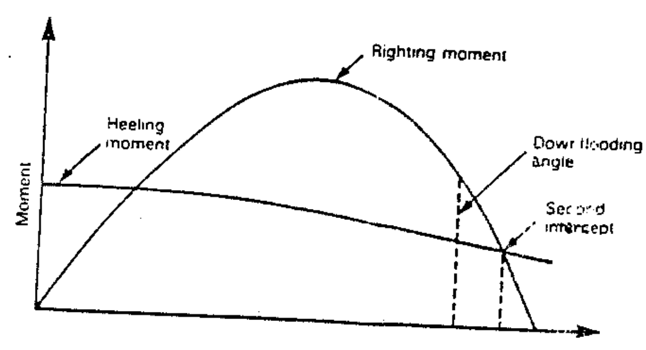
.2 Where a unit is to be limited in operation to sheltered locations (protected inland waters such as lakes, bays, swamps, rivers, etc.) consideration should be given to a reduced wind velocity of not less than 25.8 m/s (50 knots) for normal operating conditions.

4.6.3.5 In calculating the projected areas to the vertical plane the area of surfaces exposed to wind due to heel or trim, such as under decks, etc., should be included using the appropriate shape factor. Open truss work may be approximated by taking 30 per cent of the projected block area of both the front and back section, i.e. 60 per cent of the projected area of one side.

4.6.3.6 In calculating the wind heeling moments the lever of the wind overturning force should be taken vertically from the centre of pressure of all surfaces exposed to the wind to the centre of lateral resistance of the underwater body of the unit. The unit is to be assumed floating free of mooring restraint.

4.6.3.7 The wind heeling moment curve should be calculated for a sufficient number of heel angles to define the curve. For ship shaped hulls the curve may be assumed to vary as the cosine function of vessel heel.

4.6.3.8 Wind heeling moments derived from wind tunnel tests on a representative model of the unit may be considered as alternatives to the method given in 4.6.3.3 to 4.6.4.7. Such heeling moment determination should include lift and drag effects at various applicable heel angles.



Angle of inclination

Figure 4.6-2 - Righting moment and heeling moment curves

4.6.4 <u>Intact stability criteria</u>

4.6.4.1 The stability of a unit in each mode of operation should meet the following criteria (see also figure 4.6-2):

.1 For surface and self-elevating units the area under the righting moment curve to the second intercept or downflooding angle, whichever is less, should be not less than 40 per cent in excess of the area under the wind heeling moment curve to the same limiting angle.

.2 For column-stabilized units the area under the righting moment curve to the angle of downflooding should be not less than 30 per cent in excess of the area under the wind heeling moment curve to the same limiting angle.

.3 The righting moment curve should be positive over the entire range of angles from upright to the second intercept.

4.6.4.2 Each unit should be capable of attaining a severe storm condition in a period of time consistent with the meteorological conditions. The procedures recommended and the approximate length of time required, considering both operating conditions and transit conditions, should be contained in the operating manual, as referred to in 2.1.1. It should be possible to achieve the severe storm condition without the removal or relocation of solid consumables or other variable load. However, the Administration may permit loading a unit past the point at which solid consumables would have to be removed or relocated to go to severe storm condition under the following conditions, provided the allowable KG requirement is not exceeded:

.1 in a geographic location where weather conditions annually or seasonally do not become sufficiently severe to require a unit to go to severe storm condition; or

.2 where a unit is required to support extra deckload for a short period of time that is well within the bounds of a favourable weather forecast.

The geographic locations and weather conditions and loading conditions when this is permitted should be identified in the operating manual.

4.6.4.3 Alternative stability criteria may be considered by the Administration provided an equivalent level of safety is maintained and if they are demonstrated to afford adequate positive initial stability. In determining the acceptability of such criteria, the Administration should consider at least the following and take into account as appropriate:

.1 environmental conditions representing realistic winds (including gusts) and waves appropriate for world-wide service in various modes of operation;

.2 dynamic response of a unit. Analysis should include the results of wind tunnel tests, wave tank model tests, and non-linear simulation, where appropriate. Any wind and wave spectra used should cover sufficient frequency ranges to ensure that critical motion responses are obtained;

.3 potential for flooding taking into account dynamic responses in a seaway;

.4 susceptibility to capsizing considering the unit's restoration energy and the static inclination due to the mean wind speed and the maximum dynamic response;

.5 an adequate safety margin to account for uncertainties.

An example of alternative criteria for twin-pontoon column-stabilized semi-submersible units is given in section 4.6.5.

4.6.5 <u>An example of alternative intact stability criteria for twin-pontoon column-stabilized semi-submersible units</u>

4.6.5.1 The criteria given below apply only to twin-pontoon column-stabilized semi-submersible units in severe storm conditions which fall within the following range of parameters:

V_p/V_t	is between 0.48 and 0.58
$A_{wp}/(V_c)^{2/3}$	is between 0.72 and 1.00
$I_{wp}/[V_c \times (L_{ptn}/2)]$	is between 0.40 and 0.70

The parameters used in the above equations are defined in paragraph 4.6.5.3.

4.6.5.2 <u>Intact stability criteria</u>

The stability of a unit in the survival mode of operation should meet the following criteria:

.1 Capsize criteria

These criteria are based on the wind heeling moment and righting moment curves calculated as shown in section 4.6.4 of the Code at the survival draught. The reserve energy area 'B' must be greater than 10 per cent of the dynamic response area 'A' as shown in figure 4.6-3.

Area 'B'/Area 'A' ≥ 0.10

Where:

Area 'A' is the area under the righting arm curve measured from θ_1 to $(\theta_1 + 1.15\ \theta_{dyn})$
Area 'B' is the area under the righting arm curve measured from $(\theta_1 + 1.15\ \theta_{dyn})$ to θ_2
θ_1 is the first intercept with the 100 knot wind moment curve
θ_2 is the second intercept with the 100 knot wind moment curve
θ_{dyn} is the dynamic response angle due to waves and fluctuating wind
$\theta_{dyn} = (10.3 + 17.8C)/(1 + GM/(1.46 + 0.28BM))$
$C = (L_{ptn}^{5/3} * VCP_{wl} * A_w * V_p * V_c^{1/3})/(I_{wp}^{5/3} * V_t)$

Parameters used in the above equations are defined in paragraph 4.6.5.3.

.2 Downflooding criteria

These criteria are based on the physical dimensions of the unit and the relative motion of the unit about a static inclination due to a 75 knot wind measured at the survival draught. The initial downflooding distance (DFD_o) must be greater than the reduction in downflooding distance at the survival draught as shown in figure 4.6-4.

$DFD_o - RDFD > 0.0$

Where:

DFD_o is the initial downflooding distance to D_m in metres

RDFD is the reduction in downflooding distance in metres equal to $SF (k * QSD_1 + RMW)$

SF is equal to 1.10, which is a safety factor to account for uncertainties in the analysis, such as non-linear effects.

k (correlation factor) is equal to $0.55 + 0.08 (a - 4.0) + 0.056 (1.52 - GM)$

a is equal to $(FBD_o/D_m)(S_{ptn} * L_{ccc})/A_{wp}$
(a cannot be taken to be less than 4.0)
(GM cannot be taken to be greater than 2.44 m)

QSD_1 is equal to DFD_o - quasi-static downflooding distance at θ_1, in metres, but not to be taken less than 3.0 m.

RMW is the relative motion due to waves about θ_1 in metres, equal to $9.3 + 0.11(X-12.19)$

X is equal to $D_m(V_t/V_p)(A_{wp}{}^2/I_{wp})(L_{cc}/L_{ptn})$
(X cannot be taken to be less than 12.19 m)

The parameters used in the above equations are defined in paragraph 4.6.5.3.

4.6.5.3 <u>Geometric parameters</u>

A_{wp} is the waterplane area at the survival draught including the effects of bracing members as applicable (in square metres).

A_w is the effective wind area with the unit in the upright position (i.e. the product of projected area, shape coefficient and height coefficient) (in square metres).

BM is the vertical distance from the metacentre to the centre of buoyancy with the unit in the upright position (in metres).

D_m is the initial survival draft (in metres).

FBD_o is the vertical distance from D_m to the top of the upper exposed weathertight deck at the side (in metres).

GM for paragraph 4.6.5.2.1.1, GM is the metacentric height measured about the roll or diagonal axis, whichever gives the minimum restoring energy ratio, 'B'/'A'. This axis is usually the diagonal axis as it possesses a characteristically larger projected wind area which influences the three characteristic angles mentioned above.

GM — for paragraph 4.6.5.2.1.2, GM is the metacentric height measured about the axis which gives the minimum downflooding distance margin (i.e. generally the direction that gives the largest QSD_1) (in metres).

I_{wp} — is the waterplane second moment of inertia at the survival draught including the effects of bracing members as applicable (in metres to the power of 4).

L_{ccc} — is the longitudinal distance between centres of the corner columns (in metres).

L_{ptn} — is the length of each pontoon (in metres).

S_{ptn} — is the transverse distance between the centreline of the pontoons (in metres).

V_c — is the total volume of all columns from the top of the pontoons to the top of the column structure, except for any volume included in the upper deck (in cubic metres).

V_p — is the total combined volume of both pontoons (in cubic metres).

V_t — is the total volume of the structures (pontoons, columns and bracings) contributing to the buoyancy of the unit, from its baseline to the top of the column structure, except for any volume included in the upper deck (in cubic metres).

VCP_{wl} — is the vertical centre of wind pressure above D_m (in metres).

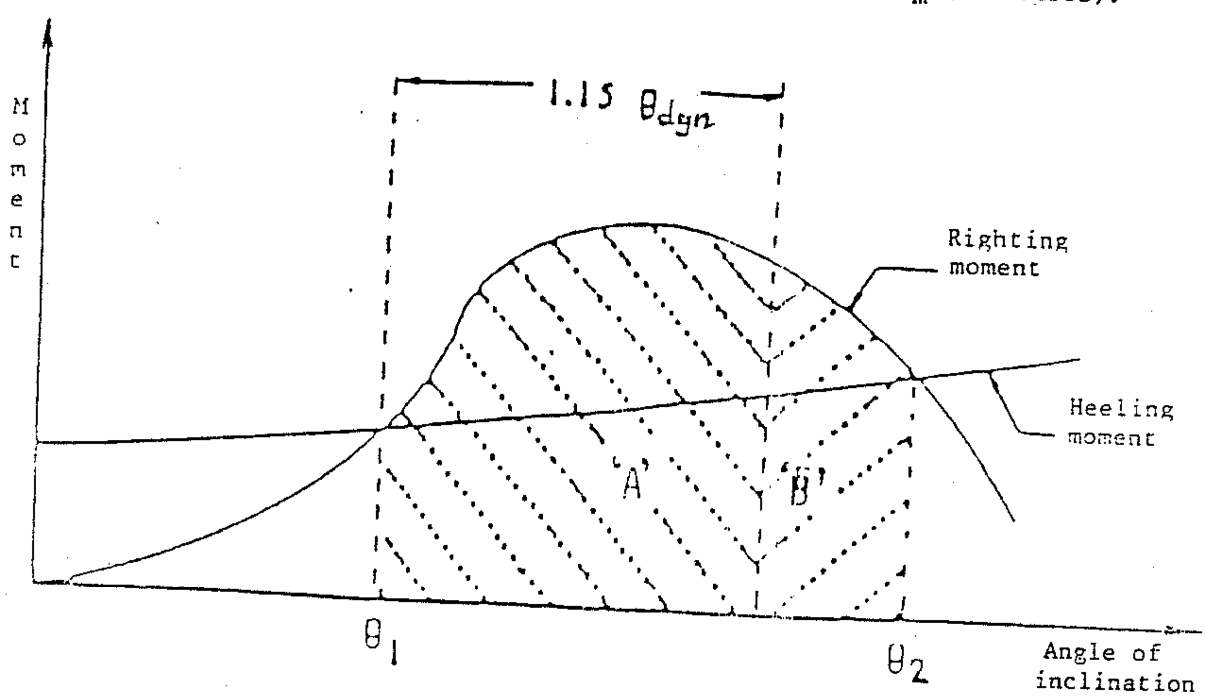


Figure 4.6-3 - Righting moment and heeling moment curves

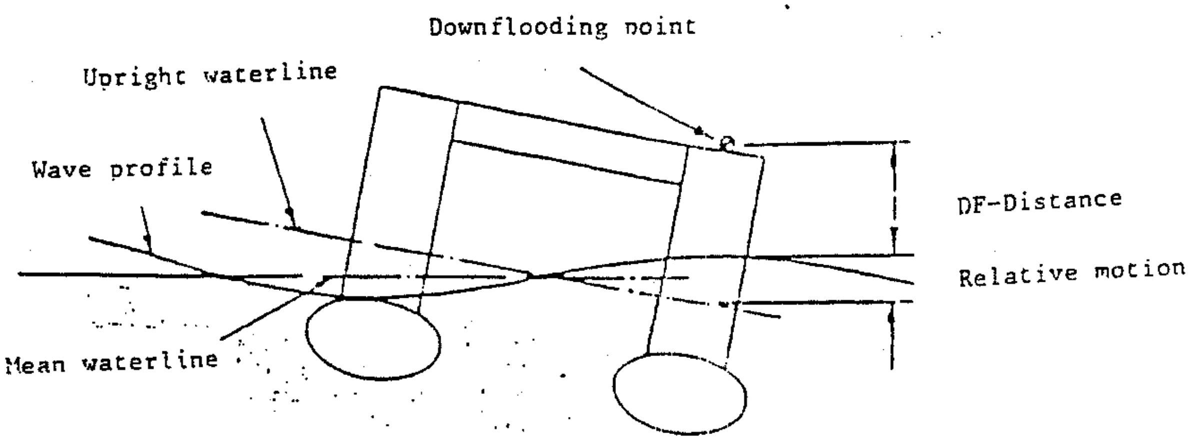


Figure 4.6-4 - Definition of downflooding distance and relative motion

4.6.5.4 Capsize criteria assessment form

Input data

GM ______________________________ = ____________ m

BM ______________________________ = ____________ m

VCP_{wl} ______________________________ = ____________ m

A_w ______________________________ = ____________ m^2

V_t ______________________________ = ____________ m^3

V_c ______________________________ = ____________ m^3

V_p ______________________________ = ____________ m^3

I_{wp} ______________________________ = ____________ m^4

L_{ptn} ______________________________ = ____________ m

Determine

θ_1 ______________________________ = ____________ deg

θ_2 ______________________________ = ____________ deg

$C = (L_{ptn}{}^{5/3} * VCP_{wl} * A_w * V_p * V_c{}^{1/3})/(I_{wp}{}^{5/3} * V_t)$

= ____________ m^{-1}

θ_{dyn} $(10.3 + 17.8C)/(1.0 + GM/(1.46 + 0.28BM))$ ____________ = ____________ deg

Area 'A' ______________________________ = ____________ m-deg

Area 'B' ______________________________ = ____________ m-deg

Results Reserve energy ratio:

'B'/'A' = ____________________ (min = 0.10)

GM = ______________ m (KG = ________________ m)

Note: The minimum GM is that which produces a 'B'/'A' ratio = 0.10

4.6.5.5 Downflooding criteria assessment form

Input data

DFD_o ______________________________ = ____________ m

FBD_o ______________________________ = ____________ m

GM ______________________________ = ____________ m

D_m ______________________________ = ____________ m

V_t ______________________________ = ____________ m^3

V_p ______________________________ = ____________ m^3

A_{wp} ______________________________ = ____________ m^2

I_{wp} ______________________________ = ____________ m^4

L_{ccc} ______________________________ = ____________ m

L_{ptn} ______________________________ = ____________ m

S_{ptn} ______________________________ = ____________ m

SF ______________________________ = __________ = 1.10

<u>Determine</u>

θ_1 ______________________________ deg
DFD_1 ______________________________ m
$QSD_1 = DFD_o - DFD_1$ ______________________________ m
$a = (FBD_o/DM)(S_{ptn} * L_{ccc})/A_{wp} =$ ______________ ($A_{MIN} = 4.0$)
$k = 0.55 + 0.08(a-4.0) + .056(1.52-GM) =$ ______________ ($GM_{MAX} = 2.44$ m)
$X = D_m(V_t/V_p)(A_{wp}{}^2/I_{wp})(L_{ccc}/L_{ptn}) =$ ______________ m = ($X_{MIN}=12.19$ m)
$RMW = 9.3 + 0.11(X-12.19)$ = ______________ m
$RDFD = SF\ (k * QSD_1 + RMW)$ = ______________ m

<u>Results</u> downflooding margin:
$DFD_o - RDFD =$ ______________ (min = 0.0 m)
$GM =$ ______________ m (KG = ______________ m)

<u>Note</u>: The minimum GM is that which produces a downflooding margin = 0.0 m.

4.7 <u>Pontoons</u>

4.7.1 <u>Application</u>

The provisions given hereunder apply to seagoing pontoons. A pontoon is considered to be normally:

.1 non self-propelled;

.2 unmanned;

.3 carrying only deck cargo;

.4 having a block coefficient of 0.9 or greater;

.5 having a breadth/depth ratio of greater than 3.0; and

.6 having no hatchways in the deck except small manholes closed with gasketed covers.

4.7.2 <u>Stability drawings and calculations</u>

4.7.2.1 The following information is typical of that required to be submitted to the Administration for approval:

.1 lines drawing;

.2 hydrostatic curves;

.3 cross curves;

.4 report of draught and density readings and calculation of lightship displacement and longitudinal centre of gravity;

.5 statement of justification of assumed vertical centre of gravity;

.6 simplified stability guidance such as a loading diagram, so that the pontoon may be loaded in compliance with the stability criteria.

4.7.2.2 Concerning the performance of calculations, the following is suggested:

.1 no account should be taken of the buoyancy of deck cargo (unless buoyancy credit for adequately secured timber);

.2 consideration should be given to such factors as water absorption (e.g. timber), trapped water in cargo (e.g. pipes) and ice accretion;

.3 in performing wind heel calculations:

.3.1 the wind pressure should be constant and for general operations be considered to act on a solid mass extending over the length of the cargo deck and to an assumed height above the deck,

.3.2 the centre of gravity of the cargo should be assumed at a point mid-height of the cargo, and

.3.3 the wind lever arm should be taken from the centre of the deck cargo to a point at one half the draught;

.4 calculations should be performed covering the full range of operating draughts;

.5 the downflooding angle should be taken as the angle at which an opening through which progressive flooding may take place is immersed. This would not be an opening closed by a watertight manhole cover or a vent fitted with an automatic closure.

4.7.3 <u>Intact stability criteria</u>

4.7.3.1 The area under righting lever curve up to the angle of maximum righting lever should not be less than 0.08 metre-radians.

4.7.3.2 The static angle of heel due to a uniformly distributed wind load of 0.54 kPa (wind speed 30 m/sec) shall not exceed an angle corresponding to half the freeboard for the relevant loading condition, where the lever of wind heeling moment is measured from the centroid of the windage area to half the draught.

4.7.3.3 The minimum range of stability should be:

For $L \leq 100$ m	20°
For $L \geq 150$ m	15°

For intermediate length by interpolation.

[4.8 <u>Dynamically supported craft (DSC)</u>

<u>Note</u>: As the Code of Safety for dynamically supported craft (resolution A.373(X)) is under current revision within IMO with the DE Sub-Committee being a co-ordinating body, the provisions given below are of an interim nature. In particular, such factors as the increase in the number of passengers carried on board and new types of DSC are expected to be among major changes to be introduced into a new code.

4.8.1 Application

4.8.1.1 The provisions given hereunder apply to dynamically supported craft as defined in 1.3.8 which are engaged on voyages between a terminal in one country and a terminal in another country, part or all of which voyages are across areas of water (but not necessarily on routes navigable to ships) through which a ship operating on an international voyage, as defined in regulation I/2(d) of the 1974 SOLAS Convention, as amended, would proceed. In applying the provisions of this chapter, the Administration should determine whether a craft is a dynamically supported craft as defined in 1.3.8, or whether its characteristics are such that the SOLAS and Load Line Conventions can be applied. For novel types of DSC other than defined in 1.3.9 and 1.3.10, the Administration should determine the extent to which the provisions of this chapter are applicable to those novel types. The contents of this chapter should be applied by Administrations through more detailed national regulations based on a comprehensive coverage of the provisions contained therein.

4.8.1.2 The provisions in this chapter apply to DSC which:

.1 carry more than 12 passengers but not more than 450 passengers with all passengers seated;

.2 do not proceed in the course of their voyage more than 100 nautical miles from the place of refuge; and

.3 may be provided within the limits of subparagraphs .1 and .2 with special category spaces intended to carry motor vehicles with fuel in their tanks.

The provisions given below may be extended to a DSC which is intended to carry passengers and cargo or solely cargo or to a craft which exceeds the limits specified in subparagraphs .1 to .3. In such cases, the Administration should determine the extent to which the provisions of the Code are applicable to these craft and, if necessary, develop additional requirements providing the appropriate safety level for such craft.

4.8.2 General provisions

4.8.2.1 A craft should be provided with:

.1 stability characteristics and stabilization systems adequate for safety when the craft is operated in the non-displacement mode and during the transient mode; and

.2 buoyancy and stability characteristics adequate for safety where the craft is operated in the displaced mode [both] in the intact condition [and the damage condition].

4.8.2.2 If a craft operates in zones where ice accretion is likely to occur, the effect of icing should be taken into account in the stability calculations in accordance with section 5.5.

4.8.3 Definitions

For the purpose of this chapter, unless expressly defined otherwise, the following definitions apply:

.1 length (L) means length of the rigid hull measured on the design waterline in the displacement mode;

.2 breadth (B) means breadth of the broadest part of the rigid hull measured on the design waterline in the displacement mode;

.3 design waterline means the waterline corresponding to the loaded displacement of the craft when stationary;

.4 weathertight means that water will not penetrate into the craft in any wind and wave conditions up to those specified as critical design conditions;

.5 skirt means a downwardly-extending, flexible structure used to contain or divide an air cushion;

.6 fully submerged foil means a foil having no lift components piercing the surface of the water in the foil-borne mode.

4.8.4 Intact buoyancy

4.8.4.1 The craft should have a designed reserve of buoyancy when floating in seawater of not less than 100 per cent at the maximum operational weight. The Administration may require a larger reserve of buoyancy to permit the craft to operate in any of its intended modes. The reserve of buoyancy should be calculated by including only those compartments which are:

.1 watertight;

.2 considered by the Administration to have scantlings and arrangements adequate to maintain their watertight integrity; and

.3 situated below a datum, which may be a watertight deck or equivalent structure watertight longitudinally and transversely and from at least part of which the passengers would be disembarked in an emergency.

4.8.4.2 Means should be provided for checking the watertight integrity of buoyancy compartments. The inspection procedures adopted and the frequency at which they are carried out should be to the satisfaction of the Administration.

4.8.4.3 Where entry of water into structures above the datum as defined in 4.8.4.1.3 would significantly influence the stability and buoyancy of the craft, such structures should be of adequate strength to maintain the weathertight integrity or be provided with adequate drainage arrangements. A combination of both measures may be adopted to the satisfaction of the Administration. The means of closing of all openings in such structures should be such as to maintain the weathertight integrity.

4.8.5 Intact stability

4.8.5.1 The stability of a craft in the displacement mode should be such that when in still water conditions, the inclination of the craft from the horizontal would not exceed 8° in any direction under all permitted cases of loading and uncontrolled passenger movements as may occur. A calculation of the dynamic stability should be made with respect to critical design conditions.

4.8.5.2 For guidance of the Administration, methods of relating to the verification of the stability of hydrofoil boats fitted with surface piercing foils and fully submerged foils are outlined in 4.8.8.

4.8.6 Stability of the craft in the non-displacement mode

4.8.6.1 The Administration should be satisfied that when operating in the non-displacement and transient modes within approved operational limitations, the craft will, after a disturbance causing roll, pitch, heave or any combination thereof, return to the original attitude.

4.8.6.2 The roll and pitch stability of each craft in the non-displacement mode, should be determined experimentally prior to entering commercial service and be recorded.

4.8.6.3 Where craft are fitted with surface piercing structure or appendages, precautions should be taken against dangerous attitudes or inclinations and loss of stability subsequent to a collision with a submerged or floating object.

4.8.6.4 The Administration should be satisfied that the structures and components provided to sustain operation in the non-displacement mode should, in the event of specified damage or failure, provide adequate residual stability in order that the craft may continue safe operation to the nearest place where the passengers and crew could be placed in safety, provided caution is exercised in handling.

4.8.6.5 In designs where periodic use of cushion deformation is employed as a means of assisting craft control or periodic use of cushion air exhausting to atmosphere for purposes of craft manoeuvring, the effects upon cushion-borne stability should be determined, and the limitations on the use by virtue of craft speed or attitude should be established.

4.8.7 Methods relating to the intact stability investigation of hydrofoil boats

The stability of these craft should be considered in the hull-borne, transient and foil-borne modes. The stability investigation should also take into account the effects of external forces. The following procedures are outlined for guidance in dealing with stability.

4.8.7.1 Surface piercing hydrofoils

.1 Hull-borne mode

.1.1 The stability should be sufficient to satisfy 4.8.5 of this chapter.

.1.2 Heeling moment due to turning.

The heeling moment developed during manoeuvring of the craft in the displacement mode may be derived from the following formula:

$$M_R = \frac{0.196\ V_o^2 \Delta KG}{L} \quad (kN * m)$$

where M_R = moment of heeling
V_o = speed of the craft in the turn (metres per second)
Δ = displacement (tonnes)
KG = height of the centre of gravity above keel (metres)
L = length of the craft on the waterline (metres)

This formula is applicable when the ratio of the radius of the turning circle to the length of the craft is 2 to 4.

.1.3 Relationship between the capsizing moment and heeling moment to satisfy the weather criterion.

The stability of the hydrofoil boat in the displacement mode can be checked for compliance with the weather criterion K as follows:

$$K = \frac{M_c}{M_v} \geq 1$$

where M_c - minimum capsizing moment as determined when account is taken of rolling;

M_v - dynamically applied heeling moment due to the wind pressure

.1.4 Heeling moment due to wind pressure

The heeling moment M_v is a product of wind pressure P_v the windage area A_v and the lever of windage area Z.

$$M_v = 0.001\ P_v A_v Z \quad (kN*m)$$

The value of the heeling moment is taken as constant during the whole period of heeling.

The windage area A_v is considered to include the projections of the lateral surfaces of the hull, superstructure and various structures above the waterline. The windage area lever Z is the vertical distance to the centre of windage from the waterline and the position of the centre of windage may be taken as the centre of the area.

The values of the wind pressure (in Pa) associated with Force 7 Beaufort scale depending on the position of the centre of windage area are given in table 4.8.8.

Table 4.8.8

Typical wind pressures for Beaufort scale 7
100 nautical miles from land

Z above waterline (metres)	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
P_V (Pa)	46	46	50	53	56	58	60	62	64

Note: These values may not be applicable in all areas

.1.5 Evaluation of the minimum capsizing moment M_C in the displacement mode.

The minimum capsizing moment is determined from the static and dynamic stability curves taking rolling into account.

.1.5.1 When the static stability curve is used, M_C is determined by equating the areas under the curves of the capsizing and righting moments (or levers) taking rolling into account - as indicated by figure 4.8.8-1, where θ_z is the amplitude of roll and MK is a line drawn parallel to the abscissa axis such that the shaded areas S_1 and S_2 are equal.

M_C = OM is the scale of ordinates, represents moments
M_C = OM x displacement if the scale of ordinates, represents levers

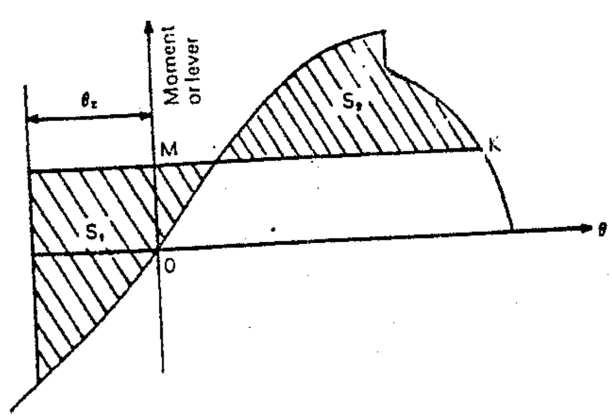


Figure 4.8.8-1

.1.5.2 When the dynamic stability curve is used, first an auxiliary point A must be determined. For this purpose the amplitude of heeling is plotted to the right along the abscissa axis and a point A is found (see figure 4.8.8-2). A line AA' is drawn parallel to the abscissa axis equal to the double amplitude of heeling (AA' = $2\theta_z$) and the required auxiliary point A is found. A tangent AC to the dynamic stability curve is drawn. From the point A the line AB is drawn parallel to the abscissa axis and equal to 1 radian (57.3°). From the point B a perpendicular is drawn to intersect with the tangent in point E. The distance $\overline{BE}$ is equal to the capsizing moment if measured along the ordinate axis of the dynamic stability curve. If, however, the dynamic stability levers are plotted along this axis $\overline{BE}$ is then the capsizing lever and in this case the capsizing moment M_c is determined by multiplication of ordinate $\overline{BE}$ in metres by the corresponding displacement in tonnes.

$$M_C = 9.81 \, \Delta \, \overline{BE} \quad (kN*m)$$

1.5.3 The amplitude of rolling θ_z is determined by means of model and full-scale tests in irregular seas as a maximum amplitude of rolling of 50 oscillations of a craft travelling at 90° to the wave direction in sea state for the worst design condition. If such data are lacking the amplitude is assumed to be equal to 15°.

1.5.4 The effectiveness of the stability curves should be limited to the angle of flooding.

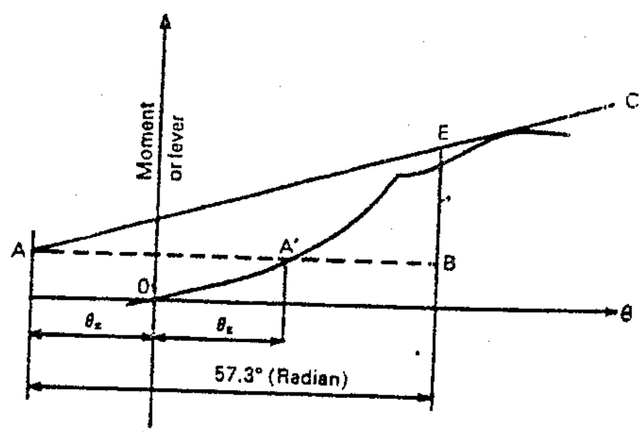


Figure 4.8.8-2 – Dynamic stability curve

.2 Stability in the transient and foil-borne modes

.2.1 The stability should satisfy the provisions of 4.8.6 of this chapter.

.2.2.1 The stability in the transient and foil-borne modes should be checked for all cases of loading for the intended service of the craft.

.2.2.2 The stability in the transient and foil-borne modes may be determined either by calculation or on the basis of data obtained from model experiments and should be certified by full-scale tests by the imposition of a series of known heeling moments by off-centre ballast weights, and recording the heeling angles produced by these moments. When taken in the hull-borne, take-off, steady foil-borne and settling to hull-borne modes, these results will provide an indication of the values of the stability in the various situations of the craft during the transient condition.

.2.2.3 The time to pass from the hull-borne mode to foil-borne mode and vice versa should be established. This period of time should not exceed two minutes.

.2.2.4 The angle of heel in the foil-borne mode caused by the concentration of passengers at one side should not exceed 8°. During the transient mode the angle of heel due to the concentration of passengers on one side should not exceed 12°. The concentration of passengers should be determined by the Administration, having regard to the guidance given in section 4.8.9.

.2.3 One of the possible methods of assessing foil-borne metacentric height (GM) in the design stage for a particular foil configuration is given in figure 4.8.8-3.

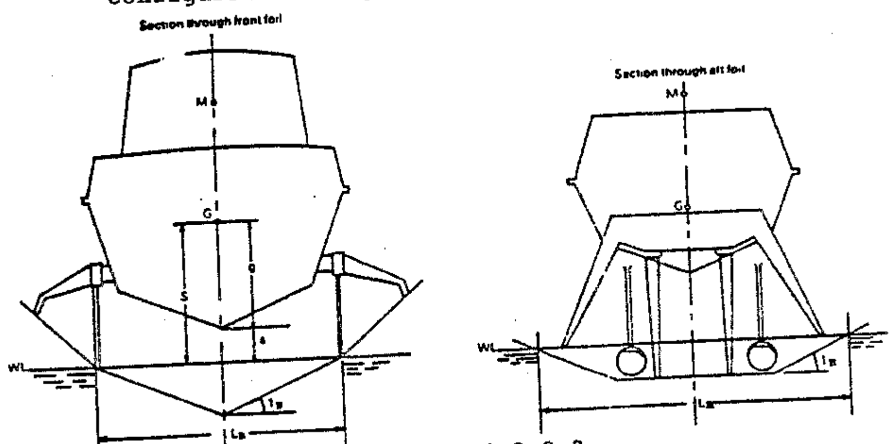


Figure 4.8.8-3

$$GM = n_B \left(\frac{L_B}{2 \tan l_B} - S \right) + n_H \left(\frac{L_H}{2 \tan l_H} - S \right)$$

where n_B = percentage of hydrofoil load borne by front foil
n_H = percentage of hydrofoil load borne by aft foil
L_B = clearance width of front foil
a = clearance between bottom of keel and water
g = height of centre of gravity above bottom of keel
l_B = angle at which front foil is inclined to horizontal
l_H = angle at which aft foil is inclined to horizontal

4.8.7.2 Fully submerged hydrofoils

.1 Hull-borne mode

.1.1 The stability in the hull-borne mode should be sufficient to satisfy the requirements given in 4.8.5.

.1.2 Paragraphs 4.8.7.1.1.2 to 4.8.7.1.1.5 of this section are appropriate to this type of craft in the hull-borne mode.

.2 Transient mode

.2.1 The stability should be examined by the use of verified computer simulations to evaluate the craft's motions, behaviour and responses under the normal conditions and limits of operation, and under the influence of any malfunction.

.2.2 The stability conditions resulting from any potential failures in the systems or operational procedures during the transient stage which could prove hazardous to the craft's watertight integrity and stability should be examined.

.3 Foil-borne mode

The stability of the craft in the foil-borne mode should be in compliance with 4.8.6 and 4.8.7.2.2.

.4 Paragraph 4.8.7.1.1.2.2 should be applied to this type of craft as appropriate and any computer simulations or design calculations should be verified by full-scale tests.]

4.9 <u>Containerships greater than 100 m</u>

4.9.1 <u>Application</u>

These requirements apply to containerships greater than 100 m as defined in 1.3.12. They may also be applied to other cargo ships with considerable flare or large waterplane areas. The Administration may apply the following criteria instead of those in paragraphs 3.1.2.1 to 3.1.2.4.

4.9.2 <u>Intact stability</u>

The area under the righting lever curve (GZ curve) should not be less than 0.009/C metre-radians up to $\theta = 30°$ angle of heel, and not less than 0.016/C metre-radians up to $\theta = 40°$ or the angle of flooding θ_f (as defined in 3.1.2) if this angle is less than 40°.

Additionally, the area under the righting lever curve (GZ curve) between the angles of heel of 30° and 40° or between 30° and θ_f, if this angle is less than 40°, should not be less than 0.006/C metre-radians.

The righting lever GZ should be at least 0.033/C m at an angle of heel equal or greater than 30°.

The maximum righting lever GZ should be at least 0.042/C m.

The total area under the righting lever curve (GZ curve) up to the angle of flooding θ_f should not be less than 0.029/c metre-radians.

In the above criteria the form factor C should be calculated using the formula and figure 4.9-1:

$$C = \frac{d.D'}{B_m^2} \cdot \sqrt{\frac{d}{KG}} \cdot \left(\frac{C_B}{C_W}\right)^2 \cdot \sqrt{\frac{100}{L}}$$

d = mean draught in m

$$D = D' + h \cdot \frac{2b - B_D}{B_D} \cdot \frac{2 \Sigma \ell_H}{L}$$, as defined in figure;

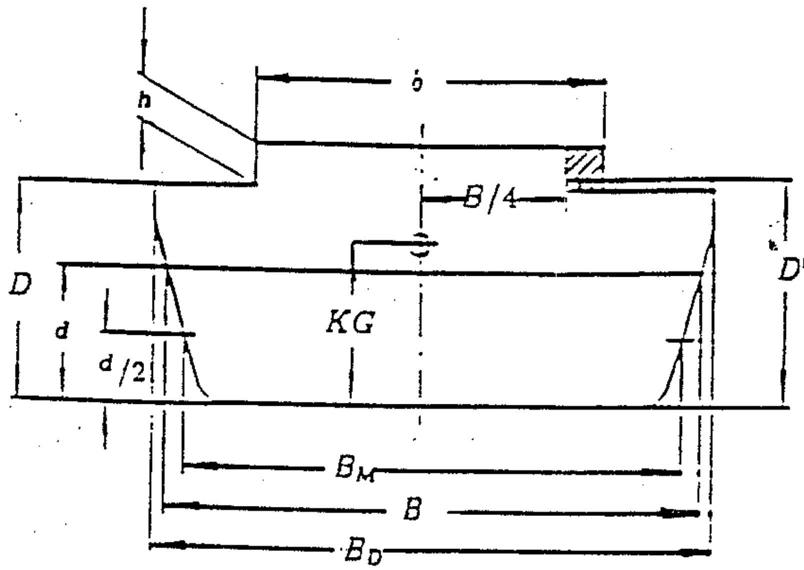
D = moulded depth of the ship in m;

B = moulded breadth of the ship in m;

KG = height of the centre of gravity in m above the keel; not to be taken as less than d;

C_B = block coefficient;

C_W = waterplane coefficient.



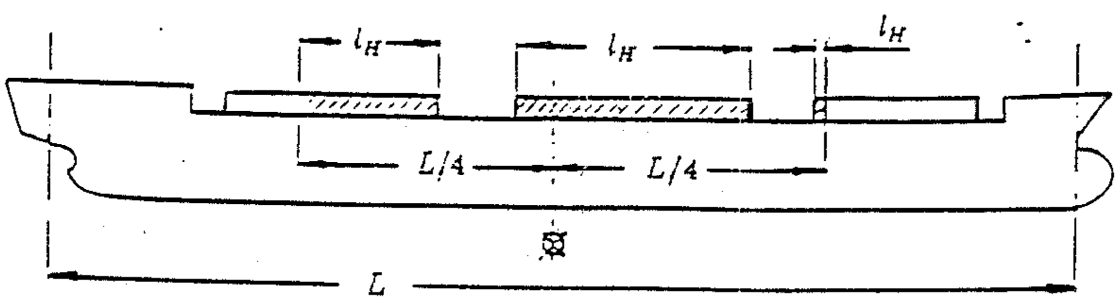


Figure 4.9-1

4.9.3 The use of electronic loading and stability computers is encouraged in determining the ship's trim and stability during different operational conditions.

CHAPTER 5 - ICING CONSIDERATIONS

5.1 General

5.1.1 For any ship operating in areas where ice accretion is likely to occur, adversely affecting a ship's stability, icing allowances should be included in the analysis of conditions of loading.

5.1.2 Administrations are advised to take icing into account and are permitted to apply national standards where environmental conditions are considered to warrant a higher standard than those recommended in the following sections.

5.2 Cargo ships carrying timber deck cargo

5.2.1* The master should establish or verify the stability of his ship for the worst service condition, having regard to the increased weight of deck cargo due to water absorption and/or ice accretion and to variations in consumables.

5.2.2 When timber deck cargoes are carried and it is anticipated that some formation of ice will take place, an allowance should be made in the arrival condition for the additional weight.

5.3 Fishing vessels

The calculations of loading conditions for fishing vessels (see section 4.2.5) should, where appropriate, include allowance for ice accretion, in accordance with the following provisions.

5.3.1 Allowance for ice accretion

For vessels operating in areas where ice accretion is likely to occur, the following icing allowance shall be made in the stability calculations:

.1 30 kg per square metre on exposed weather decks and gangways;

.2 7.5 kg per square metre for projected lateral area of each side of the vessel above the water plane;

.3 the projected lateral area of discontinuous surfaces of rail, sundry booms, spars (except masts) and rigging of vessels having no sails and the projected lateral area of other small objects shall be computed by increasing the total projected area of continuous surfaces by 5 per cent and the static moments of this area by 10 per cent.

Vessels intended for operation in areas where ice is known to occur shall be:

.4 designed to minimize the accretion of ice; and

.5 equipped with such means for removing ice as the Administration may require, for example, electrical and pneumatic devices, and/or special tools such as axes or wooden clubs for removing ice from bulwarks, rails and erections.

5.3.2 Guidance relating to ice accretion

In the application of the above standards the following icing areas should apply:

.1 the area north of latitude 65°30'N, between longitude 28°W and the west coast of Iceland; north of the north coast of Iceland; north of the rhumb line running from latitude 66°N, longitude 15°W to latitude 73°30'N, longitude 15°E, north of latitude 73°30'N between longitude 15°E and 35°E, and east of longitude 35°E, as well as north of latitude 56°N in the Baltic Sea;

.2 the area north of latitude 43°N bounded in the west by the North American coast and from the east by the rhumb line running from latitude 43°N, longitude 48°W to latitude 63°N, longitude 28°W and thence along longitude 28°W;

.3 all sea areas north of the North American Continent, west of the areas defined in subparagraphs .1 and .2 of this paragraph;

.4 the Bering and Okhotsk Seas and the Tartary Strait during the icing season; and

.5 south of latitude 60°S.

A chart to illustrate the areas is attached at the end of this chapter.

For vessels operating in areas where ice accretion may be expected:

.6 within the areas defined in subparagraph .1, .3, .4 and .5 known to having icing conditions significantly different from those described in 5.3.1, ice accretion requirements of one half to twice the required allowance may be applied;

.7 within the area defined in subparagraph .2, where ice accretion in excess of twice the allowance required by paragraph 5.3.1 may be expected, more severe requirements than those given in that paragraph may be applied.

5.3.3 Brief survey of the causes of ice formation and its influence upon the seaworthiness of the vessel

.1 The skipper of a fishing vessel should bear in mind that ice formation is a complicated process which depends upon meteorological conditions, condition of loading and behaviour of the vessel in stormy weather as well as on the size and location of superstructures and rigging. The most common cause of ice formation is the deposit of water droplets on the vessel's structure. These droplets come from spray driven from wave crests and from ship-generated spray.

.2 Ice formation may also occur in conditions of snowfall, sea fog including arctic sea smoke, a drastic fall in ambient temperature, as well as from the freezing of drops of rain on impact with the vessel's structure.

.3 Ice formation may sometimes be caused or accentuated by water shipped on board and retained on deck.

.4 Intensive ice formation generally occurs on stem, bulwark and bulwark rail, front walls of superstructures and deckhouses, hawse holes, anchors, deck gear, forecastle deck and upper deck, freeing ports, aerials, stays, shrouds, masts and spars.

.5 It should be borne in mind that the most dangerous areas as far as ice formation is concerned are the sub-Arctic regions.

.6 The most intensive ice formation takes place when wind and sea come from ahead. In beam and quartering winds, ice accumulates quicker on the windward side of the vessel, thus leading to a constant list which is extremely dangerous.

.7 Listed below are meteorological conditions causing the most common type of ice formation due to spraying of a vessel. Examples of the weight of ice formation on a typical fishing vessel of displacement in the range 100 tons to 500 tons is also given. For larger vessels the weight will be correspondingly greater.

.8 Slow accumulations of ice take place:

.8.1 at ambient temperature from -1°C to -3°C and any wind force;

.8.2 at ambient temperature -4°C and lower and wind force from 0 to 9 m/s;

.8.3 under the conditions of precipitation, fog or sea mist followed by a drastic fall of the ambient temperature.

Under all these conditions the intensity of ice accumulation may not exceed 1.5 t/h.

.9 At ambient temperature of -4°C to -8°C and wind force 10-15 m/s, rapid accumulation of ice takes place. Under these conditions the intensity of ice accumulation can lie within the range 1.5 to 4 t/h.

.10 Very fast accumulation of ice takes place:

.10.1 at ambient temperature of -4°C and lower and wind forces of 16 m/s and over;

.10.2 at ambient temperature -9°C and lower and wind force 10 to 15 m/s.

Under these conditions the intensity of ice accumulation can exceed 4 t/h.

.11 The skipper should bear in mind that ice formation adversely affects the seaworthiness of the vessel as ice formation leads to:

.11.1 an increase in the weight of the vessel due to accumulation of ice on the vessel's surfaces which causes the reduction of freeboard and buoyancy;

.11.2 a rise of the vessel's centre of gravity due to the high location of ice on the vessel's structures with corresponding reduction in the level of stability;

.11.3 an increase of windage area due to ice formation on the upper parts of the vessel and hence an increase in the heeling moment due to the action of the wind;

.11.4 a change of trim due to uneven distribution of ice along the vessel's length;

.11.5 the development of a constant list due to uneven distribution of ice across the breadth of the vessel;

.11.6 impairment of the manoeuvrability and reduction of the speed of the vessel.

5.3.4 Operational procedures related to ensuring a fishing vessel's endurance in conditions of ice formation, are given in annex 2.

5.4 <u>Offshore supply vessels 24 m to 100 m in length</u>

For vessels operating in areas where ice accretion is likely to occur:

.1 no shutters should be fitted in the freeing ports;

.2 with regard to operational precautions against capsizing, reference is made to the recommendations for skippers of fishing vessels on ensuring a vessel's endurance in conditions of ice formation, as given in paragraph 5.3.3 and in annex 2.

[5.5 <u>Dynamically supported craft</u>

5.5.1 Account should be taken of the effect of icing on the stability calculations. An example for established practice for ice accretion allowances is given in paragraphs 5.3.1 and 5.3.2 for the guidance of Administrations.

5.5.2 Information should be provided in respect of the assumptions made in calculating the conditions of the craft in each of the circumstances set out in paragraphs 5.3.1 and 5.3.2 for the following:

.1 duration of the voyage in terms of the period spent in reaching the destination and returning to port;

.2 consumption rates during the voyage for fuel, water, stores and other consumables.]

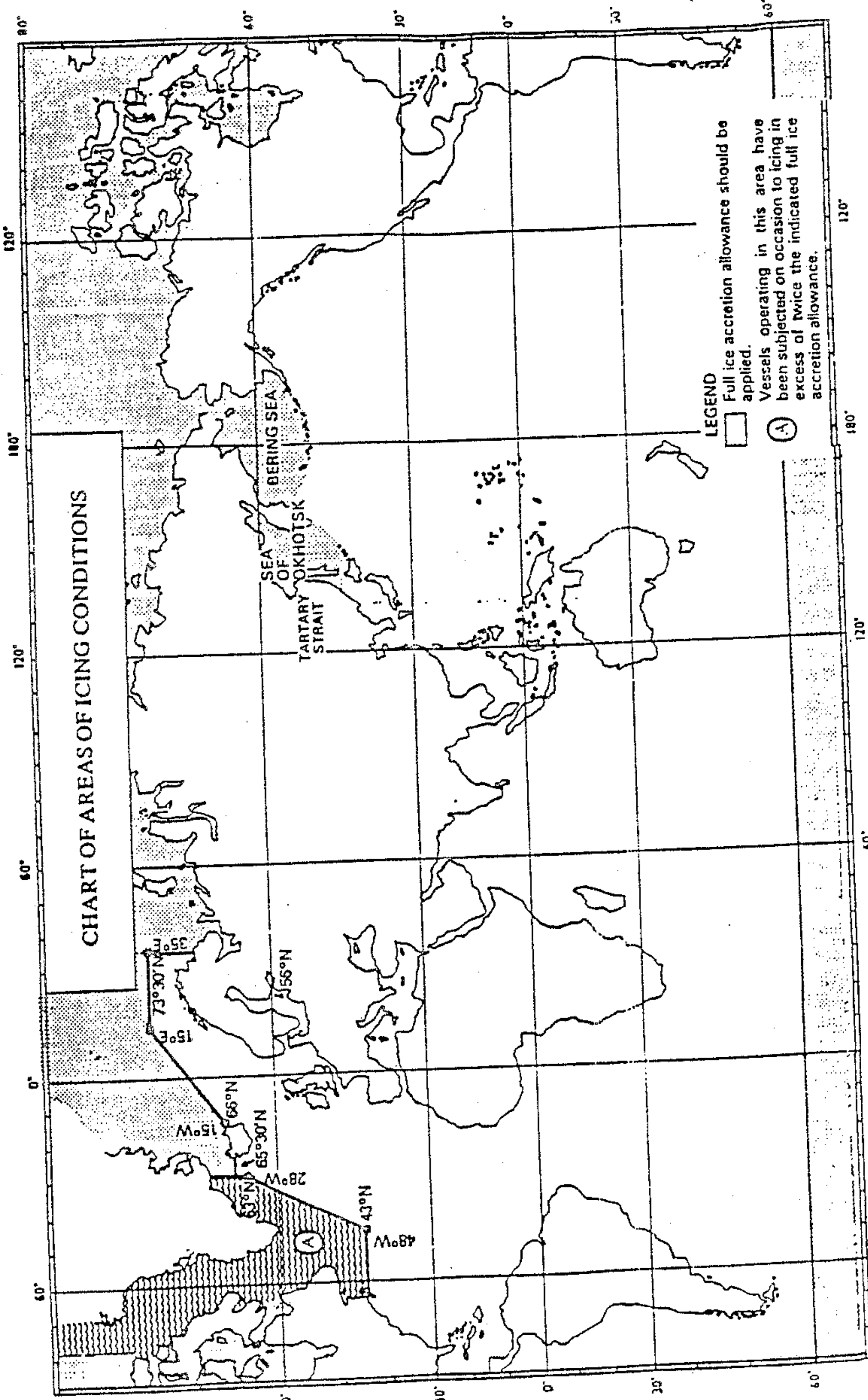


CHART OF AREAS OF ICING CONDITIONS
BERING SEA
SEA OF OKHOTSK
TARTARY STRAIT
LEGEND
Full ice accretion allowance should be applied.
Vessels operating in this area have been subjected on occasion to icing in excess of twice the indicated full ice accretion allowance.
35°E
73°30'N
15°E
56°N
66°N
15°W
65°30'N
28°W
63°N
43°N
48°W

CHAPTER 6 - CONSIDERATIONS FOR WATERTIGHT INTEGRITY

6.1 Hatchways

6.1.1* Cargo and other hatchways in ships to which the International Convention on Load Lines, 1966, applies shall comply with regulations II-1/13, 14, 15, 16 and 26(4) of this Convention.

[6.1.2* Hatchways in fishing vessels to which the Torremolinos International Convention for the Safety of Fishing Vessels, 1977, as modified by its Protocol of 1993 applies shall comply with regulations [16] and [17] of this Convention.]

6.1.3 In decked fishing vessels of 12 m in length and over but less than 24 m in length hatchways should comply with the following:

.1 All hatchways should be provided with covers and those which may be opened during fishing operations should normally be arranged near to the vessel's centreline.

.2 For the purpose of strength calculations it should be assumed that hatchway covers other than wood are subject to static load of 10 kN/m^2 or the weight of cargo intended to be carried on them, whichever is the greater.

.3 Where covers are constructed of mild steel, the maximum stress according to .2 multiplied by 4.25 should not exceed the minimum ultimate strength of the material. Under these loads the deflections should not be more than 0.0028 times the span.

.4 Covers made of materials other than mild steel or wood should be at least of equivalent strength to those made of mild steel and their construction should be of sufficient stiffness to ensure weathertightness under the loads specified in 2.

.5 Covers should be fitted with clamping devices and gaskets or other equivalent arrangements sufficient to ensure weathertightness.

.6 The use of wooden hatchway covers is generally not recommended in view of the difficulty of rapidly securing their weathertightness. However, where fitted they should be capable of being secured weathertight.

.7 The finished thickness of wood hatchway covers should include an allowance for abrasion due to rough handling. In any case, the finished thickness of these covers should be at least 4 mm for each 100 mm of unsupported span subject to a minimum of 40 mm and the width of their bearing surfaces should be at least 65 mm.

.8 The height above deck of hatchway coamings on exposed parts of the working deck should be at least 300 mm for vessels of 12 m in length and at least 600 mm for vessels of 24 m in length. For vessels of intermediate length the minimum height should be obtained by linear interpolation. The height above deck of hatchway coamings on exposed parts of the superstructure deck should be at least 300 mm.

.9 Where operating experience has shown justification and on approval of the competent authority the height of hatchway coamings, except those which give direct access to machinery spaces may be reduced from the height as specified in .8 or the coamings may be omitted entirely, provided that efficient watertight hatchcovers other than wood are fitted. Such hatchways should be kept as small as practicable and the covers should be permanently attached by hinges or equivalent means and be capable of being rapidly closed or battened down.]

6.2 Machinery space openings

6.2.1* In ships to which the International Convention on Load Lines, 1966, applies machinery space openings shall comply with regulation 17.

[6.2.2* In fishing vessels to which the Torremolinos International Convention for the Safety of Fishing Vessels, 1977, as modified by its Protocol of 1993 applies and in new decked fishing vessels of 12 m in length and over, but less than 24 m in length, the following requirements shall be met:

.1 Machinery space openings shall be framed and enclosed by casings of a strength equivalent to the adjacent superstructure. External access openings therein shall be fitted with doors complying with the requirements of or, in vessels less than 24 m in length with hatch covers other than wood complying with the requirements of section 6.1.3. of this chapter.

.2 Openings other than access openings shall be fitted with covers of equivalent strength to the unpierced structure, permanently attached thereto and capable of being closed weathertight.]

6.2.3 In offshore supply vessels, access to the machinery space should, if possible, be arranged within the forecastle. Any access to the machinery space from the exposed cargo deck should be provided with two weathertight closures. Access to spaces below the exposed cargo deck should preferably be from a position within or above the superstructure deck.

6.3 Doors

6.3.1* In passenger ships to which the International Convention for the Safety of Life at Sea, 1974 applies, doors shall comply with regulations II-1/13 and 15 of this Convention.

6.3.2* In ships to which the International Convention on Load Lines, 1966, applies, doors shall comply with regulation 12 of this Convention.

[6.3.3* In fishing vessels to which the Torremolinos International Convention for the Safety of Fishing Vessels, 1977, as modified by its Protocol of 1993 applies, doors shall comply with regulations [13] (Watertight doors) and regulation [15] (Weathertight doors) of this Convention.]

6.3.4 In decked fishing vessels of 12 m in length and over but less than 24 m in length:

.1 Watertight doors may be of the hinged type and should be capable of being operated locally from each side of the door. A notice should be attached to the door on each side stating that the door should be kept closed at sea.

.2 All access openings in bulkheads of enclosed deck erections, through which water could enter and endanger the vessel, should be fitted with doors permanently attached to the bulkhead, framed and stiffened so that the whole structure is of equivalent strength to the unpierced structure, and weathertight when closed, and means should be provided so that they can be operated from each side of the bulkhead.

.3 The height above deck of sills in those doorways, companionways, deck erections and machinery casings situated on the working deck and on superstructure decks which give direct access to parts of that deck exposed to the weather and sea should be at least equal to the height of hatchway coamings as specified in 6.1.3.8.

.4 Where operating experience has shown justification and on approval of the competent authority, the height above deck of sills in the doorways specified in 3.4.3 except those giving direct access to machinery spaces, may be reduced to not less than 150 mm on superstructure decks and not less than 380 mm on the working deck for vessels 24 m in length, or not less than 150 mm on the working deck for vessels of 12 m in length. For vessels of intermediate length the minimum acceptable reduced height for sills in doorways on the working deck should be obtained by linear interpolation.

6.4 <u>Cargo ports and other similar openings</u>

6.4.1* Cargo ports and other similar openings in ships to which the International Convention on Load Lines, 1966, applies shall comply with regulation 21 of this Convention.

[6.4.2* Openings through which water can enter the vessel and fish flaps on stern trawlers in fishing vessels to which the Torremolinos International Convention, 1977, as modified by its Protocol of 1993 applies shall comply with regulation [14] of this Convention.]

6.5 <u>Sidescuttles, window scuppers, inlets and discharges</u>

6.5.1* In passenger ships to which the International Convention for the Safety of Life at Sea, 1974 applies, openings in shell plating below the margin line shall comply with regulation II-1/14 of this Convention. Watertight integrity above the margin line shall comply with regulation II-1/17 of this Convention.

6.5.2* In ships to which the International Convention on Load Lines, 1966, applies, scuppers, inlets and discharges shall comply with regulation 22 and sidescuttles shall comply with regulation 23 of this Convention.

[6.5.3* In fishing vessels to which the Torremolinos International Convention for the Safety of Fishing Vessels, 1977, as modified by its Protocol of 1993 applies sidescuttles and windows shall comply with regulation [23] and inlets and discharges shall comply with regulation [24] of this Convention.]

6.5.4 In decked fishing vessels of 12 m in length and over but less than 24 m in length, sidescuttles, windows and other openings and inlets and discharges should comply with the following:

.1 Sidescuttles to spaces below the working deck and to enclosed spaces on the working deck should be fitted with hinged deadlights capable of being closed watertight.

.2 Sidescuttles should be fitted in a position such that their sills are above a line drawn parallel to the working deck at side having its lowest point 500 mm above the deepest operating waterline.

.3 Sidescuttles, together with their glasses and deadlights, should be of substantial construction to the satisfaction of the competent authority.

.4 Skylights, leading to spaces below the working deck, should be of substantial construction and capable of being closed and secured weathertight, and with provision for adequate means of closing in the event of damage to the inserts. Skylights leading to machinery spaces should be avoided as far as practicable.

.5 Toughened safety glass or suitably permanently transparent material of equivalent strength should be fitted in all wheelhouse windows exposed to the weather. That means of securing windows and the width of the bearing surfaces should be adequate, having regard to the window material used. Openings leading to spaces below deck from a wheelhouse whose windows are not provided with the protection required by .6 should be fitted with a weathertight closing appliance.

.6 Deadlights or a suitable number of storm shutters should be provided where there is no other method of preventing water from entering the hull through a broken window or sidescuttle.

.7 The competent authority may accept sidescuttles and windows without deadlights in side or aft bulkheads of deck erections located on or above the working deck if satisfied that the safety of the vessel will not be impaired.

.8 The number of openings in the sides of the vessel below the working deck should be the minimum compatible with the design and proper working of the vessel and such openings should be provided with closing arrangements of adequate strength to ensure watertightness and the structural integrity of the surrounding structure.

.9 Discharges led through the shell either from spaces below the working deck or from spaces within deck erections would be fitted with efficient and accessible means for preventing water from passing inboard. Normally each separate discharge should have an automatic non-return valve with a positive means of closing it from a readily accessible position. Such a valve is not required if the competent authority considers that the entry of water into the vessel through the opening is not likely to lead to dangerous flooding and that the thickness of the pipe is sufficient.

The means for operating the valve with a positive means of closing should be provided with an indicator showing whether the valve is open or closed. The open inboard end of any discharge system should be above the deepest operating waterline at an angle of heel satisfactory to the competent authority.

.10 In machinery spaces main and auxiliary sea inlets and discharge essential for the operation of machinery should be controlled locally. Controls should be readily accessible and should be provided with indicators showing whether the valves are open or closed. Suitable warning devices should be incorporated to indicate leakage of water into the space.

.11 Fittings attached to the shell and all valves should be of steel, bronze or other ductile material. All pipes between the shell and valves should be of steel, except that in vessels constructed of material other than steel, other suitable materials may be used.

6.6 Other deck openings

6.6.1* Miscellaneous openings in freeboard and superstructure decks in ships to which the International Convention on Load Lines, 1966, applies shall comply with regulation 18 of this Convention.

6.6.2 In decked fishing vessels of 12 m and over where it is essential for fishing operations, flush deck scuttles of the screw, bayonet or equivalent type and manholes may be fitted provided these are capable of being closed watertight and such devices shall be permanently attached to the adjacent structure. Having regard to the size and disposition of the openings and the design of the closing devices, metal-to-metal closures may be fitted if they are effectively watertight. Openings other than hatchways, machinery space openings, manholes and flush scuttles in the working or superstructure deck shall be protected by enclosed structures fitted with weathertight doors or their equivalent. Companionways shall be situated as close as practicable to the centreline of the vessel.

6.7 Ventilators, air pipes and sounding devices

6.7.1* Ventilators in ships to which the International Convention on Load Lines, 1966, applies shall comply with regulation 19 and air pipes shall comply with regulation 20 of this Convention.

[6.7.2* Ventilators in fishing vessels to which the Torremolinos Convention for the Safety of Fishing Vessels, 1977, as modified by its Protocol of 1993 applies shall comply with regulation [20] and air pipes shall comply with regulation [21] of this Convention. Sounding devices shall comply with regulation [22] of this Convention.]

6.7.3 Ventilators and air pipes in fishing vessels of 12 m in length and over but less than 24 m in length should comply with the following:

.1 Ventilators should have coamings of substantial construction and should be capable of being closed weathertight by devices permanently attached to the ventilator or adjacent structure. Ventilators should be arranged as close to the vessel's centreline as possible and, where practicable, should extend through the top of a deck erection or companionway.

.2 The coamings of ventilators should be as high as practicable. On the working deck the height above deck of coamings of ventilators, other than machinery space ventilators, should be not less than 760 mm and on superstructure decks not less than 450 mm. When the height of such ventilators may interfere with the working of the vessel their coaming heights may be reduced to the satisfaction of the competent authority. The height above deck of machinery space ventilator openings should be to the satisfaction of the competent authority.

.3 Closing appliances need not be fitted to ventilators the coamings of which extend more than 2.5 m above the working deck or more than 1.0 m above a deckhouse top or superstructure deck.

.4 Where air pipes to tanks or other spaces below deck extend above the working or superstructure decks the exposed parts of the pipes should be of substantial construction and, as far as is practicable, located close to the vessel's centreline and protected from damage by fishing or lifting gear. Openings of such pipes should be protected by efficient means of closing, permanently attached to the pipe or adjacent structure, except that where the competent authority is satisfied that they are protected against water trapped on deck, these means of closing may be omitted.

.5 Where air pipes are situated near the side of the vessel their height above deck to the point where water may have access below should be at least 760 mm on the working deck and at least 450 mm on the superstructure deck. The competent authority may accept reduction of the height of an air pipe to avoid interference with the fishing operations.

6.7.4 In offshore supply vessels air pipes and ventilators should comply with the following:

.1 Air pipes and ventilators should be fitted in protected positions in order to avoid damage by cargo during operations and to minimize the possibility of flooding. Air pipes on the exposed cargo and forecastle decks should be fitted with automatic closing devices.

.2 Due regard should be given to the position of machinery space ventilators. Preferably they should be fitted in a position above the superstructure deck, or above an equivalent level if no superstructure deck is fitted.

6.8 <u>Freeing ports</u>

6.8.1 Where bulwarks on the weather portion of freeboard or superstructure or, in fishing vessels, working deck form wells, freeing ports shall be arranged along the length of the bulwark as to ensure that the deck is freed of water most rapidly and effectively. Lower edges of freeing ports shall be as near the deck as practicable.

6.8.2* In ships to which the International Convention on Load Lines, 1966, applies freeing ports shall comply with regulation 24 of this Convention, which is as follows:

.1 Except as provided in paragraphs .2 and .3, the minimum freeing port area (A) on each side of the ship for each well on the freeboard deck shall be that given by the following formulae in cases where the sheer in way of the well is standard or greater than standard. The minimum area for each well on superstructure decks shall be one-half of the area given by the formulae.

Where the length of bulwark (ℓ) in the well is 20 m or less,

$A = 0.7 + 0.035\,\ell$ square metres;

where ℓ exceeds 20 metres,

$A = 0.07\,\ell$ square metres;

(in no case ℓ should be taken greater than 0.7 L).

If the bulwark is more than 1.2 m in average height the required area shall be increased by 0.004 square metres per metre of length of well for each 0.1 m difference in height. If the bulwark is less than 0.9 m in average height, the required area may be decreased by 0.004 square metres per metre of length of well for each 0.1 m difference in height.

.2* In ships with no sheer the calculated area shall be increased by 50 per cent. Where the sheer is less than the standard, the percentage shall be obtained by interpolation.

.3* Where a ship is fitted with a trunk which does not comply with the requirements of regulation 36(1)(e) of the International Convention on Load Lines, 1966, or where continuous or substantially continuous hatchway side coamings are fitted between detached superstructures the minimum area of the freeing port openings shall be calculated from the following table:

Breadth of hatchway or trunk in relation to the breadth of ship	Area of freeing ports in relation to the total area of the bulwarks
40 per cent or less 75 per cent or more	20 per cent 10 per cent

The area of freeing ports at intermediate breadths shall be obtained by linear interpolation.

.4* In ships having superstructures which are open at either or both ends, adequate provision for freeing the space within such superstructures shall be provided to the satisfaction of the Administration.

.5* Two thirds of the freeing port area required shall be provided in the half of the well nearest the lowest point of the sheer curve.

.6* All such openings in the bulwarks shall be protected by rails or bars spaced approximately 230 mm apart. If shutters are fitted to freeing ports, ample clearance shall be provided to prevent jamming. Hinges shall have pins or bearings of non-corrodible material. If shutters are fitted with securing appliances, these appliances shall be of approved construction.

6.8.3 In decked fishing vessels of 12 m in length and over, freeing ports should comply with the following:

.1 The minimum freeing port area (A) in square metres, on each side of the vessel for each well on the working deck should be determined in relation to the length (ℓ) and height of bulwark in the well as follows:

.1.1 $A = K \times \ell$

where: K = 0.07 for vessels of 24 m in length and over

K = 0.035 for vessels of 12 m in length;

for intermediate lengths the value of K should be obtained by linear interpolation (ℓ need not be taken as greater than 70 per cent of the vessel's length).

.1.2 Where the bulwark is more than 1.2 m in average height the required area should be increased by 0.004 square metres per metre of length of well for each 0.1 m difference in height.

.1.3 Where the bulwark is less than 0.9 m in average height, the required area may be decreased by 0.004 square metres per metre of length of well for each 0.1 m difference in height.

.2 The freeing port area calculated according to .1 should be increased where the Administration or competent authority considers that the vessel's sheer is not sufficient to ensure rapid and effective freeing of the deck of water.

.3 Subject to the approval of the Administration or competent authority, the minimum freeing port area for each well on the superstructure deck should be not less than one half the area (A) given in .1 except that where the superstructure deck forms a working deck for fishing operations the minimum area each side should be not less than 75 per cent of the area (A).

.4 Freeing ports should be so arranged along the length of bulwarks as to provide the most rapid and effective freeing of the deck from water. Lower edges of freeing ports should be as near the deck as practicable.

.5 Poundboards and means for stowage and working the fishing gear should be arranged so that the effectiveness of the freeing ports will not be impaired or water trapped on deck and prevented from easily reaching the freeing ports. Poundboards should be so constructed that they can be locked in position when in use and will not hamper the discharge of shipped water.

.6 Freeing ports over 0.3 m in depth should be fitted with bars spaced not more than 0.23 m more less than 0.15 m apart or provided with other suitable protective arrangements. Freeing port covers, if fitted, should be of approved construction. If devices are considered necessary for locking freeing port covers during fishing operations they should be to the satisfaction of the competent authority and easily operable from a readily accessible position.

.7 In vessels intended to operate in areas subject to icing, covers and protective arrangements from freeing ports should be capable of being easily removed to restrict ice accumulation. Size of opening and means provided for removal of these protective arrangements should be to the satisfaction of the competent authority.

.8 In addition, in fishing vessels of 12 m in length and above but less than 24 m in length where wells or cockpits are fitted in the working deck or superstructure deck with their bottoms above the deepest operating waterline, efficient non-return means of drainage overboard should be provided. Where bottoms of such wells or cockpits are below the deepest operating waterline, drainage to the bilges will have to be provided.

6.8.4 In offshore supply vessels the Administration should give special attention to adequate drainage of pipe stowage positions, having regard to the individual characteristics of the vessel. However, the area provided for drainage of the pipe stowage positions should be in excess of the required freeing port area in the cargo deck bulwark and should not be fitted with shutters.

6.9 <u>Miscellaneous</u>

6.9.1 Ships engaged in towing operations should be provided with means for quick release of the towing hawser.

CHAPTER 7 - DETERMINATION OF LIGHTSHIP DISPLACEMENT AND CENTRES OF GRAVITY

7.1 Application

7.1.1* Every passenger ship regardless of size and every cargo ship having a length, as defined in the International Convention on Load Lines in force, of length 24 m and upwards, shall be inclined upon its completion and the elements of its stability determined.

7.1.2 Where any alterations are made to a ship so as to materially affect the stability, the ship shall be re-inclined.

7.1.3* At periodic intervals not exceeding five years, a lightweight survey shall be carried out on all passenger ships to verify any changes in lightship displacement and longitudinal centre of gravity. The ship shall be re-inclined whenever, in comparison with the approved stability information, a deviation from the lightship displacement exceeding 2 per cent or a deviation of the longitudinal centre of gravity exceeding 1 per cent of L is found, or anticipated.

7.1.4 The Administration may allow the inclining test of an individual ship as required by paragraph 7.1.1 to be dispensed with provided basic stability data are available from the inclining test of a sister ship and it is shown to the satisfaction of the Administration that reliable stability information for the exempted ship can be obtained from such basic data.

7.1.5 The Administration may allow the inclining test of an individual ship or class of ships especially designed for the carriage of liquids or ore in bulk to be dispensed with when reference to existing data for similar ships clearly indicates that due to the ship's proportions and arrangements more than sufficient metacentric height will be available in all probable loading conditions.

7.1.6 The inclining test prescribed is adaptable for ships with a length below 24 m if special precautions are taken to ensure the accuracy of the test procedure.

7.2 Definitions

For the purpose of this chapter, unless expressly provided otherwise:

7.2.1 Certification of the test weights is the verification of the weight marked on a test weight. Test weights should be certified using a certificated scale. The weighing should be performed close enough in time to the inclining test to ensure the measured weight is accurate.

7.2.2 Draught is the vertical distance from the moulded baseline to the waterline.

7.2.3 The inclining test involves moving a series of known weights, normally in the transverse direction, and then measuring the resulting change in the equlibrium heel angle of the ship. By using this information and applying basic naval architecture principles, the ship's vertical centre of gravity (VCG) is determined.

7.2.4 Lightship condition is a ship complete in all respects, but without consumables, stores, cargo, crew and effects, and without any liquids on board except that machinery and piping fluids, such as lubricants and hydraulics, are at operating levels.

7.2.5 A lightweight survey involves taking an audit of all items which must be added, deducted or relocated on the ship at the time of the inclining test so that the observed condition of the ship can be adjusted to the light ship condition. The weight, longitudinal, transverse and vertical location of each item must be accurately determined and recorded. Using this information, the static waterline of the ship at the time of the inclining test as determined from measuring the freeboard or verified draught marks of the ship, the ship's hydrostatic data, and the sea water density; the lightship displacement and longitudinal centre of gravity (LCG) can be obtained. The transverse centre of gravity (TCG) may also be determined for mobile offshore drilling units (MODUs) and other ships which are asymmetrical about the centreline or whose internal arrangement or outfitting is such that an inherent list may develop from off-centre weight.

7.3 Preparations for the inclining test

7.3.1 Notification of the Administration

Written notification of the inclining test must be sent to the Administration as it requires or in due time before the test. An Administration representative should be present to witness the inclining test and the test results be submitted for review.

The responsibility for making preparations, conducting the inclining test and lightweight survey, recording the data, and calculating the results rests with the shipyard, owner or naval architect. While compliance with the procedures outlined herein will facilitate an expeditious and accurate inclining test, it is recognized that alternative procedures or arrangements may be equally efficient. However, to minimize risk of delay, it is recommended that all such variances be submitted to the Administration for review prior to the inclining test.

7.3.1.1 Details of notification

Written notification should provide the following information as the Administration may require:

.1 identification of the ship by name and shipyard hull number, if applicable;

.2 date, time, and location of the test;

.3 inclining weight data:

- .1 type;
- .2 amount (number of units and weight of each);
- .3 certification;
- .4 method of handling (i.e. sliding rail or crane);
- .5 anticipated maximum angle of heel to each side;

.4 pendulums - approximate location and length (if a substitution is desired, an inclinometer or other measuring device may be substituted for one of the two required pendulums, prior approval must be obtained from the Administration. The Administration might require that the devices be used in addition to the pendulums on one or more inclinings to verify their accuracy before allowing actual substitution for a pendulum);

.5 approximate trim;

.6 condition of tanks;

.7 estimated weights to deduct, to complete, and to relocate in order to place the ship in its true light ship condition;

.8 detailed description of any computer software to be used to aid in calculations during the inclining test;

.9 name and phone number of the person responsible for conducting the inclining test.

7.3.2 General condition of the ship

7.3.2.1 A ship should be as complete as possible at the time of the inclining test. The test should be scheduled to minimize the disruption in the ship's delivery date or its operational commitments.

7.3.2.2 The amount and type of work left to be completed (weights to be added) affect the accuracy of the lightship characteristics, so good judgement must be used. If the weight or centre of gravity of an item to be added cannot be determined with confidence, it is best to conduct the inclining test after the item is added.

7.3.2.3 Temporary material, tool boxes, staging, sand, debris, etc., on board should be reduced to absolute minimum before the inclining test. Excess crew or personnel not directly involved in the incline test should be removed from on board the ship before the test.

7.3.2.4 Decks should be free of water. Water trapped on deck may shift and pocket in a fashion similar to liquids in a tank. Any rain, snow or ice accumulated on the ship should be removed prior to the test.

7.3.2.5 The anticipated liquid loading for the test should be included in the planning for the test. Preferably, all tanks should be empty and clean, or completely full. The number of slack tanks should be kept to an absolute minimum. The viscosity of the fluid, the depth of the fluid and the shape of the tank should be such that the free surface effect can be accurately determined.

7.3.2.6 The ship should be moored in a quiet, sheltered area free from extraneous forces such as propeller wash from passing vessels, or sudden discharges from shore side pumps. The tide conditions and the trim of the ship during the test must be considered. Prior to the test, the depth of water should be measured and recorded in as many locations as are necessary to ensure that the ship will not contact the bottom. The water specific gravity should be accurately recorded. The ship must be moored in a manner to allow unrestricted heeling. The access ramps should be removed. Power lines, hoses, etc., connected to shore should be at a minimum, and kept slack at all times.

7.3.2.7 The ship should be as upright as possible and have sufficient draught so that any abrupt changes in the waterplane will be avoided as the ship is inclined from side to side. A deviation from design trim of up to 1 per cent of L is normally acceptable when using hydrostatic data calculated at design trim. Otherwise, the hydrostatic data should be calculated for the actual trim. Caution should be exercised when applying the "1 per cent rule of thumb" to ensure that excessive error, as would result from a significant change in the waterplane area during heeling, is not introduced into the stability calculations. With inclining weights in the initial position, up to one-half degree of list is acceptable.

7.3.2.8 The total weight used should preferably be sufficient to provide a minimum inclination of two degrees and a maximum of four degrees of heel to each side. However, a minimum inclination of one degree to each side may be accepted for large ships. Test weights should be compact and of such a configuration that the VCG (vertical centre of gravity) of the weights can be accurately determined. Each weight should be marked with an identification number and its weight. Recertification of the test weights should be carried out prior to the incline. A crane of sufficient capacity and reach, or some other means, must be available during the inclining test to shift weights on the deck in an expeditious and safe manner. Water ballast is generally not acceptable as inclining weight. However, water ballast transfer may be permitted when it is absolutely impractical to incline using solid weights if acceptable to the Administration.

7.3.2.9 The use of three pendulums is recommended but a minimum of two must be used to allow identification of bad readings at any one pendulum station. They should each be located in an area protected from the wind. The pendulums should be long enough to give a measured deflection, to each side of upright, of at least 15 cm. To ensure recordings from individual instruments are kept separate, it is suggested that the pendulums be physically located as far apart as practical.

The use of an inclinometer or U-tube will be considered in each separate case. It is recommended that inclinometers or other measuring devices only be used in conjunction with at least one pendulum.

7.3.2.10 Efficient two-way communications must be provided between central control and the weight handlers and between central control and each pendulum station. One person at a central control station should have complete control over all personnel involved in the test.

7.4 <u>Plans required</u>

The person in charge of the inclining test should have available a copy of the following plans at the time of the inclining test:

.1 lines plan;

.2 curves of form (hydrostatic curves) or hydrostatic data;

.3 general arrangement plan of decks, holds, inner bottoms, etc.;

.4 capacity plan showing capacities and vertical and longitudinal centres of gravity of cargo spaces, tanks, etc.;

.5 tank sounding tables;

.6 draught mark locations; and

.7 docking drawing with keel profile and draught mark corrections (if available).

7.5 Test procedure

7.5.1 Procedures followed in conducting the inclining test and lightweight survey should be in accordance with the recommendations laid out in annex 1 to this Code.

7.5.1.1 Freeboard/draught readings should be taken to establish the position of the waterline in order to determine the displacement of the ship at the time of the inclining test. It is recommended that at least five freeboard readings, approximately equally spaced, be taken on each side of the ship or that all draught marks (forward, midship and aft) be read on each side of the ship. Draught/freeboard readings should be read immediately before or immediately after the inclining test.

7.5.1.2 The standard test employs eight distinct weight movements. Movement No.8, a recheck of the zero point, may be omitted if a straight line plot is achieved after Movement No.7. If a straight line plot is achieved after the initial zero and six weight movements, the inclining test is complete and the second check at zero may be omitted. If a straight line plot is not achieved, those weight movements that did not yield acceptable plotted points must be repeated or explained.

7.5.2 A copy of the inclining data should be forwarded to the Administration along with the calculated results of the inclining test in an acceptable report format, if required.

7.5.3 All calculations performed during the inclining test and in preparation of an inclining test report may be carried out by a suitable computer program. Output generated by such a program may be used for presentation of all or partial data and calculations included in the test report if it is clear, concise, well documented, and generally consistent in form and content with Administration requirements.

7.6 Determination of ship's stability by means of rolling period tests (for ships up to 70 m in length)

7.6.1 Recognizing the desirability of supplying to masters of small ships instructions for a simplified determination of initial stability, attention was given to the rolling period tests. Studies on this matter showed that the rolling period test may be recommended as a useful means of approximately determining the initial stability of small ships when it is not practicable to give approved loading conditions or other stability information, or as a supplement to such information.

7.6.2 Investigations comprising the evaluation of a number of inclining and rolling tests according to various formulae showed that the following formula gave the best results and it has the advantage of being the simplest:

$$GM_o = \left(\frac{fB}{T_r}\right)^2$$

where:

f = factor for the rolling period (rolling coefficient) as given in 7.6.4;

B = breadth of the ship in metres;

T_r = time for a full rolling period in seconds (i.e. for one oscillation "to and fro" port - starboard - port, or vice versa).

7.6.3 The factor "f" is of the greatest importance and the data from the above tests were used for assessing the influence of the distribution of the various masses in the whole body of the loaded ship.

7.6.4 For coasters of normal size (excluding tankers) and fishing vessels, the following average values were observed:

	f-values
Empty ship or ship carrying ballast	$f \sim 0.88$
Ship fully loaded and with liquids in tanks comprising the following percentage of the total load on board (i.e. cargo, liquids, stores, etc.)	
20% of total load	$f \sim 0.78$
10% of total load	$f \sim 0.75$
5% of total load	$f \sim 0.73$
Double boom shrimp fishing boats	$f \sim 0.95$
Deep sea fishing boats	$f \sim 0.80$
Boats with a live fish well	$f \sim 0.60$

The stated values are mean values. Generally, observed f-values were within ± 0.05 of those given above.

7.6.5 The above f-values were based upon a series of limited tests and, therefore, Administrations should re-examine these in the light of any different circumstances applying to their own ships.

7.6.6 It must be noted that the greater the distance of masses from the rolling axis, the greater the rolling coefficient will be. Therefore it can be expected that:

.1 the rolling coefficient for an unloaded ship, i.e. for a hollow body, will be higher than that for a loaded ship; and

.2 the rolling coefficient for a ship carrying a great amount of bunkers and ballast - both groups are usually located in the double bottom, i.e. far away from the rolling axis - will be higher than that of the same ship having an empty double bottom.

7.6.7 The above recommended rolling coefficients were determined by tests with ships in port and with their consumable liquids at normal working levels; thus, the influences exerted by the vicinity of the quay, the limited depth of water and the free surfaces of liquids in service tanks are covered.

7.6.8 Experiments have shown that the results of the rolling test method get increasingly less reliable the nearer they approach GM-values of 0.20 m and below.

7.6.9 For the following reasons, it is not generally recommended that results be obtained from rolling oscillations taken in a seaway:

.1 exact coefficients for tests in open waters are not available;

.2 the rolling periods observed may not be free oscillations but forced oscillations due to seaway;

.3 frequently, oscillations are either irregular or only regular for too short an interval of time to allow accurate measurements to be observed; and

.4 specialized recording equipment is necessary.

7.6.10 However, sometimes it may be desirable to use the ship's period of roll as a means of approximately judging the stability at sea. If this is done, care should be taken to discard readings which depart appreciably from the majority of other observations. Forced oscillations corresponding to the sea period and differing from the natural period at which the ship seems to move should be disregarded. In order to obtain satisfactory results, it may be necessary to select intervals when the sea action is least violent and it may be necessary to discard a considerable number of observations.

7.6.11 In view of the foregoing circumstances, it needs to be recognized that the determination of the stability by means of the rolling test in disturbed waters should only be regarded as a very approximate estimation.

7.6.12 The formula given in paragraph 7.6.2 above can be reduced to:

$$GM_o = \frac{F}{T_r^2}$$

and the Administration should determine the F-value(s) for each ship.

7.6.13 The determination of the stability can be simplified by giving the master permissible rolling periods, in relation to the draughts, for the appropriate value(s) of F considered necessary.

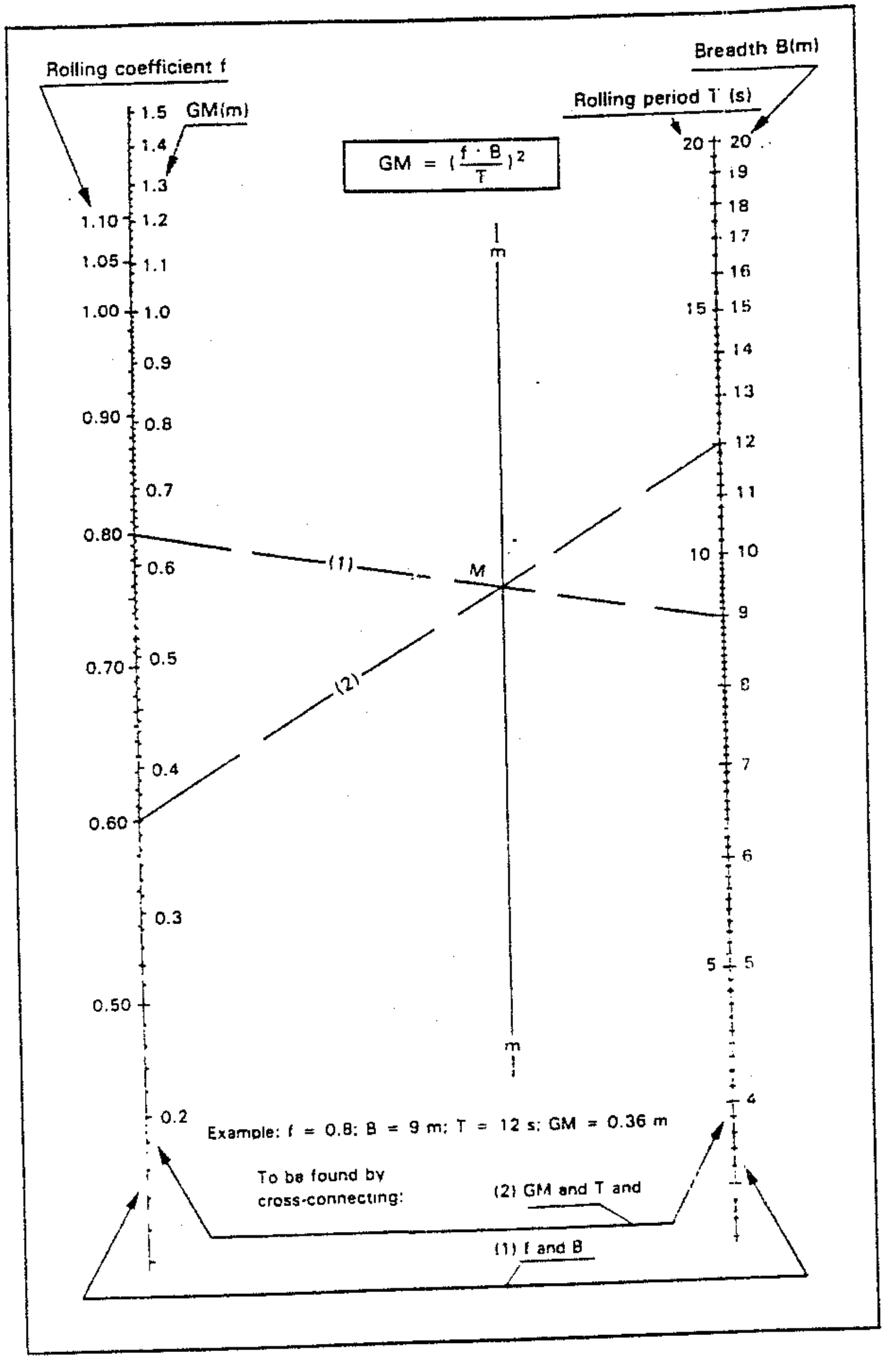
7.6.14 The initial stability may also be more easily determined graphically by using the attached sample nomogram as described below:

.1 The values for B and f are marked in the relevant scales and connected by a straight line (1). This straight line intersects the vertical line (mm) at the point (M).

.2 A second straight line (2) which connects this point (M) and the point on the T_r scale corresponding with the determined rolling period, intersects the GM scale at the requested value.

7.6.15 Section 7.6.16 shows an example of a recommended form in which these instructions might be presented by each Administration to the masters. It is considered that each Administration should recommend the F-value or values to be used.

DIAGRAM


Rolling coefficient f
GM(m)
Breadth B(m)
Rolling period T (s)
GM = (f · B / T)²
M
(1)
(2)
m
m
Example: f = 0.8; B = 9 m; T = 12 s; GM = 0.36 m
To be found by cross-connecting:
(2) GM and T and
(1) f and B

7.6.16 Test procedure

7.6.16.1 The rolling period required is the time for one complete oscillation of the ship and to ensure the most accurate results in obtaining this value the following precautions should be observed:

.1 The test should be conducted with the ship in harbour, in smooth water with the minimum interference from the wind and tide.

.2 Starting with the ship at the extreme end of a roll to one side (say port) and the ship about to move towards the upright, one complete oscillation will have been made when the ship has moved right across to the other extreme side (i.e. starboard) and returned to the original starting point and is about to commence the next roll.

.3 By means of a stop-watch, the time should be taken for not less than about 5 of these complete oscillations; the counting of these oscillations should begin when the ship is at the extreme end of a roll. After allowing the roll to completely fade away, this operation should be repeated at least twice more. If possible, in every case the same number of complete oscillations should be timed to establish that the readings are consistent, i.e. repeating themselves within reasonable limits. Knowing the total time for the total number of oscillations made, the mean time for one complete oscillation can be calculated.

.4 The ship can be made to roll by rhythmically lifting up and putting down a weight as far off middle-line as possible; by pulling on the mast with a rope; by people running athwartships in unison; or by any other means. However, and this is most important, as soon as this forced rolling has commenced the means by which it has been induced must be stopped and the ship allowed to roll freely and naturally. If rolling has been induced by lowering or raising a weight it is preferable that the weight is moved by a dockside crane. If the ship's own derrick is used, the weight should be placed on the deck, at the middle-line, as soon as the rolling is established.

.5 The timing and counting of the oscillations should only begin when it is judged that the ship is rolling freely and naturally, and only as much as is necessary to accurately count these oscillations.

.6 The mooring should be slack and the ship "breasted off" to avoid making any contact during its rolling. To check this, and also to get some idea of the number of oscillations that can be reasonably counted and timed, a preliminary rolling test should be made before starting to record actual times.

.7 Care should be taken to ensure that there is a reasonable clearance of water under the keel and at the sides of the ship.

.8 Weights of reasonable size which are liable to swing (e.g. a lifeboat), or liable to move (e.g. a drum), should be secured against such movement. The free surface effects of slack tanks should be kept as small as is practicable during the test and the voyage.

7.6.16.2 Limitations to the use of this method

.1 A long period of roll corresponding to a GM_O of 0.20 m or below, indicates a condition of low stability. However, under such circumstances, accuracy in determination of the actual value of GM_O is reduced.

.2 If, for some reason, these rolling tests are carried out in open, deep but smooth waters, inducing the roll, for example, by putting over the helm, then the GM_O calculated by using the method and coefficient of paragraph 3.6.16 above should be reduced by (figure to be estimated by the Administration) to obtain the final answer.

.3 The determination of stability by means of the rolling test in disturbed waters should only be regarded as a very approximate estimation. If such test is performed, care should be taken to discard readings which depart appreciably from the majority of other observations. Forced oscillations corresponding to the sea period and differing from the natural period at which the vessel seems to move should be disregarded. In order to obtain satisfactory results, it may be necessary to select intervals when the sea action is least violent and it may be necessary to discard a considerable number of observations.

7.7. Inclining test for MODUs

7.7.1 An inclining test should be required for the first unit of a design, when as near to completion as possible, to determine accurately the lightship data (weight and position of centre of gravity).

7.7.2 For successive units which are identical by design, the lightship data of the first unit of the series may be accepted by the Administration in lieu of an inclining test, provided the difference in lightship displacement or position of centre of gravity due to weight changes for minor differences in machinery, outfitting or equipment, confirmed by the results of a deadweight survey, are less than 1% of the values of the lightship displacement and principal horizontal dimensions as determined for the first of the series. Extra care should be given to the detailed weight calculation and comparison with the original unit of a series of column-stabilized, semi-submersible types as these, even though identical by design, are recognized as being unlikely to attain an acceptable similarity of weight or centre of gravity to warrant a waiver of the inclining test.

7.7.3 The results of the inclining test, or deadweight survey and inclining experiment adjusted for weight differences, should be indicated in the Operating Manual.

7.7.4 A record of all changes to machinery, structure, outfit and equipment that affect the lightship data, should be maintained in the Operating Manual or a lightship data alterations log and be taken into account in daily operations.

7.7.5 For column-stabilized units, a deadweight survey should be conducted at intervals not exceeding five years. Where the deadweight survey indicates a change from the calculated lightship displacement in excess of 1% of the operating displacement, an inclining test should be conducted.

7.7.6 Inclining test or deadweight survey should be carried out in the presence of an officer of the Administration, or a duly authorized person or representative of an approved organization.

7.8. Stability test for pontoons

An inclining experiment is not normally required for a pontoon, provided a conservative value of the lightship vertical centre of gravity (KG) is assumed for the stability calculations. The KG can be assumed at the level of the main deck although it is recognized that a lesser value could be acceptable if fully documented. The lightship displacement and longitudinal centre of gravity should be determined by calculation based on draught and density readings.

ANNEX 1

DETAILED GUIDANCE FOR THE CONDUCT OF AN INCLINING TEST

CONTENTS

1 INTRODUCTION

This annex supplements the inclining standards put forth in chapter 7 of this Code. This annex contains important detailed procedures for conducting an inclining test in order to ensure that valid results are obtained with maximum precision at a minimal cost to owners, shipyards and the Administration. A complete understanding of the correct procedures used to perform an inclining test is imperative in order to ensure that the test is conducted properly and so that results can be examined for accuracy as the inclining experiment is conducted.

2 PREPARATIONS FOR THE INCLINING TEST

2.1 Free surface and tankage

2.1.1 If there are liquids on board the ship when it is inclined, whether in the bilges or in the tanks, it will shift to the low side when the ship heels. This shift of liquids will exaggerate the heel of the ship. Unless the exact weight and distance of liquid shifted can be precisely calculated, the metacentric height (GM) calculated from the incline test will be in error. Free surface should be minimized by emptying the tanks completely and making sure all bilges are dry; or by completely filling the tanks so that no shift of liquid is possible. The latter method is not the optimum because air pockets are difficult to remove from between structural members of a tank, and the weight and centre of the liquid in a full tank must be accurately determined in order to adjust the light ship values accordingly. When tanks must be left slack, it is desirable that the sides of the tanks be parallel vertical planes and the tanks be regular in shape (i.e. rectangular, trapezoidal, etc.) when viewed from above, so that the free surface moment of the liquid can be accurately determined. For example, the free surface moment of the liquid in a tank with parallel vertical sides can be readily calculated by the formula:

$$\text{Free surface moment (m-tonnes)} = lb^3/12Q$$

where: l = length of tank (m)
b = breadth of tank (m)
Q = specific volume of liquid in tank (m^3/tonne)
(Measure Q directly with a hydrometer).

$$\text{Free surface correction (m)} = \frac{\text{Sum (FSM(1) + FSM(2) + ... + FSM(x))}}{\text{displ}}$$

where: FSM = free surface moment (m-tonnes)
displ = displacement (tonnes)

Free surface correction is independent of the height of the tank in the ship, location of the tank, and direction of heel. As the width of the tank increases, the value of free surface moment increases by the third power. The distance available for the liquid to shift is the predominant factor. This is why even the smallest amount of liquid in the bottom of a wide tank or bilge is normally unacceptable and should be removed prior to the inclining experiment. Insignificant amounts of liquids in V-shaped tanks or voids (e.g. a chain locker in the bow), where the potential shift is negligible, may remain if removal of the liquid would be difficult or would cause extensive delays.

2.1.2 Free surface and slack tanks - The number of slack tanks should normally be limited to one port/starboard pair or one centreline tank of the following:

.1 fresh water reserve feed tanks;

.2 fuel/diesel oil storage tanks;

.3 fuel/diesel oil day tanks;

.4 lube oil tanks;

.5 sanitary tanks; or

.6 potable water tanks.

To avoid pocketing, slack tanks should normally be of regular (i.e. rectangular, trapezoidal, etc.) cross section and be 20% to 80% full if they are deep tanks and 40% to 60% full if they are double bottom tanks. These levels ensure that the rate of shifting of liquid remains constant throughout the heel angles of the inclining test. If the trim changes as the ship is inclined, then consideration should also be given to longitudinal pocketing. Slack tanks containing liquids of sufficient viscosity to prevent free movement of the liquids, as the ship is inclined (such as bunker at low temperature), should be avoided since the free surface cannot be calculated accurately. A free surface correction for such tanks should not be used unless the tanks are heated to reduce viscosity. Communication between tanks should never be allowed. Cross connections, including those via manifolds, should be closed. Equal liquid levels in slack tank pairs can be a warning sign of open cross connections. A bilge, ballast, and fuel oil piping plan can be referred to, when checking for cross connection closures.

2.1.3 Pressed up tanks - "Pressed up" means completely full with no voids caused by trim or inadequate venting. Anything less than 100% full, for example the 98% condition regarded as full for operational purposes, is not acceptable. Preferably, the ship should be rolled from side to side to eliminate entrapped air before taking the final sounding. Special care should be taken when pressing fuel oil tanks to prevent accidental pollution. An example of a tank that would appear "pressed up", but actually contains entrapped air is shown in figure 2.1.3.

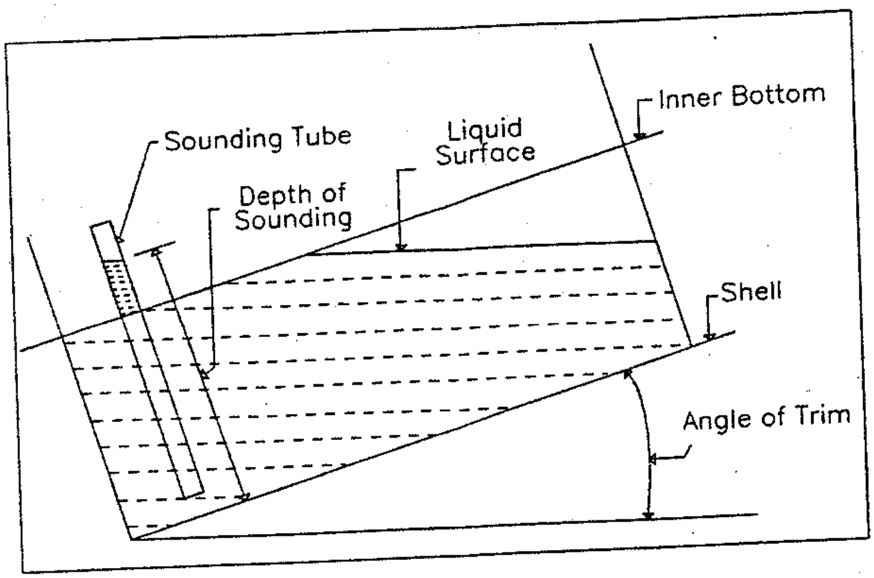


Figure 2.1.3

2.1.4 Empty tanks - It is generally not sufficient to simply pump tanks until suction is lost. Enter the tank after pumping to determine if final stripping with portable pumps or by hand is necessary. The exceptions are very narrow tanks or tanks where there is a sharp deadrise, since free surface would be negligible. Since all empty tanks must be inspected, all manholes must be open and the tanks well ventilated and certified as safe for entry. A safe testing device should be on hand to test for sufficient oxygen and minimum toxic levels. A certified marine chemist's certificate certifying that all fuel oil and chemical tanks are safe for human entry should be available, if necessary.

2.2 Mooring arrangements

The importance of good mooring arrangements cannot be overemphasized. The arrangement selection will be dependent upon many factors. Among the most important are depth of water, wind, and current effects. Whenever possible the ship should be moored in a quiet, sheltered area free from extraneous forces such as propeller wash from passing vessels, or sudden discharges from shore side pumps. The depth of water under the hull should be sufficient to ensure that the hull will be entirely free of the bottom. The tide conditions and the trim of the ship during the test, should be considered. Prior to the test, the depth of water should be measured and recorded in as many locations as necessary to ensure the ship will not contact the bottom. If marginal, the test should be conducted during high tide or the ship moved to deeper water.

2.2.1 The ship should be held by lines at the bow and the stern, attached to temporary pad eyes installed as close as possible to the centreline of the ship and as near the water line as practical. If temporary pad eyes are not feasible then lines can be secured to bollards and/or cleats on the deck. This arrangement requires that the lines be slackened when the ship is heeled away from the dock. The preferred arrangement is with the ship lying in a slip where it can be moored as shown in figure 2.2.1. In this case, the lines can be kept taut to hold the ship in place, yet allow unrestricted heeling. Note, however, that wind and/or current may cause a superimposed heeling moment to act on the ship throughout the test. For steady conditions this will not affect the results. Gusty wind or uniformly varying wind and/or current will cause these superimposed heeling moments to change, which may require additional test points to obtain a valid test. The need for additional test points can be determined by plotting test points as they are obtained.

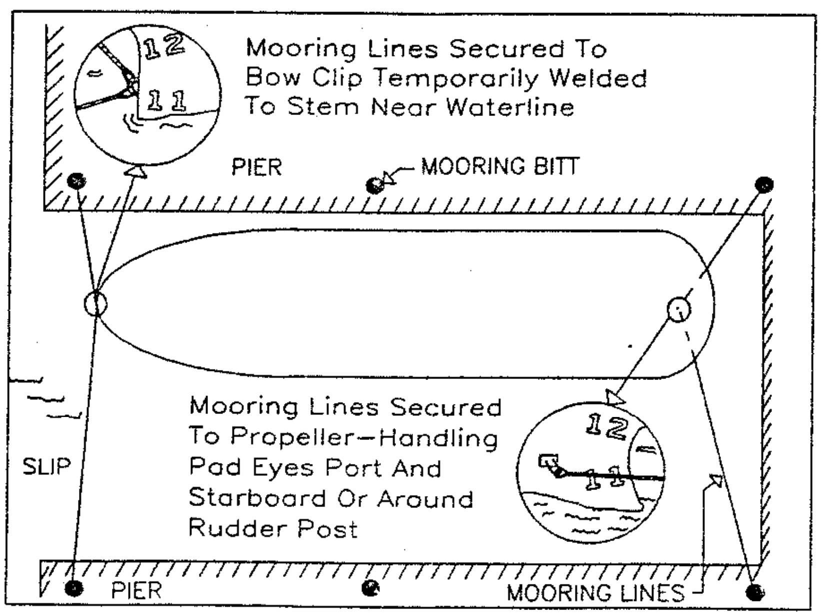


Figure 2.2.1

2.2.2 Where the ship can be moored to one side only, it is good practice to supplement the bow and stern lines with two spring lines in order to maintain positive control of the ship, as shown in figure 2.2.2. The leads of the spring lines should be as long as practicable. Cylindrical camels should be provided between the ship and the dock. All lines should be slack, with the ship free of the pier and camels, when taking readings.

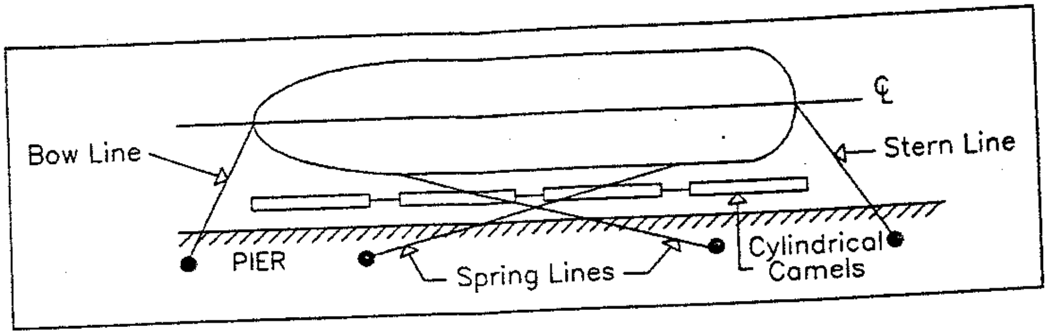


Figure 2.2.2

2.2.2.1 If the ship is held off the pier by the combined effect of the wind and current, and the bow and stern lines are secured at centreline near the waterline, they can be taut. This is essentially the same as the preferred arrangement described in 2.2.1 above. As in 2.2.1 above, varying wind and/or current will cause some distortion of the plot.

2.2.2.2 If the ship is pressed against the camels by wind and/or current, all lines should be slack. The cylindrical camels will prevent binding but again there will be an unavoidable superimposed heeling moment due to the ship bearing against the camels. This condition should be avoided but when used, consideration should be given to pulling the ship free of the dock and camels, and letting the ship drift as readings are taken.

2.2.2.3 Another acceptable arrangement is where the combined wind and current are such that the ship may be controlled by only one line at either the bow or the stern. In this case the control line need not be attached near the waterline, but it should be led from on or near the centre line of the ship. With all lines but one slack, the ship is free to veer with the wind and/or current as readings are taken. This can sometimes be troublesome because varying wind and/or current can cause distortion of the plot.

2.2.2.4 Alternate mooring arrangements should be considered if submitted for review prior to the test. Such arrangements should ensure that the ship will be free to list without restraint for a sufficient period of time to allow the pendulums to damp out motion so that the readings can be recorded.

2.2.3 If a floating crane is used for handling inclining weights, it should not be moored to the ship.

2.3 <u>Test weights</u>

2.3.1 Weights, such as porous concrete, that can absorb significant amounts of moisture, should only be used if they are weighed just prior to the inclining test or if recent weight certificates are presented. Each weight should be marked with an identification number and its weight. For small ships, drums completely filled with water may be used. Drums should normally be full and capped to allow accurate weight control. In such cases, the weight of the drums should be verified in the presence of the Administration representative using a recently calibrated scale.

2.3.2 Heeling the ship by liquid transfer should only be adopted when large ships with high GMs make solid weight transfer impacticable.

2.3.3 Precautions should be taken to ensure that the decks are not overloaded during weight movements. If deck strength is questionable then a structural analysis should be performed to determine if existing framing can support the weight.

2.3.4 Generally, the test weights should be positioned as far outboard as possible on the upper deck. The test weights should be on board and in place prior to the scheduled time of the inclining test.

2.3.5 Where water ballast is permitted, the following should be complied with:

.1 inclining tanks should be wall sided and free of large stringers (air pockets).

.2 tanks should be directly opposite to maintain ship's trim.

.3 specific gravity of ballast water should be measured and recorded.

.4 pipe lines to inclining tanks should be full.

.5 all ballast valves should be closed prior to the test. Strict valve control should be maintained during the test. If the water is transferred through manifolds or valve boxes, all valves to the branches not used should be tagged or locked to prevent opening during the test.

.6 all inclining tanks, should be manually sounded before and after each shift.

.7 calculations should account for the change of the VCG during test.

.8 accurate sounding/ullage tables should be provided.

2.4 Pendulums

2.4.1 The pendulums should be long enough to give a measured deflection, to each side of upright, of at least 15 centimetres. Generally, this will require a pendulum length of at least 3 metres. It is recommended that pendulum lengths of 4-6 metres be used. Usually, the longer the pendulum the greater the accuracy of the test; however, if excessively long pendulums are used on a tender ship the pendulums may not settle down and the accuracy of the pendulums would then be questionable. If the pendulums are of different lengths, the possibility of collusion between station recorders is avoided.

2.4.2 On smaller ships, where there is insufficient headroom to hang long pendulums, the 15 centimetres deflection should be obtained by increasing the test weight so as to increase the heel. On most ships the typical inclination is between one and four degrees.

2.4.3 The pendulum wire should be piano wire or other monofilament material. The top connection of the pendulum should afford unrestricted rotation of the pivot point. An example is that of a washer with the pendulum wire attached suspended from a nail.

2.4.4 A trough filled with a liquid should be provided to dampen oscillations of the pendulum after each weight movement. It should be deep enough to prevent the pendulum weight from touching the bottom. The use of a winged plumb bob at the end of the pendulum wire can also help to dampen the pendulum oscillations in the liquid.

2.4.5 The battens should be smooth, light-coloured wood, 1 to 2 centimetres thick, and should be securely fixed in position so that an inadvertent contact will not cause them to shift. The batten should be aligned close to the pendulum wire but not in contact with it.

2.4.6 A typical satisfactory arrangement is shown in figure 2.4.6. The pendulums may be placed in any location on the ship, longitudinally and transversely. The pendulums should be in place prior to the scheduled time of the inclining test.

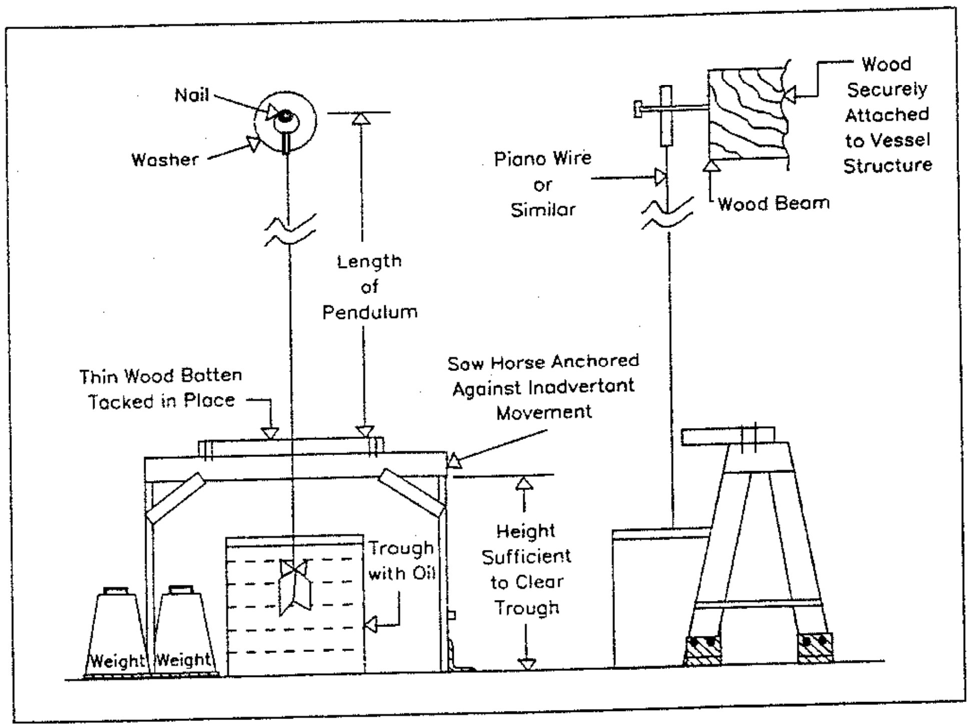


Figure 2.4.6

2.4.7 It is recommended that inclinometers or other measuring devices only be used in conjunction with at least one pendulum.

2.4.8 Where a U-tube is used, the following should be complied with:

.1 the ends of the device should be securely positioned as far outboard as possible.

.2 arrangements should be made for recording all readings at both ends. For easy reading and checking for air pockets clear plastic tube or hose should be used throughout.

.3 the horizontal distance between ends should be sufficient to obtain a level difference of at least 15 centimetres between the upright and the maximum inclination to each side.

3 EQUIPMENT REQUIRED

Besides the physical equipment necessary such as the inclining weights, pendulums, small boat, etc., the following are necessary and should be provided by or made available to the person in charge of the inclining:

.1 engineering scales for measuring pendulum deflections (rules should be subdivided sufficiently to achieve the desired accuracy);

.2 sharp pencils for marking pendulum deflections;

.3 chalk for marking the various positions of the inclining weights;

.4 a sufficiently long measuring tape for measuring the movement of the weights and locating different items on board;

.5 a sufficiently long sounding tape for sounding tanks and taking freeboard readings;

.6 one or more well maintained specific gravity hydrometers with range sufficient to cover 0.999 to 1.030, to measure the specific gravity of the water in which the ship is floating (a hydrometer for measuring specific gravity of less than 1.000 may be needed in some locations);

.7 other hydrometers as necessary to measure the specific gravity of any liquids on board;

.8 graph paper to plot inclining moments versus tangents;

.9 a straight edge to draw the measured waterline on the lines drawing;

.10 a pad of paper to record data;

.11 an explosion proof testing device to check for sufficient oxygen and absence of lethal gases in tanks and other closed spaces such as voids and cofferdams;

.12 a thermometer; and

.13 draught tubes (if necessary).

4 TEST PROCEDURE

The inclining experiment, the freeboard/draught readings and the survey may be conducted in any order and still achieve the same results. If the person conducting the inclining test is confident that the survey will show that the ship is in an acceptable condition and there is the possibility of the weather becoming unfavourable, then it is suggested that the inclining be performed first and the survey last. If the person conducting the test is doubtful that the ship is complete enough for the test, it is recommended that the survey be performed first since this could invalidate the entire test, regardless of the weather conditions. It is very important that all weights, the number of people on board, etc., remain constant throughout the test.

4.1 Initial walk through and survey

The person responsible for conducting the inclining test should arrive on board the ship well in advance of the scheduled time of the test to ensure that the ship is properly prepared for the test. If the ship to be inclined is large, a preliminary walk through may need to be done the day preceding the actual incline. To ensure the safety of personnel conducting the walk through, and to improve the documentation of surveyed weights and deficiencies, at least two persons should make the initial walk through. Things to check include: all compartments are open, clean, and dry, tanks are well ventilated and gas free, movable or suspended items are secured and their position documented, pendulums are in place, weights are on board and in place, a crane or other method for moving weights is available, and the necessary plans and equipment are available. Before beginning the inclining test, the person conducting the test should:

.1 consider the weather conditions. The combined adverse effect of wind, current and sea may result in difficulties or even an invalid test due to the following:

.1.1 inability to accurately record freeboards and draughts;

.1.2 excessive or irregular oscillations of the pendulums;

.1.3 variations in unavoidable superimposed heeling moments.

In some instances, unless conditions can be sufficiently improved by moving the ship to a better location, it may be necessary to delay or postpone the test. Any significant quantities of rain, snow, or ice must be removed from the ship before the test. If bad weather conditions are detected early enough and the weather forecast does not call for improving conditions, the Administration representative should be advised prior to departure from the office and an alternate date scheduled;

.2 make a quick overall survey of the ship to make sure the ship is complete enough to conduct the test and to ensure that all equipment is in place. An estimate of items which will be outstanding at the time of the inclining test should be included as part of any test procedure submitted to the Administration. This is required so that the Administration representative can advise the shipyard/naval architect if in their opinion the ship will not be sufficiently complete to conduct the incline and that it should be rescheduled. If the condition of the ship is not accurately depicted in the test procedure and at the time of the inclining test the Administration representative considers that the ship is in such condition that an accurate incline cannot be conducted, the representative may refuse to accept the incline and require that the incline be conducted at a later date;

.3 enter all empty tanks after it is determined that they are well ventilated and gas free to ensure that they are dry and free of debris. Ensure that any pressed up tanks are indeed full and free of air pockets. The anticipated liquid loading for the incline should be included in the procedure required to be submitted to the Administration;

.4 survey the entire ship to identify all items which need to be added to the ship, removed from the ship, or relocated on the ship to bring the ship to the lightship condition. Each item should be clearly identified by weight and vertical and longitudinal location. If necessary, the transverse location should also be recorded. The inclining weights, the pendulums, any temporary equipment and dunnage, and the people on board during the inclining test are all among the weights to be removed to obtain the lightship condition. The person calculating the lightship characteristics from the data gathered during the incline and survey and/or the person reviewing the inclining test may not have been present during the test and should be able to determine the exact location of the items from the data recorded and the ship's drawings. Any tanks containing liquids should be accurately sounded and the soundings recorded;

.4.1 it is recognized that the weight of some items on board, or that are to be added, may have to be estimated. If this is necessary, it is in the best interest of safety to be on the safe side when estimating, so the following rules of thumb should be followed:

.4.1.1 when estimating weights to be added:

- estimate high for items to be added high in the ship.
- estimate low for items to be added low in the ship.

.4.1.2 when estimating weights to be removed:

- estimate low for items to be removed from high in the ship.
- estimate high for items to be removed from low in the ship.

.4.1.3 when estimating weights to be relocated:

- estimate high for items to be relocated to a higher point in the ship.
- estimate low for items to be relocated to a lower point in the ship.

4.2 <u>Freeboard/draught readings</u>

4.2.1 Freeboard/draught readings are taken to establish the position of the waterline in order to determine the displacement of the ship at the time of the inclining test. It is recommended that at least five freeboard readings, approximately equally spaced, be taken on each side of the ship or that all draught marks (forward, midship, and aft) be read on each side of the ship. Draught mark readings should be taken to assist in determining the waterline defined by freeboard readings, or to verify the vertical location of draught marks on ships where their location has not been confirmed. The locations for each freeboard reading should be clearly marked. The longitudinal location along the ship must be accurately determined and recorded since the (moulded) depth at each point will be obtained from the ship's lines. All freeboard measurements should include a reference note clarifying the inclusion of the coaming in the measurement and the coaming height.

4.2.2 Draught and freeboard readings should be read immediately before or immediately after the inclining test. Weights should be on board and in place and all personnel who will be on board during the test including those who will be stationed to read the pendulums, should be on board and in location during these readings. This is particularly important on small ships. If readings are made after the test, the ship should be maintained in the same condition as during the test. For small ships, it may be necessary to counterbalance the list and trim effects of the freeboard measuring party. When possible, readings should be taken from a small boat.

4.2.3 A small boat should be available to aid in the taking of freeboard and draught mark readings. It should have low freeboard to permit accurate observation of the readings.

4.2.4 The specific gravity of the flotation water should be determined at this time. Samples should be taken from a sufficient depth of the water to ensure a true representation of the flotation water and not merely surface water, which could contain fresh water from run off of rain. A hydrometer should be placed in a water sample and the specific gravity read and recorded. For large ships, it is recommended that samples of the flotation water be taken forward, midship, and aft and the readings averaged. For small ships, one sample taken from midships should be sufficient. The temperature of the water should be taken and the measured specific gravity corrected for deviation from the standard, if necessary. A correction to water specific gravity is not necessary if the specific gravity is determined at the inclining experiment site. Correction is necessary if specific gravity is measured when sample temperature differs from the temperature at the time of the inclining (e.g., if check of specific gravity is done at the office).

4.2.5 A draught mark reading may be substituted for a given freeboard reading at that longitudinal location if the height and location of the mark has been verified to be accurate by a keel survey while the ship was in dry dock.

4.2.6 A device, such as a draught tube, can be used to improve the accuracy of freeboard/draught readings by damping out wave action.

4.2.7 The dimensions given on a ship's lines drawing are normally moulded dimensions. In the case of depth, this means the distance from the inside of the bottom shell to the inside of the deck plate. In order to plot the ship's waterline on the lines drawing, the freeboard readings should be converted to moulded draughts. Similarly, the draught mark readings should be corrected from extreme (bottom of keel) to moulded (top of keel) before plotting. Any discrepancy between the freeboard/draught readings should be resolved.

4.2.8 The mean draught (average of port and starboard reading) is calculated for each of the locations where freeboard/draught readings are taken and plotted on the ship's lines drawing or outboard profile to ensure that all readings are consistent and together define the correct waterline. The resulting plot should yield either a straight line or a waterline which is either hogged or sagged. If inconsistent readings are obtained, the freeboards/draughts should be retaken.

4.3 <u>The incline</u>

4.3.1 Prior to any weight movements the following should be checked:

.1 the mooring arrangement should be checked to ensure that the ship is floating freely. (This should be done just prior to each reading of the pendulums).

.2 the pendulums should be measured and their lengths recorded. The pendulums should be aligned so that when the ship heels, the wire will be close enough to the batten to ensure an accurate reading but will not come into contact with the batten. The typical satisfactory arrangement is shown in figure 2.4.6.

.3 the initial position of the weights is marked on the deck. This can be done by tracing the outline of the weights on the deck.

.4 the communications arrangement is adequate.

.5 all personnel are in place.

4.3.2 A plot should be run during the test to ensure that acceptable data is being obtained. Typically, the abscissa of the plot will be heeling moment (weight times distance) and the ordinate will be the tangent of the heel angle (deflection of the pendulum divided by the length of the pendulum). This plotted line does not necessarily pass through the origin or any other particular point for no single point is more significant than any other point. A linear regression analysis is often used to fit the straight line. The weight movements shown in figure 4.3.2-1 give a good spread of points on the test plot.

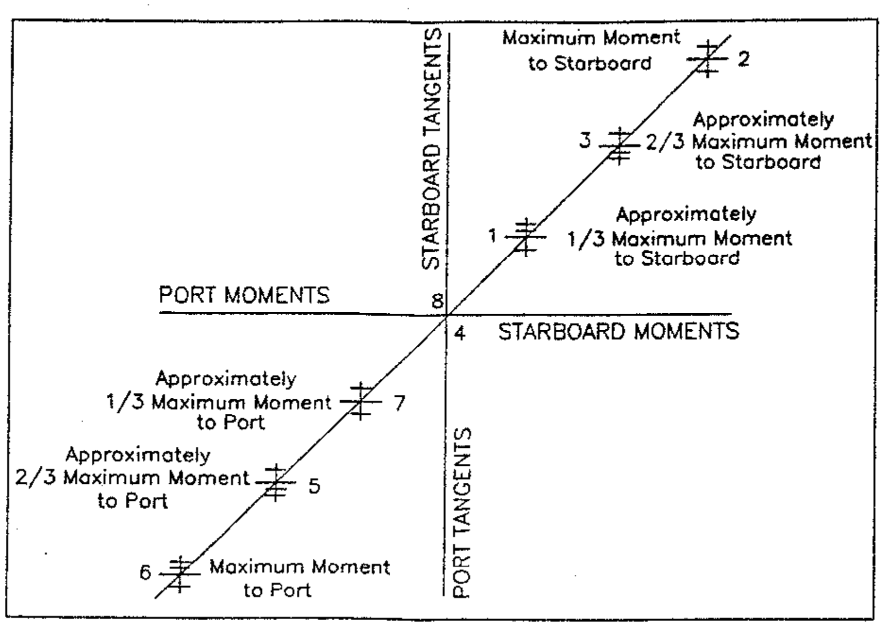
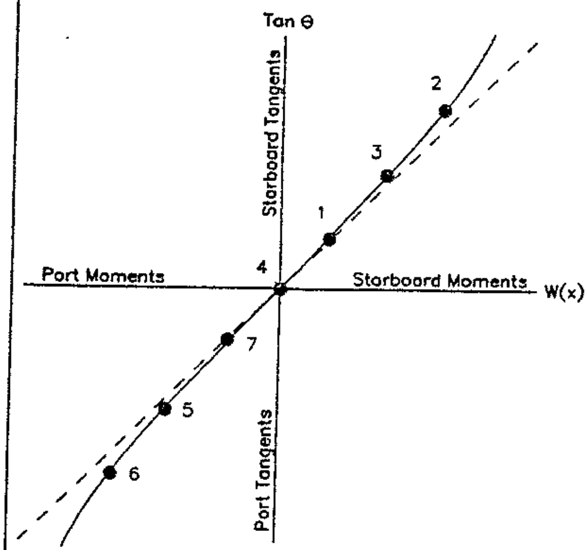


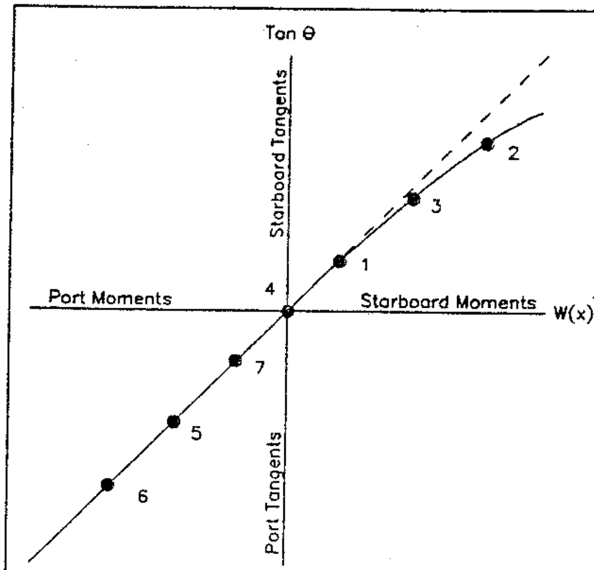
Figure 4.3.2-1

Plotting all of the readings for each of the pendulums during the inclining experiment aids in the discovery of bad readings. Since (W)(x)/tan θ should be constant, the plotted line should be straight. Deviations from a straight line are an indication that there were other moments acting on the ship during the inclining. These other moments should be identified, the cause corrected, and the weight movements repeated until a straight line is achieved. Figures 4.3.2-2 through 4.3.2-5 illustrate examples of how to detect some of these other moments during the inclining, and a recommended solution for each case. For simplicity, only the average of the readings is shown on the inclining plots.



EXCESSIVE FREE LIQUIDS (RE–CHECK ALL TANKS AND VOIDS AND PUMP OUT AS NECESSARY: RE–DO ALL WEIGHT MOVEMENTS AND RE–CHECK FREEBOARD AND DRAFT READINGS)

Figure 4.3.2–2



SHIP TOUCHING BOTTOM OR RESTRAINED BY MOORING LINES (TAKE WATER SOUNDINGS AND CHECK LINES: RE–DO WEIGHT MOVEMENTS 2 AND 3)

Figure 4.3.2–3

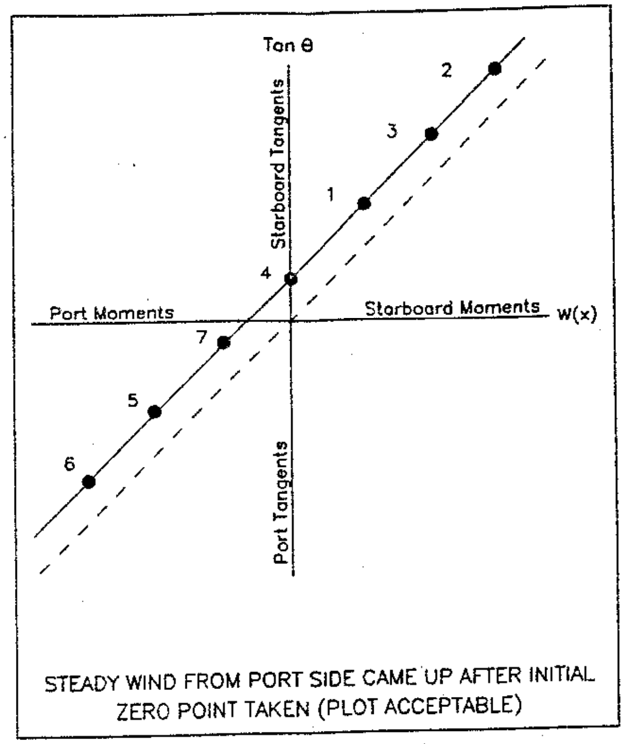


Figure 4.3.2–4

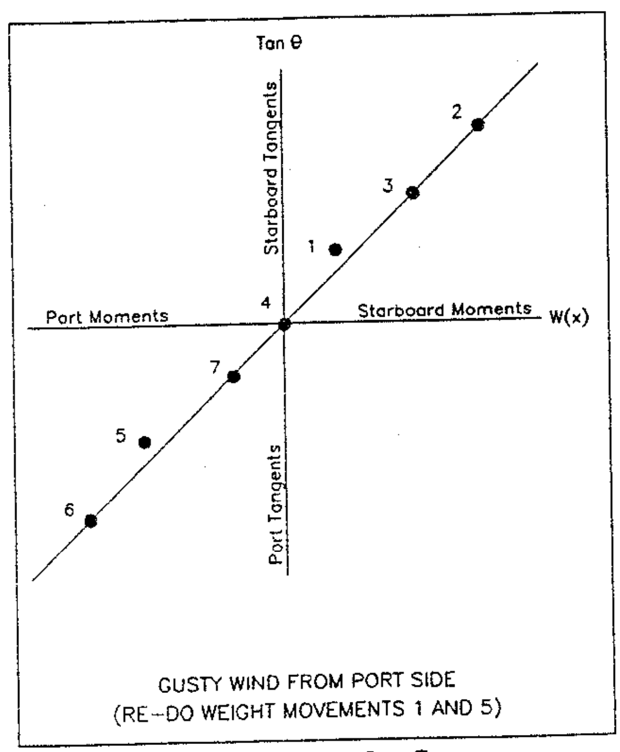


Figure 4.3.2–5

4.3.3 Once everything and everyone is in place, the zero position should be obtained and the remainder of the experiment conducted as quickly as possible, while maintaining accuracy and proper procedures, in order to minimize the possibility of a change in environmental conditions during the test.

4.3.4 Prior to each pendulum reading, each pendulum station should report to the control station when the pendulum has stopped swinging. Then, the control station will give a "standby" warning and then a "mark" command. When "mark" is given, the batten at each position must be marked at the location of the pendulum wire. If the wire was oscillating slightly, the centre of the oscillations should be taken as the mark. If any of the pendulum readers does not think the reading was a good one, the reader should advise the control station and the point should be retaken for all pendulum stations. Likewise, if the control station suspects the accuracy of a reading, it should be repeated for all the pendulum stations. Next to the mark on the batten should be written the number of the weight movement, such as zero for the initial position and one through seven for the weight movements.

4.3.5 Each weight movement should be made in the same direction, normally transversely, so as not to change the trim of the ship. After each weight movement, the distance the weight was moved (centre to centre) should be measured and the heeling moment calculated by multiplying the distance by the amount of weight moved. The tangent is calculated for each pendulum by deviding the deflection by the length of the pendulum. The resultant tangents are plotted on the graph. Provided there is good agreement among the pendulums with regard to the tan θ value, the average of the pendulum readings may be graphed instead of plotting each of the readings.

4.3.6 Inclining data sheets should be used so that no data is forgotten and so that the data is clear, concise, and consistent in form and format. Prior to departing the ship, the person conducting the test and the Administration representative should initial each data sheet as an indication of their concurrence with the recorded data.

ANNEX 2

RECOMMENDATION FOR SKIPPERS OF FISHING VESSELS ON ENSURING A VESSEL'S ENDURANCE IN CONDITIONS OF ICE FORMATION

1 Prior to departure

1.1 Firstly, the skipper should, as in the case of any voyages in any season, ensure that the vessel is generally in a seaworthy condition giving full attention to basic requirements such as:

.1 loading of the vessel within the limits prescribed for the season (paragraph 1.2.1 below);

.2 weathertightness and reliability of the devices for closing cargo and access hatches, outer doors and all other openings in the decks and superstructures of the vessel and the watertightness of the sidescuttles and of ports or similar openings in the sides below the freeboard deck to be checked;

.3 condition of the freeing ports and scuppers as well as operational reliability of their closures to be checked;

.4 emergency and life-saving appliances and their operational reliability;

.5 operational reliability of all external and internal communication equipment;

.6 condition and operational reliability of the bilge and ballast pumping systems.

1.2 Further, with special regard to possible ice accretion, the skipper should:

.1 consider the most critical loading condition against approved stability documents with due regard to fuel and water consumption, distribution of supplies, cargoes and fishing gear and with allowance for possible ice accretion;

.2 be aware of the danger in having supplies and fishing gear stored on open weatherdeck spaces due to their large ice accretion surface and high centre of gravity;

.3 ensure that a complete set of warm clothing for all members of the crew is available on the vessel as well as a complete set of hand tools and other appliances for combating ice accretion, a typical list thereof for small vessels is shown in section 4 of this annex;

.4 ensure that the crew is acquainted with the location of means for combating ice accretion, as well as the use of such means, and that drills are carried out so that members of the crew know their respective duties and have the necessary practical skills to ensure the vessel's endurance under conditions of ice accretion;

.5 acquaint himself with the meteorological conditions in the region of fishing grounds and en route to the place of destination; study the synoptical maps of this region and weather forecasts; be aware of warm currents in the vicinity of the fishing grounds, of the nearest coastline relief, of the existence of protected bays and of the location of icefields and their boundaries;

.6 acquaint himself with the timetable of the radio stations transmitting weather forecasts and warnings of the possibility of ice accretion in the area of the relevant fishing grounds.

2 <u>At sea</u>

2.1 During the voyage and when the vessel is on the fishing grounds the skipper should keep himself informed on all long-term and short-term weather forecasts and should arrange for the following systematic meteorological observations to be systematically recorded:

.1 temperatures of the air and of the sea surface;

.2 wind direction and force;

.3 direction and height of waves and sea state;

.4 atmospheric pressure, air humidity;

.5 frequency of splashing per minute and the intensity of ice accumulation on different parts of the vessel per hour.

2.2 All observed data should be recorded in the vessel's log-book. The skipper should compare the weather forecasts and icing charts with actual meteorological conditions, and should estimate the probability of ice formation and its intensity.

2.3 When the danger of ice formation arises the following measures should be taken without delay:

.1 all the means of combating ice formation should be ready for use;

.2 all the fishing operations should be stopped, the fishing gear should be taken on board and placed in the underdeck spaces. If this cannot be done all the gear should be fastened for storm conditions on its prescribed place. It is particularly dangerous to leave the fishing gear suspended since its surface for ice formation is large and the point of suspension is generally located high;

.3 barrels and containers with fish, packing, all gear and supplies located on deck as well as portable mechanisms should be placed in closed spaces as low as possible and firmly lashed;

.4 all cargoes in holds and other compartments should be placed as low as possible and firmly lashed;

.5 the cargo booms should be lowered and fastened;

.6 deck machinery, hawser reels and boats should be covered with duck covers;

.7 life-lines should be fastened on deck;

.8 freeing ports fitted with covers should be brought into operative condition, all objects located near scuppers and freeing ports and preventing water drainage from deck should be taken away;

.9 all cargo and companion hatches, manhole covers, weathertight outside doors in superstructures and deckhouses and portholes should be securely closed in order to ensure complete weathertightness of the vessel, access to the weather deck from inner compartments should be allowed only through the superstructure deck;

.10 a check should be carried out as to whether the amount of water ballast on board and its location is in accordance with that recommended in "Stability guidance to skippers"; if there is sufficient freeboard, all the empty bottom tanks fitted with ballast piping should be filled with seawater;

.11 all fire-fighting, emergency and life-saving equipment should be ready for use;

.12 all drainage systems should be checked for their effectiveness;

.13 deck lighting and searchlights should be checked;

.14 a check should be carried out to make sure that each member of the crew has warm clothing;

.15 reliable two-way radiocommunication with both shore stations and other vessels should be established; radio calls should be arranged for set times.

2.4 The skipper should seek to take the vessel away from the dangerous area keeping in mind that the lee edges of icefields, areas of warm currents and protected coastal areas are a good refuge for the vessel during weather when ice formation occurs.

2.5 Small fishing vessels on fishing grounds should keep nearer to each other and to larger vessels.

2.6 It should be remembered that the entry of the vessel into an icefield presents certain danger to the hull especially when there is a high sea swell. Therefore the vessel should enter the icefield at a right angle to the icefield edge at low speed without inertia. It is less dangerous to enter an icefield bow to the wind. If a vessel must enter an icefield with the wind on the stern, the fact that the edge of the ice is more dense on the windward side should be taken into consideration. It is important to enter the icefield at the point where the ice floes are the smallest.

3 <u>During ice formation</u>

3.1 If in spite of all measures taken the vessel is unable to leave the dangerous area, all means available for removal of ice should be used as long as it is subjected to ice formation.

3.2 Depending on the type of vessel, all or many of the following ways of combating ice formation may be used:

.1 removal of ice by means of cold water under pressure;

.2 removal of ice with hot water and steam;

.3 breaking up of ice with ice crows, axes, picks, scrapers, wooden sledge hammers and clearing it with shovels.

3.3 When ice formation begins, the skipper should take into account the recommendations listed below and ensure their strict fulfilment:

.1 report immediately ice formation to the shipowner and establish with him constant radiocommunication;

.2 establish radiocommunication with the nearest vessels and ensure that it is maintained;

.3 do not allow ice formation to accumulate on the vessel, immediately take steps to remove from the vessel's structures even the thinnest layer of ice and ice sludge from the upper deck;

.4 check constantly the vessel's stability by measuring the roll period of the vessel during ice formation. If the rolling period increases noticeably, immediately take all possible measures in order to increase the vessel's stability;

.5 ensure that each member of the crew working on the weather deck is warmly dressed and wears a safety line securely attached to the guard rail;

.6 bear in mind that the work of the crew on ice clearing entails the danger of frost-bite. For this reason it is necessary to make sure that the men working on deck are replaced periodically;

.7 keep the following structures and gears of the vessel first free from ice:

- aerials
- running and navigational lights
- freeing ports and scuppers
- life-saving craft
- stays, shrouds, masts and rigging
- doors of superstructures and deckhouses
- windlass and hawse holes;

.8 remove the ice from large surfaces of the vessel, beginning with the upper structures (such as bridges, deckhouses, etc.), because even a small amount of ice on them causes a drastic worsening of the vessel's stability;

.9 when the distribution of ice is not symmetrical and a list develops, the ice must be cleared from the lower side first. Bear in mind that any correction of the list of the vessel by pumping fuel or water from one tank to another may reduce stability during the process when both tanks are slack;

.10 when a considerable amount of ice forms on the bow and a trim appears, ice must be quickly removed. Water ballast may be redistributed in order to decrease the trim;

.11 clear ice from the freeing ports and scuppers in due time in order to ensure free drainage of the water from the deck;

.12 check regularly for water accumulation inside the hull;

.13 avoid navigating in following seas since this may drastically worsen the vessel's stability;

.14 register in the vessel's log-book the duration, nature and intensity of ice formation, amount of ice on the vessel, measures taken to combat ice formation and their effectiveness;

.15 if, in spite of all the measures taken to ensure the vessel's endurance in conditions of ice formation, the crew is forced to abandon the vessel and embark on life-saving craft (lifeboats, rafts) then, in order to preserve their lives, it is necessary to do all possible to provide all the crew with warm clothing or special bags as well as to have a sufficient number of life-lines and bailers for speedy bailing out of water from the life-saving craft.

4 <u>List of equipment and hand tools</u>

A typical list of equipment and hand tools required for combating ice formation:

5 ice crows or crowbars;

5 axes with long handles;

5 picks;

5 metal scrapers;

5 metal shovels;

3 wooden sledge hammers;

3 fore and aft life-lines to be rigged each side of the open deck fitted with travellers to which lizards can be attached.

Safety belts with spring hooks should be provided for no less than 50 per cent of the members of the crew (but not less than 5 sets), which can be attached to the lizards.

Notes:

(1) The number of hand tools and life-saving appliances may be increased, at the shipowners' discretion.

(2) Hoses which may be used for ice combating should be readily available on board.

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ANNEX 3

DRAFT MSC/CIRC.539/Add.2

REPORTS ON CASUALTY STATISTICS CONCERNING FISHING VESSELS AND FISHERMEN AT SEA

1 The Maritime Safety Committee at its [sixty-second] session considered proposals made by the Steering Group on Casualty Statistics, in consultation with the Sub-Committee on Stability and Load Lines and on Fishing Vessels Safety, concerning the modified format of reports on casualty statistics for fishing vessels and fishermen at sea and approved the format, as attached in the annex.

2 Member Governments are invited to submit information on casualties referred to above in accordance with the attached format. A summary of statistical data is considered by the Committee annually.

ANNEX

FORMAT OF REPORTS ON CASUALTY STATISTICS CONCERNING FISHING VESSELS AND FISHERMEN AT SEA

1 LOST FISHING VESSELS[1/]

01 COUNTRY:			
02 YEAR:			
VESSEL LENGTH O.A.	LOA < 12M	12M LOA < 24M	LOA ≥ 24M
03 TOTAL NUMBER OF FISHING VESSELS			
TABLE A - NUMBER OF TOTAL LOSSES, PRIMARY NATURE OF CASUALTY:			
04 FOUNDERED			
05 CAPSIZED			
06 FIRES/EXPLOSIONS			
07 COLLISION			
08 CONTACT			
09 WRECKED/STRANDED			
10 MISCELLANEOUS			
11 UNKNOWN			
12 TOTAL NUMBER OF LOST FISHING VESSELS			
TABLE B - ANALYSIS OF LOSSES OF FISHING VESSELS BY CAUSE (PRIMARY CAUSE):			
13 HUMAN ERROR			
14 STEERING GEAR FAILURES			
15 FISHING GEAR INCIDENTS			
16 OTHER FAILURES OF VESSEL, ITS MACHINERY OR EQUIPMENT			
17 ADVERSE WEATHER			
18 ICING			
19 OTHER			
20 UNKNOWN			
21 TOTAL NUMBER OF LOST FISHING VESSELS			
22 REMARKS			

1/ Any vessel used commercially for catching fish, whales, seals, walrus or other living resources of the sea.

2 LOSSES OF LIVES TO FISHERMEN ON FISHING VESSELS

VESSEL LENGTH O.A.	LOA < 12M	12M LOA < 24M	LOA ≥ 24M
23 TOTAL NUMBER OF FISHERMEN[2/]			
TABLE C - NUMBER OF LOSSES OF LIVES CAUSED BY TOTAL LOSS OF VESSELS (PRIMARY NATURE OF CASUALTY):			
24 FOUNDERED			
25 CAPSIZED			
26 FIRES/EXPLOSIONS			
27 COLLISION			
28 CONTACT			
29 WRECKED/STRANDED			
30 MISCELLANEOUS			
31 UNKNOWN			
32 SUB-TOTAL			
TABLE D - NUMBER OF LOSSES OF LIVES CAUSED BY CASUALTIES OF VESSELS, EXCLUDING TOTAL LOSSES:			
33 CAPSIZED			
34 FIRES/EXPLOSIONS			
35 COLLISION			
36 CONTACT			
37 WRECKED/STRANDED			
38 MISCELLANEOUS			
39 UNKNOWN			
40 SUB-TOTAL			
TABLE E - NUMBER OF LOSSES OF LIVES FROM ACCIDENTS ON BOARD:			
41 FALL OVERBOARD/ MISSING AT SEA			
42 HANDLING OF FISHING GEAR/MECHANICAL LIFTING			
43 INVOLVING MACHINERY EQUIPMENT			
44 FALLS ON BOARD (GENERAL)			
45 HIT BY SEAS			
46 ASPHYXIATION			
47 OTHER			
48 UNKNOWN			
49 SUB-TOTAL			
50 TOTAL NUMBER OF LIVES LOST (C) & (D) & (E)			
TABLE F - ANALYSIS OF LOSSES OF LIVES TO FISHERMEN BY CAUSE (PRIMARY CAUSE):			
51 HUMAN ERROR			
52 STEERING GEAR FAILURES			
53 FISHING GEAR INCIDENTS			
54 OTHER FAILURES OF VESSEL, ITS MACHINERY OR EQUIPMENT			
55 ADVERSE WEATHER			
56 ICING			
57 OTHER			
58 UNKNOWN			
59 TOTAL NUMBER OF LIVES LOST			
60 REMARKS			

2/ Total number should include both full-time and part-time fishermen. Where possible indicate under "Remarks" the percentage which is part-time.

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ANNEX 4

DRAFT INTERIM GUIDELINES FOR OPEN-TOP CONTAINERSHIPS

1 Definitions

1.1 "Open-top containership" means a containership especially designed so that one or more of the cargo holds need not be fitted with hatch covers.

1.2 "Freeboard" is the distance between the assigned load line and freeboard deck.

1.3 "Freeboard deck", for the purposes of chapters I and II of Annex I of the International Convention on Load Lines, 1966 (LL 1966), is the freeboard deck according to the LL 1966 as if hatch covers are fitted on top of the hatch coamings.

1.4 "Maximum sustained speed" is defined as the maximum service speed taking into account speed loss due to resistance increase in regular waves. Voluntary speed loss is not taken into consideration.

1.5 "Minimum ship manoeuvring speed" is defined to be the minimum speed which maintains directional control and is consistent with the operating characteristics of the ship.

1.6 "Green water" is sea water other than spray shipped aboard the ship under normal operating conditions.

2 Freeboard

2.1 Minimum freeboard should be determined by seakeeping characteristics and stability. Model tests and calculations should be carried out to provide Administrations with:

.1 measured data for the maximum hourly rate of ingress of green water likely to be shipped into each cargo hold;

.2 evaluation of the adequacy of the discharge rates from cargo hold freeing ports (if they are fitted).

2.2 The maximum hourly rate of ingress of green water in any one open hold determined from model testing should not exceed the hatch opening area multiplied by 400 mm/hour.

2.3 A conventional geometrical freeboard and minimum bow height should be calculated assuming that hatch covers are fitted. Under no circumstances should a freeboard and bow height be assigned to an open-top containership which is less than the equivalent geometrical freeboard determined from the LL 1966.

2.4 All seasonal freeboards should be omitted unless the minimum geometrical freeboard and corresponding seasonal freeboards for which the ship is eligible (assuming hatch covers fitted) are greater than the freeboard for which the model tests were satisfactorily carried out. In that case, the minimum geometrical freeboard and the corresponding seasonal freeboards greater than the freeboard for which the model tests were carried out should be assigned.

2.5 The minimum freeboard and minimum bow height assigned to the ship should not be less than those corresponding to the model test conditions.

3 Strength

The general and local strength of the hull should be sufficient in the intact flooded condition.

4 Initial and periodic surveys

4.1 As a condition of assignment, each open-top containership should maintain fully operational hold dewatering systems, including all system redundancies. The operability and condition of the hold dewatering systems and freeing ports if they are fitted should be inspected monthly by the crew and entered in the ship's log book for annual verification by the Administration.

4.2 At each load line renewal survey, the Administration should require that the hold dewatering systems be fully tested to assure proper functioning.

4.3 The structural survey schedule requirements for the open cargo holds should reflect that they are exposed to the sea atmosphere. A complete inspection of the open cargo holds should be conducted in conjunction with the load line renewal survey.

5 Procedure of model tests

5.1 The model experiments should be carried out in long-crested, irregular waves. The Pierson-Moskovitz, JONSWAP, or Bretschneider wave spectrum generated for the purpose of these experiments should have a significant wave height of approximately 8.5 m at the most unfavourable realistic wave period (zero crossing) as determined by calculation or previous testing experience.

5.2 For ships operating in restricted areas only, the Administration may allow other spectra.

5.3 The effect of wind generated spray need not be simulated during the tests.

5.4 The model experiments should be carried out for at least the following wave directions based on International Towing Tanks Conference conventions:

.1 following seas (0°/360°)

.2 quarter following seas (45°/315°)

.3 beam seas (90°/270°)

.4 quarter head seas (135°/225°)

.5 head seas (180°)

5.5 The model experiments should be carried out for at least the following speeds:

.1 maximum sustained speed in head seas and quarter head seas;

.2 minimum ship manoeuvring speed in quarter following seas and following seas;

.3 zero ship speed (dead ship condition) in beam seas.

5.6 The Administration may require additional tests.

5.7 The model experiments should be carried out with a self-propelled, unrestrained model without the necessity to change course and the time period of each experiment should correspond to at least one hour real time.

5.8 The loading condition used for the tests should correspond at least to the maximum loaded draught with level trim. If operational trim values differ substantially from level trim, additional trim values should be included in the model test programme.

5.9 The KG value selected should correspond to the actual value most likely to be encountered during the ship's service. If KG values which may be expected during the operation of the ship differ substantially from this selected KG value, additional KG values should be included in the model test programme.

5.10 For each test condition, the cargo hold which ships most water should be determined by preliminary tests for each combination of heading, trim and KG. In running tests for the full duration specified above, this least favourable hold should be simulated as having no containers, whilst other cargo holds (each cargo hold as a separate entity) may be simulated as completely fully loaded with containers above the line of the weather deck (or hatch coaming where applicable). Containers should not be used as a means to prevent shipping of water into an empty hold where they are stacked outboard of the open hold. Rain covers for the open holds should not be simulated in the model tests.

5.11 In addition to the usual parameters measured (ship motions, ship speed, relative motions, rudder angles, etc.) the volume of water entering all open cargo holds should be measured for each experiment. The quantities of water taken aboard the model should be removed and measured after each test run so that the metacentric height, moment of inertia and displacement are not appreciably disturbed by any accumulation of water during the testing programme.

5.12 Where freeing ports are fitted, an additional model test to comply with 2.1.2 should be conducted at a draught which corresponds to the condition of the ship fully loaded with cargo and open holds flooded to the static equilibrium level with freeing ports open. A hold permeability of 70% by volume should be assumed. Tests should be conducted at zero speed in beam seas.

5.13 The Administration may require an observer to witness the tests. A comprehensive report should be submitted to the Administration.

6 Intact stability

6.1 The stability of the ship in all conditions of loading should meet the provisions of the Code of Intact Stability for All Types of Ships Covered by IMO Instruments.

6.2 Where cargo hold freeing ports are fitted, they should be considered closed for the purpose of determining the flooding angle, provided that the reliable and effective control of closing of these freeing ports is satisfactory to the Administration.

6.3 With all open holds completely filled with water (permeability of 0.70 for container holds) to the level of the top of the hatch side or hatch coaming or, in the case of a ship fitted with cargo hold freeing ports, to the level of those ports, the stability of the fully laden ship in the intact condition should meet the survival criteria (with factor $s = 1$) of chapter II-1 part B-1 of SOLAS 1974, as amended.

6.4 For the condition with flooded holds and an intact ship the free surfaces may be determined as follows: The holds are fully loaded with containers. The seawater enters the containers and will not pour out during heeling. This condition should be simulated by defining the amount of water in the containers as fixed weight items. The free space surrounding the containers is then flooded with seawater. This free space should be evenly distributed over the full length of the open cargo holds.

6.5 Intermediate conditions of hold flooding should be investigated.

7 Damage stability

Open-top containerships should comply with the subdivision and damage stability criteria of chapter II-1 part B-1 of SOLAS 1974, as amended. The coamings of open-top holds should be considered as downflooding areas.

8 Hold bilge dewatering system and freeing ports

8.1 The bilge pumping system should have a required capacity to pump:

.1 the maximum hourly rate of green water shipped in seagoing conditions as established by the comprehensive model testing specified;

.2 an amount equal to rainfall of 100 mm/hour regardless of the installation of rain covers;

.3 the amount of shipped green water measured during the seakeeping model tests for the dead ship condition in beam seas, multiplied by safety factor 2;

.4 four-thirds of the amount of water required for fire-fighting purposes in the largest hold;

.5 an amount equal to the capacity required for ships with closed cargo holds,

whichever is the greater.

8.2 The pumping of hold bilges should be possible by at least three bilge pumps.

8.3 At least one of these pumps should have a capacity of not less than the required capacity as defined in 8.1 and should be dedicated to bilge and ballast service only. It should be located in such a way that it will not be affected by a fire or other casualty to the space containing the pumps required in 8.4 below or the space containing the main source of power and should be supplied from the emergency switchboard required by regulation II-1/43 of SOLAS 1974, as amended.

8.4 The combined output of at least two further pumps should not be less than the required capacity as defined in 8.1. These pumps should be supplied from the main source of electrical power required by regulation II-1/41 of SOLAS 1974, as amended, or any other source of power independent of the emergency switchboard required by regulation II-1/43 of SOLAS 1974, as amended.

8.5 The bilge pumping system, including the piping system, should incorporate sufficient redundancy features so that the system will be fully operational and capable of dewatering the hold spaces at the required capacity in the event of failure of any one system component.

8.6 The bilge pumping system should be arranged to be effective within the limiting angles of inclination required for the emergency source of electrical power by SOLAS 1974, as amended, and bilge wells should be readily accessible for cleaning.

8.7 All open cargo holds should be fitted with high bilge level alarms. The alarms should annunciate in the machinery spaces and the manned control location and be independent of bilge pump controls.

8.8 If the loss of suction prevents the proper functioning of the bilge system, special measures to prevent this should be considered, as for instance, the installation of level indicators.

8.9 Open cargo hold drain wells should be designed to ensure unobstructed discharge of water and easy access for cleaning under all conditions.

8.10 If provided, freeing ports should be fitted on both sides of each open cargo hold, subject to the following:

.1 the number, size and location of the freeing ports on each side of each open hold should be sufficient to prevent the accumulation of water above the level defined in 5.12;

.2 efficient means of closure to prevent the accidental ingress of water should be provided. Such means should be operated from above the freeboard deck. In the case of a ship operating in areas where icing is likely to occur, these arrangements should be suitable to enable the ports to operate efficiently under such conditions.

9 <u>Fire protection</u>

9.1 In lieu of the provisions of regulation II-2/53.1.1 of SOLAS 1974, as amended, regarding a fixed gas fire-extinguishing system, a fixed water spray system should be provided.

9.2 For the purpose of application of regulation II-2/54 of SOLAS 1974, as amended, open cargo holds for which hatch covers are not designed to be fitted should be regarded as enclosed cargo spaces under the weather deck and fixed pressure water systems should be applied.

10 Dangerous goods

10.1 Dangerous goods for which "on deck only" stowage is specified in the IMDG Code, should not be carried in or vertically above open-top container holds.

10.2 In addition to the provisions of paragraph 10.1, containers with dangerous goods extending more than 1 m above the top of the watertight upper boundary around an open-top container hold and containing liquids, gases or vapours heavier than air and for which "on deck only" stowage is specified, should not be carried within one container space* horizontally from the boundary of the open-top container holds.

10.3 Dangerous goods other than those described in paragraph 10.1 should not be carried in or vertically above open-top container holds unless such holds are in full compliance with regulation II-2/54 of SOLAS 1974, as amended, applicable to enclosed container cargo spaces, as appropriate for the cargo carried.

10.4 Containers with dangerous goods extending more than 1 m above the top of the watertight upper boundary around an open-top container hold should not be carried within one container space*, horizontally from the boundary of an open-top container hold unless that hold is in full compliance with regulation II-2/54 of SOLAS 1974, as amended, applicable to enclosed container cargo spaces, as appropriate for the cargo carried.

11 Segregation of dangerous goods

Instead of the table of segregation of freight containers on board containerships contained in section 15.3.2 of the IMDG Code, the table contained in the appendix hereto should be applied for segregation of dangerous goods for open-top container holds.

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* Defined in 15.3.1.2 of the General Introduction of the IMDG Code.

APPENDIX

Table of segregation of freight containers for open-top containership holds

SEGREGATION REQUIREMENT	VERTICAL: CLOSED VERSUS CLOSED	VERTICAL: CLOSED VERSUS OPEN	VERTICAL: OPEN VERSUS OPEN		HORIZONTAL: CLOSED VERSUS CLOSED – ON DECK	HORIZONTAL: CLOSED VERSUS CLOSED – UNDER DECK	HORIZONTAL: CLOSED VERSUS OPEN – ON DECK	HORIZONTAL: CLOSED VERSUS OPEN – UNDER DECK	HORIZONTAL: OPEN VERSUS OPEN – ON DECK	HORIZONTAL: OPEN VERSUS OPEN – UNDER DECK
"AWAY FROM" 1	ONE ON TOP OF THE OTHER PERMITTED	OPEN ON TOP OF CLOSED PERMITTED OTHERWISE AS FOR OPEN VERSUS OPEN		FORE AND AFT	NO RESTRICTION	NO RESTRICTION	NO RESTRICTION	NO RESTRICTION	ONE CONTAINER SPACE	ONE CONTAINER SPACE OR ONE BULKHEAD
				ATHWART-SHIPS	NO RESTRICTION	NO RESTRICTION	NO RESTRICTION	NO RESTRICTION	ONE CONTAINER SPACE	ONE CONTAINER SPACE
"SEPARATED FROM" 2	NOT IN THE SAME VERTI-CAL LINE	AS FOR OPEN VERSUS OPEN	NOT IN THE SAME VERTICAL LINE	FORE AND AFT	ONE CONTAINER SPACE	ONE CONTAINER SPACE OR ONE BULKHEAD	ONE CONTAINER SPACE	ONE CONTAINER SPACE OR ONE BULKHEAD	ONE CONTAINER SPACE AND NOT ABOVE SAME HOLD	ONE BULKHEAD
				ATHWART-SHIPS	ONE CONTAINER SPACE	ONE CONTAINER SPACE	TWO CONTAINER SPACES	TWO CONTAINER SPACES	TWO CONTAINER SPACES AND NOT ABOVE SAME HOLD	ONE BULKHEAD
"SEPARATED BY A COMPLETE COMPARTMENT OR HOLD FROM" 3				FORE AND AFT	ONE CONTAINER SPACE AND NOT ABOVE SAME HOLD	ONE BULKHEAD	ONE CONTAINER SPACE AND NOT IN OR ABOVE SAME HOLD	ONE BULKHEAD	TWO CONTAINER SPACES AND NOT ABOVE SAME HOLD	TWO BULKHEADS
				ATHWART-SHIPS	TWO CONTAINER SPACES AND NOT ABOVE SAME HOLD	ONE BULKHEAD	TWO CONTAINER SPACES AND NOT ABOVE SAME HOLD	ONE BULKHEAD	THREE CONTAINER SPACES AND NOT ABOVE SAME HOLD	TWO BULKHEADS
"SEPARATED LONGITUDI-NALLY BY AN INTERVENING COMPLETE COMPARTMENT OR HOLD FROM" 4	PROHIBITED			FORE AND AFT	MINIMUM HORIZONTAL DISTANCE OF 24 m AND NOT ABOVE SAME HOLD	ONE BULKHEAD AND MINIMUM HORIZONTAL DISTANCE OF 24 M*	MINIMUM HORIZONTAL DISTANCE OF 24 m AND NOT ABOVE SAME HOLD	TWO BULKHEADS	MINIMUM HORIZONTAL DISTANCE OF 24 m AND NOT ABOVE SAME HOLD	TWO BULKHEADS
				ATHWART-SHIPS	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED

* Containers not less than 6 m from intervening bulkhead.

Note: All bulkheads and decks should be resistant to fire and liquid.

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ANNEX 5

DRAFT ASSEMBLY RESOLUTION

APPLICATION OF RECOMMENDATION 2 OF THE INTERNATIONAL CONFERENCE ON TONNAGE MEASUREMENT OF SHIPS, 1969

THE ASSEMBLY,

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

NOTING Recommendation 2 of the International Conference on Tonnage Measurement of Ships, 1969, concerning the uses of gross and net tonnages and recognizing that the transition from existing tonnage measurement systems to the new system provided in the Convention should cause the least possible impact on the economics of merchant shipping and port operations,

NOTING further that the 1969 Tonnage Convention shall apply to existing ships as from 18 July 1994,

BEING AWARE that different governments issue statements concerning the use of old national tonnage for ships measured under the 1969 Tonnage Convention,

REALIZING the necessity of a uniform practice concerning the statement on the old national tonnage,

BEARING in mind the economic impact caused by the transition from the existing systems of tonnage measurement to the new system for ships the keels of which were laid before 18 July 1994,

HAVING CONSIDERED the recommendations made by the Maritime Safety Committee at its [ ] session,

1. INVITES the Governments to advise the authorities, which use the tonnage as a parameter, to consider which of the following tonnage parameters causes the least possible economic impact on shipping:

.1 the gross tonnage according to the 1969 Convention; or

.2 the gross register tonnage according to previous measurement systems;

2. ADOPTS the recommendation concerning the tonnage measurement of ships according to the International Convention on Tonnage Measurement of Ships, 1969, the text of which is given in the Annex to this resolution.

ANNEX

RECOMMENDATION CONCERNING THE TONNAGE MEASUREMENT OF SHIPS
ACCORDING TO THE INTERNATIONAL CONVENTION
ON TONNAGE MEASUREMENT OF SHIPS, 1969

In order to minimize the economic impact of the Convention and to use a unified method, Administrations are recommended to introduce the following measures:

1 In the International Tonnage Certificate (1969) under "Remarks" an entry is made as follows:

.1 for "existing" ships as defined in article 3(2)(d) of the 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:....................RT, according to the regulations ...."

.2 for ships covered by resolution A.494(XII):

"The ship is additionally measured according to resolution A.494(XII).

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: .... RT, according to the regulations ...."

2 The entry is to be signed by the tonnage authority issuing the International Tonnage Certificate (1969).

3 If the ship undergoes alterations or modifications which affect its tonnage on or after 18 July 1994 the old national tonnage figure should be deleted from the "Remarks" column.

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ANNEX 6

DRAFT TM.5/CIRC.4

INTERNATIONAL CONVENTION ON TONNAGE MEASUREMENT OF SHIPS, 1969

UNIFIED APPLICATION OF THE PROVISIONAL FORMULA TO CALCULATE A REDUCED GROSS TONNAGE OF AN OPEN-TOP CONTAINERSHIP

1 To reduce the economic disadvantages caused by the use of greater gross tonnage in comparison with conventional containerships for assessing fees, it is recommended to introduce a reduced gross tonnage based on a provisional formula.

2 The provisional formula to calculate the reduced gross tonnage is as follows:

$$\text{Reduced GT} = GT \left[1 - \frac{(30000 - GT)}{1000} \times 0{,}007 \right]$$

3 The above formula is subject to review and improvement before adoption by the Assembly. For this purpose, Governments are invited to submit to the Organization information on open-top containerships in operation and under consideration which would enable the assessment of final coefficients in the formula, including principal dimensions, gross tonnage, underdeck and ondeck carrying capacities of containers, deadweight, etc.

4 In the meantime, Administration may use the above provisional formula and include in the "Remarks" column of the International Tonnage Certificate (1969) the following statement:

"In accordance with TM.5/Circ.4 a reduced gross tonnage may be used for open-top containerships for the sole purpose of calculation of tonnage based fees.

The reduced gross tonnage is ...."

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ANNEX 7

DRAFT CHAPTER 2 AND APPENDICES III AND IV OF THE DRAFT CODE OF SAFETY FOR HIGH SPEED CRAFT

CHAPTER 2 - BUOYANCY, STABILITY AND SUBDIVISION

PART A - GENERAL

2.1 General

2.1.1 A craft should be provided with:

(a) stability characteristics and stabilization systems adequate for safety when the craft is operated in the non-displacement mode and during the transient mode; and

(b) buoyancy and stability characteristics adequate for safety where the craft is operated in the displacement mode, both in the intact condition and the damage condition.

2.1.2 Account should be taken of the effect of icing in the stability calculations. An example for established practice for ice accretion allowances is given in appendix I for the guidance of Administrations.

2.1.3 For the purpose of this and other chapters, unless expressly defined otherwise, the following definitions apply:

(a) "Length (L)" has the same meaning as in chapter 1.

(b) "Breadth (B)" means breadth of the broadest part of the moulded watertight envelope of the rigid hull at or below the design waterline in the displacement mode with no machinery active.

(c) "Design waterline" means the waterline corresponding to the maximum loaded displacement of the craft when stationary.

(d) "Down flooding point" means any opening through which flooding of the spaces which comprise the reserve buoyancy could take place while the craft is in the intact or damaged condition, and heels to an angle past the angle of equilibrium.

(e) "Multihull craft" means a craft which in any normally achievable operating trim or heel angle, has a rigid hull structure which penetrates the surface of the sea over more than one discrete area.

(f) "Watertight" in relation to a structure means capable of preventing the passage of water through the structure in any direction under the head of water likely to occur in the intact or damage condition.

(g) "Weathertight" means that water will not penetrate into the craft in any wind and wave conditions up to those specified as Critical Design Conditions.

(h) "Skirt" means a downwardly-extending, flexible structure used to contain or divide an air cushion.

(i) "Fully submerged foil" means a foil having no lift components piercing the surface of the water in the foil borne mode.

(j) "Permeability" of a space means the percentage of the volume of that space which can be occupied by water.

2.2 <u>Intact buoyancy</u>

2.2.1 All craft should have a sufficient reserve of buoyancy at the design waterline to meet the intact and damage stability requirements of this chapter. The Administration may require a larger reserve of buoyancy to permit the craft to operate in any of its intended modes. This reserve of buoyancy should be calculated by including only those compartments which are:

(a) watertight;

(b) accepted as having scantlings and arrangements adequate to maintain their watertight integrity; and

(c) situated in locations below a datum, which may be a watertight deck or equivalent structure of a non-watertight deck covered by a weathertight structure as defined in paragraph 2.2.2(b)(i).

2.2.2 (a) Arrangements should be provided for checking the watertight integrity of those compartments taken into account in paragraph 2.2.1.

(b) Where entry of water into structures above the datum as defined in 2.2.1(c) would significantly influence the stability and buoyancy of the craft, such structures should be:

(i) of adequate strength to maintain the weathertight integrity and fitted with weathertight closing appliances; or

(ii) be provided with adequate drainage arrangements; or

(iii) be an equivalent combination of both measures.

(c) The means of closing openings in the boundaries of weathertight structures should be such as to maintain weathertight integrity in all operational conditions.

2.3 Intact stability in the displacement mode

2.3.1 Hydrofoil craft fitted with surface-piercing foils and/or fully submerged foils should have sufficient stability under all permitted cases of loading to comply with the relevant provisions of appendix II and specifically maintain a heel angle of less than 10° when subjected to the greater of the heeling moments in 1.1.2 and 1.1.4 of that appendix.

2.3.2 Multihull craft should meet the relevant requirements of appendix III for all permitted cases of loading.

2.3.3 Subject to 2.3.4. all other craft should meet the following criteria in all permitted conditions of loading:

(a) resolution A.562(14) (weather criterion);

(b) the area under the righting lever curve (GZ curve) should not be less than 0.07 metre-radians up to $\Theta = 15°$ when the maximum righting lever (GZ) occurs at $\Theta = 15°$ and 0.055 metre-radians up to $\Theta = 30°$ when the maximum righting lever occurs at $\Theta = 30°$ or above. Where the maximum righting lever occurs at angles of between $\Theta = 15°$ and $\Theta = 30°$ the corresponding area under the righting lever curve should be:

$$0.055 + 0.001\ (30° - \Theta_{max}) \quad \text{(metre-radians)}$$

where,

Θ_{max} is the angle of heel in degrees at which the righting lever curve reaches its maximum;

(c) the area under the righting lever curve between $\Theta = 30°$ and $\Theta = 40°$ or between $\Theta = 30°$ and the angle of flooding Θ_f* , if this angle is less than 40°, should not be less than 0.03 metre-radians;

(d) the righting lever GZ should be at least 0.20 m at an angle of heel equal to or greater than 30°;

(e) the maximum righting lever should occur at an angle of heel not less than 15°; and

(f) the initial metacentric height GM_o should not be less than 0.15 m.

2.3.4 Where the characteristics of the craft are unsuitable for application of 2.3.3, the Administration may accept alternative criteria equivalent to those stipulated in 2.3.3, appropriate to the type of craft and area of operation.

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* In applying this criterion, small openings through which progressive flooding cannot take place need not be considered as open.

2.4 <u>Intact stability in the non-displacement mode</u>

2.4.1 The requirements of this section and section 2.11 should be applied on the assumption that any stabilisation systems fitted are fully operational.

2.4.2 Suitable calculations should be carried out and/or tests conducted to demonstrate that when operating in the non-displacement and transient modes within approved operational limitations, the craft will, after a disturbance causing roll, pitch, heave or heel due to turning or any combination thereof, return to the original attitude.

2.4.3 The roll and pitch stability on the first and/or any other craft of a series should be qualitatively assessed during operational safety trials as required by chapter 17 and annex IV. The results of such trials may indicate the need to impose operational limitations.

2.4.4 Where craft are fitted with surface piercing structure or appendages, precautions should be taken against dangerous attitudes or inclinations and less of stability subsequent to a collision with a submerged or floating object.

2.4.5 In designs where periodic use of cushion deformation is employed as a means of assisting craft control, or periodic use of cushion air exhausting to atmosphere for purposes of craft manoeuvring, the effects upon cushion-borne stability should be determined, and the limitations on the use by virtue of craft speed or attitude should be established.

2.4.6 In the case of an air cushion vehicle fitted with flexible skirts, it should be demonstrated that the skirts remain stable under operational conditions.

2.4.7 It should be demonstrated that the craft can be safely turned 180° to both sides when operating on a course with following wind and sea corresponding to the worst intended conditions and, if needed, operational limitations should be imposed.

2.5 <u>Intact stability in the transient mode</u>

2.5.1 Under weather conditions up to the worst intended conditions, the time to pass from the displacement mode to the non-displacement mode and vice versa should be minimised unless it is demonstrated that no substantial reduction of stability occurs during this transition.

2.5.2 Hydrofoil craft should comply with the relevant provisions of appendix II.

2.6 <u>Buoyancy and stability in the displacement mode following damage</u>

2.6.1 The requirements of this section apply to all permitted conditions of loading.

2.6.2 For the purpose of making damage stability calculations the volume and surface permeabilities should be in general as follows:

Spaces	Permeability
Appropriated to cargo, coal or stores	60
Occupied by accommodation	95
Occupied by machinery	85
Intended for liquids	0 or 95*
Appropriated for cargo vehicles	90

* whichever results in the more severe requirements

2.6.3 Notwithstanding 2.6.2, permeability determined by direct calculation should be used where a move onerous condition results, and may be used where a less onerous condition results from that provided according to 2.6.2.

2.6.4 Administrations may permit the use of low density foam or other media to provide buoyancy in void spaces, provided that designers can provide satisfactory evidence that any such proposed medium:

(a) of closed cell form if foam, or otherwise impervious to water absorption;

(b) structurally stable under service conditions;

(c) fire retardant or self-extinguishing; and

(d) chemically inert in relation to structural materials with which it is in contact.

2.6.5 Any damage of a lesser extent than that postulated in 2.6.6 to 2.6.8 as applicable, which would result in a more severe condition, should also be investigated. The shape of the damage should be assumed to be a parallelepiped.

2.6.6 The following side damages should be assumed anywhere on the periphery of the craft:

(a) the longitudinal extent of damage should be 0.1L, or 3 metres + 0.03L, or 11 metres, whichever is the least;

(b) the transverse extent of penetration into the craft should be 0.2B or 0.05L or 5 metres, whichever is less.

However, where the craft is fitted with inflated skirts or with non-buoyant side structures, the transverse extent of penetration should be at least 0.12 of the width of the main buoyancy hull or tank structure;

(c) the vertical extent of damage should be taken for the full depth of the craft.

2.6.7 Subject to 2.6.8, bottom damages should be assumed anywhere on the bottom of the craft as follows:

(a) the longitudinal extent of damage should be:

0.1L or 3 metres + 0.03L or 11 metres whichever is the least;

(b) the transverse extent of damage should be:

in the case of monohulls 0.2B or 5 metres whichever is the least and in the case of multihull craft 7 metres;

(c) the vertical extent of penetration into the craft should be 0.02B or 0.5 metres, whichever is less.

2.6.8 In the case of a category B craft the length of assumed damage specified in 2.6.7 should be increased by 50% in the case of damage in the forward 0.5L of the vessel.

2.7 Inclining and stability information

2.7.1 Every craft on completion of build should be inclined and the elements of its stability determined. When an accurate inclining is not practical the lightship displacement and centre of gravity should be determined by a lightweight survey and accurate calculation.

2.7.2 The master should be supplied by the owner with reliable information relating to the stability of the craft in accordance with the following provisions of this paragraph. The information relating to stability should, before issue to the master, be submitted to the Administration for approval, together with a copy thereof for their retention and should incorporate such additions and amendments as the Administration may in any particular case require.

2.7.3 Where any alterations are made to a craft so as materially to affect the stability information supplied to the master, amended stability information should be provided. If necessary the craft should be re-inclined.

2.7.4 A report of each inclining or lightweight survey carried out in accordance with this chapter and of the calculation therefrom of the lightship condition particulars should be submitted to the Administration for approval, together with a copy for their retention. The approved report should be placed on board the craft by the owner in the custody of the master and should incorporate such additions and amendments as the Administration may in any particular case require. The amended lightship condition particulars so obtained from time to time should be used by the master in substitution for such previously approved particulars when calculating the craft's stability.

2.7.5 Following any inclining or lightweight survey the master should be supplied with amended stability information if the Administration so requires. The information so supplied should be submitted to the Administration for approval, together with a copy thereof for their retention and should incorporate such additions and amendments as the Administration may in any particular case require.

2.7.6 Stability information demonstrating compliance with this chapter should be furnished in the form of a stability information book which should be kept on board the craft at all times in the custody of the master. The information should include particulars appropriate to the craft.

2.7.7 Every craft should have scales of draughts marked clearly at the bow and stern. In the case where the draught marks are not located where they are easily readable, or operational constraints for a particular trade make it difficult to read the draught marks, then the craft should also be fitted with a reliable draught indicating system by which the bow and stern draughts can be determined.

2.7.8 The owner or builder as appropriate should ensure that the positions of the draught marks are accurately determined and that the marks are located on the hull in a permanent manner. Accuracy of the draught marks should be demonstrated to the Administration prior to the inclining experiment.

2.8 Loading and stability assessment

On completion of loading of the craft and prior to its departure on a voyage, the master should determine the craft's trim and stability and also ascertain and record that the craft is in compliance with stability criteria in the relevant regulations. The Administration may accept the use of an electronic loading and stability computer or equivalent means for this purpose.

PART B - REQUIREMENTS FOR PASSENGER CRAFT

2.9 General

Where compliance with this chapter requires consideration of the effects of passenger weight, the information contained in appendix IV should be used.

2.10 Intact stability in the displacement mode

The craft should have sufficient intact stability that, when in still water conditions, the inclination of the craft from the horizontal would not exceed 10° under all permitted cases of loading and uncontrolled passenger movements as may occur.

2.11 Intact stability in the non-displacement mode

2.11.1 The total heel angle in still water due to the effect of passenger movement and due to beam wind pressure as per 1.1.4 of appendix II should not to exceed 10°.

2.11.2 In all loading conditions, the heel due to turning should not exceed 8°, and the total heel due to beam wind pressure as per 1.1.4 of appendix II and due to turning should not to exceed 12°.

2.12 Buoyancy and stability in the displacement mode following damage

Following any of the postulated damages detailed in 2.6.5 to 2.6.8, the craft in still water should have sufficient buoyancy and positive stability to simultaneously ensure that:

(a) after flooding has ceased and a state of equilibrium reached the final waterline be 300 mm below the level of any opening through which further flooding could take place;

(b) the angle of inclination of the craft from the horizontal does not normally exceed 10° in any direction. However, where this is clearly impractical angles of inclination up to 15° immediately after damage but reducing to 10° within 15 minutes may be permitted provided that efficient non-slip deck surfaces and suitable holding points, e.g., holes, bars, etc., are provided;

(c) there is a positive freeboard from the damage waterline to survival craft embarkation positions;

(d) any flooding of passenger compartments or escape routes which might occur will not significantly impede the evacuation of passengers;

(e) essential emergency equipment, emergency radios, power supplies and public address systems needed for organizing the evacuation remain accessible and operational;

(f) the residual stability of multihull craft complies with the appropriate criteria as laid out in appendix III; and

(g) residual stability of any other craft meets the requirements of resolution MSC.12(56).

2.13 Inclining and stability information

2.13.1 At periodical intervals not exceeding five years, a lightweight survey should be carried out on all passenger craft to verify any changes in lightship displacement and longitudinal centre of gravity. The passenger craft should be re-inclined whenever, in comparison with the approved stability information, a deviation from the lightship displacement exceeding 2% or a deviation of the longitudinal centre of gravity exceeding 1% of L is found or anticipated.

2.13.2 A report of each inclining or lightweight survey carried out in accordance with paragraph 2.7.1 and of the calculation therefrom of the lightship condition particulars should be submitted to the Administration for approval, together with a copy for their retention. The approved report should be placed on board the craft by the owner in the custody of the master and should incorporate such additions and amendments as the Administration may in any particular case require. The amended lightship condition particulars so obtained from time to time should be used by the master in substitution for such previously approved particulars when calculating the craft's stability.

2.14.3 Following any inclining or lightweight survey the master should be supplied with amended stability information if the Administration so requires. The information so supplied should be submitted to the Administration for approval, together with a copy thereof for their retention and should incorporate such additions and amendments as the Administration may in any particular case require.

PART C - REQUIREMENTS FOR CARGO CRAFT

2.14 <u>Buoyancy and stability in the displacement mode following damage</u>

Following any of the postulated damages detailed in 2.6.5 to 2.6.7 the craft in still water should have sufficient buoyancy and positive stability to simultaneously ensure that:

(a) after flooding has ceased and a state of equilibrium reached the final waterline be below the level of any opening through which further flooding could take place;

(b) the angle of inclination of the craft from the horizontal does not normally exceed 15° in any direction. However, where this is clearly impractical angles of inclination up to 20° immediately after damage but reducing to 15° within 15 minutes may be permitted provided that efficient non-slip deck surfaces and suitable holding points, e.g., holes, bars, etc., are provided;

(c) there is a positive freeboard from the damage waterline to survival craft embarkation positions;

(d) essential emergency equipment, emergency radios, power supplies and public address systems needed for organizing the evacuation remain accessible and operational;

(e) the residual stability of multihull craft complies with the appropriate criteria as laid out in appendix III; and

(f) the residual stability of any other craft includes a maximum GZ value of at least 0.1 m in association with a range of positive stability of at least 20°.

2.15 <u>Inclining</u>

Where it is satisfied by lightweight survey, weighing, or other demonstration, that the lightship of a craft is closely similar to that of another craft of the series to which 2.7.1 has been applied, the Administration may waive the requirement of 2.7.1 for craft to be inclined.

APPENDIX III

STABILITY OF MULTIHULL CRAFT

1 Stability criteria in the intact condition

A multihull craft, in the intact condition, should have sufficient stability when rolling in a seaway to successfully withstand the effect of either passenger crowding or high speed turning as described in 1.4. The craft's stability should be considered to be sufficient provided compliance with this paragraph is achieved.

1.1 Area under the GZ curve

The area (A1) under the GZ curve up to an angle Θ should be at least:

$$0.055 \times 30°/\Theta$$

where Θ is the least of the following angles:

(a) the downflooding angle;

(b) the angle at which the maximum GZ occurs; and

(c) 30°

1.2 Maximum GZ

The maximum GZ value should occur at an angle of at least 10°.

1.3 Heeling due to wind

The wind heeling lever should be assumed constant at all angles of inclination and should be calculated as follows:

$$HL1 = \frac{P_i . A . Z}{1000 g \Delta} \text{ (m)}$$

$$HL2 = 1.5\ HL1$$

where

P_i = 504 (N/m^2)*

A = projected lateral area of the portion of the craft above the lightest service waterline (m^2)

Z = vertical distance from the centre of A to a point one half the lightest service draught (m)

Δ = displacement (t)

g = 9.81 m/s^2

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* The value of P_i for ships in restricted service may be reduced subject to the approval of the Administration.

1.4 Heeling due to passenger crowding or high speed turning

Heeling due to the crowding of passengers on one side of the craft or to high speed turning, whichever is the greater should be applied in combination with the heeling lever due to wind.

(a) Heeling due to passenger crowding

This should be in accordance with the contents of appendix IV.

(b) Heeling due to high speed turning

When calculating the magnitude of the heel due to the effects of high speed turning a high speed turning lever should be developed using the following formula:

$$TL = \frac{1}{g} \frac{Vo^2}{R} \left(KG - \frac{d}{2}\right)$$

where TL = turning lever (m)
Vo = speed of craft in the turn (m/s)
R = turning radius (m)
KG = height of vertical centre of gravity above keel (m)
d = mean draught (m)
g = 9.8 (m/s^2)

The above formula is based on a turning circle diameter of approximately 10 craft's lengths, i.e. R = 5L. If other information is available the above formula should be modified accordingly.

1.5 Rolling in waves (Figure 1)

The effect of rolling in a seaway upon the craft's stability should be demonstrated mathematically. In doing so the residual area under the GZ curve (A2), i.e. beyond the angle of heel (Θh), should be at least equal to 0.028 metre-radians up to the angle of roll Θr. In the absence of model test or other data Θr should be taken as 15° or an angle of (Θd - Θh) whichever is less.

2 Criteria for residual stability after damage

2.1 The method of application of criteria to the residual stability curve is similar to that for intact stability except that the craft should be considered to have an adequate standard of residual stability provided:

(a) the required area A2 should be not less than 0.028 metre-radians (figure 2 refers); and

(b) there is no requirement regarding the angle at which the max GZ value should occur.

2.2 The wind heeling lever for application on the residual stability curve should be assumed constant at all angles of inclination and should be calculated as follows:

$$HL3 = \frac{P_d A.Z}{1000g\Delta} \text{ (m)}$$

where P_d = 120 (N/m^2)

A = projected lateral area of the portion of the craft above the lightest service waterline (m^2)

Z = vertical distance from the centre of A to a point one half of the lightest service draught (m)

Δ = displacement (t)

g = 9.81 m/s^2

2.3 The same values of roll angle should be used as for the intact stability.

2.4 The downflooding point is important and is regarded as terminating the residual stability curve, the area A2 should therefore be truncated at the downflooding angle.

2.5 The stability of the craft during all stages of flooding should be examined and shown to satisfy the criteria, when damaged as stipulated in 2.4 of chapter 2.

3 Application of heeling levers

3.1 In applying the heeling levers to the intact and damaged curves the following should be considered:

(a) for intact condition:

(i) wind heeling lever - steady wind (HL1);

(ii) wind heeling lever (including gusting effect) plus either the passenger crowding or speed turning levers whichever is the greater (HL2).

(b) for damage condition:

(i) wind heeling lever - steady wind (HL3);

(ii) wind heeling lever plus heeling lever due to passenger crowding (HL4).

3.2 Angles of heel due to steady wind

(a) The angles of heel due to steady wind when the heeling lever HL1, obtained as in 1.3, is applied to the intact stability curve, should not exceed 16°;

(b) The angle of heel due to steady wind when the heeling lever HL3, obtained as in 2.2, is applied to the residual stability curve, after damage, should not exceed 20°.

Multihull craft criteria

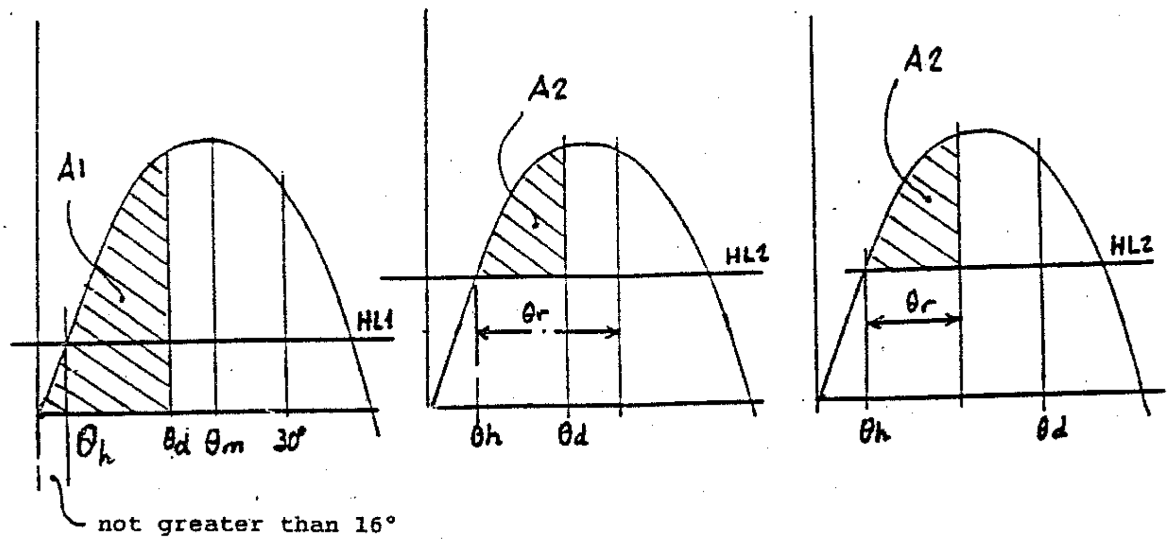

Figure 1 - Intact stability

HL1 = Heeling lever due to wind
HL2 = Heeling lever due to wind + gusting + (passenger crowding or turning)

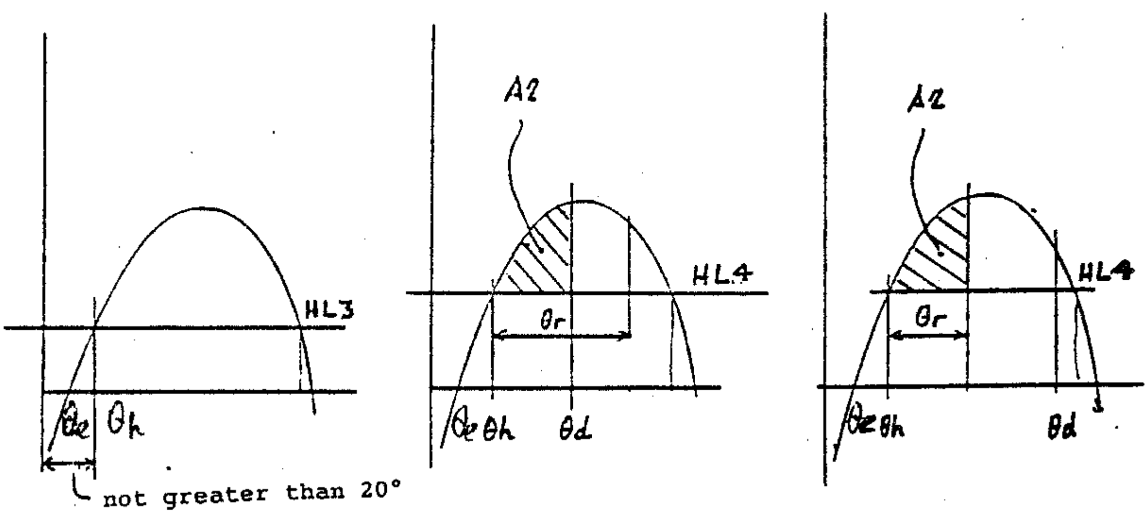

Figure 2 - Damage stability

HL3 = Heeling lever due to wind
HL4 = Heeling lever due to wind + passenger crowding
Θm = Angle of maximum GZ
Θd = Angle of downflooding
Θr = Angle of roll
Θe = Angle of equilibrium, assuming no wind, passenger crowding or turning effects
Θh = Angle of heel due to heeling lever HL1, HL2, HL3 or HL4
A1 ≥ Area required by 1.1
A2 ≥ 0.028 metre-radians

APPENDIX IV

PASSENGER LOADING

1 <u>Heeling due to passenger crowding</u>

When calculating the magnitude of the heel due to passenger crowding a passenger crowding lever should be developed using the following assumptions:

(a) the distribution of passengers is 4 persons per square metre;

(b) each passsenger has a mass of 75 kg;

(c) vertical centre of gravity of seated passengers - 0.3 m above seat;

(d) vertical centre of gravity of standing passengers - 1.0 m above deck;

(e) passengers and luggage should be considered to be in the space normally at their disposal;

(f) passengers should be distributed on available deck areas towards one side of the ship on the decks where muster stations are located and in such a way that they produce the most adverse heeling moment.

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ANNEX 8

DRAFT ASSEMBLY RESOLUTION

AMENDMENTS TO THE INTERNATIONAL CONVENTION ON LOAD LINES, 1966

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,

NOTING that proposals for amending regulation 49(7)(b) of the International Convention on Load Lines, 1966, concerning the southern tropical zone off the coast of Australia and the supporting meteorological background information were submitted by the Government of Australia to IMO in accordance with article 29(3) of the 1966 Load Line Convention and were duly considered by the Maritime Safety Committee,

NOTING ALSO that the Maritime Safety Committee at its [ ] session adopted the proposed amendments in accordance with article 29(3)(a) of the 1966 Load Line Convention,

HAVING CONSIDERED the amendments to regulation 49(7)(b) and to the chart of zones and seasonal areas,

1. ADOPTS, in accordance with article 29(3)(b) of the International Convention on Load Lines, 1966, amendments to regulation 49(7)(c) of the said Convention, set out in the the text of Annex to the present resolution, together with consequential changes to the chart of zones and seasonal areas;

2. REQUESTS the Secretary-General, in accordance with article 29(3)(b) of the 1966 Load Line Convention, to transmit certified copies of the present resolution and its Annex to all Contracting Governments to the 1966 Load Line Convention, for consideration and acceptance, and also to transmit copies to all Members of the Organization;

3. URGES all States concerned to accept the amendments at the earliest possible date.

ANNEX

AMENDMENTS TO THE INTERNATIONAL CONVENTION ON LOAD LINES, 1966

Regulation 49(7)(b)

Replace "on the south by the Tropic of Capricorn from the east coast of Australia" by "on the south by the parallel of latitude of 24°S from the east coast of Australia to longitude 154°E, thence by the meridian of longitude 154°E to the Tropic of Capricorn and thence by the Tropic of Capricorn".

Chart of zones and seasonal areas

The southern border line of the seasonal tropical area on the Tropic of Capricorn is deleted between the east coast of Australia and 154°E. In its place a line is inserted along the meridian of longitude 154°E south from the Tropic of Capricorn to 25°S, thence westward along the 24°S parallel of latitude from 154°E to the coast of Australia.

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ANNEX 9

DRAFT ASSEMBLY RESOLUTION

APPLICATION OF TONNAGE MEASUREMENT OF BALLAST SPACES IN SEGREGATED BALLAST OIL TANKERS

THE ASSEMBLY,

NOTING 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,

NOTING further resolution 9 of the International Conference on Marine Pollution, 1973, concerning tonnage measurement of segregated ballast oil tankers,

RECALLING resolution A.722(17) in which Member Governments are invited to accept the recommendation concerning tonnage measurement of ballast spaces in segregated ballast oil tankers,

REALIZING the urgent need for the establishment of principles for the treatment of tonnage resulting from the fitting of segregated ballast tanks in oil tankers provided with an International Tonnage Certificate (1969),

REALIZING ALSO the urgent need for the unified application of tonnage measurement of segregated ballast spaces in oil tankers,

REAFFIRMING its desire to encourage the design of segregated ballast tanks in oil tankers,

HAVING CONSIDERED the recommendations made by the Maritime Safety Committee at its [ ] session and the Marine Environment Protection Committee at its [ ] session,

1. ADOPTS the Recommendation Concerning Tonnage Measurement of Segregated Ballast Tanks in Oil Tankers, the text of which is given in the Annex to this resolution;

2. INVITES Governments to advise the port and harbour authorities to apply this Recommendation for assessing fees based on the reduced gross tonnage on segregated ballast tankers in accordance with regulation 13 of Annex I of MARPOL 73/78;

3. REQUESTS the Secretary-General to invite the Governments concerned to provide information on experience gained from the implementation of this resolution;

4. REVOKES resolution A.722(17).

ANNEX

RECOMMENDATION CONCERNING TONNAGE MEASUREMENT OF SEGREGATED BALLAST TANKS IN OIL TANKERS

In order to use a unified base for the application of tonnage measurement of segregated ballast tankers, Administrations are recommended to accept the following principles:

1 The ship is certified as a segregated ballast oil tanker as stated in paragraph 5 of the supplement to the International Oil Pollution Prevention Certificate and the location of the segregated ballast tanks is indicated under paragraph 5.2 of that supplement.

2 Segregated ballast tanks are those tanks exclusively used for the carriage of segregated water ballast, as defined in regulation 1(17) of Annex I of MARPOL 73/78. The segregated ballast tanks should have a separate ballast pumping and piping system arranged for the intake and discharge of ballast water from and to the sea only. There should be no piping connections from segregated ballast tanks to the fresh water system. No segregated ballast tank should be used for the carriage of any cargo or for storage of ship's stores or material.

3 In the International Tonnage Certificate (1969) under "Remarks" an entry is made for the tonnage of segregated ballast tanks in oil tankers as follows:

"The segregated ballast tanks comply with regulation 13 of Annex I of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, and the total tonnage of such tanks exclusively used for the carriage of segregated water ballast is ....

The reduced gross tonnage which may be used for the calculation of tonnage based fees is ...."

4 The tonnage of segregated ballast tanks mentioned above should be calculated according to the following formula:

$$K_1 \times V_b$$

where:

K_1 = $0.2 + 0.02 \log_{10} V$ (or as tabulated in appendix 2 of the International Convention on Tonnage Measurement of Ships, 1969)

V = the total volume of all enclosed spaces of the ship in cubic metres as defined in regulation 3 of the International Convention on Tonnage Measurement of Ships, 1969.

V_b = the total volume of segregated ballast tanks in cubic metres measured in accordance with regulation 6 of the International Convention on Tonnage Measurement of Ships, 1969.

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ANNEX 10

REVISED WORK PROGRAMME OF THE SUB-COMMITTEE

		Target completion date	Reference in the report
1	Harmonization of damage stability provisions in IMO instruments based on the probabilistic method for all types of ships:		Paragraph 22.2
.1	Regulations for dry cargo ships including ro-ro ships of less than 100 m in length	1994 1/	
.2	Explanatory notes for dry cargo ship including ro-ro ships of less than 100 m in length	1994 1/	
.3	Review of resolution A.265(VIII) including deterministic requirements (regulation 5)	[1995] 1/	
.4	Explanatory notes to resolution A.265(VIII) as revised	[1995] 1/	
.5	Development of new SOLAS parts A, B and B-1 of chapter II-1 based on a single probabilistic method for all types of ships	[1996] 1/	
.6	Harmonization of damage stability provisions in other IMO instruments	[1997] 1/	
2	Subdivision and damage stability of passenger ships (deterministic requirements):		
.1	maximum number of passengers permitted on one-compartment ships	[1994] 1/	
.2	amendments to SOLAS regulations II-1/8 and II-1/20	[1994] 1/	Paragraph 22.4
3	Intact stability:		
[.1	Review of the Code of Intact Stability for All Types of Ships Covered by IMO Instruments	1995] 2/	Paragraph 3.16
.2	Improved stability criteria and systematic model tests	Continuous	
.3	Collection and analysis of intact stability casualty records	Continuous	

		Target completion date	Reference in the report
4	Analysis of damage cards	Continuous	Section 6
5	Analysis of casualty statistics of fishing vessels and fishermen	Continuous	Section 7
6	Revision of technical regulations of the 1966 LL Convention	[1996]1/	Paragraph 8.13
7	Safety guidelines and safety training guidelines for fishermen of small fishing vessels (in co-operation with STW)	[1996]1/	Paragraph 9.5
8	Revision of the alternative intact and damage stability criteria for MODUs	1995	Paragraph 10.3
[9	Open-top container ships (in co-operation with CDG, FP and DE)	1993]3/	Paragraph 11.9
[10	Interpretation of tonnage measurement requirements	1994]4/	Paragraph 12.18
[11	Hull structural integrity of tankers and bulk carriers (work co-ordinated by DE)	1995]5/	Paragraphs 13.7 and 14.3
[12	Revision of stability requirements in the Code of Safety for Dynamically Supported Craft (co-ordinated by DE)	1993]3/	Paragraph 15.16
13	Review of existing ships' safety standards	Continuous	
14	Review of hypothetical oil outflow parameters	[1994]1/	Paragraph 17.8
[15	Use of compressed air systems for buoyancy	1993]1/	Paragraph 18.2
[16	Extension of Seasonal Tropical Zones	1994]3/	Paragraph 19.5
[17	Tonnage measurement of new oil tankers	1994]3/	Paragraph 20.14
18	Role of the human element in maritime casualties:	Continuous	
	.1 improvement of general requirements in IMO instruments		
	.2 review of SOLAS 74 and LL 66 regarding language and format of stability information		

	Target completion date	Reference in the report
.3 application of computers in determining ship stability		
.4 guidelines for the use and application of on-board computers (work co-ordinated by DE)	[1995]1/	Paragraph 21.3.3

1/ Subject to the approval at MSC 62.

2/ The item will replace item "Intact Stability Code for All Types of Ships Covered by IMO Instruments".

3/ To be deleted as work completed.

4/ The item will replace item "Livestock carriers and other ships requiring interpretations of their tonnage measurement aspects".

5/ The item will consolidate items "Hull cracking in large ships" and "Investigations into the loss of bulk carriers".

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ANNEX 11

ITEMS TO BE INCLUDED IN THE AGENDA FOR THE THIRTY-EIGHTH SESSION OF THE SUB-COMMITTEE

1 Subdivision and damage stability of passenger ships

2 Harmonization of damage stability provisions in IMO instruments based on the probabilistic method for all types of ships

3 Intact stability

4 Analysis of damage cards

5 Analysis of casualty statistics of fishing vessels and fishermen

6 Revision of technical regulations of the 1966 LL Convention

7 Safety guidelines and safety training guidelines for fishermen of small fishing vessels

8 Interpretation of tonnage measurement requirements

9 Hull structural integrity of tankers and bulk carriers

10 Review of existing ships' safety standards

11 Review of hypothetical oil outflow parameters

12 Role of the human element in maritime casualties

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ANNEX 12

INDEX OF APPLICABLE RECOMMENDATIONS AND GUIDELINES PERTAINING TO THE WORK OF THE SUB-COMMITTEE

No.	Instruments	References and remarks
	Assembly resolutions	
1	A.48(III) - Approval of the recommendation of the Maritime Safety Committee on treatment of shelter-deck and other 'open' spaces	TM
2	A.167(ES.IV) - Recommendation on intact stability for passenger and cargo ships under 100 m in length	IS Supplemented and amended by res. A.206(VII) (see 4 below). May be applied to ships over 100 m in length having conventional hull type, as set out in SLF 33/12, paragraph 3.15.
3	A.168(ES.IV) - Recommendation on intact stability of fishing vessels	IS, SFV Amended by res. A.268(VIII) (see 12 below). Included in Part B of the Code of Safety for Fishermen and Fishing Vessels.
4	A.206(VII) - Amendments to the recommendation on intact stability for passenger and cargo ships under 100 metres in length (resolution A.167(ES.IV))with respect to ships carrying deck cargoes	IS See also 2 above.
5	A.207(VII) - Recommendation for an interim simplified criterion for decked fishing vessels under 30 metres in length	IS, SFV
6	A.208(VII) - Recommendation on construction on fishing vessels affecting the vessel's stability and crew safety	SFV, IS
7	A.212(VII) - Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (BCH Code). (chapter II)	DS, ISP Applicable to ships built before 1 July 1986. For ships constructed on or after that date, the IBC Code applies
8	A.231(VII) - Amendments to the International Convention on Load Lines, 1966	LL, ISP Incorporated in the 1988 LL Protocol
9	A.265(VIII) - Regulations on subdivision and stability of passenger ships as an equivalent to part B of chapter II of the International Convention for the Safety of Life at Sea, 1960	SPS, DS, ISP May be used instead of requirements of part B of chapter II-1 of the 1974 SOLAS Convention, if regulations are applied in their entirety.

No.	Instruments	References and remarks
10	A.266(VIII) - Recommendation on a standard method for establishing compliance with the requirements for cross-flooding arrangements in passenger ships	SPS,DS Reference to this recommendation is made in regulation II-1/8 of the 1974 SOLAS Convention.
11	A.267(VIII) - Code of practice concerning the accuracy of stability information for fishing vessels	SFV, IS
12	A.268(VIII) - Amendments to recommendation on intact stability of fishing vessels. Appendix V - recommended practice on portable fish-hold divisions (resolution A.168(ES.IV))	SFV, IS See also 3 above
13	A.269(VIII) - Recommendation for skippers of fishing vessels on ensuring a vessel's endurance in condition of ice formation	SFV, IS
14	A.287(VIII) - Code of Safe Practice for Ships Carrying Timber Deck Cargoes (section 7; annexes A and B)	IS, LL Revoked by res. A.715(17) (see 43 below)
15	A.319(IX) - Amendment to the International Convention on Load Lines,1966	LL, ISP For remarks refer to 8 above
16	A.320(IX) - Regulation equivalent to regulation 27 of the International Convention on Load Lines, 1966	LL, ISP Amended by res.A.514(13) (see 32 below). For other remarks refer to 8 above.
17	A.328(IX) - Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (Gas Carrier Code) (chapter II)	IS, DS, ISP Applicable to ships built before 1 July 1986. Ships constructed on or after that date should comply with the IGC Code. Refer also to the Guidelines for the uniform application of the survival requirements of the BCH Code and the Gas Carrier Code.
18	A.329(IX) - Recommendations concerning ships not covered by the Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (resolution A.328(IX)) (chapter II)	IS Applicable to ships delivered after 31 October 1976, but prior to the application of the Gas Carrier Code (see 17 above).
19	A.373(X) - Code of Safety for Dynamically Supported Craft (chapter II)	IS, DS, ISP Subject to a revision by the Sub-Committee
20	A.388(X) - Recommendation concerning tonnage measurement of ballast spaces in segregated ballast oil tankers	TM Revoked by res. A.722(17) (see 44 below)

No.	Instruments	References and remarks
21	A.390(X) - Procedures for the control of ships under the International Convention for the Safety of Life at Sea, 1960 and the International Convention on Load Lines, 1966	Establishes the procedures of communicating information on action taken by flag States, following deficiency reports, to the Organization
22	A.411(XI) - Amendments to the International Convention on Load Lines, 1966	LL, ISP For remarks refer to 8 above
23	A.414(XI) - Code for the Construction and Equipment of Mobile Offshore Drilling Units (chapter 3)	IS, ISP, DS Applicable to MODUs built before 1 May 1991. For MODUs constructed on or after that date, 1989 MODU Code applies (see 38 below)
24	A.434(XI) - Code of Safe Practice for Solid Bulk Cargoes (sections 2 and 3)	IS, ISP
25	A.466(XII) - Procedures for the control of ships	ISP Establishes procedures for the control of ships prescribed by regulation I/19 of the SOLAS Convention and article 21 of the 1966 LL Convention
26	A.469(XII) - Guidelines for the Design and Construction of Offshore Supply Vessels (sections 2 and 3)	IS, DS, ISP
27	A.491(XII) - Code of Safety for Nuclear Merchant Ships (section 3.4)	DS, ISP
28	A.492(XII) - Application of the International Convention on Tonnage Measurement of Ships, 1969	TM
29	A.493(XII) - Use of term "gross tonnage" in lieu of "tons gross tonnage"	TM
30	A.494(XII) - Revised interim scheme for tonnage measurement for certain ships	TM
31	A.513(13) - Amendment to the International Convention on Load Lines, 1966	LL, ISP For remarks refer to 8 above
32	A.514(13) - Amendments to the regulation equivalent to regulation 27 of the International Convention on Load Lines, 1966	LL, ISP Amends res. A.320(IX). For other remarks refer to 8 above.
33	A.534(13) - Code of Safety for Special Purpose Ships (chapter 2)	IS, DS, ISP

No.	Instruments	References and remarks
34	A.540(13) - Tonnage measurement of certain ships relevant to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978	TM Follows the provisions of res. A.494(XII) for the purposes of the STCW-78 Convention
35	A.541(13) - 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	TM Follows the provisions of res. A.494(XII) for the purposes of MARPOL 73/78
36	A.562(14) - Recommendation on a severe wind and rolling criterion (weather criterion) for the intact stability of passenger and cargo ships of 24 metres in length and over	IS, SFV, ISP Applicable also to fishing vessels of 45 m and over in unrestricted service
37	A.646(16) - Safety of fishermen at sea	Refers, inter alia, to a future protocol to the 1977 SFV Convention
38	A.649(16) - Code for the Construction and Equipment of Mobile Offshore Drilling Units 1989 (chapter 3)	IS, DS, ISP Applicable to MODUs constructed after 1 May 1991
39	A.650(16) - An example of alternative intact stability criteria for twin pontoon column stabilized semi-submersible units	IS Subject to a revision by the Sub-Committee
40	A.651(16) - An example of alternative stability criteria for a range of positive stability after damage or flooding for column stabilized semi-submersible units	DS Subject to a revision by the Sub-Committee
41	A.684(17) - Explanatory notes to the SOLAS regulations on subdivision and damage stability of cargo ships of 100 m in length and over	DS, ISP
42	A.685(17) - Weather criterion for fishing vessels of 24 metres in length and over	SFV, IS
43	A.715(17) - Code of Safe Practice for Ships Carrying Timber Deck Cargoes, 1991 (chapter 2, appendices C and D)	IS, LL, ISP Revokes res. A.287(VIII) (see 14 above)
44	A.722(17) - Application of tonnage measurement of ballast spaces in segregated ballast oil tankers	TM Revokes res. A.388(X) (see 20 above)

No.	Instruments	References and remarks
	Codes and guidelines	
45	FAO/ILO/IMO Code of Safety for Fishmen and Fishing Vessels - Part A "Safety and health practice for skippers and crews" including amendments adopted in 1981 (section 3.5) - Part B "Safety and health requirements for the construction and equipment of fishing vessels" including amendments adopted in 1983 (MSC/Circ.352, chapters III and IV and annex 1).	IS, ISP To be reviewed after the Protocol to the 1977 SFV Convention is adopted.
46	FAO/ILO/IMO Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels (chapter 3)	IS, ISP Applicable to decked fishing vessels within the length range between 12 m and 24 m and expected to be reviewed after the Protocol to the 1977 SFV Convention is adopted.
	Circulars	
	MSC circulars	
47	MSC/Circ.198 - Treatment of ballast spaces of segregated ballast tankers in respect of tonnage	TM
48	MSC/Circ.253 - Recommendation on ships which regularly alter load lines and tonnage marks	TM
49	MSC/Circ.260 - Uniform interpretation resolution A.48(III)	
50	MSC/Circ.326 - Drainage of enclosed cargo spaces situated on the bulkhead deck	LL

No.	Instruments	References and remarks
51	MSC/Circ.359 - Draft amendments to the 1977 Torremolinos Convention	SFV Related to regulation 48 of the Convention. Since the circular was issued, no further action has been taken.
52	MSC/Circ.406 - Guidelines on interpretation of the IBC Code and the IGC Code and Guidelines for the uniform application of the survival requirements of the IBC and IGC Codes	DS
53	MSC/Circ.408 - Protection of the crew of fishing vessels from water shipped on deck	SFV Superseded the provisions of recommendation 9 of the International Conference on Safety of Fishing Vessels, 1977
54	MSC/Circ.434 - Guidelines for the preparation of information on the effect of flooding to be provided to masters of dry cargo ships	DS References are made to res. A.515(13) and regulation II-1/23-1 of the SOLAS Convention
55	MSC/Circ.456 - Guidelines for the preparation of intact stability information	IS
56	MSC/Circ.484/Rev.1 - Subdivision and damage stability of dry cargo ships including ro-ro- ships	DS Superseded MSC/Circ.484. Incorporated in chapter II-1 of the 1974 SOLAS Convention as part B-1 (Res.MSC.19(58))
57	MSC/Circ.503 - Intact stability requirements for pontoons	IS Superseded MSC/Circ.348.
58	MSC/Circ.525 - Guidance note on precautions to be taken by the masters of ships of below 100 metres in length engaged in the carriage of logs	IS Intended to supplement the Code of Safe Practice for Ships Carrying Timber Deck Cargoes
59	MSC/Circ.541 - Guidance notes on the integrity of flooding boundaries above the bulkhead deck of passenger ships for proper application of regulation II-1/8 and 20, paragraph 1 of the 1974 Safety of Life at Sea Convention, as amended	DS

No.	Instruments	References and remarks
60	<u>MSC/Circ.548</u> - Guidance note on precautions to be taken by masters of ships engaged in the carriage of timber cargoes	LL Intended to supplement the Code of Safe Practice for Ships Carrying Timber Deck Cargoes
61	<u>MSC/Circ.574</u> - The calculation procedure to assess the survivability characteristics of existing ro-ro passenger ships when using a simplified method based upon resolution A.265(VIII)	DS Referred to in res. MSC.26(60) and used for applying provisions of the resolution to ro-ro passenger ships constructed before 29 April 1990
	<u>LL circulars</u>	
62	<u>LL.3/Circ.19</u> - Form of record of conditions of assignment of load lines	LL
63	<u>LL.3/Circ.56</u> - Draft amendments to the 1966 LL Convention	LL Incorporated in the 1988 LL Protocol
64	<u>LL.3/Circ.69</u> - Unified interpretations of the provisions of the 1966 LL Convention	LL Amalgamates and replaces interpretations contained in LL.3/Circ.20, LL.3/Circ.22 and LL.3/Circ.42 (fourth set of interpretations)
65	<u>LL.3/Circ.77</u> - Unified interpretations of the provisions of the Convention	LL Fifth set of interpretations
	<u>TM circulars</u>	
66	<u>TM.5/Circ.1 and Corr.1</u> - Interpretations of the provisions of the Convention	TM
67	<u>TM.5/Circ.3</u> - Unified application of the 1969 Tonnage Convention to open-top containership	TM

<u>Notes</u>: Abbreviations given in the column titled "References and remarks" are as follows:

DS - subdivison and damage stability
IS - intact stability
LL - load lines and associated matters
TM - tonnage measurement
SPS - safety of passenger ships
SFV - safety of fishing vessels
ISP - IMO saleable publication
