Maritime & Coastguard Agency

INSTRUCTIONS FOR THE GUIDANCE OF SURVEYORS ON

FISHING VESSELS – CHAPTER 3 PART B STABILITY OF FISHING VESSELS OF 15M LOA AND OVER

MSIS27

Rev 12.22

PREFACE

0.1 These Marine Survey Instructions for the Guidance of Surveyors (MSIS) are not legal requirements in themselves. They may refer to statutory requirements elsewhere. They do represent the MCA policy for MCA surveyors to follow.

0.2 If for reasons of practicality, for instance, these cannot be followed then the surveyor must seek at least an equivalent arrangement, based on information from the owner/operator. Whenever possible guidance should be sought from either Principal Consultant Surveyors or Survey Operation Branch, in order to maintain consistency between Marine Offices.

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RECENT AMENDMENTS

The amendments made in the most recent publication are shown below, amendments made in previous publications are shown in the document Amendment History.

Version Number	Status / Change	Date	Author Reviewer	Content Approver	Next Review Date/Expiry Date
09.21	• Updated Code to reflect new requirements of MSN1871 Amendment No.2	31/08/21	D Fenner	G Stone	01/09/2023
11.21	• Clarify MCA witness tests at inspection • Form and content check of approved stability books • Sets out requirements for new and existing Razor fishing multihulls	09/11/21	D Fenner	G Stone	31/10/2023
01.22	• Clarify an Offset load test can be conducted after a Roll/Heel Test failure. • Clarify that where vessel is a Category A vessel, the first step after failing a test is inclining.	31/01/22	D Fenner	G Stone	31/01/2023
05.22	• Cat A vessels should be referred to the Technical Panel if they fail Roll Test to decide whether to undergo Offset Load Test or go straight to inclining	27/04/22	D Fenner	G Stone	31/05/2023
08.22	• Split Chapter 3 into new sections on Under 15m Vessels, 15m and over vessels and Freeboard, make direct reference to MGN503 for assessing stability of vessels of less than 15m and reference to MSIS27 Chapter 2 for deciding equivalencies for Freeboard. Also amendments to section 3.10.20 and 3.10.21 of Part B (formerly 3.15.20 and 3.15.21) on solid ballast	01/07/22	D Fenner	G Stone	01/07/24
12.22	• Surveyors should refer to Sections 1.23 and 1.24 of MSIS27 Chapter 1 when	2/12/22	D Fenner	L Page	28/11/24

	reviewing modifications to vessels. • Review section 3.3.5 to 3.3.7 on Ballast water				

MSIS27 Chapter 3

1. STABILITY OF FISHING VESSELS OF 15M LOA AND OVER

3.0 INTRODUCTION

3.0.1 This chapter should be read in conjunction with Chapter 3 of MSN 1872 Amendment No.1, and MSIS27 Chapter 3 Part C.

3.1 GENERAL STABILITY REQUIREMENTS

3.1.1 MSNs, 1872 and 1873 set out clear minimum requirements for fishing vessel stability. It is the skipper's responsibility to ensure that these requirements are met in all seagoing, sailing conditions. The requirements assign a set of minima to critical characteristics of the righting lever curve.

3.1.2 But the standard does not guarantee safety against all hazards. The overturning loads imposed by the fishing operations are not considered when stability books are approved. There is no requirement in the regulations that these loads should be considered. These effects are covered by the safety margin implicit, but unquantifiable, within the minimum criteria.

3.1.3 The MCA surveyors' contribution is to verify, that at the completion of the survey/inspection/approval, the safety margins on stability have not been eroded below the minimum required for all sailing conditions – this is the main purpose of stability approval and verification.

3.1.4 There are Statutory Requirements for the carriage of Stability Information on board UK fishing vessels of 12 Metres Registered length or over. A recommended format gives consistency of presentation and therefore ease of reading for those using the Freeboard and Stability Information booklet which must be made available onboard the vessel, by the vessel owner, for the use of the skipper. MGN 281 (F)[1] recommends a format for the Freeboard & Stability Information Booklet for use on board Fishing Vessels. The recommended format for the Freeboard & Stability Information Booklet is available Adobe (PDF) for download[g].

3.1.5 Surveyors should refer to Sections 1.23 and 1.24 of MSIS27 Chapter 1 when reviewing modifications to vessels.

3.2 VESSELS 15M IN OVERALL LENGTH TO LESS THAN 24M IN REGISTERED LENGTH

3.2.1 The specific stability requirements for this size of vessel are set out in Chapter 3.1.2 of MSN 1872. In brief the criteria require:

a) a GM >= 0.35 metres;

b) a GZ >= 0.20 metres at an angle of heel equal to or greater than 30°;

c) the angle of maximum GZ >= 25°;

[1] https://www.gov.uk/government/publications/mgn-281-fishing-vessel-freeboard-and-stability-information-format

d) the area under the GZ curve to 30° >= 0.055 metre-radians;

e) the area under the GZ curve to 40° (or the downflooding angle if less) >= 0.090 metre-radians;

f) the area between 30° and 40° (or the downflooding angle if less) >= 0.030 metre-radians.

3.2.2 For vessels with beam to depth ratio greater than 2.5, such as catamarans, which may not meet the above stability criteria an alternative set of criteria is given in Section 3.1.2.2 of MSN 1872.

3.2.3 For vessels engaged in single or twin boom fishing the requirements (excluding the angle of maximum GZ) are increased by 20% - Section 3.1.2.3 of MSN 1872.

3.2.4 Vessels operating in areas where they could be exposed to an accumulation of ice on their upper works (as defined in para 14 of Annex 3 of MSN 1872) should meet the criteria when “icing allowances” are applied.

3.2.5 All vessels are required to carry an approved stability book demonstrating compliance with **each** of these criteria in **all** seagoing sailing conditions (see para 10 of Annex 3 of MSN 1872).

3.2.6 MSN 1872 states that “*All vessels are to be provided with approved stability information to the satisfaction of the certifying authority for the conditions of service for which the vessel is intended”.* This provides scope to require additional stability criteria to be met in special circumstances i.e. where a clear hazard to the stability of the vessel exists and which is not adequately addressed by meeting the standard stability criteria (see also MGN 281 page 32, first paragraph, The recommended format for the Freeboard & Stability Information Booklet is available Adobe (PDF) for download[2]). If a surveyor believes that such additional measures are necessary on a specific vessel the case should be set out in a minute on the vessels SharePoint Stability file for consideration of a Consultant Surveyor (FV); who will decide on the appropriate course of action, if necessary after consultation with the members of focal point group D and/or the Head of the Stability and Plan Approval Unit. Examples of such a circumstance follow:

- Under most circumstances where vessels have open decks fitted with Rule freeing ports and non-weathertight shelters, the effect of water on deck need not be considered, as it is assumed that any water collected will be drained away by the freeing ports or other drainage means provided. However, where the arrangement of the vessel is such that a well is vulnerable to rapidly shipping large quantities of water for which the drainage arrangements are not designed, trapped water should be taken into account. In these circumstances the method set out in Chapter III Regulation 6 of the Torremolinos Protocol 1993 should be applied.

[2] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/302895/stability_inf_re_mgn281.pdf

- Vessels with side openings in weathertight shelters, such as the landing hatches on long liners are required to demonstrate that the lower edge of the hatch opening is not immersed at an angle of heel less than 30° in all seagoing conditions. If this criterion cannot be met then that part of the shelter in way of the landing hatch will not be considered weathertight and additional calculations showing the effect of loose water in that enclosed space will be required [as in the bullet above] – assuming that the space is filled to the lowest point of the landing hatch.
- Where a fishing vessel has a factory deck the likely presence of loose water on that deck should be accounted for (page 32 of Annex 1 to MGN 281 refers, The recommended format for the Freeboard & Stability Information Booklet is available Adobe (PDF) for download[3]).
- On potting vessels such as crabbers it may be appropriate to include a condition where the vessel is carrying the greatest number of pots possible to cover the circumstance when the bulk of the gear is recovered to re-deploy to another area.
- For the calculation of the stability of single and twin boom fishing vessels, the derrick booms should be assumed to be hoisted up to an angle of 45° with the horizontal; unless in the normal seagoing conditions they are stowed at a higher angle, in which case that angle should be used. Where the booms are usually stowed at about 45° when sailing but when in harbour they are topped to the vertical for ease of negotiating entrances, and general manoeuvring, the vessel should also meet the non-beamer criteria (i.e. without the 20% uplift) in all conditions with the booms vertical (these last calculations need not be contained in the approved stability book but they should be placed on the file).

3.3 VESSELS OF 24M IN REGISTERED LENGTH AND OVER

3.3.1 The specific stability requirements for this size of vessel are set out in Chapter 3.1.2 of MSN 1873.

3.3.2 The stability criteria applicable to this size of fishing vessel are essentially those set out in the Torremolinos Convention. In brief the criteria require:

a) a GM >= 0.35 metres;

b) a GZ >= 0.20 metres at an angle of heel equal to or greater than 30°;

c) the angle of maximum GZ >= 25°;

d) the area under the GZ curve to 30° >= 0.055 metre-radians;

e) the area under the GZ curve to 40° (or the downflooding angle if less) >= 0.090 metre-radians;

f) the area between 30° and 40° (or the downflooding angle if less) >= 0.030 metre-radians.

[3] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/302895/stability_inf_re_mgn281.pdf

3.3.3 The following additions are specifically for over 24m fishing vessels:

- All vessels are required to carry an approved stability book demonstrating compliance with **each** of these criteria in **all** seagoing sailing conditions
- The angle of heel at which progressive flooding of fish-holds could occur through hatches which remain open during fishing operations and which *cannot rapidly be closed* should be at least 20° unless the stability criteria can be met with the affected fish-holds partially or completely flooded. In this context “cannot rapidly be closed” means cannot be readily and speedily closed from a remote position (such as the bridge);
- Vessels must be able to withstand the effect of severe wind and rolling in associated sea conditions. The relevant calculations should be carried out in accordance with the IMO Code on Intact Stability 2008 (as amended). This calculation need only be carried out for the seagoing sailing condition(s) for which the results of the calculation would exceed the criterion by the least margin. If this is not clear without actually doing the calculations then the calculations should be done for all conditions;
- Vessels must be able to withstand the effect of water on deck. The method set out in 3.1.2.7 of MSN 1873 should be applied. Again, this calculation need only be carried out for the seagoing sailing condition(s) for which the results of the calculation would exceed the criterion by the least margin. If this is not clear without actually doing the calculations then the calculations should be done for all conditions;
- Engine room vents shall be assumed as downflooding points if the angle of initial immersion is less than 40°. This requirement must be applied regardless of what closures are fitted to these openings;
- On vessels with complete superstructure (i.e. a full width, weathertight construction above the freeboard deck running the full length of the vessel and greater than 1.8 metres in height) or for vessel of 70m in length and over the GM may be reduced to the satisfaction of the MCA but in no case should be less than 0.150 metres (i.e. the standard Load Line requirement for merchant ships);
- Where arrangements other than bilge keels are provided to limit the angles of roll (for example roll damping tanks) the MCA must be satisfied that the stability criteria are maintained in all operating conditions;
- Solid ballast shall be fixed securely in the vessel to ensure that any movement is prevented;
- Permanent water ballast stored in completely filled tanks disconnected from any pumping system can be accepted;
- Details of any permanent ballast (solid or water) carried to ensure compliance with the stability criteria should be approved by the Certifying Authority and included in the Certificate of Compliance and in the stability booklet. It must not be removed ship or repositioned without the approval of the Certifying Authority. Surveyors should witness the installation of solid ballast and verify that tanks containing permanent water ballast have been isolated by disconnection from the ship’s piping systems.;
- Vessels operating in areas where they could be exposed to an accumulation of ice on their upper works (as defined in section 3.1.6 of MSN1873 should meet the criteria when “icing allowances” are applied.

3.3.4 Vessels engaged in particular fishing methods where additional external forces are imposed on the vessel during fishing operations should meet the appropriate stability criteria, increased (if necessary) to the satisfaction of the Certifying Authority. This provides scope to require additional stability criteria to be met in special circumstances i.e. where a clear hazard to the stability of the vessel exists and which is not adequately addressed by meeting the standard stability criteria (see also MGN 281 page 32, first paragraph, The recommended format for the Freeboard & Stability Information Booklet is available Adobe (PDF) for download[4]). If a surveyor believes that such additional measures are necessary on a specific vessel the case should be set out in a minute on the vessel's SharePoint Stability file for consideration of a Consultant Surveyor (FV); who will decide on the appropriate course of action, if necessary after consultation with the members of focal point group D and/or the Head of the Stability and Plan Approval Unit; Examples of such a circumstance follow:

- Under most circumstances where vessels have open decks fitted with Rule freeing ports and non-weathertight shelters, the effect of water on deck need not be considered, as it is assumed that any water collected will be drained away by the freeing ports or other drainage means provided. However, where the arrangement of the vessel is such that a well is vulnerable to rapidly shipping large quantities of water for which the drainage arrangements are not designed, trapped water should be taken into account. In these circumstances the method set out in Chapter III Regulation 6 of the Torremolinos Protocol 1993 should be applied.
- Vessels with side openings in weathertight shelters, such as the landing hatches on long liners are required to demonstrate that the lower edge of the hatch opening is not immersed at an angle of heel less than 30° in all seagoing conditions. If this criterion cannot be met then that part of the shelter in way of the landing hatch will not be considered weathertight and additional calculations showing the effect of loose water in that enclosed space will be required [as in the bullet above] – assuming that the space is filled to the lowest point of the landing hatch.
- Where a fishing vessel has a factory deck the likely presence of loose water on that deck should be accounted for (page 32 of Annex 1 to MGN 281 refers, The recommended format for the Freeboard & Stability Information Booklet is available Adobe (PDF) for download[5]).
- On potting vessels such as crabbers it may be appropriate to include a condition where the vessel is carrying the greatest number of pots possible to cover the circumstance when the bulk of the gear is recovered to re-deploy to another area.
- For the calculation of the stability of single and twin boom fishing vessels, the derrick booms should be assumed to be hoisted up to an angle of 45° with

4 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/302895/stability_inf_re_mgn281.pdf

5 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/302895/stability_inf_re_mgn281.pdf

the horizontal; unless in the normal seagoing conditions they are stowed at a higher angle, in which case that angle should be used. Where the booms are usually stowed at about 45° when sailing but when in harbour they are topped to the vertical for ease of negotiating entrances, and general manoeuvring, the vessel should also meet the non-beamer criteria (i.e. without the 20% uplift) in all conditions with the booms vertical (these last calculations need not be contained in the approved stability book but they should be placed on the file).

- New (2003), single and twin boom fishing vessels must meet the following enhanced stability criteria:

  (i) the criteria for areas under the righting lever curve and for the righting levers must be increased by 20% (as stated in section 2.3);

  (ii) the GM >= 0.5 metres;

  (iii) the criteria given above shall be applicable only to vessels with an installed propulsion power (in kW) lower than given in the following formulae:

  (a) $N = 0.6\ L_s^2$ for vessels with a length of 35 metres or less; and

  (b) $N = 0.7\ L_s^2$ for vessels with a length of 37 metres and over;

  (c) at intermediate length (35 metres to 37 metres) of the vessel the coefficient for Ls has to be obtained by interpolation in between 0.6 and 0.7;

  (d) L_s is the overall length recorded on the registration certificate.

If the power at the flywheel exceeds the values for the standard propulsion power given in the above formulae the criteria in para (i) must be increased in direct proportion to the higher propulsion power. These requirements apply to all the seagoing sailing conditions required in the approved stability book. For the calculation of the stability, the derrick booms should be assumed to be hoisted up to an angle of 45° with the horizontal; unless in the normal seagoing conditions they are stowed at a higher angle, in which case that angle should be used. Where the booms are usually stowed at about 45° when sailing but when in harbour they are topped to the vertical for ease of negotiating entrances and general manoeuvring the vessel should also meet the non-beamer criteria (i.e. without the 20% uplift) with the booms vertical in all conditions (these last calculations need not be contained in the approved stability book but they should be placed on the file).

3.3.5 The International Convention for the Control and Management of Ships Ballast Water and Sediments (the 'Ballast Water Management Convention') entered into force globally on the 8 September 2017. The UK acceded to the Convention in May 2022 and introduced the Merchant Shipping (Control and Management of Ships' Ballast Water and Sediments) Regulations 2022 (UK SI 737/2022) which are now in effect.

Additional guidance can be found in the following documents:
MGN 675 (M+F) The Merchant Shipping (Control and Management of Ships' Ballast Water and Sediments) Regulations 2022.

MSN 1908 (M+F) The Merchant Shipping (Control and Management of Ships' Ballast Water and Sediments) Regulations 2022.

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3.3.6 Refrigerated Sea Water (RSW) tanks and water storage areas that are used to feed RSW tanks are not considered to fall under the requirements of the Convention; roll reduction tanks may be supplied from RSW stowage. The Convention stipulates that the requirement to manage ballast water will not apply to the discharge of ballast water and sediments when the discharge occurs at the same location from which the whole of the ballast was taken from, provided no mixing of ballast water or sediments from another location takes place. The term 'same location' is defined in regulation 6(2) as meaning:
where any ballast water or sediments have been taken on board a ship within a harbour, within the harbour limits of that harbour; or otherwise within one nautical mile of the point of uptake.

3.3.7 This definition will only apply in UK controlled waters. When reviewing loading conditions, the use of RSW and roll reduction tanks to control trim, list, draught, and stability are to be especially considered.

3.4 STABILITY VERIFICATION - GENERAL

3.4.1 The purpose of this assessment is to satisfy the Surveyor and the MCA **that the fishing vessel continues to meet the minimum statutory requirements for stability and freeboard**; providing the evidence to back up the Surveyor's declaration made at survey. Stability assessments should be carried out at the following times during a vessel's life:

- When new, on completion[6]
- At each renewal survey;
- At flag-in or re-registration;
- Following conversion work in which MCA has been involved, or;
- When changes affecting stability are found during a general inspection [contact a Consultant Surveyor (FV) to agree the appropriate course of action].

3.4.2 Stability assessments comprise either a roll test, or a lightship survey, or an inclining test. The next paragraphs cover their applicability and identify some practical difficulties when carrying them out.

[6] *It may be acceptable to dispense with the need for an inclining test for some catamarans and other vessels with a high initial GM (where GM is more than 3 times the VCG) In such cases the LCG should be obtained by lightship survey or by weighing with two gauges. The lightship VCG may be obtained by an accurate weight estimate calculation with a suitable (pessimistic) margin added, in no case should the lightship VCG be taken below main deck. Details of the estimated lightship weight, LCG and VCG should be submitted to the MCA for verification, prior to completion.*

3.5 STABILITY VERIFICATION – ROLL TESTS

	IMO Intact Stab Code - IMO Publications and Documents - International Codes - Intact Stability (IS) Code - Intact Stability for All Types of Ships Covered by IMO Instruments – Resolution A.749(18) - Annex - Code on Intact Stability for all Types of Ships Covered by IMO Instruments - Annex 3 - Determination of ship's stability by means of rolling period tests (for ships up to 70 m in length)	IMO RESOLUTION A.167 (ES. IV) adopted on 28 November 1968
Paragraph 3.6.1 3.18.1	Roll test – DTI pre 01 May 1975 vessels[7]	Non-boom vessels based on IMO res A.167
3.18.3	Roll test - Dutch pre 01 May 1975 vessels	Boom vessels

3.5.1 Roll tests are applicable only to:

- Existing vessels to which Chapter 3.1.1.3 of MSN 1872 applies i.e., those pre-01 May 1975 vessels under 24.4 metres registered length which have demonstrated satisfactory stability through roll tests and have not been required to have approved stability books under previous legislation.
- Existing vessels to which Chapter 3.1.1.4 of MSN 1873 applies i.e., those pre-01 May 1975 vessels under 24.4 metres registered length which have demonstrated satisfactory stability through roll tests and have not been required to have approved stability books under previous legislation.

3.5.2 Please refer to the Handbook of Exemptions (Vessels under 24.4 metres) and (Vessels of 24.4 metres and Over) which may apply to older vessels (i.e., pre-01 May 1975 vessels) which met equivalent requirements of the Fishing Vessels (Safety Provisions) Rules 1975. It is important to appreciate that by virtue of meeting the criterion in only ONE loading condition it is assumed that adequate stability will be achieved throughout the whole voyage cycle. For this to be valid there must be reasonable constancy of freeboard, trim, and draught and also that as consumables on board are used up i.e., ice, fuel, etc. are replaced by equal weights i.e., fish, at approximately the same height in the vessel. A roll test

[7] This exemption is conditional upon the vessel demonstrating adequate stability by means of a rolling period test. It is inevitable that there must be some limitations associated with this method and the exemption is given on the understanding that: (i) the vessel has a history of safe operating experience; (ii) it will continue to fish using the method of fishing which led to this safe experience; (iii) the stability will be re-examined if there has been substantive alterations to the vessel including the fishing gear e.g. adding rope drums; (iv) the vessel is rolled in a departure condition which is generally representative of other conditions during the voyage cycle and will be so operated as to achieve reasonable constancy of loading draughts, trim etc; and (v) departure from (iv) should only be undertaken if the results of the rolling period test indicate a sufficient margin of stability in excess of the minimum requirement to permit the anticipated changes in the condition e.g. the adverse effects of the shift of cargo likely to behave as a viscous liquid.

conducted for a particular mode of fishing is not necessarily valid for another mode.

3.5.3 It is important to ensure that all measurements and other records taken are agreed with the owner or his representative. References to breadth and moulded depth are references to Principal Breadth and Principal Depth as defined in MSN 1873.

3.5.4 The type of Roll Test will depend on the vessel size as follows:

- Vessels of 15m LOA and over – See section 3.12.1 below of this Chapter.

3.5.5 Proforma for recording the measurements taken during the test and for recording of the condition of the vessel can be found at Annex A to this Chapter of the Instructions.

3.5.6 It is important to ensure that all measurements and other records taken are agreed with the owner or his representative. References to breadth and moulded depth are references to Principal Breadth and Principal Depth as defined in MSN 1873.

3.5.7 Pre 01 May 1975 vessels which are Single and twin boom fishing vessels of 15m and Over subject to the Roll Test Procedure should be roll tested by a consultant and witnessed by an MCA surveyor. Owners should be advised that the services of a consultant are necessary to provide an independent check of the test and to provide advice on appropriate modifications or alterations to the vessel and/or its equipment should it fail to pass the roll test. MCA surveyors may continue to carryout roll tests on vessels which are neither single or twin boom fishing vessels.

3.5.8 Non-(single and twin)-boom fishing vessels. The practice of engaging consultants to carryout single and twin boom fishing vessel roll tests has not been extended to other types of fishing vessels but there still exists a need to provide an independent check of the roll test for these vessels. It has been agreed with industry that the owner or his elected representative should provide this independent check and surveyors should fully involve the vessel owner (or his/her elected representative) when carrying out such roll tests. Further details are given in Annex B of this Chapter of the Instructions.

3.5.9 The general background theory to roll tests is contained in Section 3.17.1 below of this Chapter.

3.5.10 Vessel condition. In the test to determine GM_{ind} the vessel should be in the *depart port* condition. Any deviation from this would invalidate the formula used to derive the GM_{req}. If ice is normally carried then this (or an equivalent weight in the same location) should be on board the vessel when carrying out the roll test. It is important that full details (including photographs) of the vessel's depart port condition are recorded, including details of:

- all storage tanks at maximum working levels;
- fishing gear onboard;
- ice onboard;

- beams and derricks where applicable (beams on deck and derricks topped);
- spare gear;
- permanent ballast.

3.5.11 Precautions to be observed. The following precautions should be taken during preparation for and whilst carrying out the roll test:

- the vessel should be in harbour, with calm waters and minimum interference from wind and tide;
- the mooring of the vessel should be slack;
- all shipyard equipment should be removed from the vessel;
- there should be a reasonable clearance of water below the keel and at the sides of the vessel to avoid contact;
- a preliminary roll should be carried out to check that the motions of the vessel are adequate to enable at least three (but preferably five) consecutive oscillations to be timed;
- all fishing and spare gear that might shift during rolling should be secured in their normal stowed position;
- fish boxes and ice stowed and secured in their normal locations;
- any free surface should be minimised and preferably eliminated by pressing up the tanks (or emptying those not in use in the depart port condition);
- the deck edge must not be allowed to be immersed during rolling;
- all bilges to be dry;
- any persons on board to remain stationary during the test.

3.5.12 Before carrying out the roll test (non-(single and twin)- boom fishing vessels), surveyors should explain the basic theory to the owner or his/her elected representative. This should be followed by a demonstration roll test explaining the roll test procedure and involving the owner in the recording of the vessels condition, taking and checking of measurements and timing the roll period. Having completed this demonstration the actual roll test should be carried out with the full involvement of the owner. It is unlikely to be necessary to re-assess the condition of the vessel or re-measure the freeboard but it is important to ensure that the owner agrees the information recorded. In addition, the owner should be handed a copy of Annex B - *Guidance on the Conduct of Roll Tests on Non-single and twin boom fishing vessels.*

3.6 ROLL TEST PROCEDURE.

Roll Test Procedure – Fishing Vessels of 15m LOA and over

3.6.1 The roll test should be conducted in the following manner:

- Check dimensions on the vessel and from previous roll test report. Freeboard measurements are unlikely to be exactly the same as those previously recorded but should not be dramatically different. It is important to ensure accurate measurement as minor errors can substantially effect the

calculation of *GM*. Freeboard measurements are best carried out from a tender with no one on board the vessel. Where this is not possible as few persons as is necessary should be on board when measurements are taken and appropriate precautions should be taken to minimise any effect on the angle of heel that may result.

- The vessel should be rolled by pulling rhythmically (in time with the vessel's rolling), with a rope, on the mast or other substantial structure well above the water line. Any other practical method may be considered (e.g. pulling on a rope fixed ashore through a high point using a warping drum on the vessel, using a crane ashore to repeatedly lift and place a weight on the deck. The important point is that the method adopted is to be used to initiate the rolling and therefore should be stopped as soon as the amplitude has increased to an acceptable level, in order to ensure that the vessel is then able to roll naturally and free of constraint.
- The roll period should be timed over as many oscillations (minimum three but preferably five) as can be reasonably discerned. In theory, to ensure the best possible accuracy, a distant or other suitable object that will align with the vessel's mast (or other suitable part of the vessel's structure), at the stage in the oscillation where the vessel is upright or near upright, should be used as a reference point for timing the oscillations. In practice this is rarely possible and the normal practice is to use the point of maximum amplitude of the roll (i.e. when the vessel has roll motion has stopped just prior to commencement of another roll cycle).
- This process should be repeated at least three times or until consistent measurements are obtained. On each occasion the time for at least three (but preferably five) oscillations should be measured.
- A mean time (T) for one oscillation (i.e. the roll period) can then be calculated from the timings taken.
- Having completed the roll test the indicated *GM* should be calculated to establish whether the vessel has passed the test i.e. $GM_{ind} >= GM_{req}$
- If the vessel 'fails' the roll test remedial action will be required.
- When the roll test proforma is complete with an accompanying minute on the SharePoint Vessel Stability file, it should be forwarded to the Consultant Surveyor (FV) for examination and confirmation prior to issuing owner's documentation.

3.6.2 ROLL/HEEL/OFFSET LOAD TEST FAILURE

3.6.2.1 If a vessel fails a test the owner should be given the opportunity to re-test the vessel and invited to consider how to modify or reduce weight. He may consider the removal of redundant equipment, slack or loose items, re-examining stowage locations of loose equipment (i.e. stow at in a lower position in the vessel) or minor modifications to the vessel (removing top weight or adding ballast. There may be instances where the bilge keel of a vessel can affect the result of the Roll Test. If the vessel does not pass a repeated roll (or, where a bilge keel may affect results, the heel test) it will be required to conduct an Inclining Test followed by submission of full stability data for approval by Stability Unit.

3.6.2.2 The conditions under which the test is repeated shall be recorded.

3.7 RECORDS

3.7.1 **Records to be taken**. In addition to roll period timings the proforma in Annex A should be used to record details of the vessel's condition. In particular the following must be recorded:

- drafts and freeboards;
- sufficient photographs (particularly of the decks showing the disposition of fishing gear and other loose and spare gear) to enable any changes to the vessel or the depart port condition to be identified at subsequent surveys;
- details of tanks and contents;
- the number of persons onboard.

3.7.2 **Documentation to be sent out.** Once analysis of the results has been completed the surveyor should send the owner the following:

- Guidance Notes to Skippers (see Annexes C and D); and
- The statement of stability following a roll test (see Annex E)

3.7.3 **Records to be kept.** The following should be retained on file:

- copies of all completed proforma;
- all calculations carried out by the surveyor;
- all photographs taken at time of test;
- calculations and results from the consultant.

3.7.4 Consequences of incorrect measurement and time recording. It is important to ensure that all measurements and time recording are as accurate as possible. Considering a typical single and twin boom fishing vessel of 20 metres in length, 5.6 metres in beam, 3.0 metres in moulded depth and with a roll period of 6.5 seconds obtained by timing 5 complete oscillations, the following errors could occur as a result of incorrect measurement, by way of an example:

PARAMETER	ERROR	CHANGE IN GM_{mod}
Breadth	+/- 0.1metres	0.3 cm
Moulded Depth	+/- 0.1metres	3.0 cm
Freeboard	+/- 0.1metres	0.5 cm
Average Roll Period	+/- 0.1 seconds	1.5 cm
	+/- 1.0 seconds	14.0 cm

3.7.5 It is clear from the above that accurate recording, particularly of the roll period and the vessels moulded depth, is essential to ensure an accurate roll test result; the breadth and depth of the vessel should be taken from the certificate of measurement and not re-measured.

3.8 STABILITY VERIFICATION – LIGHTSHIP SURVEYS

3.8.1 This section applies to all fishing vessels carrying an approved stability book in compliance with section 3.4.6, 3.7.6, 3.8 and 3.12.7 of MSN1871, Chapter 3.1.1.1 of MSN 1872 and 3.1.1.2 of MSN 1873

3.8.2 At each renewal survey a stability assessment is required to ensure that the vessel remains compliant with the required stability criteria and the approved stability book remains valid. This assessment is normally carried out by means of a lightship survey, but there are occasions when this is not appropriate, for example:

- Vessels having no margins on one or more of the stability criteria in any seagoing sailing condition should be inclined instead, and;
- When "unapproved" modifications to the vessel come to light during the survey which could have an adverse impact on stability.

Additional requirement for vessels to which MSN1873 applies

- Vessels meeting MSN 1873 are inclined at least every 10 years (in practice this means every second renewal survey);

3.8.3 A lightship survey uses the measured fore and aft draughts at which the vessel is floating to estimate the "as found" weight of the vessel and its longitudinal centre of gravity (LCG) [assuming that LCG = LCB, the longitudinal centre of buoyancy - an approximation which is accepted for lightship surveys]. The lightship is then calculated from the "as found" condition by deducting the deadweight items recorded during the survey. The calculated lightship is then compared with the latest approved lightship in the current stability book to determine the percentage change that has occurred [note: that the change in LCG is taken as a percentage of the vessel's length between perpendiculars (LBP)]. If it is found that the changes to lightship weight and/or LCG are more than MCA's prescribed limits (suggesting that the vertical centre of gravity has also changed, adversely affecting the vessel's stability) an inclining test should be carried out. Only a full inclining experiment can locate the vertical centre of gravity, accurately defining the vessel's stability.

3.8.4 A 2% change in lightship weight (or 2 tonnes, whichever is the greater change) and/or a 1% change in lightship LCG are the MCA's set limits for accepting a lightship survey report as validating compliance with approved stability book. [note that the percentage change in LCG is taken relative to the LBP i.e. percentage change in LCG = (old LCG – new LCG) / LBP] If either parameter exceeds these limits an inclining test is required. It is important to note that reduction in lightship weight can also indicate a stability concern; so the comparison must relate to a deviation exceeding either +/- 2% in weight or +/- 1% in LCG. Where a vessel is within these limits, and the lightship survey report is accepted, the values of lightweight and lightship LCG derived from the lightship survey should be used in

conjunction with the VCG derived from the most recent inclining experiment in all subsequent stability calculations which may be carried out by the skipper.

3.8.5 When a lightship check is subsequently carried out on a vessel where there are approved Records of Minor Alterations (RMAs) in the stability book, the MCA's limits for the deviation of lightship weight and LCG should be applied against the latest approved lightship i.e. that set out in the RMA, not in the original inclining test. As a consequence of this policy it is possible for a fishing vessel to have an approved "known" change in lightship weight of 2% (or 2 tonnes if greater); and in addition an allowable "unknown" change in the revised lightship of up to 2% (or 2 tonnes if greater). Similarly, for the lightship LCG changes. This policy is intended to encourage operators to come forward and involve MCA in vessel alterations at an early stage.

3.8.6 For fishing vessels marginally in excess of the stability criteria surveyors should strongly recommend to consultants and owners that an inclining test should be carried out in preference to a lightship survey at the renewal survey irrespective of any known changes to the weight or weight distribution. In this context "marginally in excess" is defined as having any single stability criterion with a compliance margin of less than 105% in any of the loading conditions in the approved SIB, as shown below:-

FV Criteria	Actual	Required	% compl
Area 0-30	0.059	0.055	107.3
Area 0-40	0.095	0.090	105.6
Area 30-40	0.057	0.030	190.0
Max GZ >	0.206	0.200	103.0
Min GZ@30	0.204	0.200	102.0
Min GM	0.426	0.350	121.7

3.8.7 Where there is no margin the Surveyor can insist that an inclining test is carried out instead of the usual lightship survey because the vessel cannot tolerate any increase in the lightship vertical centre of gravity (which is not measured by a lightship survey). Where there is a slight margin the operator should be recommended to submit the vessel for an inclining test in preference to a lightship survey to avoid the likelihood of an inclining test being required immediately afterwards because the lightweight and LCG fall outside of MCA's limits. But this is the owner's choice based on advice from the consultant.

3.8.8 The process for carrying out a lightship survey is covered in Chapter 1 Annex 1 of MSIS 9. A Lightship Declaration, MSF2229, should be completed and the results will be formally presented by the consultant in a lightship report. It is important that the surveyor checks through this report as soon as possible in order that any stability problems are identified, and remedial measures taken before the fishing vessel returns to sea. The checks should comprise:

- Verify that the basic data recorded at the lightship survey is correct i.e. agrees with the attending surveyor's own notes on items such as draughts, water density, deadweight deductions, lightship additions, etc;
- Complete an independent calculation of the lightship based on the measured data at the lightship survey, and the hydrostatics contained in the approved stability book (the surveyor should use the standard Excel spreadsheet developed by the Stability and Plan Approval Unit for carrying out this calculation);
- Verify that lightship weight and LCG are within MCA's accepted limits;
- Verify that the deadweight deductions are "reasonable" by comparison with deadweight items recorded in the approved stability book in the various seagoing conditions. This check is a very important aspect of the lightship survey. Remember that the purpose of the lightship survey is to ensure that the vessel complies with its approved stability book; it does not stop at the point where the lightship weight and LCG are shown to meet MCA's limits.

3.8.9 Practical issues that can occur and suggested solutions (surveyors' decisions on the day may differ from the guidance given here for good and valid reasons which stand up to scrutiny);

- The Vessel's SharePoint stability file should be examined before attending the lightship check. If this is impossible then a copy of the approved stability book should be obtained from the owner and examined. Check particularly: i) the margins by which the stability criteria are exceeded in each loading condition – no margins means an inclining test instead; ii) if the fishing gear is considered as part of the lightship weight or as a deadweight item; iii) the diagram showing the draught marks position and datum; and iv) take a copy of the tank plan for reference during the survey.
- Every space without exception should be accessed to accurately establish its contents and the weights of items that are not part of the vessel's lightship.
- Bilges should dry, or pumped out until suction is lost. No deductions should be permitted for any bilge water that is retained.
- The fishing gear should be itemised so that a cross-check can be made of its weight, if necessary, by referring to manufacturers or gear catalogues. This is also important in providing a good basis for comparison at future lightship surveys.
- There should be no ice in the fish room. Its weight cannot be accurately estimated and has led to erroneous lightship survey results in the past.
- It is recommended that tanks are pressed up. If not full then it is essential that the contents can be accurately measured. If this is not possible on some tanks, those should be emptied and opened up for inspection. Where possible use sight glasses or sounding tapes/rods in preference to gauges.
- Surveyors should differentiate "weighed and calculated" weights from "visual estimates". The former, such as measured tank contents, should give accurate data while the latter could be highly inaccurate. Where a 10% error in the "visual estimates" would exceed 1% of the lightship, consideration should be given to having these deadweight items weighed.

- The displacement of the vessel as found at the lightship survey is determined from the vessel's draughts. So accuracy in the draught readings is very important – see MSIS 9 Chapter 1.
- The diagram shown in paragraph 3.18.4 below of this Chapter illustrates how a 1cm error in reading the draughts impacts on the estimated lightship. [e.g. for a 20m vessel displacing 200 tonnes, the effect would be about 0.65%].
- The accuracy of the draught marks should have been verified and witnessed by an MCA surveyor at the out of water survey prior to the lightship check. This should be recorded on the Vessel's SharePoint stability file. Note the longitudinal position of the draught marks against a fixed reference point of the vessel such as the transom, this can be checked against the approved stability book data.
- For a description of how to set up or check draught marks accurately see paragraph 3.17.5 below of this Chapter;
- The hydrometer used by the consultant to verify the density of the water must be accurate – a difference of 0.005 on the hydrometer is equivalent to a difference of about 0.5% on the lightship weight. The surveyor should request to see the hydrometer's calibration certificate or verify its accuracy by testing it in fresh water.
- Check that deductions on specific items of deadweight do not substantially exceed that recorded in the approved stability book. Fishing gear and stores are the main areas where this can occur e.g. if 15 tonnes of fishing gear is deducted at the lightship survey but only 11 tonnes of fishing gear is recorded in the approved stability book it suggests that the vessel is sailing at a greater draught than that shown in the approved stability book i.e. it is operating beyond its approved loading limits or the weight of fishing gear has been overestimated during the survey. This can be resolved by either:
    - Requesting a re-working of the vessels seagoing sailing conditions (to ensure the vessel still complies with the stability criteria with the revised deadweight) in the form of a stability supplement which can be attached to the approved stability book onboard the vessel; or
    - Weighing the disputed deadweight items on a weighbridge and removing any excess deadweight from the vessel; or
    - Carrying out an inclining test on the vessel if it is considered that options i) or ii) would not effectively address the issue.
- It is equally important to identify any lightship items missing from the vessel at the time of the survey and make the appropriate adjustments. Care needs to be taken if the stability books shows fishing gear as a lightship item. In that case any fishing gear missing from the vessel at the lightship survey will have to be added on to obtain the comparable lightship.
- On balance it is preferable for all fishing gear to be onboard the vessel at the lightship survey because this provides the most accurate basis for an estimate of the displacement and LCG of the ship in a seagoing sailing condition, for comparison with the approved stability book. Where the gear isn't onboard an itemised weight break down of the current gear should be requested.
- The vessel should not be issued with a fishing vessel safety certificate (short-term or full) until the lightship report has been accepted by MCA.

3.9 STABILITY VERIFICATION – INCLINING TESTS

3.9.1 This section applies to all fishing vessels carrying an approved stability book in compliance with section 3.4.6, 3.7.6, 3.8 and 3.12.7 of MSN1871, Chapter 3.1.1.1 of MSN 1872 and 3.1.1.2 of MSN 1873

3.9.2 A lightship survey allows the lightship weight and LCG to be found. An inclining test comprises a lightship survey with heeling of the vessel under a known weight shift to give, in addition, the lightship vertical centre of gravity (VCG).

3.9.3 An inclining test is the appropriate method for assessing the stability of a fishing vessel on the following occasions:

- A new vessel on completion[8];
- An existing fishing vessel on flag-in to the UK register (as may be required);
- Vessels having no margins on one or more of the stability criteria in any seagoing sailing condition should be inclined at each renewal survey;
- Vessels which have just been subject to a lightship survey which has found an increase in lightship weight of more than 2% (or more than 2 tonnes if this is greater), or a shift in lightship LCG of more than 1% LBP against the current approved lightship particulars in the stability book;
- When "unapproved" modifications to the vessel come to light which could have an adverse impact on stability.

Additional requirements for vessels to which MSN1873 applies:

- An existing vessel meeting MSN 1873 and it is 10 years since its last inclining test (in practice this means every second renewal survey);

3.9.4 The theoretical background to the determination of the lightship VCG from heeling the vessel using a known weight shift is outlined in paragraph 3.17.6 below of this Chapter.

3.9.5 The procedure for carrying out an inclining test is covered in Annex 3 to MSIS 9, Part 6 of MSIS 1 and Annex 1 of IMO's Intact Stability Code.

3.9.6 The results will be formally presented by the consultant in an inclining test report. It is important that the attending surveyor checks through this report as soon as possible in order that any stability problems are identified and remedial measures taken before the fishing vessel returns to sea. The checks should comprise:

[8] *It may be acceptable to dispense with the need for an inclining test for some catamarans and other vessels with a high initial GM (where GM is more than 3 times the VCG) In such cases the LCG should be obtained by lightship survey or by weighing with two gauges. The lightship VCG may be obtained by an accurate weight estimate calculation with a suitable (pessimistic) margin added, in no case should the lightship VCG be taken below main deck. Details of the estimated lightship weight, LCG and VCG should be submitted to the MCA for verification, prior to completion.*

- Verify that the basic data recorded at the inclining test is correct i.e. agrees with the attending surveyor's own notes on items such as draughts, water density, deadweight deductions, lightship additions, etc
- Complete an independent calculation of the lightship based on the measured data at the inclining test, and the hydrostatics contained in the approved stability book (the surveyor should use the standard Excel spreadsheet developed by the Stability and Plan Approval Unit for carrying out this calculation[9]).
- Verify that consultant's lightship weight, LCG and VCG.

3.9.7 Practical issues that can occur and suggested solutions (those aspects relevant to the lightship survey part of the inclining test were covered in the preceding section and will be not repeated here). Surveyors' decisions on the day may differ from the guidance given here for good and valid reasons which stand up to scrutiny.

- After the first shift check that the pendulum deflections are greater than 35mm. Generally speaking the greater the deflection the greater the accuracy. To achieve the largest pendulum deflections for the least angle of heel use the longest pendulum length that can be accommodated (the practical limitations are the width of the trough in which the pendulum bob swings and the clear height at the locations onboard where a pendulum could be hung).
- After the first shift check that the heel of the vessel [calculated from the inverse *tan (pendulum deflection / pendulum length)*] is no greater than 2° (generally speaking the smaller the heel angle the greater the accuracy). The maximum heel of the vessel when all the inclining weights have been moved to one side should not exceed 4° to ensure that the relationship, *heeling moment = displacement x GM x sin(angle of heel)* holds.
- The pendulum shifts should be marked on a wooden batten or plastic draughting film securely attached to the batten. They should not be marked onto paper because this will change in length introducing inaccuracy into the measurement of pendulum deflections.
- Ensure the battens are marked with "port" and "starboard", the pendulum identifier e.g. forward pendulum, ship name, date and pendulum length. This avoids confusion once the battens have been removed from the vessel.
- Check that everyone understands which set of weights are to be moved at each shift and see that the weight sets are marked with their identifying number.
- Set out a page in your notebook marked up in the manner shown in the following example, to record the results of the test as it progresses.

[9] https://mcga.sharepoint.com/:f:/r/sites/StabilityUnit/Published%20Documents/Spreadsheets?csf=1&web=1&e=TLq2l7

Shift number	Positions of weights		Pendulum shifts between marks	
	Weights to port	Weights to starboard	Fwd pendulum (length 3.000m)	Aft pendulum (length 3.600m)
0	1, 2	3, 4	0	0
1	2	1, 3, 4	50	60
2	-	1, 2, 3, 4	52	59
3	2	1, 3, 4	51	61
4	1, 2	3, 4	51	58
5	1, 2, 3	4	49	60
6	1, 2, 3, 4	-	52	62
7	1, 2, 3	4	50	60
8	1, 2	3, 4	51	61

- As the test proceeds a check should be periodically carried out to verify that the results between the two pendulums are consistent. This is easily done on a hand calculator by comparing the means of the two pendulum shifts (adjusting one mean by multiplying it by the ratio of the pendulum lengths i.e. so that the shifts relate to the same pendulum length). The results should be within about 2mm of each other after all 8 shifts.
- Before the test is concluded the results should be plotted (pendulum deflections against heeling moments) to ensure that the points define a straight line. This is discussed in detail in the Intact Stability Code which shows how the plots can be used to find errors in the experiment. If any weight shifts need to be repeated to verify earlier readings this can be done immediately.
- Each surveyor will work out, based on their own experience, the method most effective in marking the pendulum deflections, compensating for the inevitable and continuous movement of the pendulum. Some commonly used techniques are listed:
    - Place a scale ruler over the batten and use this to mentally calculate the mean position of the swinging pendulum. For example, if the swing to port ends at 135mm followed by a swing to starboard out to 35mm the mean would be about 85mm. Over the course of many swings a “true” mean should emerge. It is also helpful to move the ruler so that the mean position coincides with a 100mm or 200mm reading on the ruler to simplify the mental arithmetic. The ruler also covers previous shift positions so that each shift is approached with a “blank sheet”.
    - The movement of the pendulum is tracked with a pencil producing an oscillating trace with a clear mean position.
    - Every 10 seconds mark the position of the pendulum until 10 marks have been made. The recorded deflection for that shift is the mean of the 10 marks.

- Place a tape measure on batten and one person calls out reading at each end of pendulum swing for 10 swings and another records on a table to determine mean position.

- If fine twine is used in place of piano wire take care to check frequently that it is not stretching so that the pendulum bob is dragging along the bottom of the trough causing erroneous deflections. This is the main concern if piano wire is not used. [“fine” means a diameter <=1.5mm]
- Always lift the pendulum bobs out of the troughs before the experiment begins to check that there are no “tails” of piano wire sticking out beyond the pendulum bob. These can catch on the sides of the trough causing erroneous deflections.

3.10 STABILITY VERIFICATION – STABILITY BOOK APPROVALS

3.10.1 Chapter 3.1.1.1 of MSN 1872 Section 3.1.1.2 of MSN 1873 requires that all vessels should be provided with approved stability information. The format in which this information is to be provided is presented in MGN 281 - Recommended Format for Fishing Vessels Freeboard and Stability Information, The recommended format for the Freeboard & Stability Information Booklet is available Adobe (PDF) for download[10]. The Codes stipulate the criteria that must be met to demonstrate that a vessel’s stability is adequate. These requirements also apply to vessels required by MSN1871 to be provided with an approved Stability Book

3.10.2 The process of approving stability books is covered in Part A Chapter 1 of MSIS 9 and is not repeated here. In this section we will look at some of the technical issues that arise during stability approval and how they could be addressed.

3.10.3 The skipper must at all times have access to the very latest approved information relating to the stability and freeboard which accurately reflects the status of the weight and centre of gravity of the lightship and deadweight items, as well as the mode of operation and the area of operation of the vessel to enable him to quickly calculate the safety margins at any time during the course of a voyage.

3.10.4 It is impossible to include all the potential loading scenarios in the approved Stability Information Book (SIB). The MCA will only approve the statutory loading conditions, including those with an allowance for icing-up, for inclusion in the SIB. In addition to the statutory conditions the SIB should also include the loading condition(s) resulting in the smallest safety margins for stability and freeboard (if this has not been covered by one of the statutory conditions).

3.10.5 The skipper is responsible for ensuring the vessel is operating within the stability criteria throughout the voyage. This should be made clear in the working instructions included in the SIB (suggested wording below):-

10 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/302895/stability_inf_re_mgn281.pdf

"The voyage cycles shown in Part III are the assumed loading conditions for the vessel. In addition to these assumed conditions, it must be shown (using the method in part II) that the minimum stability and freeboard criteria are complied with throughout the voyage in all actual operating conditions. This also applies to any special conditions associated with a change in mode or area of the vessel's operation. The weight of each item of deadweight and its location, as shown on the profile and in the table, should be studied together with the "Summary of stability" and "Summary of freeboard" ".

3.10.6 The approved stability information should be based on an accurate description of the ship's geometrical shape. The geometrical shape comprises the hull up to the freeboard deck, with appropriate deductions for the buoyancy lost in various "holes and hollows" such as bow thruster tunnels and sea chests , and includes any structures on the freeboard deck, such as a shelter or enclosed poop, which could be considered weathertight and contributing to the buoyancy of the vessel when immersed (i.e. structures fitted with weather tight doors, hatches or other devices providing a secure barrier against water ingress, see Chapter 2).

3.10.7 Shelters which are to be considered weathertight for inclusion in the stability calculations should have no openings for the shooting or retrieval of fishing gear. Loading hatches on the shelter into which the catch is dropped from the net should have a coaming with its lowest point at least 2.1 metres above the freeboard deck at that location. If the freeboard at that location is less than 300mm the height to the lowest point of the coaming should be raised to compensate.

3.10.8 Surveyors should note that Chapter 2.2.5.1 of MSN 1872 (Chapter 2.2.6.1 of MSN 1873) implies that superstructures or deckhouses contributing to stability should not have windows, only side scuttles with hinged deadlights.

3.10.9 Long-liners with side landing hatches are covered in 3.17.5 below of this Chapter.

3.10.10 It is essential that the attending surveyor at the inclining test knows what weathertight structures the stability book submitted for approval is based on and checks that these can indeed be secured weathertight. On a new construction, or on an existing vessel where modifications have been made, the Stability and Plan Approval Unit may request confirmation that specific superstructures and the closing devices fitted are weathertight.

3.10.11 The input data for the stability computer program used to check the submitted SIB are taken from the approved construction drawings. The Stability and Plan Approval Unit may request some additional dimensional checks from the attending surveyor of key features on the actual vessel, such as the deck edge or the top outer corner of the aft bulkhead to a weathertight shelter. During the build survey (usually carried out by Class or Seafish prior to 21 July 2020 and from that date forward by Class or MCA for vessels of 12m RL check measurements should be made to ensure that the construction conforms to the approved drawings.

3.10.12 The MSF 2202 stability declaration requires confirmation from the attending Marine Office surveyor for the moulded depth measurement.. It is basically the vertical distance from the base line (see paragraph 3.18.7 below of this Chapter) to the underside of the deck edge measured at a point midway between the forward and aft perpendiculars. Unless the vessel undergoes a major modification affecting its depth, this dimension should only need measuring when the vessel is built.

Reference	Definition
FISHING VESSELS FREEBOARD AND STABILITY INFORMATION BOOKLET – RECOMMENDED FORMAT MGN 281 Annex	"Moulded depth" means the vertical distance measured at the mid point of LBP from the top of the keel to the top of the freeboard deck beam at side. In wood and composite vessels the distance is measured from the lower edge of the keel rabbet. Where the form at the lower part of the midship section is of a hollow character, or where thick garboards are fitted, the distance is measured from the point where the line of the flat of the bottom continued inwards cuts the side of the keel. In vessels: i) having rounded gunwales the moulded depth should be measured to the point of intersection of the moulded lines of the deck and side shell plating, the lines extending as though the gunwale were of angular design; and ii) where the freeboard deck is stepped and the raised part of the deck extends over the point at which the moulded depth is to be determined, the moulded depth should be measured to a line of reference extending from the lower part of the deck along a line parallel with the raised part;
Medium Vessel: MSN 1872 Amndt 1 (F) The Code of Safe Working Practice for the Construction and Use of Fishing Vessels of 15m Length Overall to less than 24m Registered Length	Code Paragraph 1.2.55 If Tonnage measured to ITC ’69 so should be the same as registered depth. Vessels first registered prior to 4th September 1998 may have registered depth to the upperside of the double bottom plating or to the top of the normal line of open floors or timbers as the case may be

Reference	Definition
MGN 629 (M+F) Construction and outfit standards for fishing vessels of less than 24m registered length	1.9.26 (a) the vertical distance measured from the top of the keel to the underside of the upper deck at side. In wood and composite ships the distance is to be measured from the lower edge of the keel rabbet. Where the form at the lower part of the midship section is of a hollow character, or where thick garboards are fitted, the distance is to be measured from the point where the line of the flat of the bottom continued inwards cuts the side of the keel; (b) in ships having rounded gunwales, the moulded depth shall be measured to the point of intersection of the moulded lines of the deck and side shell plating, the lines extending as though the gunwales were of angular design; (c) where the upper deck is stepped and the raised part of the deck extends over the point at which the moulded depth is to be determined, the moulded depth shall be measured to a line of reference extending from the lower part of the deck along a line parallel with the raised part; and for the purposes of this definition, (i) "upper deck" means the uppermost complete deck exposed to weather and sea, which has permanent means of weather tight closing of all openings in the weather part thereof and below which all openings in the sides of the ship are fitted with permanent means of watertight closing. In a ship having a stepped upper deck, the lowest line of the exposed deck and the continuation of that line parallel to the upper part of the deck is taken as the upper deck; and (ii) "weather tight" means that in any sea conditions water will not penetrate into the ship
LBP – note	It is not unknown for stability information books to be presented with hydrostatic data presented using an LBP not numerically the same as per the definition due to naval architect using non-standard forward and aft perpendiculars when defining hull lines.

3.10.13 Features such as belting or masts should not be included in the buoyant structure contributing to stability for the following reasons:

- The items are not an intrinsic part of the buoyant hull and superstructures as set out in the Code on Intact Stability Part B Chapter 3.5 *Calculation of Stability Curves*;
- In the case of belting, this is a sacrificial item of fendering which is prone to damage;
- By convention such items are ignored in stability calculations; to include them would reduce the (unknown) margin of safety implicit in the stability criteria which is unacceptable.

3.10.14 MCA has accepted the addition of “buoyant” bulwarks on steel fishing vessels. These are formed by plating in the gap between stanchions to construct closed watertight boxes extending down both sides of the vessel. Such devices are considered on a case by case basis and should be referred to the Consultant Surveyor (FV) and the Head of the Stability and Plan Approval Unit for a decision. It would be considered only where the non-compliance with the stability criteria without that modification was marginal and restricted to the angle of maximum GZ. It is the equivalent of allowing the inherent buoyancy of bulwarks on wooden vessels to be included in the stability calculations, which has been accepted on some wooden vessels constructed before the implementation of the 1975 Rules. Reference should also be made to construction standard requirements for bulwarks and weathertight shelters. Consideration should be given to the fishing method the vessel uses e.g. scallop dredging where gear is repeatedly dragged aboard over the bulkwarks. If necessary, a means of confirming the integrity of the bulwark such as a drain valve or filling sections of bulwark with non permeable foam material may be necessary.

3.10.15 If a vessel is heeled over to increasingly larger angles it will eventually reach an angle at which the sea starts flooding down into its interior through an opening which cannot be closed weathertight, such as the engine room ventilators. This is the down flooding point i.e. the first opening to immerse which would lead to progressive flooding and the loss of the vessel. It sets the limit for the calculation of the areas under the GZ curve if it occurs at an angle of less than 40°. It also sets the angle at which the GZ curve should be terminated i.e. the properties of the GZ curve cannot be fully realized after this point (see The Code on Intact Stability Part B Chapter 3.5.2.8). All the stability criteria must be met before this angle is reached.

3.10.16 Down flooding points should include all ventilation openings which are required to remain open when the vessel is in operation, to supply air to the machinery spaces, stability, irrespective of whether closures are fitted or not.

3.10.17 The position(s) of down flooding point(s) should be recorded in the approved stability book; and the angle of its immersion shown on the GZ curve for each loading condition. Attending surveyors should know the location of the critical down flooding point(s) on the vessel and check during surveys that no more vulnerable openings have been introduced. Look particularly for openings which are not on the centre-line such as hatches for passing the catch from conveyor belts or processing trays into the fish room. Also note that the down flooding point may not be out on the exposed weather deck, occasionally it is a hatch through the freeboard deck inside a non-weathertight deckhouse i.e. one with windows.

3.10.18 Small openings with a clear area no greater than 100cm^2, such as those in winch houses through which wires pass, need not be considered as open if they submerge at angles of heel greater than 40°.

3.10.19 Permanent ballast can be accepted in either solid or non-flammable liquid form.

3.10.20 The location and nature of solid permanent ballast should be recorded in the vessel's approved stability book or stability records. Ideally permanent ballast should be fitted before an inclining test or other stability assessment is carried out. Prior to adding or relocating ballast, the consultant / shipyard / owner should consult with MCA to get approval for its proposed location, composition, installation, and securing. The solid ballast installation should meet the following requirements:

- A diagram or sketch showing the location, dimensions, weight, and method of securing the ballast to be added should be provided by the owner's representative. This should indicate the calculated centroid of the ballast;
- Solid ballast must be suitably secured against movement and clearly marked to prevent tampering, or permanently attached to the hull;
- Ballast not interfere with the drainage and pumping of bilge water;
- Ballast should be protected from deteriorating and contaminating the bilges;
- If concrete forms a substantial part of the ballast, the measured density of the mix should be requested because this can vary widely.
- Ballast should either be removable to allow inspection of the hull structure in that location, or sealed against the hull preventing corrosion/rotting of the encased hull structure;
- The weighing and installation of the ballast should be witnessed by a surveyor and the details recorded on the vessel's SharePoint stability file.
- Where ballast is formed of regular solid steel bars or plates of known dimensions, fitted in an easily identified location, a declaration from a suitably qualified person may be accepted in lieu of witnessing by MCA. In this case, the details of the installation should be supplemented by photographic evidence of the actual installation;
- If the vessel is Classed or being built under the supervision of a Fishing Vessel Certifying Authority, the ballast installation should also be to the satisfaction of the RO or FVCA;
- Where there is doubt over the accuracy of the information supplied in relation to the permanent ballast, the vessel should be re-inclined, or the appropriate stability test carried out again.

3.10.21 It should be noted that where solid ballast is fitted externally e.g. as an addition or extension to a ballast keel, this may have an effect on the vessel's approved hydrostatic and cross-curve data. The Stability and Plan Approval Unit should be consulted in these cases. Consideration should also be given to the position of external ballast in relation to the datum used for draught marks in order that these can be verified in future.

3.10.22 The carriage of permanent liquid ballast is permitted as an alternative to solid ballast (see Chapter 3.1.2.3 of MSN 1873). It is usually carried in the form of fresh water which is less corrosive to the steelwork than salt water. In this situation it is important that the ballast water cannot be accidentally pumped overboard. To achieve this assurance the permanent liquid ballast tanks must be isolated from any pumping and piping system onboard by the removal of the tanks' connections.

Spool pieces or bobbin pieces or spectacle flanges will be accepted as standard ways of isolating tanks. This must be witnessed by the attending surveyor and the details noted in the approved stability book, with clear instructions to the skipper that such tanks are to be full and to remain disconnected. Notices should be displayed onboard the vessel in wheelhouse and at the tank to this effect. The tanks should be sounded at regular intervals to ensure that the contents have not reduced and that a free surface is not present. Drain plugs should be fitted so that the tank can be emptied for internal inspection at surveys. Surveyors attending the vessel at periodic surveys should check this requirement is being maintained.

3.10.23 On some vessels it was found that large quantities of fresh water were being carried, ostensibly for domestic fresh water and ice making use, which on closer examination also included a substantial quantity that never left the ship i.e. permanent liquid ballast. This should be identified and placed in a separate, isolated tank to ensure that it is not used and the stability of the vessel reduced below the minimum criteria. This will be discussed further in the next section.

3.10.24 The use of oil fuel as permanent ballast is not permitted. On occasions a stability book submitted for approval may show the same tank fulfilling a variety of different roles. Examples (which were not accepted) include: a) the vessel departs port with a tank full of fuel and returns with the same tank full of seawater; and b) the vessel's roll reduction tank is full of fuel on departure, which is burnt on the way out to the fishing grounds, and the vessel returns with the tank empty.

3.10.25 On vessels with refrigerated seawater water (RSW) tanks for storing and preserving the catch there may be approved loading conditions which require some RSW tanks to be filled in order to maintain stability and trim within an acceptable range. Where this is necessary the tanks should be filled right up into the trunks to minimise the free surface. Vessel with RSW tanks are discussed further in section 3.17.6 below of this Chapter.

3.11 THE CARRIAGE OF ICE AND ICE MAKING ON FISHING VESSELS

3.11.1 Ice is carried onboard fishing vessels for the preservation of the catch. Some fishing vessels do not have the facility to make ice onboard. They fill up with ice before departing port. The quantity of ice carried on departure should reflect the capacity of the fish hold and the voyage cycle. In the arrival port conditions with 100% catch the residue of ice should be 10% of that on departure. In the arrival port condition with 20% catch the residue of ice should be calculated by deducting from the original quantity – a) the weight of ice stowed with the catch; and b) the weight that has melted during the trip. There have been cases where a stability book shows that an "excessive" quantity of ice is carried in the depart port condition (i.e. substantially more than is required to preserve a full catch), this is done to provide a large residue in the 20% catch arrival port condition improving the stability in that condition. In effect the ice is being used as ballast. MCA does not accept this for the following reasons: i) ice costs money so at some point it is likely that the vessel will not sail with the "excess" required for stability in the 20%

catch condition; and ii) the weight of the residual quantity of ice is variable, depending on a number of factors, for example if the trip was longer than planned the weight lost through melting would be greater. If ballast is required then it should be permanent ballast fitted in the manner described in the preceding section. Section 3.18.8 below of this Chapter provides some guidance on estimating the quantities of ice for boxed white fish.

3.11.2 Many fishing vessels carry ice making machines. Originally these used sea water. Now, to improve the quality of the product, the trend is to use fresh water for the ice making, requiring the carriage of many tonnes of fresh water in the vessel's tanks – the specific quantity is dependent on the voyage cycle and the type of fishing. It is essential for the safe operation of the vessel that the fresh water used for the ice making plant and that used for hotel services (such as showers, WCs, laundries, etc) is held in separate tanks from that used for permanent fresh water ballast (as discussed in the previous section permanent fresh water ballast tanks should be isolated).

3.11.3 The quantity of fresh water required to be carried onboard to meet the needs of fish preservation and hotel services should be based on the maximum catch, the number of crew and the voyage cycle.

3.11.4 In the arrival port condition the SIB should show a 10% residue in the fresh water provided for hotel services; and where a 100% catch is carried a 10% residue in the fresh water for ice making. Where the vessel leaves port with a mix of ice in the fish room and fresh water for making ice, which should in total provide the quantity required to preserve the catch, then a 10% residue of either ice in the fish room or fresh water for ice making should remain – whichever is the more onerous in regard to stability.

3.11.5 In the 20% catch arrival port condition the residue of ice and fresh water for making ice should be based on what has been consumed preserving the actual catch onboard with an allowance for losses due to ice melting. The assumption to be made is that any ice carried at the outset of the voyage will be used first in preserving the catch and that the ice maker will replace this only when it has all been consumed, at a rate sufficient to just meet the needs of fish preservation i.e. there should be no residual ice in the fish room on arrival port. Section 3.18.8 below of this Chapter provides some guidance on estimating these quantities.

3.12 THE VOYAGE CYCLE

3.12.1 An accurate voyage cycle is the necessary basis for deriving the condition of the vessel at each stage of the trip. The general form and content for the voyage cycle is given on page 31 of MGN 281 Annex, The recommended format for the Freeboard & Stability Information Booklet is available Adobe (PDF) for

download[11]. This information should be expanded where necessary to detail all the assumptions used in the derivation of the loading conditions. For example, if fresh water is used for fish preservation and hotel services that item should be broken down into its constituent parts. When examining the SIB for approval MCA should have no difficulty in replicating any loading condition from the voyage cycle. This not only speeds up the approval process but also the quality of the output.

3.12.2 The surveyor should determine the vessel's normal operating pattern in order that any assumptions made in the calculation of loading conditions can be verified i.e. are the amounts of fuel oil, fresh water and stores the vessel is able to carry, sufficient for the length of trip undertaken

3.12.3 Potting vessels and other vessels which operate on a daily fishing cycle, and vessels engaged in seasonal fisheries, may require several different voyage cycles to cover the full range of possible loading conditions. For example, setting a ground; or working a ground; or clearing a ground.

3.13 FISHING GEAR

3.13.1 The stability book should contain a breakdown of the fishing gear allowed for in the loading conditions, even if this forms a part of the lightship weight. This is used as a basis for comparison at lightweight checks. Operators should be encouraged to retain delivery notes for the gear delivered to the vessel which state the shipping weight; it's a useful reference at lightship surveys and should allow the skipper to check that the weight of gear being used remains within the limits allowed in the approved stability book.

3.13.2 For single or twin boom fishing vessels [12]the lengths of the derrick booms should be recorded and the length and weight of the trawl beams. In addition, on scallop dredgers, the number of dredges fitted to each beam.

3.13.3 The 20% uplift on the criteria for single and twin boom fishing vessels is applicable only when the beams are towed from derrick booms placing the towing point substantially outboard. The reasoning behind this decision is that the substantive difference between this and other fishing methods is the substantially greater heeling force which could be induced if a trawl beam snagged on the seabed when being towed from the end of a derrick boom rather than from a side gallows or 'A' frame.

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11 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/302895/stability_inf_re_mgn281.pdf

12 Reference to: MGN 415 (F) - Fishing Vessels: The Hazards Associated with Trawling, including Beam Trawling and Scallop Dredging, sections 2.4 and 11.1

3.13.4 A scallop fishing vessel which tows the dredge bar from outriggers and recovers the bar using the Gilson pole, sometimes referred to as “Scotch” poles, does not fit the definition of a single or twin boom fishing vessel and would not require the 20% uplift on the stability criteria.

3.13.5 MCA needs to be satisfied that the weight of gear used in the SIB is sufficient to cover the declared fishing operation(s). If the vessel switches between different modes of fishing, each of which requires a different weight of gear, then voyage cycles and loading conditions should be presented for all fishing modes in the SIB.

3.14 ALTERNATIVE STABILITY CRITERIA

3.14.1 There will be occasions when a fishing vessel does not comply with one or other of the stability criteria. Provided the vessel has adequate freeboard the solution proposed invariably involves to some extent adding permanent ballast to lower the vessel’s vertical centre of gravity. This will not work if the problematic criterion is the angle of maximum GZ. All that will be achieved by adding ballast is that the GM, GZ and areas will increase but the angle of maximum GZ will decrease.

3.14.2 It may be requested that the vessel would be more appropriately assessed using the alternative criteria presented in the Code on Intact Stability which compensates for low angles of maximum GZ by requiring greater areas under the GZ curve.

3.14.3 MCA does not consider this appropriate since it is applicable only to wide shallow vessels with breadth to depth ratios of 2.5 or more (MSN 1872 Amndt 1 (F), paragraph 3.1.2.2).

3.15 MODIFICATIONS AFFECTING STABILITY

3.15.1 A fishing vessel undergoing alterations (between surveys) which invalidate the stability information book should have its stability re-assessed at that time. It is the responsibility of the owners/operators/consultants to advise the MCA in advance of any changes to the lightship or deadweight items which may adversely affect the stability and freeboard. The following requirement (from MGN 281, The recommended format for the Freeboard & Stability Information Booklet is available Adobe (PDF) for download[13]) should be set out in the approved stability – *“Should any alterations be made to the vessel’s permanent structure or equipment so as to affect its watertight or weathertight integrity, or in the amount or disposition of the vessel’s weight, the MCA should be notified, and the alteration recorded in the book.”* It is important that operators involve MCA when changes are being considered so that the changes can be reviewed and approved. MCA should

13 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/302895/stability_inf_re_mgn281.pdf

survey the vessel as the work progresses to verify that the approved changes have been made in accordance with requirements.

3.15.2 A vessel which undergoes “major” modifications should comply with the stability requirements for ‘new’ vessels as far as it is reasonable and practical to do so. The extent of proposed modifications should be discussed with the local Consultant Surveyor (FV) and Stability and Plan Approval Unit prior to any work being carried out. Major modifications are defined as:

- any change that substantially alters the dimensions of a ship,
- any change that substantially alters the cargo-carrying capacity of a ship,
- any change that substantially increases a ship’s service life,

3.15.3 “Minor” changes affecting stability may be assessed through calculation and survey without requiring an inclining test. When these changes have been approved the Record of Minor Alterations (RMA) should be updated to record the new lightship particulars. These changes should be signed and stamped in the approved stability book to signify that they have been done with MCA’s oversight and approval. In this context “minor” changes are those which meet the following criteria:

- The cumulative effect of this, and any previously approved RMAs, change the lightship weight (recorded at the last inclining test) <= +/- 2% or 2 tonnes (whichever is the greater);
- The cumulative effect of this, and any previously approved RMAs, change the lightship LCG (recorded at the last inclining test) <= +/- 1% of LBP;
- The alterations should not involve changes to the hull form;
- The integrity or extent of the weathertight superstructures included in the approved stability book are unchanged, and which;
- Do not involve the removal or re-positioning of existing solid ballast;
- Note - vessels having no margins on one or more of the stability criteria in any seagoing sailing condition prior to the changes being made should be inclined instead.

3.15.4 The surveyor should only agree to endorse an amended RMA where the calculable changes to the vessel’s lightship weight can be verified by inspection or are supported by documentation e.g. if a vessel is re-engined, the weight, LCG and VCG of the old and new machinery along with any associated equipment must be confirmed by weighbridge tickets or manufacturers data. It is strongly recommended that the vessel’s owner or their consultant submits details of any proposed weight changes for verification prior to works being carried out.

3.16 VESSELS TRANSFERRING TO THE UK REGISTER

3.16.1 Flag-in vessels will require to be inclined prior to flag in and the stability book will require formal approval by MCA regardless of vessel age and previous approval status.

3.16.2 A vessel which transfers to the UK register from another flag state should comply with the stability requirements for ‘new’ vessels as far as it is reasonable and practical to do so. These cases should be discussed with the local Consultant Surveyor (FV) and Stability and Plan Approval Unit prior to agreement for change of flag being given

3.17 ADDITIONAL REQUIREMENTS ON SOME TYPES OF FISHING VESSELS

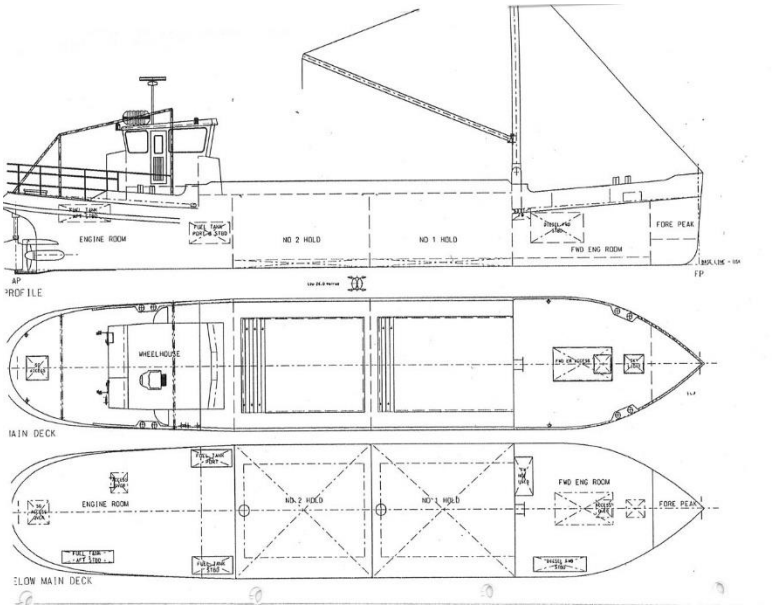
3.17.1 Due to the complex nature of the calculations which may be required to determine if certain types of vessel comply with the relevant statutory stability requirements, it is recommended that vessels of unusual or novel design are discussed in detail with the Stability and Plan Approval Unit before newbuild, flag-in or renewal surveys are carried out. The list below shows examples of vessel types where further consultation with the Stability and Plan Approval Unit may be required, this list is not considered to be exhaustive:

3.17.2 Single and twin boom fishing vessels -

It is usual practice for this type of vessel to be inclined with the booms topped (upright). In normal operation, the booms would be dipped to 45 degrees for towing. When this type of vessel departs or arrives in port, it is not always possible to have the booms lowered to 45 degrees due to manoeuvring or harbour entrance restrictions and the booms are required to be topped in these conditions.

- It is recommended that all loading conditions are calculated assuming the booms are topped i.e. using the VCG calculated at inclining with no correction applied. However, in some cases the MCA may agree to standard loading conditions being calculated with the booms at 45 degrees. In these cases, the consultant should demonstrate that the loading condition(s) with the lowest margin(s) will comply with the standard fishing vessel criteria where the booms are assumed to be topped. Details of the correction which will be applied to the as inclined VCG will also need to be submitted for agreement.

3.17.3 Mussel Dredgers



- Mussel fishing involves taking seed mussel (15 - 30 mm shell length) from offshore beds at a depth of approximately 25 metres and relaying these in other areas for further cultivation. Re- laying occurs in shallow categorised waters or in nearby, similar sea areas. The final stage in the process involves harvesting the fully grown mussels from the beds.
- Mussel dredgers are specifically designed / converted for shallow water operations. The standard design includes a high beam / shallow draught hull form with one or more large open holds. Discharge doors or valves below the waterline are fitted to allow seed mussels to be flushed out for re-laying. These vessels operate with derricks on each side towing standard size mussel dredges.
- Although primarily designed for the purpose of sowing seed mussels the remotely operated discharge doors or valves can be opened to allow the hold to flood up to the level of the outside waterline; or even to drain down to the level of the outside waterline.
- The large open holds are neither fitted with coamings nor covers so would downflood at a relatively low angle of heel (typically less than 35°). This should be reflected in the stability conditions submitted for approval (these vessels usually have such large “form” stability that the intact stability criteria will be met even with the holds flooded).
- To assume that the deck is continuous in way of the holds when assessing stability against the criteria is not only inaccurate but could seriously mislead. To ensure that the skipper has sufficient stability information on the safe operation of the vessel the stability book should include:
    - spill out calculations for all conditions where the holds contain ‘cargo’;
    - hold(s) flooded conditions for open sea coastwise trips in ballast;
    - other operating conditions exclusively in sheltered waters may be calculated assuming the deck is continuous in way of the holds, but

should be headed “Applicable to sheltered water operations only”. These conditions should assume a maximum free surface for liquid ‘cargo’ in the holds.

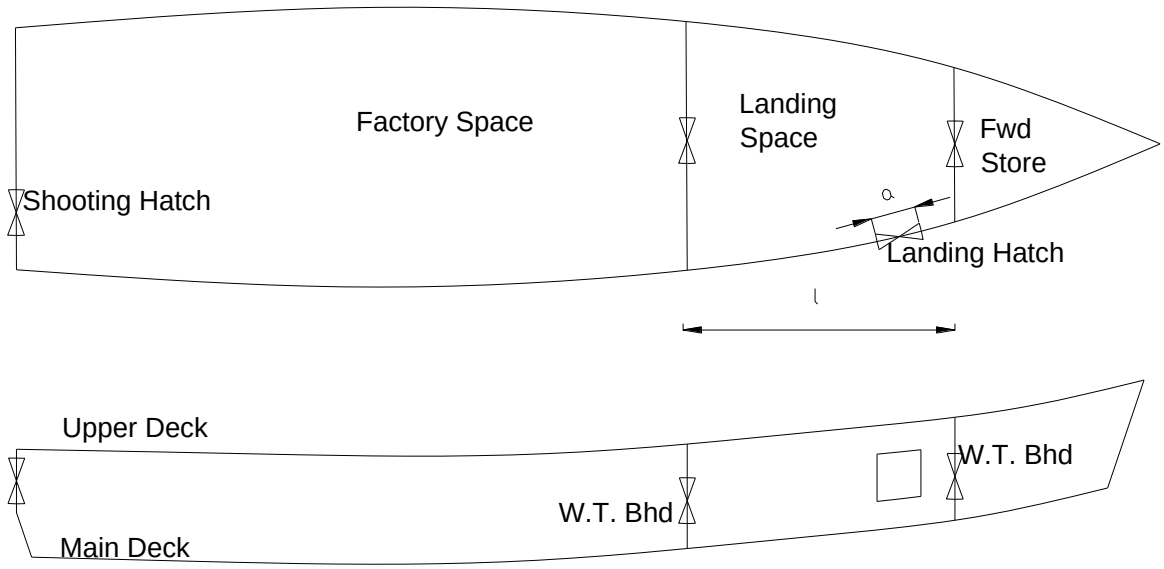
- The holds would be susceptible to swamping in adverse sea conditions. Coastal trips between grounds, or to drydock, should be undertaken in favourable weather, and this should be noted on the operating certificate.
- A further complication is the lack of freeboard marks and a ‘cargo’ of unknown density (depending upon the actual ratio of shellfish / water / sand / stones etc. taken onboard). Loaded conditions should assume a mixture of seawater and mussels at a density of 1.1 tonnes/m^3.
- Where twin or multiple dredges are used the single or twin boom fishing vessel intact stability criteria with 20% uplift should be applied.

In some cases it is not possible for the vessel to comply with all of the statutory stability criteria. In these cases consult the Stability and Plan Approval Unit to see if meeting an alternative set of intact stability criteria might be acceptable.

3.17.4 Vivier tanks –

- It is common practice for vessels undertaking creel / net fishing to be fitted with a vivier tank for the storage of catch. Any restrictions on the minimum or maximum filling of the vivier tank under various conditions of loading should be clearly indicated in the stability information booklet. The vivier tank should only be used after the skipper has consulted this guidance. Care should be taken to ensure that the vessel will retain sufficient stability to comply with the limiting VCG curves when the vivier tank is being filled / emptied. Any guidance and restrictions on the use of the vivier tank should also be posted up in the wheelhouse for quick reference.
- Where a pumped vivier system is in use the effect on tank levels of a pump failure, if this increases free surface effects, should be examined.

3.17.5 Vessels having openings in the side and/or stern



- In the above arrangement the side hatch is particularly exposed to the risk of flooding due to its forward location, the minimal freeboard to the main deck and the periods during which it is open.
- The following approach should be adopted.
  - The landing space is to be treated as “open” space.
  - Other spaces (i.e. the factory space and forward store) may be treated as “intact” in deriving the cross survey of stability, provided that they are bounded by watertight structure, and any openings in the boundary have weathertight means of closure and appropriate Rule height coamings.
  - Openings from the “open” landing space into the “intact” spaces are to be kept to the minimum number and size practicable.
  - Doorways and other openings in transverse bulkheads separating the “open” landing space from the “intact” spaces should be kept as close to the centre line of the vessel as practicable. Where the closing appliances to such openings are side hinged the hinged sides are to be nearer to the side landing hatch.
  - Where the shooting hatch in the stern is not greater than 0.25 square metres in area and its coaming is not less than 1 metre above the working deck, and it is capable of being closed weathertight, no special drainage arrangements other than the normal scuppers, or that appropriate to control loose water on decks and in factory spaces in the Instructions to Surveyors if applicable, need to be provided.
  - As in an “open” space the landing space is to be provided with freeing ports (see Chapter 2.17 for full details).
  - The side hatch should be limited in depth by the provision of a bulwark of appropriate Rule height in way of the side hatch.

- It should be recommended that the side hatch be restricted to the minimum size practicable for the landing operation and be capable of closure by one man.
- The status of the side hatch closure should be clearly indicated in the wheelhouse. The hatch should be capable of being closed rapidly, even during fishing operations, in case of emergency.
- Where provision of freeing ports of the required area is considered inappropriate due to low freeboard, the requirement may be dispensed with subject to the following requirements being met:
  - Sump pumps are fitted at suitable positions within the landing space, these should be able to sufficiently reduce the volume of water which can be entrapped in the landing space within one to two roll periods of the vessel.
  - For the purposes of stability calculations, the landing space may be assumed intact i.e. contributing to the vessels buoyancy up to the point at which the lower edge of the landing hatch becomes submerged. Beyond this point the landing space should not contribute to the vessels buoyancy. The resultant GZ curve will have a clearly defined step where the lower edge of the landing hatch becomes submerged. The vessel should be shown to comply with the standard stability criteria for all loading conditions using this method.

3.17.6 RSW tanks –

- vessels which store catch in Refrigerated Sea Water (RSW) tanks should be provided with guidance for the skipper outlining the procedure to be followed when filling, loading catch and emptying this type of tank.
- Due to the potential for overloading which could occur if the vessel loads its maximum catch when still carrying a high fuel oil / consumable load the stability booklet should caution the operator to avoid this situation by closely monitoring the use of the RSW tanks in the early stages of a trip. An extra loading condition may be included showing the vessel loading to the scantling draught mark amidships required by Class.
- Any restrictions on the minimum number of tanks which may be filled or emptied at the same time should be highlighted. In addition, any limits on the maximum / minimum number of RSW tanks which are required to be kept full to maintain stability, in conjunction with any minimum / maximum loadings for ballast tanks, fresh water tanks, fuel oil tanks, roll reduction tanks etc. should be clearly indicated in the stability information booklet. Any guidance and restrictions on the use of the RSW tanks should also be posted up in the wheelhouse for quick reference.

3.17.7 Roll reduction tanks.

- It is common practice for newer fishing vessels to be fitted with a roll reduction tank (or tanks) to improve seakeeping and / or motions in certain loading conditions (reducing the roll helps when using sonar to hunt for fish and also to reduce damage to fish in RSW tanks thereby preserving the value of the catch). The purpose of this type of tank is to reduce the vessel's

GM (and consequently the roll period) by creating a large free surface in the tank. When these tanks are in use, the vessel's VCG(fluid) will increase significantly causing a large reduction in stability. The skipper should be aware of the effect of filling this tank on the vessel's stability before filling commences. A rapid means of emptying the roll reduction tank must be available at all times to allow the contents to be quickly dumped in an emergency situation.

- Any restrictions on the use of the roll reduction tank should be clearly indicated in the stability information booklet. The roll-reduction tank should only be used after the skipper has consulted this guidance. Care should be taken to ensure that the vessel will retain sufficient stability to comply with the limiting VCG curves when the roll reduction tank is in use. Any guidance and restrictions on the use of the roll reduction tank should also be posted up in the wheelhouse for quick reference

3.18 BACKGROUND INFORMATION RELATING TO STABILITY

3.18.1 THE GENERAL THEORY OF ROLL TESTS

3.18.1.1 The roll test is used to determine the natural roll period for the vessel in a defined condition. This provides a unique measurement related to the radius of gyration of the vessel that can then be related to the GM of the vessel. However, the relationship between GM and roll period is not a simple one and can be affected by other indeterminate variables such as distance of various masses from the rolling axis, entrained water around keels, proximity to a quay or changes in the waterplane as the vessel rolls. For this reason the “GM” indicated by a roll test should never be compared with that obtained from an inclining. It is also possible to make changes to the vessel which will, in theory, affect the radius of gyration and hence roll period but not necessarily the GM of the vessel e.g. if a weight is moved laterally but not vertically.

3.18.1.2 The basic procedure for carrying out a roll test involves forcing a vessel to an angle of heel and then allowing it to roll free of constraint. The average period of roll for a full cycle is then determined as the roll decays due to damping. The pseudo GM, GM_{ind} is calculated and compared with the required GM, GM_{req} . Where GM_{ind} is equal to or greater than GM_{req} the vessel is considered to be acceptable.

3.18.1.3 When applying roll test theory to fishing vessels not subjected to an inclining experiment there are two approaches used, one for single and twin boom fishing vessels and another for all other fishing vessels.

3.18.1.4 The roll test is used to generate a value of GM_{ind} from the following formula:-

$$GM = \left(\frac{kB}{T}\right)^2 \qquad (1)$$

Where k = coefficient;

B = breadth (metres);

T = roll period (seconds);

using a fixed value of k which is related to the vessel type as follows:-

- deep sea fishing vessels 0.80
- vessels with live fish well 0.60

3.18.1.5 This DTI roll test should only be applied to vessels possessing normal geometric characteristics for vessels circa 1975, that is round bilge hulls. It should also be borne in mind that the factor 0.80 used in the GM_{ind} is an approximate figure which is only suitable for single deck flush-decked vessels less than 24 metres with relatively small deckhouses and side to side superstructure such as a forecastle or whaleback.[14]

3.18.2 APPLICATION TO NON-SINGLE AND TWIN BOOM FISHING VESSELS

3.18.2.1 In the case of non-single and twin boom fishing vessels, the GM_{ind} is compared with a minimum GM, GM_{req} calculated from the empirical formula:-

$$GM_{req} = 0.6 + 0.05B - 0.25F_{min} \qquad (2)$$

Where: - F_{min} = minimum freeboard (m) at any point along the length of the vessel (average of port and starboard readings). NB in some cases the amidships freeboard has been used in this formula. Unless the freeboard can be shown to

[14] Case study – report to be published by TSB Canada - https://www.tsb.gc.ca/eng/enquetes-investigations/marine/2020/M20P0229/M20P0229.html Fishing vessel Arctic Fox II Sinking with loss of life, a vessel built in the UK in 1947 as the Jessie West FR 559.

have changed by more than 20% this practice should continue for *those vessels only.* In cases where there is doubt, the minimum freeboard should be used.

B = moulded breath.

3.18.2.2 Where GM_{ind} is greater than GM_{req} the vessel is considered to be acceptable. A 1cm deficit in GM_{ind} is permissible to take account of experimental error.

3.18.2.3 Due to restrictions on the base data from which this formula is derived, there are limitations on the proportions of the vessels to which it can be applied:

$0.04 \leq (F_{min}/B) \leq 0.2$

$1.75 \leq (B / D) \leq 2.15$

Where: - *D* = moulded depth (metres) at amidships.

3.18.2.4 The above limitations are stipulated to avoid misleading results that may influence the radius of gyration to a greater, or lesser, extent. In such cases where the above limitations can no longer be complied with (due to changes or other circumstances) the roll test should *not* be used and advice must be sought from Stability and Plan Approval Unit.

3.18.3 APPLICATION TO SINGLE AND TWIN BOOM FISHING VESSELS

3.18.3.1 In the case of single and twin boom fishing vessels a different formula is used, known as the 'Dutch' roll method which is as follows:-

$$GM_{(\mathrm{mod})} = GM_{(ind)} + (GM_{(ind)} - 0.4).\left(\frac{6 - B}{B}\right) + a.\left(\frac{D}{B} - 0.5\right) + b.\left(\frac{S}{B} - 0.12\right) \quad (3)$$

where GM_{mod} = pseudo *GM*, GM_{ind} modified for vessel proportions

GM_{ind} = pseudo *GM* calculated from formula (*1*) with $k = 0.83$

B = breadth

D = moulded depth amidship

a = coefficient from Table 1

b = coefficient from Table 1

S = mean sheer = (sheer fwd + sheer aft)/2

Sheer fwd = freeboard at stem - minimum freeboard
Sheer aft= freeboard at stern - minimum freeboard

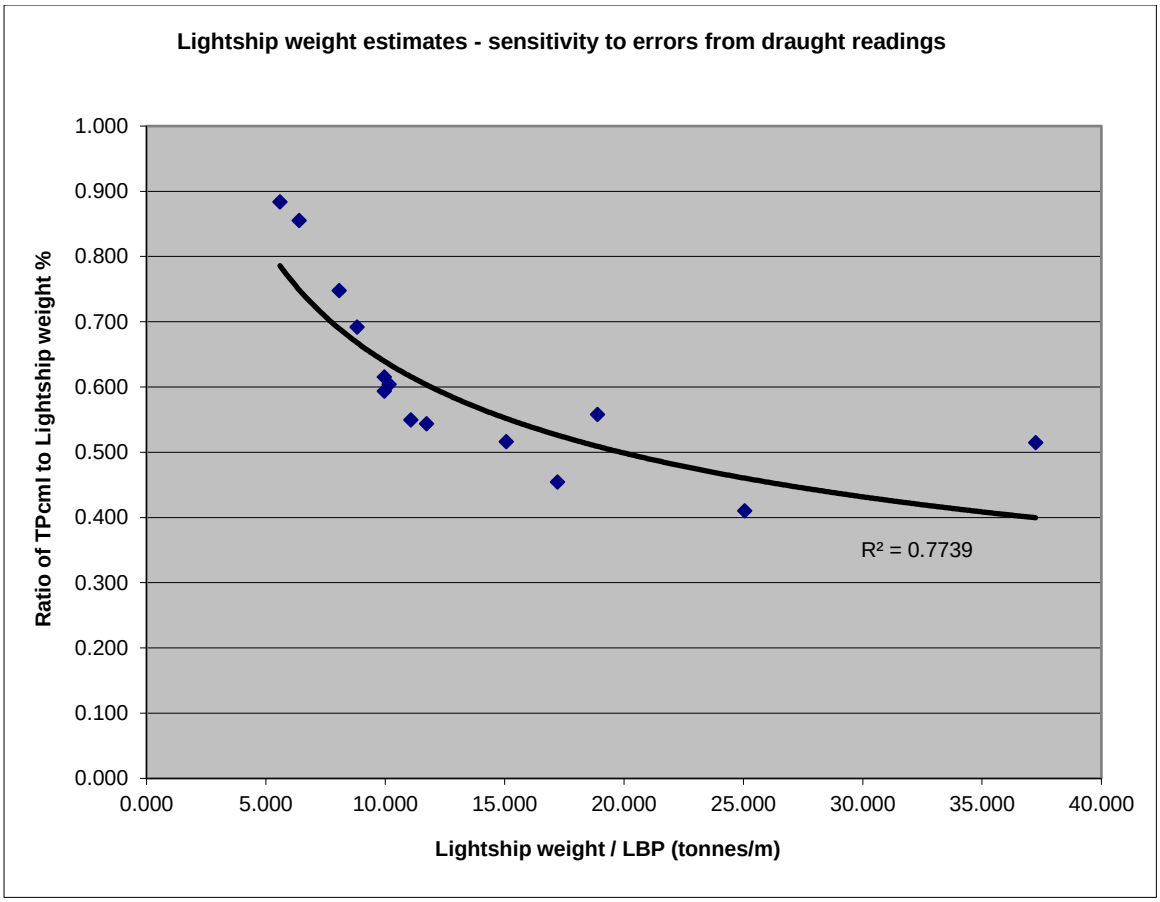
The values of *a*, *b* and GM_{req} are calculated from the following table by linear interpolation.

F/B	*A*	*b*	GM_{req}
0.04	1.25	2.11	0.938
0.05	1.13	2.03	0.883
0.06	1.01	1.95	0.832
0.07	0.92	1.88	0.777
0.08	0.83	1.78	0.728
0.09	0.77	1.70	0.682
0.10	0.73	1.61	0.636
0.11	0.71	1.51	0.597
0.12	0.71	1.39	0.563

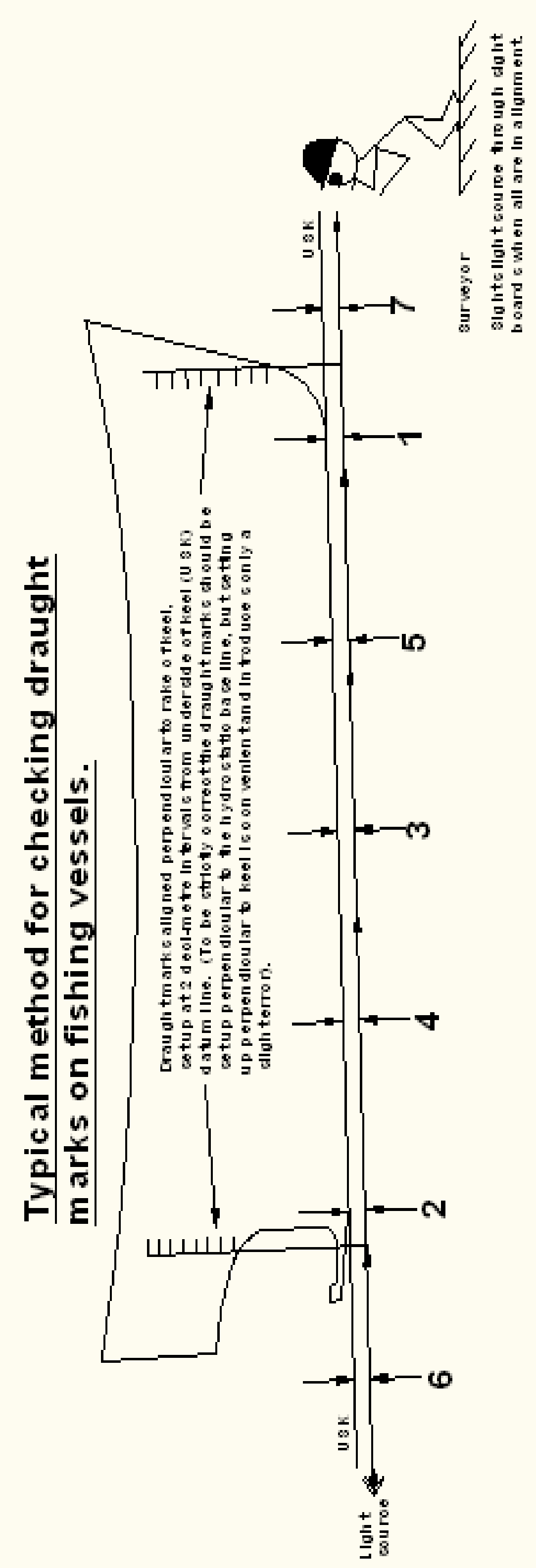
F/B	*a*	*b*	GM_{req}
0.13	0.72	1.27	0.533
0.14	0.74	1.13	0.502
0.15	0.77	0.94	0.473
0.16	0.82	0.75	0.457
0.17	0.88	0.57	0.440
0.18	0.97	0.41	0.435
0.19	1.14	0.27	0.440
0.20	1.54	0.17	0.455

3.18.3.4 The same application limitations on vessel proportions and acceptable *GM* criteria apply to single and twin boom fishing vessels as apply to non-single and twin boom fishing vessels.

3.18.4 THE SENSITIVITY TO LIGHTSHIP WEIGHT ESTIMATES TO DRAUGHT



3.18.5 MANUAL METHOD OF SETTING UP AND CHECKING DRAUGHT MARKS (PAGE 1)



Step 1 - set up sight boards in positions 1 and 2 at the same fixed distance below the USK, typically about 150mm below.

Step 2 - set up sight board 3 approximately midway between boards 1 and 2, so that light source can be seen through all three boards.

Step 3 - set up sight boards 4 and 5 either side of 3 (about midway between existing boards), and line up so that light source is visible through all.

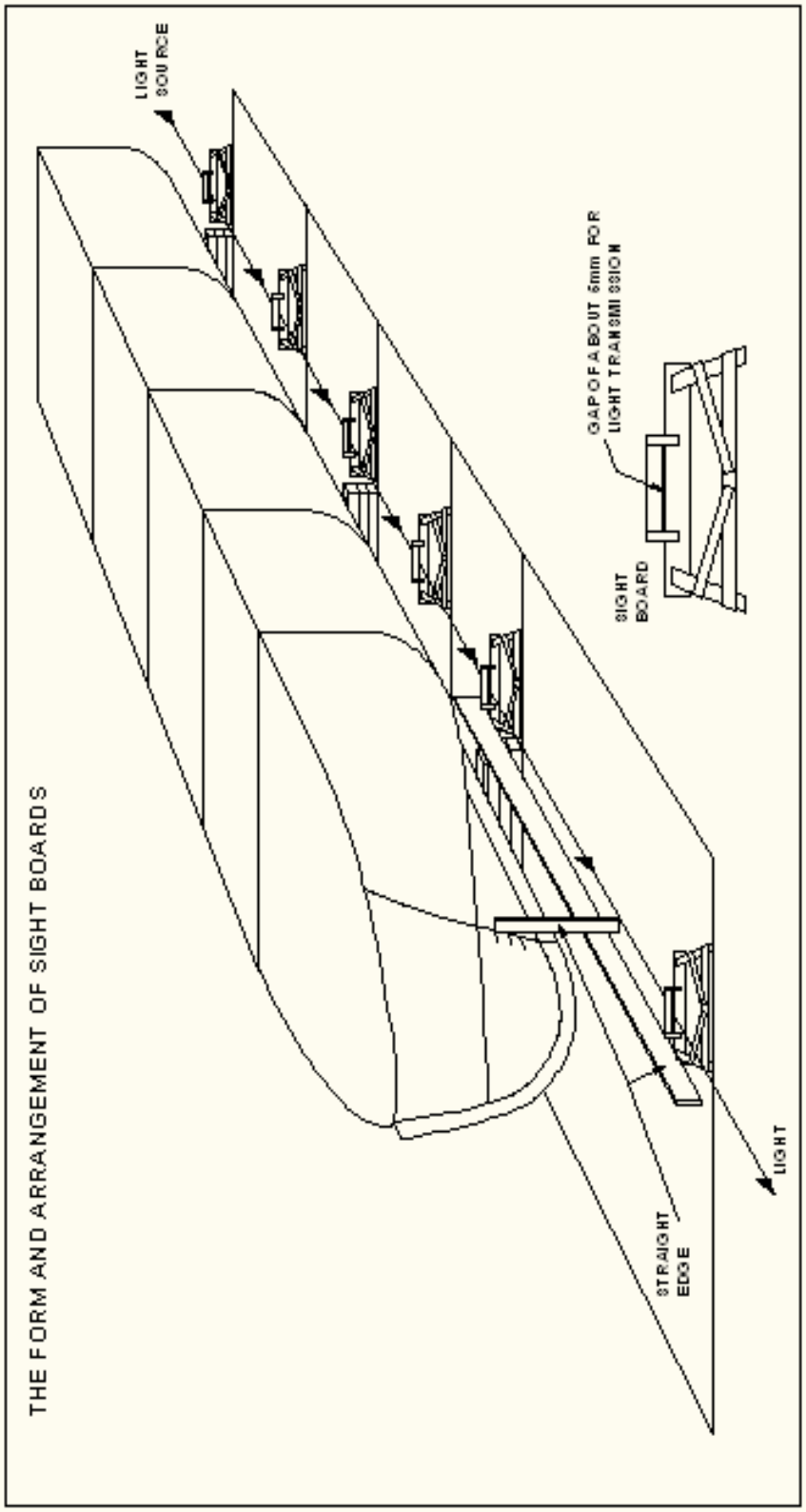
Step 4 - use the "plane" created by the light boards to find the deepest point of the keel if it is not "true" i.e. there is measurable hog or sag.

Step 5 - the offset from the lowest point of the keel should be determined; if sag is present the original 150mm offset will be reduced.

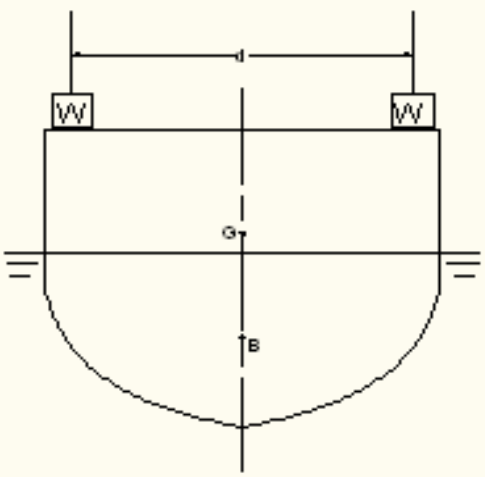
Step 6 - set up sight boards 6 and 7 clear of the ends to extend the datum beyond the draught marks.

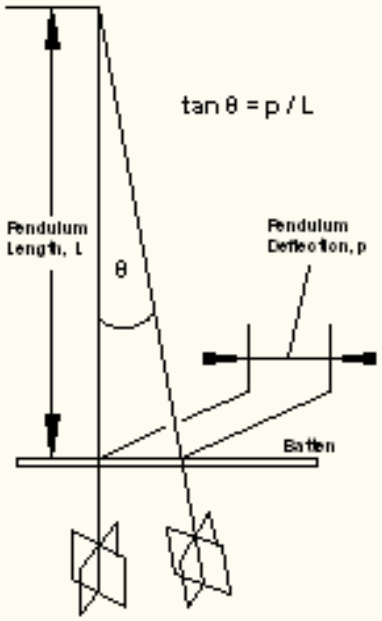
Step 7 - set off the draught marks perpendicular to the USK from level boards set up at the forward and aft draught datum i.e. line of USK through deepest point on keel.

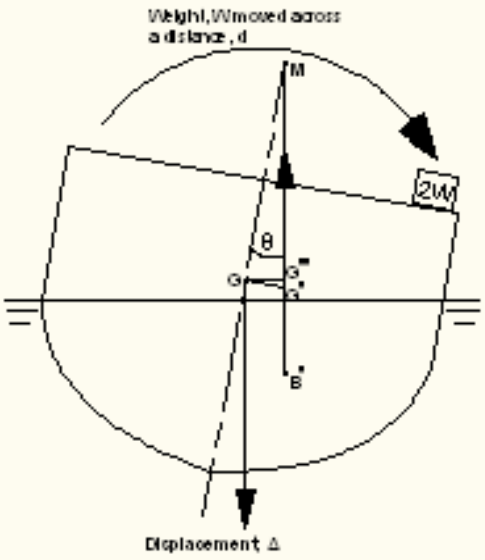
Setting up and checking draught marks (Page 2 of 2)



3.18.6 THE THEORY UNDER-PINNING THE INCLINING TEST







Heeling moment = W x d

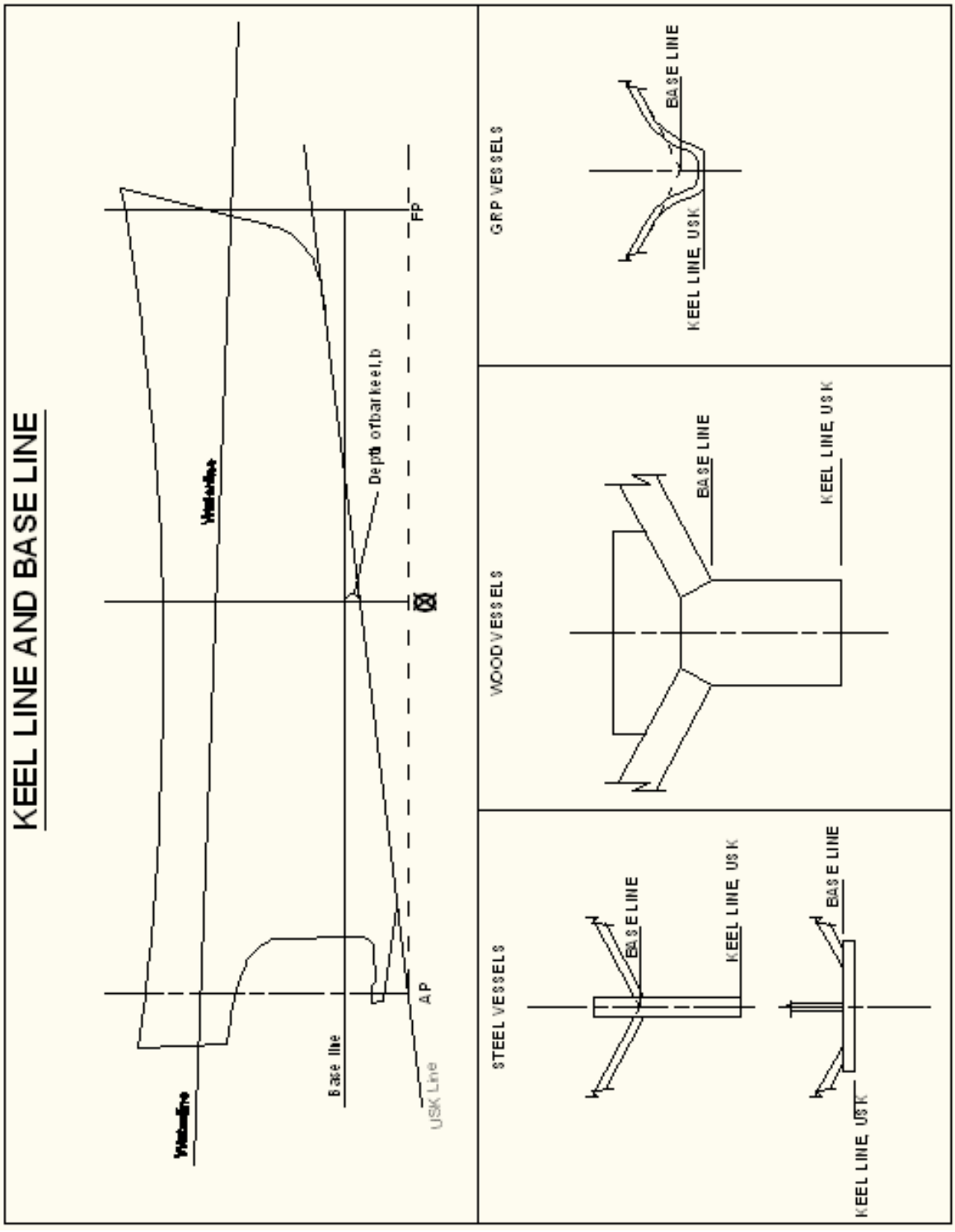
Righting moment = Δ x GG" = Δ x GM x sinθ

So, since tanθ = sinθ for small angles

$$W \times d = \Delta \times GM \times \tan\theta$$

$$GM = (W \times d) / (\Delta \times \tan\theta)$$

3.18.7 THE BASE LINE AND KEEL LINE



3.18.8 CALCULATIONS FOR ICE AND FRESH WATER FOR FISH PRESERVATION

The Excel spreadsheet calculator[15] for ice/fw requirements is activated by double-clicking on it. The assumptions in the calculations are given in the notes following spreadsheet.

Fishing vessel ice / fresh water usage calculation

----------Input Data----------

Vessel name:	PLUTO		**Assumptions:**		
Duration of trip:	11	days	Weight of ice per box on arrival in port	10	kg
Maximum catch:	750	boxes	Melt rate of ice	4	% of weight per day
Number of crew:	6	persons	Margin on ice usage	10	%
			Domestic FW requirements	90	litres per person per day

----------Calculation----------

----------Fish preservation----------			---------Domestic fresh water----------		
Weight of ice on arrival =	7500	kg	Weight of domestic fresh water required for trip =	5940	kg
Multiplier for melt loss =	1.57		10% residue on arrival port	660	kg
Ice / fresh water required for fish preservation =	11751	kg			
10% margin on ice usage	1175				
Total weight of ice / fresh water on depart port	12926	kg	Total weight of domestic fresh water on depart port	6600	kg

Assumptions:

1. There is 10kg of ice for every 50 kg box of fish and ice;
2. Hotel services fresh water consumption is 90 litres per man per day; and
3. The melt rate of ice is 4% by weight per day, and it starts with the full weight of ice on day 1.

[15] CMxxxxx-STAB-20210519-MISC Ice & Fresh Water Calculation

The icing figures given are for the general white fish sector i.e. cod, haddock, etc. High value fish such as sole , prawns, etc may be boxed with a higher proportion of ice – for vessels fishing in these sectors other parameters may be more appropriate and surveyors should check with their local producers' organisation on current practice.

ANNEX A – ROLL TEST MEASUREMENT REPORT

Beam Trawlers **CM /31/**

Basic Data: *(Data in shaded boxes is for direct input to computer based Roll Test calculation procedure)*

Vessel's Name:			
Registration (RSS) No.:		Fishing No.:	
Date of test:		Fishing method:	
Weather conditions:		Water conditions:	
Name of surveyor:		Signature of surveyor:	
Name of witness:		Signature of witness:	
Breadth:	M	Moulded Depth:	M

Condition of vessel:

Fuel oil - Full: Y/N		Derrick topped? Y/N	
Water - Full: Y/N		Beams stowed? Y/N	
Ice on board? Y/N	If Yes - amount: t	Spare warps etc	Where stowed?
Provisions - Full Y/N		Lengths of derricks:	Port m; Stbd m
		Lengths of beams:	Port m; Stbd m

Details of Fishing Gear and other loose equipment:

Freeboards:

(Data in shaded boxes is for direct input to computer based Roll Test calculation procedure)

	Aft	Minimum	Forward
Port	n/a	m	n/a
Centre	m	n/a	M
Starboard	n/a	m	n/a

Roll Period: *(Data in shaded boxes is for direct input to computer based Roll Test calculation procedure)*

	Test No 1		Test No 2		Test No 3	
Oscillations	n_1 =		n_2 =		n_3 =	
Stopwatch No 1	$t(1)_1$ =	s	$t(1)_2$ =	s	$t(1)_3$ =	S
Stopwatch No 2	$t(2)_1$ =	s	$t(2)_2$ =	s	$t(2)_3$ =	S

ROLL TEST MEASUREMENT REPORT

Stern and Side Trawlers **CM /31/**

Basic Data: *(Data in shaded boxes is for direct input to computer based Roll Test calculation procedure)*

Vessel's Name:			
Reg. (RSS) No.:		Fishing No.:	
Date of test:		Fishing method:	
Weather conditions:		Water conditions:	
Name of surveyor:		Signature of surveyor:	
Name of witness:		Signature of witness:	
Breadth:	m		

Condition of vessel:

Fuel oil - Full: Y/N		Provisions - Full Y/N	
Water - Full: Y/N		Fishing gear stowed? Y/N	Where stowed?
Ice on board? Y/N	If Yes - amount: t	Spare warps etc	Where stowed?

Details of Fishing Gear and other loose equipment:

Minimum Freeboards:

(Data in shaded boxes is for direct input to computer based Roll Test calculation procedure)

Port	Starboard
m	M

Roll Period: *(Data in shaded boxes is for direct input to computer based Roll Test calculation procedure)*

	Test No 1		Test No 2		Test No 3	
Oscillations	n_1 =		n_2 =		n_3 =	
Stopwatch No 1	$t(1)_1$ =	s	$t(1)_2$ =	s	$t(1)_3$ =	S
Stopwatch No 2	$t(2)_1$ =	s	$t(2)_2$ =	s	$t(2)_3$ =	S

ANNEX B – GUIDANCE ON THE CONDUCT OF ROLL TESTS ON NON SINGLE AND TWIN BOOM FISHING VESSELS

Involvement of Owners in Roll Tests on non single and twin boom Fishing Vessels

1. To provide an independent check roll tests on beam trawlers are now carried out by the owner's consultant and witnessed by an MCA Surveyor. This practice is not extended to other types of fishing vessel but there still exists a need to provide an independent check of the roll test for those vessels. During your last roll test you provided this independent check and the MCA surveyor explained the reasons for the test and fully involve you when carrying out the test. Having already assisted an MCA surveyor in carrying out a roll test, the following guidance is provided to enable owners to carryout their own check roll test should it be considered necessary. **It should be noted that roll tests carried out for certificate renewal, or as a result of changes to the vessel, will still require to be carried out with an MCA surveyor in attendance.**

The general theory of roll tests

2. The basic procedure for carrying out a roll test is to start the vessel rolling and then allow it to roll free of constraint. The average period of roll for a full cycle is then determined as the roll decays due to damping. The pseudo *GM*, GM_{ind} is calculated and compared with the required *GM,* $GM_{req.}$ Where GM_{ind} is equal to or greater than GM_{req} the vessel is considered to be acceptable.

Application to non single and twin boom fishing vessels

$$GM = \left(\frac{kB}{T}\right)^2 \qquad (1)$$

3. In the case of non single and twin boom fishing vessels the roll test is used to generate a value of GM_{ind} from the following formula:-

$$GM = \left(\frac{kB}{T}\right)^2 \qquad (1)$$

Where *k* = coefficient related to vessel type (for your vessel use);

B = breadth (metres);

T = roll period (seconds);

4. The GM_{ind} is compared with a minimum *GM*, GM_{req} calculated from the empirical formula:-

$$GM_{req} = 0.6 + 0.05B - 0.25F_{\min} \qquad (2)$$

Where: - F_{min} = minimum freeboard (m) at any point along the length of the vessel (average of port and starboard readings).

B = moulded breath.

5. Where GM_{ind} is greater than GM_{req} the vessel is considered to be acceptable. A 1cm deficit in GM_{ind} is permissible to take account of experimental error.

Vessel Condition

6. In the test to determine GM_{ind} the vessel should be in the *depart port* condition. Any deviation from this would invalidate the formula used to derive the GM_{req}. The condition should be very similar to that when the vessel was last tested in the presence of an MCA surveyor. As a general guide, all storage tanks should be at maximum working levels and fishing gear and ice (if normally carried) should be onboard. Beams and derricks (where applicable), spare gear and any permanent ballast should also be onboard located in their normally stowed position.

Precautions to be observed

7. The following precautions should be taken during preparation and for the actual roll test:

.1 the vessel should be in harbour, with calm waters and minimum interference from wind and tide.

.2 the mooring of the vessel should be slack.

.3 all shipyard equipment should be removed from the vessel.

.4 there should be a reasonable clearance of water below the keel and at the sides of the vessel to avoid contact with the harbour bottom, other boats or the quayside.

.5 a preliminary roll should be carried out to check that the motions of the vessel are adequate to enable at least three (but preferably five) consecutive rolls to be timed.

.6 all fishing and spare gear that might shift during rolling should be secured in their normal stowed position.

.7 fish boxes and ice stowed and secured in their normal locations

.8 any free surface should be minimised and preferably eliminated by pressing up or completely emptying tanks.

.9 the deck edge must not be allowed to be immersed during rolling.

.10 all bilges to be dry.

.11 any persons on board to remain stationary during the test.

Roll test procedure

8. The roll test should be conducted in the following manner:

.1 Check dimensions on the vessel and from previous roll test report. Freeboard measurements are unlikely to be exactly the same as those previously recorded but should not be dramatically different. It is important to ensure accurate measurement as minor errors can substantially effect the calculation of *GM*. Freeboard measurements are best carried out from a tender with no one on board the vessel. Where this is not possible a few persons as is necessary should be on board when measurements are taken and appropriate precautions should be taken to minimise any effect on the angle of heal that may result.

.2 The vessel should be rolled by pulling, with a rope, on the mast or other substantial structure. Any other practical method may be considered (e.g. pulling on a rope fixed ashore through a high point using a warping drum on the vessel, using a crane ashore to repeatedly lift and place a weight on the deck. The important point is that the method adopted is to be used to initiate the rolling and therefore should be stopped as soon as the roll has increased to an acceptable level, to ensure that the vessel is then able to roll naturally and free of constraint.

.3 The roll period should be timed over as many oscillations (minimum three but preferably five) as possible. In theory, to ensure the best possible accuracy, a distant or other suitable object that will align with the vessel's mast (or other suitable point), at the stage in the roll where the vessel is upright or near upright, should be used as a reference point for timing. In practice this is rarely possible and the normal practice is to use the point of roll (i.e. when the gunwale is at the highest or lowest point).

.4 This process should be repeated at least three times or until consistent measurements are obtained. On each occasion the time for at least three (but preferably five) oscillations should be measured.

.5 A mean time (T) for one oscillation (i.e. the roll period) can then be calculated from the timings taken.

.6 Having completed the roll test the indicated *GM* should be calculated (see paragraphs 3 & 4) to establish whether the vessel has passed the test.

.7 If the vessel 'fails' the roll test remedial action will be required. Such action may include the removal of “magpie” items, re-examining stowage locations of loose equipment (i.e. stow at in a lower position in the vessel). Remedial action may also involve minor modifications to the vessel (removing top weight or adding ballast) but this should not be attempted without first seeking the advice of a consultant. If remedial action does become necessary you must advise the

MCA. Depending on what action is proposed it may be necessary to carryout a further roll test with an MCA surveyor

ANNEX C – EXEMPTION FROM STABILITY REQUIREMENTS FOR BEAM TRAWLERS UNDER 24.4M

GUIDANCE TO THE SKIPPER

On the basis that this fishing vessel is a vessel covered by the exemption from the 1975 Safety Provisions Rules stability requirements, dated 5 April 1982,

New Start to Guidance:

On the basis that this fishing vessel is a vessel covered by the exemption from the Fishing Vessels (Codes of Practice) Regulations 2017 relating to stability requirement, dated 18 December 2017, demonstration of compliance with full stability criteria is not required provided the vessel meets the simplified stability criterion in the depart port condition. This condition being taken to be representative of the cycle of voyage operations.

This criterion specifies that an estimate of the metacentric height of the vessel be made by means of a roll test.

It is important to appreciate that by virtue of meeting the criterion in only one loading condition it is assumed that adequate stability will be maintained throughout the whole voyage cycle. This will only be valid if best practices with regard to use of consumables and stowage of catch are followed.

If the metacentric height estimated from the roll test was considerably in excess of the minimum required there is some scope for flexibility between the conditions of loading, but this should be accepted with extreme caution, bearing in mind the uncertainty of trying to estimate changes in stability caused by variations in weights, trim and draft for a vessel whose full stability and hydrostatic particulars are unknown.

In order to ensure that adequate stability is maintained throughout the voyage cycle you are advised that:

(a) Fish landed on deck should be stowed below as soon as possible.

(b) All consumables should be so used that in your judgement the stability of the vessel at any time during the voyage cycle is not less than that at the time of the roll test. In general, consumables in the uppermost tanks should be used first.

(c) It is important to appreciate that cargoes of bulk fish that can move freely should NOT be carried. In practice this would mean that a sufficient number of suitable deep longitudinal divisions will need to be provided in order to reduce the loss of stability associated with this type of cargo.

(d) A re-examination of the metacentric height in the depart port loading condition by means of a roll test will need to be carried out and the stability reconsidered, if there have been any changes, other than those considered to be minor, to fixtures or fittings (including any ballast and fishing gear) of the vessel.

ANNEX D – EXEMPTION FROM STABILITY REQUIREMENTS FOR FISHING VESSELS UNDER 24.4M

GUIDANCE TO THE SKIPPER

On the basis that this fishing vessel is an existing crabber under 24.4m in registered length which has a history of safe operating experience and there being no full stability information available, the Department of Transport has granted exemption from demonstrating compliance with the full stability criteria, provided that the vessel meets the simplified stability criterion in the depart port condition. This is taken to be representative of the cycle of voyage operations.

This criterion specifies that an estimate of the metacentric height of the vessel be made by means of a roll test.

It is important to appreciate that by virtue of meeting the criterion in only one loading condition it is assumed that adequate stability will be maintained throughout the whole voyage cycle. For this to be valid there must be a reasonable consistency of freeboard, trim, draft and the level in the vivier tank (if fitted) should remain full as recorded during the roll test.

If the metacentric height estimated from the roll test was considerably in excess of the minimum required there is some scope for flexibility between the conditions of loading, but this should be accepted with extreme caution, bearing in mind the uncertainty of trying to estimate changes in stability caused by variations in weights, trim and draft for a vessel whose full stability and hydrostatic particulars are unknown.

In order to ensure that adequate stability is maintained throughout the voyage cycle you are advised that:

(a) Where fitted, the vivier tank must never be emptied or filled at sea and the water level in the tank must not fall below the top of the tank (or bottom of trunk where fitted). A note to this effect is to be posted in the wheelhouse.

(b) All consumables should be used such that in your judgement the stability of the vessel at any time during the voyage cycle is not significantly different from that at the time of the roll test.

(c) Pots should be stowed as low as possible.

(d) A re-examination of the metacentric height in the depart port loading condition by means of a roll test will need to be carried out and the stability reconsidered, if there have been any changes, other than those considered to be minor, to fixtures or fittings (including any ballast and fishing gear) of the vessel.

ANNEX E – STABILITY STATEMENT FOLLOWING A ROLL TEST

Vessel Name: _____

Fishing Number: _____

1. The results of the roll test carried out on the above vessel on *date* have been examined. The results were as follows:

$GM_{(req)}$ = $*GM_{(ind)}$ = $*GM_{(mod)}$ =

Where $GM_{(req)}$ is the minimum required metacentric height and $GM_{(ind)}$ or $GM_{(mod}$ is the value of GM that has been determined for your vessel from the roll test.

2a*. These figures are deemed to be acceptable and therefore the vessel is considered to comply with the terms of the exemption granted by the Secretary of State under section 18(1) of the Fishing Vessels (Codes of Practice) Regulations 2016.

2b*. These figures are not acceptable as the basis for an exemption from the need to comply with the stability criteria set out in [3.1.2.1 and 3.1.2.2 of MSN 1872.] [3.1.2.1 of MSN 1873] Minor modifications in terms of removal of top weight or additional ballast will be required before the vessel may be resubmitted for a further roll test. The owner is advised that he may wish to seek professional advice before making any changes.

2c*. These figures are not acceptable as the basis for an exemption from the need to comply with the stability criteria set out in [3.1.2.1 and 3.1.2.2 of MSN 1872] .] [3.1.2.1 of MSN 1873]. The owner is advised that as minor modifications have not enabled the vessel to comply with the roll test criteria it will be necessary that is failed, an inclining test and submit full stability information. It should be noted that the two methods of assessing stability are entirely separate and it is possible that the vessel can fail the roll test criteria and comply with [3.1.2.1 and 3.1.2.2 of MSN 1872] .] [3.1.2.1 of MSN 1873] following an inclining. The owner is therefore advised to seek professional advice before putting any further modifications in place. The MCA require to be advised of any modifications.

3a*. Please note that the "Guidance to the Skipper" and this statement should be placed onboard the vessel.

3b*. Please keep MCA advised of any changes made to the vessel and contact the undersigned once the vessel is ready for a further roll test or inclining test.

* Delete as applicable

Signature of Surveyor _____

Date

DOCUMENT AMENDMENT HISTORY

Version Number	Status / Change	Date	Author Reviewer	Content Approver	Next Review Date/Expiry Date
09.21	• Updated Code to reflect new requirements of MSN1871 Amendment No.2	31/08/21	D Fenner	G Stone	01/09/2023
11.21	• Clarify MCA witness tests at inspection • Form and content check of approved stability books • Sets out requirements for new and existing Razor fishing multihulls	09/11/21	D Fenner	G Stone	31/10/2023
01.22	• Clarify an Offset load test can be conducted after a Roll/Heel Test failure. • Clarify that where vessel is a Category A vessel, the first step after failing a test is inclining.	31/01/22	D Fenner	G Stone	31/01/2023
05.22	• Cat A vessels should be referred to the Technical Panel if they fail Roll Test to decide whether to undergo Offset Load Test or go straight to inclining	27/04/22	D Fenner	G Stone	31/05/2023
08.22	• Split Chapter 3 into new sections on Under 15m Vessels, 15m and over vessels and Freeboard, make direct reference to MGN503 for assessing stability of vessels of less than 15m and reference to MSIS27 Chapter 2 for deciding equivalencies for Freeboard. Also amendments to section 3.10.20 and 3.10.21 of Part B (formerly 3.15.20 and 3.15.21) on solid ballast	01/07/22	D Fenner	G Stone	01/07/24