

Consultant \_\_\_\_\_

Book date \_\_\_\_\_

**FREEBOARD AND STABILITY INFORMATION**

VESSEL NAME \_\_\_\_\_

FISHING NUMBER \_\_\_\_\_

MARITIME AND COASTGUARD AGENCY

STABILITY INFORMATION APPROVAL DETAILS:

File No. CM \_\_\_\_\_

Date of approval \_\_\_\_\_ Approval Stamp\*

Review office and Surveyor \_\_\_\_\_

**\* Modifications to vessel arrangements, equipment, method of fishing or loading may render this approval invalid and may also endanger the vessel.**

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## ARRANGEMENT OF PARTS

This book is arranged in parts so that the most essential matters are brought to the user's attention first.

### **Part I - Working Instructions**

This part contains guidance intended to ensure that the level of stability does not fall below the minimum legal standard and that satisfactory freeboard is maintained. **The Skipper should study this part carefully.**

### **Part II - Simplified Check on Freeboard and Stability**

This part contains a method for making a simplified check on freeboard and stability using the highest allowable centre of gravity (*Maximum Permissible KG*) method. Reference to the basic information in Part IV may be necessary.

### **Part III - Voyage Cycles**

This part shows the voyage cycles upon which the Working Instructions are based. **The Skipper is expected to study the distribution of weights shown in each loading condition so that he may assure himself that in any actual loading condition the freeboard and stability are adequate.**

### **Part IV Reference Information**

This part contains basic information that may be necessary for the calculations in Part II.

### **Part V - Background Information**

This part contains only background information for the use of those familiar with stability and freeboard calculations. It is not necessary for the Skipper to refer to this part except that the imperial/metric conversion factors and the stowage rates may be found useful.

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\* Include all alternative voyage cycles

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**GENERAL PARTICULARS**

Vessel Name \_\_\_\_\_ Official Number \_\_\_\_\_

Vessel Type \_\_\_\_\_ Hull Material \_\_\_\_\_

Fishing Method(s) \_\_\_\_\_

Port of Registry \_\_\_\_\_ Fishing number \_\_\_\_\_

\*Registered dimensions L = B = D =  
(from vessel's Certificate of Registry)

\*Length Overall (LOA) = Length Between Perpendiculars (LBP) =

\*Breadth Moulded = Depth Moulded =

\*Freeboard amidships in the Deepest Foreseeable Operating  
Condition (vessels of less than 24m Registered length) =

\*Maximum permissible operating draught (moulded) amidships (vessels  
with a registered length of 24m and above only. This occurs in sailing  
condition number .....

Corresponding draught indicated by draught marks for this condition =

Builder's Name and Address Builder's Yard Number \_\_\_\_\_

\_\_\_\_\_  
Owner's Name and Address

\_\_\_\_\_

Date of Keel Lay \_\_\_\_\_

Date of contract (vessels 24m and above completed after 1999) \_\_\_\_\_

Consultant details  
  
\_\_\_\_\_

\* See over for definitions

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## Definitions (for the information of the Consultant only)

### The Code of Safe Working Practice for the Construction and Use of 15 metre (LOA) to less than 24 metre (L) Fishing Vessels:

Extracts from Chapter 1 section 2:

- 1.2.4 "Amidships" is the mid-length of Length Between Perpendiculars (LBP);
- 1.2.7 "Breadth (B)" is the maximum breadth of the vessel, measured to the moulded line of the frame in a vessel with a metal shell and to the outer surface of the hull in a vessel with a shell constructed of any other material;
- 1.2.17 "Depth" means the moulded depth;
- 1.2.18 "Draught" means the vertical distance from the moulded base line amid-ships to the operating water line of a vessel;
- 1.2.26 "Freeboard" means the distance measured vertically downwards from the upper edge of the freeboard deck to the waterline;
- 1.2.27 "Freeboard deck" means the lowest complete deck above the deepest operating waterline from which fishing is undertaken. In vessels fitted with two or more complete decks, the Certifying Authority may accept a lower deck as the freeboard deck provided that the deck is situated above the deepest operating waterline;
- 1.2.30 "Length overall (LOA)" means the overall length from the foreside of the foremost fixed permanent structure to the aftside of the aftermost fixed permanent structure of the vessel;
- 1.2.31 "Length (L)" in relation to a vessel, means the registered length shown on the vessel's register and as defined in The Merchant Shipping (Fishing Vessels - Tonnage) Regulations 1988, SI No. 1909;
- 1.2.32 "Length between perpendiculars" (LBP) is the ITC '69 definition which means 96% of the total length on a waterline of a vessel at 85% of the least moulded depth measured from the top of the keel, or the length from the fore-side of the stem to the axis of the rudder stock on that waterline. In vessels designed with a rake of keel the waterline on which this is measured should be parallel to the designed waterline. The forward perpendicular and the after perpendicular are positioned at the forward and after ends of LBP respectively;
- 1.2.42 "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;

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Fishing Vessel (EC Directive on Harmonised Safety Regime) Regulations 1999 (and 2003 amendments) which implements The Torremolinos Protocol of 1993 relating to Regulations for the Construction and Equipment of Fishing Vessels equal to and exceeding 24m in length

Extracts from Chapter 1 Regulation 2:

- (5) "The length (L)" shall be taken as 96 per cent of the total length on a waterline at 85 per cent of the least moulded depth measured from the keel line, or as the length from the foreside of the stem to the axis of the rudder stock on that waterline, if that be greater. In vessels designed with rake of keel the waterline on which this length is measured shall be parallel to the designed waterline.
- (6) "The forward and after perpendiculars" shall be taken at the forward and after ends of the length (L). The forward perpendicular shall be coincident with the foreside of the stem on the waterline on which the length is measured.
- (7) "The breadth (B)" is the maximum breadth of the vessel, measured amidships to the moulded line of the frame in a vessel with a metal shell and to the outer surface of the hull in a vessel with a shell of any other material.
- (8) (a) "The moulded depth" is the vertical distance measured from the keel line to the top of the working deck beam at side.  
(b) In vessels 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 gunwale were of angular design.  
(c) Where the working 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.
- (9) "The depth (D)" is the moulded depth amidships.
- (10) "Deepest operating waterline" is the waterline related to the maximum permissible operating draught.
- (11) "Amidships" is the mid-length of L.
- (12) "Midship section" is that section of the hull defined by the intersection of the moulded surface of the hull with a vertical plane perpendicular to the waterline and centreline planes passing through amidships.
- (13) "Keel line" is the line parallel to the slope of keel passing amidships through:
  - (a) the top of the keel or line of intersection of the inside of shell plating with the keel where a bar keel extends above that line of a vessel with a metal shell, or
  - (b) the rabbet lower line of the keel of a vessel with a shell of wood or a composite vessel; or
  - (c) the intersection of a fair extension of the outside of the shell contour at the bottom with the centreline of a vessel with a shell of material other than wood and metal.
- (14) "Baseline" is the horizontal line intersection at amidships the keel line.

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- (15) "Working deck" is generally the lowest complete deck above the deepest operating waterline from which fishing is undertaken. In vessels fitted with two or more complete decks, the Administration may accept a lower deck as a working deck provided that the deck is situated above the deepest operating waterline.

### The Merchant Shipping (Tonnage) Regulations 1997 as amended

Gives definitions for **Registered dimensions** applicable to vessels **15m LOA and above**:

"amidships" means the mid-point of the length;

"breadth" means the maximum breadth of the ship, measured amidships to the moulded line of the frame in a ship with a metal shell and to the outer surface of the hull in a ship with a shell of any other material;

"length" means the greater distance of the following distances -

- (a) the distance between the fore side of the stem and the axis of the rudder stock; or
- (b) 96 per cent of the distance between the fore side of the stem and the aft side of the stern;

the points and measurements being taken respectively at and along a waterline at 85 per cent of the least moulded depth of the ship. In the case of a ship having a rake of keel the waterline shall be parallel to the designed waterline;

"length overall" means the distance between the foreside of the foremost fixed permanent structure and the afterside of the aftermost permanent structure and "fixed permanent structure" includes any portion of the hull which is capable of being detached, but which is fixed in place during the normal operation of the vessel. It does not include functional arrangements such as safety rails, bowsprits, pulpits, stemhead fittings, rudders, steering gear, outdrives, outboard motors, propulsion machinery, diving platforms, boarding platforms, rubbing strips and fenders, other than where such functional arrangements are designed to replace any part of the hull that has been removed;

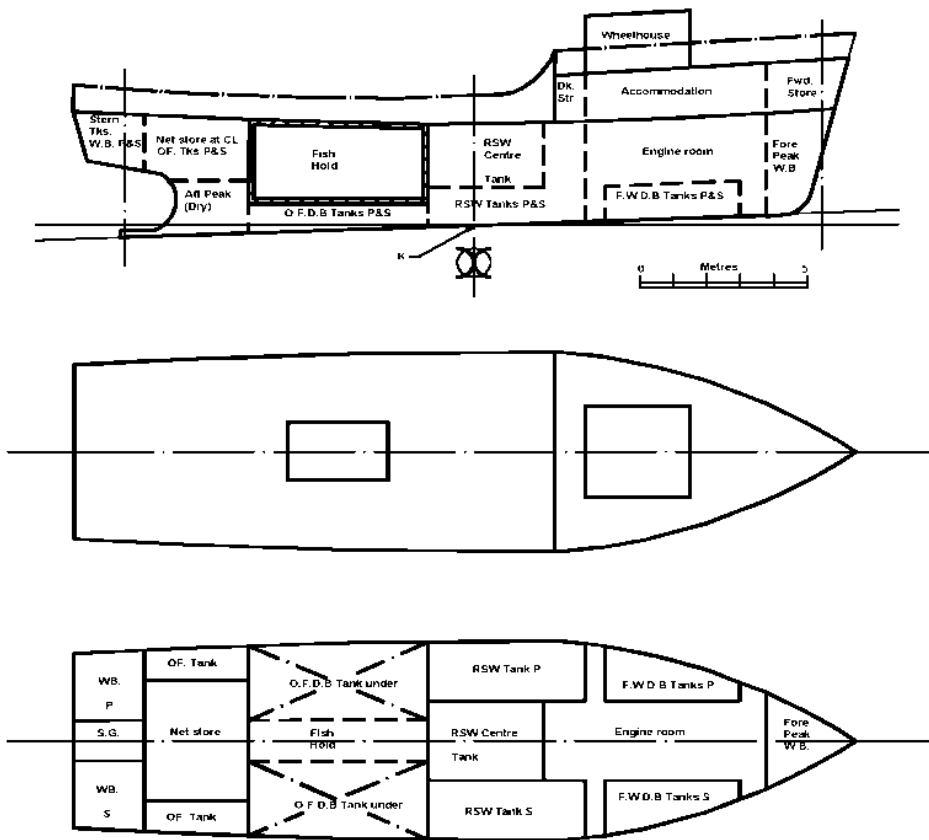
"moulded depth", and in the case of a ship of less than 24 metres "depth", means the vertical distance measured from the top of the keel of a metal ship, or in wood and composite ships from the lower edge of the keel rabbet, to the underside of the upper deck at side, or, in the case of a ship which is not fully decked, to the top of the upper strake or gunwale, provided that -

- (a) 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;
- (b) in the case of a glass reinforced plastic ship where no keel member is fitted and the keel is of open trough construction, the distance is measured from the top of the keel filling, if any, or the level at which the inside breadth of the trough is 100 millimetres, whichever gives the lesser depth;
- (c) in ships having rounded gunwales, the distance is 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; and

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- (d) where the upper deck is stepped and the raised part of the deck extends over the point at which the moulded depth is measured, the distance is 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 weathertight 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) "weathertight" means that in any sea conditions water will not penetrate into the ship;

**Vessel profile, weather deck and arrangement**



NOTE. Sketches should be provided, drawn to Scale, showing the names of all Spaces Compartments, Tanks, Storerooms and Machinery and Accommodation areas The boundary of the spaces that have been assumed intact for the purpose of the stability analysis should be cross hatched. The following comment should be included "The stability of the vessel is entirely dependent upon water being excluded from within the main hull and weathertight deck structures. Open doorways, hatchways, etc breach this watertight integrity leaving the vessel vulnerable to capsize when suddenly heeled, or when taking sea onboard. Doors hatches and similar openings, leading within weathertight structures should therefore be kept closed at sea when not in use.". It may be useful to utilise an A3 page size (folded) to contain the required information.

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**CAPACITIES, CENTRES AND FREE SURFACE MOMENTS**

Capacity		L.C.G.	V.C.G. Above	Free Surface
(m3)	(tonnes)	From A.P. (m)	design base line (m)	Moment (tonnes.m)

**OIL FUEL** (S.R. = 1.19 m3/tonne) (S.G. = 0.84)

D.B. Tank Port (frs.....)				
D.B. Tank Starboard (frs.....)				
After Tank Port (frs.....)				
After Tank Starboard (frs.....)				

**FRESH WATER** (S.R. = 1.00 m3/tonne), (S.G. = 1.00)

D.B. Tank Port (frs.....)				
D.B. Tank Starboard (frs.....)				

**WATER BALLAST** (S.R. = 0.976 m3/tonne), (S.G. = 1.025)

Fore Peak Tank				
Stern Tank Port (frs.....)				
Stern Tank Starboard (frs.....)				

**MINOR TANKS**

Total				
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**STORES**

Forward Store (frs.....)				-----
Deck Store (frs.....)				-----

**CREW AND EFFECTS**

				-----
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**R.S.W.** (S.R. = 0.976 m3/tonne), (S.G. = 1.025)

R.S.W. Centre (frs.....)				
R.S.W. Port (frs.....)				
R.S.W. Starboard (frs.....)				

**HOLD**

Fish & Ice mixed (S.R. = 1.25 m3/tonne)				-----
Bulk Fish without ice S.R. = 1.07 m3/tonne				

**ICE LOCKERS** (S.R. = 1.56 m3/tonne for crushed block ice)

Nos. 1, 2 & 3 inner, outer, P & S				-----
No. 1 centre P & S				-----

**Notes**

Stowage rates and SG are typical figures only, the correct figures should be used as appropriate.

Only 100% capacities have been shown however owners may wish to indicate additional data eg: 98% capacities for oil fuel.

Where free surface moments other than the maximum, are to be shown, the range of application should be indicated, eg. 0-10%, 10%-90% and 90%-100% full.

Where part filling is proposed, the part volume data should also be quoted.

Cross reference to the Working Instructions should be made as necessary.

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**STATEMENT BY THE OWNER & SKIPPER**

M.F.V. \_\_\_\_\_

The loading/operating conditions set out in part III of this freeboard and stability information book in conjunction with the other information contained therein, are based on the worst foreseeable service conditions in respect of the weights and disposition of fish carried in the hold or on deck, ice in the hold, fuel, water and other consumables.

Owner's name \_\_\_\_\_  
(BLOCK CAPITALS)

Signature \_\_\_\_\_

Date \_\_\_\_\_

Skipper's name \_\_\_\_\_  
(BLOCK CAPITALS)

Signature \_\_\_\_\_

Date \_\_\_\_\_

NOTES

1. The Skipper is obliged to ensure that his operation of the vessel does not render the above statement invalid.
2. Should any alteration be made in 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 Maritime and Coastguard Agency should be notified, and the alteration recorded in the book.
3. On change of ownership or Skipper the new Owner/Skipper should endorse the above statement by completing and signing the appropriate part of the table "Signatures of New Owners and Skippers" overleaf.
4. Having regard to the above statement, when the booklet is produced, the naval architect/consultant should ensure that the Owner is consulted to ensure that the assumptions made for all loading conditions are correct.



**PART I**

**WORKING INSTRUCTIONS**

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## WORKING INSTRUCTIONS<sup>1</sup>

### Note

Where possible the instructions should contain sufficient basic information to enable the vessel to be safely operated, under normal conditions, without reference to other parts of the book.

1. *Operation.*  
The voyage cycles shown in Part III are the assumed loading conditions for the vessel. The vessel must not be loaded, unloaded or operated in a way that reduces stability and freeboard without first checking (using the method in part II) that these will remain above the minima. 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".
2. *Maximum Deadweight.*  
The maximum deadweight (i.e. the weight of fuel, water, stores, fish etc. that the empty vessel can carry) should be limited to ..... tonnes. This may be expected to occur in Condition No. .... (page No. .... ) and corresponds to a minimum freeboard amidships from the ..... deck of ..... mm. Please refer to items 7, 8 and 9 for weight of fish.
3. *Bow Height*  
The forward draught (as indicated by the forward draught marks) should not exceed ..... metres, so as to maintain an acceptable bow height of ..... metres, to the freeboard deck at side at the forward perpendicular (FP).
4. *Maximum Draught at the Stern*  
The draught at the stern (indicated by the after draught marks) should not exceed ..... metres, corresponding to a minimum vertical distance of ..... metres measured from the waterline to the freeboard deck at side at the after perpendicular (AP).
5. *Ice in Hold.*  
The quantity of ice in the hold on departure from port must not exceed ..... tonnes and should not be less than ..... tonnes. It must be stowed in pounds, numbers ..... to a level that does not exceed ..... metres from the deckhead.
6. *Stowage of catch – general.*  
Catch must be secured at all stages of loading to prevent the possibility of cargo shift due to vessel motions. Details of securing arrangements for all anticipated catches should be recorded as below and within Section IV reference information, as necessary.
7. *Catch - Bulked with Ice, etc.*  
Not more than ..... kits/tonnes should be loaded and the height of stowage restricted to ..... metres from the deckhead. Permanent stanchions in the fish hold should be marked to show this loading limit.
8. *Catch – Boxed/Binned with Ice, etc.*  
Not more than ..... boxes/bins/tonnes of catch should be loaded and the height of stowage restricted to ..... metres from the deckhead. Permanent stanchions in the fish hold should be marked to show this loading limit.

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<sup>1</sup> The instructions listed under this heading are examples. Those necessary for any particular vessel will depend upon the vessel's inherent freeboard and stability characteristics and the possible variations of loading in service. In preparing the voyage cycles the naval architect/consultant should consider the effect of possible variation in the cycles and provide instructions accordingly where limitations are necessary.

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9. *Catch - Industrial fish.*  
Due to the low stowage rates of industrial catches (examples are given in the Table of Stowage Rates on page 50) part of the hold must be left empty. Either,
- a an ullage of ..... metres must be maintained between the deckhead and the surface of the catch, or
  - b the fore/aft part of the hold should be closed off by a secure temporary transverse bulkhead erected complete from the bottom of the hold to the deckhead. The section of hold that is available for loading should be filled to a maximum level of .....metres from the deckhead.

Some industrial catches may shift in a fluid manner, producing a free surface effect. To restrict this effect, ..... longitudinal pound board divisions must be provided and securely erected complete from the bottom of the hold to the deckhead.

Transverse pounding is advantageous as a secondary safety measure and should be used whenever possible.

It may also be necessary to detail the sequence of pound erection and filling to ensure that effective control of the catch is maintained during loading

Before starting to load, check that the fish hold bilge strums and slushwell grids are clear and that the hold pumping system works properly. Check bilges regularly, and pump clear. Do not load catch on top of bilge wells/suctions. Access should be maintained to allow blockages to suction to be cleared as necessary.

10. *Catch – Deck or Hopper Stowage.*
- a<sup>1</sup> Provision has not been made for deck stowage of catch. Catch landed on deck should be stowed below as soon as possible and prior to landing further catch.
  - b<sup>1</sup> Provision has been made for the stowage of ..... tonnes of fish on deck between ..... and ..... to a maximum height of ..... metres. This weight and height should not be exceeded.
  - c<sup>1</sup> In conditions ... the hopper should be loaded with caution, and emptied quickly before re-commencing fishing operations as stability may otherwise be dangerously reduced.

11. *Refrigerated .Salt .Water (RSW). (or Chilled Salt Water (C.S.W.)) Tanks*  
Careful control, in accordance with instructions of the filling and emptying of RSW or CSW tanks and the discharge or transfer of water ballast between tanks is required in relation to the quantity of consumables on board, e.g. oil fuel and fresh water. The adverse effects of free surfaces on stability should be highlighted for any conditions where large tanks are likely to be part filled.

12. *Winching, Lifting and Hauling Operations*  
In certain circumstances and/or conditions such forces may be sufficient to bring about **Capsize** of this vessel. Care should be taken when hauling gear and shipping the catch, unequal loading on warps may generate significant heel angles. Particular care should be taken when freeing snags, or when the towing warps are close to the vertical and the winches are operating at significant load. **The stability of the vessel when operating in these conditions may be substantially reduced.**

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<sup>1</sup> Delete as appropriate

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13. *Oil Fuel* \*  
The quantity of fuel on departure from / arrival at / port / grounds should be not more than / less than ..... tonnes. The after tank / forward tank / pair of tanks should be used first.
14. *Fresh Water* \*  
The quantity of Fresh Water on departure from / arrival at / port / grounds should be not more than / less than ..... tonnes. The after tank / forward tank / pair of tanks should be used first.
15. *Water Ballast* \*\*.  
When water ballast tanks have to be filled they must be pressed full. They must be filled or emptied one tank (or one pair of port and starboard tanks) at a time. When ballast water is added or removed this shall be done in accordance with the instructions and limits within the loading conditions.
16. *Stabiliser Tank (if fitted)* \*\*\*.  
This tank is designed to reduce uncomfortably high levels of stability and should be used only within the limits indicated in the loading conditions and in accordance with the Instructions on its use.

\* See also the footnotes under, "Voyage Cycle Assumptions".

\*\* See also instruction No:11 "RSW (or CSW) tanks

\*\*\* Where the loading conditions show water in the stabiliser tank, the maximum free surface correction should be applied

17. *Water on the Deck of Enclosed Fish Washing Spaces.*  
Loose water on deck can cause a significant loss of stability due to its ability for transverse movement. The deck shall be maintained clear of water. In the event of a build up of water occurring in the processing spaces, the water supply should be stopped immediately until the deck has been cleared.
18. *Control of Free Water in Holds.*  
The accumulation of free water in the hold must be avoided as this will cause loss of stability due to its transverse movement. Non-watertight pound divisions will not effectively prevent this. Check bilge levels frequently and pump out as necessary, the functioning of the hold bilge alarm should also be verified at the start of each trip.
19. *Voyage Cycles*  
In view of the seasonal nature of some fisheries and the greater versatility built into some modern vessels as regards fishing gear and stowage methods, in some cases it will be necessary to provide several voyage cycles. The pattern should follow that of Part III and be self-contained for the convenience of the user. For example, a change from trawling to seining may require the removal of trawling gear and the fitting of seining gear thus modifying the lightship and all subsequent conditions. (In such cases the derivation of the alternative lightship should be itemised as the first loading conditions of the alternative voyage cycle.)

A second example would be that of a vessel normally boxing the catch with ice, but with the alternative of industrial catches with a much better lower stowage rate, and hence substantial differences in freeboard, stability and trim. However where the provision of a complete voyage cycle would require the repetition of loading conditions identical to those in earlier voyage cycles a simple cross reference will suffice.

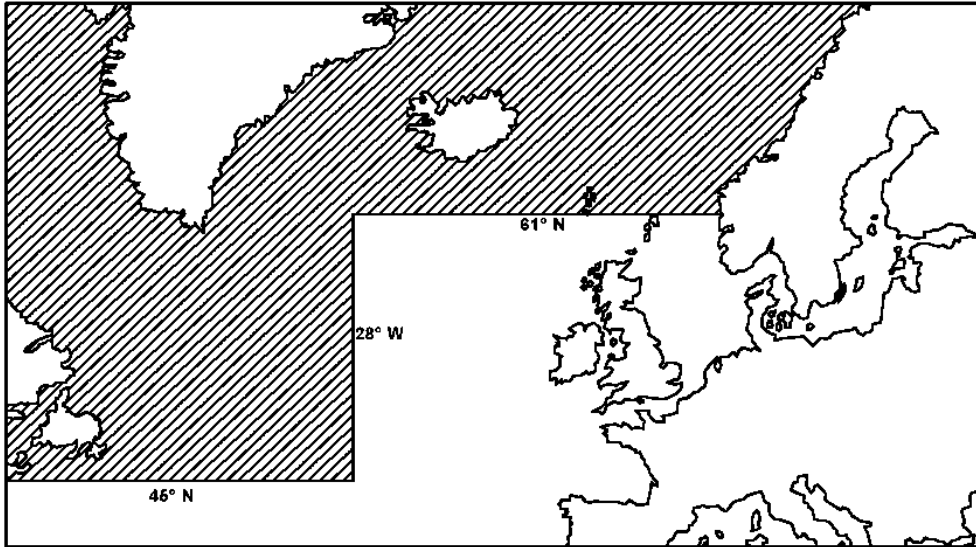
Where particular pound erection or tank filling or emptying sequences are necessary these should be detailed in the Working Instructions and need not be repeated in the voyage cycle, apart from a cross reference thereto.

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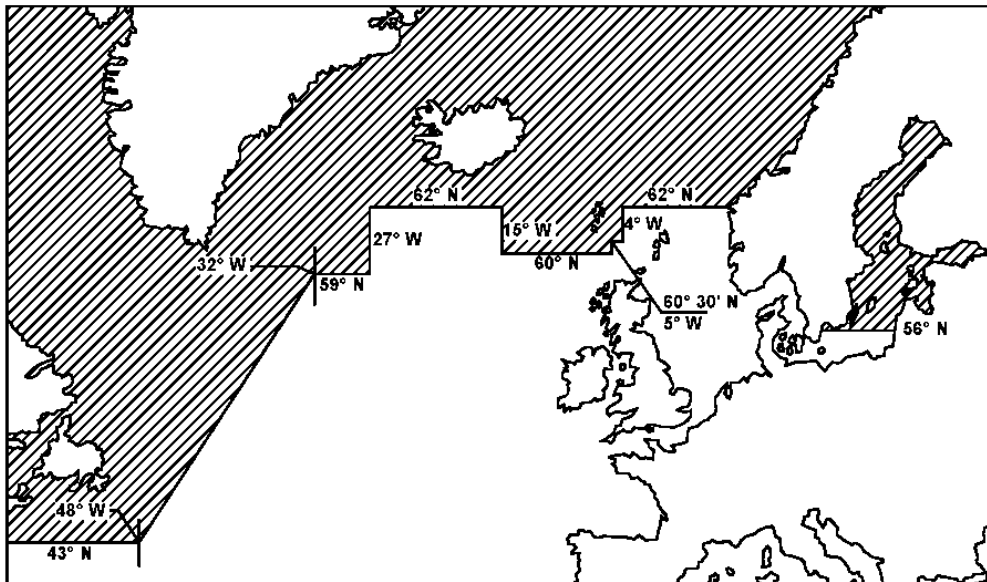
21. *Icing-up (include the statements below that are applicable to the vessel)*

- a). In winter there is a risk of "icing-up" in more Northern waters. No provision has been made for the loss of stability and freeboard that icing-up causes and its effects should be avoided. Between the 1st November and 30th April inclusive the vessel must not operate within the prohibited area that is shown on the maps below.

**Diagram showing prohibited area for new and existing vessels (15 – 24m in length) and existing vessels (built prior to 1 January 1999) of length 24m and above:**



**Diagram showing prohibited area for new vessels (built after 1 January 1999) of length 24m and above:**



 Prohibited area 1 November to 30 April inclusive

Note This page should be included when none of the vessel's loading conditions show the effect of ice on the upperworks of the vessel. The diagram that is appropriate to the length and age of the vessel should be included, only.

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b). In winter there is a risk of "icing-up" in more Northern\* waters.

New and Existing Vessels of less than 24m in Registered Length and existing vessels 24m Registered Length and above:

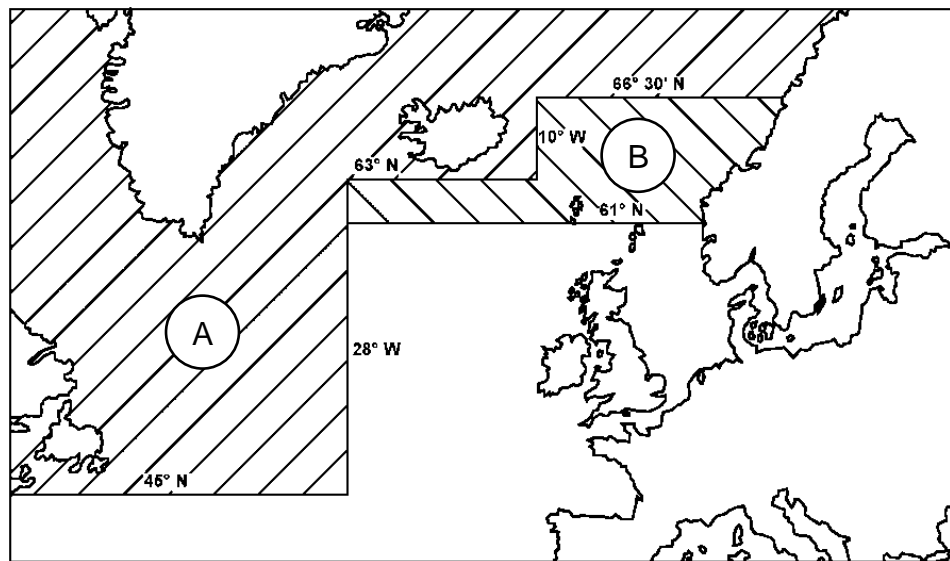
The effect of "full" and "half-icing" is shown in Loading Conditions Nos. .... (enter details of conditions in which full or half icing loads have been added)

New vessels exceeding 24m Registered Length:

The effect of icing is shown in Loading Conditions Nos. .... (enter details of conditions in which icing loads have been added)

Note            action to avoid or reduce icing must be taken as soon as it is expected or experienced.

**Diagram showing icing allowances that are applicable to new and existing vessels (15 – 24m in length) and existing vessels (built prior to 1 January 1999) of length 24m and above:**



**A** For vessels entering this area between 1 November and 30 April inclusive, stability conditions should be included within the book that contain the full icing allowance of 30 kg/m<sup>2</sup> for all exposed horizontal surfaces and 15 kg/m<sup>2</sup> for all exposed vertical surfaces (a silhouette).

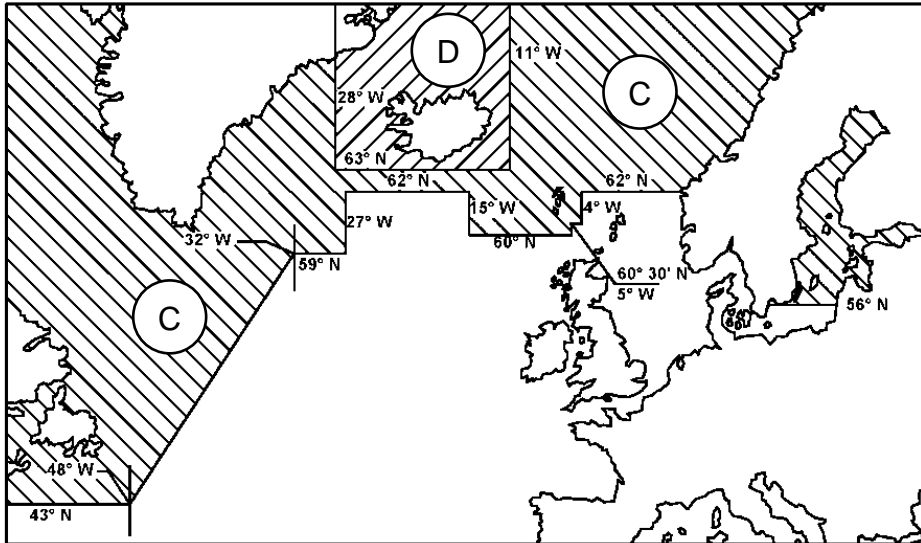
The height of the centre of gravity shall be calculated according to the heights of the respective areas and in the case of the projected lateral area the effect of sundry booms, rails, wires, etc., which will not have been included in the area calculated shall be taken into account by increasing by 5 per cent the weight due to the lateral area and the moment of this weight by 10 per cent.

\* The above and following maps show only the North Atlantic, but in the event that a vessel may operate in another part of the world where icing-up may be experienced (ie: Areas north of the European, Asian and North American continents, the Bering and Okhotsk seas and Tatar strait and South of latitude 60°S) appropriate notes and additional conditions should be added as necessary.

**B** For vessels entering this area between 1 November and 30 April inclusive, stability conditions should be included within the book that contain the half icing allowance of 15 kg/m<sup>2</sup> for all exposed horizontal surfaces and 7.5 kg/m<sup>2</sup> for all exposed vertical surfaces.

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Diagram showing icing allowances that are applicable to new vessels (built after 1 January 1999) of length 24m and above:



- C** For vessels entering this area (the Northern Region) between 1 November and 30 April inclusive, stability conditions should be included within the book that contain an icing allowance of 30 kg/m<sup>2</sup> for all exposed weather decks and gangways and 7.5 kg/m<sup>2</sup> for the projected lateral area of each side of the vessel above the waterline.

In addition the projected lateral area of discontinuous surfaces of rail, spars (except masts) and rigging of vessels having no sails and the projected lateral area of other small objects shall be computed by increasing the total projected area of continuous surfaces by 5 per cent and the static moments of this area by 10 per cent.

- D** For vessels entering this area between 1 November and 30 April inclusive, stability conditions should be included within the book that contain an icing allowance of 40 kg/m<sup>2</sup> for all exposed weather decks and gangways and 10.0 kg/m<sup>2</sup> for the projected lateral area of each side of the vessel above the waterline

**PART II**

**MAXIMUM PERMISSIBLE KG:**

**SIMPLIFIED CHECK**

**ON**

**FREEBOARD AND STABILITY**

# ONLY TO BE USED IN CONJUNCTION WITH MGN 281

## NOTES ON THE MAXIMUM PERMISSIBLE KG METHOD<sup>1</sup>

### *Condition Table*

On page 24 a blank Condition table is shown and this has to be completed to obtain the 'KG' of the vessel relevant to the operating condition being considered, i.e. the height of the centre of gravity 'G' of the vessel (and all it carries- the deadweight), above a datum point 'K' (the position of which is shown on page 43). Initially only the weight, vertical centre of gravity (V.C.G.), vertical moment and free surface moment columns need be completed. The remaining columns must be completed if the longitudinal centre of gravity (L.C.G.) has to be taken into account. Such a table is shown completed in each of the loading conditions detailed in Part III.

### *Weights and Centres of Liquids*

The maximum weight which can be carried in each tank and the centre of gravity, both vertically above point K and longitudinally, are shown in the tables on page 45. Where a tank is partly filled, the actual weight of the contents should be estimated, or taken from tank calibration tables. The V.C.G. may be taken as that for the full tank, or determined from tank calibration tables. The L.C.G. may be taken as that of the full tank, or determined from tank calibration tables.

### *Weights and Centres of Solids*

Other weights, such as those of fishing gear, equipment, beams, fish, ice, boxes, stores, crew and their effects should be included. If doubt exists as to the weight or centre of gravity of an item, an examination of the loading conditions in Part III and the reference data in Part IV should provide guidance as to likely figures.

### *Minor alterations to the vessel*

Where minor alterations have been carried out which do not justify revision of the book (refer to MCA for confirmation on this point), these should have been recorded on page 47 and totalled. The totals should be included in the Condition table.

### *Free surface effects*

Free surface effects, that is the loss of transverse stability due to liquids moving within tanks or elsewhere, or loose fish and entrained water moving within the pounded areas as may happen with some industrial catches, are taken into account in the free surface moment column of the Condition table. For each tank containing liquid, where the surface is below the top of the tank, a free surface moment should be obtained from the tank tables on page 39 or from tank calibration tables (if available). Similarly when industrial catch is carried, the free surface moments for those areas of the hold which must be pounded off when stowing the catch, are to be included in the free surface moment column. The effects of free surfaces should be added to the KG that has been calculated for the vessel and all it carries ( $KG_{\text{SOLID}}$ ) and this will give  $KG_{\text{FLUID}}$

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<sup>1</sup> This is a recommended format, other formats will be considered by the Maritime and Coastguard Agency provided that they are effective and are consistent with the information contained elsewhere in the book

## ONLY TO BE USED IN CONJUNCTION WITH MGN 281

***KG (i.e. Vertical centre of gravity of the vessel above datum K)***

The KG of the vessel,  $KG_{(SOLID)} = \text{Sum of vertical moments of weight about K} / \text{Displacement of the vessel}$ .

However, to take account of the free surface effects of fluids, a fluid KG is determined thus,

$$KG_{(FLUID)} = KG_{(SOLID)} + \frac{\text{Sum of free surface moments}}{\text{Vessel Displacement}}$$

For acceptable stability the  $KG_{(FLUID)}$  must not exceed the Maximum Permissible KG (see over).

***LCG (i.e. Longitudinal Centre of Gravity)***

The LCG of the vessel =  $\text{Sum of longitudinal moments of weight about a datum (generally the after perpendicular (AP) – see definitions page 5)} / \text{Displacement of the vessel}$

Free surface effects on the LCG position can be ignored.

***Maximum Permissible KG***

This is the maximum value above which the  $KG_{(FLUID)}$  must not rise and is determined from the notes and diagram on pages 26 and 27.

**ONLY TO BE USED IN CONJUNCTION WITH MGN 281**

**CONDITION TABLE**

Item	Weight (T)	V.C.G* Above K (m)	Vertical Moment (Tm)	Free Surface Moment (Tm)	L.C.G* From A.P. (m)	Longl. Moment (Tm)
Col 1	Col 2	Col 3	Col 4 (C.2 x C.3)	Col 5	Col 6	Col 7 (C.2 x C.6)
Oil Fuel - D.B. P & S - AFT P & S						
Fresh Water P & S						
Water Ballast - F.P. Stern P & S						
Minor Tanks						
Stores						
Crew and Effects						
R.S.W. - Centre						
Fishing gear, nets, beams, etc.						
Hold - fish						
Ice Locker						
Minor alterations to vessel						
Deadweight (total)						
Lightship						
Displacement (total)						
Free surface moment correction (FSM)	Total FSM (col 5) / Displacement					
$KG_{SOLID} = VCG \text{ of Displacement (total)}$						
$KG_{FLUID} = KG_{SOLID} + \text{FSM correction}$	For satisfactory stability $KG_{FLUID}$ must be less than the Maximum permissible KG (see sketch on page 24)					

\*Where centres of Gravity for the full tanks are to be used, irrespective of actual contents, these should be inserted beforehand for the benefit of the user.

## ONLY TO BE USED IN CONJUNCTION WITH MGN 281

### Trim Correction

The table for the calculation of trim need only be inserted if the curves for Maximum Permissible KG are based on trim, instead of LCG as presented on page 24

<p><b><u>TRIM CALCULATION</u></b>                  From the Hydrostatic data on page 46 and for a trim = .....m                  At a vessel displacement of .....Tonnes                  Longitudinal centre of buoyancy LCB = .....m forward of the AP                  Moment to change trim one centimetre MCT = .....Tm                  From table on preceding page LCG of vessel = ..... m forward of the AP</p>	
<p>Trim correction:                  = [Displacement x (L.C.G. – L.C.B.)] / 100 x M.C.T.1cm =        m</p>	
<p>Actual Trim = Trim + Trim correction</p>	

### USE OF THE MAXIMUM PERMISSIBLE KG CURVES (see overleaf)

#### Method:-

- 1       Where the vessel is not heavily trimmed, i.e. such that the LCG or trim lies within the range of values shown on the curves, a quick check can be made by plotting the vessel's displacement and  $KG_{(FLUID)}$  on the diagram for that condition. If the point plotted lies below the lowest curve, the stability and freeboard are acceptable.
- 2       If the plotted point lies within the range of curves or above, then the stability and/or freeboard depend upon the position of L.C.G. and hence trim.

For the vessel in a Condition with a value of 'LCG or trim', the maximum permissible KG will be between the two curves having LCG or trim values above and below the Condition 'LCG or trim'.

At the Condition displacement, values of maximum permissible KG are lifted from these two curves. Then either take the lesser value, or for greater accuracy interpolate according to the actual LCG or trim.

The maximum permissible KG must not be less than  $KG_{(FLUID)}$

#### Example:-

Suppose the Condition table gives displacement = 381 tonnes and  $KG_{(FLUID)}$  3.35m.

- 1       The plot of displacement = 381 tonnes and  $KG_{(FLUID)}$  = 3.35m lies above the lowest curve and it is therefore necessary to take account of the position of LCG and hence trim.
- 2       Columns 6 and 7 of the Condition table must then be completed to determine LCG. (LCG is then used in the above table to determine trim).  
 Suppose LCG or trim is calculated as 10.22/ .....m.

At the Condition displacement of 381 tonnes, the curve of:

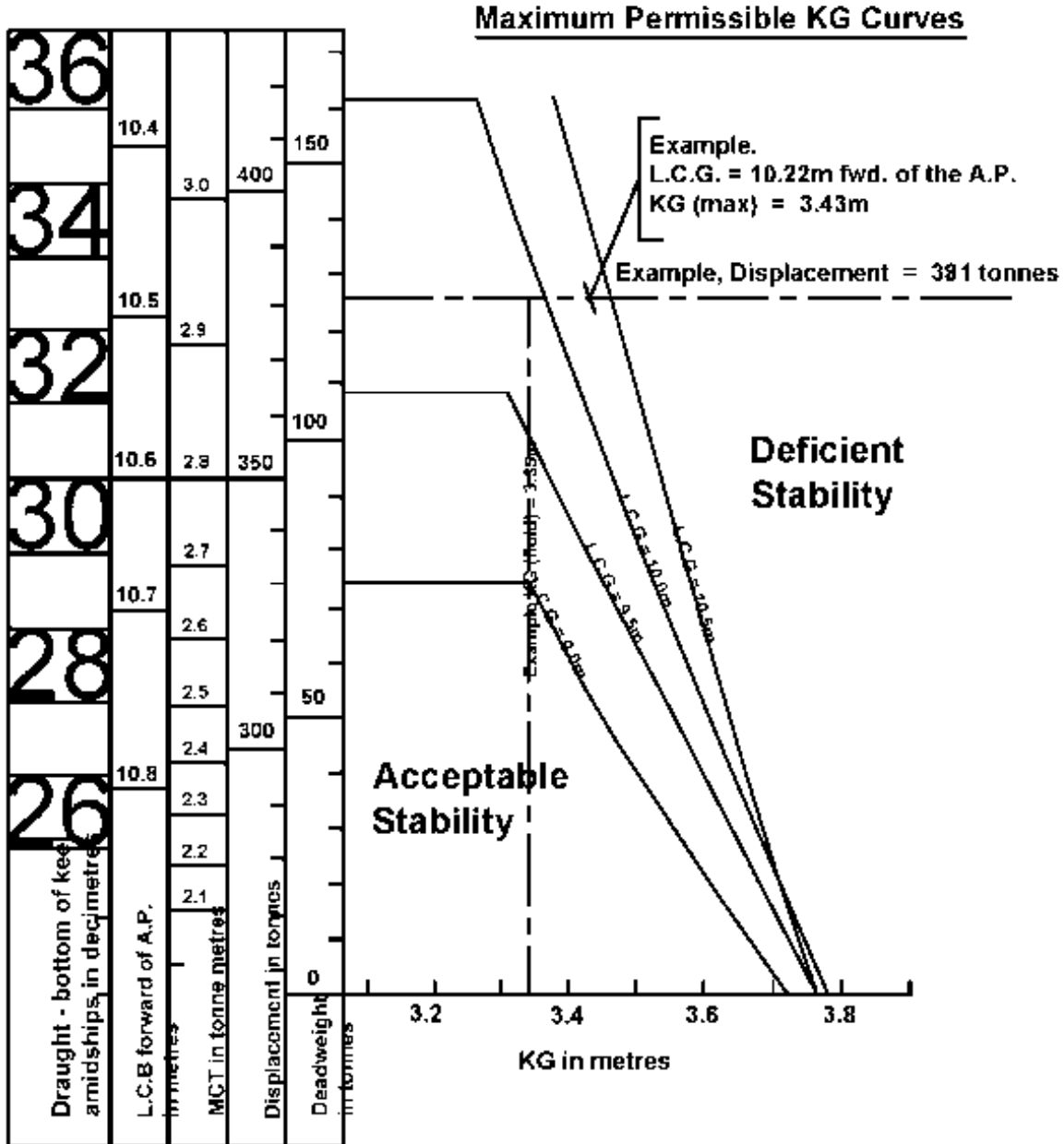
LCG or trim = 10.0m/ .....m gives a maximum permissible  $KG=3.39m$ , and the curve of LCG or trim =10.5m/ .....m gives a maximum permissible  $KG=3.48m$ .

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In this example the  $KG_{(FLUID)} = 3.35m$ . is not higher than either value, and the Condition is therefore acceptable for stability and freeboard.

However for greater accuracy, by interpolation,

Max permissible  $KG = (10.22 - 10.0) (3.48 - 3.39) + 3.39 = 3.43m$  when  $LCG/trim = 10.22m/...m$  (10.5 - 10.0)



- Note 1 For Notes on usage, see previous page
- Note 2 The hydrostatic scales are for the vessel floating at an actual trim, but are sufficiently accurate for this check.
- Note 3 In lieu of curves, the data may be presented in a tabular format

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### Footnotes

The horizontal sections of the curves represent a limitation on stern freeboard, ie the knuckles represent the combinations of displacement and L.C.G. which give the minimum recommended stern freeboard. A similar limitation could be incorporated, for bow height where head trims occur, for aft freeboard where aft trims occur or for minimum freeboard requirements.

If curves are provided for constant trim rather than L.C.G. then the Condition tables should be followed by a trim calculation as shown on the previous page and the scales for LCB & MTC1cm included as above.

Owners, or naval architects, may opt for a single curve to simplify the presentation. Where such a curve is correct for only a single L.C.G. or trim, that L.C.G or trim should be stated, and it must be apparent that there is a sufficient margin of stability to ensure compliance with the criteria over the operating range of L.C.G. or trim. Alternatively, an envelope curve can be shown for which the applicable range of L.C.G. or trim should be stated.

**PART III**

**VOYAGE CYCLE WHEN TRAWLING.**

**WET FISH**

**STOWED IN BULK WITH ICE**

**ONLY TO BE USED IN CONJUNCTION WITH MGN 281**

1 *Voyage Duration*

..... days between departure from port and arrival on the fishing grounds  
 ..... days on the fishing grounds  
 ..... days between departure from the fishing grounds and arrival in port

2 *Ice*

..... tonnes of crushed block/flake/tube ice are taken on departure from port and stowed in ..... pounds to a level of ..... metres (from the deckhead).

The ice is assumed to melt at the following rate (percentages per day).

	unused ice	ice mixed with fish in the ratio 1:2* (by weight)
On the outward part of the voyage		-----
On the fishing grounds		
On the homeward part of the voyage		

3. *Oil Fuel\*\**

The vessel is assumed to depart from port with ..... tonnes of oil fuel (ie 98% of the tank capacity) and to arrive in port with ..... tonnes (ie 10% of the tank capacity). This corresponds to a consumption rate of ..... tonnes per day between port and the grounds, and ..... tonnes per day whilst on the grounds, for the ..... day voyage.

4 *Fresh Water\*\**

The vessel is assumed to depart from port with ..... tonnes of fresh water (ie 98% of the tank capacity) and to arrive in port with ..... tonnes (ie 10% of the tank capacity). This corresponds to a consumption rate of ..... tonnes per day for the ..... day voyage.

5 *Stores*

The vessel is assumed to depart from port with ..... tonnes of stores of which ..... tonnes are consumable, and to arrive in port with ..... tonnes, corresponding to a consumption rate of ..... tonnes per day for the ..... day voyage.

6 *Stores*

The consultant should assess the likely operating condition and include any relevant information in addition to that above if needed.

\* A greater proportion of fish may be appropriate to shorter voyages, etc, as decided by the Owner.

\*\* The assumption stated is the basic one to be made. Limitations on the usage of oil fuel or fresh water are considered to be undesirable and should be avoided wherever possible.

## ONLY TO BE USED IN CONJUNCTION WITH MGN 281

**LOADING CONDITIONS, Stability Criteria and Freeboard** (new and existing fishing vessels of up to 24m in Registered Length and existing fishing vessels, (built prior 1 January 1999) of Registered Length 24m and above).

*For the information of the Consultant only.*

### **Loading conditions**

A stability statement and diagram should be provided for the usual condition of the vessel. A list of conditions is given below however, particular vessels may be subject to differing conditions to those appropriate at the time the stability criteria were established, e.g. higher catch weights on deck, and, where such hazards are anticipated, additional conditions should be included:

- (a) in the lightship condition:  
the vessel should be assumed to be empty except for system fluids. The weight and position of the centre of gravity of any permanent ballast and fishing gear should be indicated;
- (b) in each of the following circumstances so far as they may be applicable to the vessel in its foreseeable operating conditions:
  - (i) on departure from port:  
the vessel should be assumed to be loaded, ready for departure;
  - (ii) on arrival at fishing grounds:  
as sub-paragraph (i) above but with fuel, water, ice and stores appropriately reduced;
  - (iii) on arrival at fishing grounds:  
as sub-paragraph (ii) above but with the appropriate icing-up allowance;
  - (iv) on departure from fishing grounds:  
vessel loaded with its maximum catch but account taken of the consumption of fuel, water, ice and stores;
  - v) on departure from fishing grounds:  
as sub-paragraph (iv) above but with the appropriate icing-up allowance;
  - (vi) on departure from fishing grounds:  
as sub-paragraph (iv) above but with only 20% of its maximum catch;
  - (vii) on departure from fishing grounds:  
as sub-paragraph (vi) above but with the appropriate icing-up allowance;
  - (viii) on arrival at port with maximum catch:  
account should be taken of the consumption of fuel, water, ice and stores;
  - (ix) on arrival at port with 20% maximum catch:  
account should be taken of the consumption of fuel, water, ice and stores;
  - (x) if any part of the catch normally remains on deck, further statements and diagrams appertaining to that condition in all the appropriate circumstances set out in sub-paragraphs (iv) to (ix) inclusive should be provided;

The total free surface correction for the effect of liquid in tanks should be applied to each loading condition set out in the foregoing provisions of this paragraph. The free surface correction should take into account the amounts of fuel, lubricating oil, feed and fresh water in the vessel in each such loading condition.

Where provision is made in a particular area of the vessel for the washing and cleaning of the catch which could lead to an accumulation of loose water a further statement and diagram should be provided appropriate to that condition which takes into account the adverse effects of such loose water, it being assumed that:

- (i) the amount of loose water on deck is determined by the size and disposition of the retaining devices and
- (ii) in all other respects the vessel is loaded in accordance with (iv) or (vi) above, whichever is the less favourable with regard to the vessels stability.

The static stability criteria allow a margin of safety for dynamic conditions. It is the professional responsibility of the Naval Architect or Designer to check that such conditions do not place the vessel at risk.

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Attention is drawn to the potential danger of fish hoppers. The Naval Architect must investigate the effect of a filled hopper in all fishing conditions, and draw any conditions where stability is reduced below the statutory minimum required to the attention of the skipper by the addition of suitable operating guidance in working instruction 10.

### Stability Criteria

Vessels should, for the operating conditions and circumstances set out above including icing allowances when applicable, and in all foreseeable operating conditions, satisfy the following stability criteria after due correction for the free surface effects of liquids in tanks:

- a) the area under the curve of righting levers (GZ curve) should not be less than:
  - i) 0.055 metre-radians up to an angle of 30 degrees;
  - ii) 0.090 metre-radians up to an angle of 40 degrees or such lesser angle of heel at which the lower edges of any openings in the hull, superstructures, deckhouses or companionways, being openings that cannot be closed weathertight<sup>1</sup>, are immersed;
  - iii) 0.030 metre-radians between the angles of heel of 30 degrees and 40 degrees or such lesser angle as defined in (ii) above;
- b) the righting lever (GZ) should be at least 0.20 metres at an angle of heel equal to or greater than 30 degrees;
- c) the maximum righting lever (GZ) should occur at an angle of heel not less than 25 degrees;
- d) in the upright position the transverse metacentric height (GM) should not be less than 0.35 metres;

For vessels engaged on single or twin boom fishing the values of dynamic stability, righting lever and metacentric height given in paragraphs 3.1.2.1 a), b) and d) respectively should be increased by 20%.

### Lifting operations

*For vessels with lifting equipment, a sketch of the rig that is provided onboard should be appended to the vessels trim and stability manual.* N

*The freeboard and stability manual should also include a calculation that indicates the maximum theoretical heel angle that will be produced when the fishing gear, excluding catch, is statically deployed on one side of the vessel with both derricks at their maximum outreach. This is intended to provide a reference throughout the vessel's working life. The calculation should be carried out for the vessel in the 'arrive fishing grounds' condition.* N

### Freeboard

Every vessel should be so designed, constructed and operated as to ensure that in all foreseeable operating conditions the freeboard will be adequate to provide:

- i) compliance with the stability criteria set out in this section;
- ii) appropriate safety for the crew working on deck;
- iii) appropriate safety to the vessel from the entry of water into enclosed spaces having regard to the closing appliances fitted

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<sup>1</sup> An engine room vent will not be considered as closed weathertight.

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The minimum freeboard at any point along the freeboard deck should be not less than:

$$H_{min} = LBP/40 \text{ (where LBP is length between perpendiculars)} \quad \text{N}$$

The minimum freeboard criteria should be checked at the time of initial build, flag in or after substantial modifications have been made to the vessel. At renewal survey the minimum freeboard should be not less than that required to comply with the stability criteria or 300mm, whichever is greater. N

Where a vessel is fitted with bulwarks of at least 1 metre high, extending at least 0.15L abaft the forward perpendicular, the minimum bow height of the freeboard deck above the deepest operational waterline at the forward perpendicular should be not less than:

$$H_{fmin} = 0.75 + 6.6LBP/240 \quad \text{N}$$

Where the bulwark height is less than 1 metre, the minimum bow height should be increased accordingly. N

$H_{fmin}$  may, in cases where a weathertight forecastle is fitted that extends at least 0.07LBP abaft the forward perpendicular, be measured to the top of the forecastle deck plating.

The minimum freeboard aft (measured at the after perpendicular) should not be less than:

$$H_{amin} = 0.24 + LBP/37.5 \quad \text{N}$$

( $H_{amin}$ ) may, where an aft poop of weathertight construction up to the next deck level (but not less than 1.8m in height), extending from the extreme stern to at least 0.07LBP forward of the AP, with weathertight doors and hatches, no permanent openings or freeing ports but with suitable drainage being provided, be measured to the top of the aft poop deck plating. N

Additionally for vessels with particular modes of operation, in which the application of the above minimum freeboard criteria are considered to be unrealistic, then the arrangements may be specially considered and accepted by the Certifying Authority provided that equivalent safety is maintained. N

In such circumstances the coaming heights of doors, hatches, ventilators and air pipes would need to be raised above the rule minimum by an amount equivalent to the freeboard deficiency. N

**The freeboards on existing vessels will continue to be accepted providing they are maintained in accordance with The Fishing Vessels (Safety Provisions) Rules 1975. E**

N – Denotes New vessels constructed on or after 23 November 2002.

E – Denotes vessels constructed before 23 November 2002.

## ONLY TO BE USED IN CONJUNCTION WITH MGN 281

### LOADING CONDITIONS, Stability Criteria, Freeboard, Flooding of Fish Holds, Particular Fishing Methods, Severe Wind and Rolling and Water on Deck - (new fishing vessels of Registered Length 24m and Above built after 1 January 1999). For the information of the Consultant only.

- (1) The number and type of operating conditions to be considered shall be to the satisfaction of the MCA and shall include the following, as appropriate:
  - (a) departure for the fishing grounds with full fuel, stores, ice, fishing gear, etc.;
  - (b) departure from the fishing grounds with full catch;
  - (c) arrival at home port with full catch and 10 per cent stores, fuel, etc.; and
  - (d) arrival at home port with 10 per cent stores, fuel, etc. and a minimum catch which shall normally be 20 per cent of full catch but may be up to 40 per cent provided the MCA is satisfied that operating patterns justify such a value.

In addition for vessels operating in the Northern Region, in the period 1 November to 30 April, the following operating conditions shall also be considered:

- (e) operating condition (b), (c) or (d), whichever produces the lowest values of the stability parameters contained in the stability criteria listed below, shall be calculated including allowances for ice accretion as outlined earlier in the book (within the working instructions).
  - (f) for purse seiners, depart from fishing grounds with the fishing gear, no catch and 30% stores, fuel, etc., including allowance for ice accretion as outlined earlier in the book (within the working instructions).
- (2) In addition to the specific operating conditions given in paragraph (1) the MCA shall also be satisfied that the minimum stability criteria given below are met under all other actual operating conditions including those which produce the lowest values of the stability parameters contained in these criteria. The MCA shall also be satisfied that those special conditions associated with a change in the vessel's mode or areas of operation which affect the stability considerations of this section are taken into account.
- (3) Concerning the conditions referred to in paragraph (1), the calculations shall include the following:
  - (a) allowance for the weight of the wet fishing nets and tackle, etc. on the deck;
  - (b) allowance for ice accretion, if anticipated;
  - (c) homogeneous distribution of the catch, unless this is inconsistent with practice;
  - (d) catch on deck, if anticipated, in operating conditions referred to in paragraph (1)(b) and (c) and paragraph (2);
  - (e) water ballast if carried either in tanks which are especially provided for this purpose or in other tanks also equipped for carrying water ballast; and
  - (f) allowance for the free surface effect of liquids and, if applicable, catch carried.

#### **Stability criteria**

- (1) The following minimum stability criteria shall be met unless the MCA is satisfied that operating experience justifies departures therefrom. Any departure from the required minimum criteria, shall be subject to the procedure of Article 4 of EU directive 2002/35/EC.
  - (a) the area under the righting lever curve (GZ curve) shall not be less than 0.055 metre-radians up to 30 degrees angle of heel and not less than 0.090 metre-radians up to 40 degrees or the angle of flooding  $F^\circ$  if this angle is less than 40 degrees. Additionally, the area under the righting lever curve (GZ curve) between the angles of heel of 30 degrees and 40 degrees or between 30 degrees and  $F^\circ$ , if this angle is less than 40 degrees shall not be less than 0.030 metre-radians.  $F^\circ$  is the angle of heel at which openings in the hull, superstructure or deckhouses which cannot rapidly be closed weathertight commence to immerse<sup>1</sup>. In applying this criterion, small openings through which progressive flooding cannot take place need not be considered as open;

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- (b) the righting level GZ shall be at least 200 millimetres at an angle of heel equal to or greater than 30 degrees,
  - (c) the maximum righting lever GZ max shall occur at an angle of heel preferably exceeding 30 degrees but not less than 25 degrees;
  - (d) the initial metacentric height GM shall not be less than 350 millimetres for single deck vessels. In vessels with complete superstructure the metacentric height may be reduced to the satisfaction of the MCA but in no case shall be less than 150 millimetres. Reduction in the metacentric height, if allowed by MCA, shall be subject to the procedure of Article 4 of EU directive 2002/35/EC.
- (2) Where arrangements other than bilge keels are provided to limit the angles of roll, the MCA shall be satisfied that the stability criteria given in paragraph (1) are maintained in all operating conditions.
- (3) Where ballast is provided to ensure compliance with paragraph (1), its nature and arrangement shall be to the satisfaction of the MCA. In vessels with a length of less than 45 m, such ballast shall be permanent. Where ballast is permanent, it shall be solid and fixed securely in the vessel. The MCA may accept liquid ballast (but not fuel oil), stored in completely filled tanks which are not connected to any pumping system of the vessel. If liquid ballast is used as permanent ballast to ensure compliance with paragraph (1), details shall be included in the Certificate of Compliance and in the stability booklet. Permanent ballast shall not be removed from the ship or relocated without the approval of the MCA.

### **Freeboard and minimum bow height**

#### **Bow height**

The bow height shall be sufficient, to prevent the excessive shipping of water. For vessels operating in restricted areas not more than 10 miles from the coast, the minimum bow height shall be to the satisfaction of the MCA and be determined taking into account the seasonal weather conditions, the sea states in which the vessel will operate, the type of the vessel and its mode of operation.

For vessels operating in all other areas:

1. where, during the fishing operations, the catch has to be stowed into the fish holds via hatchways, which are situated on an exposed working deck forward of the deckhouse or superstructure, the minimum bow height shall be calculated in accordance with the method of calculation, contained in recommendation 4 of attachment 3 to the Final Act of the Torremolinos conference; The significant wave height appropriate to the expected area of operation should be used in calculation and working instruction 3 worded accordingly.
2. where the catch has to be stowed into the fish holds via a hatchway, which is situated on an exposed working deck, protected by a deckhouse or superstructure, the minimum bow height shall be in accordance with regulation 39 of Annex I to the International Load Line Convention 1966, but shall not be less than 2 000 mm. In this respect the maximum permissible operating draught is to be regarded in place of the assigned summer freeboard.

#### **Bulwarks, rails and guards**

Efficient bulwarks or guardrails shall be fitted on all exposed parts of the working deck and on superstructure decks if they are working platforms. The height of bulwarks or guardrails above deck shall be at least 1 metre. Where this height would interfere with the normal operation of the vessel, a lesser height may be approved by the MCA.

The minimum vertical distance from the deepest operating waterline to the lowest point of the top of the bulwark, or to the edge of the working deck if guard rails are fitted shall ensure adequate protection of the

<sup>1</sup> An engine room vent will not be considered as closed weathertight.

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crew from water shipped on deck, taking into account the sea states and the weather conditions in which the vessel may operate, the areas of operation, type of vessel and its method of fishing.

The freeboard measured amid ships from the edge of the working deck from which fishing is undertaken, shall not be less than 300 mm or not less than the freeboard corresponding with the maximum permissible draught, whichever is the greater. For vessels with sheltered working decks, which are so arranged that water will not enter the sheltered working spaces no minimum freeboard other than the one corresponding with the maximum permissible draught is required.

### Maximum permissible operating draught

A maximum permissible operating draught shall be approved by the MCA and shall be such that, in the associated operating condition, the stability criteria, bow height and bulwarks rails and guards requirements are satisfied.

### Subdivision and damage stability

Vessels of 100 metres in length and over, where the total number of persons carried is 100 or more, shall be capable, of remaining afloat with positive stability, after the flooding of any one compartment assumed damaged, having regard to the type of vessel, the intended service and area of operation. Calculations are to be carried out in accordance with the guidance in recommendation 5 in attachment 3 to the Final Act of the Torremolinos conference;

### Recommendation 4 of attachment 3 to the Final Act of the Torremolinos conference - Guidance on a method of calculation of bow height

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

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

$$H_B = K_1 L (1 + L/K_2)$$

Where L is the length of the vessel in metres, and

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

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

Waves of above 8m significant height should be assumed. A reduced bow height may be considered by the MCA for vessels operating in restricted areas. Working instruction 3 should be amended to inform the skipper of any operating restrictions.

Where the bow height is obtained by sheer, this should extend from the stem for a length of at least 0.15L abaft of the forward perpendicular. Where it is obtained by fitting a forecastle, such forecastle should extend from the stem at least 0.07L abaft the forward perpendicular. However, where the length of the forecastle exceeds 0.15L due consideration should be given to the fitting of a bulkhead with adequate closing appliances. If no such bulkhead is fitted adequate arrangements should be provided for removing water from the open forecastle.

## ONLY TO BE USED IN CONJUNCTION WITH MGN 281

Where a bulwark is fitted this may be taken into account for a height of 1 metre provided that the bulwark extends from the stem to a point at least 0.15L abaft the forward perpendicular.

When a vessel is always trimmed by the stern in service conditions, the minimum trim may be allowed in the calculation of the bow height.

### **Flooding of fish-holds**

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 shall be at least 20 degrees unless the stability criteria detailed above can be satisfied with the respective fish-holds partially or completely flooded.

### **Particular fishing methods**

Vessels engaged in particular fishing methods where additional external forces are imposed on the vessel during fishing operations, shall meet the stability criteria detailed above increased, if necessary, to the satisfaction of the MCA.

Vessels engaged in beam trawling shall comply with the following increased stability criteria:

- (a) the criteria for areas under the righting lever curve and for the righting levers as given in (1)(a) and (b) above shall be increased by 20%;
- (b) the metacentric height shall not be less than 500mm
- (c) the criteria as given under (a) shall be applicable only to vessels with an installed propulsion power not exceeding in kilowatts as given in the following formulas:
  - $N = 0.6 Ls^2$  for vessels with a length of 35 m or less, and
  - $N = 0.7 Ls^2$  for vessels with a length of 37 m and over,
  - at intermediate length of the vessel the coefficient for  $Ls$  has to be obtained by interpolation in between 0.6 and 0.7,
  - $Ls$  is the overall length according to the tonnage certificate.

If the installed propulsion power exceeds the values for the standard propulsion power given in the above formulas the criteria as mentioned under (a) shall be increased directly proportional to the higher propulsion power.

The MCA shall be satisfied that the above increased stability criteria for beam trawlers are met in all of the operating conditions that have been detailed above.

For the calculation of the stability, the derrick booms shall be assumed to be hoisted up to an angle of 45 degrees with the horizontal.

### **Severe wind and rolling**

Vessels shall be able to withstand the effect of severe wind and rolling in associated sea conditions taking account of the seasonal weather conditions, the sea states in which the vessel will operate, the type of vessel and its mode of operation. The relevant calculations shall be carried out in accordance with the IMO Code on Intact Stability for all types of Ships, Severe Wind and rolling criterion (weather criterion) for fishing vessels.

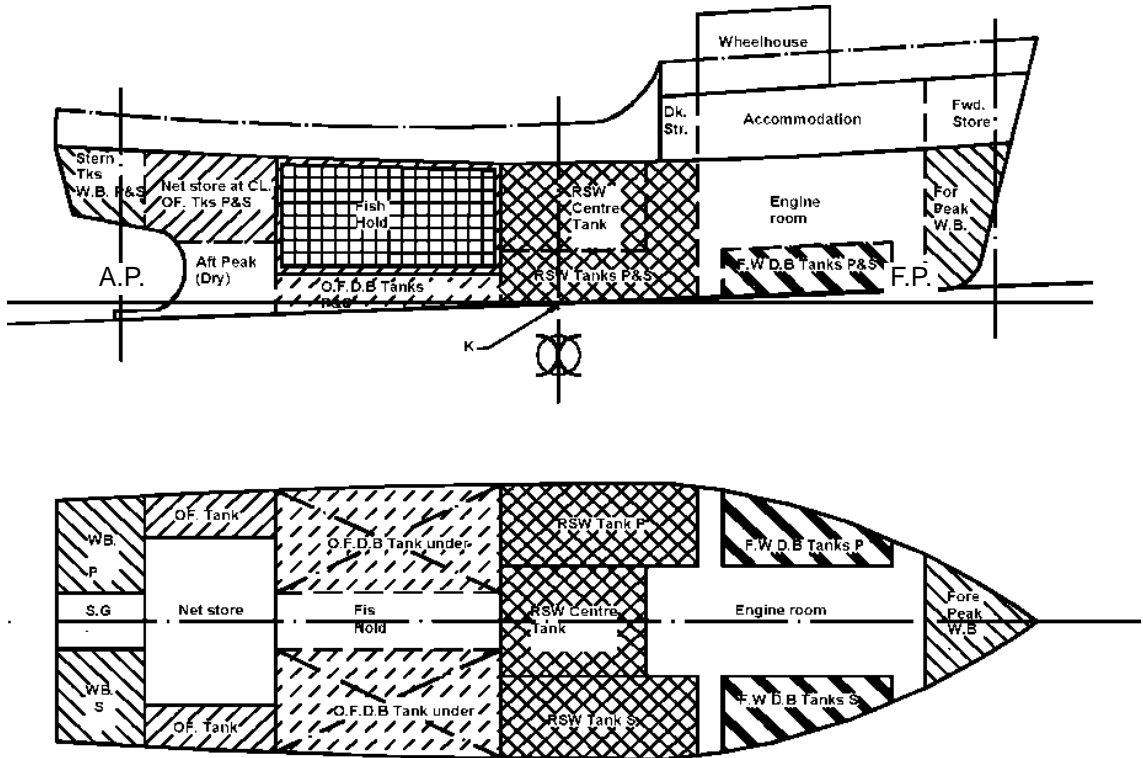
### **Water on deck**

Vessels shall be able to withstand the effect of water on deck, taking account of the seasonal weather conditions, the sea states in which the vessel will operate the type of vessel and its mode of operation. The relevant calculations shall be carried out in accordance with recommendation 1 of attachment 3 to the Final Act of the Torremolinos conference.

CONDITION No. \_\_\_\_\_

TITLE of CONDITION

Sketch of vessel showing where Deadweight items are located:



For condition table see overleaf

Notes for Sketch and condition table

\* It is recommended that an extreme aft position, such as the A.P be used as the longitudinal datum, thus permitting the use of a single moment column without the complication of summing positive and negative moments (apart perhaps from stern tanks). Where amidships is used as the datum, forward and aft should be deemed positive and negative respectively, and separate moment columns provided.

For tanks state the nature of the contents and any restricted or partial usage

If a colour code is adopted for indicating the contents of tanks etc., the following colours should be used, brown for fuel oil, blue for fresh water, green for sea water and R.S.W. and yellow for ice. The profile (and plan view if considered necessary) should be marked up in accordance with this colour code.

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**CONDITION TABLE**

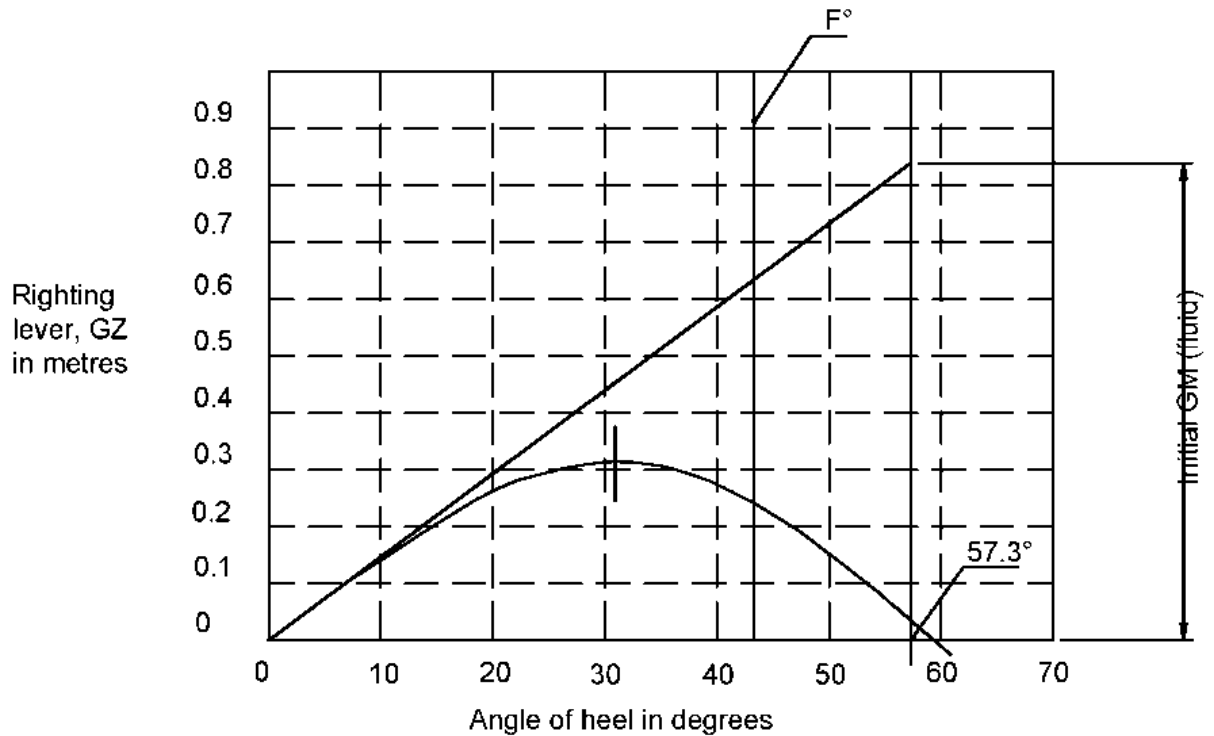
Item	Code	Weight (T)	V.C.G* Above K (m)	Vertical Moment (Tm)	Free Surface Moment (Tm)	L.C.G* From A.P. (m)	Longl. Moment (Tm)
Col 1	Col 2	Col 3	Col 4	Col 5 (C.3 x C.4)	Col 6	Col 7 (C.2 x C.6)	Col 8 (C.3 x C.7)
Oil Fuel - D.B. P & S - AFT P & S							
Fresh Water P & S							
Water Ballast - F.P. Stern P & S							
Minor Tanks							
Stores							
Crew and Effects							
R.S.W. - Centre							
RSW P&S							
Fishing gear, nets, beams, etc.							
Hold - fish							
Ice Locker							
Minor alterations to vessel							
Deadweight (total)							
Lightship							
Displacement (total)							
Free surface moment correction (FSM)	Total FSM (col 6) / Displacement (total)						
$KG_{SOLID} = VCG \text{ of Displacement (total)}$							
$KG_{FLUID} = KG_{SOLID} + \text{FSM correction}$							

<sup>1</sup> An engine room vent will not be considered as closed weathertight.

CONDITION No. \_\_\_\_\_

SAILING STATE

- \*Draught aft (to the underside of keel at the aft draught marks) =
- \*Draught forward (to the underside of keel at the forward draught marks) =
- \*Mean draught (to the underside of keel amidships L.B.P.) =
- \*Indicated trim (= draught aft - draught forward) =
- \*Actual trim (= indicated trim - rake of keel) =
- Transverse metacentric height corrected for free surface, GM (Fluid) =
- F° the angle at which the lower edge of any down flooding opening becomes immersed =



\* The datums from which trim and draught are measured should be clearly stated. The relationship between the datum for draught marks and the datum for hydrostatic data, the draught mark positions, F.P., A.P., Amidships and K should be explained in Part IV by means of a sketch (see diagram on page 43)

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<b><u>SUMMARY OF STABILITY</u></b>	<b>Minimum Required*</b>	<b>Actual value</b>
Area under righting lever (GZ) curve up to 30°	0.055m.R.	
Area under righting lever (GZ) curve up to the lesser of 40° and F°**	0.090m.R.	
Area under righting lever (GZ) curve from 30° to the lesser of 40° and F°**	0.030m.R.	
Maximum righting lever (GZ) between 30° and 90°	0.20m	
Angle of heel at which maximum righting lever (GZ) occurs	25°	
Transverse metacentric height [GM (Fluid)]	0.35m	

<b><u>SUMMARY OF FREEBOARD</u></b>	<b>Minimum Required</b>	<b>Actual Value</b>
Bow height, from top of freeboard/forecastle deck to waterline at the F.P.		
Minimum Freeboard from top of the freeboard deck at side to the waterline at .....		
Freeboard aft from top of the .....deck at side to the waterline at the A.P.		

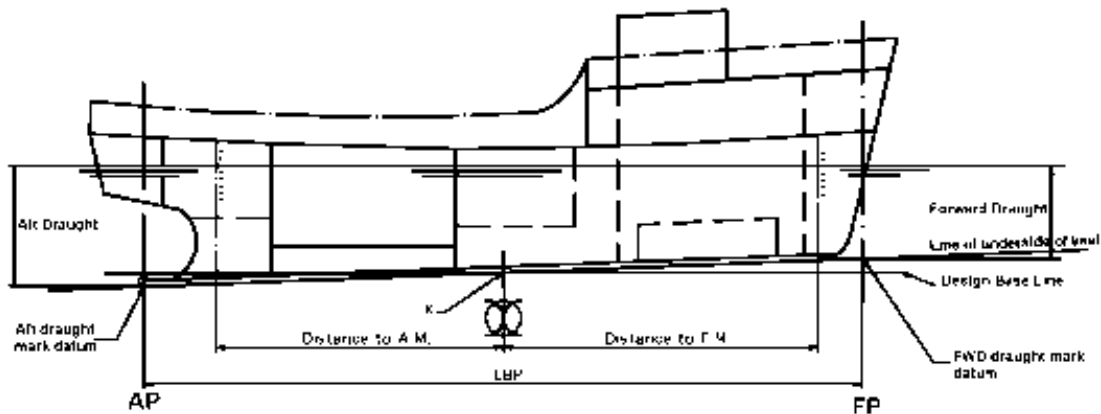
\* For vessels engaged in single or twin boom fishing, all criteria except the angle of heel at which maximum GZ occurs, are to be increased. See stability criteria pages 28 and 30. An increase in criteria appropriate to the size and age of the vessel should be utilised

\*\* Reference to F° can be omitted when downflooding does not occur at a heel angle of less than 40°

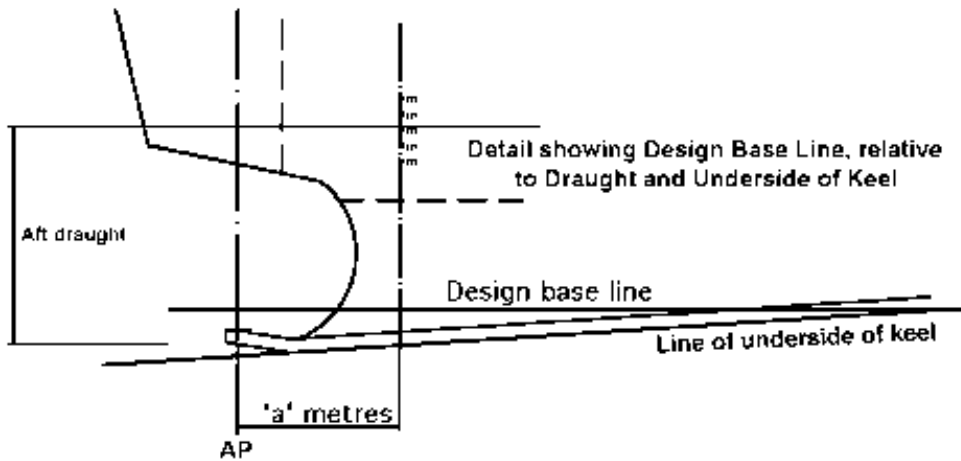
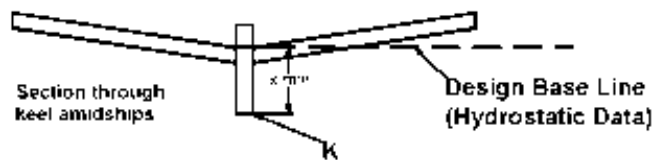
**PART IV**

**REFERENCE INFORMATION**

**Example Showing Relationship Between Draught Mark datums and Datum for Hydrostatic information.**



**Hydrostatic Data should be related to the Draught Mark readings, underside of keel amidships and design base line amidships.**



*Notes*

- 1 Rake of keel = .....m over L.B.P.
- 2 "K" is at the bottom of the keel on the centreline at amidships (the mid point of L.B.P)
- 3 Amidships is ..... mm. forward of frame .....
- 4 The datum for longitudinal measurement is the A.P.
- 5 The datum for vertical measurement is the design base line (hull moulded line amidships)

# ONLY TO BE USED IN CONJUNCTION WITH MGN 281

## DEFINITION & SUMMARY OF FISHING GEAR

**Definition of Fishing Gear:** for the purposes of the Stability Information Booklet and stability calculations, Fishing Gear is that equipment necessary for fishing which is NOT permanently fitted to the vessel and which is capable of being "changed-out" when the fishing method is varied. Permanent gear (winches, derricks etc) are part of the vessel lightship, whereas fishing gear (nets, beams etc) form part of the vessel deadweight.

Details of Towing Derricks for Beam Trawlers and Scallop Dredgers are recorded in Table 1; all other Fishing Gear is recorded in Table 2.

**Table 1 – Details of Towing Derricks for Beam Trawlers and Scallop Dredgers**

Item	Weight (tonnes)	Vertical Position (at Swivel)	Transverse Position (at Swivel)	Longitudinal Position (at Swivel)	Length of Derrick
Port Derrick	1.2	1.4m above main deck	2.0m off centre line	Frame 27	6.0m

**Table 2 - Summary of Fishing Gear:**

Item	Weight tonnes	Vertical Position of gear (centre)	Longitudinal Position of gear (centre)
<b>MAIN FISHING GEAR:</b>			
<b>Nets:</b>			
Main Net 1 ) ready			
Main Net 2 ) to			
Main Net 3 ) fish			
<b>Warps:</b>			
- __ M/fms __ circumference			
Trawling Boards/doors			
Chain mats			
<b>BEAMS</b>			
(For Beam Trawls & Scallop Dredges record weight and length)			
<b>Other:</b>			
<b>Sub-Total of Main Fishing Gear</b>			
<b>SPARE FISHING GEAR:</b>			
Spare Nets 1			
Dredges			
Warps			
Chains/Swivels/Shackles			
Other Wire			
Floats			
Bobbins			
<b>Other:</b>			
<b>Sub-Total of SPARE FISHING GEAR</b>			
<b>Total of all Fishing Gear</b>			

**ONLY TO BE USED IN CONJUNCTION WITH MGN 281**

**RECORD OF MINOR ALTERATIONS TO THE VESSEL**

All minor alterations to the vessel including alterations to permanent ballast or fishing gear, should be entered here, minor being interpreted as causing a loss in stability which is small in relation to the margin over the legal minimum, or which increases stability. Major alterations will require comprehensive revision of the book. The Maritime and Coastguard Agency should be notified of all entries made.

Alteration	Weight (tonnes)	L.C.G. From A.P. (m)	Longl. Moment (tonne metres)	V.C.G. Above K (m)	Vertical Moment (tonne metres)
On 2 February 2001, at Repairers Limited, a section of bulwark on the after deck was reduced in height.	- 0.4	8.37	- 3.35	5.43	- 2.17
On 3 May 2001, at Repairers Limited, the winch was replaced with a heavier model having the same VCG and LCG.	+ 0.5	13.00	+ 6.50	4.30	+ 2.15
Total of the above alterations for insertion in Condition tables	+ 0.1		+ 3.15		-0.02

**PART V**

**BACKGROUND INFORMATION**

**ONLY TO BE USED IN CONJUNCTION WITH MGN 281**

**HYDROSTATIC TABLES**

*Note 1*

Actual Trim = (draught at AP - draught at FP) – Rake of Keel over the L.B.P.,  
 where the draughts are measured to the underside of keel at the F.P. and A.P.  
 respectively. See also sketch on page 40

*Note 2*

Draught in the following tables is to the moulded hull line/underside of keel\* at amidships

**TABLE: TRIM = .....**

Draught* Moulded/ BOK (metres)	Extreme Displacement (tonnes)	MCT1cm (tonne metres)	L.C.B. forward of A.P. (m)	LCF forward of A.P. (m)	KMT (m)	KB (m)	T.P.C. (tonnes/cm)

\* The appropriate datum for draughts should be detailed

Notes

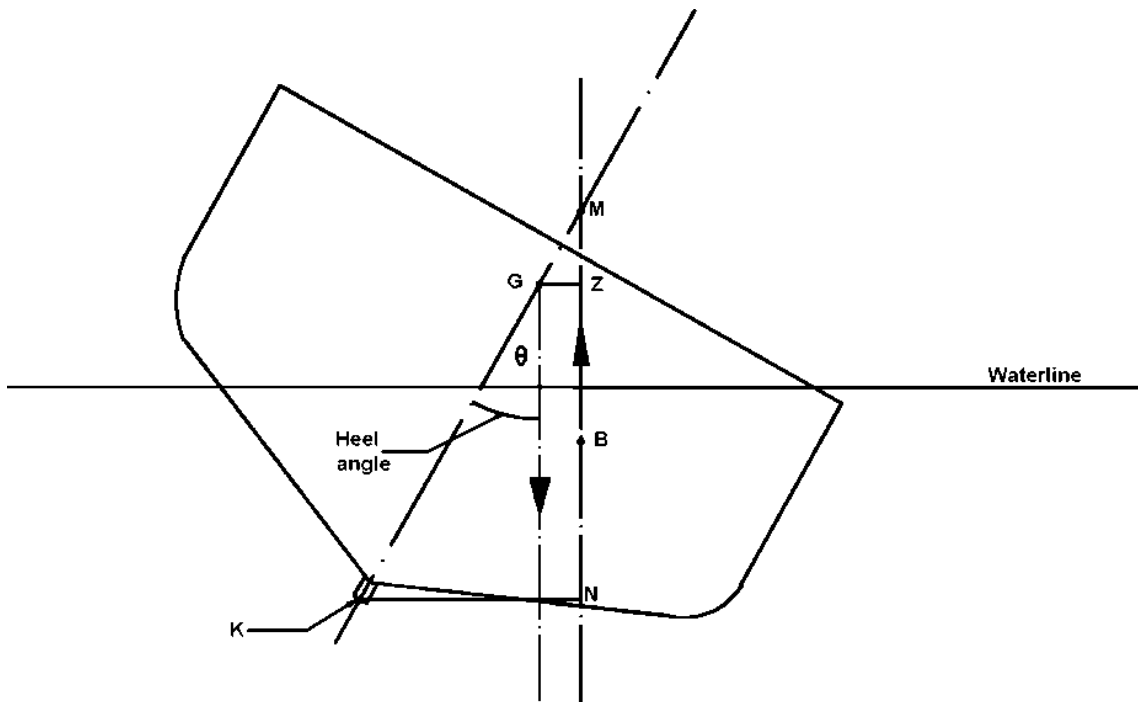
Hydrostatic Curves may be used instead of tables

Tables or curves should be provided for zero actual trim and other trims sufficient to cover the operating range at increments that are convenient for interpolation. As in the case of the maximum permissible KG curves, L.C.G. may be used instead of trim.

# ONLY TO BE USED IN CONJUNCTION WITH MGN 281

## KN TABLES\*

- Note 1* Actual Trim = (draught aft - draught forward) – (R.O.K. over the L.B.P.) where the draughts are measured to the underside of keel at the F.P. and A.P.
- Note 2* The KN values tabulated assume that sea water does not enter the hull below the Main Deck and the Forecastle (the intact spaces\*\*), when the vessel heels to the given angle. The closing appliances to these intact spaces must be kept in an efficient condition for closing in appropriate weather conditions so as to maintain the watertight integrity of the hull and forecastle.
- Note 3* KN values are determined assuming that the L.C.B.\*\*\* (or trim) does not remain constant as the vessel heels (i.e. free trim).
- Note 4* The following diagram illustrates the relationship between KN and the righting lever GZ.



$$GZ_{\theta} = KN_{\theta} - KG \cdot \sin \theta$$

Where:  $GZ_{\theta}$  = Righting Lever at  $\theta$  of Heel  
 $KN_{\theta}$  = KN at  $\theta$  of Heel  
KG = Condition KG fluid  
 $\theta$  = angle of Heel

\* KN curves may be used as an alternative to tables

\*\* Amend as necessary, depending upon the spaces assumed intact in deriving the KN values

\*\*\* Delete as appropriate Constant L.C.B. should be considered the normal method of derivation

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**KN VALUES FOR AN INITIAL TRIM = ... ..m.**

Displacement (tonnes)	Angle of Heel, °					
	5°	10°	20°	30°	40°	50°

Notes

Each table (or set of curves) may be for constant L.C.G. or initial trim (ie. Free to trim). Sufficient tables (or sets of curves) to cover the operating range should be provided at increments convenient for interpolation.

It is recommended that KN values be provided at 5° heel and at 10° increments of heel up to 40° to facilitate the computation of areas below the GZ curve. Above 40° the increments should be sufficient to define the curve of positive GZ values.

**INCLINING TEST AND LIGHTSHIP DERIVATION**

The inclining test report should include the following

- 1 A complete record of all test information, including all readings taken during the test.
- 2 A statement providing a clear account of the condition of the vessel as inclined. This should include soundings of all tanks and spaces, all weights (including fishing gear) that are onboard and all weights that are missing or need to be relocated together with the position of their centres of gravity. Derricks should be upright, or account taken in lightship calculations. All items that need to be added, deducted or relocated for derivation of the lightship condition should be included.
- 3 Calculations using the information obtained from the inclining experiment to determine the characteristics of the vessel in the inclined and lightship condition.

Notes

The vessel draughts should be obtained, and at least 3 (ideally 5) freeboard readings taken to confirm the draughts P&S

Every Inclining Test should be witnessed by an MCA Surveyor. The inclining test report should be produced to the satisfaction of the Maritime & Coastguard Agency

If the report is found to be unsatisfactory or incomplete at the time of stability review, it may be necessary to repeat the inclining experiment.

# ONLY TO BE USED IN CONJUNCTION WITH MGN 281

## METRIC TO IMPERIAL CONVERSION FACTORS

### Length

1 millimetre	=	0.03937 inch
1 centimetre	=	0.3937 inch (=0.0328 foot)
1 metre	=	39.37 inches (=3.281 feet)

### Volume

1 cubic centimetre	=	0.06102 cubic inch
1 litre (= 1000 cubic centimetres)	=	0.2200 gallon (=61.02 cubic inches)
1 cubic metre 1000 litres)	=	35.31 cubic feet (= 220 gallons)

### Weight

1 kilogramme	=	2.205 pounds
1 tonne (= 1 metric ton = 1000 kg)	=	2205 pounds (= 0.9842 ton)

### Stowage Rate (or Specific Volume)

1 litre per kilogramme	=	0.09978 gallon per pound
1 cubic metre per tonne	=	35.88 cubic feet per ton

### Miscellaneous

1 tonne metre per centimetre	=	8.202 tons feet per inch
1 tonne per centimetre	=	2.500 tons per inch
1 radian	=	57.30 degrees of arc

## IMPERIAL TO METRIC CONVERSION FACTORS

### Length

1 inch	=	25.4 millimetres (=2.54 centimetres 0.0254 metre)
1 foot	=	304.8 millimetres (=30.48 centimetres 0.3048 metre)

### Volume

1 cubic inch	=	16.39 cubic centimetres
1 gallon (= 277.4 cubic inches)	=	4.546 litres (= 4546 cubic centimetres)
1 cubic foot 6.229 gallons)	=	0.02832 cubic metre (= 28.32litres)

### Weight

1 pound	=	0.4536 kilogramme
1 ton	=	1.016 tonnes (= 1016 kilogrammes)

### Stowage Rate (or Specific Volume)

1 gallon per pound	=	10.02 litres per kilogramme
1 cubic foot per ton	=	0.02787 cubic metres per tonne

### Miscellaneous

1 ton foot per inch	=	0.1219 tonne metre per centimetre
1 ton per inch	=	0.4000 tonne per centimetre
1 degree of arc	=	0.01745 radian

**ONLY TO BE USED IN CONJUNCTION WITH MGN 281**

**TYPICAL STOWAGE RATES\*\***

	m <sup>3</sup> /Tonne	ft <sup>3</sup> /tonne
Fish in R.S.W. or C.S.W.	0.976	35
Whole fresh herring in bulk	1.07	38.5
Whole fresh sprats in bulk	1.17	42
Whole fresh mackerel in bulk	1.25	45
Whole gutted fresh cod in bulk with ice (2/3 fish to 1/3 ice by weight)	1.25 (mixture) 1.90 (fish) ‡	45 (mixture) 68 (fish) ‡
Whole gutted fresh cod stowed in single layers on ice on shelves 230mm (9") apart (including an allowance for structure)	4.46 (fish) ‡	160 (fish) ‡
Whole gutted fresh cod boxed in ice (2/3 fish to 1/3 ice by weight, and including allowance for space occupied by boxes in block stowage)	2.68*(fish) ‡	96*(fish) ‡ +
Prawns, Box 31"x8"x21" (20Kg prawns and 5 Kg Box)	3.41	-
Crushed block ice	1.56	56
Tube ice	1.84	66
Flake ice	2.09	75

\* Depending upon the ratio of effective to external volume of box, these figures may vary thus:  
2.37 - 2.86 cubic metres per tonne  
85 - 102 cubic feet per ton

‡ This figure represents the volume in cubic metres (or cubic feet) required to contain 1 tonne (or 1 ton) of fish together with 0.5 tonne (or 0.5 ton) of ice.

\*\* These rates are published by permission of the Torry Research Station, 135 Abbey Road, Aberdeen. Other rates may be added as appropriate to the vessel's catch and mode of fishing