

RESOLUTION A.267(VIII)

*Adopted on 20 November 1973
Agenda item 10*

**CODE OF PRACTICE CONCERNING THE ACCURACY OF
STABILITY INFORMATION FOR FISHING VESSELS**

THE ASSEMBLY,

NOTING Article 16(i) of the Convention on the Inter-Governmental Maritime Consultative Organization concerning the functions of the Assembly,

NOTING ALSO Recommendation 7 of the International Conference on Safety of Life at Sea, 1960, concerning intact stability of passenger ships, cargo ships and fishing vessels,

RECALLING that by Resolution A.168(ES.IV) it adopted the Recommendation on Intact Stability of Fishing Vessels, and further that Appendix I thereof contains detailed provisions for calculation of stability curves,

RECOGNIZING the importance of the accuracy of stability information in applying stability criteria to fishing vessels,

DESIRING to establish international guidance for the accuracy of stability information for fishing vessels,

HAVING CONSIDERED the Recommendation by the Maritime Safety Committee at its twenty-fifth session,

ADOPTS the Code of Practice concerning the Accuracy of Stability Information for Fishing Vessels, the text of which is set out in the Annex to this Resolution,

INVITES all governments concerned to take steps to give effect to the Code as soon as possible, unless they are fully satisfied with existing national rules and regulations.

ANNEX

**CODE OF PRACTICE CONCERNING THE ACCURACY OF
STABILITY INFORMATION FOR FISHING VESSELS**

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**CODE OF PRACTICE CONCERNING THE ACCURACY OF
STABILITY INFORMATION FOR FISHING VESSELS**

1. CALCULATION OF HYDROSTATIC DATA AND STABILITY LEVERS

1.1 General

1.1.1 This Code of practice is intended as a guidance for Administrations but not as a substitution for existing national rules and regulations.

1.1.2 The method of calculation used to produce both hydrostatic data and stability levers (cross curves) should be checked by the Administration. It is recommended that the check of computer and integrator calculations be carried out as follows:

(a) *Calculations by electronic computer programmes*

Electronic computer programmes should be approved by the Administration. Generally an extensive description of the computer programme as well as a complete listing should be submitted to the Administration together with the results of the calculation for a "Standard Vessel".

If the programme and the results are accepted by the Administration, the computer programme can be employed for subsequent calculations. Subsequent changes in the programme or in the procedure should be reported to, and approved by the Administration.

(b) *Integrator calculations*

The general procedure of the integrator method employed should be submitted together with the results of a calculation of a "Standard Vessel".

If the procedure and the results are accepted by the Administration, the procedure can be employed for subsequent calculations.

1.1.3 The following should always be submitted to the Administration:

- A declaration from the person responsible stating that the calculations have been carried out under his supervision and that data are properly checked.
- The lines plan or list of offsets used for the calculation or for lifting data.
- General arrangement drawing showing positions of openings and details of their closing appliances.

1.2 Hydrostatic data

The following hydrostatic data calculated for the designed trim should always be submitted:

- (a) Displacement (∇, Δ)
- (b) Vertical centre of buoyancy (KB)
- (c) Transverse metacentric radius (BM_T).

The following should also be submitted if especially requested by the Administration:

- (d) Longitudinal centre of buoyancy (LCB)
- (e) Longitudinal metacentric radius (BM_L)
- (f) KB for various trim conditions
- (g) BM_T for various trim conditions
- (h) Coefficients (C_b, C_w, C_p, C_m).

The coefficients should be determined in accordance with the Unified Definitions of Main Particulars and other Properties of Fishing Vessels, otherwise they must be clearly defined.

These values should be calculated for a number of draughts covering the full range of operating displacements. They should be presented as curves or tables.

1.3 Stability levers (cross curves)

The following should always be submitted to the Administration:

Calculation of stability levers for displacements including the light and maximum load conditions and at least two intermediate displacements with possible superstructures, deckhouses, etc. which may be taken into account according to Resolution A.168(ES.IV), Appendix I.

In order to assess whether the vessel complies with the Recommendation on Intact Stability of Fishing Vessels (Resolution A.168(ES.IV)), the calculations need not take account of the change of trim when heeled. However, the Administration may require the calculation of the influence of trim when heeled if there are to be expected considerable deviations from the calculations with constant trim due to the arrangement of superstructures.

If required by the Administration, stability levers for initial trims covering the full range of operational trims should also be submitted.

Heeling angles should be taken at intervals of not more than 5 degrees in the range 0 – 10 degrees, and not more than 10 degrees in the range 10 – 60 degrees. However, if the calculations are performed with the aid of an electronic computer, it is advisable also to include calculations at approximately 2 degrees in order to compare the results of the programmes for stability levers and for hydrostatic data.

The results of the calculations should be presented as curves or tables.

1.4 Hull form definition

- 1.4.1 At least 6 waterline half breadths at a minimum of 11 stations should be used for the hull definitions.
- 1.4.2 The intersection point between the base line and the keel line is denoted "K" and serves as a base for the calculations.
The angle between the base line and the keel line, which defines the designed trim condition should be marked.
- 1.4.3 For vessels with a metal shell, the constant used to include appendages and shell plating, the volume displacement, from the moulded displacement should be stated.

2. INCLINING EXPERIMENT

2.1 Preparation and execution of the inclining experiment

- 2.1.1 The Administration should be given due notice of the intention to carry out the experiment.
A representative of the shipyard or shipowner should be nominated as responsible for execution of the experiment.
- 2.1.2 Jigs or locating devices should be fitted to the deck to ensure that the location of the inclining weights does not vary. The moment arm of the inclining weights could be marked on the deck prior to the test. The accuracy of the moment arm should be within 0.5%.

- 2.1.3 The readings of the draughts should be taken before the experiment at the bow and stern together with the freeboard measurements at bow, stern and amidships (port and starboard). Additional intermediate freeboard measurements may be required by the Administration. The measurements taken should be plotted on a lines profile of the vessel and additional measurements taken if significant discrepancies are present. For each vessel, a diagram should be submitted showing how the draught marks at each end of the vessel have been applied, see Figure 1, Annex I of this Code. Further, a drawing of the midship section as shown in Figures 2 or 3, Annex I of this Code, should be submitted. Draughts and freeboards should be read to an accuracy of 10 mm.

Final draught readings should always refer to the point K on Figure 2 or Figure 3, Annex I of this Code.

A tubular device with glass against a measuring scale at its upper end should be used to measure draughts to minimize the inaccuracies caused by surface waves. The specific gravity of the water should be measured.

- 2.1.4 The maximum angle of deflection at each side of the initial condition at the inclining experiment should be 4 degrees and the minimum angle 2 degrees.

A pendulum, or other instrument approved by the Administration, should be used for evaluating the angle of deflection.

The length of the pendulum (ℓ) should be not less than 2 metres.

If the rolling period of the vessel ($T\varphi$) at the condition of the inclining experiment is known, the following pendulum length intervals should be avoided in order to ensure that there is no troublesome synchronism between the oscillations of the pendulum and the vessel.

$$(i) \quad \frac{1}{16} T\varphi^2 - 0.5 \text{ m} > \ell > \frac{1}{16} T\varphi^2 + 0.5 \text{ m}$$

$$(ii) \quad \frac{1}{4} T\varphi^2 - 0.5 \text{ m} > \ell > \frac{1}{4} T\varphi^2 + 0.5 \text{ m}$$

$$(iii) \quad T\varphi^2 - 0.5 \text{ m} > \ell > T\varphi^2 + 0.5 \text{ m}.$$

The range (ii) is the most important.

The accuracy of pendulum length measurement should be within ± 1 cm.

The pendulum readings should be plotted against heeling moment on a diagram as shown in Figure 5, Annex I of this Code. If one or more of the readings do not plot on a straight line through origin with accuracy within 4% the reason should be found and the experiment should be repeated until a minimum of 8 satisfactory readings are obtained.

A practical arrangement of the pendulum at the inclining experiment is indicated on Figure 1 below.

The pendulum should preferably be placed in a protected position.

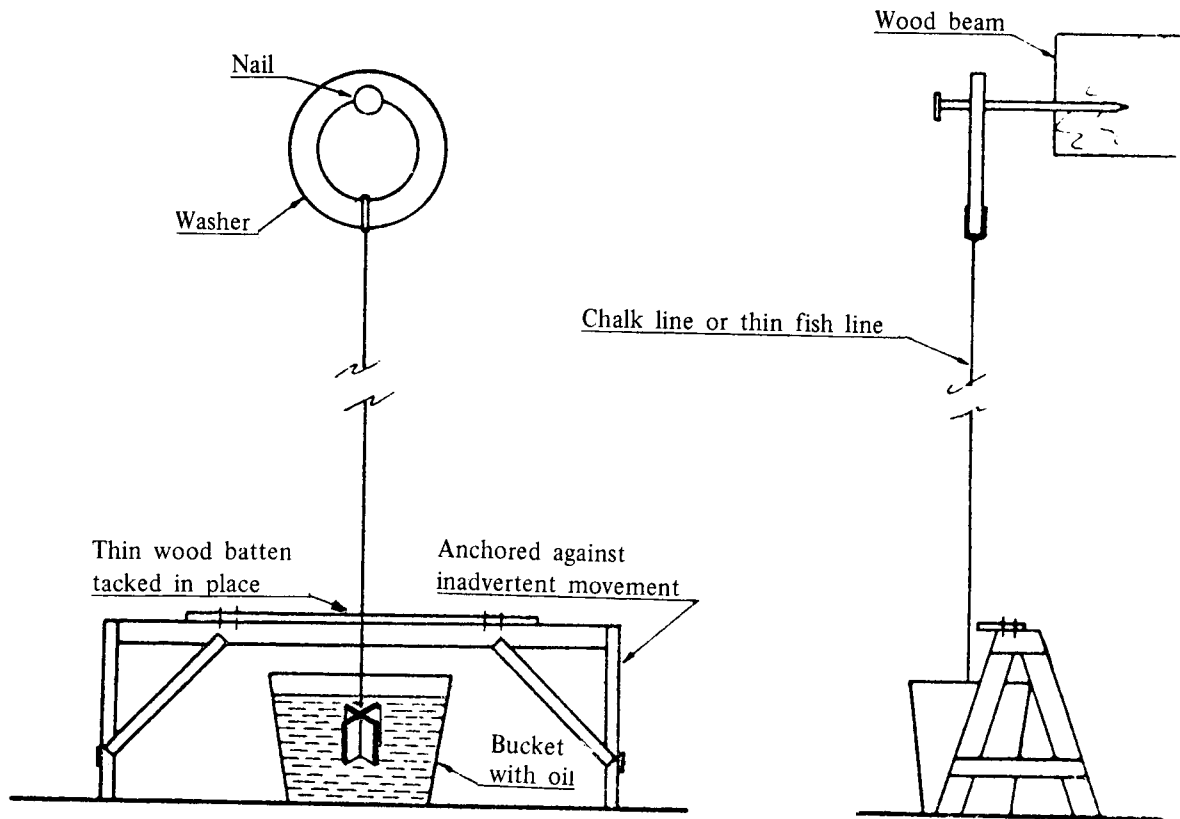


Figure 1

- 2.1.5 The vessel should be in as complete a state as practicable, with shipyard gear and equipment, etc. reduced to a minimum. Acceptance by the Administration of the vessel's condition will depend on the accuracy with which such weights and their centres can be determined and with the proviso that the inaccuracy of the lightweight of the vessel and the height above keel of the centre of gravity (KG) will not thereby exceed 0.5%. This may be obtained by ensuring 10% accuracy in determination of the weights of the surplus and missing loads, provided the absolute total weight of these loads does not exceed 4% of the lightweight of the vessel. Further, the surplus and missing loads should not cause a total shift of the position of the centre of gravity exceeding 4% of KG. The accuracy of the centre of gravity of these loads should be within 7.5%.

All movable weights should be secured in place. A minimum number of men should be on board during the experiment. At each pendulum reading, they should be situated at a predetermined position.

- 2.1.6 Tanks should in general be dry. Dry tanks are to be opened, and examined throughout for trapped liquids. Should it be necessary to fill tanks to ensure positive stability or to give satisfactory trim during the experiment, these should be pressed full and arrangements made to ensure that no air is trapped. Slack tanks may have to be accepted but the number must be severely limited. In general, not more than 2 tanks or 1 full breadth tank for each type of liquid should be allowed. When the liquid in any tank is slack, it should have a well defined free surface that will not change appreciably during the experiment; deep tanks should be between 20% and 80% full and bottom tanks between 40% and 60% full. Small quantities of unpumpable liquid that would not shift appreciably for an inclination of 45 degrees and are likely to be present in the vessel when in service, may be ignored. Accurate information on the effect of all free surfaces allowed during the experiment must be made available. All tanks are to be sounded before the experiment. It should be confirmed that sounding pipes and striker plates are fitted in accordance with the assumptions made on the calibration scales. Care should be taken to correct soundings as necessary for the effect of trim.

Densities of liquids in tanks should be noted to enable the calculation of free surface effects. It must be ascertained that bunker oils are brought to the viscosity that produces the free surface effects experienced in service.

- 2.1.7 The mooring arrangement is important. During reading of the pendulum, it should be checked that mooring arrangement does not affect the vessel. Power and communication lines of the vessel should be reduced to the minimum and remain slack during the experiment. Gangways are to be lifted clear of the vessel. Accommodation ladders should be in their "at sea" stowed position.
- 2.1.8 The inclining test should be carried out in calm weather and smooth water without substantial current.
- 2.1.9 It is recommended that the inclining experiment be performed with an estimated positive metacentric height not less than 0.20 metre.

Confirmation that the metacentric height is positive should be obtained as the experiment proceeds by plotting pendulum swings or angles of inclination against inclining moments to confirm a linear relationship. (See Figure 5, Annex I of this Code).

- 2.1.10 Before performing the inclining experiment the vessel should have no list. However, if this is unavoidable, the list should not exceed 1 degree. If the absolute value of the trim (T), i.e. total trim minus designed trim, exceeds $L_G/100$, the Administration may require calculations to be made for the "as inclined" condition. (See Part 1.2 of this Code).

2.2 Data to be submitted

- 2.2.1 Data from the inclining experiment and calculation of KG of the light vessel should be submitted to the Administration for approval by filling out a form as shown at Annex I of this Code.
- 2.2.2 If any information requested is not available, an explanation should be submitted.

3. CALCULATION OF GZ-CURVES FOR VARIOUS LOADING CONDITIONS

- 3.1 The calculation is based on the data as requested in Part 1 and Part 2.2 of this Code.
- 3.2 The most unfavourable effect of free surfaces should be used in the calculation. Otherwise the tabulated values from Resolution A.168(ES.IV) Appendix I should be used.
- 3.3 Volume and centre of gravity of cargo holds and tanks for various loading, including the volume of hatchways in fully loaded condition should be calculated.

The results of the calculations should be presented as curves or tables.

- 3.4 GZ-curves for the vessel for the various loading conditions as stated in Resolution A.168(ES.IV), Appendix II should be submitted to the Administration on a form as shown at Annex II of this Code.
- 3.5 GZ-curves and additional stability information in accordance with item 7 of Resolution A.168(ES.IV) should be supplied.

3.6 Provided the random errors of inclining weights, moment arms, pendulum readings, pendulum length and draught readings are all equal to or less than stated in this Code, the random error of the righting lever (GZ) and GM originating from the inclining experiment will not exceed $0.02 GM \sin\varphi$ and $0.02 GM$ respectively.

ANNEX I

REPORT-FORM ON INCLINING EXPERIMENT AND
CALCULATION OF LIGHTWEIGHT OF VESSEL

(Note: All data and calculations distinguished in square boxes to be filled in only when the absolute value of the trim (T), (see Part 2(c) of this Annex) exceeds $L_S/100$.)

1. GENERAL INFORMATION

(a) Shipyard:

Yard No. and/or vessel's name:

Signal letters:

(b) Date and place of experiment:

Time commenced:

Time completed:

Berth and mooring:

Weather:

Sea:

Wind:

Specific gravity of water:

(c) Person in charge:

(d) Attending surveyor:

2. PRINCIPAL DIMENSIONS

(a) Overall length L_{Oa} : _____ m

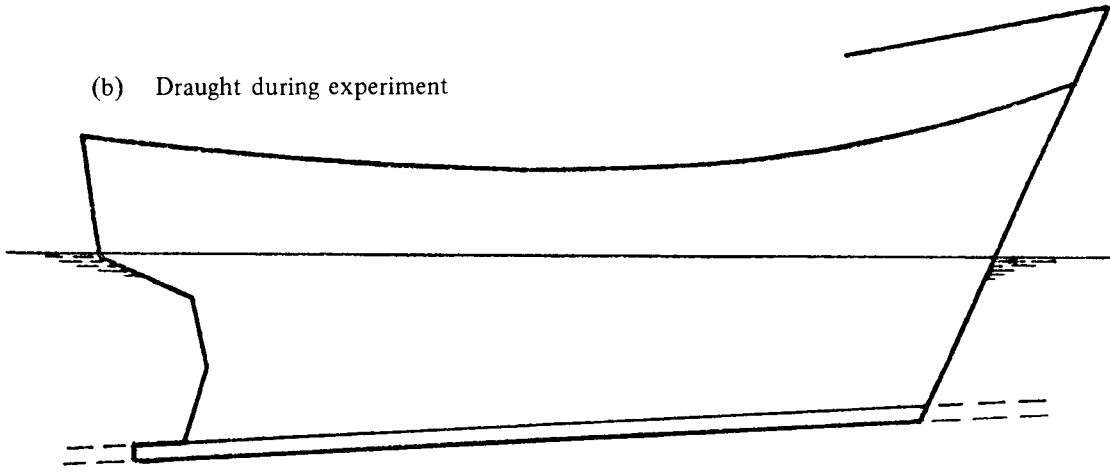
Standard waterline length L_S : _____ m

Amidship breadth B_m : _____ m

Amidship depth D_m : _____ m

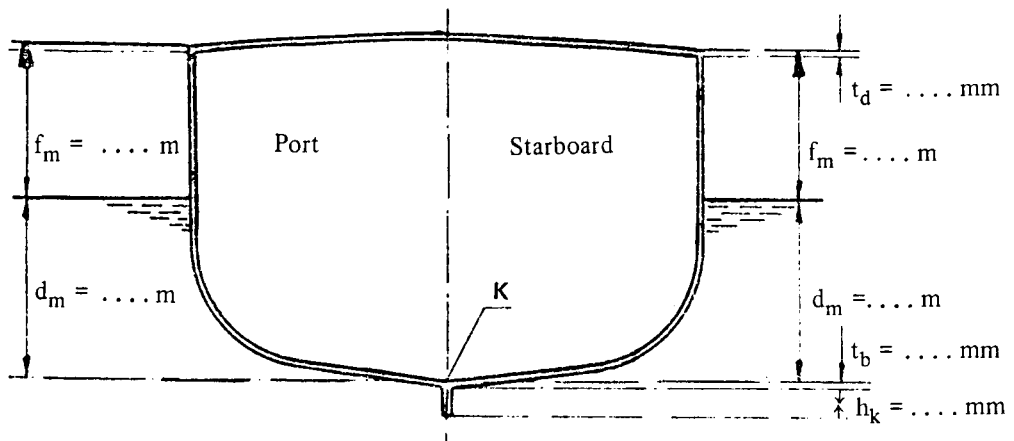
Designed trim on L_S : _____ m

(b) Draught during experiment



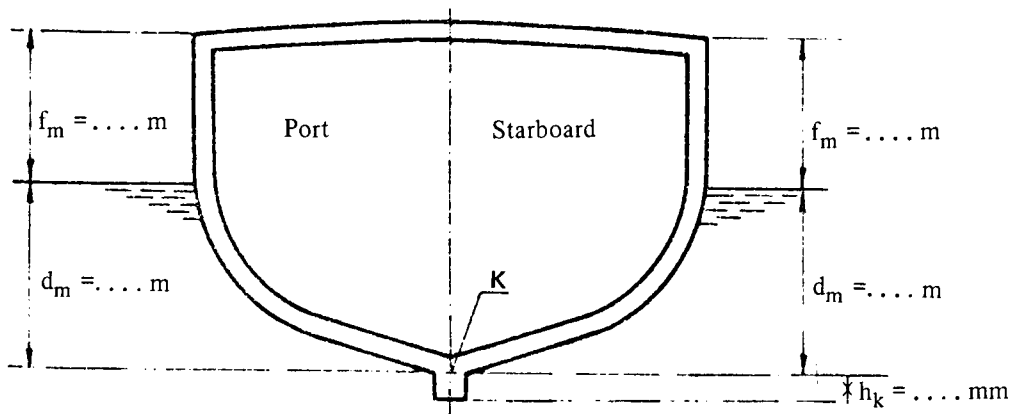
How are draught marks applied fore and aft?

Figure 1



Vessels with a metal shell

Figure 2



Vessels with non-metal shell

Figure 3

(c) Trim (T) = $(d_a - d_f) -$ designed trim on L_S : _____ m

(d) Total displacement in metric tons on even keel from displacement curve Δ : _____ t

Corrected for specific gravity of water : _____ t

Corrected for trim (T) : _____ t

(e) Permanent ballast : _____ t

3. EXECUTION OF THE INCLINING EXPERIMENT AND CALCULATIONS

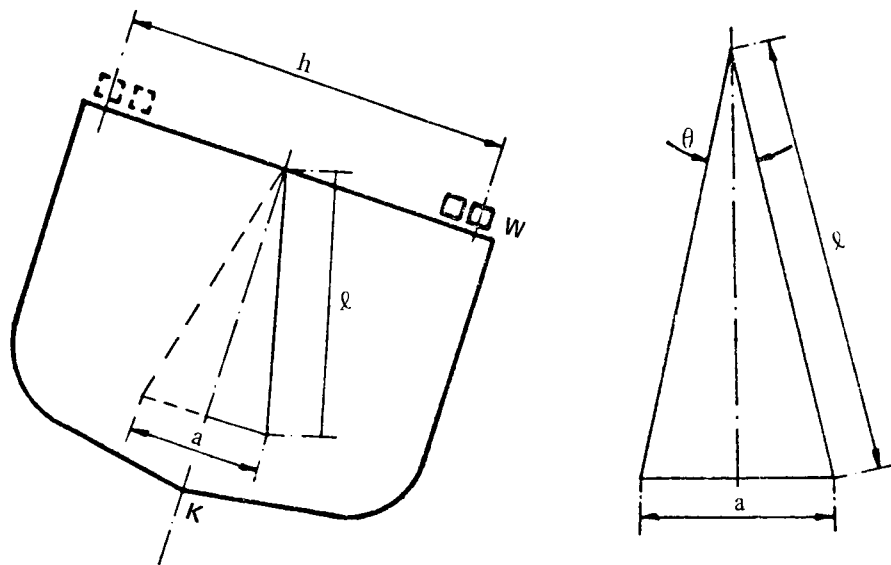


Figure 4

Shifting weights consist of:

Length of pendulum(s)(l) :

Position of " " :

_____ m

Pendulum swings (a) plotted against shifting moments ($W \cdot h$)

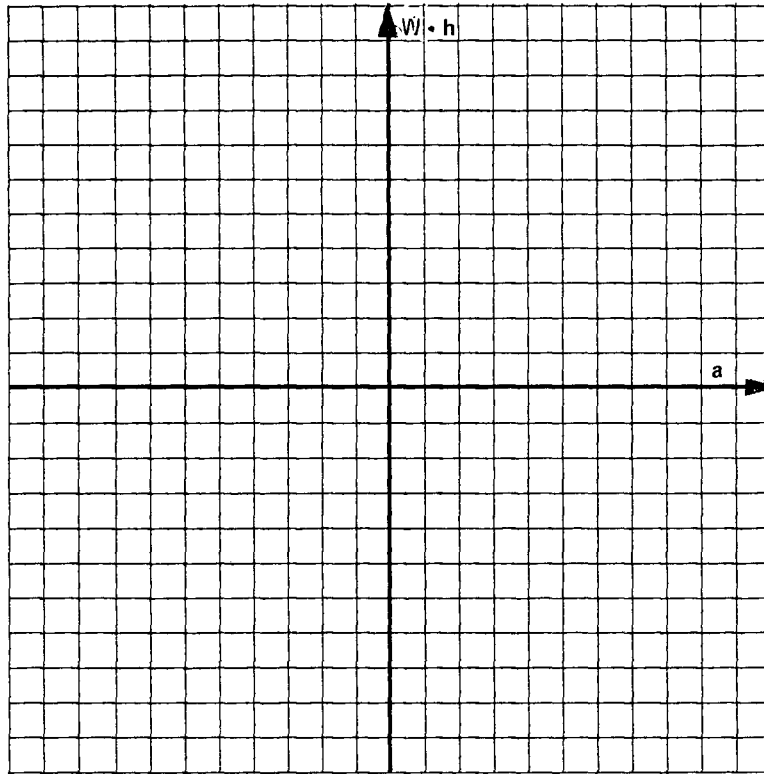


Figure 5

Weights shifted from starboard to port side (I)
 (Only accepted measurements to be used)

Shifting weight No.	Weight W (metric tons)	Shifting distance h (m)	Shifting moment $W \cdot h$ (mt)	Pendulum swing a (cm)
1				$a_1 =$
2				$a_2 =$
3				$a_3 =$
4				$a_4 =$
Σ	$W_I =$		$M_I =$	$a_I =$

Weights shifted from port to starboard side (II)
 (Only accepted measurements to be used)

Shifting weight No.	Weight W (metric tons)	Shifting distance h (m)	Shifting moment W · h (mt)	Pendulum swing a (cm)
1				a ₁ =
2				a ₂ =
3				a ₃ =
4				a ₄ =
Σ	W _{II}		M _{II} =	a _{II} =

Total number of pendulum readings to port and starboard (m) = _____

Mean shifting moment:

$$M_m = \frac{M_I + M_{II}}{m} = \text{_____ mt}$$

Mean inclining angle:

$$\theta_m = \frac{a_I + a_{II}}{\ell \cdot m \cdot 100} = \text{_____ radian}$$

Transverse metacentre above reference line (KM_T) at equivalent draught = _____ m

KM_T corrected for trim = _____ m

Transverse metacentric height (GM_T) of ship as inclined:

$$GM_T = \frac{M_m}{\Delta \cdot \theta_m} = \text{_____ m}$$

Correction for the free surface effect in tanks (gm_t)

Tank	Volume (m ³)	Transverse moment of inertia of the liquid surface (i)	γ	i · γ
Σ				

$$gm_t = \frac{\Sigma(i \cdot \gamma)}{\Delta} = \underline{\hspace{2cm}} \text{ m}$$

Corrected transverse metacentric height
 $GM_T \text{ corr.} = GM_T + gm_t = \underline{\hspace{2cm}} \text{ m}$

Centre of gravity above K:
 $KG = KM_T - GM_T \text{ corr.} = \underline{\hspace{2cm}} \text{ m}$

4. TRIM CALCULATIONS

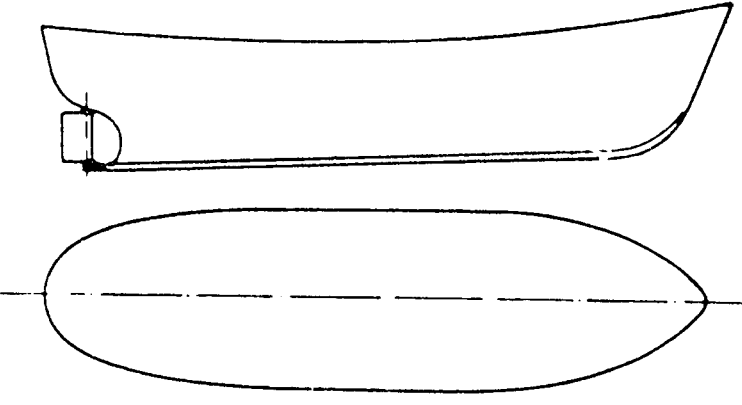
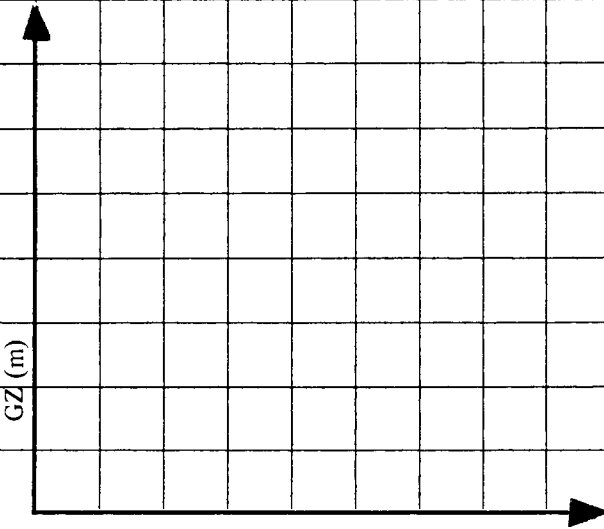
(a) Longitudinal metacentre above reference line (KM_L) at equivalent draught	= _____	m
(b) Moment to change trim one cm (MT_1):		
$\frac{KM_L - KG}{100} \cdot \frac{\Delta}{L_S}$	= _____	$\frac{mt}{cm}$
(c) Horizontal distance between the centre of gravity and the centre of buoyancy:		
$\frac{T \cdot MT_1 \cdot 100}{\Delta}$	= _____	m
(d) Centre of buoyancy fore/aft of amidships (LCB)	= _____	m
(e) Centre of gravity fore/aft of amidships (LCG)	= _____	m

5. POSSIBLE ADDITIONAL COMMENTS REGARDING THE INCLINING EXPERIMENT

6. CALCULATION OF LIGHTWEIGHT OF VESSEL

Item	Weight metric tons	KG (m)	Moment about base line (mt)	LCG from amidships (m)	Moment about $L_S/2$ (mt)
Vessel at experiment					
Surplus loads					
Sum -					
Missing loads					
Sum +					
Lightweight of vessel					

ANNEX II

SHIP NO.	CALCULATION OF GZ-CURVES	PAGE NO.
CONDITION NO:		
		L_{oa} : _____ m L_S : _____ m B_m : _____ m D_m : _____ m
CARGO	WEIGHT METRIC TONS	STOWAGE
FUEL OIL		SIGN OR COLOUR
DIESEL OIL		
LUBRICATING OIL		
SALT WATER		
FRESH WATER		
CREW PROVISION STORES		
TOTAL DEADWEIGHT		
	MEAN DRAUGHT	_____ m
	DRAUGHT AFT	_____ m
	DRAUGHT F'WD	_____ m
	TRIM (T) *	_____ m
	e_{30° **	_____
	e_{40° **	_____
	$e_{30^\circ - 40^\circ}$ **	_____
	GM_o	_____ m
	FREE SURFACES	
	Heeling angle (degrees)	

HOLD, TANK, ETC.				WEIGHT METRIC TONS	KG (m)	MOMENT ABOUT BASE LINE (mt)	LCG ABOUT L _S /2 (m)	MOMENT ABOUT L _S /2 (mt)
DEADWEIGHT TOTAL								
LIGHTWEIGHT								
DISPLACEMENT								
MEAN DRAUGHT =				KM _T		LCB		m
				GM _T		TRIM LEVER		m
				FREE SURF. CORR.	gm _t	MT ₁	:	$\frac{mt}{cm}$
				GM _T		DESIGNED TRIM	:	m
WITH SUPERSTRUCTURE						TOTAL TRIM (d _A - d _F)	:	m
						TRIM (T) *	:	m
						DRAUGHT AFT (d _A)	:	m
						DRAUGHT F'WD (d _A)	:	m
						BAR KEEL (h _K)	=	mm
φ	SIN φ	KG.SIN φ	KY	GZ	REMARKS: * See Annex I part 2, c ** e = AREA UNDER THE GZ-CURVE DATE: SIGNATURE:			
				m				
				m				
				m				
				m				
				m				
				m				