

STABILITY INFORMATION MANUAL

SMALL VESSELS

SHIPTYPE

SHIPNAME

SHIPYARD

Newbuilding No. XXXX

IMO/OFFICIAL NUMBER XXXX

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Revision No.	Revision Summary	Date
0	Final version	XXXXXX

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Computer calculations for the present data have been prepared by:

XXXXXXXXXX

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Data list

NAPA Release Bxxxxx
NAPA project no. XXXX/ Arrangement xxxxxx

Reference list:

Lines Plan	XXXXXXXX rev..xxx
Capacity plan	XXXXXXXX rev. xxx
Draught marks and position	XXXXXXXX rev. xxx
General arrangement	XXXXXXXX rev. xxx

Information about hull form, hydrostatic data, form stability, tank and cargo capacities as well as the above listed drawings are found in the Appendix to this booklet. This appendix is not to be kept onboard the vessel and is solely intended to be used by the approving authority.

1 GENERAL PARTICULARS

Ship type	:	SHIP TYPE
Ship's name	:	SHIPNAME
Flag	:	XXXX
Official Number	:	xxxxx
IMO number	:	xxxxxx
Call signal	:	xxxx
Builders	:	XXXXxxxxxxxxxxxx
Yard No.	:	XXX
Keel laying date	:	XX.XX.XXXX
Rules and Regulations	:	The vessel is built according to the following national rules
Class	:	XXXX
Class identification	:	XXXX

Main dimensions

Length overall	approx. xxxxx	m
Length Load Line	xxxxx	m
Length pp (centre of rudder stock to forward perpendicular)	xxxxx	m
Breadth moulded	xxxxx	m
Depth to bulkhead deck moulded	xxxxx	m
Draught at summer load line moulded	xxxxx	m
Draught extreme, to underside propeller / dome	xxxxx	m
Keel plate thickness	xxxxx	m
Displacement to summer load line draught	xxxxx	t
Propeller diameter	xxxxx	m
Number of passenger's	xxxxx	
Number of person's onboard	xxxxx	

Draught and trim restrictions

The vessel has to meet the following minimum draught restrictions:

Min. draught fore	x.xx m
Min. freeboard fore	x.xx m
Min. draught aft	x.xx m
Min. freeboard aft	x.xx m

Allowable trim range	x.xx m (aft) to x.xx m (fwd)
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Light ship and COG

Weight.....	xxx t
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LCG from AP xx.xx m
TCG from CL (positive to PS) xx.xx m
VCG from BL xx.xx m

Deadweight

Deadweight to summer load line draught
(even keel and density of seawater of 1.025 t/m³) xxx t

Tonnage

Gross tonnage xxx GT
Net tonnage xx NT

2 INSTRUCTIONS TO THE MASTER

A stamped copy of this booklet must be kept on board the vessel at all times, be complete, legible and readily available for use. If this booklet should be lost or become unusable, a replacement copy should be obtained immediately from the Owners, classification society or the Maritime Authorities.

The loading conditions shown in this booklet covers the intended service of the vessel. Should the vessel be loaded in another way, subject condition **MUST** be approved by the authorities prior to commencing the voyage.

Furthermore, the following should be noted:

- 1) Compliance with the stability criteria does not ensure immunity against capsizing, regardless of the circumstances, or absolve the master from his responsibilities. Masters should therefore exercise prudence and good seamanship having regard to the season of the year, weather forecasts and the navigational zone and should take the appropriate action as to speed and course warranted by the prevailing circumstances.
- 2) Care should be taken that the cargo/passengers allocated to the ship is capable of being stowed in line with the description in the loading conditions in Section 3. If not the safety of the vessel may be impacted.
- 3) Before a voyage commences, care should be taken to ensure that the cargo, cargo handling cranes and sizeable pieces of equipment have been properly stowed or lashed so as to minimize the possibility of both longitudinal and lateral shifting, while at sea, under the effect of acceleration caused by rolling and pitching. **It shall further be noted that the maximum allowed amount of cargo must not exceed either of $y y$ t/m² / $y y$ tonnes in total in the cargo hold/area.**
- 5) The number of partially filled or slack tanks should be kept to a minimum because of their adverse effect on stability. The negative effect on stability of filled pool tanks should be taken into consideration.

Operational Precautions in Heavy Weather:

The following should be noted:

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

- 7) Weathertight and watertight hatches, doors, etc., should be kept closed during navigation, except when necessarily opened for the working of the ship, and should always be ready for immediate closure and be clearly marked to indicate that these fittings are to be kept closed except for access. All portable deadlights should be maintained in good condition and securely closed in bad weather.
- 8) Any closing devices provided for vent pipes to fuel tanks should be secured in bad weather.
- 9) In all conditions of loading, necessary care should be taken to maintain a seaworthy freeboard.
- 10) In severe weather the speed of the ship should be reduced if propeller emergence, shipping of water on deck or heavy slamming occurs.
- 11) Special attention should be paid when a ship is sailing in following, quartering or head seas because dangerous phenomena such as parametric resonance, broaching to, reduction of stability on the wave crest, and excessive rolling may occur singularly, in sequence or simultaneously in a multiple combination, creating a threat of capsize. The ship's speed and/or course should be altered appropriately to avoid the above-mentioned phenomena.
- 12) Reliance on automatic steering may be dangerous as this prevents ready changes to course, which may be needed in bad weather.
- 13) Water trapping in deck wells should be avoided. If freeing ports are not sufficient for the drainage of the well, the speed of the ship should be reduced or the course changed, or both. Freeing ports provided with closing appliances should always be capable of functioning and are not to be locked.
- 14) Masters should be aware that steep or breaking waves may occur in certain areas, or in certain wind and current combinations (river estuaries, shallow water areas, funnel shaped bays, etc.). These waves are particularly dangerous, especially for small ships.
- 15) In severe weather, the lateral wind pressure may cause a considerable angle of heel. Heeling caused by the wind should not be compensated with anti-heeling measures, unless, subject to the approval by the Administration, the vessel has been proven by calculation to have sufficient stability in worst case conditions (i.e. under improper or incorrect use, mechanism failure, unintended course change, etc.).

Icing Considerations:

Sailing in areas where icing may occur shall be avoided if loading conditions including icing is not calculated and inserted in Section 3.

Conversion:

Finally, it should be pointed out to the ship's master that in case the ship undergoes a conversion, which will influence the stability conditions, new corrected stability information must be prepared.

3 NOTES REGARDING STABILITY AND LOADING OF THE SHIP

3.1 STABILITY

The stability of a vessel in general is its ability to maintain an upright position or to re-establish this after a disturbance. For the seaworthiness of an undamaged vessel it is sufficient to investigate the stability in the transverse direction. This depends on the position of two points relative to each other, the centre of gravity (G) and the transverse metacentre M, see figure on page 4-2.

The metacentric height GM, the distance between the points G and M, means the stability for small angles and is given by the following equation:

$$GM = KM_T - KG$$

The centre of gravity (KG) above keel depends on the distribution of cargo and liquids in tanks in the vessel. By adding the single weights and their moments related to base line and by division of the total moments with the total weights, the centre of gravity KG (=VCG) may be obtained. The transverse metacentre (M) above keel (K), only dependent on the lines of the vessel, may be obtained from the hydrostatic tables.

In order to obtain a positive stability ($GM > 0$) the centre of gravity must lie below the transverse metacentre (KM_T). In the event of critical loading conditions (consumed stores or "iced-up" vessel), this condition can be achieved by filling the double bottom tanks.

3.2 CURVES OF RIGHTING LEVERS

Curves of righting levers are generally used to represent the stability during inclinations. To ensure that the vessel's stability is positive, the stability arm GZ must be positive.

To illustrate the righting levers at various inclinations of the vessel in a condition, the effective righting lever GZ is derived from:

$$GZ = GM \times \sin \Theta + MS, \text{ where}$$

MS = Residual stability arm

GM = Metacentric height as defined above

Θ = Angle of inclination

Alternatively,

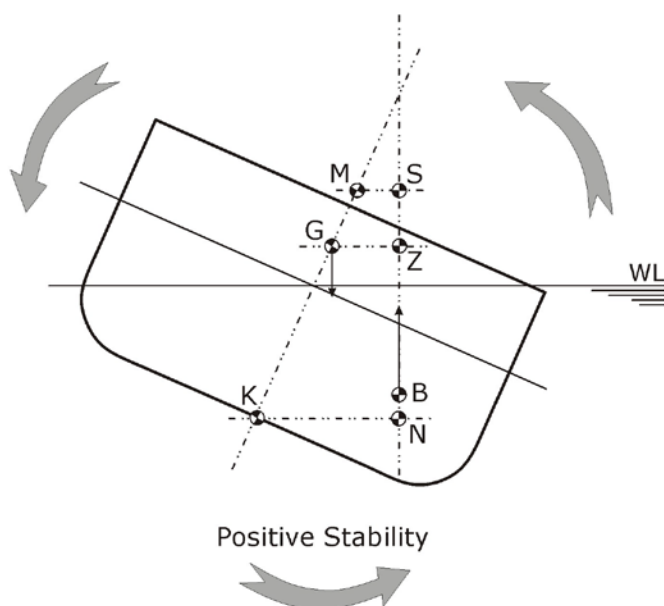
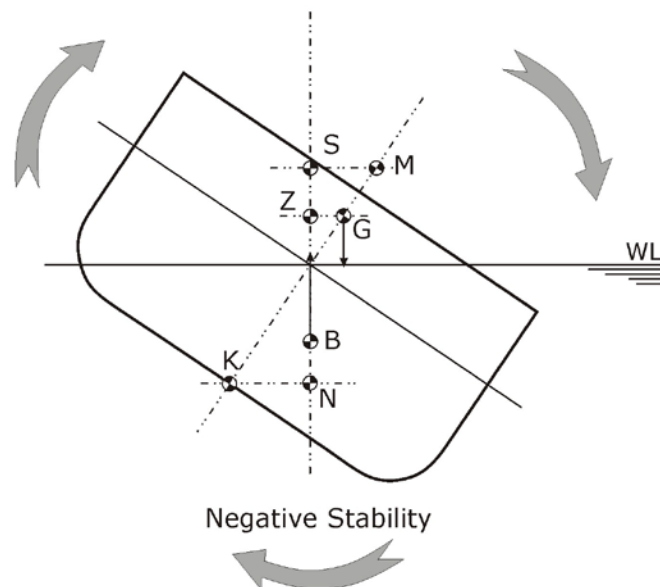
$$GZ = KN - KG \times \sin \Theta, \text{ where}$$

KN = The horizontal distance from the centre of gravity to base line

KG = Centre of gravity as defined above

Θ = Angle of inclination

The righting levers GZ calculated in accordance with the mentioned formula are plotted over the angle of inclination.
An example of the derivation of the curve of righting levers is shown on every condition sheet in this booklet in section 7.



4 LOADING CONDITIONS

A summary table showing the main data for all loading conditions should be included in the forward part of this section. This should include items such as condition name and number, mean draft, trim, heel, displacement, deadweight, weight of cargo, bunker, water ballast, actual KG (GM) corrected for free surfaces

The sketch in each loading condition showing deadweight items should include a legend of each deadweight group.

All deadweight items, including crew, stores, deck cargo etc must be included on the sketch. (depending on size of vessel)

All tanks included in the tank capacity list must be listed in all loading conditions, even if considered empty.

Where water ballast tanks, including anti-rolling tanks and anti-heeling tanks, are to be filled or discharged during a voyage, the free surface effects of such tanks must be taken into account using the most onerous transitory stage, i.e. if a water ballast tank is considered empty in the departure condition and completely filled in the arrival condition, the maximum free surface of such tank must be taken into account in both conditions.

It is recommended that all consumable tanks are always calculated with the maximum FSM.

The following conditions are recommended:

Lightship

Full Load Departure

Full Load Arrival

Ballast (no cargo) Departure

Ballast (no cargo) Arrival

Other operational conditions if deemed more onerous.

It is strongly recommended but not mandatory to include additional conditions with 50% consumables

5 INCLINING EXPERIMENT

This section must contain the approved Inclining Experiment Report.