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SHIP SAFETY BULLETIN

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Subject: **WEIGHT OF PERSONS ON BOARD**
Calculation of Intact and Damaged Stability

Introduction

Recent passenger vessel accidents in the United States and in Great Britain have raised concerns with regard to passenger weight figures used in the calculation of vessel stability. In recent marine accident reports, passenger weight has been identified as a contributing factor.

Purpose

The purpose of this bulletin is to advise of a change in the weight to be used for all persons on board (passengers and crew) when calculating stability. This change will bring the weight of persons in the *Stability, Subdivision and Load Line Standards (1975)* (TP 7301) in line with current demographic data and increase consistency of stability information across all types of vessels.

Scope

This bulletin applies to stability booklets received for approval for all new or existing vessels, including fishing vessels. When recalculation of stability data is required due to modifications to vessel construction, configuration, service, etc., revised calculations must apply the new weight of 75 kg per person on board.

Existing stability booklets are not automatically required to be revised by application of this bulletin. However, vessels with a stability-related Board Decision that have a heeling moment angle greater than 8° must recalculate conditions using the new weight by July 31, 2008.

Keywords:

1. Stability
2. Weight
3. TP 7301

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Implementation Date

This bulletin is applicable to all stability data received for approval on or after July 31, 2007.

Background

Current stability standards use the following figures for passenger weight:

- *Stability, Subdivision and Load Line Standards (1975)* (TP 7301) – STAB 5 specifies a value of 63.5 kg for unberthed passengers and 74.8 kg for berthed passengers. No figure is given for crew. Appendix B of STAB 5 stipulates 14 passengers per tonne or 71.4 kg per passenger.
- *Standards for Construction and Inspection of Small Passenger Vessels* (TP 11717) refer to the Standard TP 7301.
- *Ship Safety Passenger Ship Operations and Damaged Stability Standards (Non-convention Ships) (1993)* (TP 10943) and *Ship Safety Passenger Ship Operations and Damaged Stability Standards (Convention Ships) (1993)* (TP 10405) specify a value of 75 kg for the passenger heeling moment.
- *Construction Standards for Small Vessels (2004)* (TP 1332) uses a value of 75 kg for "persons" on board.

The latest demographic data indicates the following weights for adults and that average weight continues to increase:

- Average weight of 72.5 kg for Canadian males and females over 12 years of age (The Canadian Community Health Survey Cycle 2.1, 2003)
- Average weight of 80.7 kg for American male and female adults (US Department of Health, CDC, Report 347, October 27, 2004)

Current initiatives to improve the stability of passenger vessels:

- United States Coast Guard (USCG) issued a voluntary interim measure on April 18, 2006 with an assumed weight of 185 lbs (84 kg) for a mix of men and women.
- United Kingdom Maritime and Coastguard Agency has issued a Marine Information Note (MIN 218 M) requiring reassessment of existing stability booklets using a passenger weight of 75 kg. The notice warns that the 75 kg minimum may be further increased in the future.
- Australian Transport Council has issued a proposed National Standard for Commercial Vessels with a passenger weight of 80 kg, including an allowance of 5 kg for clothing and personal effects.
- The Society of Naval Architects and Marine Engineers (SNAME) has formed an Ad Hoc committee to support the USCG study on increased passenger weight.

General

All stability booklets submitted from the implementation date of this bulletin must use a minimum weight of 75 kg for every person on board, both passengers and crew, in the calculation of intact and/or damaged stability.

The centre of gravity of persons on board shall be assumed to be 1 metre above deck level when standing upright and 0.30 metres above the seat when seated.

The figure above is for summer clothing and does not include any allowance for personal effects and/or luggage. Naval architects are required to add a reasonable allowance for personal effects and/or luggage based on the type of vessel and the type of voyage. This allowance shall be indicated as a separate line item in the deadweight calculation sheets.

The following figures, taken from the aviation standard, are provided for guidance:

- Winter clothing – additional 2.8 kg per person
- Personal items and carry-on luggage – average of additional 6 kg per person
- Luggage – 32 kg per bag (this figure varies among airlines.)

When calculating the passenger heeling moment, only the passengers' weight of 75 kg, with their winter clothing if applicable, must be assumed to move to the side of the vessel. Personal items and luggage may be assumed to remain in their stowed position.

For passenger vessels, the emergency passenger heeling condition shall be presented in all cases where the value of GZ at 10°, in the Worst Designed Operating Condition, is equal to or less than:

$$\frac{B \cdot N}{34 \cdot \Delta}$$

where:

B = moulded breadth of vessel in metres
N = total number of passengers carried
Δ = displacement of vessel in tons

For application of STAB 5 Appendix B to multiple-pontoon vessels, the value of 'n' must be modified to 13.3 persons per tonne (75 kg).

The stability standard, *Stability, Subdivision and Load Line Standards (1975)* (TP 7301), will be updated to reflect these changes and will be renamed *Stability, Subdivision and Load Line Standards **(2007)*** (TP 7301.)

Alternative Stability Criteria

When applying the weight of 75 kg per person on board to existing passenger vessels, the following alternative stability criteria will be considered acceptable.

For existing vessels built before July 31, 2007, if the angle of static heel exceeds 10° when calculated as indicated in sections 7 and 9 of TP 7301 STAB 5, the following criteria may be used:

Option 1 – All existing vessels

(i) The angle of static heel, determined from the intersection of the righting lever (GZ) curve and the heeling arm curve, shall neither exceed 14° nor immerse the margin line.

(ii) The residual area, between the curves of righting levers and passenger heeling arms, shall be not less than $0.018 + 0.2\ A_{40/df}$ metre radians, where $A_{40/df}$ is the total area under the righting arm curve up to 40° or the downflooding angle, whichever is less.

(iii) The remaining righting lever must attain a value of at least 0.1 metres.

Option 2 – Existing vessels operating in Sheltered Waters (formerly Minor Waters II or Home Trade IV)

(i) The angle of static heel, determined from the intersection of the righting lever (GZ) curve and the heeling arm curve, shall not exceed 14° nor shall the remaining freeboard be less than 50% of the upright freeboard.

(ii) The residual area, between the curves of righting levers and passenger heeling arms, shall be not less than 0.025 metre radians.

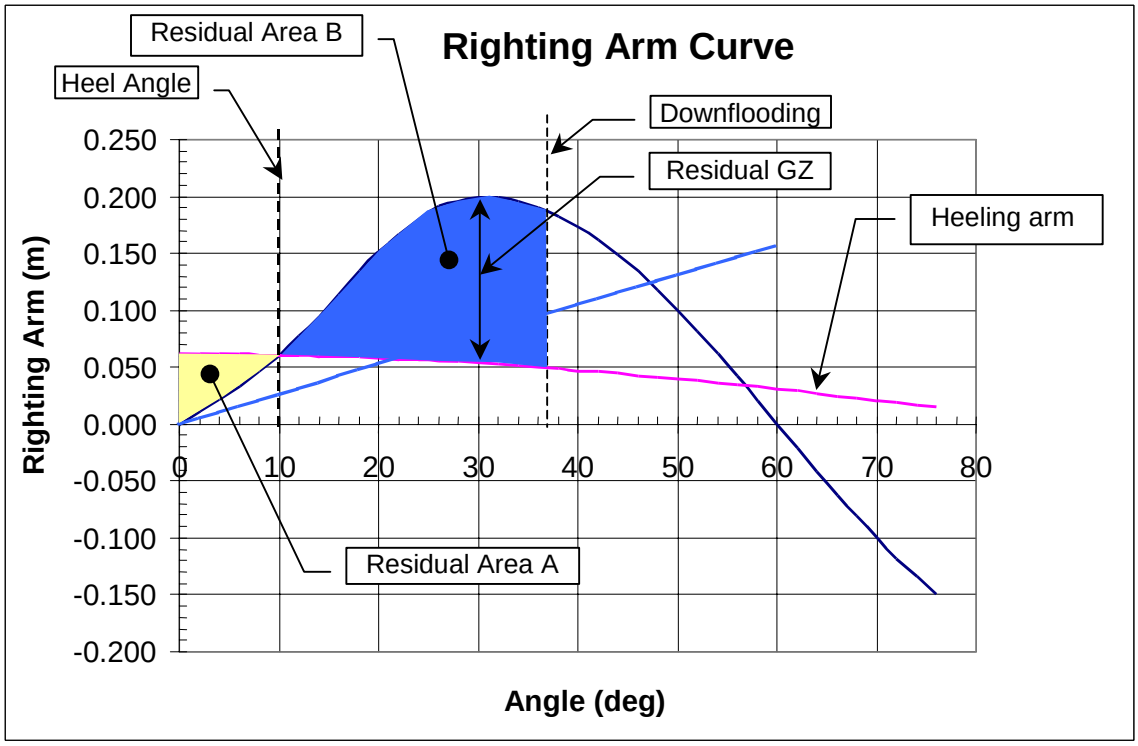
(iii) The remaining righting lever must attain a value of at least 0.1 metres.

Option 3 – Existing vessels operating in Sheltered Waters (formerly Minor Waters II or Home Trade IV)

(i) The angle of static heel, determined from the intersection of the righting lever (GZ) curve and the heeling arm curve, shall neither exceed 14° nor immerse the margin line.

(ii) The residual area ratio (Area(B) / Area(A)) shall be not less than 1.0, where Area B is between the curves of the righting lever and the passenger heeling arm taken between the angle of static heel and 40° or the downflooding angle, whichever is less, and Area A is the residual area between the curves of the passenger heeling arm and the righting lever up to the angle of static heel.

(iii) The remaining righting lever must attain a value of at least 0.1 metres.



In all cases where the angle of static heel exceeds 10°, the following conditions must also be satisfied:

- all cargo including deck cargo shall be secured against shifting;
- seating shall be provided for all persons;
- furniture shall be fixed when in use and/or when stowed;
- sufficient grab rails shall be provided in spaces that normally contain persons; and
- decks and deck surfaces shall be arranged to reduce slipping hazards.

Future Provisions

This Bulletin will remain in effect until further research is completed and the applicable Standards are revised for all vessels.