



Marine Safety Center
Technical Note

MIN 1-05

16710/SOLAS II-1/15.9.3

April 11, 2005

Subj: DETERMINING ADEQUATE SURVIVABILITY FOR WATERTIGHT DOORS KEPT OPEN DURING NAVIGATION PER SOLAS II-1/15.9.3

1. **Purpose:** This technical note establishes a process by which the Coast Guard will consider requests to keep one or more watertight doors open during navigation for passenger vessels subject to SOLAS. In accordance with the policy established in enclosure (1), requests to keep one or more watertight doors open during navigation are made to Commandant (G-MOC) via the cognizant Officer in Charge, Marine Inspection (OCMI). A final decision by that office will typically not be rendered until after the Marine Safety Center (MSC) has verified that leaving the door(s) open will not degrade the vessel's survivability after damage. Enclosure (1), in particular paragraphs 4 and 5, describes the process submitters should use to analyze this impact. Enclosure (1), paragraph 6 outlines the documentation that is necessary for a complete assessment. The calculations associated with this technical note do not replace or substitute for the damage stability calculations required to demonstrate compliance with SOLAS Chapter II-1/Part B and B-1.
2. **Applicability:** This technical note applies to U.S. passenger vessels regulated under SOLAS that are not designed to a one-compartment standard of subdivision.
3. **Action:** After Commandant (G-MOC) has determined that keeping the watertight door(s) open is necessary in accordance with SOLAS II-1/15.9.3, the MSC will independently verify the plans and calculations submitted and notify Commandant of the conclusions from that review. Final approval to operate with open watertight door(s) is subject to operational testing and local restrictions by the OCMI.


R. A. NASH

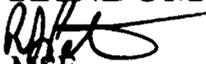
Copy: Commandant (G-MSE)
Commandant (G-MOC)

Enclosure: (1) MSE Policy Letter No. 05-01; "Policy for determining adequate survivability associated with watertight doors permitted to remain open during navigation per SOLAS II-1/15.9.3", dated April 8, 2005.



16710
February 18, 2004

MEMORANDUM

From:  G-MSE

Reply to G-MSE-2
Attn of: William Peters
7-0143

To: Commanding Officer, Marine Safety Center

Subj: **POLICY FOR DETERMINING *ADEQUATE SURVIVABILITY* ASSOCIATED WITH WATERTIGHT DOORS PERMITTED TO REMAIN OPEN DURING NAVIGATION PER SOLAS II-1/15.9.3**

1. PURPOSE

- a. Passenger vessel owners/operators apply to Commandant (G-MOC) for permission to keep one or more watertight (WT) doors open in accordance with SOLAS regulation II-1/15.9.3. If justified, Commandant (G-MOC) may permit one or more WT doors to be kept open during navigation, *provided that* the Marine Safety Center (MSC) determines that the policy given in this memorandum is satisfied and that associated operational restrictions are complied with.
- b. This memorandum presents and discusses Coast Guard policy for the process and guidance for making survivability determinations prescribed by SOLAS Ch. II-1, regulation 15.9.3, as there are no IMO interpretations. The Coast Guard intends to present this policy to IMO for consideration as the basis for development of guidelines on this matter.
- c. The calculations associated with this policy do not replace or in any way substitute for damage stability calculations required to show compliance with SOLAS Ch. II-1, regulation 8 or any other damage stability regulation.

2. APPLICATION

- a. Determinations under this policy are made by the MSC.
- b. Determinations described by this memorandum are to be made only after Commandant (G-MOC) has determined that keeping a certain watertight (WT) door or doors open in accordance with SOLAS II-1/15.9.3 is absolutely necessary and the vessel operator has submitted documentation as described in paragraph 6 to the MSC.
- c. WT doors may not be permitted to remain open under SOLAS regulation II-1/15.9.3 if the passenger ship operates under a one-compartment subdivision standard.
- d. The MSC will respond to the vessel operator with its determination of compliance with the guidance given by this policy of the flooding survivability associated with the WT door(s) determined by Commandant (G-MOC) to be kept open.

- e. Permission to keep a WT door or doors open in accordance with SOLAS regulation II-1/15.9.3 is given in writing by Commandant (G-MOC) and also may include operational requirements that may require incorporation into the ship's Safety Management System and approval by the cognizant OCMI.
- f. Appeals of determinations are handled in accordance with 46 CFR 1.03.

3. DISCUSSION

- a. Watertight subdivision is vital to the survival of flooding damage. To that end, openings in WT bulkheads (e.g., doors) are to be kept to a minimum per SOLAS regulation II-1/15.1.
- b. SOLAS Ch. II-1, regulation 15.9.1 requires that all WT doors be kept closed during navigation except that they may be opened during navigation as specified in certain circumstances. Regulation 15.9.2 allows a WT door to be opened to permit the immediate passage of passenger or crew.
- c. These regulations reflect sound WT door practice. We are aware of cruise ship operators who keep WT doors closed. They address the maintenance issues of high cycling of WT doors by incorporating advanced materials into the door's working parts and other enhanced reliability/maintainability focused measures.
- d. Regulation 15.9.3 permits certain WT doors "to remain open during navigation only if considered absolutely necessary; that is, being open is determined essential to the safe and effective operation of the ship's machinery or to permit passengers normally unrestricted access throughout the passenger area." Further: "*Such determination shall be made by the Administration only after careful consideration of the impact on ship operations and survivability.*" If permitted to remain open, WT doors shall be ready at all times to be immediately closed.
- e. In the case of damage, an open WT door in a bulkhead of a flooding compartment increases the risk of extending the flooding to additional, otherwise non-flooded compartments. Such extended flooding reduces the ship's ability to remain afloat.
- f. Risks exist because open WT doors might not be able to be closed or closed in sufficient time to effectively limit or restrict the flooding. For example, a collision damage might deform a bulkhead and deck so that a WT door cannot be closed. In another damage scenario, the Master might not order WT door closure due to concern of trapped crew or lack of knowledge of damage/flooding extent. In the case of a large damage opening, compartments flood very rapidly and even a very timely response from the bridge – remote closing of all doors – very probably means that the flooding cannot be restricted as assumed in damage stability calculations.
- g. Therefore, assessment of adequate floatability after damage is critical, if certain WT doors are permitted to be open during navigation per regulation II-1/15.9.3.
- h. Subdivision and damage stability regulations address different risks. This is why floatability assessment calculations cannot be substituted for damage stability calculations showing compliance with regulations.

4. FLOODING EXTENT TO BE EXAMINED

- a. In every case in which Commandant (G-MOC) has determined that keeping one or more WT doors open while underway is absolutely necessary, floatability assessment calculations must be performed. The extent of flooding to be assumed in these calculations is described in paragraphs b. through g. below.
- b. Floatability assessment calculations need to be performed for each damage zone involving damage to two compartments that are associated with a WT door requested to remain open underway.
- c. For all floatability assessments, all WT doors permitted to remain open during navigation shall be assumed to remain open after damage. In other words, no consideration is given to any active damage control measures (i.e., no open WT door is assumed to close).
- d. For example, in Figure 1, if damage is assumed to occur to WT-bulkhead #d, the WT doors in both WT-bulkhead #c and #e would be assumed to remain open. Hence, the four compartments bounded by bulkheads #b and #f would be assumed to be flooded.

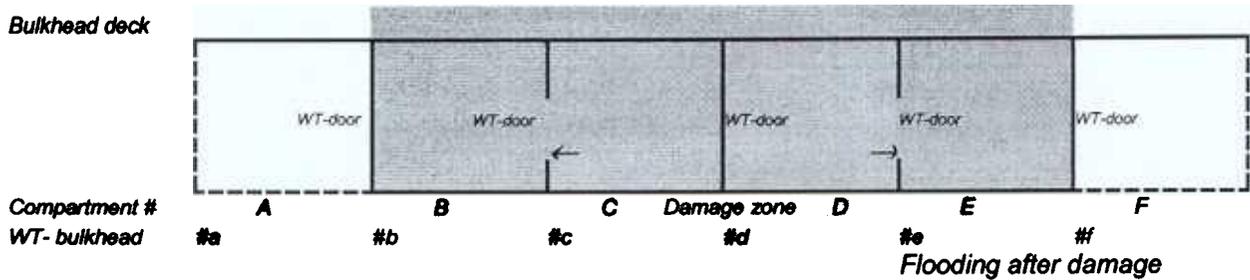


Figure 1 – Two-compartment ship

- e. In Figure 2, if damage is assumed to occur to WT bulkhead #e, both WT doors in bulkheads #c and #d would be assumed to allow flooding to extend into compartments #B and #C. Therefore, the flooding would extend to the same four compartments as in Figure 1.

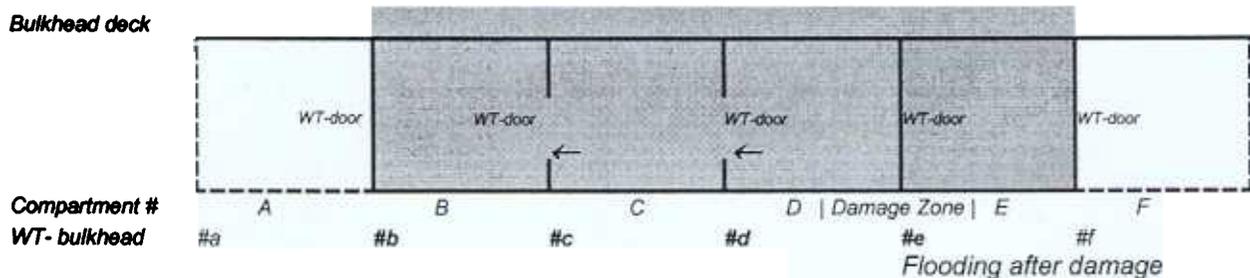


Figure 2 – Two-compartment ship

- f. For each extent of flooding, the ship must meet the floatability criteria set forth in paragraph 5.
- g. Assessments that assume the damage opening as both penetrating and not penetrating the double bottom shall be made.

5. CRITERIA FOR FLOATABILITY ASSESSMENT

- a. No confusion should exist between a ship's survivability, which connotes SOLAS after damage criteria compliance, and a ship's floatability, the criteria for which is set forth under paragraph b.
- b. In the flooded condition described in paragraph 4, the ship must be able to float upright (i.e., not capsize or founder) in the intermediate and final stages of flooding for every condition of intact loading with passengers. The following conditions apply:
 - i. a transverse moment associated with launching of two fully loaded davit-launched survival craft on the heeled side (other moments described in SOLAS regulation II-1/8.2.3.4 are not applied).
 - ii. the center of gravity is adjusted to consider all persons to be at muster locations.
 - iii. The bulkhead deck may be immersed provided that no progressive flooding occurs (i.e., closed weathertight openings may be immersed during intermediate stages; only closed watertight opening may be immersed at the final equilibrium stage of flooding).
 - iv. The maximum righting arm must not be less than 0.03 m in the final equilibrium stage.
 - v. The range of stability must not be less than 4 degrees in the final equilibrium stage.
 - vi. The maximum heel angle in intermediate stages must not be greater than 20 degrees.
 - vii. The maximum heel angle in the final equilibrium stage must not be greater than 15 degrees.

6. VESSEL OPERATOR SUBMITTED DOCUMENTATION

- a. Sufficient documentation should be submitted by the vessel owner/operator or its agent to support a determination of adequate survivability to be made by the MSC for WT doors permitted to remain open during navigation.
- b. This documentation may accompany the application to Commandant (G-MOC) or be submitted separately to the MSC. In either case, the MSC will commence determination of adequate survivability only after Commandant (G-MOC) has acted on the application as stated in paragraph 2.a. and the MSC has determined that sufficient documentation has been submitted.
- c. Sufficient documentation consists of the following:
 - i. General arrangement plans (inboard and outboard profiles, deck plans, sections) including plans showing all watertight and weathertight subdivisions of the vessel.

- ii. Details of all interior weathertight and watertight openings (i.e., all downflooding/ progressive flooding openings) in such format as may be necessary to facilitate the floatability assessment according to the criteria given in 5.b.iii.
 - iii. Hull form details that may consist of lines plans or hull offsets, preferably in a common electronic format.
 - iv. Loading and stability manual.
 - v. Supporting data and calculations associated with the floatability assessment criteria given in 5.b.i. and 5.b.ii.
 - vi. For each extent of flooding determined according to paragraph 4, floatability assessment calculations showing that the criteria of paragraph 5 are met. Floatability assessment calculations are to be performed for the full range of operational drafts and trims in which passengers are to be carried.
- 7. SAFETY MANAGEMENT SYSTEM (SMS) AND OTHER REQUIREMENTS**
- a. Regardless of permission given to keep certain WT doors open, all doors must be closed when the ship proceeds into water that may have a water depth less than twice the vessel's maximum draft or proceeds into harbor areas with high vessel traffic.
 - b. No WT doors may be kept open until the cognizant OCMI has approved the SMS documented system and procedures whereby the open WT doors are closed when the vessels proceeds into these areas and the requirements of paragraph c below.
 - c. If doors are permitted to be open, there shall be clear instructions of implications and, of course, the door shall be ready to be closed immediately. The SMS must document that all personnel shall be made aware of these instructions through formal training and that open WT doors shall be closed immediately in any collision or grounding occurrence.

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Copy Commandant (G-MOC)