



## REVIEW OF OCEANGOING TANK BARGE STABILITY

Procedure Number: C1-15

Revision Date: February 21, 2020

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S. M. Peterson, LCDR, Chief, Tank Vessel and Offshore Division

### Purpose

This Plan Review Guideline (PRG) provides guidance and information regarding the submission of stability calculations for Oceangoing Tank Barges regulated under 46 CFR Subchapters D, I, O, and/or MARPOL Annex I or II.

### Contact Information

If you have any questions or comments concerning this document, please contact the Marine Safety Center (MSC) by e-mail or phone. Please refer to Procedure Number **C1-15**.

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## **1. Applicability**

This Plan Review Guideline (PRG) is applicable to all barges regulated under 46 CFR Subchapters D, I, and/or O that operate on **oceangoing routes**. The definitions section of this guide contains further information regarding the specific meaning of oceangoing routes.

Subchapter D applies to **manned and unmanned** barges that carry cargoes listed in 46 CFR Table 30.25-1.

Subchapter I may apply to:

- (a) **Manned and unmanned** barges that carry bulk liquid cargoes that are not flammable or combustible (see 151.01-10 for more information).

Subchapter O, **Part 153** (153.1(b)) applies to all **oceangoing barges** that carry in bulk a Category A, B, or C NLS cargo listed in Table 1 of Part 153 or allowed in a written permission under 46 CFR 153.900(d), unless:

- (a) The barge is carrying the cargo under 33 CFR part 151;
- (b) The barge is carrying the cargo in a portable tank under subpart 98.30 or 98.33; or
- (c) The barge's Certificate of Inspection is endorsed for a limited short protected coastwise route and the barge is constructed and certificated primarily for service on an inland route.

Note: A seagoing barge is not subject to inspection if the vessel is unmanned and does not carry a hazardous material as cargo such as flammable or combustible liquids, including oil, in bulk. In this case, "hazardous material" as cargo includes flammable/combustible liquids or substances, and "in bulk" means 250 barrels or more (46 USC 3302(m), 46 USC 2101(17), and MSM, Volume II, Chapter 4, Part E.1).

## **2. References**

- (a) Marine Safety Manual, Volume IV
- (b) [NVIC 17-91](#), Guidelines for Conducting Stability Tests
- (c) [ASTM F 1321-14](#), "Standard Guide for Conducting a Stability Test (Lightweight Survey and Inclining Experiment) to Determine the Light Ship Displacement and Centers of Gravity of a Vessel"
- (d) G-MSE-2, 9079/10, "Intact Stability Requirements for Tank Barges greater than 5000 DWT on Ocean Routes," dated November 26, 2003

## **3. Definitions**

### **Oceangoing:**

See [33 CFR 151.05](#).

### **Ocean** (46 CFR 30.10-45):

Under this designation shall be included all tank vessels normally navigating of any ocean or the Gulf of Mexico more than 20 nautical miles offshore.

**Coastwise (46 CFR 30.10-11):**

Under this designation shall be included all tank vessels normally navigating of any ocean or the Gulf of Mexico 20 nautical miles offshore or less.

**Great Lakes (46 CFR 30.10-33):**

Under this designation shall be included all tank vessels navigating the Great Lakes.

**Special Service Voyages (MSM, Volume IV, Chapter 6, Part F.3.g):**

This is a voyage between ports, in the trades, and under conditions of operation as specified in the Special Service Load Line regulations. Special service load lines and their certificates are valid only for coastwise (20 mile offshore limit) voyages within limited areas of trade as specified in 46 CFR Part 44. Special service freeboards are not applicable to the Great Lakes.

**Downflooding Point:**

The lowest opening on a vessel that allows the entry of seawater into the hull or superstructure of an undamaged vessel due to heel, trim, or submergence of the vessel.

Additional definitions can be found here:

- (a) [46 CFR 30.10](#) (Subchapter D)
- (b) [46 CFR 151.03](#) (Subchapter O, Part 151)
- (c) [46 CFR 153.2](#) (Subchapter O, Part 153)

**4. General Guidance**

Using applicable portions of references (a) through (d), the submitter shall provide sufficient documentation and plans to indicate compliance with the requirements. The submission shall be made electronically to the above email address or, if paper, in triplicate to the MSC's address found on the above website. To facilitate plan review and project management, all plans and information specified in these guidelines should be submitted as one complete package through a single point of contact for the project. In general, new construction plan review may not occur until a copy of the Application for Inspection is received. At a minimum, the submission should include:

- (a) General Arrangements,
- (b) Lines, offsets, or computerized hull model,
- (c) Tank Capacity Tables/Plans,
- (d) Hydrostatic Tables,
- (e) Stability Calculations (intact and damage, as applicable),
- (f) A statement clearly identifying what is desired from MSC, and
- (g) Any special/unusual requests.

Note: A Plan Review Information Sheet (PRIS) is not typically issued for oceangoing tank barges which have an approved stability letter, load line, or loading manual. Specific questions regarding a PRIS may be directed to the MSC.

## **5. Lightship Verification**

Verify that lightship characteristics were (or are to be) determined using one of the following methods:

- (a) Acceptance as a sister vessel with known characteristics (reference (a), Section 6.D.2),
- (b) Deadweight survey combined with a conservatively assumed vertical center of gravity (VCG), or an inclining test (references (b) and (c)).
  - a. In accordance with 46 CFR 170.085, a written stability test procedure must be sent to the MSC at least two weeks before the stability test. Reference (c) provides guidance on the required elements for the stability test procedure. The procedure shall be approved by the MSC prior conducting the test or survey.
  - b. In accordance with 46 CFR 170.175(b), arrangements should be made with the OCM I to have an acceptable Coast Guard representative to witness the stability test.

## 6. Tank Barge Stability Matrix

	Cargo	Sub	Route	170 Sub E	172 Sub C	172 Sub D	172 Sub E	172 Sub F
Non-Self Propelled Vessels (Barges)	Cargo in 46 CFR Table 30.25-1, carried in independent tanks, and is a LFG or flammable liquid with Reid Vapor Pressure > 25 psi.	D	All	X <sup>1,2</sup>	X			
	Cargo listed in 46 CFR Table 30.25-1	D	All	X <sup>1,2</sup>				
	Oil as defined in 33 CFR 157	D	Oceans or Great Lakes	X <sup>2</sup>		X <sup>2</sup>		
	Cargo <sup>3</sup> listed in 46 CFR Table 151.05	O	All except Oceans				X <sup>5</sup>	
	Cargo <sup>3</sup> listed in 46 CFR Table 151.05 that is not an NLS <sup>4</sup>	O	Oceans				X <sup>5</sup>	
	Category A, B, or C NLS listed in Table 1 of 46 CFR 153	O	Oceans	X				X <sup>6</sup>

### Footnotes:

1. Not required for Rivers or Lakes, Bays, & Sounds service unless stability is questioned by the OCMI.
2. Not required if vessel is < 150 GT, unless stability is questioned by the OCMI.
3. Cargo not carried in a portable tank regulated under 46 CFR 98.
4. Category D NLS cargoes listed under 46 CFR 151.12-5 are allowed.
5. Intact and Damaged requirements if Hull Type I or II are required, Intact only for Hull Type III.
6. Not required for: (1) Vessel carrying cargo under 33 CFR 151 (See 46 CFR 30.25-1(d) and 46 CFR 153.1 for applicability).  
(2) Vessel carrying cargo in portable tanks under 46 CFR 98

### Notes:

1. Tank vessels of 5,000 DWT or greater carrying OPA 90 cargoes regulated by 33 CFR 157 must comply with MARPOL 74/78 Regulation 27 as required by 33 CFR 157.22 and 46 CFR 172.070
2. Any vessel equipped to lift must demonstrate compliance with 46 CFR 173 Subpart B
3. Any barge carrying cargo above the weather deck must demonstrate compliance with 46 CFR 174 Subpart B.

## 7. Review Guidance

Use the Tank Vessel Stability Matrix to determine the applicable stability requirements. Every intended loading condition must be evaluated against the applicable criteria.

- (a) If **46 CFR 170 Subpart E** is applicable:
  - a. Verify that the minimum GM is achieved in each condition of loading, 46 CFR 170.170.
- (b) If **46 CFR 172 Subpart C** is applicable:
  - a. Verify the hull type and whether the vessel uses an open hopper.
  - b. Verify the extent of damage if the barge does not use an open hopper, 46 CFR 172.050(f).
  - c. Verify the location of applied damage, 46 CFR 172.050(e).
  - d. Verify that 2 inches (50mm) of GM is achieved, 46 CFR 172.050 (c) and (e).

- (c) If **46 CFR 172 Subpart D** is applicable:
  - a. Verify the character of damage, 46 CFR 172.065(d).
  - b. Verify the extent of damage, 46 CFR 172.065(e).
  - c. Verify that the survival conditions are achieved, 46 CFR 172.065(g).

**Note:** The requirements above are the same as those contained in 33 CFR 157 Appendix A and B.
- (d) If **46 CFR 172 Subpart E** is applicable:
  - a. Verify that the intact transverse stability requirements have been met, 46 CFR 172.090.
  - b. Verify the character of damage applicable for the hull type, 46 CFR 172.104.
  - c. Verify the extent of damage, 46 CFR 172.105.
  - d. Verify that the survival conditions are achieved, 46 CFR 172.110.
- (e) If **46 CFR 172 Subpart F** is applicable:
  - a. Verify the character of damage applicable for the hull type, 46 CFR 172.133.
  - b. Verify the extent of damage, 46 CFR 172.135.
  - c. Verify that the survival conditions are achieved, 46 CFR 172.150.

Per 46 CFR 31.10-32, if the barge was constructed after September 6, 1977 and is greater than 300 feet in length, a loading manual must be submitted in accordance with 46 CFR 42.15-1(a) or 45.105(a).

**For all oceangoing tank barges that carry oil and are greater than 5,000 Deadweight Tons:** the stability criteria in reference (d) is accepted as equivalent to the criteria found in MARPOL Annex I Regulation 25A, specifically:

- (a) GM must be greater than 0.49 ft (0.15 meters);
- (b) Max righting arm must occur at an angle of heel not less than 15 degrees;
- (c) A righting arm of at least 0.66 ft (0.20 meters) must occur at an angle of heel equal to or greater than 30 degrees;
- (d) The area under each righting arm curve must be at least 16.9 ft-degrees (5.15 meter-degrees) up to an angle of heel of 40 degrees or the downflooding angle, whichever is less;
- (e) The area under each righting arm curve between the angles of 30 and 40 degrees, or between 30 degrees and the downflooding angle if it is less than 40 degrees, must be at least 5.6 ft-degrees (1.72 meter-degrees); and
- (f) The area under each righting arm curve up to the angle of maximum righting arm must not be less than the area determined by the following equation:

$$A = 10.3 + 0.187 (30 - Y) \text{ foot-degrees}$$

$$A = 3.15 + 0.057 (30 - Y) \text{ meter-degrees}$$

## **8. Disclaimer**

This guidance is not a substitute for applicable legal requirements, nor is it itself a rule. It is not intended to nor does it impose legally-binding requirements on any party. It represents the Coast Guard's current thinking on this topic and may assist industry, mariners, the general public, and the Coast Guard, as well as other federal and state regulators, in applying statutory and regulatory requirements. You can use an alternative approach for complying with these requirements if the approach satisfies the requirements of the applicable statutes and regulations. If you want to discuss an alternative, you may contact MSC, the unit responsible for implementing this guidance.



G-MSE-2, Intact Stability Memorandum

U.S. Department of  
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9079/10  
26 November 2003

**MEMORANDUM**

From:   
J. G. LANTZ  
COMDT (G-MSE)

To: CO, MSC

Ref: (a) MSC Memorandum 16715/P009299/C1-0306796 dated 30 October 2003

Subj: INTACT STABILITY REQUIREMENTS FOR TANK BARGES GREATER THAN  
5,000 DWT ON OCEAN ROUTES

1. This policy guidance is provided in response to reference (a). The provisions of 46 CFR 172.070 require all U.S. tank vessels (includes tank barges) which are oceangoing or operate on the Great Lakes of 5,000 deadweight tons (DWT) and above contracted after December 3, 2001, to comply with the intact stability requirements of MARPOL 73/78, Annex I, Regulation 25A. This regulation applies the intact stability requirements of MARPOL Regulation 25A to tank barges irrespective of the fact that 33 CFR 157.22 applies it only to "tank ships".
2. Although the applicability of MARPOL Regulation 25A does extend to tank barges, the intact stability criteria incorporated into the regulation was developed for tanks ships and not tank barges. In particular, the requirement for the maximum righting arm to occur at an angle of heel of not less than 25 degrees is not practical for most barge hulls. Tank barges generally have very good intact stability with significant reserves of righting energy and initial GM. Therefore an alternate criteria is appropriate for tank barges that will accommodate the smaller angle at which the maximum righting arm occurs by requiring additional righting energy that is dependent upon the actual angle of maximum righting arm.
3. For the reasons outlined above, the following intact stability criteria may be accepted as equivalent to the criteria in paragraph (2)(b) of MARPOL Regulation 25A for tank barges:
  - (a) An initial metacentric height (GM), corrected for free surface, of at least 0.49 feet (0.15 meters);
  - (b) A maximum righting arm that occurs at an angle of heel not less than 15 degrees;
  - (c) A righting arm (GZ) of at least 0.66 feet (0.20 meters) at an angle of heel equal to or greater than 30 degrees;
  - (d) An area under each righting arm curve of at least 16.9 foot-degrees (5.15 meter-degrees) up to an angle of heel of 40 degrees or the downflooding angle, whichever is less;
  - (e) An area under each righting arm curve between the angles of 30 degrees and 40 degrees, or between 30 degrees and the downflooding angle if this angle is less than 40 degrees, of not less than 5.6 foot-degrees (1.72 meter-degrees); and *0.03 m-rad*
  - (f) An area under each righting arm curve up to the angle of maximum righting arm of not less than the area determined by the following equation:  

$$A = 10.3 + 0.187(30 - Y) \text{ foot-degrees} \quad [A = 3.15 + 0.057(30 - Y) \text{ meter-degrees}]$$
 where: A = area in foot-degrees (meter-degrees)  
 Y = angle of maximum righting arm, degrees.

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