

# MSC Guidelines for Review of Gas Carrier Stability (Intact, Damaged, Lightship, and Special Loading Authorization)

Procedure Number: T1-30

Revision Date: 02/04/00

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## References

- a. 46 CFR Subchapter D
  - b. 46 CFR Subchapter I
  - c. 46 CFR Subchapter O
  - d. 46 CFR Subchapter S
  - e. NVIC 17-91, Guidelines for Conducting Stability Tests
  - f. ASTM F 1321-92, Standard Guide for Conducting a Stability Test (Inclining and Lightweight Survey) to Determine the Light Ship Displacement and Centers of Gravity of a Vessel
  - g. IGC Code, International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk
  - h. International Convention for the Safety of Life at Sea, 1974, and its Protocol of 1978 (SOLAS), as amended
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## Disclaimer

These guidelines were developed by the Marine Safety Center staff as an aid in the preparation and review of vessel plans and submissions. They were developed to supplement existing guidance. They are not intended to substitute or replace laws, regulations, or other official Coast Guard policy documents. The responsibility to demonstrate compliance with all applicable laws and regulations still rests with the plan submitter. The Coast Guard and the U. S. Department of Transportation expressly disclaim liability resulting from the use of this document.

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## Contact Information

If you have any questions or comments concerning this document, please contact the Marine Safety Center by e-mail or phone. Please refer to the Procedure Number: **T1-30**

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## General Review Guidance

- If the vessel is new and not a sister vessel, has the Application for Inspection been submitted? In general, no plan review will occur until receipt of a copy of the Application.
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- ❑ Is it clearly stated what is desired from the MSC? Are all plans requiring Coast Guard review and/or approval submitted in triplicate? Are there any special or unusual requests involved?
- ❑ Is the vessel being reviewed under NVIC 3-97? If yes, then MSC review of stability items is not required.
- ❑ The majority of gas carrier reviews involve unmanned tank barges and independent pressure vessel barges regulated under a dual Subchapter O/D certification, for vessels not on an international voyage. Determine applicability of regulations per 46 CFR 151.01-10, as follows:
  - ❑ For **unmanned** barges only, if cargo is listed in 46 CFR Table 151.05 and **has** flammability or combustibility characteristics as indicated by a fire protection requirement in the table, then Subchapters O and D apply.
  - ❑ For **unmanned** barges only, if cargo is listed in 46 CFR Table 151.05 and **does not have** flammability or combustibility characteristics as indicated by a fire protection requirement in the table, then Subchapters O and D or O and I apply. The option for applying D or I, in addition to O, should be indicated by the owner on the Application for Inspection.
  - ❑ Per 46 CFR 151.01-10(e), **manned** barges which carry a cargo listed in Table 151.05 will be considered individually by Commandant for applicable regulations and design requirements.
- ❑ If the vessel is an existing tank barge, consult 46 CFR 151.01-25(c) for applicable requirements.
- ❑ If the vessel is a self-propelled tankship, consult 46 CFR, Subchapter O, Parts 153 and 154. Also consult with MSC for other potential compliance and plan review issues. Ensure compliance with references (f), (g), and (h), as applicable for international voyages. Use MSC Guidelines for Review of Tankship Stability or Chemical Tanker Stability (as applicable) to conduct a review on a tankship.
- ❑ Ensure the following drawings (items) have been received:
  - ❑ General Arrangements
  - ❑ Lines, offsets, or computer disk with hull model
  - ❑ Tank Capacity Tables\Plan
  - ❑ Hydrostatic Tables

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- Lightship calculations
- Intact and Damage Stability calculations
  
- Verify Lightweight Characteristics utilizing one of the following methods:
  - 1) Does a sister vessel, with known characteristics, exist?
  - 2) Has a detailed estimate of the characteristics been provided by the owner/designer?
  - 3) Has an approved procedure and subsequent deadweight/stability test been performed in accordance with references (d), (e), and (f).
  
- Per 46 CFR 38.05-1 and 46 CFR 151.15-3(d), a minimum of hull type II is required for gas barges. A type I hull may be required depending on appropriate hazard of cargo.
  
- Per 46 CFR 31.10-32, 42.15-1(a) or 45.105, a loading manual is required if length greater than 300' and oceans service, or if dual certificated Subchapter O/I and carrying a cargo listed in table 151.05, per 151.01-10(c-1).
  
- Use the attached stability matrix to determine applicable intact and damage stability requirements. Note the following comments:
  - Verify that the proper extents of damage are used and applicable survival conditions are met.
  - For these types of vessels with longitudinal cylindrical tanks in the hoppers, longitudinal free surface has a significant effect on trim & stability and must be accounted for.
  - Barges must meet 46 CFR 173, Subpart B if equipped to lift; and 46 CFR 174, Subpart B if cargo is carried above the weather deck (as in most Subchapter O/I barges)
  
- Under 46 CFR 172, Subpart E, hull type I damaged stability is a 2 compartment standard, side and bottom damage, while hull type II is a modified 1 compartment standard. The deck edge must not submerge to survive. If the barge has coaming (which most do) then the limit is the minimum of the intersection of the deck and coaming, or the height of the quantity "f<sub>a</sub>" above the deck edge.

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- ❑ Hull type I & II intact requirements are generally the same, from 46 CFR 172, Subpart E (righting energy (5/10/15),  $GM_L$ , and  $GM_T$  requirements).
- ❑ Note the special requirements of 46 CFR 172.050 and 172.100:
  - ❑ Open hopper barges must demonstrate 2 inches of positive GM with the hopper space flooded to the weather deck, in the fully loaded condition
  - ❑ At least 2 inches of positive GM for all specified damaged conditions
- ❑ Verify the location of downflooding and ensure this is taken into account for compliance with the applicable stability criteria.
- ❑ Verify the permeability of spaces, in accordance with 46 CFR, Table 172.065(b).
- ❑ Analyze design calculations for the strength of tank securing devices, if credit is given under 46 CFR 172.050(d) or 172.100(c) for buoyancy of the immersed portion of cargo tanks.
- ❑ If a barge is seeking a one time voyage Special Loading Authorization (SLA), verify that calculations submitted comply with the applicable requirements.
- ❑ The MSC will construct a detailed HECSALV or GHS model from the lines plan, offsets, or electronic model provided, and will verify the stability of the vessel using this model and the criteria specified.

Definition

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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.

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Attachment

Tank Vessel Stability Matrix