

MSC Guidelines for the Review of Gas Carrier Plan Review Information Sheet

Procedure Number: C1-28

Revision Date: 04/25/2014

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Purpose

This Plan Review Guideline (PRG) explains the requirements for seeking plan approval for the Plan Review Information Sheet from the Marine Safety Center (MSC) for Liquefied Flammable Gas (LFG) tank barges and tank vessels in accordance with the below references.

References

- a. 46 CFR, subchapter D
 - b. 46 CFR, subchapter I
 - c. 46 CFR, subchapter O
 - d. 46 CFR, subchapter S
 - e. ABS Rules for Building and Classing Steel Barges, 1991
 - f. ABS Rules for Building and Classing Steel Vessels for Service on Rivers and Intracoastal Waterways, 2007
 - g. Ship Structure Committee (SSC) report SSC-205, "Structural Design Review of Longitudinal, Cylindrical, Liquid-filled Independent Cargo Tank Barges," 1970
 - h. Matheson Gas Data Book
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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 Homeland Security 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: **C1-28**

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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.
 - ❑ Is it clearly stated what is desired from the MSC? Are all plans requiring Coast Guard review and/or approval submitted in triplicate (if hard copy)? Are there any special or unusual requests involved?
 - ❑ Verify applicability of regulations, based upon information in the submission. Most vessels will fall under a dual Subchapter O/D classification, although O/I is also possible if there are no petroleum cargoes. Unlike ordinary tank barges, an inland barge carrying LFGs regulated only under Subchapter D must still have a PRIS. Ensure the Hull Type is correct (I or II) in accordance with the list of desired authorized cargoes. See 46 CFR 30.01, 90.05, and 150.110.
 - ❑ If the vessel is a self-propelled tankship, consult 46 CFR, Subchapter O, Parts 153 and 154. Tankships carrying LFG or other pressurized cargoes will generally require review of a comprehensive loading and stability manual, rather than generation of a PRIS document.
 - ❑ The MSC will generate a PRIS. The PRIS is a document which provides the OCM I with the information required by 46 CFR 151.01-20(b), 151.04-1(b) and (c), and 151.10-15(c), to be placed on the tank barge's COI. Also included will be a statement per 38.01-1, referencing Title 49 and/or 46 CFR 38.01-2. Also included will be a comment in the cover letter, reminding the OCM I to include a comment per 46 CFR 38.01-5 on the COI. The following guidance will be used to determine the loading restrictions that will be placed on each tank/cargo combination:
 - ❑ 46 CFR 38.15-1(b) requires non-refrigerated tanks (most inland tank barges which carry LFGs are not refrigerated) to be filled so that their filling densities shall not exceed the ratios indicated in table 38.15-(1)(b). Filling density is defined as the percent ratio of the weight of the gas in a tank to the weight of water the tank holds at 60 F. However, determination of the maximum filling density should be performed in accordance with 46 CFR 151.45-6, as Table 38.15-1 has been found to be incorrect for butylene, isobutylene, propylene, and butadiene. Cargoes with a specific gravity greater than water require additional scantling design to carry cargo to the tank top, otherwise slack
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carriage of the higher density cargoes is allowed.

- ❑ 46 CFR 151.45-6(a) states that tanks carrying liquids or liquefied gases at ambient temperatures (non-refrigerated) regulated by Subchapter O shall be limited in the amount of cargo loaded to that which will avoid the tank being liquid full at 105 F, if insulated, and 115 F if not insulated.
- ❑ Refrigerated tanks are governed by 46 CFR 38.15-1(a) and 46 CFR 151.45-6(b). An outage of at least 2% is normally required for tank/cargo expansion if refrigeration is lost.
- ❑ The following lists typical cargoes and governing regulations (an asterisk * indicates most common cargoes)

46 CFR 38, table 38.15-(1)(b)

Propane*
butane*
butylene*
propylene*
ethane

ethylene

methane (LNG)

46 CFR 151.50-30(e)

Ammonia, anhydrous*
chlorine*
methyl chloride*
vinyl chloride*
dichlorodifluoromethane

dimethylamine

monochlorodifluoromethane

46 CFR 151, not listed in Table 151.50-30(e)

butadiene*	argon (refrigerated)
ethyl chloride	acetaldehyde
carbon dioxide, liquid	sulfur dioxide
butadiene / butylene mixtures	methylamine
methyl acetylene propadiene mixture (MAPP)	methyl bromide

- ❑ The following cargoes use filling densities listed in the special requirements section:

<u>Cargo</u>	<u>Regulation</u>	<u>filling density</u>
Ethylene oxide	46 CFR 151.50-12(j)	0.83
Propylene oxide	46 CFR 151.50-13(d)	0.80

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- ❑ The submitter should provide the volume of independent tanks in ft³ which carry LFGs or compressed gases.
 - ❑ Determine maximum cargo weight by one of the following two methods:
 - ❑ Table method: obtain the maximum filling density from the tables (as previously noted, do not use this method for butylene, isobutylene, propylene, and butadiene)
 - ❑ Convert each tank's 100% volume to equivalent freshwater weight in short tons:
$$\text{Freshwater Weight} = (\text{volume in ft}^3)(7.4805 \text{ gal/ft}^3)(8.32828 \text{ lb/gal})(\text{ST}/2000 \text{ lbs})$$
 - ❑ Multiply this freshwater tank weight by the listed filling density to get maximum cargo weight in short tons (minus 2% outage):
$$\text{Max Cargo Weight} = 0.98 * \text{Freshwater Weight} * \text{Filling Density}$$
 - ❑ Specific volume method: (must be used for all refrigerated cargoes, but also recommended for non-refrigerated cargoes); obtain the specific volume of the cargo at 105 F (if insulated), or at 115 F (if uninsulated)
 - ❑ Enter the Matheson Gas Data book and interpolate to obtain the specific volume in ft³/lb at either 105 F or 115 F. Butadiene has properties of 4.8989 lbs/gal (0.0272879 ft³/lb) at 105 F, and 4.9625 lbs/gal (0.0269382 ft³/lb) at 115 F.
$$\text{Max cargo weight} = 0.98 * \text{tank volume (ft}^3\text{)} / (\text{specific volume (ft}^3\text{/lb)} * 2000 \text{ lb/ST})$$
 - ❑ Obtain the total cargo load that corresponds to the limiting drafts in the stability study (total displacement minus light ship weight), for each route and cargo density combination desired. Divide this total load proportionately into the tanks according to total tank volumes (in most cases the LFG tank volumes are identical, so that the total load is simply divided by the number of tanks to obtain the maximum load per tank from stability criteria). Compare these values to the maximum weight/tank determined from one of the filling density methods above. The MSC will list the lesser of these maximum weights per tank on the PRIS. Usually LFGs are filling density limited, but some compressed gases such as Methyl Chloride (MTC) are stability limited.

Attachments

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- ❑ None