



GENERATION OF A LIQUEFIED GAS BARGE PLAN REVIEW INFORMATION SHEET (PRIS)

Procedure Number: C1-28

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Purpose

This Plan Review Guideline (PRG) provides guidance on the information required to be submitted to the Marine Safety Center (MSC) in order to receive a Plan Review Information Sheet (PRIS) for liquefied gas tank barges. The PRIS provides the MSC's recommendation to the cognizant Officer in Charge, Marine Inspection (OCMI) for endorsements to the Certificate of Inspection (COI).

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 **C1-28**.

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1. Applicability

This Plan Review Guideline (PRG) is applicable to all Oceangoing and Inland Tank Barges that carry liquefied gases and are regulated under 46 CFR Subchapters D, I, and/or O.

Most vessels will fall under Subchapter D or a dual Subchapter O/D classification. However, if the cargoes to be carried are **not flammable** or **combustible** as indicated by the fire protection requirement in 46 CFR Table 151.05, Subchapters O and D **or** O and I apply to the barge. The option for applying D or I is left up to the barge owner. The owner must request I/O certification on the Application for Inspection, otherwise the barge will be regulated under D/O. (see 46 CFR 151.01.10(c)).

Unlike ordinary tank barges, an inland barge carrying liquefied flammable gases (LFGs) regulated only under Subchapter D must still have a PRIS.

If the vessel is a self-propelled tankship, consult 46 CFR, Subchapter O, Parts 153 and 154. Tankships carrying liquefied gases or other pressurized cargoes will generally require review of a comprehensive loading and stability manual, rather than generation of a PRIS document.

For foreign gas ships requesting a Subchapter O Endorsement in accordance with 46 CFR 154.22, please refer to the guidance in Plan Review Guide C1-43.

2. Background

The MSC will generate a PRIS when applicable. The PRIS is a document which provides the OCMI with the following:

- (a) 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.
- (b) A statement per 38.01-1, referencing Title 49 and/or 46 CFR 38.01-2.
- (c) A comment in the cover letter, reminding the OCMI to include a comment per 46 CFR 38.01-5 on the COI.

Enclosure (1) provides an example PRIS for reference.

3. References

- (a) [46 CFR Subchapter D](#)
- (b) [46 CFR Subchapter O](#)
- (c) [46 CFR Subchapter I](#)
- (d) [46 CFR Subchapter S](#)
- (e) ABS Rules for Building and Classing Steel Barges, as amended

- (f) ABS Rules for Building and Classing Steel Vessels for Service on Rivers and Intracoastal Waterways, as amended
- (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
- (i) [CG-ENG Policy Letter 02-15, “Design Standards for U.S. Barges Intending to Carry Liquefied Natural Gas in Bulk,” dated April 10, 2015](#)

4. Definitions

Filling Density (46 CFR 38.15-1(c)):

The percent ratio of the weight of the gas in a tank to the weight of water the tank holds at 60 °F.

Liquefied Flammable Gas (46 CFR 30.10-39):

Any flammable gas having a Reid vapor pressure exceeding 40 pounds, which has been liquefied.

5. General Guidance

Using applicable portions of references (a) through (i), the submitter shall provide sufficient documentation and plans in order for MSC to generate the Plan Review Information Sheet (PRIS) for liquefied gas barges. 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. At a minimum, submissions should include:

- (a) General Arrangements.
- (b) Lines, offsets, or electronic hull model.
- (c) Tank Capacity Tables/Plan.
- (d) Hydrostatic Tables.
- (e) Intact and Damage Stability Calculations indicating Type of Hull.
- (f) Lightship calculations.
- (g) Structural Calculations for Tank Supports.
- (h) Pressure Vessel Plans and Calculations (as applicable).
- (i) Hull Scantling Calculations.
- (j) A list of cargo the vessel is to carry.

Ensure the Hull Type is correct (I or II) in accordance with the list of desired authorized cargoes. In accordance with 46 CFR 38.05-1(f), all liquefied gas barges must meet the requirements for Type II. See [46 CFR Table 151.05](#) for specific hull type requirements for Subchapter O liquefied gas cargoes.

6. List of Typical Cargoes

The following lists typical liquefied gas cargoes and the associated governing regulations (an asterisk * indicates most common cargoes):

46 CFR 38, table 38.15-1(b)	46 CFR 151.50-30(e)**
Propane*	Ammonia, anhydrous*
Butane*	Chlorine*
Butylene*	Methyl chloride*
Propylene*	Vinyl chloride*
Ethane	Dichlorodifluoromethane
Ethylene	Dimethylamine
Methane (LNG)	Monochlorodi-fluoromethane

Other 46 CFR 151 Cargoes (not listed in Table 151.50-30(e))	
Butadiene*	Propylene Oxide*
Argon (refrigerated)	Acetaldehyde
Ethyl chloride	Carbon dioxide, liquid
Butadiene / Butylene mixtures	Ethylene Oxide
Methylamine	Methyl bromide
Methyl acetylene propadiene mixture (MAPP)	Sulfur dioxide

**Table 151.50-30(e) contains restrictions on the maximum permitted filling density and minimum design pressure of the tank for certain cargoes, as indicated above. For cargoes listed in 46 CFR 151, but not included in Table 151.50-30(e), the maximum amount of cargo shall be in accordance with 46 CFR 151.45-6(b) and the tank shall be designed in accordance with 46 CFR 151.15-3(b)(3).

7. Loading Limits

In order to complete the PRIS, loading limits should be calculated for each tank and for the vessel as a whole. Therefore, the submitter should provide the volume of independent tanks in ft³ which carry liquefied or compressed gases.

(a) First, determine the maximum cargo weight for each tank by using one of the following methods:

a. **Filling Density Table Method** (For non-refrigerated cargoes IAW 46 CFR 38.15-1(b) and 46 CFR 151.45-6(a)):

i. Convert each tank's 100% volume to equivalent freshwater weight in short tons using the following formula:

$$\text{Freshwater Weight} = (\text{volume [ft}^3\text{]}) * (7.4805 \text{ gal/ft}^3) * (8.32828 \text{ lb/gal}) * (\text{ST}/2000 \text{ lbs})$$

- ii. Multiply this freshwater tank weight by the filling density obtained from the table in 46 CFR 38.15-1(b) to get maximum cargo weight in short tons (formula accounts for 2% outage).

$$\text{Max Cargo Weight} = (0.98) * (\text{Freshwater Weight}) * (\text{Filling Density}[\%])$$

Note: The determination of the maximum filling density for butylene, isobutylene, propylene, and butadiene should be performed in accordance with 46 CFR 151.45-6, as Table 38.15-1(b) has been found to be incorrect for these cargoes.

Note: Cargoes with a specific gravity greater than water require additional scantling design to carry cargo to the tank top; otherwise, slack carriage of the higher density cargoes is allowed.

Note: 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.

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

Cargo	Regulation	Filling Density
Ethylene oxide	46 CFR 151.50-12(j)	0.83
Propylene oxide	46 CFR 151.50-13(d)	0.80

- b. **Specific Volume Method** (For refrigerated and semi-refrigerated cargoes IAW 46 CFR 38.15-1(a) and 46 CFR 151.45-6(b)):

- i. Enter the Matheson Gas Data book and interpolate to obtain the specific volume in ft³/lb at either 105 °F (if insulated) or 115 °F (if uninsulated). Utilize the formula below to calculate the max cargo weight in short tons (formula accounts for 2% outage).

$$\text{Max Cargo Weight} = (0.98) * (\text{volume [ft}^3\text{]}) / (\text{specific volume [ft}^3\text{/lb]} * 2000[\text{ lb/ST}])$$

Note: An outage of at least 2% is normally required for tank/cargo expansion if refrigeration is lost.

Note: This method must be used for all refrigerated and semi-refrigerated cargoes, but is also recommended for non-refrigerated cargoes.

Note: Butadiene has the following properties:

4.8989 lbs/gal (0.0272879 ft³/lb) at 105°F, and
4.9625 /gal (0.0269382 ft³/lb) at 115°F.

- (b) In order to determine the maximum cargo weight (per tank) that will be listed on the PRIS:
- Calculate 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 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 per tank determined from one of the methods above. The MSC will list the lesser of these maximum weights per tank on the PRIS.

(c) Calculate the vessel's maximum design pressure and minimum service temperature:

- For new construction vessels, or if there is no COI or PRIS available, the minimum service temperature is determined by calculating the service temperature for each desired gas, and selecting the lowest value. Service temperature is typically determined as follows (See 46 CFR 38.05-2, and 151.15-3(b)(5) for additional guidance):

$$T_s = T_w - 0.25(T_w - T_B)$$

where:

T_s = Service temperature (°F).

T_w = Boiling temperature in °F of gas at normal working pressure of container (tank) but not higher than 32°F.

T_B = Boiling temperature in °F of gas at atmospheric pressure.

- Note:** the service temperature may impact additional requirements. Please see 46 CFR 38.05-3, 151.15-3(b)(3), and 151.50-30(e).

8. Cargo Authority

Liquefied gas cargoes do not require a Cargo Authority Attachment (CAA). The COI will list loading conditions specific to each liquefied gas cargo. The loading constraints meet the requirement for the COI endorsement for liquefied gas cargoes.

If the vessel is oceangoing, carriage of liquefied gas cargoes will be restricted to domestic voyages only. There is no international standard for non-self-propelled vessels carrying liquefied gases. Barge owners desiring authority to carry liquefied gases on international routes must contact Commandant (CG-ENG-5) for guidance. Note that reference (i) contains guidance specific to the carriage of Liquefied Natural Gas (LNG) in non-self-propelled vessels.

9. 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.

Example of a Liquefied Gas Barge Plan Review Information Sheet (PRIS)

MSC Project No. P019496	January 7, 2016	Serial No. C1-1600058						
Plan Review Information Sheet (PRIS) for Unmanned Inland Tank Barge								
1. Vessel Identification		ABS classified?						
CONRAD Hull No. C-1109	Hull Type II/III	Service O/D						
		LL Only						
2. Route Permitted - Routes and Conditions								
R	Rivers							
LBS	Lakes, Bays, and Sounds (LBS)							
O	Oceans							
3. Cargo Authority - "Authorization" Tab in "Cargo" Window								
<u>Authorization:</u>								
46 CFR Sub. D Authority:	Highest Grade	LFG Capacity (bbls) 33,996						
46 CFR Sub. O Authority:	Part 151	No Part 153 No Part 154 No						
33 CFR Sub. O Authority:	Part 151.47	No Part 151.49a No Part 151.49b No						
4. "Conditions of Carriage" Tab in "Cargo" Window								
The following statements should appear at the beginning of the COI's "Conditions of Carriage" section:								
Inspected and approved for the carriage of liquified flammable gases (LFGs) at a pressure not to exceed 265psi and at temperatures not less than ambient. Those LFGs that have been authorized for carriage are identified by their CHRIS Code in the Loading Constraints below.								
Mixtures of the Subchapter D liquified flammable gas cargoes listed below are also authorized for carriage subject to the loading and stability constraints of the least dense cargo in the mixture.								
Mixtures of Subchapter O and D liquified gas cargoes not specified below must be approved by the Marine Safety Center prior to being authorized for carriage.								
In accordance with 46 CFR 150.130, the Person In Charge of the vessel is responsible for ensuring that the compatibility requirements of 46 CFR 150 are met. Cargoes must be checked for compatibility using the figures, tables, and appendices of 46 CFR 150.								
The max. tank weights listed below reflect uniform (within 5%) loading at the deepest draft allowed. When carrying Subchapter O cargoes at shallower drafts, the barge(s) should always be loaded uniformly.								
5. Loading Constraints								
The OCM should enter the following information into the "Cargo Tanks" and "Stability Constraints" tabs within the Cargo Window of MISLE								
Loading Constraints - Structural				Loading Constraints - Stability				
	Cargo (CHRIS Code)	Max Cargo Wgt/Each Tank (ST)	Max Density (lbs/gal)	Cargo (CHRIS Code)	Route	Max. Load (ST)	Max Draft (ft, in)	Max Density (lbs/gal)
P/S	BDI	3531	5.228	BDI	O	3531	10' - 4 1/2"	5.228
P/S	BTN	3323	5.149	BTN	O	3323	10' - 0 5/8"	5.149
P/S	BUT	3255	4.880	BUT	O	3255	9' - 11 1/4"	4.880
P/S	PPL	2815	4.348	PPL	O	2815	9' - 2 7/8"	4.348
P/S	PRP	2717	4.246	PRP	O	2717	9' - 1"	4.246
P/S	IBT	3138	4.690	IBT	O	3138	9' - 9"	4.690