

U.S. Department of  
Homeland Security

United States  
Coast Guard



Commandant  
United States Coast Guard

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CG-ENG Policy Letter  
No. 02-15  
April 10, 2015

From: J. W. Mauger, CAPT  
COMDT (CG-ENG)

To: Distribution

Subj: DESIGN STANDARDS FOR U.S. BARGES INTENDING TO CARRY LIQUEFIED  
NATURAL GAS IN BULK

Ref: (a) Coast Guard CG-521 Policy Letter No. 01-12 Equivalency Determination – Design  
Criteria for Natural Gas Fuel Systems.

1. Purpose. As interest in the use of LNG as a maritime fuel has increased, the Coast Guard has been approached by a number of vessel designers and operators requesting specificity regarding the design and operation of barges carrying LNG in bulk. This policy recommends design details for barges carrying LNG in bulk within the existing regulatory framework. This document consolidates guidance the Coast Guard has given to industry personnel who are designing LNG barges and to the Coast Guard personnel who are reviewing those designs.
2. Directives Affected. None.
3. Background.
  - a. The increase in domestic production of natural gas has generated renewed interest in the transportation of LNG in bulk via barge. Applications include the transportation of LNG between shore-based facilities along inland and coastal routes and the use of barges to bunker ships which use LNG as a fuel.
  - b. All barges designed to carry LNG in bulk must meet the requirements of 46 Code of Federal Regulations (CFR) Chapter I, Subchapter D (Subchapter D); however, Subchapter D is silent on details with respect to many design aspects (e.g., it requires “adequate notch toughness”, “suitable material”, “suitable for the temperatures”, etc.) Self-propelled vessels carrying LNG, in addition to Subchapter D, are required to meet Part 154 in 46 CFR Chapter I, Subchapter O (Subchapter O), which provides more detail specific to carrying LNG in bulk. Non self-propelled vessels carrying LNG, however, are not required to meet Subchapter O.

- c. The Coast Guard has received requests from industry seeking clarity regarding the application of Subchapter D to non-self-propelled vessels carrying LNG in bulk. The Coast Guard consulted with the Chemical Transportation Advisory Committee (CTAC) and the public through a series of seven public meetings regarding the best way to address the issues raised in these requests. This outreach was designed to help us address the vessel designs that were most likely to be adopted first. CTAC recommended that 46 CFR Part 154 be used as a basis for recommending the design details for non self-propelled vessels because it has specific standards, based on international guidelines, for the safe transport of LNG in bulk. The Coast Guard used the CTAC recommendations to develop this policy letter.

#### 4. Discussion

- a. This policy applies only to non self-propelled vessels on domestic routes which:
  - (1) Transport LNG in bulk, whether in single tanks or multiple tanks connected through a common manifold;
  - (2) Are dedicated to LNG carriage only; and
  - (3) Do not supply power or fuel from a barge to a towing vessel.
- b. In complying with Subchapter D, we recommend following the best practices outlined in Enclosure (1). Enclosure (1) is based on Subchapter O but shows how certain details within Subchapter O could be modified to apply to non self-propelled vessels. Other ways of modifying Subchapter O, as well as other ways of complying with Subchapter D, may be permissible. Please consult the Marine Safety Center pursuant to 46 CFR 30.15-1.
- c. Although Enclosure (1) provides a comprehensive set of design details, the Coast Guard has observed extensive innovation and a variety of equipment and design alternatives during concept review discussions. Given the variation, we recommend the completion of a comprehensive hazard analysis to address the potential failures, mitigations and consequences of the design, even if it has been designed to meet the standards identified in Enclosure (1). There are several sources available to aide in conducting a thorough hazard analysis; these include: Classification Society guides, industry association guides, and hazard analyses required by other agencies or the International Maritime Organization.
- d. This policy letter does not address operating requirements for the barges, including manning, certification, navigation restrictions, and transfer procedures. However some operating assumptions may affect the design of the barge, cargo system containment, and equipment. The cognizant Officer in Charge, Marine Inspection (OCMI) has the authority to make decisions with regard to operating requirements, including manning, certification, and navigation restrictions. Proposals regarding operating requirements should be discussed with the cognizant OCMI early in the design phase, taking into account the cargo system design (i.e., tank type, equipment on the barge, automation

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controls and alarms), route, operating plan, and applicable risk and suitability assessments.

5. Disclaimer. This policy is not a substitute for applicable legal requirements, nor is in 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 position 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. Alternative approaches for complying with these requirements may be considered. Information should be made available to Commandant (CG-ENG) to show that the approach satisfies the requirements of the applicable statutes and regulations.
6. Questions. Questions or concerns regarding this policy may be directed to Commandant (CG-ENG-5) at (202) 372-1412 or emailed to [HazmatStandards@uscg.mil](mailto:HazmatStandards@uscg.mil).

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Enclosure: (1) Design Guidance for Non Self-Propelled Vessels Carrying Liquefied Natural Gas in Bulk

Dist: COMDT (CG-CVC)  
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CG LGCNCOE

## Design Guidance for Non Self-Propelled Vessels Carrying Liquefied Natural Gas in Bulk

The following guidance provides one option of how non self-propelled vessels carrying liquefied natural gas (LNG) in bulk can show compliance with certain sections of 46 Code of Federal Regulations (CFR) Chapter I, Subchapter D (Subchapter D) through the voluntary application of 46 CFR Part 154 (Part 154). Although regulatory requirements are quoted, these excerpts from Part 154 do not apply to non-self-propelled vessels, and the Coast Guard is not requiring barges to meet them. Instead, these excerpts from and modifications to Part 154 provide detailed guidance that is not provided by the regulatory requirements in Subchapter D. Unless otherwise indicated, as required by 46 CFR 38.05-1, barges carrying LNG must be of Type II barge hull.

The excerpts and modifications in this enclosure are based on recommendations from the Chemical Transportation Advisory Committee (CTAC). They are intended to be read and applied together without further modification. Although there may be other ways to comply with Subchapter D and other ways to apply details of 46 CFR Chapter I, Subchapter O within Subchapter D, those alternatives are not covered by this policy letter.

Where specific terms are used in this enclosure, the definitions for those terms can be found in 46 CFR 154.7, except as indicated below:

- a) *Cargo handling rooms* are cargo pump rooms, cargo compressor rooms, or any room that contains equipment which processes or conveys cargo or cargo vapors.
  - b) *Gas-dangerous space* means a hazardous location as defined in 13(b) of this enclosure and specified in 13(d) below.
  - c) *Barge Situational Assessment (BSA)*: Conducted by the barge operator, this site-specific assessment is intended to ensure the barge is suitable for the desired operation. It would include an evaluation of the risk of collision and allision of the barge during transits and at bunkering locations. For bunker barges, it would include the Vessel Compatibility Assessment described in Enclosure (2) of CG-OES Policy Letter 02-15. Risk mitigation measures identified in this phase are to be addressed in the operations manuals (e.g., location of barges relative to the bunkered vessel, etc.) and through site-level control measures (e.g., safety zones, speed restrictions, etc.).
1. Comply with 46 CFR Part 154 Subpart C and the sections of Subpart E which affect vessel design (46 CFR 154.1836, 154.1838, 154.1844, 154.1848, and 154.1854), except as modified in this enclosure.
  2. § 154.170 – 154.195 Hull Structure  
In lieu of the requirement that outer hull steel plating meet the material standards of the American Bureau of Shipping “Rules for Building and Classing Steel Vessels”, barges in unrestricted service may apply the current American Bureau of Shipping “Rules for Building and Classing Steel Barges”, and inland barges may apply the current American Bureau of Shipping “Rules for Building and Classing Steel Vessels for Service on Rivers and Intracoastal Waterways”. Since neither of the latter rules refers to the carriage of LNG, in all cases, the applicable portions regarding LNG from the American Bureau of

Shipping “Rules for Building and Classing Steel Vessels” should also be used. The equivalent Rules of Recognized Classification Societies authorized by the U.S. Coast Guard to issue International Certificates of Fitness for the Carriage of Liquefied Gases in Bulk may be substituted for the American Bureau of Shipping Rules. (See 46 CFR Part 8, Subpart B. A current listing of U.S. Coast Guard Recognized Classification Societies is available at <http://www.uscg.mil/hq/cg5/acp/>.) All other hull structural requirements of Subpart C apply.

3. § 154.200 Stability requirements: General

Each barge must meet the requirements in Subchapter S Part 170 and Part 172 Subpart E as modified below.

- a) Barges in unrestricted (Oceans/Coastwise) service must meet the ship survivability requirements for type IIG hull as given in 46 CFR Part 172, Subpart G.
- b) Inland (Great Lakes/Rivers) barges may use at least the ship survivability requirements for Type II barge hull given in 46 CFR Part 172, Subpart E.

4. § 154.235 Cargo Tank Location

Cargo tanks must be located at the distances given in the following table.

		<b>Barge function</b>		
		Bunkering	Shipping between ports	
Operating Area	Unlimited	Bunkering/loading may occur at various locations that have not been evaluated for collision/allision risk through a BSA	At least B/5 inboard from the barge’s side shell and box end, and located above B/15 from the bottom shell, where B is the greatest moulded breadth of the barge. Additionally, the cargo tank(s) shall be located a minimum of 25 feet from the headlog at the bow.	Meet tank location requirements from 46 CFR 32.63-25(b)(2) for a Type II barge
	Limited	Requires completion of a BSA prior to bunkering/loading in a given operating area and may require implementation of risk control measures for that specific area	Meet tank location requirements from 46 CFR 32.63-25(b)(2) for a Type I barge	Meet tank location requirements from 46 CFR 154.235 for a type IIG ship

5. § 154.320 Cargo control station

To reflect the differences between self-propelled and non self-propelled vessels, the text in 46 CFR 154.320 should be read as follows:

- a) The cargo control station shall be above the weather deck.
- b) If a cargo control station is in a service or control space or has access to such a space, the station shall:
  - (1) Be a nonhazardous location;

- (2) Have an access to the space that meets 46 CFR 154.330 (as discussed in section 6 of this enclosure); and
  - (3) Have indirect reading instrumentation, except for gas detectors.
  - c) A cargo control station shall contain all alarms, indicators, and remote controls associated with each cargo tank and all associated machinery.
  - d) When under tow, an easily accessible remote group alarm instrumentation and control panel shall be located in a manned station on the towing vessel. A remote group or summary alarm panel shall provide visual alarms that are summarized or grouped by function, system, or equipment to allow any necessary action to be taken. The system shall be able to simultaneously indicate more than one alarm condition and not prevent actuation of subsequent alarms because of previous alarm acknowledgement.
  - e) Appropriate segregation shall be maintained between control, monitoring, alarm, and safety functions to limit the effect of single failures. This shall include all parts of the integrated or automated systems that are required to provide specified functions, including connected devices and power supplies.
  - f) The remote group alarm, instrumentation and control panel shall be designed such that the equipment under control can be operated in a safe and effective manner at all times. A hardware failure or an error by the operator must not lead to an unsafe condition. Systems and equipment shall be designed to fail-safe or to the least hazardous condition. Adequate safeguards against incorrect operation shall be provided.
  - g) The monitoring and controls in the cargo control station shall remain operable after a remote group alarm, instrumentation and control panel failure.
  - h) When under tow, means of communications shall be provided between the cargo control station and the remote group alarm, instrumentation and control panel location.
6. § 154.330 Openings to accommodation, service, or control spaces  
To reflect the differences between self-propelled and non self-propelled vessels and to eliminate the requirements that do not apply to LNG, the text in 46 CFR 154.330 should be read as follows:
- a) Entrances, forced or natural ventilation intakes and exhausts, and other openings to service, or control spaces, except as allowed in 6(c) of this enclosure, shall be:
    - (1) At least  $L/25$  or 3.05m (10 ft) from the athwartship bulkhead facing the cargo area, whichever is farther, except that the distance need not exceed 5m (16.4 ft); and
    - (2) On a house athwartship bulkhead not facing the cargo area or on the outboard side of the house.
  - b) Each port light, located on the athwartship bulkhead of a house facing the cargo area or the house sides within the distance specified in 6(a)(1) of this enclosure, shall be a fixed type.
  - c) Doors and windows may be within the distance specified in 6(a)(1) of this enclosure from the athwartship bulkhead of a house facing the cargo area, if they have gaskets and pass a tightness test with a fire hose at not less than 207 kPa gauge (30 psig).
  - d) Port lights in the hull plating below the uppermost continuous deck, or in the first tier of the superstructure, shall be a fixed type.
  - e) Air intakes and openings into service and control spaces shall have metal closures that pass a tightness test with a fire hose at not less than 207 kPa gauge (30 psig).

7. § 154.345 Access to hazardous locations

To reflect the changes in hazardous areas in section 13 of this enclosure, the text in 46 CFR 154.345 should be read as follows:

- a) An enclosed space that has direct access to a Zone 1 (Division 1) or Zone 2 (Division 2) location is the same zone or division as that location, except:
  - (1) An enclosed space that has direct access to a Zone 1 (Division 1) location is not a hazardous location when provided with:
    - (a) an air lock consisting of two steel doors, at least 1.5 m (4.9 ft.) but not more than 2.5 m(8.2 ft.) apart, each gasketed and tight when tested with a fire hose at not less 207 kPa gauge (30 psig);
    - (b) self-closing doors with no latches or other devices for holding them open;
    - (c) audible and visual alarms, at the cargo control station (a manned location), on both sides which are actuated when both door securing devices are in other than the fully closed position at the same time;
    - (d) ventilation from a nonhazardous area that causes greater pressure in the space than in the Zone 1 (Division 1) location;
    - (e) a rate of air change in the space between the doors of at least 8 changes per hour;
    - (f) gas detection monitoring between the doors for cargo vapor leaks under 46 CFR 154.1350;
    - (g) ventilation in the nonhazardous location to make the pressure in the space greater than that in the air lock; and
    - (h) a means of automatically deenergizing all electrical equipment that is not certified for Zone 1 (Division 1) in the space when the pressure in the space falls to or below the pressure in the air lock.
  - (2) An enclosed space that has direct access to a Zone 1 (Division 1) location can be considered as a Zone 2 (Division 2) location when provided with:
    - (a) a steel access door, gasketed and tight when tested with a fire hose at not less 207 kPa gauge (30 psig);
    - (b) a self-closing, gastight access door that opens into the space and that has no hold-back device;
    - (c) ventilation that causes the air to flow with the door open from the space into the Zone 1 (Division 1) location;
    - (d) visual and audible alarms at a cargo control station (manned control station) on a loss of ventilation; and
  - (3) An enclosed space that has direct access to a Zone 2 (Division 2) location is not a hazardous location when provided with:
    - (a) a self-closing, gastight access door that opens into the space and that has no hold-back device;
    - (b) ventilation causes the air to flow with the door open from the space into the Zone 2 (Division 2) location; and
    - (c) loss of ventilation alarm at a cargo control station (manned control station).
- b) Electrical equipment and devices installed in spaces made non-hazardous by the methods indicated in 7(a) of this section shall be limited to essential equipment.
- c) Enclosed hazardous (classified) locations are to be provided with ventilation as required to maintain them at a pressure lower than adjacent less hazardous locations by a minimum differential of 25 Pa (0.1 in. H<sub>2</sub>O).

8. § 154.409 Dynamic loads from vessel motion  
Barges in unrestricted service must meet the dynamic loads given in 46 CFR 154.409. Inland barges may use the loads given in 46 CFR 38.05-2.
9. §§ 154.418 - 154.421, 154.610, and 154.615  
These paragraphs do not apply to vessels carrying LNG.
10. §§ 154.705 – 154.709 Methane and Cargo Boil-off as Fuel: General  
Equipment using natural gas on the barge may comply with reference (a) in lieu of 46 CFR 154.705 - 154.709.
11. § 154.805(e) Vent masts  
If the distance required by 46 CFR 154.805(e) is not feasible, the distance may be based on a dispersion analysis accepted by the Marine Safety Center.
12. § 154.901(d)(1) Atmospheric control within cargo tanks and cargo piping systems  
Gas sampling points may be on the top and bottom fill lines rather than the cargo tank.
13. §§ 154.1000 – 154.1020 Electrical  
To harmonize with international standards and other Coast Guard guidance (e.g., reference a), the requirements in 46 CFR 154.1000 - 154.1020 should be read as follows:
  - a) General Requirements. Electrical installations should not normally be in hazardous areas. Where necessary for operational purposes, the equipment should be located in the least hazardous area practicable.
  - b) Hazardous locations
    - (1) *Special Division 1* is a Class I, Zone 0 hazardous location in Article 505 of the National Electrical Code that may require special considerations for electrical equipment installed in such locations.
    - (2) *Zone 0* is a hazardous location in which an explosive gas or vapor in mixture with air is continuously present or present for long periods.
    - (3) *Zone 1* is a hazardous location in which an explosive gas or vapor in mixture with air is likely to occur in normal operating conditions.
    - (4) *Zone 2* is a hazardous location in which an explosive gas or vapor in mixture with air is not likely to occur in normal operating conditions, or in which such a mixture, if it does occur, will only exist for a short time.
  - c) Equipment and Installation Standards. Electrical installations in hazardous locations must comply with 13(c)(1), 13(c)(2), or 13(c)(3) of this enclosure.
    - (1) NFPA 70 (2014) Articles 500 through 504. Equipment identified for Class I locations should meet the provisions of Sections 500.7 and 500.8 of the NFPA 70 (2014) and tested and listed by an independent laboratory to any of the following standards:
      - (a) ANSI/UL 674, ANSI/UL 823, ANSI/UL 844, ANSI/UL 913, ANSI/UL 1203, UL 1604 (replaced by ANSI/ISA 12.12.01) or ANSI/UL 2225;
      - (b) FM Approvals Class Number 3600, Class Number 3610, Class Number 3611, Class Number 3615 or Class Number 3620; or
      - (c) CSA C22.2 Nos. 0-M91, 30-M1986, 157-92 or 213-M1987.



Note: See Section 501.5 of the NEC for use of Zone equipment in Division designated spaces.

- (2) NFPA 70 (2014) Article 505. Equipment identified for Class I locations should meet the provisions of Sections 505.7 and 505.9 of NFPA 70 (2014) and be tested and listed by an independent laboratory as meeting one or a combination of the ANSI/ISA 60079 Series of standards incorporated in NFPA 70 (2014).

Note: See Section 505.20 of the NEC for use of Division equipment in Zone designated spaces.

- (3) Electrical apparatus in hazardous locations should meet one or the combination of IEC 60079-1, -2, -5, -6, -7, -11, -13, -15, -18 or -25 standards. Certified safe-type equipment should be tested by an IECEx System Testing Laboratory (ExTL), and certified by an IECEx System Ex Certification Body (ExCB), both accepted by the Coast Guard under 46 CFR 159.010. Certification under the European Union's (EU) ATEX Directive (94/9/EC) is not acceptable.
- d) Hazardous Locations. Gas-dangerous spaces are divided into three zones.
- (1) Zone 0 (Class I Special Division 1)  
The following are Zone 0 (Class I Special Division 1) locations.
- (a) The interiors of all LNG tanks;
  - (b) Interior of any pipework of pressure-relief or other venting systems for cargo tanks;
  - (c) Pipes and equipment containing LNG or LNG vapor;
  - (d) Interbarrier spaces;
  - (e) Hold spaces containing cargo tanks only where the cargo tank requires a secondary barrier;
  - (f) Cargo handling rooms;
  - (g) Areas on an open deck, or semi-enclosed spaces on open deck, within 0.5 meters (1.6 feet) of any cargo handling room entrance and cargo handling room ventilation inlet or outlet; and
  - (h) An enclosed or semi-enclosed space having an opening into a Zone 0 (Class I Special Division 1) location.
- (2) Zone 1 (Class I Division 1)  
The following are Zone 1 (Class I Division 1) locations:
- (a) Hold spaces containing independent cargo tanks only where the cargo tank does not require a secondary barrier;
  - (b) Cofferdams and permanent (for example, segregated) ballast tanks adjacent to cargo tanks;
  - (c) Enclosed or semi-enclosed spaces, immediately above cargo tanks requiring a secondary barrier (for example, between decks) or having bulkheads above and in line with cargo tank bulkheads forming a cruciform joint, unless that cruciform joint is protected by an arrangement as required in §154.325(b);
  - (d) Areas on open deck, or semi-enclosed spaces on open deck, within 1.5 m of any cargo tank outlet, gas or vapor outlet cargo manifold valve, cargo valve, or cargo pipe flange;
  - (e) Areas on open deck, or semi-enclosed spaces on open deck, 1.0 m beyond the areas defined in 13(d)(1)(g) of this enclosure;

- (f) Areas on open deck, or semi-enclosed spaces on open deck above and in the vicinity of any cargo tank or interbarrier space relief valve vent riser within a vertical cylinder of unlimited height and 6 m radius centered upon the center of the outlet, and within a hemisphere of 6 m radius below the outlet;
  - (g) Areas on open deck, or semi-enclosed spaces on open deck, within 1.5 m of openings into cofferdams or other Zone 1 spaces;
  - (h) Areas on open deck within spillage coamings surrounding cargo manifold valves and 3 m beyond these, up to a height of 2.4 m above the deck;
  - (i) Areas on open deck over outer surfaces of cargo tanks that are exposed to the weather, including tank domes, where structures are restricting the natural ventilation
    - i. within a distance of 2.4 m from the exposed surface of the cargo tank; and
    - ii. 3 m horizontally along the deck outward from the surfaces of the cargo tank where it meets the deck to a height of 2.4 m;
  - (j) Compartments for cargo hoses;
  - (k) Enclosed or semi-enclosed spaces in which pipes containing LNG or LNG vapor are located, unless the piping systems meet the requirements in 46 CFR 154.706;
  - (l) A space separated from a hold space, where LNG is carried in a cargo tank requiring a secondary barrier, by a single gastight boundary;
  - (m) Enclosed or semi-enclosed spaces in which pipes containing LNG, LNG vapor or natural gas for gas fuel burning systems are located, unless special precautions approved by the Marine Safety Center are provided to prevent flammable gas escaping into such spaces (note: For boil-off piping systems containing LNG, LNG vapor, or natural gas for gas fuel burning systems, compliance with reference (a) or 46 CFR 154.705 - 154.709 will not require approval by the Marine Safety Center); and
  - (n) An enclosed space or semi-enclosed space having an opening into any Zone 1 (Class I Division 1) location.
- (3) Zone 2 (Class I Division 2)
- The following are Zone 2 (Class I Division 2) locations:
- (a) Areas of 1.5 m surrounding open or semi-enclosed spaces of Zone 1 as specified in 13(d)(2)(d), 13(d)(2)(e), 13(d)(2)(g), 13(d)(2)(h) of this enclosure, if not otherwise specified below;
  - (b) Spaces 4 m beyond the cylinder and 4 m beyond the hemisphere defined in 13(d)(2)(f) of this enclosure;
  - (c) The spaces forming an air-lock as defined in 46 CFR 154.345 and as modified by paragraph 7 of this enclosure;
  - (d) Areas on open deck over outer surfaces of cargo tanks that are exposed to the weather, including tank domes, where unrestricted natural ventilation is guaranteed
    - i. within a distance of 2.4 m from the exposed surface of the cargo tank; and
    - ii. 3 m horizontally along the deck outward from the surfaces of the cargo tank where it meets the deck to a height of 2.4 m; and
  - (e) Spaces forward or aft of the open deck areas of Zone 1 locations in 13(d)(2)(i) and 13(d)(3)(d) of this enclosure, below the level of the main deck, and having

- an opening on to the main deck or at a level less than 0.5 m above the main deck, unless:
- i. the entrances to such spaces do not face the Zone 1 locations in 13(d)(2)(i) and 13(d)(3)(d) of this enclosure and, together with all other openings to the spaces, including ventilating system inlets and exhausts, are situated at least 5 m from the cited Zone 1 locations and at least 10 m measured horizontally from any cargo tank outlet or gas or vapor outlet; and
  - ii. the spaces are mechanically ventilated.
- (4) The following are additional requirements pertaining to hazardous locations for cargo handling rooms:
- (a) Providing ventilation to re-classify the cargo handling rooms is not allowed.
  - (b) Where fitted, LNG pumps and vapor compressors shall be isolated from all sources of vapor ignition by gastight bulkheads. Cable penetrations of gastight bulkheads should be provided with the appropriate cable sealing fittings. The gastight bulkhead between the pump or compressor room and the pump motor compartment may be pierced by the motor drive shaft provided that the shafts are fitted with fixed oil reservoir gland seals, pressure grease seals, double lip seal with nitrogen purge or similar gas tight arrangements where they pass through the gastight bulkheads. The arrangement of the gas tight shaft seals shall be specially approved by the Marine Safety Center. Access to a cargo handling room should be from the open deck.
  - (c) Fixed lights in cargo handling rooms should meet the arrangement and construction requirements in 46 CFR 111.105-31(g).
  - (d) A cargo handling room design that precludes the lighting arrangement of paragraph 13(d)(4)(c) of this enclosure, or where the lighting arrangement of paragraph 13(d)(4)(c) of this enclosure does not give the required illumination level, may install explosion proof, flameproof (Ex “d”) or flameproof-increased safety (Ex “de”) lighting fixtures.
- (5) Electrical equipment that complies with NFPA 496 is acceptable for installation in Class I, Divisions 1 and 2. When equipment meeting this standard is used, it does not need to be identified and marked by an independent laboratory. The Marine Safety Center will evaluate equipment complying with this standard during plan review.
- (6) Equipment listed or certified to ANSI/ISA 60079-18 or IEC 60079-18 (Ex “ma”), is not permitted in Zone 0 (Class I, Special Division 1) hazardous locations unless the encapsulating compound of Ex “ma” protected equipment is not exposed to, or has been determined to be compatible with LNG.
- e) Lighting Systems. Lighting circuits serving flameproof or explosion proof lighting fixtures in an enclosed hazardous space or room should:
- (1) Have at least two lighting branch circuits;
  - (2) Be arranged so that there is light for relamping any deenergized lighting circuit;
  - (3) Not have the switch and overcurrent device within the space for those spaces containing explosion proof or flameproof lighting fixtures; and,
  - (4) Have a switch and overcurrent protective device that should open all ungrounded conductors of the circuit simultaneously.

- f) Submerged Pumps. Submerged pump motors may be installed in tanks based on plans and installation details approved by the Marine Safety Center. Installation should include:
  - (1) A low liquid level, low motor current, or low pump discharge pressure that will automatically shutdown power to the motor if the pump loses suction;
  - (2) An audible and visual alarm at the cargo control station actuated by the shutdown of the motor; and,
  - (3) A lockable circuit breaker or lockable switch that disconnects power to the motor.
- g) Cable and Wiring in Hazardous Locations.
  - (1) Cable and wiring should comply with the cable construction and testing requirements of IEEE Std 1580 (2001); UL 1309; MIL-C-24640B; MIL-C-24643A, or IEC 60092-350 (2008) and IEC 60092-353 (2011), including the respective flammability tests contained therein, and should be of a copper-stranded type.
  - (2) For intrinsically safe systems, the wiring methods should meet Sections 504.20 and 504.30 of NEC 2011.
  - (3) Conduit and cable seals and sealing methods should meet Clause 6.8 of API 14F (1999).
  - (4) Type MC cables, when installed, should meet the requirements in 46 CFR 111.60-23.
  - (5) For the electrical apparatus in 13(c)(3), the cable and wiring systems should meet Clauses 7.3 through 7.6 of IEC 60092-502(1999).
- h) Internal Combustion Engines. Internal combustion engines installed in Zones 1 and 2 (Class I, Divisions 1 and 2) should meet the requirements in ASTM F2876–10 “Standard Practice for Thermal Rating and Installation of Internal Combustion Engine Packages for use in Hazardous Locations in Marine Applications.”

14. § 154.1110 Areas protected by system

Current 46 CFR 154.1110 does not reflect the differences between self-propelled and non self-propelled vessels. For purposes of this policy letter, read 46 CFR 154.1110 to also include:

“(i) Each boundary facing the cargo area of each superstructure that contains machinery spaces.”

15. § 154.1130 Sections

To reflect the differences between self-propelled and non self-propelled vessels, the standards in 46 CFR 154.1130(b) should be read as follows:

“(b) If the water spray system is divided into sections, the control valves must be at a single manifold that is located adjacent to the fire pump(s) and must be capable of remote control from the towing vessel.”

16. § 154.1135 Pumps

Current 46 CFR 154.1135 does not reflect the differences between self-propelled and non self-propelled vessels. For purposes of this policy letter, read 46 CFR 154.1135 to also include:

“(e) Each fire pump must be capable of local control, and must be provided with a means of remote control from the towing vessel.”

17. § 154.1140 Dry chemical system: General

To reflect the differences between self-propelled and non self-propelled vessels, 46 CFR 154.1140 should be read as follows:

“Each liquefied natural gas barge must have a dry chemical fire-fighting system or appropriately sized USCG approved semi-portable fire extinguishers that meet § 154.1145 through § 154.1170, Part 56 and § 162.039 of this chapter.”

18. § 154.1150 Distribution of dry chemical

To reflect the difference in fire protection requirements between self-propelled and non self-propelled vessels 46 CFR 154.1150(a) - (b) should be read as follows:

“(a) All locations on the above deck cargo area where cargo leakage is possible, including flanges, valves, manifolds, relief valves, etc., and the cargo piping outside the cargo area must be protected by:”

“(b) All dry chemical storage units and hand hose lines, and/or semi-portable fire extinguishers must be kept in a location away from the protected areas that can be readily accessed by the crew in the event of fire.”

19. § 154.1205(b) Mechanical ventilation system: Standards

To reflect the differences between self-propelled and non self-propelled vessels, the text in 46 CFR 154.1205(b) should be read as follows:

“The discharge end of each duct under 46 CFR 154.1205(a) must be at least 10 m (32.8 ft.) from ventilation intakes and openings to accommodations, service, control station, and other gas-safe spaces. If the distance of 10 m is not feasible, the location may be based on a dispersion analysis approved by the Marine Safety Center.”

20. § 154.1300 Liquid level gauging system: General

Closed gauging in 46 CFR 154.1300(a) may also include indirect devices, which determine the amount of cargo by means such as weighing or in-line flow metering. The requirements in 46 CFR 154.1300(b) do not apply to LNG.

21. § 154.1325 Liquid level alarm system: All cargo tanks

In addition to current 46 CFR 154.1325, the following paragraph should be included to harmonize with international standards:

(d) All elements of the level alarms, including the electrical circuit and the sensor(s), of the high, and overflow alarms, shall be capable of being functionally tested. Systems shall be tested prior to commencement of cargo operations.

22. § 154.1335 Pressure and vacuum protection

To reflect the differences between self-propelled and non self-propelled vessels, the text in 46 CFR 154.1335 should be read as follows:

a) Each cargo tank shall have the following:

(1) A pressure gauge that:

(a) Monitors the vapor space;

(b) Is readable at the tank; and

(c) Has remote readouts at the cargo control station.

- (2) If vacuum protection is required under 46 CFR 154.804, a vacuum gauge meeting 22(a)(1)(a), 22(a)(1)(b), and 22(a)(1)(c) of this section.
- b) Pressure and vacuum gauges may be installed on vapor piping provided there are no valves or connections between the gauges and the tank.
- c) The vessel shall have at least one high pressure alarm that:
  - (1) Actuates before the pressure in any cargo tank exceeds the maximum pressure setpoint specially approved by the Marine Safety Center; and
  - (2) Actuates an audible and visual alarm at the cargo control station.
- d) If vacuum protection is required under 46 CFR 154.804, the vessel shall have at least one low pressure alarm that:
  - (1) Actuates before the pressure in any cargo tank falls below the minimum pressure setpoint specially approved by the Marine Safety Center; and
  - (2) Actuates an audible and visual alarm at the cargo control station.
- e) At least one pressure gauge shall be fitted on each:
  - (1) Enclosed hold;
  - (2) Enclosed interbarrier space;
  - (3) Cargo pump discharge line;
  - (4) Liquid cargo manifold; and
  - (5) Vapor cargo manifold.
- f) There shall be a local manifold pressure gauge between each manifold stop valve and each hose connection to the shore or to another vessel.

23. § 154.1340 Temperature measuring devices

To reflect the differences between self-propelled and non self-propelled vessels, the text in 46 CFR 154.1340 should be read as follows:

- a) Each cargo tank shall have devices that measure the temperature:
  - (1) At the bottom of the tank; and
  - (2) Near the top of the tank and below the maximum liquid level allowed under 46 CFR 154.1844.
- b) Each device required by 23(a) of this enclosure shall have a readout at the cargo control station, and shall be capable of providing temperature indication across the expected cargo operating temperature range of the cargo tanks. Where thermowells are fitted on the cargo line, they shall be designed to prevent failure due to fatigue in normal service and risk of cargo leakage from the fractured fitting on the pipe.
- c) Except for independent tanks type C, each cargo containment system for a design temperature colder than -55 °C (-67 °F) shall have temperature measuring devices that meet the following:
  - (1) The number and location of the devices shall be adequate to indicate temperature in all critical locations and shall be specially approved by the Marine Safety Center;
  - (2) The devices shall be within the cargo tank's insulation or on the adjacent hull structure;
  - (3) Each device shall show the temperature continuously or at regular intervals of one hour or less; and
  - (4) Each device shall actuate an audible and visual alarm at the cargo control station before the temperature of the steel of the adjacent hull structure is cooled below the lowest temperature allowed for the steel under 46 CFR 154.172.

- d) For each cargo tank with a design temperature colder than  $-55\text{ }^{\circ}\text{C}$  ( $-67\text{ }^{\circ}\text{F}$ ), the number and arrangement of the devices that show the temperature of the tank during cool down procedures must be specified on the plans submitted to the Marine Safety Center for design review.

24. § 154.1350 Flammable gas detection system

To reflect the differences between self-propelled and non self-propelled vessels and to account for the changes in the hazardous zones of section 13 of this enclosure, the text in 46 CFR 154.1350 should be read as follows:

Gas detection equipment shall be installed to monitor the integrity of the cargo containment, cargo handling and ancillary systems, in accordance with this section.

- a) A permanently installed system of gas detection and audible and visual alarms shall be fitted in:
  - (1) each cargo handling room;
  - (2) each hold space, interbarrier space, and other enclosed or semi-enclosed spaces where cargo vapors may accumulate, including interbarrier spaces and hold spaces for independent tanks other than type C tanks;
  - (3) each space between the doors of an air lock under 46 CFR 154.345(b); and
  - (4) each motor room for cargo handling machinery.
- b) Gas detection equipment shall be designed, installed and tested in accordance with IEC 60079-29-1 (Edition 1.0, 2007-08) or an equivalent standard acceptable to the Marine Safety Center and shall be suitable for the cargo intended.
- c) Permanently installed gas detection shall be of the continuous detection type, capable of immediate response in cases where the detection system is used
  - (1) to activate the safety shutdown functions required by 24(e) of this enclosure; or
  - (2) as required by 46 CFR 154.709 when using cargo as fuel.

In all other cases, sampling type detection may be installed. For barges with Type C tanks, the gas detection system may be deactivated when all cargo handling equipment and liquid and vapor piping located in spaces protected by the system are isolated and inerted.
- d) When sampling type gas detection equipment is used, the following requirements shall be met:
  - (1) the gas detection equipment shall be capable of sampling and analyzing each sampling head location sequentially at intervals not exceeding 30 min;
  - (2) individual sampling lines from sampling heads to the detection equipment shall be fitted; and
  - (3) pipe runs from sampling heads shall not be led through non-hazardous spaces except as permitted by 24(e) of this enclosure.
- e) The gas detection equipment may be located in a non-hazardous space, provided that the detection equipment such as sample piping, sample pumps, solenoids and analyzing units are located in a fully enclosed steel cabinet with the door sealed by a gasket. The atmosphere within the enclosure shall be continuously monitored. At gas concentrations above 30% lower flammable limit (LFL) inside the enclosure, the gas detection equipment shall be automatically shut down.
- f) Sample pipes shall be of steel or equivalent material. Detachable connections are not permitted, except for the connection points for

- (1) analyzing units; and
- (2) isolating valves required in 24(g) of this enclosure.
- g) When gas sampling equipment is located in a non-hazardous space, a flame arrester and a manual isolating valve shall be fitted in each of the gas sampling lines. The isolating valve shall be fitted on the nonhazardous side. Bulkhead penetrations of sample pipes between hazardous and nonhazardous areas shall maintain the integrity of the division penetrated. The exhaust gas shall be discharged to the open air in a nonhazardous area.
- h) The overall gas detection system layout shall be approved by the Marine Safety Center. Consideration should be given to the number and the positions of detection heads, size and layout of the compartment, the compositions and densities of the cargo carried, and the dilution from compartment purging or ventilation and stagnant areas.
- i) Any alarm status within a gas detection system required by this section shall initiate an audible and visible alarm at the cargo control station where continuous monitoring of the gas levels is recorded.
- j) When under tow, any alarm status within a gas detection system required by this section shall initiate an audible and visible alarm at the remote group or summary alarm panel described under 5(d) of this enclosure.
- k) The gas detection equipment provided for hold spaces and interbarrier spaces shall be capable of measuring gas concentrations of 0% to 100% by volume.
- l) Alarms shall be activated when the vapor concentration by volume reaches the equivalent of 30% LFL in air.
- m) For membrane containment systems, the primary and secondary insulation spaces shall be able to be inerted and their gas content analyzed individually. The alarm in the secondary insulation space shall be set in accordance with 24(l) of this enclosure; the alarm in the primary space shall be set at a value approved by the Marine Safety Center during design review.
- n) For other spaces described by 24(a) of this enclosure, alarms shall be activated when the vapor concentration reaches 30% LFL and the automatic ESD shall be activated before the vapor concentration reaches 60% LFL.
- o) Gas detection equipment shall be so designed that it may be tested. Testing and calibration shall be carried out at regular intervals.
- p) Portable gas detection equipment that meets the 24(b) and 24(q) of this enclosure shall be provided.
- q) For each permanently installed flammable gas detection system, electrical equipment located in Zone 0, Zone 1 or Zone 2 areas shall meet 13(c) of this enclosure. Portable gas detection equipment to be used in Zone 0, Zone 1 or Zone 2 areas shall meet 13(c) of this enclosure.
- r) Each flammable gas detection system shall have an audible and visual alarm for power failure and, for sampling type gas detection equipment, loss of gas sampling flow.

25. § 154.1365 Audible and visual alarms

To reflect the differences between self-propelled and non self-propelled vessels, the text in 46 CFR 154.1365 should be read as follows:

- a) Each audible alarm shall have an arrangement that allows it to be silenced after sounding. For the remote group alarm panel, this arrangement shall not interrupt the alarm's actuation by other faults.



- b) Each visual alarm shall be one that can be turned off only after the fault that actuated it is corrected.
- c) Each visual alarm shall be marked to show the type and, except for the remote group alarm panel, the location of each fault that actuates it.
- d) Each alarm panel shall have means for testing each alarm.
- e) Instruments shall be tested to ensure reliability under working conditions and be recalibrated at regular intervals. Test procedures for instruments and the intervals between recalibration shall be in accordance with manufacturer's recommendations.

26. § 154.1400 Safety equipment: All vessels

To reflect the differences between self-propelled and non self-propelled vessel, the minimum requirements for first response in 46 CFR 154.1400 should be read as follows:

- a) Two complete self-contained breathing apparatus.
- b) Four spare air cylinders for self contained breathing apparatus.
- c) Resuscitator with extra oxygen cylinder.
- d) Stretcher, Paraguard, or equivalent.
- e) Two Air powered lighting and hoses (enclosed space rescue).
- f) Two wire-cored hemp lifelines.
- g) Two rescue harness.
- h) Two VHF or UHF extension aerial.
- i) Two portable oxygen and hydrocarbon meters.
- j) Two Fireman outfits and accessories (axes, etc).
- k) Four explosion proof flash lights.
- l) Protective clothing, safety shoes and other PPE as necessary for number of persons attending specific work area or carrying a work task.

27. §§ 154.1405, 154.1410, and 154.1440

These paragraphs do not apply to vessels carrying LNG.

28. § 154.1844 Cargo tanks: Filling limits

With regard to the designed tank capacity, the requirements of 46 CFR 154.1844(a)(1) should be applied to the cargo at the reference temperature as defined in 46 CFR 154.1844(b).