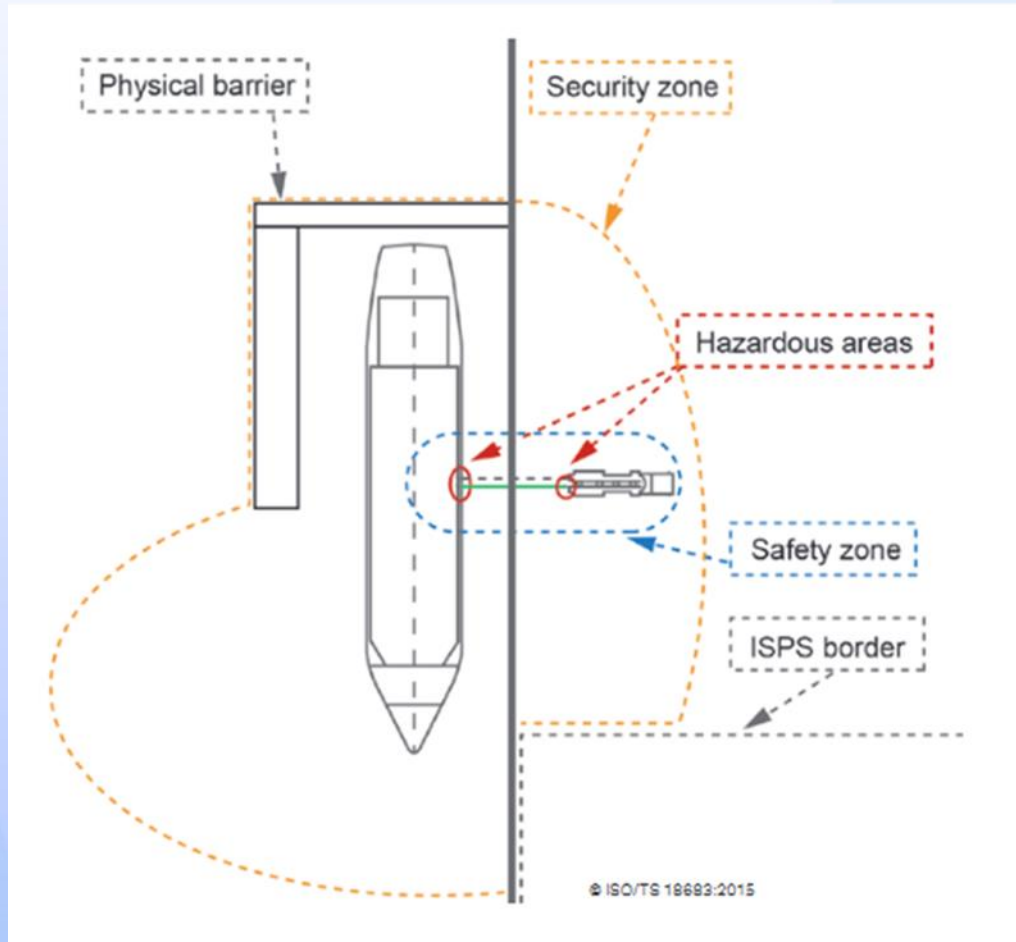


Apply occupational health and safety precautions and measures.

- 3.3 Basic knowledge of safe working practices and procedures in accordance with legislation and industry guidelines and personal shipboard safety relevant to ships subject to the IGF Code
- 3.4 Basic knowledge of first aid with reference to a Safety Data Sheet (MSDS)

Safety and security zones



Hazard zone

Zones - defines the general nature (or properties) of the hazardous material - if its gas or dust, and the probability of the hazardous material in the surrounding atmosphere

Hazard area

Hazardous area means an area in which an explosive gas atmosphere or a flammable gas (flash point below 60°C) is or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of electrical equipment

Non-hazardous area means an area in which an explosive gas atmosphere is not expected to be present in quantities such as to require special precautions for the construction, installation and use of equipment

IGF Code

- Hazardous area zone 0
- Hazardous area zone 1
- Hazardous area zone 2

Safety work practices



- Enclosed spaces
- Enclosed spaces entry procedures
- Work permits

Enclosed space

An enclosed space has one or more of the following characteristics:

- limited openings for entry and exit
- restricted natural ventilation
- not designed for continuous presence of workers



Entry procedures

- when possible, avoid entry to enclosed spaces, for example by performing the work from the outside;
- if entry to an enclosed space is unavoidable, in cases such as tank inspections, follow a safe system of work and put in place adequate emergency arrangements before the work starts;
- do not enter an enclosed space alone – enter in pairs and monitor each other.

Enclosed Space Entry

Safety procedures for entering closed compartments

Because of the **DANGER** that exists, **ENTRY** to an enclosed space should only be considered for **ESSENTIAL** reasons. The correct procedure **MUST** be followed. It is recommended that a **CHECK LIST** is used to complete the procedure. Only in an emergency should entry be considered using a Self Contained Breathing Apparatus. Seldom will any space remain safe. **CONSTANT** safety checks are essential. Someone's **LIFE** is usually at **RISK**.

 This is a Mandatory Sign

- | | |
|---|--|
| 1  CLEAN cargo tanks and lines to remove as much oil sediment and sludge as possible. | 7  COMMUNICATION tested and in good order between person at entrance and those entering. RESCUE PROCEDURES PLANNED & UNDERSTOOD. |
| 2  VENTILATE thoroughly and CONTINUOUSLY before and during operation. (PURGE with Inert Gas first if applicable). | 8  SAFETY EQUIPMENT must be worn, hard hats, boots, gloves, harness, protective clothes, personal gas monitor must be of approved type and in good condition. |
| 3  TEST ATMOSPHERE before and during operation at various levels and locations. OXYGEN 20.9%, FLAMMABLE GAS and TOXIC VAPOR, shouldn't exceed Company Regulations. | 9  RESCUE EQUIPMENT at entrance and tested: Breathing Apparatus, Recovery Gear & Resuscitators. |
| 4  TOOLS mustered at entrance and correct for intended job. Recheck tools on completion of the task. | 10  RESPONSIBLE PERSON at entrance for all operations. |
| 5  ILLUMINATION adequate and certified for hazardous area. | 11  CHECK LIST & ENTRY PERMIT completed and SIGNED by a Senior Officer or the Master. |
| 6  ACCESS adequate. Ladders and safety rails must be checked and in good condition. | 12  PERIOD OF VALIDITY shown on ENTRY PERMIT should not be exceeded. Another Permit must be issued. |



ADJACENT SPACES may be a **HAZARD** and leak into a safe compartment. Such spaces must also be rendered **SAFE** throughout the operation.



NO HOT WORK The procedure above is not adequate for Hot Work. Company Regulations must be **STRICTLY COMPLIED** with at all times whenever work is to be conducted in any space that has at any time contained a **HAZARDOUS SUBSTANCE** or **ATMOSPHERE**.

Entry procedures

Before entry:

- all parties to discuss the job to be done in the space,
- risk assessment,
- secure the space,
- ventilate,
- test,
- permit.



Entry procedures

During entry:

- ensure the space is suitably illuminated
- wear the right PPE
- continue to ventilate the space
- test the atmosphere at regular intervals
- communicate regularly
- be alert, and leave the space when requested or if you feel ill

Entry procedures

After entry:

- ensure all equipment and personnel are removed from the space
- close the access of the space to prevent unauthorised entry
- close the entry permit
- reinstate any systems as appropriate

Entry permit

Section A – Scope of Work

Location (designation of space)

Plant apparatus/identification (designation of machinery/equipment)

Work to be done (description)

Permit issued to (name of person carrying out work or in charge of the work party)

Section B – Checklist/Isolation data

Has a risk assessment of the proposed work been carried out?

Checklist

Checked

1	Space thoroughly ventilated	<input type="checkbox"/>
2	Atmosphere tested and found safe	<input type="checkbox"/>
3	Space secured for entry	<input type="checkbox"/>
4	Rescue and resuscitation entrance	<input type="checkbox"/>
5	Testing equipment available for regular checks	<input type="checkbox"/>
6	Responsible person in attendance at entrance	<input type="checkbox"/>
7	Communication arrangements made between person at entrance and those entering	<input type="checkbox"/>
8	Access and illumination adequate	<input type="checkbox"/>
9	All equipment to be used is of appropriate type	<input type="checkbox"/>
10	Personal protective equipment to be used:	<input type="checkbox"/>
	Hard hat, safety harness as necessary	<input type="checkbox"/>
11	When breathing apparatus is being used	<input type="checkbox"/>
	(i) Familiarity of user with apparatus is confirmed	<input type="checkbox"/>
	(ii) Apparatus has been tested and found to be satisfactory	<input type="checkbox"/>

Section C – Certificate of checks:

I am satisfied that all precautions have been taken and that safety arrangements will be maintained for the duration of the work.

Authorising person in charge

Name

Signature

Time

Date

Section D – Cancellation of certificate:

The work has been completed/cancelled and all persons under my supervision, materials and equipment have been withdrawn.

Authorising person in charge

Name

Signature

Time

Date

Delete words not applicable and where appropriate state:

The work is complete/incomplete as follows: (description)

Work permits

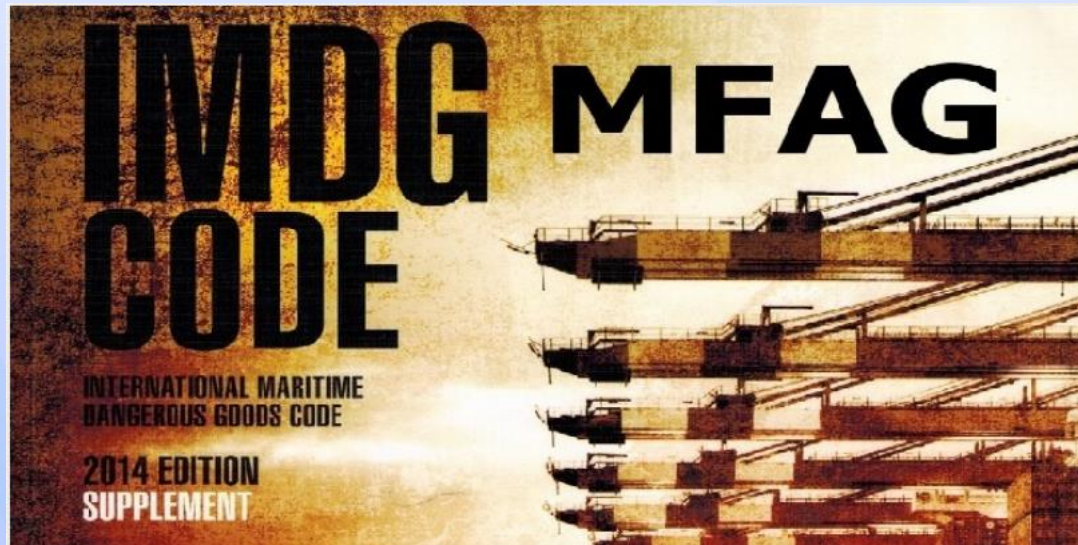
- Hot work
- Cold work
- Electrical work
- Other hazardous tasks.



Work permits	Example of work
Hot work permit	Welding, cutting
Electrical work permit	Electrical repairing
Working aloft permit	Working at height
Working outboard permit	Works outside ship hull
Cold work permit	Work with power tools outside engine room
Small craft alongside permit	Bunker barge alongside
Under water work permit	Diving

First Aid

- Medical First Aid Guide (MFAG)
- Material Safety Data Sheet (MSDS)



Medical First Aid Guide (MFAG)

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MSDS - LNG



Safety Data Sheet: Liquefied Natural Gas (LNG)

Section 1: Identification

Product Name:

Liquefied Natural Gas

SDS Number:

2015001

Synonyms/Other Means of Identification:

LNG, Liquid Methane, Natural Gas
Refrigerated Liquid

Intended Use:

Fuel

Manufacturer:

Philadelphia Gas Works (PGW)

800 W. Montgomery Avenue

Philadelphia, Pennsylvania 19122

(215) 684-6774

Emergency Health and Safety Number:

CHEMTREC: (800) 424-9300

Manufacturer Health and Safety Contact:

PGW Safety Manager: (215) 684-6554

Manufacturer Technical Information Contact:

PGW Chemical Services: (215) 787-4850

MSDS - LNG

Section 2: Hazard(s) Identification

Classification/Hazard Category

Flammable Gases – Category 1

Gasses Under Pressure – Refrigerated Liquefied Gas

Note: Under the United Nations Globally Harmonized System of Classification and Labeling of Chemicals (GHS), the lower the hazard category number, the greater the hazard, and the higher the hazard category number, the less severe the hazard.

Pictograms



Signal Word

DANGER

Hazard Statements

Extremely flammable gas. (H220)*

Contains refrigerated gas; may cause cryogenic burns or injury. (H281)*

MSDS - LNG

Section 3: Composition/Information on Ingredients

Liquefied natural gas (LNG) is a cryogenic liquid derived from natural gas by processing. LNG consists primarily of methane and ethane; the table below identifies the components in LNG that may be present in concentrations of 1 percent or more by volume. For health and safety determination purposes, the LNG composition listed in the table below represents the widest range of components observed in the LNG produced and stored by PGW based upon the results of sample analysis conducted between 2010 and 2015. The following constituents may also be present in LNG at concentrations less than 1 percent by volume: iso-butane, normal butane, pentanes, hexanes, heavier hydrocarbons (C6+), and nitrogen.

Component Name	Synonyms	Chemical Formula	CAS Number	Concentration (% Volume)
Methane	Methyl hydride, marsh gas, carbane	CH ₄	74-82-8	67-97
Ethane	N/A	C ₂ H ₆	74-84-0	3-29
Propane	N/A	C ₃ H ₈	74-98-6	0-4

MSDS - LNG

Section 4: First-Aid Measures

Eye Contact: Contact with product may cause frostbite. In case of frostbite or freeze burns, gently soak the eyes with cool to lukewarm water. DO NOT WASH THE EYES WITH HOT WATER (i.e. over 105°F). Open eyelids wide to allow liquid to evaporate. If the person cannot tolerate light, protect the eyes with a bandage or handkerchief. Do not introduce ointment into the eyes without medical advice. Seek immediate medical attention.

Skin Contact: Contact with product may cause frostbite. In case of frostbite or freeze burns, remove contaminated clothing and flush the affected area with cool to lukewarm water. Immediately place frozen area in a circulating warm water bath or in flowing warm water (100 to 105 °F). DO NOT USE HOT WATER (i.e. over 105°F) OR DRY HEAT. Seek immediate medical attention if blistering, tissue freezing, or frostbite has occurred. Under no circumstances should the frozen part be rubbed, either before or after warming.

Inhalation (Breathing): Inhalation of large quantities of LNG vapors may cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination. LNG and associated vapor is a simple asphyxiant and may cause loss of consciousness, serious injury, or death by displacing air, thereby resulting in insufficient oxygen to support life. Prompt medical attention is strongly recommended in all cases of inhalation overexposure. Rescue personnel should be equipped with a self-contained breathing apparatus. Remove inhalation victims to fresh air quickly. If inhalation victim is not breathing, ensure that their airways are open and administer cardiopulmonary resuscitation (CPR). If necessary, have a trained person administer air or oxygen once breathing is restored. Seek immediate medical treatment.

MSDS - LNG

Section 5: Fire-Fighting Measures

Fire Fighting Instructions

LNG vapors are extremely flammable and can be ignited by heat, sparks, flames, static electricity, and other sources of ignition, such as pilot lights, mechanical/electrical equipment, and electronic devices that are not intrinsically safe. Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. Vapors may accumulate in confined spaces.

Section 6: Accidental Release Measures

In case of an accidental release, activate your facility's spill contingency plan, if available. Evacuate non-essential personnel and secure all ignition sources. Do not allow road flares, smoking, cell phones, or other sources of ignition in the hazardous area. Internal combustion engines generate sparks that would serve to ignite LNG vapors, so do not drive vehicles through the vapor dispersion area, and do not attempt to start vehicles that are within the vapor dispersion area. Do not touch spilled liquid (frostbite/freeze burn hazard!), and avoid contact

MSDS - LNG

Section 7: Handling and Storage

When handling LNG, wear all appropriate personal protective equipment as described in Section 8 to avoid contact of material with eyes, skin, or clothing. Handle only with adequate ventilation, and do not breathe LNG vapors. Eliminate all sources of ignition, such as flames, sparks (including from internal combustion engines), or high temperatures when working in areas where vapors may be present. Ground and bond all lines to avoid static discharge buildup when transferring product (i.e. truck loading/unloading). Use non-sparking tools when working around LNG transfer lines and equipment. Be sure that all electrical equipment used in the area is UL listed Class I, Division I, Group D hazardous locations. Do not use cell phones in an area where LNG is stored or transferred. Polyester clothing may cause static discharge and must not be worn at LNG locations. Avoid cold burns from transfer lines or process equipment.

Store LNG only in specifically designed, cryogenic containers in a cool, dry, isolated, well-ventilated area away from heat and sources of ignition. Do not store LNG adjacent to oxidizers or other incompatible materials as listed in Section 10.

MSDS - LNG

Section 8: Exposure Controls/Personal Protection

Component Name and CAS Number	ACGIH TLV	OSHA PEL	NIOSH IDLH	Notes
Methane 74-82-8	TWA: 1,000 ppm	N/A	N/A	Simple Asphyxiant
Ethane 74-84-0	TWA: 1,000 ppm	N/A	N/A	Simple Asphyxiant
Propane 74-98-6	TWA: 1,000 ppm	TWA: 1,000 ppm	N/A	Simple Asphyxiant

Notes

MSDS - LNG

Section 9: Physical and Chemical Properties

- Appearance: LNG is a colorless liquid. Cold gas may freeze water vapor in the air, creating a visible white cloud. The visible cloud is useful for determining wind direction and product dispersion, but it does not define the boundary of the combustible gas. Combustible vapors may exist outside of the visible cloud.
- State: liquid (refrigerated gas)
- Odor: LNG is odorless; it does not exhibit the characteristic odor of natural gas.
- Odor Threshold: N/A*; LNG is odorless.
- pH: N/A
- Melting Point/Freezing Point: No data available
- Boiling Point: -259°F (-162 °C)

MSDS - LNG

Section 10: Stability and Reactivity

Reactivity: When LNG vapors mix with appropriate amounts of oxidizing agents, including air and oxygen, in the presence of an ignition source, an uncontrolled explosive reaction can occur.

Chemical Stability: LNG is stable under controlled conditions of use.

Possibility of Hazardous Reactions: Not applicable.

Conditions to Avoid: LNG vapors are extremely flammable and explosive; avoid heat, sparks, open flames, and all possible sources of ignition. Heat will increase pressure in the storage tank.

Materials to Avoid (Incompatible Materials): LNG vapors will form explosive mixtures with air or oxygen and will also burn or explode in the presence of strong oxidizing agents such as chlorine, chlorine dioxide, bromine pentafluoride, oxygen difluoride, liquid oxygen, and nitrogen trifluoride. LNG will spontaneously ignite when mixed with chlorine dioxide. Also avoid contact with acids, aluminum chloride, and halogens.

MSDS - LNG

Section 11: Toxicological Information

Inhalation: LNG vapors are not toxic; however, if LNG vapors escape and accumulate in a confined area or if large amounts of LNG vapor are released as a result of a spill or leak, the LNG vapors may displace air from the area and cause loss of consciousness, serious injury, or death.

Skin Absorption: Contact with liquefied or pressurized gas will cause severe frostbite, but otherwise, this product is not expected to cause skin irritation.

Serious Eye Damage/Irritation: Contact with the liquefied or pressurized gas may cause eye damage and swelling. Otherwise, this product is not expected to cause eye irritation.

Skin Corrosion/Irritation: Contact with liquefied or pressurized gas will cause severe frostbite, but otherwise, this product is not expected to cause skin irritation.

Skin Sensitization: Skin contact should be avoided, and sensitization as a result of skin contact is not expected.

MSDS - LNG

Section 12: Ecological Information

Ecotoxicity: Petroleum gases are volatile and rapid evaporation is expected from both land and water.

Persistence and Degradability: Not expected to remain on land surface or water for any period.

Bioaccumulative Potential: No data available.

MSDS - LNG

Section 13: Disposal Considerations

It is preferable to dispose of product by burning in a properly designed flare. Venting of vapor directly to the atmosphere is not recommended. LNG is not typically managed as a waste, but if cylinders of LNG are to be disposed, the disposal of this material should comply with all applicable federal, state, and local regulations.

Section 14: Transport Information

Transport in accordance with United States Department of Transportation (DOT) regulations governing the transportation of hazardous materials.

UN Number: UN1972

UN Proper Shipping Name: Natural gas, refrigerated liquid

Transport Hazard Class: 2.1

Packing Group: N/A*

Environmental Hazards: Refer to Section 15 for reportable quantities.

Special Precautions: Refer to Emergency Response Guide 115. Refer to 49 CFR 173.318 for additional information relating to the transportation of LNG.



MSDS - LNG

Section 15: Regulatory Information

Section 16: Other Information