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**Installation and equipment for  
liquefied natural gas — Design of  
floating LNG installations —**

**Part 1:  
General requirements**

**iTeh STANDARD PREVIEW**  
*Installations et équipements de gaz naturel liquéfié — Conception des  
installations flottantes de GNL —  
(standards.iteh.ai)  
Partie 1: Exigences générales*

[ISO 20257-1:2020](https://standards.iteh.ai/catalog/standards/sist/207a1c8f-e64b-45cd-a382-36469afe6439/iso-20257-1-2020)

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 9, *Liquefied natural gas installations and equipment*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 282, *Installation and equipment for LNG*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 20257 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

This corrected version of ISO 20257-1:2020 incorporates the following corrections:

- the broken links in References [50] and [51] were updated;
- the missing content in 5.1.2, 5.4.3.2.3, and 5.5.10.2 was added;
- editorial corrections in 12.2.2.2, G.1.2.1, G.2.1 and in the bibliography.

## Introduction

This document provides a non-exhaustive list of potential concepts. When a novel concept is proposed, the general principles in this document can be applied as far as applicable. Such design will result in a concept with equivalent level of safety and environmental friendliness to those currently considered as standard solutions. Guidance on the assessment of novel technology is provided in [Annex F](#).

In case a part of the installation, such as hull, vessel or structure, is already covered by another International Standard, including IMO, this document will only complement that applicable standard where necessary in order to ensure global safety, stability and integrity of the overall floating LNG installation.

This document assumes that a floating LNG installation is also designed to meet IMO and classification society requirements. It is not intended to preclude the use of a 'barge' solution. This document neither specifies the shape of the installation nor specifies the need for propulsion or an installation to fall within a particular regulatory regime. A barge can either be subject to exactly the same considerations as a unit designed as a non-propelled ship or not. This will depend on aspects such as whether a barge is located offshore or at shore, how it is transported, whether it stores LNG or not, the level of manning, the regulatory regime imposed on it. In this respect, the user of this document is expected to take hull structure design, means of external communications, and evacuation, escape and rescue arrangements, etc. into consideration.

Additional requirements by the Flag process, Shelf or Coastal Regulations can be applicable, that will vary depending on the type of floating LNG installation.

LNG as fuel bunkering applications is covered in ISO 20519 and in publications by the Society for Gas as a Marine Fuel.

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# Installation and equipment for liquefied natural gas — Design of floating LNG installations —

## Part 1: General requirements

### 1 Scope

This document provides requirements and guidance for the design and operation of floating liquefied natural gas (LNG) installations, including installations for the liquefaction, storage, vaporisation, transfer and handling of LNG, in order to have a safe and environmentally acceptable design and operation of floating LNG installations.

This document is applicable to:

- floating LNG liquefaction installations (plant) — FLNG;
- floating LNG regasification installations (plant) — FSRU;
- floating storage units — FSU.

This document is applicable to offshore, near-shore or docked floating LNG installations.

This document includes any jetty in the scope in case of docked floating LNG installations with regards to the mooring. This document briefly describes floating LNG mooring concepts.

This document is applicable to both newbuild and converted floating LNG installations, and addresses specific requirements.

This document is not applicable to:

- onshore LNG storage, liquefaction and/or regasification installations/plants, except for docked FSRU and/or FLNG installations;
- offshore LNG plants based on non-floating structure (such as gravity based structure [GBS] principle); and
- support onshore based facilities (such as support vessels, tugs, etc.).

This document is not intended for design floating power generation facilities though relevant parts of this document can be used.

This document is not intended to cover LNG as fuel bunkering applications.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 834 (all parts), *Fire resistance tests — Elements of building construction*

ISO 1460, *Metallic coatings — Hot dip galvanized coatings on ferrous materials — Gravimetric determination of the mass per unit area*

## ISO 20257-1:2020(E)

- ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods*
- ISO 4126 (all parts), *Safety devices for protection against excessive pressure*
- ISO 9606 (all parts), *Qualification testing of welders — Fusion welding*
- ISO 9712, *Non-destructive testing — Qualification and certification of NDT personnel*
- ISO 10497, *Testing of valves — Fire type-testing requirements*
- ISO 12944 (all parts), *Paints and varnishes — Corrosion protection of steel structures by protective paint systems*
- ISO 15614-1, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys*
- ISO 16903, *Petroleum and natural gas industries — Characteristics of LNG, influencing the design, and material selection*
- ISO 16904, *Petroleum and natural gas industries — Design and testing of LNG marine transfer arms for conventional onshore terminals*
- ISO 19900, *Petroleum and natural gas industries — General requirements for offshore structures*
- ISO 19901-1, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 1: Metocean design and operating considerations*
- ISO 19901-7, *Petroleum and natural gas industries — Specific requirements for offshore structures — Part 7: Stationkeeping systems for floating offshore structures and mobile offshore units*
- ISO 19904-1, *Petroleum and natural gas industries — Floating offshore structures — Part 1: Ship-shaped, semi-submersible, spar and shallow-draught cylindrical structures*
- ISO 20088 (all parts), *Determination of the resistance to cryogenic spill of insulation materials*
- ISO 22899 (all parts), *Determination of the resistance to jet fires of passive fire protection*
- ISO 23251, *Petroleum, petrochemical and natural gas industries — Pressure-relieving and depressuring systems*
- ISO 24409-1, *Ships and marine technology — Design, location and use of shipboard safety signs, fire control plan signs, safety notices and safety markings — Part 1: Design principles*
- ISO 28460, *Petroleum and natural gas industries — Installation and equipment for liquefied natural gas — Ship-to-shore interface and port operations*
- IEC 60079 (all parts), *Explosive atmospheres*
- IEC 60092-502, *Electrical installations in ships — Part 502: Tankers — Special features*
- IEC 60331 (all parts), *Tests for electric cables under fire conditions — Circuit integrity*
- IEC 61511 (all parts), *Functional safety — Safety instrumented systems for the process industry sector*
- IEC 61892 (all parts), *Mobile and fixed offshore units — Electrical installations*
- IEC 62305 (all parts), *Protection against lightning*
- ISO/IEC 80079 (all parts), *Explosive atmospheres*
- API RP 17B, *Recommended Practice for Flexible Pipe*
- CAA CAP 437, *Standards for Offshore Helicopter Landing Areas*

EN 1127-1, *Explosive atmospheres — Explosion prevention and protection — Part 1: Basic concepts and methodology*

EN 1474-2, *Installation and equipment for liquefied natural gas — Design and testing of marine transfer systems — Part 2: Design and testing of transfer hoses*

EN 1474-3, *Installation and equipment for liquefied natural gas — Design and testing of marine transfer systems — Part 3: Offshore transfer systems*

IMO/IGC Code, International code for the construction and equipment for ships carrying liquefied gases in bulk (IGC Code)

International Ship and Port Facility Security Code, IMO

IMO/SOLAS, International convention for the safety of life at sea

IMO/MODU, Code for the Construction and Equipment of Mobile Offshore Drilling Units

MARPOL, International Convention for the Prevention of Pollution from Ships

Ship to ship transfer guide for petroleum chemicals and liquefied gases, OCIMF

WHO Guidelines for Drinking Water Quality, World Health Organization

MOORING EQUIPMENT GUIDELINES OCIMF

### 3 Terms, definitions and abbreviated terms

#### 3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <https://www.iso.org/obp>

— IEC Electropedia: available at <http://www.electropedia.org/>

##### 3.1.1

##### **floating LNG installation**

installation typically comprising of hull structure, gas processing, vaporization and liquefaction, LNG storage, hydrocarbon *transfer* (3.1.53), mooring systems, and other systems

Note 1 to entry: The hull structure is also known as hull.

Note 2 to entry: The gas processing, vaporization and liquefaction, including flare, are also known as topsides. Topsides are not relevant for floating storage units applications.

Note 3 to entry: The LNG storage is also known cargo containment systems and cargo handling systems.

Note 4 to entry: The hydrocarbon transfer is also known as cargo transfer systems, including offloading equipment and systems (if applicable).

Note 5 to entry: Mooring systems include jetties and fendering (if applicable).

Note 6 to entry: Examples of other systems are utilities and accommodation.

### 3.1.2

#### **floating storage and regasification unit**

##### **FSRU**

floating unit for storage and regasification of *LNG* (3.1.31) for sending out to natural gas grid

Note 1 to entry: An FSRU is intended to be permanently or temporarily moored or anchored as part of an LNG installation located in a protected harbour, in a near-shore location (protected or unprotected) or offshore.

### 3.1.3

#### **floating liquefied natural gas unit**

##### **FLNG**

floating unit for production, liquefaction, storage and *transfer* (3.1.53) of *LNG* (3.1.31)

Note 1 to entry: An FLNG unit can receive gas either from offshore fields, onshore fields, onshore pipeline or other facilities (other platforms, associated gas, etc.). An FLNG units has the ability to process and export gas-field related hydrocarbon products, such as liquefied petroleum gas and condensate.

### 3.1.4

#### **floating storage unit**

##### **FSU**

floating unit for storage of *LNG* (3.1.31) and permanently or temporarily moored as part of an LNG installation

Note 1 to entry: Non-modified LNG carriers might be considered as suitable, provided that the following aspects are appraised and resulting safety level is found acceptable:

- mooring arrangement;
- transfer system;
- sloshing aspects;
- effects from/on other part of LNG installation;
- long term use inspectability.

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### 3.1.5

#### **accident**

mean uncontrolled event that can entail the loss of human life, personal injuries, environmental damage or the loss of assets and financial interests

### 3.1.6

#### **barge**

box shaped non-propelled floating structure

### 3.1.7

#### **boiling liquid expanding vapour explosion**

violent explosive vaporization following the rupture of a pressurized tank containing liquid well above its boiling point at atmospheric pressure, which can be followed by a ball fire if the vapour cloud is ignited

### 3.1.8

#### **boil-off gas**

gas generated during the storage or handling of volatile liquefied gases

### 3.1.9

#### **boundary**

property line on land or water inside over which the *operator* (3.1.38)/*owner* (3.1.39) has full control and authority, or exclusive use

### 3.1.10

#### **braid**

layer, or layers, of cylindrically woven wires covering the *hose* (3.1.25) and attached to the flexible *hose assembly* (3.1.26) end fittings, serving the function of restraining the flexible hose against elongation

**3.1.11****classification society**

non-governmental organization, which establishes and maintains technical standards for the construction and operation of ships and offshore structures, validates that the construction conforms to these standards, and carries out regular surveys in service to ensure continued conformance with the standards

**3.1.12****condensate**

hydrocarbon liquids (liquid state at standard conditions) produced from primary separation of *natural gas* (3.1.35) from a reservoir

**3.1.13****drip tray**

spill containment for minor leakage

**3.1.14****emergency release system****ERS**

system that provides a positive means of quick release of the *transfer system* (3.1.54) and safe isolation of receiving source from the supply source

**3.1.15****emergency shutdown****ESD**

system that safely and effectively stops the whole plant or individual units to minimize incident escalation

**3.1.16****enclosed area****enclosed space**

space within which, in the absence of artificial ventilation, the ventilation will be limited and any explosive atmosphere will not be dispersed naturally

**3.1.1.17****explosion**

deflagration event of uncontrolled combustion

**3.1.18****flammable gas**

gas or vapour which, when mixed with air in certain proportions, forms a combustible gas mixture

**3.1.19****flag administration**

maritime authority of a country in which a vessel is registered

**3.1.20****green water**

sea water reaching the deck of the vessel in harsh conditions

**3.1.21****harm**

physical injury or damage to the health of people, or damage to assets or the environment

**3.1.22****hazard**

potential source of *harm* (3.1.21)

**3.1.23**

**hazardous area**

area in which an explosive atmosphere is present, or can be expected to be present, in quantities such that special precautions for the construction, installation and use of electrical apparatus are taken

**3.1.24**

**hazard identification**

**HAZID**

brainstorming exercise using checklists where the potential *hazards* (3.1.22) in a project are identified and gathered in a risk register for follow up in the project

**3.1.25**

**hose**

flexible leak tight inner tube either corrugated metal, elastomer or plastic

**3.1.26**

**hose assembly**

*hose* (3.1.25) with end fittings attached, complete with *braid* (3.1.10) and/or other covering, ready for service

**3.1.27**

**high pressure natural gas**

gas under high pressure produced from either gas field or from regasification of *LNG* (3.1.31) to be dispatched in grid

**3.1.28**

**impact assessment**

assessment of how consequences (e.g. fires, explosions) affect people, structures, the environment, etc.

**3.1.29**

**individual risk**

risk to which an individual is exposed during a defined period of time

iTeh STANDARD PREVIEW

(standards.it/ehi)

ISO 20257-1:2020

<https://standards.it/ehi/catalog/standards/sist/207e1c8f-e64b-45cd-a382-36469afe6439/iso-20257-1-2020>

**3.1.30**

**jetty**

facility consisting of a trestle or similar structure, berthing facilities including fendering and topside equipment to enable primarily the *transfer* (3.1.53) of hydrocarbons

**3.1.31**

**liquefied natural gas**

**LNG**

colourless and odourless cryogenic fluid in the liquid state at normal pressure composed predominantly of methane which can contain minor quantities of ethane, propane, butane, nitrogen, or other components normally found in *natural gas* (3.1.35)

**3.1.32**

**major accident**

hazardous event that results in multiple fatalities or severe injuries; or extensive damage to structure, installation or plant; or large-scale impact on the environment

Note 1 to entry: In this document, a major accident is the realization of a major accident hazard.

Note 2 to entry: Large-scale impact on the environment is, for example, persistent and severe environmental damage that can lead to loss of commercial or recreational use, loss of natural resources over a wide area or severe environmental damage that will require extensive measures to restore beneficial uses of the environment.

Note 3 to entry: This definition is intended to incorporate terms such as “major accident” as defined by UK HSE.

**3.1.33**

**major hazard**

*hazard* (3.1.22) with the potential, if realized, to result in a *major accident* (3.1.32)

**3.1.34****management system**

set of interrelated or interacting elements of an organization to establish policies and objectives and processes to achieve those objectives

**3.1.35****natural gas**

gas without condensation at common operating pressures and temperatures where the predominant component is methane with some ethane and small amounts of heavier hydrocarbons (mainly propane and butane)

**3.1.36****non-hazardous area**

area in which an explosive atmosphere is not expected to be present in quantities such as to require special precautions for the construction, installation and use of electrical apparatus

**3.1.37****normal operation**

routine operation and also including intermittent operation such as ship loading or unloading, start-up, maintenance, planned shutdown and commissioning

**3.1.38****operator**

organization responsible for the operation of the installation

**3.1.39****owner**

organization responsible for the safe design and construction of the installation

**3.1.40****probability**

number in a scale from 0 to 1, which expresses the likelihood of an event occurrence

**3.1.41****response amplitude operator**

ratio of a vessel's motion to the wave amplitude causing that motion and presented over a range of wave periods

**3.1.42****recognized standard**

international or national standard acceptable to the relevant regulator or authorities, industry and project stakeholders

**3.1.43****risk**

combination of *probability* (3.1.40) of occurrence of harm and the severity of that harm

**3.1.44****risk analysis**

systematic use of information to identify sources and to estimate the risk

**3.1.45****risk assessment**

overall process of *risk analysis* (3.1.44) and *risk evaluation* (3.1.46)

**3.1.46****risk evaluation**

procedure based on the *risk analysis* (3.1.44) to determine whether the tolerable risk has been achieved