SLOVENSKI STANDARD
SIST EN 13645:2003

01-januar-2003

Napeljave in oprema za utekoļ injeni zemeljski plin - Naļ rtovanje kopenskih napeljav s skladiģļ no zmogljivostjo med 5 t in 200 t

Installations and equipment for liquefied natural gas - Design of onshore installations with a storage capacity between 5 t and 200 t

Anlagen und Ausrüstung für Flüssigerdgas - Auslegung von landseitigen Anlagen mit einer Lagerkapazität zwischen 5 t und 200 t

Installations et équipements de gaz naturel liquéfié - Conception des installations terrestres d'une capacité de stockage comprise entre 5 t et 200 t

Ta slovenski standard je istoveten z: **EN 13645:2001**

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75.200	Oprema za skladiģļ enje nafte, naftnih proizvodov in zemeljskega plina	Petroleum products and natural gas handling equipment

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English version

Installations and equipment for liquefied natural gas - Design of onshore installations with a storage capacity between 5 t and 200 t

Installations et équipements de gaz naturel liquéfié - Conception des installations terrestres d'une capacité de stockage comprise entre 5 t et 200 t

Anlagen und Ausrüstung für Flüssigerdgas - Auslegung von landseitigen Anlagen mit einer Lagerkapazität zwischen 5 t und 200 t

This European Standard was approved by CEN on 15 November 2001.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 282 "Installation and equipment for LNG", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2002, and conflicting national standards shall be withdrawn at the latest by June 2002.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Annexes A, B and C are informative.

Introduction

The objective of this standard is to give functional guidelines for LNG facilities with a total storage capacity between 5 t and 200 t. It recommends procedures and practices which will result in safe and environmentally acceptable design, construction and operation of LNG plants.

This standard is not applicable to existing installations, but its application is recommended when major modifications are considered.

1 Scope

This European Standard specifies requirements for the design and construction of onshore stationary liquefied natural gas (LNG) installations with a total storage capacity between 5 t and 200 t. This standard is not applicable to liquefaction process facilities based on hydrocarbon refrigerants. Larger installations are treated according to EN 1473:1997.

If other dangerous substances are present in the facility, the aforementioned storage capacity thresholds may be reduced.

NOTE It is essential that the designer refer to local regulation to determine the new values.

The installations to which this standard is applicable include the following:

— LNG satellite plants. The LNG may be supplied by road tankers, barge or rail carriers. After storage, LNG is vaporized and sent out to consumers;

— LNG gas fuelling stations for vehicles.

The installation is limited from the gas inlet or the loading LNG area to the gas outlet or the unloading LNG area. Filling systems are not covered here.

For the purposes of clause 4 «Environment Impact» and clause 5 «Safety Plan», this standard applies where LNG storage capacity exceeds the threshold specified in the local regulation. If this value is not available, a threshold of 50 t is recommended.

It is recalled that, in any case, local regulations prevail.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 1127-1, *Explosive atmospheres- Explosion prevention and protection- Basic concepts and methodology.*

EN 1160:1996, *Installation and equipment for liquefied natural gas - General characteristics of liquified natural gas.*

EN 1473:1997, *Installation and equipment for liquefied natural gas - Design of onshore installations.*

EN 12066, *Installation and equipment for liquefied natural gas - Testing of insulation linings for liquefied natural gas retention bunds.*

EN 60079-10, *Electrical apparatus for explosive gas atmospheres- Part 10: Classification of hazardous areas (IEC 60079-10:1995).*

ENV 1991-2-2, EUROCODE 1 *Basis of design and actions on structures - Part 2-2: Actions on structures - Actions on structures exposed to fire.*

ENV 1992-1-1, EUROCODE 2 *Design of concrete structures - Part 1-1: General rules and rules for buildings.*

ENV 1992-1-2, EUROCODE 2 *Design of concrete structures - Part 1-2: General rules - Structural fire design.*

ENV 1993-1-1, EUROCODE 3 *Design of steel structures - Part 1-1: General rules and rules for buildings.*

ENV 1993-1-2, EUROCODE 3 *Design of steel structures - Part 1-2: General rules - Structural fire design.*

ENV 1994-1-1, EUROCODE 4 *Design of composite steel and concrete structures - Part 1-1: General rules and rules for buildings.*

ENV 1994-1-2, EUROCODE 4 *Design of composite steel and concrete structures - Part 1-2: General rules - Structural fire design (including Technical Corrigendum 1:1995).*

3 Terms and definitions

For the purposes of this European Standard, the definitions given in EN 1160:1996 and EN 1473:1997, and the following terms and definitions apply.

3.1
above ground vessel
vessel of which all or part is exposed above ground level

3.2
boil-off gas
gas resulting from evaporation of LNG near its equilibrium state

3.3
emergency shutdown
a system that safely and effectively stops the whole plant or individual units when an incident occurs

3.4
flash gas
gas resulting from sudden evaporation of LNG out of equilibrium condition

3.5
impounding area
an area defined through the use of dykes or topography at the site for the purpose of containing any accidental spill of LNG

3.6
LNG gas fuelling station
installation including an LNG storage which supplies vehicles with LNG or gas from vaporized LNG

3.7
loading area
area where LNG is loaded from storage vessels to transport vessels when the plant supplies LNG

3.8
local regulation
set of rules, laws, national agreements, international conventions which apply to a site

3.9
operating personnel
any person who is authorised to act on the control of the plant, remotely or locally

NOTE It can include the drivers of LNG carriers who supply the plant with LNG. In the case of fuelling stations for vehicles, drivers of these vehicles are not included unless it is specified in the management plan of the installation.

3.10
plant or site
area inside of which public access is unauthorised

3.11
underground vessel
vessel which is completely buried below the general ground level of the facility

3.12
unloading area
area where LNG is unloaded from transport vessels to storage vessels when the plant is supplied with LNG

3.13
validated model
model whose effectiveness has been demonstrated by LNG industrial tests through clearly identified procedures

4 Environmental impact

4.1 General

An environmental impact study shall be carried out when the LNG storage capacity exceeds the threshold specified in the local regulation. If this value is not available, a threshold of 50 t is recommended.

The impact study shall take into account any restrictions on the transportation of LNG.

All emissions from the plant, that is, solid, liquid (including water), and gaseous (including noxious odours) shall be identified. Measures shall be implemented to ensure that normal and accidental emissions are harmless to persons, property, animals or vegetation.

An effluent management policy shall be established if relevant. The requirements in the handling of any toxic materials shall be identified.

Any increase in activity caused by operation shall also be assessed and undesirable levels of activities shall be eliminated if possible or minimized and restricted. The following items should be considered:

— noise levels;

— vibration levels;

— night working, effect of lights;

— gas flaring or venting;

— warming or cooling of water.

NOTE Fog may be created locally by atmospheric vaporizers.

4.2 Emission control

The following shall be safely controlled:

— combustion products from compressor drivers, submerged vaporizers, fired heaters for regeneration;

— normal or accidental venting of gases;

— normal or accidental flaring of gases;

— oily water condensed during dryer regeneration or from machines;

— in the case of water-cooled equipment, hydrocarbon contamination of this water from leaking exchanger tubes;

— disposal of waste products (chemicals, waste oil and chlorinated organic compounds);

— vaporizer water;

— odorant chemicals.

The standard of emissions control shall follow as a minimum specifications set by local regulation.

4.3 Boil-off / flash gas management

Continuous flaring or venting shall be avoided.

Boil-off gas can be recycled in a liquefaction process or included in the send-out gas to avoid waste gas during normal operation.

4.4 External communication networks

Traffic rates of external roads, railways and waterway networks near the LNG plant shall be identified.

5 Safety plan

5.1 Purpose

LNG installations shall be designed to minimize the risks to property and life outside and inside the plant. A safety plan shall be defined during the design of the plant or during a major modification when the LNG storage capacity exceeds the threshold specified in the local regulation. If this value is not available, a threshold of 50 t is recommended.

The safety plan shall include an identification of risks and an appropriate appraisal of the consequences. It shall also include the safety measures and principles of the actions performed by the operator for controlling risks for accidents.

Implementation of the safety plan shall be initiated as early as possible and be reviewed when unacceptable risks are identified during the design.

A hazards and operability study (HAZOP or equivalent) shall be conducted to identify and eliminate or minimise hazards.

Annex A illustrates the schematic description of the process related to an LNG satellite and fuelling plant. This description is simplified and it is not considered to be directly applicable for an actual project.

5.2 Collection of data and information

Initially all available data and information shall be assembled. It should be related to:

- natural conditions:
  - soil characteristics;
  - meteorological conditions, to include at least atmospheric temperature and wind statistics, occurrence of lightning strikes, relative humidity, atmospheric stability;
  - flooding risks;
  - seismic activity;
  - topography;
  - vegetation for identification of fire risks;
- surrounding integration:
  - surrounding infrastructure (e. g. industrial sites, built-up areas);
  - access for possible LNG trucks;
  - location of nearest fire services.

When the available information is not sufficient enough to identify the possible risks or to define relevant measures, an additional survey of data may be performed.

5.3 Threshold values

5.3.1 Heat radiation from fires

a) inside the plant:

1) in the safety plan, it shall be determined if fire can damage pieces of equipment. The maximum thermal radiation flux until which a damage to the components may be acceptable shall be specified. Table 1 gives informative maximum values excluding the solar flux, in case they are not already given in the local regulations.

Table 1 — Thermal radiation fluxes excluding solar radiation inside the boundaries

Equipment inside the plant	Maximum thermal radiation flux kW/m^2
Concrete surface storage vessels	32
Outer surfaces of pressure storage steel vessels and process facilities	15
Control room, maintenance workshops, laboratories, warehouses, etc.	8
Administrative buildings	5

The radiation fluxes of Table 1 may be increased according to the duration of the fire. In any case, the maximum radiation flux levels acceptable for each main structure or equipment inside boundaries shall be confirmed by the manufacturer or using validated methods or curves defined in ENV 1991-2-2, ENV 1992-1-1, ENV 1992-1-2, ENV 1993-1-1, ENV 1993-1-2 and ENV 1994-1-1 and ENV 1994-1-2.

The time during which the radiation is experienced is a major factor in determining the consequences on people. The observed effects of thermal radiation are in summary:

— 1,5 kW/m^2 will cause no discomfort for long exposure;

— 5 kW/m^2 is sufficient to cause pain to people if unable to reach cover within 15 s; otherwise, blistering of the skin (second degree burns) is likely.

The pieces of equipment can be either unprotected, or protected by means of water sprays, fireproofing screens or similar systems.

For storage vessels, the permissible radiation flux shall be determined taking into consideration at least the following factors:

— loss of mechanical strength of vessel;

— pressure build up within the vessel;

— the relief capacity of the safety valves;

— the temperature of the safety valve. It shall not reach the auto-ignition temperature of the flammable substance in the vessel.