SLOVENSKI STANDARD

SIST EN 14620-5:2007

01-januar-2007

Naļrtovanje in proizvodnja na mestu postavitve grajenih navpiļnih, valjastih jeklenih posod z ravnim dnom za shranjevanje hlajenih utekoļinjenih plinov z delovnimi temperaturami med 0 ÁC in ï 165 ÁC - 5. del: Preskuġanje, suġenje, ļiġļenje in ohlajanje

Design and manufacture of site built, vertical, cylindrical, flat-bottomed steel tanks for the storage of refrigerated, liquefied gases with operating temperatures between 0 °C and -165 °C - Part 5: Testing, drying, purging and cool-down

Auslegung und Herstellung standortgefertigter, stehender, zylindrischer Flachboden-Stahltanks für die Lagerung von tiefkalt verflüssigten Gasen bei Betriebstemperaturen zwischen 0 °C und -165 °C - Teil 5: Prüfen, Trocknen, Inertisieren und Kaltfahren

Conception et fabrication de réservoirs en acier à fond plat, verticaux, cylindriques, construits sur site, destinés au stockage des gaz réfrigérés, liquéfiés, dont les températures de service sont comprises entre 0 °C et -165 °C - Partie 5: Essais, séchage, inertage et mise en froid

Ta slovenski standard je istoveten z: **EN 14620-5:2006**

ICS:

23.020.10	Nepremiļne posode in rezervoarji	Stationary containers and tanks

SIST EN 14620-5:2007 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14620-5

September 2006

ICS 23.020.10

English Version

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This European Standard was approved by CEN on 20 February 2006.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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

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Ref. No. EN 14620-5:2006: E

Contents

Foreword

This European Standard (EN 14620-5:2006) has been prepared by Technical Committee CEN/TC 265 “Site built metallic tanks for the storage of liquids”, the secretariat of which is held by BSI.

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 March 2007, and conflicting national standards shall be withdrawn at the latest by March 2007.

EN 14620 *Design and manufacture of site built, vertical, cylindrical, flat-bottomed steel tanks for the storage of refrigerated, liquefied gases with operating temperatures between 0 °C and -165 °C* consists of the following parts:

— Part 1: General;

— Part 2: Metallic components;

— Part 3: Concrete components;

— Part 4: Insulation components;

— Part 5: Testing, drying, purging and cool-down.

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

1 Scope

This European Standard specifies the requirements for testing, drying, purging and cool-down of the refrigerated liquefied gas storage tanks.

This European Standards deals with the design and manufacture of site built, vertical, cylindrical, flat-bottomed steel tanks for the storage of refrigerated, liquefied gases with operating temperatures between 0 °C and –165 °C.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 14620-1:2006, *Design and manufacture of site built, vertical, cylindrical, flat-bottomed steel tanks for the storage of refrigerated, liquefied gases with operating temperatures between 0°C and –165 °C — Part 1: General*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 14620-1:2006 apply.

4 Hydrostatic and pneumatic testing

4.1 Hydrostatic test

4.1.1 General

A hydrostatic test shall be carried out. The hydrostatic test shall demonstrate that:

— tank is designed and constructed to contain the product (no leakage);

NOTE A leakage test is not applicable for membrane tanks. Instead an ‘ammonia test’ is carried out on the membrane after completion of welding. An ammonia sensitive paint is applied on the weld seam on the inside of the tank. Ammonia vapour is introduced in the insulation space and in case of a leak the ammonia will react with the paint resulting in a change of colour from yellow to blue. In order to calibrate the test, reference holes are made in the membrane so that proper performance of the inspection method is ensured. After closing of all leaks, another test is carried out. The paint on the inside of the tank is removed by ‘vacuum cleaning’. For reference, the NF A 09-107 note.

— foundation is able to support the tank contents.

4.1.2 Test requirements for each type of tank

For the various tank types, the hydrostatic test shall be carried out in accordance with Table 1.

The contractor shall prepare a specification with all the actions to be taken. The test results shall be documented.

Table 1 — Hydrostatic test requirements

Contents	Single containment	Double containment	Full containment	Membrane tank
Ammonia, butane, propane, and propylene	**Tank** (type II-III steels): FH	**Inner tank** (type I-II steels): FH	**Inner tank** (type I-II steels): FH	
		Outer tank (type I-II steels): FH	**Outer tank** (type I-II steels): FH	
		Outer tank (pre-stressed conc): No test (see NOTE 2)	**Outer tank** (pre-stressed conc): No test (see NOTE 2)	**Outer tank** (pre-stressed conc): PH (see [a])
Ethane, Ethylene and LNG	**Tank** (type IV steel): PH	**Inner tank** (type IV steel): PH	**Inner tank** (type IV steel): PH	
		Outer tank steel (type IV steel): PH	**Outer tank steel** (type IV steel): PH	
		Outer tank (pre-stressed conc): No test (see NOTE 2)	**Outer tank** (pre-stressed conc): No test (see NOTE 2)	**Outer tank** (pre-stressed conc): PH (see NOTE 2)

[a] In the case of a membrane tank, the membrane can't be hydrostatically tested. To ensure that the foundation is able to support the tank contents and the tank integrity is ensured, the concrete outer tank shall be hydrostatically tested before the insulation and membrane are installed.

NOTE 1 FH means Full height hydrostatic test;

PH means Partial height hydrostatic test.

NOTE 2 Hydrostatic testing of the pre-stressed concrete outer tank is not required, see prEN 14620-3:2005, A.2.

4.1.3 Additional requirements

The following additional requirements shall apply:

— for a full height hydrostatic test, the inner tank shall be filled to the maximum design liquid level. The same quantity of water shall be used for testing of the outer tank;

— for a partial height hydrostatic test of the inner tank, the test level shall be equal to 1,25 times the height of the maximum design liquid level multiplied by the density of the specified product to be stored. The same quantity of water contained shall be used for testing of the outer tank;

— when outer tanks are hydrostatically tested, a suitable water barrier shall be provided to prevent that test water ingress in to the bottom insulation;

— care shall be taken during filling of the annular space that water levels are controlled and regulated to prevent differential levels between the inner and annular spaces;

— hydrostatic test shall not be carried out until all welded accessories to the shell and the bottom of the tank are in place. Welding shall not be allowed after completion of the hydrostatic test;

— for tanks which are to be insulated with perlite powder, the hydrostatic test shall be carried out before installation of the perlite powder;

— test level of a membrane tank shall be based on the partial hydrostatic test requirement indicated above;

— contractor shall ensure that the quality of the water is such that no damage to the steel/concrete can occur.

4.1.4 Quality of the water

The suitability of the water for hydrostatic testing shall be demonstrated. Special attention shall be paid to possible corrosion.

The following types of corrosion shall be considered:

— general corrosion;

— galvanic corrosion

NOTE 1 galvanic corrosion (fresh and seawater) is an electrochemical form of corrosion that can occur when a metal or alloy is electrically connected to another metal or alloy with a different electrochemical potential. Both metals should be exposed to a common electrolyte and electrical path. Welding of metals can lead to dissimilar metal compositions between the weld, Heat Affected Zone (HAZ) and the plate material. The most anodic material area will corrode because of the galvanic effect with the cathodic material areas.

— localised corrosion (pitting, under deposit corrosion, bacterial corrosion);

NOTE 2 localised corrosion will occur under circumstances that promote the formation of localised cells:

1. presence of deposits and or solids;
2. presence of sulphate reducing bacteria;
3. locations where a low oxygen content is present.

Deposits or solids, present in the seawater, may settle down on the steel surface during hydrostatic testing and localised corrosion cells may develop. This can lead to high corrosion penetration rates.

NOTE 3 The main corrosion concerns, when using seawater during hydrostatic testing of 9 % nickel steel tanks, are:

1) galvanic activity between plate material, weld and HAZ;

2) when soils/deposits are present in the seawater, localised corrosion when cells can develop;

3) effect of sulphate reducing bacteria resulting in sour “corrosive” environment and possible formation of hydrogen;

4) protection of stainless steel internal components and exposed flange gasket surfaces;

5) removal/prevention of dried mineral deposits resulting from draining of sea water.

The need for cathodic protection should be investigated to avoid galvanic corrosion and to reduce general corrosion. Cathodic protection promotes the cathodic reaction, which in de-aerated conditions (under deposits) generates hydrogen and therefore increases the risk of hydrogen stress cracking, if H_2S is present at the same time.

The cathodic protection system shall be designed so that the risk of hydrogen embrittlement is avoided.

If the required water quality can’t be achieved then alternative test methods utilizing suitable inhibitors shall be considered.

In view of discharge of the water, the environmental impact shall be investigated.

4.1.5 Conditions of implementation

Before the start of the test, the tank shall be cleaned. Any spatter and slag shall be removed from the welds, and all materials, objects or temporary installations used during its construction, shall also be removed.

A permanent or temporary pressure relief system shall be used during the test. The pressure relief system shall have sufficient capacity to ensure that the internal positive and negative test pressures do not exceed those specified in the design of the tank. A water column gauge shall also be used to measure the pressure.

NOTE A corrosion inhibitor may be required.

4.1.6 Examination during filling

4.1.6.1 Peripheral level check

Before filling, the following markers shall be installed on the outer surface of the tank:

— four markers for tanks with a diameter ≤ 10 m;

— eight markers for tanks with a larger diameter.

Markers shall also be installed on the inner tank shell, in double and full containment tank systems, so that settlement of the inner tank can be monitored simultaneously with that of the outer tank.

The markers shall be of such a type that they remain visible/usable after the tank is painted.