
Stabilni valjasti varjeni jekleni rezervoarji serijske izdelave za skladiščenje utekočinjenega naftnega plina (UNP) podzemne izvedbe z notranjo prostornino do 13 m³ - Načrtovanje in izdelava

Static welded steel cylindrical tanks, serially produced for the storage of Liquefied Petroleum Gas (LPG) having a volume not greater than 13 m³ and for installation underground - Design and manufacture

Ortsfeste, geschweißte zylindrische Behälter aus Stahl, die serienmäßig für die Lagerung von Flüssiggas (LPG) hergestellt werden, mit einem Fassungsvermögen bis 13 m³ für erdgedeckte Aufstellung - Gestaltung und Herstellung

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Réservoirs cylindriques fixes en acier soudés, fabriqués en série, d'un volume inférieur ou égal à 13 m³, destinés au stockage enterré des gaz de pétrole liquéfiés (GPL) - Conception et fabrication

Ta slovenski standard je istoveten z: EN 14075:2002

ICS:

23.020.10	Nepremične posode in rezervoarji	Stationary containers and tanks
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EUROPEAN STANDARD

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Static welded steel cylindrical tanks, serially produced for the storage of Liquefied Petroleum Gas (LPG) having a volume not greater than 13 m³ and for installation underground - Design and manufacture

Réservoirs cylindriques fixes en acier, soudés, fabriqués en série, d'un volume inférieur ou égal à 13 m³, destinés au stockage enterré des gaz de pétrole liquéfiés (GPL) - Conception et fabrication

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This European Standard was approved by CEN on 14 July 2002.

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Foreword

This document EN 14075:2002 has been prepared by Technical Committee CEN/TC 286 "Liquefied petroleum gas equipment and accessories", the secretariat of which is held by NSAI.

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of an identical text or by endorsement, at the latest by April 2003, and conflicting national standards shall be withdrawn at the latest by April 2003.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

Annexes A, B, C, D, E and H are normative and annexes F and G informative.

NOTE The design formulae quoted in this document require the use of consistent units.

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, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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EN 14075:2002 (E)**1 Scope**

This European Standard specifies requirements for the design and manufacture of static welded steel cylindrical tanks, serially produced for the storage of liquefied petroleum gas (LPG) with a volume not greater than 13 m³ and for installation underground.

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 287-1, *Approval testing of welders — Fusion welding — Part 1: Steels.*

EN 288-2, *Specification and approval of welding procedures for metallic materials — Part 2: Welding procedure specification for arc welding.*

EN 288-3, *Specification and approval of welding procedures for metallic materials — Part 3: Welding procedure tests for the arc welding of steels.*

EN 288-8, *Specification and approval of welding procedures for metallic materials — Part 8: Approval by a pre-production welding test.*

EN 462, *Non-destructive testing — Image quality of radiographs.*

EN 473, *Non destructive testing — Qualification and certification of NDT personnel — General principles.*

EN 499, *Welding consumables — Covered electrodes for manual arc welding of non-alloy and fine grain steels — Classification.*

EN 571-1, *Non destructive testing — Penetrant testing — Part 1: General principles.*

EN 756, *Welding consumables — Wire electrodes and wire-flux combinations for submerged arc welding of non alloy and fine grain steels — Classification.*

EN 758, *Welding consumables — Tubular cored electrodes for metal arc welding with and without a gas shield of non alloy and fine grain steels — Classification.*

EN 837-2, *Pressure gauges — Part 2: Selection and installation recommendations for pressure gauges.*

EN 875, *Destructive tests on welds in metallic materials — Impact tests — Test specimen location, notch orientation and examination.*

EN 876, *Destructive tests on welds in metallic materials — Longitudinal tensile test on weld metal in fusion welded joints.*

EN 895, *Destructive tests on welds in metallic materials — Transverse tensile test.*

EN 910, *Destructive tests on welds in metallic materials — Bend tests.*

EN 970, *Non-destructive examination of fusion welds — Visual examination.*

EN 1290, *Non-destructive examination of welds — Magnetic particle examination of welds.*

EN 1321, *Destructive tests on welds in metallic materials — Macroscopic and microscopic examination of welds.*

EN 1418, *Welding personnel — Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanized and automatic welding of metallic materials.*

EN 1435, *Non-destructive examination of welds — Radiographic examination of welded joints.*

EN 1668, *Welding consumables — Rods, wires and deposits for tungsten inert gas welding of non-alloy and fine grain steels — Classification.*

EN 1708-1, *Welding - Basic weld joint details in steel — Part 1: Pressurized components.*

EN 1714, *Non-destructive examination of welds — Ultrasonic examination of welded joints.*

EN 10025, *Hot rolled products of non-alloy structural steels — Technical delivery conditions.*

EN 10028-2, *Flat products made of steels for pressure purposes — Part 2: Non-alloy and alloy steels with specified elevated temperature properties.*

EN 10028-3, *Flat products made of steels for pressure purposes — Part 3: Weldable fine grain steels, normalized.*

EN 10028-5, *Flat products made of steels for pressure purposes — Part 5: Weldable fine grain steels, thermomechanically rolled.*

EN 10204, *Metallic products — Types of inspection documents.*

EN 12062, *Non-destructive examination of welds — General rules for metallic materials.*

EN 13445-2, *Unfired pressure vessels — Part 2: Materials.*

EN 13445-3, *Unfired pressure vessels — Part 3: Design.*

prEN 13636, *Cathodic protection of buried metallic tanks and related piping.*

EN ISO 6520-1, *Welding and allied processes — Classification of geometric imperfections in metallic materials — Part 1: Fusion welding (ISO 6520-1:1998).*

ISO 9162, *Petroleum products — Fuels (class F) — Liquefied petroleum gases — Specifications.*

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3 Terms and definitions

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

3.1

PED

Directive 97/23/EC of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment

3.2

yield strength

upper yield strength R_{eH} or, for steels that do not exhibit a definite yield, the 0,2 % proof strength

NOTE These properties are equivalent to those specified by the symbol R_{eH} , in the PED.

3.3

serially produced tanks

more than one tank manufactured in the same factory to a common design using the same material and manufacturing procedure and produced with no major interruption within a given period of time

3.4

batch

group of pressure parts or finished tanks, made consecutively by the same manufacturer using the same manufacturing techniques to the same design, nominal size and material specifications on the same production machinery and subject to the same heat treatment conditions

NOTE In this context, consecutively need not imply continuous production.

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3.5

cold forming

forming at temperatures not less than 25 °C below the maximum permissible temperature for stress relieving in accordance with the material specification

3.6

hot forming

forming at temperatures above the maximum permissible temperature for stress relieving in accordance with the material specification

3.7

climatic area

geographic area agreed or defined by the relevant national authorities, or other bodies, responsible for defining the design conditions for LPG storage tanks, in the country(ies) where the tank is intended to be operated. The area is used to define the reference temperature for design pressure and filling

3.8

notified body

body notified to the Commission by Member States, appointed to perform the functions specified in the PED

3.9

design pressure p

gauge pressure used in design formulae

NOTE For tanks made to this standard, the design pressure is equal to the "Maximum allowable pressure", PS, in the PED.

3.10

manufacturer

manufacturer of the tank unless otherwise specified

3.11

A_{r3}

critical point, on the iron – iron carbide equilibrium diagram, representing the temperature at the end of transformation of ferrite to austenite on cooling of the steel

NOTE The actual temperature varies with composition of the steel.

4 Materials

4.1 Shells and ends

Materials for shells and ends shall be selected from the range of steels specified in EN 10028-2, EN 10028-3 or EN 10028-5. Alternatively, other equivalent material specifications, which have either European materials approval or have been subjected to a particular material appraisal may be used.

In all cases the materials used shall comply with the following:

- the chemical composition and mechanical properties shall meet the requirements of either Group 1 or Group 2, as defined in Table 1;
- the minimum specified ultimate tensile strength shall not exceed 700 N/mm^2 ;
- the minimum elongation shall be 14 %;
- impact properties shall be not less than 27 J at the minimum design temperature or shall meet the requirements for low temperature design as detailed in EN 13445-2;
- steels in sub-group 2.2 shall have a carbon equivalent limited to 0,36%, maximum, when calculated in accordance with EN 10028-5.

Steels shall be grouped in accordance with Table 1.

Table 1 — Material grouping

Group	Sub-group	Type of steel
1		Steels with a specified minimum yield strength $R_{eH} \leq 460 \text{ N/mm}^2$ ^a and with analysis in % : $C \leq 0,25$ $Si \leq 0,60$ $Mn \leq 1,70$ $Mo \leq 0,70^b$ $S \leq 0,045$ $P \leq 0,045$ $Cu \leq 0,40^b$ $Ni \leq 0,5^b$ $Cr \leq 0,3$ (0,4 for castings) ^b $Nb \leq 0,05$ $V \leq 0,12^b$ $Ti \leq 0,05$
	1.1	Steels with a specified minimum specified yield strength $R_{eH} \leq 275 \text{ N/mm}^2$
	1.2	Steels with a specified minimum yield strength $275 \text{ N/mm}^2 < R_{eH} \leq 360 \text{ N/mm}^2$
	1.3	Normalized fine grain steels with a specified minimum yield strength $R_{eH} > 360 \text{ N/mm}^2$
2		Thermomechanically treated fine grain steels and cast steels with a specified minimum yield strength $R_{eH} > 360 \text{ N/mm}^2$
	2.1	Thermomechanically treated fine grain steels and cast steels with a specified minimum yield strength $360 \text{ N/mm}^2 < R_{eH} \leq 460 \text{ N/mm}^2$
	2.2	Thermomechanically treated fine grain steels and cast steels with a specified minimum yield strength $R_{eH} > 460 \text{ N/mm}^2$
^a In accordance with the specification of the steel product standards, R_{eH} may be replaced by $R_{p0,2}$.		
^b A higher value is accepted provided that $Cr + Mo + Ni + Cu + V \leq 0,75 \%$.		

4.2 Pressure parts other than shells and ends

Materials for pressure parts other than shells and ends shall comply with the appropriate harmonised European Standard for the material or a similar specification, which has European materials approval, or particular material approval.

Materials shall also meet the requirements of 4.1.

4.3 Parts welded to the tank

Non- pressure retaining parts that are directly welded to the pressure retaining parts shall be made from suitable materials selected from EN 10025 or a material, which is compatible with the pressure retaining part material.

NOTE It can be necessary for these materials to be subject to the alternative material approval requirements of the PED.

In all cases the material shall meet the requirements of 4.1.

4.4 Welding consumables

The welding consumables shall be such that they are capable of giving consistent welds with the properties at least equal to those specified for the parent materials of the finished tank.

The welding consumables shall be selected from EN 499, EN 756, EN 758, or EN 1668 as appropriate. Suitability of the chosen consumables shall be demonstrated in accordance with 7.6.3.

4.5 Certificates

The tank manufacturer shall obtain certificates showing the chemical analysis and details of the mechanical properties of the steel supplied for the construction of the pressure retaining parts of the tank. The certificates shall be in accordance with EN 10204, certificate Type 3.1.B.

4.6 Non metallic materials (gaskets)

Non metallic materials shall be compatible with both phases of LPG over the full range of pressures and temperatures anticipated in service.

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5 Design

5.1 General

Tank thicknesses shall be calculated in accordance with annex E.

For tanks intended to contain LPG which complies with ISO 9162 supplied to a national or international standard or other equivalent specification, no internal corrosion allowance is required.

For tanks protected against external corrosion in accordance with 10.1, no external corrosion allowance is required.

The appropriate weld joint coefficient for the material used and the level of non-destructive testing to be adopted shall be selected in accordance with Table 2.

The tank shall be designed to withstand the forces of pressure, vacuum conditions, weight of the surrounding ground in operating condition, anti flotation devices and liquid load in accordance with 5.3, 5.4 and 5.5.

Where necessary, attachments to the tank shall be welded using a backing plate.

A fully detailed, dimensional drawing shall be produced.

EN 14075:2002 (E)**5.2 Temperature**

The design temperature range shall be -20 °C to 50 °C . However, if temperatures lower than -20 °C are envisaged, the manufacturer shall demonstrate that the material from which the pressure containing parts of the tank are constructed shall have properties suitable for a range of temperatures -40 °C to 50 °C in accordance with EN 13445-2.

5.3 Pressure

The design pressure, p (see 3.9), shall not be less than the maximum pressure reached in service, in accordance with annex A. It shall be selected taking into account the maximum pressure developed by the LPG:

- at the maximum soil temperature at 1 m depth; and
- at the time of delivery.

5.4 Vacuum conditions

The tank shall be designed to withstand a minimum internal pressure of 0,3 bar absolute.

NOTE 1 EN 13445 part 3 provides acceptable design methods for shells under external pressure.

NOTE 2 This requirement should ensure that the tank will withstand vacuum conditions generated by the product during operation or normal maintenance.

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5.5 Support loadings

The tank shall be designed to withstand the greater of:

- the operating mass plus the mass of the backfill above the tank;
- the load from its supports when the tank is filled with water.

This shall be demonstrated by calculation in accordance with EN 13445-3 or experimental testing.

5.6 Lifting lugs loadings

The lifting lugs shall be designed to accept the maximum loads anticipated during construction and handling. This shall be demonstrated by calculation in accordance with EN 13445-3 or experimental testing.

6 Openings**6.1 General**

Tanks shall be provided with an adequate number of openings to satisfy the need for fittings to meet service requirements. Openings using screwed or flanged connections shall be positioned such that they remain accessible after installation.

6.2 Reinforcement

Each opening shall be reinforced by a boss, pad or compensating plate attached by welding and designed in accordance with E.3.

6.3 Position of welds and openings

The welds of openings shall be clear of longitudinal and circumferential welds and welds of other openings by a minimum of 40 mm between the weld edges.

7 Workmanship and manufacture

7.1 General

Tanks shall be manufactured according to drawings and specifications in accordance with the requirements of this standard and sound engineering practice.

The manufacturer shall be responsible for the competence, training and supervision of its staff.

Materials specified for the manufacture of the tanks shall be worked (subject to the working instructions of the material manufacturer if any) so that the finished tank shows both the properties necessary to meet the design intent and the requirements of this standard.

The manufacturer shall have a defined organisation for the control of manufacturing operations which includes special processes such as forming, welding and heat treatment.

7.2 Control and traceability of materials

The manufacturer shall maintain a system of identification for the material used in fabrication in order that all material for pressure parts in the completed tank can be traced to its origin. The system shall incorporate procedures for verifying the identity of material as received from the supplier via the material manufacturers' test certificates and/ or acceptance tests.

The manufacturer shall ensure that the material used complies with that specified in the design and/or the drawings.

In laying out and cutting the material, the material identification mark shall be so located as to be:

- a) clearly visible when the pressure part is completed, or
- b) traceable by operation of a documented system which ensures material traceability for all materials in the completed tank.

When identification on materials is transferred, the method of stamping or marking shall not have any detrimental effect on the specified material properties.

NOTE Where the material identification mark is unavoidably cut out during manufacture of a pressure part, it should be transferred by the pressure part manufacturer, to another part of this component. The transfer of the mark should be carried out by a person designated by the manufacturer.

Records of the welding consumables used shall be retained.

7.3 Manufacturing tolerances

Tolerances on the shape of tanks shall be in accordance with annex B.

7.4 Acceptable weld details

Basic weld details shall be in accordance with EN 1708–1. Recommended weld details are provided in annex G.