SLOVENSKI STANDARD
SIST EN 12285-1:2003

01-december-2003

V delavnici izdelani jekleni rezervoarji - 1. del: Enoplaġļ ni in dvoplaġļ ni leģeļ i valjasti rezervoarji za podzemno skladiġļ enje gorljivih in negorljivih tekoļ in, ki onesnaģujejo vodo

Workshop fabricated steel tanks - Part 1: Horizontal cylindrical single skin and double skin tanks for the underground storage of flammable and non-flammable water polluting liquids

Werksgefertigte Tanks aus Stahl - Teil 1:Liegende zylindrische ein- und doppelwandige Tanks zur unterirdischen Lagerung von brennbaren und nicht brennbaren wassergefährdenden Flüssigkeiten

Réservoirs en aciers fabriqués en atelier - Partie 1:Réservoirs horizontaux cylindriques a simple et double paroi pour le stockage enterré de liquides inflammables et non-inflammables polluant l'eau

Ta slovenski standard je istoveten z: **EN 12285-1:2003**

ICS:

13.300	Varstvo pred nevarnimi izdelki	Protection against dangerous goods
23.020.10	Nepremiļ ne posode in rezervoarji	Stationary containers and tanks

SIST EN 12285-1:2003 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

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English version

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This European Standard was approved by CEN on 4 November 2002.

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 Management Centre 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland and United Kingdom.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

Foreword

This document (EN 12285-1:2003) has been prepared by Technical Committee CEN /TC 221 "Shop fabricated metallic tanks and equipment for storage tanks and for service stations", the secretariat of which is held by DIN.

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 September 2003, and conflicting national standards shall be withdrawn at the latest by September 2003.

This standard is part of a series of standards in the field of shop fabricated metallic tanks. The titles of the standards which are already edited or are under preparation are:

— Workshop fabricated steel tanks; Horizontal cylindrical single skin and double skin tanks for the underground storage of flammable and non-flammable water polluting liquids

— Workshop fabricated steel tanks; Horizontal cylindrical single skin and double skin tanks for the aboveground storage of flammable and non-flammable water polluting liquids.

Further standards will be evaluated according to former decisions of CEN/TC 221 and according to the common rules for standard works for CEN-standards.

Annexes A, B and C are informative.

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This standard specifies the requirements for shop fabricated cylindrical, horizontal steel tanks, single and double skin for the underground storage of water polluting liquids (both flammable and non-flammable) within the following limits:

— from 800 mm up to 3000 mm nominal diameter and,

— up to a maximum overall length of 6 times the nominal diameter and,

— for liquids with a maximum density of up to 1,9 kg/l and,

— with an operating pressure (p_0) of maximum 1,5 bar (abs.) and,

— for double skin tanks with a vacuum leak detection system where the kinematic viscosity does not exceed 5×10^{-3} m^2/s.

This standard is applicable for normal operating temperature conditions (-20 °C to +50 °C). Where temperatures are outside this range, additional requirements should be taken into account.

For guidance on the liquid-material combinations see Annex B.

This standard is not applicable to the liquid classes listed in Table 1 because of special dangers involved. This standard does not deal with internal coating.

Table 1 — List of dangerous goods not to be considered by this standard

UN-classification	Dangerous Good
Class 1	Explosives
Class 4.2	Substances liable to spontaneous combustion
Class 4.3	Substances which in contact with water emit flammable gases
Class 5.2	Organic peroxides
Class 6.2	Infectious substances
Class 7	Radioactive substances, hydrocyanic or hydrocyanic solvent liquids, metalcarbonyls, hydrofluoracid, bromide liquids

The classifications referred to are those adopted by the United Nations Committee of Experts on the Transport of Dangerous Goods (not to be interpreted as tank classes described in 3.4).

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 288–1, *Specification and qualification of welding procedures for metallic materials — Part 1: General rules for fusion welding.*

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

EN 10051:1991, *Continuously hot-rolled uncoated plate, sheet and strip of non-alloy and alloy steels — Tolerances on dimensions and shape.*

EN 10204:1991, *Metallic products — Types of inspection documents.*

prEN 13160–1, *Leak detection systems — Part 1: General principles.*

prEN 13160–2, *Leak detection systems — Part 2: Pressure and vacuum systems.*

prEN 13160–3, *Leak detection systems — Part 3: Liquid systems for tanks.*

prEN 13160–4, *Leak detection systems — Part 4: Liquid and/or vapour sensor systems for use in leakage containments or interstitial spaces.*

prEN 13160–5, *Leak detection systems — Part 5: Tank gauge leak detection systems.*

prEN 13160–6, *Leak detection systems — Part 6: Sensors in monitoring wells.*

prEN 13160–7, *Leak detection systems — Part 7: General requirements and test methods for interstitial spaces, leak protecting linings and leak protecting jackets.*

EN ISO 898–1, *Mechanical properties of fasteners made of carbon steel and alloy steel - Part 1: Bolts, screws and studs (ISO 898-1:1999).*

EN ISO 8501–1, *Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings (ISO 8501-1:1988).*

3 Terms and definitions

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

3.1
tanks
workshop fabricated cylindrical containments for the storage of liquids. They are made of steel, equipped with dished ends and consist of one or more compartments

3.2
compartment
single storage fluid space within a tank

3.3
underground tanks
tanks which are totally or partially imbedded in the ground

3.4
tank classes
are defined in Table 2

Table 2 — Tank classes

Tank class	Description
Class A	For liquids with density up to 1,1 kg/l
Class B	For liquids with density up to 1,9 kg/l
Class C	For liquids with density up to 1,9 kg/l, and explosion pressure shockproof under atmospheric conditions (see also 3.5)

3.5
explosion pressure shockproof tanks
are designed to withstand an internal explosion without leakage; permanent deformations are permissible. Where the atmospheric pressure of 1 bar the maximum explosion pressure is measured at 10 bar (abs.)

3.6
tank types
for the purpose of this standard two tank types are distinguished:

Type S: Single skin

Type D: Double skin

3.7
operating pressure (p_o)
pressure inside the tank above the liquid during operating conditions

3.8
test pressure (p_{t1})
pressure to which the tank or compartment is subjected for testing

3.9
interstitial test pressure (p_{t2})
pressure to which the interstitial space between the skins is subjected for testing. It is only applicable for double skin tanks

3.10
nominal volume
volume stated on customer's order

3.11
actual volume
volume which is equal to or greater than the nominal volume

NOTE The safe working capacity of the tank should usually not exceed 97 % of the nominal volume in normal operating temperatures.

4 Symbols and abbreviations

For the purpose of this standard the following symbols apply:

Dimensions in mm

d_1 External nominal diameter of the tank

d_2 Inside diameter of the manhole

d_3 Diameter of the manhole cover

h_1 Length of the straight flange of the dished end

k_p Pitch circle diameter

l_c Length of the compartment of a tank without dished ends

l_o Overall length of the tank

l_z Length of the tank without dished ends

r_1 Crown radius of dished ends

r_2 Knuckle radius of dished ends

r_3 Knuckle radius of the outer dished end

s_1 Nominal thickness of inner skin and inner dished ends

s_2 Interstitial space

s_3 Nominal thickness of outer skin

s_4 Nominal thickness of outer dished ends

s_5 Nominal thickness of compartment dished ends

s_6 Nominal thickness of manhole flange and cover

s_7 Plate thickness of manhole body

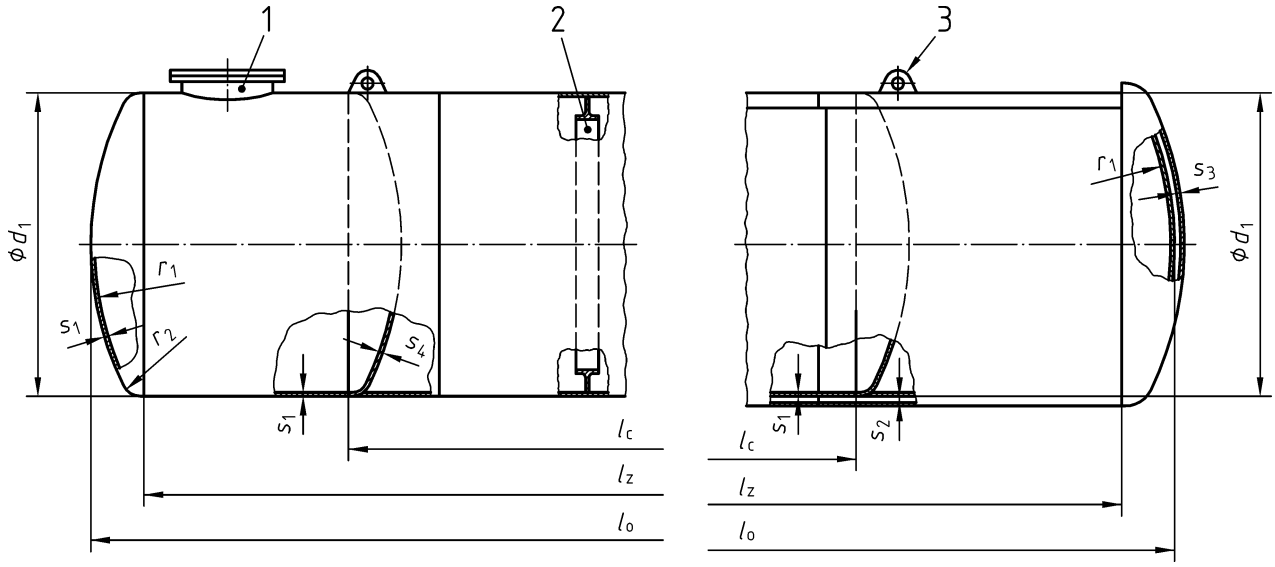
γ incline angle for T-joint welding

Tank type S

(single skin)

Tank type D

(double skin)



Key

1 nozzle detail see figure 3
2 example for stiffening ring see figure 4
3 lifting lug

Figure 1 — Example of tank symbols

5 Designation and purchaser's specification

Example for designation: A tank according to this standard with a nominal volume of 50 m³ and a nominal diameter d_1 = 2500 mm, tank class A and type D is designated as follows:

Tank	**EN**	**12285-1/50/2500/A/D**

The purchaser shall also provide the following information:

a) number of compartments and their volumes,

b) material specification,

c) kind of external coating.

6 Materials

6.1 General

The manufacturer selects the material in accordance with the customer's instructions either by using the material specified by the purchaser or by nomination of intended liquids to be stored.

Annex B provides guidelines on material specifications in relation to storage media.

6.2 Materials for shell, dished ends and manholes

Carbon steel according to EN 10025 or austenitic stainless steel according to EN 10088-1 may be used if the mechanical properties are at least equal to those of S 235 JR (EN 10025).

In areas where low temperatures have to be considered (below -20°C) and in this case wall-thicknesses are 6 mm, at least carbon steel of grade S 235 J2G3 or equal shall be used.

6.3 Materials for tank accessories

Materials used for the fabrication of tank accessories if welded to the tank shall be compatible with the tank material.

6.4 Consumable

All welding rods/wires and other consumables shall be compatible with the basic material.

6.5 Material inspection documentation

Material inspection documentation of shell plates and dished ends shall for carbon steel according to EN 10025 be in accordance with the requirements of 2.2 of EN 10204: 1991 and for all other steel qualities shall be in accordance with 3.1 B of EN 10204: 1991.

7 Design

7.1 Forms of construction

Single skin tanks shall form an impermeable containment; they constitute the inner tank of a double skin tank.

7.2 Single skin tanks

Single skin tanks shall form an impermeable containment; they constitute the inner tank of a double skin tank.

7.3 Double skin tanks

For double skin tanks, a secondary skin is welded around the inner tank, which forms an impermeable self contained tank. The secondary skin shall cover at least 97 % of the nominal volume of the inner tank.

There shall be at least two sockets for the leak detection system and these shall be located at the highest point of the interstitial space. The interstitial space shall be connected to a leak detection system in order to monitor the integrity of the tank permanently.

For leak detection systems see prEN 13160–1 to –7.

7.4 Dished ends

Dished ends shall be used for external ends and to separate compartments.

The following dimensions shall apply: $r_1 \leq d_1$ $r_2 \geq d_1/30$.

7.5 Compartments

The nominal wall thicknesses of dished ends separating the compartments (compartment dished ends) are given in Table 3. For classes A and B a different form of dished ends separating the compartments is possible, where $r_1 = d_1$, but without knuckle radius r_2 and without straight flange.

A compartment dished end with a knuckle radius and a straight flange is equivalent to a reinforcement ring at the same position.

7.6 Dimensions

7.6.1 Material thickness

The nominal wall thickness of the inner tank shell, outer tank shell and dished ends shall be specified by the manufacturer in rounded millimetres, and shall be at least as given in Table 3.

Table 3 — Nominal wall thickness for inner and outer skin of tanks, dished ends and compartment dished ends

Tank classes	Class A		Class B		Class C	
Nominal diameter of the tank d_1 in mm	Nominal shell thickness in mm					
	s_1 inner skin	s_3 outer skin	s_1 inner skin	s_3 outer skin	s_1 inner skin	s_3 outer skin
800 up to 1600	5	3	5	3	5	3
1601 up to 2000	6	3	6	3	6	3
2001 up to 2500	6	4	7	4	7	4
2501 up to 3000	7	4	9	4	9	4
Nominal diameter of the tank d_1 in mm	Nominal wall thickness of dished ends in mm					
	s_1 inner skin	s_4 outer skin	s_1 inner skin	s_4 outer skin	s_1 inner skin	s_4 outer skin
800 up to 1600	5	3	5	3	5	3
1601 up to 2000	6	3	6	3	6	3
2001 up to 2500	6	5	7	5	7	5
2501 up to 3000	7	5	9	5	9	5
Nominal diameter of the tank d_1 in mm	Nominal wall thickness of compartment dished ends in mm					
	s_5		s_5		s_5	
800 up to 1600	5		5		10	
1601 up to 2000	6		6		14	
2001 up to 2500	6		7		16	
2501 up to 3000	7		9		18	

7.6.2 Secondary skin – Circumferential angle

The secondary skin shall enclose at least 300 degrees of the circumference of the tank, leaving not more than 60 degrees on the top uncovered.

In cases where the manhole diameter exceeds $d_1/2$, the manhole shall be provided with a secondary skin.

7.6.3 Interstitial space

The interstitial space gap should be as small as practically possible but suitable for the leak detection system to function.

7.7 Tolerances

7.7.1 The overall length of the inner tank

The tolerance on the overall length of the tank shall be ± 1% of the real length stated by the manufacturer.

7.7.2 Wall thickness

The minimum thicknesses of dished ends after forming and for shell plates shall be at least 92 % of the nominal wall thickness according to Table 3. The thickness of shell plates shall be in accordance with EN 10051:1991, Table 2.

7.7.3 Circumference of dished ends

For the dished ends, the tolerances shall be -0/+6 mm for $d_1 \leq 2000$ mm, and -0/+10 mm for $d_1 > 2000$ mm based on the calculated circumference of d_1.

7.8 Shell plate arrangement

Cross seams are not allowed. Longitudinal welds are not allowed in the bottom half of the tank.

Key

a minimum distance: 5 x wall thickness but not less than 25 mm.

Figure 2 — Shell-plate arrangement for inner and outer skin

7.9 Manholes and inspection covers

Unless otherwise specified by the purchaser, the tanks shall be equipped with at least one inspection cover per compartment. In cases where inspection covers are not allowed, the tanks shall have one manhole of at least d_2 = 600 mm. No part of a compartment shall be more than 10 m from a manhole. Single skin tanks shall always have a manhole.

The manufacturer shall decide whether manholes (inspection covers, nozzles) shall be of set-through or set-on-type. Nozzles and flanges shall either be welded inside and outside, or by full penetration.

For the dimensions of the manholes and their components see Table 4.

Table 4 — Dimensions of manhole components

Inside diameter d_2 mm	Plate thickness of manhole body s_7 mm	Diameter of cover d_3 mm	Pitch circle diameter k_p mm	Bolt hole diameter mm	Flange thickness and cover thickness s_6 mm		Bolts	
							Thread size	Number
					Class A	Class B and C		
600[a]	6	720	680	18	12	16	M 16	32
800	7	920	880		12	20		44
1000[b]	7	1120	1080		--	20		48
a If a manhole is required and no specification is given by the purchaser this diameter shall be used.								
b For tanks of class C inside diameters of the manhole (d_2) exceeding 800 mm are not permitted.								

Instead of the manhole covers shown in the figure 3 and dimensioned in Table 4, ribbed or embossed covers may be used in class A tanks with a plate thickness at least equal to the thickness of the inner tank s_1. A ribbed or embossed cover shall withstand the test pressure p_{t1}.

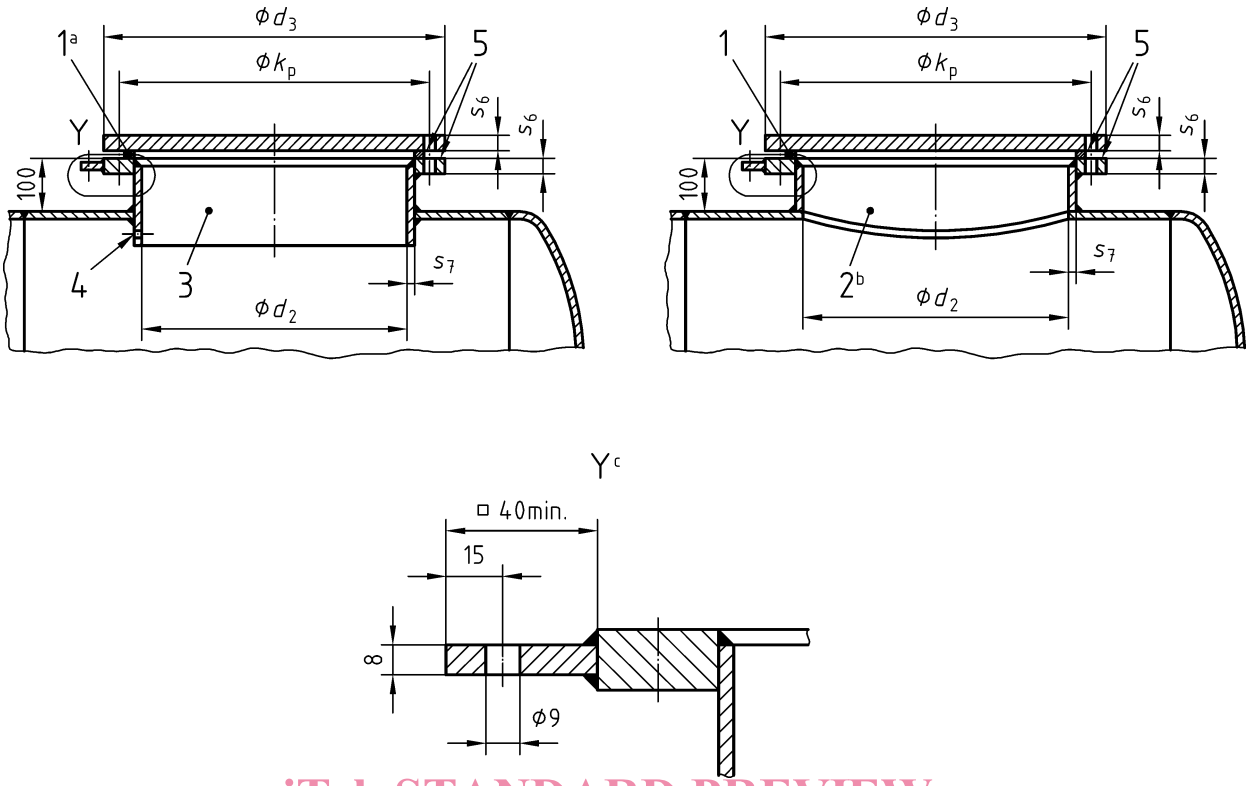
Inspection covers for tanks of class A with $d_1 \leq 1250$ mm and tanks of classes B and C with $d_1 \leq 1000$ mm. The diameter of the inspection cover shall not be larger than 300 mm and not smaller than 120 mm, and the thickness of the inspection cover shall be equal to the minimum thickness of the inner tank.

7.10 Structural bolts

Structural bolts used shall be in accordance with EN ISO 898-1, with a property class being at least 4.6. The material chosen shall be compatible with the tank material.

7.11 Tank fittings, pipes and nozzles

All tank fittings, pipes and nozzles, shall be situated on the manhole cover or in the single skin top of the tank. For tanks of class C only the set-through nozzles shall be used. A penetration of the double skin is not allowed (exception: nozzles for leak detection system). Fittings and all other openings shall have a minimum distance of 50 mm to welded seams.



Key

1 Gasket
2 set-through nozzle
3 set-on nozzle
4 vent or pressure relief device of 10 mm diameter
5 surface roughness of facing: $\sqrt{R_z \bullet 160}$

a Gaskets shall be suitable for the purpose.
b For set-through-nozzles a vent of 10 mm diameter or equivalent opening shall be provided in the manhole neck at the highest practical point.
c Connection for earthing and use for cathodic corrosion protection if required.

Figure 3 — Examples for manhole

7.12 Stiffening rings

The following methods of construction may be used:

T 80 x 80 according to EN 10055, or 100 x 12.