SLOVENSKI STANDARD
SIST EN 14025:2018

01-november-2018

Nadomešča:
SIST EN 14025:2013+A1:2016

Cisterne za prevoz nevarnega blaga - Kovinske tlačne posode - Konstruiranje in izdelava

Tanks for the transport of dangerous goods - Metallic pressure tanks - Design and construction

Tanks für die Beförderung gefährlicher Güter - Metallische Drucktanks - Auslegung und Bau

Citernes pour le transport de matières dangereuses - Citernes métalliques sous pression - Conception et fabrication

Ta slovenski standard je istoveten z: **EN 14025:2018**

ICS:

13.300	Varstvo pred nevarnimi izdelki	Protection against dangerous goods
23.020.20	Posode in vsebniki, montirani na vozila	Vessels and containers mounted on vehicles

SIST EN 14025:2018 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14025

July 2018

ICS 13.300; 23.020.20

Supersedes EN 14025:2013+A1:2016

English Version

Tanks for the transport of dangerous goods - Metallic pressure tanks - Design and construction

Citernes pour le transport de matières dangereuses - Citernes métalliques sous pression - Conception et fabrication

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This European Standard was approved by CEN on 1 July 2018.

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

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Ref. No. EN 14025:2018 E

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European foreword

This document (EN 14025:2018) has been prepared by Technical Committee CEN/TC 296 “Tanks for the transport of dangerous goods”, 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of an identical text or by endorsement, at the latest by January 2019, and conflicting national standards shall be withdrawn at the latest by January 2019.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 14025:2013+A1:2016.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

Compared with EN 14025:2013+A1:2016 the following significant changes apply:

a) alignment with RID/ADR as known at publication of this European Standard;

b) modification of the definition "pressure tank" (3.1.1), removing the reference to test pressure;

c) deletion of requirements about the thickness of the flange of the end (6.3.3.3);

d) amendment of the definition of the thickness e_n in Figure 8 (examples for reinforcements of shell openings) and Figure A.2 (example for a manhole opening) as well as in Formula (39); Sub-Figure 8 e) amended, new Sub-Figure 8 g) added;

e) external pressure resistance testing (6.4.4) replaced with a reference to EN 12972;

f) requirements for the manufacturer’s certificate or acceptance test certificate removed and clarified that it is issued according to agreement with the buyer/customer (7.1.3);

g) examination and testing of welds (7.4.3) replaced with a normative reference to EN 12972, except for requirements for the welding of the large end of a cone without a knuckle to a cylinder;

h) manufacturing tolerances concerning the plate alignment (7.5.1) adjusted in accordance with EN 12972;

i) explosion pressure shock resistant design of tanks (informative Annex B) amended so that dished ends are included;

j) normative references updated;

k) alignment of the whole document with the current principles and rules for the structure and drafting of CEN and CENELEC documents.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta,

Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This document specifies the minimum requirements for the design and construction of metallic pressure tanks having a maximum working pressure exceeding 50 kPa (0,5 bar), for the transport of dangerous goods by road and rail and sea. This document includes requirements for openings, closures and structural equipment; it does not cover requirements of service equipment. For tanks for the transport of cryogenic liquids, EN 13530-1 and EN 13530-2 apply.

Design and construction of pressure tanks according to the Scope of this document are primarily subject to the requirements of RID/ADR, Subsections 6.8.2.1, 6.8.3.1 and 6.8.5, as relevant. In addition, the relevant requirements of RID/ADR, Table A, columns 12 and 13, to Chapters 3.2, 4.3 and Subsection 6.8.2.4 apply. For the structural equipment RID/ADR, Subsections 6.8.2.2 and 6.8.3.2 apply, as relevant. The definitions of RID/ADR, Subsection 1.2.1, are referred to. For portable tanks see also RID/ADR, Chapter 4.2 and Sections 6.7.2 and 6.7.2. In addition, the relevant requirements of RID/ADR, Table A, Columns 10 and 11 to Chapters 3.2, 4.2, and Sections 6.7.2 and 6.7.3 apply. The paragraph numbers above relate to the 2017 issue of RID/ADR which are subject to regular revisions. This can lead to temporary non-compliances with EN 14025.

This document is applicable to liquefied gases including LPG; however for a dedicated LPG standard see EN 12493.

If not otherwise specified, provisions which take up the whole width of the page apply to all kind of tanks. Provisions contained in a single column apply only to:

tanks according to RID/ADR Chapter 6.8 (left-hand column);	portable tanks according to RID/ADR Chapter 6.7 (right-hand column).

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.

EN 1591-1, *Flanges and their joints – Design rules for gasketed circular flange connections – Part 1: Calculation*

EN 12972, *Tanks for transport of dangerous goods – Testing, inspection and marking of metallic tanks*

EN 13094:2015, *Tanks for the transport of dangerous goods – Metallic tanks with a working pressure not exceeding 0,5 bar – Design and construction*

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

EN 13445-3:2014, *Unfired pressure vessels – Part 3: Design*

EN 13445-4, *Unfired pressure vessels – Part 4: Fabrication*

EN 13445-8, *Unfired pressure vessels – Part 8: Additional requirements for pressure vessels of aluminium and aluminium alloys*

EN ISO 3834-1, *Quality requirements for fusion welding of metallic materials – Part 1: Criteria for the selection of the appropriate level of quality requirements (ISO 3834-1)*

EN ISO 3834-2, *Quality requirements for fusion welding of metallic materials – Part 2: Comprehensive quality requirements (ISO 3834-2)*

EN ISO 9606-1, *Qualification testing of welders – Fusion welding – Part 1: Steels (ISO 9606-1)*

EN ISO 9606-2, *Qualification test of welders – Fusion welding – Part 2: Aluminium and aluminium alloys (ISO 9606-2)*

EN ISO 14732, *Welding personnel – Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials (ISO 14732)*

EN ISO 15607, *Specification and qualification of welding procedures for metallic materials – General rules (ISO 15607)*

EN ISO 15609-1, *Specification and qualification of welding procedures for metallic materials – Welding procedure specification – Part 1: Arc welding (ISO 15609-1)*

EN ISO 15609-3, *Specification and qualification of welding procedures for metallic materials – Welding procedures specification – Part 3: Electron beam welding (ISO 15609-3)*

EN ISO 15609-4, *Specification and qualification of welding procedures for metallic materials – Welding procedure specification – Part 4: Laser beam welding (ISO 15609-4)*

EN ISO 15613, *Specification and qualification of welding procedures for metallic materials – Qualification based on pre-production welding test (ISO 15613)*

EN 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 15614-1)*

EN ISO 15614-2, *Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 2: Arc welding of aluminium and its alloys (ISO 15614-2)*

ISO 1496-3, *Series 1 freight containers – Specification and testing – Part 3: Tank containers for liquids, gases and pressurized dry bulk*

ISO 7005-1, *Pipe flanges – Part 1: Steel flanges for industrial and general service piping systems*

3 Terms, definitions and symbols

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:

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

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
pressure tank
tank as defined in the international regulations for the transport of dangerous goods by road or rail having a maximum working pressure exceeding 50 kPa (0,5 bar)

3.2 Symbols

The following general symbols are used throughout the text. They are listed in alphabetical order and special symbols are explained with the relevant formulae. Additional symbols used in the text are explained in:

RID/ADR Chapter 6.8	RID/ADR Chapter 6.7

A_1	minimum elongation at fracture of the metal chosen under tensile stress in %		
d_i	inside diameter of an opening		
D	internal diameter of shell in mm		
D_c	mean diameter of the cylindrical part of the tank at the junction of a cone		
D_e	outside diameter of the cylindrical part of the tank or the straight flange of the dished end		
D_i	inside diameter of the cylindrical part of the tank or the straight flange of dished end	D_i	diameter of the shell (in m), but not less than 1,80 m
e	minimum required wall thickness (in mm) of the shell		
e_0	minimum shell thickness for mild steel in millimetres, according to RID/ADR, Subsections 6.8.2.1.18 and 6.8.2.1.19		
e_1	minimum shell thickness for the metal chosen in mm		
e_k	wall thickness of a conical part of a shell		
e_R	wall thickness of a hemispherical end		
E	Young's modulus		
f_d	nominal design stress (allowable stress)		
h	inside height of an ellipsoidal dished end		
K	shape factor of ellipsoidal ends		
MWP	maximum working pressure, in MPa	$MAWP$	maximum allowable working pressure, in M Pa
p	design pressure, in MPa	P	design pressure, in MPa
p_{dyn}	equivalent dynamic pressure		
p_{test}	test pressure, in MPa		
p_{vap}	vapour pressure at 50 °C or at the design temperature, whichever is the higher; to be taken as the numerical value of the absolute pressure	P_{vap1}	vapour pressure of the substance at 65 °C (according to RID/ADR, Subsection 6.7.2.1)
		P_{vap2}	vapour pressure of the non-refrigerated liquefied gas depends on the portable

	tank type (according to RID/ADR, Subsection 6.7.3.1)

P_c calculation pressure in MPa as specified in RID/ADR, Subsection 6.8.2.1.14

P_T test pressure in MPa

r inner knuckle radius, in mm

R inside spherical radius of the central part of a torispherical end

R_e guaranteed (upper) minimum yield strength or guaranteed minimum 0,2 % proof strength, in N/mm^2 (for austenitic steel the 1 % proof strength may be chosen)

$R_{e,t}$ guaranteed (upper) minimum yield strength or guaranteed minimum 0,2 % proof strength, at the relevant design temperature, in N/mm^2 (for austenitic steel the 1 % proof strength at the relevant design temperature may be chosen)

R_m guaranteed minimum tensile strength, in N/mm^2

R_{m1} minimum tensile strength of the metal chosen in N/mm^2

$R_{m,t}$ guaranteed minimum tensile strength at the relevant design temperature, in N/mm^2

σ permissible stress in N/mm^2, as defined in RID/ADR, Subsection 6.8.2.1.16

S safety factor

λ welding coefficient

4 Materials

4.1 General

The tank shell shall be fabricated from metallic materials which shall be resistant to brittle fracture and of adequate impact strength within the design temperature range. The material shall be suitable for forming.

EN 13445-2 and EN 13445-8 apply, whilst the minimum material requirements given in RID/ADR, Chapter 6.8 and Chapter 6.7, are fulfilled.

	Aluminium may only be used for the shells of portable tanks when indicated in a portable tank special provision assigned to a specific substance in RID/ADR, Chapter 3.2, Table A, Column 11 or when approved by the competent authority.

NOTE 1 For aluminium and aluminium alloys, see also EN 14286.

NOTE 2 RID/ADR restrict the use of materials with respect to the maximum yield and tensile strength of fine-grained steel for welded shells, maximum ratios of yield/tensile strength for welded steel shells and of the minimum elongation at fracture for welded fine- grained other steel and aluminium shells.

Welded shells shall be fabricated from a material which has been shown to have acceptable welding characteristics.

4.2 Compatibility

Shells, fittings, equipment and pipework which are in contact with the substance(s) intended to be carried shall be constructed from materials which are:

a) substantially immune to attack by the substance(s) intended to be transported; or

b) properly passivated or neutralized by chemical reaction; or

c) lined with corrosion-resistant material directly bonded to the shell or attached by equivalent means.

They comply with:

RID/ADR, Subsection 6.8.2.1.9	RID/ADR, Subsections 6.7.2.2 and 6.7.3.2

Gaskets shall be made of materials not subject to attack by the substances intended to be transported. The materials of the tank, including any devices, gaskets, linings and accessories, shall not adversely affect the substances intended to be transported in the tank.

Guidelines on material specifications in relation to the substances to be transported may be taken from EN 12285-1:2003, Annex B.

5 Design

5.1 General

Tanks shall be designed to withstand without loss of contents the:

1) operating conditions including static and dynamic forces in normal conditions of carriage. In addition, the design of portable tanks shall account for the effects of fatigue, caused by repeated application of these loads through the expected life of the portable tank;

2) test conditions;

3) explosion-pressure-shock resistant condition (if required) (see Annex B);

under consideration of Clause 6.

If sudden temperature differences are to be expected during filling or discharge of the tank the buckling effect of one sided expansion or contraction should be taken into account.

5.2 Minimum shell thickness

The shell thickness will not be less than that given in:

RID/ADR, Subsections 6.8.2.1.17 to 6.8.2.1.18, see Figure 1 of this standard	RID/ADR, Subsections 6.7.2.4 or 6.7.3.4, see Figure 2 of this standard

5.3 Reduction of shell thickness

The reduction of the minimum shell thickness (see Figure 1) is allowed if protection of the shell against damage through lateral impact or overturning is provided (see 5.4 and RID/ADR, Subsections 6.8.2.1.19 to 6.8.2.1.20 and 6.8.2.1.21 respectively) whilst the minimum requirements given in RID/ADR, Subsection 6.8.2.1.17 are met. For shells of tanks according to RID no reduction of the minimum wall thickness due to protection is allowed.	When additional protection against shell damage is provided as described in 5.4, portable tanks with test pressure less than 2,65 bar may have the minimum shell thickness reduced, in proportion to the protection provided (see RID/ADR, Subsections 6.7.2.4.3 to 6.7.2.4.5).

5.4 Protection of the shell

5.4.1 When required by 5.3 shells of:

tank containers	portable tanks

are protected against damage if one of the following measures is provided:

— structure, in which the shell is supported by a complete skeleton including longitudinal and transverse structural members. This structure shall conform to the requirements of ISO 1496-3;

— double wall construction, where the aggregate thickness of the outer metal wall and the shell itself is not less than the minimum shell thickness prescribed in:

RID/ADR, Subsection 6.8.2.1.18 and the shell wall thickness is not less than the minimum shell thickness prescribed in RID/ADR, Subsection 6.8.2.1.19;	RID/ADR, Subsections 6.7.2.4.1 and 6.7.2.4.2 and the shell wall thickness is not less than the minimum shell thickness prescribed in RID/ADR, Subsections 6.7.2.4.3 and 6.7.2.4.4;

— "sandwich" construction, which means shells made with double walls having an intermediate layer of rigid solid materials (e.g. foam, at least 50 mm thick), where the outer wall has a thickness of at least 0,5 mm of steel, 0,8 mm of aluminium or 2 mm of a plastics material reinforced with glass fibre. For other layer materials (e.g. mineral wool, at least 100 mm thick), the outer wall has a thickness of at least 0,8 mm of austenitic steel. Other combinations of materials used to provide protection against damage shall be shown to have equivalent strength. One method of comparing the strength of sheets of materials is given in EN 13094:2015, Annex B.

5.4.2 For shells of road tank vehicles see also EN 13094:2015, 6.9.2.

5.5 Protection of equipment

Items of equipment shall be protected against the risk of being wrenched off or damaged during transport or handling.

For tanks other than rail tank wagons equipment shall be protected by strengthening rings, protective canopies or transverse or longitudinal members. This protection of equipment shall comply with EN 13094:2015, 6.14. Items of equipment of tank containers are protected if placed within the contours of a skeleton structure (frame). Equipment used on tanks of tank vehicles for the transport of substances to which the special provision TE 19 of ADR (see ADR, Subsection 6.8.4) is allocated need additional protection. RID/ADR, Subsection 6.8.2.2, applies also. NOTE For vacuum-operated waste tanks, RID/ADR, Subsection 6.10.3.1 applies.	RID/ADR, Subsections 6.7.2.5, 6.7.2.6 and 6.7.3.5, apply also.

5.6 Other design requirements

Design criteria for:

— openings; see 6.3.5.1, 6.3.5.2.1 to 6.3.5.2.5, 6.3.5.3;

— ends; see 6.3.3.2 to 6.3.3.4;

— conical section of shell; see 6.3.4.1 and 6.3.4.2;

— hinged manhole cover and cover assemblies; see 6.3.6.5;

— flanges, joints and bolts; see 6.3.7.

NOTE RID/ADR include requirements on thermal insulation of linkage between shell and vehicle, design of surge plates and partitions, leakproof linings, thermal insulation, non-metallic linings, electrical earthing and secure base and lifting devices (see RID/ADR, Subsections 6.7.2, 6.7.3, 6.8.2.1.22, 6.8.2.1.24 to 6.8.2.1.27 and 6.8.5.1.5) which are not considered in this document.

RID/ADR require that shells of portable tanks made from aluminium shall be insulated to prevent significant loss of physical properties when subjected to a heat load of 110 kW/m^2 for a period of not less than 30 min and that the insulation shall remain effective at all temperatures less than 649 °C and shall be jacketed with a material with a melting point of not less than 700 °C.

6 Calculation

6.1 General

6.1.1 General

The minimum wall thickness of the tank shall be determined according to the calculation schemes of 6.1.2 and 6.1.3.

Additional thickness to allow for corrosion (progressive decrease of wall thickness) shall not be taken into consideration in calculating the shell thickness.

The calculation schemes given in Figures 1 and 2 show how to determine the wall thickness of a shell to meet the requirements of this standard and RID/ADR where Figure 1 applies to RID/ADR Chapter 6.8 and Figure 2 applies to RID/ADR Chapter 6.7.

6.1.2 Calculation scheme for the wall thickness of metallic pressure tanks of RID/ADR Chapter 6.8

The wall thickness chosen, shall not be less than the maximum value resulting from the wall thickness determined according to branches A and B (RID/ADR, Subsection 6.8.2) on the one hand and according to the following formulae relevant to the test and service conditions (branches C and D) on the other.

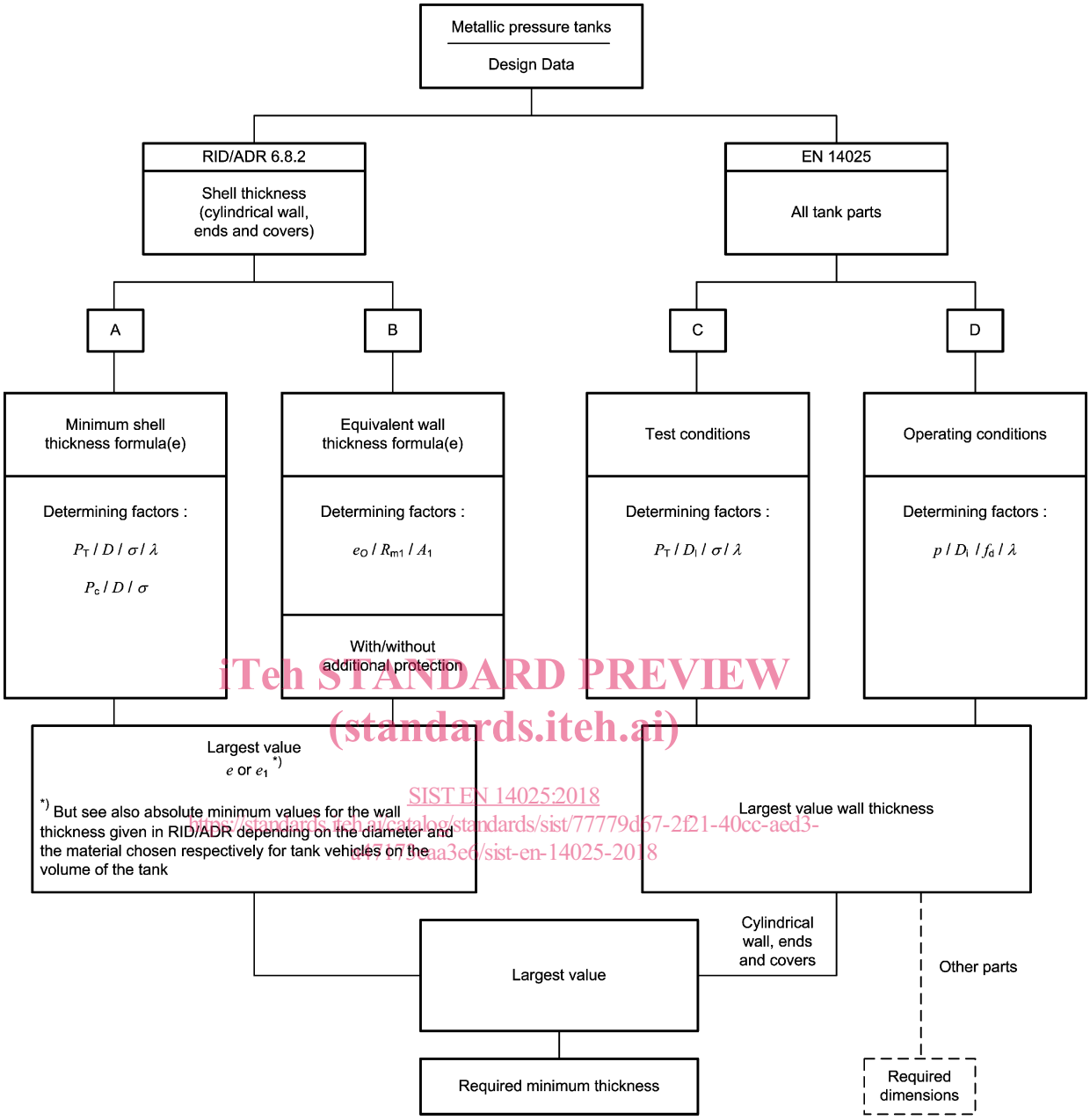

Figure 1 — Calculation scheme for the wall thickness of metallic pressure tanks of Chapter 6.8 of RID/ADR

6.1.3 Calculation scheme for the wall thickness of metallic portable pressure tanks of RID/ADR Chapter 6.7

The wall thickness chosen, shall not be less than the maximum value resulting from the wall thickness determined according to branch B (RID/ADR, Sections 6.7.2 and 6.7.3) on the one hand and according to the following formulae relevant to the test and service conditions (branches C and D) on the other.