



**SLOVENSKI STANDARD**  
**SIST EN 13445-5:2002/A2:2005**  
**01-november-2005**

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Unfired pressure vessels - Part 5: Inspection and testing

Unbefeuerte Druckbehälter - Teil 5: Inspektion und Prüfung

Réipients sous pression non soumis a la flamme - Partie 5: Inspection et contrôles

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**Ta slovenski standard je istoveten z: EN 13445-5:2002/A2:2005**

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**ICS:**

23.020.30

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English version

## Unfired pressure vessels - Part 5: Inspection and testing

Réceptifs sous pression non soumis à la flamme - Partie  
5: Inspection et contrôles

Unbefeuerte Druckbehälter - Teil 5: Inspektion und Prüfung

This amendment A2 modifies the European Standard EN 13445-5:2002; it was approved by CEN on 30 December 2004.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for inclusion of this amendment into the relevant 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 amendment 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, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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

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

## Foreword

This European Standard (EN 13445-5:2002/A2:2005) has been prepared by Technical Committee CEN/TC 54 "Unfired Pressure Vessels", the secretariat of which is held by BSI.

This document includes the text of the amendment itself. The corrected pages of EN 13445-5 will be delivered as issue 14 of the standard.

This Amendment to the European Standard EN 13445-5:2002 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2005, and conflicting national standards shall be withdrawn at the latest by December 2005.

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).

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, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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## 2 Normative references

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EN 895:1995, *Destructive tests on welds in metallic materials — Transverse tensile test*

## 10 Final assessment

### 10.2.3.3 Standard hydrostatic test

Replace 10.2.3.3.1 by:

**10.2.3.3.1** For a single-compartment vessel, subjected to internal pressure, working below the creep range, and designed according to testing group 1, 2 and 3, the test pressure, applied as internal pressure, shall be as specified in a) or b) and if necessary adjusted as specified in c).

- a) The test pressure of the vessel shall be determined as follows providing all the conditions below can be met for the main pressure bearing parts (e.g. shells, ends, tubesheets of heat exchangers, tube bundles, main flanges) and bolting associated to main flanges. This does not include flanges and bolting designed according to the rules of paragraph 11.4.2 of EN 13445-3.

NOTE The rules of paragraph 11.4.2 of EN 13445-3 deal with the use of standard flanges without calculation.

- the calculation pressure<sup>1)</sup>  $P$  does not differ from the maximum allowable pressure  $P_S$ , as a consequence, for example, of the static head, by more than 3 %
- the ratio  $\frac{f_a}{f_{t_s}}$  for materials in a different main pressure bearing part or bolting associated to a main flange does not differ by more than 3 % from the ratio  $\frac{f_a}{f_{t_s}}$  of the main pressure-bearing part or bolting used in the formula (10.2.3.3.1-1) to determine  $P_t$ .
- the sum of both deviations (in absolute value) does not exceed 3 % in total
- the calculation temperature<sup>2)</sup>  $t$  is not higher than the maximum allowable temperature  $t_{smax}$ , as a consequence, for example, of heat input

The test pressure shall not be less than that determined by the following:

$$P_t = 1,25 \cdot P_S \cdot \frac{f_a}{f_{t_s}} \quad (10.2.3.3.1-1)$$

or

$$P_t = 1,43 \cdot P_S \quad (10.2.3.3.1-2)$$

whichever is the greater.

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where:

$P_t$  is the test pressure measured at the highest point of the vessel in test position;

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$P_S$  is the maximum allowable pressure of the vessel;

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$f_a$  is the nominal design stress for normal operating load cases of the part at test temperature;

$f_{t_s}$  is the nominal design stress for normal operating load cases of the part at maximum allowable temperature;

$P_t$ ,  $P_S$ ,  $f_a$  and  $f_{t_s}$  shall have consistent units.

- b) If one or more of the conditions in a) cannot be met, it is necessary to determine for each main pressure-bearing part and bolting associated to main flanges described in a) the test pressure  $P_{tc}$  which shall not be less than that determined by the following:

$$P_{tc} = 1,25 \cdot P_C \cdot \frac{f_{ac}}{f_{tc}} \quad (10.2.3.3.1-3)$$

or

1) See definition in EN 13445-3

2) See definition in EN 13445-3

$$P_{tc} = 1,43 \cdot P_C \quad (10.2.3.3.1-4)$$

whichever is the greater.

where

$P_C$  is the calculation pressure<sup>3)</sup> of the part under consideration;

$P_{tc}$  is the test pressure determined at the part under consideration;

$f_{ac}$  is the nominal design stress for normal operating load cases of the part under consideration at test temperature;

$f_{tc}$  is the nominal design stress for normal load operating cases of the part under consideration at calculation temperature<sup>4)</sup> ;

$P_t$ ,  $P_{tc}$  and  $P_C$ ,  $f_{ac}$  and  $f_{tc}$  shall have consistent units.

The test pressure of the vessel  $P_t$  shall be the largest of all the values of  $P_{tc}$  determined for each part. The value of  $P_t$  shall be applied at the highest point of the vessel for either horizontal or vertical test positions.

NOTE If necessary, the main pressure-bearing part is divided in components (see definition of components in EN 13445-3). The test pressure of the main pressure-bearing part is then the maximum of the test pressures of the components.

c) If in any main pressure-bearing part and bolting associated to main flanges described in a) the test pressure as calculated in b) exceeds the maximum permissible pressure according to the relevant design rules of EN 13445-3 for testing load cases (see note at the end of c)), one of the two following options shall be taken:

1) An increase of the thickness of the parts up to a value which makes the test pressure acceptable.

or

2) A reduction of the test pressure. If the test pressure is reduced, it shall not be reduced below the maximum permissible pressure of the weakest part for testing load cases.

With this second option, for parts for which:

$$P_t + \rho \cdot g \cdot h_C < P_{tc}$$

where:

$\rho$  is the density of the test medium

$h_C$  is the vertical distance between the highest point of the vessel and the point of the part under consideration

$g$  is the gravity

3) See definition in EN 13445-3

4) See definition in EN 13445-3

the following tests are required to the whole vessel to give an equivalent level of safety

- Visual inspection as per 10.2.4, but with special emphasis on base material surface condition;
- The extent of NDT according to Table 6.6.2-1 shall be doubled but not greater than 100 %;
- Production tests in accordance with EN 13445-4, but always conducting transverse tensile tests according to EN 895 for each welding procedure used for longitudinal governing welds. If production tests have been conducted with transverse tensile tests according to EN 895, this shall be considered acceptable.

NOTE1 The maximum permissible pressure is defined in EN 13445-3. For Design By Formulae (DBF) and Design By Analysis (DBA) according to Annex C, the maximum permissible pressure is determined using the nominal design stress given by Table 6-1 for testing load cases. For DBA – Direct Route according to Annex B, the maximum permissible pressure is determined using the safety coefficients for testing load cases given in Tables B.8-3 and B.8-4.

NOTE2 The pressure test is not aimed to dimension the pressure vessel. It is however possible to decide an increase of the thickness to meet the criteria of EN 13445-3.

d) The test pressure of pressure vessels working in the creep range is under preparation.

#### **10.2.3.3.5**

Modify c) as follows:

c) and shall be of sufficient temperature that the risk of brittle fracture is avoided (See EN 13445-2, Annex B).

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**Annex F**  
(normative)

**Standard hydrostatic test in case of static head acting in service or testing**

Delete Annex F

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