SLOVENSKI STANDARD
SIST EN 13445-5:2002/A10:2009

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Neogrevane tlaļne posode - 5. del: Kontrola in preskuġanje

Unfired pressure vessels - Part 5: Inspection and testing

Unbefeuerte Druckbehälter - Teil 5: Inspektion und Prüfung

Récipients sous pression non soumis à la flamme - Partie 5 : Inspection et contrôle

Ta slovenski standard je istoveten z: **EN 13445-5:2002/A10:2008**

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23.020.30	Tlaļne posode, plinske jeklenke	Pressure vessels, gas cylinders

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Unfired pressure vessels - Part 5: Inspection and testing

Récipients sous pression non soumis à la flamme - Partie 5: Inspection et contrôle

Unbefeuerte Druckbehälter - Teil 5: Inspektion und Prüfung

This amendment A10 modifies the European Standard EN 13445-5:2002; it was approved by CEN on 25 July 2008.

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

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 13445-5:2002/A10:2008) has been prepared by Technical Committee CEN/TC 54 “Unfired pressure vessels”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by April 2009, and conflicting national standards shall be withdrawn at the latest by April 2009.

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

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 EC Directive(s).

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

This amendment is based on EN 13445-5 up to issue 29 (October 2007).

The document includes the text of the amendment itself. The corrected pages of EN 13445-5 will be delivered as issue 32 of the standard.

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, 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 the United Kingdom.

6.6 Non destructive testing of welded joints

6.6.1.1.2 Testing groups 1, 2 and 3

Replace the text above list a), b) and c) by:

It is intended that a single testing group is applied to the entire vessel.

When the vessel is made of several sections (courses), a combination of testing groups 1, 2, and 3 is permissible providing that the requirements of Table 6.6.1-1 are met. If a combination of testing groups is necessary, for example as the result the use of DBA Direct Route, of the Alternative Route, of design in the creep range or for fatigue in a section (course), the following shall apply:

10 Final assessment

10.2.3.3 Standard hydrostatic test

In 10.2.3.3.1, replace the text up to e by the following:

10.2.3.3.1 For a single-compartment vessel[1)] subjected to internal pressure, working below the creep range, and designed according to testing group 1, 2 or 3, the test pressure, applied as internal pressure at the highest point of the chamber of the vessel for either horizontal or vertical test positions, shall be as specified in a). The modifications of the test pressure due to the hydrostatic pressure are specified in b).

Special provisions are given in c) for single-run governing welds and in d) for complete vessels or parts of vessels working in the creep range.

a) The test pressure shall be determined by the greater of:

$$P_t = 1{,}25 \cdot P_d \cdot \frac{f_a}{f_{T_d}} \quad (10.2.3.3.1\text{-}1)$$

or

$$P_t = 1{,}43 \cdot P_s \quad (10.2.3.3.1\text{-}2)$$

where:

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

P_d and T_d are the coincident design pressure and design temperature values for the maximum pressure load case;

P_s is the maximum allowable pressure of the vessel;

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

1) The case of multi-compartment vessels is covered in 10.2.3.3.3

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

Since the ratio $\frac{f_a}{f_{T_d}}$ depends on the material of the part under consideration, the value $\frac{f_a}{f_{T_d}}$ to be used for calculation of P_t shall not be less than the smallest ratio obtained considering the different materials of the main pressure bearing parts (e.g. shells, ends, tubesheets of heat exchangers, tube bundles, main flanges but ignoring bolting associated to main flanges). Main pressure bearing parts do not include pressure rated standard flanges and bolting designed without calculation according to the rules of paragraph 11.4.2 of EN 13445-3:2002.

NOTE 1 The rules of paragraph 11.4.2 of EN 13445-3 deal with the use of standard flanges without calculation.

P_t , P_s , f_a and f_{T_d} shall have consistent units.

The maximum pressure load case is that set of coincident design pressure and design temperature which gives the highest test pressure.

If the bolting associated with the main flanges is overstressed due to the test pressure, the test pressure may be reduced until the bolt stresses are acceptable.

The design of the vessel shall be such that in no part the test pressure exceeds the maximum permissible pressure for testing load cases defined in 3.15b of EN 13445-3:2002 according to the relevant design rules of EN 13445-3:2002. 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 in 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.

NOTE 2 For testing load cases during final assessment the corrosion allowance may be ignored (but not for any in service test).

NOTE 3 The pressure test is not aimed to dimension the pressure vessel. However, possible increase of the thickness of tall vessels tested in the vertical position may be necessary to meet the criteria of EN 13445-3:2002.

b) For vessels with hydrostatic pressure during operation which exceeds 3% of the design pressure the test pressure shall be modified according to equation 10.2.3.3.1-3:

$$P_{t,mod} = P_t + (P_{hyd,ope} - P_{hyd,test}) \quad \text{but always:} \quad P_{t,mod} \geq P_t \qquad (10.2.3.3.1\text{-}3)$$

where:

$P_{t,mod}$ is the modified test pressure

P_t is as determined in a)

$P_{hyd,ope}$ is the maximum hydrostatic pressure during operation

$P_{hyd,test}$ is the maximum hydrostatic pressure during hydrostatic test

NOTE This modified test pressure is decisive only when the hydrostatic pressure during operation is higher than the hydrostatic pressure during test. This is possible if the vessel in operation contains liquid with specific gravity higher than the specific gravity of the test medium or if a vertical vessel is tested in the horizontal position.

c) For vessels with single-run governing welds not made by fully mechanical welding (see Table 6.6.1-1) and inspected according to 6.6.2.3.2 a), the proof test pressure shall be as given in a) but replacing 1,25 by F_k in formula 10.2.3.3.1-1.

$$P_t = F_k \cdot P_d \cdot \frac{f_a}{f_{T_d}} \qquad (10.2.3.3.1\text{-}4)$$

The values of F_k are given by Table 10.2.3.3.1-1.

In Table 10.2.3.3.1-1 replace f_k by F_k, *and keep the text after the table*.

Replace e) by the following:

d) For complete vessels or parts of vessels working in the creep range, the test pressure shall be calculated as in a) above but with f_{T_d} replaced by f_{nc,T_d} the nominal design stress for normal operating load cases of the material of the part under consideration at design temperature T_d of the maximum pressure load case, using time-independent material characteristics.

If the required time-independent characteristics are not available in the materials standard at that temperature they may be determined as follows:

— For vessels designed to testing group 1c (see Table F.2-1): at the highest temperature for which time-independent characteristics are available in the materials standard;

— For vessels designed to testing group 3c (see Table F.2-1): using Annex S of EN 13445-3;

— Alternatively time-dependent material characteristics can be taken.

From the three methods described above for determining the nominal design stresses for normal operating load cases, a consistent method shall be used for all parts.

NOTE 1 The level of the test pressure has no relevance to the safety of the vessel with respect to creep behaviour. It has been established to assure consistency with operation below the creep range.

NOTE 2 Use of the time-independent characteristics at the highest temperature for which they are available in the materials standard (when no such characteristics are available at T_d), gives a lower test pressure, but nevertheless provides adequate demonstration of strength in the context of testing group 1c.

NOTE 3 The nominal design stress values given in Annex S of EN 13445-3 are based on a logical extrapolation into the creep range of the time-independent characteristics given in the materials standard below the creep range.

NOTE 4 Use of the time-dependent material characteristics gives a higher test pressure and therefore assures a conservative demonstration of strength.

In 10.2.3.3.2, replace P_s by P_d and f_t by f_{T_d} *in Equations (10.2.3.3.2-1), (10.2.3.3.2-2) and (10.2.3.3.2-3).*

In 10.2.3.3.3, 3rd paragraph, replace the 1st sentence by

For vessels with common dividing walls designed for the maximum differential pressure that can possibly occur during start up, operation and shutdown, and where the differential pressure is less than the higher pressure in the adjacent chambers, then the common elements shall be subjected to a test pressure