SLOVENSKI STANDARD
SIST EN 13445-3:2014/A1:2015

01-junij-2015

Neogrevane tlačne posode - 3. del: Konstruiranje - Dopolnilo A1

Unfired pressure vessels - Part 3: Design

Unbefeuerte Druckbehälter - Teil 3: Konstruktion

Récipients sous pression non soumis à la flamme - Partie 3 : conception

Ta slovenski standard je istoveten z: **EN 13445-3:2014/A1:2015**

ICS:

23.020.30	Tlačne posode, plinske jeklenke	Pressure vessels, gas cylinders

SIST EN 13445-3:2014/A1:2015 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13445-3:2014/A1

March 2015

ICS 23.020.30

English Version

Unfired pressure vessels - Part 3: Design

Récipients sous pression non soumis à la flamme - Partie 3 : conception

Unbefeuerte Druckbehälter - Teil 3: Konstruktion

This amendment A1 modifies the European Standard EN 13445-3:2014; it was approved by CEN on 10 January 2015.

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Foreword

This document (EN 13445-3:2014/A1:2015) 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 13445-3:2014 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2015, and conflicting national standards shall be withdrawn at the latest by September 2015.

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 EU Directive 97/23/EC.

For relationship with EU Directive 97/23/EC, see informative Annex ZA, which is an integral part of EN 13445-3:2014.

This document includes the text of the amendment itself. The corrected pages of EN 13445-3 will be published in July 2015 as Issue 2 of the standard.

NOTE This document was initially submitted to Enquiry under the reference EN 13445-3:2009/prA2:2012.

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

1 Modification to C.1

Replace the last but one paragraph by:

Provisions are given in C.8 for vessels or vessel parts working in the creep range.
For vessels or vessel parts working in the creep range it is necessary that the requirements for loading of non-cyclic nature given in 5.4.2 or 17.5 respectively are considered to be met (i.e. the number of full pressure cycles or equivalent full pressure cycles is less than 500 or N_{eq} respectively).

In the present edition of the standard no rule concerning creep/fatigue interaction is given in this Annex. If this interaction is to be taken into account, the design methods of Annex B may be used.

This Annex is currently limited to sufficiently ductile materials, like the whole standard, but it is, for components operating in the creep range, also limited to sufficiently creep ductile materials, as defined in EN 13445-2:2014.

2 Modification to C.7

Replace the heading by the following

C.7 Non-creep assessment criteria

3 Modification to C.8

Add a new Clause C.8

C.8 Creep assessment criteria

C.8.1 Equations to be used

In Annex C, stresses which relate to the different stress categories (e.g. membrane, membrane plus bending, primary plus secondary stresses, etc.) are calculated. Allowable values for these are also specified. For creep design, the equations of interest are reproduced below:

$$(\sigma_{eq})_{Pm} \leq f \quad \text{(C.8-1)}$$

$$(\sigma_{eq})_{P_L} \leq 1{,}5 \cdot f \quad \text{(C.8-2)}$$

$$(\sigma_{eq})_{P} \leq 1{,}5 \cdot f \quad \text{(C.8-3)}$$

$$(\Delta\sigma_{eq})_{P+Q} \leq 3 \cdot f \quad \text{(C.8-4)}$$

NOTE Subscript P, which means general or local primary membrane plus primary bending stresses is not mentioned in C.3 where symbols used in Annex C are defined. It is defined through Formula (C.6-1).

Depending on whether the vessel service consists in one or more than one creep load cases, the following rules in C.8.1 or C.8.2 respectively shall be applied at any point likely to be critical for creep damage.

C.8.2 Assessment criteria for a single creep load case

Formula (C.8-1) to (C.8-4) shall be satisfied at the point under study, using assumed analysis thickness and a nominal design stress f obtained as explained in 19.5.

To obtain the minimum required thickness, an iterative procedure shall be used.

C.8.3 Assessment criteria for multiple creep load cases

The following procedure shall be applied:

a) For each creep load case, the analysis according to Annex C is carried out with the assumed analysis thickness. The stresses are calculated for the different stress categories (see C.6). The calculated stresses are then divided by the coefficient applicable to that stress category, as shown below:

$$\sigma_{(m)i} = (\sigma_{eq})_{Pm} \tag{C.8-5}$$

$$\sigma_{(L)i} = \frac{(\sigma_{eq})_{P_L}}{1,5} \tag{C.8-6}$$

$$\sigma_{(P)i} = \frac{(\sigma_{eq})_{P}}{1,5} \tag{C.8-7}$$

$$\sigma_{(P+Q)i} = \frac{(\Delta\sigma_{eq})_{P+Q}}{3,0} \tag{C.8-8}$$

b) The largest of $\sigma_{(m)i}, \sigma_{(L)i}, \sigma_{(P)i}, \sigma_{(P+Q)i}$ shall be determined. For the point under study, the fictitious nominal design stress f_{Fi} for the creep load case under consideration shall be the largest of these stresses:

$$f_{Fi} = \max\left(\sigma_{(m)i}; \sigma_{(L)i}; \sigma_{(P)i}; \sigma_{(P+Q)i}\right) \tag{C.8-9}$$

The allowable time to damage, t_{D,f_{Fi},T_i} shall be calculated according to Formula (19-11) for this fictitious design stress f_{Fi} at the calculation temperature T_i.

c) Steps a) and b) shall be repeated for each load case.

d) The accumulated creep damage resulting, for the point under study, from all applied load cases shall be determined by the following time-fraction rule:

$$\sum_{i=1}^{n} \frac{t_i}{t_{D,f_{Fi},T_i}} \leq 1,0 \tag{C.8-10}$$

If more than one material is used in a part or component of the pressure vessel then Formula (C.8-10) shall be applied separately for each region with different material using the fictitious design stress f_{Fi} at the corresponding point and the material creep design curve for the corresponding material.

To obtain the minimum required thickness, an iterative procedure covering the whole procedure of C.8.2 for all relevant points may be used.