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NATIONAL FOREWORD

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English Version

Unfired pressure vessels - Part 3: Design

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

Unbefeuerte Druckbehälter - Teil 3: Konstruktion

This European Standard was approved by CEN on 30 June 2009.

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

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Foreword

This document (EN 13445-3:2009) has been prepared by Technical Committee CEN/TC 54 “Unfired pressure vessels”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by *December 2009*, and conflicting national standards shall be withdrawn at the latest by *December 2009*.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 EU Directive(s).

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

This European Standard consists of the following Parts:

- Part 1: *General*.
- Part 2: *Materials*.
- Part 3: *Design*.
- Part 4: *Fabrication*.
- Part 5: *Inspection and testing*.
- Part 6: *Requirements for the design and fabrication of pressure vessels and pressure parts constructed from spheroidal graphite cast iron*.
- CR 13445-7, *Unfired pressure vessels* — Part 7: *Guidance on the use of conformity assessment procedures*.
- Part 8: *Additional requirements for pressure vessels of aluminium and aluminium alloys*.
- CEN/TR 13445-9, *Unfired pressure vessels* — Part 9: *Conformance of EN 13445 series to ISO 16528*

This document supersedes EN 13445-3:2002. This new edition incorporates the Amendments which have been approved previously by CEN members, and the corrected pages up to Issue 36 without any further technical charge. Annex Y to EN 13445-1:2009 and Annex Y to this Part provides details of significant technical changes between this European Standard and the previous edition.

Amendments to this new edition may be issued from time to time and then used immediately as alternatives to rules contained herein. It is intended to deliver a new Issue of EN 13445:2009 each year, consolidating these Amendments and including other identified corrections. Issue 5 (2013-07) includes the corrected pages listed in Annex Y.

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, 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 Scope

This Part of this European Standard specifies requirements for the design of unfired pressure vessels covered by EN 13445-1:2009 and constructed of steels in accordance with EN 13445-2:2009.

EN 13445-5:2009, Annex C specifies requirements for the design of access and inspection openings, closing mechanisms and special locking elements.

NOTE This Part applies to design of vessels before putting into service. It may be used for in service calculation or analysis subject to appropriate adjustment.

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 286-2:1992, *Simple unfired pressure vessels designed to contain air or nitrogen — Part 2: Pressure vessels for air braking and auxiliary systems for motor vehicles and their trailers*

EN 764-1:2004, *Pressure equipment — Terminology — Part 1: Pressure, temperature, volume, nominal size*

EN 764-2:2002, *Pressure equipment — Part 2: Quantities, symbols and units*

EN 764-3:2002, *Pressure equipment — Part 3: Definition of parties involved*

EN 837-1:1996, *Pressure gauges — Part 1: Bourdon tube pressure gauges — Dimensions, metrology, requirements and testing*

EN 837-3:1996, *Pressure gauges — Part 3: Diaphragm and capsule pressure gauges — Dimensions, metrology, requirements and testing*

EN 1092-1:2007, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN-designated*

EN 1591-1:2001, *Flanges and their joints — Design rules for gasketed circular flange connections — Calculation method*

EN 1708-1:1999, EN 1708-1:1999/A1:2003, *Welding — Basic weld joint details in steel — Part 1: Pressurized components*

EN 10222-1:1998, EN 10222-1:1998/A1:2002, *Steel forgings for pressure purposes — Part 1: General requirements for open die forgings*

EN 13445-1:2009, *Unfired pressure vessels — Part 1: General*

EN 13445-2:2009, *Unfired pressure vessels — Part 2: Materials*

EN 13445-4:2009, *Unfired pressure vessels — Part 4: Fabrication*

EN 13445-5:2009, *Unfired pressure vessels — Part 5: Inspection and testing*

EN 13445-8:2009, *Unfired pressure vessels — Part 8: Additional requirements for pressure vessels of aluminium and aluminium alloys*

EN ISO 4014:2000, *Hexagon head bolts — Product grades A and B (ISO 4014:1999)*

EN ISO 4016:2000, *Hexagon head bolts — Product grade C* (ISO 4016:1999)

EN ISO 15613:2004, *Specification and qualification of welding procedures for metallic materials — Qualification based on pre-production welding test*

ISO 261:1998, *ISO general purpose metric screw threads — General plan*

3 Terms and definitions

For the purposes of this Part of this European Standard, the terms and definitions given in EN 13445-1:2009, EN 13445-2:2009 and the following apply:

NOTE EN 13445-1:2009 and EN 13445-2:2009 have adopted terminology, symbols and definitions of EN 764-1:2004, EN 764-2:2002 and EN 764-3:2002.

3.1 action

imposed thermo-mechanical influence which causes stress and/or strain in a structure, e.g. an imposed pressure, force, temperature

3.2 analysis thickness

effective thickness available to resist the loading depending on the load case, see 5.3.2

3.3 assumed thickness

thickness assumed by the designer between the minimum required shell thickness e and the shell analysis thickness e_a

3.4 calculation pressure

differential pressure used for the purpose of the design calculations for a component
[EN 764-1:2004]

3.5 calculation temperature

temperature used for the purpose of the design calculations for a component
[EN 764-1:2004]

3.6 chamber

fluid space within a unit of pressure equipment
[EN 764-1:2004]

3.7 component

part of pressure equipment which can be considered as an individual item for the calculation
[EN 764-1:2004]

3.8 creep range

temperature range in which material characteristics used in design are time dependent

NOTE See also 5.1.

3.9 cryogenic applications

applications involving liquefied gases at low temperature