



# SLOVENSKI STANDARD

## SIST EN 12446:2011

01-oktober-2011

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### Dimniki - Sestavni deli - Betonski elementi plašča dimnika

Chimneys - Components - Concrete outer wall elements

Abgasanlagen - Bauteile - Außenschalen aus Beton

Conduits de fumée - Composants - Enveloppes externes en béton

Ta slovenski standard je istoveten z: **EN 12446:2011**

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#### **ICS:**

91.060.40	Dimniki, jaški, kanali	Chimneys, shafts, ducts
91.100.30	Beton in betonski izdelki	Concrete and concrete products

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EUROPEAN STANDARD

**EN 12446**

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2011

ICS 91.060.40

Supersedes EN 12446:2003

English Version

**Chimneys - Components - Concrete outer wall elements**Conduits de fumée - Composants - Enveloppes externes  
en béton

Abgasanlagen - Bauteile - Außenschalen aus Beton

This European Standard was approved by CEN on 25 May 2011.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard 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-CENELEC Management Centre has the same status as the official versions.

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

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**EN 12446:2011 (E)****Foreword**

This document (EN 12446:2011) has been prepared by Technical Committee CEN/TC 166 “Chimneys”, the secretariat of which is held by ASI.

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of an identical text or by endorsement, at the latest by December 2011, and conflicting national standards shall be withdrawn at the latest by March 2013.

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 supersedes EN 12446:2003. The main modifications to EN 12446:2003 are:

- a) a revised table of heat flow values for thermal performance testing which now includes values for high pressure applications, e.g. diesel generators,
- b) a test method for the evaluation of Flexural strength under wind loading (clause 8.7 and Test methods clause A.2),
- c) a requirement to evaluate the gas tightness of passages used for combustion air (clause 8.8 and Test methods clause A.3),
- d) a requirement relating to the Resistance to fire from an external source (clause 8.9),
- e) a requirement relating to the Release of dangerous substances (clause 8.10).

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) 89/106/EEC, see informative Annex ZA, which is an integral part of this document.

This standard is one of a series of co-ordinated standards dealing with specification, design, testing and installation of chimneys, both single and multi wall.

The co-ordinated package of standards is further divided by material of construction and this European Standard is one of a series of specifications and execution documents dealing with design and installation of concrete chimney products and systems.

The standards in this series for concrete chimney products and systems are:

EN 1857, *Chimneys — Components — Concrete flue liners*

EN 1858, *Chimneys — Components — Concrete flue blocks*

EN 12446, *Chimneys — Components — Concrete outer wall elements*

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, 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.

## 1 Scope

This European Standard specifies the material, dimensional and performance requirements for factory made precast concrete outer wall elements for chimneys including outer wall fittings.

This European Standard covers elements having up to four passages designated to accommodate a combination of flue liners and/or ventilation passages.

This European Standard also relates to storey-height and reinforced outer wall elements.

This European Standard does not apply to structurally independent (freestanding or self-supporting) chimneys constructed using these outer wall elements.

NOTE Any reference to the term "outer wall element" implies both the outer wall elements and their fittings, except where otherwise indicated.

## 2 Normative references

The following referenced documents are indispensable for the application 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 1443:2003, *Chimneys — General requirements*

EN 1857:2010, *Chimneys — Components — Concrete flue liners*

EN 1858:2008, *Chimneys — Components — Concrete flue blocks*

EN 10088-2:2005, *Stainless steels — Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes*

EN 10218-2, *Steel wire and wire products — General — Part 2: Wire dimensions and tolerances*

EN 14297:2004, *Chimneys — Freeze-thaw resistance test method for chimney products*

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1443:2003 and the following apply.

### 3.1

#### **outer wall fitting**

outer wall element such as access openings, offsets

### 3.2

#### **concrete**

material formed by mixing cement, coarse and fine aggregate and water and with or without the incorporation of admixtures, additions, glass fibres or steel fibres, which develops its properties by hydration of the cement

[EN 206-1:2000]

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## 3.3

**outer wall element**

chimney component that surrounds a flue liner to form the outer wall of a chimney

## 3.4

**hollow wall outer wall element**

outer wall element having vertical cavities

## NOTE

Cavities can pass through both ends of the hollow wall outer wall element.

## 3.5

**manufacturer's declared internal transverse dimensions**

internal dimensions of the outer wall element measured perpendicular to the longitudinal axis

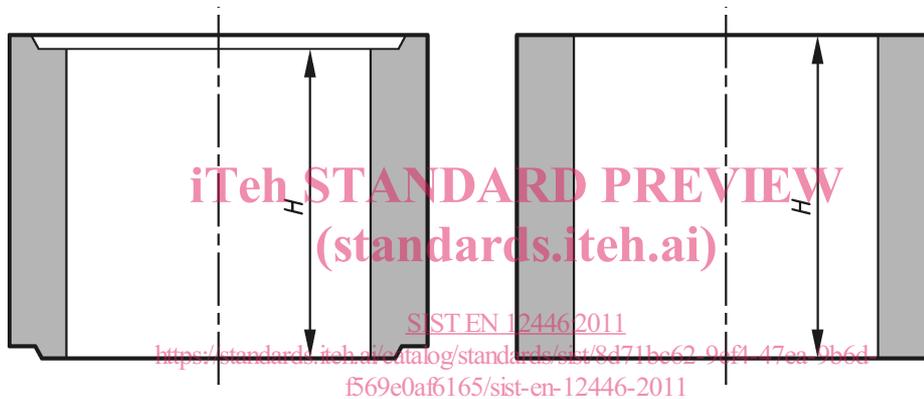
## 3.6

**manufacturer's declared height**

internal height of the outer wall element

## NOTE

Examples of measurement are shown in Figure 1.

**Key**

$H$  Internal height

**Figure 1 — Internal height**

## 3.7

**manufacturer's declared structural height**

maximum safe constructional height of the outer wall elements as declared by the manufacturer

## 3.8

**manufacturer's declared overall wall thickness**

dimensions at its thinnest point, between the inside face and the outside face of the outer wall element, not measured at any joint feature, e.g. spigot/socket end

## 3.9

**outer wall element with handling reinforcement**

outer wall element having steel reinforcement to assist handling and transportation

## 3.10

**solid wall outer wall element**

outer wall element without cavities in the thickness of its walls

**3.11****straight outer wall element**

outer wall element having the ends perpendicular to the axis of the flue

**3.12****storey-height outer wall element**

factory made outer wall element having an overall height relating to the floor to floor height of a building

**3.13****precast concrete**

concrete that is cast in a place other than its final location of use

[EN 1858:2008]

**4 Materials****4.1 General**

Outer wall elements shall be made of pre-cast concrete. Materials shall be identified for factory production control purposes.

NOTE Additions can include glass or steel fibres.

**4.2 Reaction to fire**

Attention is drawn to the Commission Decision 96/603/EC, as amended, in which non-combustible masonry units containing not more than 1 % by mass or volume (whichever is the more onerous) of homogeneously distributed organic materials are classified as reaction to fire class A1 without testing.

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**5 Reinforcement for handling**

Where an outer wall element is reinforced for handling, the reinforcement shall have a maximum diameter of 8 mm and a minimum concrete cover of 15 mm on all sides for temperature classes up to and including T 250 and 20 mm on all sides for all other temperature classes.

In outer wall elements having a bulk density of less than 2 000 kg/m<sup>3</sup>, when measured according to A.10 of EN 1857:2010, any reinforcement shall be protected against corrosion by one of the following means:

- a) use of stainless steel conforming to the requirements of EN 10088-2;
- b) by completely covering any mild steel reinforcement conforming to the requirements of EN 10218-2 with a coating (e.g. Portland cement CEM I or CEM II mixed with water to form a slurry, or epoxy resin).

**6 Surface treatment**

Any surface treatment of the outer wall element, e.g. render, coating, shall be applied as described by the product manufacturer, prior to testing.

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**7 Form, dimensions and tolerances****7.1 Form**

Outer wall elements covered by this standard shall be manufactured in one of the following forms:

- a) with a single passage to accommodate a flue liner;
- b) with up to four passages to accommodate a combination of up to four flue liners and/or duct/s used for ventilation/combustion air.

**7.2 Dimensions**

Outer wall elements shall have a wall thickness not less than 20 mm.

**7.3 Tolerances**

Tolerances on manufacturer's declared dimensions, including taper, shall be:

- a) Declared internal transverse dimensions

below 300 mm:  $\pm 3$  mm

300 mm and above:  $\pm 1,5$  %

- b) Declared height

below 300 mm  $\pm 5$  mm

300 mm to 700 mm:  $\pm 7$  mm

above 700 mm:  $\pm 10$  mm

- c) Declared overall wall thickness

below 10 mm:  $\begin{matrix} +2 \\ -1 \end{matrix}$  mm

10 mm to 40 mm :  $\begin{matrix} +5 \\ -1,5 \end{matrix}$  mm

above 40 mm:  $\begin{matrix} +12 \\ -5 \end{matrix}$  %

**7.4 Squareness of ends**

When tested in accordance with either procedure described in A.3 of EN 1857:2010, the permissible deviation from squareness of ends of concrete outer wall elements shall not be greater than 10 mm at 'G' for the first procedure. With the second procedure the deviation shall not be more than 5 mm at 'G' for elements up to 400 mm and 8 mm at 'G' for elements greater than 400 mm in height.

## 8 Performance

### 8.1 Heat stress resistance

**8.1.1** When an outer wall element, including those designated soot fire resistant, is tested as described in A.1 at the test temperature given in Table 1 appropriate to the designation, it shall also meet the requirements of 8.4.

When an outer wall element has multiple passages with an equal wall thickness, the heat stress test shall be carried out on the passage with the highest temperature designation.

**8.1.2** Bends or fittings, made of the same material mix and by the same method of manufacture as the tested straight outer wall element, shall be deemed to conform to 8.1.1.

**8.1.3** Outer wall elements, made of a different material mix or using a different method of manufacture from those in 8.1.2, shall be checked for heat stress resistance by testing a special straight test sample in accordance with 8.1.1. This straight test sample shall be made using the same material mix and manufacturing method as the outer wall elements.

**8.1.4** If a bend or fitting is available in the range of products, the test assembly shall include a combination of the fitting equivalent to the size being tested. The outer wall element shall be installed according to the manufacturer's instructions.

**8.1.5** The maximum temperature measured on the surface of adjacent combustible materials shall not exceed 85 °C when related to an ambient temperature of 20 °C. The manufacturer shall declare the distance to the combustible partition and whether the gap between the outer wall element and the adjacent combustible partition is opened or closed. The above mentioned distance shall be determined by testing to the heat stress of A.1 at a temperature given in Table 1 appropriate to the product designation.

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**Table 1 — Heat stress test temperature**  
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Temperature class	Temperature of flue gas °C
T 600	700 <sup>+50</sup> <sub>0</sub>
T 450	550 <sup>+50</sup> <sub>0</sub>
T 400	500 <sup>+50</sup> <sub>0</sub>
T 300	350 <sup>+35</sup> <sub>0</sub>
T 250	300 <sup>+30</sup> <sub>0</sub>
T 200	250 <sup>+25</sup> <sub>0</sub>
T 160	190 <sup>+19</sup> <sub>0</sub>
T 140	170 <sup>+17</sup> <sub>0</sub>
T 120	150 <sup>+15</sup> <sub>0</sub>
T 100	120 <sup>+12</sup> <sub>0</sub>
T 080	100 <sup>+10</sup> <sub>0</sub>

**EN 12446:2011 (E)****8.2 Heat shock resistance**

**8.2.1** Following the heat stress resistance test required in 8.1, when an outer wall element designated as soot fire resistant is tested as described in A.1.4 to a flue gas temperature of 1 000 °C for a period of 30 min ± 1 min, the element shall subsequently meet the requirements of 8.4.

When an outer wall element has multiple passages with an equal wall thickness, the heat shock test shall be carried out on the passage with the highest temperature designation.

NOTE The test described in A.1.4 is the method used to assess the sootfire resistance.

**8.2.2** Bends or fittings, made of the same material mix and by the same method of manufacture as the tested straight outer wall element, shall be deemed to conform to 8.2.1.

**8.2.3** Outer wall elements, made of a different material mix or using a different method of manufacture from those described in 8.2.2, shall be checked for heat shock resistance by testing a special straight test sample in accordance with 8.2.1. This straight test sample shall be made using the same material mix and manufacturing method as the outer wall elements.

**8.2.4** The maximum temperature measured on the surface of adjacent combustible materials shall not exceed 100 °C when related to an ambient temperature of 20 °C, when test assembly is tested at the test temperature of 1 000 °C over a period of 30 min. The manufacturer shall declare the distance to the combustible partition and whether the gap between the outer wall element and the adjacent combustible partition is opened or closed. This distance shall not exceed the distance determined as described in 8.1.5.

**8.3 Thermal resistance**

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Thermal resistance shall be measured according to the method given in A.4 of EN 1858:2008 (reference method) or calculated according to the method given in Annex C of EN 1858:2008 and the value obtained declared.

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**8.4 Compressive strength**

**8.4.1** When tested as described in A.8 of EN 1857:2010, straight outer wall elements shall withstand an intensity of loading equivalent to 4 times the manufacturer's declared structural height before subjecting the element to the thermal performance test(s) and three times the manufacturer's declared structural height after subjecting the element to the thermal performance test(s).

**8.4.2** Outer wall element bends and fittings made of the same material mix and by the same method of manufacture as the tested straight elements shall be deemed to conform to 8.4.1.

**8.4.3** Outer wall elements made from a different material mix, or using a different method of manufacture from those described in 8.4.2, shall be checked for compressive strength by testing a special straight test sample in accordance with 8.4.1. This special straight test sample shall be made using the same material mix and manufacturing method as the bend or fitting.

**8.5 Bulk density**

When outer wall elements are tested as described in A.10 of EN 1857:2010, the lowest and highest bulk density value shall be within a tolerance of ± 10 % of the manufacturers declared bulk density for the outer wall element.

**8.6 Freeze-thaw resistance**

Where national regulations require freeze/thaw resistance of wall elements, they shall be tested in accordance with EN 14297. The product shall not present any damage of type 7, 8, 9 and 10 in accordance with EN 14297:2004, Table 1.