



SLOVENSKI STANDARD

SIST EN 1857:2010

01-junij-2010

Nadomešča:

SIST EN 1857:2003+A1:2008

Dimniki - Sestavni deli - Betonske tuljave

Chimneys - Components - Concrete flue liners

Abgasanlagen - Bauteile - Betoninnenrohre

Conduits de fumée - Composants - Conduits intérieurs en béton

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Ta slovenski standard je istoveten z: EN 1857:2010

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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 1857

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2010

ICS 91.060.40

Supersedes EN 1857:2003+A1:2008

English Version

Chimneys - Components - Concrete flue liners

Conduits de fumée - Composants - Conduits intérieurs en
béton

Abgasanlagen - Bauteile - Betoninnenrohre

This European Standard was approved by CEN on 20 February 2010.

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Foreword

This document (EN 1857:2010) has been prepared by Technical Committee CEN/TC 166 "Chimneys", the secretariat of which is held by UNI.

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of an identical text or by endorsement, at the latest by October 2010, and conflicting national standards shall be withdrawn at the latest by October 2010.

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 1857:2003+A1:2008.

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 standard is one of a series of standards dealing with the specification, design, testing and execution of chimneys with concrete liners, 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 installation documents dealing with design and installation of concrete chimney products and systems.

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The standards in this series for concrete chimney products are:

- EN 1857, *Chimneys — Components — Concrete flue liners*
- EN 1858, *Chimneys — Components — Concrete flue blocks*
- EN 12446, *Chimneys — Components — Concrete outer wall elements*

In this European Standard, Annexes A, C and D are normative and Annexes B, E, F and ZA are informative.

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.

EN 1857:2010 (E)**1 Scope**

This European Standard specifies the material, dimensional and performance requirements, including methods of test, for precast concrete flue liners and fittings with or without insulation for the construction of multi-wall chimneys.

This document does not cover:

- high positive pressure (H) designated products;
- products designated wet (W) in conjunction with corrosion class 3.

This document also applies to storey-height and flue liners reinforced only for handling.

NOTE 1 Any reference to the term flue liners implies both flue liners and their fittings, except where otherwise indicated.

NOTE 2 The pressure classes and corrosion classes are defined in EN 1443.

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 1859, *Chimneys — Metal chimneys — Test methods*

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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 13216-1, *Chimneys — Test methods for system chimneys — Part 1: General test methods*

EN 13384-1:2002+A2:2008, *Chimneys — Thermal and fluid dynamic calculation methods — Part 1: Chimneys serving one appliance*

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

EN ISO 7500-1:2004, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system (ISO 7500-1:2004)*

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**concrete**

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

[EN 206-1:2000]

3.2**flue liner bend**

flue liner that changes the direction of the flue

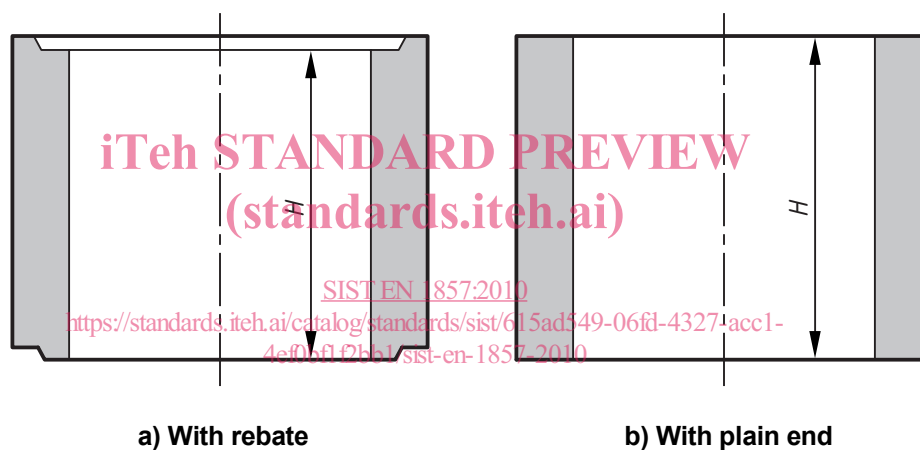
3.3**manufacturer's declared internal transverse dimensions**

internal dimensions of the flue liner measured perpendicular to the longitudinal axis

3.4**manufacturer's declared height**

internal height of the flue liner

NOTE Examples of measurement are shown in Figure 1.

**Key**

H internal height

Figure 1 — Manufacturer's declared height

3.5**manufacturer's declared structural height**

maximum height of construction of the flue liners as declared by the manufacturer

3.6**precast concrete**

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

3.7**reinforced flue liner**

flue liner having reinforcement to assist handling

NOTE The reinforcement is not for structural stability.

3.8**storey-height liner**

flue liner having manufacturer's declared height relating to the floor to floor height of a building

EN 1857:2010 (E)**4 Materials****4.1 General**

Flue liners shall be precast concrete.

Materials used shall be documented for factory production control purposes.

NOTE Additions may include glass or steel fibres.

4.2 Reaction to fire

In accordance with Commission Decision 96/603/EC, as amended, flue liners to this standard are classified as reaction to fire class A1 without test provided they contain not more than a mass or volume fraction of 1 % (whichever is the more onerous) of homogeneously distributed organic materials.

5 Reinforcement for handling

5.1 Where a liner 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 T250 and a minimum concrete cover of 20 mm on all sides for all other temperature classes.

5.2 In reinforced liners having a bulk density of less than 2 000 kg/m³, when measured in accordance with A.10, any reinforcement shall be protected against corrosion by:

- a) use of stainless steel conforming to the requirements of EN 10088-2; or
- b) by completely covering any mild steel reinforcement conforming to EN 10218-2 with a coating (e.g. typically 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 flue liner, e.g. coatings, shall be factory applied before the product is tested.

7 Tolerances**7.1 Size**

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

- a) Declared internal transverse dimensions:
 - 1) below 300 mm ± 3 mm;
 - 2) 300 mm and above ± 3 % but not more than 10 mm (see A.1.1);
- b) Declared height:
 - 1) below 300 mm ± 5 mm;
 - 2) 300 mm to 700 mm ± 7 mm;
 - 3) above 700 mm ± 3 % but not more than 10 mm (see A.1.2);

c) Declared wall thickness:

- 1) below 10 mm $\begin{matrix} +2 \\ -1 \end{matrix}$ mm;
- 2) 10 mm to 40 mm $\begin{matrix} +5 \\ -1,5 \end{matrix}$ mm;
- 3) above 40 mm $\begin{matrix} +12 \\ -5 \end{matrix}$ %.

7.2 Straightness

7.2.1 When tested as in accordance with A.2 the limit deviation from straightness of a straight concrete flue liner of manufacturer's declared height less than or equal to 1 000 mm shall not be greater than 1 % of the declared height.

7.2.2 When tested as described in A.2 for flue liners having a manufacturer's declared height greater than 1 000 mm the limit deviation shall not be greater than 0,5 % of the manufacturer's declared height.

7.3 Squareness of ends

When the deviation of the squareness of ends is tested in accordance with either procedure described in A.3 the flue liner shall not touch the upright for the first procedure and the dimension "G" shall not be greater than 5 mm for the second procedure.

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8 Performance requirements

8.1 Heat stress resistance

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8.1.1 When a flue liner is tested in accordance with A.4 to the test temperature appropriate to the flue liner designation given in Table 1, the flue liner shall subsequently conform to the requirements of 8.3.

The thermal testing shall be carried out on one size of flue liner for each geometrical configuration, e.g. circular, rectangular, square, also for each material mix, method of manufacture and wall thickness. For circular flue liners the size to be tested shall be (200 ± 50) mm internal transverse dimension. For other geometrical configurations the flue liner shall have an equivalent cross-sectional area.

Table 1 — Heat stress test temperature

Temperature class	Temperature of flue gas °C
T 600	700 ⁺⁵⁰ ₀
T 450	550 ⁺⁵⁰ ₀
T 400	500 ⁺⁵⁰ ₀
T 300	350 ⁺³⁵ ₀
T 250	300 ⁺³⁰ ₀
T 200	250 ⁺²⁵ ₀
T 160	190 ⁺¹⁹ ₀
T 140	170 ⁺¹⁷ ₀
T 120	150 ⁺¹⁵ ₀
T 100	120 ⁺¹² ₀
T 80	100 ⁺¹⁰ ₀

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8.1.2 Flue liner bends or fittings made of the same material mix and by the same method of manufacture as the tested straight flue liner shall be deemed to conform to the requirement in 8.1.1.

8.1.3 Flue liner bends or fittings made of a different material mix or using a different method of manufacture from those described in 8.1.1, shall be checked for heat stress resistance by testing a 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 bend or fitting.

8.2 Heat shock resistance

8.2.1 Following the heat stress resistance test in 8.1, when a liner designated as sootfire resistant is tested as described in A.4 to a flue gas temperature of 1 000 °C for a period of (30 ± 1) min the flue liner shall subsequently conform to the requirements of 8.3.

8.2.2 Flue liner bends or fittings made of the same material mix and by the same method of manufacture as the tested straight flue liner shall be deemed to conform to the requirement in 8.2.1.

8.2.3 Flue liner bends or fittings made of a different material mix or using a different method of manufacture from those described in 8.2.1, shall be checked for heat shock by testing a 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 bend or fitting.

8.3 Gas tightness

When tested in accordance with A.6 the gas tightness, expressed as a leakage rate of the walls of the flue liner, shall not be greater than the values specified in Table 4 for the relevant pressure class.

8.4 Abrasion resistance

For flue liners which conform to the gas tightness requirements of 8.3, when tested as described in A.7 the weight of the deposit collected shall not exceed the values in Table 2, and shall subsequently conform to the gas tightness requirements of 8.3.

Table 2 — Abrasion resistance

Dry density kg/m ³	Maximum abrasion of inner surface in kg/m ²
1 000	1,000
1 100	1,100
1 200	1,200
1 300	1,300
1 400	1,400
1 500	1,500
1 600	1,600
1 700	1,700
1 850	1,850

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8.5 Compressive strength (standards.iteh.ai)

8.5.1 The manufacturer shall declare the structural height. When tested in accordance with A.8, flue liners and straight fittings shall withstand an intensity of loading equivalent to four times the manufacturer's declared structural height.

NOTE The manufacturer's declared structural height may be derived from the ultimate compressive strength determined by the method in A.11.

8.5.2 Flue liner bends or other fittings made of the same material mix and by the same method of manufacture as the tested straight flue liner shall be deemed to conform to the requirement in 8.5.1.

8.5.3 Flue liner bends or fittings made of a different material mix or using a different method of manufacture from those described in 8.5.2, shall be checked for compressive strength by testing a special straight test sample in accordance with 8.5.1.

This special straight test sample shall be made using the same material mix and manufacturing method as the bend or fitting.

8.6 Corrosion resistance

When flue liners designated condensate resistance class W (suitable for use in wet operating conditions) are tested as described in A.9, the weight loss of the pieces shall not be greater than 0,1 %.

Flue liners designated condensate resistance class D (dry) and which conform from 8.1 to 8.4 may be assigned corrosion resistance class 3.

EN 1857:2010 (E)**8.7 Condensate resistance**

When flue liners designated W (for use in wet operating conditions) are tested as described in A.9 the maximum mass of test solution passing through the wall of the flue liner during any 24_{0}^{+1} h test period shall not be greater than $0,5 \text{ g/h}\cdot\text{m}^2$ of the flue liner external surface.

8.8 Bulk density

When flue liners are tested as described in A.10 each bulk density value shall be within a limit deviation of $\pm 10 \%$ of the manufacturer's declared bulk density for the flue liner.

8.9 Thermal resistance

Thermal resistance shall be measured in accordance with the method given in A.5 or calculated in accordance with the method given in Annex C and its value declared by the manufacturer.

8.10 Freeze/thaw resistance

Where national regulations require freeze/thaw resistance of flue liners, 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.

8.11 Flow resistance**8.11.1 Flow resistance of flue liners**

The manufacturer shall declare the mean value of roughness for a flue liner determined either:

- by testing in accordance with EN 13216-1 (which is the reference test method); or
- from the data obtained in EN 13384-1:2002+A2:2008.

8.11.2 Flow resistance of fittings

The manufacturer shall declare the coefficient of flow resistance due to a directional and/or cross sectional and/or mass flow change which shall be determined in accordance with the method given in EN 1859 or obtained from the data in EN 13384-1:2002+A2:2008.

8.12 Dangerous substances

Materials used in products shall not release any dangerous substances in excess of the maximum permitted levels specified in a relevant European Standard for the material or permitted in the national regulations of the member state of destination.

NOTE See Note 2 in ZA.1.

9 Designation**9.1 Designations and classes****9.1.1 General**

Designation classes for flue liners for temperature, pressure, resistance to sootfire, condensate resistance and corrosion resistance shall be in accordance with 9.1.2 to 9.1.6.

Flue liners shall be designated in accordance with the system given in 9.2.

9.1.2 Temperature class

Temperature classes in relation to nominal working temperature are given in Table 3.

Table 3 — Temperature class

Temperature class	Nominal working temperature °C
T600	≤ 600
T450	≤ 450
T400	≤ 400
T300	≤ 300
T250	≤ 250
T200	≤ 200
T160	≤ 160
T140	≤ 140
T120	≤ 120
T100	≤ 100
T80	≤ 80

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9.1.3 Pressure class

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Pressure classes in relation to test pressure and gas tightness are given in Table 4.

The pressure class is assigned a gas tightness level, expressed as a maximum leakage rate at a specified test pressure. For flue liners suitable for negative pressure chimneys the pressure classes are N1 and N2. For flue liners suitable for positive pressure chimneys the pressure classes are P1 and P2.

Table 4 — Pressure classes and gas tightness

Pressure class	Test pressure Pa	Gas tightness – Maximum leakage rate l/s/m ²
N1	40	2,0
N2	20	3,0
P1	200	0,006
P2	200	0,120

9.1.4 Resistance to fire class

Resistance to fire classes are designated as: