SLOVENSKI STANDARD
SIST EN 1457:1999

01-december-1999

Dimniki ï Keramiļ ne tuljave ï Zahteve in preskusne metode

Chimneys - Clay/Ceramic Flue Liners - Requirements and test methods

Abgasanlagen - Keramik-Innenrohre - Anforderungen und Prüfungen

Conduits de fumée - Conduits intérieurs en terre cuite/céramique - Exigences et méthodes d'essai

Ta slovenski standard je istoveten z: **EN 1457:1999**

ICS:

91.060.40 Dimniki, jaški, kanali Chimneys, shafts, ducts

SIST EN 1457:1999 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1457

January 1999

ICS 91.060.40

Descriptors: flue ducts, ceramics, definitions, classifications, dimensional tolerances, compressive strength, thermal shock tests, water absorption tests, density (mass/volume), acid resistance, sampling, tests, designation, marking

English version

Chimneys - Clay/Ceramic Flue Liners - Requirements and test methods

Conduits de fumée - Conduits intérieurs en terre cuite/ceramique - Exigences et méthodes d'essai

Abgasanlagen - Keramik-Innenrohre - Anforderungen und Prüfungen

This European Standard was approved by CEN on 26 December 1998.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Contents

		Page
Foreword		3
1	Scope	4
2	Normative references	4
3	Flue liners and openings	4
4	Definitions	6
5	Classes of flue liner	7
6	Materials	9
7	Dimensions	9
8	Proof load	10
9	Gastightness (leakage test) after thermal testing for straight flue liners	11
10	Acid resistance	12
11	Water absorption and bulk density	13
12	Sweeping resistance	13
13	Water and vapour flow resistance	13
14	Thermal resistance	13
15	Evaluation of conformity	14
16	Test methods	15
17	Designation	28
18	Marking	30
Annex A (normative)	Sampling procedures for an AQL of 10% and inspection level S2	31
Annex B (informative)	Thermal resistance	35

Foreword

This European Standard 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 July 1999, and conflicting national standards shall be withdrawn at the latest by July 1999.

This European Standard 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).

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

On drafting this standard the provisional requirements already available from prEN 1443 were taken into account. When further requirements are received, any necessary amendments will be made.

1 Scope

This European standard is a product standard for clay/ceramic flue liners with solid walls or walls with vertical perforations for use in the construction of chimneys and flue pipes which serve to convey products of combustion from fireplaces or heating appliances to the atmosphere by negative or positive pressure. It includes the flue liners used for domestic and industrial chimneys which are not structurally independent (free-standing). This standard specifies the performance requirements for factory made flue liners and chimney fittings. Testing, marking and inspection are covered by this standard.

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.

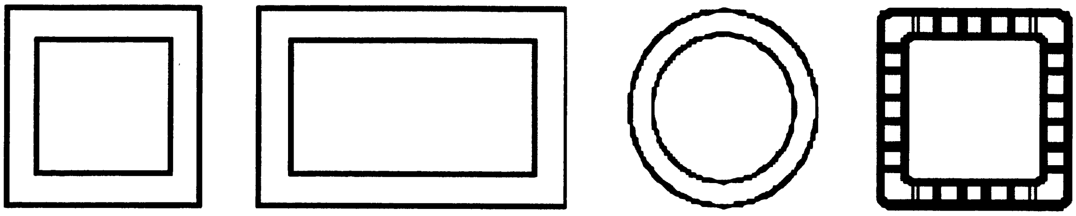
EN 312-4	Particleboards - Specifications - Part 4: Requirements for load-bearing boards for use in dry conditions
prEN 1443	Chimneys - General requirements
EN 10088-1	Stainless steels - Part 1: List of stainless steels
EN 45012	General requirements for bodies operating assessment and certification/registration quality systems (ISO/IEC Guide 62:1996)
EN ISO 9002	Quality systems - Model for quality assurance in production, installation and servicing (ISO 9002:1994)
ISO 2859-1	Sampling procedures for inspection by attributes - Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection
ISO/DIS 7500-1	Metallic materials - Verification of static uniaxial testing machines - Part 1 : Tension/compression testing machines (Revision of ISO 7500-1:1986)

3 Flue liners and openings

3.1 Flue liner cross-sections

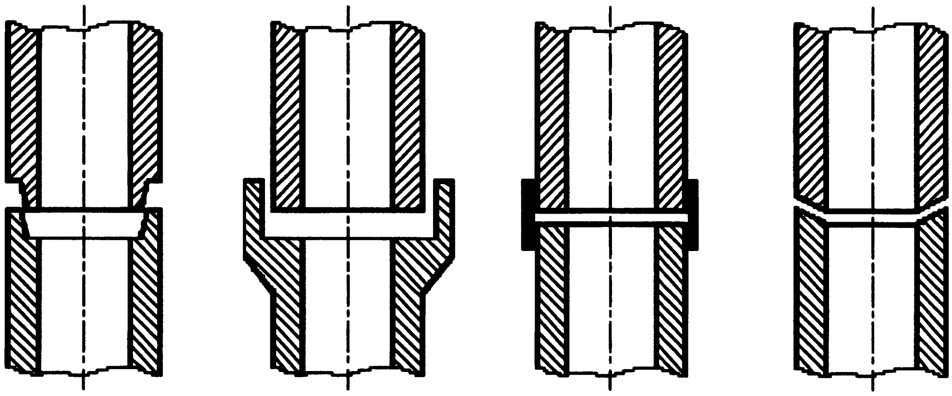
Flue liners shall be either:-

a) circular in cross-section with rebated or spigot and socket ends;
b) square or rectangular in cross-section with rebated ends and rounded internal corners;
c) circular, square or rectangular in cross-section with butt joints and jointed with a sleeve;
d) circular or square in cross-section with taper joints.



Square | Rectangular | Circular | Wall with vertical perforations

Figure 1 : Examples of cross-section configuration



Rebated | Spigot & socket | Sleeve | Tapered

Figure 2 : Joint configuration

3.2 Inspection openings, chimney junctions and inspection doors

Inspection openings are used for inspection and cleaning of the inner liners of chimneys and for soot removal and shall meet the requirements of flue liners as appropriate.

All inspection openings shall have a door.

The inspection door shall be one of the following:-

a) A single sheet door for chimneys working only in dry conditions;

b) A door with a separate humidity barrier or with two sheets for chimneys working under dry and wet conditions.

Chimney junctions are used to connect flues from heat appliances to chimneys. Chimney junctions are purpose-made tee-pieces or inner liner sections with an opening to which branches are fitted. The branch angles can be 45 ° to 90 ° (α in figure 3). At the position of junctions, the outer walls shall have corresponding openings.

Chimney junctions should have the same cross-sectional area as the flue liner. Reductions and expansions are acceptable provided that the resistance to the exhaust gases is not increased.

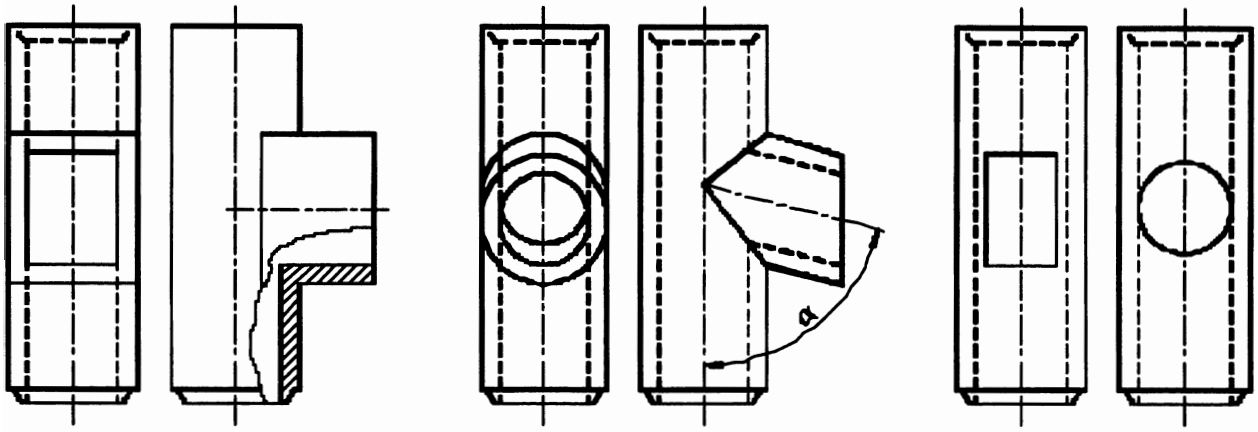


Figure 3: Examples of inspection openings and chimney junctions

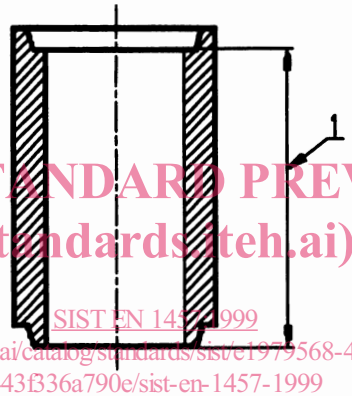
4 Definitions

For the purposes of this standard, the following definitions apply. Other definitions are given in prEN 1443.

4.1 nominal size : A numerical designation of size which is a convenient round number equal to or approximately equal to either:-

a) The internal diameter in millimetres of circular flue liners;
b) The internal width in millimetres of square flue liners;
c) The internal width and breadth in millimetres of the cross section of rectangular flue liners.

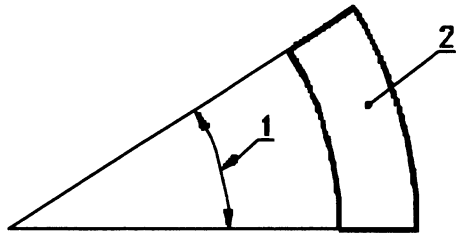
4.2 nominal height : A numerical designation of the internal height in millimetres of a straight flue liner which is a convenient round number approximately equal to the internal height of the flue liner (see figure 4).



1) Internal height

Figure 4: Internal height

4.3 nominal angle of curvature : The angle subtended in degrees by a curved flue liner at the centre of the curve (see figure 5).



1) Angle of curvature
2) Curved flue liner

Figure 5 : Angle of curvature

5 Classes of flue liner

There are four main classes of clay/ceramic flue liner dependent on working temperature, with sub-classes dependent on whether the flue liners are to be used in chimneys designed to work under negative or positive pressure or are to have soot fire resistance. The classes, working temperatures, test pressures and maximum air permeability rates are given in table 1. The suitability of each class of flue liner to be used in chimneys designed to operate under negative or positive pressure and wet or dry conditions is also given.

Table 1 : Classes of clay/ceramic flue liners, conditions of use, air test pressures and maximum air permeability rates after thermal testing

Class of flue liner	Working temperature °C	Negative or positive pressure	Soot fire resistance	Wet or dry conditions	Test pressure Pa	maximum air permeability $m^3 s^{-1} m^{-2} \cdot 10^{-3}$
A1 N2	600	Negative	Yes	Dry	20	3
A1 N1	600	Negative	Yes	Dry	40	2
A2 N2	600	Negative	No	Dry	20	3
A2 N1	600	Negative	No	Dry	40	2
A2 P1	600	Positive	No	Dry & wet	200	0,006
B1 N2	400	Negative	Yes	Dry	20	3
B1 N1	400	Negative	Yes	Dry	40	2
B2 N2	400	Negative	No	Dry & wet	20	3
B2 N1	400	Negative	No	Dry & wet	40	2
B2 P1	400	Positive	No	Dry & wet	200	0,006
C1 N2	300	Negative	No	Dry	20	3
C1 N1	300	Negative	No	Dry	40	2
C2 N2	300	Negative	No	Dry & wet	20	3
C2 N1	300	Negative	No	Dry & wet	40	2
C2 P1	300	Positive	No	Dry & wet	200	0,006
D1 N2	200	Negative	No	Dry	20	3
D1 N1	200	Negative	No	Dry	40	2
D2 N2	200	Negative	Yes	Dry & wet	20	3
D2 N1	200	Negative	Yes	Dry & wet	40	2
D3 N2	200	Negative	No	Dry & wet	20	3
D3 N1	200	Negative	No	Dry & wet	40	2
D3 P1	200	Positive	No	Dry & wet	200	0,006

NOTE 1: A flue liner may be classified in one or more classes provided it complies with the appropriate requirements for each class.

NOTE 2: A designated class of flue liner is suitable for use on all types of chimney with a nominal working temperature up to a maximum of that designated. The designation for soot fire resistance and corrosion apply throughout the temperature range. All classes of clay/ceramic flue liner are suitable for the appropriate pressure application. For clarification of the letters see clause 17, e.g.

Class Al N2 equals	T600, N2, S, D, 3 and can also be used for T600, N2, 0, D, 3 T400, N2, S, D, 3 T400, N2, 0, D, 3 T300, N2, 0, D, 3 T200, N2, 0, D, 3

NOTE 3: Flue liner classes for chimneys designed for use with low temperature products of combustion are included in this standard. When they are used with a system chimney, the whole chimney may be tested at the low working temperature for the determination of the minimum distance of combustibles away from the chimney. Flue liners classified as dry, may be used in wet conditions if back ventilation is provided, see system chimneys with clay/ceramic flue liners or blocks standard clause 8.

6 Materials

Flue liners shall be manufactured from suitable clay/ceramic material which when fired meets the performance requirements given in this standard.

Flue liners may be unglazed or glazed on the interior and/or exterior. When glazed, they need not be glazed on the jointing surfaces.

7 Dimensions

7.1 Size

When tested in accordance with 16.1, the internal diameter of circular flue liners measured on any diameter shall not deviate more than ± 3 % of the manufacturer's stated nominal internal diameter.

The internal width or breadth of square or rectangular section flue liners shall not deviate more than ± 3 % of the manufacturer's stated nominal internal length of the side.

7.2 Height

When tested in accordance with 16.2, the height of a flue liner shall not deviate more than ± 3 % of the manufacturer's stated nominal height subject to a maximum value of 10 mm.

7.3 Angle of curvature

When tested in accordance with 16.3, the angle of curvature of curved flue liners shall not deviate more than ± 5 ° of the manufacturer's stated nominal curvature.

7.4 Straightness

When tested in accordance with 16.4, the permissible deviation from straightness of straight flue liners shall be 1 % of the test length.

7.5 Squareness of ends

When tested in accordance with 16.5, the permissible deviation from square of the ends of straight flue liners, shall be not greater than an angle of slope 30 mm/m.

7.6 Deviation from shape of cross section

When tested in accordance with 16.6, the permissible deviation from square of the angles of, and flatness of walls for square or rectangular shape straight flue liners, shall be not greater than 5 % of the manufacturer's stated nominal internal width or breadth.

7.7 Joints

The design and dimensions of the joints shall be as specified by the manufacturer to provide an adequate joint.

8 Proof load

8.1 Straight flue liners

When tested in accordance with 16.7, straight flue liners shall withstand an intensity of loading of 10 MN/m^2.

8.2 Curved flue liners

Where curved flue liners are fired in a plant alongside straight flue liners, using the same materials and firing process, the proof load of these curved flue liners is deemed to be that of the straight flue liners when tested in accordance with 16.7.

If curved flue liners are not normally fired alongside straight flue liners, straight flue liners or short lengths of straight flue liners made for test purposes, using the same materials and firing process as for curved flue liners, shall be tested for compliance with the requirements of 8. 1.

8.3 Minimum load for inspection opening sections

When tested in accordance with 16.7, the minimum load of inspection opening sections shall be as given in table 2.

Table 2 : Minimum load

Height of chimney in m	Minimum load in kN
≤12,5	25
> 12,5 ≤ 25	50
> 25 ≤ 50	100

For chimneys with area greater than 0,04 m^2 the following equation shall be used:

$$F = \chi \cdot H \cdot G$$

where:

F is the minimum load in kilonewtons;
χ is the safety factor = 5;
H is the height of chimney in metres;
G is the mass per metre in kilogramms per metre.

9 Gastightness (leakage test) after thermal testing for straight flue liners

9.1 Initial test

Prior to thermal testing a test flue constructed in accordance with 16.8.2 with N l and N2 liners shall have a leakage rate not greater than 2 $m^3 s^{-1} m^{-2} \times 10^{-3}$ of internal surface area tested at a differential pressure of (40 ± 2) Pa when tested as described in 16.8.5.

Prior to thermal testing a test flue constructed in accordance with 16.8.2 with P1 liners shall have a leakage rate not greater than 0,006 $m^3 s^{-1} m^{-2} \times 10^{-3}$ of internal surface area tested at a differential pressure of (200 ± 10) Pa when tested as described in 16.8.5.

9.2 Final gastightness (leakage test) after thermal testing

When tested in accordance with 16.8, flue liners shall have a leakage rate after thermal testing not greater than the values given in table 3 for the appropriate class of flue liner, test temperature and differential pressure.