BRITISH STANDARD

BS EN
13467:2001

Thermal insulating products for building equipment and industrial installations — Determination of dimensions, squareness and linearity of preformed pipe insulation

The European Standard EN 13467:2001 has the status of a British Standard

ICS 91.120.10; 91.100.60

National foreword

This British Standard is the official English language version of EN 13467:2001. This British Standard, together with BS EN 13468:2001, BS EN 13469:2001, BS EN 13470:2001, BS EN 13471:2001 and BS EN 13472:2001, partially supersedes BS 2972:1989.

The UK participation in its preparation was entrusted by Technical Committee RHE/9, Thermal insulating materials, to Subcommittee RHE/9/4, Nomenclature and specifications, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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This British Standard, having been prepared under the direction of the Engineering Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 09 November 2001

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EUROPEAN STANDARD

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English version

Thermal insulating products for building equipment and industrial installations - Determination of dimensions, squareness and linearity of preformed pipe insulation

Produits isolants thermiques pour l'équipement du bâtiment et les installations industrielles - Détermination des dimensions, de l'équerrage et de la linéarité des coquilles isolantes préformées

Wärmedämmstoffe für die Haustechnik und für betriebstechnische Anlagen - Bestimmung der Maße, der Rechtwinkligkeit und der Linearität von vorgeformten Rohrdämmstoffen

This European Standard was approved by CEN on 18 August 2001.

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 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 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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 13467:2001 E

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 88 “Thermal insulating materials and products”, the secretariat of which is held by DIN.

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 March 2002, and conflicting national standards shall be withdrawn at the latest by March 2002.

This European Standard is one of a series of standards which specify test methods for determining dimensions and properties of thermal insulating materials and products. It supports a series of product standards for thermal insulating materials and products which derive from the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products (Directive 89/106/EEC) through the consideration of the essential requirements.

This European Standard has been prepared for products used to insulate building equipment and industrial installations, but it may also be applied to products used in other areas.

No existing European Standard is superseded.

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.

1 Scope

This European Standard specifies the equipment and procedures for determining the dimensions, squareness and linearity of preformed pipe insulation, supplied in one piece, half sections or segments. It is applicable to thermal insulating products.

2 Normative references

This European Standard contains no normative references.

3 Terms and definitions

For the purpose of this European Standard the following terms and definitions apply (see Figures 1 and 4).

3.1
circumference, *C*
the circular length of the outer surface of the pipe insulation

3.2
outside diameter, D_o
the linear distance between two opposite points on the outside surface of the pipe insulation measured across the center

3.3
inside diameter, D_i
the linear distance between two opposite points on the inside surface of the pipe insulation measured across the center

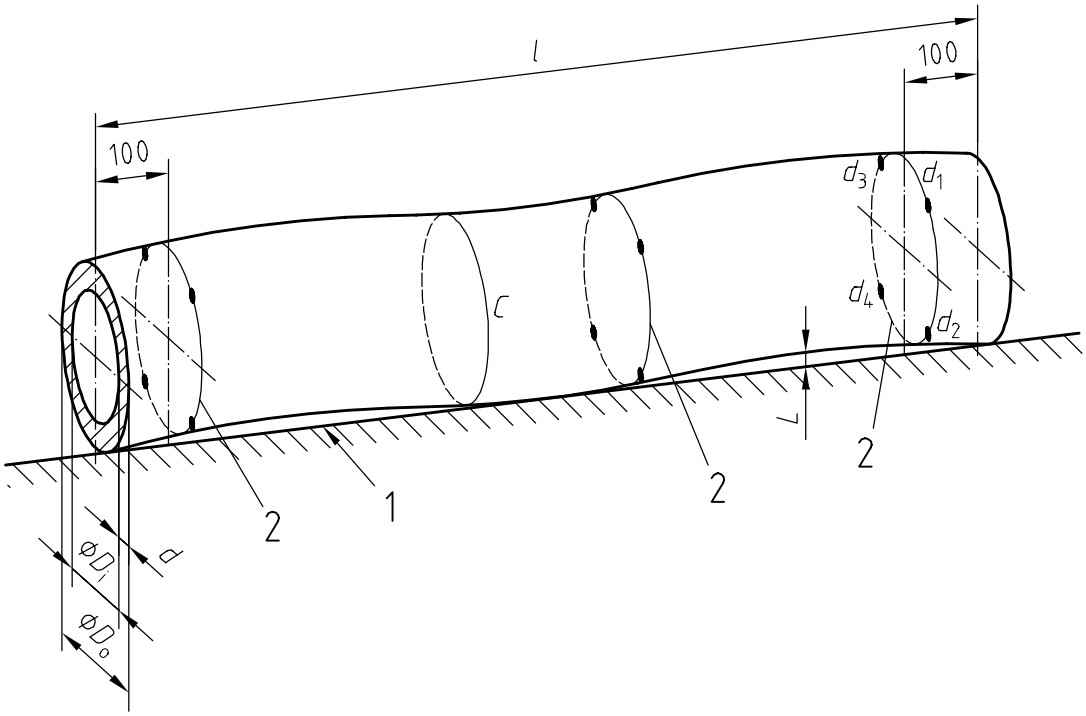
3.4
length, *l*
the linear dimension measured perpendicularly to the circumference of the pipe insulation

3.5
thickness, *d*
the thickness of the insulation product measured perpendicularly between the outside and the inside surface of the pipe insulation

3.6
deviation from squareness, *v*
the maximum distance between a product, at its end, from a line which just touches the product and which is perpendicular to its major axis (see Figure 4)

3.7
deviation from linearity, *L*
the maximum distance between a plane reference surface on which the test specimen rests and the outside surface of the pipe insulation

Dimensions in millimetres



Key
1 Flat surface
2 Locations for measurements (see 7.2.2.3)

Figure 1 - Illustration of the definitions

4 Principle

Determination of the dimensions, squareness and linearity of a pipe insulation along or at a right angle to its major axis.

5 Apparatus

5.1 For circumference, outside and inside diameter and thickness

5.1.1 Metal tape graduated in millimetres for measuring circumference and diameter.
Accuracy of reading:
diameter at least 1 mm,
circumference at least 3 mm.

5.1.2 Metal pipe for supporting the insulation with an outside diameter which ensures no deformation of the product

5.1.3 Rack for supporting the metal pipe (see Figure 2).

5.1.4 Thickness gauge, capable of applying a load of minimum (0,5 ± 0,05) N to a load distributing plate, diameter 50 mm. The load shall be such that no deformation of the product occurs during measurement.
Accuracy of reading at least 0,5 mm.

5.1.5 Conical mandrel graduated in 0,5 mm intervals (see Figure 3).
Accuracy of reading at least 0,5 mm.

5.1.6 Caliper
Accuracy of reading at least 0,1 mm.

5.2 For length

5.2.1 Metal tape graduated in millimetres.
Accuracy of reading at least 1 mm.

5.3 For deviation from squareness

5.3.1 Metal square with limbs at least 500 mm long with a deviation from squareness of not more than ± 0,1 mm when measured at 500 mm from the corners (see Figure 4).

5.3.2 Metal tape graduated in millimetres.
Accuracy of reading at least 1 mm.

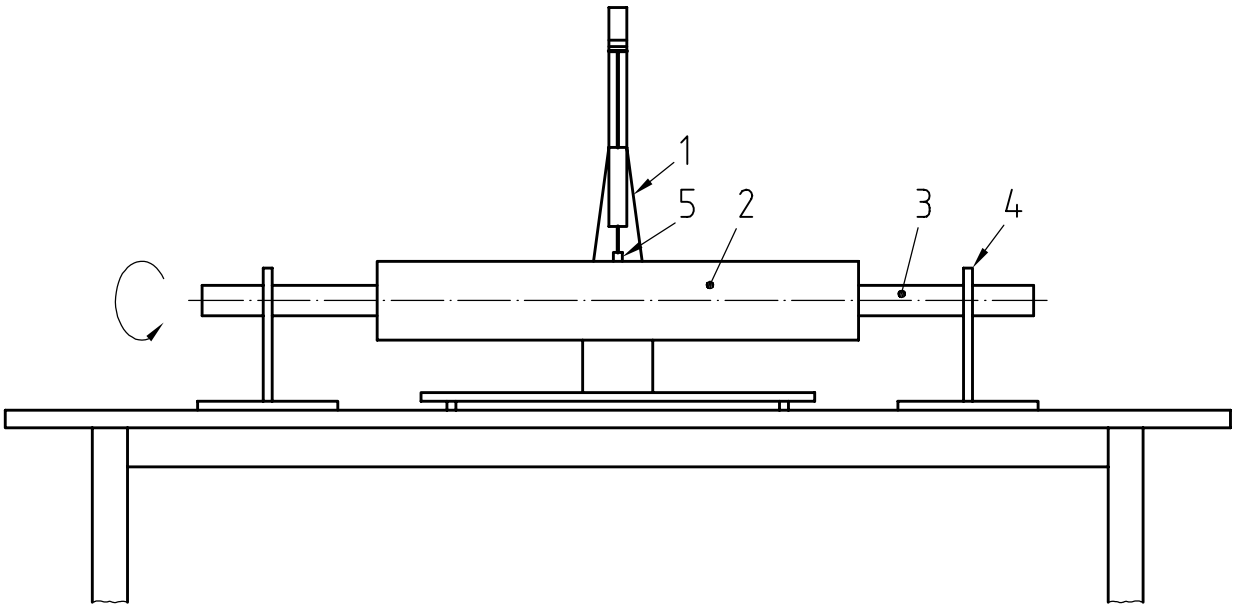
5.4 For deviation from linearity

5.4.1 Flat surface on which the test specimen rests.

5.4.2 Metal tape graduated in millimetres.
Accuracy of reading at least 1 mm.

5.4.3 Thickness gauge (wedgeshape), graduated in 0,5 mm (see Figure 5).
Accuracy of reading at least 0,5 mm.

NOTE For all measured dimensions test equipment which provides the same result with at least the same accuracy may be used.



Key
1 Thickness gauge
2 Test specimen
3 Metal pipe
4 Rack
5 Load distribution plate

Figure 2 - Example of equipment for thickness measurement with thickness gauge

Dimensions in millimetres

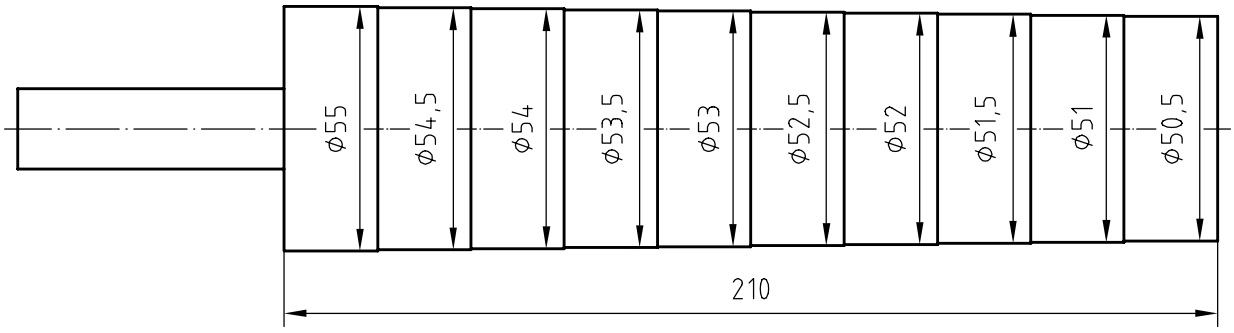
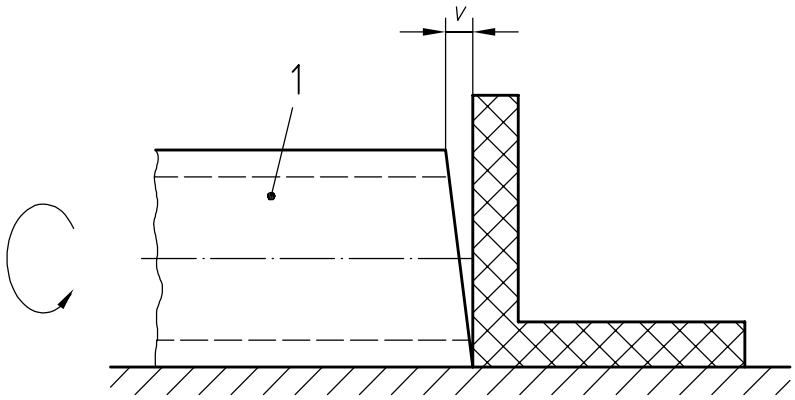


Figure 3 - Example of conical mandrel



Key
1 Test specimen

Figure 4 - Principle of measurement of deviation from squareness

Dimensions in millimetres

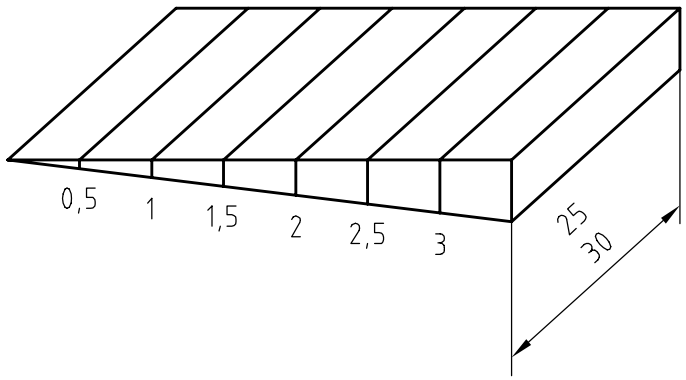


Figure 5 - Thickness gauge (wedgeshape)

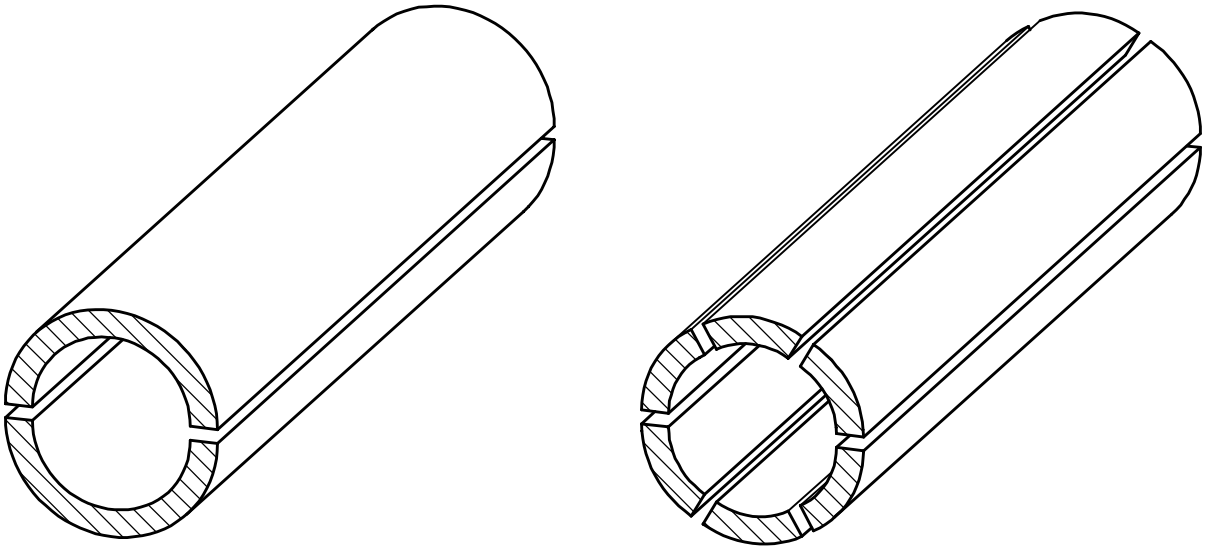
6 Test specimens

6.1 Dimensions of test specimens

The test specimens shall be, wherever possible, the full size pipe insulation product. The dimensions of the test specimens shall be measured including any surface skins, facings, and/or coatings on both the inner and the outer surfaces.

NOTE For the measurement of circumference/outside diameter, inside diameter, and thickness the test specimen may be divided transversely or longitudinally into several pieces; minimum dimension is 100 mm.

Pipe insulation pieces (half sections or segments) which together form a complete pipe insulation layer, without visual deformation, shall be held in place by adhesive tape to facilitate measurement (see Figure 6).



2 half sections segments

Figure 6 - Examples of pipe insulation pieces

6.2 Number of test specimens

The number of test specimens shall be as specified in the relevant product standard. If the number is not specified, then at least three test specimens shall be used.

NOTE In the absence of a product standard or any other European technical specification the number of test specimens may be agreed between parties.

6.3 Conditioning of test specimens

The test specimens shall be stored for at least 6 h at (23 ± 5) °C. In case of dispute they shall be stored at (23 ± 2) °C and (50 ± 5) % relative humidity for the time stated in the relevant product standard.

7 Procedure

7.1 Test conditions

The test shall be carried out at (23 ± 5) °C. In case of dispute it shall be carried out at (23 ± 2) °C and (50 ± 5) % relative humidity.

7.2 Test procedure

7.2.1 General

Determine the thickness, d, of the test specimen and its inside and outside diameter, D_i and D_o, from one of the following pairs of measurements:

a) Outside circumference and inside diameter;
b) Inside diameter and outside diameter;
c) Inside diameter and thickness;
d) Outside diameter and thickness;
e) Outside circumference and thickness.

Each set of measurements shall be performed at the same place on the pipe insulation.

NOTE 1 The listed options are not equivalent. Only when thickness itself is measured, can an estimate of concentricity be obtained.

NOTE 2 For pipe insulation with large inside diameter and small thickness attention should be paid to the required accuracy. Method c) or d) or e) should be used.

Determine the length, l, deviation from squareness, v, and deviation from linearity, L, in accordance with 7.2.3, 7.2.4 and 7.2.5.

NOTE 3 Determination of deviation from squareness and deviation from linearity are not relevant for all materials and/or applications.

7.2.2 Circumference - outside diameter, inside diameter, wall thickness

The appropriate apparatus, described in clause 5, shall be used for the measurements below.

During the measurement any longitudinal joints shall be kept close together.

The pipe insulation shall not be visibly deformed due to the measuring process.

Measure pipe insulation, with a length smaller than or equal to 600 mm, at two locations, either at the ends or 100 mm from each end.

Measure pipe insulation, with a length larger than 600 mm, as above with one extra measurement for each additional 400 mm in length evenly distributed along the length, with a maximum of 5 measurements.

NOTE The pipe insulation may be cut into smaller pieces at appropriate locations to facilitate measurement.

The reading accuracy of the measurements shall correspond to the accuracy of the apparatus.

7.2.2.1 Circumference - outside diameter

Measure the circumference, C, of the test specimen using a metal tape.

Measure the outside diameter, D_o, using either a metal tape or a caliper. Each measurement shall consist of two readings at right angles to the longitudinal axis of the test specimen at the selected locations. The readings of the outside diameter shall also be made at right angles to each other.

7.2.2.2 Inside diameter

Measure the inside diameter, D_i, using either a metal tape or a caliper. Each measurement shall consist of two readings at right angles to the longitudinal axis of the test specimen at the selected locations. The readings of the inside diameter shall also be made at right angles to each other.

Alternatively the inside diameter may be measured with a conical mandrel moved into position along the major axis of the pipe insulation.

NOTE For inside diameter greater than 55 mm the use of a conical mandrel may be impractical.

7.2.2.3 Thickness

Measure the thickness, d, using either a metal tape, a caliper or a thickness gauge. Each measurement shall consist of four readings at right angles to each other at the selected locations.

When a thickness gauge is used on a metal pipe (see 5.1.2) the pipe insulation shall be supported (see Figure 2). Before making measurements on the pipe insulation the thickness gauge shall be read with the measuring plate resting on the metal pipe. The pipe insulation shall then be suspended on the metal pipe and the thickness gauge read again. The difference between the two measurements is the thickness of the test specimen at that location. The load distributing plate of the thickness gauge shall be raised between each new reading.

7.2.2.4 Thickness uniformity

Determine the deviation from thickness uniformity, Δd, at each location by deducting the lower reading of thickness from the higher reading.

7.2.3 Length

Place the pipe insulation on a flat surface. Measure the length, l, twice, using a metal tape, at diametrically opposite sides on the surface of the pipe insulation (see Figure 1).

The length is measured with an accuracy of 1 mm for length $\leq$ 600 mm and an accuracy of 2 mm for length > 600 mm.

7.2.4 Deviation from squareness

Place the pipe insulation on a flat surface. Place the metal square on the flat surface against the end of the pipe insulation (see Figure 4). Measure the deviation from squareness, v, as the maximum distance from the top edge of the pipe insulation to the metal square. It is measured with a metal tape by rotating the pipe insulation until the point is reached where the distance between the metal square and the pipe insulation is a maximum. The measurement is carried out at both ends of the pipe insulation.

The deviation from squareness is measured with an accuracy of 1 mm.

7.2.5 Deviation from linearity

Place the pipe insulation on a flat surface and rotate it until a gap is observed between the pipe insulation and the flat surface. Measure the deviation from linearity, L, when the gap is at maximum using either a metal tape or a thickness gauge (see Figure 5) with an accuracy of 1 mm.

8 Calculation and expression of results

Table 1 – Measurement and calculation of dimensions

Measured values	Calculated values	Equations
C, D_i	D_o, d	$D_o = \frac{C}{\pi}$ (1) $d = \frac{D_o - D_i}{2}$ (2)
D_i, D_o	d	$d = \frac{D_o - D_i}{2}$ (3)
D_i, d	D_o	$D_o = D_i + 2 \times d$ (4)
D_o, d	D_i	$D_i = D_o - 2 \times d$ (5)
C, d	D_o, D_i	$D_o = \frac{C}{\pi}$ 6) $D_i = D_o - 2 \times d$ (7)

where:

C is the circumference, in millimetres;

D_o is the outside diameter, in millimetres;

D_i is the inside diameter, in millimetres;

d is the thickness, in millimetres.

8.1 Outside diameter and inside diameter

Calculate the average of the values in accordance with Table 1 and round to the nearest millimeter.

8.2 Thickness

Calculate the average of the values in accordance with Table 1 and round to the nearest millimeter.

8.3 Thickness uniformity

Record the deviation from thickness uniformity as the maximum value of Δd, in millimetres rounded to the nearest millimeter.

8.4 Length

Calculate the length, l, in millimetres as the average of two measurements, rounded to the nearest millimeter.

8.5 Deviation from squareness

Record the deviation from squareness, *v*, in millimetres as the largest angular deviation at each end of the pipe insulation, and round to the nearest millimeter. Report the nominal outside diameter of the pipe insulation.

8.6 Deviation from linearity

Record the deviation from linearity, *L*, rounded to the nearest millimeter.

9 Accuracy of measurement

NOTE It has not been possible to include a statement on the accuracy of the method in this edition of the standard, but it is intended to include such a statement when the standard is next revised.

10 Test report

The test report shall include the following information:

a) reference to this European Standard;

b) product identification

1) product name, factory, manufacturer or supplier;
2) production code number;
3) type of product;
4) packaging;
5) the form in which the product arrived at the laboratory;
6) presence of surface skins, facings and/or coatings and their nominal thickness;
7) other information as appropriate, e.g. nominal dimensions, nominal density;

c) test procedure

1) pre-test history and sampling, e.g. who sampled and where;
2) conditioning;
3) number of test specimens;
4) if any deviation from clauses 6 and 7;
5) date of testing;
6) general information relating to the test including information on thechosen apparatus and methods a) to e);
7) events which may have affected the results;

NOTE Information about the apparatus and identity of the technician should be available in the laboratory, but it need not be recorded in the report.

d) results

all individual values and the mean value for each dimension, deviation from squareness and deviation from linearity.

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