International Standard 8895

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Shaped insulating refractory products — Determination of cold crushing strength

Produits réfractaires isolants façonnés — Détermination de la résistance à l'écrasement à température ambiante

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

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Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Shaped insulating refractory products — Determination of cold crushing strength

1 Scope and field of application

This International Standard specifies a method of determination of the cold crushing strength of shaped insulating refractory products.

2 References

ISO/R 836, *Vocabulary for the refractories industry.*

ISO 5022, *Shaped refractory products — Sampling and acceptance testing.*

3 Definitions

3.1 cold crushing strength : The ultimate load per unit area, at room temperature, that a refractory will withstand before it is crushed.[1)]

3.2 shaped insulating product : A product having a true porosity of not less than 45 % (V/V).

4 Principle

At ambient temperature, a test piece of specified dimensions is subjected in a compression test machine to a load increasing at a specified rate until either the test piece collapses or its height is reduced to 90 % of its original value. The cold crushing strength is calculated from the maximum force recorded, and the dimensions of the test piece.

5 Apparatus

5.1 Mechanical or hydraulic crushing strength machine that will enable the load to be increased progressively and smoothly, and with a system of measurement that will enable the force exerted on the test piece to be known within ± 2 %. The range of the machine shall be such that the maximum force exerted in the test is greater than 10 % of the maximum force of which the machine is capable. One of the platens of the machine shall be mounted on a spherical seating that will compensate for any small error of parallelism between the face of the test piece and the platen. The platens of the machine shall be ground and the lower one shall be marked so as to facilitate placing the test piece at its centre.

5.2 Micrometer, or other suitable instrument, to measure the deformation of the test piece.

5.3 Equipment to measure the size of each test piece and to verify its geometrical form.

5.4 Drying oven, capable of being controlled at 110 ± 5 °C.

6 Test pieces

6.1 The number of items to be tested (i.e. bricks or blocks) shall be determined in accordance with ISO 5022 or another standard sampling plan agreed between the interested parties.

6.2 It shall be sufficient to take one test piece from each brick or block of standard size.

NOTE — The number to be taken from larger blocks (which detail is outside the scope of this International Standard) is a matter for agreement between the interested parties. To facilitate further statistical evaluation, the same number of test pieces should be taken from each block.

6.3 Each test piece shall be nominally the size of half a standard brick, i.e. :

114 mm × 114 mm × 76 mm

or

114 mm × 114 mm × 64 mm

6.4 In the case of special shapes, the test pieces shall be cut, dry, to one of the sizes specified in 6.3.

NOTE — If possible, the test report should indicate the relationship of the direction of loading to the direction of pressing during manufacture.

6.5 The load-bearing faces of each test piece shall be flat within a tolerance of 0,25 mm. This condition shall be checked across both diagonals of each load-bearing face with a steel rule and a 0,25 mm feeler gauge.

1) This definition is taken from ISO/R 836, omitting the specific temperature (0 °C) given in that ISO Recommendation.

6.6 The load-bearing faces of each test piece shall be parallel within a tolerance of 1 mm. This condition shall be checked by making four measurements of the height of the test piece, one at the centre of each of its four sides; the measurements shall not differ among themselves by more than 1 mm.

6.7 The axis of each test piece shall be perpendicular to its base within a tolerance of 1 mm. This condition shall be checked by placing the test piece on a surface table or surface plate and presenting a set square to the centre of each of its four sides; any gap between the set square and the side of the test piece shall not exceed 1 mm.

7 Procedure

7.1 Measure the length and breadth of each load-bearing face of the test piece, and its height at the centre of each of its four sides, in each case to the nearest 0,5 mm.

7.2 Dry the test piece to constant mass in the oven (5.4), controlled at 110 ± 5 °C, cooling it each time away from moisture.

7.3 Place the test piece on one of its larger faces (114 mm × 114 mm) in the centre of the lower platen of the testing machine (5.1). No packing material shall be used between the test piece and the platens. Mount the measuring instrument (5.2) on the lower platen to measure the deformation occurring in the test piece.

7.4 Gradually and continuously increase the load at such a rate that

a) if the expected cold crushing strength is less than 10 N/mm², the rate of increase of stress in the test piece is 0,05 ± 10 % N/(mm².s);

b) if the expected cold crushing strength is equal to or greater than 10 N/mm², the rate of increase of stress in the test piece is 0,2 ± 10 % N/(mm².s).

7.5 Continue increasing the load at the rate given in 7.4 until either the test piece collapses (fails to support the load) or its height is reduced to 90 % of its original height. Record the maximum load indicated during the test.

8 Expression of results

8.1 The cold crushing strength is given, in newtons per square millimetre, by the formula

$$\frac{F_{max}}{lb}$$

where

F_{max} is the maximum load, in newtons, indicated during the test;

l is the mean of the four measurements of the length, in millimetres, of the test piece;

b is the mean of the four measurements of the breadth, in millimetres, of the test piece.

8.2 The cold crushing strength shall be expressed in newtons per square millimetre, to the nearest 0,1 N/mm².

NOTE — The SI unit for crushing strength is the newton per square metre, but the newton per square millimetre has been chosen for practical reasons.

9 Test report

The test report shall include the following information :

a) the testing establishment;

b) the date of the test;

c) a reference to this International Standard, i.e. "Determination of cold crushing strength in accordance with ISO 8895";

d) the designation of the material tested (manufacturer, size, quality, etc.);

e) the number of items tested (see 6.1);

f) the number of test pieces cut from each item, if more than one (see 6.2);

g) the size of the test pieces (see 6.3);

h) where possible, the relationship between the direction of loading and the direction of pressing during manufacture (see, for example, 6.4);

i) the rate of stress increase (see 7.4);

j) whether the test was terminated by the collapse of the test piece or on the deformation reaching 10 % (see 7.5);

k) the individual value of the crushing strength (see 8.1) for each test piece and, if appropriate (see 6.2), the median and mean value for each item tested.

NOTE — The individual values are used in the determination of the mean, and the mean value in further statistical assessment, for example in accordance with ISO 5022.