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Neoblikovani ognjevzdržni izdelki - 1. del: Uvod in definicije

Unshaped refractory products - Part 1: Introduction and definitions

Ungeformte feuerfeste Erzeugnisse - Teil 1: Einführung und Definitionen

Produits réfractaires non façonnés - Partie 1: Introduction et définitions

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Unshaped refractory products - Part 1: Introduction and definitions

Produits réfractaires non façonnés - Partie 1: Introduction et définitions

Ungeformte feuerfeste Produkte - Teil 1: Einleitung und Definitionen

This European Prestandard (ENV) was approved by CEN on 1993-10-06 as a prospective standard for provisional application. The period of validity of this ENV is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into an European Standard (EN).

CEN members are required to announce the existance of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Contents

Foreword

This European pre-standard has been prepared by CEN/TC187 'Refractory products and materials'.

ENV 1402 'Unshaped refractory products' consists of eight Parts:

Part 1 : Introduction and definitions
Part 2 : Sampling
Part 3 : Characterization as received
Part 4 : Consistency testing
Part 5 : Preparation and treatment of test pieces
Part 6 : Measurement of physical properties
Part 7 : Pre-formed shapes
Part 8 : Classification*

* To be included in future work.

The general objective is to define, with as much accuracy as possible, the control of unshaped refractory products with special reference to:

a) quality control;
b) checking the conformity of the delivery as compared with claimed properties;
c) the control of batch homogeneity.
d) the final control of linings.

Properties are unavoidably influenced by industrial placing as a result of the equipment, environmental conditions and often by specific site conditions (target date, location). Quality control and final control of lining should not be considered in the same documents, since the former requires accuracy and clean operative methods while the latter requires the control of the placing.
Unshaped refractory products used in industrial linings are not fired, so that the firing effect which results from heating creates complicated conditions that make control difficult. The main points to be mentioned are:

i) a temperature gradient, the consequence of which is a property gradient;
ii) the level of maximum temperature reached on the hot face directly depends on the working temperature of the equipment;
iii) the life of the equipment may be numbered in hours or in years.

It should be noted that properties measured in the laboratory frequently do not reflect the properties of the material when installed. Reproducibility and repeatability data is not yet available.

CEN/TC187 approved this European pre-standard by resolution No 4 during its sixth meeting held in Paris, 93-10-06.

In accordance with the CEN/CENELEC regulations, the following countries are bound to announce this European pre-standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, UK.

1 Scope

This European pre-standard defines terms relating to unshaped refractory products and establishes designations for the various types of product.

Raw materials and crushed or granulated refractory materials which do not contain any binder are excluded.

Annex A gives guidance for the selection of test methods.

2 Normative references

This European pre-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.

ISO 565	:	Specification for test sieves
ISO R836	:	Vocabulary for the refractories industry
EN 1094-4	:	Insulating refractory products : Part 4 : Determination of bulk density and porosity of shaped products
ENV ....-3	:	Unshaped refractory products : Part 3 : Characterization as received

3 General definitions

For the purposes of this European pre-standard, the following definitions apply:

3.1 Unshaped refractory materials

Mixtures which consist of an aggregate and a bond or bonds, prepared ready for use either directly in the condition in which they are supplied or after the addition of one or more suitable liquids, and which satisfy the requirements on refractoriness given in ISO R836. They may contain metallic, organic or ceramic fibre material.

These mixtures are either dense or insulating. Insulating mixtures are those whose true porosity is not less than 45 % when determined in accordance with EN 1094-4, using a test piece fired to specified conditions.

> NOTE : Certain unshaped materials which do not correspond to the definition of refractory materials (i.e. pyrometric cone equivalent of at least 1500 °C) but which nevertheless correspond to the criteria of this European standard may be classified in accordance with it.

3.2 Pre-formed shapes

Shapes made from unshaped refractory materials, cast or moulded and pre-treated by the manufacturer, in order to prepare blocks that are directly placed in service. They may have a thermal pre-treatment.

3.3 Nature of the bond

Depending on the hardening process of the different materials, the bond may be:

a) a hydraulic bond with setting and hydraulic hardening at ambient temperature;
b) a ceramic bond with hardening by sintering during firing;
c) a chemical bond (inorganic or organic-inorganic) with hardening by chemical, but not hydraulic, reaction at ambient temperature or at a temperature lower than that of a ceramic bond;
d) an organic bond with binding or hardening at ambient temperature or at higher temperatures.

When several bonds are used together, the bond is designated (see clause 7) according to the nature of that bond which plays the principal part during the hardening.

3.4 Granulometric class

The mesh width of the finest sieve (ISO 565 series) through which at least 95 % by mass of the material passes.

3.5 Yield by volume

The mass of material as delivered which is necessary to place one m^3 of material, expressed in tonnes to the nearest 1 %.

4 Type of use

Unshaped refractory materials are subdivided according to their type of use into:

a) materials for monolithic construction;
b) materials for repairs;
c) materials for laying or jointing.

5 Product types and methods of placement

5.1 Refractory castables

5.1.1 *General*

Mixtures of refractory aggregates and bond(s), mainly supplied dry and used after the addition and mixing of water or another liquid. They are placed by casting with vibration, by casting without vibration (self-flowing), by rodding or when necessary by tamping. The bond is formed and hardening takes place without heating.

Refractory castables may be either dense castables (DC) or insulating castables (IC) (see 3.1). Dense castables are sub-divided into the types given in 5.1.2 to 5.1.4.

5.1.2 *Regular castable (RCC)*

Hydraulically bonded refractory castable containing cement but without deflocculant.

5.1.3 *Deflocculated castable (DCC)*

Hydraulically bonded refractory castable containing cement, a minimum of 2 % by weight of ultra fine particles (less than one micron) and at least one deflocculating agent.

This type is in turn sub-divided into the four categories given in table 1.

Table 1 : Categories of deflocculated cement castable

Category	Content (%) CaO	
	min	max
Medium cement castable (MCC)	> 2,5	-
Low cement castable (LCC)	> 1,0	≤ 2,5
Ultra low cement castable (ULCC)	> 0,2	≤ 1,0
No cement castable (NCC)	0	≤ 0,2

5.1.4 *Chemically bonded castable (CBC)*

Refractory castable containing one or more chemical bonds (see 3.3) which cause hardening.

5.2 Refractory gunning materials

Mixtures of refractory aggregates and bond(s), specially prepared for placing by pneumatic or mechanical projection.

They may be either:

a) castables (see 5.1) (dense or insulating) which are supplied dry and used after the addition of water during or before gunning;c

b) plastics (see 5.3.2) for gunning, which are especially designed for gunning under high air pressure with special equipment, and are normally delivered in a ready to use state.

According to the type of bond, a further distinction is made between hydraulic bonded, chemically bonded and ceramic bonded gunning materials.

5.3 Refractory mouldable materials

5.3.1 *Refractory ramming mixes (RM)*

Materials which are non-coherent before use, made up of refractory aggregates, bond(s) and if necessary liquid(s). According to the type of product, the main bond may be ceramic, chemical (inorganic or organic-inorganic) or organic.

The materials are used as delivered or after the addition of liquid(s) and placed by ramming (manual or mechanical) or vibration. They harden under the action of heat above ambient temperature.

5.3.2 *Plastic refractory materials (PM)*

Materials which are coherent and ready for use, with a plastic consistency, made up of refractory aggregates, bond(s) and liquid(s). According to the type of product, the main bond may be ceramic, chemical (inorganic or organic-inorganic) or organic.

The materials are supplied in soft, pre-formed blocks or slices and placed by ramming (manual or mechanical). Installation without shuttering is possible. They harden under the action of heat above ambient temperature.

Plastic refractory materials have indices of workability (see ENV ....-3) of greater than 14 after stabilization.

5.3.3 *Tap hole mixes*

Materials which are ready for use, having a plastic consistency and made up of refractory aggregates, bond(s) and liquid(s). After firing the materials are mainly carbon bonded.

NOTE : These materials are specially designed to fill blast furnace tap holes.

5.4 Refractory jointing materials

Materials intended for laying and jointing bricks or blocks by trowelling, grouting in the joints, or dipping the brick or block to be bonded. They are mixtures of fine refractory aggregates and bond(s), supplied in the dry state or mixed with water ready for use. There are two main types:

a) Heat setting jointing materials, which harden at elevated temperatures by chemical or ceramic bonds.

b) Air setting jointing materials, which harden at ambient temperature by chemical or hydraulic bonds.

5.5 Other unshaped refractory products

5.5.1 *Dry mixes*

These materials are specially designed to be placed in the dry state by vibration, 'vibro-compaction' or ramming. During the placing they reach a maximum compaction and it becomes possible to remove the former either before or after heating. They may include a temporary bond but are eventually ceramic bonded.

5.5.2 *Injection mixes*

These materials are specially designed to be injected by a pump, using pressures of between 10 and 200 bar. They may be supplied ready to use, or may require mixing.

5.5.3 *Coatings*

Mixture of fine refractory aggregate and bond(s), supplied ready for use with a higher water or other liquid content than materials for placing or jointing. The principal bond may be ceramic, hydraulic, chemical (inorganic or organic-inorganic) or organic. The mixtures are applied manually (with a brush or trowel), by pneumatic or mechanical projection, or by spraying.