
Specification for
Building
limes

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The following BSI references relate to the work on this standard:

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The Cement, Lime and Gypsum Products Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

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British Precast Concrete Federation	Greater London Council
*British Quarrying and Slag Federation	Gypsum Products Development Association
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*Department of the Environment, Building Research Station	*Welwyn Hall Research Association

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committees entrusted with the preparation of this British Standard:

High Calcium By-Product Lime Association	National Federation of Plastering Contractors
Institute of Building	Overseas Geological Surveys, Mineral Resources Divisions



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Foreword

This metric edition of this British Standard has been prepared, in accordance with the change to the metric system in the construction industry, giving values in terms of SI units. For further information on SI units, reference should be made to BS 3763, 'The International System of units (SI)'.

The values in this metric edition represent the equivalent of the values in imperial units in BS 890: 1966, rounded to convenient numbers. Although the values are not exact equivalents of the imperial ones, this metric edition is not a technical revision of the standard which it supersedes. However, following the publication of BS 4551, 'Methods of testing mortars and specification for mortar testing sand' the opportunity has been taken of deleting Appendices R-Y, with their associated drawings, and replacing them with cross-references.

Pending a future technical revision it was considered desirable that the contents of the Foreword of the 1966 edition, which was published in imperial units, should be retained in this edition to draw attention to the historical background. The substance of the 1966 Foreword is therefore repeated as follows:

'This standard has been revised under the authority of the Cement, Lime and Gypsum Products Industry Standards Committee in order to bring it into line with current practice and to incorporate improvements in the specification resulting from experience gained since the original specification was published. A specification for lime putty, which is now more widely available as a commercial product than at the time the original specification was prepared, has been included.'

The standard is in four parts, as follows:

- Part 1 : General
- Part 2 : Hydrated lime
- Part 3 : Quicklime
- Part 4 : Lime putty

The layout has been modified, with the intention of making the requirements for the various types of lime more rapidly apparent, and simplification has resulted from the elimination of a class with less stringent requirements (the previous Class B) which, owing to general improvements by the industry, is no longer necessary.

As in the original standard, requirements are included for the following types of lime made from limestone and chalk:

- a. high calcium limes (white limes),
- b. semi-hydraulic lime (grey lime),
- c. magnesian lime.

Eminently hydraulic limes, which are not widely available in the United Kingdom, are not included.

In this revision, also, high calcium by-product limes from the manufacture of acetylene from calcium carbide are included for the first time. Only those by-product limes made by the so-called 'wet process' have been considered, as the committee had available neither evidence nor experience to show whether or with what limitations hydrated lime from the so-called 'dry process' is suitable for direct use in building. It is however believed that if lime derived from such a source meets the requirements of the specification, it should be satisfactory for such use.

The only requirement specific to by-product limes is in respect of soluble salts. If the lime is properly processed for building purposes the soluble salts are unlikely to exceed the amount indicated and are then innocuous. The requirement is included to prevent the use of inadequately processed material.

It has not been thought necessary to specify limits for particular soluble salts or radicals.

No autoclave expansion test, such as has sometimes been suggested for magnesian limes, is included in this standard, since such a test tends to exclude any lime containing unhydrated magnesia, which is present in appreciable quantities in the majority of magnesian limes in this country that are slaked by normal methods. Experience has shown that this unhydrated magnesia does not give significant cause for dissatisfaction in the normal usage of such limes which is mainly for bricklaying mortars above damp-proof course.

Attention is drawn to the fact that certain tests, on lime putty made from dry hydrated lime and from quicklime, are carried out after the first 24 hours from preparation of the putty, since the properties improve during that period.

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The requirements of this standard should be considered particularly in relation to the manner of use of lime as described in the following BS Codes of Practice on Building:

- CP 111. Structural recommendations for load-bearing walls.
- CP 121. Brickwork and blockwork.
- CP 211. Internal plastering.
- CP 221. External rendered finishes.

Certain of the drawings illustrating apparatus described in the appendices are based on drawings in American Society for Testing and Materials (U.S.A.) and in South African Bureau of Standards Specifications, with acknowledgements to the respective organizations.

NOTE. Attention is drawn to the certification facilities offered by BSI; see the inside back cover of this standard.

British Standard Specification for

Building limes

1. General

1.1 Scope

This British Standard specifies requirements for hydrated lime powder, quicklime and lime putty for use in building.

NOTE. The titles of the British Standards referred to in this standard are listed on the inside back cover.

1.2 Water for testing

The water used in all operations shall, unless otherwise appropriate (e.g. in chemical analyses where distilled or de-ionized water is necessary), be pure and free from more than traces of soluble salts. Water fit for drinking is normally suitable.

1.3 Certificate of test

The manufacturer shall satisfy himself by regular periodical tests that the material shall be capable of conforming to the requirements of this standard, and a certificate to this effect shall be provided, free of charge, at the request of the purchaser.

1.4 Independent tests

If the purchaser or his representative requires independent tests, the samples shall, at the option of the purchaser or his representative, be taken before or immediately after delivery and the tests shall be carried out in accordance with the requirements of this British Standard on the written instructions of the purchaser or his representative. If the vendor so desires, he or his representative shall be present at the sampling. The manufacturer shall supply, free of charge, the lime required for testing. The cost of such tests unless otherwise specified shall be borne as follows:

- (1) by the manufacturer if the results show that the lime does not comply with the requirements of this British Standard;
- (2) by the purchaser if the results show that the lime complies with the requirements of this British standard.

1.5 Lime in tropical climates

The temperature mid-point of 20 °C specified in the appendices is applicable to temperate climates. Lime intended for use in tropical climates may be tested at a temperature mid-point of 27 °C, subject to the same temperature tolerances as specified for temperate climates. When so tested, lime satisfying the requirements herein specified for temperate climates complies with this British Standard.

2. Hydrated lime (powder)

2.1 Classification

2.1.1 Hydrated lime powder covered by this section of the standard shall be of one of the following types:

- (1) hydrated high-calcium lime (white lime),
- (2) hydrated high-calcium by-product lime,
- (3) hydrated semi-hydraulic lime (grey lime),
- (4) hydrated magnesian lime.

2.1.2 The lime shall be hydrated lime such that essentially all of the free lime* content shall be present as calcium hydroxide.

2.1.3 The purchaser shall state with the enquiry and order which of the above types he desires.

2.1.4 Even where the purchaser has made no specific demand, the vendor shall state which of the above types is being supplied.

2.2 Description

Hydrated lime complying with the requirements of this standard shall be in the form of a fine, dry powder produced either:

- (1) by treating quicklime with sufficient water in any suitable form so as to produce a dry, sound product. The quicklime employed shall consist essentially either of calcium oxide or of calcium oxide with a proportion of magnesium oxide, according to the type of lime as defined in 2.1.1, formed by burning a natural rock or other suitable material in such a manner that the product can be slaked effectively with water, or
- (2) by treatment of calcium carbide with water, as a by-product in the manufacture of acetylene, followed by drying and other processes necessary to give a powder of the required properties.

2.3 Size of sample and method of sampling

When independent tests are required, the hydrated lime shall be sampled at a time and place to be mutually agreed upon between the purchaser and the vendor. The size of sample and method of sampling shall be as described in Appendix A.

2.4 Composition

The hydrated lime shall conform to the appropriate chemical requirements for its type shown in Table 1, when analysed in accordance with the appendices indicated. Where no appendix is indicated, generally recognized methods shall be used. The results shall be reported on the 'as received' basis.

*Free lime in this context means calcium oxide and calcium hydroxide, which are not combined with other constituents.

Table 1. Chemical requirements for hydrated lime (powder)

Appendix	Constituent	Type of hydrated lime			
		High-calcium lime	High-calcium by-product lime	Semi-hydraulic lime	Magnesian lime
		%	%	%	%
B	Carbon dioxide, CO ₂ , not more than	6	6	6	6
	Insoluble matter, not more than	1	1	1	1
	Lime plus magnesia, CaO + MgO, not less than	65	65	60	65
	Magnesia, MgO, not more than	4	4	4	*
C	Soluble salts, not more than	*	0.5	*	*
		*	*	*	4
D	Soluble silica, SiO ₂ , not less than	*	*	5	*

*Not applicable.

2.5 Physical tests

The hydrated lime shall conform to the appropriate requirements for its type shown in Table 2, when tested in accordance with the appendices indicated.

Table 2. Physical requirements for hydrated lime (powder)

Appendix	Test	Type of hydrated lime			
		High-calcium lime	High-calcium by-product lime	Semi-hydraulic lime	Magnesian lime
E	FINENESS				
	Residue on 180 µm BS 410 fine mesh test sieve, not more than	1%	1%	1%	1%
	*Total residue on 90 µm BS 410 fine mesh test sieve, not more than	6%	6%	6%	6%
F	SOUNDNESS				
	Le Chatelier expansion average of three specimens not more than	10 mm	+	10 mm	10mm
G	Pat test	Free from pops or pits	+	Free from pops or pits	Free from pops or pits
J	PUTTY OF STANDARD CONSISTENCE				
K	Density†, not more than	1.50 g/ml	1.50 g/ml	1.50 g/ml	1.50 g/ml
L	Workability, bumps, not less than to reach a spread of 190 mm	12	12	12	12
M	HYDRAULIC STRENGTH				
	Standard sand-lime mortar				
	Modulus of rupture at 28 days				
	not less than	+	+	0.7 N/mm ²	+
	not more than	+	+	2.0 N/mm ²	+

*Including residue on 180 µm BS 410 test sieve.

†Not applicable.

†The method of calculating volume yield from density is given in Appendix K.

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3. Quicklime

3.1 Classification

3.1.1 Quicklime covered by this section of the standard shall be one of the following types:

- (1) high-calcium lime (white lime),
- (2) semi-hydraulic lime (grey lime),
- (3) magnesian lime.

3.1.2 The lime shall consist essentially of either calcium oxide, or of calcium oxide with a proportion of magnesium oxide; the remainder shall be mainly silica and alumina, which are soluble when treated in the manner described in Appendix D.

3.1.3 The purchaser shall state with the enquiry and order which of the above types he desires.

3.1.4 Even where the purchaser has made no specific demand, the vendor shall state which of the above types is being supplied.

3.2 Description

Quicklime complying with the requirements of this standard shall be produced by burning a natural rock or other suitable material in such a manner that the product can be slaked effectively with water.

3.3 Size of sample and method of sampling

When independent tests are required, the quicklime shall be sampled at a time and place to be mutually agreed between the purchaser and the vendor. The size of the sample and the method of sampling shall be as described in Appendix A.

3.4 Composition

The quicklime shall conform to the appropriate chemical requirements for its type shown in Table 3, when analysed in accordance with the appendices indicated. Where no appendix is indicated, generally recognized methods shall be used. The results shall be reported on the 'as received' basis.

Table 3. Chemical requirements for quicklime

Appendix	Constituent	Type of quicklime		
		High-calcium lime	Semi-hydraulic lime	Magnesian lime
		%	%	%
B	Carbon dioxide, CO ₂ , not more than	6	6	6
	Insoluble matter, not more than	3	3	3
	Lime plus magnesia, CaO + MgO, not less than	85	70	85
	Magnesia, MgO, not more than	5	5	*
	not less than	*	*	5
D	Soluble silica, SiO ₂ , not less than	*	6	*

*Not applicable.

3.5 Physical tests

The quicklime shall conform to the appropriate physical requirements for its type shown in Table 4 when tested in accordance with the appendices indicated.

Table 4. Physical requirements for quicklime

Appendix	Text	Type of quicklime		
		High-calcium lime	Semi-hydraulic lime	Magnesian lime
		%	%	%
P	RESIDUE ON SLAKING			
	Residue on 1.00 mm BS 410 fine mesh test sieve, not more than	5	5	5
	Total residue* on SB 410, 250 µm fine mesh test sieve, not more than	7	7	7
J	PUTTY OF STANDARD CONSISTENCE			
K	Density†, not more than	1.45 g/ml	1.45 g/ml	1.45 g/ml
L	Workability, bumps, not less than to reach a spread of 190 mm	14	14	14
M	HYDRAULIC STRENGTH			
	Standard sand-lime mortar			
	Modulus of rupture at 28 days			
	not less than	—	0.7 N/mm ²	—
	not more than	—	2.0 N/mm ²	—

*Including residue on 1.0 mm BS 410 test sieve.

†The relationship between volume yield and density is given in Appendix K.

4. Lime putty

4.1 Classification

4.1.1 Lime putty covered by this section of the standard shall be of one of the following types:

- (1) high-calcium lime (white lime) putty,
- (2) high-calcium by-product lime putty,
- (3) semi-hydraulic lime (grey lime) putty,
- (4) magnesian lime putty.

4.1.2 Essentially all of the free lime* content of the lime putty shall be calcium hydroxide.

4.1.3 The purchaser shall state with the enquiry and order which of the above types he desires.

4.1.4 Even where the purchaser has made no specific demand, the vendor shall state which of the above types is being supplied.

*Free lime in this context means calcium oxide and calcium hydroxide, which are not combined with other constituents.