

Specification for

Building limes

Committees responsible for this British Standard

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- Autoclaved Aerated Concrete Products Association
- British Aggregate Construction Materials Industries
- British Lime Association
- Department of the Environment (Building Research Establishment)
- Ministry of Agriculture, Fisheries and Food
- Mortar Producers' Association
- Water Services Association of England and Wales

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Foreword

This British Standard has been prepared under the direction of Subcommittee B/516/11. It supersedes BS 890:1972 which is withdrawn.

This standard has been revised to align it more closely with developments in the work of Technical Committee 51, Cement and building limes, of the European Committee for Standardization (CEN) which is preparing a European Standard for building limes, EN 459. Part 1 of that standard, ENV 459-1, has the status of a prestandard and specifies requirements for air limes and hydraulic limes.

Part 2, EN 459-2, comprises the supporting test methods. These tests complement those in EN 196 developed for cement.

The implementation of EN 459-2 and EN 196 as British Standards in the BS EN series necessitates the withdrawal of the corresponding tests in BS 890, BS 6463 and BS 4550. Consequently this revision of BS 890 specifies requirements based on test methods described in BS EN 459-2 and BS EN 196.

Building limes are in most cases not mixed products. Depending on the type, they harden by absorbing carbon dioxide from the air (carbonate hardening) and/or hydraulically. For this reason, and also on account of the different types being marketed (hydrated and calcined products), the classification criteria required for building limes differ from those needed for cements and masonry cements.

On mixing with water, building limes form a paste that improves the workability (flow and penetration) and water retention of mortars. During the life of lime based mortars carbonation occurs which results in the filling of small cracks and voids. This increases compressive, flexural and bond strength and reduces rain penetration. This beneficial process, which enhances durability, is known as autogenous healing.

This revision introduces the following changes.

- a) The term “air limes” is introduced and is defined as those limes mainly consisting of calcium oxide or hydroxide which slowly harden in air by reacting with atmospheric carbon dioxide. In the UK these were formerly termed non-hydraulic limes or semi-hydraulic limes as generally they do not harden under water or have only a limited ability so to do. As in the 1972 edition, hydraulic limes are not included.
- b) The high-calcium lime, high-calcium by-product lime and semi-hydraulic lime defined in the 1972 edition are replaced by three types, CL 90, CL 80 and CL 70, covering a slightly wider range of lime and magnesia ($\text{CaO} + \text{MgO}$) contents. A type of dolomitic lime with higher magnesia content has also been introduced. For further comparative details see Annex C.
- c) All types of lime in this standard may contain up to 0.1 % of admixtures without the amount and type being declared. Where more than 0.1 % is introduced, the amount and type have to be declared (see clause 5).
- d) Higher maximum carbon dioxide contents are permitted in the CL 70 and CL 80 types and also in the DL 80 and DL 85 types (see Annex D).
- e) Higher residues on both the 90 μm and the coarser mesh sieves are permitted (see Annex D).
- f) The Le Chatelier test method for soundness now adopted is similar to that described in clause 6 of BS 6463-4:1987 but differs from that in the 1972 edition of this standard. The higher expansions permitted in this revision take this change into account.
- g) The changes made in the chemical requirements are given in detail in Annex D. The chemical requirements for hydrated limes are expressed in terms of quicklime. The method for classifying hydrated limes is given in Annex F.

- h) The requirements for the workability of lime putty have been removed although the test method is retained in BS 6463 and guidance on the performance of limes using this test method is given in Annex E. A mortar penetration test has been introduced to ensure that consistence is maintained within prescribed limits.
- i) There is now a maximum requirement for the air content of a standard mortar.
- j) The strength requirements associated with the semi-hydraulic type of lime have been removed.
- k) Suppliers are now required, if requested, to make available typical values for the following properties using the methods described in BS EN 459-2:
- reactivity, $T_{\max}$ and t_u (quicklime);
 - water retention;
 - bulk density.
- l) The bag, delivery note, invoice or other accompanying documentation are required to be marked with the number and year of the standard and other means of identification, while the provision in the 1972 edition requiring the manufacturer to provide a certificate at the request of the purchaser indicating that the lime conformed to the requirements of the standard has been removed.
- m) In contrast to the European Prestandard DD ENV 459-1, the UK practice of defining requirements in terms of absolute (go-no-go) values for acceptance purposes is continued. The values adopted are the DD ENV 459-1 characteristic values plus or minus the major defect values. However, the opportunity has been taken to introduce the DD ENV 459-1 system of conformity criteria (manufacturer's autocontrol) for soundness. This will provide valuable operating experience when DD ENV 459-1 becomes BS EN 459-1 (see Annex G).
- n) Guidance on storage is given in Annex H.
- o) Guidance on protective measures to be taken when handling lime is given in Annex J.

Product certification. Users of this British Standard are advised to consider the desirability of third party certification of product conformity with this British Standard based on testing and continuing surveillance which may be coupled with assessment of a supplier's quality system against the appropriate Part of BS EN ISO 9000.

Enquiries as to the availability of third party certification schemes will be forwarded by BSI to the Association of British Certification Bodies. If a third party certification scheme does not already exist, users should consider approaching an appropriate body from the list of Association members.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 14, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard specifies requirements for building limes used as binders, predominantly in mortar for masonry as well as for rendering and plastering, and for limes used for soil stabilization. It gives a general definition of the different types of building limes and their classification. It also specifies requirements for their chemical, mechanical and physical properties, which depend on the type of building lime, and provides guidance on the manufacturer's autocontrol procedures to ensure conformity.

Hydraulic limes are not covered by this standard.

2 References

2.1 Normative references

This British Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on the inside back cover. For dated references, only the edition cited applies: any subsequent amendments to or revisions of the cited publication apply to this British Standard only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

2.2 Informative references

This British Standard refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3 Definitions

For the purposes of this British Standard the definitions given in BS ISO 3534-1 apply, together with the following.

3.1 lime

any physical and chemical form of calcium oxide and/or hydroxide with lesser amounts of magnesium oxide and/or hydroxide

3.2

building limes

binders, the main constituents of which, on chemical analysis, are the oxides and hydroxides of calcium (CaO , $\text{Ca}(\text{OH})_2$), with lesser amounts of the oxides and hydroxides of magnesium (MgO , $\text{Mg}(\text{OH})_2$), silica (SiO_2), alumina (Al_2O_3) and ferric oxide (Fe_2O_3)

3.3

air limes¹⁾

limes mainly consisting of calcium oxide or hydroxide which slowly harden in air by reacting with atmospheric carbon dioxide

NOTE Generally they do not harden under water as they have no hydraulic properties.

3.4

quicklimes

air limes mainly consisting of calcium oxide and magnesium oxide produced by calcination of limestone and/or dolomite rock

NOTE Quicklimes have an exothermic reaction when in contact with water. Quicklimes are offered in varying sizes ranging from lumps to finely ground materials.

3.5

burnt limes

quicklimes mainly consisting of calcium oxide

3.6

dolomitic limes

quicklimes mainly consisting of calcium oxide and magnesium oxide

3.7

slaked limes

air limes mainly consisting of calcium and possibly magnesium hydroxide resulting from the controlled slaking of quicklime

NOTE Slaked limes have no exothermic reaction when in contact with water. Slaked limes are produced in the form of a dry powder or as a slurry.

3.8

hydrated calcium limes

slaked limes mainly consisting of calcium hydroxide

3.9

hydrated dolomitic limes

slaked limes mainly consisting of calcium hydroxide, magnesium hydroxide and magnesium oxide

3.10

semi-hydrated dolomitic limes

hydrated dolomitic limes mainly consisting of calcium hydroxide and magnesium oxide

¹⁾ Translation of a term used in most European countries