BSI

BS 6463 : Part 1 : 1984

UDC [666.924+661.842.622] : 620.113 : 543.05

British Standard

Quicklime, hydrated lime and natural calcium carbonate

Part 1. Methods of sampling

Chaux vive, chaux hydratée et carbonate de calcium naturel
Partie 1. Méthodes d'échantillonnage

Branntkalk, Löschkalk und Naturkalziumkarbonat
Teil 1. Verfahren zur Probenahme

British Standards Institution

BS 6463 : Part 1 : 1984

Contents

Foreword

This British Standard has been prepared under the direction of the Cement, Gypsum, Aggregates and Quarry Products Standards Committee in order to bring together standard methods of test for quicklime, hydrated lime and natural calcium carbonate.

This standard incorporates and revises the test methods contained in BS 890 which will be revised in due course to refer to them. Although the standard deals primarily with methods of test for lime products used in the construction industry, methods used in other fields, e.g. water treatment, food, agriculture and the steel and chemical industries, have been included.

This standard will be published in four Parts, as follows.

Part 1. Methods of sampling
Part 2. Methods of chemical analysis
Part 3. Physical test methods for quicklime
Part 4. Physical test methods for hydrated lime and lime putty.

Part 1 gives directions for the sampling of quicklime, hydrated lime, lime putty and natural calcium carbonate. Emphasis is laid on the necessity for the sample to be the true average of the bulk of the consignment it purports to represent. The statistical aspects of sampling are not dealt with and reference should be made to BS 1017 : Part 2 and BS 6001.

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British Standard

Quicklime, hydrated lime and natural calcium carbonate

Part 1. Methods of sampling

1. Scope

This Part of BS 6463 specifies methods for sampling quicklime, hydrated lime, lime putty and natural calcium carbonate.

NOTE 1. Recommended protective measures in handling quicklime and hydrated lime are given in appendices A and B respectively. When handling lime putty the same precautions should be taken as for hydrated lime.

NOTE 2. The titles of the publications referred to in this standard are listed on the inside back cover.

2. Sampling lump and crushed quicklime and calcium carbonate

2.1 Size of increment. Where possible take samples of the material in a crushed or powdered form. When it is necessary to obtain samples in the lump form determine the size of each increment of sample by the maximum size of lump as shown in table 1.

Table 1. Sampling lump materials

Maximum size (mm)	10	20	50	75	100	125	over 125
Approximate volume of increment (L)	2	3	4	5	10	20	30

Treat crushed quicklime with a maximum particle size of 2 mm as a powder (see clause **3**).

2.2 Sampling lump materials from conveyor belts. Where possible, sample the lump material from a conveyor, at the discharge point. Take increments in accordance with the method given in **2.1**, taking precautions to ensure that the whole of the material discharged from the conveyor enters the sample container.

Where it is not practicable to sample from the discharge point, stop the belt and take a volume in accordance with the method given in **2.1**. Take increments from the full width and thickness of the stream on the conveyor or, where this is not possible, from each side and the centre in turn. The width of the scoop used to take the increment shall be not less than 2.5 times the size of the maximum size of the material passing. Sweep the belt clean and do not attempt to select the material collected.

Take increments at regularly spaced intervals during the passing of the whole of the consignment which is being sampled. Combine the increments to form one bulk sample and treat as described in **2.6**.

2.3 Sampling lump materials from trucks, lorries and piles. Where possible, sample the material as the truck or lorry is filled, or as the pile is formed. Normally this will be from a conveyor so that the sampling procedure will be as described in **2.2**. Similarly if the truck is discharged on to a conveyor, carry out the sampling at the conveyor. If neither of these procedures apply, use the method given in **2.4**.

2.4 Sampling lump materials in a pile. Cut a section, or sections, into the bulk material, taking care that the section ranges from top to bottom of the pile. Then take increments from evenly spaced positions over the face of the section. Cut the section so that its angle with the horizontal is less than the angle of repose of the material.

2.5 Size of bulk sample. Take not less than 12 increments.

2.6 Reduction of bulk sample. Crush the bulk sample, if necessary, to pass a 20 mm screen, then mix and reduce by means of a riffler, or other suitable device to approximately 25 kg.

3. Sampling powdered quicklime, hydrated lime and calcium carbonate

3.1 Sampling powdered materials from conveyors. Where possible, take increments at the discharge point of a conveyor by passing a container of not less than 1 L capacity through the stream of material until the container is filled.

Take not less than 12 increments of approximately 1 L at regularly spaced intervals from the material which is being sampled. Combine the increments to form one bulk sample and treat as described in **3.8**.

3.2 Sampling from a sack filling machine. Take increments from the spout or discharge of a sack filling machine, as described in **3.1** for taking samples from the discharge point of a conveyor, at regularly spaced intervals during the packing of a consignment.

3.3 Trickle samplers. Where a mechanical device such as a trickle sampler is used to collect a continuous sample from the discharge of a conveyor or sack filling machine, use it in such a manner that the sample taken is a true average of the material passing the sampling point. The device shall be in operation for the whole time that the consignment which is being sampled is passing the sampler.

3.4 Sampling from packages. For consignments of 12 or more packages, sample at least 5 % of the packages and in no case less than 12. Where there are less than 12, sample all packages. Space the packages sampled evenly throughout the batch or consignment being sampled.

Combine the samples, thoroughly mix to form one bulk sample and treat as described in **3.8.**

3.5 Sampling from silos, hoppers or bins. Sample materials when silos, hoppers or bins are being filled or emptied following the procedure given in **3.1.**

3.6 Sampling from bulk transport vehicles. Sample the contents of bulk transport containers, either during filling or emptying, by the procedure given in **3.1.**

3.7 Size of bulk sample. Take not less than 12 increments. The mass of the bulk sample representing the consignment shall be not less than 10 kg.

3.8 Reduction of bulk sample. Combine the increments or sub-samples taken in accordance with any of the methods described in **3.1** to **3.6** inclusive and thoroughly mix and reduce to a sample of approximately 5 kg by means of a riffler or other suitable device.

4. Sampling lime putty

4.1 Sampling of lime putty in motion. Where practicable take increments at a discharge point, e.g. during the filling or emptying of a bulk transport vehicle, by filling a container of approximately 1 L capacity in such a manner as to collect a sample representative of the whole stream of material. Make no attempt to select the material collected. Repeat the procedure at predetermined intervals, spaced throughout the passage of the batch concerned past the sampling point, so as to obtain a combined sample of at least 10 L (14 kg) for each 5 tonne unit. When the unit is less than 5 tonnes, take a minimum sample of 10 L.

4.2 Continuous samples. When a continuous or semi-continuous sampling device is used, use it in such a manner that the sample taken is a true average of the material passing the sampling point.

4.3 Sampling from hoppers, bins and tanks. Use an appropriate sampling tube of not less than 40 mm in diameter and of sufficient length to permit taking a sub-sample from the top to the bottom of the mass to be sampled.

Take sub-samples from at least 12 separate places evenly distributed throughout the mass of material so that the total sample is not less than 10 L.

4.4 Reduction of sample. Place the sample in a mechanical mixer and mix thoroughly. Take a sample of not less than 5 L (7 kg).

5. Packing and marking

Immediately after taking the sample, place it in a clean, dry, airtight container and seal.

Attach a label giving the date and time of delivery, the date and time, place, method of sampling and the quantity of the batch, or consignment to the container.

6. Preparation of samples in the laboratory

6.1 Size analysis. If a size analysis is required, prepare the sample by the method specified in BS 812 : Part 1.

6.2 Initial preparation of quicklime. If necessary, crush the bulk sample to pass a 3.35 mm BS 410 test sieve, thoroughly mix the sample and reduce by means of a riffler or other suitable device to approximately 5 kg.

NOTE. Care should be taken to ensure that there is no metallic contamination of the sample.

6.3 Initial preparation of calcium carbonate. If necessary, crush the bulk sample to pass a 3.35 mm BS 410 test sieve, thoroughly mix and reduce by means of a riffler or other suitable device to approximately 5 kg. Place the sample on a shallow metal dish and dry at 110 ± 5 °C to constant mass.

6.4 Preparation of quicklime for reactivity test. Crush the whole of the sample prepared as described in **6.2** so that it passes a 1.7 mm BS 410 test sieve and 25 % to 30 % passes a 75 μm BS 410 test sieve. Quicklime for this test shall be freshly ground.

6.5 Preparation of quicklime for chemical analysis. Thoroughly mix the sample prepared by the procedure given in **6.2** or **6.3** and reduce by means of a riffler, or other suitable device to about 100 g.

Grind the whole of this sample to pass a 150 μm BS 410 test sieve. Place the sample in an airtight container and seal.

For quicklime, the total time occupied in reduction and grinding shall not exceed 1 h.

6.6 Preparation of hydrated lime for chemical analysis. Thoroughly mix the sample and reduce by means of a riffler, or other suitable device to approximately 100 g, place in an airtight container and seal.

6.7 Preparation of lime putty for analysis. Render the sample homogeneous by a suitable mixer and remove approximately 1 kg for physical tests and 100 g for chemical analysis, place in airtight containers and seal.

Appendix A

Protective measures in handling quicklime

A.1 Hazards. The principle constituent of quicklime is calcium oxide.

When quicklime comes into contact with water, a chemical reaction occurs which is known as slaking or hydration. The reaction causes expansion of the quicklime particles and generates a considerable amount of heat. The resultant slaked or hydrated lime (calcium hydroxide, $Ca(OH)_2$) is a caustic alkali in the presence of water. This reaction can take place when quicklime comes into contact with perspiration on the body, or moisture in the eye. The material can, therefore, cause both heat burns and chemical burns, with the greatest danger being to the eyes, where irreparable damage may be caused.

The reaction between quicklime and water can often occur very rapidly and be explosive in character. Occasionally the quicklime will lie dormant in water for a time, apparently unreactive, but suddenly the reaction will start and then proceed very rapidly. The most violent reactions occur if quicklime is added to water without stirring to dissipate the heat generated. The result can be severe splashing of hot milk of lime and danger to any personnel in the area.

Quicklime is supplied in various sizes, from large lumps to fine powders. The larger sizes are usually delivered in bulk tipper road vehicles or containers. The smaller sizes and powders are often delivered in air pressure discharge vehicles into totally enclosed dust- and water-tight handling systems. Occasionally some of the grades may be supplied in bags.

A.2 Measures

A.2.1 *General.* Quicklime should be handled with great care and the following measures should be studied and implemented. Operatives should protect themselves against the possibility of injury through burning. Under no circumstances should workers be allowed to handle quicklime or operate open slaking processes without wearing goggles.

Quicklime dust should be prevented from getting to any parts of the body where perspiration is excessive. Alternatively these parts should be treated with a suitable barrier cream.

A.2.2 *Eyes.* It is essential that goggles be worn to prevent quicklime dust entering the eyes. Quicklime dust in the eyes is extremely painful and can easily cause permanent damage.

A.2.3 *Mouth and nose.* A dust mask consisting of gauze-covered aseptic cotton wool filter pads held in a wire frame with a headband is effective for protecting the mouth and nose.

A.2.4 *Face and neck.* Especially in warmer weather, the shaven parts of the face and neck are liable to be irritated by quicklime dust. These parts should be treated with a barrier cream. Mutton cloth worn round the neck will give additional protection.

A.2.5 *Hands, arms and wrists.* The hands may be protected by gloves and it is suggested that a type with a knitted wristband should be used. In wet conditions, or where the hands may come into contact with lime putty or milk of lime, a waterproof glove should be used. Plastics-coated gloves can be obtained to meet the various conditions. Any exposed parts of the arms, hands and wrists should be treated with a barrier cream.

A.2.6 *Feet.* Quicklime dust should be prevented from reaching the feet to avoid burns or irritation. Gaiters or improvised leggings of paper worn over the boot tops and bottom of the trousers will give suitable protection. In wet conditions oilskins worn over rubber boots will prevent quicklime dust reaching the feet.

A.2.7 *Fire hazard.* Owing to the intense heat generated when quicklime comes into contact with water there is a risk of fire if the reaction takes place in the presence of, or adjacent to, flammable materials. Certain precautions should therefore be taken, e.g. the storage of quicklime on wooden floors should be avoided and care exercised in dealing with any quicklime 'sweepings' to ensure that they are not mixed with combustibles such as wood shavings, sawdust, etc.

A.2.8 *First aid treatment.* Quicklime on the skin should be washed off as soon as possible. If quicklime has been inhaled, the nose and throat should be thoroughly irrigated with water for at least 20 min.

Quicklime in the eye should be removed immediately. Speed is essential. Particles should be removed with a cotton wool bud and irrigation with gently flowing mains water should commence immediately and continue for at least 20 min.

In cases affecting the eye, or in any severe cases, the person should receive medical attention.

Wherever there is the slightest danger of quicklime entering the eye it is advisable to have suitable irrigation bottles close at hand. The bottles should be of a type which contains sterile water or sterile saline solution in pre-packed containers*. After treatment partly filled bottles should be discarded.

In all cases after first-aid treatment the patient should see a doctor.

Appendix B

Protective measures in handling hydrated lime

B.1 Hazards. The principle constituent of hydrated lime is calcium hydroxide. In the presence of water, hydrated lime is a caustic alkali and can cause a chemical burn on the skin. Thus it requires to be handled with care. Unprotected parts of the body, which are damp or wet through perspiration or from external water, are likely to be worst affected. The eyes, which are permanently moist, are particularly vulnerable.

There is no explosion or fire risk when handling hydrated lime. The material will in fact inhibit the spread of flame.

B.2 Measures

B.2.1 *General.* The following protective measures should be taken to minimize the possibility of discomfort or accident when handling hydrated lime.

Hydrated lime should be prevented from getting to any parts of the body where perspiration is excessive.

*Suitable eye irrigation bottles may be obtained from: Contractorsol, c/o Steripack Ltd., Goddard Road, Astmoor, Runcorn, Cheshire WA7 1QE.

Alternatively these parts should be treated with a suitable barrier cream.

B.2.2 *Eyes.* It is essential that goggles be worn when handling hydrated lime or where in the vicinity of such a handling operation to prevent the material entering the eyes. Hydrated lime in the eyes is very painful and may cause permanent eye damage in extreme cases.

B.2.3 *Mouth and nose.* A dust mask consisting of gauze-covered aseptic cotton wool filter pads held in a wire frame with a headband is effective for protecting mouth and nose.

B.2.4 *Face and neck.* Especially in warmer weather, the shaven parts of the face and neck are liable to be irritated by hydrated lime. These parts should be treated with a barrier cream. Mutton cloth worn round the neck will give additional protection.

B.2.5 *Hands, arms and wrists.* The hands may be protected by gloves and it is suggested that a type with a knitted wristband should be used. In wet conditions, or where the hands may come into contact with lime putty or milk of lime, a waterproof glove should be used. Plastics-coated gloves can be obtained to meet the various conditions. Any exposed parts of the arms, hands and wrists should be treated with a barrier cream.

B.2.6 *Feet.* Hydrated lime should be prevented from reaching the feet to avoid burns or irritation. Gaiters or improvised leggings of paper worn over the boot tops and bottom of the trousers will give suitable protection. In wet conditions oilskins worn over rubber boots will prevent hydrated lime reaching the feet.

B.2.7 *First-aid treatment.* Hydrated lime on the skin should be washed off as soon as possible.

Hydrated lime in the eye should be removed immediately. Speed is essential. Particles should be removed with a cotton wool bud and irrigation with gently flowing mains water should commence immediately and continue for at least 20 min.

In cases affecting the eye, or in any severe cases, the person should receive medical attention.

Wherever there is the slightest danger of hydrated lime entering the eye it is advisable to have suitable irrigation bottles close at hand. The bottles should be of a type which contains sterile water or sterile saline solution in pre-packed containers*. After treatment partly filled bottles should be discarded.

*Suitable eye irrigation bottles may be obtained from: Contractorsol, c/o Steripack Ltd., Goddard Road, Astmoor, Runcorn, Cheshire WA7 1QE.

Publications referred to

BS 410	Specification for test sieves
BS 812	Methods for sampling and testing of mineral aggregates, sands and fillers Part 1 Sampling, size, shape and classification
BS 890*	Building limes
BS 1017*	Methods for sampling of coal and coke Part 2 Sampling of coke
BS 6001*	Sampling procedures and tables for inspection by attributes

*Referred to in the foreword only.

BS 6463 : Part 1 : 1984

This British Standard, having been prepared under the direction of the Cement Gypsum Aggregates and Quarry Products Standards Committee, was published under the authority of the Board of BSI and comes into effect on 29 February 1984.

ISBN 0 580 13709 0

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The following BSI references relate to the work on this standard:
Committee reference CAB/5 Draft for comment 80/14357 DC

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Cement Gypsum Aggregates and Quarry Products Standards Committee (CAB/-) to Technical Committee CAB/5 upon which the following bodies were represented:

British Aggregate Construction Materials Industries
Cement Makers' Federation
County Surveyors' Society
Department of the Environment (Building Research Establishment)
Department of the Environment (Property Services Agency)
Dry Lining and Partition Association Limited
Gypsum Products Development Association
Institution of Structural Engineers
National Federation of Building Trades Employers
National Federation of Plastering Contractors
Plasterers' Craft Guild
Royal Institute of British Architects
Scottish Master Plasterers' Association
Society of Chemical Industry

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

Chemical Industries Association Limited
Mortar Producers' Association Limited
Water Authorities

Amendments issued since publication

Amd. No.	Date of issue	Text affected