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Indian Standard

SPECIFICATION FOR QUICK LIME AND HYDRATED LIME FOR CHEMICAL INDUSTRIES

PART I QUICK LIME

(Second Revision)

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NEW DELHI 110002

Gr 4 *March* 1981

AMENDMENT NO. 1 NOVEMBER 1988
TO
IS : 1540 (Part 1) - 1980 SPECIFICATION FOR QUICK LIME AND HYDRATED LIME FOR CHEMICAL INDUSTRIES
PART 1 QUICK LIME
(Second Revision)

[(*Page* 5, *Table* 1, *Sl No.*(V)] — Substitute the following for the existing requirement:

(1)	(2)	(3)	(4)	(5)	(6)	(7)
v)	Sulphide (as S), percent by mass, *Max*	—	0.6	—	A-3	—

(CDC 56)

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Indian Standard

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PART I QUICK LIME

(Second Revision)

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Indian Standard

SPECIFICATION FOR QUICK LIME AND HYDRATED LIME FOR CHEMICAL INDUSTRIES

PART I QUICK LIME

(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Second Revision) was adopted by the Indian Standards Institution on 10 December 1980, after the draft finalized by the Acids, Alkalis and Halides Sectional Committee had been approved by the Chemical Division Council.

0.2 This standard was first published in 1959 and subsequently revised in 1967. The present second revision has rationalized different grades of quick lime prescribing only three grades instead of five in the previous version. Also spectrophotometric methods have been prescribed in the present revision for determination of phosphorus and manganese.

0.3 Lime is an important basic raw material for the chemical industry. It is obtained from limestone the requirements of which have been covered in IS: 3204-1965*, The grades of lime specified in this standard are related to the requirements of limestone specified in IS : 3204-1965*. It is obviously not practical to consider here all the possible chemical uses of lime. Only important applications of lime have, therefore, been dealt with which include soda ash; caustic soda by lime soda process; calcium carbide; bleaching powder; bleach liquor for use in paper; textiles manufacture; sugar; varnish manufacture; water treatment; and tanning industries.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960† The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Specification for limestone for chemical industries.
†Rules for rounding off numerical values (r*evisid*).

1. SCOPE

1.1 This standard (Part I) prescribes the requirements and the methods of sampling and test for quick lime for chemical industries.

1.2 This standard does not cover lime for the building, agricultural, metallurgical, glass and ceramic industries.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Lime — A general term which includes the various chemical and physical forms of quick lime and hydrated lime used for any purpose.

2.2 Quick Lime — A calcined material the major part of which is CaO or CaO in natural association with a lesser amount of MgO, capable of slaking with water.

2.3 Hydrated Lime — A dry powder obtained by treating quick lime with water enough to satisfy its chemical affinity for water under the conditions of hydration.

2.4 Available Lime — Those constituents of lime which enter into a desired reaction under the conditions of a specified method.

2.5 Dead Burnt or Overburnt Lime — Lime which is not made available in any chemical reaction is known as dead burnt lime.

3. GRADES

3.1 The limes shall be of the following three grades depending upon their suitability for various uses on the basis of their chemical properties:

Grade A — Bleaching powder, paper, textiles and varnish manufacture.

Grade B — Sugar and calcium carbide industry.

Grade C — Suitable for soda ash, caustic soda by limesoda process, water treatment and tanning industry.

4. REQUIREMENTS

4.1 Description — The material shall be in the form of lumps or fine white powder free from dirt and other foreign matter.

4.2 The material shall also comply with the requirements specified in Table 1 when tested acccording to the methods prescribed in IS : 1514-1959* and Appendix A of this standard. Reference to relevant test methods is given in col 6 and 7 of the table.

*Methods of sampling and test for quick lime and hydrated lime.

TABLE 1 REQUIREMENTS FOR QUICK LIME FOR CHEMICAL INDUSTRIES

(*Clause* 4.2)

SL No.	CHARACTERISTIC	REQUIREMENT (ON NON-VOLATILE BASIS)			METHOD OF TEST, REF TO CL NO.	
		Grade A	Grade B	Grade C	Appendix A	IS : 1514-1959*
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Available lime, CaO, percent by mass, *Min*	92	90	85	—	8
ii)	Acid insoluble matter (as SiO_2), percent by mass, *Max*	1.0	1.5	2.0		9
iii)	Carbon dioxide (CO_2), percent by mass, *Max* (sample taken at the place of manufacture)	2.0	2.5	3.0	A-2	—
iv)	Iron (as Fe_2O_3), percent by mass, *Max*	0.4	0.4	0.4	—	10
v)	Sulphur (as S), percent by mass, *Max*	—	0.2	—	A-3	—
vi)	Phosphorus (as P), percent by mass, *Max*		0.01		A-4	
vii)	Manganese (as Mn_2O_3), percent by mass, *Max*	0.03	0.03	—	A-5	—
viii)	Alumina (as Al_2O_3), percent by mass, *Max*	1.0	1.0	1.7	—	10
ix)	Magnesium (as MgO), percent by mass, *Max*	1.5	2.0	2.0	—	12
x)	Dead burnt lime (as CaO), percent by mass, *Max*	—	2.0	3.0	—	14

*Methods of sampling and test for quick lime and hydrated lime.

5. PACKING AND MARKING

5.1 Packing — Unless agreed to otherwise between the purchaser and the supplier, bulk supplies shall be made in closed wagons and smaller supplies shall be packed in air-tight or moisture proof containers.

5.2 Marking — The container or the attached label shall be legibly and indelibly marked with the following:

a) Name of the material and its grade;

b) Name of the manufacturer and his recognized trade-mark, if any;

c) Net mass;

d) Batch number; and

e) Form of the material in the container.

5.2.1 The container or the attached label may also be marked with the Standard Mark

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously, checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

6. SAMPLING

6.1 The procedure for drawing representative samples of the material and the criteria for finding out the conformity of the material to the requirements of this specification shall be as prescribed in 3 of IS : 1514-1959*.

APPENDIX A

(*Clause* 4.2, and *Table* 1)

METHODS OF TEST FOR QUICK LIME

A-1. QUALITY OF REAGENTS

A-1.1 Unless specified otherwise, pure chemicals and distilled water (*see* IS : 1070-1977†) shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

A-2. DETERMINATION OF CARBON DIOXIDE

A-2.1 Outline of the Method — A known mass of the sample is made to react with an acid and the liberated carbone dioxide freed from

*Methods of sampling and test for quick lime and hydrated lime.

†Specification for water for general laboratory use (*second revision*).

impurities is absorbed in previously weighed soda asbestos bulbs and weighed. From the difference in mass the percentage of carbon dioxide is calculated.

A-2.2 Apparatus — The assembly of apparatus is shown in Fig. 1. In order to obtain better pressure for drawing gases through the train, all joints should be mercury sealed.

A-2.3 Reagents

A-2.3.1 *Dilute Hydrochloric Acid* — 1 : 1 (*v/v*).

A-2.3.2 *Concentrated Sulphuric Acid — See* IS : 266-1977*.

A-2.3.3 *Ascarite or Soda Asbestos*

A-2.3.4 *Magnesium Perchlorate* — solid.

A-2.3.5 *Pumice Impregnated with Copper Sulphate* — anhydrous. Crush pumice to approximately 5 mm size, sift free from dust and transfer 60 g to a casserole. Cover with a concentrated solution of 30 to 35 g of copper sulphate, evaporate to dryness while constantly stirring and then heat for 3 to 4 hours at 150° to 160°C in an air-bath. Cool in a desiccator and preserve in a glass-stoppered bottle.

A-2.4 Procedure—Transfer about 1 g of the accurately weighed sample to the flask *A* and cover it with water. Insert the stopper carrying the separatory funnel *B* and a condenser *C*. Connect the latter with *D, E* and *F*. Pass air that is free from carbon dioxide through the system until it is judged that all carbon dioxide has been removed. Close the stop-cock in the separatory funnel and insert the weighed absorption bulbs *G* and *H* in the train; the latter acts as a guard tube. Half fill the separatory funnel with dilute hydrochloric acid, replace the stopper carrying the air and see that there is free passage for gases through the train. Start the flow of water in the condenser, open the stop-cock in the separatory funnel and run acid into the flask slowly if there is much carbon dioxide, and rapidly if there is but little. When effervescence diminishes in the former case, and at once in the latter, heat the flask slowly so as to secure steady but quiet ebullition. When it is judged that carbon dioxide has been boiled out of the solution, remove the flame, increase the current of air and sweep out all carbon dioxide. Disconnect the weighed bulbs. Close the inlet and outlet tubes and place them in the balance case. When cool, open the stopper momentarily and weigh.

*Specification for sulphuric acid (*second revision*).

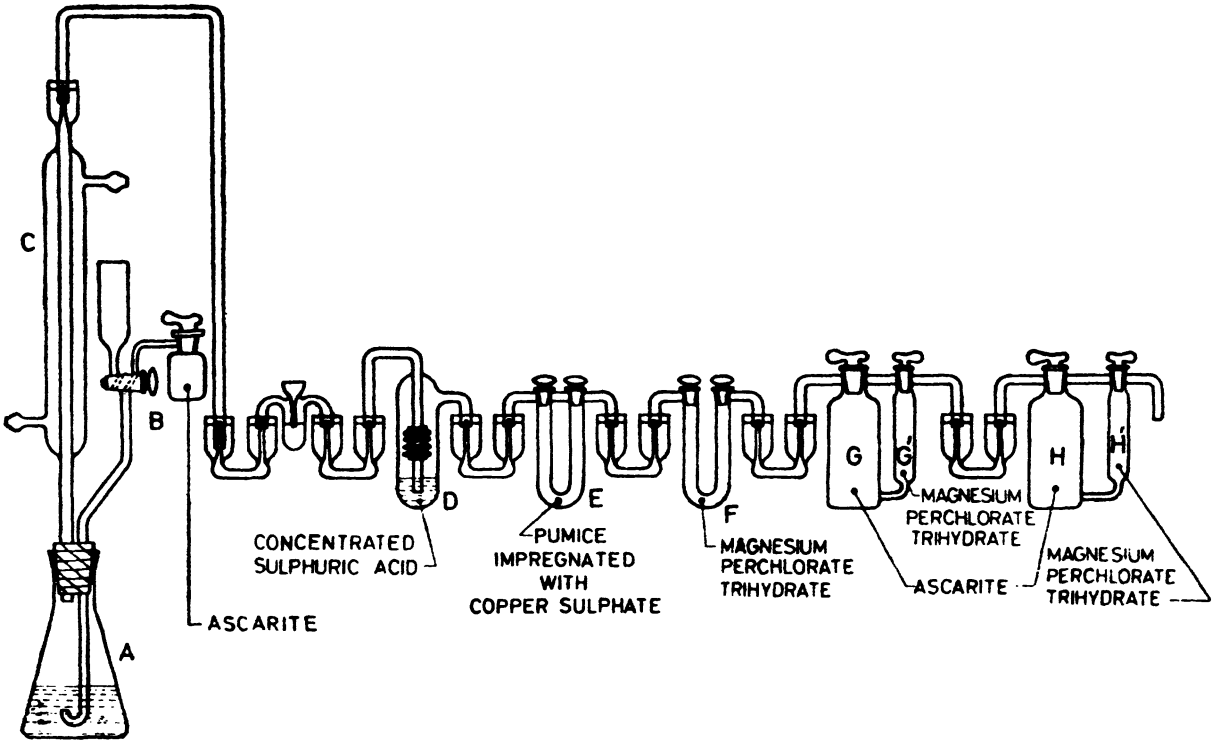

FIG. 1 ABSORPTION TRAIN FOR CARBON DIOXIDE

A-2.5 Calculation

$$\text{Carbon dioxide, percent by mass} = \frac{M_2 - M_1}{M_3} \times 100$$

where

M_2 = mass in g of the bulbs after the test,

M_1 = mass in g of the bulbs before the test, and

M_3 = mass in g of the sample taken for the test.

A-3. DETERMINATION OF SULPHUR

A-3.0 Principle — Sulphur is oxidized with bromine water and then precipitated as barium sulphate by the addition of barium chloride solution.

A-3.1 Reagents

A-3.1.1 *Sodium Carbonate — see* IS : 296-1974*.

A-3.1.2 *Bromine Water* — saturated solution.

A-3.1.3 *Dilute Hydrochloric Acid* — 1 : 1 (*v\v*).

A-3.1.4 *Methyl Red Indicator Solution* — Dissolve 0.15 g of methyl red in 500 ml of water.

A-3.1.5 *Dilute Ammonium Hydroxide Solution*— 1 : 1 (*v/v*).

A-3.1.6 *Barium Chloride Solution* — 10 percent (*m/v*).

A-3.2 Procedure — Weigh accurately about 1 g of the finely-powdered material in a platinum crucible and mix it with 5 g of sodium carbonate. Place the crucible in a furnace and gradually raise the temperature of the furnace to 800°C. Keep the crucible for half an hour at this temperature and finally raise to 1 000°C for fusion. Cool and place the crucible in a 250-ml beaker and cover with hot water. Add 10 ml of bromine water and 30 ml of dilute hydrochloric acid and boil till the solution is complete and all of bromine has been expelled. Remove the crucible, washing it with water. Add a few drops of methyl red indicator and make it alkaline with dilute ammonium hydroxide solution.

*Specification for sodium carbonate, anhydrous (*revised*).

Boil and filter, washing with hot water. To the filtrate add 5 ml of dilute hydrochloric acid, then dilute to about 200 ml and boil. To the boiling solution, add slowly with constant stirring 10 ml of hot barium chloride solution. Allow the precipitate to stand overnight. Filter through a filter paper or Gooch crucible and ignite at 800°C to constant mass.

A-3.2.1 Carry out a blank determination simultaneously using the same quantities of all the reagents.

A-3.3 Calculation

$$\text{Sulphur (as S), percent by mass} = \frac{13{\cdot}74 \times (M_1 - M_2)}{M}$$

where

M_1 = mass in g of the barium sulphate precipitate obtained from the material,

M_2 = mass in g of the barium sulphate precipitate obtained in the blank, and

M = mass in g of the material taken for the test.

A-4. DETERMINATION OF PHOSPHORUS

A-4.1 Reagents

A-4.1.1 *Standard Stock Solution* — 100 µg P/ml. Dissolve 0.439 3 g of potassium dihydrogen phosphate (KH_2PO_4) which has been previously dried at 105 ± 2°C for 1 hour, in water and dilute to 1 000 ml of volumetric flask.

A-4.1.2 *Dilute Standard Solution* — 5 *µg* P/ml. Dilute 25 ml of stock solution to 500 ml in a volumetric flask.

A-4.1.3 *Ammonium Molybdate Solution* — Dissolve 20 g of ammonium molybdate [$(NH_4)_6 Mo_7O_{24}, 4H_2O$] in 500 ml of water. Add 285 ml concentrated sulphuric acid cool and dilute to 1 000 ml with water.

A-4.1.4 *Hydrazine Sulphate Solution* — Dissolve 2 g of hydrazine sulphate ($N_2H_4.H_2SO_4$) in water and dilute to 1 000 ml.

A-4.2 Procedure

A-4.2.1 *Preparation of Standard Curve* — Treat aliquots of standard solution containing 0, 5, 50 and 75 µg of phosphorus (P) as in **A-4.2.2.** Prepare standard curve by plotting percent transmission against percent phosphorus (P).

A-4.2.2 *Preparation of Sample Solution* — Place 0.5 g of the material in 75-ml nickel crucible. If the sample contains organic matter, place uncovered crucible in cold furnace, raise temperature gradually to 900°C and hold for 15 minutes. Remove crucible from furnace and let cool. Mix 0.3 g of potassium nitrate with sample and add 1·5 g of sodium hydroxide pellets. Cover the crucible with nickel lid and heat for 5 minutes at dull redness over gas flame (do not fuse in furnace). Remove from flame and swirl melt around aides. Cool and add about 50 ml of water and warm to disintegrate fused cake. Transfer to 75.ml beaker containing 15 ml of 5N perchloric acid. Scrub the crucible and lid with policeman and wash any residue into beaker. Transfer to 100-ml volumetric flask and dilute to volume with water.

A-4.2.3 Transfer a suitable aliquot of the sample solution to 100-ml volumetric flask. Add 5 ml of ammonium molybdate solution and mix. Add 5 ml hydrazine sulphate solution, dilute to 70 ml with water and mix. Place the flask in boiling water for 10 minutes. Remove, cool rapidly and dilute to the mark with water. Read absorbance at 827 nm against reagent blank at 0 on a spectrophotometer. Determine the microgram phosphorus from the standard curve and calculate its percentage in the sample.

A-5. DETERMINATION OF MANGANESE

A-5.1 Reagents

A-5.1.1 *Standard Manganese Solution* — 50 µg Mn_2O_3/ml. Dissolve 0.035 g of manganese metal in 30 ml of 0.5 N dilute sulphuric acid and dilute to 1 000 ml with water.

A-5.1.2 *Acid Mixture* — Add 800 ml concentrated nitric acid and 200 ml of phosphoric acid to water and dilute to 2 litres.

A-5.2 Procedure

A-5.2.1 *Preparation of Standard Curve* — Treat aliquots of standard solution containing 0, 50, 100, 300 and 500 µg of Mn_2O_3 as in **A-5.2.2.** Prepare standard curve by plotting absorbance against microgram Mn_2O_3.

A-5.2.2 Transfer a suitable aliquot of the sample solution (as prepared in **A-4.2.2**) to 150-ml beaker. Add 25 ml of acid mixture and 0.3 g of potassium periodate. Bring the solution to boiling and keep near boiling temperature for 10 minutes after colour develops. Allow to cool, transfer to 50 ml volumetric flask, dilute to the mark and mix.

A-5.2.2.1 Read absorbance at 525 nm against reagent blank at 0. Determine microgram Mn_2O_3 from the standard curve and calculate its percentage in the sample.

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