



Designation: C 51 – 04~~2~~

## Standard Terminology Relating to Lime and Limestone (as used by the Industry)<sup>1</sup>

This standard is issued under the fixed designation C 51; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

### INTRODUCTION

Where appropriate, the various terms defined below should be prefixed with one or other of the adjectives “high-calcium,” “magnesian,” or “dolomitic.” (Examples: dolomitic quicklime; high-calcium hydraulic hydrated lime; magnesian or dolomitic limestone.)

The composition of a limestone should be given in terms of a percentage of the carbonates present. In limestone of interest to the lime industry, it is usually assumed that the material consists almost entirely of carbonates. Where this assumption is not valid, the percentage of noncarbonate material should be determined, and the composition expressed in terms of the carbonate material present.

This terminology is as commonly used by the industry. For specific application of lime or a limestone product, see the appropriate ASTM specification.

**agricultural lime**—either ground quicklime or hydrated lime whose calcium and magnesium content is capable of neutralizing soil acidity.

**agricultural limestone**—ground or pulverized limestone whose calcium and magnesium content is capable of neutralizing soil acidity.

**air-slaked lime**—the product containing various proportions of the oxides, hydroxides, and carbonates of calcium and magnesium which results from the exposure of quicklime to the air in sufficient quantity to show physical signs of hydration (difficult to determine visually in pulverized quicklime).

**alkaline earth solutions (AES)**—an aqueous solution of the oxide or hydroxide of an element of group IIa in the periodic table, such as calcium or magnesium. These solutions may be strongly alkaline. See **pH**.

**available lime index**—those constituents of a lime which enter into a desired reaction under the conditions of a specific method or process.

**building or construction lime**—a lime whose chemical and physical characteristics and method of processing make it suitable for the ordinary or special construction uses of the product.

**by-product lime**—by-product limes include a variety of Calcium and/or Calcium/Magnesium compounds that are usable for specific applications but generally do not meet one or more specifications required of primary lime products. Examples include lime kiln dust and lime hydrator rejects. It is advised that the specific compositions, physical properties, performance characteristics, and anticipated variabilities of such materials be evaluated for the service intended.

**calcareous**—originating from predominately calcium carbonate or one of its derivative forms.

**calcia**—the chemical compound calcium oxide (CaO).

**Cement-Lime Mortar**—Cement-Lime Mortar primarily consists of hydraulic cement, hydrated lime or lime putty, mason’s sand and water.

DISCUSSION—These mortars can be specified by proportions or properties indicated in Specification C 270 (Standard Specification for Mortar for Unit Masonry).

**chemical lime**—a quicklime or hydrated lime whose chemical and physical characteristics and method of processing make it suitable for one or more of the many and varied chemical and industrial uses of the product.

DISCUSSION—The chemical forms of calcium oxide (CaO), calcium hydroxide (Ca(OH)<sub>2</sub>), magnesium oxide (MgO), or magnesium hydroxide (Mg(OH)<sub>2</sub>) alone or in combination may be produced either primarily or as a by-product of materials other than limestone, for example, Ca(OH)<sub>2</sub> formed by acetylene generation from calcium carbide (CaC<sub>2</sub>), water treatment sludges, etc.

<sup>1</sup> This terminology is under the jurisdiction of ASTM Committee C07 on Lime and is the direct responsibility of Subcommittee C07.08 on Editorial and Nomenclature. Current edition approved Feb. June 10, 2004~~2~~. Published ~~March 2001~~; July 2002. Originally published as C 51 – 22. Last previous edition C 51 – 00~~a~~1.

**dead burned dolomite**—dolomitic limestone that has been heated with or without additives to a temperature sufficiently high and for a long enough time to decompose the carbonate structure so as to form calcium oxide and periclase in a matrix that provides resistance to subsequent hydration and recombination with carbon dioxide.

**dolomitic**—indicates the presence of 35 to 46 % magnesium carbonate ( $\text{MgCO}_3$ ) in the limestone from which the material was formed.

*dolomitic limestone*—see **limestone**.

**di-hydrated or double hydrated lime**—dolomitic lime which has been hydrated under greater than atmospheric pressure and contains less than 8 % unhydrated oxides.

**finishing hydrated lime**—hydrated lime suitable for use in the finish coat of plaster.

**finishing quicklime**—quicklime suitable (after slaking to a lime putty) for use in the finish coat of plaster.

**fluxing lime**—a term referring to quicklime used as an agent in the manufacture of steel or glass.

**fluxstone**—a term referring to limestone (high-calcium, magnesian, or dolomitic) used as an agent in the manufacture of iron and steel or glass.

**high-calcium**—indicates the presence of 0 to 5 % magnesium carbonate ( $\text{MgCO}_3$ ) in the limestone from which the material was formed.

*high-calcium limestone*—see **limestone**.

**hydrated lime**—a dry powder obtained by treating quicklime with water enough to satisfy its chemical affinity for water under the conditions of its hydration. It consists essentially of calcium hydroxide or a mixture of calcium hydroxide and magnesium oxide or magnesium hydroxide, or both.

DISCUSSION—The chemical forms of calcium oxide ( $\text{CaO}$ ), calcium hydroxide ( $\text{Ca(OH)}_2$ ), magnesium oxide ( $\text{MgO}$ ), or magnesium hydroxide ( $\text{Mg(OH)}_2$ ) alone or in combination may be produced either primarily or as a by-product of materials other than limestone, for example,  $\text{Ca(OH)}_2$  formed by acetylene generation from calcium carbide ( $\text{CaC}_2$ ), water treatment sludges, etc.

**hydraulic hydrated lime**—the hydrated dry cementitious product obtained by calcining a limestone containing silica and alumina to a temperature short of incipient fusion so as to form sufficient free lime ( $\text{CaO}$ ) to permit hydration, and at the same time, leaving unhydrated sufficient calcium silicates to give a dry powder meeting hydraulic property requirements.

**lime**—a general term which includes the various chemical and physical forms of quicklime, hydrated lime, and hydraulic lime. It may be high-calcium, magnesian, or dolomitic.

DISCUSSION—The chemical forms of calcium oxide ( $\text{CaO}$ ), calcium hydroxide ( $\text{Ca(OH)}_2$ ), magnesium oxide ( $\text{MgO}$ ), or magnesium hydroxide ( $\text{Mg(OH)}_2$ ) alone or in combination may be produced either primarily or as a by-product of materials other than limestone, for example,  $\text{Ca(OH)}_2$  formed by acetylene generation from calcium carbide ( $\text{CaC}_2$ ), water treatment sludges, etc.

**lime mortar**—a lime putty mixed with an aggregate, suitable for masonry purposes.

**lime putty**—the product obtained by slaking quicklime with water according to the directions of the manufacturer or by mixing hydrated lime and water to a desired consistency.

**limestone**—an initially sedimentary rock consisting chiefly of calcium carbonate or of the carbonates of calcium and magnesium. Limestone may be of high calcium, magnesian, or dolomitic.

(1) *dolomitic limestone*—limestone containing from 35 to 46 % magnesium carbonate ( $\text{MgCO}_3$ ).

(2) *magnesian limestone*—a limestone containing from 5 to 35 %  $\text{MgCO}_3$ .

(3) *high-calcium limestone*—a limestone containing from 0 to 5 %  $\text{MgCO}_3$ .

**liming material**—a general term which includes the various chemical and physical forms of lime, limestone, mollusk shells, marl, and slag whose calcium and magnesium compounds are capable of neutralizing acidity.

**magnesia**—the chemical compound magnesium oxide ( $\text{MgO}$ ).

**magnesian**—indicates the presence of 5 to 35 % magnesium carbonate ( $\text{MgCO}_3$ ) in the limestone from which the material was formed.

*magnesian limestone*—see **limestone**.

**masons hydrated lime**—hydrated lime suitable for use for masonry purposes.

**masons quicklime**—quicklime suitable (after slaking to a lime putty) for use for masonry purposes.

**milk of lime**—a suspension of hydrated lime (or slaked quicklime) in water in such proportions as to resemble milk in appearance.

DISCUSSION—The chemical forms of calcium oxide ( $\text{CaO}$ ), calcium hydroxide ( $\text{Ca(OH)}_2$ ), magnesium oxide ( $\text{MgO}$ ), or magnesium hydroxide ( $\text{Mg(OH)}_2$ ) alone or in combination may be produced either primarily or as a by-product of materials other than limestone, for example,  $\text{Ca(OH)}_2$  formed by acetylene generation from calcium carbide ( $\text{CaC}_2$ ), water treatment sludges, etc.

**mono-hydrated lime**—dolomitic lime which has been hydrated at atmospheric pressure and contains more than 8 % unhydrated oxides.

**non-volatile**—term used to denote the calculated chemical basis of a material in which the volatile fraction of that material is removed, relative to a specific temperature. For example, in lime and limestone, the loss on ignition is considered to be the volatile fraction.

**pH**—the negative logarithm of the hydrogen ion concentration, which can be greatly affected by temperature, particularly under

alkaline conditions. It is therefore important to measure alkaline earth solutions (AES) at a specific recommended temperature of  $25 \pm 0.5^\circ\text{C}$ .

**Portland Cement-Lime Mortar (PCL)**—See Cement-Lime Mortar.

**quicklime**—a calcined limestone, the major part of which is calcium oxide or calcium oxide in association with magnesium oxide, capable of slaking with water.

**DISCUSSION**—The chemical forms of calcium oxide ( $\text{CaO}$ ), calcium hydroxide ( $\text{Ca(OH)}_2$ ), magnesium oxide ( $\text{MgO}$ ), or magnesium hydroxide ( $\text{Mg(OH)}_2$ ) alone or in combination may be produced either primarily or as a by-product of materials other than limestone, for example,  $\text{Ca(OH)}_2$  formed by acetylene generation from calcium carbide ( $\text{CaC}_2$ ), water treatment sludges, etc.

**quicklime sizes**—the different sizes depending upon the type of limestone, kind of kiln used, or treatment subsequent to calcining.

The sizes commonly recognized are as follows:

- (1) *large lump*—8 in. (203 mm) and smaller,
- (2) *pebble or crushed*— $2\frac{1}{2}$  in. (64 mm) and smaller,
- (3) *ground, screened or granular*— $\frac{1}{4}$  in. (6.4 mm) and smaller, and
- (4) *pulverized*—substantially all passing a No. 20 (850- $\mu\text{m}$ ) sieve.

**reactivity**—reactivity is the reaction between substances, which can be monitored by some measure, either qualitative or quantitative. In the Lime Industry, it is commonly used to refer to the reaction between limestone, quicklime and/or a related material and another substance such as water, acid or  $\text{SO}_x$ .

**refractory lime**—lime (usually of a dolomitic type) that has been extremely hard burned so that it will possess little or no tendency for conversion of the oxides to hydroxides.

**run-of-kiln quicklime**—quicklime as drawn or discharged from a kiln.

**slaking**—the chemical reaction that produces hydrated lime when quicklime and water are mixed.

**spray lime**—a hydrated lime of such fineness that at least 95 % of the particles will pass a No. 325 (45- $\mu\text{m}$ ) sieve.

**white wash**—a combination of hydrated lime (or slaked quicklime), water, and other materials to be used as a paintlike coating.

*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.*

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