



Designation: C821 – 22

Standard Specification for Lime for Use with Pozzolans¹

This standard is issued under the fixed designation C821; 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 (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This specification covers all types of commercial hydrated lime such as: high-calcium, magnesian, or dolomitic-hydrated lime. By-product limes and slaked quick limes in dry, wet, or slurried form are also included.

1.2 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- C25 Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime
- C50 Practice for Sampling, Sample Preparation, Packaging, and Marking of Lime and Limestone Products
- C51 Terminology Relating to Lime and Limestone (as Used by the Industry)
- C204 Test Methods for Fineness of Hydraulic Cement by Air-Permeability Apparatus

¹ This specification is under the jurisdiction of ASTM Committee C07 on Lime and Limestone and is the direct responsibility of Subcommittee C07.02 on Specifications and Guidelines.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

- C593 Specification for Fly Ash and Other Pozzolans for Use With Lime for Soil Stabilization
- C1271 Test Method for X-ray Spectrometric Analysis of Lime and Limestone
- C1301 Test Method for Major and Trace Elements in Limestone and Lime by Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP) and Atomic Absorption (AA)

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this specification, refer to Terminology C51.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *chemical factor, n*—a numerical value of the active constituents in the hydrated lime that react chemically with a pozzolan. The value is based on the combined calcium oxide equivalents of free calcium oxide, calcium hydroxide, and magnesium oxide. Calcium carbonate and magnesium hydroxide are excluded, since these compounds have been found to be nonreactive.

3.2.2 *pozzolanic receptivity index, n*—a performance factor incorporating both chemical quality and fineness, determined by Eq 3.

4. Chemical and Physical Requirements

4.1 The lime shall conform to the requirements listed in Table 1, except as noted in Section 5.

5. Performance Requirements

5.1 If the chemical factor, Blaine fineness, or pozzolanic receptivity index is below the limits given in Table 1, the lime shall be required to meet the applicable performance requirements listed in Table 2. Where such lime complies with the limits listed in Table 2, it shall be considered acceptable for use with pozzolans. However, it may be necessary to increase the lime content in the lime-pozzolan mixtures in order to meet minimum design criteria.

6. Test Methods

6.1 Chemical Factor:

6.1.1 Determine calcium oxide (CaO) and magnesium oxide (MgO) contents in accordance with Methods C25, C1271, or

*A Summary of Changes section appears at the end of this standard

TABLE 1 Chemical and Physical Requirements

Chemical factor, min	50
Blaine fineness, min, cm ² /g	10 000
Pozzolanic receptivity index, min	100

TABLE 2 Performance Requirements

<i>Plastic Compositions:</i>		
Lime-pozzolan strength, min, MPa (psi)	4.1	(600)
<i>Nonplastic Compositions:</i>		
Lime-pozzolan-aggregate strength, min, MPa (psi)	2.8	(400)
Vacuum saturation strength, min, MPa (psi)	2.8	(400)

C1301. Determine the carbon dioxide (CO₂) content in accordance with Method **C25**. When the magnesium oxide content is greater than 5 %, determine the peak height of magnesium oxide and magnesium hydroxide using standard X-ray diffraction procedures and calculate the ratio (*r*) of magnesium oxide to hydroxide using **Eq 1**. When the magnesium oxide is less than 5 %, the value of *r* shall be 0.30.

$$r = \frac{\text{cps MgO}}{\text{cps MgO} + 2.0 (\text{cps Mg (OH)}_2)} \quad (1)$$

where:

cps = counts per second of principal peaks corresponding to an interplanar spacing for MgO of 2.106 Å and for Mg(OH)₂ of 2.365 Å.

6.1.2 Calculation of Chemical Factor—Using the test results provided by **6.1.1** the chemical factor (C.F.) is determined by **Eq 2**:

$$\text{C.F.} = (\text{CaO}) - 1.27 (\text{CO}_2) + 1.4 r (\text{MgO}) \quad (2)$$

6.2 Blaine Fineness—Calculate in accordance with Method **C204**, except use the specific gravity of the lime in calculating the trial weight of the sample, and the weight finally chosen must result in a firm bed as described in Test Method **C204**. Use the specific gravity of the lime and finally chosen weight to determine the porosity of the bed in accordance with Eq 2 of Test Method **C204**, and use this porosity (as well as specific gravity) in calculating the surface area.

6.3 Pozzolanic Receptivity Index (PRI):

$$\text{PRI} = \frac{\text{chemical factor} \times \text{Blaine fineness}}{10\,000} \quad (3)$$

6.4 Lime-Pozzolan Strength—See Specification **C593**, Section 7. The pozzolan used shall pass the requirements of Specification **C593** when tested with a lime having a pozzolanic receptivity index of 80 or higher.

6.5 Lime-Pozzolan-Aggregate Strength, Freeze-Thaw Resistance—See Specification **C593**, Section 8. The pozzolan used shall pass the requirements of Specification **C593** when tested with a lime having a pozzolanic receptivity index of 80 or higher.

7. Sampling, Inspection, Packing, and Marking

7.1 The sampling, inspection, rejection, retesting, packing, and marking shall be conducted in accordance with Methods **C50**.

8. Keywords

8.1 hydrated; lime; pozzolans

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<https://standards.iteh.ai/catalog/standards/sis/874051d4d-0d54-4049-b21d-8f913222170a/astm-c821-22>

SUMMARY OF CHANGES

Committee C07 has identified the location of selected changes to this standard since the last issue (C219 – 14) that may impact the use of this standard. (Approved Dec. 1, 2022.)

(1) Updated **1.2** and **Table 2**.

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