Designation: C 1529 – 02a

Standard Specification for Quicklime, Hydrated Lime, and Limestone for Environmental Uses[1]

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1. Scope

1.1 This specification covers lime and limestone products suitable for environmental uses as shown in Table 1.

1.2 The buyer shall designate the use, as listed in Table 1, and may specify one or more of the type designations listed below Table 1.

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 and health practices and determine the applicability of regulatory requirements prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

C 25 Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime[2]

C 50 Practice for Sampling, Sample Preparation, Packaging, and Marking of Lime and Limestone Products[2]

C 51 Terminology Relating to Lime and Limestone (as Used by the Industry)[2]

C 110 Test Methods for Physical Testing of Quicklime, Hydrated Lime, and Limestone[2]

C 400 Test Methods for Quicklime and Hydrated Lime for Neutralization of Waste Acid[2]

D 6249 Guide for Alkaline Stabilization of Wastewater Treatment Plant Residuals[3]

3. Chemical Composition and Physical Properties

3.1 The requirements for quicklime, hydrated lime, and limestone for the designated end uses are as shown in Table 1, and are on the basis of the weight of sample taken at the place of manufacture.

4. General Requirements

4.1 Quicklime shall be reasonably free of unslakable residues and shall be capable of disintegrating in water to form a suspension of finely divided material. The amount of residue shall not exceed that agreed upon between the manufacturer and the purchaser (the residue is the amount of material retained on a specified screen). The method for measuring quicklime residue appears in Test Methods C 110.

4.2 The slaking rate for the specified quicklime should be matched to the requirements of the slaking equipment. The method for measuring the slaking rate of quicklime appears in Test Methods C 110.

5. Sampling and Inspection

5.1 Conduct the sampling, inspection, rejection, retesting, packaging, and marking in accordance with Practice C 50.

6. Test Methods

6.1 The chemical analyses shall be made in accordance with Test Methods C 25.

6.2 The physical tests shall be made in accordance with Test Methods C 110.

6.3 The basicity-factor tests shall be made in accordance with Test Methods C 400.

7. Keywords

7.1 biosolids; calcium oxide; dolomitic lime; dolomitic limestone; drinking water; high calcium lime; high calcium limestone; hydrated lime; environmental; industrial waste; lime; lime by-product; limestone; magnesian lime; magnesian limestone; neutralization; quicklime; residuals; sewage sludge; stabilization; treatment; waste; wastewater; water; water softening

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[1] This specification is under the jurisdiction of ASTM Committee C07 on Lime and is the direct responsibility of Subcommittee C07.04 on Environmental Uses.

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[2] *Annual Book of ASTM Standards*, Vol 04.01.

[3] *Annual Book of ASTM Standards*, Vol 11.04.

TABLE 1 Lime and Limestone for Environmental Uses

Use	Notes Referenced	Approved Types of Lime	Chemical Requirements, %				Physical Requirements, % less than	
			CaO +MgO, min	CO_2, max	Available CaO, min	Basicity Factor, min	Dry Sieve, ⅜ in.	Wet Sieve, 100 mesh
Drinking water softening	[A]	CQ	. . .	. . .	90	. . .	. . .	. . .
		CH	. . .	. . .	68	. . .	. . .	. . .
Waste and wastewater neutralization	[B]	CH	95.0[C]	5.0	. . .	0.72	. . .	. . .
		DH	95.0[C]	5.0	. . .	0.81	. . .	. . .
		MH	95.0[C]	5.0	. . .	0.74	. . .	. . .
		BH	90.0[C]	. . .	. . .	. . .	. . .	. . .
		CQ	90.0	. . .	. . .	0.93	. . .	. . .
		DQ	90.0	. . .	. . .	1.06	. . .	. . .
		MQ	90.0	. . .	. . .	0.93	. . .	. . .
		CL[D]	90.0[C]	. . .	. . .	0.45	. . .	. . .
		DL[D]	90.0[C]	. . .	. . .	0.56	. . .	. . .
		ML[D]	90.0[C]	. . .	. . .	0.48	. . .	. . .
Wastewater treatment plant residuals stabilization[E]	[F,G,H]	CQ, DQ, MQ	90.0	. . .	. . .	. . .	100	. . .
		CH, DH, MH	90.0[C]	. . .	. . .	. . .	. . .	95
		Byproduct alkaline materials	25.0[I,J]	. . .	. . .	. . .	100	. . .

CQ = Quicklime, high-calcium
DQ = Quicklime, dolomitic
MQ = Quicklime, magnesian
CH = Hydrated lime, high-calcium
DH = Hydrated lime, dolomitic
MH = Hydrated lime, magnesian
BH = Hydrated lime, by-product
CL = Limestone, high-calcium
DL = Limestone, dolomitic
ML = Limestone, magnesian

[A] In the softening of drinking water, lime is used alone or with coagulant aids to produce a precipitate that assists in the clarification of water, removal of bacteria, and removal of hardness. Lime and soda ash may be used together for softening water. The lime serves as a chemical reagent in water softening. The only useful constituent of the lime is the calcium oxide content of the quicklime or hydrated lime capable of reacting with the other chemicals in the water or added to it. Inert material, besides reducing the value in proportion to its amount, also makes more sludge to be disposed of for a given amount of chemical action and thus reduces the capacity of the equipment in which it is used. In addition to water softening, lime is also used for color removal and clarification of water.

[B] When determining the quantity of liming material for the neutralization of liquid acidic wastes, use is made of an acid value-basicity factor relationship. Acid value and basicity factor test methods are in Test Methods C 400.

[C] On a nonvolatile basis.

[D] Limestone analyses are typically reported as carbonate (CO_3). The requirement that limestone contains a minimum of 90 % CaO + MgO on a non-volatile basis corresponds to approximately 95 % $CaCO_3$+ $MgCO_3$.

[E] Wastewater treatment plant residuals may be referred to as sewage sludge or biosolids.

[F] Also see “Standard Guide for Alkaline Stabilization of Wastewater Treatment Plant Residuals” (D 6249).

[G] Quicklime, hydrated lime, and alkaline by-product materials will raise the pH of biosolids.

[H] If quicklime or by-product alkaline materials containing calcium or magnesium oxide are used, the reaction with water will generate heat. High calcium quicklime will slake more quickly and achieve a higher total temperature rise than other alkaline materials, which generally facilitates treatment. Although slaking rate and total temperature rise are not part of this specification, they are critical site-specific factors that should be matched to the user’s treatment objective and technology. The methods for measuring the slaking rate of quicklime and total temperature rise appear in Test Methods C 110.

[I] Tested on an as received basis.

[J] The available lime index test in Test Methods C 25, which measures only calcium oxide and hydroxide, can be used.