



Designation: **C602—19 C602 – 20**

# Standard Specification for Agricultural Liming Materials<sup>1</sup>

This standard is issued under the fixed designation C602; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

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

## 1. Scope\*

1.1 This specification covers agricultural liming materials, such as quicklime (burnt lime), hydrated lime, limestone, (calcitic and dolomitic), marl, shells, and by-products including slag, lime kiln dust and other materials.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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:*<sup>2</sup>

[C25 Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime](#)

[C50/C50M Practice for Sampling, Sample Preparation, Packaging, and Marking of Lime and Limestone Products](#)

[C51 Terminology Relating to Lime and Limestone \(as used by the Industry\)](#)

[C110 Test Methods for Physical Testing of Quicklime, Hydrated Lime, and Limestone](#)

[C125 Terminology Relating to Concrete and Concrete Aggregates](#)

[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 \(AA\)](#)

[D3176 Practice for Ultimate Analysis of Coal and Coke](#)

[E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves](#)

## 3. Terminology

3.1 *Definitions:*

3.1.1 For definition definitions of most terms see terms used in this specification, refer to Terminology [C51](#).

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *agricultural liming material*—material, n—a product whose calcium and magnesium compounds are capable of neutralizing soil acidity.

3.2.2 *air-cooled blast-furnace slag and granulated blast-furnace slag*—slag, n—see Terminology [C125](#).

## 4. Chemical Classifications

4.1 Agricultural liming materials shall be classified in terms of calcium carbonate equivalent (C.C.E.), as shown in [Table 1](#).

NOTE 1—Marl and some by-product liming materials are used for neutralizing soil acidity, but due to their varying composition, their chemical limits are not included. In some economic circumstances limestone, lime kiln dust, slag, and shells of less than 80 % C.C.E. may be used.

<sup>1</sup> 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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<sup>2</sup> 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.

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

TABLE 1 Agricultural Liming Materials

Material	Calcium Carbonate Equivalent (C.C.E.), percent
Quicklime	not less than 140
Hydrated lime	not less than 110
Limestone	not less than 80
Slag	not less than 80
Shells	not less than 80

TABLE 1 Agricultural Liming Materials

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quicklime	not less than 140
hydrated lime	not less than 110
limestone	not less than 80
slag	not less than 80
shells	not less than 80

5. Sieve Analysis Classifications for Agricultural Limestone

5.1 Agricultural limestone shall be classified according to in accordance with the minimum percentages passing the ~~2.36-mm~~ 2.36 mm (No. 8) and ~~250-µm~~ 250 µm (No. 60) sieves conforming to Specification E11, as shown in Table 2.

NOTE 2—These classifications apply where the agricultural limestone is obtained by the normal crushing procedure and the product contains the fines of fracture. In some economic circumstances, coarser products are used. The ~~250-µm~~ 250 µm (No. 60) sieve was selected because research has shown that this sieve gives a more accurate representation of the particle size distribution of most agricultural limestones presently produced than a finer or coarser sieve. The ~~2.36-mm~~ 2.36 mm (No. 8) sieve is used to control the upper limit on the amount of coarse limestone particles that may be in the product.

6. Sieve Analysis Classifications for Agricultural Slag

6.1 Air-Cooled Blast-Furnace Blast-furnace Slag—Air-cooled blast-furnace slag shall be classified the same as agricultural limestone as described in Section 5.

6.2 Granulated Blast-Furnace Blast-furnace Slag—Granulated blast-furnace slag shall be classified the same as agricultural limestone as described in Section 5.

7. Sieve Analysis Classifications for Agricultural Lime Kiln Dust

7.1 Lime kiln dust sieve analysis shall be classified the same as agricultural limestone as described in Section 5.

8. Particle Size Requirements for Hydrated Lime and Quicklime

8.1 Hydrated lime and quicklime for agricultural use shall be classified in accordance with the minimum percentages passing the ~~2.36-mm~~ 2.36 mm (No. 8) and ~~250-µm~~ 250 µm (No. 60) sieves, as follows:

Passing Sieve No.	Hydrated Lime	Min. %	Quicklime
2.36 mm (No. 8)	100		95
250 µm (No. 60)	97		35

9. Regulatory Requirements

9.1 Agricultural liming materials shall be evaluated for the regulatory considerations using the required local, state, and federal test methods in effect at the time of use.

9.2 Agricultural liming materials shall meet all applicable local, state, and federal requirements in effect at the time of use.

TABLE 2 Classification for Agricultural Limestone

Class Designation	Passing No. 8	Passing No. 60
	( <del>2.36-mm</del> ) (2.36 mm) Sieve, min. percent %	( <del>250-µm</del> ) (250 µm) Sieve, min. percent %
S	100	100
F	99	75
T	99	75
Q	95	55
O	95	55
N	90	40
E	80	25
E	80	25

## 10. Sampling

10.1 Sampling shall be conducted using the procedures specified in Practice [C50/C50M](#).

## 11. Chemical Methods

11.1 Reagent grade chemicals or equivalent and water purity shall be used as specified in Test Methods [C25](#).

11.2 The analytical sample for chemical methods relative to this standards specification shall be pulverized to pass a 250  $\mu\text{m}$  (No. 60) sieve.

11.3 The following chemical parameters are to be determined using the methods as specified.

11.3.1 Calcium carbonate equivalent ~~by the method in [C25](#) and accordance with Test Methods [C25](#).~~

11.3.2 ~~Total calcium~~ *Calcium and magnesium oxide* = *Magnesium Oxide*—determination can be made by methods in Test Methods [C25](#), [C1271](#), or [C1301](#).

## SIEVE ANALYSIS OF AGRICULTURAL LIMING MATERIALS

## 12. Preparation of Sample

12.1 Dry the sample to constant weight at  $110 \pm 5$  °C and store in an airtight container. Obtain the sample from a larger sample of the material to be tested using a ~~rifle or a sample splitter~~ rifle, sectorial splitter, or coning and quartering in accordance with Practice ~~[D3176](#)~~ [C50/C50M](#), or by the method of quartering. The sample for sieve analysis shall have a weight of 100 to 150 g.

12.2 Where limestone contains clay, some agglomeration of fine particles may occur. The agglomerates must be broken by rolling the dry sample with a hard rubber roller on a hard rubber mat or by some equally effective means that does not result in crushing the limestone.

## 13. Procedure

13.1 Sieve analysis shall be conducted using the procedures in Test Methods [C110](#). Sieve the sample through ~~2.36-mm (No. 8) and 250- $\mu\text{m}$~~  2.36 mm (No. 8) and 250  $\mu\text{m}$  (No. 60) sieves. Determine the weight of liming material passing each sieve on a scale or balance sensitive to at least 0.1 g. Calculate the amount of liming material passing the sieves to the nearest whole percentage of the total weight of the dry sample.

## 14. Report

14.1 Report the following results for agricultural liming materials:

14.1.1 *Percentage Calcium Carbonate Equivalent*—The percentage calcium carbonate equivalent (C.C.E.) shall be reported on the as-received basis. Calculate as follows:

$$\frac{\text{C.C.E. (as received)}}{\text{C. C. E. (as-recieved)}} = \frac{[1 - (\% \text{ moisture} \div 100)] \times \text{C.C.E. (oven-dry)}}{[1 - (\% \text{ moisture} \div 100)] \times \text{C. C. E. (oven-dry)}} \quad (1)$$

14.1.2 *Percentage Moisture*—Calculate as follows:

$$\frac{\text{Moisture, \%}}{\text{Moisture, \%}} = \frac{\text{Weight of sample (as received)} - \text{oven-dry weight}}{\text{Weight of sample (as received)}} \times 100 \quad (2)$$

$$\frac{\text{Moisture, \%}}{\text{Moisture, \%}} = \frac{\text{Weight of sample (as-received)} - \text{oven-dry weight}}{\text{Weight of sample (as-received)}} \times 100 \quad (2)$$

14.1.3 *Percentage Calcium Oxide and Magnesium Oxide*—The percentages of calcium oxide and magnesium oxide on the basis of the as-received sample.

14.1.4 *Sieve Analysis*—The amount of dried sample passing the ~~2.36-mm~~ 2.36 mm (No. 8) and ~~250- $\mu\text{m}$~~  250  $\mu\text{m}$  (No. 60) sieves as a percentage of the total weight of the dried sample with the figures rounded to the nearest whole percentage point.

## 15. Keywords

15.1 aglime; agricultural liming materials; agricultural limestone; calcium carbonate equivalent; hydrated lime; lime by-products; lime kiln dust; limestone; LKD; quicklime; slag