



# Standard Practice for Evaluation of Limestone or Lime Uniformity From a Single Source<sup>1</sup>

This standard is issued under the fixed designation C 1164; 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.

## 1. Scope

1.1 This practice is intended for use in instances where the purchaser desires information on the uniformity of limestone or lime produced at a single source. It is intended that this test method normally be used for the predominant material manufactured at a plant. Guidelines for sampling, testing and presentation of results (Table 1) are given.

1.2 *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 limitations prior to use.*

## 2. Referenced Documents

### 2.1 ASTM Standards:

- C 25 Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime<sup>2</sup>
- C 50 Methods of Sampling, Inspection, Packing, and Marking of Lime and Limestone Products<sup>2</sup>
- C 51 Terminology Relating to Lime and Limestone (As Used by the Industry)<sup>2</sup>
- C 110 Test Methods for Physical Testing of Quicklime, Hydrated Lime, and Limestone<sup>2</sup>
- C 141 Specification for Hydraulic Hydrated Lime for Structural Purposes<sup>2</sup>

## 3. Terminology

### 3.1 Definitions:

3.1.1 For definitions of terms relating to this practice refer to Terminology C 51.

## 4. Significance and Use

4.1 This practice is designed to present in a standardized format information on the variability of limestone or lime from a single source over a period of time. It can be applied to all materials covered in Test Methods C 25 and C 110, and Specification C 141.

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee C07 on Lime and is the direct responsibility of Subcommittee C07.11 on Statistics.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 04.01.

TABLE 1 High Calcium Quicklime January 1989

NOTE 1—This data is presented only as a sample of the correct method for presentation. Other tests can be substituted and others omitted.

Day	Test			
	Acid Insoluble	% CaO	% MgO	Available CaO
1	0.66	95.85	2.27	94.90
2	0.84	95.03	2.87	94.08
3	1.24	95.85	1.57	94.90
4	1.22	96.67	1.49	95.71
5	1.22	96.26	1.32	95.31
8	0.68	95.85	2.06	94.69
9	0.96	95.54	2.27	94.89
10	1.26	96.15	1.74	95.20
11	1.04	96.04	2.00	95.11
13	1.26	96.26	1.51	95.31
15	1.34	95.23	2.09	94.28
16	1.28	95.44	2.34	94.69
19	0.68	96.15	1.46	95.20
20	1.42	95.85	1.27	94.90
22	1.06	95.85	1.86	94.90
23	0.58	96.15	2.09	95.31
24	0.84	95.03	2.61	94.08
26	1.28	95.64	1.39	94.69
27	1.48	95.54	1.58	94.39
29	0.98	94.82	2.71	93.67
30	1.24	94.41	3.42	93.67
Avg	1.07	95.70	2.00	94.76
Range	0.90	2.26	2.15	2.04
Std Dev	0.26	0.54	0.56	0.54

## 5. Sampling

5.1 The sampling shall be done in accordance with Methods C 50.

5.2 All sampling shall be performed by personnel qualified by specific training for this purpose.

5.3 Data points shall be an average of three or more separate determinations relative to a specified unit of time. For example: (1) *n* determinations for daily average, (2) daily determinations for weekly average.

5.4 The samples shall be identified by the date or dates that the represented material was obtained.

## 6. Procedure

6.1 The minimum amount of testing (see 5.3) and the type of test(s) to be performed should be agreed upon by the purchaser and producer.

NOTE 1—A single daily analysis does not necessarily characterize a

product. A minimum of three analyses is more reasonable.

6.2 It is desirable that all tests used in a single evaluation be performed in the same laboratory, preferably by the same person, in order for the results to be comparable.

NOTE 2—In order to obtain comparable results when exchanging samples between laboratories, methods used in preparation, handling and storage of those samples must be uniform.

6.2.1 When separate evaluations of a single source are made by two or more laboratories, additional tests of a standard material or exchanged portions of the same sample may be necessary to determine differences in testing that are likely to be obtained in the different laboratories. Three or more batches may be necessary to obtain comparison between laboratories.

6.2.2 Where a within-laboratory testing standard deviation history has not been established, duplicate tests made from a single sample are required to determine the effect of testing variation on the uniformity of results made in a single laboratory.

## 7. Test Method

7.1 The chemical analysis of quicklime, hydrated lime, and limestone shall be determined in accordance with Test Methods C 25.

7.2 The physical analysis of quicklime, hydrated lime, and limestone shall be determined in accordance with Test Methods C 110.

7.3 The analysis of hydraulic hydrated lime shall be determined in accordance with Specification C 141.

## 8. Calculation

8.1 Average  $\bar{X}$ :

$$\bar{X} = \frac{(X_1 + X_2 + \dots + X_n)}{n} \quad (1)$$

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where:

$X_1, X_2, \dots, X_n$  = the individual test results in accordance with Test Methods C 25 or C 110, or Specification C 141, and  
 $n$  = the number of individual samples.

## 8.2 Total Standard Deviation:

$$s = \sqrt{\frac{(X_1 - \bar{X})^2 + (X_2 - \bar{X})^2 + \dots + (X_n - \bar{X})^2}{(n - 1)}} \quad (2)$$

## 9. Report

9.1 Report the following information. Sufficient information shall be provided to identify the sample including:

9.1.1 Name of manufacturer and location,

9.1.2 Type of material or other identification,

9.1.3 All sampling and analytical practices used are to be noted (see Note 3), and

9.1.4 Period of time represented by the report.

9.2 The report shall not cover a period of time greater than one year.

NOTE 3—Laboratory designations are lost or are meaningless when averaging a number of determinations on individual samples. The purchaser needs to know the sampling and analytical practices used in generating a report to properly evaluate the information they receive concerning a specific product.

## 10. Keywords

10.1 hydrated lime; limestone; product uniformity; quicklime; sampling