Designation: C 35 – 01 (Reapproved 2005)

Standard Specification for Inorganic Aggregates for Use in Gypsum Plaster[1]

This standard is issued under the fixed designation C 35; 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.

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

1. Scope

1.1 This specification covers perlite, vermiculite, natural and manufactured sand for use as gypsum plaster aggregates.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered 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 and health practices and determine the applicability of regulatory limitations prior to use.*

1.4 The text of this specification references notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the specification.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

C 11 Terminology Relating to Gypsum and Related Building Materials and Systems

C 29/C 29M Test Method for Bulk Density (Unit Weight) and Voids in Aggregate

C 40 Test Method for Organic Impurities in Fine Aggregates for Concrete

C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates

C 471M Test Methods for Chemical Analysis of Gypsum and Gypsum Products

D 75 Practice for Sampling Aggregates

E 11 Specification for Wire-Cloth and Sieves for Testing Purposes

3. Terminology

3.1 Definitions shall be in accordance with Terminology C 11.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *manufactured sand*, *n*—the fine material resulting from the crushing and classification by screening, or otherwise, of rock, gravel, or blast furnace slag.

3.2.2 *natural sand*, *n*—the fine granular material resulting from the natural disintegration of rock or from the crushing of friable sandstone.

3.2.3 *perlite aggregate*, *n*—a siliceous volcanic glass expanded by heat.

3.2.4 *vermiculite aggregate*, *n*—a micaceous mineral expanded by heat.

4. Chemical Composition

4.1 Water-soluble impurities in sand shall not exceed 0.15 weight % and sodium ion content shall not exceed 0.02 weight % when tested in accordance with Section 7.

4.2 Sand shall develop a color no darker than the standard, when subjected to the colorimetric test for organic impurities in accordance with Test Method C 40, unless it is established by adequate tests that the impurities causing the color are not harmful in plaster.

5. Mechanical Requirements

5.1 *Grading*—Shall be as follows when tested in accordance with Section 7:

5.1.1 Perlite and vermiculite shall be graded within the limits specified in Table 1.

5.1.2 *Natural and Manufactured Sand*—Shall be graded with not more than 50 % retained between any two consecutive sieves shown in Table 1, nor more than 25 % between the No. 50 (300 μm) and No. 100 (150 μm) sieves.

5.2 *Density*:

5.2.1 Perlite shall have a density of not less than 6 nor more than 12 lb/ft^3(96 to 192 kg/m^3) when tested in accordance with Test Method C 29/C 29M using the shoveling procedure.

[1] This specification is under the jurisdiction of ASTM Committee C11 on Gypsum and Related Building Materials and Systems and is the direct responsibility of Subcommittee C11.02 on Specifications and Test Methods for Accessories and Related Products.

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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.

TABLE 1 Grading Requirements

Sieve Size	Percentage Retained on Each Sieve, Cumulative					
	Perlite, by volume		Vermiculite, by volume		Sand, by weight	
	Max	Min	Max	Min	Max	Min
No. 4 (4.75-mm)	0	...	0	...	0	...
No. 8 (2.36-mm)	5	0	10	0	5	0
No. 16 (1.18-mm)	60	5	75	40	30	5
No. 30 (600-µm)	95	45	95	65	65	30
No. 50 (300-µm)	98	75	98	75	95	65
No. 100 (150-µm)	100	85	100	90	100	90
No. 200 (15-µm)					100	95

5.2.2 Vermiculite shall have a density of not less than 6 nor more than 10 lb/ft^3(96 to 160 kg/m^3) when tested in accordance with Test Method C 29/C 29M using the shoveling procedure.

6. Sampling

6.1 *Apparatus*—Suitable thief tube.

6.2 *Bulk Aggregate*—Obtain specimens of sand in accordance with Practice D 75.

6.3 *Bagged Aggregate*—Obtain from 1 bag randomly selected from each 100 bags but not less than 6 bags from the shipment. For smaller shipments, not less than 6 % of the number of bags shall constitute the sample.

6.3.1 Secure specimens by inserting a suitable thief tube the full distance between diagonally opposite corners of the bag with the bag lying in a horizontal position. Combine the portions to produce a composite specimen having a volume not less than 1 ft^3(0.028 m^3). Prepare and test not less than 1 composite specimen separately for each 2000 bags of aggregate.

6.4 Reduce specimens obtained in accordance with 6.2 or 6.3 by quartering or riffling to obtain specimens of proper size for individual tests.

7. Test Methods

7.1 *Apparatus*:

7.1.1 *Sieve*—Specification E 11, Nos. 4, 8, 16, 30, 50, 100, 200 (4.75, 2.36, 1.18 mm, 600 µm, 300 µm, 150 µm, 15 µm).

7.1.2 *Graduated 250 mL Cylinder.*

7.1.3 *250 mL Beaker.*

7.1.4 *Tared Evaporating Dish.*

7.1.5 *Fast Paper Filter.*

7.1.6 *100 mL Volumetric Flask.*

7.1.7 *Deionized Water.*

7.1.8 *Spatula.*

7.1.9 *Weighing Scale.*

7.1.10 *Oven.*

7.1.11 *Desiccator.*

7.1.12 *Mechanical Shaker.*

7.1.13 *500 mL Graduated Cylinder.*

7.2 *Sieve Analysis for Sand*—Use Test Method C 136.

7.3 *Sieve Analysis for Perlite or Vermiculite*—Use Test Method C 136 except as modified as follows:

7.3.1 Use a specimen of 500 mL bulk volume.

7.3.1.1 Measure the volume of each sieve fraction in a 250 mL graduated cylinder. Pour the specimen loosely into the graduate without tamping or shaking. Level the surface with a spatula and read the volume to within ±2 mL.

7.3.2 Express the volumes of the individual sieve fractions as percentages of the sum of the volumes of all fractions.

7.3.3 Calculate the cumulative percentages on each designated sieve by summing the individual percentages of all fractions larger than that sieve.

7.4 *Density of Lightweight Aggregate*— Test Method C 29/C 29M; use shoveling procedure.

7.5 *Water Soluble Impurities of Sand*:

7.5.1 *Significance and Use*—Impurities can affect the setting properties, strength, and bond performance of gypsum plaster. These procedures determine the water soluble impurities of the sand being evaluated.

7.5.2 *Apparatus*:

7.5.2.1 *Analytical Balance*, with a precision of 0.0001 g.

7.5.2.2 *Balance*, capable of weighing at least 10 g to a precision of 0.1 g.

7.5.2.3 *Desiccator*, containing calcium chloride or equivalent desiccant.

7.5.2.4 *Drying Oven*, capable of being controlled to 250°F (121°C).

7.5.2.5 *Filter Paper*—A "fast" filter paper shall be used.[3]

7.5.2.6 *Atomic Absorption or Ion Chromatography Equipment.*

7.5.2.7 *Mechanical Shaker.*

7.5.3 *Procedure (Water Soluble Impurities)*:

7.5.3.1 Weigh approximately 10 g of air-dried sand and record the weight to 0.1 g. Transfer to a 250-mL beaker. Add 100 mL of distilled water. Heat to boiling and allow to simmer on a hot plate for 5 min. Filter through a fast paper into a tared evaporating dish. Wash with hot distilled water until the volume of filtrate is about 125 mL. Evaporate to dryness in an oven without allowing the temperature of the dish to rise above 250°F (121°C). Cool residue in a dessicator, weigh to 0.001 g and calculate the percentage of residue on the initial weight of sand.

7.5.3.2 *Report*—Report percentage as water soluble impurities.

7.5.3.3 *Precision and Bias*—No estimate of the precision or bias, or both, is available at this time.

7.5.4 *Procedure (Sodium Ion Content)*:

7.5.4.1 Weigh approximately 5 g of sand and record the weight to 0.01 g. Transfer to 100-mL volumetric flask. Add approximately 80 mL of deionized water to the flask. Shake on a mechanical shaker for 4 h. Remove and bring to a full volume with deionized water and allow to settle. Analyze for Na ion according to general atomic absorption in accordance with Test Methods C 471M or ion chromatography procedures.[4]

[3] The sole source of supply of the apparatus known to the committee at this time is VWR Scientific. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

[4] The sole source of supply of ion chromatographs known to the committee at this time is Dionex Inc., Sunnyvale, CA. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

NOTE 1—To minimize contamination, care must be exercised to be sure all equipment is clean.

7.5.4.2 *Calculation and Report*—Calculate and report the percent Na as follows:

$$\mu g/g = \frac{\text{Curve concentration} \times \text{any dilution factor} \times 100 \text{ mL final volume}}{\text{initial weight of sample}}$$

$$\frac{\mu g/g}{10\,000} = \%\ \text{metal ion } (Na^{+})$$

7.5.4.3 *Precision and Bias*—No estimate of the precision or bias is available at this time.

7.5.5 *Organic Impurities*—Test Method C 40.

8. Inspection

8.1 Inspection of the material shall be agreed upon between the purchaser and the producer or supplier as part of the purchase agreement.

9. Rejection and Rehearing

9.1 Rejection of material shall be reported to the producer or supplier within ten working days from the receipt of the shipment by the purchaser. Rejection of the material shall be based either on the specific cause of failure to conform to the requirements of this specification or the failure of the material to meet the minimum weight or approximate volume as stated on the shipment.

9.2 Failure to meet the minimum weight or approximate volume shall be determined as follows:

9.2.1 *Individual Packages*:

9.2.1.1 The contents, on a weight basis, are 5 % less than that indicated on the packages, or

9.2.1.2 The contents, on a volume basis, are 10 % less than that indicated on the package.

9.2.2 *The Entire Shipment*:

9.2.2.1 On a weight basis when the average contents of 2 packages for each 100 but not less than 6 packages selected at random, in any one shipment, are less than that indicated on the package. The net weight of the contents shall be determined by weighing the package or packages and deducting the weight of the container.

9.2.2.2 On a volume basis when the average contents of 2 packages for each 100 but not less than 6 packages selected at random, in any one shipment, differ by more than 5 % more or 10 % less from that indicated on the package. The volume of the contents in the package shall be calculated by determining the weight of the contents of the package and then obtaining the weight per unit of volume of the aggregate, from an average weight package of the samples selected in 6.3.1, by the shoveling procedure given in Test Method C 29/C 29M, and then dividing the weight of the contents of the bag by the unit of volume of the aggregate.

10. Certification

10.1 When specified in the purchase order, the producer's or supplier's certification shall be furnished to the purchaser stating that the material was prepared or manufactured in accordance with this specification and has been found to meet the specified requirements.

11. Packaging and Package Marking

11.1 When lightweight aggregates covered by this specification are delivered in packages, the name of the type of aggregate, and minimum weight and approximate volume of the contents shall be plainly indicated thereon.

11.2 When delivered in bulk quantities, the bill of lading shall show the quantity by weight or unit of volume, and the name of the supplier.

11.2.1 Bulk materials shall be delivered in clean transport vessels, free of contaminants.

12. Keywords

12.1 aggregates; gypsum plaster; inorganic; manufactured sand; natural sand; perlite; vermiculite