

American National Standard

procedure for — Bulk Density of Abrasive Grains

Approved July 11, 2002

Secretariat: Unified Abrasives Manufacturers' Association
Sponsor: Grain Division

1 Scope

The method of test is primarily intended for determining the bulk density of abrasive grains.

2 Summary of methods

In this method, the bulk density of abrasive grains is determined by the weight of grain required to fill a cylinder of known volume when the abrasive is allowed to flow through a funnel and fall from a fixed height. Two test units are specified to cover the range of abrasive grain sizes, 6 grit through 8 grit and 10 grit through 240 grit. Test unit A shall be used for grits 10 through 240 and test unit B shall be used for grits 6 through 8.

3 Definition

Bulk density of abrasive grains is defined as the weight in air of a given volume of the permeable material (including both permeable and impermeable voids normal to the material) expressed in grams per cubic centimeter.

4 Apparatus

4.1 Test unit A. The apparatus, as illustrated in figure 1, shall consist of the following:

4.1.1 Funnel stand, consisting of a metal base 12" x 12" (304.8 x 304.8 mm) square with a tripod 12" (304.8 mm) high. The upper part of the tripod shall consist of a horizontal circular platform 8" (203.2 mm) in diameter, forming a support for a funnel which is replaceable and adjustable and fastened in place by screws.

4.1.2 Funnel, of stainless steel having smooth inside seams. The funnel shall have the following dimensions:

- Top diameter (inside):
4-1/2" ± 1/64" (114.3 mm ± .4 mm)
- Bottom diameter (inside):
1/2" ± 1/64" (12.7 mm ± .4mm)
- Height of sloping section:
3-1/4" ± 1/64" (82.6 mm ± .4mm)
- Height of parallel section:
1/2" ± 1/64" (12.7 mm ± .4mm)

The distance from the lowest point of the discharge end to the top of the bottom base shall be 8-1/4" ± 1/32" (209.6 mm ± .8mm).

4.1.3 Shut-off, at the outlet of the funnel shall consist of a 1 3/8" (34.9 mm) rubber ball attached to the funnel by two coil springs of such strength that a firm seal is made.

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4.1.4 Brass Cylinder, of approximately 100 cm³ capacity, calibrated with water as described in section 5. The cylinder shall be made of No. 17-gage brass seamless tubing and shall have the following dimensions:

- Diameter (inside): 1-17/32" (38.9 mm) ¹⁾
- Height (inside): 3-5/16" ± 1/64" (84.1 mm ± .4 mm)
- Base Thickness: 1/2" ± 1/64" (12.7 mm ± .4 mm)

The bottom surface of the base shall be recessed to center the cylinder directly under the funnel discharge by means of a mating pin in the bottom plate. ²⁾

4.2 Test unit B. The apparatus, as illustrated in figure 2, shall consist of the following.

4.2.1 Funnel stand. The exact construction is not important. The only requirements are that the funnel is held in a vertical position and that the bottom of the funnel is 76 mm above the top of the cylinder.

4.2.2 Funnel. The slope of the funnel is such that fine powders will not stick to the sides provided the funnel material is smooth. A preferred material is stainless steel with smooth inside seams.

Top diameter: 160 mm
Bottom diameter: 20 mm (internal) ± 0.5 mm
Height of sloping section: 200 mm (240 mm overall)
Height of parallel section: 40 mm (240 mm overall)

4.2.3 Funnel release valve. Exact construction not critical provided that quick release is achieved.

4.2.4 Measuring cylinder. Internal dimensions:

- Height: 62 mm
- Diameter: 64 mm
- Volume: 200 cm³ approximately

4.2.5 Overspill dish. This is merely for convenience in collecting the excess abrasive grain and thus avoiding spillage.

5 Calibration of cylinder

Prior to use, determine the volume of the cylinder as follows: Weigh the dry empty cylinder with a flat glass plate ("slicker plate"). Fill the cylinder with water and slide the plate into contact with the upper edge of the cylinder, cutting off the water precisely in the plane of the edge. With the

glass plate held firmly in place, wipe off the excess water and obtain the gross weight.

Calculate the volume of the cylinder as follows:

$$V = \frac{w}{0.9971}$$

where:

V = volume of cylinder, in cubic centimeters
w = net weight of water, in grams

6 Procedures

6.1 The sample of abrasive grain to be tested shall have a temperature of not less than 65°F (18.3°C) and not more than 85°F (29.4°C). Place the sample of abrasive grain to be tested in a 150 ml beaker, level full for test with unit A and in a 250 ml beaker, levels full for test with unit B. With the funnel outlet closed and the cylinder centered under the outlet of the funnel, pour the sample from the beaker into the funnel. Trip the opener at the bottom of the funnel and allow the grain to fall freely to fill the cylinder. Immediately after the funnel is emptied, smoothly pass a straight edge once across in contact with the edge of the cylinder to level the surface of the grain. Until this has been done, exercise great care to avoid vibration, shock or any disturbing factor. Weigh the grain in the cylinder.

6.2 Make at least three tests and report the average as the result.

7 Calculation

Calculate the bulk density as follows:

$$D = \frac{W}{V}$$

where

D = bulk density, in grams per cubic centimeter
W = net weight of grain contained in the cylinder, in grams
V = volume of cylinder, in cubic centimeters

8 Repeatability

Duplicate determinations by the same operator and apparatus should not differ by more than ± 0.01 g per cm³.

¹⁾ Brass tube inside diameter shall be within the tolerances normal to high grade commercial tubing.

²⁾ Nonessential dimensions of the apparatus may be adjusted at the convenience of the user.

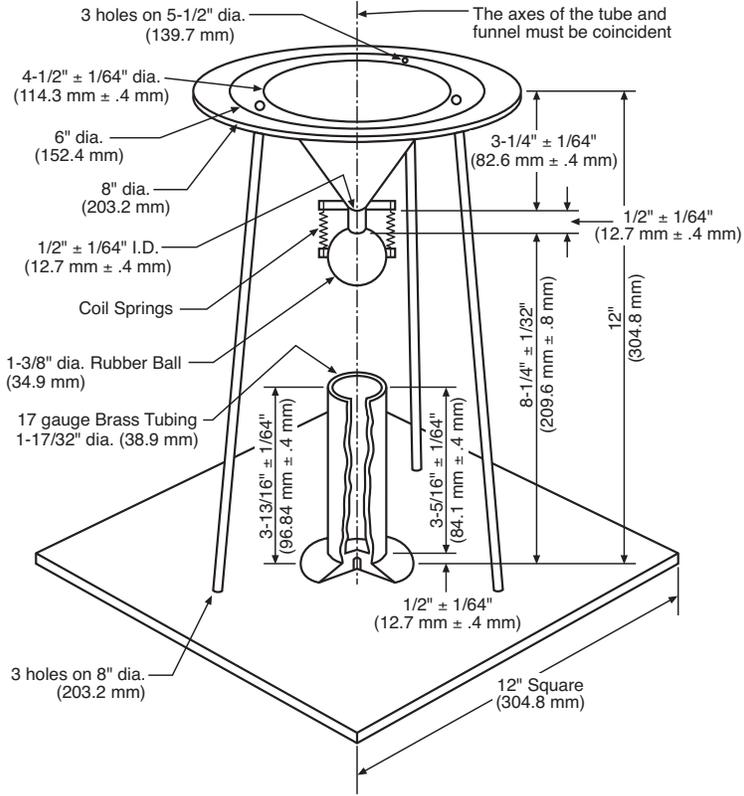


Figure 1 – Test Unit A – Bulk Density Apparatus

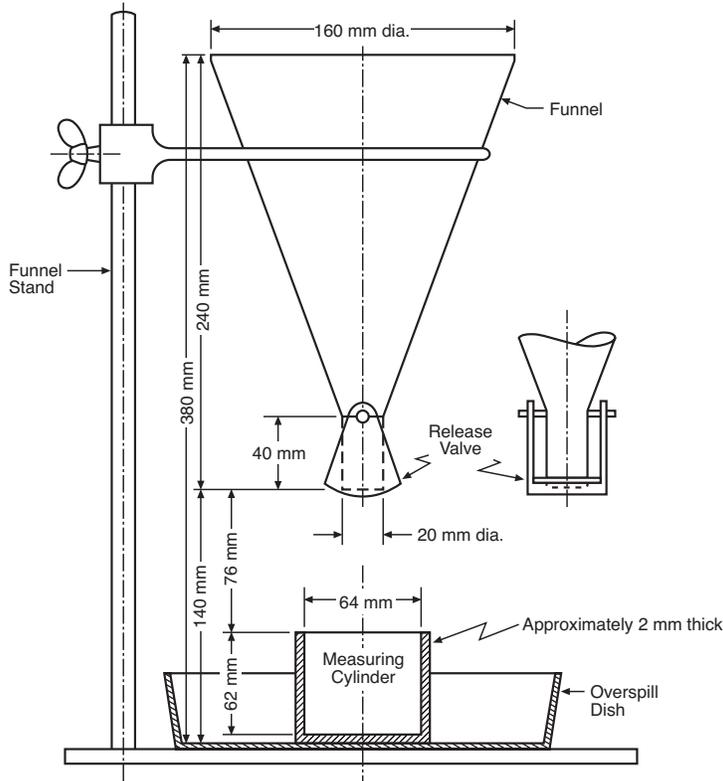


Figure 2 – Test Unit B – Bulk Density Apparatus

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