

(R) SIZE CLASSIFICATION AND CHARACTERISTICS OF GLASS BEADS FOR PEENING

Foreword—This Reaffirmed Document has been changed only to reflect the new SAE Technical Standards Board format.

The glass bead classification number is the approximate nominal diameter of the glass spheres in that classification, in hundredths of a millimeter, with the prefix GB added. Glass beads used for peening shall be made from high quality glass of the soda-line type. They should be as resistant as possible to breakage from shock-impact, or by abrasion during shipment and handling. The particles should be substantially round, free-flowing, and free from chemical impurities or contaminants that might be detrimental to the workpiece.

1. **Scope**—This specification covers the characteristics of glass beads used for peening, and provides for standard glass bead size numbers.

2. **References**

2.1 **Applicable Publications**—The following publication forms a part of this specification to the extent specified herein.

2.1.1 **ASTM PUBLICATIONS**—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM C 169—Chemical Analysis of Soda-Lime Glass (for silicon dioxide)

ASTM D 271

ASTM D 1241—Sieve Analysis of Glass Spheres

ASTM E 11—Wire Cloth Sieves for Testing Purposes

2.1.2 **FEDERAL AND MILITARY PUBLICATIONS**—Available from U.S. Government, DOD SSP, Subscription Service Division, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

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MIL-G-9954

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3. **Selection of Sample**—A representative sample of the shipment shall be selected for evaluation. This can be accomplished by:

- a. Splitting the entire large quantity by repeated passes through the sample reducer (16:1/1:1) splitter as described in ASTM D 271, or
- b. Randomly selecting a number of containers equal to the nearest integer of the cube root of the total number of containers in the entire large quantity. Selected containers can then be reduced, as in (a) above, in order to obtain a representative sample. Other sampling techniques may be used if agreed upon between the supplier and vendor. Representative samples of the whole should result in 50 g test quantities that can be sealed in properly labeled containers for the required tests.

4. **Sieve Analysis for Size Classification**

4.1 This test shall be performed on a 50 g representative sample prior to the performance of roundness or other tests on that sample.

4.2 The sieve analysis shall be performed in accordance with ASTM D 1241, "Sieve Analysis of Glass Spheres."

4.3 The screens shall be in accordance with the U.S. Standards Series sieves described in ASTM Specification E- 11 "Wire Cloth Sieves for Testing Purposes."

4.4 Classification limits shall be as shown in Table 1.

5. **Roundness Test**—Glass beads should be spherical to elliptical in shape. Minimum percentage of "true spheres" (aspect ratio 1.2:1 or less) must conform to Table 1. An actual count shall be made of a field of approximately 100 beads using a microscope with 20X magnification and substage lighting or a mounted sample and projector. Scored, broken, or angular particles by count must conform to Table 1.

6. **Coatings**

6.1 The beads shall not be coated with silicone or any other coating.

6.2 Method of testing for silicone coating shall be as follows: Slowly pour 50 g of the sample beads into a 250 mL beaker containing 200 mL of distilled water. A small number of beads floating on the water is acceptable, but no coagulation (which is an indication of silicone coating) is permitted.

7. **Composition**

7.1 Silica content shall not be less than 67% in order to provide the highest chemical stability.

7.2 The method of analysis for silica shall be in accordance with ASTM C 169, "Chemical Analysis of Soda-Lime Glass (for silicon dioxide)."

8. **Specific Gravity**

8.1 The density of the glass particles may be determined by a specific gravity measurement with a pycnometer as follows:

8.1.1 Dry a quantity of the beads by placing them in an open dish in a furnace at 105 to 110 °F (40.6 to 43.3 °C) until a constant weight is achieved.

8.1.2 Place a 50 g sample of the beads in a 100 mL graduated cylinder containing 50 mL of distilled water.

TABLE 1—GLASS BEADS FOR PEENING—SIZES

DESIGNATION ⁽³⁾⁽⁴⁾	Nominal Sizes		SIEVE SIZE (mm)				(1)	(2)	
	mm	in	MESH	MAX TRACE	MAX 5%	MAX 10%	MAX 5%	MIN %	MAX %
				RETAINS	RETAINS	PASS	PASS	TRUE SPHERES	SHARP PARTICLES
GB 280*	3.350/2.360	0.132/0.094	6/8	4.000	3.350	2.360	2.000	70	0.5
235*	2.800/2.000	0.111/0.079	7/10	3.350	2.800	2.000	1.700	75	0.5
200*	2.360/1.700	0.094/0.066	8/12	2.800	2.360	1.700	1.400	80	0.5
170*	2.000/1.400	0.079/0.056	10/14	2.360	2.000	1.400	1.180	80	0.5
140*	1.700/1.180	0.066/0.047	12/16	2.000	1.700	1.180	1.000	80	0.5
120*	1.400/1.000	0.056/0.039	14/18	1.700	1.400	1.000	0.850	80	0.5
100	1.180/0.850	0.047/0.0331	16/20	1.400	1.180	0.850	0.600	65	3.0
85*	1.000/0.710	0.039/0.0278	18/25	1.180	1.000	0.710	0.425	65	3.0
70	0.850/0.600	0.0331/0.0234	20/30	1.000	0.850	0.600	0.355	65	3.0
60*	0.710/0.500	0.0278/0.0197	25/35	0.850	0.710	0.500	0.300	70	3.0
50	0.600/0.425	0.0234/0.0165	30/40	0.710	0.600	0.425	0.250	70	3.0
40*	0.500/0.355	0.0197/0.0139	35/45	0.600	0.500	0.355	0.212	70	3.0
35	0.425/0.300	0.0165/0.0117	40/50	0.500	0.425	0.300	0.212	70	3.0
30*	0.355/0.250	0.0139/0.0098	45/60	0.425	0.355	0.250	0.180	70	3.0
25	0.300/0.212	0.0117/0.0083	50/70	0.355	0.300	0.212	0.150	80	3.0
20	0.250/0.180	0.0098/0.0070	60/80	0.300	0.250	0.180	0.125	80	3.0
18	0.212/0.150	0.0083/0.0059	70/100	0.250	0.212	0.150	0.106	80	3.0
15	0.180/0.125	0.0070/0.0049	80/120	0.212	0.180	0.125	0.090	80	3.0
12	0.150/0.106	0.0059/0.0041	100/140	0.180	0.150	0.106	0.063	90	3.0
10	0.125/0.090	0.0049/0.0035	120/170	0.150	0.125	0.090	0.053	90	3.0
9	0.106/0.075	0.0041/0.0029	140/200	0.125	0.106	0.075	0.045	90	3.0
8	0.090/0.063	0.0035/0.0025	170/230	0.106	0.090	0.063	0.038	90	3.0
6	0.075/0.053	0.0029/0.0021	200/270	0.090	0.075	0.053	0.038	90	3.0

1. A "true sphere" is defined as a spheroid with an aspect ratio (ratio of maximum to minimum diameter) of 1.2 or less.
2. "Sharp particles" are scored beads, broken beads, or angular glass particles with unfired edges.
3. Designation number is mean bead diameter mm x 100.
4. "*" indicates sizes added to SAE J1173, January 1977 list.

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8.1.3 The total volume less fifty (TV-50) represents the volume of the glass particles.

8.1.4 Specific gravity is calculated as follows:

$$\text{Sp. Gr.} = \frac{\text{Weight of original sample of dried beads (g)}}{\text{Final total volume (mL) - original volume of water (mL)}} \quad (\text{Eq. 1})$$

8.2 Specific gravity shall be not less than 2.3 g/cm³.

9. **Hardness**—Unless otherwise specified, glass beads for peening shall have the following hardness:

480 to 550 KHN (100gf)

458 to 528 DPH (50gf)

(for reference only approximately 48 to 50 HR_C)

10. **Free Iron Content**

10.1 Magnetic particles shall not exceed 0.1% of the original sample, by weight.

10.2 Iron particle content is determined by slowly sprinkling 1500 g of the sample bead material on an inclined aluminum tray that is 1.6 mm (0.62 in) deep x 152 mm (6 in) wide x 305 mm (12 in) long. The tray is supported by a nonmagnetic frame so that it is inclined with a 152 mm (6 in) rise from end to end (30 degrees from horizontal). Four 25 x 25 x 152 mm (1 x 1 x 6 in) barmagnets are positioned against the under surface and crosswise of the inclined tray about the middle of its length. Magnets shall be of not less than 10 000 Gauss magnetic strength each, and shall be arranged so that magnetic north and south poles alternate.

10.3 The magnetic particles (iron) that accumulate on the tray as the beads roll down are carefully brushed into a preweighed dish. The procedure is repeated until all visible magnetic particles are collected.

10.4 The dish is then reweighed and the magnetic particle content is calculated as percent of the total original sample.

11. **Air Inclusions**—Not more than 10% of the beads shall show air inclusions of more than 25% of their projected area, determined microscopically while glass beads are immersed in 1.5 Refractive Index Fluid.

12. **Packaging**

12.1 **Containers**—Containers shall be 50 lb multi-wall bags conforming to MIL-G-9954.

12.2 **Desiccants**—All materials GB 12 and finer shall have eight units of desiccant (conforming to MIL-D-3464) per bag.

12.3 **Marking**—Manufacturing will use control lots of not more than 1000 kg or 2200 lb. Lot numbers must be stamped on each bag, and sieve analysis record must be available on request from the manufacturer for two years after shipment.

13. **Notes**

13.1 **Marginal Indicia**—The change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document titles indicates a complete revision of the report.

PREPARED BY THE SAE FATIGUE, DESIGN, AND EVALUATON COMMITTEE

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Rationale—Not applicable.

Relationship of SAE Standard to ISO Standard—Not applicable.

Application—This specification covers the characteristics of glass beads used for peening, and provides for standard glass bead size numbers.

Reference Section

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