RECOMMENDED

PRACTICE SAE J1173

APPROVED AS ANSI/SAE J1173
BY AMERICAN NATIONAL
STANDARDS INSTITUTE

SIZE CLASSIFICATION AND CHARACTERISTICS OF GLASS BEADS FOR PEENING—SAE J1173

SPONSORED BY:
SOCIETY OF AUTOMOTIVE ENGINEERS, INC.

PUBLISHED BY:
SOCIETY OF AUTOMOTIVE ENGINEERS, INC., 400 Commonwealth Drive, Warrendale, PA 15096

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SAE Recommended Practice

Report of Mechanical Prestressing Division approved January 1977.

Scope—This SAE Recommended Practice pertains to peening with glass beads, and provides for standard glass bead size numbers.[1]

Introduction—The glass bead classification number is the approximate nominal diameter of the glass spheres in that classification, in hundredths of a millimetre, with the prefix *GB* added.

Glass beads used for peening shall be made from high quality glass of the *soda-lime* 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, and, free from inherent chemical impurities or contaminants that might be detrimental to the workpiece.

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 (riffle or splitter) as described in ASTM Method 271 or

(b) Randomly selecting the cube root of the number of containers which can then be reduced 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 which may be sealed in properly labeled containers for the required tests.

Sieve Analysis for Size Classification

1. This test shall be performed on a 50 g representative sample *prior* to the performance of roundness or other tests on that sample.
2. The sieve analysis shall be performed in accordance with ASTM Method D-1241, "Sieve Analysis of Glass Spheres."
3. The screens are in accordance with the U.S. Standard Series sieves described in ASTM Specification E-11, "Wire Cloth Sieves for Testing Purposes."
4. Classification limits shall be as shown in Table 1.

Roundness Test

1. The roundness test shall be performed in accordance with ASTM Method D-1115, "Roundness of Glass Spheres."
2. Acceptable limits of roundness for peening purposes shall be as shown in Table 2.

Coatings

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

Chemical Composition

1. The method of analysis for silica shall be in accordance with ASTM Method C-169, "Chemical Analysis of Soda-Lime Glass, (for silicon dioxide)."
2. Silica content shall not be less than 67% in order to provide the highest chemical stability.

Specific Gravity

1. The density of the glass particles is determined by a specific gravity measurement as follows:

(a) Dry a quantity of the beads by placing them in an open dish in an oven at 105 - 110°C. until a constant weight is achieved.

(b) Place a 60 g sample of the beads in a 100 mL graduated cylinder containing 50 mL of distilled water.

(c) The total volume -50 represents the volume of the glass particles.

(d) Specific gravity is computed as follows:

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

2. Specific gravity shall be not less than 2.3.

Hardness

1. Hardness shall be taken:
   (a) By Moh's Scratch Hardness or
   (b) By Knoop penetrator using 100 g load or
   (c) By diamond pyramid penetrator using 50 g load.
2. Hardness shall be as follows:

#5 to #6 Moh's Scale
525 to 575 KHN
500 to 550 KPH

Free Iron Content

1. Magnetic particles shall not exceed 0.1% of the original sample, by weight.
2. Iron particle content is determined by slowly sprinkling 500 g of the sample bead material on an inclined tray made at 0.62 in (1.6 mm) aluminum 6 in (152 mm) wide by 12 in (305 mm) long. The tray is supported by a non-magnetic frame so that it is inclined with a 9 in (229 mm) rise in 12 in (305 mm) horizontal distance. Four 1 in x 1 in x 6 in (25 x 25 x 152 mm) bar magnets are positioned against the under surface and crosswise of the inclined tray about the middle of its length.
3. The magnetic particles (Iron) that accumulate on the tray as the beads roll down are carefully brushed into a tared dish. The procedure is repeated until all magnetic particles are collected.
4. The tared dish is then reweighed and the magnetic content is calculated as percent of the total original sample.

Air Inclusions—Not more than 10% of the beads shall show air inclusions of more than 25% of their area. Test microscopically while immersed in 1.5 Refractive Index Fluid.

[1] The accompanying Glass Bead Size Classification was formulated by representatives of glass bead suppliers, equipment manufacturers, and automotive users who constituted the Mechanical Prestressing Division of the SAE Fatigue Design and Evaluation Committee.

TABLE 1–GLASS BEAD STANDARD SIZE NUMBERS–FOR PEENING

U.S. Standard Screen No.	Nominal Sieve Aperature size mm	in	SAE STANDARD BEAD SIZE NUMBER GB 100	GB 70	GB 50	GB 35	GB 25	GB 20	GB 18	GB 15	GB 12	GB 10	GB 8	GB 7	GB 6
[a]14	1.40	0.0555	all pass												
16	1.18	0.0469	5% max												
[a]18	1.00	0.0394		all pass											
20	0.850	0.0031	90% min	5% max											
[a]25	0.710	0.0278			all pass										
30	0.600	0.0234	5% max	90% min	5% max										
[a]35	0.500	0.0197				all pass									
40	0.425	0.0165			90% min	5% max									
[a]45	0.355	0.0139		5% max			all pass								
50	0.300	0.0117				90% min	5% max	all pass							
[a]60	0.250	0.0098			5% max			5% max	all pass						
70	0.212	0.0083				5% max	90% min		5% max	all pass					
[a]80	0.180	0.0070						90% min		5% max	all pass				
100	0.150	0.0059					5% max		90% min		5% max	all pass			
[a]120	0.125	0.0049						5% max		90% min		5% max	all pass		
140	0.106	0.0041							5% max		90% min		5% max	all pass	
[a]170	0.090	0.0035								5% max		90% min		5% max	all pass
200	0.075	0.0029											90% min		5% max
[a]230	0.063	0.0025									5% max			90% min	
270	0.053	0.0021										5% max			90% min
[a]325	0.045	0.0017											5% max		
400	0.038	0.0015												5% max	
[a]400															15% max

Showing opening sizes and screen numbers, with maximum and minimum cumulative percentages allowed on corresponding screens. See ASTM E-11 for sieve specifications.

[a]Corresponds to ISO Recommendation R 565