

Peening Media
Glass Shot

RATIONALE

AMS 2431/6C adds limits on heavy metal contamination.

1. SCOPE

This specification, in conjunction with the general requirements covered in AMS 2431 establishes the requirements for glass shot to be used for peening of metal parts.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply. Also, see AMS 2431.

2.1 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D 1214 Test Method for Sieve Analysis of Glass Spheres

2.2 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <http://assist.daps.dla.mil/quicksearch/>.

MIL-D-3464 Desiccants, Activated, Bagged, Packaging Use and Static Dehumidification
MIL-PRF-9954 Glass Beads, for Cleaning and Peening

3. TECHNICAL REQUIREMENTS

3.1 Glass shot shall conform to AMS 2431 and the requirements specified herein.

3.2 Composition

3.2.1 The beads shall be high quality glass of the soda-lime type. Silica content shall not be less than 67% by weight.

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3.2.2 Glass shot shall not contain more than 75 ppm arsenic and 100 ppm lead by weight. See 8.2.

3.3 Hardness

Not less than 90% of the readings shall be 500 to 550 HV or 515 to 575 HK. These values are equivalent to 48 to 52 HRC which is provided for reference only.

3.4 Density shall not be less than 2.3 g/cc.

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

3.6 Inclusions

Not more than 10% of the glass shot shall contain inclusions (including air bubbles) covering more than 20% of their projected area.

3.7 Coatings

Silicone or any other coating material are not permitted.

3.8 Workmanship

3.8.1 Shape

Glass shot shall be spherical to ellipsoid in shape. Minimum percentage of true spheres shall conform to Table 1.

3.9 Size shall conform to the requirements of Table 1.

3.10 Test Methods and Procedures

3.10.1 Size Classification

The sieve analysis shall be determined in accordance with ASTM D 1214. The screens shall be in accordance with U.S. Standard Series described in ASTM E 11.

3.10.2 Silica content shall be determined in accordance with ASTM C 169 or a method acceptable to the purchaser.

3.10.3 Hardness shall be determined by a Knoop penetrator using 100 gram load, or Vickers Diamond Pyramid penetrator using 50 gram load, or a method acceptable to the purchaser.

3.10.4 Contamination

3.10.4.1 Magnetic particle content shall be determined by slowly sprinkling approximately 1500 grams of the sample glass shot on an inclined aluminum tray, 0.062 inch (1.6 mm) deep by 6 inches (152 mm) wide by 12 inches (305 mm) long. The tray shall be supported by a nonmagnetic frame so that it is inclined with a 6 inch (152 mm) rise from end to end, (30 degrees from horizontal). Four 1 x 1 x 6 inches (25 x 25 x 152 mm) bar magnets shall be positioned against the under surface and crosswise of the inclined tray about the middle of its length. Thickness of tray at the magnet locations shall not exceed 0.062 inch (1.6 mm). Magnets shall be not less than 10,000 Gauss each and arranged so that the magnetic north and south poles alternate. The magnetic particles (iron) that accumulate on the tray as the beads roll down shall be brushed into a preweighed dish. The procedure shall be repeated with the same 1500 gram sample until all visible magnetic particles are collected. The dish shall be reweighed and the magnetic particle content calculated as a percentage of the total original sample.

3.10.5 Inclusions shall be determined microscopically, using substage lighting, while glass shot is immersed in a fluid having a refractive index of 1.5.

3.10.6 Silicone Coating

The following test shall be performed to determine the presence of silicone. Slowly pour approximately 50 grams of the sample glass shot into a 250 mL beaker containing approximately 200 mL of reagent water. A small amount of shot floating separately on the water is permissible but a agglomeration indicates presence of silicone.

3.10.7 Shape

A visual count shall be made of three fields of approximately 100 beads each, on the sample prepared as in 4.1.6, using a microscope with 20X magnification and substage lighting, or an optical projector. The three results shall be averaged and compared to Table 1.

3.10.8 Density

Approximately 60 grams of dried shot shall be placed in a 100 mL graduated cylinder containing approximately 50 mL of reagent water. The final volume minus the original volume is the volume of the shot. Calculate density using equation 1.

$$\text{Density} = \frac{\text{Shot Weight, grams}}{\text{Shot Volume, mL}} \quad (\text{Eq. 1})$$

4. QUALITY ASSURANCE PROVISIONS

The provisions of AMS 2431 shall apply except the following modifications and additions take precedence:

4.1 Classification of Tests

4.1.1 Acceptance Tests

Density (3.10.8), magnetic particles (3.5), inclusions (3.10.5), size (3.10.1), and shape (3.10.7) are acceptance tests and shall be performed on samples representing each lot.

4.1.2 Periodic Tests

Composition (3.2) and hardness (3.3) are periodic tests and shall be performed at a frequency acceptable to the purchaser.

4.2 Sampling

Sampling for testing shall be not less than the following.

4.2.1 Acceptance Tests

Two samples of approximately 200 grams each shall be selected from separate containers chosen at random from each lot except samples for magnetic particle content shall be as in 3.5.4.1.

4.2.1.1 Inclusions

The samples used in 4.2.1.3 may be used to determine inclusions.

4.2.1.2 Density

Two samples of approximately 60 grams each shall be used for density determination.

4.2.1.3 Size

Two samples of approximately 60 grams each shall be used for size determination.

4.2.1.4 Shape

Shot shall be poured into a piece of transparent adhesive tape so that beads adhere to the tape.

4.2.1.4.1 A mechanical method of inspection for shape is permitted provided that it can be correlated to the optical method and is acceptable to purchaser.

4.2.2 Periodic Tests

Sample quantities shall be not be less than the following.

4.2.2.1 Composition

Not less than two samples.

4.2.2.2 Hardness

Twenty microhardness readings shall be made from each sample with no more than 1 impression from any single shot.

5. PREPARATION FOR DELIVERY

See AMS 2431 and the following:

5.1 Packaging and Identification

Shot shall be packaged in 50 pound (23 kg) units in multi-wall bags, with a reinforced scrim conforming to MIL-PRF-9954 "Level A." An inner plastic bag shall be used having a vapor transmission rate of less than 0.5 grams of water per 100 square inches (645 cm²) per 24 hours.

5.1.1 Desiccants

All glass shot passing U.S. Screen #100 shall have eight units of MIL-D-3464 desiccant included in each bag.

6. ACKNOWLEDGMENT

See AMS 2431.

7. REJECTIONS

See AMS 2431.

8. NOTES

See AMS 2431 and the following:

8.1 Intended Use

Glass shot conforming to this specification is intended for use in peening of metal surfaces to impart compressive stresses, thereby increasing resistance to fatigue and stress-corrosion cracking. Generally, glass shot may be used where:

8.1.1 Very low intensities are required because glass shot is available in smaller sizes than other media.

8.1.2 Very small, under 0.015 inch (0.38 mm) radii or narrow slots are intended to be peened.

8.1.3 Ferrous contamination of peening media is undesirable.

- 8.2 U.S. Environmental Protection Agency test methods 3052 and 6010 have been used to determine arsenic and lead concentrations of glass shot.
- 8.3 Terms used in AMS are clarified in ARP1917.
- 8.4 Dimensions and properties in inch/pound units and the Fahrenheit temperatures are primary; dimensions and properties in SI units and the Celsius temperatures are shown as the approximate equivalents of the primary units and are presented only for information.

TABLE 1 - GLASS SHOT FOR PEENING

Designation Number	U.S. Sieve	Diameter Inch		Max Trace Retain	U.S. Sieve Size Min 95% Pass		U.S. Sieve Size Max 15% Pass		Max 5% Pass	Min % True Spheres	Max % Sharp Particle	Millimeters	
		Max	Min		Min	Pass	Max	Pass				Max	Min
AGB-200	-8+ 12	0.094	0.066	7	8	12	14	14	14	80	0.5	2.39	1.68
AGB-170	-10+ 14	0.079	0.056	8	10	14	16	14	16	80	0.5	2.01	1.42
AGB-150	-12+ -14	0.066	0.047	10	12	14	20	20	20	80	0.5	1.68	1.41
AGB-100	-14+ 20	0.0555	0.0331	12	14	20	30	30	30	65	3.0	1.41	0.841
AGB-70	-20+ 30	0.0331	0.0234	18	20	30	40	40	40	65	3.0	0.841	0.594
AGB-50	-30+ 40	0.0234	0.0165	25	30	40	45	45	45	70	3.0	0.594	0.419
AGB-35	-40+ 50	0.0165	0.0117	35	40	50	60	60	60	70	3.0	0.419	0.297
AGB-30	-45+ 60	0.0139	0.0098	40	45	60	70	70	70	70	3.0	0.358	0.249
AGB-25	-50+ 70	0.0117	0.0083	45	50	70	80	80	80	80	3.0	0.297	0.211
AGB-20	-60+ 80	0.0098	0.0070	50	60	80	100	100	100	80	3.0	0.249	0.179
AGB-18	-70+100	0.0083	0.0059	60	70	100	120	120	120	80	3.0	0.211	0.150
AGB-15	-80+120	0.0070	0.0049	70	80	120	140	140	140	80	3.0	0.178	0.124
AGB-12	-100+170	0.0059	0.0035	80	100	170	200	200	200	85	3.0	0.150	0.089
AGB-10	-120+200	0.0049	0.0029	100	120	200	230	230	230	90	3.0	0.125	0.074
AGB-9	-140+230	0.0041	0.0025	120	140	230	325	325	325	90	3.0	0.104	0.064
AGB-6	-170+325	0.0035	0.0017	140	170	325	400	400	400	90	3.0	0.089	0.043

NOTE: 1. Designation number is mean shot diameter in microns divided by 10.

2. A "true sphere" is defined as a spheroid with an aspect ratio (ratio of maximum to minimum diameter) of 1.2:1 or less.

3. "Sharp particles" are broken shot or angular glass particles with unfired edges.

4. Prefix "AGB" denotes glass peening shot to AMS 2431/6.