

**PEENING MEDIA
Ceramic Shot**

1. **SCOPE:** This specification, in conjunction with the general requirements covered in AMS 2431, establishes the requirements for ceramic shot, for peening of metal parts.

2. **APPLICABLE DOCUMENTS:** See AMS 2431.

3. **TECHNICAL REQUIREMENTS:**

3.1 **Ceramic shot:** Shall conform to AMS 2431 and the requirements specified herein.

3.2 **Composition:** Shall be high quality zirconium oxide and silica. The percentage variation by weight ranges of the main constituents of ceramic shot shall be:

	min	max
Zirconium Oxide	60	70
Silica	28	33
Alumina	--	10
Other Constituents, total	--	3

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3.2.1 **Hardness:** Not less than 90% of the readings shall fall within the range of 643 - 785 HV (58 - 63 HRC, for reference only).

3.2.2 **Density:** Shall be between 3.60 and 3.95 g/cc, measured at 70°F (21°C) by a pycnometric method.

3.2.3 **Magnetic Particles:** Shall not exceed 0.1% by weight of the original sample.

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3.2.4 Surface Discolorations: Not more than 15% of the shot shall show foreign discolorations on more than 25% of their surface area.

3.2.5 Coatings: Foreign materials are not permitted.

3.3 Workmanship:

3.3.1 Shape: Ceramic shot shall be spherical to ellipsoid in shape. Table 1 shows the maximum percentage of ceramic shot having a sphericity lower than 0.5 and the minimum percentage of ceramic shot having a sphericity of 0.8 and above (true spheres.)

3.3.2 Satellites: Maximum allowable number of beads with satellites shall be Table 2.

3.4 Size: Shall conform to the size requirements of Table 1.

3.5 Test Methods and Procedures:

3.5.1 Size Classification: Sieve analysis shall be determined in accordance with ASTM D1214. Screens shall be in accordance with U.S. Standard Series described in ASTM E11.

3.5.2 Composition: Shall be determined by x-ray fluorescence or by other method acceptable to purchaser.

3.5.3 Hardness: Shall be determined by a Vickers diamond pyramid penetrator using 1000 g load in accordance with ASTM E384.

3.5.4 Contamination:

3.5.4.1 Magnetic Particle: Content shall be determined by slowly sprinkling 1560 g of the sample ceramic shot on an inclined aluminum tray that is 0.062 inch (1.57 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 are positioned against the under surface and crosswise to the inclined tray about the middle of its length. Thickness of tray at magnet location shall not exceed 0.062 inch (1.57 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 g 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.

3.5.4.2 Surface Discolorations: Shall be determined microscopically using 20X magnification.

3.5.5 Shape: A visual count shall be made of three fields of approximately 100 shot-each, on the sample prepared as in 4.1.5, using a microscope with 20X magnification and substage lighting, or an optical projector. The three results shall be averaged and compared to Table 1.

3.5.6 Density: Sixty grams of shot, carefully weighed, and previously dried, shall be placed in a 100 mL graduated cylinder containing 50 mL of distilled water. The total volume minus 50 mL represents the volume of the shot.

$$\text{Density} = \frac{60 \text{ g}}{\text{Shot Volume}}$$

4. QUALITY ASSURANCE PROVISIONS: See AMS 2431 and the following:

4.1 Sampling: Two samples of 200 g each shall be selected from separate containers chosen at random. Each sample shall be split to the following test quantities.

4.1.1 Composition: Not less than two samples from each shipment.

4.1.2 Hardness: Not less than 20 microhardness readings shall be taken from each lot with no more than 1 impression from any one shot.

4.1.3 Specific Gravity: Two 60 g samples for specific gravity determination.

4.1.4 Size: Two representative samples of 60 g minimum weight.

4.1.5 Shape: Shot shall be poured onto a piece of adhesive transparent tape, so that shot adheres to the tape.

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

5. PREPARATION FOR DELIVERY: See AMS 2431 and the following:

5.1 Packaging and Identification: Shot shall be packaged in 25 or 50 kg units and supplied in drums.

6. ACKNOWLEDGMENT: See AMS 2431.

7. REJECTIONS: See AMS 2431.

8. NOTES: See AMS 2431 and the following:

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

8.1.1 Ferrous contamination of the part is undesirable.

8.1.2 Very hard parts (over 60HRC) are to be peened for maximum residual Compressive stress

TABLE I

CERAMIC SHOT FOR PEENING - SIZES

Designation	Nominal Sizes		Sieve Size, Millimetres				Maximum Number Minimum % of Shot W/Sphericity 0.8 and Above (True Spheres)	Maximum of Beads with Sphericity Below .5 per Square Centimetre	Number Broken or Angular Beads Acceptable per Square Centimetre
	Millimetres	Inch	Mesh	Maximum 0.5% Retains	Maximum 5% Retains	Maximum 10% Pass	Maximum 3% Pass		
AZBB50	0.85/1.18	0.033/0.045	16/20	1.400	1.180	0.850	0.710	4	2
AZB600	0.6/0.85	0.024/0.033	20/30	1.000	0.850	0.600	0.425	8	4
AZB425	0.425/0.6	0.017/0.024	30/40	0.710	0.600	0.425	0.300	14	8
AZB300	0.300/0.425	0.012/0.016	40/50	0.500	0.425	0.300	0.250	27	15
AZB210	0.210/0.300	0.008/0.012	50/70	0.355	0.300	0.212	0.180	55	20
AZB150®	0.150/0.210	0.006/0.008	70/100	0.250	0.212	0.150	0.125	300	65