

Peening Media
Ceramic Shot

RATIONALE

AMS 2431/7A is a Five Year Review and update of this specification.

1. SCOPE

1.1 Purpose

The complete requirements for procuring the product shall consist of this document and the latest issue of the basic specification, AMS 2431.

1.2 Application

Ceramic shot conforming to this specification is typically 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 ferrous contamination of the part is undesirable or very hard parts (over 60 HRC) are to be peened for maximum residual compressive stress.

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:

TABLE 1 - COMPOSITION

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

3.2.1 Hardness

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

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2006 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: custsvc@sae.org
SAE WEB ADDRESS: <http://www.sae.org>

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.

3.2.4 Surface Discolorations

Not more than 15% of the shot shall show foreign discolorations. A particle shall be considered objectionable for foreign discoloration when more than 25% of its surface area is discolored.

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 2 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 shot with satellites shall be Table 3.

3.4 Size shall conform to the requirements of Table 2.

3.5 Test Methods and Procedures

3.5.1 Size Classification

Sieve analysis shall be determined in accordance with ASTM D 1214. Screens shall be in accordance with U.S. Standard Series described in ASTM E 11.

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 gram load in accordance with ASTM E 384.

3.5.4 Contamination

3.5.4.1 Magnetic Particle

Content shall be determined by slowly sprinkling approximately 1500 gram 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 × 1 × 6 inches (25 × 25 × 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 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.

3.5.4.2 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 2.

3.5.6 Density

Sixty grams of shot, carefully weighed to the nearest 0.1 gram, and previously dried, shall be placed in a 100 mL graduated cylinder containing approximately 50 mL of reagent water. The resultant volume minus initial volume represents the volume of the shot.

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

TABLE 2 – CERAMIC SHOT FOR PEENING – SIZES AND SPHERICITY

Designation	Nominal Sizes, Millimeters	Nominal Sizes, Inch	Nominal Sizes, Mesh	Sieve Size, Millimeters	Sieve Size, Millimeters	Sieve Size, Millimeters	Sieve Size, Millimeters	Minimum % of Shot W/Sphericity 0.8 and Above (True Spheres)	Maximum Number of Shot with Sphericity Below 0.5 per Square Centimeter	Number Broken or Angular Beads Acceptable per Square Centimeter
				Maximum 0.5% Retained	Maximum 5% Retained	Maximum 10% Passing	Maximum 3% Passing			
AZBB50	0.85/1.18	0.033/0.047	16/20	1.400	1.180	0.850	0.710	65	4	2
AZB600	0.6/0.85	0.024/0.033	20/30	1.000	0.850	0.600	0.425	65	8	4
AZB425	0.425/0.6	0.017/0.024	30/40	0.710	0.600	0.425	0.300	70	14	8
AZB300	0.300/0.425	0.012/0.017	40/50	0.500	0.425	0.300	0.250	70	27	15
AZB210	0.212/0.300	0.008/0.012	50/70	0.355	0.300	0.212	0.180	80	55	20
AZB150®	0.150/0.212	0.006/0.008	70/100	0.250	0.212	0.150	0.125	80	300	65

TABLE 3 – CERAMIC SHOT WITH SATELLITES

Designation	Maximum Number of Shot with Satellites per Square Centimeter	Maximum Number of Shot with 3 or More Satellites per Square Centimeter
AZB850	8	3
AZB600	13	6
AZB425	38	12
AZB300	66	21
AZB210	125	40
AZB150**	87	25

**For AZB150, use 5 mm² area.

4. QUALITY ASSURANCE PROVISIONS

See AMS 2431 and the following:

4.1 Sampling

Two samples of approximately 200 grams 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 gram samples for specific gravity determination.

4.1.4 Size

Two representative samples of 60 grams 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.