

AEROSPACE MATERIAL SPECIFICATION



AMS-P-81985A

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Superseded by MIL-P-81985

Peening of Metals

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This specification has been declared "CANCELLED" by the Aerospace Materials Division, SAE, as of December, 2004, and has been superseded by MIL-P-81985. The requirements of the latest issue of MIL-P-81985 shall be fulfilled whenever reference is made to the cancelled AMS-P-81985. By this action, this document will remain listed in the Numerical Section of the Index of Aerospace Material Specifications, noting that it has been superseded by MIL-P-81985.

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This document has been taken directly from U.S. Military Specification MIL-P-81985(AS), Amendment 1, and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. The initial release of this document is intended to replace MIL-P-81985(AS), Amendment 1. Any part numbers established by the original specification remain unchanged.

The original Military Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, and (b) the use of the existing government specification or standard format.

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1. SCOPE:

1.1 Scope:

This specification covers procedures and requirements for dry peening the surfaces of metals by impingement of metallic shot or glass beads for the purpose of increasing the fatigue strength and resistance to stress corrosion cracking by inducing residual compressive stresses in specified surfaces.

2. APPLICABLE DOCUMENTS:

The following publications, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

2.1 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

RR-S-366	Sieves, Standard for Testing Purposes
MIL-S-851	Steel Grit, Shot and Cut Wire Shot; and Iron Grit and Shot-Blast Cleaning and Peening
MIL-S-5002	Surface Treatments and Coatings for Metal Surfaces of Weapons Systems
MIL-C-5541	Chemical Conversion Coating on Aluminum and Aluminum Alloys
MIL-I-6866	Inspection, Penetrant, Method of
MIL-I-6868	Inspection Process, Magnetic Particles
MIL-A-8625	Anodic Coatings for Aluminum and Aluminum Alloys
MIL-G-9954	Glass Beads: For Cleaning and Peening
MIL-S-13165	Shot Peening of Metal Parts

3. REQUIREMENTS:

3.1 Peening equipment:

The peening equipment shall provide means for a controlled rate propelling of dry metallic shot by air pressure or centrifugal force or of dry glass beads by air pressure against the work. The peening machine shall be equipped with suitable nozzles, deflectors or baffles to direct the peening medium against the part where desired and to prevent peening of areas not to be peened. The machine shall be so designed that the part to be peened is securely fastened. Mechanical means shall be provided to move uniformly either the part or the shot stream in either translation or rotation or both during peening. This movement shall be powered by a speed device such as a synchronous motor, induction motor, differential pressure cylinder or other controlled speed devices capable of automatically replenishing and maintaining an adequate quantity of shot at all times for maximum effectiveness and consistent reproduction of required peening intensities. Series motors and single acting cylinder activating mechanism are prohibited. All work shall be moved mechanically unless manual movement is permitted by the procuring activity in the contract or order.

3.2 Peening material:

Peening material shall be either metallic shot or glass beads. Metallic shot shall conform to MIL-S-851 as hardened cast steel (Type I), cast iron (Type II) or stainless steel cut wire (Type III). Glass beads shall be essentially solid spheres hard tempered, chemically pure crown glass and shall conform to MIL-G-9954, except for sieve analysis. Peening materials shall be capable of producing the required peening intensity without excessive fracturing or deformation of the particles.

- 3.2.1 Size: Unless otherwise specified, the as-received particle size distribution of the metallic shot shall conform to the applicable tables of MIL-S-851 for both cast shot and for cut stainless steel wire. Glass beads shall range in size from 0.0024 to 0.0661 inch (0.061 to 1.68 mm) in diameter. Unless otherwise specified, the particle size distribution of the as-received glass beads shall conform to MIL-G-9954 or to Table I, as selected by the peening contractor. Unless otherwise specified, the nominal size of the peening media charged into a machine shall be at the option of the supplier.
- 3.2.2 Uniformity: The shot or beads shall be free from sharp edges and broken pieces. Cast shot shall be spherical in shape and form and shall be free as practical from elongated, angular particles. Cut wire shot shall be free from shear cracks and laps, shall not contain seams or burrs, and shall be preused or otherwise conditioned to remove sharp edges before being used for peening, and shall be spherically formed. When visually examined the maximum number of deformed cast shot shall not exceed the values stated in Table II.
- 3.2.3 Shot maintenance: Equipment shall have a separator for continuous removal of broken or defect shot material during peening. Metallic shot shall be maintained in the equipment and shall not require replacement until more than 20 percent by weight shall pass through the sieve size specified in Table III for the shot peening number used. Glass beads used for peening over steel shot peened surfaces shall be replaced every two hours of operation.
- 3.2.4 Usability: Ferrous and non-ferrous metals shall not be peened interchangeability with the same peening medium in the same machine. Neither glass beads nor metal shot used on ferrous parts shall later be used on non-ferrous parts.
- 3.2.5 Hardness of shot: Hardness of the shot shall be in accordance with MIL-S-851. Parts to be shot peened having a hardness above Rc 50 should be shot peened with shot having a hardness of Rc 52 to Rc 62.

TABLE I - Glass Bead Sizes Through Sieves

83	70	59	49	41	35	29	24
<u>1/</u> Sieves shall be as specified in RR-S-366							
100							
98-100	100						
-	98-100	100					
0-8	-	98-100	100				
0	0-8	-	98-100	100			
	0	0-8	-	98-100	100		
		0	0-8	-	98-100	100	
			0	0-8	-	98-100	100
				0	0-8	-	98-100
					0	0-8	-
						0	0-8
							0

TABLE I - Glass Percent Passing (Cont'd)

Sieve Number 1/	Nominal Size							
	331	280	232	197	165	138	117	98
18	100	100	100	100	100	100	100	100
20	98-100							
25	-	98-100	100	100	100	100	100	100
30	0-8	-	98-100					
35	0	0-8	-	98-100	100	100	100	100
40	0		0-8	-	98-100			
45	0			0-8	-	98-100	100	100
50	0				0-8	-	98-100	
60	0					0-8	-	98-100
70	0						0-8	-
80	0							0-8
100	0							
120								
140								
170								
200								
230								
270								
325								
400								

TABLE II - Uniformity of Cast Shot

Shot Peening Number (See MIL-S-851, Table III)	Number of Acceptable Deformed Shot - Maximum	Area-Square Inch	Shot Peening Number (See MIL-S-851, Table III)	Number of Acceptable Deformed Shot - Maximum	Area-Square Inch
930 and 780	5	1	320, 280, 230,	20	1/2
660 and 550	12	1	190 and 170		
460	15	1	130	30	1/4
390	20	1	110 and 70	40	1/4

TABLE III - Uniformity of Steel Shot in the Equipment

Shot Peening Number (See MIL-S-851, Tables III and IV)		20% - Maximum Amount Passing Through Sieve <u>1/</u>		Shot Peening Number (See MIL-S-851, Tables III and IV)		20% - Maximum Amount Passing Through Sieve <u>1/</u>	
Cast shot	Cut steel wire	Sieve number	Nominal opening - inch	Cast shot	Cut steel wire	Sieve number	Nominal opening - inch
930	-	16	0.0469	280	CW 28	45	0.0139
780	-	18	0.0394	230	CW 23	50	0.0117
660	CW 62	20	0.0331	190	-	60	0.0098
550	CW 54	25	0.0278	170	CW 20	70	0.0083
460	CW 47	30	0.0234	130	-	100	0.0059
390	CW 41	35	0.0197	110	-	120	0.0049
330	CW 35	40	0.0165	70	-	170	0.0035
-	CW 32	40	0.0165				

1/ Sieves shall be as specified in RR-S-366

3.3 Preparation procedures:

- 3.3.1 Dimensions and conditions of parts: Areas of parts to be peened shall be within dimensional requirements and surface finish requirements before peening. Except as otherwise permitted (see 3.5.1), all heat treatments to meet requirements for mechanical properties, all machining, grinding and required polishing of areas shall be completed before peening. All fillets shall be properly formed, all burrs shall be removed, and all sharp edges and corners to be peened shall be provided with sufficient radii to result in complete coverage without any distortion prior to peening.
- 3.3.2 Cleaning and stripping: Unless otherwise specified, all areas shall be cleaned in accordance with MIL-S-5002. Procedures for stripping coatings shall be as specified or approved in the contract or order (see 6.11).