AEROSPACE MATERIAL SPECIFICATION

AMS2430™	REV. U
Issued 1948-09 Revised 2018-04 Superseding AMS2430T	

Shot Peening

RATIONALE

AMS2430U results from a Five-Year Review and update of this specification that revises Ordering Information, 1.1 Purpose, 1.2 Application, 1.6 Legacy Provision, 1.7 Manual and Batch Peening, 3.1 Peening Processes, Table 2A, Table 2B, 3.6.1.1 Intensity, addition of Appendix A Manual Peening and the addition of Appendix Batch Peening.

NOTICE

ORDERING INFORMATION: The following information shall be provided to the peening processor by the purchaser.

- AMS2430U
- Purchase order number and revision level
- Part number and revision level
- Quantity of parts
- Part alloy and tensile strength and/or hardness
- Media type, hardness, size in accordance with AMS2431. (3.2.1)
- Test strip type. (3.3.2)
- Pre-shot peen cleaning method. (3.4.3.2)
- Intensity requirement. (3.6.1)
- Intensity verification locations. (3.6.1.1 and 3.6.1.2)
- Coverage requirement. (3.6.2)
- Coverage verification method and if use of fluorescent tracer or dye marker inks requires cognizant engineering organization approval. (3.6.2.1)
- Part locations to be shot peened, free from peening, or peening optional. (3.6.2.2 and 3.6.2.3)

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- If externally applied forces are permitted on part during processing. (3.5.2)
- If purchaser requires approval of the processor's quality control system (3.8) and shot peening parameter sheet prior to production. (4.3.2 and 3.8)
- If purchaser allows the use of alternative intensity verification methods. (3.8.1.1)
- Post-shot peen cleaning method: include instruction and procedure to remove iron contamination, if applicable; and, if purchaser requires peening processor to perform this operation. (3.10.1)
- Part preservation/shipping method. (3.10.2 and Section 5.)
- Specific authorization for manual or batch peening. (1.7)

1. SCOPE

1.1 Purpose

This specification covers the requirements for shot peening of surfaces of parts by impingement of media, including metallic, glass, or ceramic shot.

1.2 Application

Shot peening is typically used to induce residual surface compressive stresses in metal parts to increase fatigue strength and resistance to stress-corrosion cracking for parts such as axles, springs (helical, torsional and leaf), gears, shafting, aircraft landing gear, structural parts, and similar items but usage is not limited to such applications.

1.3 Related peening processes, such as peen forming and straightening peening for prevention of intergranular corrosion, and peening to produce a surface texture, are beyond the scope of this specification.

1.4 Shot peening in accordance with AMS2432 meets or exceeds the requirements of AMS2430. Part certification in accordance with AMS2432 is acceptable in addition to AMS2430 (see 4.5).

1.5 Shot peening design guidance for the cognizant engineering organization is documented in ARP7488.

1.6 Legacy Provision

When AMS-S-13165 or MIL-S-13165 is specified and a peening procedure has been approved by or acceptable to the purchaser or cognizant engineering organization, the peening processor may continue to use the previously approved or accepted equipment, practices, and test methods to satisfy the specified requirements of AMS2430U, subject to approval by the purchaser.

1.7 Manual and Batch Peening

Unless otherwise specified (see ordering information), automatic peening shall be performed when AMS2430 is called out.

1.7.1 Manual peening processes and machinery shall only be used when specifically authorized (see Appendix A).

1.7.2 Batch peening processes, such as tumble or barrel peening, and machinery shall only be used when specifically authorized (see Appendix B).

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.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2431 Peening Media, General Requirements

AMS2432 Shot Peening, Computer Monitored

ARP7488 Peening Design and Process Control Guidelines

SAE J442 Test Strip, Holder, and Gage for Shot Peening

SAE J443 Procedures for Using Standard Shot Peening Almen Strip

SAE J2277 Shot Peening Coverage Determination

2.2 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 B214 Standard Test Method for Sieve Analysis of Metal Powders

ASTM E11 Wire Cloth and Sieves for Testing Purposes

3. TECHNICAL REQUIREMENTS

3.1 Peening Processes

3.1.1 Manual and Batch Peening

Unless otherwise specified (see ordering information), automatic peening shall be performed when AMS2430U is called out.

3.1.1.1 Manual peening processes and machinery shall only be used when specifically authorized (see Appendix A).

3.1.1.2 Batch peening processes, such as tumble or barrel peening, and machinery shall only be used when specifically authorized (see Appendix B).

3.2 Peening Media

3.2.1 New Media

3.2.1.1 New media shall conform to the requirements of AMS2431.

3.2.1.2 If conditioned cut wire shot is permitted by the cognizant engineering organization, conditioned carbon steel cut wire shot in accordance with AMS2431/3 or AMS2431/8 or conditioned stainless-steel cut wire shot in accordance with AMS2431/4 and of the equivalent size corresponding to the specified cast steel shot in Table 1, may be used only when the shot hardness is the same or greater than the specified cast steel shot.

3.2.1.3 For steels heat treated above 200 ksi, hard media in accordance with AMS2431/2, /7, or /8 is required if media hardness is not specified on the part drawing or by the cognizant engineering organization.

3.2.2 In-Process Media

Media in use during the process shall be inspected and conform to the size and shape requirements in accordance with Tables 1, 2A, and 2B and Figures 1 and 2.

Table 1 – Size requirements of in-process media

Cast Shot Sizes ASR or ASH (1)	Cut Wire Shot Sizes AWCR AWS AWCH (1)	Glass Shot Sizes AGB (1)	Ceramic Shot Sizes AZB (1)	0.5% Maximum by weight Allowed to be Retained on U.S. Sieve (2), Size mm (Inch)	Maximum 20% By Weight Passing U.S. Sieve (2), Size mm (Inch)
930	116	—	—	5, 4.00 (0.157)	8, 2.36 (0.0937)
780	96	—	—	6, 3.35 (0.132)	10, 2.00 (0.0787)
660	80	200	—	7, 2.80 (0.110)	12, 1.7 (0.0661)
550	62	170	—	8, 2.36 (0.0937)	14, 1.4 (0.0555)
460	54	150	—	10, 2.00 (0.0787)	16, 1.18 (0.0469)
390	47	—	—	12, 1.7 (0.0661)	18, 1.00 (0.0394)
330	41	100	850	14, 1.4 (0.0555)	20, 0.850 (0.0331)
—	35	—	—	16, 1.18 (0.0469)	25, 0.710 (0.0278)
280	32	—	—	16, 1.18 (0.0469)	25, 0.710 (0.0278)
230	28	70	600	18, 1.00 (0.0394)	30, 0.600 (0.0234)
190	23	—	—	20, 0.850 (0.0331)	35, 0.500 (0.0197)
170	20	50	425	25, 0.710 (0.0278)	40, 0.425 (0.0165)
130	17	—	—	30, 0.600 (0.0234)	45, 0.355 (0.0139)
110	14	35	300	35, 0.500 (0.0197)	50, 0.300 (0.0117)
—	—	30	—	40, 0.425 (0.0165)	60, 0.250 (0.0098)
—	—	25	210	45, 0.355 (0.0139)	70, 0.212 (0.0083)
70	12	—	—	40, 0.425 (0.0165)	80, 0.180 (0.0070)
—	—	20	—	60, 0.250 (0.0098)	80, 0.180 (0.0070)
—	—	18	150	60, 0.250 (0.0098)	100, 0.150 (0.0059)
—	—	15	—	70, 0.212 (0.0083)	120, 0.125 (0.0049)
—	—	—	100	80, 0.180 (0.0070)	230, 0.063 (0.0025)
—	—	12	—	100, 0.150 (0.0059)	170, 0.090 (0.0035)
—	—	10	—	120, 0.125 (0.0049)	200, 0.075 (0.0029)
—	—	9	—	140, 0.106 (0.0041)	230, 0.063 (0.0025)
—	—	6	—	170, 0.090 (0.0035)	325, 0.045 (0.0017)

NOTES:
1. See AMS2431 for definitions.
2. Sieve specified in ASTM E11.

Table 2

Table 2A – Shape requirements of in-process non-metallic media

Sample Size (Inches)	Glass Shot Sizes AGB (1)	Max Allowable Number of Unacceptable Glass Shot Shapes	Ceramic Shot Sizes AZB (1)	Max Allowable Number of Unacceptable Ceramic Shot Shapes	Minimum Magnifier
1 x 1	200	14	—	—	10X
1 x 1	170	19	—	—	10X
1 x 1	140	28	—	—	10X
½ x ½	100	14	850	14	10X
½ x ½	70	28	600	28	10X
¼ x ¼	50	14	425	14	20X
¼ x ¼	35	28	300	28	20X
¼ x ¼	30	40	—	—	30X
1/8 x 1/8	25	14	210	14	30X
1/8 x 1/8	18	28	150	28	30X
1/8 x 1/8	15	(2)	(2)	(2)	(2)
1/8 x 1/8	12	(2)	(2)	(2)	(2)
1/8 x 1/8	10	(2)	(2)	(2)	(2)
1/8 x 1/8	9	(2)	(2)	(2)	(2)
1/8 x 1/8	6	(2)	(2)	(2)	(2)

NOTES:
1. See AMS2431 for definitions.
2. Shape inspection of non-metallic media AGB-15 and AZB-100 and smaller is not required as the particle size is too small to count.

Table 2B – Metallic media shape maintenance requirements

Sample Size (Inches)	Cast Shot Sizes ASR or ASH (1)	Maximum Allowable Number of Unacceptable Cast Shot Shapes	Cut Wire Shot Sizes AWCR, AWS, AWCH (1)	Maximum Allowable Number of Unacceptable Cut Wire Shot Shapes	Minimum Magnifier
1 x 1	930	4	116	4	10X
1 x 1	780	5	96	5	10X
1 x 1	660	7	80	7	10X
1 x 1	550	9	62	9	10X
1 x 1	460	16	54	16	10X
1 x 1	390	22	47	22	10X
½ x ½	330	7	41	7	10X
½ x ½	-	-	35	9	10X
½ x ½	280	9	32	9	10X
½ x ½	230	14	28	14	10X
½ x ½	190	22	23	22	20X
½ x ½	170	31	20	31	20X
¼ x ¼	130	9	17	9	20X
¼ x ¼	110	14	14	14	20X
¼ x ¼	70	22	12	22	30X

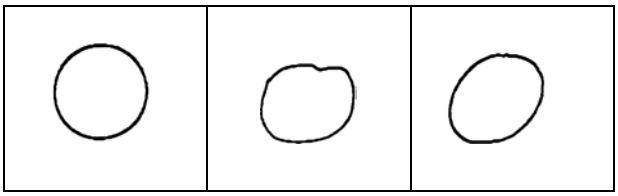
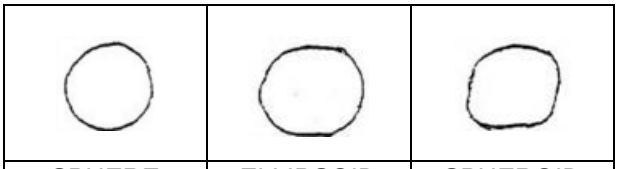


Figure 1 – Acceptable cast media shapes



SPHERE	ELLIPSOID	SPHEROID
Fully Consolidated Particles		

Figure 2 – Acceptable cut media shapes

3.3 Equipment and Materials

The following types of equipment and materials shall be provided for the peening of parts.

3.3.1 Peening Machine

3.3.1.1 The peening machine shall run automatically and may be computer controlled. Machine monitoring may be performed in accordance with AMS2432. The machine shall provide a means of propelling, at a controlled rate, media with air pressure against the part. Alternatively, media may be propelled by centrifugal force. The machine shall provide a means of moving, at a uniform speed, either the part through the media stream or the media stream over the part in either translation, rotation, or both, as required. The nozzles and the part shall be held and moved mechanically. The part shall not be subjected to any random movement during the process. The machine shall be capable of consistently reproducing the required shot peening intensities.

3.3.1.2 The machine shall incorporate equipment to extract dust and fine particle contaminants from the in-process media unless the purchaser permits its absence. Equipment may include a media separator to mechanically control size and shape such as vibrating screens, spiral device, or inclined belt.

3.3.1.3 For machines using pressurized air, a functioning low air pressure alarm shall be incorporated in the air supply system.

3.3.1.4 For wet shot peening, a separator is not required but the entire slurry shall be changed often enough that the peening intensity under any given set of parameters remains within established limits for that set of parameters. Fresh shots may be added once between changes of the entire slurry to maintain the peening intensity.

3.3.2 Test Strips

Almen test strips, sub-size test strips, and shaded or masked test strips shall conform to SAE J442 and usage shall conform to SAE J443.

3.3.2.1 An alternative method where conditions are not advantageous for standard test strips, sub-size or otherwise standard shaded or masked test strips may be used for control of peening intensity. The correlation between the peening intensity measured with sub-size or shaded or masked test strips and measurements with the standard SAE J442 test strip shall be established in accordance with SAE J443.

3.3.3 Test Strip Gage

Almen test strip gages used with standard "A", "C", and "N" test strips shall conform to SAE J442 with end stops. Gages of appropriate design in accordance with SAE J442 shall be used for arc height measurements of sub-sized strips.

3.3.4 Test Strip Holder

Almen test strip holder shall conform to SAE J442. The test strip holder shall be supported on fixtures as required during procedure development or intensity verification in accordance with SAE J443.

3.3.5 Masking

Suitable masking shall be applied to prevent peening in prohibited areas of the part. Baffles may be used to re-direct the media where desired as permitted by the cognizant engineering organization.

3.3.6 Media Size Inspection Equipment

3.3.6.1 A rotating and tapping type of machine in accordance with ASTM B214 shall be used. A mechanically operated, eccentric sieve shaker shall be used that imparts to the set of sieves a rotary motion and a tapping action of uniform speed. The number of rotations per minute shall be between 270 and 300. The number of taps per minute shall be between 140 and 160. The hold down arm of the sieve shaker shall be fitted with a shock absorbing plug to receive the impact of the tapping device.

3.3.6.2 The testing sieves shall be in accordance with ASTM E11. They shall be of the 8 inch or 200 mm diameter series and of either 1 inch (25 mm) or 2 inches (51 mm) height.

3.3.7 Media Shape Inspection Equipment

3.3.7.1 A durable template with a cut-out secured with adhesive tape to retain the media sample or a solid tool with a recess to capture the media sample, or similar method permitted by the cognizant engineering organization shall be used. The cut-out or recess shall conform to the sample size dimensional requirements or equivalent area as shown in Table 2A or 2B, as appropriate. Dimensional tolerance shall be within ±5%.

3.4 Pre-Peening Preparation

3.4.1 Purchaser requirements shall be observed and applied to the production parts.

3.4.2 The following items are not the responsibility of the peening source but shall be completed prior to peening:

3.4.2.1 All heat treatment to meet requirements for mechanical properties shall be completed prior to peening.

3.4.2.2 All machined areas to be peened shall be completed to drawing requirements.

3.4.2.3 When magnetic particle or fluorescent penetrant inspection is required, parts shall be subjected to such inspection before being peened.

3.4.2.4 Dimensions and surface finish shall be as specified by the engineering drawing prior to shot peening unless otherwise specified.

3.4.3 The following items are the responsibility of the peening source and shall be completed prior to peening:

3.4.3.1 All edges and corners in the areas to be peened shall be inspected and be free of sharp edges and burrs.

3.4.3.2 All parts shall be visually clean prior to shot peening. The purchaser shall supply clean parts to the processor or specify the cleaning method prior to peening to the processor. If no pre-peening cleaning method is specified by purchaser, processor may clean the parts using a method acceptable to the purchaser. Halogenated solvents shall not be used to clean titanium alloy parts. Parts shall be visually inspected to verify freedom from grease, dirt, oil, corrosion, mechanical damage and corrosion-preventive coatings such as anodic coatings, plating, or paint. Use of magnification as a referee for part inspection is permitted.

3.4.4 Masking

Areas of the part that are designated to be free from any shot peening shall be suitably masked or protected from the peening stream.

3.5 Peening

3.5.1 Parts shall be peened in accordance with the purchaser requirements.

3.5.2 No external loads shall be applied to the part during peening unless permitted by the cognizant engineering organization.

3.6 Shot Peening Properties

3.6.1 Intensity

3.6.1.1 Peening intensity shall be as specified by the purchaser, determined in accordance with SAE J443. Note that customer requirements or older drawing callouts for intensity may not provide the standard arc height designation per SAE J442. For example, customer requirements such as 6A or 18N typically mean 0.006 inch A and 0.018 inch N but should be confirmed by the processor. Some engineering criteria may continue to show the numeral “2” after the test strip letter, designating the use of a number 2 gage. This designation (such as A2) is neither required nor recommended. The gage defined by SAE J442 has been in use since 1943.

3.6.1.2 A minimum of one intensity verification location is required for each variation of machine settings as shown on the process parameter sheet per 3.7.

3.6.2 Coverage

3.6.2.1 Part peening for coverage shall be developed and parts shall show full/complete coverage in accordance with SAE J2277 unless otherwise specified by the cognizant engineering organization.

3.6.2.2 Areas of the part or work piece and the dimensional tolerances of these areas that are designated in the contract or applicable drawing to be free from any shot peening or as prohibited areas shall be suitably masked or otherwise handled to protect such surfaces from the shot stream.

3.6.2.3 Peening “optional” shall mean those areas, located adjacent to shot peened areas and subject to shot impingement, may have complete, partial, or no coverage.

3.7 Application to Specific Geometries

This section provides the requirements for details and constraints concerning holes, fillet radii, and reflected shot as applicable.

3.7.1 If the drawing does not specify the specific areas, peening is required on all surfaces except in holes and apertures smaller than 0.50 inch (13 mm) in diameter or width. If these small areas require shot peening, the drawing shall so designate or provide the instruction to the processor. Holes can be peened using nozzle, ricochet, or lance peening with the part positioned so as to ensure the free exit of spent shot. Lance peening is not required if the internal diameter can be peened with an external nozzle and the intensity and coverage at the resulting angle of impingement are verified and conform to the requirements. If the shot must pass through recesses or apertures to peen required surfaces, the nominal diameter of the shot shall be not greater than 25% of the width of the opening, except that the limitations as to minimum shot size specified below for peening fillets shall also apply.

3.7.2 For fillet radii on parts, the shot size used shall be such that the shot nominal diameter is not greater than one-half the smallest fillet radius to be peened, except that the nominal diameter of steel shot need not be smaller than 0.007 inch (0.18 mm) and the nominal diameter of glass shot need not be smaller than 0.002 inch (0.05 mm). If this requires a shot size that is smaller than that shown in 8.4.3, the fillet radius shall be peened in a separate setup subsequent to the one required for general peening of the part. An intensity for the fillet radius, compatible with the smaller shot size, shall be established by the cognizant engineering organization. No additional masking of previously peened areas is required.

3.7.3 When a surface on which peening is required is obstructed and it is impossible to obtain full/complete coverage by direct impact, coverage by reflected shot is allowed.

3.8 Technique Sheet

Processor shall establish, for each part number and machine, parameters for peening processing that will produce acceptable peened parts in accordance with SAE J443 and SAE J2277 unless otherwise specified by the cognizant engineering organization. These processing parameters shall be documented and constitute the process parameter sheet for the part and shall be used for peening production parts. A separate process parameter sheet shall be required to document each variation of process parameters for peening a given part. Purchaser may require approval of the process parameter sheet prior to processing parts.

3.8.1 Process Development

3.8.1.1 The machine shall be set up to shot peen the test strip fixture and a saturation curve shall be established in accordance with SAE J443 for each required intensity verification location. Using these machine settings, an intensity verification process shall be developed in accordance with SAE J443 for each intensity verification location and documented for production peening. An alternative intensity verification method for production part peening shall only be used when approved by the cognizant engineering organization.

3.8.1.2 Once intensity development is complete, coverage shall be developed in accordance with SAE J2277 on all required areas of an actual part with masking as required while still conforming to the intensity requirement. After shot peening the part for coverage, the masking shall be removed from the part. The part shall then be inspected for coverage in accordance with SAE J2277. The coverage production procedure shall be documented. Methods for cleaning to remove shot particles, preserving and packaging shall be established and documented per 3.10.1, 3.10.2, and Section 5.

3.8.1.3 All processor and purchaser required documentation shall be completed for each part.

3.8.2 All shot peening process parameter sheets shall include figures showing the machine and fixture set up with nozzle/wheel relation to the fixture/part and shall document the process parameters shown in Table 3 at minimum.

Table 3 – Process parameter sheet requirements

Process parameter sheet number and date
Purchaser approval date (if required)
Part number (drawing) revision and date
Part material and tensile strength and/or hardness
AMS2430 and/or appendix if applicable
Intensity requirement
Test strip type (N, A, C) and/or sub-size strip information if applicable
Part locations to be shot peened, free from peening, or peening optional
Coverage requirement-full/complete of percentage specified
Media type, hardness, size in accordance with AMS2431
Type of machine
Machine number or serial number
Number of nozzles or wheels
Size of nozzles or wheels
Size of metering orifice (pneumatic machine only, if metered)
Nozzle or slinger position and/or angle of impingement
Centrifugal wheel machine control cage position indicator of intensity zone (if applicable)
Media flow rate (if applicable)
Air pressure, wheel speed, or shot velocity
Nozzle (or wheel) -to-part distance (stand-off distance)
Speed of nozzle and or part movement in translation and rotation
Part holding and/or masking fixture
Intensity verification fixture
Intensity verification locations
Saturation curve data
Pre-shot peen cleaning method
Part masking
Coverage time or passes for specified area
Coverage inspection method-visual examination only, or fluorescent tracer or dye marker inks, and customer approval if required.
Post-shot peen cleaning method
Part preservation/shipping method

3.9 Production Part Peening

3.9.1 Production part peening shall comply with the documented process parameter sheet(s) for the part. Purchaser documents and/or purchase orders shall be reviewed and coordinated with the production parts. The machine parameters will be set up and intensity verification shall be performed for each intensity verification location. The part shall be inspected, cleaned, masked and fixtured as required and peened for coverage. The post-peening intensity verification shall be performed for each intensity verification location as required in accordance with the acceptance test criteria 4.2.1.

3.9.2 Masking shall be removed from the part and the part inspected for coverage.

3.10 Post-Peening Processes

3.10.1 After peening and removal of protective masks, all media and fragments shall be removed from surfaces of parts by a method acceptable to or specified by the purchaser, as applicable, that will preserve dimensional requirements and not damage the part surfaces. Parts made of aluminum, magnesium, corrosion resistant steel, and titanium alloys peened with steel media shall be cleaned of all iron contaminants. If no post-peening cleaning method is specified by purchaser, processor may clean the parts using a method acceptable to the purchaser with the constraint that halogenated solvents shall not be used to clean titanium alloys.

3.10.2 Parts subject to corrosion shall be protected from corrosion by a method acceptable to or specified by the purchaser, as applicable, protected from handling damage, and prepared for shipping. All processing documentation shall be completed.

3.10.3 The amount of metal removed by honing, lapping, polishing, or other material removal processes shall be not more than 10% of the specified nominal (midpoint of intensity range) arc height for "A" and "C" intensities and not more than 3% of the specified nominal arc height for "N" intensities unless otherwise specified by the cognizant engineering organization (see 8.4.6.4).

3.10.4 Subsequent processing shall be performed only when permitted by the engineering drawing requirements. In order to minimize reduction of the residual stresses imposed by peening, the temperature of the parts caused by such processing shall not exceed the limits of Table 4, unless otherwise specified by the cognizant engineering authority (see 8.4.6.3 for additional considerations).

Table 4 – Temperature limits for peened parts

Alloy	Temperature
Steels, other than corrosion resistant (1)	475 °F (246 °C)
Corrosion-Resistant Steels (2)	750 °F (399 °C)
Aluminum Alloys	205 °F (96 °C)
Titanium Alloys	475 °F (246 °C)
Magnesium Alloys	200 °F (93 °C)
Nickel and Cobalt Alloys	1000 °F (538 °C)

NOTES:
1. Except 300 °F (149 °C) for steel parts that are tempered below the recommended 475 °F (246 °C) maximum after a quench hardening operation.
2. Except 475 °F (246 °C) for PH and cold worked 300 series CRES (aka, stainless steel).

3.10.5 Straightening of peened parts is prohibited, unless otherwise specified.

3.11 Tolerances

3.11.1 Unless otherwise specified, variation from the specified (minimum) peening intensity shall be -0, +30% to the nearest 0.001 inch (0.025 mm) or 0.003 inch (0.075 mm); whichever is greater. For example, a specified peening intensity of 0.006 inch A denotes an arc height of 0.006 to 0.009 inch (0.15 to 0.23 mm) on the "A" test strip and a specified peening intensity of 0.018 inch N denotes an arc height of 0.018 to 0.023 inch (0.46 to 0.58 mm) on the "N" test strip.

3.11.2 Intensity verification test strip measured arc heights shall be reproduced within ±0.0015 inch (0.0375 mm) of the process parameter sheet and shall be within the intensity range for the part. When sub-sized test strips are used, the intensity arc height shall be verified with the SAE J443 correlation procedure.

3.11.3 Unless otherwise specified, the variation in boundaries of areas to be peened shall be -0 to +0.125 inch (-0 to +3.18 mm) into the area not required to be peened.

3.12 Test Methods

3.12.1 Intensity shall be determined in accordance with SAE J443.

3.12.2 Coverage shall be determined in accordance with SAE J2277.

3.12.3 In-Process Media Size Inspection Procedure

3.12.3.1 Obtain a media sample representative of the media being propelled onto the part being processed. Sample size will be dependent on the media size and type. For media inspection with U.S. Sieve Size 35, 0.0197 inch (0.500 mm) and larger screen openings, a 100 g minimum sample size is required. For smaller screen openings, a sample size of less than 100 g is permitted.

3.12.3.2 Select the appropriate size sieves according to Table 1. The sieves shall be nested from the sieves with the largest mesh size at the top decreasing to the smallest mesh size and a catch pan at the bottom.

3.12.3.3 Locate the nested sieves and pan in the rotating and tapping machine. Place the media sample on the top sieve and place the cover on the sieve to prevent media escape.

3.12.3.4 The sample shall be run in the rotating and tapping machine for 5 minutes ± 5 seconds where the smallest sieve used is 35 mesh or coarser and 10 minutes ± 5 seconds where the smallest sieve used is finer than 35 mesh.

3.12.3.5 The stack of sieves shall be removed from the rotating and tapping machine and the percentage of total weight shall be recorded for the media remaining on each sieve and in the catch pan. Trace amounts of media shall be defined as any amount whose weight is less than 0.5% of the sample size. Trace amounts shall be recorded but reported as 0% of the sample size. Compare the results with the requirements in Table 1.

3.12.4 In-Process Media Shape Inspection Procedure

3.12.4.1 Obtain a media sample representative of the media being propelled onto the part being processed. The sample shall not be altered by any process or motion that could remove or reduce the number of viewable unacceptable pieces, e.g., sieving.

3.12.4.2 The media sample shall be poured onto an adhesive tape when using the cut-out template, poured into the recess when using a solid tool, or similar treatment with other methods. The surplus media shall be removed to leave a complete, single layer of media with minimal gaps.

3.12.4.3 The sample shall be inspected using magnification according to the size of media being inspected in accordance with Tables 2A and 2B.

3.12.4.4 Media shapes shall be compared with the requirements shown in Figures 1 and 2 and Tables 2A and 2B as applicable.

4. QUALITY ASSURANCE PROVISIONS

4.1 Inspection and Process Control

4.1.1 The processor shall be responsible for the performance of all required tests. Purchaser reserves the right to perform any testing deemed necessary to ensure that processing conforms to the specified requirements.

4.1.2 If any media violations are detected or any intensity (arc height) verification value does not meet specified requirements, peening shall cease, affected parts shall be segregated for dispositioning, the purchaser notified of the proposed corrective action, and purchaser concurrence obtained before corrective action is implemented.

4.2 Classification of Tests

4.2.1 Acceptance Tests

4.2.1.1 Peening intensity verification (3.5.1 and 3.11.1) is an acceptance test shall be performed at the beginning and, for lot sizes greater than one, at the end of each lot or every eight machine peening hours, whichever is less. Peening intensity verification shall also be performed whenever the in-process media requirements are violated or whenever the size, type, or all of media in the machine is changed. The intensity verification arc height shall be documented in accordance with 4.5. If approved by the cognizant engineering organization, intensity verification intervals may be changed.

4.2.1.2 Verification of coverage (3.5.2 and 3.11.2) is an acceptance test and shall be performed on all parts in each lot unless the cognizant engineering organization provides a sampling plan.

4.2.2 Periodic Tests

In-process media size (3.1.2 and 3.11.3) and shape (3.1.2 and 3.11.4) verifications are periodic tests and shall be inspected in accordance with the frequency shown in Table 5 and whenever the size, type, or all of media in the machine is changed.

Table 5 – In-process media inspection frequency requirements

Media	Machine With Separator (Hours)	Machine without Separator (Hours)
AMS2431/1 Cast Steel Shot Regular	40	8
AMS2431/2 Cast Steel Shot Hard	40	8
AMS2431/3 Cut Wire Shot Carbon, Regular	80	16
AMS2431/4 Cut Wire Shot Stainless	120	24
AMS2431/5 Peening Balls	20	4
AMS2431/6 Glass Shot	8	NOTE 1
AMS2431/7 Ceramic Shot	8	4
AMS2431/8 Cut Wire Shot Carbon, Hard	80	16

NOTES:

1. Media shall be replaced after 2 hours of peening. No inspection of outgoing media required. When wet glass shot is used, the entire slurry charge shall be changed at frequent intervals for compliance with this requirement. Fresh shot may be added only once between changes of the entire slurry to maintain the media quality.

4.3 Preproduction Requirements and Testing

4.3.1 The processor's quality control system and compliance to this specification shall be approved by the cognizant quality assurance organization before parts for production use are supplied, however this approval is not required for non-aerospace parts unless specifically invoked by purchase order, specification or drawing (see 8.6).

4.3.2 Qualification of the peening process parameter sheet and part set up in accordance with 3.7 is a preproduction test and shall be performed prior to part production, and when the cognizant engineering organization requires confirmatory testing. When approval of the process parameter sheet is required by purchaser, the process parameter sheet shall be approved by the cognizant engineering organization.

4.3.3 The processor’s equipment used for measuring and controlling the shot peening process such as Almen gages, shot flow/metering devices, air pressure gages and transducers, computer-controlled monitoring equipment, and equipment controllers shall be calibrated as required and media and test strips shall meet the requirements of this specification. Calibration shall be against instruments whose calibration is traceable to National Institute of Standards and Technology (NIST) or other nationally accredited standards organization approved by the cognizant engineering organization.

4.3.4 Training Requirements

Personnel that perform the following operations shall be trained and demonstrate proficiency in:

4.3.4.1 Nozzles/wheels and fixture/part set up

4.3.4.2 Saturation curve development and documentation

4.3.4.3 Part coverage development and documentation

4.3.4.4 Setting and operating machine parameters from the process parameter sheet

4.3.4.5 Media inspection

4.3.4.6 Intensity verification method

4.3.4.7 Part masking

4.3.4.8 Coverage inspection

4.3.4.9 Part cleaning

4.3.4.10 Part corrosion prevention

4.3.4.11 Part shipping

4.3.4.12 Purchaser documentation

4.4 Retesting and Corrective Action

4.4.1 Intensity

If any test strip fails to meet the specified intensity verification requirements in accordance with 4.2.1.1, disposition of the parts may be based on the results of one additional test strip of each original nonconforming test strip location using the same machine settings with no changes, or additions of media. Failure of the additional strip to meet the specified intensity verification requirements shall be cause for disposition and corrective action per 4.1.

4.4.2 Media

If media shape test or media size test fails to meet the requirements, peening shall cease, and corrective actions shall be made per 4.1. If the shape test failed, then the full media charge shall be replaced with conforming media, then the shape and size requirements tested and met before recommencing peening. If the size test failed, the media charge shall be replaced or supplemented with sufficient conforming media, then the shape and size requirements tested and met before recommencing peening.

4.5 Reporting

The processor shall furnish with each shipment a report stating that the parts have been processed in accordance with the requirements, including specific intensity and coverage. In addition, for aluminum alloy, magnesium alloy, corrosion resistant steel alloy, and titanium alloy parts peened with steel media, the report shall state if the parts have or have not been cleaned of iron contamination. This report shall include the purchase order number, AMS2430U, part number, lot identification, and quantity. Conformance with AMS2432 (latest revision) may also be reported if applicable.

5. PREPARATION FOR DELIVERY

5.1 Packaging and Identification

5.1.1 Peened parts shall be handled, protected from corrosion, and packaged to ensure that the required physical characteristics and properties of the peened parts are preserved.

5.1.2 Packages of peened parts shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the parts to ensure carrier acceptance and safe delivery.

6. ACKNOWLEDGMENT

The processor shall mention AMS2430 and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS

Parts on which peening does not conform to this specification, or to modifications authorized by purchaser, will be subject to rejection.

8. NOTES

8.1 Revision Indicator

A change bar (l) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

8.2 Terms used in AMS are clarified in ARP1917 and as follows:

8.2.1 Automatic

A class of peening machine that precludes use of manual movement of either the shot stream or the work part but relies upon mechanical means to provide these features.

8.2.2 Manual

A class of machine that uses manual movement of either the shot stream or the work or both.

8.2.3 Batch

A class of machine that presents multiple parts to the media stream while tumbling in a barrel or belt system.

8.2.4 Media

Any of the commonly used materials used for peening, such as cast steel shot, cut wire shot, ceramic shot, glass shot, or peening balls (refer to AMS2431).

8.2.4.1 The nominal media size is found by reference to Table 1, Maximum 20% by Weight Passing column. Example: ASR/ASH-110, AWCR/AWS/AWCH-14, AGB35, or AZB300 = 0.0117 inch = 11.7 thousandths of an inch or 0.300 mm diameter. This nominal diameter is used for calculations of fillet radius requirements (see 3.6.2).

8.2.4.2 The naming convention for cast steel shot uses the Table 1 screen size of the 20% by Weight Passing screen.

8.2.4.3 The naming convention for cut wire media is based upon the wire diameter.

8.2.5 Lot Definition

A lot is all parts in a production run that are peened in one set up of the machine using the same process peening parameter sheet.

8.3 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.

PREPARED BY “ASEC” AND AMS COMMITTEE “B”

APPENDIX A – MANUAL PEENING

A.1 SCOPE

A.1.1 Purpose

Appendix A, in addition to the main specification requirements stated above, covers the manual movement of the part through the shot stream or the movement of the shot stream over the part or both.

A.1.2 Application

Manual peening, when authorized (see 1.7.1), is typically used for, but not limited to, repair and touch-up peening or when the geometry of a part is such that mechanical movement of the nozzle(s) or part or both, will not facilitate coverage in all areas that require peening, or when the part quantities or size would make automated machine set up impractical. Only operators qualified in accordance with this specification may perform manual peening.

A.2 REQUIREMENTS

A.2.1 Peening Machine

A.2.1.1 The machine shall provide a means of propelling, at a controlled rate, media with air pressure against the part. The operator shall move either the part through the media stream or the media stream over the part in either translation, rotation, or both, as required.

A.2.1.2 The machine shall be capable of consistently reproducing the required shot peening intensities.

A.2.2 Operator Qualification

A.2.2.1 Operators performing manual shot peening shall be qualified to the requirements of this specification.

A.2.2.2 The peening processor shall have an internal procedures for the training and qualification of manual peening operators that meets the requirements of this specification.

A.2.2.2.1 Training shall include instruction in use of manual peening equipment, peening procedures including but not limited to: shot size, intensity, consistent shot flow, nozzle stand off, angle of impingement, and movement.

A.2.2.3 Qualification Tests

The following tests shall demonstrate conformance to the requirements of this specification. The test shall include demonstration of operator skill in obtaining consistency of shot peening intensity and coverage.

A.2.2.3.1 Creation of Saturation Curves

A.2.2.3.2 The operator shall create two saturation curves at two different intensities.

A.2.2.3.3 Establishment of Coverage Requirements

A.2.2.3.4 The operator shall manually peen all specimens in A.2.2.6 to full coverage at one of the intensities used in A.2.2.3.1.1.

A.2.2.3.5 The coverage specimens and saturation curves shall be reviewed by the quality control organization for conformance to the requirements of AMS2430. Failure of any test specimen shall require retest of the failed specimen. Only one retest of each specimen is permitted. Failure of a retest necessitates additional training before another retest is permitted.

A.2.2.3.6 Upon acceptance of specimens and saturation curves the operator shall be qualified.

A.2.2.4 Requalification

Operators shall be requalified on an annual basis.

A.2.2.5 Operator Qualification Record

A.2.2.5.1 The peening facility shall be responsible for retaining records of all operator qualifications.

A.2.2.6 Specimens

A.2.2.6.1 Plate

Minimum of 4 inches square to simulate shot peening of flat surfaces.

A.2.2.6.2 Angle

Minimum of 1 inch x 1 inch x 8 inches long with 0.125 inch internal radii to simulate shot peening of a radius.

A.2.2.6.3 Hole

Having a depth to diameter ratio of 2:1.

A.2.2.6.4 Material

A.2.2.6.5 Steel

Any alloy with 180 to 300 ksi UTS.

A.2.2.6.6 Aluminum

Any alloy that is aged or cold worked.

A.3 PEENING PROCESS

A.3.1.1 If the operator is changed during the peening of a lot of parts, the new operator shall perform an intensity verification per 4.2.1.1 before resuming peening of the lot.

APPENDIX B - BATCH PEENING

B.1 SCOPE

B.1.1 Purpose

Appendix B, in addition to the main specification requirements stated above, covers tumble peening, barrel peening, or other method, where the movement of the parts relative to the shot stream is not fixtured, thus allowing random peening coverage.

B.1.2 Application

Batch peening, when authorized (see 1.7.2), is typically used for, but not limited to, simultaneously peening quantities of parts without the use of a part holding fixtures. Parts shall not be peened which are subject to interlocking in a manner that causes masking or shading of areas required to be peened or cause damage to adjacent parts due to part-to-part contact. Parts that are typically packaged in bulk, such as springs, gears or other relatively small components, are commonly peened in this fashion. Parts which are packaged so as to constrain movement thus preventing part-to-part contact during transit typically would not be batch peened.

B.2 REQUIREMENTS

B.2.1 Peening Machine

B.2.1.1 The machine shall provide a means of propelling, at a controlled rate, media with air pressure against the part. The tumbler or barrel shall move either the part through the media stream part in either translation, rotation, or both, as required.

B.2.1.2 The machine shall be capable of consistently reproducing the required shot peening intensities.

B.2.2 Operator Qualification

B.2.2.1 Operators performing batch peening shall be qualified to the requirements of this specification.

B.2.2.2 The peening processor shall have an internal procedure for the training and qualification of batch peening operators that meets the requirements of this specification.

B.2.2.2.1 Training shall include instruction in use of batch peening equipment, peening procedures including but not limited to: shot size, intensity, consistent shot flow, nozzle stand off, angle of impingement, and movement.

B.2.2.3 Qualification Tests

The following tests shall demonstrate conformance to the requirements of this specification. The test shall include demonstration of operator skill in obtaining consistency of shot peening intensity and coverage.

B.2.2.3.1 The operator shall create two saturation curves at two different intensities.

B.2.2.3.2 Establishment of Coverage Requirements

B.2.2.3.3 The operator shall batch peen a represented sample of parts to full coverage at the required intensity range.

B.2.2.3.4 The coverage results and saturation curves shall be reviewed by the quality control organization for conformance to the requirements of AMS2430. Failure of any test part shall require retest of the failed part. Only one retest of each part is permitted. Failure of a retest necessitates additional training before another retest is permitted.

B.2.2.3.5 Upon acceptance of parts and saturation curves the operator shall be qualified.

B.2.2.4 Requalification

Operators shall be requalified on an annual basis.

B.2.2.5 Operator Qualification Record

B.2.2.5.1 The peening facility shall be responsible for retaining records of all operator qualifications.

B.3 PEENING PROCESS

B.3.1.1 If the operator is changed during the peening of a lot of parts, the new operator shall perform an intensity verification per 4.2.1.1 before resuming peening of the lot.