SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS3346 | REV. G

Issued 1956-07
Reaffirmed 2001-10
Revised 2013-07

Superseding AMS3346F

Silicone Rubber
1000 psi (6.89 MPa) Minimum Tensile Strength
55 - 65 Durometer

RATIONALE

AMS3346G Specification was updated for the five year review.

1. SCOPE

1.1 Form

This specification covers a silicone rubber material that can be used to manufacture product in the form of sheet, strip, tubing, molded shapes, and extrusions.

This specification should not be used to address products such as O-rings, compression seals, O-ring cord, and molded-in-place gaskets.

1.2 Application

These products have been used typically for parts required to operate or seal at temperatures from -130 to +401 °F (-90 to +205 °C), compounded especially for high strength, but usage is not limited to such applications. Silicone elastomer is resistant to deterioration by weathering and aircraft piston engine oil and remains flexible over the temperature range noted. These products are not normally suitable for use in contact with gasoline or aromatic fuels and low-aniline-point petroleum-base fluids due to excessive swelling of the elastomer.

1.3 Terms / Definitions

1.3.1 “Material”

The mixed rubber compound used to manufacture product.

1.3.2 “Product”

The ‘end product’ being supplied to the contract/purchase order originator, usually in the form(s) specified in 1.1 above.

1.3.3 “Lot”

Shall be all products from the same batch of compound processed in one continuous run and submitted for inspection at one time. The material batch size allowed to form any single inspection lot of product shall not exceed 500 pounds (227 kg).

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1.3.4 “Batch”

Shall be the quantity of compound run through a mill or mixer at one time.

(Note: Smaller batches of mixed compound may be formed into a larger batch by utilizing a cross blending process that insures the homogenous nature of the newly formed larger batch. When utilizing this process all ingredient traceability of the smaller batches must be maintained and directly tied to the resulting larger batch. Only the resulting larger batch needs to be subject to Batch Acceptance Testing requirements of this specification.)

1.3.5 “Mixer”

The vendor in the supply chain that performs the actual mixing of the Rubber Compound utilized to produce product.

1.3.6 “Masterbatch”

A batch of compound that has been mixed to completely incorporate most of the compound ingredients, omitting the active chemicals that constitute the cure system. Typically for silicone compounds this includes catalysts and color pigments.

1.3.7 “Material Rework”

Minor adjustments made to the existing ingredient content levels of a compound recipe, while remaining within the tolerance limits specified in the recipe, which may enhance physical properties or processability performance, yet still maintain the original compound identity.

1.4 Safety Hazardous Materials

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

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 724-776-4970 (outside USA), www.sae.org.

AMS2279 Tolerances, Rubber Products

AMS2810 Identification and Packaging, Elastomeric Products

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 D 297 Standard Test Methods for Rubber Products - Chemical Analysis ASTM D 395 Standard Test Methods for Rubber Property - Compression Set

ASTM D 412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension

ASTM D 471 Standard Test Methods for Rubber Property - Effect of Liquids ASTM D 573 Standard Test Method for Rubber - Deterioration in an Air Oven

ASTM D 624 Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers

ASTM D 2137 Standard Test Methods for Rubber Property - Brittleness Point of Flexible Polymers and Coated Fabrics

ASTM D 2240 Standard Test Method for Rubber Property - Durometer Hardness

ASTM D3182 Standard Practice for Rubber – Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets.

3. TECHNICAL REQUIREMENTS

3.1 Material

Shall be a compound, based on a silicone rubber, suitably cured to produce a product meeting the requirements of 3.2.

3.1.1 Toxicological Formulations

The material shall have no adverse effects on the health of personnel when used for its intended purpose in accordance with manufacturer's instructions and with appropriate handling procedures.

3.1.2 Color

The color of the material shall be as specified on available design data or per customer contract. When no color is specified, the color shall be the natural color of the compound furnished.

3.2 Physical Properties

The product shall conform to the requirements shown in Table 1; tests shall be performed in accordance with specified ASTM methods, insofar as practicable (also see 4.2.3).

TABLE 1 - PROPERTIES

Paragraph	Test	Requirement	Test Method
3.2.1	Original Properties		
3.2.1.1	Hardness, Durometer "A" or equivalent	60 ± 5	ASTM D 2240
3.2.1.2	Tensile Strength, minimum	1000 psi (6.89 MPa)	ASTM D 412, Die B or C
3.2.1.3	Elongation, minimum	400%	ASTM D 412, Die B or C
3.2.1.4	Tear Strength, minimum	150 pounds force/inch (26.3 kN/m)	ASTM D 624, Die B
3.2.1.5	Specific Gravity	Preproduction Value ± 0.03	ASTM D 297
3.2.2	Petroleum Lubricating Oil Resistance		ASTM D 471 ASTM Oil No. 1 150 °C ± 3 (302 °F ± 5) 70 hours ± 0.5
3.2.2.1	Hardness Change, Durometer "A" or equivalent	-10 to +5	
3.2.2.2	Tensile Strength Change, maximum	-25%	
3.2.2.3	Elongation Change, maximum	-35%	
3.2.2.4	Volume Change, maximum	0 to +15%	
3.2.3	Dry Heat Resistance		ASTM D 573 200 °C ± 3 (392 °F ± 5) 70 hours ± 0.5
3.2.3.1	Hardness Change, Durometer "A" or equivalent	0 to +20	
3.2.3.2	Tensile Strength Change, maximum	-40%	
3.2.3.3	Elongation Change, maximum	-50%	
3.2.4	Compression Set		ASTM D 395, Method B 175 °C ± 3 (347 °F ± 5) 22 hours ± 0.5
3.2.5	Percent of Original Deflection, maximum	55	
3.2.6	Low-Temperature Resistance		
3.2.6.1	Brittleness	Pass	ASTM D 2137, Method A -90 °C ± 3 (-130 °F ± 5)

3.3 Product Quality

The product, as received by purchaser, shall be uniform in quality and condition, smooth, as free from foreign materials as commercially practicable, and free from imperfections detrimental to usage of the product.

3.4 Dimensions and Tolerances

Dimensions and tolerances shall be as specified in the parts standard, drawing, other design data, or purchase document, and shall conform to all applicable requirements of AMS2279.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of the product shall be responsible to assure that all required material testing and product inspection has been performed and that the data is available. Unless specified otherwise by contractual requirements, testing may be performed either at the product vendor's own test facility, at the mixer, or at a suitable independent test facility. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Preproduction Testing

Preproduction Testing shall consist of all of the Physical Property requirements listed in Table 1 and shall be performed prior to certification of materials to this Specification. Compound preproduction testing is valid for a period of three (3) years or until preproduction re-testing may be required (See 4.2.1.1). Objective evidence of this testing must be kept on file and available for review during the validity period.

4.2.1.1 Preproduction retesting shall be required if one of the following occurs:

- At the end of the current three year Preproduction Testing validity period – or;
- When a change in ingredients and/or processing requires re-approval as in 4.5.2 - or;
- Upon three consecutive failures of batch Acceptance Testing – or,
- When the Purchaser contractually requires that Preproduction Testing be performed.

4.2.2 Acceptance Tests

The following requirements are acceptance tests and shall be performed on each batch of mixed compound (See 4.1): Each production batch that may have been drawn from a larger uncatalyzed masterbatch, and then had the catalyst incorporated, shall be subject to this requirement.

Hardness, Original Properties (3.2.1.1)

Tensile Strength, Original Properties (3.2.1.2)

Elongation, Original Properties (3.2.1.3)

Specific Gravity, Original Properties (3.2.1.5)

Compression Set, (3.2.4)

4.2.3 Test Samples

4.2.3.1 For Preproduction Testing, specimens shall be prepared from 6 inch (152 mm) square by 0.075 inch ± 0.008 (1.90 mm ± 0.20) thick molded test slabs per ASTM D3182 compounded for the same intended curing process as the end product.

4.2.3.2 For Acceptance Testing, sufficient material shall be taken at random from each lot of product to provide specimens to perform all required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three (See 4.2.3.3 below). If specimens cannot be prepared from the product, test specimens prepared from the same batch of material and in the same state of cure as the product shall be used. At a minimum, specific gravity tests shall be conducted on the end item or a section removed from the end item (except as noted in 4.2.3.2.3 below).

4.2.3.2.1 If the product supplied is an extrusion of such shape that suitable test specimens cannot be cut from the product, then a separate extruded flat strip test sample, 3.0 inches ± 0.25 (76.2 mm ±6.4) by 0.075 inch ± 0.008 (1.90 mm ±0.20) thick, produced from the same production batch of compound, in the same state of cure as the product being supplied, shall be used to prepare test specimens.

4.2.3.2.2 When the product is a molded item of such shape that suitable test specimens cannot be cut, a slab 6 inches (152 mm) square by 0.075 inch ± 0.008 (1.90 mm ± 0.20) thick per ASTM D 3182, molded from the same batch of compound, in the same state of cure as the product being supplied, shall be used to prepare test specimens.

4.2.3.2.3 When the mixer of the material is not the actual manufacturer of the end product, specimens shall be prepared from 6 inch (152 mm) square by 0.075 inch ± 0.008 (1.90 mm ± 0.20) thick molded test slabs per ASTM D3182, catalyzed and cured equivalent to the intended curing process for the end product.

4.2.3.3 Specimen Test Values

All individual specimen test result values used to determine pass/fail criteria must be within acceptable limits as indicated in Table 1. Where Test Methods dictate that results be reported as Average or Median values, ‘failed’ values shall not be allowed in these calculations (See 4.2.4).

4.2.4 Retesting and Rework

4.2.4.1 If any specimen fails to meet the pass/fail criteria as listed in Table 1, a retesting of three (3) additional specimens with acceptable results for each nonconforming specimen, shall be necessary for acceptance. The same material batch as was used for the failed test shall be used for retesting. Failure of any retest specimen shall be cause for rejection of the batch along with the rejection of any product that may have been produced from the batch. Results of all tests shall be reported. Records of all rejections and material rework shall be maintained.

4.2.4.1.1 Individual specimen failures that occur due to obvious flaws in the specimen itself or because of mechanical failure of the test equipment, may be disregarded with only a single retest specimen required for acceptance. All such occurrences must be recorded.

4.2.4.2 Any rejected batch that has undergone material rework because of failed Acceptance Testing must be retested to the full Acceptance Criteria, not just the failed test.

4.2.4.2.1 No batch may be reworked more than two (2) times.

4.3 Sampling

When a statistical sampling plan for product acceptance has been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan and the report of 4.6 shall state that such plan was used, Otherwise sampling shall be in accordance with ANSI/ASQ-Z1.4, Single Sampling Plan, Inspection Level II, AQL 1.0, except that the acceptance number shall be zero (0).

4.4 Certification

Certification to this Material Specification shall only be permitted if all testing requirements specified in 4.2 have been met.