SAE Aerospace
An SAE International Group

AEROSPACE STANDARD

SAE AS5502 | REV. C

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Superseding AS5502B

(R) Standard Requirements for Aerospace Sealants and Adhesion Promoters

RATIONALE

Five-year update. Many terms were clarified to correlate to current AMS specification revisions. Changed requalification requirement for some materials from 5 years to 7 years.

1. SCOPE

This document establishes standard requirements for aerospace sealants and adhesion promoters, which may be incorporated as part of Aerospace Material Specifications (AMS) for such products. This document provides for commonality of methods and procedures for responsibility for inspection, source inspection, classification of tests, establishment of/and qualification to qualified products lists, approval, reports, resampling and retesting, packaging, and marking.

1.1 Safety - Hazardous Materials

While the materials, methods, applications, and processes described or referenced in this standard may involve the use of hazardous materials, this standard 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. Refer to the specific product's Materials Safety Data Sheet (MSDS) or Safety Data Sheet (SDS) for health and safety information.

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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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.

AS7001 National Aerospace and Defense Contractors Accreditation Program (Nadcap) - Program Description

AS7002 National Aerospace and Defense Contractors Accreditation Program (Nadcap) - Rules for Implementation

AS7003 Nadcap - Program Requirements

AS9100 Quality Management Systems - Requirements for Aviation, Space and Defense Organizations

AS9120 Quality Management Systems - Requirements for Aviation, Space and Defense Distributors

2.2 PRI Publications

Available from Performance Review Institute, 161 Thorn Hill Road, Warrendale, PA 15086-7527, Tel: 724-772-1616, www.pri-network.org.

AC7200/1 Nadcap Requirements for the Sealant Manufacturers' Accreditation Program

AC7202 Nadcap Requirements for the Sealant Value Added Distributor Accreditation Program

PD2000 Governance and Administration of an Industry Managed Product Qualification Program

PD2001 Manufacturer Request for Product Approval and Qualification Process

PD2103 Aerospace Quality Assurance, Product Standards, Qualification Procedure, Sealants

3. TECHNICAL REQUIREMENTS

For purposes of this standard, sealant shall be synonymous with "sealing compound".

Technical requirements for a specific class of sealant or adhesion promoter shall be defined by the Aerospace Material Specification (AMS). In case of conflict in requirement(s), the AMS takes precedence over this Aerospace Standard (AS).

3.1 Date of Manufacturing, Date of Packaging, and Conformance Testing

3.1.1 Date of Manufacturing (DOM)

Date of Manufacturing (DOM) is defined as the last day of Initial Acceptance Tests per 4.2.2 as dated on the applicable test report.

3.1.2 Date of Packaging (DOP)

For sealants, the Date of Packaging (DOP) is defined as the date that bulk sealant is packaged from its components, base compound and curing agent, by the manufacturer or value added distributor (repackager). Date of Packaging shall be no more than 90 days from the DOM or the most recent Conformance Testing per 3.1.3.

For adhesion promoters, the Date of Packaging (DOP) is defined as the date that the bulk adhesion promoter is packaged into smaller container sizes per AMS3100 Section 5. (Note: The shelf life of the adhesion promoter is based on the DOM per AMS3100 paragraph 3.4.)

3.1.3 Conformance Testing (CT) for Packaging Extensions - Sealant Only

Conformance Testing (CT) shall be performed within 90 days of the bulk material DOM to extend the time for packaging material. The material shall be limited to a maximum of two 90-day extensions, and shall be limited to a maximum of 270 days from the DOM. The 1st Conformance Testing requires performing the Final Acceptance Tests of the applicable AMS. The 1st conformance testing may be performed by the manufacturer or, with the manufacturer's approval, by approved value added distributors (repackagers). The 2nd Conformance Testing requires performing the Initial Acceptance Tests of the applicable AMS, and shall be performed by the manufacturer within 90 days of the 1st Conformance Testing. The following diagram describes the extension procedure for packaging:

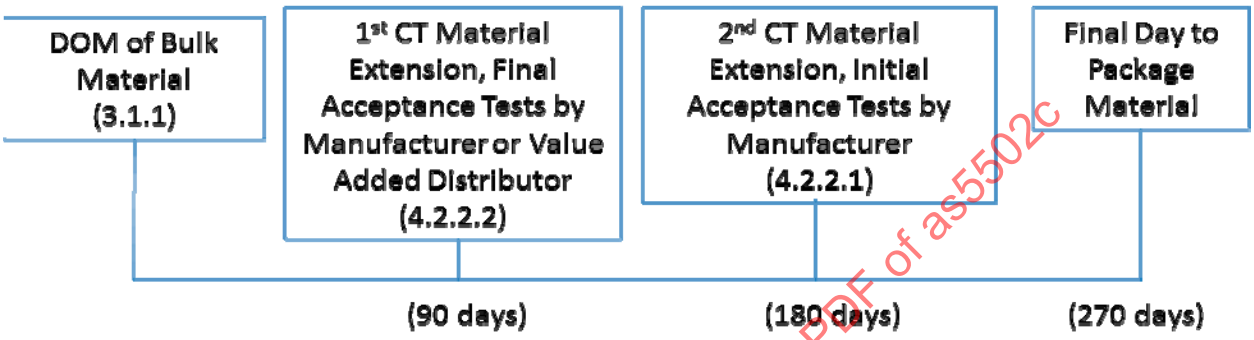

FIGURE 1

3.2 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 Materials Safety Data Sheets (MSDS) or Safety Data Sheet (SDS) and with appropriate handling procedures. Questions pertinent to this effect shall be referred by the contracting activity to the appropriate medical service who will act as an advisor to the contracting agency.

3.3 Quality

3.3.1 Sealant Quality

The sealant's base compound and curing agent, as received by the purchaser, shall each be of uniform blend and shall be free of excessive air, skins, lumps, and gelled or coarse particles that could interfere with the application of the material and its function. There shall be no separation of ingredients which cannot be easily redispersed.

3.3.2 Adhesion Promoter Quality

The adhesion promoter, as received by the purchaser, when visually examined, shall be uniform in quality and condition, free of sedimentation and turbidity, and free from foreign materials, particulate matter, and other contaminates detrimental to use of the adhesion promoter. Material packaged in aerosol containers may be sprayed into a clear glass container to determine appearance.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The manufacturer of the material shall supply all samples and shall be responsible for performance of all required tests. Purchaser reserves the right to sample and perform any confirmatory testing deemed necessary to ensure that the material conforms to the requirements of the applicable AMS.

4.1.1 Source Inspection (Nadcap)

Each batch of material procured under specifications referencing this standard shall be third party approved prior to shipment to ensure that material meets acceptance tests (as defined by the AMS). Third party approval shall be by a third party accreditation process in accordance with AS7001, AS7002, AS7003, and AC7200/1. Also, the manufacturer of the sealant or adhesion promoter shall hold a third party accreditation in accordance with AC7200/1. Value added distributors (repackagers) and pass-through distributors supplying sealant or adhesion promoter shall supply material from an accredited manufacturer and from a batch of material that has been third party source inspected. Value added distributors shall also be third party accredited in accordance with AC7202, Pass-through distributors shall be certified in accordance with AS9100 or AS9120.

4.1.2 Sampling

Shall be in accordance with 4.3.1.

4.2 Classification of Tests

4.2.1 Qualification Tests

All technical requirements are qualification tests and shall be performed prior to or on the initial shipment of the material by the manufacturer. Compliance testing is required when a change in ingredients and/or processing requires reapproval as in 4.4.2, or when the SAE AMS G-9 QPG (Qualified Products Group) deems it necessary. The compliance tests will be defined by the SAE AMS G-9 QPG.

4.2.2 Acceptance Tests

4.2.2.1 Initial Acceptance Tests

Technical requirements that are tested on each batch of material are initial acceptance tests. Initial acceptance tests are performed after production, but before repackaging.

4.2.2.2 Final Acceptance Tests

Final acceptance tests shall be performed on each lot of material after packaging or repackaging as applicable.

4.2.2.2.1 Final Acceptance Tests for Sealant Can Kits (Cans, Pails, or Drums)

4.2.2.2.1.1 No final acceptance tests are required.

4.2.2.2.1.2 A fill weight check must be performed on a minimum of one kit per production run.

4.2.2.2.2 Final Acceptance Tests for Sealant Injection Kits

4.2.2.2.2.1 Test one kit per base compound/curing agent combination, regardless of how many different sizes of kits are produced, in accordance with the following conditions:

a. Dedicated Equipment: If the base compound/curing agent combination is run on dedicated equipment, kit testing does not need to be repeated if runs are done on different days.

b. Non-dedicated Equipment: If another material was used on the equipment, another kit must be tested when the next run begins.

c. Hand-filling: If the material is filled by hand, kit testing does not need to be performed if the same base compound/curing agent combination packaged by another process has been tested. If the base compound/curing agent combination has not been packaged by another process, then a kit must be tested.

4.2.2.2.2.2 A fill weight check must be done on at least one kit of each kit size per run.

4.2.2.2.2.3 The following tests are required, unless the AMS directs otherwise:

a. Application time

b. Tack-free time

c. Cure time

d. Flow (if applicable)

4.2.2.2.3 Final Acceptance for Pre-mixed and Frozen (PMF) Sealant Cartridges

4.2.2.2.3.1 Test a minimum of one cartridge per run for Class B materials and three cartridges (from the beginning, middle, and end of the run) for Class A and Class C materials. The Classes are defined in the applicable AMS specification.

NOTE: A weight ratio check is required at the start of each production run.

4.2.2.2.3.2 The following tests are required, unless the AMS directs otherwise:

a. Application time

b. Tack-free time

c. Cure time

d. Flow (if applicable)

4.2.2.2.3.3 Button Board Inspection

4.2.2.2.3.3.1 For Class B materials, and cartridges 2.5 oz or larger, the operator extrudes a small amount of product from each sequentially numbered cartridge onto a correspondingly numbered square on the button board. For Class B materials and cartridges smaller than 2.5 oz, a small amount of product from every tenth cartridge shall be extruded onto a correspondingly numbered square on the button board.

4.2.2.2.3.3.2 Button board sealant may be subject to accelerated cure.

4.2.2.2.3.3.3 Inspection criteria on 100% buttons

a. Visual: Uniform color, mix, and texture, no streaks, free of flakes, grit or foreign objects

b. Cure: Uniform solid rubbery state, tack-free to touch

c. Air: No sponginess or excessive air - “Excessive air” is defined as 20% or more porosity of the internal surface area of the halved button.

NOTE: For PMF cartridges 2.5 oz or larger being filled using a continuous mixing machine, either with dynamic or static mixing heads, the cartridge corresponding to a discrepant button and the one following shall be discarded. If another PMF cartridge filling process is used, the corresponding cartridge and the one before and after shall be discarded.

For each discrepant button of cartridges smaller than 2.5 oz, the corresponding cartridge and the nine before and ten after, corresponding to the fill process, shall be discarded.

4.2.2.2.4 Final Acceptance Tests for Pre-mixed and Frozen Sealant Used to Fill Pre-molded Sealant Caps

The following tests, to be performed on a sample of the pre-mixed and frozen sealant are required, unless the AMS directs otherwise:

a. Application time

b. Tack-free time

c. Cure time

d. Flow (if applicable)

4.2.2.2.5 Final Acceptance Tests for One Part Cartridge

The following tests are required, unless the AMS directs otherwise:

a. Tack-free time

b. Cure time

c. Flow (if applicable)

4.2.2.2.6 Final Acceptance Tests for Adhesion Promoter are the following unless the AMS specification directs otherwise:

4.2.2.2.6.1 Color, when applicable, shall be uniform and impart a stain on the substrate when dried.

4.2.2.2.6.2 Appearance shall be uniform in quality and condition, free of sedimentation and turbidity, and free from foreign materials, particulate matter, and other contaminants detrimental the use of the adhesion promoter.

4.3 Sampling and Testing

4.3.1 For Initial and Final Acceptance Tests

Sufficient material shall be taken at random from each batch or lot 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. Multiple testing is not required for color, viscosity, application time, flow, tack-free time, and cure time.

4.3.1.1 A batch shall be the quantity of material run through a mill or mixer at one time. A lot shall be the quantity of repackaged material in a production run.

4.3.1.2 Requirement is deleted. Paragraph is empty so that other paragraph numbers will numerically correspond to the AMS specification.

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4.3.1.5 Requirement is deleted. Paragraph is empty so that other paragraph numbers will numerically correspond to the AMS specification.

4.4 Approval

4.4.1 For products without a Qualified Products Lists (QPL) requirement, purchaser shall approve the sealing compound or adhesion promoter before the sealing compound or adhesion promoter is supplied for production use, unless the purchaser waives such approval. Results of tests on the production sealing compound shall be essentially equivalent to those on the approved sample.

4.4.2 Manufacturer shall use ingredients, manufacturing procedures, processes, and methods of inspection on production materials which are essentially the same as those used on the qualified sample. If it is necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, the manufacturer shall submit a statement of the proposed changes for reapproval and, when requested, a product sample. Products listed on AMS Qualified Products Lists (QPLs) shall be submitted for approval in accordance with PD2103. Production product made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports

With each shipment, the supplier of the material shall furnish a report showing the results of tests to determine conformance to the Initial Acceptance Test requirements, and stating that the product conforms to the other technical requirements of the applicable AMS specification. This report shall include the purchase order number, batch/lot number, AMS designation, Type, Class, and Grade (as defined in the AMS), and manufacturer's identification. Other reports such as the Final Acceptance Test Report and the Packaging Extension Test Report shall be supplied upon request.

For the Initial Acceptance Tests for batches of materials produced with source inspection, reports shall be stamped by the third party source inspector (Nadcap). The source inspection stamp is not required for subsequent test reports.

4.6 Resampling and Retesting

If any specimen used in the tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional specimens for each nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented. Results of all tests shall be reported.

4.7 Qualification

Specifications which require a Qualified Products List (QPL) to be maintained by the Performance Review Institute shall include the following provisions:

All products sold to an AMS shall be listed, or approved for listing, on the qualified products list, PRI QPL AMS designation. The qualified products list shall be in accordance with PD2000, PD2001, and PD2103.

NOTE: It is unacceptable to sell products to an AMS that are not listed on the QPL. Language such as "conforms to," "in accordance with," "tested to," "meets," or other similar language shall not be used to imply or promote the perception that the products are qualified. When referencing the technical properties of a non-listed product to an AMS, the manufacturer shall clearly indicate the product is not qualified to the referenced specification. Language such as "tested in accordance with but not qualified to AMSXXXX" is acceptable.

For the sealant or adhesion promoter to be included on the Qualified Products List (QPL), manufacturers are required to submit their materials in accordance with PD2000, PD2001, and PD2103. The SAE AMS G-9 Qualified Products Group (QPG) evaluates the products that are submitted for listing. The organization responsible for the QPL is the Performance Review Institute, 161 Thorn Hill Road, Warrendale, PA 15086-7527, Tel: 724-772-1616, Fax 412-772-1699, www.pri-network.org. Information pertaining to qualification of sealant or adhesion promoter may be obtained from that organization. For materials that are subject to source inspection per 4.1.1, qualifications shall be re-approved every seven years in accordance with PD2000, PD2001, and PD2103, and the instructions from the Performance Review Institute. All other qualifications shall be re-approved every five years in accordance with PD2000, PD2001, and PD2103, and the instructions from the Performance Review Institute. The SAE AMS G-9 QPG has the authority to grant the Performance Review Institute responsibility for approving QPL listings based solely on the supplier's corporate identification.