



AEROSPACE RECOMMENDED PRACTICE

ARP5316™**REV. E**

Issued 1998-11
Revised 2014-10
Cancelled 2018-10

Superseded by AS5316D

Storage of Elastomer Seals and Seal Assemblies Which
Include an Elastomer Element Prior to Hardware Assembly

RATIONALE

This document is being cancelled and replaced by AS5316.

CANCELLATION NOTICE

This Technical Report has been declared "CANCELLED" as of October, 2018, and has been superseded by AS5316. By this action, this document will remain listed in the respective index, if applicable. Cancelled Technical Reports are available from SAE.

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1. SCOPE

This SAE Aerospace Recommended Practice (ARP) addresses the general requirements for data recording procedures, packaging, and storing of elastomeric seals and seal assemblies which include an elastomeric element prior to the seal being assembled into hardware components. It applies specifically to those elastomeric seals and seal assemblies packaged shortly after manufacture. The storage period prior to installation of the elastomeric seals and seal assemblies into hardware components is commonly referred to as shelf life.

The information contained in this ARP is intended to be utilized by those organizations who do not have specific requirements or recommendations already in place for the control of elastomeric seals and seal assemblies. This ARP can be specified in control, storage, and procurement documents. However, when the requirements of this document are in conflict with the customer's requirements or specifications, the requirements of the customer's detailed specification shall govern.

1.1 Disclaimer

This document does not establish limitations or storage times for assembled components nor the operating life of said components.

2. REFERENCES

2.1 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.

2.1.1 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.

AMS2817	Packaging and Identification, Preformed Packings
AS1933	Age Controls for Hose Containing Age-Sensitive Elastomeric Material

2.1.2 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 D1418	Standard Practice for Rubber and Rubber Latices - Nomenclature
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2.1.3 Electric Power Research Institute Publications

Available from EPRI, 3420 Hillview Avenue, Palo Alto, CA 94304, www.epri.com.

NP-6608	Shelf Life of Elastomeric Components
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2.1.4 U.S. Government Publications

Available from DLA Document Services, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6396, <http://quicksearch.dla.mil/>.

AFML-TR-67-235	Literature Survey on the Effects of Long-Term Shelf Aging of Elastomer Materials
ANA Bulletin 438	Age Control of Age-Sensitive Elastomeric Items
DOD 4140.27.M	Shelf Life Management Manual
MIL-HDBK-695	Rubber Products: Recommended Shelf Life
MIL-STD-1523	Age Control of Age-Sensitive Elastomeric Materials

2.2 Definitions

- 2.2.1 ELASTOMER: A material that possesses elastic properties and has undergone vulcanization and/or conversion into a finished product.
- 2.2.2 SEAL: An elastomeric finished product or an assembly with an elastomeric element which prevents the excursion of media on one side of the product from migrating to the other side.
- 2.2.3 STORAGE LIFE: The maximum period of time, starting from the time of manufacture, that an elastomeric seal element, appropriately packaged, may be stored under specific conditions, after which time it is regarded as unserviceable for the purposes for which it was originally manufactured. The time of manufacture is the time of cure for thermoset elastomers or the time of conversion into a finished product for thermoplastic elastomers.
- 2.2.2 HARDWARE COMPONENT: The unit in which the elastomeric seal element is placed.

3. BACKGROUND

Listed below is the background information which led to the creation of this Aerospace Recommended Practice.

3.1 MIL-STD-1523

Age control was imposed on elastomers used in critical sealing devices of aircraft hydraulic, lubricating, and fuel systems after World War II. Several different requirements and specifications were implemented in the years following the war until 1958 when ANA Bulletin 438 was released. This bulletin's purpose was to collect all previous requirements for age control in one document and to make it easier for various agencies and contractors to effectively implement age control. However, confusion in interpretations resulted in abuses, cost increases and inconsistently imposed exceptions.

Many other programs were then undertaken to study age control. The results of many of these were summarized in the Air Force report, AFML-TR-67-235. The conclusion of the studies summarized in this report and others that were in progress was that the overall properties of elastomeric materials were much improved over the materials initially evaluated and age control should be made less restrictive. As a result of this information, MIL-STD-1523 was released in 1973 and superseded ANA Bulletin 438. One of the basic requirements of the new document was to provide a cure date limitation of twelve quarters from cure date to acceptance of the seals by the original procuring activity, whether a government agency, a first or second contractor or an organization which assembles seal and hardware kits. In all cases, the use of cure date was intended to provide for good FIFO (First In - First Out) warehousing procedures.

On February 1, 1984, MIL-STD-1523A was issued to supersede MIL-STD-1523. This revision was targeted at eliminating the confusion in interpretation of the previous document. It also extended cure date requirements from 12 quarters to 40 quarters. MIL-STD-1523A controlled the age of elastomers only at time of acceptance by the government. This meant that the cure date of each elastomer had to be known at the time a system was accepted by the government.

Even with the clarifications of MIL-STD-1523A, confusion still existed and the discussion regarding the need for age control continued.

3.2 EPRI NP-6608

In June, 1989, Bruce Boyum and Jerral Rhoads presented an IEEE Paper: "Elastomer Shelf Life: Aged Junk or Jewels" - IEEE Transactions on Energy Conversion, Vol.4, No.2, pp 191-203, June, 1989. After a detailed review of the information from previous studies and the age control documents including MIL-HDBK-695C, they concluded that age control limits were very conservative and shelf life could be extended as long as proper storage conditions were maintained.

This was followed up in May, 1994 by EPRI NP-6608, "Shelf Life of Elastomeric Components". The conclusion of this detailed study was that with proper storage, shelf life for elastomer seals could be extended to 32 years.

3.3 AS1933A

Based upon the data from the numerous studies concerning age control and shelf life, MIL-STD-1523A was canceled on January 30, 1995 - without replacement but reference was made to AS1933A. This action, in essence, released aerospace elastomers from age control.

In the time since the cancellation of MIL-STD-1523A confusion has reigned. Contractors are not aware of the history of age control and still insist on it. Quality organizations are not only still insisting on age control but are now using AS1933A for seals or referring to MIL-HDBK-695C.

Some of the insistence for age control is due to the requirement that the latest revision of specifications must be used and if age control or cure date requirements are removed, there is no traceability to specification revisions. In addition, organizations are concerned about FIFO requirements being maintained.