



AEROSPACE INFORMATION REPORT	AIR1364™	REV. C
	Issued 1975-05 Reaffirmed 2003-12 Revised 2018-04 Stabilized 2024-11	
Superseding AIR1364B		
Age Control of Age Sensitive Elastomeric Materials		

RATIONALE

AIR1364C stabilizes this document because this document contains mature technology that is not expected to change and thus no further revisions are anticipated.

STABILIZED NOTICE

This document has been declared "STABILIZED" by SAE AMS CE Elastomers Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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FOREWORD

The scope of this document is limited to nitrile elastomers and their blends.

MIL-STD-1523A, "Age Controls of Age-Sensitive Elastomeric Materiel (For Aerospace Applications)", requiring maximum ages of age sensitive elastomeric items for use in military aircraft and missiles and for space vehicles at the time of acceptance, was cancelled on 30 January 1995. The cancellation notice for MIL-STD-1523A replaces it by AS1933 for hose applications and ARP5316 for seal applications. In addition, MIL-HDBK-695 is applicable for all elastomeric parts not covered by these two specifications.

U.S. military specifications for nitrile rubber O-rings such as MIL-P-5315, MIL-P-5510, MIL-P-25732, and MIL-P-83461 [and their replacements AMS-P-5315, AMS-P-5510, and AMS-P-83461], which were formerly controlled by MIL-STD-1523A, are now age controlled by the three specifications cited in the paragraph above.

The following text is unchanged from the 1975 revision (except where indicated) and is republished for historical purposes.

1. SCOPE

This SAE Aerospace Information Report (AIR) summarizes data and background relative to age control of specific classes of those nitrile type synthetic elastomers used in sealing devices which are resistant to petroleum base hydraulic fluids, lubricating oils, and aircraft fuels. This includes, but is not limited to, those nitrile (NBR or BUNA-N) elastomers previously covered by Section I of MIL-STD-1523.

1.1 Purpose

To provide users with appropriate references and information correlating past need and use of age controls with current needs and to provide summary guidelines for consideration when future use of age controls is required or contemplated.

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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.

2.2 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.

- AMS-P-5315 Acrylonitrile-butadiene (NBR) Rubber For Fuel-Resistant Seals 60 to 70
- AMS-P-5510 O-Ring, Preformed, Straight Thread Tube Fitting Boss, Type I Hydraulic (-65 to 160 °F)
- AMS-P-83461 Packing, Preformed, Petroleum Hydraulic Fluid Resistant, Improved Performance at 275 Degrees F (135 Degrees C)
- ARP5316 Storage of Elastomer Seals and Seal Assemblies Which Include an Elastomer Element Prior to Hardware Assembly
- AS1933 Age Controls for Hose Containing Age-Sensitive Elastomeric Material

2.3 U.S. Government Publications

Copies of these documents are available online at <http://quicksearch.dla.mil>.

- MIL-HDBK-695 RUBBER PRODUCTS: RECOMMENDED SHELF LIFE
- MIL-P-5315 PACKING, PREFORMED, HYDROCARBON FUEL RESISTANT (Canceled and replaced by AMS-P-5315)
- MIL-P-5510 PACKING, PREFORMED, STRAIGHT THREAD TUBE FITTING BOSS, TYPE I HYDRAULIC (-65 DEG.F TO 160 DEG.F) (Canceled and replaced by AMS-P-5510)
- MIL-P-25732 PACKING, PREFORMED, PETROLEUM HYDRAULIC FLUID RESISTANT, LIMITED SERVICE AT 275 DEG.F (135 DEG. C) - Inactive
- MIL-P-83461 PACKING, PREFORMED, PETROLEUM HYDRAULIC FLUID RESISTANT, IMPROVED PERFORMANCE AT 275 DEGREES F (135 DEGREES C) (Canceled and replaced by AMS-P-83461)
- MIL-STD-1523 AGE CONTROLS OF AGE-SENSITIVE ELASTOMERIC MATERIAL (FOR AEROSPACE APPLICATIONS) (Canceled and replaced by AS1933 and ARP5316)

2.4 Other Publications

ANA 438

3. BACKGROUND

3.1 ANA Bulletin 438

After World War II, particular concern was expressed relative to the apparent aging characteristics of the then recently developed BUNA-N and nitrile/neoprene blended elastomers being used in critical sealing devices of aircraft hydraulic, lubricating, and fuel systems.

These early compounds apparently possessed poor ozone and weather resistance characteristics and were soon classified as "age sensitive". As a result, age controls were established on these materials, initially in various general coverage government documents; when this proved unwieldy, all requirements were collected in 1958 and published in a single document, ANA Bulletin 438. Unfortunately, subsequent interpretations of this document by various agencies and contractors resulted in additions and variations in its implementation with subsequent confusion, abuses, and cost increases being incurred during enforcement of these variations.

3.2 MIL-STD-1523

At the same time age controls leading to ANA 438 were being promulgated, at least ten programs were initiated relative to evaluation of long term aging of elastomeric materials. Results of these evaluations have been summarized in an excellent Air Force report AFMA-TR-67-235. The tests indicated that, while certain mechanical properties did undergo some change with time (i.e., increases in hardness, tensile, and modulus with a corresponding decrease in ultimate elongation), these property changes tended to level off after 4 or 5 years. Further, the changes that did occur were not of sufficient magnitude to result in seal failure.

In addition to the above test programs, a large amount of performance data for "old" components containing "over-age" elastomeric seals have also been generated over the years that further indicate elastomers are less affected by aging than originally expected. Several of the more widely publicized studies involved the analysis of equipment removed from two aircraft that had crashed during WW II, one in the Libyan desert and the other on the Arctic ice cap. Functional tests performed on assemblies and mechanical property data on O-rings from these aircraft indicated that the elastomeric seals were in remarkably good condition when tested and that most of these old units functioned within their original specification limits. As the elastomeric parts removed from these two planes had probably been cured in 1941 or 1942, these materials represented the state of the art for very early nitrile or nitrile-neoprene blended compounds.

In view of the above results and the fact that overall properties of current nitrile materials are much improved over those evaluated, it was concluded that the then current age controls should be reconsidered and made less restrictive. Accordingly, MIL-STD-1523 was promulgated and when released in 1973, superseded ANA Bulletin 438. Among other considerations, this document basically provides for a cure date limitation of twelve quarters from cure date to acceptance of the seals or bulk hose by the original procuring activity, whether a government agency, a first or second tier subcontractor or kitter. In all cases, continued use of cure dates is intended to provide for good first-in/first-out warehousing procedures.

3.3 MIL-STD-1523A

MIL-STD-1523A was issued 1 February 1984, superseding MIL-STD-1523. This somewhat alleviated the burden imposed by the earlier versions. Limitation of time from cure date to acceptance was extended from 12 quarters to 40 quarters.

In both ANA Bulletin 438c and MIL-STD-1523, ages were controlled as the items moved through the development and production cycles. Acceptance for the government was done by procuring activities at intermediate stages as well as acceptance by the government of the completed system. Later acceptances depended upon previous age requirements having been met. O-rings were not controlled after installation. Both versions required that the history of an elastomeric item be known at installation. Therefore, not all elastomeric items already installed in an assembly or subassembly at acquisition were automatically acceptable for critical programs, i.e., for the acquisition of space vehicles, military aircraft, and missiles. The history of each elastomeric item had to be known at the time it was installed and its age had to fall within the limit given in the table of each version.

In MIL-STD-1523A the ages of both O-rings and hoses were controlled only at time of acceptance by the government. The limits were meant to apply to items installed in a system to be accepted by the government. Since the only age control was at acceptance, the cure date of each item had to be known at that time.