SAE Aerospace
An SAE International Group

# AEROSPACE MATERIAL SPECIFICATION

SAE AMS-C-6183 REV. A

Issued 1998-07
Reaffirmed 2007-03
Revised 2013-04

Superseding AMS-C-6183

## Cork and Rubber Composition Sheet; for Aromatic Fuel and Oil Resistant Gaskets

RATIONALE

Clarify the hardness range for the Types, update sampling and packaging requirements.

NOTICE

The initial SAE publication of this document was taken directly from U.S. Military Standard MIL-C-6183B. This Standard may retain the same part numbers established by the original military document.

Any requirements associated with Qualified Products Lists (QPL) may continue to be mandatory for DoD contracts. Requirements relating to QPLs have not been adopted by the SAE for this standard and are not part of this SAE document.





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## 1. SCOPE

### 1.1 Scope

This specification covers vulcanized sheet made of granulated cork uniformly dispersed in a synthetic rubber compound, for use in gaskets where aromatic fuel or oil resistance is required (See 6.2).

### 1.2 Classification

The sheet gasket material shall be of the following types, classes and grades, as specified (See 6.3):

#### 1.2.1 Types

Type I - Molded
Type II - Continuous roll

#### 1.2.2 Classes

Class 1 - Aromatic Fuel
Class 2 - Oil resistant

#### 1.2.3 Grades

Grade A - Soft
Grade B - Medium
Grade C - Firm

## 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 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/.

MIL-PRF-121 Barrier Material, Greaseproof, Waterproof, Flexible

MIL-STD-129 Military Marking for

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 395 Rubber Property - Compression Set

ASTM D 471 Standard Test Method for Rubber Property - Effect of Liquids

ASTM D 1418 Rubber and Rubber Latices - Nomenclature

ASTM D 1974 Standard Practice for Methods of Closing, Sealing, and Reinforcing Fiberboard Boxes

ASTM D 2240 Rubber Property - Durometer Hardness

ASTM D 3951 Standard Practice for Commercial Packaging

ASTM D 5486 Standard Specification for Pressure-Sensitive Tape for Packaging, Box Closure, and Sealing

ASTM D 6251 Standard Specification for Wood-Cleated Panelboard Shipping Boxes

ASTM D 6880 Standard Specification for Wood Boxes

ASTM F 104 Nonmetallic Gasket Materials

2.3 Uniform Classification Committee, Agent

Available from Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.

Uniform Freight Classification Rules

2.4 ASQ Publications

Available from American Society for Quality (ASQ) 600 North Plankinton Avenue, Milwaukee, WI 53203 Tel: 800-248-1946 (inside USA and Canada) or 414-272-8575 (outside USA), www.asq.org.

ASQ/Z1.4 Sampling Procedures and Tables for Inspection by Attributes

ASQ Z1.9 Sampling Procedures and Tables for Inspection by variables for Percent Nonconforming

3. REQUIREMENTS

3.1 Materials

Materials used in the manufacture of the cork and rubber sheet shall be as specified below. The finished product shall have uniformly dispersed cork throughout the vulcanized rubber binder.

3.1.1 Cork

The cork shall be clean and free from hardback. The particles of cork shall be of such size that they shall pass through a 10 mesh screen and not less than 20 percent shall be retained by a 20 mesh screen.

3.1.2 Binder

The binder shall consist of a synthetic rubber type product compounded with other necessary agents to insure compliance with the requirements of this specification.

3.2 Construction

The gasket sheet material shall be fabricated by uniformly dispersing the cork in synthetic rubber and vulcanizing the resultant mixture. The methods of dispersion and vulcanization shall be as specified by the manufacturer.

3.3 Form

Unless otherwise specified (See 6.3), the gasket material shall be furnished in sheet form.

3.4 Physical Properties

Physical properties shall be in accordance with Table 1.

3.4.1 Resistance to Immersion

Each gasket material test specimen shall show no signs of disintegration, cracking, or tackiness when visually examined after all the immersion tests specified in Table 1.

3.5 Dimensions and Tolerances

3.5.1 Dimensions

Unless otherwise specified, thickness and width dimensions of the gasket sheeting shall be as specified in Table 2. Length dimensions shall be as specified by the acquiring activity.

3.5.2 Tolerances

3.5.2.1 Thickness

The thickness of the sheet gasket material shall not vary from the thickness specified by more than 0.015 inch (0.38 mm), and the thickness at any point on the sheet gasket material shall not vary from the thickness at any other point by more than 0.010 inch (0.25 mm), when determined in accordance with Table 4.

3.5.2.2 Linear Dimensions

Unless otherwise specified, width tolerances on sheet gasket material shall be 0.25 inch (6.35 mm). Length tolerances shall be ±1 percent.

3.6 Finish

The finish shall be as smooth as possible giving due consideration to the coarseness of the starting materials.

3.7 Identification of Product

Unless otherwise specified, all material furnished to this specification shall be legibly marked using a fuel and oil resistant lacquer, ink or dye. The marking shall not adversely affect the serviceability or performance of the gasket material. Specific markings for sheets and small parts shall be as follows:

3.7.1 Sheets

The markings on sheets (red - class 1; white - class 2) shall be 0.25 inch (6.35 mm) in height, running continuously across the sheet, recurring either lengthwise or crosswise with lines approximately 1.5 inch (38.1 mm) apart. The markings shall be on one side only and shall include the following:

Specification No.
Type, grade, class
Manufacturer's identification
ASTM D 1418 symbol for polymer used
Date of cure (1-80 indicates 1st quarter of calendar year 1980)

3.7.2 Small Parts Cut from Sheet

When the shape and size of the material does not permit marking in accordance with 3.7.1, a green dot shall be used to indicate type I material, a yellow dot for type II, a red dot for class 1 and a white dot for class 2. For example, type I, class I material shall have a green dot and a red dot in close relationship to each other. The dots shall appear on the face of the piece, if the piece has a minimum of 1 inch (25.4 mm) surface dimension in each of two directions. In the event that the dimensions of the material are such that dot marking cannot be made in accordance with the above, the individual pieces shall be stacked for marking purposes and printed identification stripes applied to the stacked edges. Where pieces are small and furnished loose in containers, markings shall appear on the containers only and shall be in accordance with that specified for sheet material.

3.8 Workmanship

The sheet gasket material shall be uniform in quality and condition, clean, smooth and free from foreign materials and defects detrimental to the appearance or performance of parts fabricated from the material.

3.9 Hardness Range

The original hardness of sheet gasket material shall fall within the listed limits.

| Grade | Hardness range |
|---|---|
| A-Soft | 40-55 |
| B-Medium | 55-70 |
| C-Firm | 70-85 |

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specifications where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of Inspections

The examination and testing of the gasket sheeting shall be classified as quality conformance inspections (See 4.3).

4.3 Quality Conformance Inspection

4.3.1 Lot Formation

A lot shall consist of all the sheet gasket material of the same type, grade, class and thickness manufactured under essentially the same conditions and offered for inspection at one time.

4.3.2 Prior Approval

When a supplier has previously delivered an acceptable product in accordance with this specification and contractual requirements, the acquiring activity may, at its discretion, waive certain requirements for subsequent acquisitions (See 4.3.3.2).

4.3.3 Sampling and Inspection Procedures

4.3.3.1 Visual Inspections

The sample unit for this inspection shall be one sheet or roll, as applicable. Samples shall be selected in accordance with Inspection Level II of ASQ Z1.4. Each sample unit shall be inspected as specified in Table 3. The acceptable quality level (AQL) shall be 2.5 percent defective.

4.3.3.2 Physical Properties

4.3.3.2.1 Initial Acquisition

For first time deliveries by a contractor, sufficient gasket sheet material shall be selected from each lot to complete testing to all the properties in Table 4. In addition, the contractor may be requested to furnish a quantity of sheeting in the thickness required for compression set (See 4.5.2.2). Failure of the product to pass any requirement in Table 4 shall be cause to reject the lot represented by the sample. Samples inspected in 4.3.3.1 may be utilized to prepare specimens for this inspection.

4.3.3.2.2 Subsequent Acquisitions

The sample unit for this inspection shall be one sheet or roll, as applicable. Sample units shall be randomly selected from each lot in accordance with Inspection Level IV of MIL-STD-414 and may be selected from the samples of 4.3.3.1. Each sample unit shall be tested only to those requirements indicated by footnote 3/ to Table 4. The AQL for this inspection shall be 2.5 percent defective (normal inspection) utilizing Table B-3 of ASQ/Z1.9 .

4.3.3.3 Packaging Inspection

The lot size for purposes of this inspection shall be the number of shipping containers. The sample unit shall be one shipping container. Sample size shall be selected in accordance with Inspection Level S-2 of ASQ Z1.4. An AQL of 2.5 percent defective shall be used for the inspection specified in Table 5.

4.4 Test Conditions

4.4.1 Standard Conditions

Unless otherwise specified herein, all tests shall be conducted at 24 °C ± 3 (75 °F ± 5) and a relative humidity of 50 percent ± 4.

4.4.2 Specimen Conditioning

Unless otherwise specified, all test specimens shall be conditioned at standard conditions for at least 24 hours prior to undergoing tests.

4.5 Test Methods

4.5.1 ASTM Methods

ASTM methods are as specified in Table 4 when there are no exceptions to the method. Otherwise, the ASTM procedure is identified as part of the applicable test method.

4.5.2 As Received Test Procedures

4.5.2.1 Hardness

Hardness shall be determined in accordance with ASTM D 2240, except that 10 readings shall be obtained on each specimen.

4.5.2.2 Compression Set

Compression set shall be determined in accordance with ASTM D 395, method B and the following:

a. Specimens die cut as specified in note 4 - ASTM D 395.

b. Type I sheet thickness shall be 0.50 inch (12.7 mm). All type I thicknesses shall not vary more than ±0.005 inch (0.127 mm) from each other.

c. Type II sheet thickness shall be 0.25 inch (6.35 mm). All type II sheet thicknesses shall not vary more than ±0.025 inch (0.635 mm) from each other.

d. Percent deflection as specified in Table 6.

e. Test conditions are 70 °C ± 1 (158 °F ± 2) for 22 hours.

f. Results shall agree within 5 percent for each pair of specimens.

4.5.2.3 Compressibility and Recovery

Compressibility and recovery shall be determined on a single layer specimen having a minimum circular or square surface area on one side of 2 square inches (12.9 $cm^2$). A compressibility testing apparatus, Figure 1, or equal, with a circular presser foot having an area of 1 square inch ± 0.001 (6.45 $cm^2$) shall be used.

4.5.2.3.1 Procedure

The specimen shall be inserted in the test apparatus and a preload of 1 psi (6.89 kPa) applied for 15 seconds. The original thickness (A) shall be measured at this time to the nearest 0.001 inch (0.025 mm). Immediately following this, the major load specified in Table 7 shall be applied to the specimen, without impact, at a uniform rate, so that the load is applied within 10 seconds ± 1. The total load (Table 7) shall be maintained for a period of 60 seconds ± 1 at which time the compressed thickness (B) shall be measured to the nearest 0.001 inch (0.025 mm). Immediately remove the major load after this measurement. The specimen shall be permitted to recover for 60 seconds ± 1 under the 1 psi (6.89 kPa) preload, then the recovered thickness (C) shall be measured. Compressibility and recovery shall be calculated as follows:

$$\text{Compressibility \%} = \frac{A - B}{A} \times 100 \quad \text{(Eq. 1)}$$

$$\text{Recovery, \%} = \frac{C}{A} \times 100 \quad \text{(Eq. 2)}$$

where:

A = Original thickness under preload (inch, mm)

B = Thickness when compressed (inch, mm)

C = Thickness under preload after release of compressive load (inch, mm)

4.5.3 Oven Aging

Gasket sheeting material undergoing heat aging shall be subject to a temperature of 100 °C ± 1 (212 °F ± 2) for a period of 70 hours ± 15 minutes using a circulating air oven, equipped so the specimens may be suspended vertically. Specimens for hardness, weight change and flexibility shall be exposed, then tested as specified below between 16 and 72 hours after removal from oven.

4.5.3.1 Hardness Change

Hardness shall be determined as specified in 4.5.2.1. Change in hardness shall be determined using the obtained value and the as received hardness.

4.5.3.2 Weight Change

Specimens approximately 1 by 2 by 0.063 inch (25 by 50 by 1.6 mm) shall be weighed ($W_1$) to the nearest 0.001 gram, exposed as specified in 4.5.3, cooled and reweighed ($W_2$) to the nearest 0.001 gram. Percent change in weight shall be calculated as follows:

$$\text{Weight change, \%} = \frac{W_2 - W_1}{W_1} \times 100 \quad \text{(Eq. 3)}$$

where:

$W_1$ = initial weight

$W_2$ = weight after oven aging

4.5.3.3 Flexibility

Six - 1 by 6 inches (2.5 by 14 cm) specimens (3 from each direction) shall be oven aged (4.5.3). Upon competition of the aging cycle, each specimen shall be bent through 180 degrees on a mandrel whose diameter is equal to 10 times the thickness of the material.

4.5.4 Immersion Tests

4.5.4.1 Procedure

Immersion media and testing conditions shall be as specified in Table 8. Changes in hardness (4.5.3.1), volume (4.5.1, Table 4) and compressibility (4.5.2.3) shall be determined after immersion in oil or fuel. Change in volume (ASTM D 471) shall be determined after immersion in water.

4.5.5 Low Temperature Tests

4.5.5.1 Compressibility

Compressibility at low temperature shall be determined by using the apparatus and following the procedures described in 4.5.2.3, except that the test specimen, after determination of the original thickness (A), shall be conditioned at -40 °C ± 1 (-40 °F ± 2) for 5 hours ± 15 minutes before adding the major load. The major load shall be added at the low temperature. Compressed thickness (B) shall be determined as specified in 4.5.2.3. Compressibility at low temperature shall be calculated as follows:

$$\text{Compressibility at -40°C, \%} = \frac{A - B}{A} \times 100 \quad \text{(Eq. 4)}$$

where:

A = Original thickness obtained at standard conditions

B = Compressed thickness at -40 °C

Using the “as received” compressibility value, low temperature compressibility factor shall be calculated as follows:

$$\text{Low temperature compressibility, \%} = \frac{C}{D} \times 100 \quad \text{(Eq. 5)}$$

where:

C = percent compressibility at -40 °C

D = percent compressibility as received

5. PACKAGING

5.1 Preservation - Packaging

Preservation - packaging shall be Level A or Commercial, as specified (See 6.3).

5.1.1 Level A

The sheet gasket material shall be separated with paper or other suitable separator sheets which will not adhere to, or otherwise damage the material. Rolled material and sheets shall be wrapped in barrier material conforming to MIL-PRF-121 and sealed with tape conforming to ASTM D 5486.

5.1.2 Commercial

The gasket material shall be packaged in accordance with ASTM D 3951.

5.2 Packing

Packing shall be Level A, B or Commercial, as specified (See 6.3).

5.2.1 Level A

The packaged gasket sheeting shall be packed in an overseas, exterior type box conforming to ASTM D 6251, ASTM D 6880, or ASTM D 1974. Boxes shall be strapped in accordance with the appendix of the applicable box specification.

5.2.2 Level B

The gasket material shall be packed as specified in 5.2.1, except that the boxes shall be domestic type.

5.2.3 Commercial

The gasket material shall be packed in a manner to insure carrier acceptance and safe delivery at destination. Containers shall be in accordance with Uniform Freight Classification Rules or regulations of other carriers applicable to the mode of transportation.

5.3 Marking for Shipments

In addition to any special markings required by the contract (See 6.3), each package and shipping container shall be marked in accordance with MIL-STD-129 and shall include the following:

MIL-C-6183B
National stock number
Type, class and grade
Manufacturer's part no. (when applicable)
Quarter and calendar year of manufacture
Contract number

6. NOTES

6.1 A change bar (|) 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.

6.2 Intended Use

The sheet gasket material covered by this specification is intended for use as gaskets where aromatic fuel or oil resistance is required.

6.2.1 Manufacturing Processes

The choice of type I or type II is at the option of the acquiring activity. Consideration should be given to the property differences noted in Table 1.

6.3 Ordering Data

Acquisition documents should specify the following:

a. Title, number, and date of this specification

b. Type, class, grade and form (See 1.2 and 3.3)

c. Thickness and other dimensions (See 3.5.1)

d. Manufacturer’s part number (when applicable)

e. Total quantity desired

f. Selection of applicable levels of preservation, packaging and packing (See Section 5)

PREPARED BY AMS COMMITTEE “CE”

TABLE 1 - PHYSICAL PROPERTIES (SEE 3.4.1)

| TYPE | CLASS | GRADE | AS RECEIVED: HARDNESS pts. | AS RECEIVED: SPECIFIC GRAVITY max | AS RECEIVED: COMPRESSION SET % max | AS RECEIVED: COMPRESSIBILITY % | AS RECEIVED: RECOVERY % min | AFTER OVEN AGING: 70 ± 1/4 hr. at 100° ± 1°C (212° ± 2°F) CHANGE IN: HARD. pts. | AFTER OVEN AGING: VOL. % max | AFTER OVEN AGING: FLEX. 180° BEND | AFTER IMMERSION: WATER 1 hr. ± 5 min. at 100° ± 1°C (212° ± 2°F) CHANGE IN: VOLUME % | AFTER IMMERSION: OIL 70 ± 1/4 hr. at 100° ± 1°C (212° ± 2°F) CHANGE IN: HARD. pts. | OIL: VOLUME % | OIL: COMPRESSIBILITY | AROMATIC FUEL 24 ± 1/4 hr. at 23° ± 1°C (73.5° ± 2°F) CHANGE IN: HARD. pts. | AROMATIC FUEL: VOLUME % | AROMATIC FUEL: COMPRESSIBILITY | LOW TEMPERATURE COMPRESSIBILITY 5 ± 1/4 hr. at -40° ± 1°C (-40° ± 2°C) % min |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | AROMATIC FUEL RESISTANT | SOFT | 1/ | 0.90 | 80 | 35 ± 5 | 95 | +15-0 | -10 | 2/ | +15-10 | ±15 | ±15 | 3/ | +0-20 | +20 | 3/ | 10 |
| | | MEDIUM | 1/ | 0.90 | 80 | 25 ± 5 | 95 | +10-0 | -10 | 2/ | +15-10 | ±10 | ±15 | 3/ | +0-20 | +20 | 3/ | 10 |
| | | FIRM | 1/ | 1.05 | 55 | 15 ± 5 | 95 | +10-0 | -10 | 2/ | +15-10 | ±10 | ±15 | 3/ | +0-20 | +20 | 3/ | 25 |
| | OIL RESISTANT | SOFT | 1/ | 0.90 | 80 | 35 ± 5 | 95 | +15-0 | -10 | 2/ | +15-10 | ±10 | +10-0 | 3/ | +0-20 | +60 | 3/ | 25 |
| | | MEDIUM | 1/ | 0.90 | 80 | 25 ± 5 | 95 | +10-0 | -10 | 2/ | +15-10 | ±10 | +10-0 | 3/ | +0-20 | +60 | 3/ | 25 |
| | | FIRM | 1/ | 1.05 | 55 | 15 ± 5 | 95 | +10-0 | -10 | 2/ | +15-10 | ±10 | +10-0 | 3/ | +0-20 | +60 | 3/ | 25 |
| II | AROMATIC FUEL RESISTANT | SOFT | 1/ | 0.90 | 80 | 25 ± 5 | 90 | +15-0 | -10 | 2/ | +15-10 | ±15 | ±15 | 3/ | +0-30 | +25 | 3/ | 15 |
| | | MEDIUM | 1/ | 0.90 | 80 | 25 ± 5 | 90 | +10-0 | -10 | 2/ | +15-10 | ±10 | ±15 | 3/ | +0-30 | +25 | 3/ | 15 |
| | | FIRM | 1/ | 1.30 | 55 | 15 ± 5 | 95 | +10-0 | -10 | 2/ | +15-10 | ±10 | ±15 | 3/ | +0-30 | +25 | 3/ | 15 |
| | OIL RESISTANT | SOFT | 1/ | 0.90 | 80 | 35 ± 5 | 90 | +15-0 | -20 | 2/ | +15-10 | ±10 | +10-0 | 3/ | +0-30 | +60 | 3/ | 30 |
| | | MEDIUM | 1/ | 0.90 | 80 | 25 ± 5 | 90 | +10-0 | -10 | 2/ | +15-10 | ±10 | +10-0 | 3/ | +0-30 | +60 | 3/ | 30 |
| | | FIRM | 1/ | 1.30 | 55 | 15 ± 5 | 95 | +10-0 | -10 | 2/ | +15-10 | ±10 | +10-0 | 3/ | +0-30 | +60 | 3/ | 30 |

1/ As determined - This value shall be used to calculate change in hardness after oven aging, oil immersion, and fuel immersion.

2/ No cracking.

3/ No rupture.