

MIL-G-22050C (SHIPS)
 25 January 1973
 SUPERSEDING
 MIL-G-22050B (SHIPS)
 15 March 1967
 (See 6.6)

MILITARY SPECIFICATION

**GASKET AND PACKING MATERIAL, RUBBER, FOR USE WITH
 POLAR FLUIDS, STEAM, AND AIR AT MODERATELY HIGH TEMPERATURES**

1. SCOPE

- 1.1 Scope. This specification covers rubber gaskets, packing, seals, strips, molded forms, and sheet material for use in hot air, hot water, steam, and various polar fluids such as aryl phosphate ester hydraulic fluids and aqueous monoethanolamine (MEA), at moderately high temperatures (see 6.1)
- 1.2 Classification. The rubber gasket and packing material shall be of the following grades, as specified (see 6.2).

Grade 1 - Nominal 65 durometer hardness.
 Grade 2 - Nominal 80 durometer hardness.

2. APPLICABLE DOCUMENTS

- 2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

PPP-B-566 - Boxes, Folding, Paperboard.
 PPP-B-636 - Boxes, Shipping, Fiberboard.
 PPP-B-640 - Box, Fiberboard, Corrugated, Triple-Wall.
 PPP-B-676 - Boxes, Setup.
 PPP-B-1055 - Barrier Material, Waterproofed, Flexible.
 PPP-T-76 - Tape, Pressure-Sensitive Adhesive Paper, Water Resistant (For Carton Sealing).

MILITARY

MIL-P-116 - Preservation, Methods of.
 MIL-P-4861 - Packing, Preformed, Rubber, Packaging of.
 MIL-H-19457 - Hydraulic Fluid, Fire Resistant.
 MIL-M-23573 - Monoethanolamine Chelating Agent Solution.

STANDARDS

FEDERAL

FED-STD-601 - Rubber: Sampling and Testing.

MILITARY

MIL-STD-129 - Marking for Shipment and Storage.
 MIL-STD-190 - Identification Marking of Rubber Products.
 MIL-STD-289 - Visual Inspection Guide for Rubber Sheet Material.
 MIL-STD-407 - Visual Inspection Guide for Rubber Molded Items.
 MIL-STD-413 - Visual Inspection Guide for Rubber O-Rings.

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

- 2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

UNIFORM CLASSIFICATION COMMITTEE

Uniform Freight Classification Rules.

FSC 5330, 9320

MIL-G-22050C (SHIPS)

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, Illinois 60606.)

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT
National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Association Inc., Traffic Order Section, 1616 "P" Street, N.W., Washington, D.C. 20036.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
D 512-67 - Chloride Ion in Industrial Water and Industrial Waste Water, Tests for.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.)

SOCIETY OF AUTOMOTIVE ENGINEERS, INC. (SAE)
ARP No. 568 - Aerospace Recommended Practices, Uniform Dash Numbering System for O-Rings.

(Application for copies should be addressed to the Society of Automotive Engineers, 485 Lexington Avenue, New York, N.Y. 10017.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Sample for first article inspection. Prior to beginning production, a sample shall be tested as specified in 4.2 (see 6.3).

3.2 Material. The material shall be made from an ethylene-propylene elastomeric compound which will meet the applicable requirements specified herein. Suggested formulations are given in 6.4 for both grades of material.

3.2.1 The manufacturer shall furnish a certification with the material that there are no low melting point metals such as mercury, lead or antimony used in either the formulation or preservation and packaging materials.

3.3 Form. The material shall be furnished in the form of sheets, strips, gaskets, packings, seals, or molded items of the sizes specified (see 6.2).

3.3.1 O-rings. Unless otherwise specified (see 6.2), O-ring sizes shall be in accordance with the dimensions and tolerances specified in ARP-568.

3.4 Physical requirements of the rubber. The rubber compounds used in the gaskets and packing material shall conform to the applicable requirements in table I when tested as specified in 4.5, and in addition, shall not contain more than 200 parts per million of chlorides leachable by water when tested as specified in 4.5.9.

Table I - Physical requirements of rubber compounds.

<u>Initial properties:</u>	<u>Grade 1</u>	<u>Grade 2</u>	<u>Test method</u>
Tensile strength, psi, minimum (min.)	2400	2400	4.5.2
Ultimate elongation, percent, min.	250	150	4.5.2
Hardness, Shore A durometer, points, 15 sec.	65 ± 5	80 ± 5	4.5.3
Leachable chlorides (parts per million) maximum (max.)	200	200	4.5.9
<u>Properties after oven aging 166 hours at 280°F:</u>			4.5.4
Tensile strength, percent of initial, min.	70	70	4.5.4.1
Ultimate elongation, percent of initial, min.	70	70	4.5.4.1
Hardness, change in Shore A durometer, points max.	15	15	4.5.4.2

MIL-G-22050C(SHIPS)

Table I - Physical requirements of rubber compounds (cont'd.).

	Grade 1	Grade 2	Test method
<u>Properties after oven aging 166 hours at 280°F. (cont'd.):</u>			4.5.4
Compression set, percent, max.	60	60	4.5.4.3
<u>Properties after immersion in MIL-H-19457 hydraulic fluid¹ for 166 hours at 212°F:</u>			4.5.5
Tensile strength, percent of initial, min.	80	80	4.5.5.1
Ultimate elongation, percent of initial, min.	80	80	4.5.5.1
Hardness, change in Shore A durometer, points max.	10	10	4.5.5.2
Volume change, percent (no shrinkage allowed)	0 to 10	0 to 10	4.5.5.3
<u>Properties after immersion in distilled water for 166 hours at 330°F:</u>			4.5.6
Tensile strength, percent of initial, min.	80	80	4.5.6.1
Ultimate elongation, percent of initial, min.	80	80	4.5.6.1
Volume change, percent (no shrinkage allowed)	0 to 10	0 to 10	4.5.6.2
<u>Properties after immersion in 25 percent aqueous solution of MEA for 166 hours at 330°F:</u>			4.5.7
Tensile strength, percent of initial, min.	80	80	4.5.7.1
Ultimate elongation, percent of initial, min.	80	80	4.5.7.1
Volume change, percent (no shrinkage allowed)	0 to 10	0 to 10	4.5.7.2
<u>Properties after 166 hours in steam at 330°F:</u>			4.5.8
Tensile strength, percent of initial, min.	80	80	4.5.8.1
Ultimate elongation, percent of initial, min.	80	80	4.5.8.1
Volume change, percent, max.	5	5	4.5.8.2

¹/Cellulube 220 or equal.

3.5 Identification. Material supplied under this specification shall be identified with white markings in accordance with MIL-STD-190. A permanent marking material that will have no deleterious effect on the rubber shall be used or in the case of individual one-item packaging, the marking may be put on the package.

3.6 Workmanship. The material shall be examined for defects as specified in 4.4.1.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier 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 specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 First article inspection. First article inspection shall consist of the examination and tests specified in 4.4 and 4.5.

MIL-G-22050C(SHIPS)

4.2.1 Prior to production, tests shall be conducted on a sample, sufficient in size to determine the conformance with all the tests and requirements of this specification. The test material shall be certified to be identical in composition and equivalent in cure to the material to be supplied later for quality conformance inspection. The sample shall meet all the requirements of this specification. First article tests shall be monitored by a Government representative. The contractor shall submit all test data results certified by the Government representative to the procuring activity.

4.3 Sampling for quality conformance inspection.

4.3.1 Lot. For purposes of sampling, a lot shall consist of all the material of the same grade, produced in one plant under essentially the same conditions, not exceeding 1000 pounds, and offered for delivery at one time.

4.3.2 Sampling for examination. Random samples shall be taken from each lot in accordance with the sampling plan given in table II for the examination specified in 4.4.1. A unit area of material is defined as one square foot, regardless of thickness. The sampling of sheet and strip material shall be divided among all rolls in the lot.

Table II - Sampling for examination.

Lot size, number of gaskets, molded items, packings, or unit areas of sheets or strips	Sample size, number of gaskets, molded items, packings, or unit areas of sheets or strips	Number of nonconforming or defective pieces or unit areas			
		Major defects AQL=1.5 percent		Total defects AQL=6.5 percent	
		Accept	Reject	Accept	Reject
2 to 8	2	0	1	0	1
9 to 15	3	0	1	0	1
16 to 25	5	0	1	0	1
26 to 50	8	0	1	1	2
51 to 90	13	0	1	2	3
91 to 150	20	0	1	3	4
151 to 280	32	1	2	5	6
281 to 500	50	2	3	7	8
501 to 1200	80	3	4	10	11
1201 to 3200	125	5	6	14	15
3201 and over	200	7	8	21	22

4.3.2.1 Defects defined. A major defect is a defect that is likely to result in failure, or to reduce materially the usability of the unit or product for its intended purpose. A minor defect is a defect that is not likely to reduce materially the usability of the unit or product for its intended purpose, or is a departure from established standards having little bearing on the effective use or operation of the unit. Total defects are the sum of major and minor defects.

4.3.3 Sampling for tests. Representative samples shall be taken at random from each lot that passes the examination of 4.4.1, in sufficient quantity to conduct the quality conformance tests specified in 4.4.2. If the items are of such size or shape that test specimens cannot be prepared from them, substitute samples shall be provided in the form of a piece or pieces of rubber having dimensions appropriate to the tests required. The substitute samples shall be certified by the supplier to be of identical material and equivalent cure to that used in the lot of finished material offered for delivery.

4.4 Examinations and tests.

4.4.1 Visual and dimensional examination. Each of the samples taken in accordance with 4.3.2 shall be subjected to surface examinations for identification, workmanship, dimensions, and tolerances. MIL-STD-289, MIL-STD-407, or MIL-STD-413, as applicable, shall be used to determine and evaluate visual defects. The dimensions shall be determined in accordance with the applicable method specified in FED-STD-601.

4.4.1.1 Rejection. Any piece or unit area with one or more defects shall be rejected and counted as one defect. If the number of defective or nonconforming pieces or unit areas exceeds the applicable acceptance number of table II, the entire lot represented by the sample shall be rejected.

4.4.2 Quality conformance tests. Quality conformance tests shall be conducted on samples selected in accordance with 4.3.3. The tests specified in 4.5.2, 4.5.3, 4.5.4, and 4.5.5.3 shall be conducted.

MIL-G-22050C (SHIPS)

4.4.3 Action in case of nonconformance. If any of the samples in the quality conformance tests is found not to be in conformance with the requirements of the specification, the lot which it represents shall be rejected.

4.5 Test methods.

4.5.1 Testing conditions. Unless otherwise specified herein, the testing shall be conducted at a temperature of $80^{\circ} \pm 9^{\circ}\text{F}$.

4.5.2 Tensile properties. The tensile strength and ultimate elongation shall be determined by methods 4111 and 4121, respectively, of FED-STD-601. Die III specimens that are 0.080 ± 0.010 inches thick shall be used for determinations of tensile properties.

4.5.3 Hardness. Hardness shall be determined with a Shore A durometer on specimens that are 0.500 ± 0.010 inch thick and at least 1.129 inch diameter, in accordance with method 3021 of FED-STD-601. The hardness readings shall be taken 15 seconds after firm contact is made between the rubber and the presser foot of the durometer.

4.5.4 Oven aging. Method 7221 of FED-STD-601 shall be used for oven aging the test specimens as specified for the individual tests, with the following exception: the aging period shall be 166 ± 1 hours at $280^{\circ} \pm 2^{\circ}\text{F}$. After the aging period, the tensile and hardness specimens shall be set aside for 16 to 96 hours at $80^{\circ} \pm 9^{\circ}\text{F}$, before determining the required property.

4.5.4.1 Tensile properties after oven aging. The tensile properties after oven aging shall be determined by the procedure specified in 4.5.2.

4.5.4.2 Hardness after oven aging. The hardness after oven aging shall be determined by the procedure specified in 4.5.3.

4.5.4.3 Compression set after oven aging. Compression set shall be determined in accordance with method 3311 of FED-STD-601 except that three 0.500 ± 0.010 inch thick specimens shall be tested and the specimens shall be held at a 25 percent deflection during oven aging.

4.5.5 Immersion in hydraulic fluid. Test specimens for the individual tests shall be immersed in hydraulic fluid conforming to MIL-H-19457 for 166 ± 1 hours at $212^{\circ} \pm 2^{\circ}\text{F}$.

4.5.5.1 Tensile properties after immersion in hydraulic fluid. Tensile properties after immersion in hydraulic fluid shall be determined in accordance with method 6111 of FED-STD-601 and as specified in 4.5.2. Tensile strength shall be based on the swollen cross-sectional area.

4.5.5.2 Hardness after immersion in hydraulic fluid. Hardness shall be determined after immersion in hydraulic fluid. Before testing as specified in 4.5.3, the specimens shall be removed from the hot fluid and cooled in the test fluid at $80^{\circ} \pm 9^{\circ}\text{F}$ for 30 minutes and then removed from the fluid and wiped dry.

4.5.5.3 Volume change after immersion in hydraulic fluid. Volume change after immersion in hydraulic fluid shall be determined in accordance with method 6211 of FED-STD-601. The specimens shall consist of three strips 1 inch by 2 inches by 0.080 ± 0.010 inch.

4.5.6 Immersion in hot distilled water. Test specimens for the individual tests shall be immersed in distilled water in a covered glass jar. The jar shall be put in a container capable of withstanding an internal pressure of 300 p.s.i. The container shall be sealed and placed in a steam autoclave and heated for 166 ± 1 hours at $330^{\circ} \pm 2^{\circ}\text{F}$.

4.5.6.1 Tensile properties after immersion in hot distilled water. After immersion in hot distilled water as specified in 4.5.6, the tensile properties shall be determined in accordance with method 6111 of FED-STD-601 and as specified in 4.5.2. Tensile strength shall be based on the swollen cross-sectional area.

4.5.6.2 Volume change after immersion in hot distilled water. Volume change after immersion in hot distilled water shall be determined as specified in 4.5.5.3.

4.5.7 Immersion in 25 percent aqueous solution of NEA. Test specimens for the individual tests shall be immersed in a 25 percent by volume aqueous solution of NEA in a covered glass jar. The jar shall be put in a container capable of withstanding an internal pressure of 300 p.s.i. The container shall be sealed and placed in a steam autoclave and heated for 166 ± 1 hours at $330^{\circ} \pm 2^{\circ}\text{F}$. The NEA shall conform to MIL-M-23573.

MIL-G-22050C (SHIPS)

4.5.7.1 Tensile properties after immersion in MEA solution. After immersion as specified in 4.5.7, the tensile properties shall be determined as specified in 4.5.5.1.

4.5.7.2 Volume change after immersion in MEA solution. After immersion as specified in 4.5.7, the volume change shall be determined as specified in 4.5.5.3.

4.5.8 Aging in steam. Test specimens for the individual tests shall be exposed to steam in an autoclave for 166 ± 1 hours at 330° ± 2°F. After the aging period, the tensile specimens shall be set aside at 30° ± 9°F. for 16 to 96 hours before determining the required property.

4.5.8.1 Tensile properties after aging in steam. After aging in steam as specified in 4.5.8, the tensile properties shall be determined as specified in 4.5.2.

4.5.8.2 Volume change after aging in steam. After aging in steam as specified in 4.5.8, the volume change shall be determined as specified in 4.5.5.3.

4.5.9 Water leachable chlorides. The following test method shall be used:

- (a) Two test specimens, each of approximately but not less than 15 grams, shall be taken. Each test specimen shall be taken from a different sample. Test specimen from rubber bonded paper shall be taken from the samples of the first and the last roll of the lot. Test specimen of packing material shall be representative of the sample cross section.
- (b) The test specimens shall be unravelled and cut into pieces no larger than 1/4 by 1/2 inch.
- (c) Each test specimen shall be weighed, transferred to an Erlenmeyer flask equipped with a reflux condenser, covered with 200 to 300 milliliters (ml) of distilled or demineralized water and simmered in the range of 200° to 212°F. for a minimum of 6 hours. The leach water shall then be separated by filtration and the filter rinsed. A blank determination shall be run using similarly cleaned equipment and distilled or demineralized water from the same source.
- (d) The extracted chloride ion shall be determined by the mercuric nitrate titration method, ASTM D512-67, referee method A or equal, and shall be corrected by the results of the blank determination.
- (e) The results of each test shall be calculated as net parts per million of extractable chloride ion by weight of the test specimen.

4.6 Inspection of preparation for delivery. Samples shall be taken from each lot and inspected in accordance with MIL-P-116 to verify conformance to the requirements of section 5 herein.

5. PREPARATION FOR DELIVERY

(The preparation for delivery requirements specified herein apply only for direct Government procurements. For the extent of applicability of the preparation for delivery requirements of referenced documents listed in section 2, see 6.5.)

5.1 Preservation and packaging. Preservation and packaging shall be level A or C as specified (see 6.2).

5.1.1 Level A. Material in the form specified shall be packaged as follows:

5.1.1.1 Sheets, strips, and packing. Sheets, strips, and packings of like description shall be dusted with soapstone powder or talcum, interleaved over the complete area with kraft paper and rolled. Rolls shall be secured with tape conforming to PPP-T-76. Rolls shall be individually wrapped with barrier material conforming to PPP-B-1055. All seams, joints, and closures of the barrier wrap shall be sealed with adhesive or other suitable materials.

5.1.1.2 Gaskets and molded items. Gaskets and molded items in quantity specified (see 6.2), shall be packaged together without folding. Gaskets and molded items shall be dusted with soapstone powder or talcum, interleaved with kraft paper, and unit packaged in folding or set-up paperboard or fiberboard boxes conforming to PPP-B-566, PPP-B-676, or PPP-B-636 at the option of the supplier. Box closure shall be as specified in the box specification or appendix thereto.

5.1.1.3 O-rings. O-rings shall be packaged level A in accordance with the requirements of MIL-P-4861.

MIL-G-22050C (SHIPS)

5.1.2 Level C. Preservation and packaging of gasket and packing material shall afford adequate protection against deterioration and physical damage during shipment from the supply source to the first using activity for early material use.

5.2 Packing. Packing shall be level A, B, or C as specified (see 6.2).

5.2.1 Level A. Material packaged as specified (see 6.2), shall be packed for shipment in containers conforming to class weather-resistant of PPP-B-636, or class 2 of PPP-B-640, at the option of the supplier. All corners and edge seams and body (manufacturer's) joints of fiberboard boxes shall be waterproofed with tape in accordance with the appendix to the box specification. Boxes shall be closed and banded with pressure sensitive tape in accordance with the applicable box specification or appendix thereto. The gross weight of fiberboard boxes shall not exceed the weight limitations of the applicable fiberboard box specification. Unit fiberboard boxes conforming to class weather-resistant of PPP-B-636, closed, sealed, and banded as specified herein, and used as the shipping container need not be overpacked.

5.2.2 Level B. Material packaged as specified (see 6.2), shall be packed for shipment in containers conforming to class domestic of PPP-B-636, or class 1 of PPP-B-640, at the option of the supplier. Box closures shall be as specified in the applicable box specification or appendix thereto. The gross weight of the containers shall not exceed the weight limitations of the applicable box specification. Unit fiberboard boxes conforming to PPP-B-636, closed as specified herein, and used as the shipping containers need not be overpacked.

5.2.3 Level C. Material packaged as specified (see 6.2), shall be packed for shipment in containers in a manner which will insure acceptance by common carrier, at the lowest rate, and will afford protection against physical or mechanical damage during direct shipment from the supply source to the first using activity for early material use. The shipping containers or method of packing shall conform to the Uniform Freight Classification Rules and the National Motor Freight Classification Rules and Regulations or other carrier regulations as applicable to the mode of transportation.

5.3 Marking. In addition to any special marking required by 3.5 and the contract or order (see 6.7), interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129, and with the grade number, lot number, and the date cured.

6. NOTES

6.1 Intended use. The material furnished under this specification is intended for use in air at temperatures up to 230°F., and for use in water, steam, and certain polar fluids at temperatures up to 280°F. This material is especially intended for use in CO₂ scrubbers, in coolant discharge systems, and in flexible joints. The suitability of this material for use in fluids other than those designated in this specification must be determined beforehand in appropriate immersion tests.

6.1.1 Grade 1 material is intended for use in all applications listed in 1.1 up to and including 230°F.

6.1.2 Grade 2 material is intended for use in all applications listed in 1.1 up to and including 280°F.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Grade of material required (see 1.2).
- (c) Form and dimensions required (see 3.3).
- (d) Level of preservation, packaging, and packing required (see 5.1 and 5.2).
- (e) Quantity of gaskets per package (see 5.1.1.2).
- (f) Special marking, if required (see 5.3).

6.3 First article inspection.

6.3.1 Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection as to those bidders offering a product which has been previously procured or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending procurement.

MIL-G-22050C(SHIPS)

6.4 Suggested formulations. Vulcanizates prepared from the formulations shown below have been found to meet the requirements of this specification:

<u>Compounding ingredients</u> ^{1/}	<u>Grade 1 parts by weight</u>	<u>Grade 2 parts by weight</u>
Nordel 1040	100	100
United SPF	50	80
Protox 166	5	5
Calcium stearate	1	1
Age Rite Resin D	2	2
Sulfur	0.3	0.3
DiCup 40-C	10	10

Cure: 30 minutes at 320°F. (160°C.)

^{1/} These were the specific ingredients used when developing these formulations. Many of these ingredients are available under other brand names. It is not the intention of this listing to limit the choice of the commercial source of an ingredient or to infer that one brand is better than another.

6.4.1 The above formulations are offered only as suggestions. The Government does not guarantee that materials made from these formulations will conform to the requirements of this specification. Use of these formulations does not relieve the supplier from having his product tested for conformity with the specification.

6.5 Sub-contracted material and parts. The preparation for delivery requirements of referenced documents listed in section 2 do not apply when material and parts are procured by the supplier for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.6 THE MARGINS OF THIS SPECIFICATION ARE MARKED "*" TO INDICATE WHERE CHANGES (ADDITIONS, MODIFICATIONS, CORRECTIONS, DELETIONS) FROM THE PREVIOUS ISSUE HAVE BEEN MADE. THIS WAS DONE AS A CONVENIENCE ONLY AND THE GOVERNMENT ASSUMES NO LIABILITY WHATSOEVER FOR ANY INACCURACIES IN THESE NOTATIONS. BIDDERS AND CONTRACTORS ARE CAUTIONED TO EVALUATE THE REQUIREMENTS OF THIS DOCUMENT BASED ON THE ENTIRE CONTENT IRRESPECTIVE OF THE MARGINAL NOTATIONS AND RELATIONSHIP TO THE LAST PREVIOUS ISSUE.

Preparing activity:
Navy - SH
(Project 5330-N036)

