

INCH-POUND

HH-G-156E

5 April 1993

SUPERSEDING

HH-G-156d

September 25, 1967

(See 6.5)

FEDERAL SPECIFICATION

GASKET MATERIAL, GENERAL PURPOSE; RUBBER SHEETS, STRIPS, AND SPECIAL SHAPES

This specification is approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers material for general purpose rubber gaskets and packing except those for shipboard hatches, airports, watertight and airtight doors.

1.2 Classification. Gaskets covered by this specification shall be of the following types, as specified (see 6.2):

Type I - Soft (nominally 40 Shore A durometer).

Type II - Medium (nominally 55 Shore A durometer).

Type III - Hard (nominally 80 Shore A durometer).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, SEA 05Q42, Naval Sea Systems Command, 2531 Jefferson Davis Hwy., Arlington, VA 22242-5160 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 5330

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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SPECIFICATIONS

FEDERAL

- MMM-A-260 - Adhesive, Water-Resistant, (For Sealing Waterproofed Paper).
- PPP-B-636 - Boxes, Shipping, Fiberboard.
- PPP-B-1055 - Barrier Material, Waterproofed, Flexible.
- PPP-F-320 - Fiberboard, Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes.

MILITARY

- MIL-L-19140 - Lumber and Plywood, Fire-Retardant Treated.

STANDARDS

FEDERAL

- FED-STD-123 - Marking for Domestic Shipment (Civilian Agencies).
- FED-STD-601 - Rubber: Sampling and Testing.

MILITARY

- MIL-STD-190 - Identification Marking of Rubber Products.
- MIL-STD-289 - Visual Inspection Guide for Rubber Sheet Material.
- MIL-STD-298 - Visual Inspection Guide for Rubber Extruded Goods.
- MIL-STD-407 - Visual Inspection Guide for Rubber Molded Items.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government Publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- D 395 - Standard Test Methods for Rubber Property - Compression Set. (DOD adopted)
- D 412 - Standard Test Methods For Rubber Properties in Tension. (DOD adopted)
- D 573 - Standard Test Method For Rubber - Deterioration in an Air Oven. (DOD adopted)
- D 792 - Standard Test Methods For Specific Gravity (Relative Density) and Density of Plastics by Displacement. (DOD adopted)

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D 2240 - Standard Test Method for Rubber Property - Durometer Hardness
(DOD adopted)

D 3951 - Standard Practice for Commercial Packaging. (DOD adopted)

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

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the 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.

3. REQUIREMENTS

3.1 Materials. The gasket material shall be natural rubber, synthetic rubber, or a mixture of the two, formulated and processed to meet the applicable requirements of this specification.

3.1.1 Recovered materials. Unless otherwise specified herein, all equipment, material, and articles incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified.

3.2 Physical properties. The rubber shall meet the applicable physical property requirements listed in table I, (see 4.6).

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TABLE I. Physical Properties of rubber.

Property	Requirement			Test procedures
	Type I	Type II	Type III	
(a) Initial:				
Tensile strength, p.s.i, minimum	1500	1000	600	4.6.2
Ultimate elongation, percent minimum	400	300	150	4.6.2
Hardness, Shore A durometer	40+/-5	55+/-5	80+/-5	4.6.3
Specific gravity, maximum	1.20	1.65	2.20	4.6.4
Water extraction, percent, maximum	0.5	0.5	0.5	4.6.5
(b) After oven aging 94 +/- 1/4 hours at 158 +/- 2 deg. F:				
Tensile strength, percent of initial, minimum	75	75	75	4.6.6
Ultimate elongation, percent of initial minimum	75	65	50	4.6.6
Compression set, percent, maximum	45	75	75	4.6.7
(c) After water immersion 166 +/- 1 hours at 212 deg. F:				
Tensile strength, percent of initial, minimum	80	80	80	4.6.8
Ultimate elongation, percent of initial, minimum	70	70	70	4.6.8
Volume change, percent maximum	0 to +10	0 to +10	0 to + 10	4.6.9
(d) Flexibility at minus 20 +/- 2 deg. F:				4.6.10
Load in grams, maximum, required to deflect				
1 inch	50	50		
2 inches	70	70		

3.3 Form and dimensions. The rubber gasket material shall be of the form and dimensions specified (see 6.2). The form may be sheets, strips or molded pieces of either rectangular cross-section or special shapes, extruded shapes or shapes cut from sheets.

3.3.1 Sheets. Sheet rubber shall have smooth surfaces and shall have the thickness specified (see 6.2) within the tolerances allowed in table II. Unless otherwise specified (see 6.2), sheet rubber shall be furnished in rolls 36 inches wide weighing approximately 100 pounds.

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3.3.2 Strips. Strip rubber of rectangular cross section shall have smooth surfaces and shall have the dimensions specified (see 6.2) within the tolerances allowed in table II.

TABLE II. Tolerances in width and thickness of sheets and strips.

Dimensions, inches (width or thickness)	Tolerance (plus or minus)
1/16 or less	0.010 inch
1/16 to 1/8, inclusive	.016 inch
1/8 to 3/8, inclusive	.031 inch
3/6 to 3/4, inclusive	.047 inch
3/4 to 2, inclusive	.063 inch
Over 2	3 percent

3.3.3 Molded, extruded or cut shares. Molded, extruded, and cut shapes shall have the form, dimensions, and tolerances as specified (see 6.2).

3.3.4 Rolls and strips. In order to constitute a roll, a sheet shall be not less than 60 inches in length and a strip shall be not less than 11 feet in length.

3.4 Identification marking. Material supplied under this specification shall be identified in accordance with MIL-STD-190. In addition, the specification number and class of material being supplied shall be included in the marking. The marking shall be accomplished by molding when the size and shape of the item permits this to be done without damage to critical surfaces of the item itself. Surfaces of an o-ring are considered critical. If molding cannot be done, a permanent marking material shall be used or in the case of individual one-item packaging, the marking may be put on the package.

3.5 Workmanship. The end products shall be uniform, smooth finished, (except that type III material may have a fine fabric impression) free from dirt, flash or rough edges to the extent permitted by the acceptable quality levels in section 4.

4. QUALITY ASSURANCE PROVISIONS

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

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4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of the manufacturing operations, is an acceptable practice to ascertain conformance to requirements. However, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- (a) First article inspection (not applicable).
- (b) Quality conformance inspection (see 4.4).

4.3 Sampling.

4.3.1 Lot. For purposes of sampling, examinations, and tests, a lot shall consist of all material of the same type, form and dimensions, produced under essentially the same conditions, not exceeding 2500 pounds, and offered for delivery at one time.

4.3.2 Sampling for visual and dimensional examinations. For the examination specified in 3.3 through 3.5, sample pieces shall be selected at random from each lot in accordance with table III. A unit area of strips or sheet material is defined as 1 square foot of material.

TABLE III. Sampling for visual and dimensional examination.

Lot size	Sample size	Accept	Reject	L ₁	L ₂	L ₃
Up to 50	2	0	1			
51 to 500	3	0	1			
501 to 3200	5	0	1			

L₁ All defective items shall be replaced with acceptable items prior to lot acceptance.

L₂ Inspect sample size until reject criteria is reached. If reject criteria is reached, reject the entire lot.

L₃ Reject lots may be screened and resubmitted for inspection and test.

4.3.3 Sampling for quality Conformance tests. Sampling for quality conformance tests specified in 4.4.2 shall be in accordance with table IV from material which has passed the examination of 4.4.1.

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TABLE IV. Sampling for quality conformance tests.

Lot size	Sample size ^{L1} , ^{L2}		Accept	Reject ^{L3} ^{L4} ^{L5}		
	Major defects	Total defects (major plus minor)				
up to 90	5	4	0	1		
91 to 150	6	5	0	1		
151 to 280	7	6	0	1		
281 to 500	9	7	0	1		
501 to 1200	11	8	0	1		
1201 to 3200	13	9	0	1		

- ^{L1} In sheet and strip material each test specimen shall be cut from a different roll; if not possible then from a different length in the roll.
- ^{L2} When test specimens can not be cut from the cut, molded, or extruded gaskets, special test pieces representing the gaskets shall be obtained from different parts of the batch. These pieces shall be certified to be of the same composition and equivalent cure as the finished gaskets submitted in the lot. The sample sizes shall be 6 by 6 inches by 0.080 +/- 0.010 inch thick, 4 by 4 by 1/2 inch thick, and 10 by 1 by 1/4 inch thick as required for the various tests.
- ^{L3} All defective items shall be replaced with acceptable items prior to lot acceptance.
- ^{L4} Inspect sample size until reject criteria is reached. If reject criteria is reached, reject the entire lot.
- ^{L5} Reject lots may be screened and resubmitted for inspection and test.

4.3.3.1 Defects defined. Major defect and minor defect as used in table III are defined as follows: A major defect is a defect that is likely to result in failure, or to reduce materially the usability of the unit of 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 is defined as major and minor defects combined. Any number of defects greater than the applicable acceptance number is a rejection number and this shall be cause for rejection of the lot represented by the sample.

4.3.4 Sampling for production check test. Sampling for production check test specified in 4.5 shall be in accordance with table V from material which has passed the examination of 4.4.1.

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TABLE V. Sampling for production check test.

Lot size pounds of material	Sample size, L_1 , L_2 number of specimens required for each test
Up to 150	1
151 to 280	3
281 to 1200	5
1201 to 3200	13

L_1 In sheet and strip material each test specimen shall be cut from a different roll; if not possible then from a different length in a roll.

L_2 When test specimens can not be made from the cut, molded, or extruded gaskets, special test pieces representing the gaskets shall be obtained from different parts of the batch. These pieces shall be certified to be of the same composition and equivalent cure as the finished gaskets submitted in the lot. The sample sizes shall be 6 by 6 inches by 0.080 +/- 0.010 inch thick, 4 by 4 by 1/2 inch thick, and 10 by 1 by 1/4 inch thick as required for the various tests.

4.4 Quality conformance examination and tests.

4.4.1 Visual and dimensional examination. Each of the samples selected in accordance with 4.3.2 shall be subjected to surface examinations for identification marking, workmanship, dimensions, and tolerances. MIL-STD-289, MIL-STD-298, and MIL-STD-407, as applicable, shall be used to determine and evaluate visual defects. The dimensions shall be determined as described in FED-STD-601, method 2011 for thickness, method 2111 or 2121, as applicable for width, and method 2411 for length.

4.4.1.1 Rejection. Any gasket containing one or more defects shall not be offered for delivery and if the number of defective gaskets or unit areas of strips or sheet material exceeds the applicable acceptance number, this shall be cause for rejection of the entire lot represented by the sample.

4.4.2 Quality conformance tests. Quality conformance tests shall be conducted on samples from (or representing) all intermediate lots on which production check tests were not performed (see 4.5). Quality conformance tests shall consist of the tests specified in 4.6.2, 4.6.3, and 4.6.7.

4.5 Production check tests. Production check tests shall be conducted on samples from (or representing) the first lot of material and from every fifth lot thereafter. Production check tests shall consist of all the tests specified in 4.6.

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4.5.1 Action in case of nonconformance. If any of the samples in the production check tests is found not to be in conformance with the requirements of the specification, this shall be cause for rejection of the entire lot. Furthermore, additional samples shall be selected or provided from each subsequent lot and shall be subjected to the test or tests wherein the failure occurred. Each lot shall then be considered acceptable only after satisfactory results are obtained on the test or tests by all the samples taken or provided to represent the lot. This additional testing shall be discontinued after four successive lots have passed the test or tests.

4.6 Test Procedures.

4.6.1 Test conditions. Unless otherwise specified herein, tests shall be made at a room temperature of 80 +/- 9 degrees Fahrenheit (deg. F) (27 +/- 5 degrees Celsius (deg. C)) and a relative humidity of 50 +/- 5 percent. The specimens shall be conditioned for not less than 3 hours before being tested, and shall be tested in the same atmosphere.

4.6.2 Tensile properties. The tensile strength and ultimate elongation shall be determined as specified in ASTM D 412.

4.6.3 Hardness. Hardness shall be determined as specified in ASTM D 2240 using a Shore A durometer and a 3-second reading. The specimens shall be 1/4 inch thick. Plied up specimens may be used.

4.6.4 Specific gravity. The specific gravity shall be determined as specified in ASTM D 792.

4.6.5 Extraction in distilled water. The percent extraction shall be determined in accordance with method 6621 of FED-STD-601, except that the specimens shall be 0.080 +/- 0.010 inch thick. The water solution shall be evaporated to dryness on a steam bath and the residue shall be dried at a temperature of 122 +/- 3.6 deg. F (50 +/- 2 deg. C).

4.6.6 Tensile Properties after oven aging. The tensile strength and ultimate elongation shall be determined after oven aging in accordance with ASTM D 573 except that the aging period shall be 94 +/- 1/4 hours.

4.6.7 Compression set. The compression set shall be determined in accordance with method B of ASTM D 395 except that the aging period shall be 94 +/- 1/4 hours at 158 +/- 1.8 deg. F (70 +/- 2 deg. C).

4.6.8 Tensile properties after water immersion. The tensile strength and ultimate elongation shall be determined after water immersion in accordance with method 6611 of FED-STD-601.

4.6.9 Volume change after water immersion. The volume change shall be determined after water immersion in accordance with method 6211 of FED-STD-601 except the immersion temperature shall be 212 +/- 2 deg. F (100 +/- 1.1 deg. C) and the immersion time shall be 166 +/- 1 hour.

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4.6.10 Flexibility (types I and II only. The flexibility shall be determined in accordance with method 5211 of FED-M-601, except that the specimens shall be 0.250 +/- 0.010 inch thick and the conditioning temperature shall be 20 +/- 2 deg. F (29 +/- 1.1 deg. C).

4.7 Inspection of packaging. An inspection shall be made to date that the preservation, packing and marking comply with the requirements of section 5. For examination of packaging the sample unit shall be one shipping container fully prepared for delivery, selected at random just prior to the closing operations. Defects of closure shall be examined on shipping containers fully prepared for delivery. The lot size shall be the number of shipping containers in the end item inspection lot. Sampling shall be in accordance with MIL-STD-2073-1.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition.)

5.1 General.

5.1.1 Navy fire-retardant requirements.

- (a) Treated lumber and plywood. When specified (see 6.2), all lumber and plywood including laminated veneer material used in shipping container and pallet construction, members, blocking bracing, and reinforcing shall be fire-retardant treated material conforming to MIL-L-19140 as follows:

Levels A and B	- Type II	- weather resistant.
	Category 1	- general use.
Level C	- Type I	- non-weather resistant.
	Category 1	- general use.

- (b) Fiberboard. When specified (see 6.2), fiberboard used in the construction of class - domestic, non-weather resistant fiberboard and cleated fiberboard boxes including interior packing forms shall meet the flamespread index and the specific optic density requirements of PPP-F-320 and amendment thereto.

5.1.2 Asbestos.

5.1.2.1 Dusting material. Unless otherwise specified (see 6.2), dusting material such as talc, talcum and powdered soapstone shall be asbestos free (see 6.3).

5.2 Preservation. Preservation shall be level A, C or commercial as specified (see 6.2).

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5.2.1 Level A.

5.2.1.1 Casket material, rubber sheets and strips. Rubber sheets and strips of one type and like description shall be coated (see 5.1.2) and interleaved with either kraft paper or plastic film and then rolled. The rolls shall be secured with waterproof, pressure-sensitive adhesive tape. The rolls shall be individually wrapped with waterproof, kraft paper conforming to PPP-B-1055 with all fold, seams and laps sealed with water-resistant adhesive conforming to MMM-A-260.

5.2.1.2 Gaskets, special shares. Caskets of one type and like description shall be packaged together in quantities specified (see 6.2) without folding. They shall be coated (see 5.2.1) and interleaved with either kraft paper or plastic film and placed in a snug fitting water resistant, fiberboard box conforming to PPP-B-636. Cushioning shall be used to prevent movement within the box. The boxes shall be closed in accordance with method V of the specification or appendix thereto.

5.2.2 Level B. Approximately 25 feet of 36-inch rubber sheeting shall be wound into a compact roll in accordance with normal commercial practice. The roll shall be secured with waterproof, pressure-sensitive adhesive tape. The rolls shall be individually wrapped with waterproof, kraft paper conforming to PPP-B-1055 and secured with water-resistant, pressure-sensitive tape conforming to MMM-A-260.

5.2.3 Level C. Gasket material in the form and dimensions specified (see 3.3) shall be preserved as specified under level A except that the fiberboard box shall be of the class-domestic or class-domestic/ fire-retardant (see 5.1.1(b)). Box closure shall be in accordance with method I using pressure sensitive adhesive tape.

5.2.4 Commercial. Commercial packaging (cleaning, preservation (see 5.1.2), cushioning, and unit pack) requirements shall be in accordance with ASTM D 3951.

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

5.3.1 General requirements for levels A, B and C. Containers selected (see 5.3.2), shall be of minimum weight and cube consistent with the protection required, of uniform size, and contain identical quantities of identical gasket material.

5.3.2 Levels A, B and C containers. Gasket material preserved as specified (see 5.2), shall be packed in exterior shipping containers for the level of packing specified (see 5.3), in accordance with table VII of MIL-STD-2073-1, Appendix C, and herein. Unless otherwise specified (see 6.2), container selection shall be at the contractor's option.

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5.3.2.1 Caseliners, closure and gross weight.

5.3.2.1.1 Caseliners. Unless other-wise specified (see 6.2), level A shipping containers containing gasket material preserved level C or commercial shall be provided with waterproof caseliners in accordance with MIL-STD-2073-1.

5.3.2.1.2 Closure. Container closure, reinforcing, or banding shall be in accordance with the applicable container specification or appendix thereto except that weather-resistant fiberboard boxes shall be closed in accordance with method V and reinforced with non-metallic or tape banding and domestic or fire retardant fiberboard boxes shall be closed in accordance with method I using pressure sensitive tape.

5.3.2.1.3 Weight. Wood, plywood, and cleated type containers exceeding 200 pounds gross weight shall be modified by the addition of skids in accordance with MIL-STD-2073-1 and the applicable container specification or appendix thereto.

5.3.3 Commercial. Gasket material preserved specified (see 5.2) shall be packed for shipment in accordance with ASTM D 3951 and herein.

5.3.3.1 Container modification. Shipping containers exceeding 200 pounds gross weight shall have a minimum of two, 3-inch by 4-inch nominal wood skids laid flat, or a skid or sill type base which will support the material and facilitate handling by mechanical handling equipment during shipment, stowage and storage.

5.4 Marking.

5.4.1 Military activities (levels A, B, C and commercials. In addition to any special marking required (see 6.2), interior (unit) packs and shipping containers shall be marked including bar coding and the material cure date (quarter and year) for shipment, stowage, and storage in accordance with MIL-STD-2073-1, Appendix F.

5.4.2 Civilian activities. In addition to any special marking required (see 6.2), interior (unit) packs and shipping containers shall be marked including bar coding and material cure date (quarter and year) in accordance with FED-STD-123.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The material is intended for use for general purpose rubber gaskets and packing except those for shipboard hatches, airports, watertight and airtight doors.

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6.2 Acquisition requirements. Acquisition documents must specify the following:

- (a) Title, number, and date of this specification.
- (b) Type required (see 1.2).
- (c) Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- (d) Form, dimensions, and tolerances required (see 3.3).
- (e) Size of rolls furnished and weight, if different (see 3.3.1).
- (f) When Navy fire-retardant requirements are required (see 5.1 (a) and (b)).
- (g) When asbestos free certification is not required (see 5.1.2.1).
- (h) Level of preservation and level of packing required (see 5.2 and 5.3).
- (i) Quantity of gaskets required (see 5.2.1.2).
- (j) Container selection if other than contractor's option (see 5.3.2).
- (k) When caseliners are not required (see 5.3.2.1.1).
- (l) Special marking required (see 5.4.1 and 5.4.2).

6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DIDs) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DIDs are tailored to reflect the requirements of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

Reference Paragraph	DID number	DID title	Suggested Tailoring
5.1.2.1	DI-NDTI-80809	Test, Inspection Reports	Use contractor format

The above DIDs were those cleared as of the date of this specification. The current issue of DoD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DIDs are cited on the DD Form 1423.

6.4 Subject term (key word) listing.

Compression set
Tensile strength
Water extraction

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6.5 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

MILITARY CUSTODIANS:

Army - MR
Navy - SH
Air Force - 99

Preparing activity:

Navy - SH
(Project 5330-0773)

Review activities:

Army - AR
Navy - AS, OS
Air Force - 82
DLA - IS

User activities:

Army - AV, GL
Navy - MC