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SUPERSEDING

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MILITARY SPECIFICATION  
(CODE IDENT 53711)  
PACKING, PREFORMED,  
OTTO FUEL COMPATIBLE,  
SPECIFICATION FOR

This specification is approved for use within the Naval Sea Systems Command (OS), Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers standard requirements for construction and testing of Otto fuel compatible preformed packing for use in torpedo fuel tanks and fuel delivery systems.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

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

SPECIFICATIONS

MILITARY

MIL-B-121 - Barrier Material, Greaseproofed, Waterproofed, Flexible

MIL-P-4861 - Packing, Preformed, Rubber, Packaging of

MIL-O-82672 - Otto Fuel II

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Ordnance Station, Standardization/Documentation Division (Code 524), Indian Head, MD. 20640-5000, by using the self-addressed Standardization Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC: N/A

FSC 5330

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## STANDARDS

## MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
- MIL-STD-129 - Marking for Shipment and Storage
- MIL-STD-413 - Visual Inspection Guide for Elastomeric O-Rings

(Copies of specifications, standards, handbooks, drawings, publications, and other Government documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity).

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue of the non-government documents which is current on the date of the solicitation.

## ASTM

- ASTM D 395 - Rubber Property-Compression Set-Standard Test Methods for
- ASTM D 412 - Rubber Properties in Tension, Standard Test Methods for
- ASTM D 573 - Rubber-Deterioration in an Air Oven, Standard Test Methods for
- ASTM D 2137 - Rubber and Rubber-Coated Fabrics, Brittleness Temperature by Impact, Standard Test Methods for
- ASTM D 2240 - Rubber Property-Durometer Hardness, Standard Test Methods for

(Applications for copies should be addressed to ASTM, 1916 Race Street, Philadelphia, Pa. 19103).

(Nongovernment standards and other publications are normally available from the organizations which prepare or which 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 specification and the references cited herein, (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

3.1 Qualification. Preformed packing furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time set for opening of bids (see 4.4.2 and 6.3).

3.2 Material. Preformed packing shall be a compound of ethylene propylene rubber, formulated, mixed, and cured as necessary to meet the requirements of 3.4.

3.3 Dimensions and tolerances. The dimensions and tolerances shall conform to the dimensional requirements of the applicable NAVSEA drawings.

3.4 Physical properties. The physical properties of the cured rubber shall conform to the values given in Table I.

TABLE I. PHYSICAL PROPERTIES

PROPERTY	REQUIREMENT	MAXIMUM ALLOWABLE CHANGE FROM ORIGINAL VALUE AFTER AGING FOR 70 HRS AT 212° F (100° C)
Durometer, Hardness, Type A	80 $\pm$ 5 points	10 points
Tensile Strength	1000 psi, min	25% decrease
Ultimate Elongation	150%, min	35% decrease
Compression Set After 22 Hrs at 158° F (70° C)	25%, max	—
Low Temperature Brittleness when exposed to -40° F (-40° C)	No sign of Brittleness	—

3.4.1 Otto fuel compatibility. The molded preformed packing shall not exhibit degradation by exposure to Otto Fuel II.

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3.5 Workmanship. The preformed packing shall be of uniform quality, clean and free from foreign materials, and free from defects detrimental to the fabrication, appearance or performance of parts in service in accordance with MIL-STD-413.

#### 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 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must 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 assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

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

- a. Qualification inspection (see 4.4)
- b. Quality conformance inspection (see 4.5)

4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in 4.4, 4.5, 4.5.2 and 4.5.3.

#### 4.4 Qualification inspection.

4.4.1 Sample. Test samples shall consist of twenty (20) preformed packings (1.5 to 3 inch inside diameter by .070 inch cross section diameter) manufactured from a single batch tested in accordance with 4.7.

4.4.2 Qualification inspection. Qualification inspection consists of all the tests specified in 4.10, and shall be performed at a laboratory acceptable to the Government (see 6.3) on sample units produced with equipment and procedures normally used in production. Data for the tests of 4.7 shall be included with the samples.

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4.5 Quality conformance inspection. Quality conformance inspection shall be as specified in Table II.

TABLE II. QUALITY CONFORMANCE INSPECTION

INSPECTION	REQUIREMENT PARAGRAPH	TEST PARAGRAPH
Group A Dimensions and tolerances Otto fuel compatibility, Workmanship	3.3 <sup>1/</sup> 3.4.1 3.5	4.5.2.2, 4.10.2 4.10.1 4.5.2.1, 4.10.3
Group B Durometer hardness Tensile strength Ultimate elongation Compression set Low temperature brittleness Resistance to heat aging	3.4 3.4 3.4 3.4 3.4 3.4	4.9.1.1 4.9.1.2 4.9.1.3 4.9.1.4 4.9.1.6 4.9.1.5
Group C Not applicable		

<sup>1/</sup> All requirements not covered by tests

4.5.1 Inspection of materials and components. The supplier is responsible for insuring that materials and components used were manufactured, tested, and inspected in accordance with referenced subsidiary specifications and standards to the extent specified or if none, in accordance with this specification (see 4.1). In the event of conflict, this specification shall govern. Inspection records shall be kept complete and available to the procuring activity at all times.

4.5.2 Sampling for Group A inspection. Inspection of the end item shall be in accordance with Table II, Table III, and Acceptable Quality Levels (AQL) set forth herein. The lot size, for the purpose of determining the sample size in accordance with MIL-STD-105, shall be expressed in units of preformed packing.

4.5.2.1 Examination for defects in appearance and workmanship. The examination shall be in accordance with MIL-STD-413. The sample size shall be in accordance with MIL-STD-105, Inspection Level II, AQL=1.0.

TABLE III. CLASSIFICATION OF DEFECTS

CATEGORY	DEFECT
Critical	Not compatible with Otto Fuel II
Major	
101	Durometer hardness does not meet test requirements
102	Tensile strength not as specified in Table I
103	Ultimate elongation not as specified in Table I
104	Compression set not as specified (see 3.4)
105	Dimensions not in accordance with applicable NAVSEA drawings
106	Low temperature brittleness not in accordance with Table I
107	Not resistant to heat aging
108	Workmanship not in accordance with MIL-STD-413

4.5.2.2 Examination for dimensional defects. The examination shall be made to the tolerances as specified in the applicable NAVSEA drawing. Sampling shall be in accordance with MIL-STD-105, Inspection Level II, AQL = 1.0.

4.5.2.3 Otto fuel compatibility inspection. Sample for Otto fuel compatibility quality conformance shall be as specified by MIL-STD-105 and as required by 4.10.1.1.

4.5.3 Sampling for Group B inspection. Sample for batch testing shall be as specified by MIL-STD-105 and as required by 4.9.1. The samples shall be cured under conditions identical to the production lot.

4.5.3.1 Disposition of sample units. Sample units which have passed all the Group B inspections shall not be delivered on the contract or purchase order if the lot is accepted and the sample units are still within specified requirements.

4.5.3.2 Noncompliance. If a sample fails to pass Group A or B inspection, the manufacturer shall notify the qualifying activity and the cognizant inspection activity of such failure and take corrective action on the material or processes, or both, as warranted, and on all units of product which can be corrected and which were manufactured with essentially the same materials and processes, and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the qualifying activity has been taken. After the corrective action has been taken, Group A or B inspection shall be repeated on additional sample units (all tests and examinations, or the test which the original sample failed, at the option of the qualifying activity). Groups A and B inspections may be reinstituted; however, final acceptance and shipment shall be withheld until the Group A and B inspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure shall be furnished to the cognizant inspection activity and the qualifying activity.



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4.5.4 Examination for defects in packaging. An examination shall be made to determine that packaging, packing, and markings comply with Section 5. The sample unit for this examination shall be one shipping container fully packed, selected just prior to the closing operation. Shipping containers fully prepared for delivery shall be examined for closure defects in accordance with Table IV.

TABLE IV. DEFECTS IN PACKAGING

EXAMINE	DEFECT
Packaging	Not the level specified. <sup>1/</sup> Not packaged in accordance with Section 5 Packaging material, closures not as specified
Packing	Not level specified, not in accordance with contract requirements Container not as specified, closures not accomplished by specific or required methods or materials Any nonconforming component, component missing, damaged or otherwise defective, affecting serviceability Inadequate application of components, such as incomplete closure of case liners, containing flaps loose or inadequate strapping, bulged or distorted containers
Count	Less than specified quantity
Weight	Gross weight exceeds specified requirements
Markings	Interior or exterior markings, as applicable, omitted, illegible, incorrect, incomplete or not in accordance with contract requirements. Date of cure, storage instruction missing.

<sup>1/</sup> The sample size shall be in accordance with MIL-STD-105, Inspection Level II, AQL=2.5.

4.6 Retention of qualification. To retain qualification, the contractor shall forward a report at 36-month intervals to the qualifying activity. The qualifying activity shall establish the initial reporting date. The report shall consist of:

- a. A summary of the results of the tests performed for inspection of product for delivery (Groups A and B), indicating as a minimum the number of lots that have passed, the number that have failed, and the group which they failed. The results of tests of all reworked lots shall be identified and accounted for.

- b. Failure to submit the report within 30 days after the end of each 36 month period may result in loss of qualification for the product. In addition to the periodic submission of inspection data, the contractor shall immediately notify the qualifying activity at any time during the 36-month period that the inspection data indicates failure of the qualified product to meet the requirements of this inspection.
- c. In the event that no production occurred during the reporting period, a report shall be submitted certifying that the company still has the capabilities and facilities necessary to produce the item. If during two consecutive reporting periods there has been no production, the manufacturer may be required, at the discretion of the qualifying activity, to submit his qualified products to testing in accordance with the qualification inspection requirements and to state the reason for no production.

4.7 Quality conformance tests. The following tests shall be conducted on each batch of material.

Original Properties

Durometer hardness  
Tensile strength  
Ultimate elongation

Compression set  
Low temperature brittleness  
Resistance to heat aging

4.7.1 Rejection criteria. A lot shall be rejected upon the failure of any sample to meet the test requirements specified herein. A lot that has been rejected may be reworked to correct the deficiencies and resubmitted for inspection. Lots are reworked by replacing defective preformed packings (configuration defects) with acceptable packing. Lots represented by a sample of preformed packing which failed to meet Otto fuel compatibility test requirements shall not be reworked.

4.8 Test conditions. Unless otherwise specified in the test procedure, all tests and examinations shall be performed at the following ambient conditions:

- a. Temperature  $77^{\circ} \pm 18^{\circ}\text{F}$
- b. Barometric pressure  $30 \pm 2$  inches of mercury
- c. Relative humidity Room ambient, 90% maximum

4.9 Test procedures. Test samples from each batch shall be tested in accordance with the procedures of this section as specified. (see 4.7)

4.9.1 Physical and chemical tests. A Government Representative shall verify the below listed testing for each batch.

4.9.1.1 Durometer hardness. The batch sample shall meet the requirements of 3.4 and shall be tested in accordance with ASTM D2240 using a Type A durometer.



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4.9.1.2 Tensile strength. The batch sample shall meet the requirements of 3.4 and shall be tested in accordance with ASTM D412 using a dumb-bell shaped specimen cut with a die conforming to the C die dimensions.

4.9.1.3 Ultimate elongation. The batch sample shall meet the requirements of 3.4 and shall be tested in accordance with ASTM D412 using a dumb-bell shaped specimen cut with a die conforming to the C die dimensions.

4.9.1.4 Compression set. The batch sample shall meet the requirements of 3.4 and shall be tested in accordance with ASTM D395, Method B. The test specimen shall be solid, Type I.

4.9.1.5 Resistance to heat aging. The batch sample shall meet the requirements of 3.4 and shall be tested in accordance with ASTM D573. Test specimens shall be in accordance with ASTM D412 using a dumb-bell shaped specimen cut with a die conforming to the C die dimensions. After testing for change in durometer hardness, tensile strength, and ultimate elongation of the aged specimens, one part of the broken specimen shall be bent back upon itself and held in that position for 30 seconds with no evidence of cracking.

4.9.1.6 Low temperature brittleness. Determination of the requirements of 3.4 shall be in accordance with ASTM D2137, Method A, paragraph 9.3.2. Five Type B specimens shall be tested at one time. Specimens being tested shall be conditioned for  $3.0 \pm 0.5$  minutes in a liquid at  $-40 \pm 2$  degrees F prior to testing. There shall not be any break, crack, fissure, or hole visible to the naked eye after testing.

4.10 Finished item requirements.

4.10.1 Otto fuel compatibility. Samples shall be selected in accordance with 4.5.2 from the completed lot and submitted to the government approved test facility (see 6.3). Testing shall be by immersion in Otto fuel II at 170 degrees F (77 degrees C)  $\pm 5$  degrees for  $90 \pm 2$  hours. Unless otherwise specified by the applicable NAVSEA drawings, volume change shall not exceed 0 to +5 percent, no shrinkage is permitted. After testing, the samples shall not exhibit any surface decomposition or tackiness. When bent over upon itself and pressed flat the tested preformed packing shall not exhibit any evidence of cracking or splitting.

4.10.1.1 Selection of test samples. A test sample shall be selected from each completed lot of preformed packings and submitted with the compound number, batch number and cure date, to the government approved test facility (see 6.3). A test sample shall consist of five test specimens. Test specimen requirements are as follows:

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- a. A test specimen shall consist of one preformed packing unit when the weight of the individual packing is equal to, or greater than 0.2g and the largest dimension (diameter, width, or height) is equal to or less than 4.5 inches. The 0.2g minimum weight/unit is required to obtain accurate weight measurements. The maximum dimension of 4.5 inches is required to ensure that the packing will fit in the Otto fuel test container without contacting the container surfaces and/or other test specimens.
- b. A test specimen shall consist of two or more preformed packing units as required to total 0.2g or a greater weight when the weight of the individual packing is less than 0.2g.
- c. A test specimen shall consist of one  $3.50 \pm 0.08$ -inch segment from one preformed packing when the largest dimension (diameter, width or height) is greater than 4.5 inches. Five preformed packings shall be submitted to the testing facility, where one segment will be cut from each preformed packing.

4.10.1.2 Testing by immersion in Otto Fuel II. Testing shall be by immersion in Otto Fuel II at the temperature and for the test period specified by the NAVSEA preformed packing drawing. The allowable volume change due to immersion in Otto Fuel II shall be in accordance with drawing specification.

4.10.2 Dimensions. Dimensions shall be as specified by the applicable NAVSEA drawings.

4.10.3 Surface quality and workmanship. Surface quality and workmanship shall be in accordance with MIL-STD-413.

## 5. PACKAGING

5.1 Preservation, packaging, and packing. Unless otherwise specified by the procuring activity, preservation, packaging, and packing shall be in accordance with MIL-P-4861, Level A, with barrier material in accordance with MIL-B-121, Grade A, Type I, Class I. Each item shall be individually packaged.

5.2 Item markings. Preformed packing with nominal inside diameters of .239 inch and smaller shall be marked with semi-permanent white mark. Sizes larger than .239 inch nominal inside diameter shall be marked with one permanent white mark. Additional color marks, other than white, are optional.

5.2.1 Marking. The packaged preformed packing shall be marked in accordance with MIL-STD-129 as follows:

- a. NSN/NATO stock number.
- b. FSCM and Manufacturer's part number.
- c. Item description.
- d. Quantity and unit of issue.
- e. Contract number or purchase order number, including the four-digit delivery order or call number, when used.
- f. Level of protection and data.

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In addition, package markings shall include any applicable dash number designations with the military part number and the Otto fuel compatibility verification test number (CTB-XXX) which is assigned by the government approved test facility of 6.3 for the Otto fuel compatibility test of 4.10.1.

## 6. NOTES

6.1 Intended use. The preformed packing covered by this specification are intended for use on all Torpedo MK48 systems.

### 6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number and date of this specification
- b. Sizes in accordance with applicable NAVSEA drawings
- c. Quantity
- d. Applicable Federal Stock Number
- e. Applicable levels of preservation, packaging and packing required (see 5.1)

6.2.2 Production lot test report. A test report is required for each production lot (see 4.5.2). The report shall include the following:

- a. Supplier's name
- b. Government contract number
- c. Military part number (and applicable dash number)
- d. Manufacturer's name
- e. Manufacturer's compound number
- f. Manufacturer's batch number
- g. Actual values for the batch test of 4.9.1.1 thru 4.9.1.6
- h. Attribute data for the inspections of 4.10.2 , 4.10.3
- i. A copy of the test results of 4.10.1

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List (QPL XXXX) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Underwater Systems Center, Newport, Rhode Island 02841 and information pertaining to qualification of products may be obtained from that activity. The Government approved test facility for performing the OTTO fuel compatibility testing of 4.10.1 is the Naval Undersea Warfare Engineering Station, Weapons Quality Engineering Center, Keyport, Washington 98345. Testing will not be performed without the results of 4.9.1 and the Manufacturer's compound number, batch number and cure date accompanying the sample.

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## 6.4 DEFINITIONS

6.4.1 Batch. For the purpose of this specification, batch refers to a quantity of Ethylene Propylene rubber compounded on a mill or mixer at one time, is homogenous, and shall not exceed 250 pounds. Blending together of batches for production of preformed packing in accordance with this specification is not permitted.

6.4.2 Lot. For the purpose of this specification, lot refers to a quantity of finished preformed packing manufactured to the same dimensions and tolerances and produced from the same material batch and cured under similar conditions on the same date.

6.5 Age limitations. When packaged in accordance with the requirements of section 5, the preformed packing shall not be subject to shelf life restrictions.

6.6 Changes from previous issue. Asterisks (or vertical lines) are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

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(Project 5330-0596)

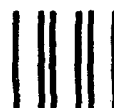
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