

MIL-C- 81251 (WP)  
20 April 1965

**MILITARY SPECIFICATION**  
**CLOTH, SILICA, PHENOLIC IMPREGNATED**

This specification has been approved by the  
Bureau of Naval Weapons, Department of the Navy.

**1. SCOPE**

1.1 Scope. This specification covers the requirements for one type of silica cloth, impregnated with a phenolic in the semi-cured state.

**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 this specification to the extent specified herein.

**SPECIFICATIONS**

Military

MIL-P-116

MIL-R-9299

Preservation, Methods of  
Resin, Phenolic, Low Pressure  
Laminating

Department of the Navy  
Bureau of Naval Weapons

OS 9349

Fabric, Woven, Vitreous Fiber,  
For Plastic Laminates

**STANDARDS**

Federal

Federal Test Method  
Standard 406

Plastics, Methods of Testing

Military

MIL-STD-105

MIL-STD-129

Sampling Procedures and Tables  
For Inspection by Attributes

Marking for Shipment and Storage

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**MIL-C-81251(WP)**

(When requesting any of the above documents, give the title and complete designation of the item shown above. Copies of this specification and other unclassified specifications, standards and publications required by contractors in connection with specific procurement functions may be obtained from the Commanding Officer, Navy Supply Depot (CDS), 5801 Tabor Avenue, Philadelphia, Pennsylvania, 19120.)

**3. REQUIREMENTS**

**3.1 Preproduction samples.** Unless otherwise specified in the contract or order, preproduction samples of the impregnated cloth shall be manufactured using the methods and procedures proposed for the production. The sample shall be tested as specified in Section 4 herein and is for the purpose of determining that, prior to starting production, the contractor's production methods are capable of yielding items that comply with the technical requirements of the contract. After satisfactorily passing all the preproduction tests specified herein, no changes in raw materials and processing of materials for production shall be made without prior written approval of the procuring activity.

**3.2 Data requirements.** No data is required by this specification or by applicable documents referenced in Section 2 unless specified in the contract or order (see 6.2).

**3.3 Material.** The raw materials used to make the finished product shall be silica cloth, conforming to OS 9349, Type II, except that it shall contain a minimum of 96 percent silica, and a phenolic resin conforming to MIL-R-9299, Type II, Class 2.

**3.4 Physical and chemical properties**

**3.4.1 Resin solids content.** The uncured resin-impregnated cloth shall contain  $28 \pm 3$  percent by weight of resin solids.

**3.4.2 Volatiles content.** The uncured resin-impregnated cloth shall contain 4 to 7 percent by weight of volatile matter.

**3.4.3 Resin flow.** The uncured resin-impregnated cloth shall have a

MIL-C- 81251(WP)

resin flow of 15 to 21 percent.

3.4.4 Flexural strength. The flexural strength of the cured resin-impregnated fabric shall be a minimum average of 19,000 pounds per square inch (psi) at  $75 \pm 5$  degrees Fahrenheit (F). No individual value shall be below 18,000 psi.

3.4.5 Ultimate tensile strength. The ultimate tensile strength of the cured resin-impregnated fabric shall be a minimum average of 12,000 psi at  $75 \pm 5$  degrees F. No individual value shall be below 11,000 psi.

3.4.6 Specific gravity. The specific gravity of the cured resin-impregnated fabric shall be a minimum of 1.67.

3.5 Workmanship. The material shall be uniform in quality and shall be free from impurities and other defects that could adversely affect its use.

#### 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, the supplier may utilize his own facilities or any commercial laboratory acceptable to 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 Classification of inspections. Inspection of the insulation shall be classified as follows:

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

#### 4.3 Sampling

4.3.1 Preproduction sample. A preproduction sample of 3 specimens manufactured in accordance with 3.1 shall be subjected to the preproduction tests detailed in 4.4 at an activity designated by the procuring activity.

**MIL-C-81251(WP)**

Further production of the phenolic-impregnated cloth by the supplier prior to the approval of the preproduction sample, shall be at the supplier's risk.

**4.3.2 Quality conformance inspection sampling.** Except as otherwise specified, the sampling plans and procedures set forth in MIL-STD-105, level II shall be used in the determination of acceptability of the phenolic-impregnated cloth as specified in 4.5. Samples shall be selected from material prior to any slitting.

**4.3.3 Inspection lot.** An inspection lot of impregnated cloth shall consist of all material presented for acceptance at one time and produced in a single manufacturing run under homogeneous conditions of manufacture.

**4.4 Preproduction inspection.** The preproduction sample, after satisfactorily passing the quality conformance inspections detailed in 4.5, shall be subjected to the following tests and examinations.

**4.4.1 Mechanical test specimen preparation.** From the broad-goods samples provided, prepare a parallel laminate 10 × 12 inches in size with a cured thickness of 0.125 + 0.010 - 0.020 inch. The warp direction of the fabric shall be in the 10-inch direction. Cure the laminate as follows:

1. Place the laminate in a preheated press at 325 ± 10 degrees F, close rapidly, then apply pressure of 100 ± 10 psi and cure 1 hour.
2. Post cure in a circulating-air oven at 325 ± 5 degrees F for 3 to 3-1/4 hours.

A minimum of 5 specimens, 0.125 + 0.010 - 0.020 inch thick, shall be run for each property.

**4.4.1.1 Flexural strength test.** The flexural strength shall be determined in accordance with Federal Test Methods Standard 406, method 1031.

**4.4.1.2 Ultimate tensile strength test.** The ultimate tensile strength

shall be determined in accordance with Federal Test Methods Standard 406, method 1011.

4.4.1.3 Specific gravity test. The specific gravity shall be determined in accordance with Federal Test Methods Standard 406, method 5011.

#### 4.5 Quality conformance inspection

4.5.1 Visual examination. Visually examine all containers in a lot to determine compliance with 3.5 and Section 5.

4.5.2 Volatiles content test. Cut five 4 inch  $\times$  4 inch square specimens on the bias from random locations on each sample of broad-goods. Weigh each specimen to the nearest milligram (0.001 gram) and then suspend each in a circulating-air oven maintained at  $325 \pm 5$  degrees F for  $10 \pm 0.5$  minutes. On removing the specimens from the oven, cool to room temperature and reweigh each specimen to the nearest milligram. Calculate the volatile content as follows:

$$\text{Volatile content, weight percent} = \frac{W_0 - W_1}{W_0} \times 100$$

where:

$W_0$  = Original weight, grams

$W_1$  = Weight of specimen after volatiles removed, grams

The average and range of the five values shall be reported.

4.5.3 Resin solids test. The five specimens used for the volatile content tests shall be placed in previously heated muffle furnace. The samples shall then be maintained at  $1600 \pm 50$  degrees F for a minimum of one hour or until a white fabric free of carbon remains. Cool the specimens to room temperature and reweigh each specimen to the nearest milligram. Calculate the resin solids content as follows:

**MIL-C- 81251 (WP)**

$$\text{Resin solids content, weight percent} = \frac{W_1 - W_2}{W_1} \times 100$$

where:

$W_1$  = Weight of specimen after volatiles are removed, grams

$W_2$  = Final weight of specimen after ignition at 1600 degrees F, grams

The average and range of the five values shall be reported.

**4.5.4 Resin flow test.** Cut twenty-one 4 inch  $\times$  4 inch squares on the bias from random locations on each sample. Stack seven of these squares to form a specimen and place a sheet of 0.005-inch thick parting material on each side of the specimen. Place the specimen in the center of a pre-heated press with platen maintained at  $325 \pm 10$  degrees F. Immediately close the press and apply a dead-weight load on the sample of  $100 \pm 5$  psi. Cure the specimen for 10 minutes minimum, remove from the press and while still hot remove the parting agent from the specimen. Allow to cool to room temperature and weigh to the nearest milligram. Care should be exercised in handling the specimen after removing it from the press so as not to lose any of the flash. After determining the specimen weight with the resin flash, remove this flash and reweigh the specimen to the nearest milligram. Calculate the resin flow as follows:

$$\text{Resin flow, weight percent} = \frac{W_3 - W_4}{W_3} \times 100$$

where:

$W_3$  = Weight of specimen after cure with flash, grams

$W_4$  = Weight of specimen after cure with flash removed, grams

The average and range of the three results shall be reported.

#### **4.6 Acceptance criteria**

**4.6.1 Preproduction.** Failure of any sample to comply with any requirement of this specification shall be cause for rejection of the sample.

## MIL-C- 81251(WP)

4.6.2 Quality conformance. Failure of any sample to comply with any requirement of this specification shall be cause for rejection of the sample. Acceptance of the lot shall be based upon an Acceptable Quality Level (AQL) of 1.0 percent as per MIL-STD-105, level II, normal inspection, single sampling. One hundred percent inspection shall be required when quantity of material on order is below MIL-STD-105, level II.

## 5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging and packing. Unless otherwise specified by the procuring activity, the preservation, packaging and packing shall be in accordance with MIL-P-116, method III.

5.2 Marking. Each container shall be marked in accordance with MIL-STD-129. Marking shall include, but not be limited to, the following information:

- a. Manufacturer's name and location
- b. Material trade name
- c. Net weight or volume
- d. Lot number, batch number and date of manufacture
- e. Shelf life or storage limitations
- f. Number and revision letter of this specification

## 6. NOTES

6.1 Intended use. The material purchased in accordance with this specification is intended to be used in rocket motors.

6.2 Ordering data. Procurement documents should specify, but not be limited to, the following information:

- a. Title, number and revision letter of this specification
- b. Minimum lot size, if applicable
- c. Whether preproduction sample is required
- d. Place of delivery
- e. Size of container
- f. Request for test data
- g. Request for broad-goods samples





SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004
<b>INSTRUCTIONS</b>		
This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).		
SPECIFICATION MIL-C-81251(WP) CLOTH, SILICA, PHENOLIC IMPREGNATED		
ORGANIZATION (Of submitter)		CITY AND STATE
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT \$
MATERIAL PROCURED UNDER A <input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? A. GIVE PARAGRAPH NUMBER AND WORDING.		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE? <input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES", IN WHAT WAY?		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity)		DATE

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Bureau of Naval Weapons  
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