

MIL-A-9962A
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Superseding
MIL-A-9962 (USAF)
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MILITARY SPECIFICATION

ABRASIVE MATS, NON-WOVEN, NON-METALLIC

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers non-woven, non-metallic mats made of nylon fiber which are bonded together with waterproof adhesives containing abrasives.

1.2 Classification. The mats covered by this specification shall be of the following types, classes, and grades as specified by the procuring activity (See 6.2):

Type I - Nylon, aluminum oxide mat

Type II - Nylon, flint mat

Type III - Nylon, silicon carbide mat

Class 1 - Sheets

Class 2 - Rolls

Class 3 - Disks

Grade AAA- Ultra fine

Grade AA - Super fine

Grade A - Very fine

Grade B - Fine

Grade C - Medium

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.

FSC 5350

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SPECIFICATIONS

Military

MIL-P-3816

Abrasives and Abrasive Products
for Shipment and Storage, Packaging
and Packing of
Remover, Paint and Lacquer, Solvent
Type

MIL-R-25134

MIL-C-25769

Cleaning Compound, Aircraft Surface,
Alkaline Waterbase

MIL-C-38334

Corrosion Removing Compound,
Prepaint, for Aircraft Aluminum
Surfaces

STANDARDS

Military

MIL-STD-105

Sampling Procedures and Tables
For Inspection by Attributes

MIL-STD-129

Marking for Shipment and Storage

(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 publication. 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.

U.S. Department of Commerce

CS217-59

Grading of Abrasive Grain on
Coated Abrasive Products

(Application for copies should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.)

American Society for Testing Materials

ASTM D1117-59 Testing Non-woven Fabrics

(Application for copies should be addressed to the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa.)

3. REQUIREMENTS

3.1 Materials. Materials used in the manufacture of the abrasive mats shall meet the applicable test requirements of this specification.

3.2 Mineral types.

3.2.1 Type I. Type I abrasive shall be aluminum oxide with a minimum of 94% of Al_2O_3 and a hardness of 9.4 Moh's scale (2050 Knoop). Type I mats shall be furnished in Grade A, Grade B, or Grade C as specified (See 6.2).

3.2.2 Type II. Type II abrasive shall be a mild natural silicon dioxide (flint) with a hardness of 6.8 - 7.0 Moh's scale (approximately 820 Knoop). It shall be free from extraneous material. Type II mats will be furnished in Grade B (See 6.2).

3.2.3 Type III. Type III abrasive shall be silicon carbide with a minimum of 97% SiC and a hardness of 9.6 Moh's scale (2480 Knoop). Type III mats shall be furnished in Grade AAA, Grade AA, Grade A, Grade B, or Grade C as specified (See 6.2).

3.3 Mineral grades.

3.3.1 Sedimentation grade.

3.3.1.1 Grade AAA. The ultra fine particles shall average less than 10 microns (see 4.6).

3.3.1.2 Grade AA. The super fine particles shall be grit size 500 (See 4.6).

3.3.1.3 Grade A. The very fine particles shall be grit size 280 to 400 for Type I and 280 for Type III (See 4.6).

3.3.2 Screen grades.

3.3.2.1 Grade B. The fine particles shall be grit size 180 for Types I, II, and III. (See 4.6)

3.3.2.2 Grade C. The medium particles shall be grit size 100 to 150 (See 4.6).

3.4 Fiber. The fiber for Type I, II, and III mats shall be crimped, cut filament nylon meeting the requirements of Table I.

3.5 Adhesive.

3.5.1 The composition of the adhesive for Type I, II, and III abrasive mats shall be as specified in Tables II, III, and IV, respectively. A tolerance of $\pm 10\%$ of the specified amount of dye is permissible.

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TABLE I
REQUIREMENTS FOR CRIMPED, CUT FILAMENT NYLON

Property	Grade AAA, AA, A, & B	Grade C
Material	Nylon	Nylon
Polymer type	Type 6 or Type 6-6	Type 6 or Type 6-6
Denier	15 ± 5	58 ± 10
Crimps per inch	12 ± 5	12 ± 5
Heat set	Yes	Yes
Staple length	$1\frac{1}{2} \pm 1/8$ inch	$2 \pm 3/16$ inch.
Tenacity - grams per denier	3.0 - 6.0	2.5 - 4.5
% elongation	40 - 140	50 - 150

TABLE II
COMPOSITION OF ADHESIVE FOR TYPE I MATS

Material	Grade A	Grade B	Grade C
Thermosetting resin	99.30%	99.40%	99.09%
Red Dye	0.70%	0.60%	0.91%

TABLE III
COMPOSITION OF ADHESIVE FOR TYPE II MATS

Material	Grade B
Thermosetting resin	85.50%
White pigment	9.69%
Yellow pigment	4.81%

3.5.2 Color. The abrasive mats shall be color coded according to mineral type. Type I mats shall be maroon in color; Type II mats shall be tan in color; and Type III mats shall be grey in color.

3.5.3 The adhesive and the mineral shall be evenly distributed on all surfaces and through the entire depth of the mat so as to obtain essentially the same abrasive characteristics when used on either side or on edge (See Table X).

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TABLE IV

COMPOSITION OF ADHESIVE FOR TYPE III MATS

Material	Grade AAA	Grade AA	Grade A	Grade B	Grade C
Thermosetting resin	99.95%	99.53%	40.62%	99.70%	99.71%
Black dye	0.05%	0.47%	0.42%	0.30%	0.29%
White pigment (Filler)	-----	-----	58.96%	-----	-----

3.6 Ash test. Type I and III mats shall contain the amount of mineral specified in Tables V and VI, respectively (See 4.5.1). Type II mats shall contain a minimum of 1.5.1 grains of mineral and pigment per square inch when tested as specified in 4.5.1.

TABLE V

AMOUNT OF MINERAL IN TYPE I MATS

Grade	Minimum Mineral Content by Weight per Square Inch
A	2.16 grains
B	3.62 grains
C	3.75 grains

TABLE VI

AMOUNT OF MINERAL IN TYPE III MATS

Grade	Minimum Mineral Content by Weight per Square Inch
AAA	1.08 grains
AA	1.79 grains
A	2.48 grains
B	2.66 grains
C	3.22 grains

3.7 Dimensions. Unless otherwise specified, the dimensions of Class 1, 2, and 3 abrasive mats shall be as specified in Table VII (See 6.2).

3.7.1 Dimensional tolerances. Permissible variations in the dimensions of Class 1, 2, and 3 abrasive mats shall be as specified in Table VII.

3.7.2 Thickness. The thickness of Type I, II, and III mats shall be a minimum of 0.250 inch except Grade C which shall have a minimum thickness of 0.400 inch.

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TABLE VII
DIMENSIONS AND DIMENSIONAL TOLERANCES

Forms <u>1/</u>	Dimensions	Tolerances
Class 1, sheets	9 x 11 inches 3-2/3 x 9 inches or 3 x 8 inches	All sheets $\pm 1/16$ inch
Class 2, rolls	1, 1½, or 2 inch width by 30 foot length	All rolls $\pm 1/16$ inch width, ± 12 or minus 0 inches in length
Class 3, disks (without center holes unless otherwise specified) (See 6.2) <u>2/</u>	5, 7, 8, and 9 inch outside diameter	All disks $\pm 1/16$ inch outside diameter

1/ Only the popular sizes of sheets, rolls, and disks are listed; however, other sizes may be obtained and, if required, should be specified (See 6.2).

2/ If center holes are desired in Class 3 disks, specify size required. The allowable variation of the center hole is plus or minus 1/32 inch for diameters equal to or less than 1-1/4 inches and the allowable variation for diameters equal to or greater than 1-5/16 inches is plus or minus 1/16 inch.

3.8 Weight. The weight of the abrasive mats expressed in grains/square inch shall be as specified in Table VIII.

TABLE VIII
WEIGHT OF ABRASIVE MATS

Type	Weight in Grains/Square Inch				
	Grade AAA	Grade AA	Grade A	Grade B	Grade C
I	----	----	5.5 \pm 0.6	8.1 \pm 0.8	10.0 \pm 1.0
II	----	----	----	4.2 \pm 0.4	----
III	3.0 \pm 0.3	5.0 \pm 0.5	7.7 \pm 0.8	7.4 \pm 0.7	10.0 \pm 1.0

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3.9 Water and chemical resistance. When tested as specified in 4.5.3, mats shall not show more loss in tensile strength than specified in Table IX.

TABLE IX
WATER AND CHEMICAL RESISTANCE

Test Solution	Maximum Allowable Loss in Tensile Strength - %
Water	40%
5% NaOH	45%
Mineral Spirits 165° B.P.	10%
Paint Remover (MIL-R-25134)	35%
Mixture of one part alkaline water base cleaner (MIL-C-25769, Type I) and three parts water	30%
Metal conditioner (MIL-C-38334(USAF))	40%

3.10 Workmanship. All details of workmanship shall be in accordance with high-grade manufacturing practices for the type of product specified herein.

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 tests. All the tests required herein for the testing of abrasive mats are classified as acceptance tests, for which necessary sampling techniques of testing are specified in this section.

4.3 Sampling for lot acceptance.

4.3.1 Lot. For the purpose of inspection, a lot shall consist of not more than 100 pounds of material of the same type, class, grade and dimensions manufactured from the same batch and offered for delivery at one time by one supplier.

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4.3.2 Samples. A sample from each lot shall be selected in accordance with Standard MIL-STD-105 using an AQL of 4.0 percent defective. A sample shall consist of 144 square inches of abrasive mat. Each sample shall be suitably tagged to identify it with the lot represented. Samples shall be subjected to tests as specified herein.

4.4 Examination for defects. Each of the sample mats selected in accordance with 4.3.2 shall be examined visually and dimensionally to verify compliance with this specification. Examination shall be conducted as specified in Table X. Any sample containing one or more defects shall be rejected and if the number of defective indicators in any sample exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected.

4.5 Tests

4.5.1 Ash test. A 4 x 6 inch sample of material shall be placed in a crucible, then placed in a muffle furnace and burned off for two hours at 1400°F. The residue shall be cooled and weighed. The results shall be converted to grains per square inch. The results shall conform with 3.6.

4.5.1.1 Type III, Grade A. The residue from 4.5.1 shall be digested in 10% hydrochloric acid. The residue shall be filtered, dried, weighed and converted to grains per square inch. The results shall conform with 3.6.

4.5.2 Thickness measurement. The thickness measurements shall be taken by placing a 4 x 6 inch sample between the centers of two approximately 4 x 6 x 0.045 inch aluminum plates and measuring the thickness with a micrometer. No pressure is to be exerted on the micrometer. The average of at least three measurements shall be reported.

4.5.3 Water and chemical resistance. Samples for this test may be taken from the sample quantity selected in accordance with 4.3.2. Three samples shall be designated as control samples and thus as test samples for each of the solutions specified in Table XI. Each set of three test samples shall be completely immersed in the applicable test solution at the temperature and time specified in Table XI. Tensile strength shall be run on the test samples and the control samples using procedure specified in ASTM D1117-59. The average tensile strength reading for each set of three samples shall be recorded and the percent loss in tensile strength computed in the following manner (See 3.9):

Loss In
Tensile Strength =

$$\frac{(\text{Average Tensile Strength of Control}) - (\text{Average Tensile Strength After Immersion})}{\text{Average Tensile Strength of Control}} \times 100$$

Average Tensile Strength of Control

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TABLE X
CLASSIFICATION OF VISUAL AND DIMENSIONAL DEFECTS

Categories	Defects
Critical	None defined
Major	
101	Wrinkles in material
102	Out-of-round disks
103	Excessively large hard particles of adhesives and mineral within critical working areas
104	Torn edges
105	Gouged surfaces or excessively large thin areas
106	Areas uncoated with abrasive
107	Excessively heavy or lightweight areas
108	Flat, matted (low loft) areas
109	Irregular shape of sheets (not rectangular or as specified)
110	More than 2 pieces per 30 foot roll
111	Mats not within dimensional tolerances. (See 3.6)
Minor	None defined

4.5.3.1 Test results. When test results reflect more loss in tensile strength than specified for the test solution (Table IX), it shall be cause for rejection of the lot represented.

4.6 Mineral grades. The grading procedures of abrasive shall be in accordance with the U.S. Department of Commerce Commercial Standard CS217-59.

4.7 Weight. A 2 x 3 inch sample shall be accurately measured and weighed. The weight in grains/square inch shall be calculated (See 3.8).

4.8 Certificate of compliance. The supplier shall submit to the contracting officer a certificate of compliance certifying that the abrasive mats meet the mineral type (See 3.2), fiber (See 3.4), and adhesive (See 3.5) requirements of this specification.

4.9 Examination of preparation for delivery. Preservation, packaging, packing, and marking for shipment and storage shall be examined to determine compliance with the requirements of Section 5 of this specification.

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TABLE XI
IMMERSION TESTS

Test Solution	Temperature of test solution	Time (min)
Water	Boiling (212°F)	10
5% NaOH	150 \pm 5°F	5
165° Boiling Point Mineral Spirits	73 \pm 5°F	5
Paint Remover per MIL-R-25134	73 \pm 5°F	10
Mixture of one part water base cleaner per MIL-C-25769, Type I and three parts water	73 \pm 5°F	15
Metal Conditioner per MIL-C-38334(USAF)	73 \pm 5°F	15

5. PREPARATION FOR DELIVERY

5.1 Application. The packaging, packing, and marking requirements specified herein apply to direct purchases by or direct shipment to the Government.

5.2 Packaging. Packaging shall be Level A or C as specified (See 6.2).

5.2.1 Level A or C. Rolls, sheets, or disks shall be packaged in accordance with the packaging requirements of Specification MIL-P-3816 as specified for rolls, sheets, or disks.

5.3 Packing. Packing shall be Level A, B, or C as specified (See 6.2).

5.3.1 Level A, B, or C. Rolls, sheets or disks packaged as specified in 5.2.1 shall be packed in accordance with the packing requirements of Specification MIL-P-3816 as specified for rolls, sheets, or disks.

5.4 Marking. In addition to any special marking required by the contract or order, all containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use.

6.1.1 Class 1. Sheets can be used by hand or with an oscillating sander for cleaning, scouring, development or new surface finishes, and preparing surfaces for painting or enameling. The product is suitable for removal of light corrosion products from metal surfaces of aircraft and missiles.

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6.1.2 Class 2. Rolls are recommended for conversion to sheets in operations where various sizes of sheets might be needed.

6.1.3 Class 3. Disks can be used on the sides or on the edges when mounted singly or in multiple thickness to form a roll or wheel.

6.1.4 Type I. Aluminum oxide is recommended for use in operations where fine finish plus stock removal is required.

6.1.5 Type II. Flint is a general use cleaning and scouring material. Due to the softness of the mineral it will have a relatively mild attack on the surfaces.

6.1.6 Type III. Silicon carbide is recommended for use in operations where fast cut under light pressure is required and finish is not extremely critical.

6.2 Order data. Procurement documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type, class and grade desired (See 1.2).
- c. Dimension (See 3.7) (If disk, specify center hole diameter desired, otherwise disk will be supplied without center hole) (See Table I).
- d. Quantity.
- e. Selection of applicable levels of preservation, packaging, and packing (See section 5).
- f. Special marking, if required (See 5.4).

6.3 Hardware. Hardware such as fittings, back-up plates, and flanges needed as accessories should be considered in the procurement.

Custodians:

Army - MR
Navy - AS
Air Force - 84

Preparing Activity:

Air Force - 84
Project Nr. 5350-0028
Code C

Review:

Army - MR, WC
Navy - AS
Air Force - 84, 85, 15

User:

Army - WC, EL, MI

FOLD

POSTAGE AND FEES PAID

OFFICIAL BUSINESS

WRAMA (WRNEC)
Robins AFB, Georgia 31093

FOLD

Figure V-5, Example of Specification Analysis Sheet (back)

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004	
<p align="center">INSTRUCTIONS</p> <p>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 of 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.</p>			
SPECIFICATION			
ORGANIZATION		CITY AND STATE	
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT \$	
MATERIAL PROCURED UNDER A			
<input checked="" 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

DD Form 1426

Figure V-5, Example of Specification Analysis Sheet (front)