H-B-178D/GEN
May 10, 1976
SUPERSEDING
Fed. Spec. H-B-178C
January 24, 1969,
Fed. Spec. H-B-175B
April 19, 1968, and
MIL-B-15319E
17 November 1971 (in part)

FEDERAL SPECIFICATION

BRUSHES, WIRE AND PLATERS GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification covers the general requirements for wire and platers brushes.

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.

Federal Specifications:

H-B-178/1 - Brushes Wire and Platers; Curved Handle, 4 Row Brushes
H-B-178/2 - Brushes Wire and Platers; Curved Handle, 3 Row Brushes
H-B-178/3 - Brushes Wire and Platers; Shoe Handle Brushes
H-B-178/4 - Brushes, Wire and Platers; Straight Block Brushes
H-B-178/5 - Brushes Wire and Platers; Curved Block Brush

FSC 7920

H-S-951	-	Synthetic Filaments for Brushes; General Specification For
L-P-394	-	Plastic Molding Material (Polypropylene Plastic, Injection and Extrusion)
QQ-A-225/7	-	Aluminum Alloy Bar, Rod, and Wire; Rolled, Drawn or Cold Finished, 5052
QQ-C-530	-	Copper-Beryllium Alloy Bar, Rod, and Wire (Copper Alloy, Numbers 172 and 173)
QQ-W-321	-	Wire, Copper Alloy
QQ-W-423	-	Wire, Steel, Corrosion-Resisting
PPP-B-1880	-	Brushes, Preparation of Delivery of

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification and other Federal specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, WA.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Standards:

MIL-STD-105	-	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-1363	-	Measurement of Wood Moisture Content

(Copies of Military Specifications and Standards 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 a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply:

American Society for Testing and Materials (ASTM) Standard:

D 785 - Rockwell Hardness of Plastics and Electrical Insulating Materials Rockwell Superficial Hardness of

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

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheets.

3.2 Standard product. The brushes delivered under this specification shall be the manufacturer's commercial product, except for any changes necessary to comply with requirements specified herein.

3.3 Materials. Materials not definitely specified shall be of the quality normally used by the manufacturer for brushes provided the completed item complies with all requirements specified herein. Unless otherwise specified, herein, commercial tolerances apply.

3.3.1 Wood. Wood shall be a close-grained and straight-grained hard wood, thoroughly and uniformly dried to a moisture content not exceeding 12 percent at time of assembly when tested as specified in 4.2.1.1.

3.3.2 Polypropylene block material. The polypropylene shall be virgin, general purpose homopolymer polypropylene meeting the requirements of L-P-394, except that the physical reuqirements after molding into a block shall be limited to those given in table I when tested as specified in 4.2.1.2. Clean, unburned plastic material in the form of imperfect parts, sprues, runners or other scrap of the same composition as virgin material and produced in the molding or finishing operations, may be reground and mixed with virgin material.

TABLE I. Requirements for polypropylene plastic

Property 23°C (73°F)	Units	Property values
Density		
Solid	gm/ml	Min 0.901 Max 0.907
Foam	gm/ml	Min 0.50 Max 0.60
Tensile yield strength	psi	Min 4900
Izod impact strength	ft lb/in	Min 0.5
Rockwell hardness	R scale	Min 96

3.3.3 Filler materials.

3.3.3.1 Poylpropylene filler material. The polypropylene filler material shall be 0.020 inch diameter and shall conform to class P, type II of H-S-951.

3.3.3.2 Hog bristle. Hog bristle shall be pure black without artificial coloring and cleaned and sterilized as follows when tested as specified in 4.2.1.3. The hog bristle shall be treated so as to contain not less than 0.50 percent nor more than 0.70 percent DDT (dichloro-diphenyl-trichoroethane). The DDT content shall be based on the air dried weight of the treated bristle when tested as specified in 4.2.1.3. The hog bristle shall be sterilized after washing and rinsing, as follows. The temperatures and pressures shall be recorded by the supplier (see 4.2.1.3).

The hog bristle shall be soaked in boiling water (212°F.) for not less than 30 minutes.
The hog bristle shall be placed in a chamber and a temperature above 284°F. shall be maintained for not less than 3 hours.
The hog bristle shall be autoclaved at not less than 15 pounds per square inch steam pressure for not less than 45 minutes.

3.3.3.3 Tampico. Fiber shall be new and unused commercially available tula tampico fiber.

3.3.3.4 Carbon steel wire. Carbon steel wire shall be commercial, high carbon, round, oil tempered brush wire with a diameter as specified in the specification sheet. Flat carbon steel wire shall be as specified in the applicable specification sheet.

3.3.3.5 Corrosion-resisting steel wire. The corrosion-resisting steel wire shall conform to form 1, condition B and composition 302, 304, 305, or 316 of QQ-W-423. The diameter shall be as specified in the specification sheet.

3.3.3.6 Copper alloy wire. Copper alloy wire shall be round wire alloy number 510, spring temper of QQ-W-321. The copper alloy wire shall have a diameter of 0.005 or 0.006 inch.

3.3.3.7 Copper-beryllium alloy. The copper-beryllium alloy wire shall conform to temper XHT, of QQ-C-530 and shall have a tensile strength 145 to 205 thousand pounds per square inch (k.s.i). The diameter shall be 0.014 inch.

3.3.3.8 Aluminum alloy wire. The aluminum alloy wire shall conform to 5052-H38 of QQ-A-225/7. The diameter of the wire shall be 0.10 inch.

3.3.4 Staple wire. Staple wire shall be either corrosion-resisting steel staple wire or commercial carbon steel staple wire, finished to resist corrosion in accordance with manufacturers current commercial practice. The wire shall have a diameter of 0.032 inch.

3.4 Design. Except as otherwise noted thereon, the illustrations on the specification sheets are intended for information purposes only and are not intended to preclude brushes otherwise meeting the requirements of this specification and applicable specification sheets.

3.5 Construction. Brushes shall have staple set filler materials and shall be fabricated as specified herein and in applicable specification sheets. The brush filler material lengths shall be evenly and uniformly trimmed to conform to the dimensional requirements of the finished brushes as specified in the applicable specification sheets. The weight of the filler material shall be not less than as specified in the applicable specification sheet when tested as specified in 4.3.2. Staples and filler material shall be driven to the bottom of the tuft holes and the staples imbedded in the block at the bottom of the holes. The set staples shall be capable of withstanding the retention test specified in 4.3.3.

3.5.1 Blocks. Blocks shall be of one-piece construction. All edges of the blocks shall be rounded. Plastic molded blocks shall be provided with a scored, corrugated, or slip resistant gripping surface. Wood blocks shall be free of roughness. Tuft holes in the brush blocks shall be uniformly distributed in the quantity noted on the applicable specification sheet.

3.5.2 Identification marking. Each brush block shall be permanently and legibly indented or marked with the manufacturer's name or trade name, or trademark of such characters as to be identifiable with the manufacturer.

3.5.3 Finish. Brush blocks shall be finished in accordance with the manufacturer's current commercial practice.

3.6 Workmanship. The finished brushes shall be clean and free from oil, grease, and dirt. Blocks shall be free of any crack, rough or sharp edges or corners. Wood blocks shall be free of loose grain and splinters. Filler material shall be free of foreign and loose materials. The leg of the staples shall not penetrate through the block.

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 Quality conformance inspection. Except as otherwise specified herein, sampling for inspection shall be performed in accordance with the provisions set forth in MIL-STD-105.

4.2.1 Component and material inspection. The supplier shall insure that all components and materials used are inspected in accordance with referenced specifications and standards unless excluded, amended, modified or qualified in this specification or applicable purchase document.

4.2.1.1 Moisture content of wood blocks. When wood blocks are furnished, the moisture content of wood requirement as specified in 3.3.1 shall be determined in accordance with MIL-STD-1363 at time of assembly. The lot shall be all wood blocks of one type and size prepared under the same conditions, stored as a group, and submitted for inspection at one time. The sample unit shall be one block. The inspection level shall be S-1 with an acceptable quality level (AQL) of 4.0, expressed in terms of defects per hundred units. Three determinations shall be made on each sample unit. The average of the three determinations shall be the moisture content of the sample unit. Any sample unit of wood having more than 12 percent moisture content shall be classified as a defect.

4.2.1.2 Properties of plastic. When plastic blocks are furnished testing of the blocks shall be in accordance with L-P-394 and procedure A of ASTM Test Method D 785. Three determinations of hardness shall be made on each sample unit. The average of the three determinations to the nearest Rockwell scale reading shall be the Rockwell hardness of the sample unit. The lot shall be all like modified general purpose polypropylene blocks submitted for inspection at one time. The sample unit shall be one block. The inspection level shall be S-1. The lot shall be unacceptable if one or more samples fails to comply with all property values in table I.

4.2.1.3 Sterilization and DDT content of hog bristle. Examination shall be made to determine that the sterilization of the hog bristle is in accordance with 3.3.3.2. Whenever nonconformance is noted correction shall be made to the lot affected and process. The hog bristle shall be tested in accordance with 4.3.1 to determine compliance with the DDT content specified. The sample shall be 10 grams (g) $\pm$ 1 g of treated bristle. The lot shall be all bristle offered for inspection at one time. Failure of the sample to meet the DDT treatment requirement of 3.3.3.2 shall be cause for rejection of the lot.

4.2.1.4 Wire hardness. When hardened flat steel wire is required, the hardness shall be tested in accordance with ASTM E 18. The lot shall be all the wire offered for inspection at one time. The sample unit shall be one piece of wire cut to length. The inspection level shall be S-2. Any failure shall be reason for rejection of the wire.

4.2.2 End item inspection. The inspection lot shall be all like brushes submitted for inspection at one time. The sample unit shall be one brush.

4.2.2.1 Visual examination. The brushes shall be examined for the defects in table II. The inspection level shall be II with an AQL of 2.5 for major defects and 6.5 for total defects, expressed in terms of defects per hundred units.

TABLE II. Classification of defects

Examine	Defect	Classification Major	Minor
Finish	Wood block, when applicable, is rough		X
	Finish is not manufacturer's current commercial practice		X
Construction	Wood block, when applicable, is not clear, close-grained or straight grained	X	
	Brush filler material lengths not evenly or uniformly trimmed		X
	Blocks are more than one piece construction	X	
	Any edge of block not rounded		X
	Plastic block, when applicable, is not provided with a shaped, scored, corrugated, or slip resistant gripping surface or handle as applicable		X
	Tuft holes in the block not located to insure an even distribution of filler material		X
Marking for identification	Missing, illegible, or incomplete		X
Workmanship	Evidence of oil, grease or dirt		X
	Any block having crack, rough, or sharp edge or corner	X	
	Wood block, when applicable, has loose grain or splinter		X
	Foreign or loose filler material	X	
	Legs of staple penetrate through the block	X	

4.2.2.2 Dimensional examination. The brushes shall be examined for compliance with dimensions specified. Any dimension not within the specification tolerance shall be a defect. The inspection level shall be S-2 with an AQL of 6.5, expressed in terms of defects per hundred units.

4.2.2.3 End item testing. Testing of the completely fabricated brushes shall be performed in accordance with 4.3.2 and 4.3.3 for the characteristics shown therein. The inspection lot shall consist of all like brushes submitted for inspection at one time. The sample unit shall be one brush. The inspection level shall be S-2 and the AQL shall be 4.0, expressed in terms of defects per hundred units.

4.2.2.4 Inspection of preparation for delivery. Preservation, packaging, packing and marking shall be inspected in accordance with the quality assurance provisions in PPP-B-1880.

4.3 Tests.

4.3.1 DDT test. When hog bristle are furnished the sample unit shall be extracted for two hours in a Soxhlet apparatus with petroleum ether or any other suitable solvent, after which most of the solvent shall be removed by evaporation on a steam bath. Do not evaporate to dryness, since the DDT may decompose. Add 25 ml of 99 percent isopropyl alcohol and 2.5 g of metallic sodium cut into small pieces and swirl the flask in order to mix its contents. Connect to a water-cooled reflux condenser and boil gently for a minimum of 30 minutes. Shake the flask occasionally. Decompose the excess sodium by cautiously adding 10 ml or 50 percent isopropyl alcohol through the condenser at a rate of one to two drops per second. Boil for an additional 10 minutes and then add 60 ml of distilled water. Cool to room temperature, add two to three drops of phenolphthalein solution, neutralize by adding nitric acid (1 to 1), and add 10 ml of the diluted acid in excess. Add dropwise, with stirring of the solution a measured excess (25 ml) of 0.1N $AgNO_3$ solution. Coagulate the precipitate by heating on a steam bath for 30 minutes. Cool to room temperature and filter through a No. 52 Whatman filter paper and wash thoroughly with distilled water, receiving the filtrate in a 500-ml Erlenmeyer flask. Add 5 ml of ferric amonium sulfate indicator and titrate the excess $AgNO_3$ with 0.1N KSCN. Compute the net number of ml of 0.1N $AgNO_3$ consumed by the sample. Calculate percent DDT as follows:

$$\text{Percent DDT (dichloro-diphenyl-tricholorethane)} = \frac{\text{Milliliters of 0.1N } AgNO_3 \text{ (consumed)} \times .7094}{\text{Weight of sample (grams)}w}$$

A blank determination for the chemicals used shall be made following the exact procedure given above, but limiting the 0.1N $AgNO_3$ solution to 5 ml to obtain a chloride correction value. This blank value shall be subtracted from the DDT determination to obtain the exact value of DDT present. Nonconformance to the requirement in 3.3.3.2 constitutes failure of this test.

4.3.2 Weight of filler material. The filler material shall be removed from the brush. Wire or polypropylene filler material shall be weighed. Noncompliance with the specification sheets, as applicable, constitutes failure of thitest. Hog bristle or tampico fiber, as applicable, shall be conditioned for a period of not less than 16 hours in air at a relative humidity of 50 percent ± 4 percent and at a temperature of 23 ± 2°C. Following the conditioning period, the filler material shall be weighed. Noncompliance with the specification sheet shall constitute failure of this test.

4.3.3 Set retention of staples. The block shall be held with a holding device. Individual tufts of filler material shall be grasped with another holding device and, with a spring scale or weight, a pulling force of eight pounds shall be applied in a direction tending to pull the tuft and the staple from the block. Determination shall be made on ten different tufts on each brush. Any staple pulled loose from the block as the result of the test shall be classified as a defect (see 3.5).

5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, marking and palletization shall be in accordance with PPP-B-1880 for level A, B, or C as specified (see 6.2).

6. NOTES

6.1 Intended use. Brushes covered by this specification are intended for clearing materials of scale, rust and coatings.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

(a) Title, number and date of this specification and applicable specification sheet.
(b) Part number of brush required (see specification sheets).
(c) Selection of applicable level of packaging and packing (see 5.1).

6.3 Supersession data. H-B-178C, H-B-175B and MIL-B-15319E have been included in this specification as follows:

SPECIFICATION			H-B-178D PART NO.
H-B-178	Type I,	Class 1	HB178/2-1
		Class 2	HB178/2-2
	Type II,	Class 1	HB178/1-3
	Type III,	Class 1	HB178/3-1
		Class 3	HB178/3-2
	Type IV,	Class 1, Size 7-1/2 by 2-1/4	HB178/4-1
		Class 1, Size 4-1/2 by 1-11/16	HB178/4-2
		Class 2, Size 7-1/2 by 2-1/4	HB178/4-3
	Type V,	Class 1	HB178/5-1
H-B-175,	Type I		HB178/4-4
	Type II		HB178/4-5
MIL-B-15319	Type I,	Class 1	HB178/1-1
		Class 2	HB178/1-2
		Class 3	HB178/1-3A
		Class 4	HB178/1-4
		Class 5	HB178/1-5
		Class 6, Size 1	HB178/1-6
		Class 6, Size 2	HB178/2-3

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