

# MIL-W-81840(AS)

9 February 1972

1972008

## MILITARY SPECIFICATION

### WHEELS, PEENING, ROTARY FLAP

This specification has been approved by the Naval Air Systems Command, Department of the Navy.

#### 1. SCOPE

1.1 Scope. This specification covers rotary flap wheels used with portable equipment for peening of metal parts.

1.2 Classification. The peening wheels shall be of the following types and classes, as specified (see 6.2):

Type I - Rigid core with bonded flap  
Type II - Slotted mandrel with inserted flap assembly

Class 1 - Flap assembly - 2 x 1 inch  
Class 2 - Flap assembly - 1-1/4 x 9/16 inch  
Class 3 - Flap assembly - 1 x 9/16 inch

#### 2. APPLICABLE DOCUMENTS

2.1 Government documents normally furnished. 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.

#### SPECIFICATIONS

##### Federal

QQ-N-290 Nickel Plating (Electrodeposited)

##### Military

MIL-S-851 Steel Grit, Shot, and Cut Wire Shot, and Iron Grit and Sand-Blast Cleaning and Peening  
MIL-P-3816 Abrasive and Abrasive Products for Shipment and Storage, Packaging and Packing of

FSC 5130

MIL-W-81840(AS)

## SPECIFICATIONS

### Military (Continued)

MIL-S-13165	Shot Peening of Metal Parts
MIL-R-81841	Rotary Flap Peening of Metal Parts

## STANDARDS

### Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
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(When requesting applicable documents, refer to both title and number. Copies of unclassified documents may be obtained from the Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120. Requests for copies of classified documents should be addressed to the Naval Publications and Forms Center, via the cognizant Government representative.)

## 3. REQUIREMENTS

3.1 Design. The rotary flap peening wheel shall be of the manufacturer's latest design. The design shall be such as to provide convenience and safety of operation. All parts shall be new, designed and constructed to the requirements listed herein. All parts shall be of such size, material, and strength as to properly sustain the maximum allowable load imposed upon them with an adequate factor of safety.

3.1.1 Interchangeability. All parts shall be manufactured to standards that will permit replacement of parts without modification of the parts, the wheel or the portable equipment for operation.

3.2 Materials. All materials for parts shall be new and of the quality necessary to produce a wheel to meet the requirements specified herein.

3.3 Shot material.

3.3.1 For Type I wheel. The material used for the shot in the Type I wheel shall be cast shot with a hardness of 55 to 65 Rockwell C. The chemical composition of the steel shall be in accordance with MIL-S-851. The nominal size of the shot shall be 0.043 .004 inch diameter. The material shall be processed to eliminate all shell-like shots with wall thickness less than 10 percent of shot

diameter. The processed shot shall be free from cracks, sharp edges and broken pieces and shall comply with the acceptable shape requirements as specified in MIL-S-13165. The shot shall be examined for freedom from cracks and other defects by microscopic examination.

3.3.2 For Type II wheel. The material used for shot in the Type II wheel shall be a metallic carbide with a nominal composition of 94 percent tungsten carbide and 6 percent cobalt. The nominal size of the shot to be used shall be  $0.045 \pm 0.003$  inch diameter. The sphericity of the shot shall be not more than  $\pm 0.003$  inch out of round. The material for the shot shall have a microhardness equivalent to Rockwell A  $91 \pm 3$  (with a 60 Kgm load).

3.4 Flap material.

3.4.1 Fiber. The fiber for the flap shall be square weave geige nylon cloth formed of sixteen 840 denier thread (140 filaments per thread) in both warp and weft directions and having a 225 pounds per inch grab tensile strength in both length and cross section directions.

3.4.2 Adhesive. The adhesives used for the flaps and bonding of flaps shall be a thermosetting resin which may contain dyes, pigments or combination of the same. The adhesive shall be evenly distributed over all surfaces and throughout the entire depth of the flap so as to obtain essentially the same characteristics on either side or on the edges.

3.4.3 Shot distribution.

3.4.3.1 Type I. On Type I flaps, the cast steel shot (see 3.3.1) shall be evenly distributed on one surface of the adhesive filled fiber so as to obtain essentially the same peening characteristics on that surface.

3.4.3.2 Type II. On Type II, Class 1 flaps, the carbide shot (see 3.3.2) shall be a double row of 15 particles on the outer 1 inch edges as shown in Figure 2. On Type II, Class 2 flaps, the carbide shot shall be a double row of 8 particles on the outer 9/16 inch edges as shown in Figure 3. On Type II, Class 3 flaps the carbide shot shall be a single row of 8 particles on the outer edges as shown in Figure 4.

3.5 Construction of Type I wheel. The Type I wheel shall be constructed from a rigid core (see 3.5.1) with 12 radially extended shot coated flaps bonded to it (see 3.4) as shown in Figure 1. The equally spaced flaps shall be  $1 \pm 1/32$  inch in length and backed with nonwoven 15 denier nylon web on the side not covered with shot. The wheel shall be  $3 - 7/16 \pm 1/16$  inches in diameter. Unless otherwise specified, the wheel shall be  $1 \pm 1/16$  inch wide.

3.5.1 Core. The materials used in the construction of the core shall be free of all defects that would impair the serviceability or proper functioning of the finished item. The core shall be spirally wound of resin impregnated laminated paper or equivalent with an inside diameter of 1 inch, -0.000, +0.010 inch tolerances and a wall thickness of 0.188 with the tolerance on the inside diameter. The adhesive used for bonding the core shall be of a suitable type, free from objectionable odor.

3.6. Construction of Type II wheel. The Type II wheel shall be constructed from a steel mandrel (see 3.6.1) with two radially extended flaps inserted in the slot of the mandrel. The flaps shall be of the size shown in Figures 2, 3, or 4 as applicable for the class.

3.6.1 Mandrels. Mandrels for Type II wheels shall be suitable for use in any electrical or pneumatic portable drill with a three jaw chuck. The mandrel shall conform to the dimensions specified in Table I and be similar in construction to that shown in Figures 2, 3, or 4 as applicable for the specified class.

TABLE I

DIMENSIONAL REQUIREMENTS OF MANDRELS FOR TYPE II WHEELS

REQUIREMENTS	CLASS 1	CLASS 2	CLASS 3
Shaft - Form	Cylindrical	Cylindrical	Tapered
Length (inches)	8	3	3 $\frac{1}{16}$
Diameter (inch)	$\frac{3}{8}$	$\frac{1}{4}$	$\frac{1}{4}$ $\frac{1}{16}$
Slot for Flaps - length (inches)	5- $\frac{1}{2}$	$\frac{9}{16}$	$\frac{9}{16}$
- opening (inch)	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$
Sleeve - length of large piece (inches)	1- $\frac{3}{4}$	-	-
- length of small piece (inch)	$\frac{3}{8}$	-	-
- inside diameter (inch)	$\frac{3}{8}$	-	-
- wall thickness (inch)	$\frac{1}{16}$	-	-

$\frac{1}{16}$  Tapered for 1- $\frac{5}{16}$  inches from  $\frac{1}{4}$  inch diameter to  $\frac{3}{16}$  inch diameter at slotted end.

3.6.1.1 Material. The mandrel shall be cut from cold finished round carbon steel bar stock or drill rod of sufficient strength to preclude failure through fracture or bending when operated at the maximum safe operating speed. All surfaces of the mandrel shall be smooth, free from burrs, sharp edges or other

harmful extraneous imperfections and shall be copper nickel plated all over. Plated surfaces shall be free from unplated spots, blisters or other defects which might adversely affect the serviceability of the mandrel. Plating shall be done by electro deposition in accordance with QQ-N-290, Class 1.

3.6.1.2 Sleeves. The Type II, Class 1 mandrel shall be provided with two translucent polyethylene sleeves conforming to the dimensions specified in Table I and shall be similar in construction to that shown in Figure 2.

3.7 Peening intensities and shot loss.

3.7.1 Type I wheel. When tested as specified in 4.6.1, the operation with the Type I wheel shall show a peening intensity of not less than 0.006 arc height-inches. After 10 minutes of testing, the weight loss of the wheel shall be less than 0.001 grains. All flaps shall be intact and shall show no indications of loosening from the core and bonding adhesive.

3.7.2 Type II, Class 1 wheel. When tested as specified in 4.6.2, the operation with the Type II, Class 1 wheel shall show a peening intensity of not less than 0.012 arc-height-inches. After 7 minutes of testing, not more than 2 particles of the carbide shot shall be missing from the flap assembly. The flap assembly shall be intact and shall show no indication of separation.

3.7.3 Type III, Classes 2 and 3 wheels. When tested as specified in 4.6.3, the peening intensity after 1 minute of operation with either Type II, Class 2 or Type II, Class 3 wheel shall be not less than 0.010 arc-height-inches. After an additional 4 minutes of operation with either wheel, the peening intensity shall be not less than 0.014 arc-height-inches. After 5 minutes of testing, not more than 2 particles of carbide shot shall be missing from the flap assembly. The flap assembly shall be intact and shall show no indication of separation.

3.8 Kit of wheels. When kits are specified, the parts of the kit shall conform to the requirements of the respective types and classes for one of each types and classes covered in this specification. If extra flap inserts for the Type II wheels are to be required in the kits as replacements, the number of each class shall be specified. If specified, a magnetic strip holder as detailed in MIL-R-81841 shall also be included as part of the kit with wheels.

3.8.1 Boxes for kit. Wheels, with replacement flaps and a magnetic strip holder if specified (see 3.8), when ordered as a kit shall be furnished in a plastic box moulded from polypropylene. All of the wheels or parts in the kit shall be contained in one compartment of ABS plastic shaped in such a manner that the mandrels and flaps of Type II wheels are stored in progressive positions from the largest to the smallest, for storage of the Type I wheel and for the strip holder if specified. The box shall be of durable and rigid construction, shall have a cover held by a self-hinge or equivalent and shall have a positive catch. The parts of

the kits shall be protected with 1/4 inch thickness of cellular polyethylene cushion material.

3. 9 Workmanship. The wheels and parts of wheels shall be uniform in quality and free from any imperfections which would cause breaking or cracking under normal operating conditions. Workmanship shall be in accordance with high grade commercial practice. The metal portions of the wheel shall be free from fins, burrs, external sharp or rough edges, corners, or surfaces, and other defects which would impair service and durability.

#### 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 Lot. All rotary flap peening wheels, mandrels, flap assemblies of the same type and class, if applicable, or kits, offered for delivery at one time shall be considered a lot for the purpose of quality conformance inspection.

4. 3. Sampling for quality conformance inspection.

4.3.1 Sampling of shot material. At least one determination for shot size, uniformity and freedom from defects for conformance with 3. 3 for each 4 hours of production prior to fabrication of flaps shall be conducted. Samples of shot for visual examination shall consist of microscopic examination of the number of shots in one layer which completely fills an area of 1 square inch. Any indication of defective shot shall cause rejection of this lot of shot for flap assemblies.

4.3.2 Sampling for examination. A random sample of peening, wheels, mandrels, or flap assemblies shall be selected from each lot for examination of visual and dimensional characteristics in accordance with MIL-STD-105, Inspection Level II, Acceptable Quality Level (AQL) of 1. 5 percent defective; however, kits shall be randomly selected in accordance with Level S-4 of MIL-STD-105 with an Acceptable Quality Level (AQL) of 1.5 percent defective.

4.3.3 Sampling for tests. Three rotary peening wheels or mandrels and flap assemblies to construct three Type II wheels shall be selected from each lot and subjected to the test specified in 4. 6 as applicable for the Type and class.

#### 4.4 Quality conformance inspection.

4.4.1 Examination. Each of the sample peening wheels, mandrels, flap assemblies or kits selected in accordance with 4. 3.1 shall be visually and dimensionally examined to verify compliance with the requirements of this specification. The items shall be checked for such points as general finish, quality of plating (mandrels), and workmanship. Any peening wheel, part thereof, kit or items contained therein, of the sample containing one or more defects shall not be offered for delivery. If the number of defective items in any sample exceeds the acceptance number, the lot shall be rejected.

4.4.2 Materials for components. The supplier shall furnish certification that the materials used in the manufacture of the peening wheels furnished under this specification has been inspected and accepted in accordance with the applicable paragraphs of this specification (see 3. 2, 3. 3.1, 3. 3. 2, 3.4.1, 3.4.2, 3.5, 3. 5. 1, 3.6.1.1, 3.6.1. 2 and 3. 8. 1).

4. 5 Inspection of preservation, packaging, packing and marking for shipment and storage. Preservation, packaging, packing and marking shall be examined to determine conformance with Section 5 or as specified in the contract or order.

#### 4.6 Test procedure.

4.6.1 Type I performance. The sample Type I peening wheel, selected in accordance with 4. 3. 2 shall be mounted in a suitable tool. A used test strip, complying with the requirement of MIL-R-81841 for a Type A test specimen, shall be mounted on a magnetic strip holder, detailed in MIL-R-B L °9:1. This strip shall be peened for two minutes. The wheel shall be removed from the tool, examined for any defects and weighed prior to remounting. The used strip shall be removed from the holder and replaced with a new Type A test strip complying with the requirements of MIL-R-81841. The test strip shall have been examined for flatness and set for zero curvature position with a micrometer gage of the form and dimensions conforming to Figure 6 of MIL-S-13165. The strip and holder shall be placed on the weighing pan of a balance with a capacity of about 2600 grams and a readability of 0.1 grams. The holder and strip shall be tared and 600 grams additional weight added. The strip shall be peened for 2 minutes uniformly at a rotation of  $2700 \pm 50$  RPM, while applying the 600 grams pressure, in accordance with MIL-R-81841 and then removed. The amount of arc height shall be measured. The wheel shall be examined for compliance with 3.7.1. The peening operation shall be repeated for four more 2 minute cycles to total ten minutes, alternating used and new test strips so that three new test strips shall be used, that is for the 1st, 3rd and 5th cycles. The wheel shall be examined for compliance with 3. 7.1 after the final cycle and reweighed. If the wheel fails the performance test, this shall be cause for rejection of the lot represented by the sample.

4.6.2 Type II, Class 1 performance. The sample Type II, Class 1 peening wheel, selected in accordance with 4.3. 2 shall be mounted in a suitable tool so that rotation will produce a speed of  $3000 \pm 100$  RPM with 100 percent flap deflection in accordance with MIL-R-81841. A used test strip, complying with the requirements of MIL-R-81841 for a Type A test specimen shall be mounted on a magnetic strip holder, detailed in MIL-R-81841. This strip shall be peened for one minute. The wheel shall be examined for compliance with 3. 7. 2. The used strip shall be removed and replaced with a new Type A test strip complying with the requirements of MIL-R-81841. The strip shall have been examined for flatness and set for zero curvature position with a micrometer gage of the form and dimensions conforming to Figure 6 of MIL-S-13165. The new strip shall be exposed to the peening action for 2 minutes in accordance with MIL-R-81841 and then removed. The amount of arc height shall be measured. The wheel shall be re-examined for compliance with 3. 7. 2. The peening operation shall be repeated two more times, each time using a new strip. If the wheel fails the performance test, \* this' shall become cause for rejection of the lot represented by the sample.

4.6.3 Type II, Classes 2 and 3-performance. The sample Type II, Classes 2 or 3 wheel, selected in accordance with 4.3. 2 shall be mounted in a suitable tool so that the rotation will produce a speed of  $5000 \pm 200$  RPM with 100 percent flap deflection in accordance with MIL-R-81841. A used test strip shall be peened for 1 minute with the wheel as detailed in 4. 6. 2. The wheel shall be examined for compliance with 3.7.3. The used strip shall be removed and replaced with a new Type A test strip, as detailed in 4. 6. 2. The new strip shall be exposed to the peening action for 1 minute in accordance with MIL-R-81841 and then removed. The amount of arc height shall be measured. The wheel shall be re-examined for compliance with 3.7.3. The peening operation shall be repeated three more times, using the same test specimen. If the wheel fails the performance test, this shall be cause for rejection of the lot represented by the sample.

## 5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, packing and marking. Unless otherwise specified (see 6. 2), preservation packaging, packing and marking shall be in accordance with MIL-P-3816. Level of preservation and packaging and level of packing shall be as specified (see 6. 2).

## 6. NOTES

6.1 Intended use. Rotary flap peening tools are intended to form part of the portable equipment to be used to induce surface compressive stresses in metal parts as detailed in MIL-R-81841. The tool is rotated rapidly while the periphery is forced against the substrate to be peened. A portion of the flat face of each flap is intended to strike the metal surface, thereby causing the peening particles to perform their normal peening function.



6.1.1 Type I wheel. Type I wheels are intended to be used for mounting on a shaft to be rotated at a normal operational speed of 1500 to 4000 RPM.

6.1.2 Type II wheel. Type II wheels are intended to be used for mounting on a flexible shaft or in a three jaw chuck to be rotated at a normal operational speed of 1500 to 7000 RPM. Class 1 wheels are normally operated in the range of 1500 to 5000 RPM. Classes 2 and 3 wheels will be used at a normal operational speed of 2750 to 7000 RPM but may be used to a maximum of 14000 RPM.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Type and class of wheel, if applicable (see 1. 2).
- (c) Width of Type I wheel, if other than specified (see 3. 5).
- (d) If kit of wheels are required (see 3. 8).
- (e) If extra flap inserts or magnetic strip holder are required in the kit (see 3.8)
- (f) Whether preservation and packaging shall be Level A or C, and whether packing shall be Level A, B or C (see 5.1).

Preparing Activity:

Navy - AS

(Project No. 5130-N207)

MIL-W-81840(AS)

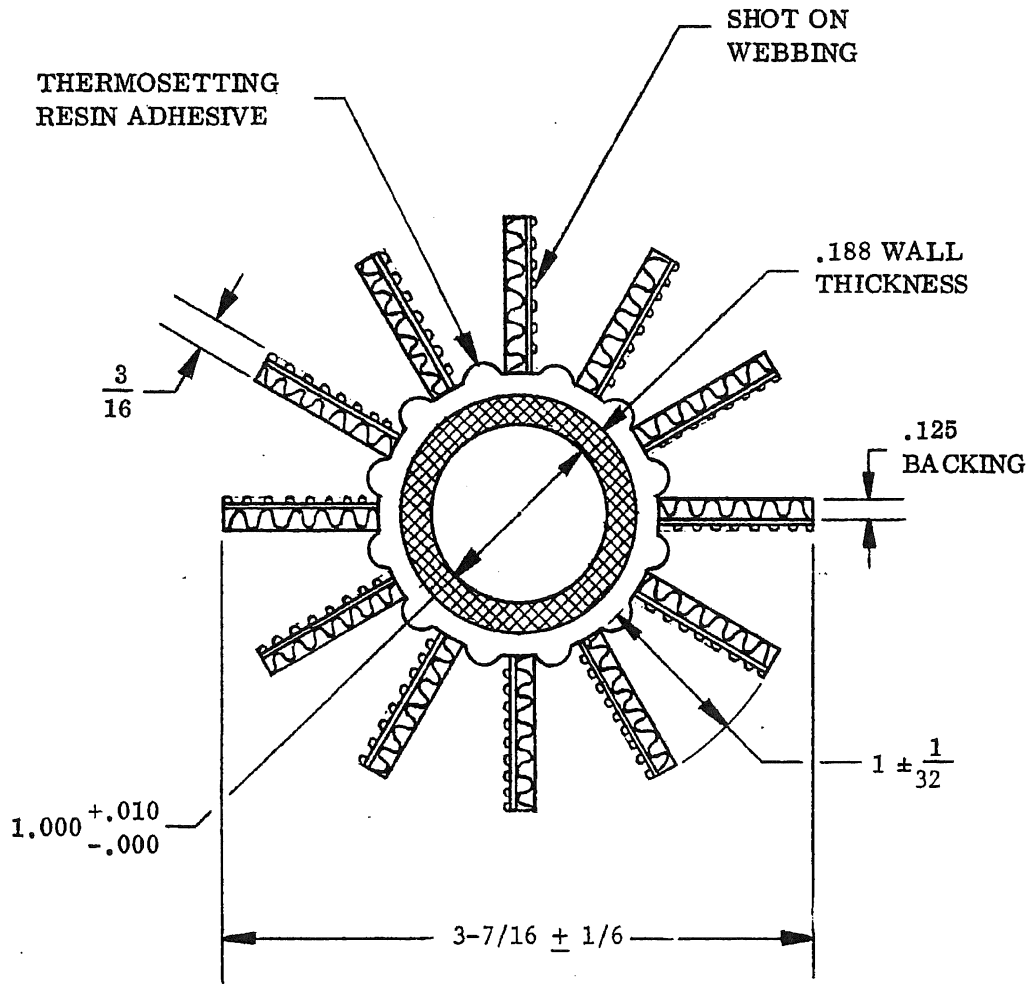
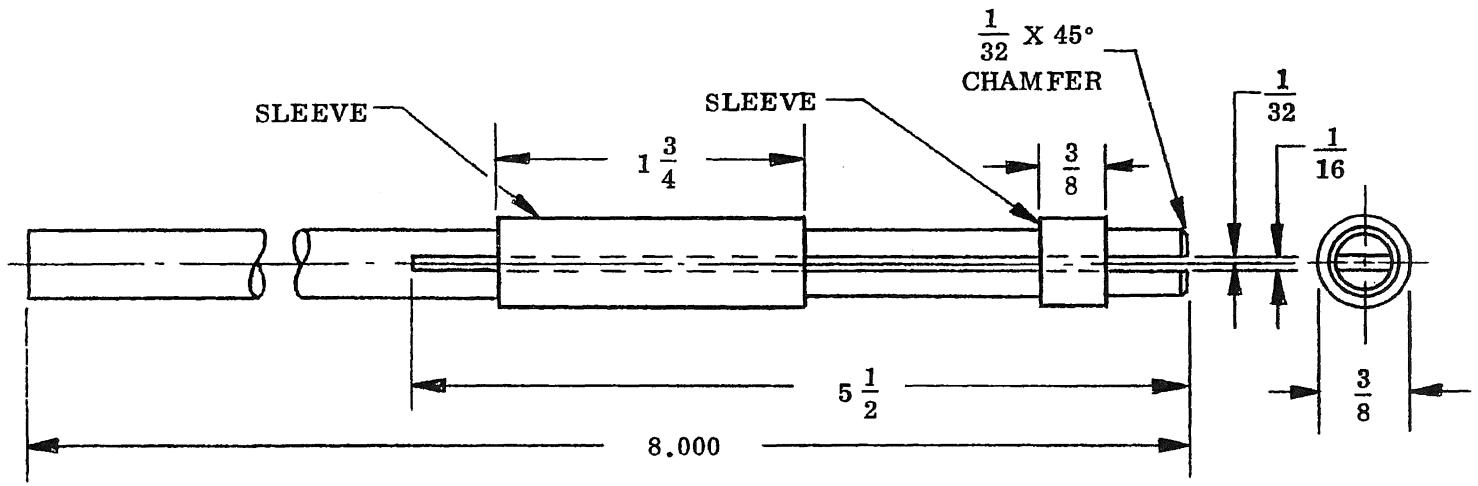
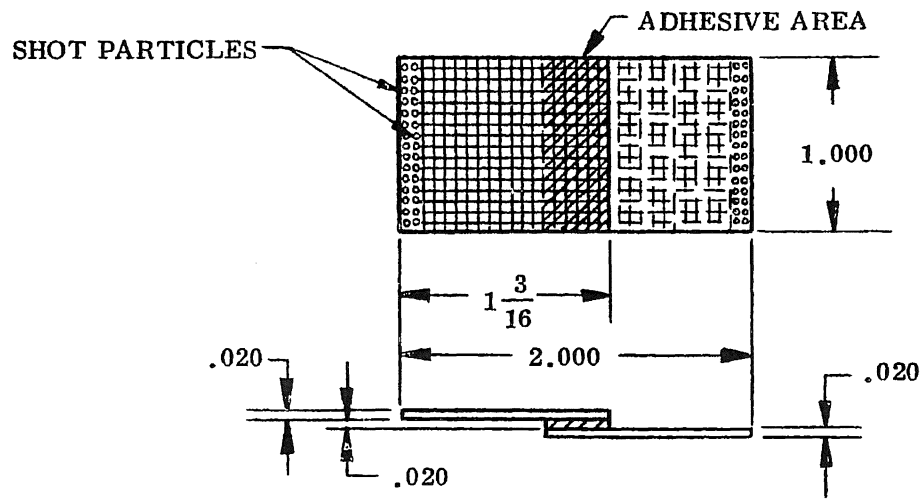


FIGURE 1. TYPE I WHEEL



MANDREL



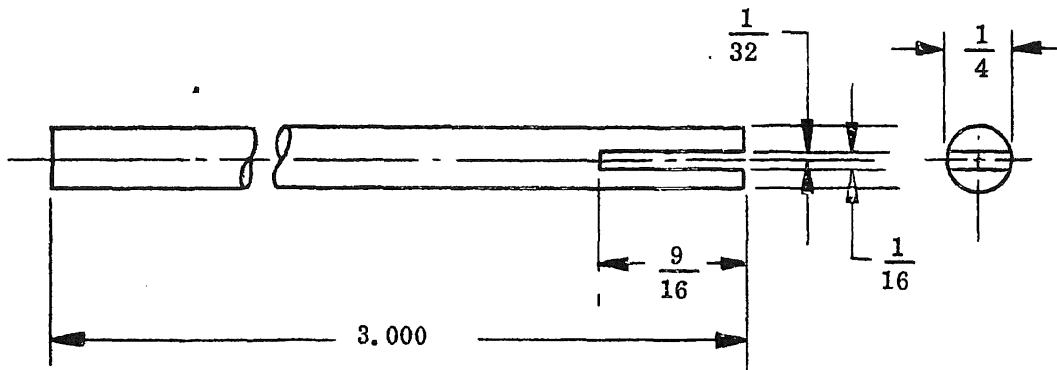
DOUBLE SHOT FLAP

FIGURE 2. TYPE II, CLASS 1 WHEEL

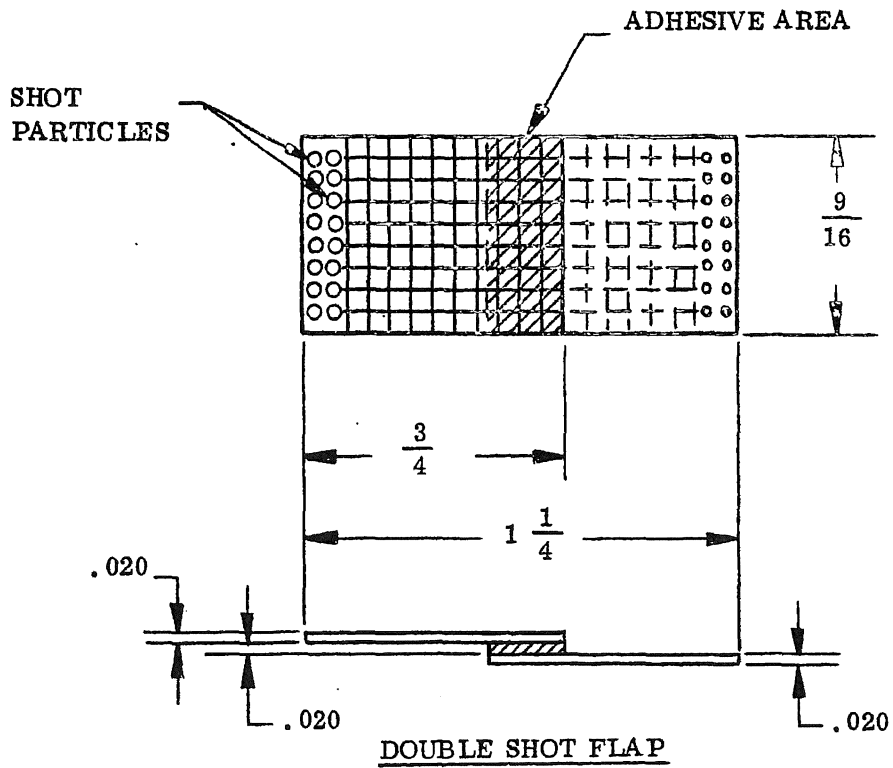
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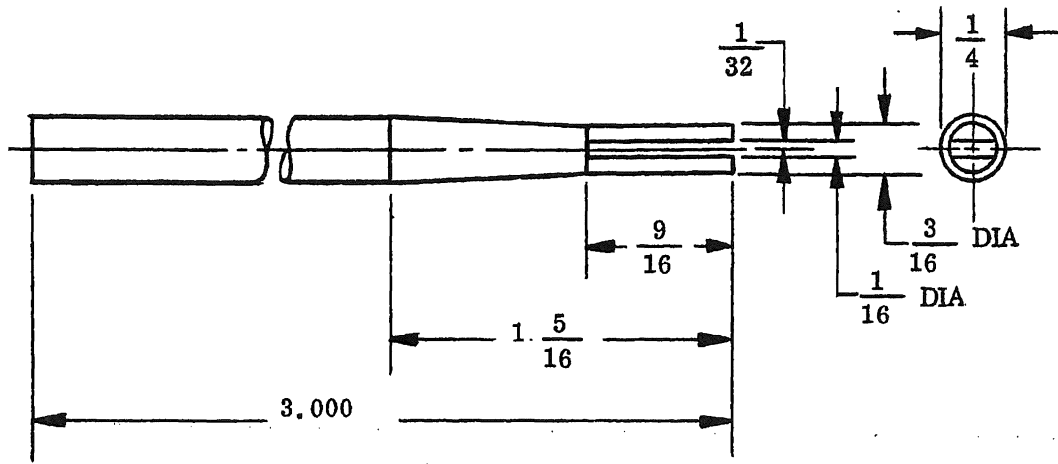


MANDREL

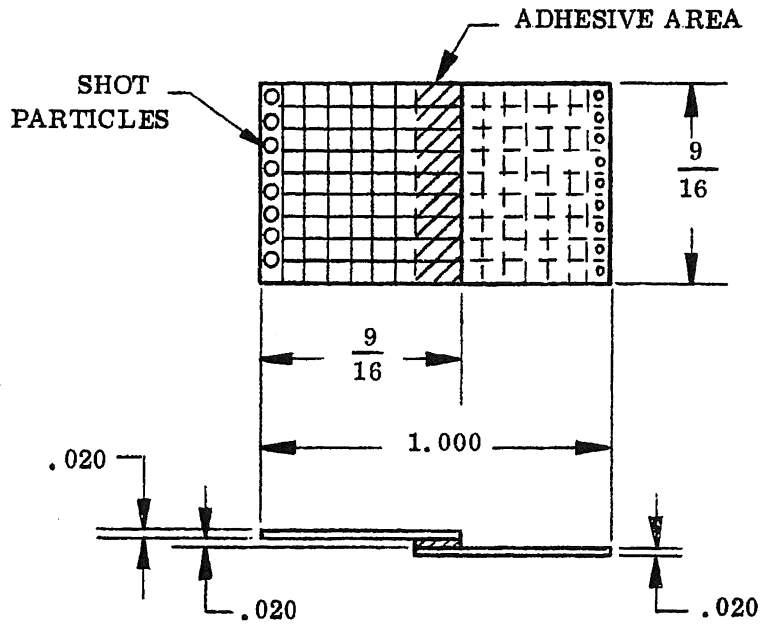


DOUBLE SHOT FLAP

FIGURE 3 TYPE II, CLASS 2 WHEEL



MANDREL



SINGLE SHOT FLAP

FIGURE 4 TYPE II, CLASS 3 WHEEL

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SPECIFICATION

MIL-W-81840 (AS) WHEELS, PEENING, ROTARY FLAP

ORGANIZATION

CITY AND STATE

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

DIRECT GOVERNMENT CONTRACT

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?

YES

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 • Optional)

DATE

# SPECIFICATIONS AND STANDARDS REQUISITION

Form Approved  
OMB No. 0704-0130  
Expires Dec 31, 1991

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1. CUSTOMER NUMBER (Mandatory for Repeat Orders to expedite requests), CAGE CODE, OR UIC NUMBER

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1. YOUR ADDRESS (Print or Type)



If YOUR ADDRESS HAS CHANGED, X THIS BLOCK.



3. ATTENTION:

## 4. DOCUMENTS REQUESTED

a. STANDARDIZATION DOCUMENT NUMBER	b. QUANTITY (Restricted to 5)	c. TITLE (From DOD Index of Specifications and Standards)

## INSTRUCTIONS

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. PRINT OR TYPE ALL INFORMATION.</li> <li>2. Enter your customer number, CAGE (formerly FSCM), or UK number at the top of this form. It will expedite your order</li> <li>3. If you have a customer number use the Telephone Order Entry System (TOES) for telephone orders (275)647-1187 between the hours of 8 a.m. and 8 p.m. Eastern Standard time, Monday through Friday See Guide to Private Industry" for details.</li> <li>4. Documents ordered must appear in the DOD Index of Specifications and Standards (DODISS) or DODISS Notice Requests submitted on this form will speed service Reorder forms will be enclosed with each shipment.</li> <li>5. Requests for Official Use Documents or documents without Distribution Statement "A" must be submitted via cognizant DoD Inspector/Officer of Contract Administrator ?Or certification canon of ' need to know '</li> </ol> | <ol style="list-style-type: none"> <li>6. Non Government Standardization Documents will not be furnished to commercial concerns. Copies may be purchased from the appropriate Non Government Standards Body.</li> <li>7. Questions concerning documents not listed in the Department of Defense index of Specifications and Standards (DODISS) or DODISS Notice should be directed to: NPFC AM, - Code ivy, Telephone: (215)697-2667 or (215)697-Z 179.</li> <li>8. Further information may be obtained from NPFC "Guide to Private Industry " Order as GUIDE-?.</li> <li>9. FORWARD REQUEST TO<br/>Standardization Document Order Desk<br/>700 Robbins Avenue<br/>9., Building 1 4, Section O<br/>Philadelphia PA 19114-5094</li> </ol> |
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5. SIGNATURE OF REQUESTER	6. DATE SIGNED (YYMMDD)	7. CLOSING DATE (YYMMDD) (IFB, RFQ, or REP)
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# 1991124

NOTICE  
OF VALIDATION

INCH-POUND

MIL-W-81840(AS)  
NOTICE 1  
26 September 1991

MILITARY SPECIFICATION  
WHEELS, PEENING, ROTARY FLAP

MIL-W-81840(AS), dated 9 February 1972, has been reviewed and determined to be valid for use in acquisition.

Preparing activity:  
Navy - AS

AMSC N/A

FSC 5130

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



# 1996189

NOTICE OF  
CANCELLATION

INCH-POUND

MIL-W-81840(AS)  
NOTICE 2  
02 October 1996  
SUPERSEDING  
NOTICE 1  
26 September 1991

MILITARY SPECIFICATION  
WHEELS, PEONING, ROTARY FLAP

MIL-W-81840(AS), dated 09 February 1972, and Notice 1, are hereby canceled without replacement.

Preparing Activity:  
Navy-AS  
(Project 5130-N392)

AMSC N/A

FSC 5130

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