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MILITARY SPECIFICATION

FORGINGS, PREALLOYED STEEL POWDER

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

1. SCOPE

1.1 This specification covers forged metal powder parts fabricated from 4600 (Modified) prealloyed powder plus blended carbon.

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.

STANDARDS

Federal

Fed. Test Method Std. No. 151 - Metals; Test Methods

American Society for Testing and Materials

ASTM Standard Test Method B-328

(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.)

3. REQUIREMENTS

3.1 Chemical composition. The forged metal powder parts, and the mechanical test specimens, shall conform to the requirements of Table I. The parts and test specimens shall be fabricated from 4600 (Modified) prealloyed powder plus blended carbon.

Table I
Chemical Composition

Element	Analysis (Percent)
Carbon	0.38-0.43
Nickel	1.65-2.00
Molybdenum	0.4 -0.6
Manganese	0.15-0.30
Phosphorus	0.04 (max.)
Sulfur	0.04 (max.)
Oxygen	0.030 (max.)
Silicon	0.35 (max.)

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3.2 Mechanical properties. The mechanical properties, at room temperature, of the austenitized, quenched, and tempered test specimens representing the metal powder parts shall conform to Table II.

Table II
Mechanical Properties
(Minimum)

Yield Strength[1] (ksi)	Tensile Strength (ksi)	Elongation[2] (Percent)	Reduction of Area (Percent)	Impact Strength[3,4] (Ft. lbs.)	Hardness[5] (Rockwell-C)
110	130	10.0	35.0	25 @ +72°F 8 @ -70°F	30-33

1 0.2% offset
2 2" gage length
3 Charpy V-notch
4 Specified temperatures have a tolerance range of ±2°F
5 Although the drawing or requirement for a particular part may specify different hardness levels, the test specimens, and only the test specimens, shall be heat treated to the hardness specified in this table.

3.3 Density. The density of the parts and the test specimens shall be at least 7.81 g/cc. The density of sample specimens taken from the part shall be at least 7.80 g/cc.

3.4 Decarburization. Unless otherwise specified, surface decarburization, total and partial, of the parts and the test specimens shall not exceed 0.001 inch.

3.5 Microstructure. The microstructure of the quenched and tempered parts and test specimens shall be the same and exhibit homogeneity equal to or better than Figure 1. Figure 2 is a representative example of unacceptable microstructure.

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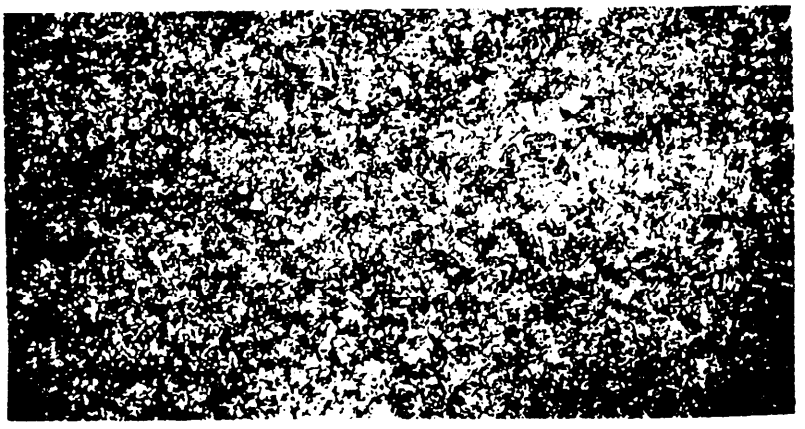

FIGURE 1 ETCHANT: 2% Nital MAG. 100X

FIGURE 2 ETCHANT: 2% Nital MAG. 100X

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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 Inspection provisions.

4.2.1 Inspection lot. Unless otherwise specified, a lot shall consist of that quantity of finished (complete) parts produced from one batch of blended powder.

4.2.2 Sampling.

4.2.2.1 For chemical analysis. At least two samples for chemical analysis, consisting of one part and one mechanical test specimen, shall be selected from each lot, after final heat treating procedures. The sampling procedure shall be in accordance with Method 111 or 112 of Federal Test Method Standard No. 151.

4.2.2.2 For mechanical properties. A quantity of test specimens numbering at least 6 per each 100 production parts, or other quantity as mutually agreed upon by the manufacturer and purchaser, consisting of 3 for each of the tensile and impact tests, shall be prepared and processed concurrently with, and in an identical manner except for final tempering temperature, the production parts.

4.2.2.3 For density. Each production part and each test specimen shall be tested for density in accordance with 4.3.3. Test samples taken from representative locations in the part shall be selected as mutually agreed upon by the manufacturer and purchaser.

4.2.2.4 For surface decarburization. At least one test sample from each heat treat batch shall be tested in accordance with 4.3.4.

4.2.2.5 For microstructure. Each Charpy V - notch impact specimen, and one production part from each corresponding 100 parts, shall be prepared and examined in accordance with 4.3.5.

4.3 Tests.

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4.3.1 Chemical analysis. The samples shall be prepared and tested .s specified in Method 111 or 112 of Federal Test Method Std. No. 151 'or all elements except oxygen. In case of dispute, analysis by Method 111 hall be the basis for acceptance or rejection. Vacuum fusion analysis or ther suitable methods as mutually agreed upon by the manufacturer and urchaser shall be used for determination of oxygen content.

'4.3.2 Mechanical properties. Tensile test specimens shall be repared and tested as specified in Method 211.1 (round specimens) of ederal Test Method Std. No. 151. Yield point shall be determined by the .2 percent offset method. Charpy V-notch impact specimens shall be preared and tested as specified in Method 221.1 of Federal Test Method td. No. 151. Testing shall be done on a government qualified test machine.

4.3.3 Density. The parts and test specimens shall be tested n accordance with ASTM Standard Test Method B-328.

4.3.4 Surface decarburization. A specimen for microscopic examnation shall be taken from a test slice of 1/4 to 1/2 inch thickness nd shall extend from the surface of the test slice to a depth greater than ne allowable decarburization specified in 3.4. The specimen shall be olished and suitably etched. The depth of decarburization shall be etermined using a magnification of 100X or greater.

4.3.5 Microstructure. A specimen shall be cut from each fractured harpy V-notch impact specimen such that the surface to be examined shall e parallel to the fracture face and approximately 0.050 inch away. The ecimen shall be suitably polished, etched, viewed at 100X, and compared Figure 1 as specified in 3.5. Specimen location as taken from the roduction part shall be optional. However, the specimen shall be prepared s specified above and compared to Figure 1.

4.4 Rejection and retest. Failure of samples or specimens to mply with specified requirements shall be cause for rejection of the rts represented by the specimens or samples. However, at the discretion the contractor, retesting will be permitted. Retest samples or specins shall be tested to replace each failed sample or specimen. If one test sample or specimen fails, the parts shall be rejected and additional testing shall not be permitted.

PREPARATION FOR DELIVERY

5.1 Packaging, packing, and marking of parts shall be as ecified in the applicable packaging document or in the contract.

NOTES

6.1 This specification provides basic requirements for forged tal powder parts. Dimensional requirements shall be as specified on the plicable drawing or in the contract.

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6.2 Ordering data. Procurement documents should specify the following:

a. Title, number and date of this specification.
b. Applicable drawing or dimensional data.
c. Hardness level if required (see Table II).
d. Preparation for delivery requirements.

Custodians:
Army - WC
Navy - YD
Air Force - 11

Preparing activity:
Army - WC

Project No. FORG-0038

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

OMB Approval No. 22-R255

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DOCUMENT IDENTIFIER AND TITLE

MIL-F-45961, Forgings, Prealloyed Steel Powder

NAME OF ORGANIZATION AND ADDRESS

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

. COMMENTS ON ANY DOCUMENT REQUIREMENT CONSIDERED TOO RIGID

IS THE DOCUMENT RESTRICTIVE?

☐ YES ☐ NO *(If "Yes", in what way?)*

REMARKS

IBMITTED BY *(Printed or typed name and address - Optional)*

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