

INCH-POUND

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 SUPERSEDING
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FEDERAL SPECIFICATION

NUT: SQUARE, HEXAGON, CAP, SLOTTED, CASTLE,
 KNURLED, WELDING AND SINGLE BALL SEAT

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

1 SCOPE AND CLASSIFICATION

1.1 Scope This specification covers cap, castle, hexagon, knurled, slotted, square, welding and single ball seat nuts (see 6.3)

1.2 Classification

1.2.1 Types and styles Nuts shall be of the following types and styles (see 6.2, fig 1)

Type I - Nuts, square (fig 1)

Style 1 - Regular

Style 2 - Heavy

Style 3 - Machine screw

Type II - Nuts, hexagon (fig 1)

Style 4 - Plain

Style 5 - Jam

Style 6 - Thick

Style 7 - Flat

Style 8 - Flat jam

Style 9 - Heavy flat

Style 10 - Heavy flat jam

Style 11 - Heavy

Style 12 - Heavy jam

Style 13 - Machine screw

Type III - Nuts, cap (fig 1)

Style 14 - High crown

Style 15 - Low crown

Beneficial comments (recommendations, additions, deletions) any pertinent data which may be of use in improving this document should be addressed to Defense Industrial Supply Center, DISC-EPP, 700 Robbins Avenue, Philadelphia, PA 19111-5096 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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Type IV - Nuts, slotted (fig 1)

Style 16 - Plain

Style 17 - Thick

Style 18 - Heavy.

Type V - Nuts plain, castle (fig 1)

Type VII - Nuts, plain, knurled (fig 1).

Type VIII - Nuts, welding (fig 1)

Style 19 - Without pilot

Style 20 - Pilot

Type IX - Nuts, plain, single ball seat, hexagon (fig 1)

1 2 2 Sizes Nuts shall be of the sizes specified in ANSI B18.2.2 and B18 6 3, except for weld. cap. knurled and slotted nuts, which shall be in accordance with the applicable Military standards (see 3.1.1 1 and 3 1 4) Single ball seat nuts shall be of the size specified (see 6 2)

2 APPLICABLE DOCUMENTS

2 1 Government documents

2 1 1 Specifications, handbooks, and standards Unless otherwise specified, issues of referenced documents are those in effect at the time of solicitation Information regarding the latest issue of government documents and adopted non-government documents can be obtained from the Department of Defense Index of Specifications and Standards

Federal Specifications

QQ-A-225/6	- Aluminum Alloy Bar, Rod, and Wire, Rolled, Drawn, or Cold Finished, 2024
QQ-N-281	- Nickel-Copper-Alloy Bar, Plate, Rod, Sheet, Strip, Wire, Forging, and Structural and Special Shaped Sections.
QQ-N-286	- Nickel-Copper-Aluminum Alloy, Wrought
QQ-N-290	- Nickel Plating (Electrodeposited)
QQ-P-35	- Passivation Treatments for Austenitic, Ferritic, and Martensitic Corrosion-Resisting Steel (Fastening Devices)
QQ-P-416	- Plating, Cadmium (Electrodeposited)
QQ-S-763	- Steel Bars, Wire, Shapes, and Forgings, Corrosion-Resisting

Federal Standards

FED-STD-H28	- Screw-Thread Standard for Federal Services
FED-STD-H28/2	- Screw-Thread Standard for Federal Services
FED-STD-H28/20	- Screw-Thread Standard for Federal Services
FED-STD-66	- Steel Chemical Composition and Hardenability.

(Activities outside of 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 product specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service enters 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 Specifications

MIL-F-495	- Finish, Chemical, Black, for Copper Alloys
MIL-H-6088	- Heat Treatment of Aluminum Alloys
MIL-I-6870	- Inspection Requirements, Non-destructive for Aircraft Materials and Parts
MIL-A-8625	- Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-C-13924	- Coating, Oxide, Black for Ferrous Metals.
DOD-P-16232	- Phosphate Coatings, Heavy, Manganese or Zinc Base (for Ferrous Metals)
MIL-C-81562	- Coatings, Cadmium, Tin-Cadmium and Zinc (Mechanically Deposited)

Military Standards

MIL-STD-109	- Quality Assurance Terms and Definitions
MIL-STD-410	- Nondestructive Testing Personnel Qualification and Certification
MIL-STD-1312	- Fasteners, Test Methods
MIL-STD-1312-6	- Fasteners, Test Methods, Method 6, Hardness
MIL-STD-6866	- Inspection, Liquid Penetrant
MIL-STD-45662	- Calibration Systems Requirements
MS16994	- Nut, Plain, Knurled
MS24679	- Nut, Plain, Cap, High Crown, UNC-2B and UNF-2B
MS24680	- Nut, Plain, Cap Low Crown, UNC-2B and UNF-2B
MS27127	- Nut, Plain, Welding - without Pilot
MS27128	- Nut, Plain, Welding - Pilot.
MS35692	- Nut, Slotted, Hexagon

Military Handbook

MIL-HDBK-131	- Military Handbook, Identification Markings for Fasteners, Bolts, Screws, Studs, Nuts and Rivets
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(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 Unless otherwise specified, issues of referenced documents are those in effect at the time of solicitation. Information regarding the latest issue of non-government documents not adopted by the government can be obtained from the organization responsible for their publication.

American Society of Mechanical Engineers (ASME):

ANSI/ASME B1 1	- Unified Inch Screw Thread
ANSI/ASME B18.2.2	- Square and Hex Nuts
ANSI/ASME B18.6.3	- Slotted and Recessed Head Machine Screws and Machine Screw Nuts
ANSI/ASME B18.18.2M	- Inspection and Quality Assurance for High Volume Machine Assembly Fasteners

Application for copies should be addressed to the American Society of Mechanical Engineers, 345 East 47th Street, New York, New York 10017)

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American Society for Testing and Materials (ASTM)

- A 108 - Steel Bars, Carbon, Cold-Finished, Standard Quality
- A 153 - Standard Specification for Zinc Coating (HOT-DIP) on Iron and Steel Hardware
- A 309 - Standard Test Method for Weight and Composition of Coating on Long Terne Sheet by the Triple-Spot Test.
- A 484 /
- A 484M - Standard Specification for General Requirements for Stainless and Heat Resisting Steel Bars, Billets, and Forgings
- A 582 - Standard Specification for Free-Machining Stainless and Heat Resisting Steel Bars, Hot-Rolled or Cold-Finished
- A 630 - Standard Test Method for Determination of Tin Coating Weight for Hot-Dip and Electrolytic Tin Plate
- B 16 - Standard Specification for Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines
- B 21 - Standard Specification for Naval Brass Rod, Bar and Shapes
- B 36 /
- B 36M - Standard Specification for Brass Plate, Sheet, Strip and Rolled Bar
- B 98 - Standard Specification for Copper-Silicon Alloy Rod, Bar, and Shapes
- B 99 - Standard Specification for Copper-Silicon Alloy Wire for General Purposes
- B 105 - Standard Specification for Hard-Drawn Copper Alloy Wires for Electric Conductors
- B 117 - Standard Test Method of Salt Spray (Fog) Testing
- B 121 /
- B 121M - Standard Specification for Leaded Brass Plate, Sheet, Strip and Rolled Bar
- B 124 - Standard Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes
- B 138 - Standard Specification for Manganese Bronze Rod, Bar, and Shapes
- B 154 - Standard Test Method for Mercurous Nitrate Test for Copper and Copper Alloys
- B 283 - Standard Specification for Copper and Copper Alloy Die Forgings
- B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
- D 3951 - Practice For Commercial Packaging
- D 4066 - Standard Specification for Nylon Injection and Extrusion Materials
- E 172 - Standard Practice for Describing and Specifying the Excitation Source in Emission Spectrochemical Analysis
- E 376 - Standard Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods
- E 427 - Standard Practice for Testing for Leaks Using the Halogen Leak Detector
- E 498 - Standard Test Method for Leaks Using the Spectrometer Leak Detector or Residual Gas Analyzer in the Tracer Probe Mode
- E 515 - Standard Test Method for Leaks Using the Bubble Emission Techniques
- E 1282 - Standard Guide for Specifying the Chemical Compositions and Selecting Sampling Practices and Quantitative Analysis Methods for Metals and Alloys.
- E 1444 - Standard Practice for Magnetic Particle Examination
- F 1469 - Standard Guide for Conducting Reproducibility Studies on Test Equipment for Non-Destructive Testing
- F 1470 - Guide for Fastener Sampling for Specified Mechanical Properties in Performance Inspection
- F 812 /
- F 812M - Standard Specification for Surface Discontinuities of Nuts.
- G 47 - Standard Test Method for Determining Susceptibility to Stress Corrosion Cracking of High-Strength Aluminum Alloy Products
- G 69 - Standard Practice for Measurement of Corrosion Potentials of Aluminum Alloys

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

3. REQUIREMENTS

3.1 Materials.

3.1.1 Steel, carbon or low alloy. Unless otherwise specified (see 6.2), material for carbon steel nuts shall conform in chemical composition to Table III. Unless otherwise specified (see 6.2), Grade A nuts shall be furnished. When specified (see 6.2), carbon steel nuts shall conform in chemical composition to Table IV. For proof-load requirements see 3.3.

3.1.1.1 Steel, carbon or low alloy (Nuts, welding). Steel welding nuts, type VIII, styles 19 and 20 shall be made from steel which meets the material and proof-load requirements of MS27127 and MS27128 (see 6.2).

3.1.2 Corrosion-resistant steel. Corrosion-resisting steel nuts shall be made from materials of the 300 series (302, 303, 304, 305, 316, 321 and 347) and 400 series (410, 414 and 416) as specified (see 6.2), in conformance with the chemical composition requirements of Fed. Std No. 66 and the mechanical property requirements of QQ-S-763, ASTM A 484 or ASTM A 582, as applicable. The 300 series nuts shall be condition A and shall have an ultimate tensile strength of 75,000 psi min. The 400 series nuts shall be condition T or H and shall have an ultimate tensile strength of 100,000 psi min. For proof load requirements see 3.3.

3.1.3 Non-ferrous materials. When specified (see 6.2), nuts shall be made from the following non-ferrous materials:

3.1.3.1 Brass. Naval brass shall be in accordance with ASTM B 21, ASTM B 124, or ASTM B 283, alloy no. 464, half-hard or alloy no. 462, hard, and shall have an ultimate tensile strength of 60,000 psi min. Leaded & non-leaded brass shall be in accordance with ASTM B 36, alloy no. 260, half-hard, and shall have an ultimate tensile strength of 60,000 psi min. or alloy no. 360, half hard in accordance with ASTM B16 and shall have an ultimate tensile strength of 58,000 psi min.

3.1.3.2 Aluminum alloy. Aluminum alloy shall be in accordance with QQ-A-225/6, T6 temper when heat-treated in accordance with MIL-H-6088, and shall have an ultimate tensile strength of 62,000 psi min.

3.1.3.3 Nickel-copper alloy. Nickel-copper alloy shall be in accordance with QQ-N-281, class A or class B, and shall have an ultimate tensile strength of 80,000 psi min.

3.1.3.4 Silicon bronze. Silicon bronze shall be in accordance with ASTM B 98, ASTM B 99, ASTM B 105 or ASTM B 124, alloy no. 651, hard or alloy no. 655, half-hard, and shall have an ultimate tensile strength of 60,000 psi min.

3.1.3.5 Manganese bronze. Manganese bronze shall be in accordance with ASTM B 138, alloy no. 675, soft, and shall have an ultimate tensile strength of 55,000 psi min.

3.1.3.6 Nickel-copper aluminum alloy. Nickel-copper-aluminum alloy shall be in accordance with QQ-N-286, class A or class B, age hardened, and shall have an ultimate tensile strength of 130,000 psi min.

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3.1.4 Plastic (nylon) Plastic (nylon) nuts shall be made from material in accordance with ASTM D 4066, group 1, class 1, grades 1 or 2, natural color

3.1.5 Material for cap, knurled, and slotted nuts Cap, knurled and slotted nuts procured under this specification (see 6.2), shall meet the requirements of this specification, MS24679 and MS24680 for cap nuts, MS16994 for knurled nuts and MS35692 for slotted nuts

3.2 Stress relief of brass and bronze nuts Cold-worked brass and bronze nuts shall be stress relieved by heating the part to a temperature of 600 °F, and holding at that temperature for a minimum of one hour per inch diameter of thickness. Cold-worked brass or bronze nuts shall pass the mercurous nitrate test of 4.5.5 without evidence of cracks. Stress relief of nuts made of extruded or soft temper brass or bronze will not be required.

3.3 Proof loads Carbon or low alloy steel and corrosion-resisting steel nuts shall pass their respective proof loads specified in tables V and VI and MS sheet form standards as applicable, without evidence of stripped threads or ruptured metal. These requirements are based on the principle that the nut shall be capable of withstanding a stripping load equal to the minimum tensile strength requirements of the bolt grade with which it is used.

3.4 Dimensions Dimensions, including thickness, width across flats and corners, chamfer, diameter & depth of washer face and perpendicularity of bearing surface with axis of thread shall conform to the applicable tables of ANSI B18.2.2 and B18.6.3, except welding, cap, slotted and knurled nuts which shall agree with the applicable MS (see 3.1.1.1 and 3.1.5). Dimensions of single ball seat nuts shall be as specified (see 6.2).

3.4.1 Slot tolerance Opposite slots of slotted and castle nuts shall coincide within 0.005 inch and the slot axis shall be within 0.005 inch of the pitch diameter axis.

3.5 Threads

3.5.1 Series and class Thread series, class, dimensions and tolerances, shall be in accordance with ASME B1.1 and the applicable specification sheet(s).

3.5.2 Overtapping of nuts Hot-dip galvanized nuts shall be tapped after galvanizing and shall be tapped oversize by the following minimum diametral amounts:

4/375 inch diameter and smaller	0.010 inch
Over 4/375 inch to 1.000 inch diameter	0.015 inch
Over 1.000 inch diameter	0.020 inch

3.6 Protective finishes Nuts shall be furnished uncoated, passivated or coated, as specified (see 6.2). When cadmium, zinc, nickel, black oxide, anodic or passivation coatings are specified, they shall be coated in accordance with 3.6.1 thru 3.6.7, as applicable.

3.6.1 Cadmium finish Cadmium finish shall conform to type II, class 2 of QQ-P-416.

3.6.2 Zinc finishes

3.6.2.1 Zinc, Electrodeposited Electrodeposited zinc coating shall be in accordance with ASTM B 633, Fe/Zn 8, Type II. Electrodeposited finish shall be used only on .500 inch (nominal size) and smaller.

3.6.2.2 Zinc, Hot Dipped Zinc hot-dipped (galvanizing) shall conform to ASTM A153.

3 6.2.3 Zinc, mechanically deposited. Mechanically deposited zinc shall conform to MIL-C-81562 as specified on applicable specification sheet(s)

3 6.3 Phosphate coating. Phosphate coating shall conform to type Z, class 2 of DOD-P-16232

3 6.4 Anodic coating. Anodic coating shall conform to type II of MIL-A-8625

3 6.5 Nickel plating. Nickel plating shall conform to class 2 of QQ-N-290

3 6.6 Black oxide coating. Black oxide coating for carbon and low alloy steel shall conform to class 1 of MIL-C-13924, for copper alloys the finish shall conform to MIL-F-495 and for 300 series corrosion-resisting steel the coating shall conform to class 4 of MIL-C-13924.

3 6.7 Passivation. Passivation treatments shall conform to QQ-P-35

3 7 Identification markings. When specified (see 6.2), nuts shall be marked in accordance with MIL-HDBK-131

3.8 Discontinuities. Discontinuities such as laps, seams and inclusions in the nuts shall not exceed the depth limits specified in Table I and illustrated in Figure 2. The length shall not exceed the height of the nut when tested as specified in 4.5.7

3.8.1 Cracks. A crack is a clear crystalline fracture passing through or across the grain boundaries without inclusion of foreign elements. Quench cracks are not permitted in any location. Forging cracks located in the top and bottom face are permitted provided that there are no more than two forging cracks which extend from the tapped hole across the full width of the face; no forging crack extends into the tapped hole beyond the first full thread, and the width of any forging crack does not exceed 0.008 inch plus 0.010D, where D is the nominal nut size in inches. Forging cracks located at the intersection of the top or bottom face with the flat are permitted provided that the width does not exceed 0.010 inch plus 0.020D, where D is the nominal nut size in inches.

TABLE I Limits of depths on laps, seams, inclusions and forging cracks of nuts

Thread size of nut (Inch)	Depth limits (Inch)	Thread size of nut (Inches)	Depth limits (Inch)
.3125 and under	.010	.750	.019
.375	.011	.875	.022
.4375	.012	1.000	.022
.500	.014	1.125	.022
.5625	.016	1.250	.022
.625	.017	1.375 and over	.025

3.9 Decarburization. The decarburization limits of the bars from which the non-corrosion-resistant steel nuts are to be made shall not exceed the values specified in table II (See 4.5.8)

TABLE II Decarburization limits

Thread size (Inches)	Complete decarburization (Max in inches)	Complete plus partial decarburization (Max in inches)
Hot Rolled Bars		
Up to .500 incl	.003	.010
Over .500 to .750 incl	.004	.012
Over .750 to 1.000 incl	.005	.015
Over 1.000 to 1.500 incl	.007	.020
Over 1.500 to 2.000 incl	.008	.025
Over 2.000 to 2.500 incl	.010	.030
Over 2.500 to 3.000 incl	.012	.035
Over 3.000	.015	.050
Annealed or Cold Drawn Bars		
Up to .500 incl	.006	.015
Over .500 to 1.000 incl	.007	.017
Over 1.000 to 1.500 incl	.008	.020
Over 1.500 to 2.000 incl	.010	.025
Over 2.000 to 2.500 incl	.012	.030
Over 2.500 to 3.000 incl	.014	.035
Over 3.000	.020	.050

3.10 Workmanship The workmanship shall be compatible with the type of product, class of fit, and finish specified. The nuts shall be free from pipes, fissures, gas cavities, sponginess, segregation, scale, fins, seams, or any other defects which might affect their serviceability.

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 facility 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 that supplies and services conform to prescribed requirements.

4.2 Inspection terms Inspection terms and definitions used herein are in accordance with MIL-STD-109.

4.2.1 Inspection equipment and facilities Gaging and equipment used for inspection shall conform in all respects to ASTM F1469 and MIL-STD-45662.

4.3 Inspection lot All nuts of the same type, material, protective finish, thread series, and size, produced under essentially the same conditions and offered for acceptance at one time shall be considered a lot for the purpose of inspection.

4.4 Sampling for examination Statistical sampling and inspection shall be I/A/W the criteria called out in ASTM F 1470 and ASME B18.18.2M.

4.4.1 Sampling for proof load testing (steel nuts) A random sample of nuts shall be taken from each lot in accordance with ASTM F 1470, tables 1 and 2.

4.4.2 Sampling for protective finish test Sampling for tests of protective finishes shall be in accordance with the applicable specifications in 3.6.1 through 3.6.7.

4.4.3 Sampling for mercurous-nitrate test A random sample shall be taken from each lot of cold-worked brass or bronze nuts in accordance with ASTM F 1470, table 1 sample size A.

4.4.4 Sampling for packaging and packing Sampling for preservation, packaging, packing and marking shall be in accordance with ASTM F1470

4.4.5 Sampling for chemical analysis When chemical analysis is specified (see 6.2), sampling shall be in accordance with ASTM E1282 for the test in 4.5.3.

4.4.6 Sampling for hardness test Sampling for hardness of nuts excluded from the proof load test in 4.5.1 shall be in accordance with ASTM F 1470, tables 1 and 2

4.4.7 Discontinuities Sampling for discontinuities by means of magnetic particle inspection or penetrant inspection shall be in accordance with ASTM 1470, tables 1 and 2. The acceptance and rejection numbers of this sampling plan shall apply to those nuts which are judged defective or are in non-conformance with the requirements contained herein after microexamination has been performed on those samples revealing indications. These inspection requirements shall not apply to nuts of less than .250 inch thread size.

4.4.8 Sampling for slot alignment test Sampling for slot alignment of slotted & castle nuts shall be in accordance with ASME B18.18.2M

4.5 Test methods

4.5.1 Proof load Each nut of the sample taken in accordance with 4.4.1 shall be subjected to the proof-load test and tables V, VI, as applicable. Jam, slotted, castle and machine-screw nuts, nuts under standard thickness, plated nuts tapped oversize, or nuts with specified proof-loads beyond the capacity of commercially available testing equipment shall not be subjected to the proofload test but shall meet the hardness test in 4.5.2.

4.5.1.1 Test equipment A hardened threaded mandrel shall be used in conjunction with a tension testing machine for conducting the proof-load test. The mandrel shall be threaded to Unified Thread Series, class 3A, except that the major diameter shall be the minimum major diameter with a plus tolerance of .002 inch. The mandrel shall have a minimum hardness of 45 HRc. In lieu of a hardened mandrel, a bolt with a minimum hardness of 45 HRc may be used.

4.5.1.2 Test procedures The nuts, with the exception of nuts covered by table IV, shall be assembled to the mandrel of 4.5.1.1 and mounted in a tension testing machine and subject to a load equal to the proof-load in tables V or VI, for the nut size applied, to determine conformance to 3.3. To meet the requirements of this test, the nut shall resist the load without stripping or rupture. If the threads of the mandrel are damaged during the test, the test shall be discarded. If the unit tensile strength developed in the mandrel is required, the load thus obtained shall be divided by the stress area as given in tables V and VI.

4.5.2 Hardness test When a hardness test is to be conducted in lieu of a proof-load test (see 4.5.1), it shall be conducted in accordance with Test. No. 6 of MIL-STD-1312 to determine conformance to tables III or IV of this specification.

4.5.3 Chemical analysis When chemical analysis is specified (see 6.2), conformance to chemical composition requirements shall be in accordance with ASTM E1282.

4.5.4 Protective finish test Tests of protective finishes shall be conducted in accordance with the applicable specifications in 3.6.1 through 3.6.7.

4.5.5 Mercurous-nitrate test (Stress relieved nuts.) The mercurous nitrate test of stress relieved brass and bronze nuts shall be conducted in accordance with ASTM B154 to determine conformance to 3.2.

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4.5.6 Examination and tests of packaging and packing Examination and tests of preservation, packaging, packing & marking shall be in accordance with ASTM D3951.

4.5.7 Discontinuities This test is not applicable to nuts of less than .250 inch thread size. The presence of discontinuities in nuts shall be determined by magnetic particle inspection or penetrant inspection, depending upon the material, unless visual inspection discloses discontinuities which would preclude the necessity for such inspection.

4.5.7.1 Magnetic particle inspection The nuts shall be subjected to magnetic particle inspection in accordance with ASTM E 1444. Personnel conducting magnetic particle inspection shall be certified in accordance with MIL-STD-410.

4.5.7.2 Penetrant inspection Penetrant inspection shall be performed in accordance with MIL-STD-6866. Personnel conducting penetrant inspection shall be certified in accordance with MIL-STD-410.

4.5.8 Decarburization Microscopic examination to determine the extent of decarburization of bars from which non-corrosion-resisting steel nuts are to be fabricated shall be made on sample specimens at a magnification of 100 diameters. The etchant shall be 5 percent nital.

4.5.9 Slot alignment Samples taken as specified in 4.4.8 shall be tested to determine conformance to 3.4.1. To check the slot alignment, use a threaded plug having the same basic pitch diameter as the nut being tested. The plug shall have a slot in one end in accordance with table VIII. The plug shall be screwed into the nut and the three slots aligned so that the pin will pass through.

5 PREPARATION FOR DELIVERY

5.1 Preservation, packaging, packing, and marking Preservation, packaging, packing, and marking shall be in accordance with ASTM D 3951 (see 6.2).

5.2 Methods Methods of preservation, packaging, and packing shall be in accordance with ASTM D3951 unless otherwise specified by the procuring activity (see 6.2).

6. NOTES

6.1 Intended use This specification covers various types of nuts (1.2.1) which are designed for assembly with bolts and screws for application at normal atmospheric temperatures.

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
- b Type, style, size and thread series of nut (1.2.1, 1.2.2 and 3.5.1)
- c Material, type and grade, if applicable (3.1). If grade is not specified, carbon or low alloy steel nuts will be Grade A (3.1.1)
- d Dimensions of single ball seat nuts (3.4)
- e Type of protective finish, if required (3.6)
- f Marking when required (3.7)
- g Chemical analysis, if required (4.5.3)
- h Method of Packings (if required)

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6.3 Military procurement Items procured under this specification for Military use are to be limited to the variety shown on the applicable Military Standard. Personnel of the Military departments are requested to refer to these documents for guidance.

6.4 Cross reference data Supersession data cross references between the types and styles of nuts covered by this specification and the group types and styles of the preceding FF-N-836, dated September 16, 1955, FF-N-836A, dated January 18, 1961, FF-N-836B, dated January 26, 1965, FF-N-836C, dated September 5, 1968 and FF-N-836D dated April 24, 1972 are shown in table VIII.

6.5 Supersession data This specification includes the requirements of FF-N-836D, dated April 24, 1972, FF-B-571A, dated January 9, 1934 in part, MIL-B-857A (Ships), dated 1 June 1956 in part and MIL-N-6034B, dated 7 October 1965 (see table VII).

6.6 Change from previous issue Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

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TABLE III MECHANICAL AND CHEMICAL PROPERTIES OF CARBON AND ALLOY STEEL NUTS

GRADE	NOMINAL SIZE	ANALYSIS	CHEMICAL COMPOSITION		ULTIMATE TENSILE STRENGTH PSI MIN			ROCKWELL HARDNESS
			CARBON MAX %	PHOS-PHORUS MAX %	HEX AND SQUARE NUTS	HEX THICK AND HEAVY NUTS	MIN	
A(1)	250-4 000	LADLE	.55	12	15	UNC	UNC	MAX
		CHECK	58	13	--	90,000	100,000	
B(2)	250-1 000	LADLE	.55	12	15	120,000	109,000	C32
		CHECK	58	13	--	120,000	133,000	
B(2)	1 125-3 000	LADLE	.55	12	15	105,000	94,000	C32
		CHECK	58	13	--	105,000	116,000	
C	250-3 000	LADLE	.55	12	15	144,000	130,000	C38
		CHECK	58	13	--	144,000	160,000	
D	250-1 500	LADLE	.55	04	05	150,000	135,000	C38
		CHECK	58	048	058	150,000	165,000	

NOTES

1/ Optional material - Steel, Grade 12L14 (UNSS G12144) per ASTM A108

2/ Optional material - Steel, Grade 11L37 (UNSS G11374) per ASTM A108

TABLE IV MECHANICAL AND CHEMICAL PROPERTIES OF CARBON AND ALLOY STEEL NUTS (FOR NAVY USE)

MATERIAL	NOMINAL SIZE	PROOF LOAD (PSI)						HARDNESS		COMPOSITION	
		HEXAGON NUTS		HEXAGON JAM NUTS		HEXAGON SLOTTED NUTS		BRINELL	ROCKWELL	PHOS-PHORUS % MAX	SULFUR % MAX
		UNC	UNF	UNC	UNF	UNC	UNF				
GRADE 1	ALL SIZES	55,000	55,000	--	--	--	--	207 MAX	95B MAX	.05	.06
GRADE 2	UP TO 500 INCL.	69,000	69,000	41,000	41,000	55,000	55,000	--	--	04	05
	OVER 500 TO 750 INCL.	64,000	64,000	38,000	38,000	51,000	51,000	--	--	04	05
	OVER 750	55,000	55,000	33,000	33,000	44,000	44,000	--	--	04	05
GRADE 5	UP TO 750 INCL.	120,000	109,000	72,000	65,000	96,000	87,000	187 MIN	90B MIN	04	05
	OVER 750 TO 1 000 INCL.	115,000	104,000	69,000	62,000	92,000	83,000	175 MIN	88B MIN	04	05
	OVER 1 000 TO 1 500 INCL.	105,000	94,000	63,000	57,000	84,000	75,000	156 MIN	83B MIN	04	05
GRADE 8	OVER 1 500	90,000	79,000	54,000	47,000	72,000	63,000	121 MIN	69B MIN	04	05
	250 TO 1 500 INCL.	150,000	150,000	90,000	90,000	120,000	120,000	248-302	24-32C 1/2	04	05

NOTES

1/ Rockwell 37C maximum permissible on sizes 1 250 inches and larger

TABLE V MINIMUM PROOF LOADS OF STEEL AND CORROSION RESISTING STEEL NUTS - COARSE THREAD

NOM SIZE DIA OF THD (IN)	THREADS PER INCH UNC	AREA OF MATING EXTERNAL THREADS (SQ IN)	PROOF LOADS POUNDS MIN 1/ 2/											
			GRADE A		GRADE B		GRADE C		GRADE D		300 SERIES ALL NUTS	400 SERIES ALL NUTS		
			HEX & SQUARE	HEAVY AND THICK	HEX & SQUARE	HEAVY AND THICK	HEX & SQUARE	HEAVY AND THICK	HEX & SQUARE	HEAVY AND THICK				
250	20	0318	2,862	3,180	3,800	4,229	4,575	5,085	4,770	5,250	2,400	3,175		
3125	18	0524	4,716	5,240	6,288	6,969	7,545	8,380	7,860	8,650	3,950	5,250		
375	16	0775	6,975	7,750	9,300	10,308	11,160	12,400	11,625	12,800	5,800	7,750		
4375	14	1063	9,567	10,650	12,756	14,138	15,300	17,000	15,945	17,540	7,975	10,650		
500	13	1419	12,771	14,200	17,028	18,872	20,433	22,700	21,285	23,400	10,650	14,200		
5625	12	182	16,380	18,200	21,840	24,200	26,208	29,120	27,300	30,000	13,650	18,200		
625	11	226	20,340	22,600	27,120	30,058	32,540	36,160	33,900	37,300	16,950	22,600		
750	10	334	30,060	33,400	40,080	44,422	48,100	53,440	50,100	55,100	25,050	33,400		
875	9	462	41,580	46,200	55,440	61,446	66,528	73,920	69,300	76,230	34,650	46,200		
1 000	8	606	54,540	60,600	72,720	80,600	87,264	96,960	90,900	100,000	45,450	60,600		
1.125	7	763	68,670	76,300	80,100	88,500	109,872	122,000	114,450	125,900	57,225	76,300		
1.250	7	969	87,210	96,900	101,750	112,400	139,536	155,200	145,350	159,900	72,675	96,900		
1.375	6	1 155	103,950	115,500	121,300	134,000	166,320	184,800	173,250	190,600	86,625	115,500		
1 500	6	1 405	126,450	140,500	147,500	162,980	202,320	224,800	210,750	231,800	105,375	140,500		
1 750	5	1 900	171,000	190,000	199,500	220,400	273,600	304,000	273,600	304,000	142,500	190,000		
2.000	4-1/2	2 500	225,000	250,000	262,500	290,000	360,000	400,000	360,000	400,000	187,500	250,000		
2.250	4-1/2	3 250	292,500	325,000	341,850	377,000	468,000	520,000	468,000	520,000	243,750	325,000		
2 500	4	4 000	360,000	400,000	420,000	464,000	576,000	640,000	576,000	640,000	300,000	400,000		
2 750	4	4 930	443,700	493,000	517,650	571,880	690,200	788,800	690,200	788,800	367,750	493,000		
3 000	4	5 970	537,300	597,000	626,850	692,520	859,680	955,200	859,680	955,200	447,750	597,000		
3 250	4	7 100	639,000	710,000							532,500	710,000		
3 500	4	8 330	749,700	833,000							622,500	833,000		
3 750	4	9 660	869,400	966,000							724,500	966,000		
4.000	4	11.080	997,200	1,108,000							831,000	1,108,000		

NOTES:

1/Strengths of slotted and castle nuts shall be assumed as 67 percent of the tabulated loads

Strengths of jam nuts shall be assumed as 50 percent of the tabulated loads

2/Proof-loads shown above are based on stress areas shown and minimum tensile strengths specified (See Table IV for carbon steel nuts and 3 1 2 for cres nuts)

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TABLE VI MINIMUM PROOF LOADS OF STEEL AND CORROSION RESISTING STEEL NUTS - FINE THREAD

NOM DIA OF THD (IN)	THREADS PER INCH UNF	STRESS AREA OF MATING EXTERNAL THREADS (SQ IN)	PROOF LOADS POUNDS MIN 1/ 2/											
			GRADE A		GRADE B		GRADE C		GRADE D		300 SERIES ALL NUTS	400 SERIES ALL NUTS		
			HEX & SQUARE	HEAVY AND THICK	HEX & SQUARE	HEAVY AND THICK	HEX & SQUARE	HEAVY AND THICK	HEX & SQUARE	HEAVY AND THICK				
250	28	0364	2,912	3,280	3,970	4,368	4,730	5,240	5,460	4,914	5,460	2,750	3,650	
3125	24	0580	4,640	5,220	6,322	6,960	7,540	8,350	8,700	7,830	8,700	4,350	5,800	
375	24	0878	7,024	7,900	9,570	10,536	11,410	12,640	13,170	11,853	13,170	6,590	8,780	
4375	20	1187	9,500	10,680	12,940	14,244	15,430	17,090	17,800	16,025	17,800	8,900	11,870	
500	20	1599	12,792	14,390	17,430	19,188	20,790	23,000	23,980	21,586	23,980	12,000	15,900	
5625	18	203	16,240	18,270	22,130	24,360	26,400	29,232	30,450	27,405	30,450	15,250	20,300	
625	18	256	20,480	23,040	27,900	30,720	33,300	36,900	38,400	34,560	38,400	19,200	25,600	
750	16	373	29,840	33,510	40,660	44,760	48,500	53,700	55,950	50,355	55,950	27,980	37,300	
875	14	509	40,720	45,810	55,480	61,080	66,200	73,300	76,350	68,715	76,350	38,180	50,900	
1000	12	663	53,040	59,670	72,267	79,560	86,200	95,500	99,450	89,505	99,450	49,725	66,300	
1125	12	856	68,480	77,040	80,464	89,900	111,300	123,300	128,400	115,560	128,400	64,200	85,600	
1250	12	1073	85,840	96,570	100,862	112,665	139,500	154,500	160,950	144,885	160,950	80,480	107,300	
1375	12	1315	105,200	118,350	123,610	138,075	171,000	189,400	197,250	177,525	197,250	98,650	131,500	
1500	12	1581	126,480	142,300	148,614	166,000	205,500	227,700	237,150	213,435	237,150	118,580	158,100	
1750	12	2190	175,200	219,000	205,860	229,950	284,700	315,400				164,250	219,000	
2000	12	2890	231,200	289,000	271,660	303,450	375,700	416,200				216,750	289,000	
2250	12	3690	295,200	369,000	346,860	387,450	479,700	531,400				276,750	369,000	
2500	12	4600	368,000	460,000	432,400	483,000	598,000	662,400				345,000	460,000	
2750	12	5590	447,200	559,000	525,460	586,960	726,700	805,000				419,250	559,000	
3000	12	6690	535,200	669,000	628,860	702,450	869,700	963,400				501,750	669,000	
3250	12	7890	631,200	789,000								591,750	789,000	
3500	12	9180	734,400	918,000								688,500	918,000	
3750	12	10570	845,600	1,057,000								792,750	1,057,000	
4000	12	12060	964,800	1,206,000								904,500	1,206,000	

NOTES:

1/ Strengths of slotted and castle nuts shall be assumed as 67 percent of the tabulated loads Strengths of jam nuts shall be assumed as 50 percent of the tabulated loads

2/ Proof-loads shown above are based on stress areas shown and minimum tensile strengths specified (See Table III for carbon steel nuts and 3 1 2 for cres nuts)

TABLE VII CROSS REFERENCE DATA

FF-N-836	FF-N-836A	FF-N-836B	FF-N-836C	FF-N-836D
Group A	Type I Style 1 Type I Style 2	Type I Style 1 Type I Style 2	Type I Style 1 Type I Style 2	Type I Style 1 Type I Style 2
Group B	None None None Type II Style 1 Type II Style 2 Type IV Style 1 Type V Style 1	Type I Style 4 Type I Style 5 Type II Style 1 Type II Style 2 Type IV Style 1 Type V Style 1	Type VIII Style 19 Type VIII Style 20 Type II Style 4 Type II Style 5 Type IV Style 16 Type V	Type VIII Style 19 Type VIII Style 20 Type II Style 4 Type II Style 5 Type IV Style 16 Type V
Type 2	Type II Style 3 Type IV Style 2	Type II Style 3 Type IV Style 2	Type II Style 6 Type IV Style 17	Type II Style 6 Type IV Style 17
Type 3	Type II Style 4 Type II Style 5 Deleted Deleted Deleted	Type II Style 4 Type II Style 5 None None None	Type II Style 7 Type II Style 8 None None None	Type II Style 7 Type II Style 8 None None None
Type 4	Type II Style 6 Type II Style 7 Type II Style 8 Type II Style 9 Type IV Style 3	Type II Style 6 Type II Style 7 Type II Style 8 Type II Style 9 Type IV Style 3	Type II Style 9 Type II Style 10 Type II Style 11 Type II Style 12 Type IV Style 18	Type II Style 9 Type II Style 10 Type II Style 11 Type II Style 12 Type IV Style 18
Type 5	Type III Style 1 Type III Style 2	Type III Style 1 Type III Style 2	Type III Style 14 Type III Style 15	Type III Style 14 Type III Style 15
Group C	Type I Style 3 Type II Style 10 None	Type I Style 3 Type II Style 10 Type II Style 11	Type I Style 3 Type II Style 13 Type VIII Style 20	Type I Style 3 Type II Style 13 Type VIII Style 20
None	None	None	Type VI Type VII Type IX	Deleted Type VII Type IX
None	None	None		
None	None	None		

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TABLE VIII

Slot Dia	Pin Dia	Slot Dia	Pin Dia
.078	.073	.188	.168
.094	.084	.203	.183
.125	.110	.250	.230
.156	.141	.312	.292
.172	.152	.375	.355

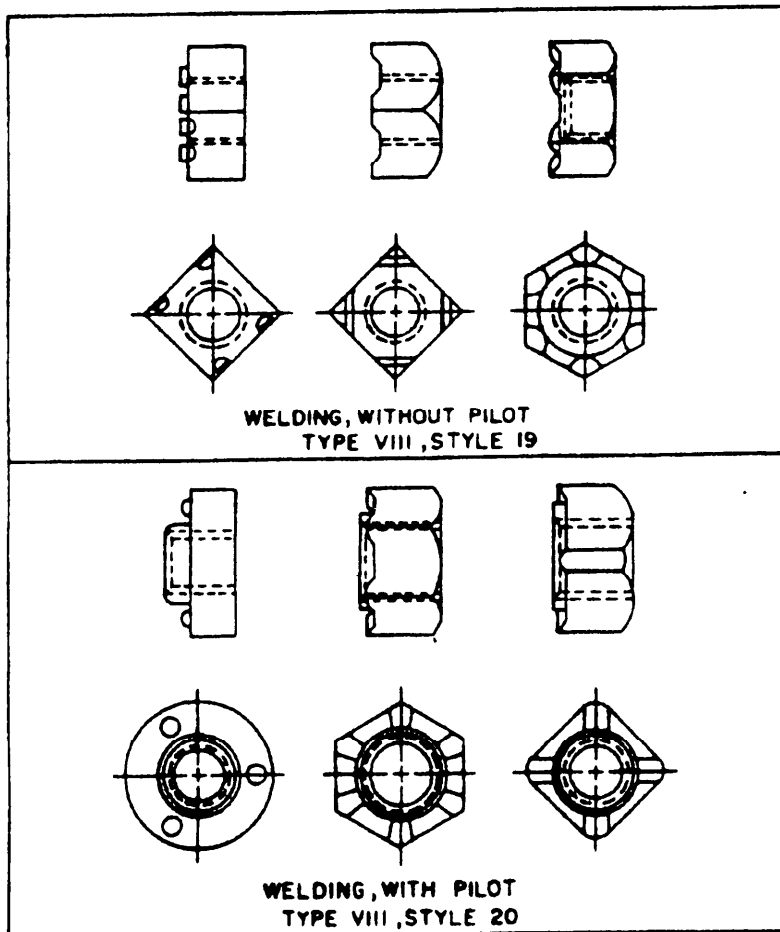


FIGURE 1 - NUTS

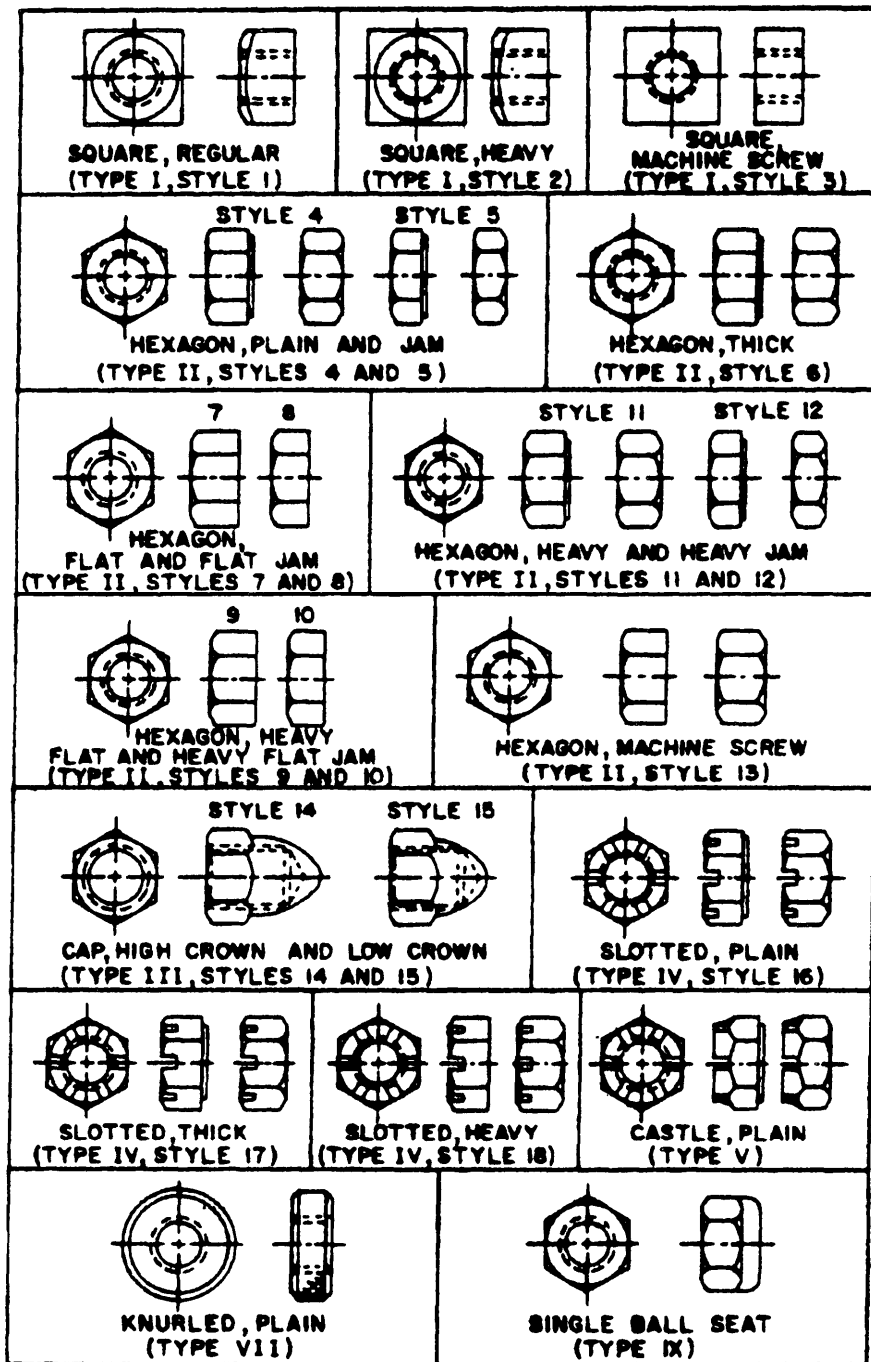
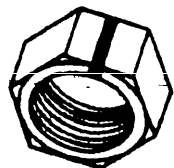


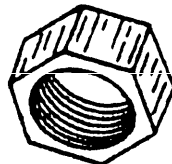
FIGURE 1 (CONTD) - NUTS

FF-N-836E

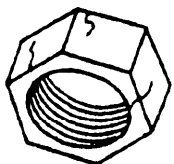


Seam extends into washer face and side, forged nut.

Acceptable, provided discontinuities are within the limits of Table I.

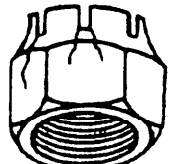


Toolmarks and draw marks on nuts as a result of normal machining or heading operations shall not be cause for rejection.



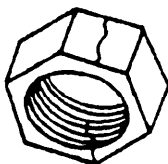
Nuts fabricated from bar stock which has seams, laps or inclusions which intersect an edge.

Acceptable, provided discontinuities are within the limits of Table I.



Nuts having seams, laps or inclusions which intersect an edge in line with beam slots passing through the center of the hex flats.

Acceptable, provided discontinuities are within the limits of Table I.



Nuts having laps or seams due to the forming of the metal in excess of the limits specified in Table I - Rejectable.

Figure 2 - Discontinuities

MILITARY INTERESTS

Army - AR
Navy - AS
Air Force - 99

Preparing Activity

DLA-IS

Review Activities

Army - AV, EA, MI, AT, GL
Navy - OS, MC, YD
Air Force - 82
NSA - NS

Project Number 5310-1964

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1 RECOMMEND A CHANGE:

1 DOCUMENT NUMBER FF-N-836E

2 DOCUMENT DATE (YYMMDD)

14 September 1994

3 DOCUMENT TITLE NUT, SQUARE, HEXAGON CAP, SLOTTED, CASTLE, KNURLED, WELDING AND SINGLE BALL SEA'

4 NATURE OF CHANGE: (Identify paragraph number and include proposed rewrite, if possible. Attach sheets if needed)

5 REASON FOR RECOMMENDATION

6 SUBMITTER

a NAME (Last, First Middle Initial)

b ORGANIZATION

c ADDRESS (Include Zip Code)

d TELEPHONE (Include Area Code)

7 DATE SUBMITTED

(1) Commercial

(YYMMDD)

(2) AUTOMON (if applicable)

8 PREPARING ACTIVITY DLA-IS

a NAME

E ALDOMARI/EUGENE BEUTTEL

b TELEPHONE (Include Area Code)

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(2) AUTOMON 442-6827/3457

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