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INCH-POUND

MIL-S-1222H
INT. AMENDMENT 3(SH)
30 September 1994
USED IN LIEU OF
AMENDMENT 2
12 October 1990

MILITARY SPECIFICATION

STUDS, BOLTS, HEX CAP SCREWS, SOCKET HEAD CAP SCREWS AND NUTS

This interim amendment is approved for use within the Naval Sea Systems Command, with MIL-S-1222H, dated 21 October 1986.

PAGE 1

1.1, Second line: Delete: “in diameters of 1/4 inch and larger.’

PAGE 2

2.1.1, under “SPECIFICATIONS, FEDERAL, QQ-C-465": Delete ‘Numbers 606, 614, 630, 632M, and 642” and substitute “Numbers C60600, C61400, C63000, C63200 and C64200’ .

PAGE 3

2.1.1, under “SPECIFICATIONS, MILITARY’: Delete "MIL-N-24106’.

2.1.1, under “STANDARDS, FEDERAL”: Delete "FED-STD-H28/20"; Add, "FED-STD-H28/2 - Screw Thread Standards for Federal Services, Section 2, Unified Thread Form and Thread Series for Bolts, Screws, Nuts, Tapped Holes, and General Applications. ”

2.1.1, under ‘STANDARDS, MILITARY”: Add : "MIL-STD-792 - Identification Marking Requirements for Special Purpose Components. ”

2.2, under “ANSI”: Add : "B1.3 - Screw Thread Gaging Systems for Dimensional Acceptability.“

PAGE 4

2,2, under “ASTM”: Delete reference to “ASTM A 751”.

* 2.2, under ‘ASTM”: Add:

"B446 - Standard Specification for Nickel-Chroxninum-Molybdenum-Columbium Alloy (UNS N006625)* Rod and Bar.
B504 - Standard Test Method for Measurement of Coating Thickness by the Coulometric Method.
B568 - Standard Test Method for Measurement of Coating Thickness by X-Ray Spectrometry.’

2.2, under "SAE" after “J 995”, Add: "AMS 2750 - Pyrometry. ”

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PAGE 5

3.1, line 3, above TABLE I: Add :

"WARNING NOTE: STRENGTH LEVELS FOR MARTENSITIC STAINLESS STEELS (GRADES 410, 416, AND 416Se) CONDITION H, OF MIL-S-1222H DO NOT HAVE STRENGTHS EQUIVALENT TO CONDITION H OF MIL-S-1222G. HOWEVER, CONDITION H OF MIL-S-1222H WITH INTERIM AMENDMENT 2 AND 3 IS EQUIVALENT TO CONDITION H OF MIL-S-1222G. "

Table I, under "Material Grade" for alloy steels: Delete "574" and substitute "A57" .

PAGE 6

Table I, under "Identification Marking" for martensitic corrosion resistant steels: Delete footnote "5/"; replace 410H, 416H, and 416SeH, with 410, 416, and 416Se; replace 410HT, 416HT, and 416SeHT with 410, 416, and 416SE.

PAGE 7

Table I, under "Identification Marking" for martensitic corrosion resistant steels: Delete footnote "5/"; replace 410H, 416X, and 416SeH, with 410, 416, and 416Se; replace 410HT, 416HT, and 416SeHT with 410, 416, and 416SE.

Table I, under Chemical requirement for Ni-Cu-A1: Delete "class A" ,

Table I, under "Identification Marking" for Ni-Cu-A1 nut: Add "8/" .

* Table I, insert new line in "Nickel Alloy" Section as shown:

Ni-Cr-Mo-Cb UNS N06625	625	Stud, bolt, hex head cap screw, socket head cap screw, nut	ASTM B446	625 3/

PAGE 8

Table I, under "Material grade" for copper alloys, Nickel-aluminum-bronze : Delete "632" and substitute "C63200".

PAGE 9

* Table I, footnote 3, (a): Delete "303, 303Se".

Table I, footnote 6, (f): Delete "651".

Table I, footnote 8: Delete and substitute: 'See 3.9."

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* 3.1.2: Retitle as follows:

"3.1.2 Special requirements for nickel alloys, grades 400 and 500."

* 3.1.2.1: Delete and substitute:

"3. 1.2.1 Grade 500 (Nickel-Copper-Aluminum) externally threaded fasteners. Manufacture of grade 500 fasteners shall have the following restrictions:

(a) The finished material condition of all fasteners shall be annealed and age hardened.
(b) For fasteners produced by cold or hot heading, the finished fasteners shall be annealed and age hardened after heading.
(c) Threads formed prior to final anneal and aging may be rolled or cut.
(d) Threads formed after final anneal or final anneal and aging shall be cut only."

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* 3.1.2.2: Delete and substitute:

"3.1.2.2 Grade 400 externally threaded fasteners. Grade 400 externally threaded fasteners shall be fabricated from either hot finished, annealed, or cold drawn and stress relieved barstock in accordance with QQ-N-281.

* 3.1.2.3: Add as new:

"3.1.2.3 Grade 625 externally and internally threaded fasteners. Inconel Alloy Grade 625 shall be fabricated under the following guidelines:

(a) Grade 625 fasteners shall be produced from material that was electroslag remelted or vacuum arc remelted.
(b) Grade 625 fasteners entirely machined (cut or ground threads only) from annealed bar- stock need not be reannealed."

* 3.2: Add to end of paragraph: 'Heat treatment shall be controlled in accordance with AMS 2750. Tensile properties shall be determined after heat treatment. "

PAGE 11

Table II, under "Nominal diameter" for carbon and alloy steels and 300 series corrosion resistant steels: Delete "1/4 inch to *" wherever it appears and substitute "* or less". (Where * is a variable number.)

* Table II, under "Tensile strength ksi" for grade 8 carbon and alloys steels,': Delete "150 - 170" and "140 - 170" and substitute "150 - 175" and "140 - 175", respectively.

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* Table II, under “Hardness’ for grade 8 carbon and alloy steels: Delete "C32 - C38" and "C30 . C38" and substitute "C32 - C39" and "C30 - C39" respectively.

Table II, under “Nominal diameter’ for 400 series corrosion resisting steels: Delete "1/4 and over” and substitute “All sizes” .

Table II, For corrosion resistant steels; under grade: Delete "431"; under “Heat treatment or condition” for 410, 416, 416Se: Delete “H” and substitute “T”; Delete "HT" and substitute “H”. Add new line as shown:

*

Grade	Condition	Diameter	Full size fasteners			Rockwell hardness
			Tensile strength ksi	Yield strength ksi, min	Proof stress ksi, min	
410, 416, 416Se	T	All sizes	125-150	95	---	C25-34
	H	All sizes	180-220	135	---	C38-47
431	H	All sizes	125-150	95	---	C25-34
	HT	All sizes	180-220	135	---	C38-47

Machined specimens from fasteners or on parent barstock			
Tensile strength ksi, min	Yield strength ksi, min	Elongation in 4D percent min	Reduction of area percent min
125	95	20	---
180	135	12	---
125	95	20	---
180	135	12	---

PAGE 12

Table II, under “Nominal diameter” for copper and aluminum alloys and grade 630 stainless steel: Delete "1/4 and over’ and substitute “All sizes’.

Table II, under “Nominal diameter for nickel alloys 400 and 405”: Delete “1/4 and over” and substitute “All sizes".

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* Table II, Insert new lines across from “Nickel Alloys” as shown:

			Full size fasteners				Machined specimens from fasteners or on parent stock			
Grade	Heat treatment or condition	Nominal diameter (inches)	Tensile strength ksi	Yield strength ski min	Proof stress ksi min	Rockwell hardness	Tensile strength ksi min	Yield strength ksi min	Elongation in 40 percent min	Reduction of area percent min
Ni-Cr-Mo-Cb UNS NO6625	Annealed	2-1/4 or less	120	60	---	B85 C35	120	60	30	---
		Over 2-1/4	110	50	---	B85 C35	110	50	25	---

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Table II, under “Nominal diameter” for titanium alloys: Delete "1/4 to *“ wherever it appears and substitute “* or less” .

* Table II: Delete footnote 2/.

* Table II, At “Titanium alloys”, “Grade T7, Solution treated and aged’: Delete both lines.

* Table III, under “Nominal diameter” for all grades: Delete “1/4 to *“ wherever it appears and substitute “* or less" .

Table III, under ‘Grade” for grades “574, 4340”: Delete: “574” and substitute "A574" .

* Table III: Add to end of table as shown:

Ni-Cr-Mo-Cb UNS NO 6625	Annealed	2-1/4 or less	120	60	---	B85-C35	120	60	30	---
		over 2-1/4	110	50	---	B85-C35	110	50	25	---

* Table III: Delete "1/".

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Table IV, under “Nominal size” for all grades: Delete "1/4 and over” wherever it appears and substitute “All sizes”.

Table IV, under “Grade”: Delete “431’, under ‘Heat treatment or condition” for corrosion resistant steels 410, 416, 416Se: Delete "H" and substitute ‘T”; Delete: "HT" and substitute “H”. Add new line as follows:

“431	H	all sizes	125	C25-34
431	HT	all sizes	180	C38-47"

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* Table IV, insert new lines across from ‘Nickel Alloys” as shown:

Ni-Cr-Mo-Cb UNS N06625	2-1/4 or less	120	B85-C35
	over 2-1/4	110	B85-C35

* Table IV, under "Rockwell hardness" for yiysnium alloys: Delete "C26 max."

* Table IV, For “Titanium alloys”, ‘Grade T7, Solution treated and aged”: Delete "Solution treated and aged”, "1/4 and over”, “140” and C26 min".

PAGE 17

* 3.6, Add: Grades "A574" and “4340” to the list of grades that require a decarburization examination. Add to end of sentence:

"Decarburization examination shall not be required for studs provided the starting bar used to machine the studs has been subjected to a decarburization examination, the depth of total decarburization is removed during machining, and no heat treatment is performed after machining. Headed fasteners machined from heat treated bar shall not require a decarburization examination.“

* 3.7.1: Delete and substitute:

“3.7.1 Carbon and alloy steels. When protective coating is specified (see 4.4.7, 6.1.1 and 6.2.1), carbon and alloy steel fasteners shall be coated as follows:

Metallic ceramic coating: MIL-C-81751, type 1, class 4, including an phosphate-chromate topcoat.
Ion vapor deposited aluminum coating: MIL-C-83488, type II
Immersion zinc flake/chromate dispersion coating: MIL-C-87115.
Electodeposited zinc coating: ASTM B 633, type II.
Mechanically deposited zinc coating: ASTM B 695.’

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* 3.7,1.2: Delete and substitute :

“3. 7 .1,2 Protective coating thickness . Minimum coating thickness shall be 1/6 the allowance as defined in ANSI B1 .1. Coating outside the thread area shall be whatever thickness is developed by normal plating practice while plating the threaded area. MIL-C-81751 coating system shall consist of a base coat to MIL-C-81751, type I, class 4, plus an approved phosphate-chromate topcoat.’

* 3.7.1.3: Delete and substitute:

‘3.7.1.3 Hydrogen embrittlement relief. Externally threaded fasteners of grades 410, 416, and 431, in the H condition, and grades 8, 630, A574 and 4340, in the final heat treated condition, which are electroplated or exposed to pickling acids or any other process that may introduce hydrogen, shall receive a hydrogen exnbrittlement relief treatment in accordance with ASTM B 633.”

* 3.7.1.4, replace the first sentence with the following:

“Unless otherwise specified, after coating class 2A external threads (see 3,7.1.2) shall not exceed the maximum dimensional limits for class 3A,"

PAGE 19

3.8.1: Delete first sentence and substitute:

‘Except for stud end threads of style a or b studs, screw threads shall be in accordance with ANSI B1.1 and unless otherwise specified (see 6.2.1), shall be unified class 2A/2B."

PAGE 20

Table VI, under "Full body, Type I," “Styles a and c“ and “Styles b and d,” maximums for both 1-318 sizes: Delete “1.295’ and substitute “1.395’.

Table VI, footnote 1/, line 2: Delete "FED-STD-H28/20" and substitute "FED-STD-H28/2".

PAGE 22

3.8.2.4, under “Tolerance for nominal stud diameter-: Delete "5/8 to 1-1/4" and substitute "9/16 to 1-1/4’.

PAGE 27

* 3.9: Delete and substitute:

‘3.9 Identification marking. Unless otherwise specified (see 6.2.1), identification symbols/marking shall be as shown in table I, When heat to heat traceability (lot definition ‘a”) is desired, and for grade 500 nickel alloy fasteners, the material symbol, manufacturer’s symbol and the lot number shall be marked on the fasteners greater than 1/4-inch nominal size. For fasteners 1/4-inch in nominal size or less, if all of the marking on the item cannot be applied due to

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space limitations, the marking shall be applied using the following order of precedence: material symbol, lot number, manufacturer's symbol. The material symbol is mandatory for all fasteners. Marking shall be applied to the head of bolts, hex cap screws and socket head cap screws, the nut end of studs and the top face of nuts. Studs with same thread configuration on both ends may be marked on either end. Any markings applied after final heat treatment shall be permanent as defined in MIL-STD-792 and shall be applied in accordance with one of the methods of MIL-STD-792, except types IV and VI. Grades 410, 416, and 431 in the H condition and grades 8, 630, A574 and 4340 in the final heat treated condition shall only be marked by electrochemical etching process. Markings shall be raised or depressed sufficiently that they are clearly visible after application of an electroplated coating. "

* 3.10 and 3.10.1: Delete and substitute:

"3.10 Workmanship. Fasteners shall be uniform in quality and condition, free from rust, scale, cracks, seams, bursts, voids, laps, nicks, gouges, and burrs to the extent required by the applicable inspection standards (see 4,4.5.1). "

PAGE 28

* Table XI: Restructure the first part as follows:

Type of test or inspection	Number of samples per lot or method
Chemical analysis	One for each heat
Decarburization (see 3.6)	One for each lot

Table XI, under "Type of test or inspection": Delete "Nondestructive testing" from the box with "Permeability measurement'.

PAGE 30

* 4.4.3: Delete third sentence and substitute: "Screw thread gaging shall be in accordance with ANSI B1.3, System 22. Screw thread gauges shall be in accordance with ANSI B1.2.n

* 4.4.4: Add as new third sentence: "Externally threaded fasteners produced by cold work, (that is, cold heading and thread rolling without subsequent heat treatment) shall be tested as full-size fasteners.'

* 4.4.4: Add to end of paragraph: "Bolts, screws and studs which have insufficient overall length or thread length for wedge tensile, axial tensile, elastic proof load and yield strength tests shall be tested by manufacturing an identical fastener to those in the lot it represents except for overall length and/or length of threads. These test specimens shall be of the same type, style, diameter and heat and shall be processed and heat treated with the fasteners they represent. The maximum length of the longer fasteners processed with the lot of fasteners represented shall be restricted to the length specified in table I of ASTM F 606 plus 1/4."

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* 4.4.4.1: Delete and substitute:

"4.4 ,4.1 Wedge tensile. Headed fasteners shall be wedge tested in accordance with ASTM F 606. Those which require a calculated test load greater than 150,000 shall be tested to 150,000 pounds or the limit of the test machine whichever is greater. Flat countersunk head cap screws and button head cap screws are excluded from wedge testing. Failure must occur in the threaded section or body and not in the head to shank fillet area of bolts/cap screws having an unthreaded shank. Bolts/cap screws threaded to the head shall meet this test if the fracture causing failure originates in the threaded area even though it may have extended into the fillet area or head before separation. Bolts/cap screws are considered threaded to the head if they are threaded one diameter or closer to the under side of the head. Wedge angles for socket head cap screws shall be in accordance with ASTM A 574."

* 4.4.4.3: Delete 'Table II" and substitute "Tables II and III."

PAGE 31

Table XIII, footnote 2, at end add: "and IV.'

* Table XIII, footnote 4: Delete and substitute: "4/ See 4 .4.4.1."

Table XIII, footnote 5: Delete and substitute: "5/ See 4.4.4.4. "

* 4.4.4.4: Add second, third, and fourth sentences:

"Nuts, other than titanium, with a calculated proof load greater than 150,000 pounds shall not be subject to the proof load test but shall meet the hardness test of 4.4.4.5, where specified in table IV. Titanium nuts which require a proof test of greater than 150,000 pounds shall be tested on equipment with a minimum capacity of 150,000 pounds to the limit of the test machine or the required proof load whichever is less. For those facilities with the capability, proof load test results, for alloys other than titanium, shall be submitted along with hardness test results, where applicable. "

* At end of new sixth sentence: Delete "Table IV" and substitute "Table V".

PAGE 32

4.4.4.5, line 2: Delete "ASTM A 606" and substitute "ASTM F 606".

4.4,4.5, line 2: Delete "table 11 and III" and substitute "tables 11, III, and IV".

* 4.4.4.6: Delete and substitute:

'4.4.4.6 Alternate mechanical properties. Certified mechanical test reports (see 4.5) furnished by the barstock supplier which demonstrates compliance with the mechanical properties of tables 11, III, and IV may be substituted for mechanical testing of fasteners provided that all of the following are met:

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(a) For bolts, screws or studs were fabricated solely by machining without further heat treatment or cold working.
(b) Lot definition 'a' is specified and marking or identification is maintained to ensure traceability to the raw material certification.
(c) Mandatory mechanical tests on full size fasteners are performed on finished fasteners as specified in table XIII.'

* 4.4.4.6.1: Add as -new:

"4.4 .4.6.1 Size limitations. When bolts and studs are machined from quenched and tempered barstock, the following requirements apply when using mechanical test results from barstock:

(a) For studs, the nominal diameter of the finished stud shall not be less than one-half the nominal diameter of the heat treated bar stock.
(b) For bolts greater than 1/2-inch nominal diameter the nominal diameter of the finished bolt shall not be less than one-half the nominal diameter of the heat-treated barstock.
(c) For bolts less than or equal to 1/2-inch nominal diameter, the nominal diameter of the finished bolt shall not be less than one-quarter the nominal diameter of the heat-treated barstock.

These limitations are not applicable if testing the full size fastener or a tensile specimen machined from a fastener. "

4.4.5: Delete and substitute:

"4.4.5 Nondestructive testing. Fasteners shall be nondestructively inspected by wet magnetic particle or liquid penetrant test in accordance with MIL-STD-271. Fasteners made from magnetic materials shall be wet magnetic particle inspected+ All other fasteners shall be inspected by the liquid penetrant test. When protective coating is specified, the nondestructive tests shall be performed before the coating process. "

* 4.4.5.1: Add the following after 'screws and studs": "except that head socket discontinuities on cylindrical socket head cap screws, flat countersunk head cap screws and button head cap screws shall be evaluated in accordance with FF-S-86."

* 4.4.7: Delete and substitute:

'4.4.7 Protective coating thickness. Protective coating thickness may be determined by any of the following methods: microscopic to ASTM B 487, coulometric method to ASTM B 504, or x-ray spectrometry to ASTM B 568. No less than two measurements shalL be made on each sample to determine compliance with 3.7.1. The method used shall produce results that are precise within 1 micrometer or 10 percent, whichever is greater. Failure of the coating thickness to meet the minimum coating thickness requirements shall be cause for rejection."

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* 4.4.8: Delete and substitute:

"4.4.8 Stress durability test. When hydrogen embrittlement relief is required by 3.7> 1.3, a stress durability test shall be performed in accordance with MIL-STD-1312, method 5. The test duration shall not be less than 48 hours."

4.4.10, Insert 'be" between "shall" and "impact".

4.5: Delete "When specified in the contract or order," and substitute "when specified (see 6.2.1),".

PAGE 35

Table XIV, under 'Steel grades': Delete "Carbon steel grades SAE 2 and 5" and substitute "Carbon steel grades SAE 2, 5, and 8".

Table XIV, under "Steel grades': Delete "Grade B7 externally threaded used with grade 2H, 4, or 7 nuts" and substitute "Grade B7 externally threaded fasteners used with grade 2H, 4, or 7 nuts".

PAGE 36

6.1.4, line I: Delete "steal" and substitute "steel" .

PAGE 37

6.2.1 (b): Delete and substitute:

"(b) Type, style, material grade, and heat treatment or condition of fasteners (see 1.2, 3.1, 3.2, and tables I, 11, III, or IV)."

6.2.1 (C): Delete and substitute:

'(c) If grade 400 should be cold drawn and stress relieved (see 3.1.2.2). "

6.2.1: Add new (l):

"(1) Test report, if required (see 4.5)."

PAGE 38

6.2.2: Add :

'Paragraph no.	Data requirements title	Applicable DID no.	Option
4.5	Certification data for non-nuclear level I material"	DI-MISC-80705	----

6.3, line 3: Delete "table XVI" and substitute "table XVII"

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PAGE 39

Table XVI, title: Delete “TABLE XVI" and substitute “TABLE XVII”.

PAGE 40

6.4, line 3: Delete “6.4.1 and 6.4.2” and substitute ‘6.4.1, 6.4.2, and 6.4.3”.

6.4, lines 3 and 5: Delete “table XVI" and substitute "table XVII" .

6.4.1, line 12: Delete “table XVII" and substitute “table XVIII”.

* Table XVII. title: Delete “Table XVII" and substitute “Table XVIII".

* New table XVIII, under "MIL-S-1222H" for carbon and alloy steels: Acid "A574" and “4340”.

* New table XVIII, under "MIL-B-857A" for corrosion resistant steel: Add "304".

PAGE 41

Table XVII, title: Delete "Table XVII" and substitute “Table XVIII”.

* New table XVIII, under "MIL-S-1222H" for copper alloys: Delete “632’ and substitute "C63200" .

* New table XVIII, under "MIL-B-857A" for copper alloy 544: Delete “Aluminum bronze” and substitute “Phosphor bronze”.

* New table XVIII, under "MIL-S-1222H, MIL-S-001222G, and MIL-B-857A" for copper alloys : Add “670”, “670”, and ‘Manganese bronze”, respectively.

* New table XVIII, under "MIL-B-857A" for nickel alloy 500: Delete "Ni-Cu-A2" and substitute "Ni-Cu-A1" .

PAGE 42

6.6: Add : ‘Studs’.

6.7: Delete and substitute:

‘6.7 Changes from previous issue. The margins of this interim amendment are marked with an asterisk (*) to indicate where changes from amendment 2 were made. This was done as a convenience only and the Government assumes no liability for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the amendment 2,"

Preparing activity:
Navy - SH
(Project 53GP-N027)

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NOTICE OF CANCELATION

NOT-MEASUREMENT SENSITIVE

MIL-S-1222H
INTERIM AMENDMENT 3
NOTICE 1
6 May 1999

MILITARY SPECIFICATION

STUDS, BOLTS, HEX CAP SCREWS, SOCKET HEAD CAP SCREWS AND NUTS

MIL-S-1222H Interim Amendment 3, dated 30 September 1994, is hereby canceled without replacement.

Custodians:
Navy - SH

Preparing activity:
Navy - SH

AMSC N/A **FSC 53GP**

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NOTICE OF REINSTATEMENT

NOT MEASUREMENT SENSITIVE

MIL-S-1222H
NOTICE 2
1 October 1999
SUPERSEDING
NOTICE 1
6 May 1999

MILITARY SPECIFICATION

STUDS, BOLTS, HEX CAP SCREWS, SOCKET HEAD CAP SCREWS AND NUTS

MIL-S-1222H Interim Amendment 3, dated 30 September 1994, is hereby reinstated through 31 December 2000 and may be used for acquisition. If MIL-S-1222H has not been revised or amended by 31 December 2000, Interim Amendment 3 will be canceled.

Preparing activity:
Navy – SH
(Project 53GP-N015)

AMSC N/A FSC 53GP

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