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Fastener Part Standard—Caps Screws, Hex Bolts, and Hex Nuts (inch Dimensioned)**1. Scope**

This SAE Part Standard covers selected inch screws, hex bolts, and nuts manufactured in accordance with SAE and American Society for Testing and Materials (ASTM) fastener standards. This document covers fastener materials often used in ship systems and equipment but its use may be applied wherever fasteners of the covered materials are used. This document permits the fasteners to be identified and ordered by a part or identifying number (PIN) as defined in this document.

1.1 Purpose

The purpose of this document is to assist the designer and other personnel by providing requirements and part identifying numbers for the most commonly used fasteners for ship systems and equipment. A part or identification number (PIN) is normally required for all military applications and provides a useful means of communicating fastener requirements to suppliers and manufacturers in a very succinct manner.

1.2 Fastener Part Numbers

This document provides part or identifying numbers that can be used to identify socket head cap screws, hex head cap screws, and bolts and hex nuts for the parts covered by this document. The parts covered by this document are to be manufactured in accordance with fastener standards issued by the SAE and ASTM. The part identification number (PIN) identifies material, material strength, coatings and special features, nominal diameter, thread configuration, fastener length, marking requirements, along with the applicable ASTM or SAE fastener specification.

2. References**2.1 Applicable Publications**

The following documents form a part of this specification to the extent specified herein. The latest issue of the documents shall be used except in those cases where an invitation for bid or procurement contract specifically identifies the issues in effect on a particular date.

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2.1.1 SAE PUBLICATIONS

Available from SAE, 400 Commonwealth Drive, Warrendale, Pa 15096-0001. Web site: www.sae.org
Tel. (724)-776-4970

SAE AMS 2412—Silver Plating
SAE AMS 2485—Black Oxide Coating
SAE AMS 2487—Anodic Treatment of Titanium and Titanium Alloys
SAE AMS 2488—Anodic Treatment, Titanium and Titanium Alloys
SAE AS1701—Lubricant, Solid Dry Film
SAE J121—Decarburization In Hardened and Tempered Unified Threaded Fasteners
SAE J429—Mechanical and Material Requirements for Externally Threaded Fasteners
SAE J995—Mechanical and Material Requirements for Steel Nuts
SAE J2270—Ship Systems and Equipment—Fasteners—Test, Inspection, and Installation Requirements
SAE J2271—Ship Systems and Equipment—Part Standard for Studs—Continuous and Double End (Inch Series)
SAE J2280—Ship Systems and Equipment—Fasteners—Selection and Identification Requirements
SAE J2295M—Fasteners—Part Standard—Cap Screws, Hex Bolts, and Hex Nuts (Metric)
SAE J2484—Fastener Part Standard – Machine Screws
SAE J2485—Fastener Part Standard -- Machine Screw Nuts (Inch and Metric)

2.1.2 AEROSPACE INDUSTRIES ASSOCIATION PUBLICATIONS

Available from the Aerospace Industries Association, 1000 Wilson Boulevard, Suite 1700 Arlington, VA 22209-3901 Web site: www.aia-aerospace.org Tel: 703-358-1000

NAS 1283—Fasteners, Male, Threaded, Self-locking
NAS 1351—Screw, Cap, Socket Head, UNRF-3A Threads
NAS 1352—Screw, Cap, Socket Head, UNRC-3A Threads

2.1.3 ASME PUBLICATIONS

Available from the American Society of Mechanical Engineers, 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300.

Web site: www.asme.org Tel: 800-843-2763

ASME B1.1—Unified Inch Screw Thread
ASME B18.2.1—Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2—Square and Hex Nuts (Inch Series)
ASME B18.2.6—Fasteners for Use in Structural Applications
ASME B18.3—Socket Cap, Shoulder and Set Screws, Hex and Spline Keys (Inch Series)

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2.1.4 ASTM PUBLICATIONS

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

Web site: www.astm.org Tel: 610-832-2763

ASTM A 193/A193M—Alloy Steel and Stainless Steel Bolting Materials for High-Temperature Service

ASTM A 194/A194M—Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service

ASTM A 307—Carbon Steel Bolts and Studs, 60,000 Psi Tensile Strength

ASTM A 325—Structural Bolts, Steel Heat Treated, 120/105 ksi Minimum Tensile Strength

ASTM A 342—Standard Test Methods for Permeability of Feebly Magnetic Materials

ASTM A 354—Quenched and Tempered Alloy Steel Bolts, Studs and Other Externally Threaded Fasteners

ASTM A 380—Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment and Systems

ASTM A 449—Quenched and Tempered Steel Bolts and Studs

ASTM A 453/A 453M—Bolting Materials, High-Temperature, 50 to 120 ksi [345 to 827 MPa] Yield Strength, with Expansion Coefficients Comparable to Austenitic Steels

ASTM A 490—Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile

ASTM A 563—Carbon and Alloy Steel Nuts

ASTM A 574—Alloy Steel Socket Head Cap Screws

ASTM B 580—Anodic Oxide Coatings on Aluminum

ASTM F 467—Nonferrous Nuts for General Use

ASTM F 468—Nonferrous Bolts, Hex Cap Screws and Studs for General Use

ASTM F 593—Stainless Steel Bolts, Hex Cap Screws and Studs

ASTM F 594—Stainless Steel Nuts

ASTM F 788/F 788M—Surface Discontinuities of Bolts, Screws, and Studs, Inch and Metric Series

ASTM F 812/F 812M—Surface Discontinuities of Nuts, Inch and Metric Series

ASTM F 835—Alloy Steel Socket Button and Flat Countersunk Head Cap Screws

ASTM F 837—Stainless Steel Socket Head Cap Screws

ASTM F 879—Stainless Steel Socket Button and Flat Countersunk Head Cap Screws

ASTM F 1136—Chromium/Zinc Corrosion Protective Coatings for Fasteners

ASTM F 1137—Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners

ASTM F 1470—Fastener Sampling for Specified Mechanical Properties and Performance Inspection

ASTM F 1941—Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))

2.1.5 U.S. GOVERNMENT PUBLICATIONS

Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

Web site: <http://assist.daps.mil> or <http://stinet.dtic.mil> Tel. (215)-697-2179

MIL-DTL-16232— Phosphate Coating, Heavy, Manganese or Zinc Base

QQ-N-286—Nickel-Copper-Aluminum Alloy, Wrought

3. Fastener Part or Identifying Numbers

3.1 SAE Fastener Part Standards

This SAE part standard is for fasteners manufactured to ASTM and SAE fastener standards in accordance with the requirements defined herein. ASTM has issued many fastener standards but generally has not established part or identifying numbers for fasteners to these standards. When using the ASTM or SAE standards, it is necessary to identify the applicable dimensional configuration, coating requirements, and supplemental quality assurance requirements. This SAE part standard provides for the identification of many frequently used fasteners by identifying the applicable dimensional, coating, and other special features with simple part identifying numbers that can be easily recognized by both manufacturers and users.

3.2 Part or Identifying Numbers

(PINs) for Selected Fasteners—PINs are provided herein for selected bolts, cap screws, and hex nuts for the purpose of common logistics parts identification between designers, builders, repair activities, and equipment operators. Part numbers are provided for only those fastener configurations and materials most likely to be needed. Industry or military specifications and standards with part numbers already exist for many types of fasteners and therefore part numbers to cover similar fasteners in this standard have usually not been developed.

3.2.1 PINs FOR SCREWS AND BOLTS

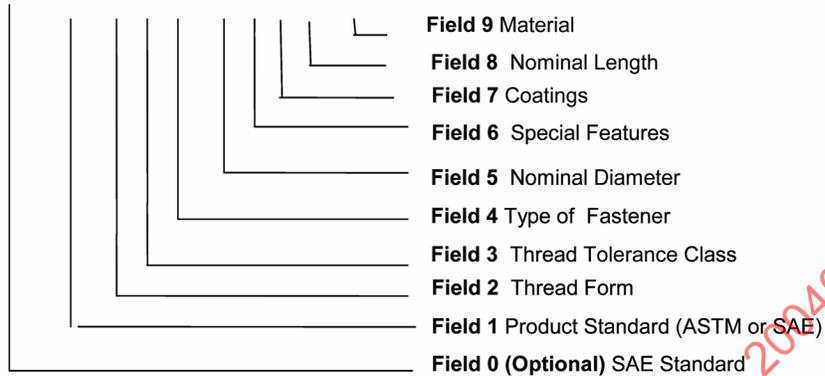
Figure 1 provides part or identifying numbers for hex and socket head screws and bolts in accordance with selected ASTM and SAE product standards. Table 1 is a listing of the standards with the selected materials identified for inch screws and bolts. The part number consists of a number of fields in the following order as identified in Figure 1:

- Field 0 —J2295 (Optional prefix, recommended)
- Field 1 —Product standard (ASTM or SAE)
- Field 2 —Thread form
- Field 3 —Thread tolerance class
- Field 4 —Type of fastener
- Field 5 —Nominal Diameter
- Field 6 —Special Features
- Field 7—Coatings
- Field 8 —Nominal length
- Field 9 —PIN suffix for the selected material as obtained from Table 1

FIGURE 1—PART NUMBER SYSTEM FOR SELECTED HEX AND SOCKET HEAD SCREWS AND BOLTS

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J2295 J429 C 2 H 08 L Z 24 G5



Field 0—J2295 – Identifies this SAE Standard (This prefix is optional and may be omitted when drawing or computer limitations cannot accommodate the extra characters. See 4.2 for guidance when this prefix is omitted.

Field 1— Product Standard (ASTM or SAE) The applicable standards and the Field 1 identification are contained in the first column of Table 1.

Field 2—Thread Form

- C = UNC/UNRC (ASME B1.1)
- U = 8UN/8UNR (ASME B1.1)
- F = UNF/UNRF (ASME B1.1)

Field 3—Thread Tolerance Class

- 2 = 2A (ASME B1.1)
- 9 = Oversize for zinc coating (No longer used. See 4.10)
- 3 = 3A (ASME B1.1)

Field 4—Type of Fastener

- B = Heavy Hex Structural Bolt
- H = Heavy Hex Cap Screw
- R = Regular Hex Cap Screw
- F = Hexagon Socket Flat Countersunk Head Cap Screw (inch - 82° countersunk)
- S = Socket Head Cap Screw

Field 5—Nominal Diameter (See 3.3.2)

Inch = 16ths of an inch (For sizes 9/16 inch and smaller use two digits, For example, 09.)

Field 6—Special Features

- = No special features
- L = Locking Element. See 3.7 for location and testing of locking elements

Note—See 4.11 for earlier PIN's when Fields 6 and 7 were combined.

FIGURE 1—PART NUMBER SYSTEM FOR SELECTED HEX AND SOCKET HEAD SCREWS AND BOLTS (CONTINUED)

Field 7—Coatings

N = None (No Coating) (However, passivation shall be provided on CRES fasteners and the coating requirements of 3.4.3 shall apply to all titanium fasteners.)

A = Aluminum plated (See 3.4.2)

B = Black Oxide (See 3.4.3)

D = Dry Film Lubricant (see 3.4.7)

G = Zinc – Hot-Dip (H) or Mechanically Deposited (M) These designators no longer used (See 4.10)

K = Manganese Phosphate Coating (see 3.4.5)

P = Zinc Phosphate Coating (see 3.4.5)

S = Silver Plating (see 3.4.6)

X = Zinc/Aluminum Inorganic Coating-No Chromium Permitted (see 3.4.8 and 3.4.8.1)

Y = Zinc/Aluminum or Chromium/Zinc Inorganic Coating (see 3.4.8)

Z = Zinc Electroplate (Electroplated zinc coating per ASTM F 1941. See 3.4.4)

Field 8—Nominal Length (See 3.3.1 for length increments)

Inch = 16ths of an inch (For 9/16th inch and shorter use two digits. Example: 09)

Field 9—PIN Suffix to Designate Material - Select applicable PIN Suffix from Table 1. If applicable suffix is a number a dash prefix must be used; i.e. "-660" (This suffix usually consists of the mechanical property marking for the material except that the portion of the mechanical property marking containing the number of the fastener product standard is not included.)

Examples of Part Numbers

The part number used as an example in Figure 1, **J2295J429C2H08LZ24G5**, is as identified below:

The optional "J2295" indicates the standard for the applicable part number. "J429" is the standard to which the part conforms. "C" indicates UNC/UNCR Coarse threads and the "2" indicates a 2A thread tolerance class. "H" indicates a Heavy Hex Cap Screw configuration per the J429 standard. The "08" indicates a nominal diameter of 8/16 ths or 1/2 inch. The "L" for the special features code indicates a self-locking element and the "Z" indicates zinc electroplate coating. The "24" indicates a length of 24/16 ths or 1-1/2 inches. The material designator "G5" indicates Grade 5 as defined in J429 and identified in Table 2.

J2295A193U2H20-N72B16 is the part number for a Heavy hex Cap Screw 1-1/4 inch diameter (20/16 ths) with UNC Class 2A threads and a length of 4-1/4 inches (72/16 ths) of material in accordance with ASTM A 193, Grade B16 (chromium-molybdenum-vanadium steel for high temperature applications) with no special features or coatings.

FIGURE 1—PART NUMBER SYSTEM FOR SELECTED HEX AND SOCKET HEAD SCREWS AND BOLTS (CONTINUED)

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TABLE 1—HEX AND SOCKET HEAD INCH SCREW AND BOLT MARKINGS AND PIN IDENTIFIERS

Product Standard Figure 1 Field 1	Alloy Groups And Conditions	Coatings Recommended	Permitted Size Range (inches)	Yield/Tensile Strength(ksi) ¹ (Values are Yield except T.S. = Tensile)	Mechanical Property Marking	Material PIN Suffix Figure 1 Field 9
A193 (See 4.9)	Heavy Hex Cap Screw (ASME B18.2.1)					
	Chromium-molybdenum, Grade B7	None	¼ to 2-1/2	105 min.	B7	B7
	Chromium-molybdenum, Grade B7M	None	¼ to 2-1/2	80 min.	<u>B7M</u>	B7M
	Chromium-molybdenum, Grade B16	None	¼ to 2-1/2	105 min.	B16	B16
A307	Heavy Hex Bolt (ASME B18.2.1) Carbon Steel, Grade B	None	½ to 4	60 - 100 T.S.	307B	B
	Hex Cap Screws (ASME B18.2.1) Grade A (See 4.8)		¼ to 1-1/2	60 - 100 T.S.	307A	A
A325	Heavy Hex Structural Bolt (ASME B18.2.6)					
	Type 1, Medium Carbon Steel	None or "G"	½ to 1-1/2	½ to 1 - 92 min	A325 (see note)	T1
	Type 3, Weathering Steel (See 3.10)	None	5/8 to 1-1/4	> 1 in - 81 min	A325	T3
Note: Additionally, the bolts may be marked with 3 radial lines, 120 degrees apart.						
A354	Heavy Hex Cap Screw (ASME B18.2.1) Alloy Steel, Grade BD	None, "A" or "Y"	Over 1-1/2	109 min.	BD (See note)	BD
			Over 2-1/2	99 min.		
Note: May be marked with 6 radial lines 60° apart if manufactured of alloy steel. See 4.5 for smaller diameters						
A449	Hex Cap Screws (ASME B18.2.1) Type 1 Medium Carbon Steel	None, "A", "Y" or "Z"	1-3/4 to 3	55 min	3 rad. Lines 120°	T1
A453	Hex Cap Screws (ASME B18.2.1) (Other configurations may be ordered.)	None or "D"	½ to 3	85 min.	660A, B or C	660 Add A, B or C if required
A490	Heavy Hex Structural Bolts (ASME B18.2.6)					
	Type 1 Alloy Steel	None	½ to 1-1/2	130 min.	A490	T1
A574	Socket Head Cap Screws (ASME B18.3) - Alloy Steel (See 3.11 for special hardness requirements)	"A", "B" or "Y"	1/8 to 1/2	180 min. T.S.	A574 (See 3.11)	None
			5/8 to 4	170 min. T.S.		
F468	Hex Cap Screws (ASME B18.2.1) and Socket & Socket Flat (82° Countersunk) Head Cap Screws (ASME B18.3)					
	Nickel-Copper Alloy 400 (See 4.7.3 re Alloy 405)	None	¼ to 3/4	40 min.	F468U	U
	Nickel-Copper Alloy 405 (See 4.7.3)	None	7/8 to 1-1/2	30 min.	F468V	V
	Brass Alloy Cu 462 (See 4.7.1)	None	¼ and >	25 min.	F468C	C
	Brass Alloy Cu 464 (See 4.7.1)	None	¼ and >	15 min.	F468D	D
	Silicon Bronze, Alloy Cu 651 (See 4.7.2 re Alloys 651 & 655)	None	¼ to ¾	55 min.	F468K	K
	Silicon Bronze, Alloy Cu 655	None	7/8 to 1-1/2	40 min.	F468L	L
	Nickel-Copper-Aluminum QQ-N-286 (See 3.8)	None	¼ and >	20 min.	F468L	L
	Alloy 500 (See 3.8)	None	1 and >	85 min.	F468WX	WX
	Nickel Alloy 686 (UNS N06686)	Gr. 1 Gr. 3	¼ and >	90 min.	F468W	W
	Titanium 5-1-1-1 (UNS R55111)	(See 3.4.1.3)	¼ to 1-1/2	150 min.	F468BN	BN
	Titanium 19 (Not for new design)	(See 3.4.1.3)	¼ and >	90 min.	F468DN	DN
			¼ and >	115 min.	F468HT	HT
		¼ and >		F468FT	FT	

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TABLE 1—HEX AND SOCKET HEAD INCH SCREW AND BOLT MARKINGS AND PIN IDENTIFIERS (CONTINUED)

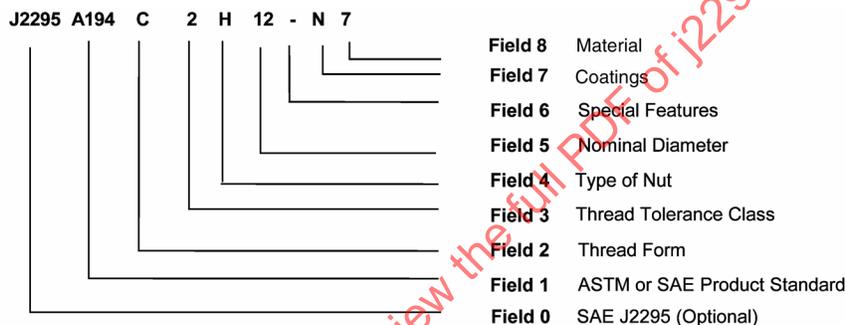
Product Standard Figure 1 Field 1	Alloy Groups And Conditions	Coatings Recommended	Permitted Size Range (inches)	Yield/Tensile Strength(ksi) ¹ (Values are Yield except T.S. = Tensile)	Mechanical Property Marking	Material PIN Suffix Figure 1 Field 9
F593	HEX CAP SCREWS (ASME B18.3)					
	Stainless GP-1 Alloys 304, 305, 384, XM7					
	Cold Worked 1	Passivate	¼ to 5/8	65 min.	593C	C
	Cold Worked 2	(See 3.4.1.2 & 3.4.7)	¾ to 1-1/2	45 min.	593D	D
	Strain Hardened 1		¼ to 5/8	95 min.	593A	A-SH
	Strain Hardened 2		¾ to 1	75 min.	593B	B-SH
	Strain Hardened 3		1-1/8 to 1-1/4	60 min.	593C	C-SH
	Strain Hardened 4		1-3/8 to 1-1/2	45 min.	593D	D-SH
	Stainless Group 2 Alloys 316, 316L					
	Cold Worked 1	Passivate	¼ to 5/8	65 min.	593G	G
	Cold Worked 2	(See 3.4.1.2 & 3.4.7)	¾ to 1-1/2	45 min.	593H	H
	Strain Hardened 1		¼ to 5/8	95 min.	593E	E-SH
	Strain Hardened 2		¾ to 1	75 min.	593F	F-SH
	Strain Hardened 3		1-1/8 to 1-1/4	60 min.	593G	G-SH
Strain Hardened 4	1-3/8 to 1-1/2		45 min.	593H	H-SH	
F835	Flat Countersunk Head Cap Screw - Alloy Steel	None, "A", "B" or "Y"	1/8 to 1/2 9/16 to 1-1/2	145 min. T.S. 135 min. T.S.	None	None
F837	Socket Head Cap Screws – Stainless Steel					
	Alloy Gp 1 304, 305, 384, XM7 & 316 Cold Worked	Passivate (See 3.4.1.2 and 3.4.7)	1/8 to 5/8 ¾ to 1-1/2	30 min. 26 min.	CW (See 3.11)	CW
	Alloy Gp 2 - 316, 316L Only				316 CW (See 3.11)	CW3
Alloy Gp 5 – Martensitic Alloy 410 Cond HT	Passivate (See 3.4.1.2 & 3.4.7)	1/8 to 1-1/2	120 min.	HT (See 3.11)	HT	
F879	Flat Countersunk Head Cap Screw - Stainless Steel Alloy 304, 305, 384, XM7 & 316 Cold Worked	Passivate (See 3.4.1.2 & 3.4.7)	1/8 to 5/8	40 min.	None (Package Only)	CW
	Stainless Alloy 316 & 316L Only					CW3
J429	Hex Cap Screws (ASME B18.2.1)					
	Medium Carbon Steel – Grade 5	"A", "B", "D", "Y" & "Z"	1/4 to 1 >1 to 1-1/2	92 min. 81 min.	3 radial lines, 120° apart	G5
	Medium Carbon Alloy Steel – Grade 8 (See 3.9)		1/4 to 1-1/2	130 min.		6 radial lines, 60° apart

Notes: ¹ Strength values are for informational use only in selecting fasteners and the detailed requirements in the referenced fastener standards apply.

3.2.2 PINS FOR NUTS

Figure 2 provides part or identifying numbers for hex nuts in accordance with selected ASTM and SAE product standards. Table 2 lists the standards with the selected materials identified. The part number consists of a number of fields in the following order as identified in Figure 2:

- Field 0 —J2295 (Optional Prefix, Recommended)
- Field 1 —Product standard (ASTM or SAE)
- Field 2 —Thread form
- Field 3 —Thread tolerance class
- Field 4 —Type of nut:
- Field 5 —Nominal Diameter
- Field 6 —Special features
- Field 7—Coatings
- Field 8—PIN suffix for the selected material as obtained from Table 2.



Field 0—J2295 – Identifies this SAE Standard. (This prefix is optional and may be omitted when drawing or computer limitations cannot accommodate the extra characters. See 4.2 for guidance when this prefix is omitted.)

Field 1— Product Standard (ASTM & SAE) The applicable product standards and the Field 1 identification are contained in the first column of Table 2.

Field 2—Thread Form

- F = UNF/UNRF (ASME B1.1)
- U = 8UN/8UNR (ASME B1.1)
- C = UNC/UNRC (ASME B1.1)

Field 3—Thread Tolerance

- 2 = 2B (ASME B1.1)
- 3 = 3B (ASME B1.1)

Field 4—Type of Nut

- R = Hex Nut
- S = Hex Slotted Nut
- J = Hex Jam Nut
- H = Heavy Hex Nut
- T = Heavy Hex Slotted Nut
- K = Heavy Hex Jam Nut

FIGURE 2—PART NUMBER SYSTEM FOR SELECTED HEX NUTS

Field 5—Nominal Diameter (See 3.3.2)

Inch = 16ths of an inch (For sizes 9/16 inch and smaller use two digits. For example, 09.)

Field 6—Special Features

— = No special features

Note—See 4.11 for earlier PIN's when Fields 6 and 7 were combined.

Field 7—Coatings

N = None (No Coating) (However, passivation shall be provided on CRES fasteners and the coating requirements of 3.4.1.3 shall apply to all titanium fasteners.)

A = Aluminum coatings (See 3.4.2)

B = Black Oxide (See 3.4.3)

D = Dry Film Lubricant (See 3.4.7)

G = Zinc - Hot Dip (H) or Mechanically Deposited (M). These designators no longer used (See 4.10)

K = Manganese Phosphate Coating (see 3.4.5)

P = Zinc Phosphate Coating (see 3.4.5)

X = Zinc/Aluminum Inorganic Coating-No Chromium Permitted (see 3.4.8 and 3.4.8.1)

Y = Zinc/Aluminum or Chromium/Zinc Inorganic Coating (see 3.4.8)

Z = Zinc Electroplate (Electroplated zinc coating. See 3.4.4)

Field 8—PIN Suffix To Designate Material - Select applicable PIN Suffix from Table 2. (This suffix usually consists of the mechanical property marking for the material except that the portion of the mechanical property marking containing the number of the fastener product standard is not included.)

Part Number Example—The part number used as an example in Figure 2, J2295A194C2H12-N7, is as identified below:

The optional "J2295" indicates the standard for the part number. "A194" is the applicable ASTM product standard. "C" indicates UNC/UNCR Coarse threads. The "2" indicates a 2B thread tolerance class. "H" indicates a Heavy Hex Nut configuration. The "12" indicates a nominal diameter of 12/16 ths or 3/4 inch. The "-" indicates no special features and the "N" indicates no coating. The "7" indicates Grade 7 material as identified in Table 2 for ASTM A 194.

FIGURE 2—PART NUMBER SYSTEM FOR SELECTED HEX NUTS (CONTINUED)

TABLE 2—INCH DIMENSIONED NUT MARKINGS AND PIN IDENTIFIERS FOR SELECTED MATERIALS

Product Standard Figure 2 Field 1*	Alloy Groups And Dimensional Standards (ASME B18.2.2 unless otherwise indicated)	Coatings Recommended	Permitted Size Range (inches)	Proof Stress (ksi) (min.) ²	Mechanical Property Marking	Material PIN Suffix Figure 1 Field 8	
A194 (See 4.9)	Heavy Hex Nuts Grade 7	None	1/4 to 4	See Standard	7	7	
	Grade 2H	See 4.9.2			2H or 2HB	2H	
	Grade 2HM				2HM or 2HMB	2HM	
	Hex nuts can be ordered in sizes 1/4 to 1-1/2 inches but are not the preferred configuration. (See 4.8 and 4.8.2)						
A453	Heavy Hex Nuts Grade 660 (see 4.9.4)	None or "D"	1/4 to 4		660A, B or C	660 Add A, B or C for a specific class	
A563 (See 4.9.3)	Carbon Steel Nuts	For diameters ≤ 1-1/2 inches, use SAE J995					
	Grade D (Heavy Hex) See 4.9.2	"A", "B", "D", "Y" & "Z"	1-5/8 to 4	Note: For all coated nuts use the value for zinc coating in ASTM A 563	D	D	
	Grade DH (Hex and Heavy Hex) Note: See 4.9.2	"A", "B", "D", "Y" & "Z"	1-5/8 to 4		DH	DH	
	Note: For diameters 1-1/2 inches and smaller select nuts to J995 as listed below.						
	Atmospheric Corrosion Resisting Steel	The availability of these materials is limited, particularly above 1-1/2 inches and they may not be cost effective choices in low quantities.					
	Grade C3 (Heavy Hex)	None	1/4 to 4	See A 563	3 circumferential marks 120° apart and the numeral 3	C3	
	Grade DH3 (Hex)	None	1/2 to 1		HX3	DH3	
Grade DH3 (Heavy Hex)	None	1/4 to 4	DH3		DH3		
ASTM A 563 provides a nut/bolt suitability guide for inch steel fasteners							
F467	Nonferrous Hex Nuts						
	Brass Alloy Cu 462 (See 4.7.1)	None	1/4 to 1-1/2	50	F467C	C	
	Brass Alloy Cu 464 (See 4.7.1)	None	1/4 to 1-1/2	50	F467D	D	
	Nickel-Copper Alloy 405 (See 4.7.3)	None	1/4 to 1-1/2	70	F467V	V	
	Nickel-Copper Alloy 400 (See 4.7.3)			80	F467U	U	
	Nickel-Copper Alloy 400/405 (See 4.7.3)			See above	As Applicable	VU	
	Nickel-Copper-Al, QQ-N-286	None	1/4 to 1-1/2	130	F467WX	WX	
	Nickel-Copper-Aluminum, Alloy 500 (See 3.8)				F467W	W	
	Ni Alloy 686 Gr 1 (UNS N06686) ¹	None	1/4 and >	85	F467BN	BN	
	Silicon Bronze, Cu 651 (See 4.7.2)	None	1/4 to 1-1/2	70	F467K	K	
	Silicon Bronze, Cu 655 (See 4.7.2)	None	1/4 to 1-1/2	50	F467L	L	
	Titanium 5-1-1-1 (UNS R55111)	(See 3.4.1.3)	1/4 to 1-1/2	105	F467HT	HT	
	Titanium 19 (Ti-38-6-44) (See 4.3)	(See 3.4.1.3)	1/4 to 1-1/2	120	F467FT	FT	

**TABLE 2—INCH DIMENSIONED NUT MARKINGS AND
PIN IDENTIFIERS FOR SELECTED MATERIALS (CONTINUED)**

Product Standard Figure 2 Field 1*	Alloy Groups And Dimensional Standards (ASME B18.2.2 unless otherwise indicated)	Coatings Recommended	Permitted Size Range (inches)	Proof Stress (ksi) (min.) ²	Mechanical Property Marking	Material PIN Suffix Figure 1 Field 8
F594	Stainless Steel Nuts					
	Gp 1 – Alloys 304, 305, 384, XM7	Passivate				
	Cold Worked 1	(See 3.4.1.2 and 3.4.7)	¼ to 5/8	100	F594C	C
	Cold Worked 2		¾ to 1-1/2	85	F594D	D
	Strain Hardened 1		¼ to 5/8	120	F594A	A-SH
	Strain Hardened 2		¾ to 1	110	F594B	B-SH
	Strain Hardened 3		1-1/8 to 1-1/4	100	F594C	C-SH
Strain Hardened 4	1-3/8 to 1-1/2		85	F594D	D-SH	
F594	Group 2 – Alloy 316, 316L	Passivate (See 3.4.1.2 & 3.4.7)				
	Cold Worked 1	Passivate (See 3.4.1.2 & 3.4.7)	¼ to 5/8	100	F594G	G
	Cold Worked 2		¾ to 1-1/2	85	F594H	H
	Strain Hardened 1		¼ to 5/8	120	F594E	E-SH
	Strain Hardened 2		¾ to 1	110	F594F	F-SH
	Strain Hardened 3		1-1/8 to 1-1/4	100	F594G	G-SH
	Strain Hardened 4		1-3/8 to 1-1/2	85	F594H	H-SH
	Group 7 – Alloy 630 (Cond. AH)		¼ to 1-1/2	135	F594U	U
J995	Steel Nuts					
	Grade 5 – Hex Nuts, Hex Jam Nuts, Heavy Hex Nuts, Hex Slotted Nuts, Heavy Hex Slotted Nuts	"A", "B", "D", "Y" & "Z"	1/4 to 1-1/2	See J995	2 circumferential lines 120 degrees apart	G5
	Grade 8 – Hex Nuts, Hex Jam Nuts, Heavy Hex Nuts, Hex Slotted Nuts, Heavy Hex Slotted Nuts	"A", "B", "D", "Y" & "Z"	1/4 to 1-1/2	See J995	2 circumferential lines 60 degrees apart	G8

Notes: ¹ See 4.7.4

² Proof Stress values are for informational use only in selecting fasteners and the detailed requirements in the referenced fastener standards apply.

3.3 Dimensional Requirements for Fasteners

The dimensional requirements for a particular fastener are based on the applicable ASME configuration as identified in the particular fastener standard. Tables 1 and 2 identify the recommended configuration and the applicable ASME dimensional standard. However, if the dimensional standard contains other configurations not especially recommended the part identification numbering system may allow identification and ordering of these parts. The reasons for the recommended configurations are:

- a. When both hex head cap screws and hex head bolts can be procured to an applicable standard, the hex head cap screws are preferred since they are suitable for use as both bolts and screws and are often more readily available.
- b. Heavy hex configurations have been chosen for the higher strength fasteners and in most cases this is in accordance with the recommendations of the product standards.
- c. Certain configurations are not listed as recommended configurations because there are other industry standards with part identifying numbers that are preferred. For example, socket head cap screws are not listed for ASTM A 453 since socket head cap screws of similar material are more widely available to National Aerospace Standards NAS 1351 and NAS 1352 as are cadmium plated alloy steel socket head cap screws. Stud configurations are not listed since SAE J2271 covers them.
- d. To achieve standardization and minimize logistic support requirements.

3.3.1 LENGTHS OF FASTENERS

Lengths shall be restricted to those lengths identified in the applicable dimensional standards. When guidance is not provided in the dimensional standard, the length shall be limited to the increments in Table 3:

TABLE 3— INCREMENTS

Units	Screw Length	Length Increments
Inch	0.375 to 1.5 in	0.125 in
	1.75 to 5.0 in	0.250 in
	5.50 and longer	0.500 in

3.3.2 DIAMETERS OF FASTENERS

Diameters shall be restricted to those identified in the applicable dimensional standards. For new design, diameters should be restricted to the following sizes when possible:

Inch—1/8, 3/16, 1/4, 5/16, 3/8, 1/2, 5/8, 3/4, 7/8, 1, 1-1/8, 1-1/4, 1-3/8, 1-1/2, 1-3/4, 2

NOTE—See SAE J2484 and J2485 for diameters less than 1/4 inch except for socket head products per ASME B18.3.

3.3.3 THREAD TYPES AND FITS

See SAE J2280 for guidance on thread selection. For fit, class 2A (inch series) is recommended for externally threaded fasteners and class 2B (inch series) is recommended for internally threaded fasteners. Plated or coated external threads shall be accepted using 3A GO (high limits) and 2A NOGO (low limits). Uncoated, plated and coated internal threads shall be accepted using 2B limits.

3.4 Coating Requirements

Coatings should be limited to those recommended for the applicable material standards in Tables 1 and 2. The requirements for the applicable coatings are as follows:

3.4.1 REQUIRED TREATMENTS/COATINGS FOR ALUMINUM, STAINLESS STEEL AND TITANIUM FASTENERS

The following treatments are required for all fasteners of the indicated material and is not identified in the part identification number since the treatment is mandatory.

3.4.1.1 Aluminum

All aluminum fasteners shall be anodized in accordance with ASTM B 580.

3.4.1.2 Stainless Steel

All corrosion-resistant steel fasteners shall be passivated in accordance with ASTM A 380. Additional coatings are not necessary for protection of corrosion resistant steel fasteners but solid dry film lubricants (see 3.4.7) may be added for lubricity.

3.4.1.3 Titanium

Fasteners of titanium alloy shall be anodized in accordance with SAE AMS 2487 or AMS 2488 Type 2 (except testing requirements may be negotiated between manufacturer and coating supplier). Additional coatings are not necessary for protection of titanium fasteners but solid dry film lubricants (see 3.4.7) may be added for lubricity.

3.4.2 ALUMINUM COATINGS

Aluminum coatings shall have a conversion or other top coat and shall be subjected to a 400 hour salt spray test and meet the coating requirements of ASTM F 1137 except for appearance.

3.4.3 BLACK OXIDE COATINGS

Black oxide coatings shall be in accordance with SAE AMS 2485.

3.4.4 ELECTRODEPOSITED COATINGS

Zinc electro-deposited coatings shall be in accordance with ASTM F 1941 for inch dimensioned screws as identified herein. The minimum coating thickness shall be one-sixth the pitch diameter allowance as identified in the applicable coating document or ASME B1.1. Low coating thickness impairs chromate adhesion and performance and use of coated screws is not recommended when the coating thickness will be less than 0.00015 inches for inch series screws. Coating thickness is applicable to significant surfaces only as defined and measured in accordance with ASTM F 1941. Unless designated by the purchaser, any of the chromate finishes identified in the referenced ASTM documents may be supplied. Designation A (Clear) for inch screws is recommended.

3.4.5 PHOSPHATE COATINGS

Manganese Phosphate coatings should not be exposed to temperature in excess of 121°C (250°F). Zinc Phosphate coatings should not be used if contact with alkaline materials or exposure to temperatures above 93°C (200°F) is expected. A supplementary coating shall be provided for improved corrosion resistance and shall be selected from one of the applicable coatings below:

K = Manganese Phosphate with chemically converted supplemental treatment in accordance with MIL-DTL-16232, Type M, Class 2

P = Zinc Phosphate Coating with supplementary zinc rich epoxy resin coating. (Coating shall be in accordance with ASTM F 1137 Grade II or Grade III and shall meet 240 hour salt spray test.)

3.4.6 SILVER PLATING

Silver Plating shall be in accordance with SAE AMS 2412.

3.4.7 SOLID DRY FILM COATINGS

Dry or solid film lubricants are used on fasteners to prevent corrosion and to reduce installation friction. These coatings are particularly recommended for use on titanium and corrosion resisting steel fasteners to reduce friction and galling. Solid or dry film lubricants shall be in accordance with SAE AS1701 Class I except that the dry film lubricant for heat and corrosion resistant screws shall be of a class rated for 399 °C (750 °F) or higher. The dry film lubricants are generally suited for all fastener materials and may be used even if not listed in the tables.

3.4.8 ZINC/ALUMINUM OR CHROMIUM/ZINC INORGANIC COATINGS

These coatings shall meet the requirements of Grade 3 in accordance with ASTM F 1136 except that a pigmented topcoat is permitted. The basecoat shall have a minimum thickness of 5.5 μm. (If a particular pigmented topcoat color is required, see 4.6. for guidance.) With designator "Y", coatings with or without chromium may be furnished at manufacturer's option.

3.4.8.1 Zinc/Aluminum Inorganic Coating

When designator "X" is used, the coating shall not contain chromium.

3.5 Product Marking

All fasteners shall be marked in accordance with the applicable product standard. Applicable mechanical property markings are listed in Tables 1 and 2.

3.6 Quality Assurance

The ordering document must address quality assurance requirements. Many of the ASTM standards have supplementary requirements that apply only when specified by the purchaser in the contract or order. SAE J2280 Appendix A identifies additional test/inspection requirements that are to be applied when SAE J2280 Appendix A is contractually invoked, such as for most military procurements. If the ordering document does not address quality control requirements, the following inspections shall apply:

3.6.1 SURFACE DISCONTINUITIES

Non-destructive inspection for surface discontinuities shall be in accordance with the applicable product standards in Tables 1 and 2. See 4.12 for additional guidance .

3.6.2 DECARBURIZATION

Decarburization inspection of externally threaded and heat treated carbon or alloy steels shall be in accordance with SAE J121 Class B. Unless otherwise specified, only one sample per lot is required.

NOTE—If certification of in-process inspections is provided, the inspection of a finished fastener is not required.

3.6.3 DIMENSIONS

Dimensional inspections in accordance with the applicable ASME dimensional standard. Unless otherwise specified, samples shall be as specified in the ASME dimensional standard except that for lots of 5000 pieces or less, Sample Size A of ASTM F 1470 may be applied for dimensional inspection..

3.6.4 STRENGTH AND MATERIAL TESTS AND INSPECTIONS

These tests and inspections shall be in accordance with the applicable referenced fastener standard. For ASTM A 193/A 193M, A 194/A 194M and A 453/A 453M fasteners (see 4.9.3) and for fastener standards which do not define the number of test samples, the number of samples shall be per ASTM F 1470 unless the manufacturer utilizes a quality assurance process that provides equivalent or better assurance. An axial tensile test shall be performed when the product configuration, such as countersunk head cap screws, does not support wedge tensile tests as identified in the product standard. Unless specifically identified in the referenced fastener standard, the proof load for hex slotted nuts and heavy hex slotted nuts shall be 80 percent of the proof load for regular hex nuts and heavy hex nuts respectively. For jam nuts, where proof strengths are not identified in the referenced standard, the proof load stress shall be determined by multiplying the ratio of the minimum thickness of the jam nut to the minimum thickness of the regular hex nut or heavy hex nut, as applicable, times the proof load stress of the hex or heavy hex nut.

3.7 Locking Elements

Locate locking elements on external threads in accordance with NAS 1283. Performance and testing of locking elements shall meet the requirements in SAE J2270. Fasteners with self-locking elements shall be identified on the head by six raised or depressed dots, equally spaced in a circular pattern where possible.

3.8 Nickel-Copper-Aluminum Alloy Material Requirements

For improved material characteristics, only material in accordance with QQ-N-286 rather than ASTM F 468 Alloy 500 is now recommended.

3.8.1 MATERIAL CONDITION

If the manufacturing process consists of thread rolling, heading or other forming operations, the starting material shall be in the annealed condition. After all forming procedures have been completed, the fasteners shall be reannealed and age hardened per QQ-N-286. If the fastener manufacturing process consists solely of machining operations, the starting material may be in the final annealed and age hardened condition with no supplementary heat treatment required.

3.8.2 MATERIAL PROPERTIES

The finished fasteners shall have the following properties:

Material:	QQ-N-286, UNS – N05500
Tensile Strength:	130,000 - 180,000 psi (900 – 1240 MPa)
Yield Strength:	(0.250 – 0.875D) 90,000 psi (620 MPa) min. (1.000 – 1.500D) 85,000 psi (590 MPa) min.
Elongation	20% min in 4 Diameters (Test specimen)

3.9 SAE J429 Grade 8 Material Requirements

Medium carbon alloy steel must be used for SAE J429 Grade 8 fasteners.

3.10 Atmospheric Corrosion Resisting Steel

The applicable procurement specifications usually permit the manufacturer of a choice of material compositions. The availability of these materials is limited, particularly above 1-1/2 inches and they may not be cost effective choices in low quantities.

3.11 Supplementary Requirements for Socket Head Cap Screws

The following supplementary requirements apply to socket head cap screws:

- a. The hardness for alloy steel socket head cap screws designated as per ASTM A 574 shall have a maximum hardness of 43 HRC, a limit imposed for socket head cap screws by most military and NAS standards. Socket head cap screws per ASTM A 574 for nominal sizes $\frac{1}{4}$ (0.250) and larger shall be marked with "A574" and the manufacturer's or private label distributor's identification symbol. Both the top of the head and side of the head may be used for marking.
- b. For stainless steel socket head cap screws to ASTM F 837, the supplementary Alloy Condition Identification and Manufacturer Identification supplementary requirements of ASTM F 837 shall be applied for nominal sizes $\frac{1}{4}$ (0.250) and larger. For alloys 316 and 316L the alloy "316" shall be marked on nominal sizes $\frac{1}{4}$ (0.250) and larger.

4. Notes

This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.

4.1 Intended Use

This document establishes requirements and part or identifying numbers for selected materials from ASTM and SAE fastener standards. While this document was developed specifically for ship systems and equipment, its use is not restricted to these applications. Metric cap screws, hex bolts, and hex nuts originally in J2295 are now covered in the companion J2295M standard. The addition of other materials or configurations to this standard will be considered upon request.

4.2 Identification of Part Numbering System on Drawings

The optional J2295 prefix identifies the Part Identification Number as coming from SAE J2295. If the J2295 prefix is not used due to lack of space or computer limitations, the J2295 source must be identified in an alternate manner. On drawings where a column exists for identifying the manufacturer or his Commercial and Government Entity (CAGE) Code, indicate the CAGE Code "81343/J2295" or "SAE J2295" as required by the drawing standard. If no column exists or there is space only for the 5-digit CAGE Code, then a note must indicate that the part numbers are defined in SAE J2295. This is necessary since reference to the applicable ASTM or SAE fastener part standard will not explain the part identifying number.

4.3 Comparison of ASTM F 468 Titanium Materials

Alloy 32 (Ti-5-1-1-1) is a near alpha titanium alloy of intermediate strength with high toughness, good weldability, stress corrosion cracking resistance and room temperature creep resistance. It is well suited for marine environments where toughness and corrosion resistance are necessary. Titanium Alloy 23 (Ti-6Al-4V ELI) and Alloy 19 (Ti-38-6-44), have higher tensile and yield strengths than does Ti-5-1-1-1. The dynamic toughness (a measure of the load and plastic energy dissipation necessary for crack initiation and propagation) of Ti-5-1-1-1 alloy is nearly three times that of Ti-6Al-4V ELI and approximately an order of magnitude greater than Ti-38-6-44. Aerospace standards for some configurations of Ti-6Al-4V ELI fasteners are available and therefore fasteners of this material are not covered in this standard.

4.4 Magnetic Permeability

For certain applications, low magnetic permeability may be required. Most non-ferrous fasteners have a relative magnetic permeability in air of 2.0 maximum when determined in accordance with ASTM A 342 on the finished fastener. However Nickel-Copper Alloy 400 and 405 fasteners should not be used when a magnetic permeability of 2.0 maximum is required as the magnetic permeability changes significantly at a transition temperature that is within the temperature range of normal usage. For CRES fasteners, alloy 316/316L should be specified when low magnetic permeability is required. Unless extremely cold worked, the relative permeability should not exceed 2.0 maximum for alloy 316/316 alloy fasteners while similar CRES fasteners of other 300 series alloy may exceed this value.

Note—If compliance with magnetic permeability requirements is necessary, the fastener is then considered a special for which the permeability requirements must be identified in addition to the part number for the screw.

4.5 ASTM A 354, ASTM A 449 and SAE J429 Cap Screws and ASTM A 563 and J995 Nuts

Due to market availability, ASTM A 354BD and ASTM A 449 Type 1 hex head cap screws of diameters of 1-1/2 inches and less are no longer covered. Therefore, these cap screws shall be identified by SAE J429 (inch) part identification numbers. Similarly, steel nuts 1-1/2 inch diameter and smaller are no longer identified by ASTM A 563 part numbers except for hot dipped and mechanically deposited zinc coatings for which over-tapped threads are required. Instead steel nuts should be ordered with SAE J995 or ASTM A 194 materials.

4.6 Use of Zinc/Aluminum or Chromium/Zinc Coatings

If a pigmented topcoat of a particular color is desired it must be specified in the ordering documentation

4.7 Availability and Interchangeability of Copper Base Alloys

The availability of certain alloys should be considered since several of these alloys may not be readily available and may result in high costs for small lot procurements. In some cases similar materials may be available but with somewhat different strength properties. The parameters to be considered are briefly identified below with guidance as to possible interchangeability.

4.7.1 NAVAL BRASS ALLOYS 462 AND 464

Alloy 462 is usually not readily available and is generally produced only in coil form for use in cold heading operations. This material cold forms well and is the preferred material for large production runs. Alloy 464 is readily available in round and hex bar suitable for hot heading and machining. The minimum tensile strength is the same for both alloys but the minimum yield strength for Alloy 464 is lower than for Alloy 462. This could be a factor in the interchangeability in applications for externally threaded fasteners. For nuts, the proof load is the same for both materials and interchangeability should not be a problem.

4.7.2 SILICON BRONZE ALLOYS 651 AND 655

Like brass alloy 462, Silicon Bronze Alloy 651 is not readily available and should be selected for large production runs of cold-headed fasteners. Alloy 655 with lower strength characteristics is more readily available. The two alloys may not be interchangeable unless the application is based on the strength properties of Alloy 655.

4.7.3 NICKEL-COPPER ALLOYS 400 AND 405

Alloy 400 is readily available in bar and coil form and is the best option for cold or hot heading. Alloy 405 is readily available in round and hex bar and machines much easier than Alloy 400 due to increased sulfur content. In smaller diameters, Alloy 400 has a higher tensile and yield strength and should be used for externally threaded fasteners. For nuts, the difference in strength (proof load) is usually not a factor. A PIN suffix is available to allow either alloy 400 or 405 to be furnished. If this code is not used, substitution of one alloy for the other requires approval of the procuring activity.

4.7.4 NICKEL ALLOY (UNS N06686)

Additional grades of this material, including higher strengths, have been developed and may be covered in the future.

4.8 Selection Guidance

All configurations, materials and coatings are not available as stocked off-the-shelf items. Users are advised to check with distributors and manufacturers in regard to availability of particular items. Tables 1 and 2 list configurations recommended for use. Configurations not specifically listed in Tables 1 and 2, (such as jam nuts, slotted nuts, heavy hex, etc.) may be identified and ordered by part number. However, they are likely to be special order items. For example, non-ferrous materials are not normally furnished in the heavy hex configuration since the material strength is insufficient to justify the use of this more costly configuration. Similarly, slotted hex nuts are usually not stocked in non-ferrous materials.

4.8.1 HEX CAP SCREWS VS. HEX BOLTS

For many fastener product standards, externally threaded parts may be ordered as either hex bolts or hex head cap screws. The hex head cap screws have tighter tolerances and are suitable for more applications and can always be substituted for hex bolts. Hex bolts cannot be substituted for hex cap screws. Because of their versatility, many manufacturers are standardizing on the hex cap screws and they may be more readily available. Accordingly, this standard covers hex head cap screws when the product standard, such as ASTM A 307, appears to favor hex bolts.

4.8.2 HEX AND HEAVY HEX JAM NUTS

A jam nut is a hex nut having a reduced thickness used to provide resistance to loosening in combination with thicker nuts. This type installation is considered unreliable because of errors in assembly and complex torque requirements and a self-locking nut is usually a better choice. However, a jam nut can be used where a thin nut is required or as a jam nut on a turnbuckle where it does not carry any of the tension load. Jam nuts are not readily available in some materials and may not be cost effective choice in these materials.

4.9 ASTM A 193, ASTM A 194 and ASTM A 453 Fastener Standards

Care must be exercised in using these standards as requirements may be subject to interpretation and quality assurance requirements need to be supplemented (see 4.9.3) to cover additional inspections. Accordingly, the following guidance and requirements are applicable for fasteners to be procured to these standards using the part identification numbers listed herein.

4.9.1 COATINGS/PLATINGS

These fasteners are all designated for high temperature service and generally should not be coated or plated unless the coating is suitable for the maximum temperature limit of the fastener. SAE J2280 provides information on the maximum temperature limits for fastener materials and coatings. Since installers may rely on fastener markings for suitability, the markings in these standards should not be used for materials with coatings and platings. (ASTM A 194/A 194M identifies special markings for coated nuts, See 4.9.2) Accordingly, this standard (J2295) does not permit coatings not suitable for the maximum temperature of the fastener material.