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INTERNATIONAL
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SURFACE VEHICLE STANDARD

SAE J2271

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Submitted for recognition as an American National Standard

SHIP SYSTEMS AND EQUIMENT—PART STANDARD FOR STUDS—CONTINOUS AND DOUBLE END (INCH SERIES)

Foreword—This Document has not changed other than to put it into the new SAE Technical Standards Board Format.

1. Scope

1.1 Purpose—This SAE Parts Standard provides dimensional and quality assurance requirements for 1/4 through 2 in sizes of studs in the following configurations in standard materials used for ship system applications:

a. Continuous thread studs in UNRC and 8UNR series.
b. Double end studs (clamping type) where both ends are of the same thread series (UNRC or 8UN). Also called bolt-studs. (These are suitable for mating with nuts or the set end may be installed with anaerobic thread locking compound.)
c. Double end studs (interference thread type) with the nut end having UNRC or 8UNR series thread and where the tap end has NC 5 HFS interference fit thread forms. Also called a tap end stud.

1.1.1 A complete metric companion to this document is provided in SAE J2271M, therefore no metric equivalents are presented.

1.2 Field of Application—These studs are primarily for use in ship systems and equipment. The continuous thread studs and the constant strength double end studs are configurations particularly suited to applications which are subject to high shock requirements.

1.3 Configurations and Part Identification Numbers—Figure 1 identifies the type and body configurations of the studs covered by the document. A part numbering system provides a unique part identification number for each stud. The part identification number identifies thread type, diameter, type of stud, body diameter, length of the stud, and material (including coating, where applicable).

2. References

2.1 Applicable Publications—The following publications form a part of this publication to the extent specified herein. Unless otherwise specified, the latest issue of all publications shall apply.

NOTE—Contracts invoking this document may establish an effectivity date for referenced documents.

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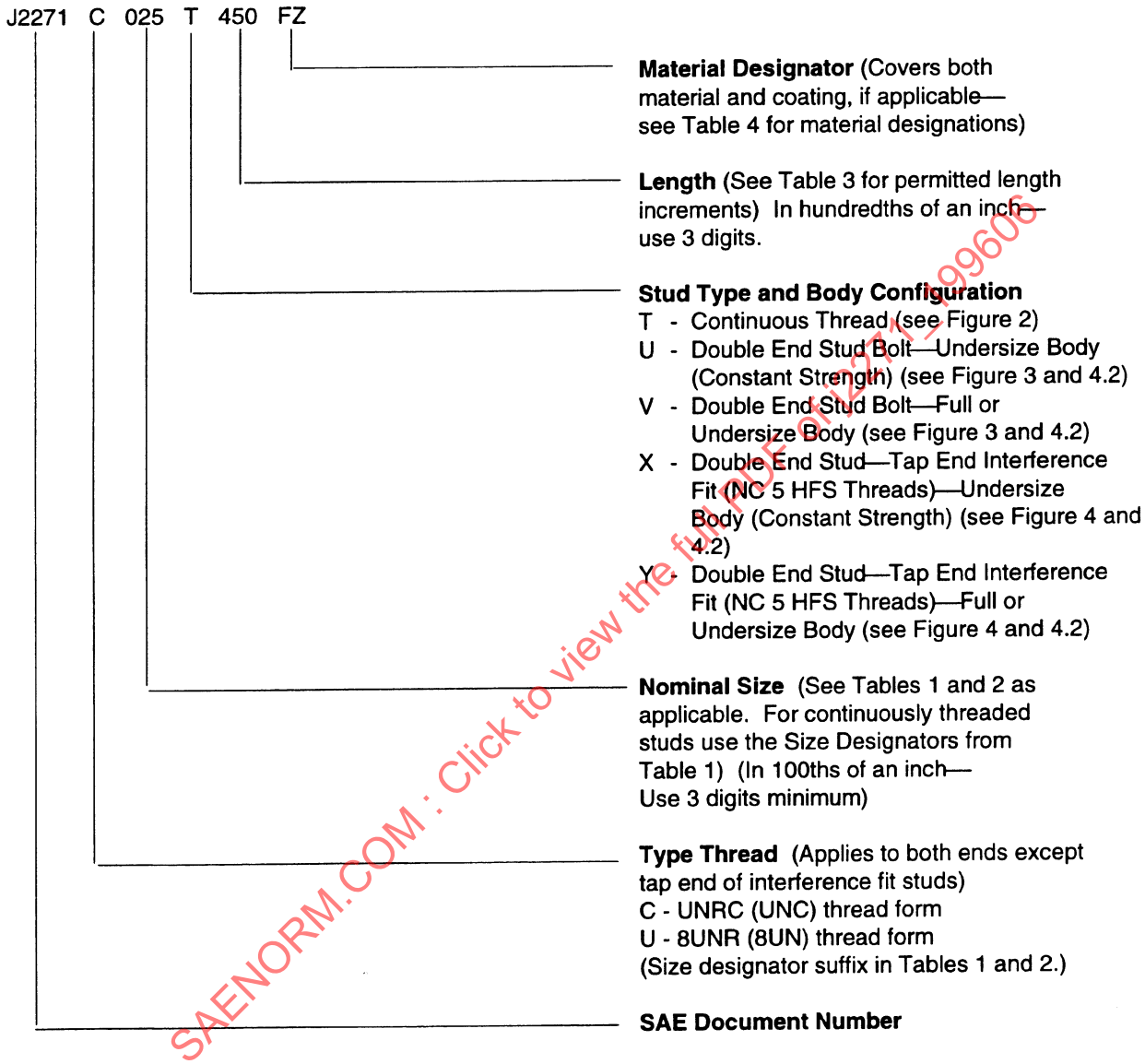
PART NUMBERING SYSTEM:

Part Number for Studs



The part number example shown above is for a continuously threaded stud with 1/4 –20 UNC threads with a length of 4-1/2 in manufactured of ASTM A 449 medium carbon steel and zinc plated.

FIGURE 1—PART IDENTIFICATION NUMBERS (PIN'S) FOR CONTINUOUS AND DOUBLE END STUDS (INCH SERIES)

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE AMS 2487—Anodic Treatment of Titanium and Titanium Alloys
SAE AS1701—Lubricant, Solid Dry Film
SAE J121—Decarburization in Hardened and Tempered Fasteners, Recommended Practice
SAE J123—Surface Discontinuities of Bolts, Screws, and Studs in Fatigue Applications
SAE J2270—Ship Systems and Equipment-Threaded Fasteners—Inspection, Test, and Installation Requirements
SAE J2271M—Ship Systems and Equipment—Part Standard For Studs—Continuous and Double End (Metric)
SAE J2280—Ship Systems and Equipment—Fasteners—Selection and Identification Requirements

2.1.2 ASME PUBLICATIONS—Available from ASME, 345 East 47th Street, New York, NY 10017-2392.

ASME B1.1—Unified Inch Screw Threads (UN and UNR Thread Forms)
ASME B1.3M—Screw Thread Gaging Systems for Dimensional Acceptability—Inch and Metric Screw Threads (UN, UNJ, M and MJ)
ASME B1.12—Class 5 Interference-Fit Thread
ASME B18.18.3M—Inspection and Quality Assurance For Special Purpose Fasteners

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

ASTM A 193/A 193M—Steel Bolting Materials for High-Temperature Service
ASTM A 307—Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 354—Quenched and Tempered Alloy Steel Bolts, Studs and Other Externally Threaded Fasteners
ASTM A 449—Quenched and Tempered Steel Bolts and Studs
ASTM B 633—Electrodeposited Coatings of Zinc on Iron and Steel
ASTM B 695—Coatings of Zinc Mechanically Deposited on Iron and Steel
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 1470—Standard Guide for Fastener Sampling for Specified Mechanical Properties and Performance Inspection

2.1.4 U.S. GOVERNMENT PUBLICATIONS—Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

QQ-N-286—Nickel-Copper-Aluminum Alloy, Wrought
MIL-L-46010—Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting

3. Definitions

3.1 Body Bound Studs—Studs whose body is manufactured to specific close tolerances to ensure a tight or interference fit with the specific equipment being secured, and thus not covered by this document. Also identified as finished, close body studs.

3.2 Constant Strength Studs—A stud where the stress area is essentially unchanged throughout the length of the stud. This can be achieved by the use of continuous threads or by providing an undersize body which has a cross-sectional area approximately equivalent to the stress area of the threads.

3.3 Double End Studs—Double end studs have threads on each end, typically with an unthreaded body in between.

3.3.1 CLAMPING TYPE—Has conventional threads on both ends and serves the function of clamping two bodies together with a nut on either end.

3.3.2 INTERFERENCE THREAD TYPE—Has conventional threads on the nut end and threads on the tap end that will give an interference fit in the hole in which it is installed.

3.4 Full or Undersize Body Studs—This category covers a wide range of body diameters that may be furnished when the body diameter is not of particular concern (see 4.2).

3.5 Lot—A lot of fasteners shall consist of one heat of material, of one type and style, of the same nominal size and length, and fabricated and heat treated in the same batch or by a continuous process under the same conditions as to time and temperature.

3.6 Nut End—The end or end(s) of the stud to be mated with a nut. (In some cases, stud-bolts which are designed for nuts on each end may be installed with the nut end acting as a set end.)

3.7 Set End—The end of the stud which is not intended for use with a nut but is to be threaded into a piece of material or component. The set end is often secured with an anaerobic compound or by interference fit threads (see tap end).

3.8 Stud Bolt—A headless fastener threaded with the same form and fit of thread on both ends or continuously threaded throughout its length. Generally used with a nut on each end.

3.9 Tap End—The end of the stud not intended for use with a nut. Particularly, an end with interference fit threads.

4. Technical Requirements

4.1 Configurations

4.1.1 CONTINUOUS THREAD STUDS—The studs are continuously threaded over the entire length with a single thread configuration as shown in Figure 2.

4.1.2 DOUBLE END STUD BOLTS AND STUDS

4.1.2.1 Double End Stud Bolts—This document defines two types:

a. Type U—Double End Stud Bolt with Constant Strength Body (see Figure 3)
b. Type V—Double End Stud Bolt with Full or Undersize Body (see Figure 3)

4.1.2.2 Double End Studs—This document defines two types:

a. Type X—Double End Stud with Constant Strength Body (see Figure 4)
b. Type Y—Double End Stud with Full or Undersize Body (see Figure 4)

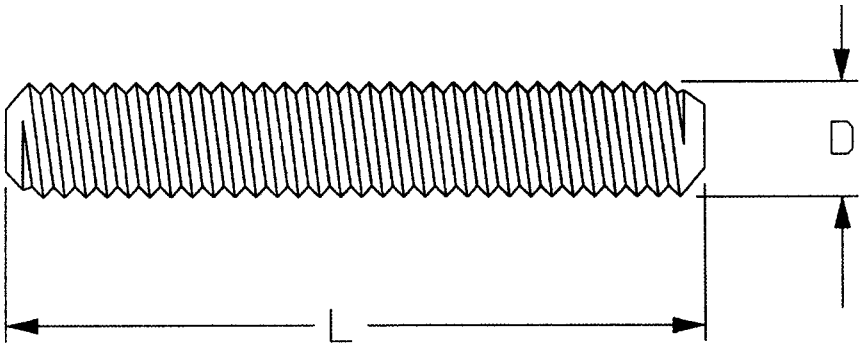


FIGURE 2—CONTINUOUS THREAD STUDS

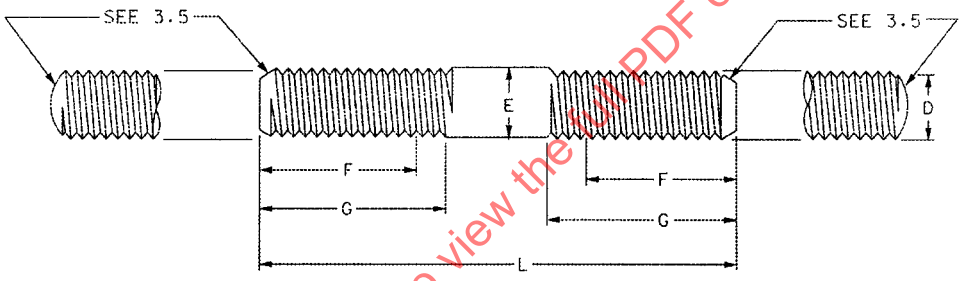


FIGURE 3—DOUBLE END STUD BOLTS—CLAMPING TYPE
(REFER TO TABLE 1 FOR DIMENSIONS)

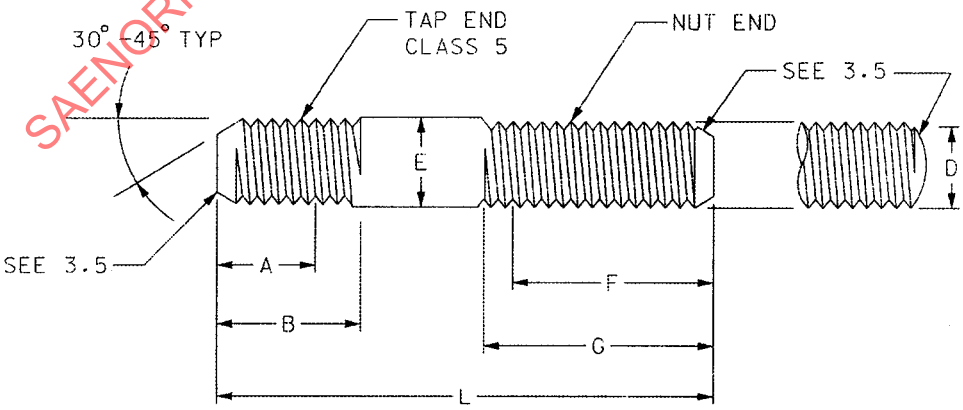


FIGURE 4—DOUBLE END STUDS—INTERFERENCE FIT TAP END
(REFER TO TABLE 2 FOR DIMENSIONS)

4.2 Body Diameter Tolerances—This document covers the following body diameter tolerances.

4.2.1 CONSTANT STRENGTH (UNDERSIZE BODY)—The body diameter dimension (E in Figures 3 and 4 and Tables 1 and 2) is based on blank diameters before thread rolling with a generous tolerance.

4.2.2 FINISHED, FULL, OR UNDERSIZE BODY—The maximum body diameter shall not exceed the basic major diameter of the thread, the minimum diameter shall not be less than the minimum diameter specified for the constant strength stud. (This permits use of studs with body diameters ranging from those of constant strength studs up to those of full body studs with a maximum diameter as defined above.)

4.3 Threads—Threads, when rolled, shall be Unified inch coarse or 8 thread series (UNRC, or 8UNR series), Class 2A in accordance with ASME B1.1. Threads produced by other methods shall preferably be UNRC or 8UNR but may be Unified inch coarse or 8 thread series (UNC or 8UN series), Class 2A. Interference fit threads shall be NC 5 HFS in accordance with ASME B1.12.

4.3.1 THREADS FOR CONTINUOUSLY THREADED STUDS—For diameters 1 in and smaller, threads shall be Unified inch coarse (UNC) Class 2A. For diameters larger than 1 in, threads shall be Unified inch coarse or 8 thread series (UNC or 8UN), the same as identified in Table 1 for double end studs. Threads shall be in accordance with ASME B 1.1.

4.3.2 THREADS FOR DOUBLE END—BOLT STUDS—(BODY TYPES U AND V)—Both ends have the same thread form, either UNC or 8UN as designated by the part number. (See Tables 1 and 2 for selection.) For diameters 1 in and smaller, threads shall be Unified inch coarse (UNC) Class 2A. For diameters larger than 1 in, threads shall be Unified inch coarse or 8 thread series (UNC or 8UN) as identified in Tables 1 and 2. Threads shall be in accordance with ASME B 1.1.

TABLE 1—DIMENSIONS OF DOUBLE END (CLAMPING TYPE) STUDS (1/4 TO 2 IN DIAMETER)

Desig-nator Thread Form & Size	Nominal Thread Form Nut End Thread D	Body Diameter For Constant Strength Studs (For other studs see Figure 1 and 4.2) Max E	Body Diameter For Constant Strength Studs (For other studs see Figure 1 and 4.2) Min F	Nut End(s) Thread Length For Short Studs Stud Length Min L	Nut End(s) Thread Length For Short Studs Full Thread Min F	Nut End(s) Thread Length For Short Studs Total Thread Max G	Nut End(s) Thread Length For Longer Studs Stud Length Min L	Nut End(s) Thread Length For Longer Studs Full Thread Min F	Nut End(s) Thread Length For Longer Studs Total Thread Max G
C025	1/4 -20 UNC	0.220	0.212	1.75	0.750	0.875	6.25	1.000	1.125
C031	5/16-18 UNC	0.278	0.271	2.00	0.875	1.031	6.25	1.125	1.281
C038	3/8 -16 UNC	0.336	0.328	2.25	1.00	1.188	6.25	1.250	1.438
C044	7/16-14 UNC	0.393	0.385	2.50	1.125	1.344	6.25	1.375	1.594
C050	1/2 -13 UNC	0.452	0.443	2.75	1.250	1.500	6.25	1.500	1.750
C056	9/16-12 UNC	0.510	0.501	3.00	1.375	1.656	6.25	1.625	1.906
C063	5/8 -11 INC	0.568	0.558	3.50	1.500	1.812	6.25	1.750	2.063
C075	3/4 -10 UNC	0.687	0.677	4.00	1.750	2.125	6.25	2.000	2.375
C088	7/8 - 9 UNC	0.804	0.794	4.50	2.000	2.438	6.25	2.250	2.688
C100	1 - 8 UNC	0.920	0.910	5.00	2.250	2.750	6.25	2.500	3.00
C113	1-1/8 - 7 UNC	1.034	1.022	5.50	2.500	3.062	6.25	2.750	3.312
U113	1-1/8 - 8 UN	1.046	1.034	5.50	2.500	3.062	6.25	2.750	3.312
C125	1-1/4 - 7 UNC	1.159	1.147	6.00	2.750	3.375	6.50	3.00	3.625
U125	1-1/4 - 8 UN	1.171	1.159	6.00	2.750	3.375	6.50	3.000	3.625
C138	1-3/8 - 6 UNC	1.269	1.256	6.50	3.000	3.688	7.00	3.250	3.928
U138	1-3/8 - 8 UN	1.296	1.284	6.50	3.000	3.688	7.00	3.250	3.928
C150	1-1/2 - 6 UNC	1.394	1.381	7.00	3.250	4.000	7.50	3.500	4.250
U150	1-1/2 - 8 UN	1.421	1.409	7.00	3.250	4.000	7.50	3.500	4.250
U163	1-5/8 - 8 UN	1.546	1.533	7.50	3.500	4.250	8.50	3.750	4.500
U175	1-3/4 - 8 UN	1.672	1.658	7.50	3.500	4.250	9.00	4.000	4.500
U188	1-7/8 - 8 UN	1.797	1.782	8.00	3.750	4.500	10.00	4.250	5.000
U200	2 - 8 UN	1.922	1.906	8.00	3.750	4.500	10.00	4.500	5.000
		See Notes (1), (2)	See Notes (1), (2)	See Note (3)	See Note (3)	See Note (4)	See Notes (5), (6)	See Notes (5), (6)	See Notes (5), (6)	See Notes (5), (6)	See Notes (5), (6)

1. The number listed is the thread form, “C” for UNC(R) Coarse Threads or “U” for 8UN(R) Threads plus the diameter in hundredths of an inch. (See 1.3 and Figure 1 for complete part number.)
2. Size numbers C044 and C056 are not for new design.
3. It is intended that the body diameter (E) be essentially the same diameter as the blank before thread rolling. The same dimensions also apply for cut threads.
   CAUTION—Control of the body diameter to closer dimensions than those shown will normally be required in order to meet thread rolling requirements and the dimensions may vary with the stud material.
4. Studs shorter than the minimum allowed length will not meet the minimum thread length. If shorter studs are required, use continuously threaded studs. Thread lengths for short studs shall not be used for stud lengths which meet the minimum length for longer studs.
5. The minimum full thread length is defined in 4.8.1. Imperfect threads shall not extend more than 2-1/2 threads beyond the full threads. Imperfect threads for the two ends may overlap.
6. See 4.5 for finish of the ends of the stud.

TABLE 2—DIMENSIONS OF DOUBLE END—INTERFERENCE FIT TAP END STUDS (1/4 TO 2 IN DIAMETER)

Desig-nator Thread Form & Size	Nominal Thread Form Nut End Thread D	Tap End NC 5 HFS Threads Thread Length Min A	Tap End NC 5 HFS Threads Thread Length Max B	Body Diameter For Constant Strength Studs (For other studs see Figure 1 and 4.2) Max E	Body Diameter For Constant Strength Studs (For other studs see Figure 1 and 4.2) Min E	Nut End Thread Length For Short Studs Stud Length Min L	Nut End Thread Length For Short Studs Full Thread Min F	Nut End Thread Length For Short Studs Total Thread Max G	Nut End Thread Length For Longer Studs Stud Length Min L	Nut End Thread Length For Longer Studs Full Thread Min F	Nut End Thread Length For Longer Studs Total Thread Max G
C025	1/4 -20UNC	0.375	0.500	0.220	0.212	0.750	0.875	1.25	6.25	1.000	1.125
C031	5/16-18UNC	0.469	0.625	0.278	0.271	0.875	1.031	1.50	6.25	1.125	1.281
C038	3/8 -16UNC	0.562	0.750	0.336	0.328	1.000	1.188	1.75	6.25	1.250	1.438
C044	7/16-14UNC	0.656	0.875	0.393	0.385	1.125	1.344	2.00	6.25	1.375	1.594
C050	1/2 -13UNC	0.750	1.000	0.452	0.443	1.250	1.500	2.25	6.25	1.500	1.750
C056	9/16-12UNC	0.843	1.125	0.510	0.501	1.375	1.656	2.50	6.25	1.625	1.906
C063	5/8 -11UNC	0.937	1.250	0.568	0.558	1.500	1.812	2.75	6.25	1.750	2.062
C075	3/4 -10UNC	1.125	1.500	0.687	0.677	1.750	2.125	3.25	6.25	2.000	2.375
C088	7/8 - 9UNC	1.312	1.750	0.804	0.794	2.000	2.438	3.75	6.25	2.250	2.688
C100	1 - 8UNC	1.500	2.000	0.920	0.910	2.250	2.750	4.25	6.25	2.500	3.000
C113	1-1/8 - 7UNC	1.687	2.250	1.034	1.022	2.500	3.062	4.75	6.25	2.750	3.312
U113	1-1/8 - 8UN	1.687	2.250	1.046	1.034	2.500	2.750	4.75	6.25	2.750	3.312
C125	1-1/4 - 7UNC	1.875	2.500	1.159	1.147	4.25	1.875	2.500	6.50	3.000	3.625
U125	1-1/4 - 8UN	1.875	2.500	1.171	1.159	4.25	1.875	2.500	6.50	3.000	3.625
C138	1-3/8 - 6UNC	2.062	2.750	1.269	1.256	5.00	2.062	2.750	6.50	3.250	3.938
U138	1-3/8 - 8UN	2.062	2.750	1.296	1.284	4.50	2.062	2.750	6.50	3.250	3.938
C150	1-1/2 - 6UNC	2.250	3.000	1.394	1.381	5.00	2.250	3.000	6.50	3.500	4.250
U150	1-1/2 - 8UN	2.250	3.000	1.421	1.409	5.00	2.250	3.000	6.50	3.500	4.250
U163	1-5/8 - 8UN	2.438	3.250	1.546	1.533	5.50	2.438	3.250	6.50	3.750	4.500
U175	1-3/4 - 8UN	2.625	3.500	1.672	1.658	6.00	2.625	3.500	7.00	4.000	5.000
U188	1-7/8 - 8UN	2.813	3.750	1.797	1.782	6.50	3.00	3.750	7.50	4.250	5.250
U200	2 - 8UN	3.000	4.000	1.922	1.906	6.50	3.00	4.000	8.00	4.500	5.500
		See Notes (1), (2)	See Notes (1), (2)	See Notes (3),(4)	See Notes (3), (4)	See Note (5)	See Note (5)	See Note (6)	See Notes (3), (4)	See Notes (3), (4)	See Notes (3), (4)	See Notes (3), (4)	See Notes (3), (4)

1. The number listed is the thread form, “C” for UNC(R) Coarse Threads or “U” for 8UN(R) Threads plus the diameter in hundredths of an inch. (See Figure 1 for complete part number.)
2. Size numbers C044 and C056 are not for new design.
3. The minimum thread length is the minimum full thread length. (See 4.8.1) Imperfect threads shall not extend more than 2-1/2 threads beyond the full threads. Incomplete threads from the two ends may overlap.
4. See 4.5 for finish of the ends of the stud.
5. It is intended that the body diameter (E) be essentially the same diameter as the blank before thread rolling. The same dimensions also apply for cut threads.
   CAUTION—Control of the body diameter to closer dimensions than those shown will normally be required in order to meet thread rolling requirements and the dimensions may vary with the stud material.
6. Studs shorter than the minimum allowed length will not meet the minimum thread length. Thread lengths for short studs shall not be used for stud lengths which meet the minimum length for longer studs.

4.3.3 THREADS FOR DOUBLE END STUDS—INTERFERENCE FIT TAP END (BODY TYPES X AND Y)

4.3.3.1 Nut End—Threads shall be the same as identified in Tables 1 and 2.

4.3.3.2 Tap End—Threads shall be Class 5 interference fit threads, NC 5 HFS, in accordance with Appendix C of ASME B1.12.

4.4 Length—The length of the stud, measured parallel to the axis, is the distance from extreme end to extreme end. Lengths shall be whole inches and the intermediate increments tabulated in Table 3. The tolerances on length shall be as tabulated in Table 3.

4.5 Finish of Stud Ends (Points)—Ends shall be chamfered or rounded at the manufacturer's option from approximately 0.016 in below the minor diameter of the thread. The length of the point end shall be the distance from the end of the stud to the last trace of thread and shall be equal to 1/2 to 1-1/2 threads.

4.6 Material—Materials shall be selected from one of those listed in Table 4 and shall be designated in the part identifying number (see 4.9) with the letter designation from Table 4. Material shall be in accordance with the applicable standard current at the time of ordering.

4.6.1 SPECIAL REQUIREMENTS FOR NICKEL-COPPER-ALUMINUM MATERIAL—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.

4.6.2 PASSIVATION—All corrosion resistant steel fasteners shall be passivated in accordance with the applicable material standard.

4.7 Identification Marking—Marking shall be in accordance with the applicable product marking requirements of the applicable material standard as identified in Table 4 except marking of QQ-N-286 material shall be in accordance with 4.7.2. In addition, for studs with interference fit studs, the tap end shall be marked “NC 5 HFS” or “5 HFS” to identify the interference fit threads.

4.7.1 MARKING LOCATION—The material symbol, manufacturer's symbol, and lot number (if required) shall be marked on each stud. The marking shall be applied to one or both nut ends of Double End Studs (Clamping type) and Continuous Thread Studs. If all of the marking cannot be applied due to space limitations, the marking shall be applied using the following order of precedence: material symbol, manufacturer's symbol, and lot number.

4.7.2 MATERIAL MARKING SYMBOL FOR QQ-N-286 MATERIAL—The following identification symbol shall be used: •K•

4.8 Thread Length—Continuously threaded studs shall be threaded the full length with ends finished per 4.5. The length of threads for double ended studs shall be in accordance with Tables 1 and 2 as applicable with ends finished per 4.5.

TABLE 3—LENGTH INCREMENTS AND LENGTH TOLERANCES

Nominal Stud Diameter (inches)	For Lengths 6 in and Shorter Length Increments	For Lengths 6 in and Shorter Tolerance on Length (inches)	For Lengths Over 6 in Length Increments	For Lengths Over 6 in Tolerance on Length (inches)
1/4 to 1/2	1/4 in	±0.03	1/2 in	±0.06
9/16 to 1-1/4	1/4 in	±0.06	1/2 in	±0.10
Over 1-1/4	1/2 in	±0.10	1/2 in	±0.125

TABLE 4—MATERIALS

PIN Material Designator	Material Standard	Grade or Alloy & (Marking)	Strength (min ksi) Tensile	Strength (min ksi) Yield	Type Material and Coating (When Applicable)
A	ASTM A 193/ A 193M	B16 (B16)	125	105	Chrome-molybdenum-vanadium steel for high temperature
B	ASTM A 193/ A 193M	B7 (B7)	125	105	Chrome-molybdenum steel for high temperature
C	ASTM F 593	Alloy 316 Cold Worked (F593G) (F593H)	100-150 85-140	65 < 3/4 in 45 3/4 in and >	AISI Type 316 Stainless Steel (Passivated)
D	ASTM A 354	BD (6 radial lines 60 degrees apart)	150	130	Alloy steel, Uncoated
E	ASTM A 307	Grade B (307B)	60	—	Carbon steel, Uncoated
F	ASTM A 449 1/4 - 1 in 1-1/8 - 1-1/2 1-5/8 - 2	Type 1 (3 radial lines 120 degrees apart)	 120 105 92	 92 81 58	Medium carbon steel
FZ(1)	Same as F above	Same as F above			Medium carbon steel, zinc coated.(2)
K	QQ-N-286	(See 4.7.2 for marking)	130 130	90, < 1 in 85, 1 in and >	Nickel-copper-aluminum alloy
N	ASTM F 468	400 (F468U)	80 70	40, < 0.875 in 30, 0.875 and >	Nickel-copper alloy
T	ASTM F 468	Ti Alloy 19 (F468FT)	120	115	Titanium alloy, anodized with dry film lubricant.(3)

1. Zinc coating is not permitted on studs with interference fits. See 4.10 for zinc coating requirements.
2. Plate per ASTM B 633 or ASTM B 695 to a minimum thickness of 1/6 the allowance of ASME B1.1. After plating, fastener shall not exceed Class 3A maximum size thread requirements.
3. Anodize in accordance with SAE AMS 2487 (except testing requirements may be negotiated between manufacturer and coating supplier) and apply molybdenum disulfide dry film lubricant in accordance with SAE AS 1701, Class I or MIL-L-46010.

4.8.1 FULL THREAD LENGTH—The full thread length, F, in Figures 3 and 4 and Tables 1 and 2, is the distance, measured parallel to the axis of the stud, from extreme end of the stud to the opposite face of a thread ring gage, having the chamfer and/or counterbore removed, which has been assembled by hand as far as the thread will permit.

4.8.2 TOTAL THREAD LENGTH—The total thread length is the distance, measured parallel to the axis of the stud, from the extreme end of the stud to the last scratch on cut threads or to the top of the extrusion angle on rolled threads.

4.9 Part Identification Number—To avoid possible misunderstandings when specifying these studs and to comply with Department of Defense requirements for part identification, studs shall be identified with a part identification number. Part identification numbers shall be limited to those permitted by Figure 1 applying the requirements of this document.

4.10 Zinc Coatings—Interference fit studs, types X and Y per Figure 1 as shown in Table 2 are not to be zinc plated. Zinc coatings for ASTM A 449 material shall be per ASTM B 633 or ASTM B 695 to a thickness of 1/6 the allowance of ASME B1.1. After plating, fastener shall not exceed Class 3A maximum size requirements.

5. Quality Assurance Requirements

5.1 General Requirements

5.1.1 Inspection and testing for mechanical properties, physical properties, dimensions, and other quality requirements shall be as specified in the applicable material specifications. Unless otherwise specified, the supplier shall provide certification documenting the performance of all mandatory tests and inspections. Where the applicable material specification is silent regarding the number of samples to be tested, sampling shall be in accordance with ASTM F 1470.

5.1.2 Inspection and sampling for dimensions and thread fit shall be in accordance with ASME B18.18.3M. Acceptability of screw threads shall be determined based on System 21 or System 22 of ASME B1.3M, at manufacturer's option. System 21 shall be the referee method in case of dispute.

5.2 Dimensional and Nondestructive Inspections—Each lot shall be subject to an inspection in accordance with ASME B18.18.3M in which the following nondestructive characteristics are inspected when applicable:

a. Body Diameter
b. Length
c. Point diameter/dimensions
d. Thread acceptability
e. Thread length
f. Visual Inspection (including marking)
g. Surface discontinuity inspection in accordance with SAE J123

5.2.1 Should a nondesignated dimension be determined to have a variance, it shall be deemed conforming to this document if the user, who is the installer, accepts the variance based on fit, form, and function.

5.3 Tests for Mechanical and Physical Requirements—As a minimum each lot of studs shall be subjected to the following tests when test procedures and acceptance criteria are identified in the applicable material specification:

a. Proof load
b. Tensile strength (axial or wedge, at manufacturer's option)
c. Hardness
d. Hydrogen embrittlement