



SURFACE VEHICLE STANDARD

J2270™**JUN2016**

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Superseding J2270 JUN2003

(R) Ship Systems and Equipment - Threaded Fasteners -
Inspection, Test, and Installation Guidance

RATIONALE

This document has not been revised since 1996 and due to extensive changes this document has been rewritten and retitled appropriately as a guidance document. This revision restructures the sequencing of the information to provide better readability and flow. Definitions were modified to be in accordance with Navy standards. References have been updated and new references added. The test section was expanded to add more information on hardness testing, non-destructive testing and sampling. The test section now includes wedge testing, coating thickness, hydrogen embrittlement testing, impact testing, elongation testing, reduction of area testing, decarburization and receipt inspection. The self-locking fastener sample plan has been updated to be in accordance with Navy standards. The installation section has been expanded to include additional information on lubrication, methods for obtaining preload, tightening sequence and procedures such as the use of crow's foot and feel method, and the use of anaerobic compounds such as primers, cure speeds, K values and selection guidance.

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1. SCOPE

This SAE Standard covers both quality assurance and installation requirements for fasteners.

This document establishes engineering criteria and guidance for quality assurance requirements (including Test and Inspection) for procurement of threaded fasteners where such criteria and guidance is not otherwise provided by existing fastener standards or specifications. The document also provides requirements and test procedures for self-locking fasteners including those manufactured by the installing activity.

This document also provides requirements for the selection and use of fastener lubricants, additional corrosion protection treatments, fastener tightening procedures, and the use of thread-locking compounds.

1.1 Field of Application

This document applies specifically to fasteners for ship systems and equipment. This document is intended for commercial and military ships and vehicles, not watercraft for recreational use.

2. REFERENCES

2.1 Applicable Documents

The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

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

2.1.1 Order of Precedence

In the event of a conflict between the text of this document and the references cited herein, the text of the referenced documents takes precedence. Nothing in this document, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.2 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2518	Thread Compound, Anti-Seize, Graphite-Petrolatum
AMS2526	Molybdenum Disulfide Coating, Thin Lubricating Film, Impingement Applied
AMS3090	Lubricant, Dry Film, Heat Cured, For Fasteners, Polysulfide Sealant Compatible
AMS-M-7866	Molybdenum Disulfide, Technical, Lubrication Grade
AMS-S-8802	Sealing Compound, Fuel Resistant, Integral Fuel Tanks and Fuel Cell Cavities
AS8660	Silicon Compound NATO Code Number S-736
AS1701	Lubricant, Solid Film
AS5272	Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting Procurement Specification
SAE J122	Surface Discontinuities on Nuts
SAE J2295	Fastener Part Standard - Caps Screws, Hex Bolts, and Hex Nuts (inch Dimensioned)

2.1.3 ASME Publications

Available from ASME, P.O. Box 2900, 22 Law Drive, Fairfield, NJ 07007-2900, Tel: 800-843-2763 (U.S./Canada), 001-800-843-2763 (Mexico), 973-882-1170 (outside North America), www.asme.org.

ASME B1.1	Unified Inch Screw Threads (UN and UNR Thread Form)
ASME B1.15	Unified Inch Screw Threads (UNJ Thread Form)
ASME B1.2	Gages and Gaging for Unified Inch Screw Threads
ASME B1.3M	Screw Thread Gaging Systems for Dimensional Acceptability - Inch and Metric Threads (UN, UNR, UNJ, M and MJ)
ASME B1.16M	Gages and Gaging for Metric M Screw Threads
ASME B16.5	Pipe Flanges and Flanged Fittings NPS ½ Through NPS 24 Metric/Inch Standard
ASME B18.2.1	Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)
ASME B18.2.2	Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B18.2.6	Fasteners for use in Structural Applications
ASME B18.3	Socket Cap, Shoulder, Set Screws and Hex Keys (Inch Series)
ASME B18.18	Quality Assurance for Fasteners

2.1.4 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org

ASTM A194/A194M	Standard Specification for, Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High-Pressure and High-Temperature Service,
ASTM A320	Standard Specification for Alloy Steel and Stainless Steel Bolting for Low Temperature Service
ASTM A325	Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
ASTM A342/A342M	Standard Test Methods for Permeability of Weakly Magnetic Materials
ASTM A370	Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A490	Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
ASTM A574	Standard Specification for Alloy Steel Socket Head Cap Screws
ASTM B487	Standard Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of Cross Section
ASTM B504	Standard Test Method for Measurement of Thickness of Metallic Coatings by the Coulometric Method
ASTM B568	Standard Test Method for Measurement of Coating Thickness by X-Ray Spectrometry

ASTM D520	Standard Specification for Zinc Dust Pigment
ASTM D3951	Standard Practice for Commercial Packaging
ASTM D5363	Standard Specification for Anaerobic Single-Component Adhesives (AN)
ASTM E384	Standard Test Method for Knoop and Vickers Hardness of Materials
ASTM E1417/E1417M	Standard Practice for Liquid Penetrant Testing
ASTM E1444/E144M	Standard Practice for Magnetic Particle Testing
ASTM F467	Standard Specification for Nonferrous Nuts for General Use
ASTM F468	Standard Specification for Nonferrous Bolts, Hex Cap Screws, Socket Head Cap Screws, and Studs for General Use
ASTM F606/ 606M	Standard Practice for, Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets
ASTM F704	Standard Practice for Selecting Bolting Lengths for Piping System Flanged Joints
ASTM F788	Standard Specification for Surface Discontinuities of Bolts, Screws, and Studs, Inch and Metric Series
ASTM F1789	Standard Terminology for F16 Mechanical Fasteners
ASTM F812	Standard Specification for Surface Discontinuities of Nuts, Inch and Metric Series
ASTM F959	Standard Specification for Compressable-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
ASTM F1470	Standard Practice for Fastener Sampling for Specified Mechanical Properties and Performance Inspection
ASTM F2328	Standard Test Method for Determining Decarburization and Carburization in Hardened and Tempered Threaded Steel Bolts, Screws, Studs, and Nuts
ASTM G98	Standard Test Method for Galling Resistance of Materials
ASTM F1941/F1941M	Standard Specification for Electrodeposited Coatings on Mechanical Fasteners, Inch and Metric

2.1.5 IFI Publications

Available from Industrial Fasteners Institute, 6363 Oak Tree Boulevard, Independence, OH 44131, Tel: 216-241-1482, www.industrial-fasteners.org.

IFI-100/107	Prevailing-Torque Type Steel Hex and Hex Flange Nuts - Regular and Light Hex Series
IFI-124	Test Procedure for the Performance of Non-Metallic Resistant Element Prevailing-Torque Lock Screws
IFI-524	Test Procedure for the Performance of Metric Nonmetallic Element Prevailing-Torque Screws

2.1.6 NAS Publications

Available from Aerospace Industries Association, 1000 Wilson Boulevard, Suite 1700, Arlington, VA 22209-3928, Tel: 703-358-1000, www.aia-aerospace.org.

AIA/NAS NAS1283 Fasteners, Male Threaded, Self-Locking

AIA/NAS NAS1312 Fastener Test Methods

AIA/NAS NASM25027 Nut, Self-Locking, 250 °F, 450 °F, and 800 °F

2.1.7 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <http://assist.daps.dla.mil/quicksearch/>.

2.1.7.1 Federal Specifications

Single-Component

FF-S-86 Screw, Cap, Socket-Head

2.1.7.2 Military Specifications

MIL-DTL-18240 Fastener Element, Self-Locking, Threaded Fastener, 250 °F Maximum

MIL-L-8937 Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting, NATO Code Number S-1738

MIL-R-46082 Retaining Compounds, Single Component, Anaerobic

MIL-S-22473 Sealing, Locking, and Retaining Compounds: (Single Component)

MIL-L-23398 Lubricant, Solid Film, Air-Cured, Corrosion Inhibiting, NATO Code S-749

MIL-L-24131 Lubricant, Colloidal Graphite in Isopropanol

MIL-L-24478 Lubricant, Molybdenum Disulfide in Isopropanol

MIL-PRF-907 Antiseize Thread Compound, High Temperature

MIL-PRF-17331 Lubricating Oil, Steam Turbine and Gear, Moderate Service

DOD-PRF-24574 Lubricating Fluid for Low and High Pressure Oxidizing Gas Mixtures

MIL-PRF-27617 Grease, Aircraft and Instrument, Fuel and Oxidizer Resistant

MIL-PRF-81733 Sealing and Coating Compound, Corrosion Inhibitive

MIL-L-46010 Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting

MIL-S-46163 Sealing, Lubricating, and Wicking Compounds: Thread Locking, Anaerobic, Single Component

2.1.7.3 Military Handbooks

MIL-HDBK-60 Threaded Fasteners - Tightening to Proper Tension

2.1.7.4 Commercial Item Descriptions

A-A-59004 Anti-galling Compound, Thread Lubricating, Seizing Resistant, and Calcium Hydroxide Containing

A-A-59313 Thread Compound; Antiseize, Zinc Dust-Petrolatum

A-A-59691 Silicone Compound NATO Code Number S-736

A-A-59720 Commercial Item Description Sealing and Locking Compounds

2.1.8 Naval Sea Systems Command Publications

Available from Naval Sea Systems Command, 1333 Isaac Hull Avenue, SE, Washington Navy Yard, DC 20376.

S9505-AM-GYD-010 Submarine Fastening Criteria (Non-Nuclear)

S9086-CJ-STM-010 Chapter 075 Fasteners

T9074-AS-GIB-010/271 Requirements for Nondestructive Testing Methods

3. DEFINITIONS

For fastener definitions or terms used in this standard see ASME B18.12, ASTM F1789, S9086-CJ-STM-010 or S9505-AM-GYD-010.

3.1 BREAKAWAY TORQUE

Breakaway torque is the torque required to start the rotation of a fastener with respect to the mating threads. The magnitude of this torque is significant when checking the bonding of an anaerobic locking compound. The term is also used to describe the torque required to start the rotation of a fastener when loosening it or restarting its rotation when tightening a group of fasteners in successive increments. Breakaway torque will generally be higher than that required to continue the rotation.

3.2 DRY-FILM LUBRICANT

See 3.17 Solid-Film Lubricant.

3.3 GALLING

A condition on any of the rubbing surfaces of one or both mating parts where friction between microscopic high spots causes localized welding, resulting in spalling, further roughening of the surface, followed by more severe localized welding. This can result in chipping, fragmentation or deformation of the threads or bearing surface.

3.4 LIQUID-FILM LUBRICANT

A liquid or paste which adheres to the fastener and provides for reduction in friction or galling.

3.5 MAGNETIC PERMEABILITY

The relationship between magnetic induction and magnetizing force. Absolute permeability is the quotient of a change in magnetic induction divided by the corresponding change in magnetizing force. Relative permeability is the ratio of absolute permeability to the permeability of free space.

3.6 MAJOR DIAMETER

On a straight thread, the major diameter is the diameter of the crest of the external thread or the root of the internal thread.

3.7 MAXIMUM MATERIAL CONDITION

Maximum material is the condition where the crest and root of an externally threaded fastener are at their maximum diameter, or the crest and root of an internally threaded fastener are at their minimum diameter.

3.8 MINIMUM MATERIAL CONDITION

Minimum material is the condition where crest and root of an externally threaded fastener are at their minimum diameter, or the crest and root of an internally threaded fastener are at their maximum diameter.

3.9 MINOR DIAMETER

On a straight thread, the minor diameter is the diameter of the root of the external thread or the crest of the internal thread.

3.10 PRELOAD

The initial amount of clamping or tension force exerted by a fastener on joined members that is solely attributed to fastener stress induced by tightening. The stress will decrease shortly after installation due to embedment, thermal creep, and other factors. See 3.14 Relaxation. These factors need to be considered and minimized in joint design because they change the preload.

3.11 PROOF LOAD

Proof load is a specified test load that a fastener must withstand without indicating any yielding or permanent deformation.

3.12 PREVAILING-TORQUE

The torque required to rotate a nut or a bolt when the fastener applies no clamping force to the parts being fastened. The prevailing torque must be measured and added to the torque specified to achieve the desired clamping force. The torque required to bring mating parts together is not considered prevailing torque.

3.13 PREVAILING TORQUE LOCKING FEATURE

A feature such as nylon pellet or insert that maintains a prevailing torque or resistance to rotation even with no clamping force present.

3.14 RELAXATION

The decrease in stress over time while the total strain remains essentially constant. Relaxation can result from vibration loosening, temperature expansion, and other factors.

3.15 RETAINING COMPOUNDS

Retaining compounds are adhesives used to secure bearings, brushings, gears and cylindrical parts onto housings or shafts.

3.16 SLUGGING

A procedure for tightening large fasteners by striking a special wrench, called a slugging wrench that has a large flat striking surface on the end of its short handle.

3.17 SOLID-FILM LUBRICANT

Paint-like coatings of very fine particles of lubricating pigment blended with a binder and other additives. The lubricant is applied to a substrate by spray, dip or brush methods and, once cured, creates a solid film which repels water, reduces friction and increases the wear life of the substrate to which it has been applied. Some types are graphite and molybdenum disulfide, which may be used directly or as a colloidal suspension in some fluid such as oil or alcohol.

3.18 SPALLING

The breaking or chipping of material, usually by impact forces but also resulting from fatigue and galling.

3.19 STAKING

The upsetting of the surrounding metal at three or four points with a center punch at the fastener's head, if it is exposed, to secure the fastener.

3.20 TENSILE STRENGTH

The maximum tensile stress a material can sustain without tearing apart. Also referred to as ultimate strength. Inch-based fasteners use pounds per square inch (lb/in² or psi), and sometimes ksi. Metric-based fasteners use mega Pascals (MPa) or Newtons per square millimeter (N/mm²).

3.21 TENSILE STRESS AREA

Tensile stress area is the circular cross-sectional area of a theoretical unthreaded rod whose cross-sectional area is such that it would fail in tension at the same load as a particular threaded fastener.

3.22 THREAD GAGES

Devices used to determine if a screw thread conforms to the dimensional requirements of the specification. Gages may be classified as attribute/fixed limit (qualitative) or variables/indicating (quantitative). Classification of specific gages is found in ASME B1.3M.

3.23 THREAD GAGING

The process, using suitably calibrated gages, of determining if thread dimensional characteristics conform to specified requirements.

3.24 TOLERANCE(S)

Tolerances are specified amounts by which dimensions are permitted to vary. The tolerance is the difference between the maximum and the minimum limits permitted.

3.25 TOLERANCE CLASS A

Dimensionless parameter that defines the fastener thread tolerances for fasteners in both metric-based fastener dimensioning systems.

3.26 TORQUE

(1) Application of a force at a distance producing a torsional moment. (2) A turning or twisting force exerted on a fastener.

3.27 TORQUE CONTROL

A procedure for tightening fasteners using a torque wrench to control the amount of preload that is applied.

3.28 WASHERFACE

Shoulder formed on the bearing surface of a bolt head or nut with a smooth bearing surface and a round outer diameter, designed to eliminate the need for a flat washer.

4. QUALITY ASSURANCE REQUIREMENTS

Procurement documents must include Quality Assurance requirements to ensure the fastener meets the end user's performance requirements. When adequate requirements are not identified in the applicable fastener standard or specification; appropriate manufacturing, test, marking, and inspection requirements shall be identified in the fastener procurement document.

4.1 Test and Inspection Requirements

Threaded fasteners shall be manufactured, tested, inspected, and marked in accordance with their part standard and/or defined in acquisition specifications.

4.2 Selection of Tests and Inspections

All mandatory tests and inspections provided by the fastener standard or specification shall be performed. Optional tests and inspections are required only when needed to meet end use performance requirements or when specifically invoked.

When testing and inspection criteria are not identified in the applicable fastener standard or specification, the fastener properties needed for the design shall be determined. The appropriate tests shall then be specified to ensure the fastener provides the needed properties. When additional testing or the specification is silent on testing, the guidance of sections 5 and 6 below may be used.

Navy applications usually invoke additional design and test requirements for fasteners. Users should review the Navy specifications and contract documents for additional requirements. Typically, this includes 10% minimum elongation for screws to avoid brittle material for high impact (H.I.) shock applications, wedge tensile tests to ensure the head quality of the fastener and minimum yield strength testing.

4.3 Test and Inspection Data

Certification shall be provided that shows compliance with the applicable fastener specification or procurement document. When fastener tests are specified, the test and certification data that may be submitted to the contracting activity to ensure fastener compliance. Review of data shall be performed as part of receipt inspection. Contractor shall specify if data is required in the ordering data, see section 9 for acquisition.

5. TEST AND INSPECTION PROCEDURES

The procedures herein shall be used when applicable and they do not conflict with or duplicate requirements in the fastener procurement standard. Accordingly, they are particularly applicable to fasteners not covered by industry or military part standards and specifications.

5.1 Test Methods

Test methods may be specified for chemical, mechanical, dimensional, decarburization, coating compliance, stress relieving, nondestructive inspection and workmanship.

In general, fastener performance and mechanical testing shall be done in accordance with ASTM F606/606M or AIA/NAS NAS1312. ASTM F606/606M establishes procedures for conducting tests to determine the mechanical properties of externally and internally threaded fasteners, washers, and rivets. AIA/NAS NAS1312 presents unified standard methods of testing, analysis of data, and presentation of results for use in research, development, procurement, design selection, assembly and maintenance.

The minimum tensile and yield strengths of the externally threaded fasteners may be based on the minimum ultimate tensile and yield strengths in the specification for the rod, bar, or wire used to make the fasteners. Reduced tensile and breaking strength of socket button and flat countersunk cap screws may be in accordance with the specifications, except ASTM F468. ASTM F468 button head and flat countersunk head cap screws shall have ultimate tensile strength reduced to 80 percent of the cited values therein. Button head and flat countersunk head cap screws shall not be used in applications limited to the yield strength of the fastener.

For nonferrous fasteners the required testing in ASTM F467 with supplementary requirement (S2) that the manufacture shall make an analysis of a randomly selected finished nut from each lot of product to be shipped. Heat or lot control shall be maintained. The analysis of the starting material from which the nuts have been manufactured may be reported in place of the product analysis. or ASTM F468 with supplementary requirement (S2) that the manufacture shall make an analysis of a randomly selected finished fastener from each lot of product to be shipped. Heat or lot control shall be maintained. The analysis of the starting material from which the fasteners have been manufactured may be reported in place of the product analysis, as applicable, may be used.

5.2 Fastener Dimensional Inspection

Applicable requirements in ASME B18.18 can be used when identifying and specifying inspection and quality assurance requirements for fasteners that do not have dimensional and other nondestructive requirements identified in their associated part standard, industry standard, or drawing.

When the specification listed does not have dimensional or thread form requirements for the fasteners, the dimensions may be in accordance with ASME B18.2.1, ASME B18.2.2, ASME B18.2.6 or ASME B18.3, as applicable, except for specially made or altered fasteners that are used for a specific use. The thread form shall be in accordance with ASME B1.1 or ASME B1.15. [Table 1](#) lists the major parameters often required for dimensional inspection by the fastener manufacturer.

Fastener gaging shall be in accordance with the applicable fastener specification. Where no guidance on gaging is given, the fastener thread gages and gaging shall be in accordance with ASME B1.2 or B1.16M as applicable. Fastener thread gaging shall be in accordance with the requirements of System 21 or 22 of ASME B1.3M and Table 1. When fasteners are coated with a dry film lubricant, dimensions apply before the application of the lubricant.

Table 1 - Fastener dimension and marking inspection parameters

Parameter to be Examined	Fastener Type	Recommended for Receipt Inspection
Marking	Bolts, studs, screws, and nuts	Yes ⁽¹⁾
Major diameter	Bolts, studs, and screws	Yes
Minor diameter (rounded root)	Bolts, studs, and screws	
Minor diameter	Nuts	Yes
Go maximum material	Bolts, studs, screws, and nuts	Yes
Minimum material or NOT GO Functional diameter	Bolts, studs, screws, and nuts	Yes
Root profile of J threads	Bolts, studs, and screws	
Thickness	Nuts	Yes
Head height	Bolts and screws	Yes
Distance across flats	Bolts, screws, and nuts	Yes
Width across corners	Bolts and screws	
Total run-out	Bolts, studs, and screws	
Shank diameter	Bolts, studs, and screws	
Thread length	Bolts, studs, and screws	Yes
Fillet radius	Bolts and screws	
Straightness	Bolts, studs, and screws	Yes ⁽²⁾
Location and type locking element	Bolts, studs, screws, and nuts	Yes
Socket Broach	Socket Screws	Yes ^(3, 4)
Socket Key Engagement	Socket Screws	Yes

1. Marking often applies to only 6 mm (1/4 in) or larger diameter fasteners.

NOTE: In some cases, low-strength carbon steel products are not marked in larger sizes.

2. Visual only.

3. Broach petals at the bottom are permissible if not loose.

4. For Broached Sockets, the max acceptable overcut shall be a size causing an average 20% flat length reduction in the maximum dimension across flat hexagon for socket sizes up to and including 1 in, 30% for larger. The max overcut on any one of the six flats shall not exceed a 40% reduction in flat length for any size.

For hexagon sockets, Mandatory Requirement 1 of ASME B18.3 applies.

- Hexagon sockets in screws the GO member of the gage shall enter freely to the minimum key engagement depths specified.
- For hexagon sockets that are not chamfered, the NOT GO gage shall not enter any of the three across flat dimensions of the socket for normal socket sizes of 1/8 inch and larger and not enter the socket for nominal socket sizes smaller than 1/8 inch.
- For chamfered hexagon sockets the NOT GO gage shall be permitted to enter to only a depth equal to 10% the nominal socket size up to and including 1/16 and 7.5% for larger.
- For coated products use Go gages identified as applicable in ASME B18.3

5.3 Mechanical Testing

Performance and mechanical testing shall be done in accordance with referenced fastener standard or if not specified ASTM F606/606M or AIA/NAS NAS1312.

Mechanical test results on the rod, bar or wire for producing the fasteners may be substituted for yield and axial tensile tests of externally threaded fasteners, provided that the following conditions are met:

1. The tests were conducted on the same heat/lot of rod, bar or wire for producing the fasteners.
2. The fasteners were fabricated solely by machining without further heat treatment or cold work.
3. The rod, bar or wire for producing studs, bolts or screws 1/2 inch in diameter or less is no more than four times the nominal diameter of the stud, bolt or screw.
4. The rod, bar or wire for producing studs, bolts or screws over 1/2 inch in diameter is no more than twice the nominal diameter of the bolt or screw.

5.3.1 Hardness

Fasteners may be tested in accordance with ASTM F606/606M. Hardness conversion in accordance with ASTM A370 is permitted. Hardness testing shall be performed post any heat or annealing processes.

5.3.1.1 Additional hardness tests for grade 500 fasteners.

For new design, it is recommended that if the tensile strength of any full sized grade 500 fasteners obtained during tensile testing exceeds 160 ksi, a micro-hardness test should be conducted at the root of three different un-deformed threads on the tested fastener. When performed, the fastener shall be cross-sectioned and micro-hardness tested, using a Vickers indenter and a test force of 1000 gf, in accordance with ASTM E384. The hardness measurements shall be taken directly under a thread root and no more than a distance equal to 1/2 the thread height below the minor diameter of the fastener. None of the hardness values shall exceed 326 HV.

5.3.2 Wedge Testing

Fasteners may be tested in accordance with ASTM F606/606M. For specially designed threaded parts wedge testing may not be required. Wedge angles for socket head cap screws shall be in accordance with ASTM A574. Flat countersunk and button head cap screws to any standard provided in accordance with SAE J2295, including ASTM A193, are not required to be wedge tensile tested. These screws shall be axial tensile tested.

CAUTION: Where a proof load test and wedge tensile test, both tests may be performed on the same fastener. However, where a yield and wedge test are required, a separate (new untested) fastener is required for each of the two test methods. Reuse of a yield strengths tested fastener in a wedge tensile test may result in a false value for wedge tensile test and is therefore, not permitted.