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# Standard Terminology for F16 Mechanical Fasteners<sup>1</sup>

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## 1. Scope

1.1 This terminology standard provides a compilation of definitions for terminology used for mechanical fasteners.

1.2 Terms in this terminology are organized alphabetically. In **Appendix X1** they are listed under fastener characteristic.

1.3 Additional definitions are shown in ANSI/ASME B18.12; IFI Glossary of Terms, IFI-139 and IFI-140; and SAE J412.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

[A563 Specification for Carbon and Alloy Steel Nuts](#)  
[E456 Terminology Relating to Quality and Statistics](#)  
[F432 Specification for Roof and Rock Bolts and Accessories](#)  
[F2428 Guide for Selection and Use for Pelvic Ring Circumferential Compression Stabilization Devices \(PRCCSD\)](#)

### 2.2 ANSI/ASME Standard:<sup>3</sup>

[B18.12 Glossary of Terms for Mechanical Fasteners](#)

### 2.3 IFI Standards:<sup>4</sup>

[Glossary of Terms Relating to Aerospace Fasteners](#)  
[IFI-139 Quality Assurance Requirements for Fastener Testing Laboratories](#)  
[IFI-140 Carbon and Alloy Steel Wire, Rods, and Bars for Mechanical Fasteners](#)

<sup>1</sup> This terminology is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.91 on Editorial.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

<sup>4</sup> Available from Industrial Fasteners Institute, 1717 E. 9th Street, Suite 1105, Cleveland, OH 44114. <http://www.indfast.org>

### 2.4 SAE Standard:<sup>5</sup>

[SAE J412 General Characteristics and Heat Treatments of Steels](#)

### 2.5 ISO/IEC Standards:<sup>6</sup>

[ISO/IEC 17011 Conformity assessment -- General requirements for accreditation bodies accrediting conformity assessment bodies](#)

[ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories](#)

## 3. Terminology

### Mechanical Fastener Definitions

**acceptance number**—numerical value representing the maximum number of permissible non-conformances within a sample submitted for testing and acceptance of the population.

**accredited laboratory**—an organization found to be operating in conformance with the requirements of ISO/IEC 17025 by an accrediting body that has been found to be compliant to ISO/IEC 17011, and is recognized as a signatory to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA).

**age hardened**—precipitation of constituents within certain alloy metals to increase mechanical properties.

**alloy group**—materials grouped by their chemical designation and considered to be functionally or chemically similar for general purpose use.

**alloy steel**—steel is considered to be alloy when the maximum range given for manganese exceeds 1.65 % or a definite minimum quantity for any of the following elements is specified or required within the limits of the recognized field of constructional alloy steels: chromium, molybdenum, nickel, or any other alloying element added to obtain a desired alloying effect.

<sup>5</sup> Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, <http://www.sae.org>.

<sup>6</sup> Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, <http://www.iso.ch>.

**alter**—to change fastener properties such as hardness, tensile strength, surface finish, length, or other characteristics of the fastener through such processes as heat treatment, plating, and machining.

**alteration**

*insignificant alteration*—any change to the fastener from its purchased condition that results in no diminished or modified mechanical, metallurgical, or functional properties.

*significant alteration*—any change to the fastener from its purchased condition that results in modified mechanical, metallurgical, or functional properties.

**alteration distributor**—distributor of fasteners who alters a fastener prior to sale and assumes the full responsibilities of the alteration and its affected mechanical and performance characteristics.

**anchor bolt**—steel rod or bar, one end of which is intended to be cast in concrete while the opposite end is threaded and projects from the concrete for anchoring other material to the concrete. The end cast in concrete may be either straight or provided with an anchor, such as a bent hook, forged head, or a tapped or welded attachment to resist forces imposed on the anchor bolt as required.

**annealing**—general term applied to a variety of thermal treatments applied to fasteners for the purpose of softening or homogenizing material properties. The specific types of annealing are:

*full annealing*—heating steel above the upper critical transformation temperature, holding it there long enough to fully transform the steel to austenite, and then cooling it at a controlled rate, in a furnace, to below a specified temperature. A full anneal refines grain structure and provides a relatively soft, ductile material that is free of internal stresses.

*intercritical annealing/isothermal annealing*—heating a steel above the lower critical transformation temperature, but below the upper-critical transformation temperature, to dissolve all the iron carbides, but not transform all the ferrite to austenite. Cooling slowly from this temperature, through the lower critical temperature, produces a structure of ferrite and pearlite that is free of internal stresses. In *intercritical annealing*, the steel continues to cool slowly in the furnace, similarly to full annealing. In *isothermal annealing*, cooling is stopped just below the lower critical, assuring complete transformation to ferrite and coarse pearlite, and eliminating the potential for bainite formation. The coarse pearlite structure greatly improves machinability of medium carbon steels.

*normalizing*—variation of full annealing in which steel is heated above the upper critical temperature and is then air cooled in air, rather than in a furnace. Normalizing relieves the internal stresses caused by previous working, and while it produces sufficient softness and ductility for many purposes, it leaves the steel harder and with a higher tensile strength than full annealing. To remove cooling stresses, normalizing is often followed by tempering.

*process annealing*—sometimes called subcritical annealing or stress relieving, performed at temperatures just below the lower critical temperature. Process annealing neither refines grains nor redissolves cementite, but does improve the ductility and decreases residual stress in work-hardened steel.

*solution annealing*—heating an austenitic stainless steel to a temperature that puts the carbides into solution. The steel is held at this temperature long enough to achieve grain growth. It is then quenched in a medium for fast cooling, which prevents most of the carbides from reprecipitating. The process achieves optimum creep strength.

*spheroidize annealing*—type of subcritical annealing used to soften steel and improve machinability. Heat treating fine pearlite for a long time just below the lower critical temperature of the steel, followed by a very slow cooling, produces a spheroidal or globular form of the pearlite.

*stabilization annealing*—heating an austenitic stainless steel used in severe aqueous corrosion environments by first solution annealing and then reheating to about 1600°F, and holding at that temperature. The treatment causes grain boundary precipitation of carbides, but also the hold time permits the chromium remaining in the austenite solution to redistribute within the grains, restoring corrosion resistance, even adjacent to the grain boundaries.

**applicable standards**—those having the capability of being applied in some fashion to the host standard.

**arbitration hardness location**—prescribed location on the fastener, such as at mid-radius, using 90° intervals taken through the cross section, one diameter from the threaded end for bolts and screws.

**assembly lot**—assembly lot may consist of a combination of different products. As long as the products that make up the assembly are in accordance with *lot*, the quantity of assemblies determine the sample size. Example: ten assemblies consisting of a bolt, nut, and a washer would have a lot size of ten if the bolts, nuts, and washers meet the criteria of *lot*. However, if any of the components in the assembly are not in accordance with *lot* then the ten assemblies will have to be separated into lots that meet all the requirements of *lot*.

**austenitic stainless alloys**—steel alloys that contain a minimum of 15 % chromium and from a residual to 20 % nickel. Some alloys may contain as much as 18 % manganese. The metal is predominantly face centered cubic in structure and hardenable only by cold working. Essentially nonmagnetic in its wire form, it may become slightly magnetic from cold working. Austenitic stainless steels can be grouped into three categories: 300 series alloy, Cr-Ni-Mn alloys, and Cr-Ni-Mo-Ti.

**average coating thickness**—determined as either the value obtained by analytical methods or the mean value of a specified number of local thickness measurements that are evenly distributed over the significant surface.

**baking duration**—time measured from when the plated product reaches a specified temperature in the baking furnace or oven until it is removed.

**bar**—solid rolled or forged section that is long in relationship to its cross-sectional dimensions with a relatively constant cross-section throughout its length. Carbon and alloy steel bars are produced from hot rolled or cast billets, or from blooms rolled single strand into coils.

**barrel-plating process**—fastener-coating process which employs a containment vessel called a barrel that is designed to move a given batch of fasteners together through each of the process steps, allowing ready ingress and egress of processing solutions and rinses. As the barrel moves through the process steps, it is rotated or oscillated, causing the fasteners to cascade over one another, and in the electrocleaning and electroplating steps, and electric current is applied.

**batch average thickness**—calculated average thickness of a coating if it were uniformly distributed on the surfaces of the items.

**batch lot**—a quantity of identical fasteners of the same part number, taken from a production lot subjected as one batch to the same fastener manufacturing processes such as plating or heat treatment, etc.

**bend test**—various tests in which a fastener is bent through its axis or on a round mandrel to determine the toughness and ductility of the fastener.

**bendable bolts**—bolts furnished with an altered section at some location at which the bolt will bend.

**beveled washer**—a washer which is square or rectangular with a beveled one to six ratio surface for use with American Standard beams and channels.

**bilateral specifications**—specifications that have both an upper and a lower value.

**bolt**—headed and externally threaded fastener designed to be assembled with a nut.

**bolt load - elongation behavior**—when tensile loaded, a bolt will elongate elastically until stressed beyond its proportional limit where it will behave plastically.

**bolt-nut-washer assembly**—a combination of bolt, nut, and washer components from singular lots that have been assembled, lubricated as necessary, tested as required, and prepared for shipment to a customer creating a unique set and certifiable lot.

**break loose torque**—torque applied in a removal direction necessary to start the fastener in motion from its fully preloaded installed position.

**breakaway torque**—torque necessary to start a fastener in motion after the axial load of the mating components has been reduced to zero.

**burst**—open break in the metal during forging located on the flats or corners of bolt and screw heads, or at the periphery

of a flanged or circular headed bolt or screw, or on the flats or corners of the nut.

**carbide precipitation “sensitization”**—condition which affects some austenitic stainless steels which have been subjected to temperatures in the critical range, typically 800° to 1400°F. Complex chromium carbides precipitate and reside primarily at the grain boundaries, causing deterioration of its corrosion resistance by depleting its adjacent areas of chromium.

**carbon boron steel**—carbon steel in which boron has been intentionally added at a minimum of 0.0005 % and a maximum of 0.003 % in order to obtain an expected hardenability.

**carbon steel**—steel for which no minimum content is specified or required for chromium, molybdenum, nickel, or any other element added to obtain a desired alloying effect; or steel for which maximum content specified for manganese does not exceed 1.65 %. When specified, boron may be added to killed carbon steel with a maximum allowable of 0.003 %.

**carburization**—process or result of increasing carbon content of the surface layers of the steel fastener product. **F2428**

**case hardening**—a process which intentionally produces a surface hardness for a steel fastener that is harder than its core.

**center hardness**—hardness of the core of a bolt, screw, or stud measured at the center of a transverse section. Center hardness measurement is not the location for determining conformance of hardness to product specifications. Refer to *mid-radius hardness* and *surface hardness*.

**certificate of compliance**—document or electronic record, signed by an authorized party, affirming that the supplier of the fastener or related service, or both, has met the requirements of the relevant specifications, contract, or regulation.

**certificate of conformance**—document or electronic record affirming that the fastener has met the requirements of the relevant specifications, contract, or regulation.

**certification**—procedure and action by a duly authorized body of determining, verifying, and attesting in writing to the qualifications of personnel, processes, procedures, or items in accordance with applicable requirements.

**certified quality assurance system**—system so designated officially by a recognized accrediting body as having met all of the criteria within a national or an international third party quality system standard.

**chemical anchors**—chemical materials that provide anchorage between a bolt or bar and a drilled hole.

**check analysis**—see *product analysis*.

**clamp load**—sometimes called preload or initial load. It is a tension on a bolt or screw, which results in equal and opposite forces which exist at the interface between two members generated through the cumulative effect of tightening one or more fasteners.

**cold forged**—formed by hammering or pressing with the material at or near ambient temperature.

**cold forming**—process of forming material below the recrystallization temperature by forcing or pressing metal into various dies.

**cold heading quality material**—material that has dimensional, chemical, and residual limits such that it will successfully form a given fastener geometry when machine-applied pressure produces a metal flow that results in the desired geometry. Additionally, subsequent treatment as necessary to achieve given mechanical properties results in a fastener with freedom from internal or external imperfections that would impair its intended use.

**cold heading wire**—wire produced by specially controlled manufacturing practices to provide satisfactory quality for heading, forging, and roll threading.

**commingling**—mixing of fasteners from different lots that are of the same grade and size in the same container.

**common cause**—common cause variation affects all the individual values of the process output being studied. In control chart analysis, it appears as part of the random process variation.

**compressible-washer-type direct tension indicator (DTI)**—a washer-type element inserted under the cap screw or bolt head, hex nut, or hardened washer, having the capability of indicating the achievement of a required bolt tension by the degree of direct tension plastic indicator deformation.

**compression load**—load which tends to compress or shorten the member. The value for compressive strength may depend upon the degree of distortion.

**cone proof load—inch series**—a calculated value derived from the formula

$$CPL = (1 - 0.30D) \times f \times A_s \quad (1)$$

where:

$CPL$  = cone proof load (lbs),  
 $D$  = nominal diameter of nut (in.),  
 $f$  = specified proof stress of nut (psi), and  
 $A_s$  = tensile stress area of nut (in.<sup>2</sup>).

To meet the requirements of the cone proof load test, the nut shall support its specified cone proof load without stripping or rupture.

**cone proof load—metric series**—a calculated value derived from the formula

$$CPL = (1 - 0.012D)f \times A_s \times 0.001 \quad (2)$$

where:

$CPL$  = cone proof load (kN),  
 $D$  = nominal diameter of nut (mm),  
 $f$  = specified proof stress of nut (MPa), and  
 $A_s$  = tensile stress area of nut (mm<sup>2</sup>).

To meet the requirements of the cone proof load test, the nut shall support its specified cone proof load without stripping or rupture.

**cone proof load test**—test performed using a conical washer and threaded mandrel to determine the influence of surface discontinuities (that is, forging cracks or seams) on the load-carrying capability of hardened steel nuts. The test includes a simultaneous dilation and stripping action of the nut.

**conical washer**—washer that has a crown height that flattens under load and is partially recovered following load removal.

**consensus standard**—widely available standard developed by ASTM, ASME, SAE, ISO, or any other standards-setting organization which has under its structure those parties which include users, producers, and other interested persons.

**control limit**—limits on a control chart which are used as criteria for signaling the need for action, or for judging whether a set of data does or does not indicate a state of statistical control. **E456**

**control plan**—written description of a system for controlling fasteners and the processes used in their manufacture. Three distinct phases are used in a control plan, including prototype, pre-launch, and production.

**conversion coating**—the conversion of the surface of a metal into a superficial coating by a chemical or electrochemical process in which compounds of the metal in question become part of the coating.

**core**—part of the body of a fastener beginning beneath the surface, at the point where subsurface hardness ends. For example, if a bolt is either carburized or decarburized, the core beings at the point where the effect of carburization or decarburization is no longer measurable. The core is not a precise location; therefore, fastener standards universally require that the core hardness be measured at mid-radius.

**corrosion resistance**—ability of a fastener to resist corrosion under specified conditions.

**crack**—crystalline fracture passing through or along the grain boundaries which is normally caused by overstressing the metal during manufacturing, such as forging, forming, or heat treating.

**cut thread**—produced by removing material from the surface with a form cutting tool.

**decarburization**—loss of carbon from the surface layer of the fastener, normally associated with heat treatment.

*gross decarburization*—a complete decarburization characterized by a sufficient carbon loss to show only clearly defined ferrite grains.

*partial decarburization*—a loss of carbon sufficient to cause a lighter shade of tempered martensite than of the immediately adjacent base metal, but as being of insufficient carbon loss to show clearly defined ferrite grains.

- defect**—departure of a quality characteristic from its intended level or state (or the sum of departures of different quality characteristics) that occurs with a severity sufficient to cause a fastener not to satisfy intended normal, or reasonably foreseeable, usage requirements. The term *defect* is appropriate for use when a quality characteristic is evaluated in terms of its usage.
- deoxidation**—process of reducing the oxygen content from steel during the process of steel making, either by adding strong oxide forming elements, such as silicon or aluminum, or by the process of vacuum degassing to such a level that no oxidation of carbon or other elements takes place during solidification of steel.
- destructive test**—test to determine the properties of a material or the behavior of an item which results in the destruction of the sample or item.
- detection process**—past-oriented strategy of quality control that attempts to identify the nonconforming product after it has been produced, and then to separate it from the conforming product.
- detection system**—system which relies on final inspection as the primary means of controlling the quality of finished fasteners.
- distributor**—person or organization who purchases fasteners for the purpose of reselling them. A distributor may or may not alter the fasteners prior to resale. (Significant alterations and insignificant alterations are defined separately.)
- drill-drive test**—test in which a self-drilling screw is driven into and through a test plate, under specified test conditions, to determine drilling and thread forming performance characteristics of the screw.
- drive test**—test in which a tapping screw is driven into a test plate hole to determine thread forming or thread cutting performance characteristics.
- drive torque**—the maximum torque to install a screw prior to contact of the head of the fastener with the surface of the test plate.
- dry-to-touch**—a condition of coated fasteners in which no significant visibly discernable material is transferred when they are manually gripped with an absorbent material.
- ductility of externally threaded fasteners**—ability of a fastener to deform before it fractures. Machined test specimens made from a fastener allow the measurement of elongation and reduction of area which are criteria used to evaluate the specimen. However, since yielding and fracture normally occur in the screw threads, these are impractical for the actual fastener. Hardness and the wedge tensile test are ductility indicators for the actual fastener. The lower the ratio of its specified minimum yield strength to its specified minimum tensile strength, the greater the fastener ductility.
- dud**—incomplete, mutilated, or foreign part.
- effective case depth**—perpendicular distance from the surface of a hardened case to the furthest point where a specified level of hardness is maintained.
- elongation**—increase in length of the gage length expressed as a percentage of the original gage length.
- endurance limit**—maximum stress below which a bolt or screw can presumably endure an infinite number of stress cycles.
- end user**—party that installs the mechanical fastener during assembly of a component or product.
- environmental hydrogen embrittlement**—can be “corrosion-assisted hydrogen embrittlement” caused by the liberation of hydrogen during the corrosion process, which is absorbed as atomic hydrogen, resulting in embrittlement under certain conditions of material strength and applied external stress. The end result is brittle failure. The hydrogen may also be absorbed from other external chemical sources.
- expansion shells**—anchorage devices that expand to grip the sides of a drilled hole mechanically, and transfer load from the location of the anchor to the bar or bolt **F432**
- extensometer**—device for sensing the elongation of fastener material while it is subjected to tensile stress, for the purpose of measuring linear deformation under controlled test conditions.
- eye bolt**—bolt having a head which is a closed or open ring which has a threaded shank and has a defined breaking strength, proof load, and tensile strength.
- fastener**—see *mechanical fastener*.
- fastener electroplating**—electro-deposition by electrolysis of an adherent metallic coating upon a fastener serving as an electrode. This coating may function as protective, decorative, or in a defined engineering function such as wearability or abrasive resistance.
- fastener manufacturer**—organization or firm that procures a raw material, fabricates it into a mechanical fastener, and processes it to have certain mechanical properties.
- fastener quality**—conformance of a fastener to its specification for dimensions, mechanical properties, performance requirements, and other requirements of a specification.
- fastener specification**—precise statement of a set of requirements to be satisfied by a fastener, its material, or its processing. It also indicates the procedure used to determine whether the requirements given are satisfied.
- fastener standard**—document which details the attributes of a finished fastener and includes such characteristics as geometry, material or chemistry, heat treatment, finish, lot size, and packaging.
- fastener tensile stress area**—assumed cross sectional area of a threaded fastener through the thread, which is used when computing the load a fastener can support in tension.
- fastener testing**—determination or verification that the fastener meets its specification requirements.
- fatigue limit**—see *endurance limit*.

**fatigue strength**—maximum stress on an externally threaded fastener which can be tolerated for a specified number of repeated cycles prior to failure.

**fold**—doubling over of metal which occurs during forging at or near the intersection of diameter changes which are found on the shoulders, heads, or shanks of bolts and screws, or on nuts at the intersection of diameter changes on the top face or on the bottom face.

**forging cracks**—occur during fastener manufacturing at the cutoff or forging operations and are located on the top of the head or on the raised periphery of indented head bolts and screws.

**forming**—primary operation in the fastener industry which includes heading, upsetting, extruding and forging.

**fracture**—the separation of a fastener or test specimen into two or more separate pieces in service or during testing.

*brittle fracture*—a separation accompanied by little or no macroscopic or microscopic plastic deformation. The fracture typically has a bright granular appearance with little or no necking apparent.

*ductile fracture*—a separation accompanied by tearing with appreciable gross plastic deformation.

**full size specimen**—tension test specimen consisting of a completed fastener for testing in the ready to use condition without altering the configuration.

**grade identification symbols**—inch series standardized symbols denoting the combination of the fastener's base material, its strength properties, its performance capabilities, and the engineering standard against which it was produced.

**hardness**—measure of a material's ability to resist abrasion or indentation, or both.

**head-to-shank integrity**—assurance that a headed fastener under load is able to meet its mechanical and performance requirements without failure at the junction of the head to shank.

**heat analysis**—chemical analysis of a given heat by the producer which determines the percentages of its elements.

**heat control**—the control by a manufacturer at any step in the processing of a fastener, which allows identification of the heat of material from which it is manufactured.

**heat resistance**—extent to which a material retains useful properties as measured during exposure of the material to a specified temperature and environment for a specified time.

**hexavalent chromium**—corrosion inhibitor often used in passivation and conversion coatings. It consists of chromium in the +6 (hexavalent) oxidation state.

**high strength bolts**—term which is used commercially to denote ASTM A325 or A490 bolts which are primarily used in construction applications.

**high temperature bolts**—bolts that are specifically manufactured of high temperature alloys to sustain tensile loads at temperatures between 500°F and 1800°F, depending upon the alloy and processing during manufacture.

**high temperature fastener alloys**—those alloys that will maintain their anticipated strength and characteristics within the high temperature range.

**high temperature galvanizing**—a galvanizing process carried out in a ceramic vessel (kettle) at an approximate temperature between 530 and 560°C (990 to 1040°F).

**high temperature for mechanical fasteners**—this term is generally understood to refer to a temperature range of approximately 500°F (260°C) to 1800°F (982°C).

**hot dip galvanizing**—immersion of fasteners in a bath of molten zinc for a controlled time period to obtain specified coating weight or thickness.

**hot forged**—formed by hammering or pressing of metal at a temperature which allows recrystallization to occur simultaneously with deformation, and avoids strain hardening.

**hot forming**—heat is applied to wire or rod to enhance metal flow into dies using machine applied pressures as opposed to metal removal by cutting for forming purposes.

**hydrogen embrittlement, internal**—see *internal hydrogen embrittlement*.

**hydrogen embrittlement relief**—process applied to fasteners which reduces or eliminates embrittlement caused by the absorption of hydrogen during processing. Normally, this is described as a baking operation.

**impact strength**—often referred to as impact energy; it is the amount of energy required to fracture a fastener, usually measured by either an Izod or Charpy test.

**inch threaded Class 2A coating thickness**—a coating thickness which does not exceed 1/8 of the allowance for Class 2A threads to avoid interference.

**indentation hardness**—resistance of a material to indentation. This is the usual type of hardness test in which a pointed or rounded indenter is pressed into a surface under a substantially static load.

**in-process control**—system that provides a method to detect the variation of product characteristic(s) during manufacturing and processing and initiates corrective action to maintain the product characteristic(s) within its specified limits.

**in-process material control and traceability**—a system that maintains product traceability back to the original mill heat of raw material.

**in-process sampling inspection**—random sample of product drawn from prescribed points of the processing stream (usually characteristic sensitive) and performing specific inspections and tests to determine conformance of the product at that point of the processing stream.

**inspection**—process of measuring, examining, testing, gaging, or using other procedures to ascertain the quality or state of, detect errors or defects in, or otherwise appraise materials, products, services, systems, or environments to a preestablished standard.

**inspection plan**—set of instructions defining product characteristics, specifications, or frequency of inspection, or a combination thereof, for product at a specified operation.

**inspection test**—fastener or its selected characteristics tested in process or after manufacture to determine conformance of the fastener or its selected characteristics to the manufacturing specifications.

**inspection torque**—torque necessary to maintain tightening motion in a fastener at its fully preloaded installed tension.

**installation failure**—a failure that occurs during installation of a fastener such that the fastener is no longer able to fulfill its intended function.

**internal hydrogen embrittlement**—embrittlement caused by residual hydrogen from fastener processing, such as cleaning, pickling, phosphating, or electroplating.

**ladle analysis**—see *heat analysis*.

**liquid medium**—liquid used to quench a steel fastener to achieve desired mechanical properties. The selection of the medium must be compatible with the basic material and geometry to avoid quench cracks.

**load-indicating externally threaded fastener**—these fasteners utilize mechanical, electronic, or ultrasonic means to indicate fastener tension. **F2428**

**load indicating fastener**—externally threaded fastener equipped with a load indicating device capable of measuring fastener tension during the tightening process or residual tension after tightening, or both.

**local thickness**—mean of the thickness measurements of which a specified number is made within a reference area.

**locking ability**—characteristic intentionally manufactured or added to a fastener to resist loosening.

**lot**—quantity of product of one part number that has been processed essentially under the same conditions from the same heat treatment lot and produced from one mill heat of material and submitted for inspection at one time.

*lots from blanks*—A quantity of bolts or screws having the same diameter which has been manufactured from preformed blanks, processed essentially under the same conditions from the same heat treatment lot and produced from one mill heat of material and submitted for inspection at one time. Lots of bolts or screws manufactured from preformed blanks may consist of multiple lengths and different part numbers as applicable.

**lot sampling inspection**—random sample drawn from a lot and performing specified inspections and tests to determine the acceptability of the lot.

**low carbon martensite**—as-quenched phase of low carbon steels, particularly to which Boron has been intentionally added to increase the hardenability of the material, and some stainless steels.

**machine process capability study**—study conducted to provide a level of confidence in the ability of a machine/process to meet engineering specification requirements.

**machined specimen**—test specimen machined from a full-size fastener to specific dimensions to standardize test results; often specified when a full-size fastener cannot be reasonably or practically tested.

**macro-etch test**—immersion of a prepared fastener specimen into a hot acid or aggressive media followed by examination of the etched surface. The examination is done with the unaided eye or at magnification not exceeding 10 $\times$ .

**macrograph**—photographic reproduction of any object that has not been magnified more than ten times.

**macroscopic**—visible either with the naked eye or under low magnification (as great as about ten diameters).

**macrostructure**—structure of metal as revealed by macroscopic examination.

**magnetic permeability**—degree which a material becomes magnetically attractive.

**manufacturer**—see *fastener manufacturer*.

**martensitic alloys**—iron-chromium alloys with 12% to 17% chromium and sufficient carbon to permit strengthening by conventional heat treatment.

**material lap**—longitudinal surface discontinuity extending into rod, bar, or wire, caused by doubling over of metal during hot rolling.

**material review**—evaluation by a team of fastener experts to determine the fasteners' fitness for general use, fitness for intended use, or fitness for specified use.

**material specification**—proprietary or consensus standards document which defines the material, acceptable chemical limits, and other requirements used in fastener manufacturing.

**material test report**—written document or electronic record, signed by an authorized party, attesting that the raw material is in accordance with specified requirements, including the actual results of all required chemical analyses, tests, and examinations.

**maximum hardness**—hardness specified in fastener standards above which the fastener is considered nonconforming to the standard.

**mechanical deposition**—coating process in which particles of the plating metal are impacted against the fastener surface such that cold welding of the plating metal to the fastener surface is accomplished.

**mechanical fastener**—mechanical device that holds or joins two or more components in definite positions with respect to each other and is often described as a bolt, nut, rivet, screw, washer, or special formed part.

**mechanical properties**—fastener characteristics which relate to its reaction to applied loads; these properties may be those of the basic raw material or result from the manufacturing process.

**metallography**—study of the structure of fastener metals using optical or electronic microscopes that produce a magnified image of the material structure of the fastener.

**microstructure**—structure of a given metal revealed by microscopic observation of an etched surface.

**mid-radius hardness**—hardness of the core of a bolt, screw, or stud, measured at mid-radius of a transverse section approximately one diameter from the point end.

**minimum hardness**—hardness value of a fastener below which it is not in conformance with the specification.

**minimum local thickness**—lowest local thickness value on the significant surface of a single article.

**modulus of elasticity**—for a given material, the ratio of unit stress to unit strain within its elastic range which may be used as a measure of stiffness. Sometimes called *Young's Modulus*.

**nick**—indentation on the surface of a bolt, nut, screw, or stud. Also referred to as a gouge.

**nominal**—a convenient numerical term used to express the approximate dimension of a fastener without listing tolerances or other factors.

**non-alteration distributor**—distributor of mechanical fasteners who buys, resells, and may repackage the fasteners, but does not change the individual fasteners in any way.

**nonconformance**—fastener or fastener component which does not conform to a specification or other inspection standard.

**nonferrous alloys**—alloys that do not contain iron as their main constituent although iron may be present as an impurity. The most common nonferrous groups are copper, nickel, aluminum, and titanium alloys.

**nut**—internally threaded product intended for use on external or male screw threads such as a bolt or a stud for the purpose of tightening or assembling two or more components.

**organic coating**—a layer of material on a fastener that has a compound containing a carbon chain as its binder.

**part identifying number (PIN)**—alphanumeric sequence used to code B18 fasteners. The system was developed by ASME Standards Committee B18.

**passivation**—process of forming an oxide film on the surface of stainless steel fasteners by chemical treatment, usually nitric acid solution, to improve corrosion resistance of stainless steel fasteners.

**performance properties**—design feature(s) manufactured into the fastener to achieve a specific characteristic relative to the fastener application, such as torque-tension.

**physical properties**—those properties inherent in the raw material which remain unchanged or exhibit only slight alteration in the fastener following manufacture.

**plain washer**—fastener accessory that accepts a bolt or screw through its center hole and provides a surface to distribute bearing stress. It also serves to provide a surface for head or nut rotation during tightening.

**plastic deformation**—permanent distortion of a material under the action of applied stresses.

**plasticity**—ability of the metal to undergo permanent deformation without rupture.

**plating**—deposition of an adherent metal onto the surface of the base metal of the fastener. A specific process should be specified; that is, electroplating, hot dip galvanizing, mechanical deposition, etc.

**PPM**—an acronym for *parts per million* used as a description of perceived quality. For mechanical fasteners, it is an expression of the maximum theoretical number of nonconformances in a theoretical million-piece lot.

**precipitation hardening alloys**—group of alloys that can be hardened by participation of second phases or intermetallic compounds by cooling during a thermal or thermal-mechanical aging treatment.

**pre-launch production plan**—written description of the dimensional, mechanical, chemical, and performance testing that will be carried out during initial production, prior to full production.

**prevailing torque**—torque necessary to rotate a fastener relative to its mating component with the torque being measured with the fastener in motion and zero axial load in the assembly.

**prevention process**—future-oriented strategy that, through analysis and action toward correcting the process itself, enriches quality through continuous improvement activities.

**prevention system**—system which outlines advance quality planning, in-process inspection, process controls, and statistical methods to control the processes and seek continuous improvement.

**private label distributor**—distributor who, by prearrangement with a manufacturer, markets fasteners identified with the distributor's unique identification marking and who assumes responsibility for the fasteners.

**process flow**—current or anticipated sequential process steps required to produce a fastener.

**process parameters**—combination of conditions originating from people, measurement, materials, method, and environment that contribute to a given output.



**product analysis**—chemical analysis performed on the finished fastener to verify that the chemical composition is within specified limits.

**production lot: zinc coating, hot-dip**—batches of fasteners originating from the same manufacturing lot, processed continuously through cleaning, pickling, fluxing, dipping in molten zinc, and, spun in a centrifuge, or other means, without any significant change in time, temperature, and concentration of constituents of the process.

**production plan**—complete written plan of fastener and process characteristics, process controls, tests, and acceptance procedures that will occur during full production.

**proof load, externally threaded fastener**—tension applied load that the fastener must support without evidence of permanent deformation (for most carbon or alloy steel fastener strength grades or property classes, proof loads are established at approximately 90 % to 93 % of the expected minimum yield strength).

**proof load, internally threaded fastener**—axially-applied load using a bolt or mandrel that must be supported by a nut without evidence of thread stripping or rupture.

**property class**—system of strength classifications used for bolts, nuts, and screws manufactured to metric standards.

**property class symbols**—metric series standardized symbols denoting the combination of the fastener’s base material, its strength properties, its performance capabilities, and the engineering standard against which it was produced.

**proportional limit**—greatest stress that the material is capable of sustaining without a deviation from the law of proportionality of stress to strain (Hooke’s Law). In many cases, the elastic limit is so close to the proportional limit that no distinction is made.

**protective finish**—a surface condition that may be the result of oxidation of the basic material or the addition of a chemical or metallic coating, which enhances corrosion protection in the intended application.

**prototype plan**—written description of the dimensional, mechanical, chemical, and performance tests that will be used to facilitate the building of a prototype.

**qualification (personal)**—characteristics or abilities gained through training or experience, or both, that enable an individual to perform a required function.

**quality assurance**—all of the planned and systematic activities carried out for the purpose of establishing that a fastener lot is within specified tolerances, limits, and other requirements.

**quality assurance program**—specific requirements within a quality system which serves to focus the activities of a fastener organization in pursuit of stated requirements of the quality plan.

**quality assurance system**—manufacturing system for assuring quality that incorporates either a written control plan or

employs other acceptable methods for controlling quality. This may include provisions for prototype development, initial production, and full production including advanced quality planning, continuous improvement, defect prevention, and in-process controls of dimensional, mechanical, and performance characteristics of the fastener.

**quench cracks**—surface discontinuities which usually transverse an irregular or erratic course on the surface of the fastener which may occur because of excessive high thermal or transformation stresses, or both, during fastener heat treatment.

**rack-plating process**—fastener coating process in which individual fasteners are placed on a support called a rack which moves the fasteners together through the process steps while providing ready ingress and egress of processing solutions and rinses. In process steps which utilize an electric current, the rack serves to maintain electrical continuity.

**random sampling**—method of sample selection for fasteners in a lot where each fastener has an equal and independent chance of being selected for the sample.

**raw material manufacturer**—organization which manufactures rod, wire, or bar, used to produce mechanical fasteners, from raw material it manufactures and controls in terms of chemistry and mechanical properties.

**reduced diameter body**—fastener having a body diameter not less than the minimum pitch diameter of its thread nor more than its minimum full body diameter.

**recrystallization**—formation of a new, strain-free grain structure from that which exists in cold worked metal, usually accomplished by heating; the change from one crystal structure to another as occurs on heating or cooling through a critical temperature.

**reduction of area**—difference, expressed as a percentage, of the original cross sectional area of a tensile test specimen at its minimum cross section after fracture.

**referee test method**—a method specified in a standard to be used to settle any disputes concerning measurement of conformance for a given characteristic.

**referenced standards**—those which contain guidelines or nondated requirements germane to one or more elements of the host standard.

**registered quality assurance system**—system that a registration body has found to be in compliance with a designated quality system standard.

**registration**—evaluation of a fastener manufacturing facility’s quality assurance system by an accredited registration body resulting in a certification of full compliance with a designated quality system standard; the registration body shall be accredited by a third party registration accreditation body, for example, ANSI/RAB.

**reinspection**—inspection of a fastener lot that has been sorted, reworked, or reprocessed, or a combination thereof, for the

characteristic(s) originally found nonconforming and also those characteristics that would be affected by reworking or reprocessing operations.

**related standards**—those standards which possess certain relevance to the host standard in terms of understanding its concepts, but do not of necessity specify any mandated requirements.

**relaxation**—a loss of bolt or screw clamp.

*long-term relaxation*—loss of clamp load over a period of time, which is related to transient loads that exceed the initial clamp load or temperature induced creep.

*short-term relaxation*—loss of a portion of a fastener’s clamp load, usually within 24 hours after initial tightening.

*stress-relaxation*—a phenomenon that takes place after a bolt or screw is preloaded and the preload decreases as a function of time. This may be introduced, for example, by a rise in temperature.

**repeatability**—variation in the values of measurement obtained when one operator uses the same gage for measuring identical characteristics of the same parts.

**reprocess**—repeating of a process that has already been conducted on a fastener as part of the standard requirement.

**reproducibility**—variation in average measurements obtained when two or more people measure the same parts or items using the same measuring technique.

**residuals**—measurable elements present in a metal or alloy which were not intentionally added to meet a specification requirement.

**resilience**—tendency of a material to return to its original shape after the removal of a stress.

**responsibility for the fastener**—party responsible for the fastener shall be the organization that supplies the fastener to the purchaser and certifies that the fastener was manufactured, sampled, tested, and inspected in accordance with the specification and meets all of its requirements.

**A563**

**responsible party**—responsible party for the fastener shall be the organization that supplies the fastener to the purchaser and certifies that the fasteners were manufactured, sampled, tested, and inspected in accordance with applicable specifications and meets all of the requirements.

**review**—deliberately critical examination, including observation of plant operation, evaluation of audit results, procedures, certain contemplated actions, and after-the-fact investigations of abnormal conditions.

**rivet**—a headed fastener whose shank is passed through joint plies and the unheaded end is then upset to form a second head while pulling the joint plies together. Rivets may be solid, tubular, or split.

**rod**—produced from hot rolled or cast billets, usually rolled in a multiple strand mill to a round cross section then coiled into one continuous length.

**roll thread**—thread produced by action of a form tool which, when pressed into the surface of a blank, displaces material radially.

**roof and rock bolts**—headed hot-rolled bars with cold-rolled or machine-cut threads at the end to be used with anchorage devices to hold up mine roofs, hold back walls, or hold down equipment or foundations.

**rotational capacity test**—test in which a zinc-coated bolt is inserted in a steel joint or tension measuring device, assembled with a lubricated zinc coated nut, and initially tightened to not less than 10% of the bolt proof load. After initial tightening, the nut is rotated through specified degrees of rotation.

**routine hardness locations**—hardness readings made on prescribed fastener surfaces, such as wrench flats, unthreaded shank, bearing face, etc., after removal of oxide, platings, or other coating materials. Used for testing the hardness of a finished fastener.

**salt spray test**—corrosion test in which the metallic fastener specimens are exposed to a fine mist of salt water solution, either continuously or intermittently.

**scrapping of fasteners**—the process of removing fasteners from commerce or placing the fasteners into a state, condition, or form that renders them unusable.

**screw**—mechanical fastener having basic design characteristics which facilitate its assembly into a tapped hole or to form its own threads during installation.

**screw thread**—helical ridge generally of uniform cross section formed on a cylindrical surface used to facilitate assembly of mechanical components.

**seam**—straight or smooth curved line surface discontinuity running longitudinally on the fastener thread, shank, and head.

**secondary manufacturer**—any entity, including the original manufacturer, that alters the fastener.

**secondary processing**—process that is performed to a fastener in order to add further value, such as drilling, assembly with other fastener components, lubricating, coating, and machining. This product may already be tested (or certified when applicable, or both) in compliance with a given standard.

**shall**—used to denote a mandatory requirement.

**shear burst**—open break in the fastener metal at approximately 45° to the product axis, usually at the periphery of fasteners having flanged or circular heads or on the side of hex heads.

**shear strength**—maximum load applied normally to a fastener’s axis that can be supported prior to fracture. Single shear is load occurring in one transverse plane, thus cutting the fastener into two pieces; double shear is load applied in two planes so that, at fracture, the fastener would be cut into three pieces.

**shear stress area: bolt or screw**—area perpendicular to the fastener axis which is based on the root diameter (minor diameter) of an externally threaded bolt or screw.

**should**—used to denote a recommendation. Not suitable for specification use to denote mandatory requirements.

**signature**—a certification signature may be hand written, a digital or stamped facsimile, or a code that provides traceability to the individual within the organization who is responsible for the accuracy and authenticity of fastener certification content.

**significant surface**—surface area where the minimum thickness to be met shall be designated on the applicable drawing or by the provision of a suitably marked sample. However, if not designated, significant surfaces shall be defined as those normally visible, directly or by reflection, which are essential to the appearance or serviceability of the fastener when assembled in normal position, or which can be the source of corrosion products that deface visible surfaces on the assembled fastener.

**significantly alter**—any action which would change the mechanical or performance capabilities of the fastener following its original manufacture.

**solution treat**—see *annealing, solution annealing*.

**source inspection**—inspection by the purchaser prior to shipment.

**special cause variation**—special cause variation is intermittent, unpredictable and unstable. In control chart analysis, it is signaled by a point beyond the control limits, a run, or some other nonrandom pattern of points within the control limits.

**spherical washers or seats**—washers comprised of two mating washer components: one component is a washer having one flat side and a convex spherical surface on the other side. The other component is a washer having one flat side and a concave spherical depression machined into the other side. The two convex and concave spherical portions are mated and fit together to make up one spherical washer unit.

**spheroidize**—see *annealing, spheroidize annealing*.

**stack up**—a series of plates or other fixtures, inserted in an assembled joint or test fixture to assure there are sufficient threads (typically three to five) between the bolt head bearing surface and the nut, such as when conducting the rotational capacity or fastener tension verification test.

**stainless steel**—steel which has been alloyed with chromium ranging from 10% to less than 30%. Other alloying elements may also be added.

**statistical control**—exists when all special causes of variation have been eliminated from a process and only common causes remain.

**statistical process control**—use of statistical techniques, such as control charts, to analyze a process or its outputs so as to

take appropriate actions to achieve and maintain a state of statistical control and to improve the process capability.

**strain**—deformation produced on a fastener by an outside force.

**strain hardening**—increase in hardness and strength resulting from plastic deformation by cold working.

**strength grade**—system of strength classifications used for bolts, nuts, and screws made to inch standards.

**stress**—force expressed in units per unit of area, which represents resistance that a fastener offers to deformation.

**stress corrosion cracking**—cracking phenomena that occurs when an installed fastener under stress is exposed to a corrosive service environment.

**stress relief annealing**—heating process applied to fasteners having a geometry with a high degree of upset (round head square neck, for example) to relieve mechanical stresses generated during forming.

**structural bolt**—heavy hex head bolt having a controlled thread length intended for use in structural connections and assembly of such structures as buildings and bridges.

**subgroup**—one or more events or measurements used to analyze the performance of a process.

**surface discontinuities**—irregularities that occur prior to or during the manufacturing or processing of the fastener. These may include cracks, head bursts, shear bursts, seams, folds, thread laps, voids, tool marks, and nicks or gouges.

**systematically selected samples**—commonly used technique whereby specimens are chosen for inspection or testing based on stated criteria of a sampling plan, such as occurs during process-control charting, during tooling changes, or at specific timed intervals.

**tempering-temperature-audit test**—means of checking whether a fastener was tempered at its specified temperature.

**tensile strength, fastener**—see *ultimate strength*.

**tension control structural bolt-nut-washer assembly**—assembly that consists of a bolt, nut, and washer capable of developing a minimum predetermined tension that is visually apparent by the separation of the spline end of the bolt from the bolt body during tightening.

**test report**—written document or electronic record, signed by an authorized party, which contains sufficient data and information to verify that the tested fastener properties conform to the particular specification requirements.

**thread galling**—displacement of material between mating threads during tightening which causes interface contact points to shear, producing high friction, increased resistance to tightening, and even seizing of the threads. Thread galling is most prevalent with fasteners made of materials that self-generate an oxide surface film.

**thread lap**—doubling over of metal on the thread which is created during roll threading operations.

**threaded deformed bar**—steel bar that has a continuous hot-rolled pattern of thread-like deformations along its entire length that allows a nut and coupler to thread onto the bar.

**threaded slotted bars**—bars threaded at one end and having a forged, burned, or sawed slot on the other end into which a tapered wedge may be inserted.

**tool marks**—longitudinal or circumferential grooves of shallow depth produced by the movement of manufacturing tools over the bolt, nut, or screw surface.

**torsional strength**—load, usually expressed in terms of applied torque, at which the fastener fails by being twisted off about its axis.

**total case depth**—distance measured perpendicularly from the surface of a hardened case to a point where differences in chemical or physical properties of the case and core no longer can be distinguished.

**toughness**—ability of a fastener to absorb energy and to deform plastically before fracture.

**traceability**—ability to verify the manufacturing history, raw material, heat number, location, or application of an item by means of recorded identification.

**uniform hardness**—is a relative term that relates the difference between core hardness and the surface hardness of a fastener in terms of the number of hardness points. Measurement of hardness uniformity does not determine conformance of hardness to product specifications. Refer to *mid-radius hardness* and *surface hardness*.

**ultimate tensile load**—maximum tensile-applied load or force a fastener can support prior to or coincidental with its fracture, and normally expressed in terms of pounds or Newtons.

**unilateral specifications**—specifications that have only maximum or minimum values.

**user**—see *end user*.

**verification**—act of confirming, substantiating, and assuring that an activity or condition has been implemented in conformance with the specified requirements.

**Vickers hardness test**—standard method for measuring the hardness of metals, particularly those with extremely hard surfaces; the surface is subjected to a standard pressure for a standard length of time by means of a pyramid-shaped diamond. The diagonal of the resulting indentation is measured under a microscope and the Vickers hardness value is then read from a conversion table.

**void**—shallow pocket or hollow on the surface of a fastener because of nonfilling of metal during forging.

**warm forged (warm formed)**—formed by hammering or pressing with material preheated to a level which remains below the recrystallization temperature prior to or during forming or forging.

**warm heading or working**—forming method in which material is heated to a given temperature to improve formability before heading. The temperature used is below the recrystallization point or transformation temperature of the metal being formed.

**washer-retainer crack**—opening in the lip or hub of metal used to retain a washer on a nut.

**weathering steels**—steels having added alloying elements to enhance the resistance to atmospheric corrosion.

**wedge tensile strength**—ultimate strength determined by testing with the use of a wedge with a prescribed angle.

**wedge tensile test**—tensile test performed on various headed fasteners and studs using a wedge of prescribed dimensions and hardness, and in a prescribed manner for the purpose of verifying good head quality or ductility, or both.

**wire**—used extensively in fastener manufacturing. It is produced from hot rolled or annealed rods or bars by cold drawing. Steel sizes range from 0.062 to 1.375 in.

**workmanship**—expected absence of imperfections affecting serviceability of a fastener. Often used to describe a finish free from injurious burrs, seams, laps, or irregular surfaces.

**yield strength**—tension-applied load at which the fastener experiences a specific amount of permanent deformation, that is, the bolt has been stressed beyond its elastic limit and is in the plastic zone. It is very difficult to test full size bolts for yield strength. Because of different strain rates in the threaded section, thread runout and unthreaded shank which together comprise the stressed length, a “proof load” concept was introduced.

**Young’s modulus**—see *modulus of elasticity*.

**zero defects**—term which indicates that no deviation from the requirements of a specification are present within a statistically valid sample drawn from a given fastener lot.

**zinc phosphate**—coating that serves as a vehicle to retain various lubricants on the surface of wire or rod and protects the surfaces of the tool and workpiece against damage during various steps in the cold forming and extrusion process. It is also a coating used for corrosion protection of finished fasteners.

**APPENDIX**
**(Nonmandatory Information)**
**X1. FASTENER TERMS BY CHARACTERISTIC**

X1.1 Mechanical fastener terminology may also be organized by fastener characteristics relating to coatings and finishes, inspection and related documentation, materials and manufacturing/processing, mechanical properties, performance properties, physical properties, product definition, quality assurance, and testing.

*Coatings and Finishes*

Average Coating Thickness  
 Baking Duration  
 Barrel-Plating Process  
 Batch Average Thickness  
 Dry-to-touch  
 Fastener Electroplating  
 Hexavalent Chromium  
 High Temperature Galvanizing  
 Hot Dip Galvanizing  
 Inch Threaded Class 2A Coating Thickness  
 Local Thickness  
 Mechanical Deposition  
 Minimum Local Thickness  
 Organic Coating  
 Passivation  
 Plating  
 Production Lot: Zinc Coating, Hot-Dip  
 Protective Finish  
 Rack-Plating Process  
 Zinc Phosphate

*Inspection and Related Documentation*

Applicable Standards  
 Assembly Lot  
 Certificate of Compliance  
 Certificate of Conformance  
 Certification  
 Control Plan  
 Detection Process  
 Fastener Specification  
 Fastener Standard  
 Inspection  
 Inspection Plan  
 Inspection Test  
 Lot  
 Lot from Blanks  
 Lot Sampling Inspection  
 PPM  
 Prevention Process  
 Process Flow  
 Referenced Standards  
 Reinspection  
 Related Standards  
 Reproducibility  
 Shall  
 Shear Burst  
 Should  
 Signature  
 Special Cause Variation  
 Statistical Control  
 Statistical Process Control  
 Subgroup  
 Unilateral Specifications  
 Void

*Materials and Manufacturing/Processing*

Age Hardened  
 Alloy Group  
 Alloy Steel  
 Alter

Alteration  
 Insignificant Alteration  
 Significant Alteration  
 Annealing  
 Austenitic Stainless Alloys  
 Carbide Precipitation "Sensitization"  
 Carbon Steel  
 Carbon Boron Steel  
 Carburization  
 Case Hardening  
 Check Analysis  
 Cold Forming  
 Cold Heading Quality Material  
 Cold Heading Wire  
 Crack  
 Cut Thread  
 Decarburization  
 Deoxidation  
 Effective Case Depth  
 Elongation  
 Forging Cracks  
 Forming  
 Heat Analysis  
 Heat Control  
 High Temperature Fastener Alloys  
 Hot Forged  
 Hot Forming  
 Hydrogen Embrittlement, Internal  
 Hydrogen Embrittlement Relief  
 In-Process Control  
 Internal Hydrogen Embrittlement  
 Ladle Analysis  
 Liquid Medium  
 Low Carbon Martensite  
 Martensitic Alloys  
 Material Specification  
 Microstructure  
 Nonferrous Alloys  
 Precipitation Hardening Alloys  
 Process Parameters  
 Property Class  
 Quench Cracks  
 Raw Material Manufacturer  
 Recrystallization  
 Reprocess  
 Residuals  
 Rod  
 Roll Thread  
 Seam  
 Secondary Manufacturer  
 Secondary Processing  
 Significantly Alter  
 Solution Treat  
 Spheroidize  
 Stainless Steel  
 Strain Hardening  
 Strength Grade  
 Stress Relief Annealing  
 Total Case Depth  
 Warm Heading or Working  
 Weathering Steels  
 Wire

*Mechanical Properties*

Bilateral Specification  
 Center Hardness  
 Clamp Load  
 Cone Proof Load-Inch Series  
 Cone Proof Load-Metric Series

Fastener Tensile Stress Area  
 Fatigue Strength  
 Fracture  
 Grade Identification Symbols  
 Hardness  
 Impact Strength  
 Maximum Hardness  
 Mechanical Properties  
 Minimum Hardness  
 Modulus of Elasticity  
 Proof Load, Externally Threaded Fastener  
 Proof Load, Internally Threaded Fastener  
 Property Class Symbols  
 Proportional Limit  
 Reduction of Area  
 Shear Strength  
 Strain  
 Stress  
 Tensile Strength, Fastener  
 Toughness  
 Uniform Hardness  
 Ultimate Tensile Load  
 Wedge Tensile Strength  
 Yield Strength  
 Young's Modulus

*Performance Properties*

Bolt Load - Elongation Behavior  
 Break Loose Torque  
 Breakaway Torque  
 Compression Load  
 Drive Torque  
 Corrosion Resistance  
 Ductility of Externally Threaded Fasteners  
 Endurance Limit  
 Environmental Hydrogen Embrittlement  
 Fatigue Limit  
 Heat Resistance  
 High Temperature for Mechanical Fasteners  
 Inspection Torque  
 Locking Ability  
 Performance Properties  
 Plasticity  
 Prevailing Torque  
 Relaxation  
 Stress Corrosion Cracking  
 Thread Galling  
 Torsional Strength

*Physical Properties*

Magnetic Permeability  
 Physical Properties  
 Resilience

*Product Definition*

Anchor Bolt  
 Bar  
 Bendable Bolts  
 Bolt  
 Bolt-Nut-Washer Assembly  
 Chemical Anchors  
 Compressible-Washer-Type Direct Tension Indicator  
 Conical Washer  
 Consensus Standard  
 Dud  
 Eye Bolt  
 Fastener  
 High Strength Bolts  
 High Temperature Bolts  
 Load Indicating Fastener  
 Mechanical Fastener  
 Nominal  
 Nut  
 Part Identifying Number (PIN)  
 Plain Washer  
 Reduced Diameter Body  
 Rivet  
 Roof and Rock Bolts

Screw  
 Screw Thread  
 Shear Stress Area: Bolt or Screw  
 Significant Surface  
 Spherical Washers or Seats  
 Structural Bolt  
 Tension Control Structural Bolt-Nut-Washer Assembly  
 Threaded Deformed Bar  
 Threaded Slotted Bars

*Quality Assurance*

Acceptance Number  
 Burst  
 Certified Quality Assurance System  
 Commingling  
 Common Cause  
 Control Limit  
 Defect  
 Detection System  
 Fastener Quality  
 Fold  
 In-Process Sampling Inspection  
 Machine Process Capability Study  
 Material Lap  
 Material Review  
 Nick  
 Nonconformance  
 Pre-Launch Production Plan  
 Prevention System  
 Production Plan  
 Prototype Plan  
 Qualification (Personal)  
 Quality Assurance  
 Quality Assurance Program  
 Quality Assurance System  
 Random Sampling  
 Registered Quality Assurance System  
 Registration  
 Repeatability  
 Responsibility for the Fastener  
 Responsible Party  
 Review  
 Scrapping of Fasteners  
 Surface Discontinuities  
 Systematically Selected Samples  
 Thread Lap  
 Tool Marks  
 Traceability  
 Verification  
 Washer-Retainer Crack  
 Workmanship  
 Zero Defects

*Supplier/User*

Alteration Distributor  
 Distributor  
 End User  
 Fastener Manufacturer  
 Manufacturer  
 Non-Alteration Distributor  
 Private Label Distributor

*Testing*

Accredited Laboratory  
 Arbitration Hardness Location  
 Bend Test  
 Cone Proof Load Test  
 Destructive Test  
 Drill-Drive Test  
 Drive Test  
 Extensometer  
 Fastener Testing  
 Full Size Specimen  
 Head-to-Shank Integrity  
 Indentation Hardness

Machined Specimen  
Macro-etch Test  
Macrograph  
Macroscopic  
Macrostructure  
Material Test Report  
Metallography  
Plastic Deformation  
Product Analysis

Referee Test Method  
Rotational Capacity Test  
Routine Hardness Locations  
Salt Spray Test  
Stack Up  
Tempering-Temperature-Audit Test  
Test Report  
Vickers Hardness Test  
Wedge Tensile Test

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