

ASME B18.12-2020
(Revision of ASME B18.12-2012)

REAFFIRMED 2025

Glossary of Terms for Mechanical Fasteners

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AN AMERICAN NATIONAL STANDARD



**The American Society of
Mechanical Engineers**

Meishan v. Howmet
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Ex. 1026-001

ASME B18.12-2020
(Revision of ASME B18.12-2012)

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AN AMERICAN NATIONAL STANDARD



**The American Society of
Mechanical Engineers**

Two Park Avenue • New York, NY • 10016 USA

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FOREWORD

Sectional Committee B18 on Dimensional Standardization of Bolts, Nuts, Rivets, Screws, and Similar Fasteners was organized in March 1922 under the procedure of the American Engineering Standards Committee (AESC), with the Society of Automotive Engineers and The American Society of Mechanical Engineers (ASME) as joint sponsors.

Subcommittee 10 on the Glossary of Terms for Mechanical Fasteners was organized in February 1947. The purpose of the subcommittee was to promote and coordinate the standardization of fastener nomenclature for those products falling under the scope of the various other subcommittees of the B18 Sectional Committee, the definitions themselves being the responsibility of the cognizant subcommittee. It was later decided that terms not strictly in the above category but closely allied should be defined in the Glossary.

During the development period, Subcommittee 10 prepared and studied several drafts of the Glossary before agreeing on a suitable format and content.

To cover completely the field of mechanical fasteners, it has been necessary to include in this Standard illustrations of certain fastener features and types of fasteners that are of proprietary origin. Because it was impossible to include all variations of such proprietary designs, this Standard includes selected illustrations that exemplify the type of fastener or feature described. This selection was made on an impartial basis. The inclusion of any one proprietary design in this Standard does not constitute endorsement by the committee or the sponsors, nor is omission of certain styles to be construed as rejection of such styles by the committee and sponsors.

ASA B18.12 was approved by the B18 Sectional Committee, the sponsors, and the AESC, which had changed its name to American Standards Association (ASA). It was designated an American Standard on June 22, 1962.

In May 1995, Subcommittee 12 of the B18 Standards Committee set forth the concept that a complete update and significant revision of the Glossary of Terms was necessary. The content was completely reorganized to reflect a logical approach to basic fastener characteristics and configurations. Many new sections and items, such as blind fasteners and retaining rings, were included. In total, 538 terms were included in the 2001 edition of ASME B18.12-2001, which was approved by American National Standards Institute (ANSI), formerly known as ASA, on August 15, 2001 and revised in 2006.

For the 2012 edition, [para. 3.1.3](#) was revised in its entirety, and [para. 3.1.4](#) was added. It received ANSI approval on January 9, 2012.

In May 2019, Subcommittee 12 of the B18 Standards Committee reviewed the text of this Standard and made minor revisions and changes to bring the language and definitions of the Standard up to date. This edition of ASME B18.12 received ANSI approval on January 6, 2020.

ASME B18 COMMITTEE

Standardization of Bolts, Nuts, Rivets, Screws, Washers, and Similar Fasteners

(The following is the roster of the Committee at the time of approval of this Standard)

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General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions or a case, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B18 Standards Committee
The American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016-5990
<http://go.asme.org/Inquiry>

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Proposing a Case. Cases may be issued to provide alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the Standard and the paragraph, figure, or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the Standard to which the proposed Case applies.

Interpretations. Upon request, the B18 Standards Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B18 Standards Committee.

Requests for interpretation should preferably be submitted through the online Interpretation Submittal Form. The form is accessible at <http://go.asme.org/InterpretationRequest>. Upon submittal of the form, the Inquirer will receive an automatic e-mail confirming receipt.

If the Inquirer is unable to use the online form, he/she may mail the request to the Secretary of the B18 Standards Committee at the above address. The request for an interpretation should be clear and unambiguous. It is further recommended that the Inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry in one or two words.
Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. Please provide a condensed and precise question, composed in such a way that a "yes" or "no" reply is acceptable.
Proposed Reply(ies):	Provide a proposed reply(ies) in the form of "Yes" or "No," with explanation as needed. If entering replies to more than one question, please number the questions and replies.
Background Information:	Provide the Committee with any background information that will assist the Committee in understanding the inquiry. The Inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in the format described above may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

Moreover, ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Standard requirements. If, based on the inquiry information submitted, it is the opinion of the Committee that the Inquirer should seek assistance, the inquiry will be returned with the recommendation that such assistance be obtained.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

Attending Committee Meetings. The B18 Standards Committee regularly holds meetings and/or telephone conferences that are open to the public. Persons wishing to attend any meeting and/or telephone conference should contact the Secretary of the B18 Standards Committee. Future Committee meeting dates and locations can be found on the Committee Page at <http://go.asme.org/B18committee>.

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GLOSSARY OF TERMS FOR MECHANICAL FASTENERS

1 INTRODUCTION

1.1 Scope

This Standard is a summary of mechanical fastener terminology, related characteristics, and manufacture.

(a) *Fastener*. A fastener is a mechanical device designed specifically to hold, join, couple, assemble, or maintain equilibrium of single or multiple components. The resulting assembly may function dynamically or statically as a primary or secondary component of a mechanism or structure. Fasteners are used in just about every mechanical assembly, and they have been designed to meet the needs of products ranging from wristwatches to the space shuttle. Each fastener is produced with the degree of built-in precision and engineering capability needed to ensure adequate, sound service under preestablished environmental conditions.

(b) *Bolts, Studs, Screws, Nuts, Washers, Rivets, Pins, and Custom-Formed Parts*. These are the general product families used to classify mechanical fasteners. Within each product family are numerous fasteners whose names either conform to the technical language of a national standard or relate to their original applications, e.g., "stove bolt" or "carriage bolt." The names given to fasteners appear to be as limitless as the imaginations of their designers. While many fasteners may look alike, each has defined engineered capabilities based upon its intended application.

(c) *Primary Operations*. Mechanical fasteners are produced by forming or screw machine operations.

(1) Forming may produce thousands of fasteners per minute with looser tolerance (depending on the size and configuration of the fastener) and typically creates minimal scrap.

(2) Screw machining is significantly slower and typically produces tighter tolerance but has a higher risk of creating scrap.

(d) *Secondary Operations*. Fasteners typically undergo several secondary operations or processes, such as thread rolling, heat treating, or plating.

1.2 Referenced Documents

The developers of this Standard wrote a number of terms based on the language found in more than 230 standards and other publications of the following organizations:

(a) The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016-5990 (www.asme.org)

(b) American Society for Testing and Materials (ASTM International), 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 (www.astm.org)

(c) Industrial Fasteners Institute (IFI), 6363 Oak Tree Boulevard, Independence, OH 44131 (www.indfast.org)

(d) Research Council on Structural Connections (RCSC), c/o AISC, One East Wacker Drive, Suite 700, Chicago, IL 60601 (www.boltcouncil.org)

(e) Society of Automotive Engineers (SAE International), 400 Commonwealth Drive, Warrendale, PA 15096 (www.sae.org)

2 TERMINOLOGY

2.1 Basic Fastener Terminology

2.1.1 Commercial Fastener

commercial fastener: a fastener manufactured to published consensus standards and stocked by manufacturers and distributors.

2.1.2 Compression Fastener

compression fastener: a fastener whose primary function is to resist compressive forces.

2.1.3 Endurance Limit or Endurance Strength

endurance limit or endurance strength: the maximum alternating stress that a fastener can withstand for a specified number of stress cycles without failure.

2.1.4 Headed Fastener

headed fastener: a fastener that is enlarged or formed at one end.

2.1.5 Headless Fastener

headless fastener: a fastener, either threaded or unthreaded, that is not enlarged at either end.

2.1.6 High-Strength Fastener

high-strength fastener: a fastener whose high tensile and shear strengths are attained through a combination of materials, work-hardening, and heat treatment. These fasteners usually have a tensile strength in excess of 120,000 psi.

2.1.7 Lock Pin and Collar

lock pin and collar: a headed and externally grooved mechanical device designed for insertion through holes in assembled parts. A cylindrical collar is swaged into the external groove as the lock pin is hydraulically tensioned. Collars either are smooth bored or contain a fit-tab. An optional flange provides a built-in washer.

2.1.8 Mechanical Properties

mechanical properties: the properties of a fastener in reaction to applied loads. The mechanical properties of the fastener are rarely those of the raw material from which it was made. Properties such as tensile and yield strengths, hardness, and ductility will vary widely depending on the choice of manufacturing methods and metallurgical treatments.

2.1.9 Modified Standard

modified standard: a standard part that has one or more of its features or characteristics slightly changed. Such a part is typically customized to a customer's specs for a particular application, but the change is such that any interested manufacturer can produce the modified part.

2.1.10 Nonstandard Fastener or Special Fastener

nonstandard fastener or special fastener: a fastener that differs in size, length, configuration, material, or finish from established and published standards.

2.1.11 Physical Properties

physical properties: inherent properties in the raw material that remain unchanged or undergo only slight alteration in the fastener following manufacture. These properties may include density, thermal conductivity, and magnetic susceptibility.

2.1.12 Part Identifying Number (PIN)

Part Identifying Number (PIN): a 21-character code that identifies an ASME B18-manufactured product by specific characteristic fields, such as fastener family identification, ASME B18 standard identification, fastener style or type, thread series, nominal diameter, nominal length or dimensional/other characteristics, material and treatment, plating, coating, passivation, and special features relevant to the fastener product.

2.1.13 Precision Fastener

precision fastener: a fastener manufactured to close dimensional and geometric tolerances.

2.1.14 Proof Load

proof load: the tensile load that a fastener must support without evidence of permanent deformation. Proof load is an absolute value, not a maximum or minimum value. 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 loads are frequently used as design values in joint analysis and fastener selection.

2.1.15 Proof Test

proof test: a form of tensile test in which the maximum load applied is the proof load value in the applicable specification.

2.1.16 Fastener Quality

fastener quality: the accuracy of manufacture of a fastener in conformance to specified tolerances, limits, and requirements.

2.1.17 Aircraft/Aerospace Fastener

aircraft/aerospace fastener: a fastener intended for use in a vehicle that travels through air.

2.1.18 Fit

fit: the amount of clearance or interference between mating parts.

2.1.19 Shear Fastener

shear fastener: a fastener whose primary function is to resist forces applied at a right angle to the fastener axis that tend to shear it.

2.1.20 Standard Fastener

standard fastener: a fastener that can be described from nationally recognized consensus standards and may be produced by any interested manufacturing facility.

For example, an order that specifies 1/2-13 UNC-2A Hex Cap Screws, SAE J429 Grade 5, should result in the exact product being delivered by any fastener manufacturer accepting the order. It is often said that a standard fastener could be ordered by phone and the identical product received from multiple sources.

All other fasteners are classified as SPECIAL or NONSTANDARD and may fall into the following groups:

- (a) modified standard
- (b) proprietary — patented
- (c) engineered special parts

Generally, these require a written description and/or blueprint or drawing to communicate exactly what is required.

2.1.21 Stock Fastener

stock fastener: a fastener commercially available in quantity from a manufacturer or distributor of fasteners.

2.1.22 Substandard Fastener

substandard fastener: a fastener that does not meet specified requirements related to fit, form, or function.

2.1.23 Tensile Strength

tensile strength: the maximum tension-applied load a fastener can support prior to or coincident with its fracture. Tensile strength is normally expressed in terms of stress, i.e., pound-force per square inch (psi) (U.S. Customary) or megapascals (MPa) (SI).

2.1.24 Tension Fastener

tension fastener: a fastener whose primary function is to resist forces that tend to elongate it.

2.1.25 Threaded Fastener

threaded fastener: a fastener whose design includes a portion of some form of screw thread.

2.1.26 Wedge Tensile Test

wedge tensile test: a test for studs. A wedge under either the head of a bolt or screw or a nut is subjected to a tension-applied load to induce a bending stress, which shows the ductility and integrity of the head-to-shank junction.

2.1.27 Yield Strength

yield strength: the tension-applied load at which the fastener experiences a specific amount of permanent deformation (i.e., the bolt is 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 stressed length, which includes the threaded section, thread runout, and unthreaded shank. A proof load test is the recommended method for checking full-size bolts.

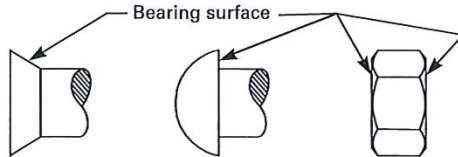
2.1.28 Torque

Torque: the tendency of a force to rotate an object about its axis. The magnitude of the torque is the applied force multiplied by the distance from the rotational axis (often referred to as the lever arm). Since there is a relationship between torque and tension, torque is often used to achieve a desired axial load (preload) in a fastener. It is typically expressed in foot-pounds (ft-lb) and inch-pounds (in.-lb) (U.S. Customary) or newton-meters (N m) (SI).

2.2 Fastener Characteristics (Excluding Head Styles)

2.2.1 Bearing Face

bearing face: the load-carrying surface. Examples include the underside of a bolt head, the washer face on a nut, and the surface of a fastener that is in contact with the joint surface.

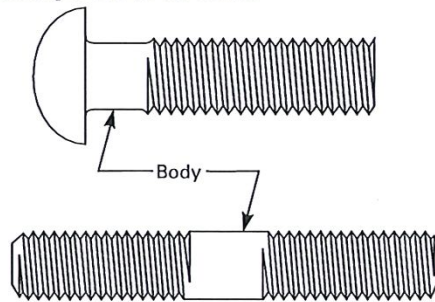


2.2.2 Blank

blank: a portion of material cut off before the first stage of forming. [See also *blank* (para. 2.5.1).]

2.2.3 Body, Threaded Fastener

body, threaded fastener: the unthreaded portion of the shank.

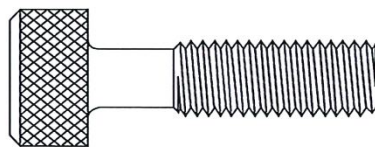


2.2.3.1 Bound Body (Body-Bound or Fitted)

bound body (body-bound or fitted): a bolt that has a definite interference or extremely small clearance with its mating hole.

2.2.3.2 Externally Relieved Body

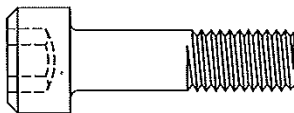
externally relieved body: a body whose diameter in whole or part is reduced to less than the minimum pitch diameter of the thread.



Externally Relieved Body

2.2.3.3 Full or Nominal Diameter Body

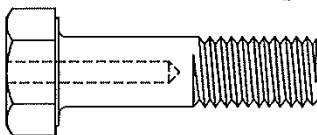
full or nominal diameter body: a body whose diameter is generally within the dimensional limits of the major diameter of the thread. Sometimes referred to as “full-size body.”



Full or Nominal Diameter Body

2.2.3.4 Internally Relieved Body

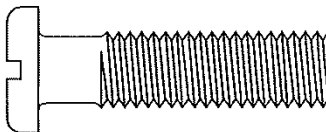
internally relieved body: a fastener that has an axial hole drilled through a portion of the body.



Internally Relieved Body

2.2.3.5 Reduced Diameter Body (Also Known as Reduced Shank)

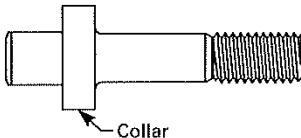
reduced diameter body (also known as reduced shank): a body whose diameter may range from the minimum pitch diameter of the thread up to but not exceeding the minimum full-size body diameter.



Reduced Diameter Body

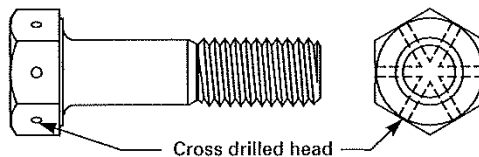
2.2.4 Collar

collar: a raised ring or flange of material on the head or shank of a fastener.



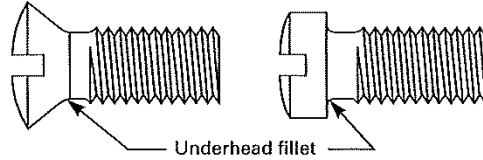
2.2.5 Cross Drilled

cross drilled: a fastener that has one or more holes drilled in the head or shank at right angles to, and normally intersecting, the axis of the fastener.



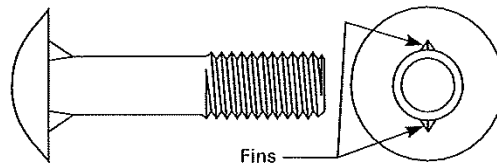
2.2.6 Under Head Fillet or Fillet Radius

under head fillet or fillet radius: the radiused section at the junction of the head and shank of a headed fastener.



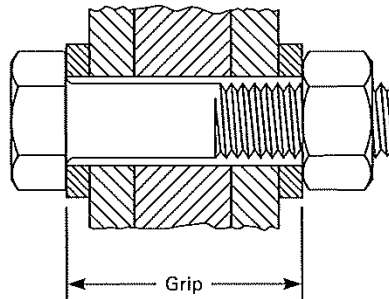
2.2.7 Fin

fin: a form of key under the head of a fastener that serves to keep the fastener from turning during assembly and use.



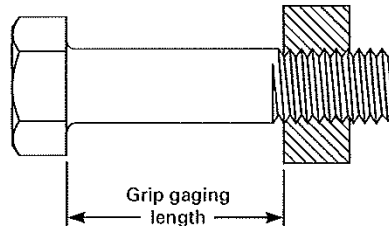
2.2.8 Grip

grip: the thickness of the material or parts that the fastener is designed to secure when assembled. The term is typically associated with structural bolting.



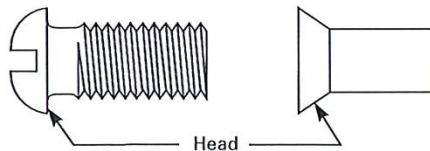
2.2.9 Grip Gaging Length

grip gaging length: the distance, measured parallel to the axis of a bolt or screw, from the under head bearing surface to the face of the appropriate noncounterbored or noncountersunk GO thread ring gage that is assembled by hand as far as the thread will permit.



2.2.10 Head

head: the enlarged shape on one end of a fastener. The shape may be upset or trimmed and is always dimensionally larger than the nominal fastener diameter.

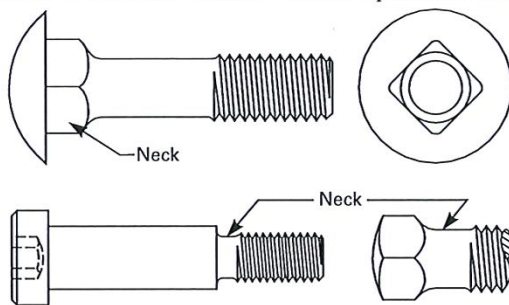


2.2.11 Neck

neck:

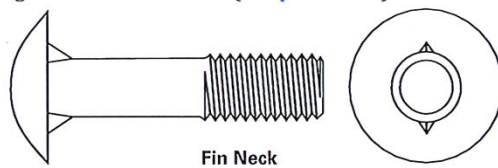
(a) a specialized form of a portion of the body of a fastener near the head that performs a definite function, e.g., preventing rotation.

(b) a reduced diameter of a portion of the shank of a fastener that is required for manufacturing or application reasons.



2.2.11.1 Fin Neck

fin neck: a style of neck consisting of two or more fins (see para. 2.2.7) under and integral with the head.



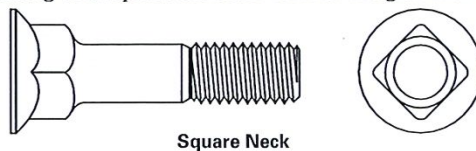
2.2.11.2 Ribbed Neck

ribbed neck: a style of neck consisting of longitudinal ribs around the shank adjacent to the underside of the head.



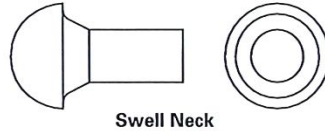
2.2.11.3 Square Neck

square neck: a style of neck consisting of a square shoulder formed integral with the underside of the head.

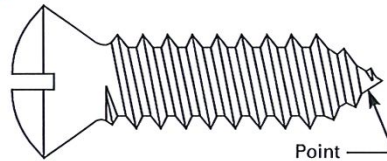


2.2.11.4 Swell Neck

swell neck: a tapered or variable neck.

**2.2.12 Point**

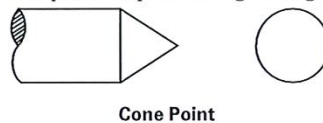
point: a conical or cylindrical configuration of the end of the shank of a headed fastener or of each end of a headless fastener. Depending on point style and manufacturing equipment, the point may be formed (header point), extruded (dog point), or machined (cup screw point). Points applicable to set screws and tapping screws are described and illustrated under the respective screw types in [para. 3.1.2](#).

**2.2.12.1 Chamfer Point**

chamfer point: a truncated cone point, the end of which is approximately flat and perpendicular to the fastener axis. These points on threaded fasteners generally have point-included angles of 45 deg to 90 deg and a point diameter equal to or slightly less than the minor diameter of the thread. This point is intended to facilitate entry of fasteners into holes at assembly and protect the lead thread from damage during handling.

**2.2.12.2 Cone Point**

cone point: a sharp conical point designed to perform perforating or aligning functions at assembly.

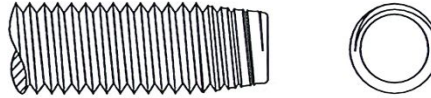
**2.2.12.3 Gimlet Point**

gimlet point: a threaded cone point that usually has a point angle of 45 deg to 50 deg. It is used on thread-forming screws such as Type AB tapping screws, wood screws, lag bolts, etc.

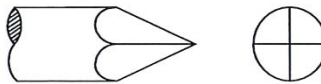


2.2.12.4 Header Point

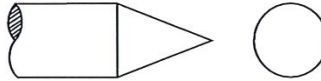
header point: a chamfered point normally produced during heading when the screw blank is chamfered before threads are rolled.

**Header Point****2.2.12.5 Nail Point**

nail point: a sharp pyramidal point, with a typical point angle of 30 deg to 45 deg, that is produced by a pinching operation. It is designed for piercing wood or other resilient materials.

**Nail Point****2.2.12.6 Needle Point**

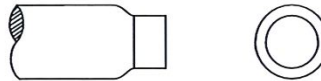
needle point: a cone point of long length intended to perform a piercing function.

**Needle Point****2.2.12.7 Oval Point**

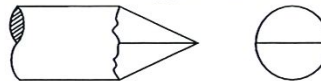
oval point: a radiused point. Sometimes referred to as "crowned end" or "round point."

**Oval Point****2.2.12.8 Pilot Point**

pilot point: a cylindrical point that has a diameter somewhat smaller than the shank diameter. It is designed to facilitate the alignment and starting of fasteners such as drive screws and groove pins into holes at assembly. [See also *full dog point* (para. 3.1.2.18.3).]

**Pilot Point****2.2.12.9 Pinch Point**

pinch point: a short, sharp cone point, with a typical point angle of 45 deg, formed by a pinching operation. This point is usually limited to diameters of $\frac{1}{4}$ in. or smaller and is applied to metal drive screws and Type BP tapping screws.

**Pinch Point**

2.2.12.10 Plain Point

plain point: the unpointed end of a fastener cut approximately flat and perpendicular to the fastener axis. These points on threaded fasteners may be slightly concave, especially when threads are rolled.



Plain Point

2.2.12.11 Spherical Point

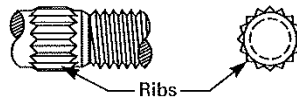
spherical point: an oval point in which the point radius is equal to half the shank diameter.



Spherical Point

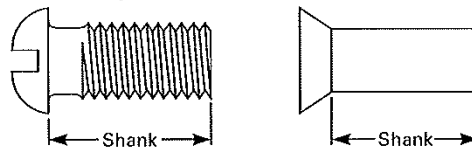
2.2.13 Ribs

ribs: small ridges of material usually formed longitudinally around the shank. Sometimes referred to as “serrations” or “knurls.”



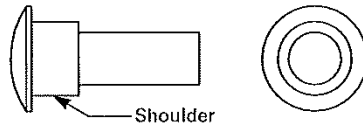
2.2.14 Shank

shank: the portion of a headed fastener that lies between the head and the extreme point end. In some non-ASME standards, the shank is only the unthreaded portion.



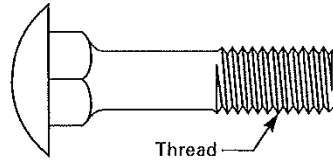
2.2.15 Shoulder

shoulder: an enlarged portion of the body of a threaded fastener or shank of an unthreaded fastener.



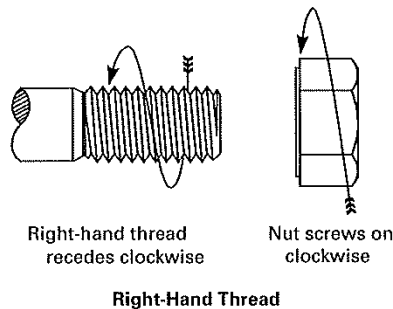
2.2.16 Thread

thread: a ridge of uniform section in the form of a helix on the external or internal surface of a cylinder. This is known as a straight or parallel thread to distinguish it from a taper thread, which is formed on a cone or frustum of a cone.



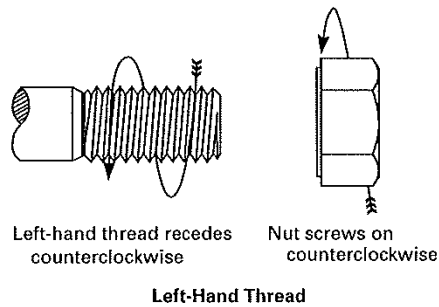
2.2.16.1 Right-Hand Thread

right-hand thread: a thread that, when viewed axially, winds in a clockwise and receding direction. All threads are right-hand threads unless otherwise designated.



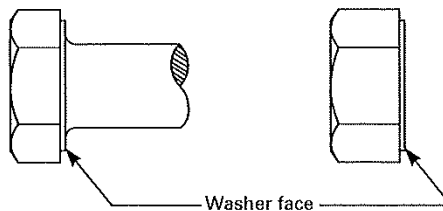
2.2.16.2 Left-Hand Thread

left-hand thread: a thread that, when viewed axially, winds in a counterclockwise and receding direction. All left-hand threads are designated LH.



2.2.17 Washer Face

washer face: a circular boss on the bearing surface of a screw or nut. The only bolt that has a washer face is the heavy hex structural bolt.

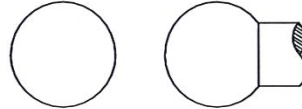


2.3 Fastener Head Styles

2.3.1 Threaded Fasteners. Refer to [Table 2.3.1-1](#) for a list of common applications of threaded fastener head styles.

2.3.1.1 Ball Head

ball head: a head that is approximately spherical in shape.



Ball Head

2.3.1.2 Binding Head

binding head: a head that has a rounded top surface, slightly tapered side surface, and flat bearing surface, a portion of which is sometimes undercut adjacent to the shank.



Binding Head

2.3.1.3 Button Head

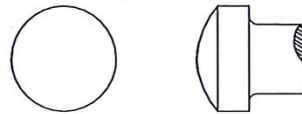
button head: a threaded fastener that has a low-rounded top surface with a large, flat bearing surface. [See also *truss head* ([para. 2.3.1.28](#)).]



Button Head

2.3.1.4 Fillister Head

fillister head: a head that has a rounded top surface, cylindrical side surface, and flat bearing surface.



Fillister Head

2.3.1.5 Flat Fillister Head

flat fillister head: a head that has a flat top surface, cylindrical side surface, and flat bearing surface.



Flat Fillister Head

Table 2.3.1-1 Common Applications of Threaded Fastener Head Styles

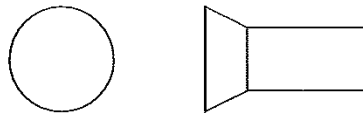
Head Style	Bolts	Machine Screws	Tapping Screws	Wood Screws	Cap Screws	Set Screws	Drive Screws	
							Metal	Wood
Ball head	...	X	...	A	...	...	...	...
Binding head	...	AB	...	...	...	...	...	...
Button head	X	...	...	...	...	D	...	...
Fillister head	...	ABC	ABC	...	A	...	...	...
Flat fillister head	...	A	...	...	...	...	...	...
Flat head, 82 deg	...	ABC	ABC	ABC	AD	...	X	AX
Flat head, 90 deg	...	ABS	ABS	...	...	...	...	...
Flat head, 100 deg	...	AB	...	...	...	...	...	...
Flat trim head	...	B	B	...	...	...	...	...
Flat undercut head	...	AB	AB	...	...	...	...	...
Headless	...	...	...	...	...	ADE	...	...
Hexagon head	AX	AX	AX	...	X	...	...	...
Hexagon washer head	AX	AX	AX	...	...	...	...	...
Oval head	...	ABC	ABC	ABC	A	...	...	AX
Oval trim head	...	B	B	...	...	...	...	...
Oval undercut head	...	AB	AB	...	...	...	...	...
Pan head	...	ABC	ABC	...	...	...	X	...
Round countersunk head	X	...	...	...	...	...	...	...
Round head	...	AB	AB	AB	A	...	X	AX
Round washer head	...	AB	AB	...	...	...	...	...
Socket head	...	...	...	...	DE	...	...	...
Square countersunk head	X	...	...	...	...	...	...	...
Square head	X	...	...	...	...	X	...	...
T-head	X	...	...	...	...	...	...	...
Truss head	...	ABC	ABC	...	...	...	...	...
12-point flange head	...	X	...	...	X	...	...	...
12-spline head	...	...	...	...	X	...	...	...

GENERAL NOTE: The types of head are designated as follows:

- A = slotted
- B = cross recessed
- C = clutch recessed
- D = hexagon socket
- E = spline socket
- S = square recessed
- X = plain, no slot or recess

2.3.1.6 Countersunk Head

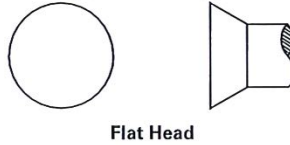
countersunk head: a head designed to be flush with the surface when installed.



Countersunk Head

2.3.1.7 Flat Head

flat head: a head that has a flat top surface and a conical bearing surface with various nominal head angles (82 deg, 90 deg, and 100 deg). [See also *round countersunk head* (para. 2.3.1.20).]



Flat Head

2.3.1.8 Flat Trim Head

flat trim head: a head that has a smaller head diameter and lower head height than the standard flat head.



Flat Trim Head

2.3.1.9 Flat Undercut Head

flat undercut head: basically the standard flat head except that it is undercut to 70% of the basic head height.



Flat Undercut Head

2.3.1.10 Headless

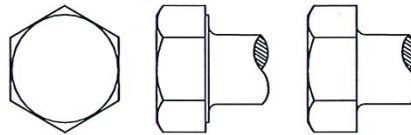
headless: a head that typically has a slot, recess, or socket in one end.



Headless

2.3.1.11 Hexagon Head

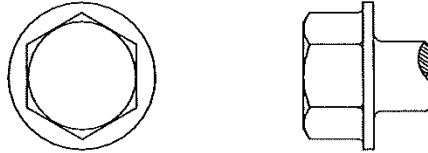
hexagon head: a head that has a flat or indented top surface, six flat sides, and a flat bearing surface or washer face.



Hexagon Head

2.3.1.12 Hexagon Washer Head

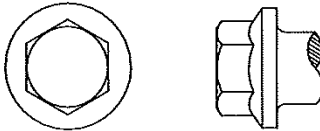
hexagon washer head: a hexagonally shaped head with an integral formed washer at the base of the hexagon. The washer diameter may be equal to or greater than the width across corners of the hexagon.



Hexagon Washer Head

2.3.1.13 Hexagon Flange Head

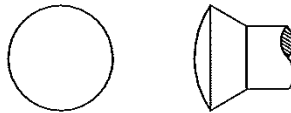
hexagon flange head: a hexagonally shaped head with an integral circular collar connected to the base of the hexagon by a conic section. The flanged diameter is normally larger than the width across corners of the hexagon.



Hexagon Flange Head

2.3.1.14 Oval Head

oval head: a head that has a rounded top surface and a conical bearing surface with a nominal head angle of 82 deg [90 deg (SI)].



Oval Head

2.3.1.15 Oval Trim Head

oval trim head: an oval head that has a smaller head diameter and lower head height than the standard oval head and a controlled radius at the junction of the top and the conical bearing surface.



Oval Trim Head

2.3.1.16 Oval Undercut Head

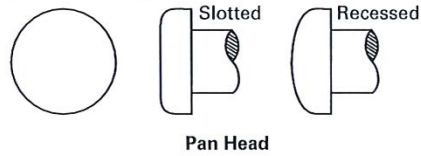
oval undercut head: the same basic head as the standard oval head except that it is shorter. The screw head is undercut to 70% of the basic head side height to afford a greater length of thread.



Oval Undercut Head

2.3.1.17 Pan Head

pan head: a head that has a flat bearing surface and a flat top surface rounding into a cylindrical side surface. On recessed pan heads, the top surface is semielliptic, rounding into a cylindrical side surface.

**Pan Head****2.3.1.18 Recessed Head**

recessed head: a head that has a designed indentation or recess centered in its top surface to facilitate installation/driving.

2.3.1.19 Reduced or Shear Head

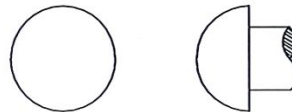
reduced or shear head: a fastener head designed primarily for shear application loading that has a head height less than the standard head height for fasteners designed for full axial tension.

2.3.1.20 Round Countersunk Head

round countersunk head: a circular head that has a flat top surface and a conical bearing surface. [See also *flat head* (paras. 2.3.1.7 and 2.3.2.8).]

**Round Countersunk Head****2.3.1.21 Round Head**

round head: a head that has a semielliptic top surface and a flat bearing surface. This term also applies to a fastener head designed without a driving surface or recess.

**Round Head****2.3.1.22 Round Washer Head**

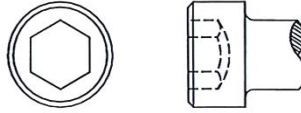
round washer head: a washer head that has a round head formed on top. [See also *washer head* (para. 2.3.1.31).]

**Round Washer Head****2.3.1.23 Slotted Head**

slotted head: a head that has a slot centered across its top surface to facilitate driving.

2.3.1.24 Socket Head

socket head: a head that has a flat chamfered top surface with a smooth or knurled cylindrical side surface and a flat bearing surface. A hexagon or spline (formerly known as “fluted”) socket is formed in the center of the top surface.



Socket Head

2.3.1.25 Square Countersunk Head

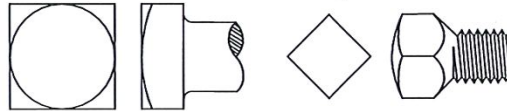
square countersunk head: a square head that has a flat top surface and a pyramidal bearing surface.



Square Countersunk Head

2.3.1.26 Square Head

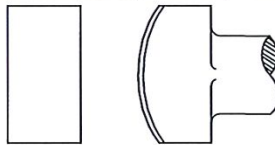
square head: a head that has a flat top surface, four flat sides, and a flat bearing surface. A square head on a set screw has a rounded top surface and may have an under head construction tapered or radiused directly into the threads.



Square Head

2.3.1.27 T-Head

T-head: a rectangular-shaped head that has a rounded top surface, flat sides, and a flat bearing surface.



T-Head

2.3.1.28 Truss Head

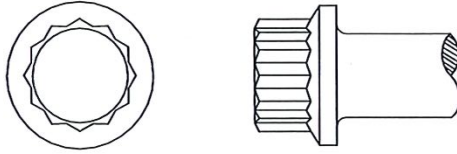
truss head: a head that has a low rounded top surface and a flat bearing surface. For a given screw size, the diameter of the truss head is larger than the diameter of the corresponding round head. Sometimes referred to as “oven head” or “stove head.” [See also *button head* (para. 2.3.1.3).]



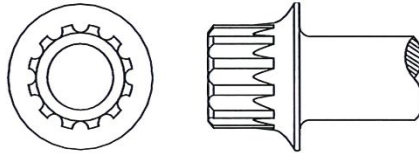
Truss Head

2.3.1.29 12-Point Flange Head

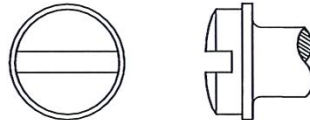
12-point flange head: a head that has a flat or indented top surface, 24 flats (double hex), and an integral formed circular collar connected to the base of the double hex by a conic section. Sometimes referred to as "double hexagon head."

**12-Point Flange Head****2.3.1.30 12-Spline Head**

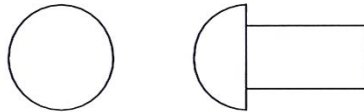
12-spline head: a head that has 12 splines centered at 30-deg increments around the outer circumference of the head, parallel to the axis of the screw or bolt.

**12-Spline Head****2.3.1.31 Washer Head**

washer head: a head that has a circular collar with a large flat bearing surface upon which various other head styles are integrally superimposed.

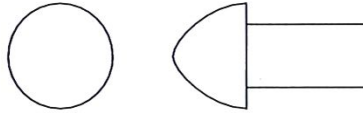
**Washer Head****2.3.2 Nonthreaded Fasteners****2.3.2.1 Button Head**

button head: a circular head that has a hemispherical top surface and a flat bearing surface. Sometimes referred to as "round head" (see [para. 2.3.1.21](#)).

**Button Head**

2.3.2.2 High Button Head

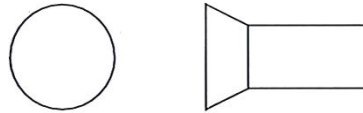
high button head: a circular head that has a high semielliptic (acorn-shaped) top surface and a flat bearing surface. Sometimes referred to as “acorn head.”

**High Button Head****2.3.2.3 Cone Head**

cone head: a high conical head with a small, flat, truncated top and a flat bearing surface.

**Cone Head****2.3.2.4 Countersunk Head**

countersunk head: a circular head that has a flat top surface and a conical bearing surface with head angles that vary with the rivet type.

**Countersunk Head****2.3.2.5 Flat Top Countersunk Head**

flat top countersunk head: the head designation used for large rivets. [See also *countersunk head* (para. 2.3.2.4).]

2.3.2.6 Flat Top Countersunk Head (With Chamfered Top)

flat top countersunk head (with chamfered top): similar to a flat top countersunk head but with a chamfered top.

**Flat Top Countersunk Head
(With Chamfered Top)****2.3.2.7 Round Top Countersunk Head**

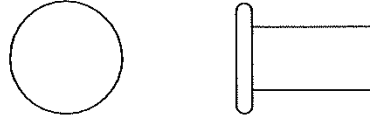
round top countersunk head: a circular head that has a rounded top surface and a conical bearing surface with a head angle of 78 deg. This is a designation used for large rivets.

**Round Top Countersunk Head**

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2.3.2.8 Flat Head

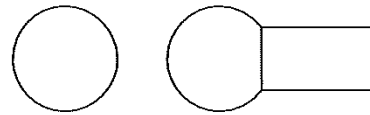
flat head: a low cylindrical head having a flat top, rounded side surface, and flat bearing surface.



Flat Head

2.3.2.9 Globe Head

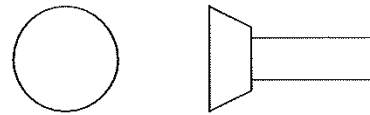
globe head: a head approximately spherical in shape.



Globe Head

2.3.2.10 Machine Head

machine head: a high, inverted conical head with a large, flat top; tapered side surface; and small, flat bearing surface.



Machine Head

2.3.2.11 Oval Head

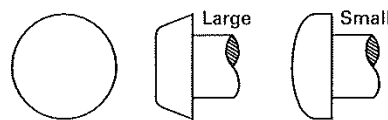
oval head: a circular head that has a low-rounded top surface and a flat bearing surface. For a given size, the oval head is thinner than the button head but thicker than the truss head.



Oval Head

2.3.2.12 Pan Head

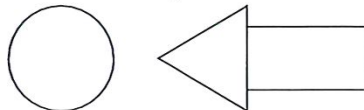
pan head: a large rivet that has a low conical head with a flat top and a flat bearing surface. The pan head on small rivets has a semielliptic top surface and a flat bearing surface.



Pan Head

2.3.2.13 Steeple Head

steeple head: a sharp conical head that has a flat bearing surface.



Steeple Head

2.3.2.14 Truss (Wagon Box) Head

truss (wagon box) head: a large circular head that has a low-rounded top surface and a flat bearing surface.



Truss (Wagon Box) Head

2.4 Dimensional Terms and Size

The following terms are commonly used in designating the size and dimension of fasteners and their various components.

2.4.1 Actual Size

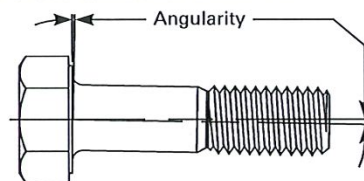
actual size: the measured size of a given fastener characteristic.

2.4.2 Allowance

allowance: an intentional difference between the maximum material limits of mating parts. It is the minimum clearance (positive allowance) or maximum interference (negative allowance) between such parts. [See also *fit* ([para. 2.4.12](#)).]

2.4.3 Angularity

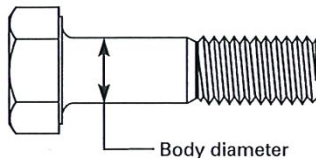
angularity: the angle between the axes of two surfaces of a fastener.

**2.4.4 Basic Size**

basic size: the size from which the limits of size are derived by the application of allowances and tolerances.

2.4.5 Body Diameter

body diameter: the diameter of the body of a threaded fastener. This is also referred to as "shank diameter" (see [para. 2.4.37](#)).



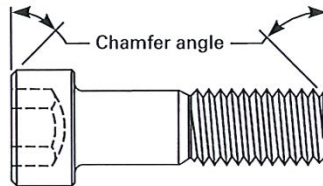
2.4.6 Bow or Camber

bow or camber: the amount that a side of a surface of a fastener deviates from being straight.



2.4.7 Chamfer Angle

chamfer angle: the angle of the chamfer measured from the normal to the axis of the fastener. It is generally specified in conjunction with either a length or a diameter.



2.4.8 Concentric, Concentricity

concentric, concentricity: two surfaces of a fastener that have a common center or axis are concentric. "Concentricity" is the term used to describe this condition.

2.4.9 Countersink

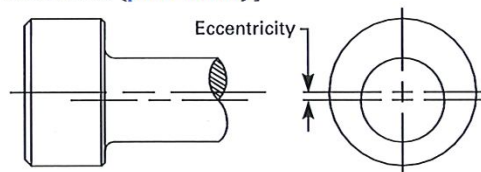
countersink: an internal chamfer.

2.4.10 Design Size

design size: the size from which the limits of size are derived by the application of tolerances. When there is no allowance, the design size is the same as the basic size.

2.4.11 Eccentric, Eccentricity

eccentric, eccentricity: two surfaces of a fastener that do not have the same center or axis are eccentric. The amount by which the centers or axes are displaced from each other is called "eccentricity." This is not to be confused with full indicator movement (FIM). [See also *runout* (para. 2.4.36).]



2.4.12 Fit

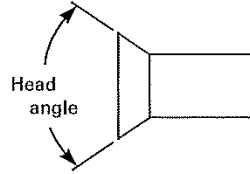
fit: the general term used to signify the range of tightness that may result from the application of a specific combination of allowances and tolerances in the design of mating parts.

2.4.12.1 Actual Fit

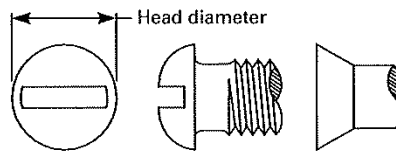
actual fit: the relation between two mating parts with respect to the amount of clearance or interference that is present when they are assembled.

2.4.13 Head Angle

head angle: the included angle of the bearing surface of the head.

**2.4.14 Head Diameter**

head diameter: the diameter at the largest periphery of the head.

**2.4.15 Head Eccentricity**

head eccentricity: the amount that the head of a fastener is eccentric with the fastener body or shank.

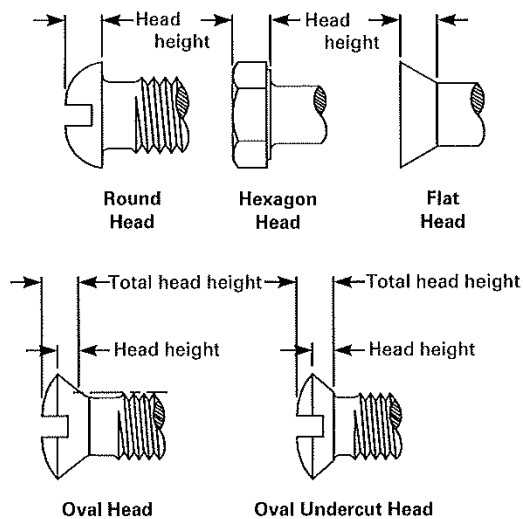
2.4.16 Head Height

head height:

(a) for a conical bearing surface head, the overall distance, measured in a line parallel to the fastener axis, from the extreme top to the intersection of the bearing surface with the extended thread major diameter cylinder on a threaded fastener or with the shank on an unthreaded fastener.

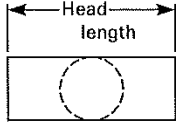
(b) for a flat bearing surface head, the overall distance, measured parallel to the fastener axis, from the extreme top to the bearing surface.

(c) for flat and oval undercut heads, the distance measured to the intersection of the bearing surface with the undercut. For oval heads and oval undercut heads, the overall distance is referred to as total head height.



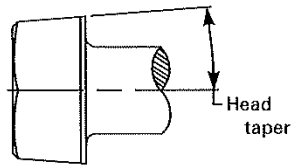
2.4.17 Head Length

head length: the distance along the longest axis of a rectangular or irregularly shaped head, measured in a plane perpendicular to the axis of the fastener.



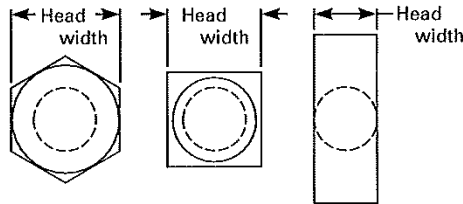
2.4.18 Head Taper

head taper: the angle formed by the side or sides of the head and the axis of the fastener. This is not applicable to conventional countersunk heads and should not be confused with head angle.



2.4.19 Head Width

head width: the distance across opposite flats of hexagon, square, or 12-point heads measured in a plane perpendicular to the fastener axis. For rectangular or irregularly shaped heads, the head width is the distance along the narrowest axis of the head measured in a like manner.

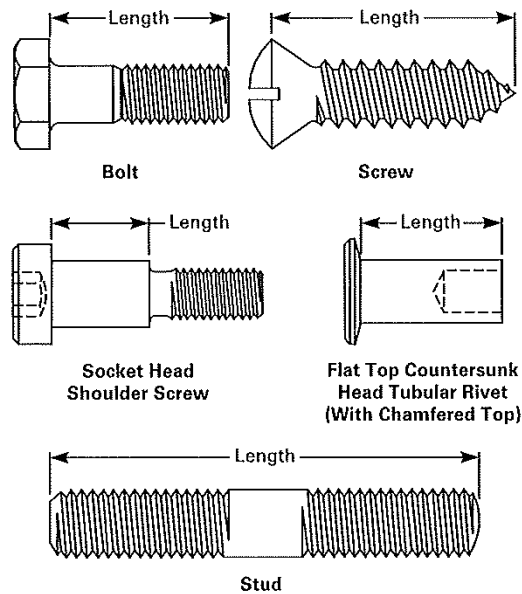


2.4.20 Length

length: the distance from the intersection of the largest diameter of the head with the bearing surface to the extreme point, measured in a line parallel to the axis of the fastener.

Exceptions are as follows:

- (a) The length of shoulder and socket head shoulder screws is the length of the shoulder.
- (b) The length of a flat top countersunk head tubular rivet (with chamfered top) is measured from the intersection of the bearing surface with the shank diameter to the extreme point.
- (c) The length of a headless fastener is the distance from one extreme point to the other, measured in a line parallel to the axis of the fastener.



2.4.21 Length of Thread Engagement

length of thread engagement: the distance between the extreme points of contact on the pitch cylinders or cones for two mating threads, measured parallel to the axis.

2.4.22 Limits of Size

limits of size: the applicable maximum and minimum sizes. Sometimes referred to as "limits."

2.4.23 Maximum Material Condition (MMC)

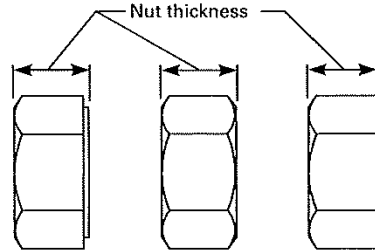
maximum material condition (MMC): the maximum amount of material permitted by the tolerance shown for any particular feature of a fastener.

2.4.24 Nominal Size

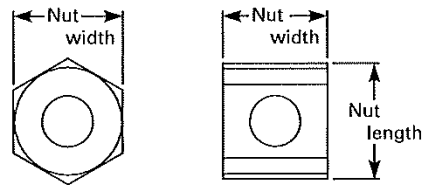
nominal size: the designation used for the purpose of general identification.

2.4.25 Nut Thickness

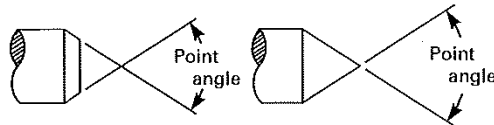
nut thickness: the overall distance from the top of the nut to the bearing surface, measured parallel to the axis of the nut.

**2.4.26 Nut Width and Length**

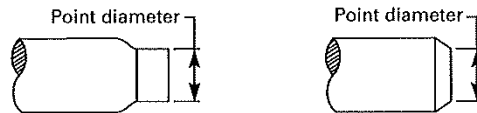
nut width and length: the distance across opposite flats of hexagon, square, or 12-point nuts. See the following illustration for width and length of rectangular nuts.

**2.4.27 Point Angle**

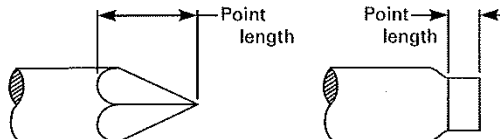
point angle: the included angle of the point.

**2.4.28 Point Diameter**

point diameter: the diameter of the point measured at the extreme end of the fastener. It may sometimes be designated "chamfer diameter" or "pilot diameter" on respective point types.

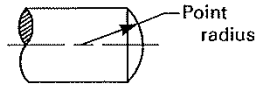
**2.4.29 Point Length**

point length: the length of the pointed portion of the fastener, measured parallel to the axis of the fastener from the extreme end. It may sometimes be designated "chamfer length" or "pilot length" on respective point types.



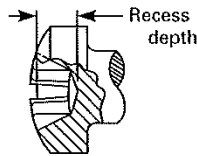
2.4.30 Point Radius

point radius: the spherical radius on an oval or spherical point.



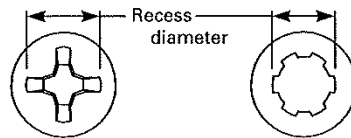
2.4.31 Recess Depth

recess depth: the distance, measured parallel to the fastener axis, from the intersection of the head surface with the maximum diameter of the recess to the bottom of the recess.



2.4.32 Recess Diameter

recess diameter: the diameter, measured in a plane perpendicular to the fastener axis, over the intersection of the outermost extremities of the recess with the head surface.

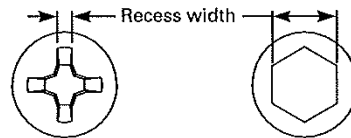


2.4.33 Recess Eccentricity

recess eccentricity: the amount that a recess in a recessed head is eccentric with the shank of the fastener.

2.4.34 Recess Width

recess width: the distance, measured in a plane perpendicular to the fastener axis, across the intersection of the sides or wings of the recess with the head surface.



2.4.35 Reference Dimension

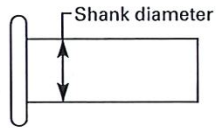
reference dimension: a dimension on a fastener without tolerance that is used for informational purposes only.

2.4.36 Runout

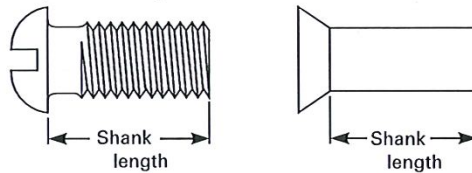
runout: the amount that the outside surface of one component of a fastener runs out with respect to the outside surface of another component. The term is frequently used interchangeably with eccentricity, but "runout" includes angularity and bow as well as eccentricity. The amount of runout is usually expressed in terms of FIM.

2.4.37 Shank Diameter

shank diameter: the diameter of the shank of an unthreaded fastener. The diameter of the unthreaded portion of a threaded shank is termed the "body diameter." [See also *body diameter* (para. 2.4.5).]

**2.4.38 Shank Length**

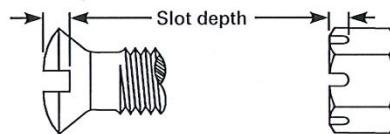
shank length: the length of the shank, measured parallel to the axis of the fastener.

**2.4.39 Slot Depth**

slot depth:

(a) for a headed fastener, the distance, measured parallel to the fastener axis, from the highest part of the head to the intersection of the bottom of the slot with the head or bearing surface.

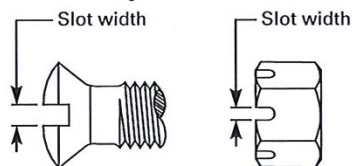
(b) for a nut or headless fastener, the distance, measured parallel to the fastener axis, from the top surface to the extreme bottom of the slot.

**2.4.40 Slot Eccentricity**

slot eccentricity: the amount that a slot in a slotted head is eccentric with the body of the fastener.

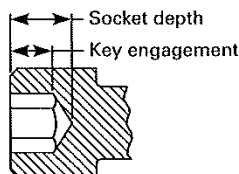
2.4.41 Slot Width

slot width: the distance, measured in a plane perpendicular to the fastener axis, over the intersection of the sides of the slot with the head surface of a headed fastener or the top surface of a nut.



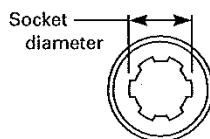
2.4.42 Socket Depth

socket depth: the distance, measured parallel to the fastener axis, from the intersection of the socket with the head surface to the extreme end of the socket. In socket head screws, the effective socket depth is often specified as “key engagement,” which is the distance from the intersection of the socket with the head surface to that depth to which the key or wrench will penetrate, measured in a like manner.



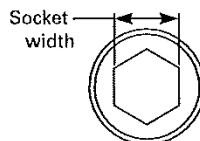
2.4.43 Socket Diameter

socket diameter: the diameter, measured in a plane perpendicular to the fastener axis, over the intersection of the outermost extremities of the socket with the head surface.



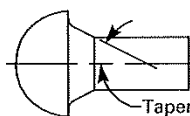
2.4.44 Socket Width

socket width: the distance, measured in a plane perpendicular to the fastener axis, over the intersection of opposite sides of the socket with the head surface.



2.4.45 Taper

taper: the angle between one side and the axis of the fastener. Taper may refer to head, shank, or some other feature of a fastener.



2.4.46 Thread Lengths

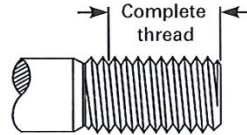
2.4.46.1 Complete Thread

complete thread: the length of that cross section of a threaded length having full form at both crest and root. Where there is a chamfer at the start of the thread not exceeding two pitches in length, it is included within the length of the complete thread. The thread length shall be the gaging length or the length of threads having full form (i.e., the partial threads shall be outside or beyond the length specified).

When designing threaded products, it is necessary to be aware of

- (a) permissible length of chamfer
- (b) the first two threads, which by virtue of HI-LO gaging practice may be included within the length of complete thread

However, if the application requires a minimum or maximum number or length of complete threads, the specification shall so state. Similar specification is required for definite length of engagement.



2.4.46.2 Effective Thread

effective thread: the complete thread and that portion of the incomplete thread that has fully formed roots but not fully formed crests. Sometimes referred to as “useful thread.”

2.4.46.3 Incomplete Thread

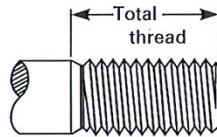
incomplete thread: that portion at the end of straight threads whose roots are not fully formed by the lead or chamfer on threading tools. The crest at the end of taper threads also may not be fully formed due to the intersection of the major cone of an external thread or the minor cone of an internal thread with the cylindrical surface of the work. Sometimes referred to as “vanish” or “washout thread.”

2.4.46.4 Thread Runout

thread runout: see *runout* (para. 2.4.36).

2.4.46.5 Total Thread

total thread: the complete or effective thread and the incomplete thread.



2.4.47 Tolerance

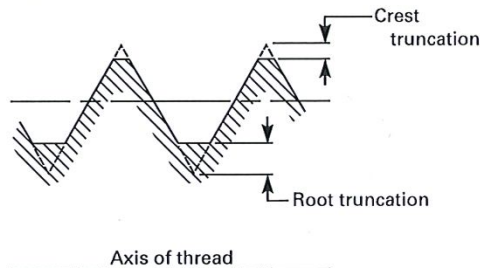
tolerance: the total permissible variation of a size. The tolerance is the difference between the limits of size.

2.4.48 Truncate, Truncation

truncate, truncation: to truncate is to cut off the apex. “Truncation” is the axial or centerline length by which the apex is cut off.

2.4.48.1 Crest Truncation

crest truncation: the distance, measured perpendicular to the axis, between the sharp crest (or crest apex) and the cylinder or cone that bounds the crest.

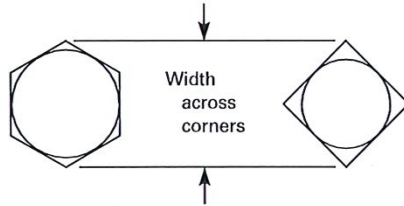


2.4.48.2 Root Truncation

root truncation: the distance, measured perpendicular to the axis, between the sharp root (or root apex) and the cylinder or cone that bounds the root.

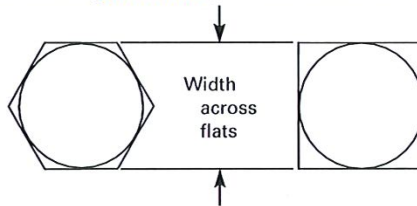
2.4.49 Width Across Corners

width across corners: for hex-, square-, or rectangular-shaped fastener heads, the distance, measured perpendicular to the fastener axis, from the intersection of two sides to the intersection of the two opposite sides.



2.4.50 Width Across Flats

width across flats: the distance measured, perpendicular to the fastener axis, across opposite sides of hex- or square-shaped fastener heads. [See also *head width* (para. 2.4.19) and *nut width and length* (para. 2.4.26).]



2.5 Terms Relating to the Manufacture of Fasteners

2.5.1 Blank

blank: the length of wire or rod sheared off as it enters a header to which machine pressures will be subsequently applied to form a part. [See also *blank* (para. 2.2.2).]

2.5.2 Bolt Maker

bolt maker: a specialized type of transfer header that forms the head on a blank and may trim the head to a required shape, point the end, or roll a thread. [See also *cold forming* (para. 2.5.9) and *transfer header* (para. 2.5.37).]

2.5.3 Broaching

broaching: the process of removing metal by pushing or pulling a cutting tool along the surface.

2.5.4 Burnishing

burnishing: the process of producing a smooth surface by rubbing or rolling a tool against the surface.

2.5.5 Burr

burr: a small amount of material extending out from the edge of a hole, shoulder, etc. as the result of a machining or forming operation.

2.5.6 Chip

chip: a small fragment of metal removed from a surface by cutting with a tool.

2.5.7 Coining

coining: a process of forming metal by forcing it to flow while confined within closed dies.

2.5.8 Cold Header

cold header: a horizontal machine that is supplied with wire or rod at room temperature and then produces parts in a continuous manner by applying machine pressure to cause the metal to flow and form a given configuration. Machines used in this process are classified by the number of blows they deliver to each workpiece and the types of dies used to hold and shape the blank.

2.5.9 Cold Forming (Cold Heading)

cold forming (cold heading): a process performed at room temperature that includes heading, upsetting, extrusion, forging, etc. in a cold header, bolt maker, or parts former.

2.5.10 Cold Working Fillets

cold working fillets: the application of machine pressures to compress the outer metal fibers in the fillet. This process will improve fatigue strength.

2.5.11 Counterboring

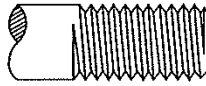
counterboring: the process of enlarging a previously formed hole for part of its depth and providing a shoulder at the bottom of the enlarged hole. Special tools called counterbores are typically used for this operation.

2.5.12 Countersinking

countersinking: the process of beveling or flaring the end of a hole. Holes in which countersunk head-type fasteners will be used must be countersunk to provide a mating bearing surface.

2.5.13 Cut Thread

cut thread: a thread produced by removing material from the surface with a form-cutting tool.



Cut Thread

2.5.14 Drilling

drilling: the process of forming holes by means of specialized cutting tools called drills.

2.5.15 Embossing

embossing: the process of raising a boss or protuberance on the surface.

2.5.16 Extruding

extruding: the process of reducing the size of some feature or diameter by forcing it through a die.

2.5.17 Facing

facing: the machining of the end, flat face, or shoulder of a fastener.

2.5.18 Flash

flash: the thin fin of metal along the sides or around the edges of a forged or upset section. It is caused by the flow of metal between the edges of the forging dies.

2.5.19 Forging

forging: the process of forming a product by hammering or pressing. When the material is forged below the recrystallization temperature, it is said to be cold forged. When it is worked above the recrystallization temperature, the material is said to be hot forged.

2.5.20 Grinding

grinding: the process of removing material from the surface by the cutting action of a bonded abrasive wheel.

2.5.21 Ground Thread

ground thread: a thread finished on the flanks by a grinding operation.

2.5.22 Header

header: a specialized form of horizontal press.

2.5.23 Heading

heading: a manufacturing process that uses a header. This process may or may not involve upsetting or extruding. A part made from wire below the recrystallization temperature is said to be cold headed, and a part made from wire above the recrystallization temperature is said to be hot headed.

2.5.24 Knurling

knurling: the process of producing a roughened surface by means of a specialized forming tool called a knurl.

2.5.25 Machining

machining: the process of forming the surface by cutting away material.

2.5.26 Milled From the Bar

milled from the bar: fasteners machined from bar stock on a lathe, screw machine, etc.

2.5.27 Nut Former

nut former: a transfer-type header that in successive steps makes a square or hexagon nut with a hole ready for threading.

2.5.28 Pointing

pointing: a secondary machining operation that consists of cutting points on fastener blanks that were not pointed during the heading operation.

2.5.29 Polishing

polishing: the process of producing a smooth surface by rubbing with fine abrasive wheels, belts, or compounds.

2.5.30 Punching

punching: the process of trimming or removing material with dies in a press.

2.5.31 Rolled Thread

rolled thread: a thread produced by the action of a form tool that, when pressed into the surface of a blank, displaces material radially.



Rolled Thread

2.5.32 Scale

scale: an oxide of iron that sometimes forms on the surfaces of hot headed or forged fasteners.

2.5.33 Shaving

shaving: a cutting operation in which thin layers of material are removed from the outer surfaces of the product.

2.5.34 Shot Peening

shot peening: a cold working process in which the surface of a part is bombarded with small spherical media called shot.

2.5.35 Sliver

sliver: an irregularly shaped piece of metal clinging loosely to the finished fastener.

2.5.36 Slotting

slotting: the process of forming or cutting the slot on the head of a fastener during either the primary or the secondary operation.

2.5.37 Transfer Header

transfer header: a multiple (usually three or four) solid die cold header with a separate heading hammer for each die. The blank is transferred automatically between blows.

2.5.38 Trimming

trimming: the process of shaping or sizing by forcing a part through a die of desired shape and size.

2.5.39 Tumbling

tumbling: the process of cleaning or abrading parts in a rotating container, either with or without cleaning or abrasive materials.

2.5.40 Upsetting

upsetting: the process of increasing the cross-sectional area by displacement of material longitudinally and radially.

2.5.41 Warm Forming

warm forming: an operation carried out below the critical temperature that does not alter a metal's properties. The range of temperature is typically from 200°F to 1,000°F (93°C to 538°C). This process is used for metals that work harden severely.

2.6 Fastener Performance Terminology

2.6.1 Cone Proof Load

cone proof load: the load applied axially, using a conical washer (defined in ASTM F606 and ASTM F606M) and threaded mandrel, that a nut must withstand without evidence of thread stripping or wall rupture.

2.6.2 Ductility

ductility: the ability of a fastener to deform prior to fracture.

2.6.3 Fatigue Strength

fatigue strength: the maximum load a fastener can withstand for a specified number of repeated applications before its failure.

2.6.4 Hardness

hardness: a measure of the fastener material's ability to resist abrasion, indentation, and a tension-applied load.

2.6.5 Proof Load

proof load: the tension-applied load that the fastener must support without evidence of permanent deformation.

2.6.6 Shear Strength

shear strength: the maximum load applied normal to a fastener's axis that can be supported prior to fracture.

2.6.7 Tensile Strength

tensile strength: the maximum tension-applied load a fastener can support prior to or coincident with its fracture.

2.6.8 Torsional Strength

torsional strength: the measure of a fastener's resistance to a load, usually expressed in terms of applied torque, at which the fastener fails by being twisted apart about its axis.

2.6.9 Toughness

toughness: the fastener's ability to sustain impact and shock loading. Usually stated as impact strength.

2.6.10 Yield Strength

yield strength: the tension-applied load at which the fastener experiences a specific amount of permanent deformation.

2.7 Terms Relating to Material and Heat Treatment of Fasteners

2.7.1 Alloy Steel

alloy steel: a steel to which elements other than carbon have been added to obtain definite mechanical or physical properties, such as higher strength at elevated temperatures, toughness, etc.

2.7.2 Annealed

annealed: the state of a fastener achieved by heating the fastener at a given temperature for a given time and cooling it at a given rate to make it soft (i.e., free of hardness caused by working or previous heat treatment).

2.7.3 Carbon Steel

carbon steel: a steel that does not contain substantial amounts of any alloying material other than carbon.

2.7.4 Case Hardened

case hardened: a fastener of ferrous material whose surface has been made harder than its core. [See also *surface heat treatment* (para. 2.8.20) and *surface treatment* (para. 2.8.21).]

2.7.5 Cold Heading Stock

cold heading stock: material produced under closely controlled manufacturing and inspection methods to be suitable for heading and free from those defects that cause fractures during heading.

2.7.6 Decarburized

decarburized: the surface of a fastener that has a carbon content lower than the carbon content of the core.

2.7.7 Grains

grains: individual crystals of a material.

2.7.8 Inclusions

inclusions: particles of nonmetallic impurities contained in material.

2.7.9 Laps

laps: longitudinal surface defects caused by fins or sharp corners folding over into the surface of the material.

2.7.10 Pits

pits: sharp depressions on the surface of a raw material or fastener.

2.7.11 Screw Stock

screw stock: metal in the form of wire or rod that is used for making screw machine parts. It is usually of a free machining type of material.

2.7.12 Soft

soft: the condition of a fastener that, although made from a material that can be — and normally is — hardened by heat treatment, has been left in the as-fabricated temper.

2.7.13 Stainless Steel

stainless steel: a corrosion-resistant type of alloy steel that contains a minimum of 12% chromium.

2.7.14 Strain Hardening

strain hardening: the increase in hardness, and hence strength, that results from plastic deformation at a temperature below the recrystallization range. Sometimes referred to as “work hardening.”

2.7.15 Temper

temper: the state of a metal or alloy whose structure and mechanical properties have been manipulated by temperature. Temper varies from the annealed temper (soft) to spring temper.

2.7.16 Toughness

toughness: the ability of a material to absorb considerable energy without fracturing.

2.7.17 Voids

voids: internal fissures in ferrous materials. Sometimes referred to as "chrome checks," "fish eyes," "shatter cracks," or "snowflakes."

2.7.18 Work Hardening

work hardening: see *strain hardening* (para. 2.7.14).

2.8 Coatings and Finish Terminology

The following terms are commonly used in designating the various finishes applied to fasteners.

2.8.1 Anodizing

anodizing: the use of an anodic treatment to form an oxide film on a surface. This is commonly used on aluminum.

2.8.2 Black Oxide

black oxide: a black finish on a fastener produced by immersing it in hot oxidizing salts or salt solutions.

2.8.3 Coating

coating: the application of some material (e.g., a metal, organic compound, etc.) to the surface of a fastener.

2.8.4 Chromate Treatment

chromate treatment: the use of a hexavalent chromium compound solution to produce a conversion coating on a fastener.

2.8.5 Dichromate Treatment

dichromate treatment: the use of a hot sodium dichromate solution at a specified temperature to produce a chromate conversion coating on a fastener.

2.8.6 Dry Film Lubricant

dry film lubricant: a dry solid substance that is applied to a fastener surface to reduce friction or wear between the fastener and its mating surfaces. Natural dry film lubricants include graphite and molybdenum disulfide.

2.8.7 Electrogalvanizing

electrogalvanizing: the process of coating metal with zinc by electroplating.

2.8.8 Electroplating

electroplating: the process of electrodepositing a metal or alloy on a fastener serving as a cathode.

2.8.9 Finish

finish: the condition of the surface of a fastener as a result of chemical or organic treatment subsequent to fabrication. The term "finish" is also applied to some types of fasteners to indicate the condition of the surface as a result of mechanical operations and the degree of precision.

2.8.10 Flash Plating

flash plating: the deposit of a very thin layer of metal, whose thickness is in the range of 0.00005 in. to 0.00015 in (0.000127 cm to 0.000381 cm).

2.8.11 Galvanizing

galvanizing: the process of coating metal with zinc by hot-dipping or an immersion process. Sometimes referred to as "hot-dip galvanizing."

2.8.12 Mechanical Plating

mechanical plating: a process where fine metal powders are peened onto a fastener by tumbling or other mechanical means.

2.8.13 Oiled

oiled: a suitable corrosion-retarding oil has been applied to a fastener.

2.8.14 Organic Compound

organic compound: a coating based on organic binders applied to fasteners for decorative, protective, or functional purposes. The terms “organic coating” and “paint” are essentially interchangeable.

2.8.15 Passivating

passivating: the process of dissolving ferrous particles and surface impurities from stainless steel by chemical means (normally a nitric acid dip) to improve the corrosion resistance of the surface.

2.8.16 Phosphate Coating

phosphate coating: the treatment of a metal with a dilute solution of phosphoric acid and other chemicals to produce a base layer of crystalline phosphate. The three principal types of phosphate coatings are zinc, iron, and manganese phosphate.

2.8.17 Pickling

pickling: the process of removing surface oxides or impurities by chemical or electrochemical means.

2.8.18 Plain

plain: the surface of a fastener that has been oiled but has had no supplementary surface treatment (e.g., plating, coating, etc.).

2.8.19 Plating

plating: the application of a metallic deposit other than oil to the surface of a fastener by electrolysis, coating, etc.

2.8.19.1 Plating Build-Up

plating build-up: the deposit of more plating on edges or corners than on other surfaces of a fastener.

2.8.20 Surface Heat Treatment

surface heat treatment: a process that improves the hardness or other mechanical properties of a fastener in any surface area. Surface heat treatment and case hardened (see [para. 2.7.4](#)) are special forms of surface treatment (see [para. 2.8.21](#)).

2.8.21 Surface Treatment

surface treatment: any treatment that changes the chemical, physical, or mechanical properties of a surface. [See also *case hardened* ([para. 2.7.4](#)) and *surface heat treatment* ([para. 2.8.20](#)).]

2.9 Quality Assurance Including Inspection Terminology**2.9.1 Acceptable Quality Level (AQL)**

acceptable quality level (AQL): the maximum percentage of defects that, for purposes of sampling inspection, are considered satisfactory as a process average.

2.9.2 Applicable Characteristics

applicable characteristics: all characteristics of a fastener that are described by engineering drawings and related standards and/or specifications.

2.9.3 Control Plan

control plan: a written plan that outlines the fastener manufacturing process and its control points to provide an orderly documented procedure for controlling and minimizing process and product variation. Typically, the control plan identifies actions at each phase of the manufacturing process, including receiving, in-process manufacturing, and outgoing operations. Continuing versus periodic requirements are identified, and strategies are provided for continued updating and improvement.

2.9.4 Designated Characteristic

designated characteristic: one that requires specific inspection, testing, and/or other specific attention by the customer.

2.9.5 Dud

dud: an incomplete, mutilated, or foreign part.

2.9.6 In-Process Inspection

in-process inspection: inspection at each machine or processing station to verify conformance to a specification and/or standard of the characteristics imparted by that machine or process.

2.9.7 Inspection Level

inspection level: the relative importance assigned to a given fastener characteristic based on the sample size used for inspection of that characteristic for a given lot size.

2.9.8 Lot

lot: a group of fasteners with the same geometry/configuration and made of the same heat of material processed together at the same time.

2.9.9 Lot Number

lot number: a unique designator assigned by a fastener manufacturer to a lot that identifies the number of pieces, processing and forming operations, raw material, heat number, and plant and date of manufacture.

2.9.10 Major Characteristic

major characteristic: one that materially affects the usability of the fastener for its intended application.

2.9.11 Major Defect

major defect: a defect that could produce a failure or materially reduce or eliminate the usability of the fastener for its intended application.

2.9.12 Minor Characteristic

minor characteristic: one that does not materially affect the usability of the fastener for its intended application.

2.9.13 Minor Defect

minor defect: one that does not materially reduce the usability of the fastener.

2.9.14 Quality

quality: the suitability of a fastener for its intended application as established by the accuracy of manufacture within specified tolerances, limits, and other requirements.

2.9.15 Quality Assurance

quality assurance: the selection and application of an inspection plan to establish the acceptability of a lot of fasteners.

2.9.16 Source

source: the manufacturer or private label distributor of a fastener.

2.9.17 Third Party Accreditation

third party accreditation: certification of a quality system by a third party using independent audits under the provisions of a fastener accreditation plan published by a consensus standards organization.

2.9.18 Zero Acceptance

zero acceptance: a finding of zero defects within a statistically valid sample that has been inspected for a given lot.

2.10 Packaging

2.10.1 Blister Pack

blister pack: a preformed hard plastic shell configured to contain hardware items fixed to a backing card.

2.10.2 Bulk Packing

bulk packing: a predetermined quantity of uniformly processed fasteners placed into a single container of corrugated or plastic material that is properly sealed and labeled for marketing.

2.10.3 Carton

carton: a small container, usually made of cardboard, that holds a predetermined number of uniformly processed fasteners and is sealed and labeled for marketing purposes.

2.10.4 Case

case: a container, usually made of cardboard, of a predetermined size in which cartons of fasteners are stacked in logical fashion with little or no void that is sealed and labeled for marketing purposes.

2.10.5 $\frac{1}{4}$ keg

$\frac{1}{4}$ *keg*: a standard industry bulk container with inside dimensions of 9 in. x 9 in. x $6\frac{5}{8}$ in. yielding 535 in.³ of volume for packing uniformly processed fasteners that is sealed and labeled for marketing.

2.10.6 Package

package:

- (a) the act or process of packing fasteners that are prepared for storage or shipment
- (b) a unit of a product uniformly processed, wrapped or sealed in a container, and labeled for marketing
- (c) that in which anything is packed
- (d) a box, case, carton, etc. in which fasteners are packed

2.10.7 Packaged Goods

packaged goods: a predetermined number of uniformly processed fasteners placed in cartons and/or cases that are sealed and labeled for marketing purposes.

2.10.8 Poly Bag

poly bag: flexible plastic material formed in a bag shape to contain specific fastener parts. This bag is normally heat sealed.

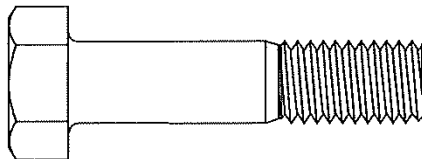
3 PRODUCT FAMILIES

3.1 Externally Threaded Products

3.1.1 Bolts

3.1.1.1 Bolt

bolt: an externally threaded product designed for insertion through a hole in an assembly to mate with a nut and usually intended to be tightened or released by turning that nut. The only bolt that has a washer face is the heavy hex structural bolt.



Bolt

3.1.1.2 Anchor Bolt

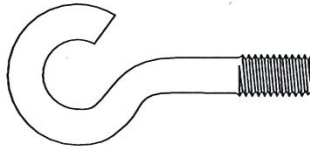
anchor bolt: a bar or rod, one end of which is threaded, designed to fasten objects to concrete. The other end is bent or welded to an attachment that expands or enlarges the bolt's embedded contact with the concrete. This distributes loading stress transmitted from the threaded end, which projects above the concrete and to which structural members are attached.

3.1.1.3 Bent Bolt

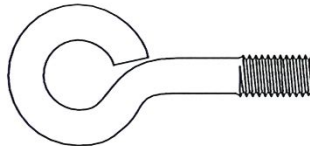
bent bolt: a bolt formed from a cylindrical rod that has one or both ends threaded and bent into configurations called “U,” “eye,” “hook,” or “J.”

3.1.1.3.1 Eyebolt

eyebolt: a bolt that has a closed or open anchor ring for its head and threads only on its straight shank. [See also *eyebolt* (para. 3.1.1.11).]



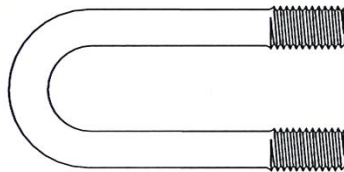
Eyebolt, Open Anchor Ring



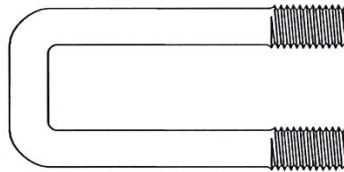
Eyebolt, Closed Anchor Ring

3.1.1.3.2 U-Bolt

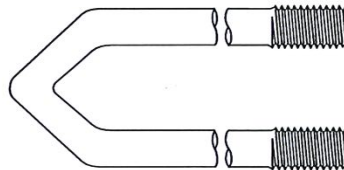
U-bolt: a bolt that has a round, square, or Vee bend and threads on both ends of its shanks.



U-Bolt, Round Bend



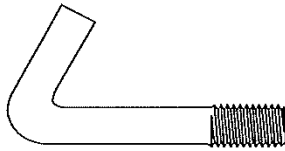
U-Bolt, Square Bend



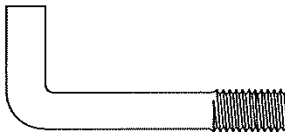
U-Bolt, Vee Bend

3.1.1.3.3 Hook Bolt

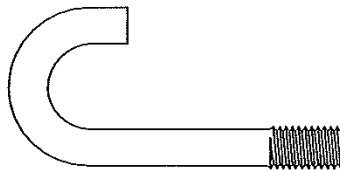
hook bolt: a bolt that may have a round, square, right angle, or acute angle bend and threads only on one end of the unbent shank.



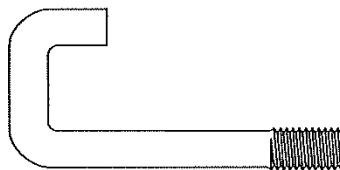
Hook Bolt, Acute Angle Bend



Hook Bolt, Right Angle Bend



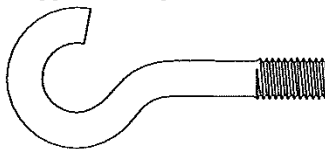
Hook Bolt, Round Bend



Hook Bolt, Square Bend

3.1.1.3.4 J-Bolt

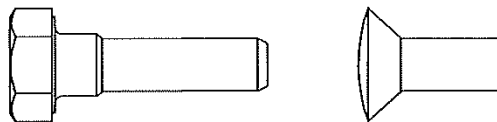
J-bolt: a bolt that has an offset round bend approximating a semicircle and threads on the straight shank.



J-Bolt, Offset Round Bend

3.1.1.4 Bolt Blank or Screw Blank

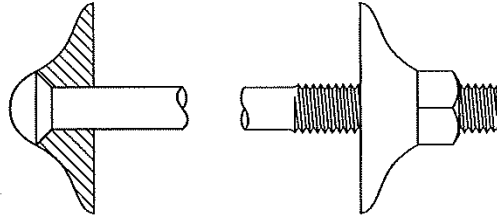
bolt blank or screw blank: a rod or bar that has a head configuration formed but no threads and is intended to be cut off as necessary and threaded at a time other than that of the initial forming operation.



Bolt Blank or Screw Blank

3.1.1.5 Building Roof/Bridge Bolt

building roof/bridge bolt: a bolt used to provide a watertight seal on building roofs. It features a specialized washer that is extruded during tightening to form a watertight joint.



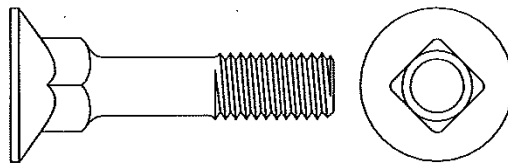
Building Roof/Bridge Bolt

3.1.1.6 Carriage Bolt

carriage bolt: a bolt that has a circular, oval, or flat head with a square, fin, or ribbed neck designed to prevent rotation during tightening.

3.1.1.6.1 Countersunk Head Square Neck Bolt

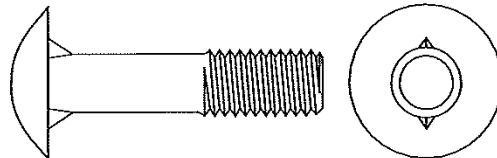
countersunk head square neck bolt: a bolt that has a flat top, a conical bearing surface, and a square shoulder under the head.



Countersunk Head Square Neck Bolt

3.1.1.6.2 Round Head Fin Neck Bolt

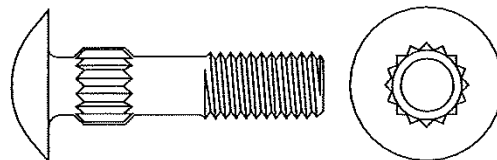
round head fin neck bolt: a bolt that has two fins, 180 deg apart, under the head.



Round Head Fin Neck Bolt

3.1.1.6.3 Round Head Ribbed Neck Bolt

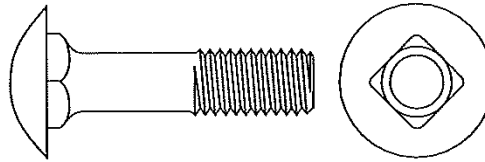
round head ribbed neck bolt: a bolt that has a ribbed or serrated shoulder under the head.



Round Head Ribbed Neck Bolt

3.1.1.6.4 Round Head Short Square Neck Bolt

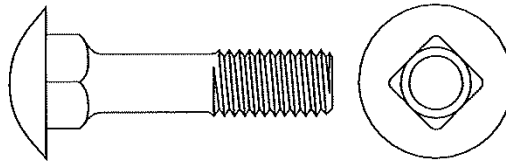
round head short square neck bolt: a bolt that has a short square shoulder under the head. It is designed for use in sheet metal, where a full square shoulder would project through and present an obstruction.



Round Head Short Square Neck Bolt

3.1.1.6.5 Round Head Square Neck Bolt

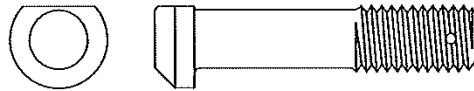
round head square neck bolt: a bolt that has a square shoulder under the head. It is designed for use in wood.



Round Head Square Neck Bolt

3.1.1.7 Connecting Rod Bolt

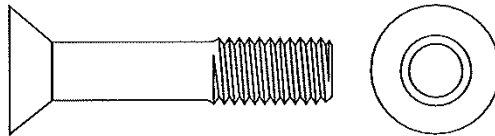
connecting rod bolt: a bolt that commonly has a chamfered, round head with a flat side or other feature to prevent the bolt from turning. It is occasionally provided with a transverse hole through the thread and a chamfer or oval point. This bolt is designed for use in assembling the connecting rod and bearing cap of a reciprocating engine.



Connecting Rod Bolt

3.1.1.8 Countersunk Bolt

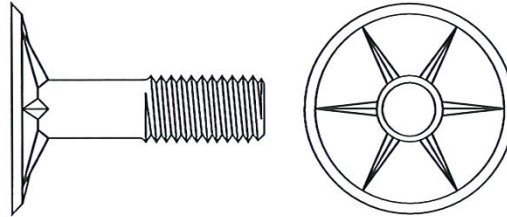
countersunk bolt: a bolt that has an unslotted circular flat top and a conical bearing surface tapering inward from the top.



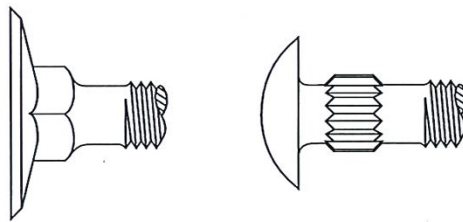
Countersunk Bolt

3.1.1.9 Elevator Bolt

elevator bolt: a bolt that has a thin circular head of large diameter with an oval or flat head profile and a means similar to the carriage bolt to prevent rotation when installed. It is used in flooring or similar applications.



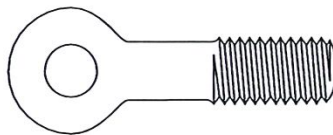
Countersunk, Ribbed Head

Countersunk Head,
Square NeckRound Head,
Ribbed Neck**Elevator Bolts****3.1.1.10 Expansion Bolt**

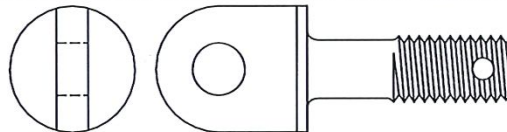
expansion bolt: see *expansion fastener* ([para. 3.4.4](#)).

3.1.1.11 Eyebolt

eyebolt: a bolt that has a head in the form of an open or closed anchor ring or of a flattened or pierced section. [See also *eyebolt* ([para. 3.1.1.3.1](#)).]

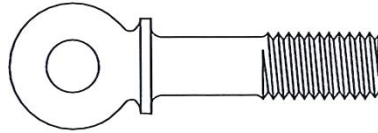
**Eyebolt****3.1.1.11.1 Aircraft Eyebolt**

aircraft eyebolt: a bolt whose design differs somewhat from the drop bolt (see [para. 3.1.1.11.3](#)) but that performs the same basic function for aircraft applications that the drop bolt does for marine applications.

**Aircraft Eyebolt**

3.1.1.11.2 Collared Eyebolt or Shouldered Eyebolt

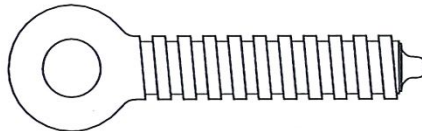
collared eyebolt or shouldered eyebolt: a bolt that has a collar or shoulder machined or formed at the juncture of the “head eye” with the bolt shank to limit the amount of penetration into the mating part.



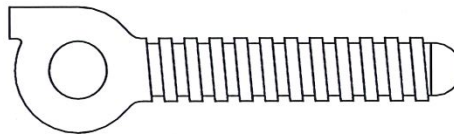
Collared Eyebolt or Shouldered Eyebolt

3.1.1.11.3 Drop Bolt

drop bolt: a type of eyebolt commonly threaded with either an Acme or a Unified form of thread and assembled with a wing nut or hexagon nut. The shank may be drilled for a cotter pin. The bolt is used for clamping purposes, particularly for bulkhead doors and porthole covers on ships. [See also *aircraft eyebolt* ([para. 3.1.1.11.1](#)).]



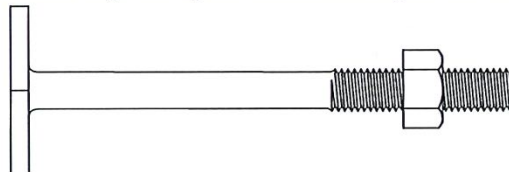
Drop Bolt



Shoulder Head-Type Drop Bolt

3.1.1.12 Fire-Brick Anchor Bolt

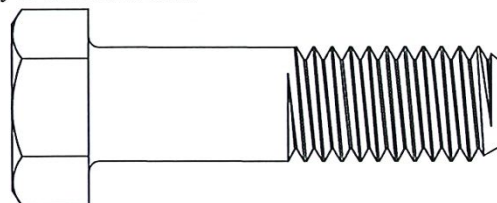
fire-brick anchor bolt: a bolt that has a large low square head. It is designed for use as a masonry support.



Fire-Brick Anchor Bolt

3.1.1.13 Fitting-Up Bolt

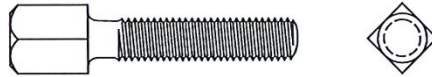
fitting-up bolt: a bolt that has a square or hex head and a coarse-pitch 60-deg stub thread. It is designed for use in the preliminary placement/assembly of structural steel.



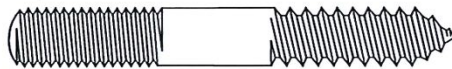
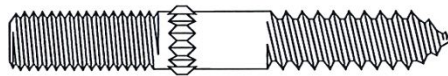
Fitting-Up Bolt

3.1.1.14 Forcing Bolt

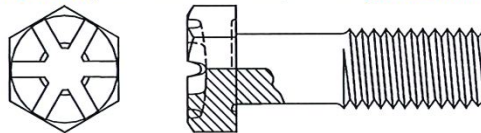
forcing bolt: a bolt that resembles a square head set screw but has a high head. It is used for adjusting and locating purposes when there is considerable resistance to motion.

**Forcing Bolt****3.1.1.15 Hanger Bolt**

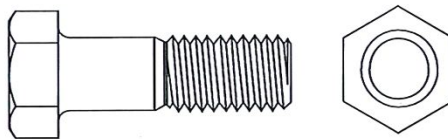
hanger bolt: a gimlet-pointed bolt that has wide-spaced threads at one end, similar to a lag bolt, for wood installation. The other end has unified coarse threads for mating with a nut. The center section may be plain or made with a square or ribbed shoulder.

**Plain Body-Type Hanger Bolt****Ribbed Shoulder Body-Type Hanger Bolt****3.1.1.16 Head-Locking Bolt**

head-locking bolt: a bolt that has added deflection as the result of the design of the head. [See also *head-locking screw* (para. 3.1.2.9), *insert screw* (para. 3.1.2.10), and *thread-locking screw* (para. 3.1.2.23).]

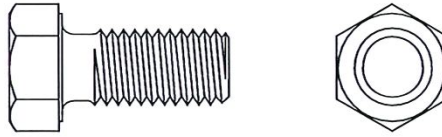
**Head-Locking Bolt****3.1.1.17 Hexagon Head Bolt**

hexagon head bolt: a bolt with a hex-shaped head for external wrenching that is designed to resist bolt rotation while being tightened with a nut.

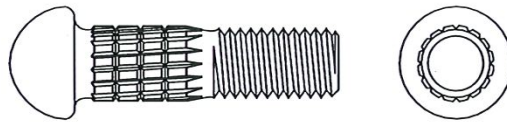
**Hexagon Head Bolt**

3.1.1.18 High-Strength Structural Bolt

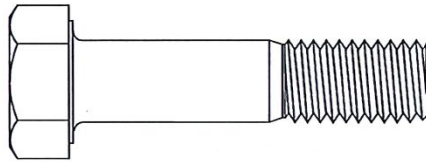
high-strength structural bolt: a bolt that has a heavy hex head configuration, a washer face under its head, a controlled thread length, and distinctive markings in accordance with ASTM A325, ASTM A325M, ASTM A490, or ASTM A490M.



Clearance-Type High-Strength Bolt



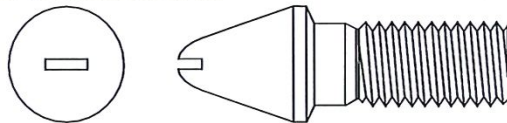
Bound-Body-Type High-Strength Bolt



Heavy Hex Structural Bolt

3.1.1.19 Hood Latch Bolt

hood latch bolt: a bolt that has a truncated, cone-shaped, slotted, or plain head. It is designed for use in the latching mechanism of automobile engine compartment hoods.



Hood Latch Bolt

3.1.1.20 Hook Bolt

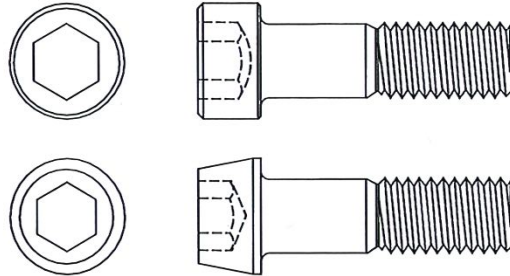
hook bolt: a bent bolt (see [para. 3.1.1.3](#)) that has a threaded and unthreaded end. The unthreaded end is bent to form a hook.

3.1.1.21 Interference Body Bolt

interference body bolt: see *interference fit body bolt* ([para. 3.1.1.32](#)).

3.1.1.22 Internal Wrenching Bolt

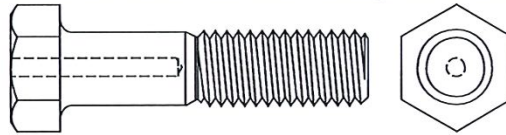
internal wrenching bolt: a bolt that has a large cylindrical head with flat top, flat bearing surface, and hexagonal socket. The bolt is designed for use in high-strength, high-temperature applications, such as steam turbines and aircraft. The internal wrenching bolt used in aircraft has a head that is a truncated cone, indicative of a large radius between the shank and the head, and requires the use of a countersunk washer.



Internal Wrenching Bolts

3.1.1.23 Internally Relieved Body Bolt

internally relieved body bolt: a bolt that has an axial hole drilled through the head and through a portion of its body.



Internally Relieved Body Bolt

3.1.1.24 J-Bolt

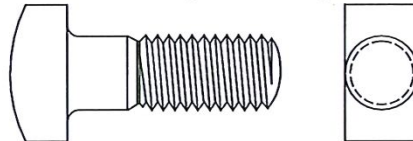
J-bolt: see *J-bolt* (para. 3.1.1.3.4).

3.1.1.25 Machine Bolt

machine bolt: any bolt that has a conventional head of a square, hexagon, button, or countersunk type and a cylindrical body below the head. It is designed for general use in machine and other types of construction. Machine bolts are supplied with nuts unless otherwise specified.

3.1.1.26 Meter Bolt

meter bolt: a bolt that has a rectangular "T" head equal in width to its body diameter and 2 or 3 times as long as it is wide. The bolt is commonly made of silicon bronze. It is designed to hold gas and water meters together.



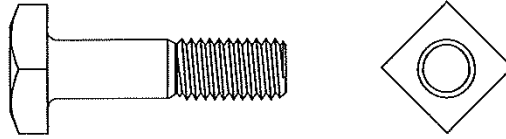
Meter Bolt

3.1.1.27 Mine Roof Bolt

mine roof bolt: a bolt that has a device in the thread end that expands upon tightening to hold it in a drilled hole and prevent rotation. A bearing plate or plate washer on the exposed end serves to distribute the loading over a broad area, providing roof support.

3.1.1.28 Planer Bolt

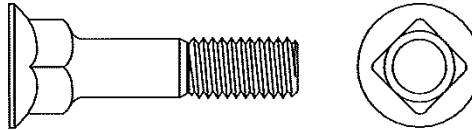
planer bolt: a bolt that has a large, low, square head. It is designed for insertion in the T-slots of planer, shaper, or milling machine tables.

**Planer Bolt****3.1.1.29 Plow Bolt**

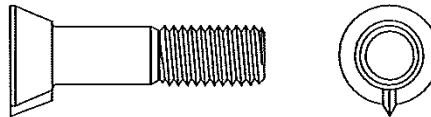
plow bolt: a bolt that has a countersunk head with a feature under the head or on the shank to prevent rotation.

3.1.1.29.1 Round Countersunk Head Square Neck Plow Bolt (No. 3 Head)

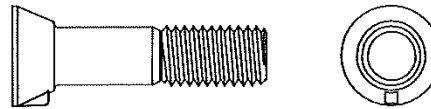
round countersunk head square neck plow bolt (no. 3 head): a bolt that has a round countersunk head with an 80-deg [90-deg (SI)] head angle and a short square neck to prevent rotation.

**Round Countersunk Head Square Neck Plow Bolt****3.1.1.29.2 Round Countersunk Heavy Key Head Plow Bolt (No. 6 Head)**

round countersunk heavy key head plow bolt (no. 6 head): a bolt that has a round countersunk head with a 40-deg head angle and a triangular-shaped key on one side to prevent rotation.

**Round Countersunk Heavy Key Head Plow Bolt****3.1.1.29.3 Round Countersunk Reverse Key Head Plow Bolt (No. 7 Head)**

round countersunk reverse key head plow bolt (no. 7 head): a bolt that has a round countersunk head with a 60-deg [90-deg (SI {for sizes less than M20})] head angle and a rectangular key on one side to prevent rotation.

**Round Countersunk Reverse Key Head Plow Bolt****3.1.1.29.4 Square Countersunk Head Plow Bolt (No. 4 Head)**

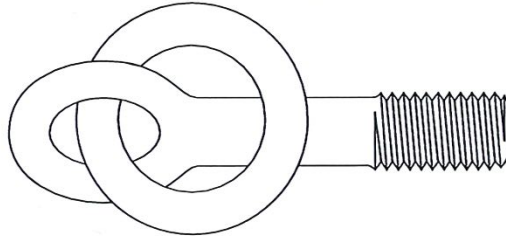
square countersunk head plow bolt (no. 4 head): a bolt that has a square pyramidal-shaped head with an 80-deg head angle in which the corners of the square prevent rotation.

**Square Countersunk Head Plow Bolt**

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3.1.1.30 Plain Nut Ring Bolt

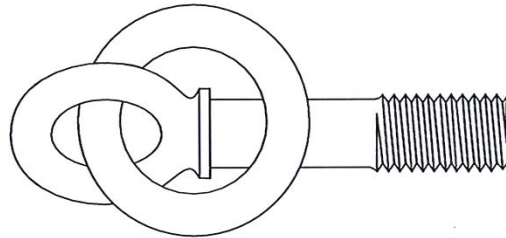
plain nut ring bolt: a threaded eyebolt preassembled with a ring through the eye.



Plain Nut Ring Bolt

3.1.1.31 Shouldered Nut Ring Bolt or Collared Nut Ring Bolt

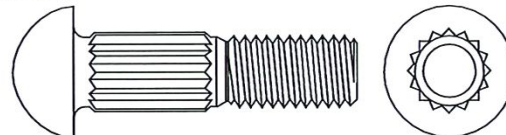
shouldered nut ring bolt or collared nut ring bolt: the same as the plain nut ring bolt (see para. 3.1.1.30), except that the bolt is a threaded collared or shouldered eyebolt. It is used often in marine applications. [See also *collared eyebolt or shouldered eyebolt* (para. 3.1.1.11.2).]



Shouldered Nut Ring Bolt or Collared Nut Ring Bolt

3.1.1.32 Interference Fit Body Bolt

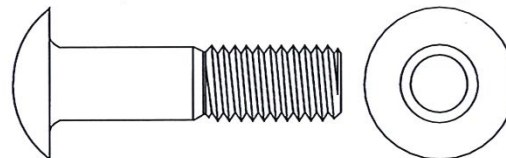
interference fit body bolt: a bolt that has a button head, ribbed shank, and coarse or special thread. It is designed as a substitute for rivets in structural steel.



Interference Fit Body Bolt

3.1.1.33 Round Head Bolt

round head bolt: a machine bolt that has a plain circular head with an oval top.



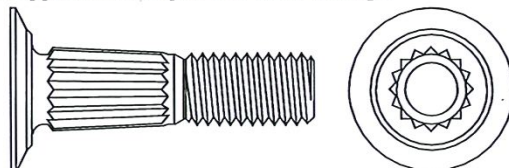
Round Head Bolt

3.1.1.34 Reduced Body Bolt

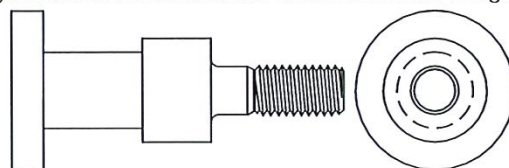
reduced body bolt: a bolt that has the diameter of all or a portion of the unthreaded shank reduced to less than the minimum pitch diameter of the thread.

3.1.1.35 Seal Bolt

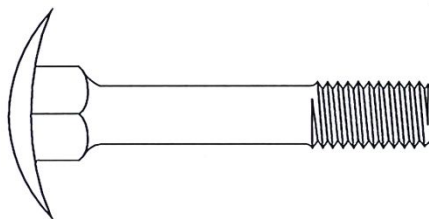
seal bolt: a bolt that has straight or helical flutes on the body, the head of which may be of various designs. It is designed for railroad car flooring and similar applications to prevent water leakage.

**Seal Bolt****3.1.1.36 Securing Bolt**

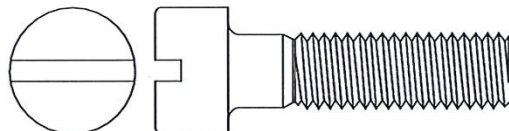
securing bolt: a bolt that has a cylindrical head and shoulder on the shank. It is designed for use in securing ship decks.

**Securing Bolt****3.1.1.37 Shaft Bolt**

shaft bolt: a bolt that has an elongated head curved to fit a round form and may or may not have a square neck.

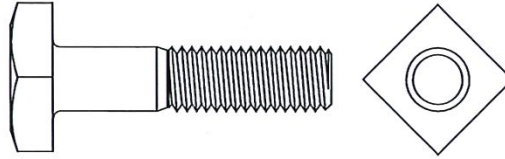
**Shaft Bolt****3.1.1.38 Spring Center Bolt**

spring center bolt: a bolt that has a cylindrical slotted or unslotted head for holding the leaves of a vehicle spring together. When provided with a conical point (usually an 80-deg included angle), it is known as a "universal spring center bolt." [See also Screws (para. 3.1.2).]

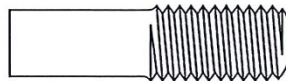
**Spring Center Bolt**

3.1.1.39 Square Head Bolt

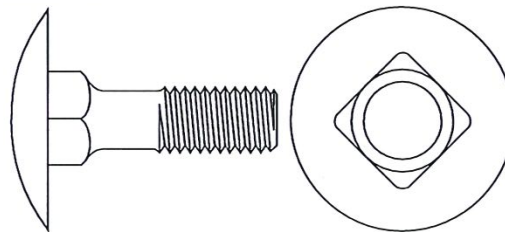
square head bolt: a bolt that has a square-shaped external wrenching head of standard proportions.

**Square Head Bolt****3.1.1.40 Staybolt**

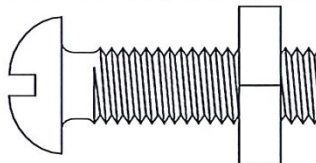
staybolt: an iron or mild steel rod that commonly has a reduced diameter body and (in some instances) a continuous thread. It is designed for bracing the flat surfaces of boilers, particularly fire-box boilers and all boilers of the locomotive type, and tying the fire-box to the external shell. The bolts are screwed through tapped holes in the sheets or plates and allowed to project far enough at each end to permit riveting cold with shallow round heads.

**Staybolt****3.1.1.41 Step Bolt**

step bolt: a round-head, square-neck bolt that has an extra-large head diameter and thin head. This fastener is designed for use in fastening flooring, step treads, etc.

**Step Bolt****3.1.1.42 Stove Bolt**

stove bolt: a former commercial standard manufactured in fractional sizes of $\frac{1}{8}$ -32, $\frac{5}{32}$ -28, $\frac{3}{16}$ -24, $\frac{7}{32}$ -22, and $\frac{1}{4}$ -18. It is now supplied as the equivalent machine screw with nut. [See also *machine screw* ([para. 3.1.2.13](#)).]

**Stove Bolt****3.1.1.43 Stripper Bolt**

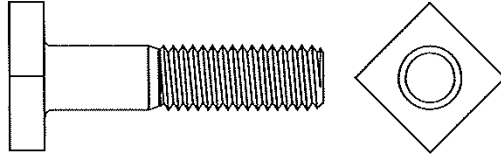
stripper bolt: see *socket head shoulder screw* ([para. 3.1.2.20](#)).

3.1.1.44 Structural Bolt

structural bolt: see *machine bolt* ([para. 3.1.1.25](#)).

3.1.1.45 T-Bolt

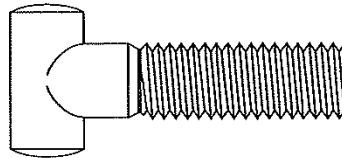
T-bolt: a finished bolt with a square head. It is designed for holding fixtures and other accessories in the T-slots of machine tools.



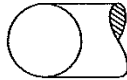
T-Bolt

3.1.1.46 Round Section T-Bolt

round section T-bolt: a bolt that has an oblong head consisting of a cylindrical rod, usually of the same diameter as the bolt, that is forged or welded perpendicular to the body. Such bolts are commonly used as ends for automotive gasoline tank straps or for clamping purposes.

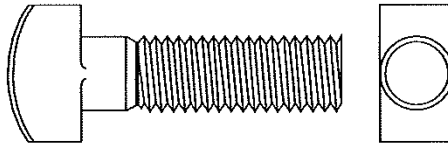


Round Section T-Bolt



3.1.1.47 T-Head Bolt

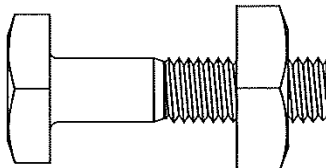
T-head bolt: a bolt, similar to a machine bolt, that has an oblong head with a convex cylindrical top.



T-Head Bolt

3.1.1.48 Tank Bolt

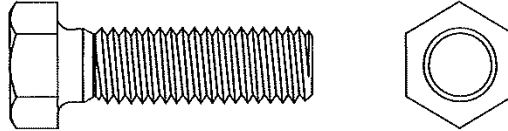
tank bolt: a medium-strength square-head bolt.



Tank Bolt

3.1.1.49 Tap Bolt

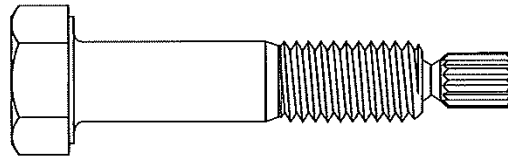
tap bolt: a square- or hex-head machine bolt, threaded relatively close to the head.



Tap Bolt

3.1.1.50 Twist Off Bolt

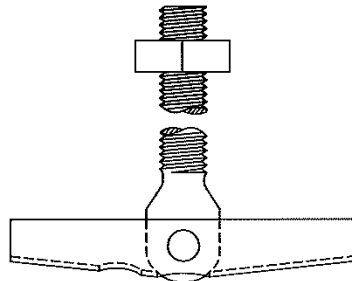
twist off bolt: a round- or hex-head bolt manufactured with a 12-spline drive and control groove on the threaded end. The fastener is tightened using a special wrench that simultaneously engages the nut and spline. The spline is designed to shear off when a predetermined clamp load has been achieved.



Twist Off Bolt

3.1.1.51 Toggle Bolt, Head Anchored

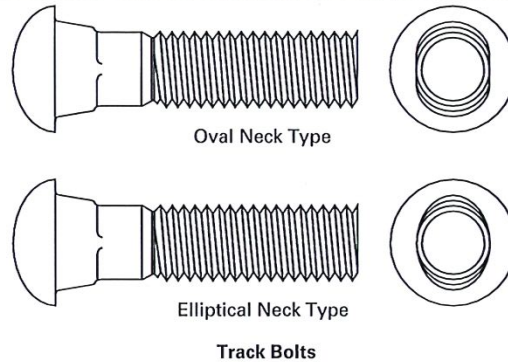
toggle bolt, head anchored: a toggle bolt that has a U-shaped wing capable of rotation attached to the head in such a way that it can be aligned with the shank and pushed through a hole. It is used as a fastener in a hole that is accessible only from one side.



Head Anchored Toggle Bolt

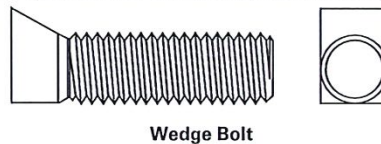
3.1.1.52 Track Bolt

track bolt: a steel bolt that has a circular head with an oval or mushroom top, an oval or elliptical neck that fits into an oval hole in a rail joint bar to prevent the bolt from turning, and a chamfer point. It is designed for joining railroad rails.



3.1.1.53 Wedge Bolt

wedge bolt: a bolt that has a head of tapered rectangular section, one side of which is tangent to the body of the bolt while the opposite side is at an angle to the body. It is available in long and short tapers. It is used principally in cultivators.



3.1.1.54 Wheel Bolt

wheel bolt: a bolt with a conical bearing surface designed to mate with the conical bearing surface on the wheel being attached. Used in the transportation industry for attaching wheels. [See also *wheel stud* (para. 3.1.3.9).]

3.1.2 Screws

3.1.2.1 Screw

screw: a headed and externally threaded mechanical device that is capable of being inserted into holes in assembled parts, mating with a preformed internal thread or forming its own thread, and being tightened or released by wrenching its head. Refer to Table 3.1.2.1-1 for a list of type designations for tapping screws and metallic drive screws.

3.1.2.2 Adjusting Screw

adjusting screw: a special headed screw used for adjusting or locating. [See also *knurled head screw* (para. 3.1.2.11).]

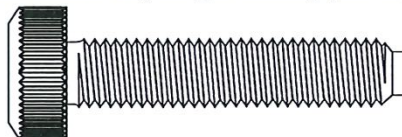
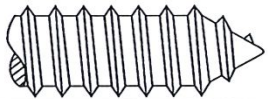
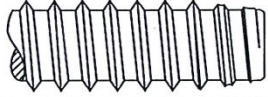
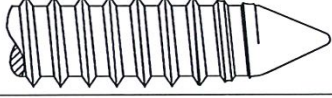
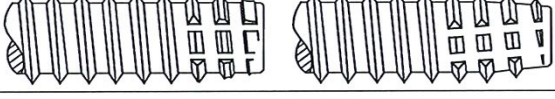
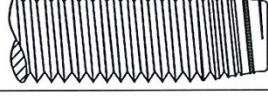
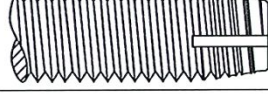
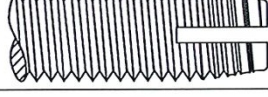
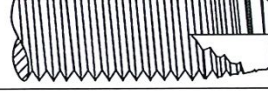


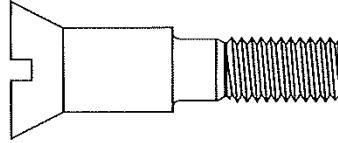
Table 3.1.2.1-1 Type Designations for Tapping Screws and Metallic Drive Screws

Pictorial Representation	ANSI/ASME Designation	Manufacturers' Designation
	AB	AB
	B	B
	BP	BP
	BF	BF
	BT	25
	C [Note (1)]	C [Note (1)]
	D	1
	F	F
	G	G
	T	23
	U	U

NOTE: (1) Not recommended for new design.

3.1.2.3 Anchor Light Mounting Screw

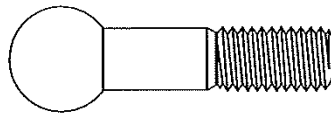
anchor light mounting screw: a slotted, flat countersunk head type of shoulder screw.



Anchor Light Mounting Screw

3.1.2.4 Ball Head Screw

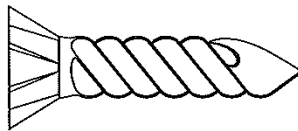
ball head screw: a screw that has an approximately spherical head and is generally used for ball and socket swivel applications.



Ball Head Screw

3.1.2.5 Bobbin Screw

bobbin screw: a type of flat-head wood drive screw that has a smaller head diameter than the standard drive screw. It may have locking serrations on, or fins under, the countersunk portion of the head. It is designed for holding the heads and bodies of textile bobbins together.



Bobbin Screw

3.1.2.6 Bone Screw

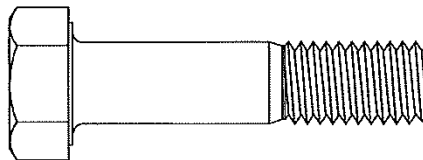
bone screw: a corrosion-resistant screw designed for the surgical fixation of fractured or grafted bones. It may have a Unified, wood screw, or tapping screw thread form.



Bone Screw

3.1.2.7 Cap Screw

cap screw: a screw with a closely controlled body diameter, a washer-faced bearing surface, and a flat chamfered point that eases its installation into tapped holes. Cap screws usually have hexagon, splined socket, hexagon socket, button, flat, fillister, or round head styles.

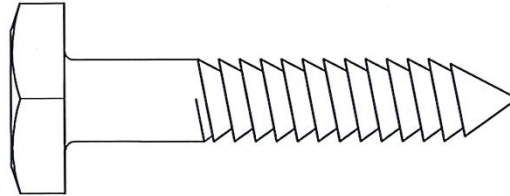


Cap Screw

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3.1.2.8 Fetter Drive Screw

fetter drive screw: a lag screw that has a buttress-type thread known as the fetter drive thread. It is designed for attaching hardware to wooden poles used for electric power lines.



Fetter Drive Screw

3.1.2.9 Head-Locking Screw

head-locking screw: a screw that has a head designed to resist forces tending to loosen it.

3.1.2.10 Insert Screw

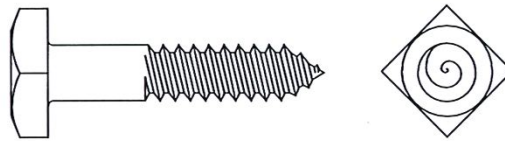
insert screw: a screw designed for permanent assembly of the head or shank within a cast or molded material, such as hard rubber, organic plastics, or die castings. The head or shank or both are provided with serrations, knurling, or other projections or indentations to prevent rotation in the molded material.

3.1.2.11 Knurled Head Screw

knurled head screw: a screw with a circular head whose periphery is knurled or serrated, allowing manual (without tools) turning. [See also *adjusting screw* (para. 3.1.2.2).]

3.1.2.12 Lag Screw

lag screw: a screw that has a distinct point, wide spaced threads, and a hex or square head. It is designed to form a mating thread when driven into a predrilled hole.

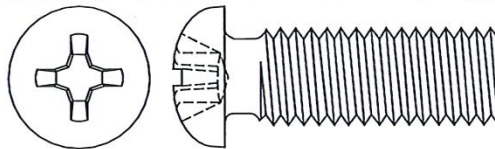


Lag Screw

3.1.2.13 Machine Screw

machine screw: a screw that has a slotted, recessed, or wrenching head and is threaded for assembly with a preformed internal thread. Machine screws are generally available in the following standard head styles: binding, fillister, 80 deg and 100 deg flat [90 deg (SI)], flat trim, hexagon, hexagon washer, oval, oval trim, pan, round, and truss. They are also made in numerous special head styles to suit particular requirements. They are generally furnished with plain points but for special purposes may have chamfered, header, pilot, or other type points.

"Machine screw with nut" has practically replaced the term "stove bolt" (see para. 3.1.1.42).



Machine Screw

3.1.2.14 Metallic Drive Screw (Type U)

metallic drive screw (Type U): a hardened screw that has a blunt or sharp pilot point, single or multiple threads of steep lead angle, and a head that is generally round or flat. It is designed for use with a clearance hole and assembly by impact in sheet metal, castings, fiber, plastics, etc.

3.1.2.15 Miniature Screw

miniature screw: a screw less than 0.06 in. (1.6 mm) in diameter that has a slotted head and is threaded for assembly with a preformed internal thread. It is generally furnished with chamfer points. Miniature screws are available in the following standard head styles: fillister, pan, 100 deg flat, and binding.

3.1.2.16 One-Way Head Screw

one-way head screw: a slotted round-head screw that has side clearances at diagonally opposite sides of the slot so that the screw can be driven only in the direction of assembly. Sometimes called "tamper-proof screws," they are designed to prevent tampering or theft.

3.1.2.17 Ornamental Head Screw

ornamental head screw: a screw that has a head of artistic design for use when an improved appearance is desired.

3.1.2.18 Set Screw

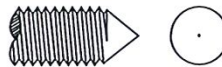
setscrew: a hardened screw with or without a head, threaded the entire length, that has a formed point designed to bear on a mating part. Set screws are regularly furnished in square head, headless slotted, hexagon socket, and spline socket styles and in combination with the set screw point styles described and illustrated in paras. 3.1.2.18.1 through 3.1.2.18.7.



Set Screw

3.1.2.18.1 Cone Point

cone point: a sharp conical-shaped point whose angle is dependent on the screw length.



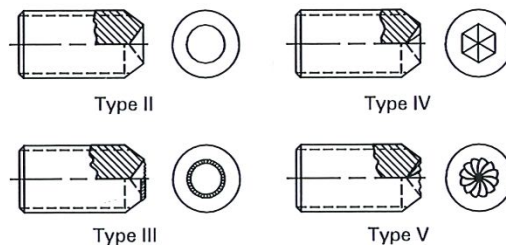
Cone Point

3.1.2.18.2 Cup Point

cup point: a truncated, conical point with a conical recess in the truncated portion. There are many variations of this point, e.g., knurled outer cone, hexagonal recess, etc. It is designed to provide good holding power with slight penetration.



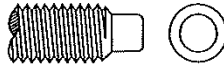
Cup Point



Cup Point Knurl Types

3.1.2.18.3 Full Dog Point

full dog point: a cylindrical point whose diameter is smaller than the minor diameter of the thread (commonly one-half the nominal diameter in length). It has a flat end with slightly rounded edges and a chamfer between the point and thread. Fasteners that have a full dog point are designed to project into a fairly deep hole or slot.

**Full Dog Point****3.1.2.18.4 Half Dog Point**

half dog point: a dog point that has only half the length of the full dog point. It serves the same purpose as the full dog point but for short-length screws or projection into shallow holes or slots.

**Half Dog Point****3.1.2.18.5 Flat Point**

flat point: a truncated, conical point with a flat surface on the truncated portion that is designed for holding with minimum penetration.

**Flat Point****3.1.2.18.6 Oval Point**

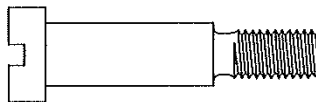
oval point: a point whose radius is greater than half the nominal diameter.

**External Self-Locking Ring
(Type NA-14)****3.1.2.18.7 Spherical Point**

spherical point: a point whose radius is equal to half the nominal diameter.

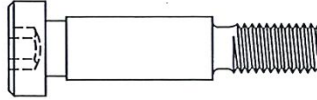
**Spherical Point****3.1.2.19 Shoulder Screw**

shoulder screw: a slotted, flat fillister head screw that has a cylindrical shoulder under the head to serve as a bearing or spacer.

**Shoulder Screw**

3.1.2.20 Socket Head Shoulder Screw

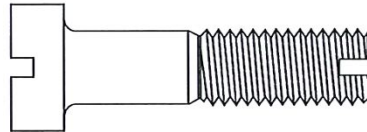
socket head shoulder screw: a socket head screw that has a cylindrical shoulder under the head to serve as a bearing or spacer and a necked portion between the thread and shoulder. Formerly called “stripper bolt.”



Socket Head Shoulder Screw

3.1.2.21 Shuttle Screw

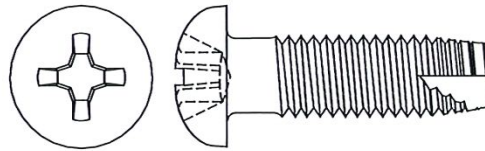
shuttle screw: a slotted fillister head screw that has a short thread and a full diameter body. The underside of the head is sometimes countersunk, and the point may be slotted to permit adjustment from either side of the shuttle. Designed for use in textile shuttles.



Shuttle Screw

3.1.2.22 Tapping Screw

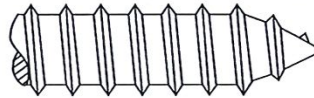
tapping screw: a screw with a slotted, recessed, or wrenching head that is designed to form or cut a mating thread in one or more of the parts to be assembled. Tapping screws are generally available in various combinations of the following head and screw styles: fillister, flat, flat trim, hexagon, hexagon washer, oval, oval trim, pan, round, and truss head styles with thread-forming screw types A, B, AB, BP, and C or thread-cutting screw types D, F, G, T, BF, BG, and BT, as described and illustrated in [paras. 3.1.2.22.1 through 3.1.2.22.12](#). See [Table 3.1.2.1-1](#) for type designations for tapping screws and metallic drive screws.



Tapping Screw

3.1.2.22.1 Type A

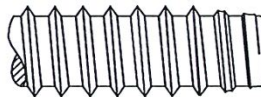
Type A: a thread-forming screw that has a coarse-spaced thread and a gimlet point.



Type A

3.1.2.22.2 Type B

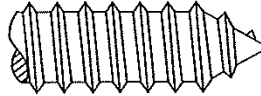
Type B: a tapping screw with a spaced thread, incomplete entering threads, and a blunt, tapered, thread-forming point.



Type B

3.1.2.22.3 Type AB

Type AB: a thread-forming screw that has a spaced thread and a gimlet point.



Type AB

3.1.2.22.4 Type BF

Type BF: a screw that has a spaced thread and a blunt, tapered, thread-cutting point with incomplete entering threads and multiple flutes.



Type BF

3.1.2.22.5 Type BG

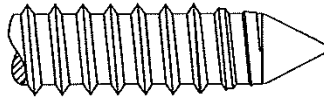
Type BG: a screw that has a spaced thread and a slotted, blunt, tapered, thread-cutting point with incomplete entering threads.



Type BG

3.1.2.22.6 Type BP

Type BP: a Type B screw that has a sharp conical or pinched point.



Type BP

3.1.2.22.7 Type BT (Also Known As Type 25)

Type BT (also known as Type 25): a tapping screw that has a spaced thread and a blunt, tapered, thread-cutting point with incomplete entering threads and a wide, milled, cutting slot.



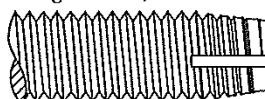
Type BT

3.1.2.22.8 Type C

Type C: a tapping screw with Unified diameter-pitch combination threads approximating Unified form that has a blunt, tapered, thread-forming point and incomplete entering threads.

**Type C****3.1.2.22.9 Type D**

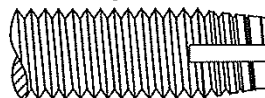
Type D: a tapping screw with Unified diameter-pitch combination threads approximating Unified form that has a blunt, tapered, thread-cutting point; incomplete entering threads; and one flute.

**Type D****3.1.2.22.10 Type F**

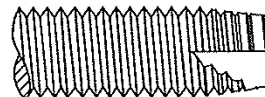
Type F: a tapping screw with threads of machine screw diameter-pitch combinations approximating Unified form or metric coarse thread series that has a blunt, tapered, thread-cutting point; incomplete entering threads; and multiple flutes.

**Type F****3.1.2.22.11 Type G**

Type G: a tapping screw with threads of machine screw diameter-pitch combinations approximating Unified form or metric coarse thread series that has a slotted, blunt, tapered, thread-cutting point and incomplete threads.

**Type G****3.1.2.22.12 Type T (Also Known As Type 23)**

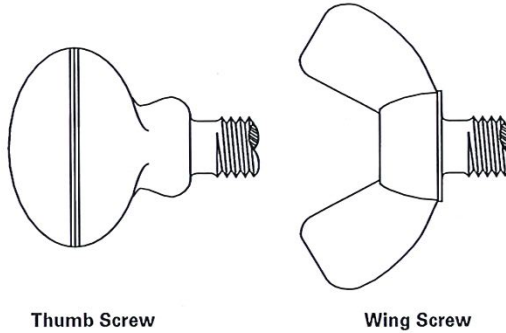
Type T (also known as type 23): a tapping screw with Unified diameter-pitch combination threads approximating Unified form that has a blunt, tapered, thread-cutting point; incomplete entering threads; and a wide, milled cutting slot.

**Type T****3.1.2.23 Thread-Locking Screw**

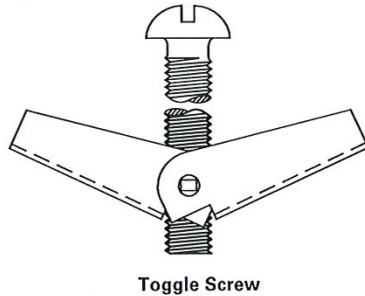
thread-locking screw: a screw that has a thread designed to produce interference with its mating thread.

3.1.2.24 Thumb or Wing Screw

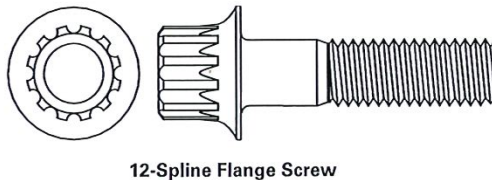
thumb or wing screw: a screw that has a flattened or wing-shaped head designed for manual turning without a driver or wrench.

**3.1.2.25 Toggle Screw**

toggle screw: a screw that has a U-shaped wing capable of rotation attached to a nut in such a way that it can be aligned with the shank and pushed through a hole. It is used as a fastener in a hole that is accessible only from one side. Toggle screws are generally furnished with round-, flat-, or truss-slotted-head machine screws.

**3.1.2.26 12-Spline Flange Screw**

12-spline flange screw: a highly engineered screw with a 12-spline flange head configuration that offers reduced bearing stress, lower stress concentration in head-to-shank fillets, and a reduction in the raw material required when compared with a standard hex head design. Additionally, the design provides for a 225% wrenching torque capacity of the threaded section torsional strength.

**3.1.2.27 Watch Screw**

watch screw: see *miniature screw* ([para. 3.1.2.15](#)).

3.1.2.28 Welding Screw

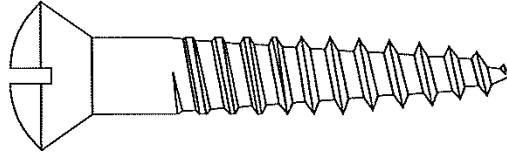
welding screw: see *projection weld stud* ([para. 3.1.3.8](#)).

3.1.2.29 Wood Drive Screw

wood drive screw: a thread-forming screw that has a cone or pinch point, multiple threads of steep lead angle, and a reduced diameter body. It is generally available with flat, oval, or round head styles designed for rapid assembly in wood.

3.1.2.30 Wood Screw

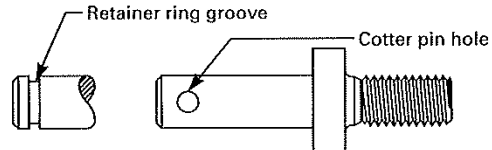
wood screw: a thread-forming screw that has a slotted or recessed head, a gimlet point, and a sharp-crested, coarse-pitch thread. It is generally available with flat, oval, and round head styles. It is designed to produce a mating thread when assembled into wood or other resilient materials.

**Wood Screw****3.1.3 Studs****3.1.3.1 Stud**

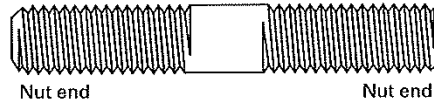
stud: a cylindrical fastener that is externally threaded on one end, threaded on both ends, or threaded over its entire length. Threaded ends are pointed. A stud is designed for insertion either through holes in assembled parts to mate with nut(s) or into a threaded hole.

3.1.3.2 Collar Stud

collar stud: a stud, threaded on one end, that has a collar of a diameter larger than the thread and a retaining ring groove used to carry gears, cam rolls, and rocker levers.

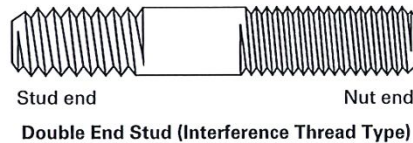
**Collar Stud****3.1.3.3 Double End Stud (Clamping-Type Stud — Identical Ended Stud)**

double end stud (clamping-type stud — identical ended stud): a stud that has screw threads of the same length and configuration on each end. This type is often used for clamping two bodies together, with a nut applied to each end. The length of a double end stud is usually measured from end to end. These studs are available in both reduced body diameter and full body diameter.

**Double End Stud (Clamping Type)**

3.1.3.4 Tap-End Stud (Double End Stud Type)

tap-end stud (double end stud type): a stud threaded on each end with an unthreaded portion on the body diameter. The thread length dimension on the tap end controls the depth the tap end will engage into a tapped hole and also controls the extension length of the stud beyond the surface into which the stud is installed.

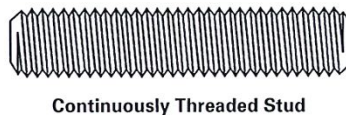


3.1.3.4.1 Interference-Thread Tap-End Stud

interference-thread tap-end stud: a tap-end stud in which the tap end is threaded per ASME B1.12 NC-5 to provide an interference fit between the stud threads and tapped hole threads. Inch threads with a class 3A tolerance and metric coarse threads with a 6h tolerance are often used to provide a tight fit between stud threads and tapped hole threads, but these are not considered interference-fit threads.

3.1.3.5 Continuously Threaded Stud (All Thread Stud or Full Thread Stud)

continuously threaded stud (all thread stud or full thread stud): a stud that has thread over its entire length without interruption. This type of stud is often used for flange bolting applications, with a nut applied to each end. The preferred length measurement of a continuous thread stud is from end to end, although length is sometimes measured from first thread to first thread.



3.1.3.6 Stud Bolt (Standing Bolt)

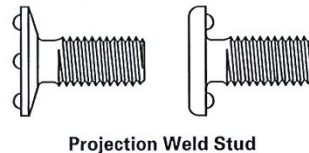
stud bolt (standing bolt): a stud, either threaded on both ends or continuously threaded, that is screwed permanently into a fixed part at one end with a nut on the other end. [See *double end stud* ([para. 3.1.3.3](#)) and *continuously threaded stud* ([para. 3.1.3.5](#)).]

3.1.3.7 Weld Stud

weld stud: see *projection weld stud* ([para. 3.1.3.8](#)).

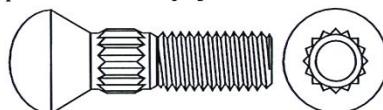
3.1.3.8 Projection Weld Stud

projection weld stud: an externally threaded component with a round head of varied configuration that has one or more integrally formed projections under or on top of the head suitable for resistance welding to a joint surface.



3.1.3.9 Wheel Stud

wheel stud: a threaded stud that consists of a round head with serrations under the head for fastening the stud in place. It is used for attaching wheels in the transportation industry. [See also *wheel bolt* (para. 3.1.1.54).]



Ribbed Shoulder Type

Wheel Stud

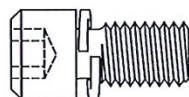
3.1.4 Threaded Rod

3.1.4.1 Threaded Rod (Threaded Bar)

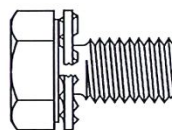
threaded rod (threaded bar): a continuously threaded cylindrical fastener made from rod or bar with plain points (non-chamfered) on both ends.

3.1.5 Screw and Washer Assembly (Sems)

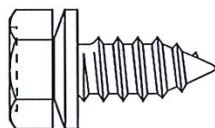
screw and washer assembly (sems): a preassembled screw and washer unit in which the washer is retained but free to rotate under the screw head by the rolled thread. These units expedite assembly operations and ensure the presence of a washer in each assembly. They are generally available in various combinations of head styles and washer types. (See Table 3.1.5-1.)



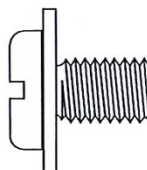
Socket Head Cap Screw
and Spring Lock Washer



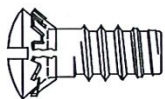
Hex Head Cap Screw and
Internal Tooth Lock Washer



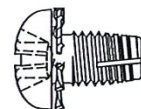
Hex Head Type AB
Tapping Screw and
Conical Spring Washer



Pan Head Machine Screw
and Plain Flat Washer



Oval Head Type B Tapping
Screw and External Tooth
Lock Washer



Round Head Type D
Tapping Screw and
External Tooth Lock Washer

Screw and Washer Assemblies (Sems)

Table 3.1.5-1 Screw and Washer Assembly Combinations

Screw and Head Style	Tooth Lock Washer		Helical Spring Lock Washer	Conical Spring Washer	Plain Washer
	External	Internal			
Fillister head	...	X	X	X	X
Flat head	X	...	...	...	...
Hexagon head	X	X	X	X	X
Hexagon washer head	X	X	X	X	X
Oval head	X	...	...	...	...
Pan head	X	X	X	X	X
Round head	...	...	...	...	...
Truss head	...	...	...	...	...
Socket screw	...	...	X	...	...
Cap screw	X	X	X	X	X

3.2 Internally Threaded Products

3.2.1 Nuts

3.2.1.1 Nut

nut: a perforated block with an internal screw thread that is designed to assemble with an external screw thread, such as those on a bolt or other threaded part. Its intended function is fastening, adjusting, transmitting motion, or transmitting power with a large mechanical advantage and nonreversible motion.

3.2.1.2 Acorn Nut

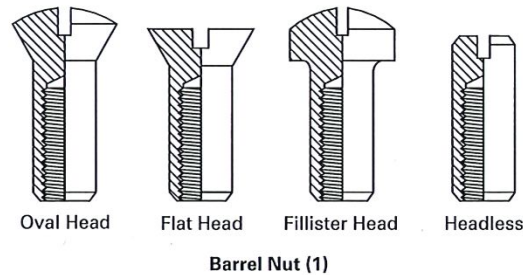
acorn nut: see *crown nut* (para. 3.2.1.12).

3.2.1.3 Anchor Nut

anchor nut: see *clinch nut* (para. 3.2.1.10).

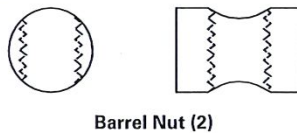
3.2.1.4 Barrel Nut (1)

barrel nut (1): a blind, internally threaded fastener that is externally shaped like a machine screw. The threads extend inside almost to the head.



3.2.1.5 Barrel Nut (2)

barrel nut (2): a cylindrical nut tapped at right angles to the cylinder axis. This type of barrel nut is designed to fit in a hole formed at right angles to its mating screw.



3.2.1.6 Cage Nut

cage nut: see *captive nut* (para. 3.2.1.8).

3.2.1.7 Cap Nut

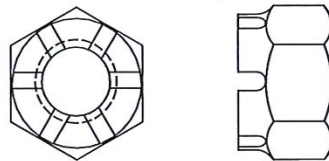
cap nut: see *crown nut* (para. 3.2.1.12).

3.2.1.8 Captive Nut

captive nut: a threaded member, usually a square nut, held loosely in a shaped sheet metal box. Variations in mating assembly parts are usually overcome by this type of nut since it can float laterally.

3.2.1.9 Castle Nut

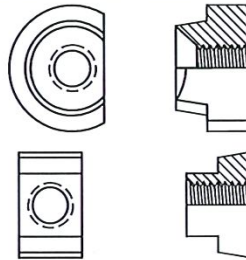
castle nut: a slotted hexagon nut that has a cylindrical portion at the slotted end equal in length to the slot depth and slightly smaller in diameter than the hexagon width. This nut is designed for the insertion of a cotter pin to secure the nut in place when it is used with a drilled shank fastener. Formerly called a "castellated nut."



Castle Nut

3.2.1.10 Clinch Nut

clinch nut: a solid nut that has a pilot or other feature to be inserted in a preformed hole. The pilot may be clinched, staked, or expanded to retain the nut and prevent rotation. It is available in a large variety of types, some of which are capable of piercing the holes for assembly. Sometimes referred to as "anchor nut."



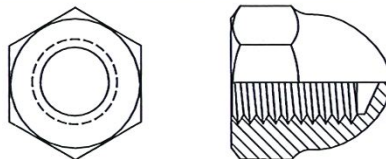
Clinch Nuts

3.2.1.11 Conduit Nut

conduit nut: a thin nut, usually stamped, that may be square with scalloped corners or hexagonal or octagonal in shape.

3.2.1.12 Crown Nut

crown nut: a hexagon nut that has an acorn-shaped top and a blind threaded hole. Crown nuts are generally furnished in two types: high crown and low crown. Sometimes referred to as "acorn nut" or "cap nut."

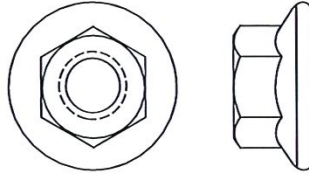


Crown Nut

ASME B18.12-2020

3.2.1.13 Flange Nut

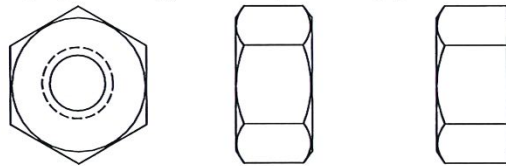
flange nut: an integral nut and washer designed for increased bearing area.



Flange Nut

3.2.1.14 Hexagon Nut

hexagon nut: a nut that has a hexagonal shape and may or may not have a washer face. The six parallel sides serve as wrenching flats. Hexagon nuts are available in various dimensional series (i.e., finished hexagon, heavy hexagon, regular hexagon) and various thicknesses (i.e., standard, jam or thin, and thick). [See also *machine screw nut* ([para. 3.2.1.19](#)).]



Hexagon Nut

3.2.1.15 Internal Wrenching Nut

internal wrenching nut: a cylindrical nut, one end of which has a socket of suitable form for wrenching purposes.

3.2.1.16 Jam Nut

jam nut: a hex nut that has a reduced thickness usually 63% to 70% of that of a full-size hex nut. It is used in combination with thicker nuts to provide resistance to loosening.

3.2.1.17 Knurled Nut

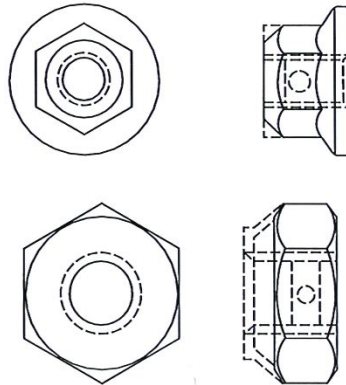
knurled nut: a cylindrical nut that has a portion or portions of its cylindrical surface knurled.

3.2.1.18 Lock Nut

lock nut: either of the following two types of lock nuts:

(a) a prevailing torque type that resists relative bolt-nut movement with or without an axially applied load to the bolt-nut combination.

(b) a free-running type that exhibits a locking ability when there is an axial load applied to the base of the nut. The "locking" or stopping action of the nut is accomplished either by thread deformation or clamping or by the addition of nonmetallic inserts. The free-running type usually has a design feature that adds to the elastic elongation of the bolt-nut combination.



Prevailing Torque Lock Nut

GENERAL NOTE: Size, shape, and location of the prevailing torque elements are optional.

3.2.1.19 Machine Screw Nut

machine screw nut: a hexagon or square nut of proportions suitable for use with a machine screw.

3.2.1.20 Micro Slotted Nut

micro slotted nut: the same type as the slotted nut (see [para. 3.2.1.26](#)), except it has more slots.

3.2.1.21 Planer Head Bolt Nut

planer head bolt nut: a thin, hexagonal, case-hardened nut that has a flat and chamfered top. It is designed for use with a planer head bolt on machine tools.

3.2.1.22 Plate Nut

plate nut: an internally threaded unit with a plate that is designed to hold the threaded unit in place relative to the work. The threaded unit may be integral with the plate or held by a retainer, and it may have conventional or locking threads. Two-piece plate nuts are generally of the floating type, in which the threaded unit has a limited movement with respect to the plate and normal to the thread axis to facilitate alignment with the mating fastener. Plates may be of the following types:

- (a) the hole type, for riveting, nailing, or otherwise fastening the plate to the work.
- (b) the boss type, which has weld embossments for resistance welding the plate to the work. The embossments may be on top of the plate — internal boss — or on bottom — external boss.
- (c) the prong type, which has projections to grip soft materials such as wood. Some forms of plate nuts are designated "tee nuts."

3.2.1.23 Round Nut

round nut: a plain, cylindrical nut that has no features for wrenching it onto a mating thread.

3.2.1.24 Skein Nut

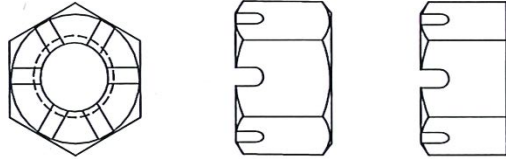
skein nut: an internally and externally threaded nut. The outside thread is a wood screw thread for insertion into wood components, and the inside is a thread suitable for machine screws or bolts. The end is usually slotted for driving.

3.2.1.25 Sleeve Nut

sleeve nut: an internally threaded fastener that is externally shaped like a machine screw. It is essentially the same as a barrel nut (see [para. 3.2.1.4](#)), except the threads extend throughout its entire length.

3.2.1.26 Slotted Nut

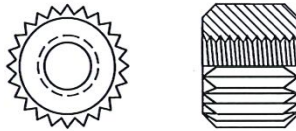
slotted nut: a hexagon nut that has opposed slots through the centers of the flats. The slots are on the end opposite the bearing surface and are perpendicular to the axis of the nut. Slotted nuts are designed for the insertion of a cotter pin to secure the nut in place when it is used with a drilled shank fastener.



Slotted Nut

3.2.1.27 Spline Nut

spline nut: a cylindrical nut that has external splines or serrations to hold it in place when forced into a hole of slightly smaller diameter. It may also be cast in place in plastic or low-strength metallic die cast alloys.



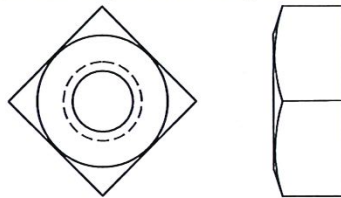
Spline Nut

3.2.1.28 Spring Nut

spring nut: a nut fabricated from thin spring steel with an impression designed to accommodate the mating thread. It is used in place of a solid nut. Spring nuts are available in many shapes and styles.

3.2.1.29 Square Nut

square nut: a square-shaped nut that is generally manufactured without a washer face. The four parallel sides serve as wrenching flats. These nuts are available in the regular and heavy series with varying proportions.



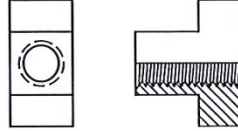
Square Nut

3.2.1.30 Stamped Nut

stamped nut: a hexagon nut that is stamped from thin spring steel with prongs formed to engage the mating thread. It sometimes has an integral washer. It is used in place of a solid nut in low-stress applications or as a retaining nut against a solid nut.

3.2.1.31 T-Nut

T-nut: a square finished nut in the form of a "T" designed to fit a T-slot in a machine tool.



T-Nut

3.2.1.32 Tee-Nut

tee-nut: see *plate nut* ([para. 3.2.1.22](#)).

3.2.1.33 Thick Nut

thick nut: see *hexagon nut* ([para. 3.2.1.14](#)).

3.2.1.34 Thin Nut

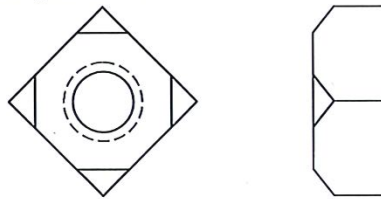
thin nut: see *hexagon nut* ([para. 3.2.1.14](#)).

3.2.1.35 Thumb Nut

thumb nut: see *wing nut* ([para. 3.2.1.41](#)).

3.2.1.36 Track-Bolt Nut

track-bolt nut: a square nut designed for use with a track bolt on railroads. It is available in two standard types: one with a standard 45-deg chamfer and the other with a 60-deg chamfer. There is also an alternate type of thick square nut with 60-deg chamfer for the $\frac{15}{16}$ -in., 1-in., and $1\frac{1}{8}$ -in. sizes.



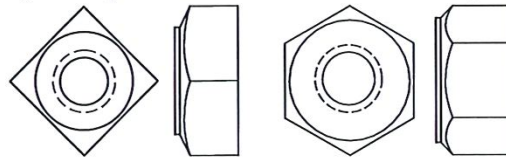
Track-Bolt Nut

3.2.1.37 Tri-Slot Nut

tri-slot nut: a slotted nut that has three large slots. It may be used in place of a castle nut (see [para. 3.2.1.9](#)) or a slotted nut (see [para. 3.2.1.26](#)) of the same dimensions.

3.2.1.38 Washer Crown Nut

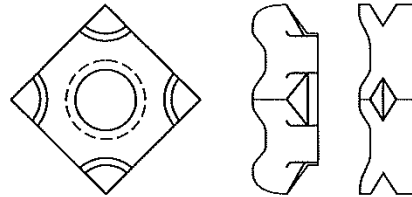
washer crown nut: a regular hexagon or square nut with a washer crown on top.



Washer Crown Nuts

3.2.1.39 Weld Nut

weld nut: a solid nut provided with lugs, annular rings, or embossments to facilitate its attachment to a metal part by resistance welding.



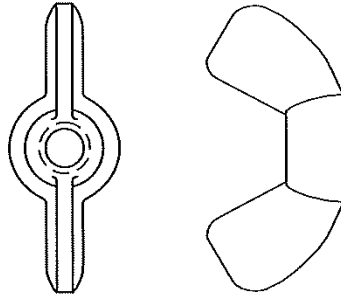
Weld Nuts

3.2.1.40 Wheel Nut

wheel nut: an ordinary hex nut with a conical or spherical bearing surface designed to mate with the conical or spheric bearing surface on the wheel being attached.

3.2.1.41 Wing Nut

wing nut: a nut that has “wings” designed for manual turning. It may be forged, machined, stamped, or cast. Sometimes referred to as “thumb nut.”

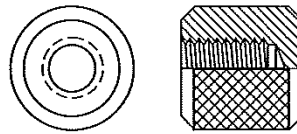


Wing or Thumb Nut

3.2.2 Inserts

3.2.2.1 Threaded Insert

threaded insert: an internally threaded bushing designed to be assembled with soft or brittle materials to provide a threaded hole with greater strength, hardness, and wear resistance. They are normally available as free-running, into which a mating screw assembles without resistance, and screw locking, in which residual locking torque is applied to the mating screw.



Threaded Insert

3.2.2.2 Helical Coil Screw-Threaded Insert

helical coil screw-threaded insert: an insert of diamond-shaped cross section wire coiled into a helix that forms an internal thread when screwed into a tapped hole of the appropriate size and pitch. Helical coil inserts are available in both free-running and screw-locking configurations.



Helical Coil Threaded Insert

3.2.2.3 Key-Locked Insert

key-locked insert: an insert threaded on its exterior surface to allow it to be screwed into tapped holes in the workpiece. They are locked in place by keys that drive into slots in their external thread and broach through the threads of the workpiece.

3.2.2.4 Keyring-Locked Insert

keyring-locked insert: essentially the same as a key-locked insert except that the keys, rather than being individual and separate, are attached by a ring.

3.2.2.5 Molded-In Insert

molded-in insert: an insert that has knurls or other configurations on its external surfaces that lock the insert in place. They are positioned in molds or dies such that the molten plastic or metal will flow around the insert.

3.2.2.6 Post-Molded Insert

post-molded insert: an insert that has knurls or other configurations on its external surfaces that lock the insert in place after being pressed or ultrasonically assembled into a molded or drilled hole in plastics or soft metals.

3.2.2.7 Self-Tapping Insert

self-tapping insert: an insert that has external threads that cut or form a mating thread when assembled into an untapped drilled or cored hole.

3.2.2.8 Solid Bushing Insert

solid bushing insert: an internally threaded sleeve designed for assembly into a workpiece by one of several methods.

3.3 Nonthreaded Products

3.3.1 Washers

3.3.1.1 Washer

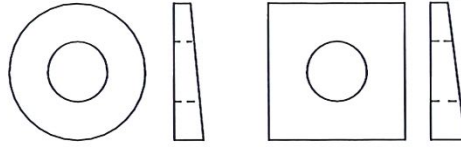
washer: a thin cylinder with a centrally located hole that is used with other fasteners as a spacer, a load distribution device, or a hardened seat or to increase resistance to loosening in a fastened joint.

3.3.1.2 Belleville Washer

belleville washer: see *conical spring washer* ([para. 3.3.1.6](#)).

3.3.1.3 Bevel Washer

bevel washer: a flat, square, or circular washer with a definite taper between opposite bearing faces.



Bevel Washer

3.3.1.4 C Washer

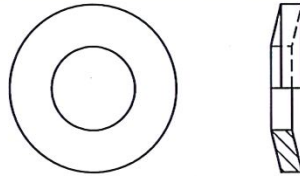
C washer: see *open or horseshoe washer* (para. 3.3.1.12).

3.3.1.5 Cone Lock Washer

cone lock washer: see *conical spring washer* (para. 3.3.1.6).

3.3.1.6 Conical Spring Washer

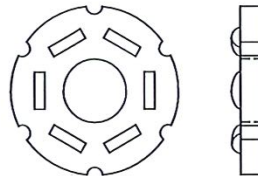
conical spring washer: a hardened circular steel washer formed with a slight dish and edges sheared parallel to the centerline. This type of washer is designed to store energy and provide a sealing effect as the sharp edges tighten into the bearing surfaces. Sometimes referred to as “belleville washer” and “cone lock washer.”



Conical Spring Washer

3.3.1.7 Direct Tension Indicator Washer

direct tension indicator washer: a washer that indicates the achievement of a predetermined clamp load by the amount its protrusions compress.



Direct Tension Indicator Washer

3.3.1.8 Finish Washer

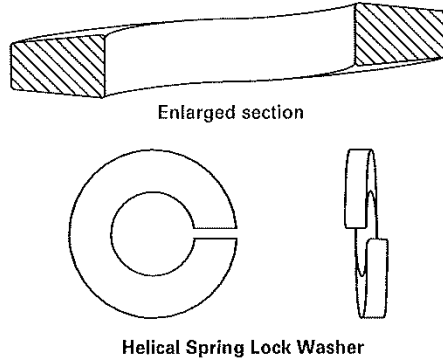
finish washer: a formed circular washer designed to accommodate the head of a flat or oval head screw and provide additional bearing area on the material being fastened. Finish washers are available in the raised and flush types.

3.3.1.9 Flat Washer

flat washer: see *plain washer* (para. 3.3.1.13).

3.3.1.10 Helical Spring Lock Washer

helical spring lock washer: a coiled, hardened, split circular washer that is made from wire or rod and has a trapezoidal section. It is designed so the deformation caused by loading the trapezoid section increases the spring rate in a bolted joint. This compensates for developed looseness and loss of tension between the parts of an assembly and functions as a hardened thrust bearing. It also distributes the load over a larger area for some head styles.

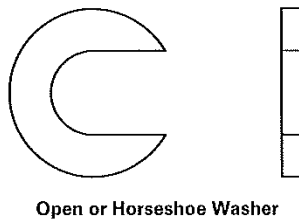


3.3.1.11 Lock Plate

lock plate: a flat plate fastened to an assembled element with screws or held by lanced ears. The lock plate provides projections that are bent into place against a flat of the screw head, effectively preventing rotation of the head.

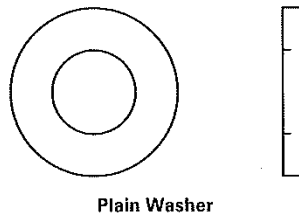
3.3.1.12 Open or Horseshoe Washer

open or horseshoe washer: a flat, circular washer that has a slot of width equal to the hole diameter and extending from the hole to the periphery. It is designed for installation on or removal from the shank of the fastener without removing the fastener from the assembly. This washer is also known as a "C washer."



3.3.1.13 Plain Washer

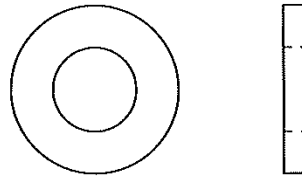
plain washer: a flat, circular or square washer with a central hole designed to fit around a bolt or screw and under the head or nut.



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3.3.1.14 Riveting Burr

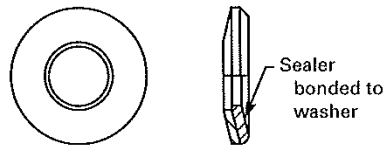
riveting burr: a small, plain washer that is assembled with a small rivet before peening the end to provide a large area of contact on the part.



Riveting Burr

3.3.1.15 Sealing Washer

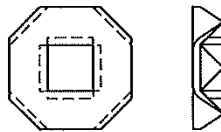
sealing washer: a washer made of relatively soft materials and of various designs. This washer is sometimes used in connection with metallic washers to which it can be bonded.



Sealing Washer

3.3.1.16 Square Grip Washer

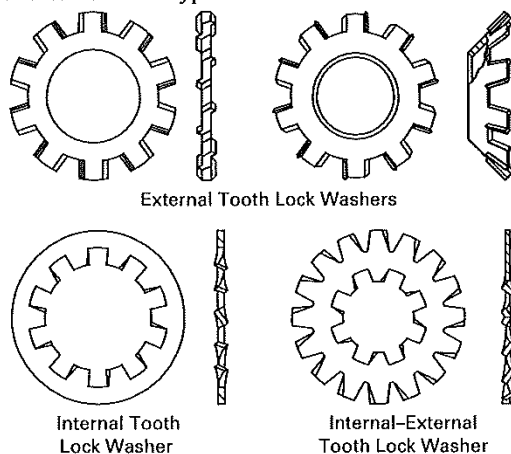
square grip washer: a modified square or plain washer that has a square hole. The sides of the hole and outside corners of the washer are bent at right angles to one face of the washer to form grips that prevent rotation of square neck fasteners when assembled on soft materials, such as wood.



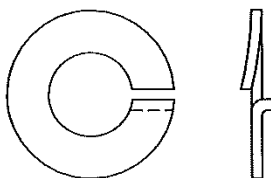
Square Grip Washer

3.3.1.17 Tooth Lock Washer

tooth lock washer: a hardened, circular washer that has twisted or bent prongs or projections that deform when assembled. The prongs, on which the pressure is localized, resist loosening of the fastener. It is generally furnished in external, internal, and internal-external tooth types.

**Tooth Lock Washer****3.3.1.18 Wood Grip Washer**

wood grip washer: a modified circular, plain washer that has the annulus cut and ends bent to form a grip. It is designed for use on soft materials such as wood.

**Wood Grip Washer****3.3.2 Rivets: Solid, Split, and Tubular****3.3.2.1 Rivet**

rivet: a headed metal fastener of malleable material used to join parts of structures and machines by inserting the shank through the aligned holes in each piece and forming a head on the headless end by upsetting.

3.3.2.2 Large Rivet

large rivet: a solid rivet having a body diameter of $\frac{1}{2}$ in. (12 mm) or more and a head of one of the following forms: button, high button, cone, countersunk, or pan. Large rivets are usually driven at forging heat.

**High Button Head Large Rivet**

3.3.2.3 Small Rivet

small rivet: a typically solid rivet that has a body diameter of less than $\frac{1}{2}$ in. (12 mm) and a head of one of the following forms: button, countersunk, flat, oval, pan, or truss. Small rivets are usually driven cold.



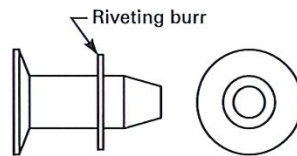
Oval Head Small Rivet

3.3.2.4 Rivet Head Styles

rivet head styles: the many head styles of nonthreaded fasteners apply to rivets. See [para. 2.3.2](#).

3.3.2.5 Belt Rivet

belt rivet: a small, solid rivet with a flat top, a countersunk head, and a chamfer point. It is used with a riveting burr for joining leather.



Belt Rivet

3.3.2.6 Boiler Rivet

boiler rivet: a large rivet with a cone head.



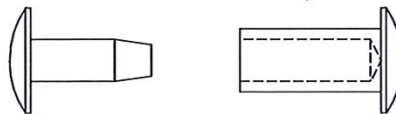
Boiler Rivet

3.3.2.7 Brake-Lining Rivet

brake-lining rivet: see *tubular rivet* ([para. 3.3.2.16](#)).

3.3.2.8 Compression Rivet

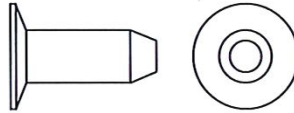
compression rivet: one that consists of two parts: a solid rivet and a deep-drilled tubular rivet. The diameters of the solid shank and drilled hole are selected to produce a compression or pressed fit when the two parts are assembled. Rivets of this type may also have flat heads. Sometimes referred to as "cutlery rivet."



Compression Rivet

3.3.2.9 Coopers' Rivet

Coopers' rivet: a small, solid rivet with a flat top, a countersunk head, and a chamfer point. It is used for joining the ends of barrel hoops.



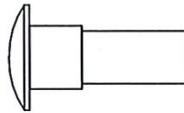
Coopers' Rivet

3.3.2.10 Cutlery Rivet

cutlery rivet: see *compression rivet* (para. 3.3.2.8).

3.3.2.11 Shoulder Rivet

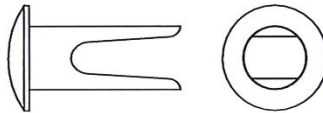
shoulder rivet: a solid or tubular rivet with a shoulder under the head.



Shoulder Rivet

3.3.2.12 Split Rivet

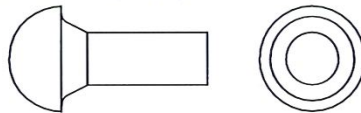
split rivet: a small rivet that has a split end to enable securing by spreading the ends. It is commonly furnished with an oval or countersunk head.



Split Rivet

3.3.2.13 Swell-Neck Rivet

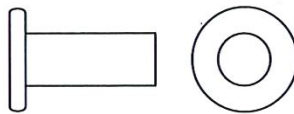
swell-neck rivet: a large, solid rivet that has an enlarged, tapered neck under the head for tightly fitting a hole in a part.



Swell-Neck Rivet

3.3.2.14 Tank Rivet

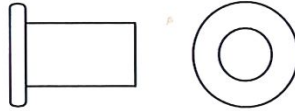
tank rivet: a small, solid rivet designed for use in sheet metal. It commonly has a button, countersunk, flat, or truss head.



Tank Rivet

3.3.2.15 Tinnners' Rivet

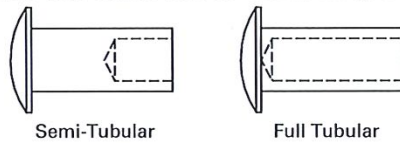
tinnners' rivet: a small, solid rivet with a head that is of the same form as a flat head rivet but larger in diameter. It is designed for use in sheet metal work.



Tinnners' Rivet

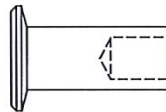
3.3.2.16 Tubular Rivet

tubular rivet: a small rivet with a coaxial cylindrical or tapered hole in the headless end. It is commonly furnished with a countersunk, flat, oval, or truss head. [See also *Nonthreaded Fasteners* ([para. 2.3.2](#)).] The top of the flat top countersunk head may be slightly chamfered. Tubular rivets are designed to be secured by splaying or curling the ends. They are further classified as semi-tubular, which have hole depths that do not exceed 112% of the mean shank diameter measured on the wall, and full tubular, which have hole depths that do exceed 112% of the mean shank diameter.



Semi-Tubular

Full Tubular



Flat Top Countersunk Head Tubular Rivet
(With Chamfered Top)

Tubular Rivets

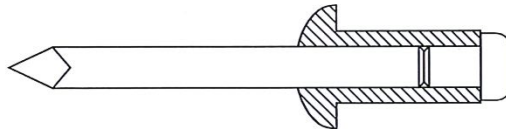
3.3.3 Blind Fasteners and Blind Rivets

3.3.3.1 Blind Fastener

blind fastener: a mechanical device that has the capability to join component parts in an assembly in which access for fastener installation and activation is available from one side only.

3.3.3.2 Blind Rivet

blind rivet: a blind fastener that has a self-contained, typically mechanical feature that permits the formation of an upset on the blind end of the rivet and the expansion of the rivet shank during rivet setting to join the component parts of an assembly.



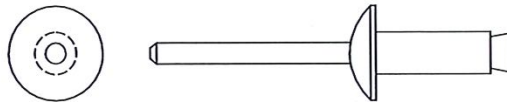
Blind Rivet

3.3.3.2.1 Pull Mandrel Blind Rivet

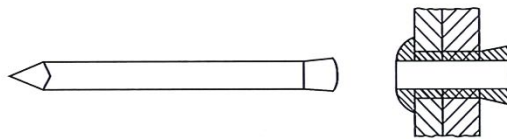
pull mandrel blind rivet: a multiple-piece assembly that consists of at least a rivet body and mandrel. In the setting operation, the rivet is inserted into the components to be joined and the mandrel is gripped and pulled axially. Its head upsets the rivet body, forming a blind head. Pull mandrel blind rivets are further classified as described in paras. 3.3.3.2.2 through 3.3.3.2.7.

3.3.3.2.2 Pull-Through Mandrel Blind Rivet

pull-through mandrel blind rivet: a pull mandrel type of blind rivet in which the mandrel is pulled completely through the rivet body during the setting operation, thus leaving a hollow rivet.



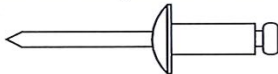
Pull-Through Mandrel Blind Rivet



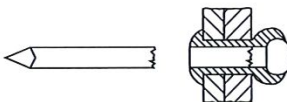
Set Pull-Through Mandrel Blind Rivet

3.3.3.2.3 Break Mandrel Blind Rivet

break mandrel blind rivet: a pull mandrel type of blind rivet in which the mandrel is pulled into or against the rivet body during the setting operation and breaks at or near the junction of the mandrel and its upset end.



Break Mandrel Blind Rivet



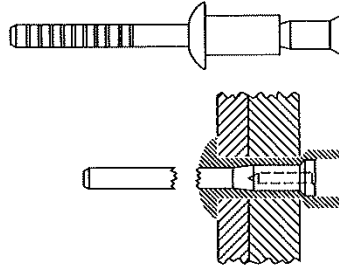
Set Break Mandrel Blind Rivet

3.3.3.2.4 Nonbreak Mandrel Blind Rivet

nonbreak mandrel blind rivet: a pull mandrel type of blind rivet in which the mandrel is pulled into or against the rivet body during the setting operation but does not break. This type requires the mandrel to be dressed in a subsequent operation.

3.3.3.2.5 Structural Self-Plugging Pull Mandrel Blind Rivet

structural self-plugging pull mandrel blind rivet: a pull mandrel type of blind rivet in which the mandrel is pulled into or against the rivet body during the setting operation and breaks at a point within or above the rivet head, with the entrapped length of mandrel retained in the rivet body.



Multi-Grip Flush Break Self-Plugging
Pull Mandrel Blind Rivet

3.3.3.2.6 Structural Flush Break Pull Mandrel Blind Rivet

structural flush break pull mandrel blind rivet: a pull mandrel type of blind rivet in which the mandrel is pulled into or against the rivet body during the setting operation and breaks at a point within or above the rivet head. Flush break means that the break plane of the mandrel occurs above the junction of rivet shank and head. Thus the shear plane(s) of the joint will occur through rivet shank and mandrel.

3.3.3.2.7 Multi-Grip Flush Break Pull, Positive Lock Mandrel Blind Rivet

multi-grip flush break pull, positive lock mandrel blind rivet: a pull mandrel type of blind rivet in which the mandrel is pulled into the rivet body and breaks essentially flush with the top of the rivet head during the setting operation. Because the break plane of the mandrel occurs above the junction of rivet shank and head, the shear plane(s) of the joint will occur through rivet shank and mandrel. Multi-grip means the rivet has the design capability to join component parts that have a broad range of thicknesses. Positive lock means that during rivet setting, an intentional deformation occurs in the rivet mandrel and/or body that provides a mechanical resistance to mandrel removal from the body.

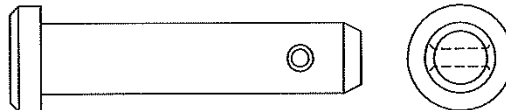
3.3.4 Pins

3.3.4.1 Pin

pin: a straight cylindrical or tapered fastener, with or without a head, designed to perform a semipermanent attaching or locating function.

3.3.4.2 Clevis Pin

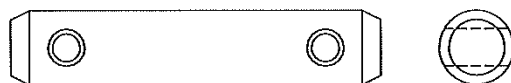
clevis pin: a solid cylindrical pin designed for use with clevises and rod ends. It has a cylindrical head with chamfered point on one end, and it usually has a drilled hole for a cotter pin or a groove for a retaining ring on the headless end.



Clevis Pin

3.3.4.2.1 Headless Clevis Pin

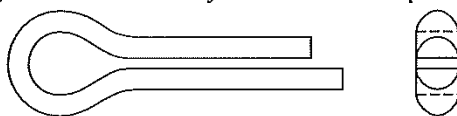
headless clevis pin: a solid pin designed for use with clevises and rod ends that has chamfer points and drilled holes for a cotter pin on both ends.



Headless Clevis Pin

3.3.4.3 Cotter Pin

cotter pin: a double-bodied pin made by bending a length of semicircular wire approximately in half, forming a loop that provides a head. After installation, each half of the body can be bent to keep the pin in place.



Extended Prong Square Cut Type



Hammer Lock Type

Cotter Pins

3.3.4.4 Dowel Pin

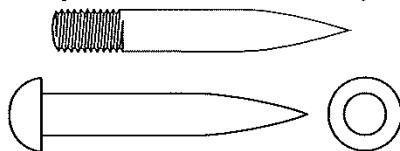
dowel pin: a solid, headless straight pin whose diameter is closely controlled. Hardened and ground dowel pins have one end chamfered and the other end radiused to form a crown. Unhardened ground pins have both ends chamfered.



Dowel Pin

3.3.4.5 Hand Drive Pin

hand drive pin: a small-diameter, sharp-pointed-end pin that can be installed with small special hand tools and a hammer into concrete, light steel, etc. The end that protrudes after installation may be plain, headed, or threaded.



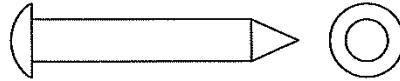
Hand and Power Drive Pins

3.3.4.6 Power Drive Pin

power drive pin: the same type of pin as the hand drive pin, except that it is larger in diameter and used for heavier loads. The power for driving is usually provided by a ballistic powder charge.

3.3.4.7 Escutcheon Pin

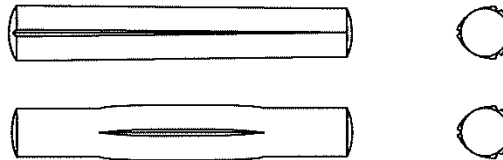
escutcheon pin: a pin that has a semispherical head with a flat bearing surface formed on one end and a long cone or pinch point on the other.



Escutcheon Pin

3.3.4.8 Grooved Pin

grooved pin: a solid, cylindrical pin, manufactured from bar or coil stock, with three longitudinal grooves. The three grooves are pressed into the cylindrical body to expand its diameter to a size greater than its nominal diameter in a precisely controlled way. Material is displaced, but not removed, from the pin in the process. When a grooved pin is pressed into a hole the size of the pin's nominal diameter, the constraining action of the hole will compress the expanded material in a spring-like manner and produce a holding force. This unique locking action is accomplished without permanent deformation of either the base material or the pin.



Grooved Pins

3.3.4.9 Spring Pin

spring pin: a hollow, headless pin of a controlled length, with rounded or chamfered ends, that is formed to a diameter somewhat greater than that of the hole into which it is to be assembled. Spring pins are available in two styles: slotted and coiled.

3.3.4.9.1 Coiled Spring Pin

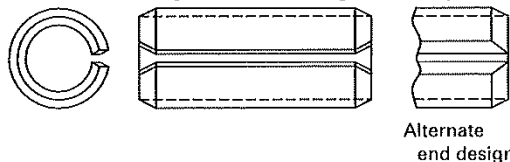
coiled spring pin: a fastener made by coiling thin material into a cylindrical shape. The pin is installed into a slightly smaller hole and retained by the spring action of the coils. The coils allow for radial movement after installation and absorb shock and vibration. The pin is well suited for installation into wide tolerance and mismatched holes.



Coiled Spring Pin

3.3.4.9.2 Slotted Spring Pin

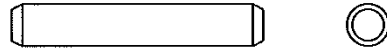
slotted spring pin: a headless, hollow, cylindrical tube that has a longitudinal slot down the entire length and chamfered or rounded ends to aid installation. It is produced to a controlled outside diameter slightly greater than the hole into which it will be installed. Compressed as it is installed, the pin applies continuous pressure toward the sides of the hole wall. The pressure provides tension in a radial manner to prevent loosening created by vibration or shock.

Alternate
end design

Slotted Spring Pin

3.3.4.10 Chamfered Straight Pin

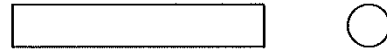
chamfered straight pin: a solid, headless pin that has controlled diameter and length and ends that are chamfered and approximately square with the axis of the fastener.



Chamfered Straight Pin

3.3.4.11 Square End Straight Pin

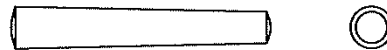
square end straight pin: a solid, headless pin that has controlled diameter and length and ends that are nonchamfered and approximately square with the axis of the fastener.



Square End Straight Pin

3.3.4.12 Taper Pin

taper pin: a headless, solid pin that has controlled diameter, length, and taper and crowned ends.



Taper Pin

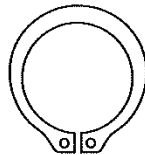
3.3.5 Retaining Rings

3.3.5.1 Retaining Ring

retaining ring: a precision-engineered fastener designed to provide an accurately located shoulder for positioning and securing components in an assembly. External types are expanded to spread over a shaft and internal types are compressed to fit into a bore/housing. When the ring is seated, it forms a removable shoulder for accurately locating and fastening parts in the assembly.

3.3.5.2 Basic External Ring (Type NA1)

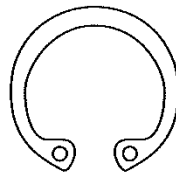
basic external ring (Type NA1): a ring designed to fit tightly in the groove of a shaft by expansion of the lugs with an assembly plier and installation in an axial direction.



Basic External Ring (Type NA1)

3.3.5.3 Basic Internal Ring (Type NA2)

basic internal ring (Type NA2): a ring designed to fit tightly in the groove of a housing or bore by compression of the lugs with an assembly plier and installation in an axial direction.



Basic Internal Ring (Type NA2)

3.3.5.4 E-Ring External (Type NA3)

E-ring external (Type NA3): a ring designed to provide a large shoulder on smaller diameter shafts. Ring is installed radially in the groove of a shaft, usually by means of an assembly applicator.



E-Ring External (Type NA3)

3.3.5.5 Heavy Duty External Ring (Type NA4)

heavy duty external ring (Type NA4): a ring that provides higher thrust load capacity and a larger shoulder than the basic external ring (see [para. 3.3.5.2](#)) due to its extra thickness and increased section height. This ring is installed with an assembly plier in an axial direction.



Heavy Duty External Ring (Type NA4)

3.3.5.6 Reinforced E-Ring (Type NA5)

reinforced E-ring (Type NA5): a reinforced version of the E-ring (see [para. 3.3.5.4](#)) that is designed to provide greater radial push-out forces and higher RPM limits. It is installed in a radial direction, usually by means of an assembly applicator.



Reinforced E-Ring External (Type NA5)

3.3.5.7 C-Ring External (Type NA6)

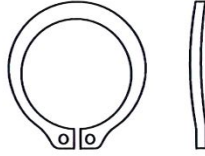
C-ring external (Type NA6): a ring whose narrow section height and uniform shoulder make it ideal for assemblies in which clearance dimensions are critical. It is installed in a radial direction, usually by means of an assembly applicator.



C-Ring External (Type NA6)

3.3.5.8 Bowed External Ring (Type NA7)

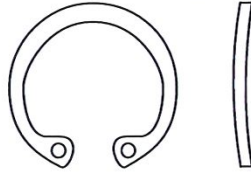
bowed external ring (Type NA7): a bowed version of the basic external ring (see [para. 3.3.5.2](#)) designed to take up resilient end play in an assembly. It is installed in an axial direction using assembly pliers.



Bowed External Ring (Type NA7)

3.3.5.9 Bowed Internal Ring (Type NA8)

bowed internal ring (Type NA8): a bowed version of the basic internal ring (see [para. 3.3.5.3](#)) designed to take up resilient end play in an assembly. It is installed in an axial direction using assembly pliers.



Bowed Internal Ring (Type NA8)

3.3.5.10 Bowed E-Ring (Type NA9)

bowed E-ring (Type NA9): a bowed version of the E-ring (see [para. 3.3.5.4](#)) designed to take up resilient end play in an assembly. It is installed in a radial direction, usually by means of an assembly applicator.



Bowed E-Ring External (Type NA9)

3.3.5.11 Inverted External Ring (Type NA10)

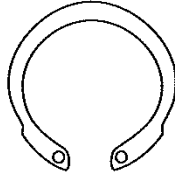
inverted external ring (Type NA10): an inverted lug design that provides greater clearance and a higher uniform protruding shoulder. It is installed in an axial direction using assembly pliers.



Inverted External Ring (Type NA10)

3.3.5.12 Inverted Internal Ring (Type NA11)

inverted internal ring (Type NA11): an inverted lug design that provides clearance and a higher uniform protruding shoulder. It is installed in an axial direction using assembly pliers.

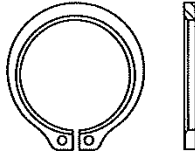


Inverted Internal Ring (Type NA11)

3.3.5.13 Beveled External Ring (Type NA12)

beveled external ring (Type NA12): a ring with a beveled inside diameter edge design that provides rigid end-play take-up in assemblies.

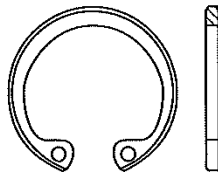
It is installed in an axial direction using assembly pliers.



Beveled External Ring (Type NA12)

3.3.5.14 Beveled Internal Ring (Type NA13)

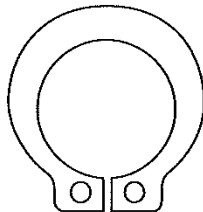
beveled internal ring (Type NA13): a ring with a beveled outside diameter edge design that provides rigid end-play take-up in assemblies. It is installed in an axial direction using assembly pliers.



Beveled Internal Ring (Type NA13)

3.3.5.15 External Self-Locking Ring (Type NA14)

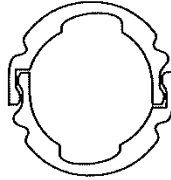
external self-locking ring (Type NA14): a ring that does not require a groove because of the frictional gripping power of the design. It is ideal for applications characterized by low-thrust loads. The ring is installed in an axial direction using assembly pliers.



Self-Locking Ring (Type NA14)

3.3.5.16 External Interlocking Ring (Type NA15)

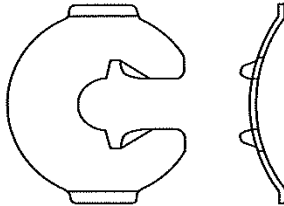
external interlocking ring (Type NA15): a circular ring comprised of two halves that interlock into a groove that, when assembled, is dynamically balanced and provides resistance to withstand high rotational speeds. It is installed in a radial direction using an assembly plier or assembly fixture.



External Interlocking Ring (Type NA15)

3.3.5.17 External Bowed Locking Prongs Ring (Type NA16)

external bowed locking prongs ring (Type NA16): a ring designed with two inside diameter prongs that lock it positively in its groove. Additionally, the bowed design provides resilient end-play take-up in assemblies. The ring is installed in a radial direction using an assembly applicator.



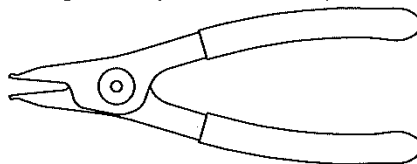
External Bowed Locking Prongs Ring (Type NA16)

3.3.5.18 Basic Hand Assembly Tools For Retaining Rings

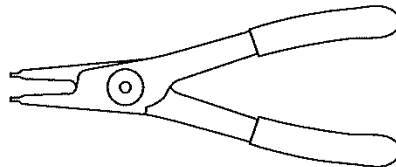
basic hand assembly tools for retaining rings: the pliers that all axially-installed retaining rings require for assembly and disassembly in an application and the applicators that all radially-installed retaining rings require for assembly.

3.3.5.18.1 Retaining Ring Assembly Pliers

retaining ring assembly pliers: pliers designed with tips that can be inserted into the holes of retaining ring lugs to properly hold axially-installed retaining rings during assembly and disassembly.



External Ring Plier

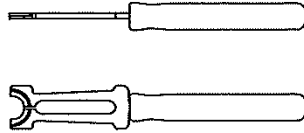


Internal Ring Plier

Retaining Ring Assembly Pliers

3.3.5.18.2 Retaining Ring Applicators

retaining ring applicators: applicators that have a fork-like blade designed to fit the contour of the ring and properly hold radially-installed retaining rings during assembly.



Retaining Ring Applicators

3.4 Miscellaneous Fasteners

3.4.1 Binding Post

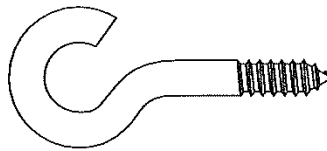
binding post: a special type of subassembly used for clamping or holding electrical conductors in a rigid position. It commonly consists of a screw with a collar head or body with one or more clamping screws.

3.4.2 Binding Post Screw Assembly

binding post screw assembly: a combination of a slotted machine screw and a barrel nut.

3.4.3 Ceiling Hook

ceiling hook: a fastener similar to an open eyebolt, except that it has lag screw threads.



Ceiling Hook

3.4.4 Expansion Fastener

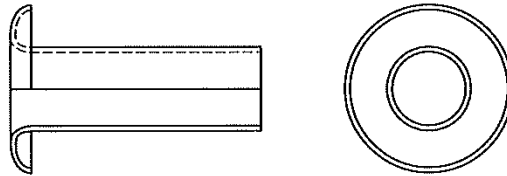
expansion fastener: either of the following types:

(a) a type that consists of a machine screw, an expansion shield, and an expander nut. The shield body expands in a wedge-like manner when the expander nut is tightened. This fastener is commonly used in fastening to masonry.

(b) a type that consists of a lag screw and an internally threaded split sleeve. It is designed for fastening to stone or concrete by inserting the sleeve into a hole in the stone or concrete and expanding to a tight fit in the hole by turning the lag screw.

3.4.5 Eyelet

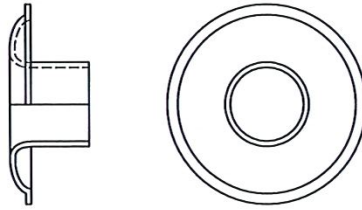
eyelet: a flanged tubular fastener designed for securing by curling or expanding the tubular end.



Eyelet

3.4.6 Grommet

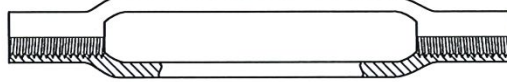
grommet: a large eyelet-type fastener designed for securing by curling the tubular end over a washer to provide strength in holes through resilient materials.



Grommet

3.4.7 Turnbuckle

turnbuckle: a loop or sleeve, usually internally threaded with a left-hand thread at one end and a right-hand thread at the other, designed for assembly with a threaded stud, eye, hook, or jaw at each end. It is used for applying tension to rods, wire rope, etc. Turnbuckles are sometimes made with a swivel feature at one end.



Turnbuckle

3.4.8 Wall Anchor

wall anchor: see *expansion fastener* ([para. 3.4.4](#)).

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