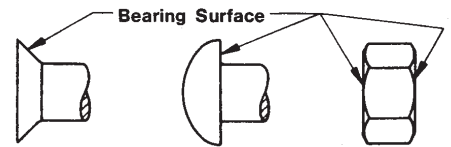




FASTENER DEFINITIONS

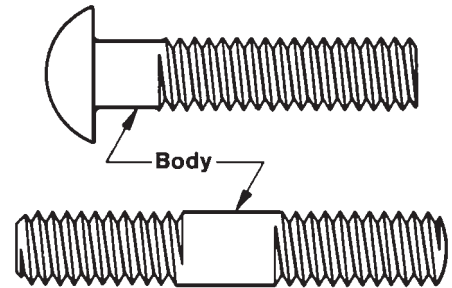
Alloy Steel: A steel containing elements other than carbon which have been added to obtain definite mechanical or physical properties, such as high strength at elevated temperatures, toughness, etc.

Bearing Surface: The supporting or locating surface of a fastener with respect to the part which it fastens (mates). The loading of a fastener is usually through the bearing surface.

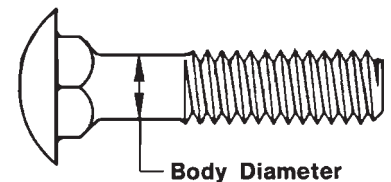


Blind Rivet: A rivet designed for use where only one side of the work is accessible.

Body: The body of a threaded fastener is the unthreaded portion of the shank.



Body Diameter: The diameter of the body of a threaded fastener.



Bolt: A headed and externally threaded mechanical device designed for insertion through an oversized hole and mated with a nut.

Carbon Steel: A steel which does not contain any substantial amounts of alloying materials other than carbon.

Case Hardened: A case hardened fastener is a fastener of ferrous material having a surface which has been made harder than the core.

Coating: The application of some material such as metal, organic compound, etc. to the surface of a fastener.

Electro-Galvanizing: The process of coating metal with zinc by electroplating.

Elongation: Longitudinal stretching of a fastener caused by a tensile load due either to tightening or to the external load.

Endurance Limit: The maximum stress that a fastener can withstand without failure for a specified number of stress cycles. (Also called Fatigue Limit)

Fastener: A mechanical device for holding two or more bodies in definite positions with respect to each other.

Fatigue Strength: Under variations in applied stress a fastener stretches internally which can cause rupture after a specific number of cycles. The number of cycles to failure for a specific load is the fatigue life of the screw. In rigid assemblies preloading above the external load should eliminate fatigue failure.

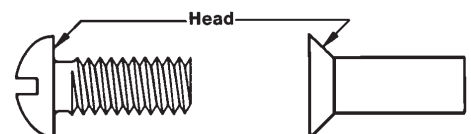
Ferrous: Relating to or containing iron.

Finish: The term finish is commonly applied to 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 type of fasteners to indicate the condition of the surface as a result of mechanical operations and the degree of precision.

Galvanizing: The process of coating metal with zinc by hot dipping.

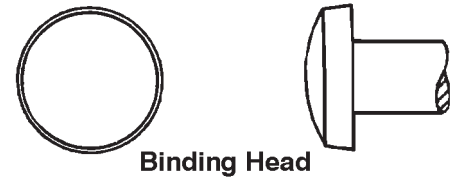
Grip: In general, the grip of a fastener is the thickness of material or parts which the fastener is designed to secure when assembled.

Head: The head of a fastener is the enlarged shape performed on one end of a headed fastener to provide a bearing surface.



Types of Heads:

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



Button Head: A button head as applied to threaded fasteners has a low rounded top surface with a large flat bearing surface.



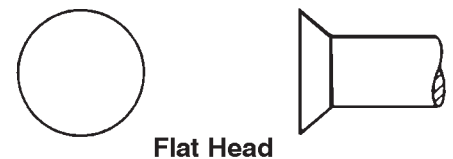
Fillister Head: The fillister head has a rounded top surface, cylindrical side surface and a flat bearing surface.



Flat Fillister Head: The flat fillister head has a flat top surface, cylindrical side surface and a flat bearing surface.



Flat Head: The flat head has a flat top surface and a conical bearing surface with head angles of nominally 82 degrees or 100 degrees.



Flat Trim Head: The flat trim head has a smaller head diameter and lower head height than the standard flat head.



Flat undercut Head: The flat undercut head is basically the same as the standard 82 degrees flat head except it is undercut to 70 percent of the basic head height.

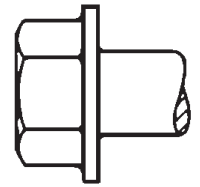
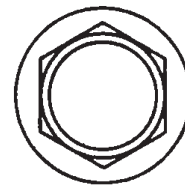


Hexagon Head: The hexagon head has a flat or indented top surface, six flat sides and a flat bearing surface.



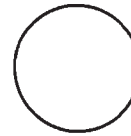
Types of Heads (Continued):

Hexagon Washer Head: The hexagon washer head is a washer head upon which a hexagon head is formed.

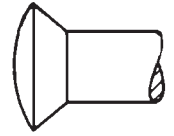


Hexagon Washer Head

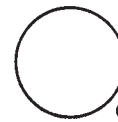
Oval Head: The oval head has a rounded top surface and a conical bearing surface with head angle of nominally 82 degrees.



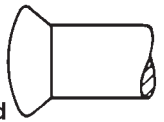
Oval Head



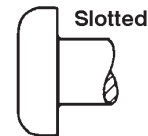
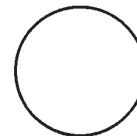
Oval Trim Head: The oval trim head has a smaller head diameter and lower head height than the standard oval head with a controlled radius at the junction of the top and the conical bearing surface.



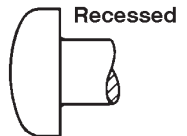
Oval Trim Head



Pan Head: The pan head has a flat bearing surface and a flat top surface rounding into a cylindrical side surface. On recessed pan heads, the top surface is semi-elliptical, rounding into a cylindrical side surface.



Slotted



Recessed

Recessed Head: A recessed head is a head having a specially formed indentation or recess centered in its top surface. Two common forms or recessed heads are the "Cross Recess" and "Clutch Recess."



Cross
Recess
Head

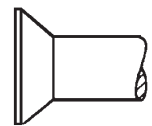
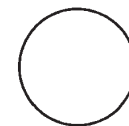


Clutch
Recess
Head

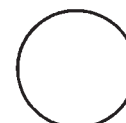


Recessed Heads

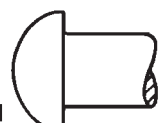
Round Countersunk Head: The round countersunk head is a circular head having a flat top surface and conical bearing surface.



Round Head: The round head has a semi-elliptical top surface and a flat bearing surface.



Round Head



Types of Heads (Continued):

Round Washer Head: The round washer head is a washer head upon which a round head is formed.



Round Washer Head

Slotted Head: A slotted head is a head having a slot centered across its top surface.



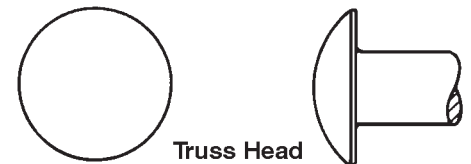
Slotted Head

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



Socket Head

Truss Head: The truss head has a low rounded top surface with 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. It is sometimes called “Oven Head” or “Stove Head.”



Truss Head

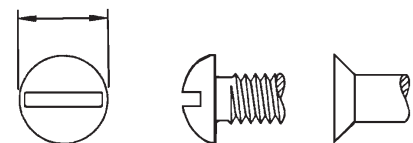
Washer Head: A washer head is a head having a circular collar with a large flat bearing surface upon which various other heads styles are integrally superimposed.



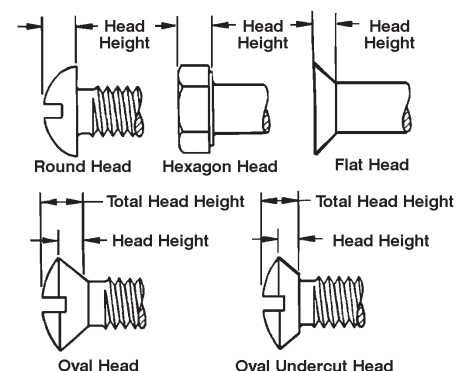
Washer Head

Head Diameter. The head diameter is the diameter at the largest periphery of the head.

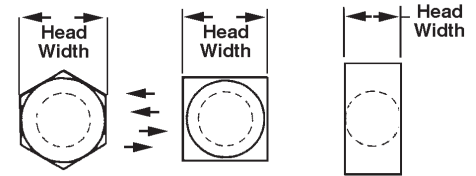
Head Diameter: The diameter at the largest periphery of the head.



Head Height: For a flat bearing surface head, the head height is the overall distance, measured parallel to the fastener axis, from the extreme top to the bearing surface. For a conical bearing surface head, the head height is 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. For flat and oval undercut heads, it is the distance measured to the intersection of the bearing surface with the undercut. For oval heads and undercut oval heads, the overall distance is referred to as total head height. For head height see figures.



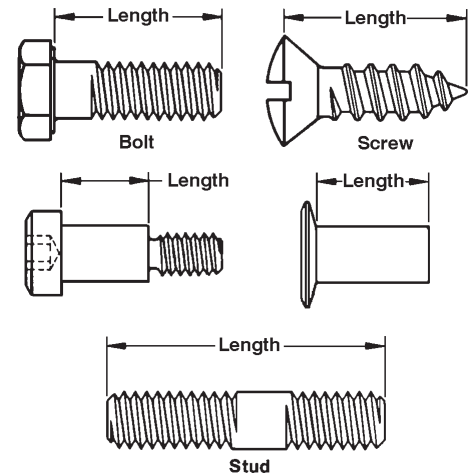
Head Width: The distance across opposite flats of hexagon, square or twelve-point heads measured in a plane perpendicular to the fastener axis. For rectangular or irregular shaped heads, the head width is the distance along the narrowest axis of the head measured in a like manner.



Hex (Hexagon): A polygon of six angles and six sides.

High Strength Fastener: A fastener having high tensile and shear strengths attained through combinations of materials, work hardening, and heat treatment.

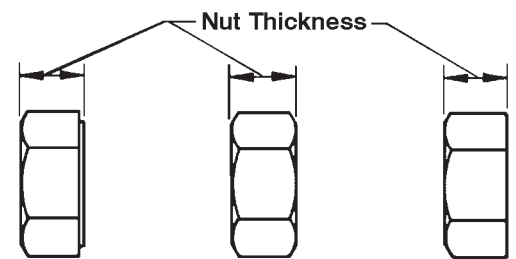
Length: The length of a headed fastener is the distance from the intersection of the largest diameter of the head with the bearing surface to the extreme point., measured in a line parallel to the axis of the fastener. Exceptions: The length of a shoulder screw and a socket head shoulder screw is the length of the shoulder. The length of flat top countersunk head tubular rivet (with chamfered top) is measured form the intersection of the bearing surface with the shank diameter to the extreme point. 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.



Non-Ferrous Metal: Metals or alloys without an appreciable amount of iron. Examples are aluminum, brass, copper, etc.

Nut Thickness: The overall distance form the top of the nut to the bearing surface, measured parallel to the axis of the nut.

Nut Width and Length: The distance across opposite flats of hexagon, square or twelve-point nuts. See figure for width and length of rectangular nuts.



Pin: A straight cylindrical or tapered fastener, with or without a head, designed to perform a semi-permanent attaching or locating functions.

Pitch: The distance; measured parallel to fastener axis, between corresponding points on adjacent thread forms in the same axial plane and on the same side of the axis.

Pitch Diameter: On a straight thread, the diameter of the coaxial cylinder, the surface of which would pass through the thread profiles at such points as to make the width of the groove equal to one-half of the basic pitch. On a perfect thread this occurs at the point where the widths of the thread and groove are equal.

Plain: Plain as applied to finish of fasteners is used to indicate that the fastener has had no supplementary surface treatment, such as plating, coating, etc., other than being oiled.

Plating: The application of a metallic deposit on the surface of the fastener by electrolysis, impact, or other suitable means.

Point: The point of a fastener is the configuration of the end of the shank of a headed fastener or of each end of the headless fastener. Points of fasteners fall into the general categories described and illustrated below.

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 to 90 degrees and a point diameter equal to or slightly less than the minor diameter of thread. This point is intended to facilitate entry of fasteners into holes at assembly.

Cone Point: A sharp conical point designed to perform perforating or aligning functions as assembly.

Gimlet Point: A threaded cone point usually having a point angle of 45 to 50 degrees. It is used on thread forming screws such as Type "A" tapping screws, wood screws, lag bolts, etc.

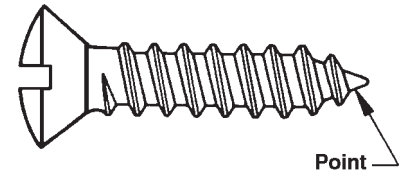
Header Point: A chamfered point normally produced during the heading operation. The screw blank is chamfered before threads are rolled. It is applied to machine screws in certain sizes and lengths.

Pinch Point: A pinch point is a short sharp cone point, usually having a point angle of 45 degrees, formed by a pinching operation. The point is normally limited to diameters of 1/4 inch or smaller and is applied to metal drive screws, and Type "BP" tapping screws.

Quench Hardening: Hardening a ferrous alloy by austenitizing and then cooling rapidly enough so that some or all the austenite transforms to martensite.

Quenching: Rapid cooling. When applicable, the following more specific terms should be used; direct quenching, fog quenching, hot quenching, interrupted quenching, selective quenching, spray quenching, and time quenching.

Rivet: A headed metal fastener of malleable material used to join parts of structures and machines by inserting the shanks through the aligned hole in each piece and forming a head on the headless end by upsetting. Common head styles are as follows.



Types of Rivet Heads:

Button Head Rivet: A button head is a circular head having a hemispherical top surface and a flat bearing surface. It is sometimes called "Round Head."

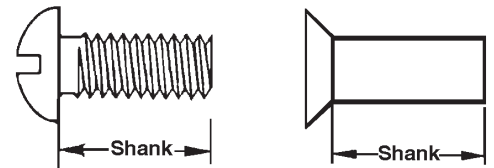


Countersunk Head Rivet: A countersunk head is a circular head having a flat top surface and a conical bearing surface with head angles that vary with the rivet type.

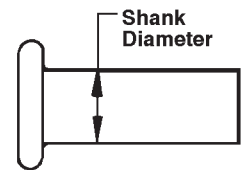


Rockwell Hardness Test: A measure of hardness by determining the depth of penetration of a penetrator into a specimen under certain fixed conditions of test. The penetrator may be either a steel ball or a diamond sphero-conical penetrator. The hardness number is related to the depth of indentation and the higher the number the harder the material.

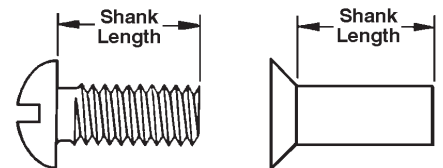
Shank: That portion of headed fastener which lies between the head and the extreme point.



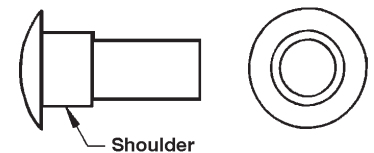
Shank Diameter: The diameter of the shank of an unthreaded fastener. The diameter of the unthreaded portion of a threaded shank is termed the Body Diameter.



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



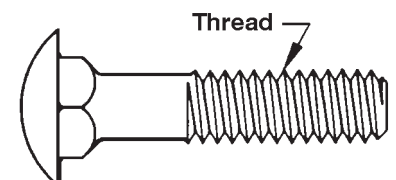
Shoulder: An enlarged portion of the body of a threaded fastener or shank of an unthreaded fastener.



Stainless Steel: A corrosion resistant type of alloy steel which contains a minimum of 12 percent chromium.

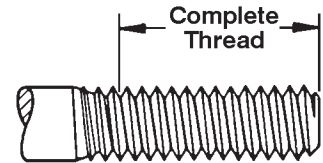
Tensile Strength: Force or stress required to break a fastener when pulled in straight tension. When expressed as a force, lbs., it applies to a specific size part. Expressed as a stress, psi, means the force is applied over a specific area and it could apply to a range of sizes. For example, socket screws from No. 0 to 1/2 inch can withstand an applied stress of 180,000 psi.

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.



Types of Threads:

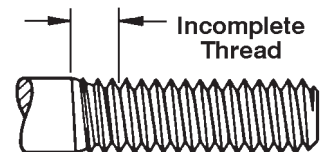
Complete Thread: The length of complete thread is the length of that cross section of a threaded length having full form at both crest and root. Where there is a chamfer at the start of the thread not exceeding two pitches in length, it is included within the length of the complete thread. The thread length on the drawing 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 take cognizance of (1) such permissible length of chamfer and (2) the first two threads which by virtue of HI-LO gaging practice may exceed the product limits and which may be included within the length of complete thread. However, where the application is such as to require a minimum or maximum number, or length, of complete threads the specification shall so state. Similar specification is required for definite length of engagement.



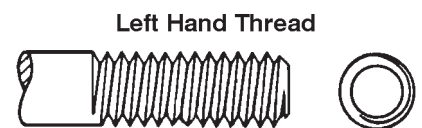
Effective Thread: The effective (or useful) thread includes the complete thread and that portion of the incomplete thread having fully formed roots but having crests not fully formed.

Incomplete Thread: This is also known as the vanish or washout thread. On straight threads, the incomplete thread is that portion at the end having roots not fully formed by the lead or chamfer on threading tools.

On taper threads, the crest at then end may also be not 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.



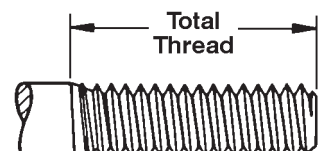
Left-Hand Thread: A thread is a left-hand thread if, when viewed axially, it winds in a counterclockwise, and receding direction. All left-hand threads are designated LH.



Right-Hand Thread: A thread is a right-hand thread if, when viewed axially, it winds in a clockwise and receding direction. All threads are right hand threads unless otherwise designated.

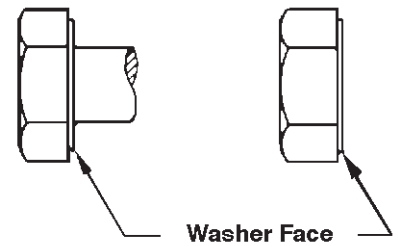


Total Thread: The total thread includes the complete or effective thread and the incomplete thread.

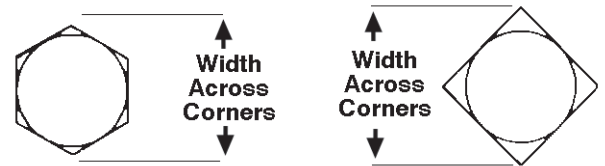


Threaded Fastener: A fastener, a portion of, which has some form of screw thread.

Washer Face: A circular boss on the bearing surface of a bolt or nut.






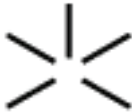


Width Across Corners: The width across corners of hexagon, square, or rectangular shaped fasteners is the distance measured perpendicular to the axis of the fastener from the intersection of two sides to the intersection of the two opposite sides.



Width Across Flats: The width across flats of hexagon or square heads of fasteners is the distance measured perpendicular to the fastener axis across opposite sides of the fastener.

Yield Strength: This is the measure of the resistance of a material to plastic (permanent) deformation. It is usually at a point of 0.2% permanent strain.

Tensile Strength and Identification Marking for Bolts, Screws, Studs & Sems®

Grade Designation	Products	Nominal Size Diameter Inches	Grade Identification Marking
1	Bolts, Screws, Studs	1/4" thru 1-1/2"	None
2	Bolts, Screws, Studs	1/4" thru 3/4" Over 3/4" to 1-1/2"	None
4	Studs	1/4" thru 1-1/2"	None
5	Bolts, Screws, Studs	1/4" thru 1" Over 1" to 1-1/2"	
5.1	Sems, Bolts, Screws	No. 6 thru 5/8" No. 6 thru 1/2"	
5.2	Bolts, Screws	1/4" thru 1"	
7	Bolts, Screws	1/4" thru 1-1/2"	
8	Bolts, Screws, Studs	1/4" thru 1-1/2"	
8.1	Studs	1/4" thru 1-1/2"	None
8.2	Bolts, Screws	1/4" thru 1"	

Tensile Strength For Metric Bolts & Screws

Steel Property Class 3.6 Through 12.9	Tensile Strength min. (psi)	Similar To
3.6	47,850	
4.6	58, 000	
4.8	60,900	
5.6	72,500	
5.8	75,400	Grade 2
6.8	87,000	
8.8 ≤ 16mm	116,000	Grade 5
8.8 > 16mm	120,350	
9.8	130,500	Above Grade 5
10.9	150,800	Grade 8
12.9	176,900	ASTM A574