Structural Bolts

A325 Structural Bolts

ASTM A325 Bolts are typically supplied as plain or galvanized (Mechanical or Hot Dipped). We offer A325 Bolts as Type I, Type III (weathering steel), or A325T (thread-to-head, in lengths up to four times the diameter). All of these bolts are heat-treated to a minimum tensile strength of 120 ksi up to 1" diameter, and 105 ksi over 1". The Type III Bolts are made from medium carbon alloy steel with copper, nickel, and chromium additions for weathering purposes. Please see our Technical Data Sheet on Type III Structural Fasteners if you would like further information. Dimensions are as specified for Heavy Hex Structural Bolts in ANSI/ASME B18.2.6 and threads are UNC (Unified Coarse) per ANSI/ASME B1.1.

A325M Metric Structural Bolts

ASTM A325M Bolts are typically supplied as plain or galvanized (Mechanical or Hot Dipped). The ASTM A325M Bolt is equivalent to the properties of an ASTM F568 Class 8.8 Bolt. These properties are essentially identical to Class 8.8 in ISO 898/1. Surface discontinuity limits are specified in ASTM F788/F788M. The ASTM A325M Bolts are produced to the dimensions for Heavy Hex Structural Bolts as specified in ANSI B18.2.3.7M. The threads are rolled as specified in ANSI B1.13M, to a metric coarse thread with Grade 6g tolerance.

A490 Structural Bolts

ASTM A490 Bolts are only permitted to be supplied as plain (black) finish. These bolts are heat-treated to a tensile strength range of greater than 150 ksi. Medium carbon, alloy steel is used for these bolts. Dimensions are as specified for Heavy Hex Structural Bolts in ANSI/ASME B18.2.6 and threads are UNC (Unified Coarse) per ANSI/ASME B1.1.

Applications

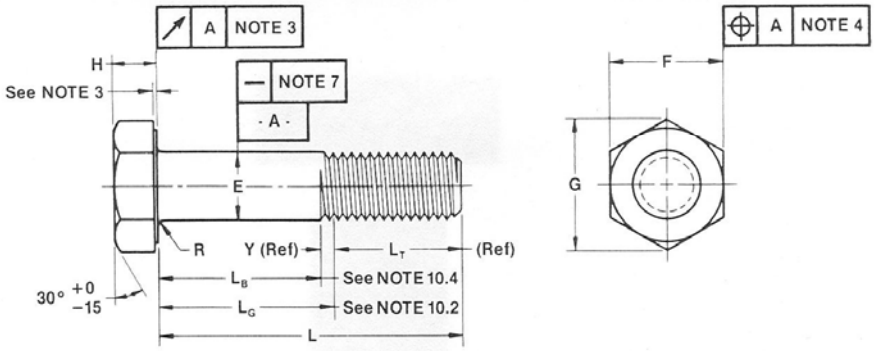
Structural Bolts are designed to be used with nuts for the connection of structural members. The head of a Heavy Hex Structural Bolt is specified to be the same size as a Heavy Hex Nut of the same nominal diameter, thus allowing a single size wrench or socket to be used on the bolt head and the nut. Structural Bolts also have a shorter thread length so that the threads can be eliminated from the shear planes of the connection. There are two primary ways in which Structural Bolts are used; Slip Critical Connections and Snug Tightened. The AISC (American Institute of Steel Construction) publishes the "Specification of Structural Joints Using ASTM A325 or A490 Bolts", which describes tightening methods for joints using Structural Bolts. In many cases (e.g., bearing connections, and bolts not in slip critical connections or subject to tension loads), bolts can be used in the snug tight condition. Snug tight is defined as the tightness that exists when all plies of a joint are in firm contact. It can normally be attained with a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. If full pretentioning is required, such as in slip critical connections, then a load equal to 70% of the minimum tensile strength is referenced. Slip critical connections, formerly known as friction type connections, rely on the friction between the steel plies being clamped together and the high clamp load of the Structural Bolt/Nut to prevent any movement (or slip) of the joint. To accomplish this high level of friction, the Structural Bolts must be fully tensioned to the following minimum clamp loads:

NOMINAL BOLT SIZE (INCHES)	*MINIMUM TENSION IN 1000'S OF POUNDS (kips)*	
	A325 BOLTS	*A490 BOLTS*
1/2	12	15
5/8	19	24
3/4	28	35
7/8	39	49
1	51	64
1-1/8	56	80
1-1/4	71	102

The AISC gives four appropriate methods to fully tension bolts for Slip Critical connections. They include the "turn-of-the-nut" method (where you turn the nut through a certain number of degrees to elongate the bolt), alternative bolts (such as our Tru-Tension® line of twist-off bolts), Load Indicating Washers (or DTI's), and lastly, calibrated torque wrench method. The first edition of the AISC manual (1951) had a torque/tension table; however, the table was withdrawn in 1954 due to recognition of the tremendous variation that was found (+/-40%). "Standard" torque/tension relationships determined from tables or formulas are no longer recognized as appropriate means to control pretension. Calibrated wrench tightening may be used provided that the installation procedures are calibrated daily (for each bolt diameter, length, grade, and surface condition). The torque value is best obtained by using a calibrated torque wrench (or transducer) and a Skidmore-Wilhelm type load indicating device to equate torque to tension. The calibrated torque wrench method should be considered as the least favorable of the four tightening options.

HEAVY HEX STRUCTURAL BOLTS

ANSI/ASME B18.2.1 1981



Dimensions of Heavy Hex Structural Bolts

Nominal Size or Basic Product Dia		E		F			G		H			R		L_T	Y	Runout of Bearing Surface FIM
		Body Dia		Width Across Flats			Width Across Corners		Height			Radius of Fillet		Thread Length	Transition Thread Length	
		Max	Min	Basic	Max	Min	Max	Min	Basic	Max	Min	Max	Min	Basic	Max	Max
1/2	0.5000	0.515	0.482	7/8	0.875	0.850	1.010	0.969	5/16	0.323	0.302	0.031	0.009	1.00	0.19	0.016
5/8	0.6250	0.642	0.605	1-1/16	1.062	1.031	1.227	1.175	25/64	0.403	0.378	0.062	0.021	1.25	0.22	0.019
3/4	0.7500	0.768	0.729	1-1/4	1.250	1.212	1.443	1.383	15/32	0.483	0.455	0.062	0.021	1.38	0.25	0.022
7/8	0.8750	0.895	0.852	1-7/16	1.438	1.394	1.660	1.589	35/64	0.563	0.531	0.062	0.031	1.50	0.28	0.025
1	1.0000	1.022	0.976	1-5/8	1.625	1.575	1.876	1.796	39/64	0.627	0.591	0.093	0.062	1.75	0.31	0.028
1-1/8	1.1250	1.149	1.098	1-13/16	1.812	1.756	2.093	2.002	11/16	0.718	0.658	0.093	0.062	2.00	0.34	0.032
1-1/4	1.2500	1.277	1.223	2	2.000	1.938	2.309	2.209	25/32	0.813	0.749	0.093	0.062	2.00	0.38	0.035
1-3/8	1.3750	1.404	1.345	2-3/16	2.188	2.119	2.526	2.416	27/32	0.878	0.810	0.093	0.062	2.25	0.44	0.038
1-1/2	1.5000	1.531	1.470	2-3/8	2.375	2.300	2.742	2.622	15/16	0.974	0.902	0.093	0.062	2.25	0.44	0.041
See Notes	15, 16	5		2										10.3	10.5	3