



ISO 9001 / ISO 14001 REGISTERED

TENSION CONTROL FASTENING SYSTEM

COST SAVING FEATURES:

- Pre-assembled fasteners providing consistent, reliable tension, and faster assembly time.
- Single source for bolt, nut, and washer.
- Greater than minimum tension is guaranteed with proper installation.



- Visual inspection of sheared pintail verifies proper torque-tension coefficient.
- Dependable, repeatable results. Consistent tension is not dependent on tools or operator skill.
- Lightweight electric installation tool provides less operator fatigue.
- One operator installation reduces installation time and manpower costs.



U. S. A.

**LEADING MANUFACTURER OF
DOMESTIC HIGH STRENGTH STRUCTURAL FASTENERS**

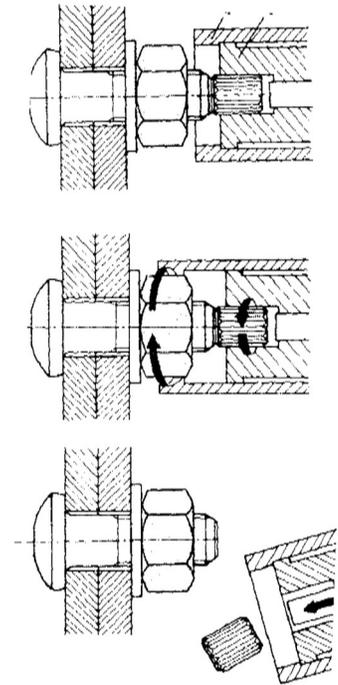
STRUCTURAL STEEL FASTENING SYSTEM

Unytite Inc., a ISO 9001/ISO 14001 registered facility located in Peru, Illinois, is a manufacturer of "Structural Fastening Systems" for the Heavy Construction (High Rise, Bridge, Road, and Industrial Building applications), Petro Chemical (Refinery, Pipeline, and Chemical Industries), Heavy Equipment, Rail Car, and Tractor-Trailer O.E.M.'s.

The unique Tension Control Fastening System is a 3 piece fastening assembly comprised of a button head design bolt with a 12 point pintail, a high strength heavy hex nut, and a hardened flat washer. When installed with a dual socket electric shear wrench, the outer socket applies the turning force to the nut, while the inner socket holds the bolt in place by gripping the 12 point spline tip. When the forces reach or exceed the designed torque-tension coefficient, the 12 point spline tip will shear off, leaving the bolt and nut securing the application at the proper tension.

INSTALLATION PROCEDURE

1. Fit the inner socket of the shear wrench over the spline on the bolt and push forward until the outer socket engages completely with the nut.
2. Pull the larger trigger on the wrench. The inner socket will hold the bolt in place, while the outer socket tightens the nut. The spline will shear off when proper tension is reached.
3. Remove the wrench from the nut and pull the ejection trigger. This will eject the spline from the inner socket of the wrench. The installation is now complete, and may be verified visually.



HANDLING – STORAGE – INSTALLATION

1. All structural fasteners should be protected from dirt and moisture at the job site. No more than the amount of bolts to be used that day should be removed from the container, or protected storage. Remaining bolts at the end of the day should be returned to the correct container. Dirty or rusted bolts should not be used.
2. Place all the bolts into the connection, with a washer under the nut in standard and short slotted holes. For long slotted and oversize holes, a washer should be placed under the head of the bolt and under the nut. Washer and nut identification markings should always face the opposite direction of the connection.
3. Bring all the fasteners in the connection to a snug tight condition, starting with the most rigid part of the connection.

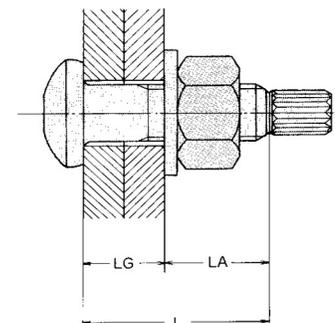
(The above recommendations by AISC apply to all A325 and A490 fasteners regardless of installation methods)

DETERMINING PROPER BOLT LENGTH

To determine the proper length of fastener that is needed, refer to the chart at right for the proper length to add to the grip. The bolt length should be adjusted to the next 1/4 inch for washer thickness.

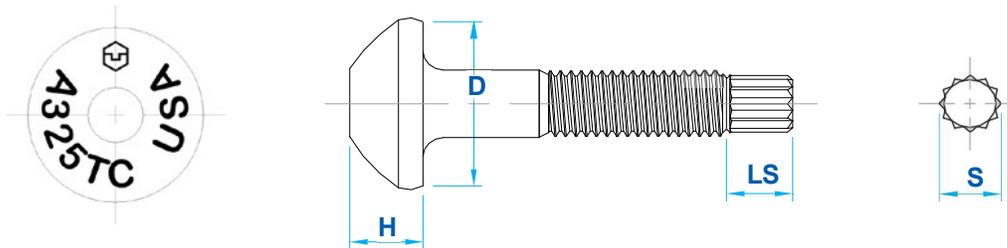
(NOTE: 3-5 bolt threads should be within the structural member to avoid thread run out)

NOMINAL BOLT SIZE	LENGTH ADDED TO GRIP
5/8"	7/8"
3/4"	1"
7/8"	1-1/8"
1"	1-1/4"
1-1/8"	1-1/2"
1-1/4"	1-5/8"
L = Bolt Length LG = Grip Length LA = Length Added to Grip	



UNYTITE, INC. tension control bolts are designed, manufactured and tested to conform to ASTM (American Society for Testing and Materials) ASTM F3125, AISC (American Institute of Steel Construction), FHWA* (Federal Highway Administration) and the most demanding customer specifications.

*Production to meet FHWA on customer request.



ASME B18.2.6 DIMENSIONS FOR TWIST OFF STRUCTURAL BOLT

Normal Size per Basic Product Diameter	H		D	LS*	S*	
	Height		Bearing Surface Diameter	Length of Spline	Width Across Flats	
	Max	Min	Min	Ref	Ref	
5/8"	0.625	0.403	0.378	1.102	0.60	0.43
3/4"	0.750	0.483	0.455	1.338	0.65	0.53
7/8"	0.875	0.563	0.531	1.535	0.72	0.61
1"	1.000	0.627	0.591	1.771	0.80	0.70
1-1/8"	1.125	0.718	0.658	1.991	0.90	0.80
1-1/4"	1.250	0.813	0.749	2.213	1.00	0.90

*The spline length (LS) and across the flat (S) dimensions are used for reference only. The grooved spline design may vary in size and shape.

ASTM F3125 GRADE F1852 MECHANICAL PROPERTIES

F1852 FASTENER TENSION

	Bolt			Nut		Washer
	Grade F1852			A563 DH		F436
	Proof Load	Tensile Strength	Hardness	Proof Load	Hardness	Hardness
Min		Rockwell				
5/8" -11	19,200	27,100	HRC 25-35	39,550	HRC 24-38	HRC 38-45
3/4" -10	28,400	40,100		58,450		
7/8" -9	39,250	55,450		80,850		
1" -8	51,500	72,700		106,050		
1-1/8" -7	64,900	91,600		133,525		
1-1/4" -7	82,400	116,300		169,575		

Nominal Diameter	1	2
	ASTM F3125 Grade F1852	UNYTITE Fastener Tension
	Min.	Min.
5/8" -11	19,900	21,900
3/4" -10	29,450	32,400
7/8" -9	40,750	44,850
1" -8	53,450	58,800
1-1/8" -7	67,350	74,100
1-1/4" -7	85,500	94,050

Mechanical Galvanized & Weathering Steel are available.

ASTM F3125 GRADE F2280 MECHANICAL PROPERTIES

F2280 FASTENER TENSION

	Bolt			Nut		Washer	
	Grade F1852			A563 DH		F436	
	Proof Load	Tensile Strength	Hardness	Proof Load	Hardness	Hardness	
Max		Min	Rockwell				
3/4" -10	40,100	57,800	50,100	HRC 33-38	58,450	HRC 24-38	HRC 38-45
7/8" -9	55,450	79,950	69,300		80,850		
1" -8	72,700	104,850	90,900		106,050		
1-1/8" -7	91,550	132,000	114,450		133,525		
1-1/4" -7	116,300	167,650	145,350		169,575		

Nominal Diameter	1	2
	ASTM F3125 Grade F2280	UNYTITE Fastener Tension
	Min.	Min.
3/4" -10	36,800	40,500
7/8" -9	50,950	56,050
1" -8	66,800	73,500
1-1/8" -7	84,100	92,500
1-1/4" -7	106,850	117,500

Weathering Steel is available.

1 – ASTM F3125 Minimum Fastener Tension
2 – UNYTITE Minimum Designed Assembly Fastener Tension

INSPECTION CERTIFICATE

A. Assembly Lot Number - All UNYTITE Bolts, Nuts, and Washers are manufactured and processed in accordance with our lot identification quality assurance plan. Each production lot is assigned an identification number, which follows the product throughout its manufacturing process. Each lot is tested individually and/or as an assembly with other production lots, and assigned an assembly lot number, which is labeled clearly on each shipping drum.

B. Fastener Tension - In each assembly lot, 5 fastener assemblies are tested for fastener tension. None of the five assemblies are lower than the minimum fastener tension. The average tension is reported on the certificate, along with the standard deviation.

C. Other Information - All UNYTITE certificates include mechanical properties, chemical composition, and heat numbers of raw materials.

CASE STUDY: HEX VS T.C. COST ADVANTAGES

EXAMPLE SITUATION... Steel Usage: 1,500 ton Bolt Usage: 30,000 sets Erection Period: 2 months

UNYTITE ASTM F3125 Grade A325 HEX HEAD BOLT	UNYTITE ASTM F3125 Grade F1852 TENSION CONTROL BOLT
EQUIPMENT AND TOOLS: 1) Impact Wrench - 3 sets (Approx. 30 lbs./Set) 2) Tension Calibrator - 1 set 3) Torque Wrench - 1 set 4) Air Compressor (30 HP) - set	EQUIPMENT AND TOOLS: 1) Electric Wrench - 3 sets (Approx. 15 lbs./Set) 2) Tension Calibrator - 1 set 3) Generator - 1 set
LABOR DAYS: 1) 5 man group 2) 1,200 bolts per group per day 3) 30,000 bolts / 1,200 = 25 days erection time 4) 5 men x 25 days = 125 labor days	LABOR DAYS: 1) 3 man each group 2) 2,400 bolts per group per day 3) 30,000 bolts / 2,400 = 13 days erection time 4) 3 men x 13 days = 39 labor days
INSPECTION: 1) Torque check for 5% of bolts installed 2) 250 bolts / 2 inspectors / per day 3) 30,000 x 0.05 / 250 = 6 days 4) 2 inspectors x 6 days = 12 labor days	INSPECTION: 1) Visual inspection
DIRECT LABOR COST: 1) Assembly = \$ 21,000 (30,000 bolts / 250 x \$35 x 5) 2) Bolt Fastening Labor Cost = \$ 175,000 (\$35 x 5 x 8 hours x 125 labor days) 3) Inspection Cost = \$ 6,720 (\$35 x 2 x 8 hours x 12 labor days) Total Labor Costs = \$ 202,720	DIRECT LABOR COST: 1) Assembly = \$ 0 2) Bolt Fastening Labor Cost = \$ 32,760 (\$35 x 3 x 8 hours x 39 labor days) 3) Inspection Cost = \$ 0 Total Labor Costs = \$ 32,760
BOLT, NUT, WASHER COST 3/4 x 2 1/4 22,000 sets 7/8 x 2 1/2 8,000 sets = \$ 50,000	T.C. BOLT NUT WASHER ASSEMBLY COST 3/4 x 2 1/4 22,000 sets 7/8 x 2 1/2 8,000 sets = \$ 35,000
TOTAL COST: = \$252,720	TOTAL COST: = \$ 67,760
SUMMARY: (\$252,720 - \$67,760) = \$184,960 Estimated Savings (Approx. 73%) and 25-13= 12 Fewer Erection Days (Cost reductions increase proportionately as project size and labor duration increase. Figures do not reflect savings due to fewer rental days of equipment)	

TENSION CONTROL ASSEMBLIES COMPARISON: BUTTON HEAD VS. HEX HEAD

T.C. bolts are manufactured or produced with a button head design which incorporates a larger bearing surface than the hex head design. In structural applications the hardened, flat, bearing surface under the bolt head is in contact with a softer steel beam surface which is generally rough with mill scale, blast cleaned, or primer coated. These surfaces will have a higher friction coefficient than the hardened surfaces of the bolt, thus preventing rotation. Therefore, with the Unytite button head, which has 40% more bearing surface than the subject hex head, there is less chance of rotation because there is 40% more resistance and clamping force being distributed between the bolt head and the structural member.

The lower friction coefficient inherent in the hex head design has a greater chance for rotation in installations, thus resulting in decreased torque and causing the tip to shear before minimum tension is achieved. This could mean having to remove the assembly and reinstalling a new assembly.