



ISO 9001 / ISO 14001 REGISTERED

TENSION CONTROL FASTENING SYSTEM

**QUICK, SAFE,
AND EASY**

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**

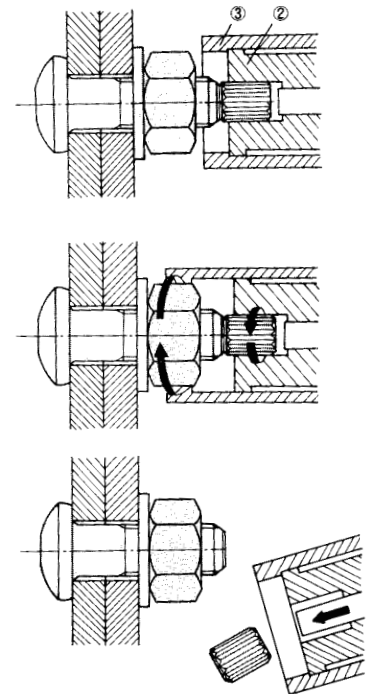
STRUCTURAL STEEL FASTENING SYSTEM

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.

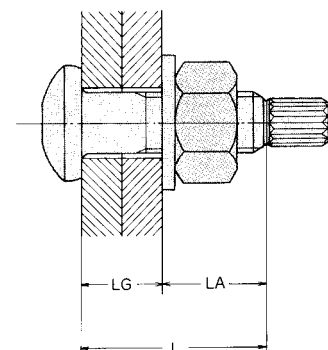
(NOTE: 3-5 bolt threads should be within the structural member to avoid thread run out)

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"

L = Bolt Length

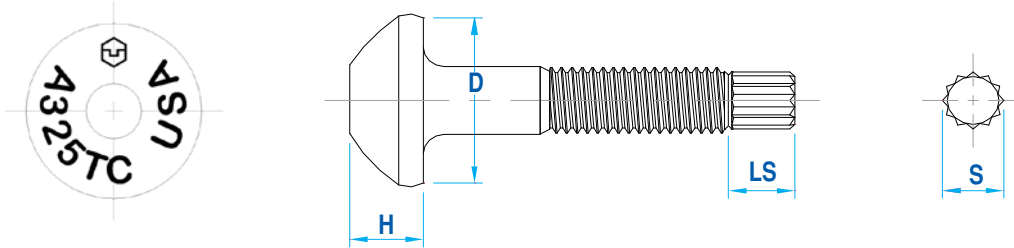
LG = Grip Length

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 or 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

*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

	Bolt			Nut		Washer
	Grade F1852			A563 DH		F436
	Proof Load	Tensile Strength		Proof Load	Hardness	Hardness
Min		Rockwell	HRC			
5/8"-11	19,200	27,100	HRC 25~34	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		

Mechanical Galvanized & Weathering Steel are Available.

F1852 FASTENER TENSION

Nominal Diameter	1	2
	ASTM F3125 Grade F1852	UNYTITE Fastener Tension
	Average	Min.
5/8"-11	19,900	20,900
3/4"-10	29,450	30,950
7/8"-9	40,750	42,800
1"-8	53,450	56,150
1-1/8"-7	67,350	70,750

ASTM F3125 GRADE F2280 MECHANICAL PROPERTIES

	Bolt			Nut		Washer	
	Grade F1852			A563 DH		F436	
	Proof Load	Tensile Strength		Proof Load	Hardness	Hardness	
Max		Min	Rockwell				HRC
3/4"-10	40,100	57,800	50,100	HRC 33~38	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

Weathering Steel Available.

F2280 FASTENER TENSION

Nominal Diameter	1	2
	ASTM F3125 Grade F2280	UNYTITE Fastener Tension
	Average	Min.
3/4"-10	36,800	38,650
7/8"-9	50,950	53,500
1"-8	66,800	70,150
1-1/8"-7	84,100	88,350

1 - ASTM F3125 Minimum Average Fastener Tension




2 - UNYTITE Designed Assembly Fastener Tension (Individual Sample Minimum)

INSPECTION CERTIFICATE

A. Set 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 as a set with other production lots, and assigned a set lot number, which is labeled clearly on each shipping drum.

B. Fastener Tension – In each set lot, 5 fastener sets are tested for fastener tension. None of the five sets 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.

INSPECTION CERTIFICATE																
SET LOT NO. 19930-20355140		Specification		Size		Quantity										
ASTM F1852 Type 1 ASTM A309 Grade DH ASTM F436 Type 1		3/4" x 10 x 2"		35,280 pcs				 UNYTITE, INC. One Unytite Drive Peru, Illinois 61354 815-224-2321 — FAX # 815-224-3434								
Mechanical properties tested in accordance to ASTM F606/F606M, ASTM A370, ASTM E18																
BOLT LOT NO. 19930 Date: 01-15-15																
Mechanical Property of Full Size Bolts			Heat Treatment		IDENTIFICATION		Chemical Composition %									
Tensile Strength	Proof Load	Hardness	% FC	Quench	Temper.		C	Si	Mn	P	S	Cu	Ni	Cr	Mo	B
Load (ksi)	Position of Rupture	25-34 HRC					x 100	x 100	x 100	x 1000	x 1000	x 100	x 100	x 100	x 100	x 10000
Min.	Max.	Min.	Min.	Min.	Min.		30	15	Max.	Max.	Max.	—	—	—	—	—
Average	50,600	Part of Spec. ALL PASS	31.9	1980	887	20355140	31	22	85	9	2	10	4	8	1	22
NUT LOT NO. 19930-NF14201615																
Hardness (HRC)		Hardness After 24 hr + 1000° F HSB	Proof Load (ksi)	% FC	Quench	Temper.	IDENTIFICATION		Chemical Composition %			Thread Accuracy				
24-38		H8B #9	58,450	—	—	—		C	Si	Mn	P	S	Cu	Ni	Cr	
Min.		Max.	Min.	Min.	Min.	Min.		x 100	x 100	x 100	x 1000	x 100	x 100	x 100	x 100	
28.8		—	ALL PASS	1342	1049	NF14201615		43	21	84	10	21	8	4	6	
WASHER LOT NO. 03051										Fastener Tension		REMARKS				
Hardness (HRC)		IDENTIFICATION		Chemical Composition %			Spec. 98/2		Min.		40,100					
38-45		Heat No. 418046		C x 100, Si x 100, Mn x 100, P x 1000, S x 100, Cu x 100, Ni x 100, Cr x 100			Mean / 5 sets		38,300		Standard Deviation					
38-45		25 22 120 9 2		Max. 40 50			1,400									
Material used for the bolt, nut and washer were melted & manufactured in the USA. The product was manufactured in the USA per ASTM specifications. The bolt and nut are manufactured by Unytite. We hereby certify that the material described has been manufactured and inspected satisfactorily with requirement of the above specification.										Chief of Quality Assurance Section <i>Chang</i>						

CASE STUDY: HEX VS T.C. COST ADVANTAGES

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 = \$ 8,400 (30,000 bolts / 250 x \$70.00) 2) Bolt Fastening Labor Cost = \$ 70,000 (\$70.00 x 8 hours x 125 labor days) 3) Inspection Cost = \$ 6,720 (\$70.00 x 8 hours x 12 labor days) Total Labor Costs = \$ 85,120	DIRECT LABOR COST: 1) Assembly = \$ 0 2) Bolt Fastening Labor Cost = \$ 21,840 (\$70.00 x 8 hours x 39 labor days) 3) Inspection Cost = \$ 0 Total Labor Costs = \$ 21,840
BOLT, NUT, WASHER COST 3/4 x 2 1/4 22,000 sets = \$ 30,000 7/8 x 2 1/2 8,000 sets	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: = \$ 115,120	TOTAL COST: = \$ 56,840
SUMMARY: (\$115,120 - \$56,840) = \$58,280 Estimated Savings (Approx. 50%) 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.