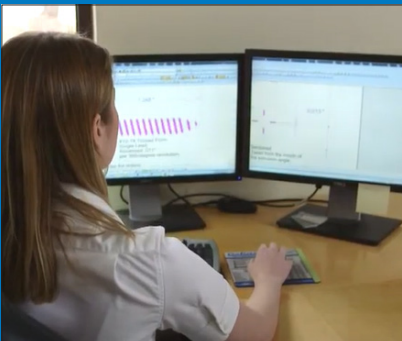


FASTENER ENGINEERING GUIDE



FOR ENGINEERS AND ARCHITECTS



NOV 2022



800.486.1832

www.trianglefastener.com



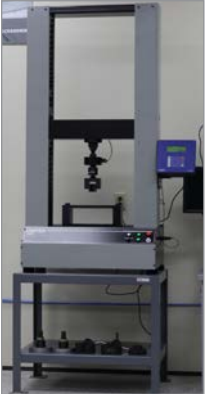
We offer the following services at no charge to you!

- Product development
- Application testing
- Quality assurance

- Engineering support
- Product and application training
- Fastener recommendations

***Do you need technical assistance?
Contact us and we are happy to help!***

DESIGN • DEVELOPMENT • PRODUCT CONFORMANCE • FASTENER RECOMMENDATIONS



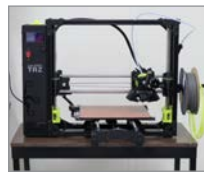
Tensile & Compression (10kips max)

We can conduct pullout, shear, and compression testing for fasteners.



Hardness Test (Rockwell Scales B & C)

The hardness of the substrate affects the pull-out and shear loads of the fastener. That is why we check the hardness of the steel and include that information with our results.



3D Printer

We use the most up-to-date tools to develop the newest innovations in fastening technologies.



Drill / Pierce Test Machine

We test our fasteners to assure that they drill or pierce quickly and consistently.

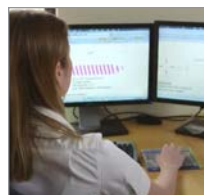
Our specifications exceed industry standards, assuring the performance of our products.

Our state of the art drill test machine is capable of testing fasteners up to 8" long.



Lathe, Mill, Grinder, Brake, Shear, Table & Mitre Saw

We can fabricate samples to help in testing and product evaluation.



Product Conformance

We QC all of our products for dimensional, mechanical, and physical performance.

PRODUCT AND APPLICATION TRAINING



Training for up to 20 people

Our TECH CENTER is equipped to train you on fastener installation using a hands-on approach.

We can help you learn about the best product for your application, provide the best installation techniques and keep you informed on the latest tool technology.

We can simulate your specific application, and help you develop a fastener that meets your needs.

TFC TECH CENTER LOCATION

4661 Hinckley Parkway • Cleveland, OH 44109
P: 216.351.9933 • www.trianglefastener.com

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FASTENER PROPERTIES

Physical, mechanical and performance characteristics are material related properties which collectively give the fastener its service capability.

PHYSICAL PROPERTIES

Inherent in the raw material and remain unchanged or only slightly altered in the fastener after its manufacture.

MECHANICAL PROPERTIES

Identify the reaction of a fastener to applied loads. Properties such as hardness, ductility and tensile and yield strengths are all subject to significant change as the raw material is processed into a finished fastener.

PERFORMANCE PROPERTIES

Functional design features manufactured into the fastener to assist it to satisfy various service requirements. Properties of this type include prevailing torque, driving torque, locking ability and sealing. Choice of material and its metallurgical treatment influence magnitude rather than the presence of a particular performance property.

MECHANICAL PROPERTIES

TENSILE STRENGTH

The maximum tension applied load a fastener can support prior to fracture.

YIELD STRENGTH

A tension applied load at which a fastener experiences a specified amount of permanent deformation: i.e., the material has been stressed beyond its elastic limit and has entered its plastic zone.

PROOF LOAD

The tension applied load supported by the fastener without evidence of permanent deformation (about 90-93% of expected material yield).

HARDNESS

A measure of ability to resist abrasion and indentation. For carbon steel fasteners there is a close correlation between hardness and tensile strength. A similar pattern exists for stainless and non-ferrous materials, but it is not as precise as for carbon steels.

DUCTILITY

Ability of a material to deform before it fractures. Elongation and reduction of area are common criteria to evaluate ductility.

TOUGHNESS

A material's ability to resist damage when stressed by impact or shock loading. Impact strength testing is rarely a testing requirement outside of aerospace applications.

SHEAR STRENGTH

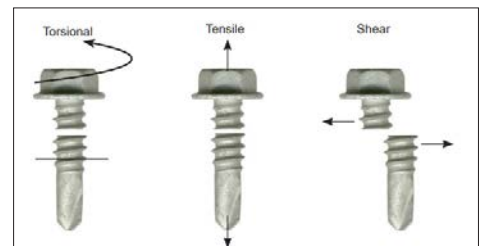
The maximum load applied normal to a fastener's axis that can be supported prior to fracture. Single shear is load occurring in one transverse plane, thus cutting the fastener into two pieces. Double shear is load applied in two planes, so that the fastener would be cut into three pieces.

TORSIONAL STRENGTH

Load usually expressed in terms of applied torque at which fastener fails by being twisted off about its axis. The torsional strength of the driving recess or wrenching surface is the torque which can be sustained without damage to the tool/fastener interface resulting in unsuccessful installation.

FATIGUE STRENGTH

The maximum load a fastener can withstand for a specified number of repeated applications prior to failure. For a single load application to failure, the fatigue strength equals the static tensile strength. As the load is reduced, the fastener endures an increasing number of loading cycles until it reaches its other extreme of fatigue strength known as its endurance limit, which is the cyclic load the fastener can accept and survive indefinitely. Rarely used outside of aerospace applications, but helps compare relative performance to resist dynamic loadings.





304 STAINLESS STEEL SELF-TAPPING SCREWS IN-STOCK NOW!

- < 3" Long | Bagged 250-pcs
- Oversize or special sealing washers available!
- Can be painted to match your specific color!

You want'em...we got'em!



#14-10 Type A

Tapping Range: <=14ga & Wood

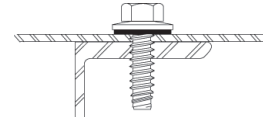


Description	Part Number With Washer	Box Qty.	Wgt/M
#14-10 x 3/4"	14075AW35	2.5M	10.8
#14-10 x 1"	14100AW34	2.5M	14.2
#14-10 x 1-1/2"	14150AW35	1.5M	19.1
#14-10 x 2"	14200AW35	1M	23.4
#14-10 x 2-1/2"	14250AW35	1M	28.1
#14-10 x 3"	14300AW35	500	34.1
#14-10 x 4"	14400AW35	500	45.5
#14-10 x 5"	14500AW34	300	52.8
#14-10 x 6"	Call for Availability		
#14-10 x 7"			
#14-10 x 8"			
#14-10 x 9"			



1/4-14 Type B

Tapping Range: 14ga - 1/2"



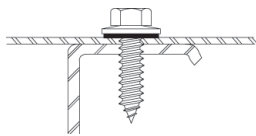
Description	Part Number		Box Qty.	Wgt. Per M
	With Washer	No Washer		
1/4-14 x 1"	14100BW34	14100B35	2.5M	14.1
1/4-14 x 1-1/2"	14150BW35	14150B35	1.5M	19.5
1/4-14 x 2"	14200BW35	14200B35	1M	23.1
1/4-14 x 2-1/2"	14250BW35	14250B35	1M	29.0
1/4-14 x 3"	14300BW35		500	33.3
1/4-14 x 4"	14400BW35	14400B35	500	43.4
1/4-14 x 5"	14500BW35	14500B35	300	53.5
1/4-14 x 6"	14600BW35	14600B35	250	62.2
1/4-14 x 7"	Call for Availability			
1/4-14 x 8"				
1/4-14 x 9"				

Blue colored sizes denotes In-stock Items



1/4-14 Type AB

Tapping Range: <=10ga & Wood

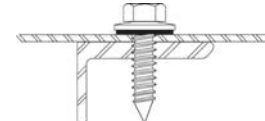


Description	Part Number		Box Qty.	Wgt. Per M
	With Washer	No Washer		
1/4-14 x 3/4"	14075XW35		2.5M	12.5
1/4-14 x 1"	14100XW34		2.5M	14.9
1/4-14 x 1-1/2"	14150XW34		1.5M	19.7
1/4-14 x 1-3/4"	14175XW35	14175X35	2M	23.4
1/4-14 x 2-1/2"	14250XW35	14250HWABS3	1M	28.1



1/4-14 Type BP

Tapping Range: 14ga - 1/2"



Used for alignment into structure.

Description	Part Number With Washer	Box Qty.	Wgt. Per M
1/4-14 x 1-3/4"	14175P35	2M	23.4



#17-14 Type AB

Tapping Range: Up to 10ga



GOOF SCREW

Description	Part Number With Washer	Box Qty.	Wgt. Per M
#17-14 x 1"	17100XW35	2M	18.9

SPECIFICATIONS

Material: Type 304 Stainless Steel (18-8 Family)

Finish: Type AB, B & BP: .0003" Min. Cad Plating (For lubricity)

Type A: .00015" Min. Zinc Plating (For lubricity)

Washer: 15MM OD | 304SS and EPDM

Drive: 3/8" Hex Head

Drill Bit: Use 135° split point drill bits for optimal performance.

Screwgun Speed: 1,000 rpm maximum. Torque control. (DeWalt DW269)

Pullout Loads | Ultimate in Pounds Force

Carbon Steel, 304SS, & 410SS Tapping Screws

The tensile strength of the substrate that is used in this chart below is typical for metal building and roofing applications. Contact TFC if other substrate tensile strengths are required.

For allowable loads, please apply an appropriate Factor of Safety as required by local and national code requirements.

AISI S100 Section E4 recommends a Factor of Safety of 3 for allowable loads

Fastener Information		PULLOUT ULTIMATE LOAD IN POUNDS Calculated Values In Accordance to AISI S100 Section E4													
Screw Size	Nom Dia. (in.)	Grade 50 per ASTM A1011 60Ksi Min. Steel					Grade 50 per ASTM A792/A653/A572/A529 65Ksi Min. Steel								
		26 Ga. (.018")	25 Ga. (.021")	24 Ga. (.024")	22 Ga. (.030")	20 Ga. (.036")	18 Ga. (.048")	16 Ga. (.060")	14 Ga. (.075")	12 Ga. (.105")	1/8" (.125")	10 ga (.135")	1/4" (.250")	3/8" (.375")	1/2" (.500")
#14-10 1/4-14	.250"	230	268	306	383	459	633	829	1,036	1,450	1,727	1,865	*3,453	*5,180	*5,967
Drill Bit size		1/8" (.125")		5/32" (.156")			3/16"		#7 (.201")		#2 (.221")		#1 (.228")		
Point Type		A, AB		A , AB			A, AB, BP		AB , B, BP		AB , B, BP		B, BP		
*Denotes exceeds tensile strength of screw															
Point Type		AB													
Drill Bit Size		3/16" (.187")					1/4" (.250")					Not Recommended			
#17-14	.285"	262	305	348	432	523	756	945	1,181	1,653	1,968	2,126			
Screw Size	Nom Dia. (in.)	26 Ga. (.018")	25 Ga. (.021")	24 Ga. (.024")	22 Ga. (.030")	20 Ga. (.036")	18 Ga. (.048")	16 Ga. (.060")	14 Ga. (.075")	12 Ga. (.105")	1/8" (.125")	10 ga (.135")	1/4" (.250")	3/8" (.375")	1/2" (.500")

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CARBON STEEL & STAINLESS STEEL SELF-TAPPING SCREWS

Fastener Data and Submittal Sheet



Material Information

Product: TFC Tapping Screws
General Specification: ANSI B18.6.4, AC 118)

Material: C 1018 / C 1022
410 Stainless Steel
Heat Treat: Case Hardened
Finish: .0003" Zinc Plated - 24 hrs salt spray /
No red rust
Optional: TRI-SEAL Coated – 1,000 hrs
salt spray / No red rust

Material: Type 304 Stainless Steel (18-8)
Heat Treat: None
Finish: Type B & BP: .0003" Min. Cad Plating (For lubricity)
Type A & AB: .0003" Min. Zinc Plating (For lubricity)
Salt Spray: >2,000 hrs / No red rust

Pressure Treated or Fire Treated Wood Connections

Screw made of 410 or 300 series stainless steel are recommended. Carbon steel screws must be hot dipped galvanized or TRI-SEAL® coated. Do not use standard, zinc plated, carbon steel screws.

Sealing Washer Information

Carbon Steel Screws: 15MM O.D. Galvanized Steel / EPDM.
Stainless Steel Screws: 15MM O.D. Stainless Steel / EPDM.
#17 with VRT® Screws: 3/4" O.D. Galvanized Steel / EPDM.
Zinc Cap Head and Stainless Cap Head: 5/8" O.D. Head / EPDM.

Application and Description

Carbon Steel Screws

These general purpose screws are designed for normal atmospheric conditions. They should not be used in heavy industrial applications or close proximity to the ocean where corrosion can occur. They are case hardened and can tap up to 1/2" thick steel using the appropriate hole size listed on this sheet.

410 Stainless Steel Screws

These screws can be used in mild atmospheres, steam, and many mild chemical environments. They provide superior strength and are plated or coated to provide lubricity during tapping. 410 screws may show signs of red rust but will not rust as quickly as carbon steel screws. Not recommended for use in aluminum connection. Expansion of the aluminum may stress the screw to failure due to the screw's hardness.

304 Stainless Steel Screws

These screws are used in applications that require superior corrosion resistance or ductility. The chromium in the material reacts with oxygen forming a thin, invisible, non-reactive chromium oxide film. It is resistant to ordinary rusting in wastewater treatment, food-processing environments, and a wide variety of chemicals. 304 stainless steel screws are slightly magnetic caused during head and thread forming. They are not heat treated and are plated to provide lubricity that helps minimize thread roll-over caused during tapping.

Mechanical Properties

Screw Type	Major Dia.	Torsional Lb-in.	Material	Tensile Lbs	Shear Lbs.
#14-10 Type A	.235" .246"	125	Carbon Steel	3,150	2,150
			304 SS	2,925	1,925
1/4-14 Type AB & B	.237" .246"	150	Carbon Steel	3,850	2,575
			304 SS	3,700	2,800
#17-14 Type AB	.280" .290"	170	Carbon Steel	5,890	3,285
			304 SS	5,200	3,125

Hole Size and Pullout Values - Tapping Screws

Rev 1221JS

Pullout Loads | Ultimate in Pounds Force

Carbon Steel, 304SS, & 410SS Tapping Screws

The tensile strength of the substrate that is used in this chart below is typical for metal building and roofing applications.

Contact TFC if other substrate tensile strengths are required.

For allowable loads, please apply an appropriate Factor of Safety as required by local and national code requirements.

AISI S100 Section E4 recommends a Factor of Safety of 3 for allowable loads

Use 135° split point drill bits for optimal performance.



Fastener Information		PULLOUT ULTIMATE LOAD IN POUNDS Calculated Values In Accordance to AISI S100 Section E4													
Screw Size	Nom Dia. (in.)	Grade 50 per ASTM A1011 60Ksi Min. Steel					Grade 50 per ASTM A792/A653/A572/A529 65Ksi Min. Steel								
		26 Ga. (.018")	25 Ga. (.021")	24 Ga. (.024")	22 Ga. (.030")	20 Ga. (.036")	18 Ga. (.048")	16 Ga. (.060")	14 Ga. (.075")	12 Ga. (.105")	1/8" (.125")	10 ga (.135")	1/4" (.250")	3/8" (.375")	1/2" (.500")
#14-10 1/4-14	.250"	230	268	306	383	459	633	829	1,036	1,450	1,727	1,865	*3,453	*5,180	*5,967
Drill Bit size		1/8" (.125")		5/32" (.156")			3/16"		#7 (.201")		#2 (.221")		#1 (.228")		
Point Type		A, AB		A, AB			A, AB, BP		AB, B, BP		AB, B, BP		B, BP		
		*Denotes exceeds tensile strength of screw													
Point Type		AB													
Drill Bit Size		3/16" (.187")					1/4" (.250")					Not Recommended			
#17-14	.285"	262	305	348	432	523	756	945	1,181	1,653	1,968	2,126			
Screw Size	Nom Dia. (in.)	26 Ga. (.018")	25 Ga. (.021")	24 Ga. (.024")	22 Ga. (.030")	20 Ga. (.036")	18 Ga. (.048")	16 Ga. (.060")	14 Ga. (.075")	12 Ga. (.105")	1/8" (.125")	10 ga (.135")	1/4" (.250")	3/8" (.375")	1/2" (.500")

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SUGGESTED HOLE SIZES FOR TAPPING SCREWS

Thread Rolling and
Thread Cutting Types D, F, G and T

Formula For Hole Diameter

1.015 x basic nominal thread major diameter. Tolerance is +/- 3%.

SCREW SIZE	HOLE DIAMETER			DRILL BIT SIZE	
	Max	Mean	Min	Drill Size	Drill Dia.
2- 56	0.078	0.076	0.074	48	0.076
2-64		0.077			
3-48	0.090	0.087	0.084	44	0.086
3-56		0.089			
4- 40	0.100	0.097	0.094	41	0.096
4-48		0.100			
5-40	0.113	0.110	0.107	35	0.110
5-44		0.112			
6-32	0.123	0.119	0.115	31	0.120
6-40		0.124			
8-32	0.150	0.146	0.141	20	0.147
8-36		0.148			
10 - 24	0.170	0.165	0.160	19	0.166
10-32	0.177	0.172	0.167	11/64	0.1719
12-24	0.198	0.192	0.186	11	0.191
12-28		0.196			
1/4 - 20	0.228	0.221	0.214	2	0.221
1/4-28		0.230			
5/16 - 18	0.289	0.281	0.273	K	0.281
5/16-24		0.290			
3/8 - 16	0.349	0.339	0.329	R	0.339
3/8 - 24		0.353			
7/16 - 14	0.409	0.397	0.385	X	0.397
7/16-20		0.411			
1/2 - 13	0.471	0.457	0.443	29/64	0.4531
1/2 - 20		0.475			

Thread Forming Types AB, B, and BP
Thread Cutting Types BF and BT

Formula For Hole Diameter

0.98 x basic nominal thread major diameter. Tolerance is +/- 7%.

SCREW SIZE	HOLE DIAMETER			DRILL BIT SIZE	
	Max	Mean	Min	Drill Size	Drill Dia.
2- 32	.077	.072	.067	49	.073
3-28	.090	.084	.078	45	.082
4-24	.103	.096	.089	41	.096
5-20	.114	.107	.100	36	.1065
6-20	.124	.116	.108	32	.116
7-19	.138	.129	.120	30	.1285
8-18	.148	.138	.128	29	.136
10-16	.170	.159	.148	21	.159
12-14	.194	.182	.169	14	.182
1/4-14	.226	.211	.196	4	.209
5/16-12	.289	.270	.251	I	.272
3/8-12	.356	.333	.310	0	.332
7/16-10	.413	.386	.359	w	.386
1/2 - 10	.480	.449	A18	29/64	A531

Physical Properties

Fastener Diameter	Nominal Screw Diameter	Torsional (Lb-In.)	Tensile (Pounds)	Shear (Pounds)
#6-20	0.138	24	1,125	750
#8-18	0.164	42	1,575	1,000
#10-16	0.190	61	2,100	1,400
#10-24	0.190	65	3,400	2,275
#12-14	0.216	92	2,778	2,000
#12-24	0.216	100	3,188	2,100
1/4-14	0.250	150	3,850	2,600
1/4-20	0.250	156	4,275	2,700
#18-9	0.306	196	4,550	2,576
5/16-12	0.313	290	5,439	3,264

Note

As a general practice, tapping torque should equal approximately 70% of the fasteners torsional strength.

Adjust hole size to accommodate hardness and thickness of material.

DISCLAIMER: ALL TEST RESULTS AND SPECIFICATIONS ARE A RESULT OF LABORATORY TESTS. APPROPRIATE SAFETY FACTORS SHOULD BE USED BY THE USER OR SPECIFIER. DETERMINING THE PROPER FASTENER IS THE RESPONSIBILITY OF THE USER OR SPECIFIER. SINCE APPLICATION CONDITIONS VARY AND ARE UNCONTROLLABLE BY TFC, WE ASSUME NO LIABILITY FOR THE USE OF THIS INFORMATION.

DECIMAL EQUIVALENT (inch) for Fractional, Number, Letter & Metric Bits



DECIMAL	BIT SIZE	DECIMAL	BIT SIZE	DECIMAL	BIT SIZE	DECIMAL	BIT SIZE	DECIMAL	BIT SIZE
.0625	1/16	.1299	3.3mm	.2165	5.5mm	.3281	21/64	.5469	35/64
.0630	1.6mm	.1339	3.4mm	.2188	7/32	.3307	8.4mm	.5512	14.0mm
.0635	52	.1360	29	.2205	5.6mm	.3320	Q	.5625	9/16
.0650	1.65mm	.1378	3.5mm	.2210	2	.3346	8.5mm	.5709	14.5mm
.0669	1.7mm	.1405	28	.2244	5.7mm	.3386	8.6mm	.5781	37/64
.0670	51	.1406	9/64	.2280	1	.3390	R	.5906	15.0mm
.0689	1.75mm	.1417	3.6mm	.2283	5.8mm	.3425	8.7mm	.5938	19/32
.0700	50	.1440	27	.2323	5.9mm	.3438	11/32	.6094	39/64
.0709	1.8mm	.1457	3.7mm	.2340	A	.3465	8.8mm	.6102	15.5mm
.0728	1.85mm	.1470	26	.2344	15/64	.3480	S	.6250	5/8
.0730	49	.1495	25	.2362	6.0mm	.3504	8.9mm	.6299	16.0mm
.0748	1.9mm	.1496	3.8mm	.2380	B	.3543	9.0mm	.6406	41/64
.0760	48	.1520	24	.2402	6.1mm	.3580	T	.6496	16.5mm
.0768	1.95mm	.1535	3.9mm	.2420	C	.3583	9.1mm	.6562	21/32
.0781	5/64	.1540	23	.2441	6.2mm	.3594	23/64	.6693	17.0mm
.0785	47	.1562	5/32	.2480	Q	.3622	9.2mm	.6719	43/64
.0787	2.0mm	.1570	22	.2480	6.3mm	.3661	9.3mm	.6875	11/16
.0807	2.05mm	.1575	4.00mm	.2500	1/4	.3680	U	.6890	17.5mm
.0610	48	.1590	21	.2500	E	.3701	9.4mm	.7031	45/64
.0620	45	.1610	20	.2520	6.4mm	.3740	9.5mm	.7087	18.0mm
.0827	2.1mm	.1614	4.1mm	.2559	6.5mm	.3750	3/8	.7188	23/32
.0846	2.15mm	.1654	4.2mm	.2570	F	.3770	V	.7283	18.5mm
.0660	44	.1660	19	.2598	6.6mm	.3780	9.6mm	.7344	47/64
.0866	2.2mm	.1693	4.3mm	.2610	G	.3819	9.7mm	.7480	19.0mm
.0686	2.25mm	.1695	18	.2638	6.7mm	.3858	9.8mm	.7500	3/4
.0690	43	.1719	11/64	.2656	17/64	.3860	w	.7656	49/64
.0906	2.3mm	.1730	17	.2660	H	.3898	9.9mm	.7677	19.5mm
.0925	2.35mm	.1732	4.4mm	.2677	6.8mm	.3906	25/64	.7812	25/32
.0935	42	.1770	16	.2717	6.9mm	.3937	10.0mm	.7874	20.0mm
.0938	3/32	.1772	4.5mm	.2720	I	.3970	X	.7969	51/64
.0945	2.4mm	.1600	15	.2756	7.0mm	.4016	10.2mm	.8071	20.5mm
.0960	41	.1811	4.6mm	.2770	J	.4040	Y	.8125	13/16
.0985	2.45mm	.1820	14	.2795	7.1mm	.4055	10.3mm	.8268	21.0mm
.0960	40	.1850	13	.2810	K	.4062	13/32	.8281	53/64
.0984	2.5mm	.1850	4.7mm	.2812	9/32	.4130	Z	.8438	27/32
.0995	39	.1875	3/16	.2835	7.2mm	.4134	10.5mm	.8465	21.5mm
.1015	38	.1890	12	.2874	7.3mm	.4219	27/64	.8594	55/64
.1024	2.6mm	.1890	4.6mm	.2900	L	.4252	10.8mm	.8661	22.0mm
.1040	37	.1910	11	.2913	7.4mm	.4331	11.0mm	.8750	7/8
.1063	2.7mm	.1929	4.9mm	.2950	M	.4375	7/16	.8858	22.5mm
.1065	36	.1935	10	.2053	7.5mm	.4409	11.2mm	.8906	57/64
.1064	7/64	.1960	9	.2969	19/64	.4528	11.5mm	.9055	23.0mm
.1100	35	.1969	5.0mm	.2992	7.6mm	.4531	29/64	.9062	29/32
.1102	2.8mm	.1990	8	.3020	N	.4646	11.8mm	.9219	59/64
.1110	34	.2008	5.1mm	.3031	7.7mm	.4688	15/32	.9252	23.5mm
.1130	33	.2010	7	.3071	7.8mm	.4724	12.0mm	.9375	1516
.1142	2.9mm	.2031	13/64	.3110	7.9mm	.4803	12.2mm	.9449	24.0mm
.1160	32	.2040	6	.3125	5/16	.4844	31/64	.9531	61/64
.1181	3.00mm	.2047	5.2mm	.3150	8.0mm	.4921	12.5mm	.9846	24.5mm
.1200	31	.2055	5	.3160	Q	.5000	1/2	.9688	31/32
.1220	3.1mm	.2087	5.3mm	.3189	8.1mm	.5118	13.0mm	.9843	25.0mm
.1250	1/8	.2090	4	.3228	8.2mm	.5156	33/64	.9844	63/64
.1260	3.2mm	.2126	5.4mm	.3230	P	.5312	17/32	1.0000	1
.1285	30	.2130	3	.3288	8.3mm	.5315	13.5mm		



The largest selection of 304 stainless steel bi-metal self-drilling screws in-stock!

The head and threads are made of 304 stainless steel, providing exceptional corrosion protection and ductility. The drill point is made of hardened carbon steel welded to the body. Sizes that will drill and tap steel up to 1/2" thick!

Sizes • Specifications • Part Numbers

Head Style		Description	Drilling Thickness	Load Bearing Length W/W	Part Number	
					No Washer	With Washer
5/16" AF HWH	A	#12-14 x 1" DP1	.090" max	.470"		12100HWT1S3BMBW
	B	#12-14 x 1" DP3	.059" - .236"	.350"	12100HWT3S3BM	12100HWT3S3BMBW
		#12-14 x 1-1/4" DP3		.550"	12125HWT3S3BM	12125HWT3S3BMBW
		#12-14 x 1-3/8" DP3		.750"	12137HWT3S3BM	12137HWT3S3BMBW
		#12-14 x 2" DP3		1.375"	12200HWT3S3BM	12200HWT3S3BMBW
	C	#12-14 x 1-1/2" DP5	.157" - .472"	.500"	12150HWT5S3BM	12150HWT5S3BMBW
		#12-14 x 2-1/4" DP5		1.220"	12225HWT5S3BM	12225HWT5S3BMBW
3/8" AF HWH	D	1/4-14 x 1" DP2	.047" - .118" (AL = .125")	.468"	14100HWT2S3BM	14100HWT2S3BMBW
		1/4-14 x 1-1/2" DP2		.970"	14150HWT2S3BM	14150HWT2S3BMBW
		1/4-14 x 2" DP2		1.4327"	14200HWT2S3BM	14200HWT2S3BMBW
	E	1/4-20 x 1-1/8 DP4	.100" - .312"	.375"	14112HWT4S3BM	14112HWT4S3BMBW
		1/4-20 x 1-1/2" DP4		.718"	14150HWT4S3BM	14150HWT4S3BMBW
		1/4-20 x 2" DP4		1.203"	14200HWT4S3BM	14200HWT4S3BMBW
		1/4-20 x 2" DP5		.937"	14200HWT5S3BM	14200HWT5S3BMBW
	F	1/4-20 x 4" DP5		1.3968"	14400HWT5S3BM	14400HWT5S3BMBW
T25 TORX	G	#12-14 x 1" DP2	.047" - .118"	.340" (n/w)	12100TPCULT2S3BM	
#2 Square	H	#12-14 x 1" DP3	.059" - .210"	.375"	12100SPC3BM	
	I	#12-14 x 2" DP3		1.750"	12200SPC3BM	
T-25 TORX	J	#12-14 x 1" DP1	.090" max	.475"		12100TBT1S3BMBW
	K	#12-14 x 2" DP2	.059" - .118"	1.475"	12200TBT2S3BM	12200TBT2S3BMBW
		#12-14 x 1" DP3		.350"	12100TBT3S3BM	12100TBT3S3BMBW
		#12-14 x 1-3/8" DP3		.750"	12137TBT3S3BM	12137TBT3S3BMBW
	L	#12-14 x 1-1/2" DP5	.157" - .472"	.510"	12150TBT5S3BM	12150TBT5S3BMBW
M	T-25 TORX WEDGE BIT				Part Number: TB25W	

Notes

1. Add .125" to bearing length for no washer.
2. TORX Recess: Must use a T25W Torx Wedge bit.

T-25W TORX RECESS

Must use T-25W Wedge Drive Bits.



For best installation of button head screws, use the **BUTTON-DRIVE™** tool. #9152600000

MATERIAL

Body: 304 Stainless Steel
Drill Tip: Carbon Steel

PLATING

#12 Dia.: Zinc and Wax
1/4" Dia.: Zinc with TRI-SEAL Topcoat

SEALING WASHERS (BOND-SEAL)

15MM OD. 304SS Stainless Steel
Backing to Non-conductive EPDM

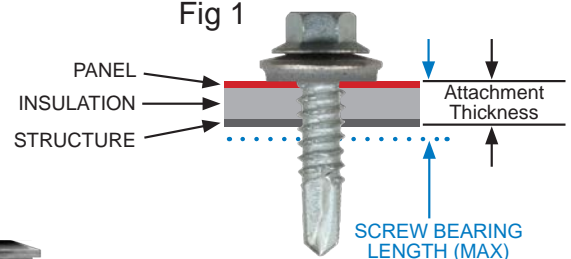
Installation Information

Use a 2,000 rpm max screw-gun with torque control or depth sensing.

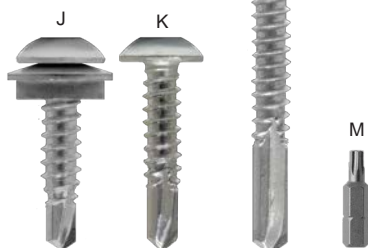
Screw Length Selection

The attachment thickness should not exceed the load bearing length of the screw. Refer to fig 1 below.

Fig 1



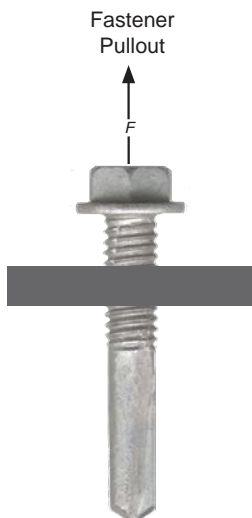
NEW!
#12 Pancake with
#2 Sq Drive
TRI-SEAL® Coated



MANY MORE SIZES AVAILABLE!

Checkout our **CONCEALOR®** pancake line of screws!

All information is non-binding and without guarantee. Before using the products, all specifications and calculations must be checked by a suitably qualified person and local regulations must be observed. This document is subject to revision. We reserve the right to make technical changes. (0321-1)



PULLOUT

Because the tensile strength of the substrate dramatically affects the pullout of the fastener, TFC provides published pullout results based on a calculation developed by AISI and **The Aluminum Association Aluminum Design Manual**

The following pullout loads were calculated per AISI S100 | Section 4 of the Supplement No. 2 to the American Specification for the Design of Cold-Form Steel Structural members (S100-07/S2-10).

Many tests were conducted with compressible fiberglass insulation placed between steel sheet samples. It was determined by the results that the equations are valid for steel connections including applications that use compressible insulation. Refer to AISI S100 for more details.



- The pullout calculation requires the use of the nominal diameter of the screw and the tensile strength of the substrate.
- Because substrate tensile and specific fastener details like point diameter affects pullout loads, these pullout loads are conservative.

For tested values, contact Triangle Fastener to conduct actual pullout tests based on a specific fastener style and the tensile strength requirement of the substrate.

PULLOUT LOADS | ULTIMATE IN POUNDS (Carbon Steel, 304 Stainless Steel & 410 Stainless Steel Screws)

The tensile strength of the substrate that is used in the chart below is typical for metal building and roofing applications. Contact TFC if other substrate tensile strengths are required.

STEEL

Fastener Information		PULLOUT ULTIMATE LOAD IN POUNDS Calculated Values In Accordance to AISI S100 Section E4										
Screw Size	Nom Dia. (in.)	Grade 50 per ASTM A1011 60Ksi Min. Steel		Grade 50 per ASTM A792/A653/A572/A529 65Ksi Min. Steel								
		22 Ga. (.030")	20 Ga. (.036")	18 Ga. (.048")	16 Ga. (.060")	14 Ga. (.075")	12 Ga. (.105")	1/8" (.125")	10 ga (.135")	1/4" (.250")	3/8" (.375")	1/2" (.500")
#10-16	.190"	291	349	504	627	786	1,101	1,311				
#12-14	.216"	330	397	573	716	895	1,253	1,492	1,611	2,984	*4,475	*5,967
1/4-14	.250"	383	459	633	829	1,036	1,450	1,727	1,865	3,453		
1/4-20	.250"							1,727	1,865	3,453	*5,180	*6,906

* Denotes load exceeds tensile strength of screw.

ALUMINUM | 6063-T5

Fastener Information			PULLOUT ULTIMATE LOAD IN POUNDS Calculated per The Aluminum Association Aluminum Design Manual					
Screw Size	Nom Dia. (in.)	Tensile	Grade 6063 - T5 (27Ksi Tensile - 21Ksi Yield)					
			.030"	.040"	.050"	.125"	.250"	.375"
#10-16	.190"	950 ¹	161	201	242	599	2090	3582*
#12-14	.216"	1135 ¹	183	229	275	680	2231	3928*
1/4-14	.250"	2138 ²	212	265	318	788		
1/4-20	.250"	2413 ²					2583	4546*

* Denotes load exceeds tensile strength of screw.

¹ Per ICCES ESR-4009 (Ejot)

² Per CCRR-0387 (SFS)

Fastener Information		Screw Strengths (Ultimate)	
Screw Size	Nom Dia. (in.)	Tension	Shear
#10-16	.190"	950 ¹	695 ¹
#12-14	.216"	1135 ¹	875 ¹
1/4-14	.250"	2138 ²	1703 ²
1/4-20	.250"	2413 ²	1803 ²

¹ Per ICCES ESR-4009 (Ejot)

² Per CCRR-0387 (SFS)

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REPORTS

ICCES ESR-4009 (Ejot)
CCRR-0387 (SFS)

MATERIAL

Body: 304 Stainless Steel
Drill Tip: Carbon Steel

PLATING

#10 & #12 Dia.: Zinc and Wax
1/4" Dia.: Zinc with TRI-SEAL Topcoat
Salt Spray Per ASTM B117 - > 2,000 Hrs

SEALING WASHERS (BOND-SEAL)

15MM OD. 304SS Stainless Steel
Backing to Non-conductive EPDM



For allowable loads, please apply an appropriate Factor of Safety as required by local and national code requirements. AISI S100 Section E4 recommends a Factor of Safety of 3 for allowable loads.

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Where Different Grades of Stainless Steel Are Used

ACIDS

Hydrochloric acid: Stainless generally is not recommended except when solutions are very dilute and at room temperature.

"Mixed acids": There is usually no appreciable attack on Type 304 or 316 as long as sufficient nitric acid is present.

Nitric acid: Type 304L or 430 is used.

Phosphoric acid: Type 304 is satisfactory for storing cold phosphoric acid up to 85% and for handling concentrations up to 5% in some unit processes of manufacture. Type 316 is more resistant and is generally used for storing and manufacture if the fluorine content is not too high. Type 317 is somewhat more resistant than Type 316. At concentrations up to 85%, the metal temperature should not exceed 212 F (100 C) with Type 316 and slightly higher with Type 317. Oxidizing ions inhibit attack and other inhibitors such as arsenic may be added.

Sulfuric acid: Type 304 can be used at room temperature for concentrations over 80%. Type 316 can be used in contact with sulfuric acid up to 10% at temperatures up to 120 F (50 C) if the solutions are aerated; the attack is greater in airfree solutions. Type 317 may be used at temperatures as high as 150 F (65 C) with up to 5% concentration. The presence of other materials may markedly change the corrosion rate. As little as 500 to 2000 ppm of cupric ions make it possible to use Type 304 in hot solutions of moderate concentration. Other additives may have the opposite effect.

Sulfurous acid: Type 304 may be subject to pitting, particularly if some sulfuric acid is present. Type 316 is usable at moderate concentrations and temperatures.

BASES

Ammonium hydroxide, sodium hydroxide, caustic solutions : Steels in the 300 series generally have good corrosion-resistance at virtually all concentrations and temperatures in weak bases, such as ammonium hydroxide. In stronger bases, such as sodium hydroxide, there may be some attack, cracking or etching in more concentrated solutions and at higher temperatures. Commercial purity caustic solutions may contain chlorides, which will accentuate any attack and may cause pitting of Type 316 as well Type 304.

ORGANICS

Acetic acid: Acetic acid is seldom pure in chemical plants but generally includes numerous and varied minor constituents. Type 304 is used for a wide variety of equipment including stills, base heaters, holding tanks, heat exchangers, pipelines, valves and pumps for concentrations up to 99% at temperatures up to about 120 F (50 C). Type 304 is also satisfactory for contact with 100% acetic acid vapors, and-if small amounts of turbidity or color pickup can be tolerated for room temperature storage of glacial acetic acid. Types 316 and 317 have the broadest range of usefulness, especially if formic acid is also present or if solutions are unaerated. Type 316 is used for fractionating equipment, for 30 to 99% concentrations where Type 304 cannot be used, for storage vessels, pumps and process equipment handling glacial acetic acid, which would be dis-colored by Type 304. Type 316 is likewise

applicable for parts having temperatures above 120 F (50 C), for dilute vapors and high pressures. Type 317 has somewhat greater corrosion resistance than Type 316 under severely corrosive conditions. None of the stainless steels has adequate corrosion resistance to glacial acetic acid at the boiling temperature or at superheated vapor temperatures.

Aldehydes: Type 304 is generally satisfactory.

Amines: Type 316 is usually preferred to Type 304.

Cellulose acetate: Type 304 is satisfactory for low temperatures, but Type 316 or Type 317 is needed for high temperatures.

Citric, formic and tartaric acids: Type 304 is generally acceptable at moderate temperatures, - but Type 316 is resistant to all concentrations at temperatures up to boiling.

Esters: From the corrosion standpoint, esters are comparable with organic acids.

Fatty acids: Up to about 300 F (150 C), Type 304 is resistant to fats and fatty acids, but Type 316 is needed at 300 to 500 F (150 to 260 C) and Type 317 at higher temperatures.

Paint vehicles: Type 316 may be needed if exact color and lack of contamination are important.

Phthalic anhydride: Type 316 is usually used for reactors, fractionating columns, traps, baffles, caps and piping.

Soaps: Type 304 is used for parts such as spray towers, but Type 316 may be preferred for spray nozzles and flake-drying belts to minimize off color product.

Synthetic detergents: Type 316 is used for preheat, piping, pumps and reactors in catalytic hydrogenation of fatty acids to give salts of sulfonated high molecular alcohols.

Tall oil (pulp and paper industry): Type 304 has only limited usage in tall-oil distillation service. High-rosin-acid streams can be handled by Type 316L with a minimum molybdenum content of 2.75%. Type 316 can also be used in the more corrosive high-fatty-acid streams at temperatures up to 475(245 C), but Type 317 will probably be required at higher temperatures.

Tar: Tar distillation equipment is almost all Type 316 because coal tar has a high chloride content; Type 304 does not have adequate resistance to pitting.

Urea: Type 316L is generally required.

Pharmaceuticals : Type 316 is usually selected for all parts in contact with the product because of its inherent corrosion resistance and greater assurance of product purity.

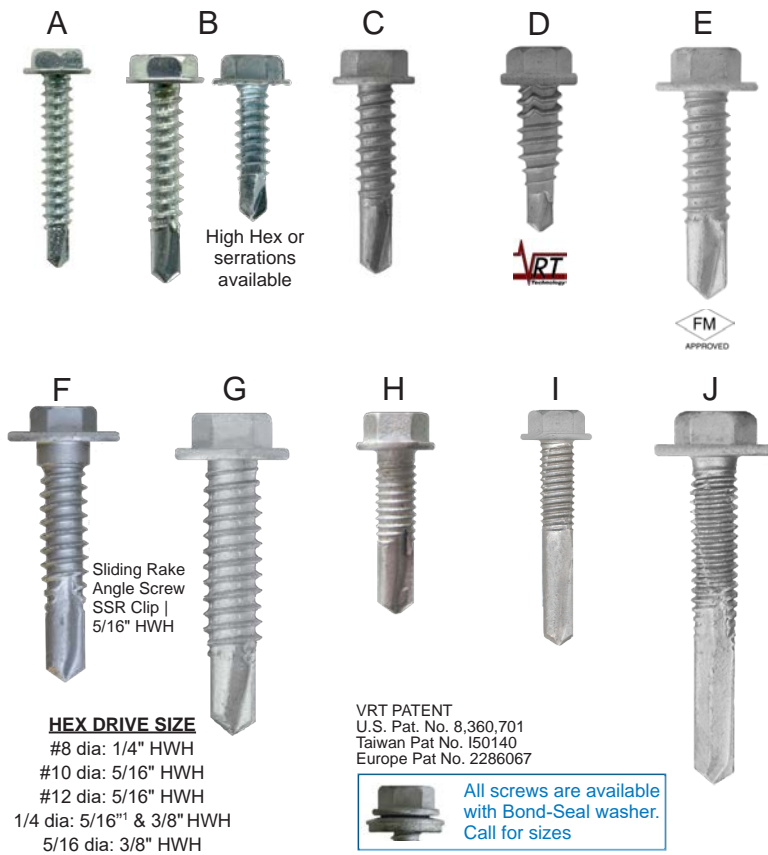
Source: Design Guidelines for the selection and use of stainless steel. Specialty Steel Industry of the United States.

- The hex washer head is the most popular drive system and provides the best stability during installation.
- Available with TRI-SEAL® long life coating for the ultimate corrosion protection...1,000 hrs salt spray with no red rust!

SIZES

****Blue colored sizes denotes popular DC items****

ITEM	SIZE	Point Type	LENGTHS	Load Bearing Length (MAX)	Box Qty
A	#8-18	DP2	1/2"	.100"	10M
			5/8"	.125"	10M
			3/4"	.250"	10M
			1"	.500"	7.5M
			1-1/4"	.750"	5M
			1-1/2"	1"	5M
B	#10-16	DP3	2"	1.5"	1.5M
			1/2"	.100"	10M
			5/8"	.125"	5M
			3/4"	.250"	5M
			3/4" HH/SERR	.250"	5M
			1"	.500"	5M
C	#12-14	DP3	1-1/2"	1"	3.5M
			2"	1.500"	2M
			3"	2.500"	1M
			3/4"	.125"	5M
			1"	.250"	3.5M
			1-1/4"	.625"	3M
D	1/4-14 ¹ VRT	DP1	1-1/2"	.750"	2M
			2"	1.25"	2M
			2-1/2"	1.75"	1M
			3"	2.25"	1M
			4"	3.75"	500
			7/8" VRT	.325"	2.5M
E	1/4-14	DP3	3/4"	.125"	2.5M
			1"	.250"	2.5M
			1-1/4" ¹	.625"	2M
			1-1/2" ¹	.875"	2M
			2"	1"	1.5M
			2-1/2"	1.50"	1M
F	1/4-14 SHLDR	DP3	3"	1.25" - 2.4"	1M
			4"	1.73" - 3.4"	500
			5"	2.5" - 4.4"	500
			6"	3.5" - 5.4"	250
			8"	5.5" - 7.4"	250
			10"	7.5" - 9.4"	250
G	5/16-12	DP3	1-1/4"	.625"	3.5M
			1"	.250"	1.5M
			1-1/2"	.875"	1M
			2"	1.25"	1M
			3"	2.25"	750
			4"	3.25"	500
H	#12-24	DP4	5"	1.38 - 4.25"	500
			6"	2.50 - 5"	500
			8"	4.25" - 7"	200
			7/8"	.325"	5M
			1-1/4"	.500"	2.5M
			1-1/2"	.625"	1.5M
I	#12-24	DP5	2"	.750"	1.5M
			1-1/2"	.500"	2M
			2-1/4"	1.250"	1M
			2-1/2"	1.500"	1M
			3-1/8"	2.125"	1M
			4"	3"	250
J	5/8" OD washer face	DP5	5"	4"	250
			6"	2.50" - 5"	250
			7"	3.38" - 6"	500
			8"	4.25" - 7"	500



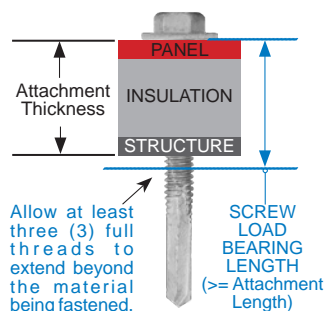
Drill Point and Length Selection

1. Determine the Screw Drill Point Type

- Add up the total thickness that will be drilled by the screw.
- Select the desired drill point (DP) type and screw size located on the size chart below.



Drilling and Tapping Thickness													
Gauge	24	20	18	16	14	12	10						
Inch	.024	.036	.048	.060	.072	.100	.105	.135	.175	.210	.250	.375	.500
Screw & Point	1/4-14 DP1	.024" - .072"											
	#8-18 DP2	.024" - .100"											
	#10-16 DP3	.024" - .175"											
	#10-24 DP3	.048" - .210"											
	#12-14 DP3	.024" - .210"											
	1/4-14 DP3	.035" - .250"											
	5/16-12 DP3	.048" - .175"											
	#12-24 DP4	.175" - .375"											
	#12-24 DP5	.175" - .500"											
	1/4-20 DP5	.175" - .500"											



2. Determine Screw Length

- Measure from the top surface of the material being fastened to the underside of the metal that will be drilled and tapped. Be sure to allow for any void or insulation. This is called the attachment thickness.
- Select a screw length where the attachment thickness is less than or equal to the Load Bearing Length listed on the chart to the right.

All information is non-binding and without guarantee. Before using the products, all specifications and calculations must be checked by a suitably qualified person and local regulations must be observed. This document is subject to revision. We reserve the right to make technical changes. (0321-1)

BLAZER® STAINLESS CAP HEAD WITH EPDM SEALING WASHER



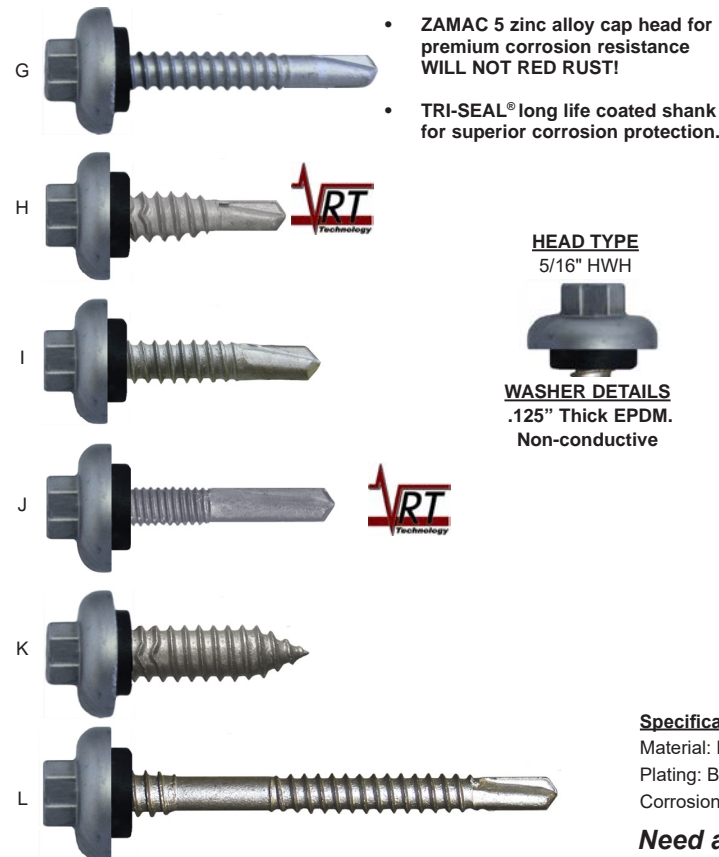
SIZES AND PERFORMANCE SPECIFICATIONS

DIAMETER AND POINT		LENGTH	Load Bearing Length (Max)	Box Qty	LIST PRICE
A	#12-14 BLAZER-2/3 LP	x 1"	.250"	3.5M	
		x 1-1/4"	.625"	2.5M	
		x 1-1/2"	.750"	2.5M	
		x 2"	1.25"	2M	
		x 3"	2.25"	500	
B	1/4-14 BLAZER-1 VRT	x *7/8" VRT	.325"	2.5M	
		x 1-1/8" VRT	.750"	2M	
C	1/4-14 BLAZER-3	x *1-1/4"	.625"	2M	
		x 3"	2"	1M	
		x 4"	3"	500	
D	#17-14 x 1" TYPE AB W/VRT	x 1"	.750"	2.5M	
E	#12-24 BLAZER-5	x 1-1/4"	.500"	2.5M	
		x 1-1/2"	.625"	2.5M	
		x 2"	.750"	3M	
F	#12-14 1/4-14 BLAZER-3	x 1-7/8"	.875" - 1.125"	2M	
		x 2-3/8"	1.250" - 1.625"	1M	
		x 3-1/4"	1.750" - 2.437"	1m	
		x 4"	2.500" - 3.1875"	500	

LP denotes long-pilot design for metal roofing and siding

SCREW AND POINT	DRILL AND TAP CAPACITIES					
	.036"	.100"	.175"	.210"	.250"	.375"
#8-18 BLAZER-2						
#10-16 BLAZER-3						
#12-14 BLAZER-3						
#12-24 BLAZER-4						
#12-24 BLAZER-5						
1/4-14 BLAZER-1 VRT						
5/16-12 BLAZER-3						
1/4-14 BLAZER-3						
1/4-20 BLAZER-5						

BLAZER® ZINC CAP HEAD WITH EPDM SEALING WASHER



SIZES AND PERFORMANCE SPECIFICATIONS

DIAMETER AND POINT		LENGTH	Load Bearing Length (Max)	Box Qty	LIST PRICE
G	#12-14 BLAZER-2/3 LP	x 1"	.250"	3.5M	
		x 1-1/4"	.625"	2.5M	
		x 1-1/2"	.750"	2.5M	
		x 2"	1.25"	2M	
		x 2-1/2"	1.5"	1M	
H	1/4-14 BLAZER-1 VRT	x *7/8" VRT	.325"	2.5M	
		x 1-1/8" VRT	.750"	2M	
i	1/4-14 BLAZER-3	x *1-1/4"	.625"	2M	
		x 1-1/2"	.750"	2m	
		x 2"	1"	2m	
		x 3"	2"	1M	
		x 4"	3"	500	
J	#12-24 BLAZER-5	x 1-1/4"	.500"	2.5M	
		x 1-1/2"	.625"	2.5M	
		x 2"	.750"	3M	
K	#17-14 x 1" TYPE AB W/VRT	x 1"	.750"	2.5M	
L	#12-14 1/4-14 BLAZER-3	x 1-7/8"	.875" - 1.125"	2M	
		x 2-3/8"	1.250" - 1.625"	1M	
		x 3-1/4"	1.750" - 2.437"	1m	
		x 4"	2.500" - 3.1875"	500	

Specifications

Material: HEAD - Zamac 5 Zinc Alloy; THREAD - Carbon Steel

Plating: BODY - TRI-SEAL® Long-life Coating.

Corrosion Resistance: HEAD - No Red Rust; BODY - 1,000hrs Salt Spray

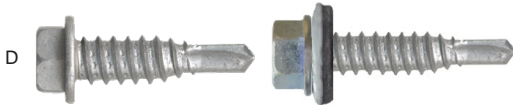
Need a 3/8" Hex Washer Head? Contact us for available sizes.

- Provides corrosion resistance in mild atmospheres.
- Plated to resist surface rust and to reduce tapping torque.
- Optional TRI-SEAL® 1,000 hrs salt spray long-life coated to reduce tapping torque and provide additional corrosion protection.

Blue colored sizes denotes popular DC items

SIZES AND PERFORMANCE SPECIFICATIONS

DIAMETER & POINT	LENGTH	Load Bearing Length (MAX)	Box Qty	LIST PRICE
A #8-18 BLAZER-2	1/2"	.100"	10M	
	3/4"	.125"	10M	
B #10-16 BLAZER-3	3/4"	.250"	7.5M	
	1"	.500"	5M	
	1-1/2"	1"	5M	
C #12-14 BLAZER-3	3/4"	.125"	5M	
	1"	.250"	3.5M	
	1-1/4" LP	.625"	3M	
	1-1/2"	.750"	2M	
	2"	1.250"	2M	
	2-1/2"	1.750"	1.5M	
D 1/4-14 BLAZER-1 VRT	7/8"	.325"	2.5M	
	1-1/8"	.875"	2.0M	
E 1/4-14 BLAZER-3	3/4"	.125"	2.5M	
	1"	.250"	2.5M	
	1-1/4"	.625"	2M	
	1-1/2"	.575"	2M	
	2"	1"	1.5M	
	3"	2"	1.5M	
	4"	3"	500	
	5"	4"	500	
F #12-24 BLAZER-5	1-1/4"	.500"	5M	
	1-1/2"	.625"	3.5M	
	2"	.875"	2m	



All screws are available with Bonded Sealing Washers. Call for sizes

HEAD SIZE
SIZE
 #8
 #10, #12, *1/4"
 1/4"
HEAD TYPE
 1/4" HWH
 5/16" HWH
 3/8" HWH

BONDED WASHER
 #8, #10 = 1/2" o.d.
 #12, #14 = 15mm o.d.
MATERIAL
 304 Stainless Steel
 EPDM Sealant

SCREW AND POINT	DRILL AND TAP CAPACITIES						
	.036"	.100"	.175"	.210"	.250"	.375"	.500"
#8-18 BLAZER-2							
#10-16 BLAZER-3							
#12-14 BLAZER-3							
#12-24 BLAZER-4							
#12-24 BLAZER-5							
1/4-14 BLAZER-1 VRT							
5/16-12 BLAZER-3							
1/4-14 BLAZER-3							
1/4-20 BLAZER-5							

MATERIAL: 410 Stainless Steel

PLATING: Passivated (24hrs Salt Spray), Zinc Plated (48hrs Salt Spray), TRI-SEAL® Coated (1,000hrs Salt Spray). Call for sizes

Pullout Loads | Ultimate in Pounds Force

Carbon Steel and 410 Stainless Steel Screws

The tensile strength of the substrate that is used in the chart below is typical for metal building and roofing applications. Contact TFC if other substrate tensile strengths are required.

Fastener Information		PULLOUT ULTIMATE LOAD IN POUNDS													
		Calculated Values In Accordance to AISI S100 Section E4													
		Grade 50 per ASTM A1011 60Ksi Min. Steel							Grade 50 per ASTM A792/A653/A572/A529 65Ksi Min. Steel						
Screw Size	Nom Dia. (in.)	26 Ga. (.018")	25 Ga. (.021")	24 Ga. (.024")	22 Ga. (.030")	20 Ga. (.036")	18 Ga. (.048")	16 Ga. (.060")	14 Ga. (.075")	12 Ga. (.105")	1/8" (.125")	10 ga (.135")	1/4" (.250")	3/8" (.375")	1/2" (.500")
#8-18	.164"	151	177	202	252	303	435	543							
#10-16	.190"	174	203	233	291	349	504	627	786	1,101	1,311				
#12-14	.216"	198	231	264	330	397	573	716	895	1,253	1,492	1,611			
#12-24	.216"										1,492	1,611	2,984	*4,475	*5,967
1/4-14	.250"	230	268	306	383	459	633	829	1,036	1,450	1,727	1,865	3,453		

For allowable loads, please apply an appropriate Factor of Safety as required by local and national code requirements.

AISI S100 Section E4 recommends a Factor of Safety of 3 for allowable loads

All information is non-binding and without guarantee. Before using the products, all specifications and calculations must be checked by a suitably qualified person and local regulations must be observed. This document is subject to revision. We reserve the right to make technical changes. (0321-1)



BACK-OUT RESISTANT SCREWS



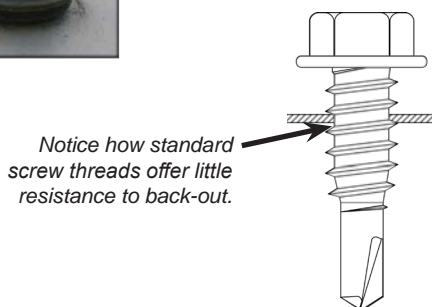
U.S. Pat. No. 8,360,701
Taiwan Pat No. I50140
Europe Pat No. 2286067

Our Vibration Resistant Thread (VRT®) is designed to significantly increase back-out torque and reduce the potential for leaks. VRT® keeps the fastener tighter in applications where expansion, contraction and vibration are a concern. Independent tests verify that VRT® produces 3-1/2 times more back-out resistance than a standard thread.

PROBLEM



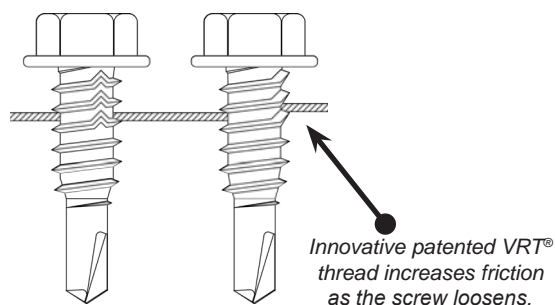
Screws with standard threads can back-out easily with little force. This can cause joint failure resulting in leaks.



SOLUTION



Our Vibration Resistant Thread (VRT) is designed to significantly increase back-out torque and reduce the potential for leaks.



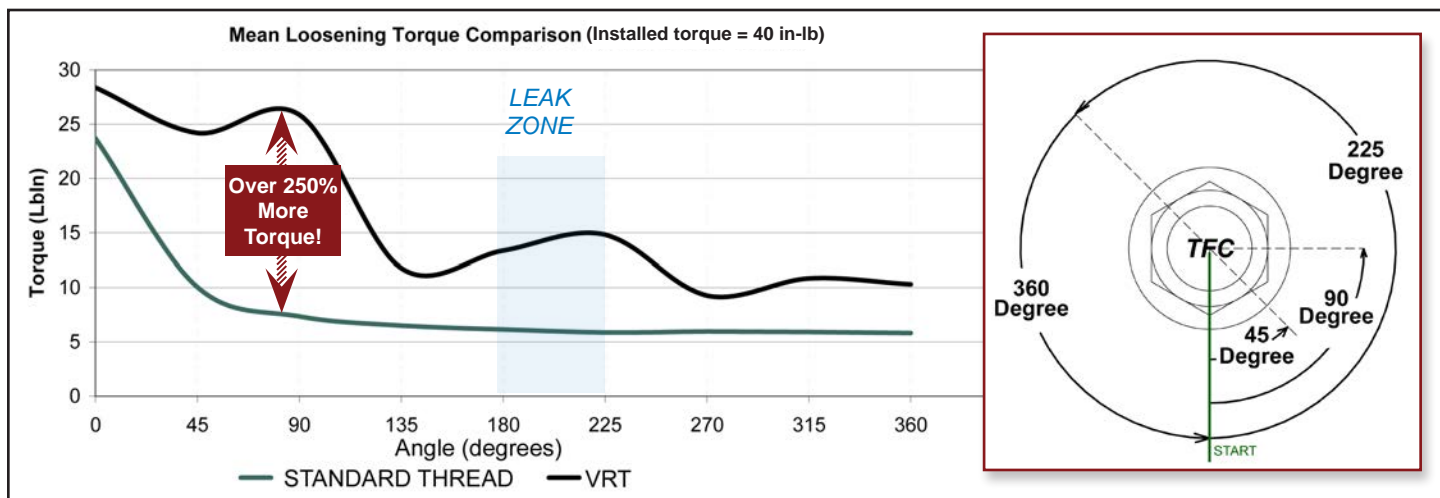
Why VRT™?

You can see how the shape of VRT® is designed to increase the resistance to back-out compared to a standard thread. VRT® keeps the fastener tighter in applications where expansion, contraction and vibration are a concern.



Test Results

Independent tests verify that VRT produces over 3-1/2 times more back-out resistance than standard threads due to it's innovative thread design that increases friction.



All information is non-binding and without guarantee. Before using the products, all specifications and calculations must be checked by a suitably qualified person and local regulations must be observed. This document is subject to revision. We reserve the right to make technical changes. (0321-1) Copyright 2017 Triangle Fastener Corporation



Our Vibration Resistant Thread (VRT®) is designed to significantly increase back-out torque and reduce the potential for leaks.

VRT® keeps the fastener tighter in applications where expansion, contraction and vibration are a concern.

Independent tests verify that VRT® produces 3 -1/2 times more back-out resistance than a standard thread.



U.S. Pat. No. 8,360,701
Taiwan Pat No. I502140
Europe Pat No. 2286067

BACK-OUT RESISTANT SCREWS

Sizes and Technical Data Sheet

Light Gauge Applications

Maximum Drilling Thickness: .090"

	Description	Part Number	Carton Quantity	WT Per M Pcs
	1/4" -14 X 7/8" DP1/LAP w/VRT® CONCEALOR® Pancake Head w/Bonded Sealing Washer TRI-SEAL™ Coated 1,000Hrs Salt Spray	14087C1TSVBW	2,500 pcs 250/Bag	13.5#
	1/4" -14 X 7/8" DP1/LAP w/VRT® BLAZER® Flange Head w/Sealing Washer TRI-SEAL™ Coated 1,000Hrs Salt Spray	14087HW1CSTSVW	2,500 pcs 250/Bag	13.5#
	1/4" -14 X 7/8" DP1/LAP w/VRT® BLAZER® TRI-SEAL™ Coated 1,000Hrs Salt Spray	14087HW1CSTSV	2,500 pcs 250/Bag	10.2#
	1/4" -14 X 7/8" DP1/LAP w/VRT® BLAZER® w/Bonded Sealing Washer TRI-SEAL™ Coated 1,000Hrs Salt Spray	14087HW1CSTSVBW	2,500 pcs 250/Bag	13.5#
	1/4" -14 X 7/8" DP1/LAP w/VRT® BLAZER® Stainless Cap Head w/Sealing Washer TRI-SEAL™ Coated 1,000Hrs Salt Spray	14087HW1CSTSVWSC	2,500 pcs 250/Bag	13.5#
	1/4" -14 X 7/8" DP1/LAP w/VRT® BLAZER® Zinc Cap Head w/Sealing Washer TRI-SEAL™ Coated 1,000Hrs Salt Spray	14087HW1CSTSVWZC	2,000 pcs 250/Bag	13.5#
	1/4" -14 X 1-1/8" DP1/LAP w/VRT® BLAZER® Stainless Cap Head w/Sealing Washer TRI-SEAL™ Coated 1,000Hrs Salt Spray	14112HW1CSTSVWSC	2,000 pcs 250/Bag	19.3#
	#17-14 X 1" TYPE AB w/VRT® TAPPER w/Bonded Sealing Washer (3/4"OD) TRI-SEAL™ Coated 1,000Hrs Salt Spray	17100HWABCSTSVBW	2,000 pcs 250/Bag	20#

Technical Data

Specifications

BLAZER Drill Screws conforms to SAE J-78 for self-drilling tapping screws.

#17 TAPPER conforms to ANSI/ASME B18.6.4 for tapping screws.

Material

Carbon Steel: C1022
Stainless Cap: 304 SS
Zinc Cap: Zamac 5

Tensile Strength

1/4-14: 4,275 lbs.
#17-14: 5,200 lbs.

Torsional Strength

1/4-14: 150 lbs-inch
#17-14: 175 lbs-inch

Corrosion Resistance

TRI-SEAL®
Salt Spray: 1,000 hrs minimum.

Sealing Washers

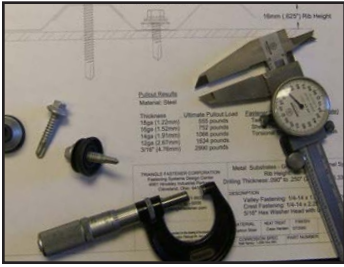
Flange Head:
EPDM Cut Tubular

Bonded Washer

EPDM Vulcanized to
G-90 Galvanized
Steel.
(15MM O.D.).

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BLAZER® ENGINEERING DATA



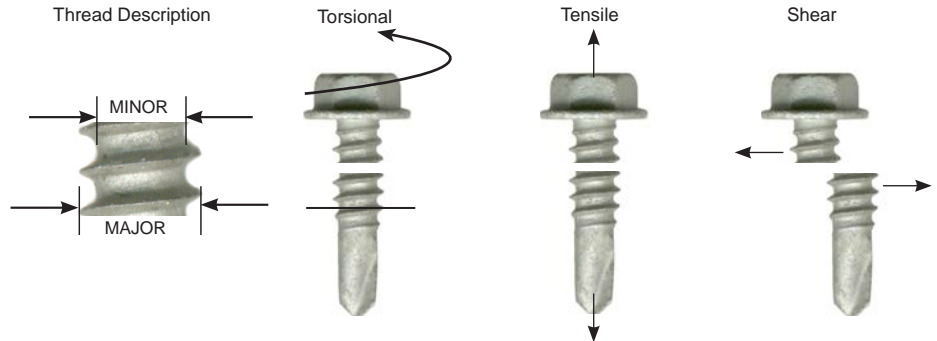
The following information is compiled to assist the design professional in selecting the appropriate fastener for the application. This data is compiled from fastener standards and independent tests. An engineering professional should be consulted to determine expected loads on the connection, environmental effects, and any other conditions that could effect the performance of the fastener. Selecting a fastener is the responsibility of the engineer and changes to a fastener should not be made without approval. Using the wrong fastener can lead to failure.

TFC WILL NOT WARRANTY, EITHER EXPRESSED OR IMPLIED, THE USE OF THIS INFORMATION.

TECHNICAL DATA



BLAZER® self-drilling fasteners are produced and perform to SAEJ78, ASME B18.6.4 and AISI TS-4-02 specifications. Conforms to ICCES AC118 acceptance criteria for tapping screw fasteners.



Physical Properties

Fastener Diameter	Nominal Screw Diameter	Major Diameter (inch)		Minor Diameter (inch)		Area Of Minor Dia. (sq in.)	Torsional (Lb-In.)	Tensile (Pounds)	Shear (Pounds)
		Max	Min	Max	Min				
#6-20	0.138	0.139	0.135	0.104	0.099	0.0077	24	1,125	750
#8-18	0.164	0.166	0.161	0.122	0.116	0.0106	42	1,575	1,000
#10-16	0.190	0.189	0.183	0.141	0.135	0.0143	61	2,100	1,400
#10-24	0.190	0.190	0.182	0.144	0.137	0.0147	65	3,400	2,275
#12-14	0.216	0.215	0.209	0.164	0.157	0.0194	92	2,778	2,000
#12-24	0.216	0.216	0.209	0.189	0.185	0.0269	100	3,188	2,100
1/4-14	0.250	0.246	0.240	0.192	0.185	0.0269	150	3,850	2,600
1/4-20	0.250	0.250	0.242	0.218	0.214	0.0360	156	4,275	2,700
#18-9	0.306	0.306	0.300	0.217	0.209	0.0343	196	4,550	2,576
5/16-12	0.313	0.315	0.306	0.244	0.236	0.0702	290	5,439	3,264

Material: C1018-C1022 / 410 SS

Heat Treatment: Case Harden

Case Hardness: 52-58 Rockwell C

Case Depth:

#6 Dia = .002" - .007"

#8, #10, #12 Dia = .004" - .009"

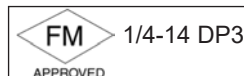
1/4" = .005" - .011"

Core Hardness

Carbon Steel: 32-40 Rockwell C

410 Stainless: 42-48 Rockwell C

Ductility: 5 Degree minimum bend



English to Metric

Formula to Use

Decimal to Millimeters Decimal x 25.4

PSI to Newton / Millimeters² PSI x .007

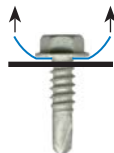
Pounds Force to Newtons Pounds Force x 4.448

Gauge Thickness	Decimal	Metric
29 GA	.013"	.33mm
28 GA	.015"	.38mm
26 GA	.018"	.46mm
24 GA	.024"	.61mm
22 GA	.030"	.76mm
20 GA	.036"	.91mm
18 GA	.048"	1.22mm
16 GA	.060"	1.52mm
14 GA	.075"	1.91mm
12 GA	.105"	2.67mm
1/8"	.125"	3.18mm
10 GA	.135"	3.43mm
1/4"	.250"	6.35mm
5/16"	.312"	7.92mm
3/8"	.375"	9.53mm
1/2"	.500"	12.7mm

PULLOVER TEST RESULTS

These pullover results are for self-sealing fasteners listed in this catalog.

Pounds - Ultimate Average



Note: Estimated pullover for fasteners without sealing washers can be calculated using the following formula per AISI.

Pullover force = 1.5 -x- Thickness of the member in contact with the screw head. -x- Larger of the screw head diameter or washer diameter. -x- Tensile strength of the member in contact with the screw head.

Steel Thickness	BOND-SEALER		FLANGE SEALER	ZINC CAP HEAD	STAINLESS CAP HEAD
	12.7MM OD	15MM OD			
22 ga	945	1,249	1,298	1,647	1,298
24 ga	704	1,056	1,102	1,310	1,102
26 ga	519	654	692	794	692

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FASTENER PULLOUT LOADS / DRILL SCREWS

Because the tensile strength of the substrate dramatically affects the pullout of the fastener, TFC provides published pullout results based on a calculation developed by AISI.

The following pullout loads were calculated per AISI S100 | Section 4 of the Supplement No. 2 to the American Specification for the Design of Cold-Form Steel Structural members (S100-07/S2-10).

Many tests were conducted with compressible fiberglass insulation placed between steel sheet samples. It was determined by the results that the equations are valid for steel connections including applications that use compressible insulation. Refer to AISI S100 for more details.

- The pullout calculation requires the use of the nominal diameter of the screw and the tensile strength of the substrate.
- Because substrate tensile and specific fastener details like point diameter affects pullout loads, these pullout loads are conservative.



For tested values, contact Triangle Fastener to conduct actual pullout tests based on a specific fastener style and the tensile strength requirement of the substrate.

Pullout Loads | Ultimate in Pounds Force

Carbon Steel, 304 Stainless Steel & 410 Stainless Steel Screws

The tensile strength of the substrate that is used in the chart below is typical for metal building and roofing applications. Contact TFC if other substrate tensile strengths are required.

Fastener Information		PULLOUT ULTIMATE LOAD IN POUNDS													
		Calculated Values In Accordance to AISI S100 Section E4													
		Grade 50 per ASTM A1011 60Ksi Min. Steel					Grade 50 per ASTM A792/A653/A572/A529 65Ksi Min. Steel								
Screw Size	Nom Dia. (in.)	26 Ga. (.018")	25 Ga. (.021")	24 Ga. (.024")	22 Ga. (.030")	20 Ga. (.036")	18 Ga. (.048")	16 Ga. (.060")	14 Ga. (.075")	12 Ga. (.105")	1/8" (.125")	10 ga (.135")	1/4" (.250")	3/8" (.375")	1/2" (.500")
#8-18	.164"	151	177	202	252	303	435	543							
#10-16	.190"	174	203	233	291	349	504	627	786	1,101	1,311				
#10-24	.190"						504	627	786	1,101	1,311				
#12-14	.216"	198	231	264	330	397	573	716	895	1,253	1,492	1,611			
#12-24	.216"										1,492	1,611	2,984	*4,475	*5,967
1/4-14	.250"	230	268	306	383	459	633	829	1,036	1,450	1,727	1,865	3,453		
1/4-20	.250"										1,727	1,865	3,453	*5,180	*6,906
5/16-12	.3125"						829	1,036	1,295	1,813	2,158	2,331			

* Denotes load exceeds tensile strength of screw.

For allowable loads, please apply an appropriate Factor of Safety as required by local and national code requirements.

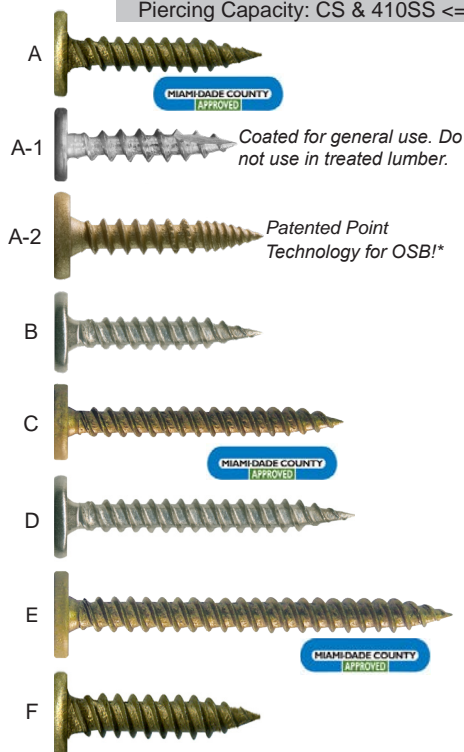
AISI S100 Section E4 recommends a Factor of Safety of 3 for allowable loads.

WOOD OR THIN METAL

Piercing Capacity: CS & 410SS <=20 ga

#10, #12, & 1/4" PIERCING POINTS AND DRILL POINTS

CONCEALOR® low profile head fasteners are engineered to perform in a variety of applications. They are specified in many metal roofing systems to attached SSR clips to metal or wood. They are easy to install and provides optimal strength.

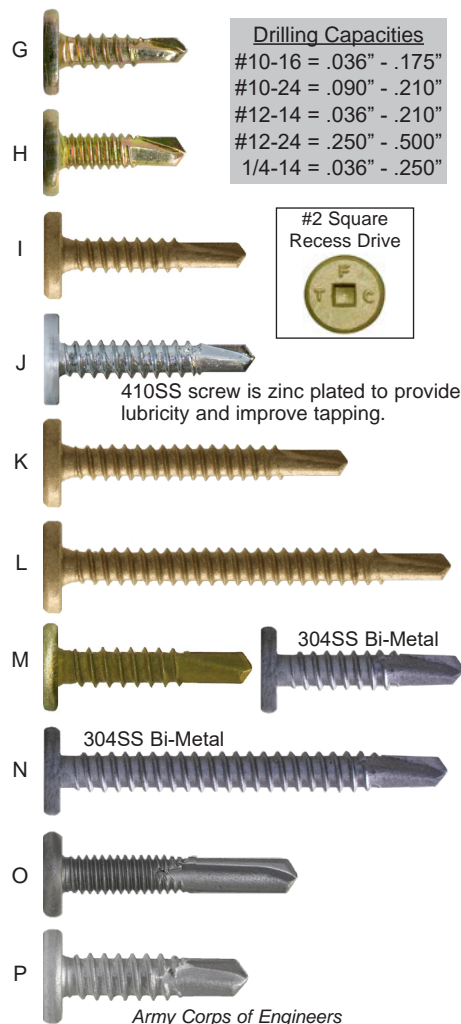


SIZES

MEETS FLORIDA BUILDING CODE 1506.6 & R904.5.2 (TRI-SEAL® & SS ONLY)

	Description	Load Bearing Length (Max)	Part Number	Box Quantity	WT Per Box
A	#10-13 X 1" GP Long-life TRI-SEAL® coated	1"	10100SPCGCSTS	5,000 pcs	36.0 lbs.
A-1	#10-9 X 1" Type 17 Coated for general use	1"	10100SPC17CSCZ	5,000 pcs	36.0 lbs.
A-2	#10-12 X 1" BURR BUSTER Long-life TRI-SEAL® coated	1"	10100SPCGBBCSTS	5,000 pcs	36.0 lbs.
B	#10-13 X 1" GP 302 Stainless Steel	1"	10100SPCGS3	5,000 pcs	39.0 lbs.
C	#10-13 X 1-1/2" GP Long-life TRI-SEAL® coated	1-1/2"	10150SPCGCSTS	3,000 pcs	31.0 lbs.
D	#10-13 X 1-1/2" GP 302 Stainless Steel	1-1/2"	10150SPCGS3	3,000 pcs	32 lbs.
E	#10-13 X 2" GP Long-life TRI-SEAL® coated	2"	10200SPCGCSTS	1,500 pcs	19.0 lbs.
F	#12-11 X 1" GP Long-life TRI-SEAL® coated	1"	12100SPCGCSTS	5,000 pcs	44.0 lbs.
G	#10-16 X 5/8" DP3 .0003" Zinc and Yellow	.125"	10062SPC3CS	5,000 pcs	27.0 lbs.
H	#10-24 X 5/8" DP3 .0003" Zinc and Yellow	.125"	10062SPC3CSYZ	5,000 pcs	27.0 lbs.
I	#10-16 X 1" DP3 Long-Life TRI-SEAL® coated	.500"	10100SPC3CSTS	5,000 pcs	37.0 lbs.
J	#10-16 X 1" DP3 410 Stainless Steel / ZP	.500"	10100SPC3S4	5,000 pcs	37.0 lbs.
K	#10-16 X 1-1/2" DP3 Long-Life TRI-SEAL® coated	1"	10150SPC3CSTS	3,000 pcs	32.0 lbs.
L	#10-16 x 2" DP3 Long-Life TRI-SEAL® coated	1.5"	10200SPC3CSTS	1,500 pcs	21.0 lbs.
M	#12-14 X 1" DP3 Long-Life TRI-SEAL® coated	.375"	12100SPC3CSTS	5,000 pcs	43.0 lbs.
	#12-14 X 1" DP3 304SS Bi-Metal	.375"	12100SPC3BM	5,000 pcs	43.0 lbs.
N	#12-14 X 2" DP3 304SS Bi-Metal	1.5"	12200SPC3BM	1,500 pcs	21.0 lbs.
O	#12-24 X 1-1/4" DP5 Long-Life TRI-SEAL® coated	.500"	12125SPC5CSTS	4,000 pcs	52.0 lbs.
	#12-24 X 1-1/2" DP5 Long-Life TRI-SEAL® coated	.625"	12150SPC5CSTS	4,000 pcs	43.8 lbs.
P	1/4-14 X 1" DP3 Long-Life TRI-SEAL® coated	.325"	14100SPC3CSTS	2,500 pcs	27.0 lbs.

METAL SUBSTRATES



Bagged 250 pcs. per bag

SPECIAL APPLICATIONS

Assemble CONCEALOR® with a bonded sealing washer that locks out weather!



We can color match to your exact requirements in three days or less!

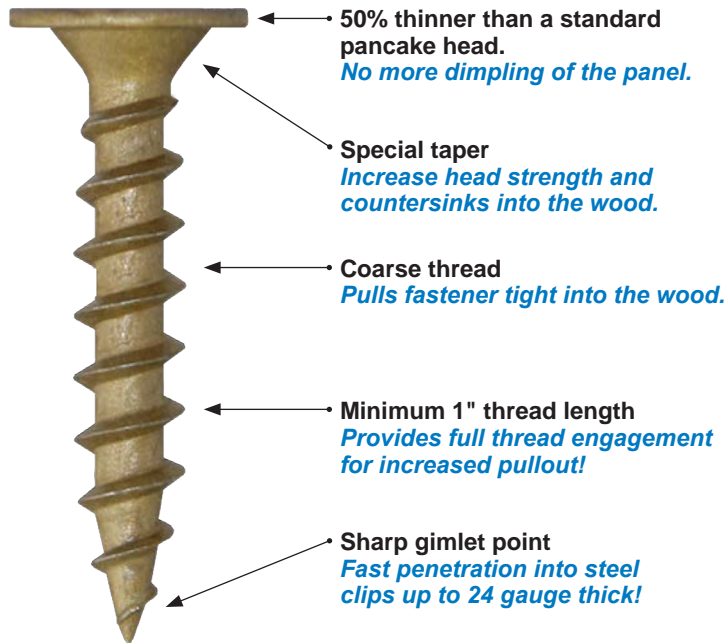


Installation: Do NOT use impact drivers. Use 2,500 RPM max variable speed screw drivers with torque control or depth sensing nosepiece.

*Pat. No.: 11,105,362

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Need it Ultra Low?



Available in lengths up to 2-1/8"!

Trust the original Ultra Low Profile Screw!

The CONCEALOR® ULP screws are engineered to attach standing seam roof clips to wood. They are the preferred screw for attaching clip-less nail hem metal roof panels, are easy to install, and provide optimal strength. ULP's are supplied with TRI-SEAL® 1,000-hours salt spray coating which can be used in treated and fire treated lumber.



Bagged 250 pcs. per bag for your convenience!

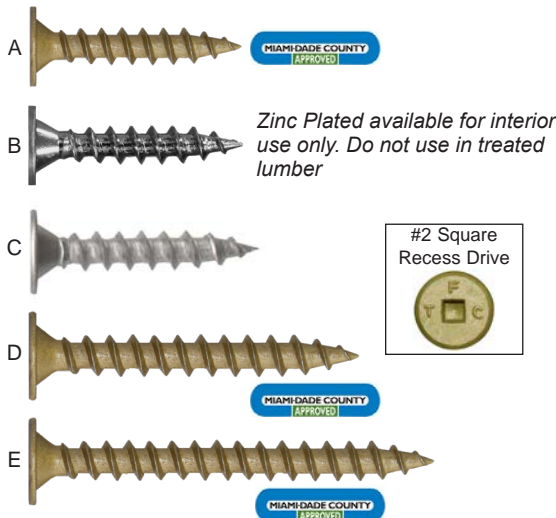
MEETS FLORIDA BUILDING CODE 1506.6 & R904.5.2(TRI-SEAL® & SS ONLY)

Sizes

Pierce up to 20 ga steel

	Description	Part Number	Box Quantity	WT Per Box	Price
A	#10-9 X 1-1/8" ULP (CS) Long-life TRI-SEAL™ coated	10112SPCUGCSTS	5,000	31.0 lbs	
B	#10-9 X 1-1/8" ULP (CS) Zinc Plated Interior Use Only	10112SPCUGCSZP	5,000	31.0 lbs	
C	#10-9 X 1-1/8" ULP (410 SS) Passivated	101125SPCUGS4	5,000	32.0 lbs.	
D	#10-9 X 1-5/8" ULP (CS) Long-life TRI-SEAL™ coated	1062SPCUGCSTS	3,000	34.0 lbs.	
E	#10-9 X 2-1/8" ULP(CS) Long-life TRI-SEAL™ coated	10212SPCUGCSTS	1,500	17.0 lbs.	

CS = Carbon Steel - C1018 / C1022
410 SS = 410 Stainless Steel



TECHNICAL INFORMATION

Description: #10-9 Gimlet Point self-tapping screw
Head Style: Ultra low pancake head with taper.
Drive System: #2 square recess
Head Thickness: .040"
Material: C1022 carbon steel
410 Stainless steel
(Copper Roofing Compatible)
Heat Treat: Case hardened to ANSI/ASME B18.6.4 specification
Finish
Carbon Steel: TRI-SEAL™ long-life coating (1,000hrs. salt spray)
Stainless Steel: Passivated (48hrs. salt spray)

Thread Detail

Major Diameter: .195"
Minor Diameter: .125"
Stress Area: .01267 in²

Pullout - Average Ultimate in Pounds

Fastener Dia. & Point	Wood Type						
	1/2" Plywood	5/8" Plywood	3/4" Plywood	7/16" OSB	19/32" OSB	23/32" OSB	2 x 4 SYP
#10-9 GP	383	395	574	136	356	514	813

Farabaugh Engineering Test: Project No. T279-10

Rev 040711

Fastener Strength

Torsional	60 lb-in
Tensile	1,520 lbs. min.
Shear	1,150 lbs. min.

Installation: Do not use impact drivers!
Use 2,500 RPM max variable speed screw drivers
with torque control or depth sensing nosepiece.

All information is non-binding and without guarantee. Before using the products, all specifications and calculations must be checked by a suitably qualified person and local regulations must be observed. This document is subject to revision. We reserve the right to make technical changes. (0321-1)

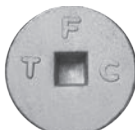


1/4-14 DP3 - DRILL AND TAP UP TO 1/4" THICK STEEL

#14 DP3 CONCEALOR® pancake head screws are designed for heavy gauge applications and can drill and tap up to 1/4" steel. The 1/4-14 thread produces greater strength and resists bending compared to smaller diameter screws. Originally designed for IMP!

These screws are coated with TRI-SEAL™ long-life coating that exceeds ASTM B633 specifications providing 1,000-hours salt spray performance, and FM4470 per ASTM G87 Sulfur Dioxide Test.

SPECIAL HEAD DESIGN



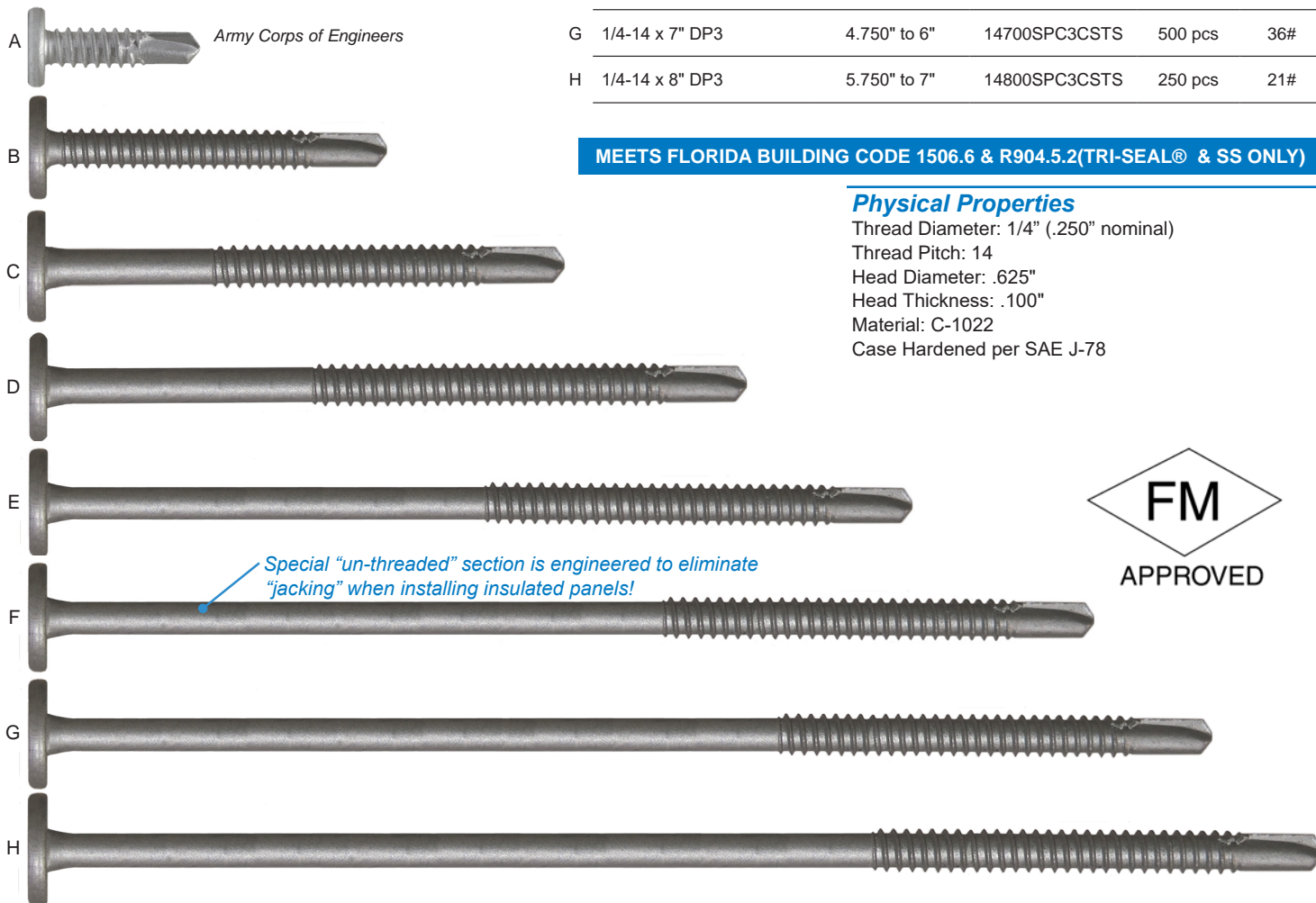
- 5/8" diameter head increases pullover strength and minimizes dimpling.
- #3 square recess drive provides stability during installation.

	Description	Load Bearing Length (MAX)	Part Number	Carton Quantity	Wt Per Carton
A	1/4-14 X 1" DP3	.325"	14100SPC3CS	2,500 pcs	27#
B	1/4-14 x 2" DP3	1.000"	14200SPC3CSTS	1,000 pcs	23#
C	1/4-14 x 3" DP3	1.375" to 2"	14300SPC3CSTS	1,000 pcs	33#
D	1/4-14 x 4" DP3	1.625" to 3"	14400SPC3CSTS	500 pcs	21#
E	1/4-14 x 5" DP3	2.750" to 4"	14500SPC3CSTS	500 pcs	25#
F	1/4-14 x 6" DP3	3.750" to 5"	14600SPC3CSTS	500 pcs	30#
G	1/4-14 x 7" DP3	4.750" to 6"	14700SPC3CSTS	500 pcs	36#
H	1/4-14 x 8" DP3	5.750" to 7"	14800SPC3CSTS	250 pcs	21#

MEETS FLORIDA BUILDING CODE 1506.6 & R904.5.2(TRI-SEAL® & SS ONLY)

Physical Properties

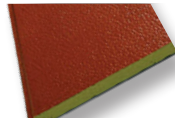
Thread Diameter: 1/4" (.250" nominal)
 Thread Pitch: 14
 Head Diameter: .625"
 Head Thickness: .100"
 Material: C-1022
 Case Hardened per SAE J-78



SPECIAL APPLICATIONS

Use to attach a variety of material to steel up to 1/4" thick!

ARCHITECTURAL
INSULATED PANELS



STRUCTURAL
INSULATED PANELS



NAIL
BASE



METAL ROOF
CLIPS



TOOLING: Install using a 2,000 RPM screw-gun with torque control. (DeWalt DW267)
 Do not use impact tools.

All information is non-binding and without guarantee. Before using the products, all specifications and calculations must be checked by a suitably qualified person and local regulations must be observed. This document is subject to revision. We reserve the right to make technical changes. (0321-1)

TFC VALUE PROPOSITION

Large Selection

Lengths to meet your application needs.

Best Quality

Assures low in-place cost.

Fast Delivery / Need-it-Now!

Reduces your inventory costs.

SS Denotes available sizes in stainless steel **SS**

Here is why we use a special thread...

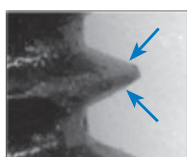
We use a buttress thread that provides exceptional clamping loads and is specified in many metal roofing systems to attached SSR clips over rigid insulation into metal deck.

CONCEALOR® with Buttress Thread

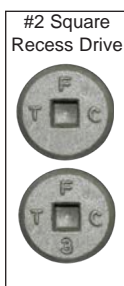


"Flat" thread keeps the joint tight

Ordinary Thread Form



A "Tapered" thread tends to cause the joint to loosen



- Attach to metal, wood, and concrete -

CARBON STEEL

- TRI-SEAL® coated provides over 10-times more corrosion resistance than black epoxy coated screws
- Drill and tap up to *16ga steel
- Can be used in concrete applications.

* The hardness of the steel can affect the drill and tap performance and may require predrilling. For concrete, predrill using a 3/16" masonry bit.

304 STAINLESS STEEL

- 304 Stainless Steel Bi-Metal provides superior corrosion resistance
- Drill and tap up to *18ga steel
- TRI-SEAL® coated provides lubricity that minimizes thread roll-over

SIZES

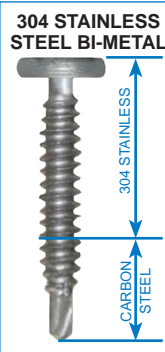
* Denotes 4-1/2" Thread Length

Description	Load Bearing Length	Part Number	Carton Quantity	Wt Per Carton	PRICE
#14-13 x 3/4" DP1	.125"	14075SPC1CSTS	3,000 pcs	21 lbs	
#14-13 x 1-1/2" DP1	.750"	CS: 14150SPC1CSTS 304SS: 14150SPC1BM	2,500 pcs	34 lbs	
#14-13 x 2" DP1	1.250"	CS: 14200SPC1CSTS 304SS: 14200SPC1BM	1,000 pcs	18 lbs	
#14-13 x 3" DP1	.125" - 2.250"	CS: 14300SPC1CSTS 304SS: 14300SPC1BM	1,000 pcs	24 lbs	
#14-13 x 4" DP1	.125" - 3.250"	14400SPC1CSTS	500 pcs	16 lbs	
#14-13 x 4-1/2" DP1	.625" - 3.375"	14450SPC1CSTS	500 pcs	17 lbs	
#14-13 x 5" DP1*	1.250" - 4.250"	14500SPC1CSTS	500 pcs	19 lbs	
#14-13 x 6" DP1*	2.125" - 5.250"	14600SPC1CSTS	500 pcs	23 lbs	
#14-13 x 7" DP1*	3.875" - 6.250"	CS: 14700SPC1CSTS 304SS: 14700SPC1BM	500 pcs	28 lbs	
#14-13 x 8" DP1*	4.875" - 7.250"	14800SPC1CSTS	250 pcs	17 lbs	
#14-13 x 9" DP1*	5.875" - 8.250"	14900SPC1CSTS	250 pcs	19 lbs	

Installation: DO NOT USE IMPACT DRIVERS!

Use 2,500 RPM max variable speed screw drivers with torque control or depth sensing nosepiece.

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MEETS FLORIDA BUILDING CODE 1506.6 & R904.5.2 (TRI-SEAL® & SS ONLY)

Technical Info

Refer to page MD28 for complete technical data.

Pullout In Steel - Average Ultimate (lbs) (Carbon and Stainless Steel Screws)

Fastener Information (Drill Points)		PULLOUT ULTIMATE LOAD IN POUNDS Calculated Values In Accordance to AISI S100 Section E4													
Screw Size	Nom Dia. (in.)	Grade 50 per ASTM A1011 60Ksi Min. Steel					Grade 50 per ASTM A792/A653/A572/A529 65Ksi Min. Steel								
		26 Ga. (.018")	25 Ga. (.021")	24 Ga. (.024")	22 Ga. (.030")	20 Ga. (.036")	18 Ga. (.048")	16 Ga. (.060")	14 Ga. (.075")	12 Ga. (.105")	1/8" (.125")	10 ga (.135")	1/4" (.250")	3/8" (.375")	1/2" (.500")
#10-16	.190"	174	203	233	291	349	504	630	787	1102	1312				
#10-24	.190"								787	1102	1312				
#12-14	.216"	198	231	264	330	397	573	716	895	1253	1492	1611			
#12-24	.216"									1492	1611	2984	*4475	*5967	
#14-13	.235"	216	252	288	360	431	623	779							
1/4-14	.250"							829	1036	1450	1727	1865	3453	*5180	*6906

Tested values are available upon request.
Revised: 0220AR

NOTE: * exceeds tensile strength of the screw.



PULLOVER

Screw	Tee Clip 24 ga. (Ave. Ultimate)	Zee Clip 24 ga. (Ave. Ultimate)
#10	415 lbs.	510 lbs.
#12	430 lbs.	692 lbs.
#14 DP1	407 lbs.	677 lbs.

* Berridge Clips
REV.JES082712

APPROVALS

Factory Mutual: 1/4-14 DP3 CONCEALOR.
FM Approval Standard 4481 Class 1 - Wall Fastener
Miami Date: #10 GP CONCEALOR

MEETS FLORIDA BUILDING CODE 1506.6
& R904.5.2 (TRI-SEAL® & SS ONLY)

Pullout In Wood - Average Ultimate (lbs)

Screw Size and Point type	PLYWOOD - CDX			OSB			SYP
	15/32" (1/2" Nom)	19/32" (5/8" Nom)	23/32" (3/4" Nom)	7/16"	19/32"	23/32"	
#10-9 GP	383	395	574	136	256	514	813
#10-12 BB *		450	706	258	381		648*
#10-13 GP	375	505	654	166	357	442	737
#12-11 GP	418	455	624	*164	379	573	918
#14-13 DP1	434	475	626	153	327	457	991

Farabaugh Engineering Test: Project No. T279-10 & * T282-15 REV JS042220



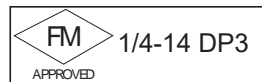
Decking fasteners tested with full thread embedment.
2 x 4 SYP with 1" embedment in side

* Test Report # T279-17 & T299-17 | Farabaugh Engineering.
NOTE: * 1" embedment into face of 2x.
Deeper embedment will increase pullout.

Pullout In Concrete - Average Ultimate (lbs)

Fastener Dia. & Point	3,000 psi Concrete
	1" Embedment
#14-13 DP1	740 lbs.

TF Test: 10.15.09
Drill Bit Size: 3/16" Masonry Bit. Depth of hole > 2".
(Screw should not exceed 1" embedment.) REV JS1218



SALT SPRAY

The chart below provides general corrosion information about various plating and coatings. Contact TFC for detailed information.

SALT SPRAY Per ASTM F1941 & B117 (0% red rust) Rev. 120313

Coating	Salt Spray
.0002" min. (6um) zinc plating with clear chromate	24hrs
.0002" Zinc Plating / Coated	60hrs
.0005" min. (12 um) zinc plating with clear chromate	72hrs
.0003" min. (8 um) zinc plating with yellow dichromate	120hrs
.0002" Zinc Plated 410 Stainless Steel	450hrs
Passivated / Coated 410 Stainless Steel	500hrs
TRI-SEAL™ Long-life coating	1,000hrs
Passivated 302 & 304 SS	>2,000hrs

NOTE: 304SS and 410SS screws are zinc plated or TRI-SEAL® coated to provide lubricity and improve tapping performance.

TOOLING | Do not use impact tools!

Screw-gun RPM

Carbon Steel & 410SS Screws: 2,500 RPM Max.
DP5, 1/4" & 5/16" DP3: 2,000 RPM Max.
302 & 304 Stainless Steel Tapping Screws: 1,000 RPM Max.
For optimal performance, use screw-guns with torque control feature.

DO NOT OVER-TORQUE FASTENERS.

Fastening Tips

- A minimum of 3 factors of safety should be used for most self-drilling or self-tapping fasteners in metal | 5-6 for wood. Consult a design professional for appropriate values.
- Install fastener perpendicular to the work surface and tighten to no more than approximately 70% of the torsional strength.
- Allow at least three full threads to extend beyond the material. For wood applications, allow 1" minimum embedment or full thread embedment in plywood and OSB for optimal pullout resistance.

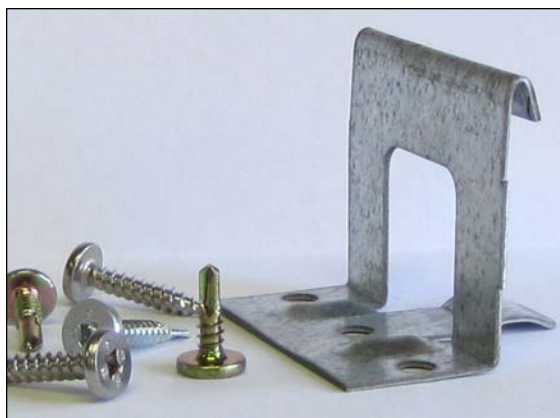
FASTENER MATERIAL SELECTION BASED ON THE GALVANIC SERIES OF METALS

BASE METAL	FASTENER MATERIAL			
	STEEL Zinc Plated	STAINLESS STEEL Type 410	STAINLESS STEEL Type 302, 304, 316	ALUMINUM
Zinc Galvanized Zn/Al Coated Steel	A	C	C	B
Aluminum	A	Not Recommended	B	A
Steel / Cast Iron	A,D	C	B	A
Brass, Copper, Bronze	A,D,E	A	B	A,E
Stainless Steel 300 Series	A,D,E	A	A	A,E

Key

- The corrosion of the base metal is not increased by the fastener.
- The corrosion of the base metal is slightly increased by the fastener.
- The corrosion of the base metal may be considerably increased by the fastener material.
- The plating on the fastener is rapidly consumed.
- The corrosion of the fastener is increased by the base metal.

*NOTE: Marine environments can cause galvanic corrosion. Consult panel manufacture for compatible fasteners to minimize galvanic corrosion.



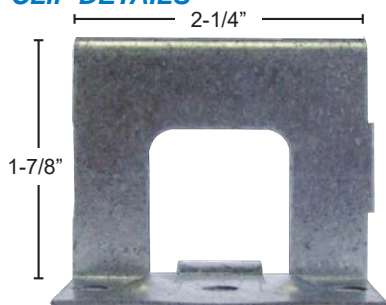
Are you tired of having to calculate the uplift loads of SSR clips used in your metal roof assembly?

We have a solution...the SSR CLIP KIT!

We provide a 1-7/8" tall fixed clip that is UL classified and has been independently tested to certify its ultimate uplift load capacity.

Clips are supplied with approved fasteners that meet your specific application requirement.

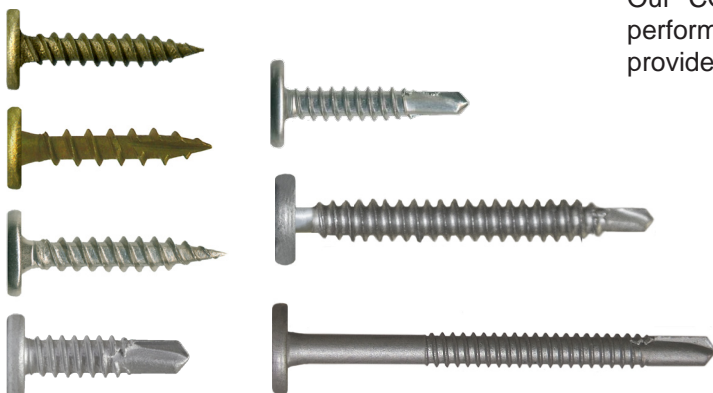
CLIP DETAILS



Our SSR fixed clips are engineered to high standards. They are produced to tight tolerances so they install easily and perform with many different panel brands. Specifically designed for a Snap-Lock style SSR panel.

- Clip is high strength 18ga. galvanized steel for superior performance.
- 1-7/8" tall providing additional clearance between the panel and the decking for better air flow and energy efficiency.
- UL classified.
- Compatible for PAK-CLAD, Snap-Clad, and Fabral thin seam panels.

FASTENER DETAILS



Our CONCEALOR® low profile head screws are engineered to perform in a variety of applications. They are easy to install and provide exceptional pullout.

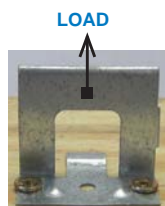
- High performance CONCEALOR® Low Profile Clip Screws for a variety of substrates.
- Carbon steel with TRI-SEAL™ long-life coating or stainless steel.
- Square recess drive for optimal installation stability.
- #10, #12, #14 diameters in lengths up to 9" long!

TECHNICAL DATA

These loads are from tests conducted at an independent laboratory. They are values for the clip assembly; where the clip is attached to the substrate using two (2) screws.

A load was applied to the vertical leg of the clip until failure occurred.

Loads are ultimate for each clip and screw assembly.



Upload Test Results - Clip and Screw Assembly - Average Ultimate

Screw Type	PLYWOOD			OSB			2X PINE	METAL (50KSI minimum)				
	1/2"	5/8"	3/4"	7/16"	19/32"	23/32"	1" EMBD	'22 ga	'20 ga	18 ga	16 ga	14 ga
#10-9 GP	486	598	834	217	491	538	978					
#12-14 GP	436	665	786	182	491	678	800					
#10 DP3										661	*1194	*1334
#12 DP3										706	*1088	*1296
#14-13 DP1	520	725	*1173	234	552	611	*1175	736	839			
1/4 DP3										683	*1047	*1325

* Denotes clip failure | Tore Clip

Clip dimensions: 1-1/8" x 3 1/2" x 1 7/8" | 18 ga. Galvanized Steel | 1/2" Screw Offset

1. Denotes test set-up using two inches of foam insulation on top of deck. A 16-ga. bearing plate was between the clip and the insulation.

NOTE: To produce values listed in this chart, clip must be installed using CONCEALOR® pancake head screws only.

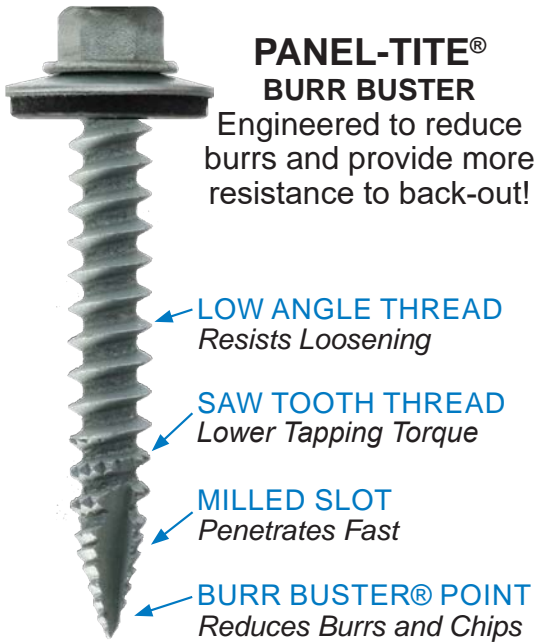
Load values are a result of tests conducted at Farabaugh Engineering Services, McKeesport PA. Report # XXXXX. Certified test report available.

CONTACT TFC FOR SPECIFIC LENGTH

DISCLAIMER: ALL DATA AND SPECIFICATIONS ARE BASED ON LABORATORY TESTS. APPROPRIATE SAFETY FACTORS SHOULD BE USED BY THE USER OR SPECIFIER. DETERMINING THE PROPER FASTENER IS THE RESPONSIBILITY OF THE USER OR SPECIFIER. BECAUSE APPLICATION CONDITIONS VARY, WE ASSUME NO LIABILITY FOR THE USE OF THIS INFORMATION.

Report #JS031711

Concealor is a registered trademark of
Triangle Fastener Corporation. Copyright 2011



Penetrates up to 20ga Steel

*Patented Anti-burr Thread
and Point Technology!**

REDUCES BURRS



Problem

Ordinary self-piercing screws produce burrs during installation that can damage the washer and corrode quickly!

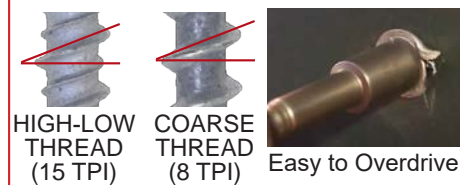
Solution

The BURR-BUSTER® point is designed to extrude the metal as it penetrates, minimizing burrs.

RESISTS BACK-OUT

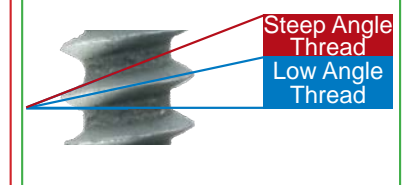
Problem

Ordinary metal-to-wood screws have steep angled threads that are easily overdriven causing back-out.



Solution

PANEL-TITE's low-angle thread helps keep the screw from loosening



MEETS FLORIDA BUILDING CODE 1506.6 & R904.5.2 (TRI-SEAL® & SS ONLY)

All screws are plated with TRI-SEAL® M1 1,000-hrs salt spray coating for superior corrosion protection

SIZES | BURR BUSTER® WITH TYPE 17 MILLED POINT

All fasteners can be painted with our Kalida-Kote paint finish to your exact color match.

Bagged 250pcs

#10-12 | CARBON STEEL | 1/4" HWH

Washer: .500" Dia. BondSealer 26ga G90 to EPDM



#12-12 | CARBON STEEL | 1/4" HWH

Washer: .562" Dia. BondSealer 26ga G90 to EPDM



#14-12 | CARBON STEEL | 5/16" HWH

Washer: .590" Dia. BondSealer 26ga G90 to EPDM



Size	Part #	Box Qty	List Price
#10-12 x 1" Burr-Buster CS / TS	10100HWBB17CSTSBW	4,000	
#10-12 x 1-1/2" Burr-Buster CS / TS	10150HWBB17CSTSBW	2,500	
#10-12 x 2" Burr-Buster CS / TS	10200HWBB17CSTSBW	2,000	
#10-12 x 2-1/2" Burr-Buster CS / TS	10250HWBB17CSTSBW	1,500	
#10-12 x 3" Burr-Buster CS / TS	10300HWBB17CSTSBW	1,000	
#12-12 x 3/4" Burr-Buster CS / TS	12075HWBB17CSTSBW	4,000	
#12-12 x 1" Burr-Buster CS / TS	12100HWBB17CSTSBW	4,000	
#12-12 x 1-1/2" Burr-Buster CS / TS	12150HWBB17CSTSBW	2,500	
#12-12 x 2" Burr-Buster CS / TS	12200HWBB17CSTSBW	2,000	
#14-12 x 1" Burr-Buster CS / TS	14100HWBB17CSTSBW	2,500	
#14-12 x 1-1/2" Burr-Buster CS / TS	14150HWBB17CSTSBW	2,000	
#14-12 x 2" Burr-Buster CS / TS	14200HWBB17CSTSBW	1,500	
#14-12 x 2-1/2" Burr-Buster CS / TS	14250HWBB17CSTSBW	1,000	
#14-12 x 3" Burr-Buster CS / TS	14300HWBB17CSTSBW	1,000	

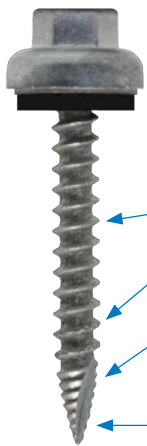
TRI-SEAL® M1 1,000-hrs Salt Spray - No Red Rust

INSTALLATION: Use a 2,500 RPM screw-gun with torque control or depth sensing feature. Impact tools are not recommended.

***Pat. No.: 11,105,362**

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FOR WARRANTED SYSTEMS & LONG-LIFE PERFORMANCE



PANEL-TITE® BURR BUSTER ZAC
Zinc Die Cast Head

- Use on 20yr warranty roof systems.
- Carbon steel shank with TRI-SEAL® M1 plating
- Provides outstanding corrosion protection.

- ← **LOW ANGLE THREAD**
Resists Loosening
- ← **SAW TOOTH THREAD**
Lower Tapping Torque
- ← **MILLED SLOT**
Penetrates Fast
- ← **BURR BUSTER® POINT**
Reduces Burrs and Chips

Penetrates up to 20ga Steel

Also Available
Stainless Cap Head
with Flange Sealer



PANEL-TITE® BURR BUSTER SS
304 Stainless Steel

- 304 SS BOND-SEALER washer
- Used in aluminum applications.
- Preferred screw for treated lumber.

Penetrates Steel up to 20 ga.

*Patented Anti-burr Thread and Point Technology!**

Bagged 250pcs

#10-12 ZAC ZINC CAP HEAD | 5/16" HWH

Washer: .565" Dia. / Aluminum to EPDM



ZAC Zn/AL alloy head provides the best protection against galvanic corrosion. Preferred screw for used on Galvalume and Zinalume coated panels.



ZAC® ZINC CAP HEAD | TRI-SEAL® M1 COATED SHANK

Size	Part #	Box Qty	List Price
#10-12 x 1" Burr Buster	10100HWBB17CSTSZH	4,000	
#10-12 x 1-1/2" Burr-Buster	10150HWBB17CSTSZH	2,500	
#10-12 x 2" Burr Buster	10200HWBB17CSTSZH	2,000	
#10-12 x 2-1/2" Burr Buster	10250HWBB17CSTSZH	1,500	
#10-12 x 3" Burr Buster	10300HWBB17CSTSZH	1,000	

#10-12 SSC STAINLESS CAP HEAD | 1/4" HWH

Washer: .500" Dia. Undercut / EPDM Washer



#12-14 HIGH LOW TYPE 17 STAINLESS CAP HEAD | 5/16" HWH

Washer: .570" Dia. Undercut / EPDM Washer



#14-10 STAINLESS CAP HEAD | 5/16" HWH

Washer: .570" Dia. Undercut / EPDM Washer



Attach metal panels with a 1-1/2"- 2" high rib height. Great for replacing screws that are stripped!

#10-12 304 STAINLESS STEEL

Washer: Stainless Steel



Diameter & Point: #10-12
Material: 304 Stainless Steel
Plating: Passivated & TRI-SEAL®
Head Style: 1/4" HWH
Thread: #10-12 Single Lead

STAINLESS STEEL CAP HEAD | TRI-SEAL® M1 COATED SHANK

Size	Part #	Box Qty	List Price
#10-12 x 1" Burr Buster	10100HWBB17CSTSSC	4,000	
#10-12 x 1-1/2" Burr-Buster	10150HWBB17CSTSSC	2,500	
#10-12 x 2" Burr Buster	10200HWBB17CSTSSC	2,000	
#10-12 x 2-1/2" Burr Buster	10250HWBB17CSTSSC	1,000	
#10-12 x 3" Burr Buster	10300HWBB17CSTSSC	1,000	
#12-14 x 1-1/2" Type 17	12150HW17CSTSSC	1,500	
#14-10 x 3-1/2" Type 17	14350HW17CSTSSC	1,000	

All ZAC and SSC screws are plated with TRI-SEAL® M1 1,000-hrs salt spray coating for superior corrosion protection

(Note: #14-10 x 3-1/2" Type 17 is coated with standard TRI-SEAL®)

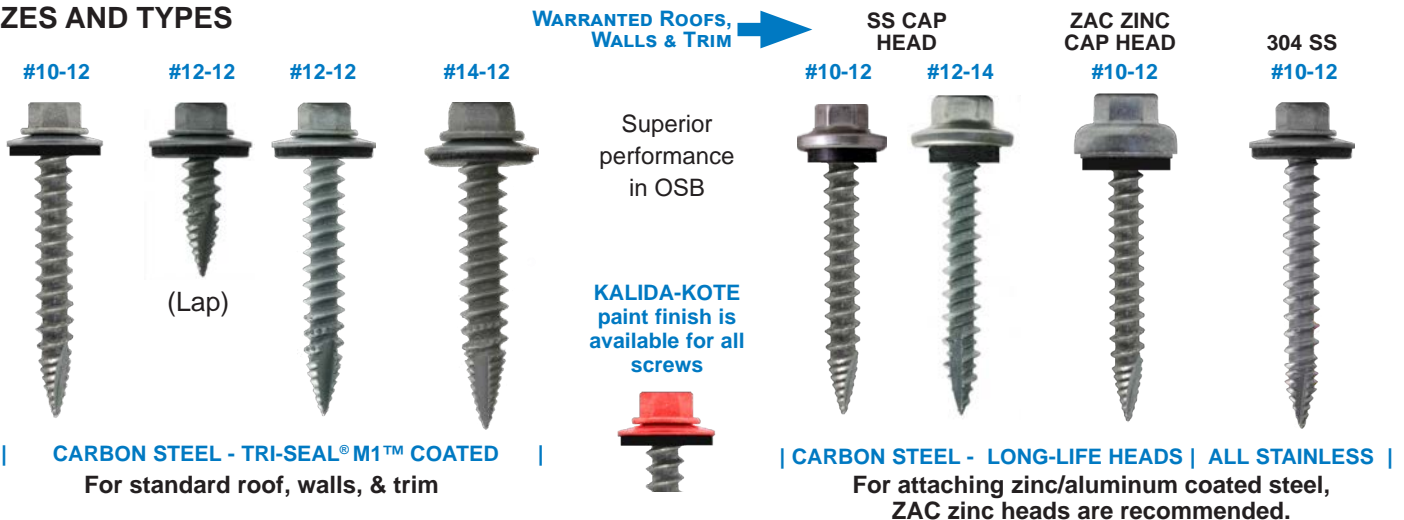
304 STAINLESS STEEL | PASSIVATED & TRI-SEAL® COATED

Size	Part #	Box Qty	List Price
#10-12 x 1" Burr Buster	10100HWBB17S34BW	3,000	
#10-12 x 1-1/2" Burr Buster	10150HWBB17S34BW	2,500	
#10-12 x 2" Burr Buster	10200HWBB17S34BW	2,000	
#10-12 x 2-1/2" Burr Buster	10250HWBB17S34BW	1,500	
#10-12 x 3" Burr Buster	10300HWBB17S34BW	1,000	

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***Pat. No.: 11,105,362**

SIZES AND TYPES



GENERAL SPECIFICATIONS

Strengths (Carbon Steel = CS and Stainless Steel = SS)

Size	Thread Major Dia.	Tensile (lbs. min)	Shear (avg. lbs. ult.)	Torsional (min. in. lbs.)
#10-12 304 SS BB	.190	1,950	1270	60
#10-12 CS BB	.190	1,850	1,216	65
#12-14 CS HL	.216	2,183	1,946	80
#12-12 CS BB	.216	2,183	1,946	80
#14-12 CS BB	.235	3,150	2,150	125

Hex Sizes

#10, #12 = 1/4" HWH
#14 = 5/16" HWH

Washer Diameters

#10 = 12.8mm OD
#12 = 14mm OD
#14 = 15mm OD

*Patented Anti-burr Thread and Point Technology!**

*Pat. No.: 11,105,362

ZAC Zinc Heads: Zamac 5
SS Heads : 304 SS

MATERIAL SPECIFICATIONS

Material: Carbon Steel

Finish: TRI-SEAL® M1™ Long-life Plating
(ACQ Compatible for use in treated lumber)

Material: 304 Stainless Steel

Finish: Passivated & TRI-SEAL®
(Preferred for use in treated lumber)

Paint: Kalida-Kote Polyurethane with UV stabilizer.

Washer Types

Stainless Steel Screws

304SS vulcanized to non-conductive EPDM.

Carbon Steel Screws

G90 20ga Galvanized Steel vulcanized to non-conductive EPDM.

PERFORMANCE SPECIFICATIONS

Pullout Values in Wood (Carbon Steel or Stainless Steel)
Ultimate Average Load in Pounds Force



Fastener Dia. & Point	Wood Type							
	PLYWOOD-CDX				OSB			SYP
	11/32" 3/8" NOM	15/32" 1/2" NOM	19/32" 5/8" NOM	23/32" 3/4" NOM	7/16"	19/32"	23/32"	2 x 4
#10-12 BURR BUSTER		349	450	706	258	381	484	1059 1445*
#12-12 BURR BUSTER ¹	249	418	467	608	218	383	573	1241 1491*
#12-8 Type 17 High Low		296	445	552	139	445	538	748
#14-12 BURR BUSTER ¹	337		539	676	258	404		1169*

Report #T279-10 | Farabaugh Engineering and Testing | 9.30.2010

¹Report #T213-20 | Farabaugh Engineering and Testing | 05.01.2020

#10-12 and #12-12 BB SYP tested in TFC Tech Center | 04.12.22

REV: JK0422

PULLOUT TEST SETUP - EMBEDMENT

2 x 4 = 1" embedment. * Denotes 1-1/2" penetration (Full Threads.)
All other tests full thread embedment.

Note: The specific gravity and variations in grain should be considered and affects the pullout. A minimum safety factor of 4 should be used.

MEETS FLORIDA BUILDING CODE 1506.6 & R904.5.2
(TRI-SEAL® & SS ONLY).
Miami Dade Approved for < 1,000 hrs

Corrosion Test Results TRI-SEAL® M1 COATING

Testing Method	*Results
SO ₂ Test Per ASTM G87	20 Cycles (2 liters)
Salt Spray Per ASTM B117	1,000 hours

*0% Red Rust

Exceeds ASTM B633 Salt Spray requirements.

Pullover Strength in Pounds

Grade 50 per ASTM A1011 60Ksi Min. Steel

Washer Size	26ga (.019")	24ga (.023")	22ga (.031")	20ga (.035")	18ga (.049")
1/2" O.D.	810	1080	1350	1620	2160
9/16" O.D.	912	1216	1520	1824	2432
15mm O.D.	955	1274	1593	1912	2548

Calculated per AISI S100

DISCLAIMER: All information is non-binding and without guarantee. Before using the products, all specifications and calculations must be checked by a suitably qualified person and local regulations must be observed. This document is subject to revision. We reserve the right to make technical changes. (0321-1)



The following information is provided to help you install tapping screws correctly in metal roofing and siding applications.

SCREW GUNS

Using the proper tooling is important for producing consistent installation. It also reduces the chance for screw or application failure caused by over-driven and under-driven fasteners.

SCREW-GUN SELECTION

For the best performance, we recommend the following RPM and DeWalt screw-guns.



Corded Tools

DW267
DW268
DW269



Cordless Tools

DC668M2

Screw Size	Max RPM	Model
#6, #8, #10, #12, #14	2,500	DW268
1/4", 5/16", all DP5	2,000	DW267
304SS Tapping Screws	1,000	DW269

Screw Size	Max RPM	Model
All Screws	0 - 2,000	DC66M2

Use a tool with torque control or depth sensing nose piece to prevent over-torqued and under-torqued screws.

WARNING! DO NOT USE IMPACT TOOLS FOR INSTALLATION!

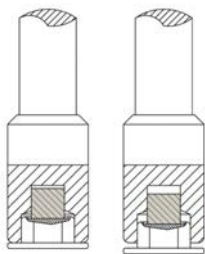
Using impact tools to install pancake head screws can cause the head to separate from the body due to the high torque and impulse generate by the tool. Impact tools can also chip the paint on the head of the screw. TFC is not responsible for failures caused by the use of improper tooling or improper installation.

ACCESSORY TIPS



Paint chipping or stripping out recess?

Worn out drive bits and sockets produces poor drilling, can strip the recess, and damage painted fasteners. Use only high quality bits and sockets.



Correct Incorrect

SET THE MAGNET!

Be sure screw head engages into the socket completely. This will eliminate screw wobble, improve the drilling performance, and reduce damage to painted screw heads.

INSTALLATION TECHNIQUES



DO

- Install fastener perpendicular to the work surface.
- Let the drill point do the work.
- Allow all material to be drilled before tapping occurs.

DO NOT

- Do not exert excessive pressure!
- Do not over drive the screw!
- **Do not use impact tools! (They can torque the screw to failure!)**

DETERMINE SCREW LENGTH

METAL SUBSTRATE

Measure from the top surface of the material being fastened to the underside of the metal. Be sure to allow for any void or insulation. Select a screw length that is at least 1" longer than the attachment length.

WOOD SUBSTRATE

Allow full penetration into wood decks so the screw point extends beyond the bottom side. Allow at least 1" screw embedment in 2 x structures to maintain designed pull out resistance. Greater penetration can achieve higher pull out values.

SEALING WASHERS

To assure a proper seal, tighten the screw until the EPDM sealant extrudes just to the outer edge of the backing material. This also is a great way to visually inspect the screw to assure it is properly sealed.



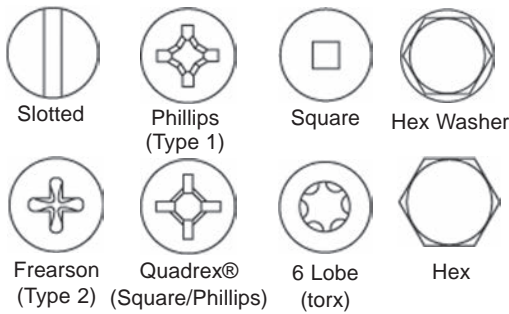
Disclaimer: Hardware should always be installed by a competent professional with a good understanding of interior wall types and mounting fasteners. Please do not attempt to install any hardware unless you know how to safely operate the necessary tools, and have a good understanding of what you are doing. The following instructions are basic guidelines for qualified installers, and should be read through completely before starting your job.

PS110615JS

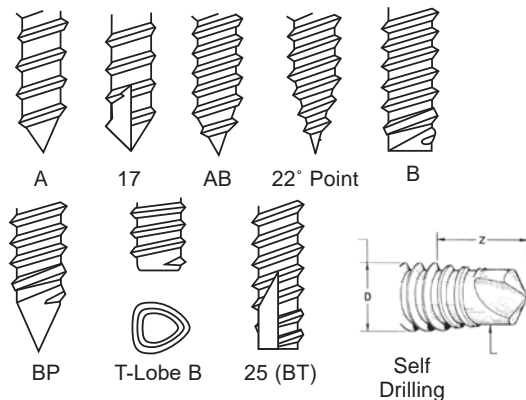
FASTENING TIPS

This handy reference sheet provides important information that helps you in selecting a fastener. Please call our local service center at 800.486.1832 for all of your fastening system needs.

Drives



Point Styles



Tooling | Installation



Screw-gun RPM

Carbon Steel & 410SS Screws: 2,500 RPM maximum
304 Stainless Steel Screws: 1,000 RPM maximum
For optimal performance, use screw-guns with torque control feature.
DO NOT OVER-TORQUE FASTENERS.

Installation Tips

- A minimum of three (3) factors of safety should be used for most self-drilling or self-tapping fasteners. Consult a design professional for appropriate values.
- Install fastener perpendicular to the work surface and tighten to no more than approximately 70% of the torsional strength.
- Allow at least three full threads to extend beyond the material. For wood applications, allow 1" minimum embedment or full thread embedment in plywood and OSB for optimal pullout resistance.

NOTE: DO NOT USE IMPACT TOOLS OR THE FASTENER CAN FAIL!

Fastener Material Selection Based on the Galvanic Series of Metals

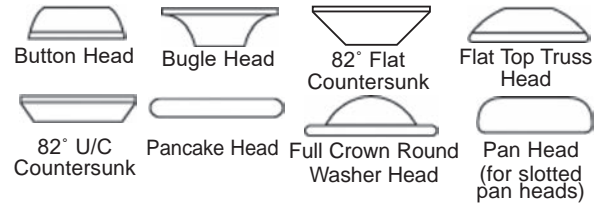
Table developed using information supplied by AISI Committee of Stainless Steel Producers.

		FASTENER MATERIAL			
		STEEL Zinc Plated	STAINLESS STEEL Type 410	STAINLESS STEEL Type 302, 304, 316	ALUMINUM
BASE METAL	Zinc Galvanized ZN/Al Coated Steel	A	C	C	B
	Aluminum	A	Not Recommended	B	A
	Steel / Cast Iron	A,D	C	B	A
	Brass, Copper, Bronze	A,D,E	A	B	A,E
	Stainless Steel 300 Series	A,D,E	A	A	A,E

Key

- A. The corrosion of the base metal is not increased by the fastener.
- B. The corrosion of the base metal is slightly increased by the fastener.
- C. The corrosion of the base metal may be considerably increased by the fastener material.
- D. The plating on the fastener is rapidly consumed.
- E. The corrosion of the fastener is increased by the base metal.

Head Styles



Gauges | Metric Conversion

English to Metric	Formula to Use
Decimal to Millimeters	Decimal x 25.4
PSI to Newton / Millimeters ²	PSI x .007
Pounds Force to Newtons	Pounds Force x 4.448

Gauge Thickness	Decimal	Metric
29 GA	.013"	.33mm
28 GA	.015"	.38mm
26 GA	.018"	.46mm
24 GA	.024"	.61mm
22 GA	.030"	.76mm
20 GA	.036"	.91mm
18 GA	.048"	1.22mm
16 GA	.060"	1.52mm
14 GA	.075"	1.91mm
12 GA	.105"	2.67mm
1/8"	.125"	3.18mm
10 GA	.135"	3.43mm
1/4"	.250"	6.35mm
5/16"	.312"	7.92mm
3/8"	.375"	9.53mm
1/2"	.500"	12.7mm



Largest Selection of Painted Rivets...IN STOCK!

- #43 and #44 Stainless Steel
- Over 50 colors in-stock for same day ship!
- Chip resistant paint is formulated to resist fading caused by UV rays.
- 250 pieces per bag for easy handling.

WE'LL SHIP ONE BAG!

Popular Sizes and Technical Information

Body Dia.	Rivet #	Grip Range	Rivet Length	Head Dia.	Head Height	Drill Hole
1/8"	43	.126 - .187	.337	.250	.040	#30 (.129" - .133")
	44	.188 - .250	.400			
3/16"	63	.126 - .187	.337	.375	.060	#11 (.192" - .196")
	64	.188 - .250	.400			

BLIND RIVETS | DOMED HEAD
TFC standard rivets are all stainless, all aluminum or all steel

Use the correct hole size to assure the rivet performs properly. Refer to size chart for hole size.

Drill Bit Type
High Speed / 135° Split Point

Pullout in Steel

1/8" BLIND RIVET (#42, #43, #44) STAINLESS STEEL					
	Steel Thickness and Tensile				
	0.021"	0.032"	0.047"	0.074"	
	49 ksi	44 ksi	112 ksi	63 ksi	66 ksi
PULLOUT (lbs)	106 ¹	175 ¹	571 ¹	647 ²	631 ²

Farabaugh Report: T311-16

Pullover in Steel

1/8" BLIND RIVET (#42, #43, #44) STAINLESS STEEL			
	Steel Thickness and Tensile		
	0.021"	0.032"	0.074"
	49 ksi	44 ksi	66 ksi
PULLOVER (lbs)	306 ¹	425 ¹	644 ²

Farabaugh Report: T175-21

Rivet Strengths

RIVET	Tensile	Shear
1/8" SS	600	520
1/8" AL	180	150
3/16" SS	1300	1150
3/16" AL	700	440

Country of Origin: USA

Tools

Milwaukee® M12™ Tool 12 Volt Cordless



Delivers fast, easy riveting while maintaining performance, durability, and consistency.

Model: M12 - 2550-22 Tool Kit

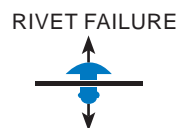
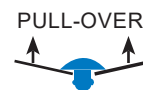
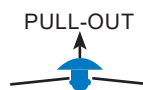
Capability | One full Charge
3/16" stainless steel rivets (250 rivets)
1/8" steel rivets (450 rivets)



Tool Kit includes battery, charger, bag.

Manual

The Rivet King model RK-65 hand rivet tool can set blind rivets up to 3/16" in diameter.



FAILURE MODES
1. Pullover or Pullout
2. Rivet

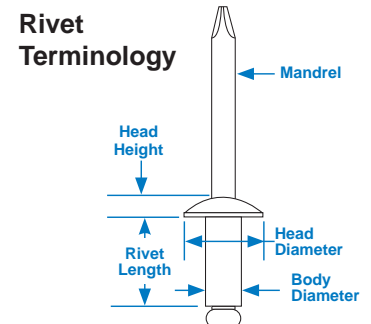
Pullout in Aluminum

1/8" BLIND RIVET (#42, #43, #44)		
ALUMINIUM THICKNESS (6063 T5)	0.040"	0.125"
STAINLESS RIVET PULLOUT (lbs)	102 ¹	561 ¹
ALUMINUM RIVET PULLOUT (LBS)	103 ¹	194 ²

3/16" BLIND RIVET (#62, #63, #64)		
ALUMINIUM THICKNESS (6063 T5)	.040"	0.125"
STAINLESS RIVET PULLOUT (lbs)	124 ¹	1,082 ¹
ALUMINUM RIVET PULLOUT (lbs)	128 ¹	512 ²

Farabaugh Report: T220-16 & T305-20

All tests conducted at Farabaugh Engineering and Testing



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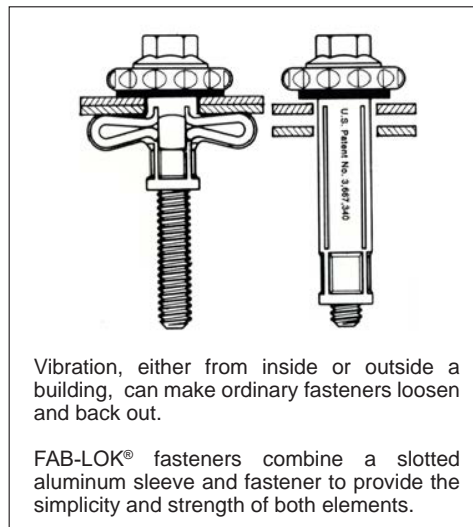
We Stock a Full-Line for Immediate Shipping!

FAB-LOK® fasteners were designed to maintain panel integrity in high-stress environments such as: high wind areas, expansion and contraction, severe vibration, racking and the repair of oversized holes.

Sizes

Material	Size	Penetrating Length	Grip Range	Wt. / M
Carbon Steel	FAS 10-4	1.373"	.062"-.250"	23
	FAS 10-8	1.612"	.250"-.500"	24
	FAS10-12	1.807"	.500"-.750"	28
H-3 (300 series) Stainless Steel	FAC10-4	1.373"	.062"-.250"	23
	FAC 10-8	1.612"	.250"-.500"	24
	FAC 10-12	1.807"	.500"-.750"	28

WEATH-R-SEAL Washers	
Part	Description
Aluminum Bonded Weath-R-Seal Washers	.729" O.D. - .040 Aluminum
	1" O.D. - .040" Aluminum
304 Stainless Steel Bonded Weath-R-Seal Washers	.729" O.D. 20 gauge 304 S/S
	1" O.D. 20 gauge 304 S/S



Installation

1. Pre-drill with a 5/16" diameter drill bit
2. Insert FABLOK into hole. Use the FABLOK holding sleeve with a DEWALT screw-gun (DW268 or DW267)

Holding Sleeve
p.n. : EZL900



Technical Information

Pull-out tests were performed on a Model L Dillon Dynamometer. FAB-LOK® fasteners were installed in single sheet and two sheets of metal and pulled over the tines of the FAB-LOK® to determine holding values.

Clamping Force

FAB-LOK® Type
Maximum 900 lbs.
Residual 860 lbs.

Comparison: FAB-LOK® & Sheet Metal SC

Sheet Material	FAB-LOK® FAS-10-4	#14 Sheet Metal Screw
Strip test in .032" Aluminum	75 inch-lbs.*	65 inch-lbs.*
Strip test in 26 ga. Steel	75 inch-lbs.*	45 inch-lbs.*
Strip test in 24 ga. Steel	75 inch-lbs.*	55 inch-lbs.*

Single Shear Strength

FAB-LOK® Type	FAC	FAS
Avg. shear	1885 lbs.	2400 lbs.

Hydrostatic Test

FAB-LOK® Type	H2O Pressure	Length of test	Result
FAC - 10-4	100 psi	5 days	No leaks

Type Fac - Single Sheet

Sheet Material	Sheet Thickness	Failure lbs.*	Type of Failure
Steel	24 ga.	833	Sheet Split
	20 ga.	858	Sheet Split
	18 ga.	1050	Sheet Split
	16 ga.	1293	Sheet Split
	14 ga.	1400	Fastener Broke

Fatigue Tests

Two thicknesses of 26 gauge metal fastened with FAB-LOK® and tested on 5000 lb. capacity machine at 1500 cycles per minute, sustained 1,775,500 cycles when failure of sheets occurred. Fastener did not fail.

FAB-LOK® fastening 1/8" aluminum plate to 3/16" steel of a railroad freight car, held without failure when the car was subjected to jarring vibration by a Hewitt-Robins Car Shaker at 900 cycles for ten minutes.

INFORMATION PROVIDED HERE IS BASED UPON TESTS BELIEVED TO BE RELIABLE. IN AS MUCH AS ELCO FASTENING SYSTEMS HAS NO CONTROL OVER THE EXACT MANNER IN WHICH OTHERS MAY USE THIS INFORMATION, IT DOES NOT GUARANTEE THE RESULTS TO BE OBTAINED NOR DOES THE COMPANY MAKE ANY EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE CONCERNING THE EFFECTS OR RESULTS OF SUCH USE.



FASTENER SELECTION GUIDE FOR EXPOSED METAL BUILDING AND ROOFING APPLICATIONS

Environments

URBAN/RURAL
INDUSTRIAL
COASTAL/MARINE

Select a fastener based on the environment and the panel type.

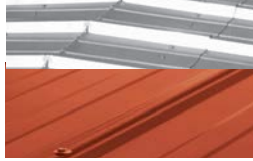
To minimize galvanic corrosion, it is important that the fastener material is compatible with the roofing material. The following list of fasteners were selected based on specifications from various panel producers throughout the world. **Harsh environments can corrode metals quickly.** Contact the panel manufacturer for their specific recommendations.

NOTE: Electroplated zinc plated screws are not for use in exterior applications and will corrode quickly.

Use With Warranted Roof Systems

PANEL MATERIAL Fasteners

COATED STEEL



- Galvanized
- Zinc/Aluminum
- Painted Metal

CARBON STEEL
TRI-SEAL® COATED
URBAN/RURAL
INDUSTRIAL



***410**
STAINLESS STEEL
URBAN/RURAL
INDUSTRIAL



*Coated or Zinc Plated

STAINLESS CAP
URBAN/RURAL
INDUSTRIAL
COASTAL/MARINE



ZINC HEAD
URBAN/RURAL
INDUSTRIAL
COASTAL/MARINE



304
STAINLESS STEEL
URBAN/RURAL
INDUSTRIAL
COASTAL/MARINE



Note: 300 series stainless may corrode the base metal in severe marine environments. Consult the panel manufacturer for specific conditions

PANEL MATERIAL Fasteners

ALUMINUM



CARBON STEEL
TRI-SEAL® COATED
URBAN/RURAL



STAINLESS CAP
URBAN/RURAL
INDUSTRIAL
COASTAL/MARINE



ZINC HEAD
URBAN/RURAL
INDUSTRIAL
COASTAL/MARINE



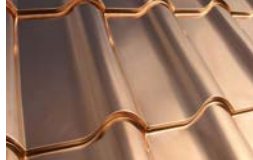
304
STAINLESS STEEL
URBAN/RURAL
INDUSTRIAL
COASTAL/MARINE



Note: 300 series stainless may corrode the base metal in severe marine environments. Consult the panel manufacturer for specific conditions

PANEL MATERIAL Fasteners

COPPER



***410**
STAINLESS STEEL
URBAN/RURAL
INDUSTRIAL

*Coated or Zinc Plated



STAINLESS CAP
URBAN/RURAL
INDUSTRIAL
COASTAL/MARINE



304
STAINLESS STEEL
URBAN/RURAL
INDUSTRIAL
COASTAL/MARINE



PANEL MATERIAL Fasteners

STAINLESS STEEL



***410**
STAINLESS STEEL
URBAN/RURAL
INDUSTRIAL

*Coated or Zinc Plated



STAINLESS CAP
URBAN/RURAL
INDUSTRIAL
COASTAL/MARINE



304
STAINLESS STEEL
URBAN/RURAL
INDUSTRIAL
COASTAL/MARINE



For detailed product information, please view our product page located on our website or our PRODUCT QUICK FACTS sheet.

BLAZER
DRILL SCREWS

- TRI-SEAL® Coated | Carbon Steel
- Stainless Cap or Zinc Head
- 410 Stainless Steel

PANEL-TITE
METAL-TO-WOOD SCREWS

- TRI-SEAL® Coated | Carbon Steel
- Stainless Steel Cap Head Screws
- 304 Stainless Steel

TFC TAPPERS
SELF-TAPPING SCREWS

- TRI-SEAL® Coated | Carbon Steel
- Stainless Steel Cap Head
- 304 Stainless Steel

SD300
304 Stainless Self-Drill Screws

- 304 Stainless Steel Bi-Metal Drill Screws

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TRI-SEAL® LONG-LIFE COATING

TRI-SEAL® Long-Life Coating is a high performance dip spin finish, developed to minimize corrosion when used in exterior building applications. It consists of three layers; the first layer is a metallic zinc layer, the second layer is a high-grade anti-corrosion chemical conversion film and the third, outer layer, is a baked ceramic surface coating.

The distinguishing feature of **TRI-SEAL®** is the tight joining of the baked ceramic surface coating and the chemical conversion film. These two layers are bonded together through chemical reactions, and this unique method of combining layers result in a rigid combination of the coating films.

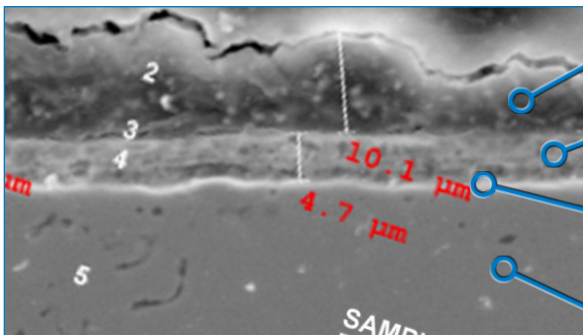
Salt Spray Test Results

1,000hrs Per ASTM B117 - No Red Rust

Applications: Exceeds salt spray requirement specified in ASTM B633, B659, & F1941 (zinc plating).
Compatible for use in treated lumber

- Excellent resistance against gas, weather, and other kinds of corrosion factors, including salt water.
- Compatible for use in ACQ and Fire Treated Lumber.
- Composite layers minimize the effect of scratches on the protection coating.
- Compatible for use in aluminum applications.
- UV resistant. Does not chalk or fade

SEM IMAGING



Layer 1 - Baked Ceramic Surface Coating Layer

Corrosive elements are intercepted by the strong paint film made of ceramic materials.

Layer 2 - Chemical Conversion Coating Layer

Rust proof performance is improved as the chemical conversion inactivates the zinc plated surface and creates a tight adhesion between the chemically converted layer and the paint layer.

Layer 3 - Metallic Zinc Layer

The steel / iron substrate is protected from corrosion by the self-sacrificial galvanic effect of the zinc coating.

Layer 4 - Fastener

MATERIAL PROPERTIES

Test Items	Test Methods	Test Results
Hardness	Peeling test by pencil hardness	Over 4H
Adhesion	Peeling test by adhesive tape on cross scribed test piece in 1 mm width	Nothing abnormal
Acid Resistance	Immersion in 5% sulfuric acid solution for 24 hours	Nothing abnormal
Alkali Resistance	Immersion in 5% sodium hydroxide solution for 72 hours	Nothing abnormal
Heat Resistance	Exposure to 250 C (482 F) heat for an hour	Nothing abnormal
Accelerated Weathering	Sunshine weather-0-meter test for 1,000 hours	Free from red rust
Contact Corrosion w/other Metals	Corrosive investigation after Salt Spray Test (JIS Z2371) done comparatively on surface treated steel bolts/nuts tightened on a stainless steel plate	Clearly superior to zinc electroplated (colored chromate) and hot dip galvanizing

Corrosion Testing

Salt Spray: 1,000hrs.
Per ASTM B117.
No red rust

Kesternich:
30 cycles | 1.0 L
15 cycles | 2.0 L
ASTM G87
No Red Rust

UV Resistant

Exceeds salt spray requirements specified in ASTM B633, B695, & F1941 (zinc plating).

Contact TFC for additional details on TRI-SEAL®.

Interacting Influences

This brief look at the rusting of steel points up the interacting influences which initiate, and control, the mechanism of electrochemical corrosion.

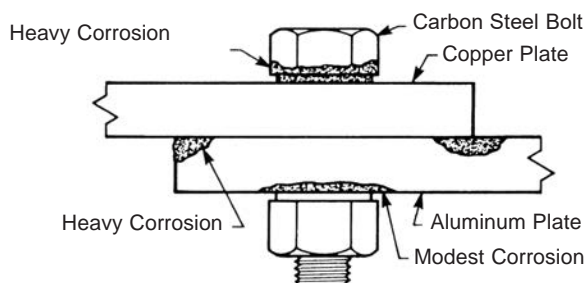
First, there must be the possibility for any electrical current to flow. This means either the contacting of dissimilar metals with different electro-potentials, or some measure of heterogeneity in the same base metal. The greater the differential, the stronger the current flow and the faster and more severe the corrosive action. Corrosion of the same metal, for example; the rusting of steel, normally results in a uniform corroding of the entire exposed surface. When dissimilar metals contact, the attack is usually more localized.

Second, there must be an electrolyte a medium through which the electrical current flows. Electrolytes occur naturally in our everyday environments - humidity, fog, dew, condensation, rain - and with a broad variation in their occurrence and intensity. For example, the corrosion survival expectancy of steel is shortened considerably when exposed in the high humidity Southern states as opposed to the ultra-dry desert climates of Nevada and Arizona. Similarly, structures and equipment survive longer in rural Midwestern states than in either ocean bordering states or in heavily industrialized areas with their high impurity atmospheres. Even in the home, storing articles in the dryness of an attic is more protective than in the dampness of a basement.

Distilled water is a poor conductor; tap water with its modest chemical content is better; industrial exposures with their pollutants and contaminants are even better; and salt water is exceptionally good. Whenever the electrolyte is agitated, such as flowing water, its conductivity is significantly magnified. The "dirtier" the electrolyte, the better its conductivity, and the faster the rate of corrosion.

Third, there must be oxygen. As most products of corrosion are oxides formed by the chemical reaction, the presence of oxygen is mandatory. Without oxygen, most forms of corrosion would be stalemated. However, its complete elimination is an engineering impracticality. Oxygen is the principal element of the air we breathe, and it is present, although to a lesser degree, underground and underwater.

The importance of oxygen can be illustrated by considering an oceangoing steel-hulled ship. Without suitable protection of its exposed surfaces, the entire hull would corrode, but at three different rates. The plates at the water line would go first because of the concentrated aggressiveness of the sea water coupled with unlimited oxygen. The upper structure and decks would corrode more slowly because the electrolyte is now a spray which has lost some of its intensity although the oxygen supply is undiminished. The fully submerged bottom of the hull would survive the longest simply because of the meagerness of the oxygen supply.



Effects of Galvanic Corrosion

Temperature, while not a direct contributor to corrosion, is definitely a factor in the rate at which it occurs. Generally, heat accelerates chemical reactions. All other conditions being equal, corrosion happens quicker and more markedly in southern climates than in those of the north. It also occurs

more quickly in industrial plants where heat is inherent in the process as opposed to industries which conduct their operations at ambient temperatures or in the luxury of an air conditioned atmosphere.

Galvanic Corrosion

Similar metals are compatible; dissimilar metals are not. When dissimilar metals contact in the presence of an electrolyte, a galvanic action occurs which causes one of the metals to corrode at a much faster than normal rate, while the other corrodes more slowly, if at all. The rate, location and extent of the corrosion depends on three factors:

- The difference in electrical potentials
- The conductivity strength of the corroding medium, and
- The relative sizes of the contacting areas.

All metals have electrical potentials. Through research, the potentials of different base metals and their alloys, when exposed to sea water, were measured and then ranked into a series. In an electrical couple, the metal of higher electrical potential is the cathode (-), that of the lower the anode (+). Current flows from the cathode to the anode, from the anode through the electrolyte (corroding medium), and back to the cathode. Corrosion occurs at the point the current leaves the anode to enter the electrolyte. When dissimilar metals contact, the anode corrodes, the cathode survives.

Galvanic Series

Table 1 presents the Galvanic Series of Metals and Alloys. The various metals are grouped. Those within the same group are reasonably compatible when used together; those from different groups cause a corrosion problem. Some metals, basically those with significant contents of nickel and chromium, are included in the Series both in their active and passive conditions. Passivation (surface cleaning and sealing) lowers the metal's electrical potential and improves its corrosion behavior.

Study of the Galvanic Series suggests that steel and aluminum are reasonably compatible; but, if titanium and aluminum contact, the aluminum, as the anode, will corrode. Fig. 2 illustrates another example. A copper plate is joined to an aluminum plate using a carbon steel bolt. If none of the contacting surfaces are protected, corrosion will occur. The bolt, where it touches the copper, will corrode severely. However, the bolt, where it contacts the aluminum, will not corrode, because it is now the cathode. The aluminum plate in contact with the bolt may corrode, but only slightly because of the minor difference in their electropotentials and the large anode-to-Cathode area ratio. The aluminum plate will corrode where its exposed exterior surfaces contact the copper plate. The aluminum plate may also corrode on its interior surface, but not to the same degree, because the corroding medium and oxygen supply are largely sealed out due to the bolt's clamping action.

GALVANIC SERIES OF METALS AND ALLOYS

+Corroded End (anodic, or least noble)

Magnesium, Magnesium alloys, Zinc
Aluminum 1100, Cadmium, Aluminum 2024-T4, Steel or Iron, Cast Iron, Chromium-iron (active),
Ni-Resist cast iron
Type 304 Stainless (active), Type 316 Stainless (active)
Lead tin solders, Lead, Tin
Nickel (active), Inconel nickel-chromium alloy (active), Hastelloy Alloy c (active)
Brasses, Copper, Bronzes, Copper-nickel alloys, Monel nickel-copper alloy
Silver solder, Nickel (passive), Inconel nickel-chromium alloy (passive)
Chromium-iron (passive), Type 304 Stainless (passive),
Type 316 Stainless (passive), Hastelloy Alloy C (passive)
Silver, Titanium, Graphite, Gold, Platinum

- Protected End (cathodic, or most noble)

Taken from IFI Fastener Standards

GALVANIC CORROSION - COMPATIBLE METALS CHARTS

To minimize galvanic corrosion, select fasteners based on their material compatibility with the substrates. The closer together the material are on the chart to the right, the less galvanic action will occur. Metals listed on the top of the chart (anodic) will corrode faster than the metals on the bottom of the chart (cathodic). Contact a corrosion specialist to determine the best material for your application.

Material	Anodic Index (Volts)
Graphite	+0.25
Type 316 Stainless Steel (Passive)	0.05
Type 304 Stainless Steel (Passive)	0.08
Monel 400	0.08
Silver	0.13
Type 410 Stainless Steel (Passive)	0.15
Type 316 Stainless Steel (Active)	0.18
Nickel	0.20
Type 430 Stainless Steel (Passive)	0.22
Copper Alloy 443 (Admiralty Brass)	0.29
G Bronze	0.31
Copper Alloy 687 (Aluminum Brass)	0.32
Copper	0.36
Type 410 Stainless Steel (Active)	0.52
Type 304 Stainless Steel (Active)	0.53
Carbon Steel	0.61
Cast Iron	0.61
Aluminum 3003-H	0.79
Zinc	1.03

Galvanic Compatibility

When design requires that dissimilar metals come in contact, galvanic compatibility can be managed by finishes and plating which protects the base materials from corrosion.

The cart to the left is Galvanic Series In Flowing Sea Water.

- Harsh environments, such as outdoors, high humidity, and salt environments. Typically there should be not more than 0.15 V difference in the "Anodic Index". For example; silver - nickel would have a difference of 0.17V being acceptable.
- Normal environments like non-temperature and humidity controlled environments. Typically there should not be more than 0.25 V difference in the "Anodic Index".
- Controlled environments, such that are temperature and humidity controlled, 0.50 V can be tolerated. Caution should be maintained when deciding for this application as humidity and temperature do vary from regions.

Active (Anodic) Most Likely To Corrode
Magnesium
Magnesium alloys
Zinc (hot-dip, die cast, or plated)
Aluminium 1100, 3003, 3004, 5052, 6053
Tin (plated)
Lead
Steel 1010
Iron (cast)
Stainless steel 410 (active)
Copper (plated, cast, or wrought)
Nickel (plated)
Chromium (Plated)
Stainless steel 301,304,310 (active)
Stainless steel 430 (active)
Tungsten
Brass
Nickel-silver (18% Ni)
Stainless steel 316L (active)
Bronze 220
Copper 110
Red Brass
Stainless steel 347 (active)
Copper-nickel 715
Admiralty brass
Stainless steel 202 (active)
Bronze, Phosphor
Monel 400
Stainless steel 201 (active)
Stainless steel 321 (active)
Stainless steel 316 (active)
Stainless steel 309 (active)
Stainless steel 17-7PH (passive)
Silicone Bronze 655
Stainless steel 301,304,321 (passive)
Stainless steel 201,286 (passive)
Stainless steel 316L (passive)
Stainless steel 202 (passive)
Titanium
Nobel (Cathodic) Lest Likely To Corrode

Fastener Material Selection Based on the Galvanic Series of Metals

Table developed using information supplied by AISI Committee of Stainless Steel Producers.

Key

- The corrosion of the base metal is not increased by the fastener.
- The corrosion of the base metal is slightly increased by the fastener.
- The corrosion of the base metal may be considerably increased by the fastener material.
- The plating on the fastener is rapidly consumed.
- The corrosion of the fastener is increased by the base metal.

		FASTENER MATERIAL			
		STEEL Zinc Plated	STAINLESS STEEL Type 410	STAINLESS STEEL Type 302, 304, 316	ALUMINUM
BASE METAL	Zinc Galvanized ZN/Al Coated Steel	A	C	C	B
	Aluminum	A	Not Recommended	B	A
	Steel / Cast Iron	A,D	C	B	A
	Brass, Copper, Bronze	A,D,E	A	B	A,E
	Stainless Steel 300 Series	A,D,E	A	A	A,E

Footnotes

1. Because aluminum can expand a large distance, the high hardness of 410 SS case harden screws may lead to screw to failure due to lack of ductility or stress corrosion cracking.

NOTE: Organic coating to the screw will improve the corrosion resistance. Environments can affect the rate of corrosion and change the activity of the metals.

Revised by TFC: 1221JS

Special Note: Preservative-Treated Lumber Applications

ACQ, Penta, CA or CBA preservative-treated lumber can be incompatible with certain types of fasteners. In those cases where any type of metal roof or wall cladding materials are being attached to preservative treated lumber, the following fasteners are not compatible: zinc plated screws, zinc-alloy headed screws, stainless capped screws, aluminum, copper and copper alloy. When attaching metal panels to those types of preservative-treated lumber, a moisture barrier should be used between the lumber and the panel material. Metal panel fasteners that are compatible with preservative-treated lumber are stainless steel fasteners, or hot dip galvanized nails manufactured to ASTM A153 class D or heavier. Other types of fasteners coated with proprietary anti-corrosive technologies are also available for use with preservative-treated lumber. In addition, zinc-plated screws can be used in CCA and MCQ pressure-treated lumber.

All information is non-binding and without guarantee. Before using the products, all specifications and calculations must be checked by a suitably qualified person and local regulations must be observed. This document is subject to revision. We reserve the right to make technical changes. (0321-1)



Characteristics of Platings, Coatings and Finishes

Plating, Coating or Finish	For Use On	Degree of Corrosion Resistance	Characteristics
Rust inhibitors	All metals	Varies with type	Oils, greases, etc. Vary in color and film thickness. Usually applied to black oxide finishes. Used to protect parts in transit and temporary storage.
Zinc, electroplated	All metals	Very good	Blue to blue-white gray color.
Cadmium, electroplated	Most metals	Excellent	Bright silver-gray, dull gray, or black finish. Particularly effective corrosion protection in marine applications. Used for decorative purposes. High lubricity.
Clear chromate finish	Zinc and cadmium plated parts	Very good to excellent	Clear bright or iridescent chemical conversion coating applied to plated parts to enhance corrosion protection, coloring, and paint bonding.
Dichromate	Zinc and cadmium plated parts	Very good to excellent	Yellow, brown, green or iridescent colored coating same as clear chromate.
Color chromate finish	Zinc and cadmium plated parts	Very good to excellent	Olive drab, blue, gold, bronze, etc. Same as clear chromate.
Zinc or Manganese Phosphate	Steel	Good	Black in color. Added protection when oiled with a non-drying petroleum oil containing corrosion inhibitors. Good lubricity.
Color phosphate coatings	Steel	Superior to regular phosphate and oiled surfaces	Chemically produced color coating. Available in blue, green, red, purple, etc.
Hot-dip zinc	All metals	Very good	Gives maximum corrosion protection. Dull grayish color. Necessitates thread size adjustments to permit assembly.
Hot-dip aluminum	Steel	Very good	Gives maximum corrosion protection. Dull grayish color. Necessitates thread size adjustments to permit assembly.
Mechanically deposited Zinc	Steel	Very good	Dull gray, smooth finish. Corrosion protection depends on coating thickness. Good coverage in recesses and thread roots.
Tin, electroplated	All metals		Silver-gray color. Excellent corrosion protection for parts in contact with food.
Hot-dip tin	All metals	Excellent	Same as electroplated but thickness is harder to control.
Lead-tin	Steel, usually	Fair to good	Silver-gray, dull coating. Applied by hot-dip method. Helps lubricity.
Silver, electroplated	All metals	Excellent	Decorative, expensive, excellent electrical conductor.
Chromium, electroplated	Most metals	Good (improves with copper and nickel undercoats)	Bright, blue-white, lustrous finish. Has relatively hard surface. Used for decorative purposes or to add wear resistance.
Copper, electroplated	Most metals	Fair	Used for nickel and chromium plate undercoat. Can be blackened and relieved to obtain Antique, Statuary, and Venetian finishes.
Brass, electroplated, lacquered	Steel, usually	Fair	Brass electroplated which is then lacquered. Recommended only for indoor decorative use.
Bronze, electroplated, lacquered	Steel, usually	Fair	Has color similar to 80% copper, 20% zinc alloy. Electroplated and then lacquered. Recommended only for indoor decorative use.
Copper, brass, bronze, miscellaneous finishes	Most metals	Indoor, very good	Decorative finishes. Applied to copper, brass, and bronze plated parts to match colors. Color and tone vary from black to almost the original color. Finish names are: Antique, Black Oxide, Statuary, Old English, Venetian, Copper Oxidized.
Bright nickel	Most metals	Indoor excellent. Outdoor good if thickness at least 0.0005 in.	Electroplated silver-colored finish. Used for appliances, hardware, etc.
Dull nickel	Most metals	Same as bright nickel	Whitish cast. Can be obtained by mechanical surface finishing or a special satin bath.
Lacquering, clear or color-matched	All metals	Improves corrosion resistance. Some types designed for humid or other severe applications	Used for decorative finishes. Clear or colored to match mating color or luster
Anodizing	Aluminum	Excellent	Acid electrolytic treatment. Frosty-etched appearance. Hard oxide surface gives excellent protection.
Passivating	Stainless steel	Excellent	Chemical treatment. Removes iron particles and produces a passive surface.



“TFC SPECIFIC” FASTENERS FOR USE IN TREATED LUMBER AND FIRE RATED LUMBER

Lumber treated with arsenic (CCA – Chromated Copper Arsenic) is no longer produced for residential applications, and a new treated lumber material known as ACQ (Alkaline Copper Quaternary) is being utilized.

From a fastener standpoint, it's important to know that ACQ has up to six (6) times more copper content than the wood it replaces. This condition can cause fasteners plated with electro-plated zinc to corrode at a very fast rate, leaving the bare steel to red rust.

As recommended by the Southern Pine Council (SPC); recognized by the NRCA and the MCA; required by the International Residential Code (R319.3) and the International Building Code (2304.9.5), the following fasteners are acceptable for use in ACQ pressure treated lumber and fire rated lumber;

- Hot-dipped galvanized complying with ASTM A153,
- or coated with proprietary anti-corrosion coatings.
- For maximum corrosion protection, fasteners made from 302, 304, 305 or 316 stainless steel (18-8) should be considered.














Below is a list of TFC brand fasteners that is acceptable for use in ACQ treated lumber or Fire Rated lumber.

1. BLAZER® Drill Screws for wood-to-metal applications coated with TRI-SEAL™ long-life ceramic topcoat.
2. CONCEALOR® Low Profile Pancake head screws coated with TRI-SEAL™ long-life ceramic topcoat.
3. CONCEALOR® ULP Ultra Low Profile head screws coated with TRI-SEAL™ long-life ceramic topcoat.
4. PANEL-TITE® BURR BUSTER® Post Frame metal-to-wood screws coated with TRI-SEAL™ M1 long-life Plating.
5. PANEL-TITE® BURR BUSTER® Post Frame metal-to-wood screws made of 304 stainless steel.
6. DEKFAST® Roofing Fasteners coated with an electro-coated epoxy (E-coat) topcoat.
NOTE: Approved for the attachment of treated wood to metal or concrete. Approved for the attachment of a prepunch roof clip to treated wood. Not approved for the attachment of metal panel, trim or siding to treated wood where the screw must penetrate the steel.
7. TRACER® Drywall screws coated with TRI-SEAL® long-life ceramic topcoat.
8. TRI-SEAL® Long-life coated screws.
9. Any fastener made from 300 series stainless steel.
10. Any fastener made from 410 stainless steel

Note: Estimating service life of fasteners in ACQ treated lumber cannot be determined due to variables uncontrollable by TFC. **Stainless steel screws are recommended.** It is important that if carbon steel fasteners are used, they are at the least coated with a finish that provides protection equal to or better than hot dipped galvanized like the ones listed above. Determining the proper fastener is the responsibility of the user or specifier, who assumes all risks and liabilities.

Rev.: 102921JS

Grade Identification Markings for Carbon Steel Externally Threaded Fasteners

Grade Identification Marking	Specification	Material	Nominal Size in.	Proof Load Stress ksi	Tensile Strength Min ksi	Hardness Rockwell		See Note
						Min	Max	
 No Mark	SAE J429 - Grade 1	Low or Medium Carbon Steel	1/4 thru 1 1/2	33	60	B70	B100	
	SAE J429 - Grade 2		1/4 thru 3/4 over 3/4 thru 1 1/2	55	74	B80	B100	
	ASTM A307 - Grade A		1/4 thru 4	—	60	B69	B100	
	ASTM A307 - Grade B		1/4 thru 4	—	60 Min 100 Max	B69	B95	
	SAE J429 - Grade 5 ASTM A449 - Type 1	Medium Carbon Steel, Quenched and Tempered	1/4 thru 1 over 1 thru 1 1/2	85 74	120 105	C25 C19	C34 C30	
	ASTM A449 - Type 1		over 1 1/2 thru 3	55	90	183	235	3
	SAE J429 - Grade 5.1	Low or Medium Carbon Steel, Quenched and Tempered	N0.6 Thru 1/2	85	120	C25	C40	4
	SAE J429 - Grade 5.2 ASTM A449 - Type2	Low Carbon Martensite Steel, Quenched and Tempered	1/4 thru 1	85	120	C26 C25	C36 C34	
	ASTM A325 - Type 1	Medium Carbon Steel Quenched and Tempered	1/2 Thru 1 over 1 to 1 1/2	85 74	120 105	C24 C19	C35 C31	5
	ASTM A325 - Type 2	Low Carbon Martensite Steel, Quenched and Tempered						
	ASTM A325 - Type 3	Atmospheric Corrosion Resistant Steel, Quenched and Tempered						6
	ASTM A354 - Grade BC	Medium Carbon Alloy Steel, Quenched and Tempered	1/4 thru 2 1/2 over 2 1/2 thru 4	105 95	125 115	C26 C22	C36 C33	
	SAE J429 - Grade 8 ASTM A354 - Grade BD	Medium Carbon Alloy Steel, Quenched and Tempered	1/4 thru 1 1/2	120	150	C33	C39	
			1/4 thru 2 1/2 over 2 1/2 thru 4	120 105	150 140	C33 C31	C39 C39	7
	SAE J429 - Grade 8.2	Low Carbon Martensite Alloy Steel, Quenched and Tempered	1/4 thru 1	120	150	C33	C39	
	ASTM A490 - Type 1	Medium Carbon Alloy Steel, Quenched and Tempered	1/2 Thru 1 1/2	120	150 Min 170 Max	C33	C38	
	ASTM A490 - Type 2	Low Carbon Martensite Steel, Quenched and Tempered	1/2 Thru 1	120	150 Min 170 Max	C33	C38	
	ASTM A490 - Type 3	Atmospheric Corrosion Resistant Steel, Quenched and Tempered	1/2 Thru 1	120	150 Min 170 Max	C33	C38	6

- NOTES:**
1. In addition to the indicated grade marking, all grades included in this Table must be marked for manufacturer identification.
 2. While hex heads are shown, grade markings apply equally to products with other head configurations.
 3. Hardnesses are Brinell Hardness Numbers.
 4. Grade 5.1 is a popular grade for sems.
 5. A325 Type 1 bolts may also be marked with 3 radial lines 1200 apart in addition to the A325 marking.
 6. The bolt manufacturer, at his option, may add other markings to indicate the use of atmospheric corrosion resistant steel.
 7. A354 Grade BD products, in sizes 1 1/2 in. and smaller, are identified as shown and, at the manufacturers option, may have the letters BD added. Larger sizes are marked only BD.



CARBON STEEL BOLTS PROOF AND TENSILE STRENGTHS



PROOF LOAD AND TENSILE STRENGTH REQUIREMENTS (A)

Nominal Dia of Product and Threads per in.	Stress Area, in. ²	Grade 1		Grade 2		Grade 4		Grades 5 and 5.2 ^a		Grade 5.1		Grade 7		Grades 8, 8.1,8.2 ^a	
		Proof Load, lb	Tensile Strength Mm, lb	Proof Load, lb	Tensile Strength Mm, lb	Proof Load, lb	Tensile Strength Mm, lb	Proof Load, lb	Tensile Strength Mm, lb	Proof Load, lb	Tensile Strength Mm, lb	Proof Load, lb	Tensile Strength Mm, lb	Proof Load, lb	Tensile Strength Mm, lb
Coarse Thread Series - UNC															
No.6-32	0.00909	-		-		-	-	-	-	750	1,100	-	-	-	-
8-32	0.0140	-		-		-	-	-	-	1,200	1,700	-	-	-	-
10-24	0.0175	-					-	-	-	1,500	2,100	-	-	-	-
12-24	0.0242	-			-	-	-	-	-	2,050	2,900	-	-	-	-
1/4-20	0.0318	1,050	1,900	1,750	2,350	2,050	3,650	2,700	3,800	2,700	3,800	3,350	4,250	3,800	4,750
5/16-18	0.0524	1,750	3,150	2,900	3,900	3,400	6,000	4,450	6,300	4,450	6,300	5,500	6,950	6,300	7,850
3/8-16	0.0775	2,550	4,650	4,250	5,750	5,050	8,400	6,600	9,300	6,600	9,300	8,150	10,300	9,300	11,600
7/16-14	0.1063	3,500	6,400	5,850	7,850	6,900	12,200	9,050	12,800	9,050	12,800	11,200	14,100	12,800	15,900
1/2-13	0.1419	4,700	8,500	7,800	10,500	9,200	16,300	12,100	17,000	12,100	17,000	14,900	18,900	17,000	21,300
9/16-12	0.182	6,000	10,900	10,000	13,500	11,800	20,900	15,500	21,800	15,500	21,800	19,100	24,200	21,800	27,300
5/8-11	0.226	7,450	13,600	12,400	16,700	14,700	25,400	19,200	27,100	19,200	27,100	23,700	30,100	27,100	33,900
3/4-10	0.334	11,000	20,000	18,400	24,700	21,700	38,400	28,400	40,100	-	-	35,100	44,400	40,100	50,100
7/8-9	0.462	15,200	27,700	15,200	27,700	30,000	53,100	39,300	55,400	-	-	48,500	61,400	55,400	69,300
1-8	0.606	20,000	36,400	20,000	36,400	39,400	69,700	51,500	72,700	-	-	63,800	80,600	72,700	90,900
1-1/8-7	0.763	25,200	45,800	25,200	45,800	49,600	87,700	56,500	80,100	-	-	80,100	101,500	91,600	114,400
1-1/4-7	0.969	32,000	58,100	32,000	58,100	63,000	111,400	71,700	101,700	-	-	101,700	127,700	116,300	145,400
1-3/8-6	1.155	38,100	69,300	38,100	69,300	75,100	132,800	85,500	121,300	-	-	121,300	153,600	138,600	173,200
1-1/2-6	1.405	46,400	84,300	46,400	84,300	91,300	161,600	104,000	147,500	-	-	147,500	186,900	168,600	210,800
Fine Thread Series - UNF															
No.6-40	0.01015	-	-	-	-	-	-	-	-	850	1,200	-	-	-	-
8-38	0.01474	-	-	-	-	-	-	-	-	1,250	1,750	-	-	-	-
10-32	0.0200	-	-	-	-	-	-	-	-	1,700	2,400	-	-	-	-
12-28	0.0258	-	-	-	-	-	-	-	-	2,200	3,100	-	-	-	-
1/4-28	0.0364	1,200	2,200	2,000	2,700	2,350	4,200	3,100	4,350	3,100	4,350	3,800	4,850	4,350	5,450
5/16-24	0.0580	1,900	3,500	3,200	4,300	3,750	6,700	4,900	6,950	4,900	6,950	6,100	7,700	6,950	8,700
3/8-24	0.0878	2,900	5,250	4,800	6,500	5,700	10,100	7,450	10,500	7,450	10,500	9,200	11,700	10,500	13,200
7/16-20	0.1187	3,900	7,100	6,550	8,800	7,700	13,650	10,100	14,200	10,100	14,200	12,500	15,800	14,200	17,800
1/2-20	0.1599	5,300	9,600	8,800	11,800	10,400	18,400	13,600	19,200	13,600	19,200	16,800	21,300	19,200	24,000
9/16-18	0.203	6,700	12,200	11,200	15,000	13,200	23,300	17,300	24,400	17,300	24,400	21,300	27,000	24,400	30,400
5/8-18	0.256	8,450	15,400	14,100	18,900	16,600	29,400	21,800	30,700	21,800	30,700	26,900	34,000	30,700	38,400
3/4-16	0.373	12,300	22,400	20,500	27,600	24,200	42,900	31,700	44,800	-	-	39,200	49,600	44,800	56,000
7/8-14	0.509	16,800	30,500	16,800	30,500	33,100	58,500	43,300	61,100	-	-	53,400	67,700	61,100	76,400
1 -12	0.663	21,900	39,800	21,900	39,800	43,100	76,200	56,400	79,600	-	-	69,600	88,200	79,600	99,400
1-1/4 uns	0.679	22,400	40,700	22,400	40,700	44,100	78,100	57,700	81,500	-	-	71,300	90,300	81,500	101,900
1-1/8-12	0.856	28,200	51,400	28,200	51,400	55,600	98,400	83,300	89,900	-	-	89,900	113,800	102,700	128,400
1-1/4-12	1.073	35,400	64,400	35,400	64,400	69,700	123,400	79,400	112,700	-	-	112,700	142,700	128,800	161,000
1-3/8-12	1.315	43,400	78,900	43,400	78,900	85,500	151,200	97,300	138,100	-	-	138,100	174,900	157,800	197,200
1-1/2-12	1.581	52,200	94,900	52,200	94,900	102,800	181,800	117,000	116,000	-	-	166,000	210,300	189,700	237,200

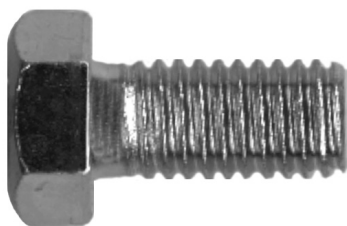
A) Proof loads and tensile strengths are computed by multiplying the proof load stresses and tensile strength stresses given in Table 1 by the stress area of the thread.

The stress area of sizes and thread series not included in this table may be computed from the formula: $A_s = 0.7854 [D - \frac{0.9743}{n}]^2$ where D equals nominal diameter in inch, and n equals threads per inch.

B) Grades 5.2 and 8.2 applicable to sizes 1/4 through 1 in.



STAINLESS STEEL BOLTS & NUTS PROOF AND TENSILE STRENGTHS

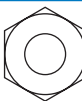














MECHANICAL REQUIREMENTS FOR STAINLESS STEEL BOLTS, SCREWS, STUDS AND NUTS

Grade ¹	General Description	Mechanical Requirements							
		Bolts ¹ Screws And Studs					Nuts		
		Full Size Bolts, Screws, Studs		Machined Test Specimens Of Bolts, Screws, Studs					
		Yield ² Strength min ksi	Tensile Strength min ksi	Yield ² Strength min ksi	Tensile Strength min ksi	Elongation ³ % Min	Hardness Rockwell Min	Proof Load Stress ksi	Hardness Rockwell Min
303-A	Austenitic Stainless Steel Sot. Annealed	30	75	30	75	20	B75	75	B75
304-A	Austenitic Stainless Steel Sol. Annealed	30	75	30	75	20	B75	75	B75
304	Austenitic Stainless Steel Cold Worked	50	90	45	85	20	B85	90	B85
305-A	Stainless Steel Sol. Annealed	30	75	20	75	20	B70	75	B70
305	Austenitic Stainless Steel Cold Worked	50	90	45	85	20	B85	90	B85
316-A	Austenitic Stainless Steel Sol. Annealed	30	75	30	75	20	B70	75	B70
316	Austenitic Stainless steel Sol. Annealed	50	90	45	85	20	B85	90	B85
316-SH	Austenitic Stainless Steel Strain Hardened	See Note 6	See Note 6	See Note 6	See Note 6	15	C25	See Note 6	C20
410-H	Stainless Steel Hardened and Tempered	95	125	95	125	20	C22	125	C22
410-HT	Martensitic Stainless Steel Hardened and Tempered	135	180	135	180	12	C36	180	C36
416-H	Martensitic Stainless Steel Hardened and Tempered	95	125	95	125	20	C22	125	C22
416-HT	Martensitic Stainless Steel Hardened and Tempered	135	180	135	180	12	C36	150	C36
430	Ferritic Stainless Steel	40	70	40	70	20	B75	70	B75



GRADE IDENTIFICATION MARKINGS FOR POPULAR GRADES OF CARBON STEEL NUTS

Grade Identification Marking	Specification	Material	Nominal Size in.	Proof Load Stress ksi	Hardness Rockwell		See Note
					Min	Max	
	ASTM A 563 - Grade 0	Carbon Steel	1/4 thru 1 1/2	69	B55	C32	3, 4
	ASTM A 563 - Grade A	Carbon Steel	1/4 thru 1 1/2	90	B68	C32	3, 4
	ASTM A 563 - Grade B	Carbon Steel	1/4 thru 1	120	B55	C32	3, 4
			over 1 thru 1 1/2	105			
	ASTM A563 - Grade C	Carbon Steel, May Be Quenched and Tempered	1/4 thru 4	144	B78	C38	5
	ASTM A563 - Grade C3	Atmospheric Corrosion Resistant Steel, May Be Quenched and Tempered	1/4 thru 4	144	B78	C38	5.9
	ASTM A563 - Grade D	Carbon Steel, May Be Quenched and Tempered	1/4 thru 4	150	B84	C38	6
	ASTM A563 - Grade DH	Carbon Steel, Quenched and Tempered	1/4 thru 4	175	C24	C38	6
	ASTM A563 - Grade DH3	Atmospheric Corrosion Resistant Steel, Quenched and Tempered	1/4 thru 4	175	C24	C38	5, 9
	ASTM A194 - Grade 1	Carbon Steel	1/4 thru 4	130	B70	-	7
	ASTM A194 - Grade 2	Medium Carbon Steel	1/4 thru 4	150	159	352	78
	ASTM A194 - Grade 2H	Medium Carbon Steel, Quenched and Tempered	1/4 thru 4	175	C24	C38	7
	ASTM A194 - Grade 2HM	Medium Carbon Steel, Quenched and Tempered	1/4 thru 4	150	159	237	7, 8
	ASTM A194 - Grade 4	Medium Carbon Alloy Steel, Quenched and Tempered	1/4 thru 4	175	C24	C38	7
	ASTM A194 - Grade 7	Medium Carbon Alloy Steel, Quenched and Tempered	1/4 thru 4	175	C24	C38	7
	ASTM A194 - Grade 4	Medium Carbon Alloy Steel, Quenched and Tempered	1/4 thru 4	150	159	237	7
See note 1,2,10							

NOTES:

- In addition to the indicated grade marking, all grades, except AS63 grades 0, A and B, must be marked for manufacturer identification.
- The markings shown for all grades of A194 nuts are for cold formed and hot forged nuts. When nuts are machined from bar stock the nut must be additionally marked with the letter 'B'.
- Nuts are not required to be marked unless specified by the purchaser. When marked, the identification marking shall be the grade letter 0, A or B.
- Properties shown are those of non-plated or non-coated coarse thread hex nuts.
- Properties shown are those of coarse thread heavy hex nuts.
- Properties shown are those of coarse thread heavy hex nuts.
- Properties shown are those of coarse and 8-pitch thread heavy hex nuts.
- Hardnesses are Brinell Hardness Numbers.
- The nut manufacturer; at his option, may add other markings to indicate the use of atmospheric corrosion resistant steel.
- Specifications - ASTM A563 - Carbon and Alloy Steel Nuts / ASTM A194 - Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service

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Carbon Steel or Stainless Steel.

Diameters: 3/16", 1/4", 3/8", 1/2", 5/8", 3/4"

Lengths: Up to 6"

HAMMER-IN ANCHORS

ZAMAC or SPIKES
Zinc Alloy, Carbon Steel or Stainless Steel.

Diameters

ZAMAC: 1/4"

SPIKES: 1/4", 3/8", 1/2"

Lengths: Up to 14"

EXPANSION ANCHORS

Sleeve, Wedge, or Drop-in
Carbon Steel or Stainless Steel.

Diameters: 1/4", 3/8", 1/2", 5/8", 3/4", 7/8", 1", 1-1/4"

Lengths: Up to 12"

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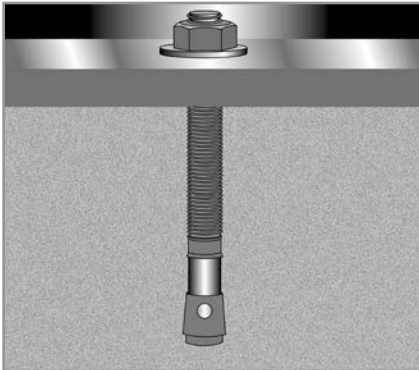
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DISCLAIMER: All information is non-binding and without guarantee. Before using the products, all specifications and calculations must be checked by a suitably qualified person and local regulations must be observed. This document is subject to revision. We reserve the right to make technical changes. (0321-1)

The Inside Story About Mechanical and Adhesive Anchors

Types of Anchors



Expansion Type

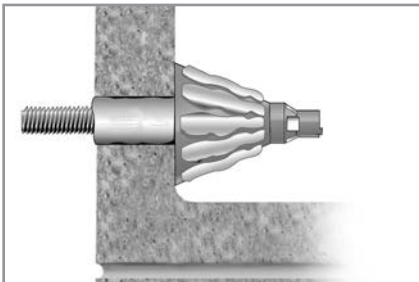
Tension loads are transferred to the base material through a portion of the anchor that is expanded inside the drill hole.

Examples: Red Head Redi-Bolts, Dynabolts, Multi-Set II Anchors and Hammer-Sets.

Adhesive Type

Resistance to tension loads is provided by the presence of an adhesive between the threaded rod (or rebar) and the inside walls of the drill hole.

Examples: Epcon A7, C6, G5, Maxima 7 Capsules and Impact Capsules



Keying Type

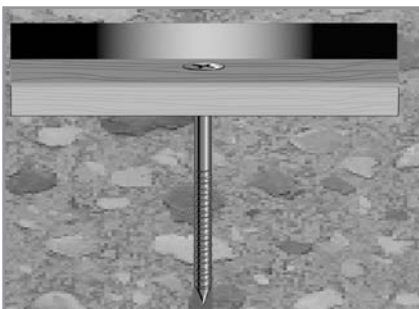
Holding strength comes from a portion of an anchor that is expanded into a hollow space in a base material that contains voids such as concrete block or brick.

Examples: Epcon adhesives used in screen tubes or umbrella insert

Friction Type

Load capacity is created by driving a fastener into a pre-drilled hole that is slightly smaller than the fastener itself.

Examples: Redi-Drives



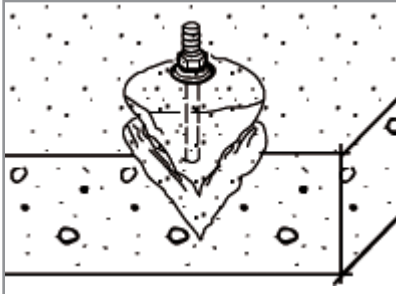
Mechanical Interlocking Type

Tension loads are resisted by threads on the fastener engaging with threads cut into the base material.

Examples: LDT, Tapcon and E-Z Anchors

Modes of Failure

When anchors are loaded to their maximum capacity, several different types (modes) of failure are possible depending on the type of anchor, strength of the base material, embedment depth, location of the anchor, etc. Common modes of failure include:

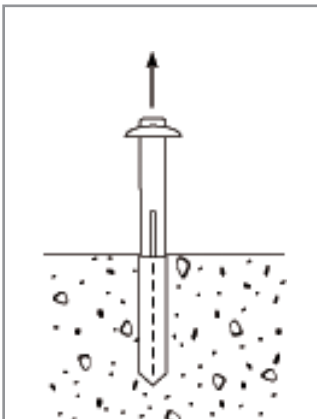
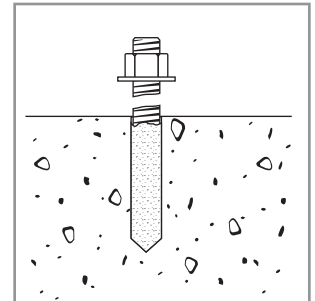


Concrete Spill Cone

Occurs at shallow embedments where the resistance of the base material is less than the resistance of the anchor and the base material fails.

Steel Breakage

The capacity of the anchorage exceeds the strength of the steel anchor or rod material.

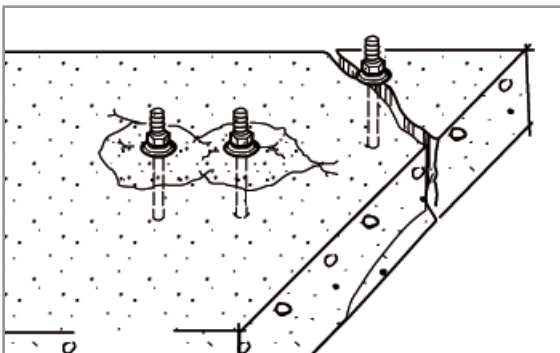
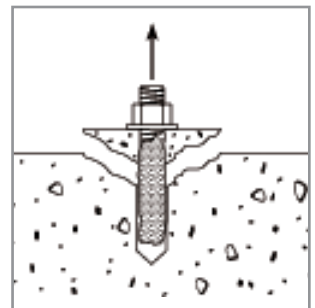


Anchor Pullout

Base material adjacent to the extension portion of an anchor crushes, resulting in the anchor pulling out of the hole until the capacity of the spill cone is reached, at which point the concrete will spill. This type of failure happens more commonly when anchors are set with deep embedment depths.

Bond Failure

Shear failure of the adhesive at rod adhesive interface or adhesive-base material interface. Occurs more commonly in deep embedments using high strength steel rods.



Edge Distance and Spacing Reduction

Reduces the holding values, when anchors are placed too close to the edge. This also occurs when two or more anchors are spaced closely together. See suggested edge distance, anchor spacing distances and reduction values in the product sections.



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