Owners, architects and, design engineers expect longer life cycles from buildings. Extended warranties and use of more sustainable materials add up to greater expectations for performance – from structural integrity to the purely aesthetic – of all building components.

The Solution: Bi-Flex™ 300 Series (18-8) Stainless Steel Self-Drilling Fasteners

Bi-Flex™ fasteners bring the corrosion resistance of 300 series stainless steel and the efficiency of self-drilling fasteners together, in one unique fastener.

- Unmatched, multi-level corrosion resistance
- Quick and easy installs into structural steel and aluminum up to 1/2" thick
- Perfect choice for exposed/wet areas/aggressive environments
- High performance for your most critical applications

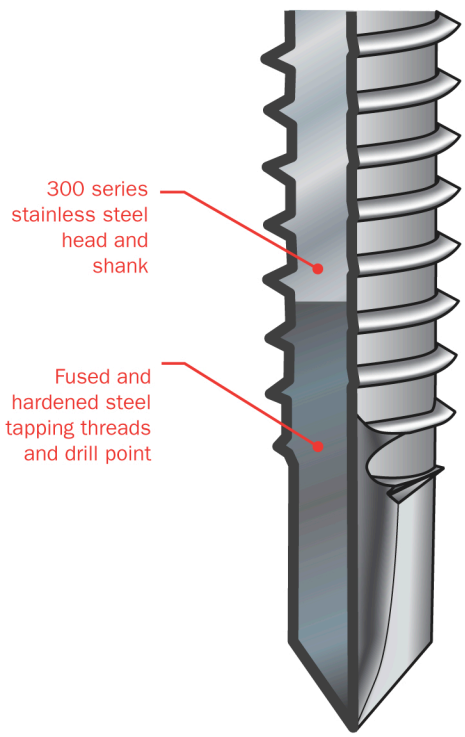
To provide the maximum, long term corrosion resistance, Elco chose 300 series stainless steel for their Bi-Flex™ fasteners.

To allow for the most efficient installations, each Bi-Flex™ fastener has a fused and hardened, self-drilling and tapping point.

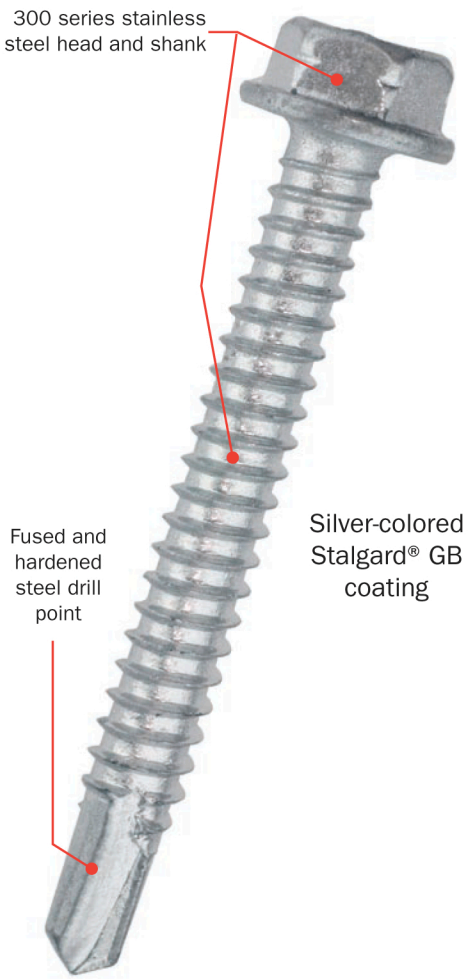
To combat the widest variety of corrosion scenarios involving dissimilar metals such as aluminum, each 300 series stainless steel Bi-Flex™ fastener has Stalgard® GB (Galvanic Barrier) coating.

To eliminate the threat of delayed “embrittlement” fastener failures, such as Hydrogen Assisted Stress Corrosion Cracking (HASCC), seen in hardened 400 series self-drilling stainless steel fasteners, Bi-Flex™ fasteners are made of 300 series stainless alloys that are virtually immune to this type of catastrophic failure.

For the most demanding applications that other fasteners can’t handle, Bi-Flex™ 300 series stainless steel self-drilling fasteners are the right choice.



Bi-Metal Technology



Features

- Bi- metal technology – 300 (18-8) stainless steel head and shank
- Fused and hardened steel drill point
- Silver-colored Stalgard® GB coating
- Wide variety of sizes and head styles

Benefits

- Outstanding corrosion resistance and long service life
- High strength, ductility and reliability
- Virtually immune to delayed embrittlement failures
- Greater galvanic compatibility in dissimilar metal applications involving aluminum
- Quickly drill and tap into steel or aluminum up to 1/2" thick
- High in-place value over the life of structures, components and systems

Applications

- Exposed/wet areas/coastal/aggressive environments
- Curtain wall/window wall systems/rain-screen systems
- Windows/doors/aluminum enclosures/skylights
- Composite panel systems to aluminum or steel
- ACQ treated wood to steel
- Brick veneer anchoring

Whether your application is lightweight, structural or purely aesthetic, you won't find a better or easier-to-install 300 series stainless steel fastener with multi-level corrosion protection for your toughest construction applications.

Types of Corrosion:

Uniform corrosion is the general breakdown of a metal into an oxide of the metal or other corrosion product. The most common type of uniform corrosion is the visible formation of red rust on steel.

Galvanic corrosion occurs when dissimilar metals are in contact in the presence of an electrolyte (such as water, condensation, etc.). One metal will become the anode, or sacrificial component, and the other metal will be the cathode, or the metal that does not corrode (see chart).

Hydrogen assisted stress corrosion cracking occurs when hydrogen, generated most often during a galvanic corrosion process, enters hardened steels and causes damage. This is commonly described as “heads popping” off installed fasteners.

Hydrogen from the corrosion process accumulates in the highest stressed area of the installed fastener, typically under the head or at the interface of the application materials. There is no visible indication that embrittlement is taking place. Ultimately, failures may occur without warning in less than 24 hours, or may be delayed, due to changing application conditions, for weeks, months or even years.

Galvanic Series

Anodic End	
Metal/Alloy	*EMF (v)*
Magnesium	-1.60
Zinc	-1.10
Alum (5000, 6000, 7000)	-.75
Iron, Low Alloy Steels	-.70
Alum (2000)	-.60
Lead	-.55
18% Chromium Steel	-.35
Naval Brass	-.30
Brass, Bronze	-.25
Austenitic Stainless (300 Series)	-.20
Nickel	-.15
Silver	0
Gold	+15
Cathodic End	

In the presence of moisture, materials higher on the list will be sacrificial to materials lower on the list. The greater the EMF differential, the greater the sacrificial action of the anode to the cathode in a galvanic cell.

Why Other Fasteners Don't Perform

410 stainless steel self-drilling fasteners

- Hard enough to drill and tap after heat treatment
- Require special platings and/or coatings to delay red rust corrosion
- Coatings applied to delay red rust **do not** protect against HASCC failures

410 super-passivated stainless steel self-drilling fasteners

- Hard enough to drill and tap after heat treatment
- Super-passivation process **does not** protect against HASCC failures
- Subject to red rust and pitting corrosion

400 modified stainless steel self-drilling fasteners

- Hard enough to drill and tap after heat treatment
- Modified chemistry improves corrosion resistance over standard 410 SS
- Modified chemistry **does not** protect against HASCC embrittlement failures

Bi-Flex™ bi-metal fasteners bring multi-level corrosion protection

Bi-Flex™ 300 fasteners manage visible, galvanic and hydrogen assisted stress corrosion failures through a combination of high grade 18-8 stainless steel, bi-metal technology and our solid understanding of corrosion mechanisms and effects.

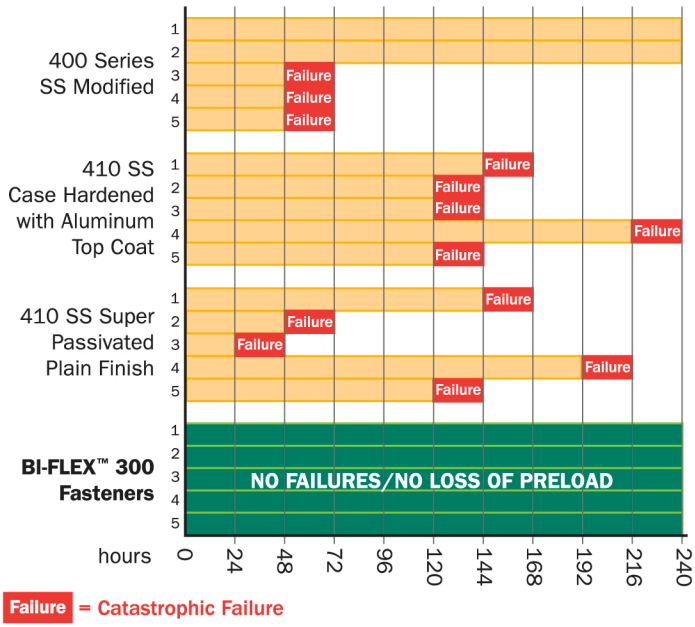
- 300 series stainless steel head and shank provides superior resistance to visual corrosion and HASCC failures
- Stalgard® GB coating provides a Galvanic Barrier to protect aluminum from becoming sacrificial to the stainless fastener

Susceptibility To Embrittlement Failures

In head to head testing, Bi-Flex™ 300 fasteners and three different types of 400 series martensitic stainless, self-drilling screws were installed in identical test coupons of unplated steel and aluminum. They were then subjected to a mildly corrosive environment of 5% neutral salt spray testing per ASTM B117. At the start of the test all samples were torqued (pre-loaded) to 75 in lbs. Every 24 hours the samples were inspected for torque value and retorqued to 75 in lbs. Out of the three types of 400 series fasteners, all had catastrophic failures within 10 days.

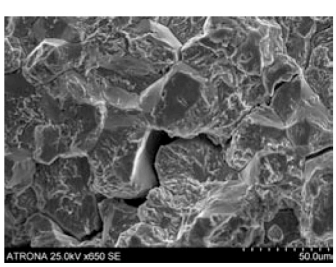
The parts were evaluated by scanning electron microscope (S.E.M.) to determine the type of fracture that had occurred. The three 400 series fasteners showed an intergranular type failure, indicative of fracturing that occurs from hydrogen assisted stress corrosion cracking.

No failures or loss of preload occurred with the Bi-Flex™ fasteners.

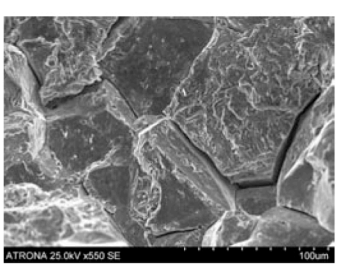


Failure = Catastrophic Failure

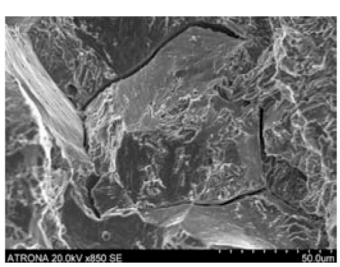
All fasteners were placed through a clear hole in 6061 T6 aluminum with a thickness of 0.125" and drilled into an unplated steel strip measuring a thickness of 0.125". A strip of 0.060" aluminum was placed in between the 0.125" aluminum and steel strip on one side, to simulate a fastener placed under load.



Modified 400 series SS fastener



410 SS super passivated fastener with plain finish



410 fastener with aluminum-filled topcoat

S.E.M. images show gapping grain boundaries and micropores consistent with hydrogen-assisted stress-corrosion cracking

The modified 400 SS fasteners, 410 SS super passivated fasteners with plain finish, and 410 fasteners with aluminum-filled topcoat failed at the interface of the aluminum and steel or directly under the fastener head.

The Bi-Flex™ fasteners did not fail and did not lose preload.

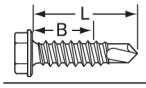
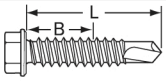
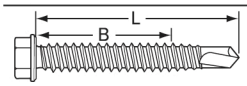
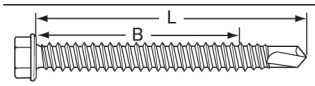
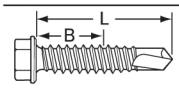
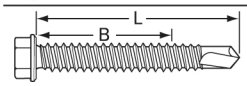
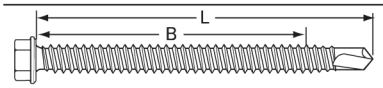
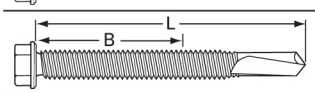
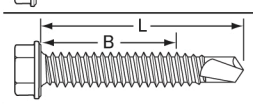
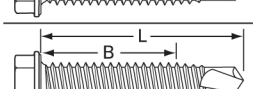
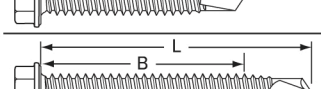
GB Improves Galvanic Compatibility

In another test, unplated 300 series stainless tapping screws and Bi-Flex™ fasteners with Stalgard® GB were installed side-by-side in aluminum plate and put into salt spray testing for 1000 hours per ASTM B117. Note the loss of aluminum is significant where the unplated 300 SS had been installed (left) compared to the Bi-Flex™ fastener location (right).

BI-FLEX™

300 Stainless Steel Bi-Metal Self-Drilling Fasteners

Selection Guide

	ECP Catalog Number†	Size	L Length	Drive System	Point Size	Max. Drilling Capacity	B Maximum Load-bearing Length*	Pieces per 1/4 Keg†	Job Pack: Pieces per Box†
Hex Washer Head									
	EAJ110	10-16	3/4"	5/16" hex	2	.110"	0.320"	6000	250
	EAJ185	12-14	1"	5/16" hex	2	.140"	0.500"	4000	150
	EAJ215		1-1/2"				1.00"	2500	125
	EAJ240		2"				1.500"	2000	75
	EAJ190	12-14	1"	5/16" hex	3	.210"	0.500"	4000	150
	EAJ220		1-1/2"				1.00"	2500	125
	EAJ260		2-1/2"				2.00"	1500	50
	EAJ340	12-24	2"	5/16" hex	5	.500"	1.100"	2000	75
	EAJ415	1/4-14	1"	3/8" hex	2	.175"	0.500"	3000	125
	EAJ430		1-1/2"				1.00"	2000	75
	EAJ445		2"				1.500"	1500	50

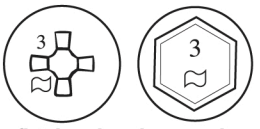
* The load-bearing length is the length of 300 series stainless under the hex head or including the flat head. Hardened steel length (lead threads and point) should be through the connection and not in the load bearing section of the connection.

† **Standard packaging:** ¼ keg quantities as shown.

Job Pack: Pieces per box as shown/six boxes per shipper. Available upon request. Indicate Job Pack by placing a "P" at the end of the ECP Catalog Number.

Identification

The head marking consists of the number "3" above the Elco® logo as shown to the right.

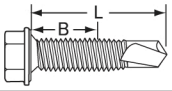
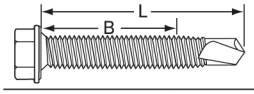
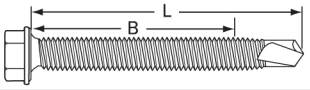
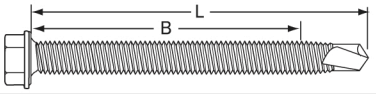
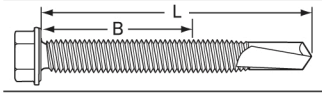
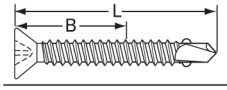
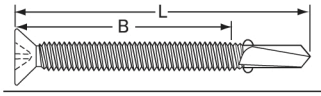
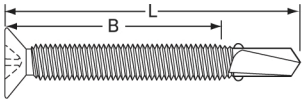
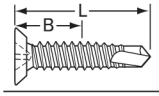
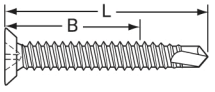


flat head **hex washer head**

BI-FLEX™

300 Stainless Steel Bi-Metal Self-Drilling Fasteners

Selection Guide

	ECP Catalog Number†	Size	L Length	Drive System	Point Size	Max. Drilling Capacity	B Maximum Load-bearing Length*	Pieces per 1/4 Keg†	Job Pack: Pieces per Box†
	EAJ540	1/4-20	1"	3/8" hex	3	.312"	0.500"	2500	125
	EAJ580		1-1/2"				1.00"	2000	75
	EAJ610		2"				1.500"	1500	50
	EAJ640		2-1/2"				2.00"	1000	50
	EAJ615	1/4-20	2"	3/8" hex	5	.500"	1.100"	1500	50
Flat Head Reamers w/wings									
	EBN140	10-16	1-1/2"	#2 phillips	3	.140"	0.800"	3500	125
	EBN345	12-24	2-13/16"	#3 phillips	5	.500"	1.710"	1500	50
	EBN645	1/4-20	2-13/16"				1.710"	1000	50
Flat Head Undercut									
	EBN200	12-14	1"	#3 phillips	2	.140"	0.500"	4000	150
	EBN240		1-1/2"				1.00"	2500	125

* The load-bearing length is the length of 300 series stainless under the hex head or including the flat head. Hardened steel length (lead threads and point) should be through the connection and not in the load bearing section of the connection.

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BI-FLEX™

300 Stainless Steel Bi-Metal Self-Drilling Fasteners

Performance Data

Pull-Out Values

Screw Size	Drill Point Type	Drill Cap (in.)	Pull-Out (Lbs)								
			Steel RB60-75 50 – 66KSI							Aluminum 6063-T5 22KSI	
			18 ga.	16 ga.	14 ga.	12 ga.	1/8"	3/16"	1/4"	1/8"	1/4"
10-16	2	0.150	455	677	793	1394	1906	–	–	994	–
10-16	3	0.187	–	616	684	1242	1605	1527	–	961	–
12-14	2	0.187	528	750	892	1536	2602	2514	–	1132	–
12-14	3	0.210	417	679	802	1371	2028	2499	–	974	–
12-24	5	0.500	–	–	–	–	–	2110	2781	538	1995
1/4-14	2	0.210	619	885	1082	1830	2943	3535	–	1310	–
1/4-20	3	0.375	–	680	780	1442	2623	3684	4069	1037	2786
1/4-20	5	0.500	–	–	–	–	–	–	2622	–	1724

Ultimate Strengths*

Size	Tensile (Lbs)	Shear Average Lbs Ultimate
10-16	1847	1282
12-14	2628	1950
12-24	2734	2284
1/4-14	3459	2676
1/4-20	4124	2860

* Values are for 300 series stainless fastener threaded shank

NOTE: All performance data shown is based on tests performed under laboratory conditions at independent construction testing facilities. The appropriate safety factor should be applied and code requirements factored into specification and use of these fasteners. A safety factor of 4:1 or 25% of the ultimate average values shown is generally accepted as an appropriate working load. Final determination of the appropriate safety factor and use of these fasteners is the sole responsibility of the user, specifying Engineer, Architect or other responsible person designing the connection. Due to a wide variety of application conditions or intervening factors not under our control, we assume no liability for the use of the information provided in this document. For additional product information and technical assistance, please contact Elco directly at 1-800-435-7213.