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CORROSION RESISTANT CRITICAL CONSTRUCTION FASTENING

ELCO® FLEX™ Technology

Dril-Flex® / Tap-Flex® / Bi-Flex® / Alumi-Flex®

STALGARD® Outstanding Corrosion Protection

DEWALT ANCHORS & FASTENERS

Typical Flex Technology Applications

- Dissimilar Metal Applications
- Windows, Doors & Skylights
- Blast Protection Systems
- Solar Panel Racking Support Systems
- Building Enclosures/Envelope
- Curtain Wall Systems, Stone Facades
- Insulated Metal Panels

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60-01 55th Drive, Maspeth, NY 11378 (718) 786-2050
800 3rd Ave., Brooklyn NY 11232 (929) 337-1821
168 Broadhollow Rd., Farmingdale, NY 11735 (631) 694-4935

Elco FLEX Technology fasteners surpass any standard fastening format available allowing designers and system manufacturers to manage their risk and enhance the performance of critical connections.

Fasteners using FLEX Technology are engineered using special alloy materials that received proprietary heat treatments and tempering processes and are finished with STALGARD® Corrosion Protection coatings.

They meet strict RoHS compliance and are chrome-free clearly making them an ideal industrial fastening choice when quality is of the utmost importance.

STRUCTURAL GRADE-5 FASTENERS

Dril-Flex
Structural Self Drilling Screws

Tap-Flex
Thread-Forming, Self-Tapping Structural Screws

STAINLESS STEEL FASTENERS

Bi-Flex
300 Series Stainless Steel Bi-Metal Self-Drilling Screws

Alumi-Flex
300 Series Stainless Steel Self-Drilling Screws

Elco Flex Technology Fasteners are Engineered to Prevent Corrosion and Stress Failures.

Virtually Immune to Hydrogen Assisted Stress Corrosion Cracking

Stalgard® Long Life Coatings

Stalgard® High-Performance Protective Coatings Provide Consistent, High Corrosion Resistance in Construction Applications

- Stalgard and Stalgard SUB Coatings provide enhanced galvanic compatibility in dissimilar metal applications
- Fasteners coated with Stalgard SUB finish typically show no red rust or other base metal corrosion on significant surfaces after 2000 hours of 5% neutral salt spray exposure (per ASTM B117)
- Fasteners coated with Stalgard finish typically show no red rust or other base metal corrosion on significant surfaces after 1000 hours of 5% neutral salt spray exposure (per ASTM B117)
- Stalgard GB coating creates greater galvanic compatibility in dissimilar metal applications, including connections involving aluminum

Dril-Flex GRADE 5 ALLOY STEEL

Self-Drilling Structural Screws

APPLICATIONS

- ☐ Curtain Wall Assemblies & Systems
- ☐ Aluminum And Steel Facades
- ☐ Brick And Masonry Veneers
- ☐ Aluminum Decking & Roofing
- ☐ Solar Panel Racking Support Systems
- ☐ Windows, Doors And Skylights
- ☐ Building Enclosures/Envelopes
- ☐ Insulated Metal Panels
- ☐ Blast Protection Systems
- ☐ Architectural Railings

APPROVALS AND LISTINGS

- International Code Council, (ICC-ES), ESR-3332
- International Code Council, (ICC-ES), ESR-4367
- International Code Council, (ICC-ES), ESR-4374
- Code compliant with the International Building Code/International Residential Code: 2021 IBC/IRC, 2018 IBC/IRC, 2015 IBC/IRC, and 2012 IBC/IRC
- Los Angeles Building Code (LABC) and Los Angeles Residential Code (LARC)
- Florida Building Code (FBC) ICC-ES
- Tested in accordance with ICC-ES AC118 for use in Steel-to-Steel Connections
- Tested in accordance with ICC-ES AC500 for attaching Miscellaneous Building Materials to Steel
- Tested in accordance with ICC-ES AC491 for use in Aluminum

ESR-4374 ESR-4367 ESR-3332

PERFORMANCE

Dissimilar Metal Applications
Virtually Immune to Delayed Embrittlement Failures
Lubricity in Coating for Fast Installation

DURABILITY

STALGARD® SUB (Hex Head Screws)
High Corrosion Resistant Coating 2,000 hours, ASTM B117

STALGARD®
High Corrosion Resistant Coating 1,000 hours, ASTM B117

FASTENER SPECS

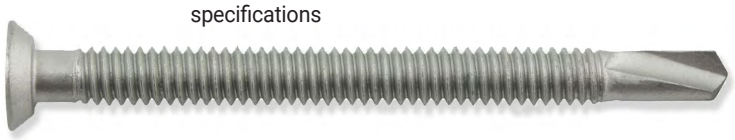
Fastener Sizes: #10 thru 5/16"

Lengths: 3/4" thru 4"

Head Styles: Hex Washer, Pan Phillips, Flat Head Undercut Phillips, Wafer Head Phillips

Point Sizes: #2, 3, 4 & 5

Material: Alloy Steel – Dual Hardened - Load Bearing Area meets SAE J429 Grade 5 and ASTM A449 Type 1 specifications



Dril-Flex® Structural Fasteners

Tap-Flex ALLOY STEEL

Thread-Forming Structural Screws

APPLICATIONS

- ☐ Aluminum To Aluminum And Aluminum To Steel Curtain Wall Framing
- ☐ Attachment To Heavy Steel Beam
- ☐ Solar Panel Racking Support Systems
- ☐ Windows, Doors And Building Enclosures/Envelopes
- ☐ Curtain Wall Systems
- ☐ Stone Facades
- ☐ Blast Protection Systems
- ☐ Architectural Railings

KEY FEATURES

- Eliminates thread-tapping operations
- E-Form® thread profile overcomes friction build-up and reduces drive torque
- Forms work-hardened threads to resist loosening caused by vibration or thermal changes
- Serrations on underside of hex washer head lock against the fixture
- High hardness lead threads for tapping
- In the load-bearing area, a lower hardness heat treatment provides grade 5 bolt properties, resulting in a fastener with increased ductility having no significant susceptibility to Hydrogen Assisted Stress Corrosion Cracking (HASCC)
- Fasteners accept standard nuts and washers (if desired and/or required)

PERFORMANCE

Alloy Steel Structural Grade-5 Properties Dual Hardness Technology ASTM449, 120 KSI. Fits Standard ANSI Nut for bolted joint requirements.

DURABILITY

Stalgard® PLUS Fasteners coated with Stalgard PLUS finish typically show no red rust or other base metal corrosion on significant surfaces after 1500 hours of 5% neutral salt spray exposure (per ASTM B117)

FASTENER SPECS

Fastener Sizes: 3/8", 1/2" & 5/8"

Lengths: 1-1/2" thru 5"

Head Styles: Hex Washer Heads

Material: Alloy Steel Structural Grade-5 Properties Dual Hardness Technology – ASTM449, 120 KSI

Tapping Feature: Patented E-FORM, 30% lower tapping torque, roll forms threads

Tap-Flex™ Structural Fasteners

Bi-Flex STAINLESS STEEL FASTENERS

300 Stainless Steel Bi-Metal Self-Drilling Screws

APPLICATIONS

- ☐ Solar panel racking support systems
- ☐ Dissimilar metal applications
- ☐ Windows, doors and skylights
- ☐ Building enclosures/envelopes
- ☐ Curtain wall systems
- ☐ Stone facades
- ☐ Insulated metal panels
- ☐ Marine wet environment applications
- ☐ Architectural Railings
- ☐ Other Stainless Steel specified trades.

PERFORMANCE

Virtually immune to delayed embrittlement failures and Galvanic reactions- HASCC

300 Series Stainless Steel Technology – Higher corrosion resistance compared with carbon steel and 410 series stainless steel fasteners

DURABILITY

STALGARD® GB

Galvanic Barrier Coating

APPROVALS AND LISTINGS

- International Code Council, Evaluation Service (ICC-ES), ESR-4367
- International Code Council, Evaluation Service (ICC-ES), ESR-4374
- Code compliant with the International Building Code/International Residential Code: 2021 IBC/IRC, 2018 IBC/IRC, 2015 IBC/IRC and 2012 IBC/IRC
- 2020 Los Angeles Building Code (LABC) and Los Angeles Residential Code (LARC) ICC-ES Report Supplement
- 2020 Florida Building Code (FBC) ICC-ES Report Supplement
- Tested in accordance with AISI S905 and ICC-ES AC500 for attaching Miscellaneous Building Materials to Steel
- Tested in accordance with ICC-ES AC491 for use in Aluminum

ICC ES ESR-4374 ICC ES ESR-4367

FASTENER SPECS

Fastener Sizes: #8 thru 1/4" -- Lengths: 3/4" thru 8"

Head Styles: HEX Washer, Pan Phillips, Flat Under Cut Phillips, HEX Washer

Point Sizes: #2, 3 & 5

Material: 300 series stainless head and shank and hardened steel tapping threads and drill point

BI-FLEX™ 300 Series Stainless Steel Self-Drilling Fasteners

Alumi-Flex STAINLESS STEEL FASTENERS

300 Series Stainless Steel Self-Drilling Screws

KEY FEATURES

- ☐ Virtually immune to delayed embrittlement failures and Galvanic reactions- HASCC
- ☐ 300 series stainless steel provides a very high level of corrosion resistance
- ☐ Stalgard GB coating provides greater galvanic compatibility in aluminum

APPLICATIONS Aluminum to Aluminum Attachment Only!

PERFORMANCE

300 Series Stainless Steel for Aluminum to Aluminum applications only

DURABILITY

STALGARD® GB

Galvanic Barrier Coating

APPROVALS AND LISTINGS

- International Code Council, Evaluation Service (ICC-ES), ESR-4374
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- 2020 Florida Building Code (FBC) ICC-ES Report Supplement
- Tested in accordance with ICC-ES AC491 for use in Aluminum

ICC ES ESR-4374

FASTENER SPECS

Fastener Sizes: #10 thru 1/4" -- Lengths: 1/2" to 1-1/2"

Head Styles: Hex Washer, Flat Undercut Phillips

Point Sizes: #3 & 4

Material: 300 series (18-8) stainless steel

Alumi-Flex Stainless Steel Drill Screws

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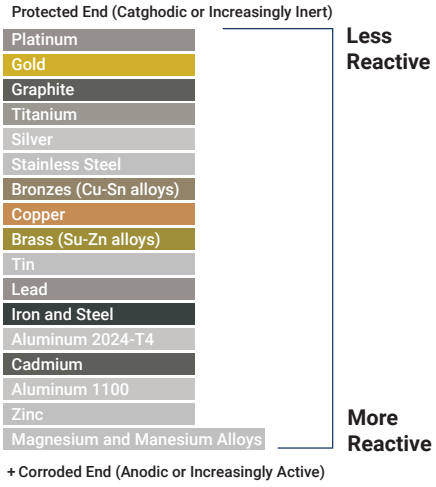
ELCO FLEX TECHNOLOGY™

FLEX TECHNOLOGY FASTENERS VS. DISSIMILAR METALS

FLEX TECHNOLOGY FASTERS VS. DISSIMILAR METALS

- Galvanic action in dissimilar metals generates hydrogen.
- Hydrogen penetrates case hardened steel and creates internal stresses that weaken fasteners.
- Stress concentrations initiate micro-cracking that propagate across fastener and lead to failure.
- HASCC can occur days, months or years after fastener installation if connection is exposed to moisture.
- Failure is often sudden and without warning.
- **FAILURES CAN BE AVOIDED!**

Galvanic Series of Dissimilar Metals



HYDROGEN EMBRITTLEMENT (MFG INDUCED) VS. HYDROGEN ASSISTED STRESS CORROSION CRACKING (ENVIRONMENT INDUCED)

- Electroplating/acid or alkaline cleaning & pickling during fastener manufacturing & processing can lead to "**Hydrogen Embrittlement**" (Induced by the manufacturing processes) (***THIS IS NOT HASCC***)
- Application Generated- Galvanic corrosion from dissimilar metals in the presence of moisture typical in steel to aluminum or aluminum to aluminum connections using steel or 400 series stainless steel fasteners can lead to "**Hydrogen Assisted Stress Corrosion Cracking**"- HASCC (induced by the environment the fastener and application are exposed to)

THREE INGREDIENTS NEEDED FOR HASCC

1. **Hardened Fastener** (Hardness above RC 34*) Typical of hardened carbon steel & 410 stainless steel, self-drilling & tapping screws made to industry standards
2. **Part under stress or applied load** -From installation and/or design load
3. **Presence of available hydrogen** -From galvanic corrosion

** Rockwell "C" Metallurgical Hardness Scale*

HASCC EXAMPLE

- **Curtainwall/Window/Glazing:** Aluminum components
- **Cladding/Building Envelope:** Aluminum & stainless steel components
- **Brick/Masonry Veneer:** Often "like-metal" connections, but very corrosive environment

WHAT HAPPENS TO THE FASTENER GRAIN STRUCTURE WHEN HASCC ATTACKS - CREATION OF A FRACTURE

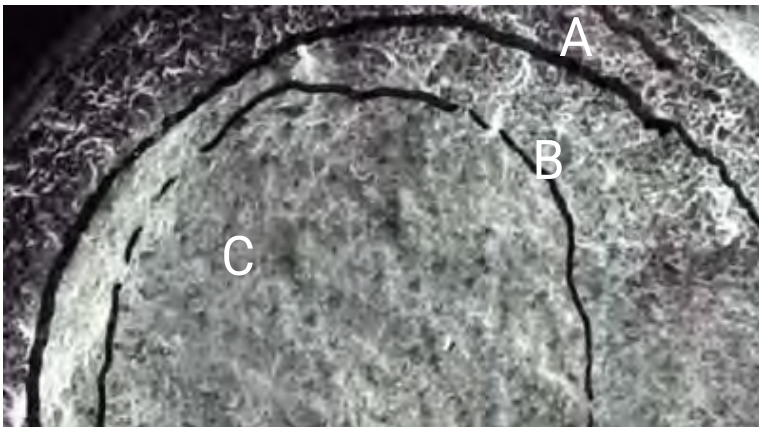
Zones

A Inter-granular cracking: Hydrogen Assisted Stress Corrosion Embrittlement

B Evidence of both inter-granular cracking & ductile failure

C Complete ductile failure. Remaining cross-sectional area could not withstand load and the fastener broke.

HASCC occurs when dissimilar metals are in presence of an electrolyte (an electrically conductive medium) and form a galvanic cell. Like an electric battery, except two pieces of metal form a short circuit.



In case hardened fasteners, only the brittle outer layer is vulnerable to HASCC. However, a weakening outer layer placed the entire load onto the core of the fastener, a significantly smaller diameter of steel than the original design. The design load can overwhelm this reduced fastener diameter, leading to failure.

ELCO FLEX TECHNOLOGY™
SUMMARY

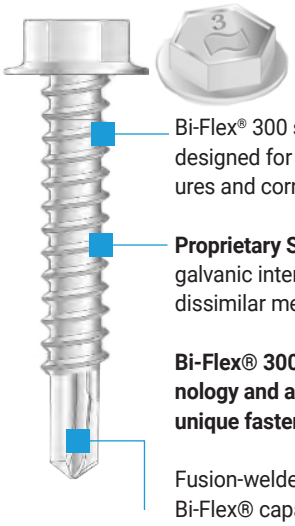
- Fasteners are critical components of buildings.
- HASCC can cause sudden catastrophic failures when self-drilling screws are used in conditions with dissimilar metals and the potential for exposure to moisture.
- Selectively hardened (**Dril-Flex**) and bi-metal (**Bi-Flex**) self-drilling fasteners mitigate risk because their load bearing sections remain ductile and less vulnerable to HASCC.
- The lowest cost fastener may not be the most economical when labor and service life are considered.
- Specialty fasteners can save money by providing lower installed costs.
- Fasteners are typically less than 2% of total building cost but installing inadequate fasteners can cause up to 100% of construction defect costs.

For applications where dissimilar metals will be in contact, use **Dril-Flex** dual heat-treated structural drill screws to resist Hydrogen-Assisted Stress Corrosion Cracking (HASCC).

In aggressive environments requiring stainless steel for protection against visible corrosion, use **Bi-Flex** 300 series self-drilling screws with a stainless head and shank and hardened steel tapping threads and drill point.

Using ordinary stainless steel fasteners in architectural aluminum elements such as windows, curtain wall or wall cladding can create galvanic corrosion of the aluminum, weakening the connection until it fails at well below design loads. Avoid this problem by using **Alumi-Flex** 300 series stainless steel self-drilling screws with Stalgard GB coating for aluminum-to- aluminum connections.

If using a conventional bolt/nut configuration, consider **Tap-Flex** to eliminate nuts and/or thread tapping operations. **Tap-Flex** fasteners are designed to offer a replacement option for traditional nut and bolt assemblies. These fasteners also provide an excellent solution in blind applications.



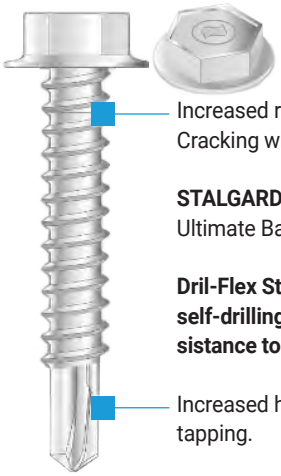
BI-FLEX®
Bi-Metal Self-Drilling Structural Screws

Bi-Flex® 300 series stainless steel screw shank and head is designed for performance, resistance to embrittlement failures and corrosion resistance.

Proprietary Stalgard® GB (Galvanic Barrier) coating minimizes galvanic interactions, making Bi-Flex® an excellent choice for dissimilar metal applications (eg. Aluminum-steel).

Bi-Flex® 300 Series Stainless fasteners utilize bi-metal technology and a proprietary coating formula to create a single, unique fastening system.

Fusion-welded, hardened drill point and lead threads make Bi-Flex® capable to drilling and tapping up to 1/2" (12.7 mm) thick steel.



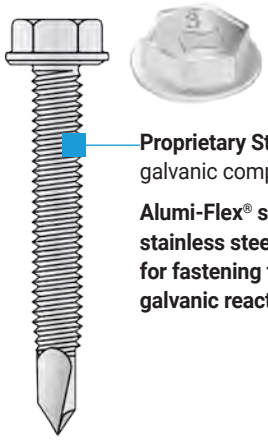
DRIL-FLEX®
Self-Drilling Structural Screws

Increased resistance to Hydrogen-Assisted Stress Corrosion Cracking when compared to case hardened fasteners.

STALGARD® SUB
Ultimate Barrier Corrosion Protection.

Dril-Flex Structural Drill Screws are dual heat treated self-drilling tapping screws that provide the strength and resistance to embrittlement required for critical applications.

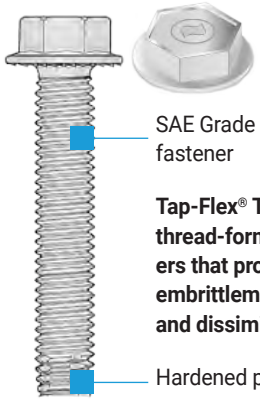
Increased hardness point and lead threads for drilling and tapping.



ALUMI-FLEX®
Self-Drilling Structural Screws

Proprietary Stalgard® GB (Galvanic Barrier) provides greater galvanic compatibility in aluminum

Alumi-Flex® structural drill screws are 300 series (18-8) stainless steel self-drilling tapping screws that are used for fastening to aluminum when corrosion resistance and galvanic reaction are a primary concern.



TAP-FLEX®
Self-Drilling Structural Screws

SAE Grade 5 properties in "Load-Bearing Area" of fastener

Tap-Flex® Thread-Forming Structural Screws are thread-forming, dual heat treated self-tapping fasteners that provide the strength, ductlity, and resistance to embrittlement failures required in critical curtain wall and dissimilar metal applications.

Hardened point and tapping threads