

Dril-Flex® Structural Self-Drilling Fasteners

Offers virtual immunity to hydrogen-assisted stress corrosion cracking for maximum performance in the field

Dril-Flex® fasteners are specially designed and processed to help prevent hydrogen-induced brittle failures. Each fastener undergoes the unique Flex Technology® dual-hardening process to ensure the optimal combination of ductility and hardness required for maximum performance in the field.

Testing of this product, in accordance with ASTM standards, has proven that Dril-Flex® fasteners provide the same resistance to hydrogen-assisted cracking (HAC) as a Grade 5 fastener.

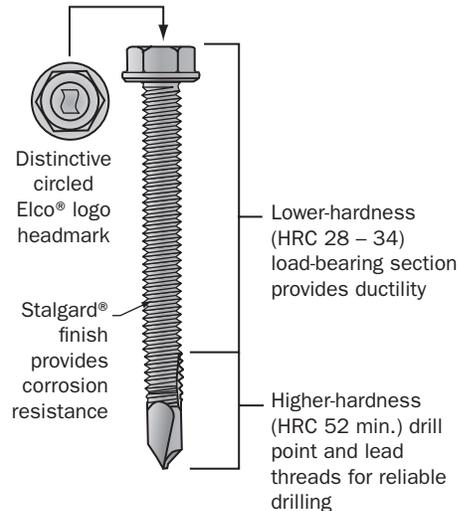
Unique Hardening and Finishing Processes Provide High Performance

Hydrogen-Assisted Stress Corrosion Cracking (HASCC) refers to a time-delayed failure that is aggravated or accelerated by hydrogen generated in the application. This is most often encountered and associated with dissimilar metal applications through the galvanic corrosion process. Most self-drilling fasteners, including 410 fasteners, are case or similarly hardened, which provides the necessary hardness for drilling and tapping, but leaves the screws vulnerable to HASCC due to their high surface or core hardness.

Dril-Flex fasteners offer the unique Flex Technology® dual-hardening process. The self-drilling point and lead tapping threads are selectively hardened to a minimum of HRC 52. The load-bearing portion of the screw is held at or below the critical HRC 34 level. This reduced hardness level also meets SAE J429 Grade 5 and ASTM A449 strength and ductility standards.

Dril-Flex fasteners are then coated with silver Stalgard® finish to provide superior corrosion resistance and enhanced galvanic compatibility. Fasteners coated with Stalgard® finish typically show no red rust or other base metal corrosion on significant surfaces even after 800 hours of 5% neutral salt spray exposure (ASTM B117).

The combination of this unique dual-hardening process and Stalgard® finish results in a strong, reliable fastener that can be used where other self-drillers would fail. Dril-Flex self-drilling fasteners are the ideal fastening solution for demanding construction applications.



Features

- Self-drilling point
- Higher hardness (HRC 52 min.) point and lead threads
- Lower-hardness (HRC 28 – 34) load-bearing threads
- Silver Stalgard® multi-layered corrosion resistant finish

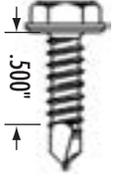
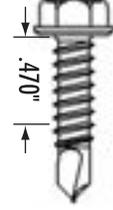
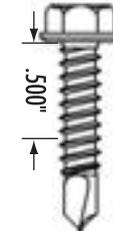
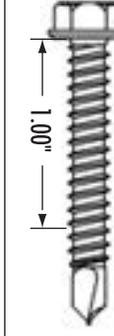
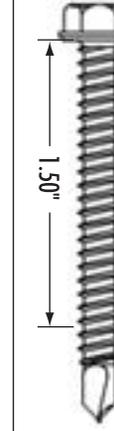
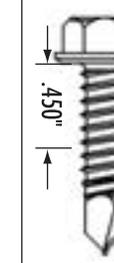
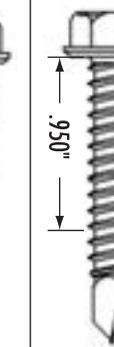
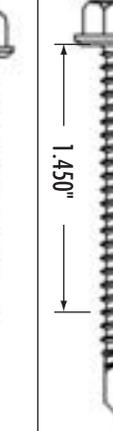
Benefits

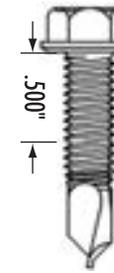
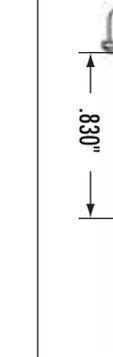
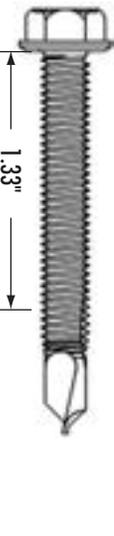
- Virtually immune to delayed HASCC brittle failures found with other hardened fasteners
- Provides the same high resistance to hydrogen-assisted failure as a Grade 5 fastener
- Precision self-drilling point ensures consistent, reliable drilling and tapping
- Eliminates separate drilling and tapping operations
- Corrosion resistance superior to zinc- or cadmium-based finishes
- Provides enhanced galvanic compatibility in dissimilar metal applications
- Approvals: ICC ES ER-4780 Legacy Report; COLA (City of Los Angeles) Research Report #25095

Product Information
Dril-Flex® Structural Self-Drilling Fasteners



SELECTION GUIDE*

Size	10-16	12-14	12-14	12-14	12-14	1/4-14	1/4-14	1/4-14
Length	3/4"	7/8"	1"	1-1/2"	2"	1"	1-1/2"	2"
Head Style	HWH #3	HWH #3	HWH #3					
Application Use	steel and aluminum	aluminum only	steel and aluminum	steel and aluminum	steel and aluminum	steel and aluminum	steel and aluminum	steel and aluminum
Drilling Capacity	.150"	.187"	.187"	.187"	.187"	.210"	.210"	.210"
Catalog Number	AF 430	AF 621	AF 641	AF 681	AF 690	AF 816	AF 841	AF846
Maximum Load-Bearing Area** Indicated By Arrows								

Size	1/4-20	1/4-20	1/4-20	1/4-20	12-14	5/16-24
Length	1-1/8"	1-1/2"	2"	2-1/2"	1"	1-1/2"
Head Style	HWH #4	HWH #4	HWH #4	HWH #4	Undercut Flat Head #3	HWH #4
Application Use	steel and aluminum	steel and aluminum				
Drilling Capacity	.210" to .312"	.210" to .312"	.210" to .312"	.210" to .312"	.187"	steel: 0.187" aluminum: 0.25"
Catalog Number	AF 865	AF 876	AF 886	AF 890	BL 215	AF960
Maximum Load-Bearing Area** Indicated By Arrows						

* Fasteners shown are in-stock. Other head styles, threads, lengths and drilling capabilities can be produced to meet specific application needs.

** IMPORTANT: to ensure proper performance, only the load-bearing area should be engaged in the material being fastened.

COMPARISON TO STAINLESS STEEL FASTENERS

300 series stainless steel fasteners will not rust, and, because of their low hardness, they also provide high resistance to hydrogen embrittlement failures. However, because stainless steel is galvanically incompatible with certain building materials – including steel and aluminum – it can cause other problems (see chart) when combined with these materials. Stainless steel fasteners trigger a sacrificial action in the aluminum or steel panel, which can lead to degradation of the panel and loosening of the fastener.

The dual-hardening process allows Dril-Flex fasteners to provide high strength and resistance to hydrogen embrittlement failures. Their unique Stalgard® finish provides corrosion resistance several times greater than other commonly-used finishes. Fasteners coated with Stalgard finish typically show no red rust or other base metal corrosion on significant surfaces even after 800 hours of 5% neutral salt spray exposure (ASTM B117).

If the environment is corrosive enough to significantly affect the Stalgard® finish, the potential for significant degradation of the aluminum/stainless steel assembly would also exist.

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.

EMBRITTELEMENT TESTING

Embrittlement testing of Dril-Flex fasteners was performed in accordance to ASTM F1624-06, “Standard Test Method for Measurement of Hydrogen Embrittlement in Steel by the Incremental Loading Method”. Fastener lots were tested to determine their Threshold Stress Limits for both Internal Hydrogen Embrittlement and Environmental Hydrogen Embrittlement. Threshold Stress Limit is the stress level below which no time-dependent cracking will occur. Above this level, subcritical cracking that leads to time-delayed fracture or embrittlement may occur if the fastener is exposed to a hydrogen environment.

Embrittlement Test Results

- Dril-Flex fasteners have a hardness range of HRC 28 – 34, which is roughly equivalent to a SAE Grade 5 fastener (HRC 25 – 34).
- Dril-Flex fasteners showed resistance to the effect of hydrogen-assisted cracking when loaded to 75% of their tensile strength. This is within accepted industry guidelines for in-service loading conditions.
- Dril-Flex fasteners showed no degradation or failures in tensile strength below their Ultimate Tensile Strength.

SHEAR AND PULL-OUT VALUES

Pull-out Tests – Steel

Pull-out values shown are in lbs.

Screw Size	Point Type	Drill Cap	Steel								
			18	16	14	12	1/8	3/16	1/4	5/16	
10-16	3	.150	396	501	634	1595	1693				
12-14	3	.187	396	527	710	1678	2061	2898			
1/4-14	3	.187	398	530	686	1950	2264	3919			
1/4-20	4	.312		516	649	1912	2296	2928	3561	4488	
5/16-24	4	.312				2148	2573	4226	5424	6622	

Shear Tests – Steel

Shear values shown are in lbs.

Screw Size	Point Type	Drill Cap	Steel						
			18-18 gage	18-14 gage	16-16 gage	14-14 gage	1/8"-3/16"	3/16"-1/4"	1/4"-12 gage
10-16	3	.150	1362	1733	1462				
12-14	3	.187	1315	2118	1655	1816			
1/4-14	3	.187	1395	2313	1681	2417	2600		
1/4-20	4	.312	1350	2086	1582	2450	2814	2810	2706
5/16-24	4	.312					5486	5283	4761

Pull-out Tests – Aluminum

Pull-out values shown are in lbs.

Screw Size	Point Type	Drill Cap	Aluminum 6063-T5		
			1/8"	1/4"	3/8"
10-16	3	.150			
12-14	3	.187	939	2286	
1/4-14	3	.187	1003	2424	
1/4-20	4	.312	897	2075	3683
5/16-24	4	.312	1043	2566	

Shear Tests – Aluminum

Shear values shown are in lbs.

Screw Size	Point Type	Drill Cap	Aluminum 6063-T5	
			1/8" - 1/8"	1/8" - 1/4"
10-16	3	.150	1466	
12-14	3	.187	1797	2483
1/4-14	3	.187	1996	2883
1/4-20	4	.312	2006	2926
5/16-24	4	.312	1849	2926

NOTE: All test setups and dimensions were as limited and outlined in AISI Test Method for Mechanically Fastened Cold-Formed Steel Connections (CF92-1) document. Performance values listed are ultimate values obtained under laboratory conditions. Appropriate safety factors should be applied for design purposes.

SPECIFICATIONS

Application:

Metal (including aluminum) to steel structurals

Short Form Specification:

Dual-hardened fastener with self-drilling point and self-tapping thread that meets SAE J429 Grade 5 and ASTM A449 strength and ductility requirements, which provides a maximum load-bearing area of _____.

Approvals/Listings:

- ICC ES ER-4780 Legacy Report
- COLA (City of Los Angeles) Research Report #25095

Diameters:

#10, #12, 1/4", 5/16"

Head Styles:

Hex washer head, undercut flat head; custom heads styles available

Thread Form:

Self-tapping

Point Type:

Self-drilling

Material:

Special alloy steel

Finish:

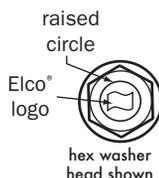
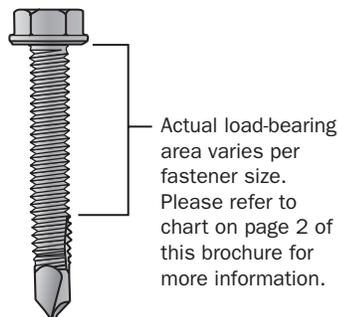
Silver-colored
Stalgard® corrosion-resistant finish withstands a minimum of 800 hours salt spray per ASTM B117 standards

Installation Tools:

Standard 4.5 min. amp screw gun that has a torque-limiting and/or depth-sensitive nose piece

Inspection

In-place inspection can be made by identifying the special Dril-Flex® headmarking. This is a combination of two markings: an Elco® logo surrounded by a raised circle.



DESIGNING WITH DRIL-FLEX FASTENERS

Download CAD files from our web site at www.elcoconstruction.com or contact Elco Construction Products for a free disk containing CAD drawings and specifications of Dril-Flex fasteners.

QUALITY CONTROL

Dril-Flex fasteners are produced under lot control conditions. Each production run is sampled and checked for two key conditions. First, that the lower hardness zone extends down the shank to the length specified, and second, that the hardness in that zone is per the specifications. Documentation is retained for a period of five years. Lot numbers are marked on every box of product.



QUALITY PRODUCTS

A number of other high-quality products for construction are available from Elco Construction Products, including:

- Self-drilling fasteners
- UltraCon® Masonry Fasteners in 3/16", 1/4" and 5/16" diameters
- ConFlex® Masonry Fasteners in 3/8" and 1/2" diameters
- Crete-Flex® SS4 Masonry Fasteners
- HangerMate® Threaded Rod Anchoring System
- Fab-Lok™ Vibration-Resistant Fasteners

For more information on our wide selection of products, visit our web site at www.fastenersforconstruction.com or contact your Elco Construction Products representative.



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