The Guarantee of a Lifetime

Grip-Rite® PrimeGuard Max™ stainless steel fasteners all carry a lifetime guarantee against corrosion, including when used with all treated lumber, cedar and redwood.

What Causes Fasteners to Corrode?

Fastener corrosion is a chemical reaction between a fastener and chemicals either in the wood or in the environment, or a combination of both that results in the wearing away of metals. Certain situations may lead to several forms of corrosion on the same piece of material.

There are many forms of corrosion, including galvanic corrosion, filiform corrosion, and microbial corrosion, to name a few.

Galvanic corrosion is the chemical reaction between two unlike metals. There are three conditions that need to be present for galvanic action to occur:

1. **Metals must be apart on the galvanic series.** If two metals are on opposite ends of the chart, they are more likely to result in galvanic action when used together (see "The Galvanic Series" chart on this page for more information).
2. **Metals must be in electrical contact.** Either the metals must be touching directly, bolted, welded, or clamped together.
3. **The metal junction must be bridged by an electrolyte.** An electrolyte is simply any fluid (distilled water is an exception) that can carry an electrical current from one metal to the other, such as rain water or even moisture.

Galvanic corrosion can occur when mixing and matching two different metals, especially if the two metals are far apart on the galvanic series (see "The Galvanic Series" chart on this page) as described in the first condition above. Be sure to not mix and match metals, especially galvanized steel with stainless steel, in the same connection. When these dissimilar metals come into physical contact with each other, galvanic action will occur and the zinc on the galvanized fastener will corrode.

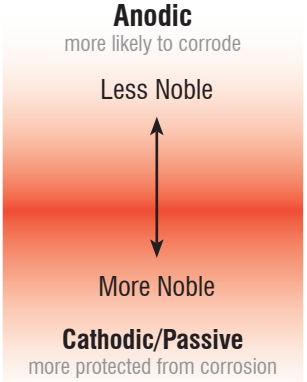
Galvanic action also occurs when certain chemicals interact with metal, such as tannic acids. Tannic acids are extractives that are released from within the wood and rise to the surface around the fastener head when fasteners are driven into the wood causing fastener corrosion (see "Moisture: Extractive Bleeding and Galvanic Action" on p. 32 for more information).

For example, copper is used in many types of treated wood—use zinc fasteners and you cause galvanic action. Whichever metal is the least noble, or anodic, (towards the top of the series, zinc in this example) will 'sacrifice' itself to corrosion for the more noble cathodic metal (towards the bottom of the series, in this case copper). Moisture accelerates this problem.

Other corrosions include: general surface corrosion, filiform corrosion, stress corrosion cracking, microbial corrosion, etc. Many of these are caused by things like moisture, heat, ocean-salt air, de-icing salts, bacteria in the environment, and/or can be caused by friction or stress. These corrosions differ from galvanic in that there does not need to be two different kinds of metals reacting to each other, but that can be a factor in some cases.

With proper maintenance, design, material choice, and other preventative maintenance, you may be able to minimize the possibility of corrosion.

The Galvanic Series:[1]



- Zinc
- Aluminum
- Galvanized Steel
- Mild Steel, Cast Iron
- Lead
- Tin
- Brass, Bronze
- Copper
- Silver Solder
- Stainless Steel (passive)[2]
- Silver
- Graphite
- Gold

[1] The precise arrangement of materials in a galvanic series depends on the surrounding environment. This chart is for general information only.
[2] Stainless steels used in light construction are usually passive, typically Type 304. Type 316 stainless steel is recommended for projects near saltwater.

What is Stainless Steel?

Stainless steel is a steel alloy that is solid, not a plating. This means that the stainless steel fasteners are immune to the dangers of chipping and scratching that can leave coated fasteners vulnerable to corrosion. As its name implies, it is "stain-LESS" not "stain-PROOF," however it is the best solution available for corrosion resistance because of its chemical properties. The Chrysler building's peak is made of stainless steel that has proven its strength, durability, and corrosion resistance over time.

Chemistry of Stainless Steel

Typical stainless steels are alloys of iron and other elements added to improve corrosion resistance and workability, and to vary material strength. These elements include nickel, molybdenum, copper, titanium, silicon, aluminum, and sulfur. Stainless steel always includes a minimum of 12% chromium. Greater corrosion resistance is achieved by adding even more chromium to the alloy.

This mix is important because as the chromium in the steel is exposed to oxygen, it becomes a protective film of corrosion-resistant chromium oxides. Damage to the surface of the fastener simply exposes fresh chromium, creating more chromium oxides and maintaining the fastener's integrity against corrosion, a self-healing action from a surface phenomenon called passivation.

Galvanic Action Chart:

✓ **No galvanic action**, compatible materials
~ **Some galvanic action**, base material may corrode
⊘ **Not recommended**, fastener or plating will corrode

Base Material	Fastener or Plating Material: Zinc, Galvanized Steel	Aluminum, Aluminum Alloys	Brass, Bronze, Copper, Monel	410 SS Martensitic Stainless Steel	302, 303, 304, or 305 SS Austenitic Stainless Steel
Zinc, Galvanized Steel	✓	~	~	~	~
Aluminum, Aluminum Alloys	✓	✓	~	⊘	~
Steel, Cast Iron	⊘	✓	~	~	~
Brass, Bronze, Copper, Monel	⊘	⊘	✓	✓	~
430 SS Ferritic Stainless Steel	⊘	⊘	✓	✓	✓
302, 303, 304, or 305 SS Austenitic Stainless Steel	⊘	⊘	⊘	✓	✓
Terne (Lead-Tin) Plated Steel Sheets	⊘	⊘	~	~	~

Nickel also resists corrosion, and steels made with molybdenum, such as Type 316 stainless steel, are even more durable. The nickel and passivation of chromium in stainless steel protects against corrosion from galvanic action and non-galvanic action. This makes stainless steel fasteners the most corrosion resistant option for demanding applications, as well as a strong and workable solution.

Carbon + Chromium = Carbides

All stainless steels are strengthened with carbon. This added carbon reduces corrosion resistance: Carbon converts chromium to carbides. These carbides provide no corrosion resistance.

Because carbon can convert up to seventeen times its own weight in chromium to carbides, stronger steels made with more carbon require much greater amounts of chromium to maintain their resistance to corrosion.

Why Use Stainless Steel?

Using stainless steel reduces the replacement material cost and provides negligible project cost upgrade over the total cost of the expected project life, protecting your investment's safety and longevity. With the guarantee that the Grip-Rite PrimeGuard Max stainless steel fasteners will last the lifetime of your project and provide the peace of mind that your project will be safe for years to come, a better question is why wouldn't you use stainless steel on your most important projects?

What type of Stainless Steel will I need?

There are several grades, or types, of stainless steel, each with a different mix of metals in the alloy. If you are ever uncertain which type of fastener or plating material to use with your base material, check our easy-to-use "Galvanic Action Chart" below, or talk with your hardware manufacturer.

The 200 series is less expensive, but also the least corrosion resistant.

For real protection against the elements, the 300 series is the best choice. Type 302, 304, and 305 stainless steels are popular and highly corrosion resistant, and Type 316 is made with molybdenum for maximum protection.

If you're building in a seaside area, PrimeGuard Max Type 316 stainless steel fasteners are your #1 choice.

Proportion of Elements in Stainless Steel, by Grade:

	200 SS	302 SS	302 HQ	302 HQ (XM7)	304J3-S	304 SS	305 SS	316 SS
Chromium	16–18%	17–19%	17–19%	17–19%	17–19%	18–20%	17–19%	16–18%
Nickel	3.5–5.5%	8–10%	8.5–10.5%	8–10%	8–10.5%	8–10.5%	10.5–13%	10–14%
Carbon	0.15% max	0.08–0.15%	< 0.8%	0.03%	0.08%	0.08% max	0.12% max	0.08% max
Copper	—	—	3–4%	3–4%	1–3%	—	—	—
Molybdenum	—	—	—	—	—	—	—	2–3%
Manganese	5.5–7.5%	< 2%	< 2%	< 2%	< 2%	< 2%	< 2%	—
Iron	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance