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4 Facts and Fallacies about Stainless Steels

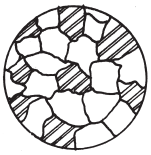
So you've thought (like all of us have) that stainless steel beats rust (or corrosion). So here goes to debunk that theory. **[1]** Just leave a piece of "stainless" steel outside and exposed to the elements (especially near the sea) and it won't take long before it shows brown pock marks – just like the piece of rod in our picture below.

But let's be fair, this applies more to the most common grades rather than special grades of stainless steel - (More about grades later). Now for fallacy No **[2]** Stainless steel bolts will stop seized up and "frozen in" threads. ***Not true*** - if stainless bolts are used with ordinary steel or cast iron – yes – they will generally help but may not totally prevent seizures, but with aluminium and magnesium alloys you've got a real big corrosion problem and seized thread headaches. **[3]** Is the problem that stainless steel in marine or chemical processing environments can "corrode" and fracture just because of stress and strain, even when it's put under just the ordinary stresses created by its normal everyday use. This has caused serious, life threatening accidents when stainless pipes burst. **[4]** Finally mistaken beliefs about stainless steel as a "cure all" cause serious troubles in repair shops.

Now for Some Steel Terms & Words

Austenitic The common grades of stainless steel are known as austenitic steels. Without getting technical, if you could look inside steel, it is a made up of "grains" mainly grains of iron and carbon (like the picture following) and in the case of stainless and hi-tensile steels, there are other alloys added.

Austenitic grain



Martensitic grain

"Austenitic" refers to the grain structure found inside the most common stainless steels. To use homely language, austenitic grain structure causes the steel to be more "stretchy" or "chewy" than ordinary mild and carbon steels [like the difference between hard sweets and chewing gum!]. This "austenitic" structure toughens up as soon as it is drilled, cut, stretched or put through a rolling process. This is called **work hardening** and is the reason why stainless steels are so difficult to drill or machine. A big difference between ordinary carbon steels and austenitic steels is that austenitic steels will not harden with heat treatment.

Martensitic Is the grain structure found inside the ordinary everyday steels commonly called **mild steel** or **carbon steel**. Martensitic steels have a more "crumb like" structure than austenitic steels [like the hard sweets instead of chewing gum]. This is why these steels cut and machine more easily than stainless

High Tensile Tensile strength measures how much a bolt can be tightened or how far it will stretch before it will snap. It's usually measured in lb/in^2 (pounds per square inch) or Mpa (megapascals – this is the metric measure). Without going into technical details, the bigger the number in either system the greater the tensile or "stretch" strength.

Free Machining Means that a metal is easier to machine or drill or cut.

A Bit About Grades & Numbers

You've probably hear someone say that some type of stainless steel is 18/8 stainless. 18/8 is not a grade but a family name for steels and covers quite a few Grades. What 18/8 means is that there is 18% of Chromium and 8% of Nickel alloyed in the steel.

Now, let's say a little bit about the most common ***grades***, which are 303, 304 and 316.

Grade 303 is an 18/8 stainless with a couple of other things added and it has about 0.15% carbon which is about half what is found in the mild/carbon steel family. 303 Grade is rightly or wrongly called "free machining" but believe me, it still has its hangups. It is far easier than any other grade of stainless to drill, tap, cut or machine but nowhere near as easy as the carbon steel family to work with.

Grade 304 is also an 18/8 stainless and a very close relative of 303 but quite a bit harder to work with and machine. However, its big advantage over 303 is that it is far slower to corrode or show rust pitting. This is because in 304 there are smaller amounts of additives like Sulphur that are put into 303 to make it easier to cut. 304 also only has about half the carbon content of 303. It is claimed that 304 is the most widely used of all stainless steels.

Grade 316 is about 16/10 instead of 18/8 [16% chromium and 10% Nickel] plus other alloys which are added to give it far more resistance to corrosion. It is commonly known as "marine grade" and stands up to salt water and other severe chemical combinations far better than 303 or 304.

The worst fallacy about stainless is the belief that it's a "bullet proof" answer to corrosion problems. For ordinary workshop use be sure to remember that stainless bolts used in aluminium and magnesium are a total no - no - no! To check what metal goes with what go to the "Corrosion the thread killer" newsletter in the newsletter archives above.

Finally for tips about drilling and machining stainless, go to our newsletter archive above and click on the "Tips about drilling stainless steel and wearplate" newsletter.