Stand 62 Hereford Drive
Longmeadow West Business Park
Modderfontein
Tel: 011 663 6600

Postnet Suite 122
P/Bag X 10010
Edenvale 1610
Fax: 011 663 6700

REG NO: 2001/029111/07

VAT NO:4080175799

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Stainless Steel: 304 vs 316. A Comparison.

A common misconception about stainless steel is that it is not affected by corrosion. While misleading, the phenomenal success of the metal makes this common belief understandable. Stainless steel is what its name suggests; it stains “LESS”. All metals except gold, platinum, and palladium corrode spontaneously.

To understand the possibility of corrosion in stainless, we must first understand what gives it the ability to resist corrosion. Stainless steel is a family of alloy steels containing a minimum of approx 10.5% Chromium. The chromium, when in contact with oxygen, forms a natural barrier of chromium oxide called a "passive film". Only microns thick, this invisible and inert film is self repairing and is what gives the steel its stainless properties.

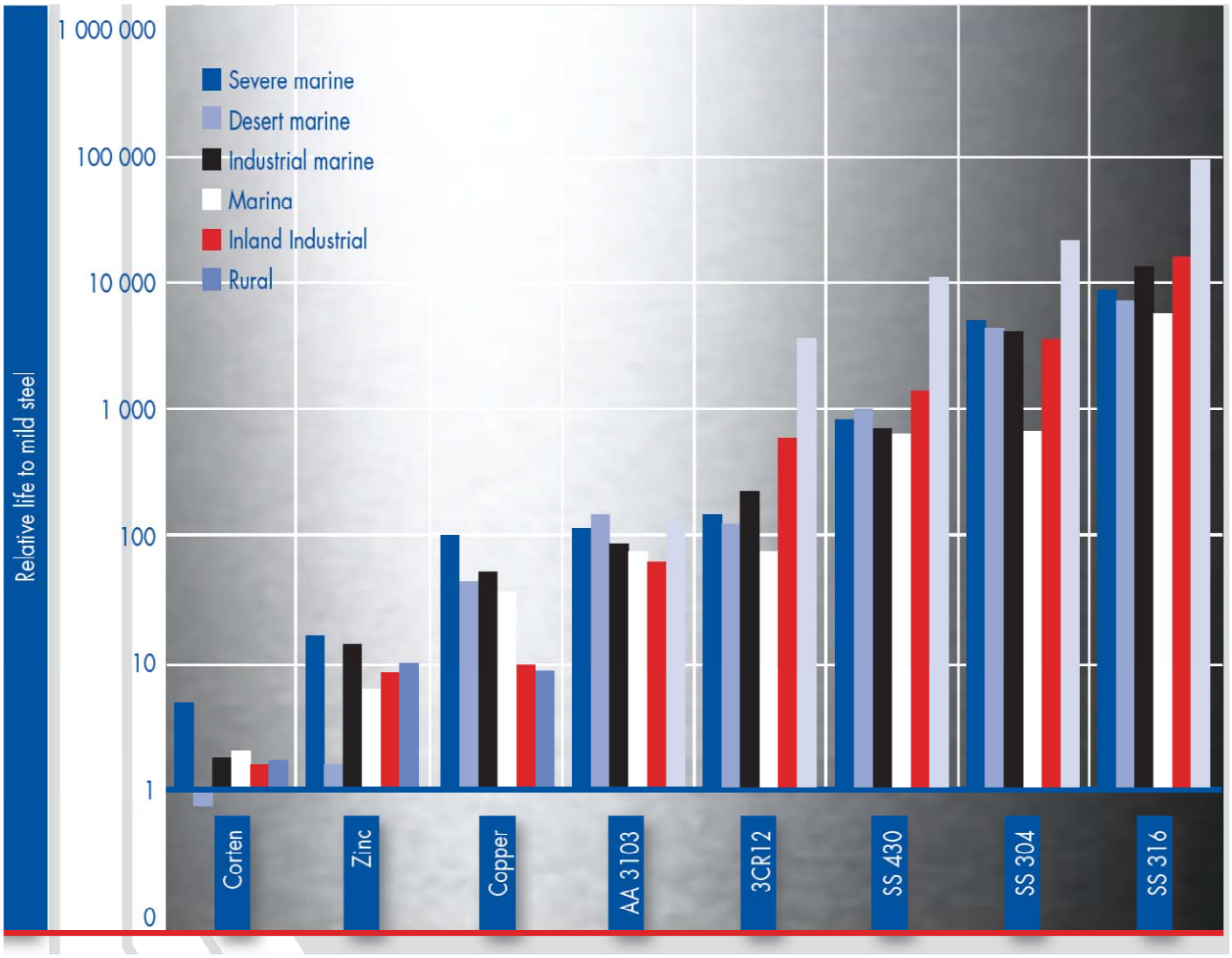
The international standards for various grades of stainless steel are well documented, and the percentage content of chromium in grades 304 and 316 is listed below:

	Chromium Content
Grade 304	18-20%
Grade 316	16-18%

Under normal atmospheric conditions the corrosion properties of these two grades are remarkably similar. Why then is grade 316 preferred in marine environments? You may have noticed the lower chromium content in the grade 316. Surely more chrome equals a thicker layer of chromium oxide or “ passive film”?

There is a reason for this. Stainless steels are particularly susceptible to attack by chlorides, and next to water, chloride is the most common chemical found in nature. Fortunately in most environments the concentrations are so small the effects on stainless are minute. In marine applications the presence of sodium chloride, or more commonly salt, can cause increased corrosion. The reason then for the decreased chromium content in grade 316 is to make space for another component: Molybdenum. Inclusion of Molybdenum provides increased resistance in marine environments.

Shown in the table below are the average relative lives of the different metals when compared to the average relative life of mild steel. This according to the CSIR report **(Atmospheric Corrosion Testing in Southern Africa - Results of a Twenty Year Exposure Programme, BG Callaghan, Division of Materials Science and Technology, CSIR).**



For all but the most demanding marine environments, the similarity in resistance properties between grade 304 and grade 316, and the 30-40% difference in price, make grade 304 the most suitable grade and obvious choice for general use.

It is important to note that stainless steel that is exposed to an aggressive atmospheric environment is **primarily affected by staining, sometimes referred to as tea staining. However, not all discoloration is necessarily the result of corrosion.** It can also be discoloration from dirt or extraneous rust caused, for example, by iron particles on the surface. However, if the chloride level is high enough, stainless steel can, over time, also be attacked by localized corrosion such as pitting and crevice corrosion.

What can we do to combat corrosion in stainless steel? Clean, clean, clean. A simplistic example of the effectiveness of cleaning is right in the house. A stainless grade 304 kitchen sink can see some of the most hostile chemical attacks in a home. But the stainless stays bright. Why? The constant flow of fresh water and wiping down removes the harmful chemicals that if left unattended, could attack the stainless' passive film. The more hostile the environment, the more cleaning is required. Cleanliness is essential for maximum resistance to corrosion.