



WHAT ARE CORROSION RESISTANT ALLOYS?

A NOTE FROM OUR METALLURGIST

Corrosion resistant alloys are metals engineered to resist degradation by oxidation or other chemical reactions. The most common cra's, used for mild to moderate corrosion resistance, are stainless steels. Stainless steels are iron-based alloys containing a minimum of 10.5% chromium, which is sufficient to prevent rust under typical room temperature atmospheric conditions. Stainless steels simply alloyed with Chromium, such as Type 430, are referred to as Ferritic Stainless Steels. This family of alloys can't be strengthened by heat treatment, however, with the addition of carbon and other elements, they become Martensitic Stainless Steels.

The most common Martensitic Stainless Steels, Types 410 or 13 Chrome, are strengthened by quench and temper heat treatment. There is also a family of Precipitation Hardened Martensitic Stainless Steels which includes the widely used Type 17-4. Martensitic Stainless Steels may also contain additions of Nickel and Molybdenum for improved corrosion resistance.

With sufficient Nickel, Austenitic Stainless Steels, such as types 304 and 316, are formed. Highly alloyed Austenitic Stainless Steels include Types 28 Chrome and 2535, widely used in oil & gas production. Most Austenitic Stainless steels are not heat treatable, however they can be cold worked to achieve high strengths. An exception to this is the Precipitation Hardened Austenitic Stainless Steel, Type A286.

Duplex Stainless Steels are formed with a balance of Chromium, Nickel, and Molybdenum between that of Ferritic and Austenitic Stainless Steels, named so because their microstructure is a mix of Ferrite and Austenite. These alloys may be cold worked to achieve very high strength, and are most commonly used where pitting or crevice corrosion is a problem, such as environments with water high in chlorides or dissolved oxygen.

The most highly alloyed of this family are referred to as Super Duplex Stainless Steels. In addition to the Chromium, Nickel, and Molybdenum found in all Duplex Stainless Steels, Super Duplex Stainless steels may include alloying elements such as Copper and Tungsten to improve corrosion resistance for specific environments.

Alloys containing more Nickel than Iron are considered Nickel Base Alloys. This group of alloys includes Types 825, 625, and 2550, which may be cold worked to achieve high strength. Precipitation Hardened Nickel Base Alloys include Types 718 and 925.

Nickel Base Alloys are included in a class of materials referred to as specialty metals. Used in extremely corrosive conditions, these specialty metals also include titanium, molybdenum, zirconium, and tantalum base alloys.

**While every effort has been made to ensure the accuracy of the above review, assessment, conclusions, and report, the appropriateness of their application and their interpretation remain the sole responsibility of the user.*