

304 Vs. 410 Stainless Steel Panel And Clip Fasteners

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Many long-life metal panel and panel clip attachment specifications read "Fasteners Must be Stainless Steel." This specification is tantamount to walking up to a bar and order-



ing, "Let me have a drink with ice." Depending on what you are served, you may be happy later, or you may really regret it! When stainless steel is called for, clearly the specifier is trying to accomplish something. Most likely, he is seeking to eliminate concerns of red rust for the life of the building. Unfortunately, this loose specification allows fastener suppliers to satisfy this order with a material that may not work as desired.

410 (or 400 series, martensitic) stainless steels are indeed stainless steels by definition in that they do contain a minimum of about 12% chromium. The fact that they are officially designated as stainless steels, however, does little to assure a specifier that they will resist corrosion and maintain integrity throughout the life of a building. In fact, martensitic stainless steels are highly susceptible to a phenomenon known as Stress Corrosion Cracking (SCC). This is just as it sounds—corrosion that occurs when a component (or fastener) is under the stress of service, over time, leading to cracks and potentially head separation.

Martensitic stainless steels simply were not developed for structural applications. They are

useful in flat, non-load bearing components where a combination of wear and corrosion resistance is desired. But when put in use under load, 410 stainless steel is at risk of developing SCC, particularly as it absorbs acidic pollutants from the atmosphere. In fact, even under the best of manufacturing conditions, these materials are susceptible to this phenomenon.

The feature that makes 410 stainless steel attractive to fastener manufacturers is its excellent hardenability. This makes it appear to be a useful solution for the need to combine stainless corrosion properties and the hardness of carbon steel for self-drilling properties. Unfortunately, the harder the martensitic stainless material, the greater the propensity for SCC. Major fastener manufacturers who produce 410 stainless steel products know how to minimize this effect through proper heat treatment and plating procedures; nevertheless, mother nature leaves a significant portion of this process out of their control. The very nature of these materials combined with often ordinary environmental conditions can lead to internal (within the fastener body) corrosion that results in SCC and eventually fastener failure. Extensive industry tests have proven that the susceptibility of these materials to SCC is too great to be ignored.

410 or martensitic stainless steels have been used for years in metal panel and clip attachment as well as in flat-roofing applications; however, this does not make such applications of this material acceptable. Intuitively we know that under most conditions, if only half of the fastening points on a panel remain intact after 10 years, the panel is still likely to remain in place absent high winds or other

weather phenomena. Architects, however, would never specify materials using this thought process. Designers, builders and building owners alike expect that ALL of the fasteners installed in a building will remain in positive service for the life of the structure. This being the case, they should insist on austenitic, or 300 series (such as types 304 or 316) stainless steels.

Austenitic stainless steels are more expensive than martensitic stainless steels. They are designed to resist corrosion due to pollutants, salt, water and many other present compounds. They do not red rust and are not susceptible to SCC like martensitic varieties. When specifiers call for stainless steel fasteners, they are nearly always seeking these properties. 300 series austenitic stainless steels are the same materials used to resist corrosion in such applications as power plant equipment, jet engines and even kitchen appliances.

Austenitic stainless steels for panel attachment have been slow to become embraced because of certain characteristics beyond cost. The material is softer than heat-treated martensitic stainless steels. In the past, this made them require pre-drilling for use in panel and clip attachment. Today, however, this concern is not necessary. Fastener manufacturers produce austenitic stainless steel fasteners that have welded or crimped carbon steel drill points or tips. These hard points allow for quick installation without the need for pre-drilling, and are sacrificed over time, leaving the long life stainless steel fastener head and shank in place for the life of the building.

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