Barracuda JAMES TAYLOR

Barracuda Brick Slip Support System – Commentary Stainless Steel Grades

Within the building construction industry, the most commonly used grades of stainless steel are 304 (1.4301) and 316 (1.4401). Because of the way that the Barracuda system works, with its 'springy' teeth, that grab hold of the brick slip and accommodate the wide range of brick height tolerances, a different grade of stainless steel is required. We need a stainless steel that can be 'hardened' sufficiently to provide the Barracuda teeth with their resilience or 'springiness'. We use grade 301 (1.4310) which is a 'spring' grade of stainless steel.

The very basic commonly understood hierarchy of corrosion resistance is as follows (from least to most corrosion resistant) – 301 (1.4310), 304 (1.4301), 316 (1.4401).

The above statement is true if one considers the entirety of the corrosion resistance performance envelope offered by these materials but it should be understood that not all of that performance envelope is relevant to this particular application. There are no 'aesthetic' requirements and there is no requirement for corrosion resistance at significantly elevated temperatures (for example).

The mechanical properties that can be achieved with each grade are arguably a more important pre-requisite than corrosion resistance. Of course, a component needs to do its job for the required period of time. However, if it can't do its job in the first place then it becomes irrelevant how long it does it for.

This does require a little understanding of the various alloying elements and what they do (and the quantities in which they occur).

The most relevant are tabulated below;

These are maximum values unless stated as an allowable range.

Grade	Carbon %	Chromium %	Nickel %	Molybdenum %
301 (1.4310)	0.05 to 0.15	16 to 19	6 to 9.5	0.8
304 (1.4301)	0.07	17.5 to 19.5	8 to 10.5	None
316 (1.4401)	0.07	16.5 to 18.5	10 to 13	2 to 2.5

There are other alloying elements that are largely consistent in their quantities across all three grades.

Chromium

This is what makes stainless steel 'stainless steel', it is the principal alloying element that provides stainless steel with its corrosion resistant characteristics (by the formation of a Chromium Oxide 'protective layer' on the surface of the stainless steel). Please note the constituent % for each grade and that a particular production batch (cast) of 316 might conceivably have the lowest quantity of Chromium of all three.

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Nickel

Nickel will contribute to corrosion resistance but its principle function is to provide workability. It helps the material remain ductile so that it can be bent and formed and makes it easier to weld. Please note that the Nickel content of 301 and 304 potentially 'cross over' and neither are hugely different from 316.

Molybdenum

This is really the main difference between 316 and 304 and is the principal reason why 316 is considered to be more corrosion resistant than 304. Please note that 304 has no Molybdenum. The addition of Molybdenum improves resistance to 'pitting' and 'crevice' corrosion (particularly in Chloride and Sulphur rich environments).

Carbon

This is the most important alloying element in the specific context of the Barracuda rail component. The inclusion of greater amounts of Carbon is what enables 301 to achieve high tensile strengths and hardness and hence the spring like qualities that this component requires. Austenitic stainless steels cannot be hardened by heat treatment so they need to be work hardened. This happens when the material is progressively reduced in thickness during the rolling process (and to some further extent during fabrication).

Because of the increased Carbon content in 301 it hardens at a very high rate. It gains much more strength for each % of reduction than 304 or 316. Please note that the tabulated carbon content in 304 and 316 (0.07%) is the max allowable so most stainless-steel producers, when producing 304 and 316 try to keep well below this level.

For the Barracuda rail we need material with a 0.2% proof strength of +CP900 (so, in the range of 900 to 1100 N/mm²). This is readily achievable/available in 301 but not in 316.

Material usage and context

There are no 'aesthetic' considerations. The Barracuda rails aren't visible. They are enveloped within and largely protected from exposure by the mortar that fills the bed joints between the brick slips. In this usage context, the functional corrosion resistance of 301 (1.4310) and 316 (1.4401) will be similar. James & Taylor offers a 'Design Life Warranty' that warrants that the Barracuda Brick Slip Support System will remain free from significant performance impairing defects for a duration equivalent to the specified design life of the building façade. James & Taylor offers this warranty to the owners of buildings that are situated in both urban and coastal environments.