MARLEY®

301L SS insight

Overview

Stainless steel, as an alternative to galvanized steel, has found widespread use in wet cooling equipment due to its excellent mechanical properties combined with its superior corrosion resistance. Cooling towers are excellent applications for stainless steel because the clean aerated water flow maintains a protective layer of chromium oxide on the steel surfaces.



Primary Benefits

- Selective substitution of stainless steel in place of galvanized steel for cold water and hot water basins improves material performance in marginal environments.
- When warranted, complete substitution with stainless steel is available on most Marley steel products. Series 300 stainless steel, specifically 301L, is recommended, 304 is also available.
- For the most severe applications, such as chloride levels above 900 ppm; 316 stainless is available.
- An important difference between Types 304, 301 and 301L stainless steel is the maximum carbon allowed, which impacts corrosion at weld lines. 304 allows up to 0.08%, 301 allows up to 0.15%, while 301L allows only up to 0.03% carbon. See Benefit Detail - Welding Advantages.

Circulating Water Chloride Level	Recommended Tower Material
< 300 ppm	G235 Galvanized Steel
300-900 ppm	301L Stainless Steel
> 900 ppm	316 Stainless Steel

Benefit Detail

301L Stainless Steel versus 304 Stainless Steel

301L Welding and Forming Advantages:

- Higher tensile strength, yield strength and fatigue resistance.
- Lower carbon content, resulting in less chromium carbide precipitation and less corrosion at weld lines (reduced intergranular corrosion, sensitization and weld decay).
- Faster work hardening, which minimizes thinning when forming and results in higher strength in the formed areas.



more

Stainless Steel Grade Comparisons: Composition and Mechanical Properties

Composition[1]									
Grade		Carbon	Manganese	Silicon	Phosphorus	Sulfur	Chromium	Nickel	Nitrogen
304	min	–	–	–	–	–	17.5	8.0	–
	max	0.08	2.0	0.75	0.045	0.030	19.5	10.5	0.10
301L	min	–	–	–	–	–	16.0	6.0	–
	max	0.03	2.0	1.0	0.045	0.030	18.0	8.0	0.20

Mechanical Properties[1]				
	Tensile Strength ksi (Mpa) min	**Yield Strength** 0.2% offset - ksi (Mpa) min	**Elongation** in 2 inches (50mm) - % min	**Hardness** Rockwell B max
304	75 (515)	30 (205)	40	92
301L	80 (550)	32 (220)	45	100

Conclusions

- Type 301L Stainless Steel provides welding and forming advantages, including higher tensile and yield strength and forming consistency.
- Both 301 and 304 are listed as appropriate for the same environments – industrial and marine atmospheres, and mild to oxidizing chemical environments.[2]
- 301L has better fatigue resistance than 304.
- With similar corrosion resistance, 301L stainless steel has the same upper limit for chlorides in cooling tower circulating water as 304 stainless steel. This established limit of 900 ppm is based on decades of engineering research and product performance data on Marley products. This limit far exceeds the typical circulating chloride range of 20-400 ppm found in most HVAC applications.

[1] *ASTM A240*. www.astm.org/Standards/A240.htm

[2] *Design Guidelines for the Selection and Use of Stainless Steels.* AISI Handbook No. 9014. www.nickelinstitute.org

SPX COOLING TECHNOLOGIES, INC.
7401 WEST 129 STREET
OVERLAND PARK, KS 66213 USA
913 664 7400 | spxcooling@spx.com
spxcooling.com

IN-SS-16 | ISSUED 8/2016
COPYRIGHT © 2017 SPX CORPORATION
In the interest of technological progress, all products are subject to design and/or material change without notice.