

Tech Note 1: Chlorides, Chlorine & Stainless Steel

TN.01

Stainless steel has a high resistance but as with all materials, is not resistant to everything and may be prone to pitting or damage from the interaction with *chlorides or chlorine* in certain conditions. These conditions are dependent on the grade of stainless, temperature, concentration and exposure.

Chloride (Cl-) is a salt ion, a compound of Chlorine (Cl) and present in many chemicals and processes such as Sodium chloride (NaCl). **Chloride and Chlorine are different.**

Laboratory testing of project water samples is the only method to accurately confirm concentrations and is recommended when the likelihood of increased risk is possible. Bore water, saltwater and chemicals (including dosing and cleaning) are common sources that can be overlooked.

Design Considerations

Laboratory and metallurgist advice is highly recommended for installations due to the possible complexities for successful long term management. One or all of the following can affect the performance and requires careful review:

- Grade - Each grade of stainless has a different resistance. Eg 2205 has a higher resistance to chlorides than 316; 316 has a higher resistance to chlorides than 304.
- Temperature – higher the temperature, the lower the resistance to chlorides.
- Concentration – the higher the concentration, the lower the resistance to chlorides.
- Exposure – the greater contact time (eg stagnant water), the lower the resistance.
- Solution pH – Acidity and alkalinity effect the resistance (pH 7 = neutral).

Water Sample Testing

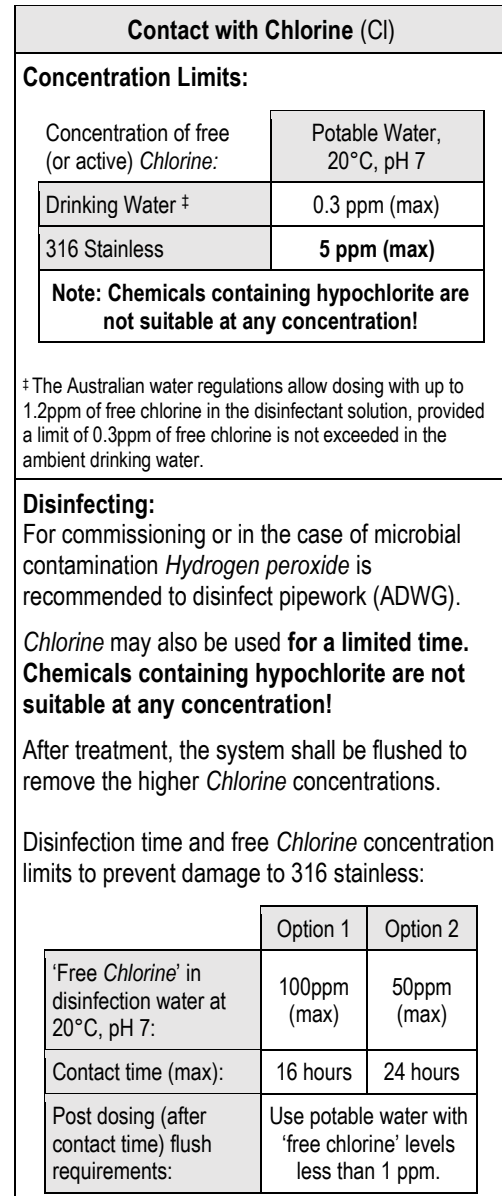
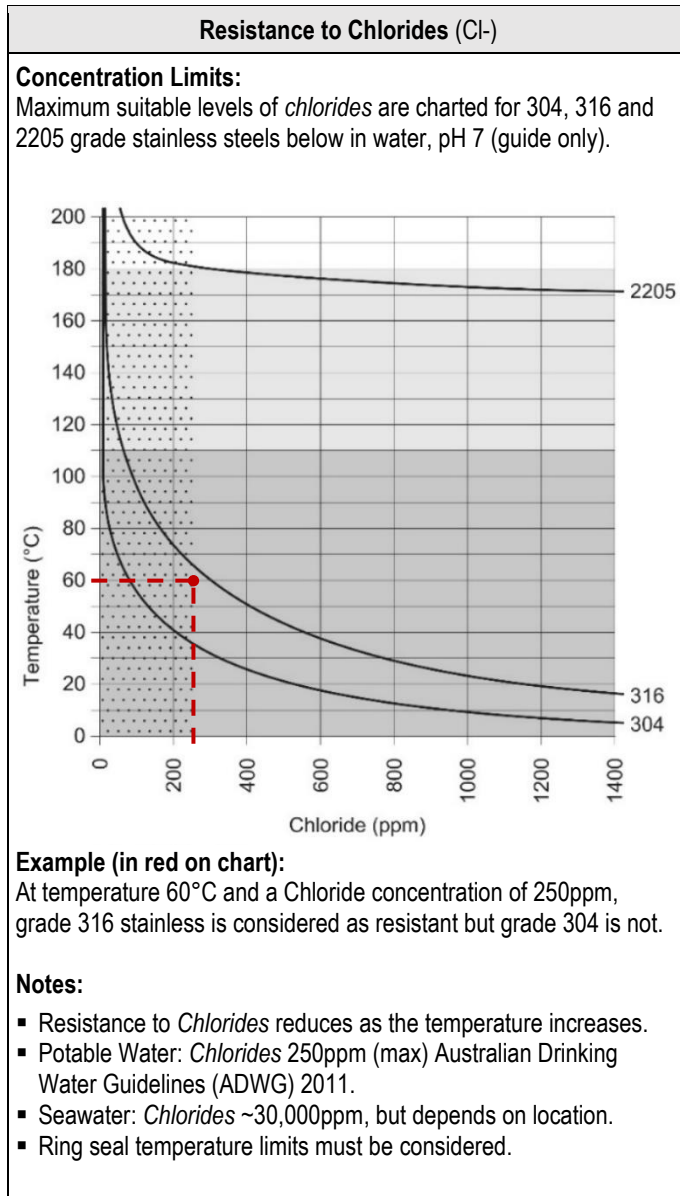
Several samples of the actual project water before installation is highly recommended as other chemicals in the water can alter values. Refer to our AusPress “Water Analysis Testing Guide” document for procedures and a range of tests recommended for different water types.

Collecting the samples: All water collection procedures must be documented and collected in accordance with best practices (incl: purge line, rinse with test waters, empty bottle, collect sample, seal & label bottle with location and time taken, deliver for collection ASAP).

External Resistance

Stainless can be exposed to chlorides from the external environment and insulation lagging effecting the outer surface of the material. Preventative measures include:

- Specify 'low chloride' insulation products or separate by wrapping (protecting) the stainless first with a barrier (eg petroleum based tape wrap or plastic film). – see Tech Note “TN.04” regarding insulation & stainless steel for specifics.
- For coastal and industrial locations, include a wash and rinse process as part of a regular maintenance programme where salts exposure is present for external surfaces.
- High water table and soil chloride levels are recommended to be tested by a NATA certified laboratory– contact us if these conditions are present before installation.
- For reactive soil situations, lining the trench with geotextile fabric, then a bed and pipe cover of pH neutral sand (min pipe surround of 100mm), geotextile top cover to encase the sand then backfill can offer additional protection from the existing soil. Note press-fit is not recommended to be buried bare – refer Tech Note TN.07.
- Cleaning agents, such as sanitisers, shall have their suitability with stainless steel confirmed before application including rinsing requirements.

Concentrations – Chlorides and Chlorine

Stagnant Water

If the system is to be emptied again after a water pressure test or not to remain completely full of water, it is advisable to conduct the pressure test with air in order to avoid an increased risk of damage to the stainless steel. The same risk exists if the system is drained or partially drained for maintenance for an extended period of time.

Water Hardness

Hard water can cause build-up of solids within the pipework, accelerates as temperature increases, generally from CaCo₃ concentration. Classes: 0 - "soft" - 60 - "medium" - 120 - "hard" - 180ppm. Adelaide: 134-148ppm; Melbourne: 10-26ppm; Perth: 29-226ppm; Brisbane: 100ppm.