



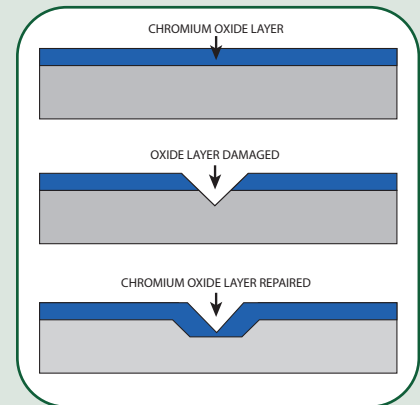
## MAINTAINING & REPAIRING STAINLESS STEEL

### IT'S THE CHEMISTRY THAT MAKES STAINLESS STEEL "STAINLESS"

The term "stainless steel" is used to describe more than two hundred different grades, with each one tailored to give outstanding performance in specific applications. All metals react with oxygen in the air or water to form a film or oxide on the surface. The oxide formed on ordinary steel allows the oxidation to continue producing the typical rusty appearance. However, since stainless steels contain more than 10.5% chromium, the characteristics of the oxide are changed. The chromium reacts with oxygen in the air or water to form the protective passive layer. The passive film is self-healing (in most situations) if damaged. Nickel improves corrosion resistance and formability, and molybdenum improves resistance to localized corrosion.

Stainless steel surfaces can show rusty stains if ferrous contamination on the surface prevents the formation of a continuous passive film. Furthermore, accumulation of dirt may lead to concentrations of corrosive substances that can break down the passive film.

This bulletin outlines some methods to avoid iron contamination on stainless steel surfaces, along with methods of cleaning stainless steels.



### CORROSION PREVENTION

- 1. Keep stainless steel and carbon steel fabrication areas separate.** This step reduces the risk of iron contamination. Iron particles can embed into the stainless steel and damage the oxide layer. This could produce localized or pitting corrosion at the site of contamination.
- 2. Avoid grinding of carbon steels near stainless steels.** Grinding can embed carbon steel into the stainless steel causing staining and localized corrosion.
- 3. Keep stainless and carbon steel inventories separate.** This reduces the risk of iron contamination as described in point 1.
- 4. Steel bands are routinely used to secure fabricated parts to skids and other packaging used to transport.** Place cardboard or other appropriate packaging material on top of stainless steel parts, and then wrap the steel bands on top of this packing material, preventing the carbon steel band from making direct contact with the stainless steel.
- 5. Use stainless steel processing and handling equipment when possible.** Use work table bearers, non-metallic contact materials, and vacuum lifting equipment.
- 6. Do not allow your completed fabrications to ship untarped.** Road salts contain high levels of chlorides — a chemical that can produce corrosion in stainless steels. Moreover, do not allow steel chains to come in contact with stainless steel.



## REPAIR & MAINTENANCE

Inevitably, it becomes necessary to take steps to maintain and repair the chromium oxide layer. Simple maintenance processes can enhance the luster and extend the life-cycle.

**Pickling and passivation of stainless steel fabrications can be used to remove contaminants** on the surface of the metal. Pickling is used for contamination such as embedded iron. Passivation removes surface chemicals and other contaminants. The passivation process helps in the formation of a tenacious protective chromium oxide film. There are a number of specifications commonly governing stainless steel passivation.



*Staining from iron contamination  
Salt / chlorides present*



*Surface after passivation*

**ASTM A380** - Practice for Cleaning, Descaling and Passivating of Stainless Steel Parts, Equipment and Systems

**ASTM A967** - Specification for Chemical Passivation Treatments for Stainless Steel Parts (based on US Defense Department standard QQ-P-35C)

## CLEANING STAINLESS STEELS

How often should stainless steels be cleaned? The answer is quite simply: "Clean the metal when it is dirty in order to restore its original appearance." This may vary from one to four times a year for external applications, or it may be once a day for an item in hygienic or aggressive situations. In many applications the cleaning frequency is after each use.

Routine Cleaning All finishes	Use soap or mild detergent and water (preferably warm)	Sponge, rinse with clean water, wipe dry if necessary. Follow polish lines.
Fingerprints All finishes	Soap and warm water or organic solvent (e.g., acetone, alcohol, methylated spirits)	Rinse with clean water and wipe dry. Follow polish lines.
Stubborn Stains and Discoloration All finishes	Mild cleaning solutions, specialty stainless steel cleaners	Use a sponge, rag or fiber brush (soft nylon or natural bristle). Rinse complete with clean water. Wipe dry. Follow polish lines.
Lime Deposits from Hard Water	Solution of one part vinegar to three parts water	Soak in solution then brush to loosen. Rinse well with clean water.
Oil or Grease Marks All finishes	Organic solvents (e.g., acetone, alcohol, methylated spirits, proprietary "safety solvents"); baked-on grease can be softened beforehand with ammonia	Clean after with soap and water, rinse with clean water and dry. Follow polish lines.
Rust and other Corrosion Products  Embedded or Adhering "Free Iron"	Rust stains can be removed by adding one part of nitric acid to nine parts of warm water. Leave for 30 to 60 minutes, then wash off with plenty of water, and flush any drains thoroughly. See also previous section on Passivating.	Rinse well with clean water. Wear rubber gloves, mix the solution in a glass container, and be very careful with the acid. (See Precautions for acid cleaners.)
Dark Oxide From Welding or Heat Treatment	"Pickling Paste" or pickling solutions	Must rinse carefully, and use care in handling. Dispose of solutions according to environmental regulations.
Scratches on Polished (Satin) Finish	Slight scratches – use impregnated nylon pads. Polish with scurfs dressed with iron-free abrasives for deeper scratches. Follow polish lines. Then clean with soap or detergent as for routine cleaning.	Do not use ordinary steel wool – iron particles can become embedded in stainless steel and cause further surface problems. Stainless steel and "Scotch-brite" scouring pads are satisfactory.

Penn Stainless Products is providing this guide on an informational basis only. When selecting specific cleaners or cleaning processes, we strongly recommend that you work with an expert in the field of stainless steel maintenance and follow all directions supplied by the manufacturer of any cleaning solutions used.



**Penn Stainless Products, Inc** • 190 Kelly Road • Quakertown, Pennsylvania 18951 USA  
Toll Free: 1-800-222-6144 • Phone: 215-536-3053 • Fax: 215-536-3255 • E-mail: sales@pennstainless.com

**WWW.PENNSTAINLESS.COM • WWW.PIPEANDTUBES.COM**