Recommended Preventitive Maintenance for Leda Stainless Steel Products

INTRODUCTION

LEDA SECURITY PRODUCTS

Leda stainless steel bollards and bike parking products are often manufactured and supplied from Grade 304 stainless steel. Grade 316 is available if specified, and is recommended for installations within 2 kilometres of the coast. Discolouration or 'tea staining' of stainless steel is often seen around coastal locations and can get progressively worse closer to the ocean, in higher temperatures or with exposure to wind. For these aggressive environmental conditions, Leda recommends electropolishing (pickling) as an alternative treatment and finish.

The electropolishing process involves immersing the finished stainless steel product in a nitric and hydrofluoride bath to pickle and passivate the metal surface and remove any contamination caused by the fabrication process.

While correct specifications and smoother surface finishes like electropolishing help minimise this staining, regular cleaning (2-3 times per year) of stainless steel surfaces is recommended.

Leda's Care and Maintenance of Stainless Steel Products provides a helpful guide to cleaning procedures and methods, and can be downloaded from the Leda website.

MAINTENANCE OF STAINLESS STEEL PRODUCTS

When using proprietary cleaners it is essential that very low or zero chloride contents are present. Both Ajax “Spray & Wipe” (Colgate-Palmolive) and “Windex” (Johnsons Wax) claim suitability for use on stainless steel, but we do not have a guarantee of chloride level. 3M’s domestic “Scotch Brite Pads” seem very good for cleaning provided they are used gently and not on polished stainless steel.

The cleaning procedure needs to be qualified as to whether it is being applied to:

1. Physical removal of deposits and their type, e.g. fingerprints, atmospheric deposits, surface corrosion products, organic material or building materials.

2. Maintenance of an architectural finish.

3. The original surface finish of the stainless steel.

CLEANING

Stainless steel is often thought to be a maintenance-free material. Unlike gold and platinum, however, it is not a metal that never rusts and is not completely maintenance-free. Rather, it should be termed a building material whose beauty can be retained semi- permanently with proper cleaning and maintenance in addition to considerations as cited above, regarding design, fabrication and installation.

Generally, special stainless steels with excellent corrosion resistance should be used for building entrance applications in seashore areas. A proper cleaning and maintenance routine, however, permits the use of common grades such as S30400 and S316 00.

The cleaning frequency varies according to the geographical location, building element and structure the general cleaning criteria are:

2 times/year for rural areas

3 times/year for other areas.

A more frequent cleaning routine is advisable for more corrosive environments, however, such as seashore areas, laden heavily with wind-borne sea salt particles, areas near railroad tracks or iron works laden heavily with airborne iron particles, and volcanic areas. Even in less corrosive environments – eaves, soffits, undereave components and other building components – on which pollutants readily accumulate, should be cleaned more frequently.

REQUIREMENT	SUGGESTED METHOD	COMMENTS
Routine cleaning of light soiling.	Soap, detergent or dilute (1%) ammonia solution in warm clean water. Apply with a clean sponge, soft cloth or soft-fibre brush then rinse in clean water and dry.	Satisfactory on most surfaces.
Fingerprints	Detergent and warm water. Alternatively,Hydrocarbon solvent.	Proprietary spray-applied polishes availableto clean and minimise remarking.
Oil and grease marks.	Hydrocarbon solvent.	Alkaline formulations are also available with
Stubborn spots, stains and lightdiscolouration. Water marking. Light rust-staining.	Mild, non-scratching creams and polishes.Apply with soft cloth or soft sponge, rinse off residues with clean water and dry.	Avoid cleaning pasts with abrasive additions.Cream cleaners are available with soft calcium carbonate conditions.Avoid chloride containing solutions.
Localised rust stains caused bycarbon steel contamination.	Proprietary gels or 10% phosphoric acidsolution (followed by ammonia and water rinses) or oxalic acid solution (followed by water rinses).	Small areas may be treated with a rubbing-block comprising fine abrasive in a hard rubber or plastic filler. Carbon steel wool should not be used, nor should pads that have previously been used on carbon steel. A test should be carried out to ensure that the original surface finish is not damaged.
Adherent hard water scales andmortar/cerrent splashes.	10-15% volume solution of phosphoricacid. Use warm, neutralise with diluted ammonia solution, rinse with clean water and dry.	Proprietary formulations available withsurfactant additions.Avoid the use of hydrochloric acid-based mortar removers.
Heat tinting or heavy discolouration.	a) Non-scratching cream or polish.Apply with soft cloth or soft sponge. Rinse off residues with clear water and dry. b) Nylon-type pad.	a) Suitable for most finishes. b) Use of brushed and polished finishes along the grain.
Badly neglected surfaces withhardened accumulated grime deposits.	A fine abrasive paste as used for car body refinishing. Rinse clean to remove all paste material and dry.	May brighten dull finishes. To avoid apatchy appearance, the whole surface may need to be treated.
Paint, graffiti.	Proprietary solutions or solvent paint stripper depending upon paint type. Use soft, nylon or bristle brush on pre-treated material.	Apply as directed by manufacturer.

ENIVORNMENT	WASHING INTERVALS TYPE 304	 TYPE 304
Clean inland environment.	3-6 months.	6-12 months.
Polluted urban environment or industrial atmosphere.	Unsuitable	6-12 months.
Coastal atmosphere.	Unsuitable	3-6 months.

Washing is best carried out with soap or a mild detergent and warm water, followed by rinsing with clean cold water. The appearance of the surface can be improved further if the washed surface is wiped dry.

ROUTINE CLEANING AND MAINTENANCE

Both exterior and interior building components require routine cleaning, the frequency of which is dependent upon environmental conditions and aesthetic requirements.

Well-designed facades will be effectively cleaned by rain reducing the amount of supplemental, routine cleaning to once or twice a year (about as often as the windows).

When severe environmental conditions are encountered (such as high chloride, marine environments or environments that may be compounded by high concentrations of aggressive pollutants) or where design uses the rain less efficiently, more frequent washing may be necessary and a guide is provided.

For heavier soiling, pressure jet cleaning with hot water to remove material, followed by rubbing with a suitable mild-abrasive cleaner, a water rinse and drying should do. Cleaners containing harsh abrasive should be avoided. If left on the surface chlorine compounds, in many cleaning compounds, may cause corrosion and cleaners with these substances should be avoided.

Special care must be taken with chemically coloured or painted stainless steel. Providing care is taken not to damage the surface the method detailed as follows, is suitable:-

1. Rinse with water to remove loose dirt.
2. Wash with water containing soap, detergent or 5% ammonia, using a soft long fibre brush if necessary.
3. Rinse with water.
4. If required, remove water with overlapping strokes, working from top to bottom .

For more heavy soiling, pressure jet cleaning will not be appropriate. Hosing with water and detergent, and if necessary, gentle rubbing with a soft cloth sprinkled with fine calcium carbonate powder (200 mesh or finer), could be tried, but this could take the gloss off if done too vigorously or frequently and professional cleaning advice should be sought.

WHAT CAUSES STAINLESS STEEL TO STAIN OR CORRODE?

A stainless steel may be discoloured by tea staining

- If it is exposed to a more aggressive environment than that for which that particular grade of steel is intended, e.g. highly polluted air, salt solutions or residues of cleaning agents containing chlorine
- If it has a rough surface finish that provides a foothold for corrosive substances and corrosion products from the surroundings
- If the design of the structure is inappropriate, with pockets and narrow gaps
- If the surface is contaminated by grinding swarf and other iron particles from tools used in the installation work
- If fasteners of ordinary steel are used for securing the material, or if the material comes into direct contact with adjacent components made of plain carbon steel in wet or humid conditions.

The risk of corrosion in the first three situations is highest for the lower -alloy stainless steel grades and can be reduced substantially right from the start by specifying molybdenum alloyed stainless grades (such as type 316). In the last two cases, the surface of the stainless steel will be discoloured by rust from the plain carbon steel.

ENVIRONMENT	RURAL (INCLUDING SUBURBAN AND RESIDENTIAL AREAS)				SEASIDE (INCLUDING INDUSTRIAL AND SEVERE URBAN AREAS)			
Building element	Roof and wall washed by rain water		Eave soffit and under-eave wall unwashed by rain water		Roof and wall washed by rain water		Eave soffit and under-eave wall unwashed by rain water	
Structure	Deposits Unaccumulated	Deposits Accumulated	Deposits Unaccumulated	Deposits Accumulated	Deposits Unaccumulated	Deposits Accumulated	Deposits Unaccumulated	Deposits Accumulated
Cleaning criterion	1 time/year	1 time/year	1-2 times/year	1-2 times/year	1 time/year	1 time/year	3-4 times/year	4-12 times/year

Note: Cleaning involves washing with potable, low-chloride water or washing with a neutral detergent followed by rinsing with potable water.

WIDELY used in outdoor electronic security applications, stainless steel is not meant to corrode but in extreme environments, particularly in coastal areas, it often does. Stainless steel doesn't rust in layers as iron or steel will. Instead, corrosion will occur in one spot, with holes called pits carving through bolts or brackets, causing leaks that further weaken the metal, or stress points from which the steel will crack or tear. The cause of this pitting has long been a mystery - a mystery now solved by the Imperial College and the University College in London.

Stainless steel was first made in Sheffield, England, in 1913 using an alloy of chromium and iron, and it's this combination of metals that ensures the presence of flaws. When stainless steel is cooling after a pour, microscopic sulphur-rich impurities solidify at temperatures lower than the surrounding steel and are molten after the rest of the metal has hardened. Using advanced microscopy, the research team found that around each ofthese particles of impurity lies a shell of steel one millionth of a metre thick. This shell contains so little chromium it isn't stainless steel at all. The team found that during the cooling process the impure particles physically sucked chromium out of the steel surrounding them, creating spherical shells of plain steel. As these plain steel shells corrode, pitting drills down through successive particles, compromising the metal structure.

The British team has suggested using heat treatments after processing to allow chromium-depleted sites to be replenished. The other obvious alternative is to use low-sulphur steel but it's much more expensive to produce."

Security Electronics Magazine, March 2002 issue, "Techno file"page 16.

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