



Care and Maintenance of Stainless Steel

Introduction

Stainless steels are selected in applications where their inherent corrosion resistance, strength and aesthetic appeal are required.

However, dependent on the service conditions, stainless steels will stain and discolour due to surface deposits and so cannot be assumed to be completely maintenance free. In order to achieve maximum corrosion resistance and aesthetic appeal, the surface of the stainless steel must be kept clean. Provided the grade of stainless steel and the surface finish are correctly selected, and cleaning schedules carried out on a regular basis, good performance and long service life will result.

Factors Affecting Maintenance

Surface contamination and the formation of deposits must be prevented. These deposits may be minute particles of iron or rust from other sources used on the building of new premises and not removed until after the stainless steel items have been fixed. Industrial and even naturally occurring atmospheric conditions can produce deposits, which can be equally corrosive, e.g. salt deposits from marine conditions.

Working environments can also provide aggressive conditions such as heat and humidity, in a swimming pool buildings. These conditions can result in surface discoloration of stainless steels and so maintenance on a more frequent basis may be required.

Modern processes use many cleaners, sterilizers and bleaches for hygienic purposes. Proprietary solutions, when used in accordance with makers' instructions, should be safe but if used incorrectly (e.g. warm or concentrated), may cause discolouration or corrosion on stainless steels. Strong acid solutions are sometimes used to clean masonry and tiling of buildings. These acids should never be used where contact with metals, including stainless steel is possible, but if this happens, the acid solution must be removed immediately, followed by dilution and rinsing with clean water.

Maintenance Programme

With care taken during fabrication and installation, cleaning before "hand-over" should not present any problems. More attention may be required if the installation period has been prolonged or hand-over delayed. Where surface contamination is suspected, immediate cleaning after site fixing should avoid problems later. Food handling, pharmaceutical, aerospace and certain nuclear applications required extremely high levels of cleanliness applicable to each industry.

The frequency of cleaning is dependent on the application; a simple rule is; "Clean the metal when it is dirty in order to restore its original appearance".

This may vary from once to four times a year for external applications, but may be daily for items in "hygienic" applications. Recommendations on cleaning frequencies in architectural applications are shown in Table 2.



Cleaning Methods

Stainless steel is easy to clean. Washing with soap or mild detergent and warm water followed by a clear water rise is usually quite adequate for domestic and architectural equipment.

Where stainless steel has become extremely dirty with signs of surface discolouration (perhaps following periods of neglect, or misuse) alternative methods of cleaning can be used, as outlined in the Table 1

Table 1 Summary of Cleaning Methods for Stainless Steels

| Requirement | Suggested Method ^{1,2} | 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-fibrebrush then rinse in clean water and dry | Satisfactory on most surfaces |
| Fingerprints | Detergent and warm water, alternatively, hydrocarbon solvent | Proprietary spray-applied polishes available to clean and minimise remarking |
| Oil and grease marks | Hydrocarbon solvents (methylated spirit, isopropyl alcohol or acetone) ² | Alkaline formulations are also available with surfactant addition e.g. "D7" Polish ¹ |
| Stubborn spots, stains and light discolouration Water marking. Light rust staining | Mild, non-scratching creams and polishes. Apply with soft cloth or soft sponge and rinse off residues with clean water and dry ^{6,7} | Avoid cleaning pastes with abrasive additions. ³ Suitable cream cleansers are available with soft calcium carbonate additions, e.g. "Cif", or with the addition of citric acid, e.g. "Shiny Sinks" ¹ Do not use chloride solutions ^{8,9} |
| Burnt on food or carbon deposits | Pre-soak in hot water with detergent or ammonia solution. Remove deposits with nylon brush and fine scouring powder if necessary. Repeat if necessary and finish with " routine cleaning" | Abrasive scouring powder can leave scratch marks on polished surfaces |
| Tannin (tea) stains and oily deposits in coffee urns | Tannin stains - soak a hot solution of washing soda i.e. sodium carbonate Coffee deposits - soak in a hot solution of baking soda (sodium bicarbonate) | These solutions can also applied with a soft cloth or sponge. Rinse with clean water. Satisfactory on most surfaces. |
| Adherent hard water scales and mortar/cement splashes | 10-15 volume % solution of phosphoric acid. Use warm neutralise with dilute ammonia solution, rinse with clean water and dry ⁶ . Alternatively soak in a 25% vinegar solution and use a nylon brush to remove deposits | Proprietary formulations available with surfactant additions Take special care when using hydrochloric acid based mortar removers ^{8,9} |
| Heating or heavy discolouration | a) Non-scratching cream or polish e.g. Solvol Auto Chrome Metal Polish ^{1,9} b) Nylon-type pad, e.g. 'Scotchbrite' ^{3,4,5} | Creams are suitable for most finishes, but only use "Solvol" on bright polished surfaces. Some slight scratching can be left. Use on brushed and polished finishes along the grain. |
| Badly neglected surfaces with accumulated grime deposits | A fine, abrasive paste as used for car body refinishing, e.g. 'T-cut' rinsed clean to remove all paste material & dried ¹ | May brighten dull finishes To avoid a patchy appearance, the whole surface may need to be treated |
| Paint, graffiti | Proprietary alkaline or solvent paint strippers, depending upon paint type. Use soft nylon or bristle brush on patterned surfaces | Apply as directed by manufacturer |



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Table 2 Cleaning Frequency in Architectural Applications for Common Stainless Steel Grades Specified (See Ref. 2)

| Location | 1.4016 (430) | 1.4301 (304) | 1.4401 (316) |
|---------------------|--|-----------------------|---------------------|
| Internal | As required to maintain appearance or design | | |
| Suburban or rural | 6-12 month intervals (as appropriate to location and design) | | |
| Industrial or urban | Grade not recommended | 3-6 months | 6-12 months |
| Coastal or marine | Grade not recommended | Grade not recommended | 6-12 months |

Notes

1. The products referenced in this information sheet are understood to be suitable for stainless steels. However, no endorsement of the products or their manufacturers is implied and it is acknowledged that other manufacturing companies may provide products of equal or better quality.
The following companies manufacture proprietary names mentioned: -
"Cif" (Jif) - Lever Brothers Ltd
"Shiny Sinks" - Home Products Ltd
"Ajax" - Colgate Palmolive Ltd
"D7 Stainless Steel Polish" - Diversey Ltd
"T-Cut" - Automotive Chemicals Ltd
"Solvol Auto Chrome Metal Polish" – Hammerite Products Ltd
2. Cleaning agents should be approved for use under the relevant national environmental regulations and, in addition, prepared and used in accordance with the manufacturers or suppliers' health & safety instructions. Solvents should not be used in enclosed areas.
Before commencing any task ensure that you have received the appropriate health and safety literature from the supplier and fully understand it. If in doubt seek advice.
3. Nylon abrasive pads should be adequate for dealing with most deposits. If a more severe treatment is needed to mask coarse scratches or physical damage on a surface, use the finest abrasive medium consistent with covering the damage marks. With directional brushed and polished finishes, align and blend the new "scratch pattern" with the original finish, checking that the resulting finish is aesthetically acceptable. Silicon carbide media may be used, especially for the final stages of finishing. Avoid using hard objects such as knife blades and certain abrasive/souring agents as it is possible to introduce surface scuffs and scratches. Scratching is particularly noticeable on sink drainer areas. These are usually superficial and can be removed with proprietary stainless steel cleaners or, alternatively, with a car paint restorer, such as "T-cut".
4. If wire brushes are used, these should be made of a similar or better grade of stainless steel. Ensure that all abrasive media used are free from sources of contamination, especially iron and chlorides
5. When cleaning a surface with any chemical preparation or abrasive medium, a trial should be done on a small, unobtrusive hidden or non-critical area of the surface, to check that the resulting finish matches with the original.
6. To avoid water marks, use clean rinsing water, such as reasonable quality potable (tap) water. Drying marks may be avoided using an air blower or wiping with clean disposable wipes.
7. Rust marks or staining on stainless steels is unlikely to be the result of corrosion to the stainless steel itself (similar marks may also be found on porcelain and plastic sinks). These marks are likely to result from small particles of "ordinary" (non-stainless) steel from wire wool or scouring pads becoming attached or embedded in the surface. In the damp environment of a sink, these iron particles rust and cause staining. Rust marks may be removed using non-scratching creams or alternatively using an oxalic acid solution, where iron particles have been embedded in the surface. Special precautions are necessary with oxalic acid, as, although it may not "burn" unprotected skin, it is poisonous, if ingested



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8. Chloride-containing solutions, including hydrochloric acid-based cleaning agents and hypochlorite bleaches can cause unacceptable surface staining and pitting, and should not be used in contact with stainless steels. Under no circumstances should concentrated bleaches contact decorative stainless steel surfaces. Hydrochloric acid based solutions, such as silver cleaners, or building mortar removal solutions must not be used in contact with stainless steels. Hypochlorite containing bleaches must be used in the dilutions suggested in the manufacturers' instructions and contact times kept to a minimum. Thorough rinsing after use is very important. A frequent cause of staining and micropitting of stainless steels is splashing with undiluted bleach solutions and mortar cleaners. Soaking stainless steel sinks or cookware in dilute bleach solutions for long periods e.g. overnight is not advisable. Similarly, common salt added during cooking or concentrated salt/vinegar mixtures may cause pitting over a period of time. It is good practice to wash stainless steel surfaces after food preparation and cooking.
9. Heavy heat tinting (oxidation) of stainless steel surfaces is unlikely to be encountered in normal use. Normally repeated cleaning with non-scratching creams should remove burn marks from stainless steel cookware, but in exceptional cases, (e.g. after a repair requiring welding or after fire damage) it may be necessary to clean these areas using nitric acid-hydrofluoric acid pickling pastes or a nitric acid passivation solution. Changes in surface appearance usually result when cleaning with these acids. Strong acids should only be used for on-site cleaning when all other methods have been proved unsatisfactory. Nitric and phosphoric acids can be used with care for cleaning and maintenance on stainless steels but sulphuric and hydrochloric acids can be very corrosive and should not be used for cleaning and maintenance of stainless steel items. Citric acid cleaners are less potentially hazardous. Rubber gloves should be used when handling strong acids and care taken to avoid spillage over adjacent areas (see note 2).
10. If all the suggestions and actions in the table have been attempted unsuccessfully, it is worth bearing in mind that stainless steel can be mechanically polished or electropolished by specialists on site. Stainless steel is homogenous and does not rely on surface plating or its corrosion resistance. If in difficulty please contact the BSSA for more details:
BSSA, Park Suite, Forsyth Enterprise Centre, Bramall Lane, Sheffield S2 4SU
Phone: +44 (0)114 292 2636 Fax: +44 (0)114 292 2633
Email: admin@bssa.org.uk

References

Assessment of Cleaners and Polishes for use on Stainless Steels
British Steel Swinden Technology Centre – Confidential Report SL/SSE/RGC/S1147/1/97/R
PF Freeman

Architects Guide to Stainless Steel
Steel Construction Institute – SCI-P-179
N Baddoo, R Burgan, R Ogden

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