Architecture, Building & Construction

Cleaning and maintaining stainless steel

With appropriate specification, stainless steel can last the life of a building. However, as with any other material, unsightly surface deposits can accumulate after many years of service. Accidents, vandalism, use of inappropriate cleaning procedures, and installation issues can make surfaces unsightly, cause damage, or even lead to rapid surface corrosion. Surface restoration is often possible with the right remediation approach.

By Catherine Houska

In exterior environments, sheltered areas (e.g., balconies or the lower floors on high-rises) can face more aggressive environments because rainwater has not had time to wash off corrosive surface deposits. A more corrosion-resistant stainless steel, smoother finish, and/or increased maintenance may be necessary to retain an attractive appearance.

One should always request the cleaning product’s Generally Hazardized System of Classification and Labelling of Chemicals (GHS) information or material safety and data sheet (MSDS), and avoid chemicals containing “chlorine” (i.e., chlorides), acids, particulate, and anything potentially corrosive or abrasive. When there are concerns, a stainless steel supplier, industry association, or consultant can review the product chemistry before it is used. (A cleaning company, blogger, or random website does not necessarily understand metal corrosion or specialized finishes.)

Proprietary detergent and water solutions, including those used for automotive or dishwasher, and ‘environmentally friendly’ cleaning products containing hydroponic peroxide, vinegar, or similar chemicals are also used. The detergent should contain both a surfactant and degreaser, not leave a coating on the surface, and preferably be chlorine-free and pH-neutral (i.e., non-acidic). Many cleaning products and wipes contain chloride compounds, such as bleach (sodium hypochlorite). If such products are used, the chloride or bleach content should be less than three percent, and thorough rinsing to remove the chlorides is critical. Bleach concentrations of five percent or higher cause corrosion of commonly used stainless steels like Type 304/304L at room temperature, so it is critical not to let solutions dry and concentrate.

Wash water

Clean, potable water is used for rinsing surfaces after most cleaning procedures, but it is important to check the water’s chemistry. The U.S. Environmental Protection Agency (EPA) suggests no more than 250 ppm for chlorides and 500 ppm for total dissolved solids (TDS) for human consumption, but there are no hard maximums. In some areas, these levels are much higher, which could add to both corrosion and hard water staining problems. Suitable water may need to be purchased or a reverse-osmosis (RO) system installed. It is important never to use natural untreated, industrial, or swimming pool water. When acidic cleaning products are used, the rinse water should have a maximum TDS content of 200 ppm or be de-ionized, distilled, or RO water—otherwise, hard water staining occurs (Figure 2). While it can be removed, opting for avoidance is far more cost-effective.

Applying cleaning products

Even durable finishes can be damaged with inappropriate cleaning methods – this is a particular concern for fragile mirror and colored finishes. Too often, ‘cleaning’ is attempted with abrasives only appropriate for refinishing. One should use a new or clean, soft, lint-free cloth or a clean sponge reserved for exclusive use on stainless steel. It is critical to avoid cleaning products used on other materials, such as carbon steel.

Products that can potentially change the finish appearance, or contaminate the surface with iron, include:
• abrasive abrasives pads (e.g., sandpaper or non-metallic abrasives);
• metal scrapers, brushes, or wool pads;
• coarse abrasive powders; and
• abrasive blast media. (See Figures 3 and 4.)

Mild detergent and degreaser solutions will increase cleaning effectiveness. If there are chlorides (coastal or de-icing salts) on the surface, cleaning effectiveness is improved by a proprietary additive specially formulated to improve removal.

Heavy fingermarks, grease, and oil

Heavy grease and oil deposits can be removed with vapor or steam degreasing, high pressure water jets, or alkaline or emulsion cleaners. Hot-water power-washing with a mild detergent or oil-free citric acid solution can also be effective. Some household oil-free citric acid cleaners and degreasers effectively remove many heavier fingermarks, oil, and lighter grease deposits.

Proprietary industrial strength degreasers, such as alkali formulations with surfactant additions, are effective on heavier oil and grease deposits. Any new product should be tested on a small stainless steel surface before use to ensure it does not cause color change. Manufacturer instructions for application and surface rinsing must also be followed.

Clear coatings, oil, and wax

Stainless steel provides the best corrosion resistance when the surface is clean and exposed to oxygen. Clear coatings prevent oxygen exposure and can potentially cause corrosion problems and increase maintenance costs. The most problematic coatings are those that peel or delaminate; they create crevices as they fail, increasing corrosion problems.
Coatings increase surface reflectivity and can yellow over time. When applied in the field, service life is typically relatively short; repeated removal and replacement can be more expensive than simple cleaning. Further, some require such hazardous chemicals for removal that contractors frequently remove them by abrasion, destroying the initial surface.

If a coating must be applied to hide fingerprints or improve corrosion performance, one should select products that naturally dissipate or are easily removed to avoid finish damage. Examples include oil, wax, and silicon mixtures. With the exception of lanolin, which is dry and adds natural corrosion protection, oils should not be used in exterior applications, swimming pool environments, or any other location with airborne dust or corrosive substances (e.g., salt or pollution), as they increase surface accumulations and can cause corrosion. Carnauba wax and similar automotive waxes that dry hard are also acceptable, but do not provide a corrosion-inhibitor. Oil, wax, and silicon coatings can be removed by wiping off with a cloth where fingerprinting is a concern. It is important to select products carefully since some do not harden and accumulate dirt (Figure 6).

Adherent deposits
Degreasers can be very helpful in loosening some adherent deposits not involving adhesives. If the finish is not mirror-like, colored, or coated, then very fine abrasive powders suitable for cleaning glass can be effective when made into a paste and gently rubbed on the surface. (They should first be tested on a small area to make certain no surface damage occurs.) The surface must be rinsed thoroughly to remove the white powder residue. A soft cloth or nylon brush can be used to loosen the powder. Calcium carbonate, which is used in toothpaste, a preferred base for pastes, does not scratch most finishes and is environmentally neutral. Fine crystalline silica, pumice powders, and baking soda (sodium bicarbonate) are also used. Coarse scouring powders should be avoided as they can contain bleach and can scratch surfaces.

Adhesive removal
Removal of residual adhesive deposits from protective stripable films, posters, and other sources can usually be accomplished without damaging the stainless steel surface. If the supplier can be identified, it should be contacted for removal advice. Several different adhesives are used in construction, and the appropriate removal products vary. When recently applied, some can be removed with an eraser, mild detergent, vinegar (or ammonia), and water mixture. Plastic bristle brushes and scrapers may assist in removal, but anything that could scratch the surface should be avoided. Non-toxic household adhesive removers are also often very effective. If the finish is not mirror-polished or colored, fine abrasive cleaners suitable for glass can be made into a paste and then gently rubbed on with the grain to assist in removal. A strong solvent may be required, but it should be tested on a small area in advance and washed off completely afterward (Figure 8).

Cement and mortar
If cement or mortar is accidentally spilled onto stainless steel, it should be washed off immediately with adequate water before it can set. Otherwise, removing solidified material can be difficult without causing surface damage. If the surface is smooth, it may fall off as it dries. Low-power washing can also be tried, with the water angled slightly to loosen the deposit edge. If the cement or mortar has been allowed to dry on the surface, dark, multi-color alkaline staining may be apparent on the stainless steel surface after the deposit is removed. This can be removed by rubbing a paste of fine abrasive powders and water on the surface. However, if the stainless steel surface is colored or coated with metal, permanent surface damage may occur (Figure 10).

Notes
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