



### Map of Corrosive Environments

Chicago is in a Severe Area

Illinois/Indiana/Ohio is in a Moderate Area



Washing or clean rain (NOT acid rain) will remove pollution and salt deposits

### HOW TO WASH STAINLESS STEEL

1. Rinse with clean water
2. Wash with mild soap or detergent
3. Wash with warm water followed by cold water
4. Wipe with a dry rag

Never use abrasives, chlorides, or bleach

### MINIMUM WASHING SCHEDULE

#### Washed by Rain:

City.....2 to 4x / year  
Suburbs.....1 to 2x / year

#### Under Cover:

City.....6 to 12x / year  
Suburbs.....4 to 12x / year



**Discuss The Need for Regular Maintenance with the client**



Stainless steel showing signs of discoloration is called "**Tea Staining**". This type of staining is only cosmetic and does not affect the structural integrity or the life expectancy of the steel. Tea staining is common in a salted and/or polluted environment, such as adjacent to a busy street and in an enclosed courtyard that does not receive periodical cleaning from clean rain or regular washing.



Stainless steels need to be cleaned for aesthetic considerations and to preserve corrosion resistance. Stainless steel is protected from corrosion by a thin layer of chromium oxide. Oxygen from the atmosphere combines with the chromium in the stainless steel to form this passive chromium oxide film that protects from further corrosion. Any contamination of the surface by dirt, or other material, hinders this passivation process and traps corrosive agents, reducing corrosion protection. Thus, some form of routine cleaning is necessary to preserve the appearance and integrity of the surface. When the contamination is left on the surface for an extended period of time, the chance of discoloration is to be expected.

In sheltered areas, such as building eaves, the surface will accumulate dust, car pollution, road salt and sidewalk salt. Building eaves are microclimates and tend to have higher temperatures and more moderate humidity levels than exposed locations. Moderate humidity levels (above 50%) and high temperatures produce higher corrosive rates. Therefore, sheltered building locations, have a higher probability of corrosion than exposed locations on the same building. If sheltered locations are not cleaned on a regular basis and salt (chlorides) are present, a more corrosion resistant stainless steel may be necessary.

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- ▶ Stainless steel is **LOW** maintenance, **NOT** maintenance free...Set expectations with your client / Architect
- ▶ Oil and waxes are discouraged as there are temporary and tend to attract pollutants
- ▶ Smoother stainless steel is better for drainage...a textured surface will hold moisture on the surface

### Atmospheric Conditions Which Cause "Tea Staining" Issues

- ▶ Pollutants, sulfur dioxide, deicing salts, road mist / wind, corrosive damp film, acid rain, sheltered locations – **NOT** washed w/ rain & higher humidity, moderate to high temperature & high humidity...are all causes of "Tea Staining"
- ▶ Pitting of stainless steel is typically caused by higher temperatures and high chloride concentration and are typically localized
- ▶ Surface orientation plays a small factor – horizontal surfaces will hold the corrosive film longer, no sun will prolong the issue
- ▶ According to IDOT in 2006, salt accumulation of deicing salts up to 1.2 miles away & as high as 59 floors above the street.

### Common Stainless Steel Types—Make Sure the Correct SS is Specified

There are many different types of stainless steel (over 100), all have their unique properties and corrosive resistance. There are 10 in common use, 5 of the most common are shown below:

- 304** – The most common, good corrosion resistance, easy to form and fabricate.
- 304L** – A low carbon version of 304...should be used when welding is to be done.
- 316** – Excellent for corrosive atmospheres - should be used in severe areas, under cover, etc.
- 316L** – A low carbon version of 316L...should be used when welding is to be done.
- 430** – Typically used for interior use, low corrosion resistance, is somewhat magnetic.

- ▶ 316 offers more corrosion resistance than 304 due to the addition of Molybdenum & a higher nickel content, which provides greater resistance to pitting & crevice corrosion in the presence of chlorides.
- ▶ Indiana Limestone Assoc. recommends 316 for locations with deicing salts and pollutions nearby



### Passivation and Pickling Stainless Steel—For Exterior Welds:

- ▶ If the welds are showing darker areas, these welds should be properly treated with Chemical passivation treatment which includes a mixture of Nitric & Hydrofluoric Acids or diluted Nitric Acid
- ▶ Passivation and Pickling restores the protective layer of stainless steel
- ▶ Passivation will not change the surface appearance of stainless steel, unless it has a bright finish (will make it cloudy)...Electroplating is recommended for bright surfaces
- ▶ Intermediate welds will create crevices and trap moisture—only install full welds
- ▶ Hydrochloric Acids will stain the stainless steel (masonry cleaning) - Always Protect
- ▶ *When cutting stainless steel, try and use aluminum oxide cutting wheels/blade*
- ▶ **Always request a chemistry certification with the stainless steel order showing that the stainless steel meets the requirements for the specified grade in accordance with ASTM A240**

