

# SURFACE PREPARATION

Proper surface preparation is of great importance in obtaining the optimum film performance. This page describes the initial surface treatment for steel plates, secondary surface treatment for fabricated steels, and the application of repair paint.

## A. INITIAL SURFACE TREATMENT FOR STEEL PLATES

The following initial surface treatment is to be applied to steel plates.

1. Oil or grease shall be removed by wiping or scrubbing the steel with clean rags or brushes wetted in solvent, as outlined by the STEEL STRUCTURES PAINTING COUNCIL - SURFACE PREPARATION SPECIFICATIONS, SP-1-63: "**SOLVENT CLEANING**". Deposits firmly adhering to the steel shall first be removed by scraping and shall then be cleaned using solvent.
2. Corroding salts, such as chlorides and sulphates, etc. on the steel's surface shall be rinsed-off with fresh water. Water and moisture shall be removed by wiping the steel using dry rags or by drying the steel with hot forced air.
3. All mill-scale, rust, rust scale, paint marks or foreign matter shall be removed by shot-blasting, grit-blasting, or sandblasting to meet the Swedish Standard SIS 055900 SA2.5 as recommended by the STEEL PAINTING COUNCIL - SURFACE PREPARATIONS SPECIFICATIONS, SP 10 - 63 T: "**NEAR-WHITE BLAST CLEANING**" or any other method of higher grade. For blasting at the time of new construction under well controlled conditions, a grade SA2.0 to SA2.5 is also acceptable in practice.
4. Before shop primer is applied, dust, sand residue, crushed steel shot or any grit and all other contaminants must be removed from the surface using a vacuum cleaner, air blower, etc.

## B. Secondary Surface Treatment For Fabricated Steel And The Application Of Repair Paint

Defective areas with damage and rust owing to gas cutting, welding, and stress relieving measures must be cleaned by blasting or with power tool cleaning. Degreasing and washing may also be necessary to clean the surface before the subsequent coats are applied. To do so, follow the steps below:

1. Remove corroding salts, chalk marks, soil or other contaminants and foreign matter by brushing the steel with a stiff fibre or wire brush or a combination of both.
2. Deposited oil and grease must be removed using solvent.
3. Use a power tool to clean rust and damaged paint film from areas suffering from stress relief, heat treatment applied to meet Swedish Standard SIS 05 5900 C ST3.0 as outlined by the STEEL STRUCTURES PAINTING COUNCIL - SURFACE PREPARATION SPECIFICATIONS SP 3-63: "**POWER TOOL CLEANING**". When using power tools to clean, use power sanders and/or power grinders. If the film of WILKOZINC shop primers has changed white in colour due to heat, remove loose zinc salts formed on the surface using a stiff fibre or wire brush.
4. Use a blast cleaner or power tool to remove weld flux slugs, weld metal spatters, weld flux fume deposits, rust and damaged paint film in welded areas. In this case, manual cleaning using a wire-brush or scraper is not efficient.
5. Use a vacuum cleaner to remove dust, sand residue, and other contaminants.

## C. Surface Preparation Standards

The following three standards are the most popular and widely applied:

SSPC      Steel Structures Painting Council  
ISO 8501-1   International Organisation for Standardisation  
BS4232      British Standards Institution

In Collaboration with:

**NIPPON PAINT**  
MARINE COATINGS CO., LTD.

## Marine & Protective Coatings

Below please note a table for the Surface Preparation Standards generally used in the marine and other industries:

SSPC STANDARD	DESCRIPTION	EQUIVALENT
<b>SP1</b> Solvent Cleaning	Removal of oil, grease, dirt, soil, salts and contaminants by cleaning with solvent, vapour, alkali, emulsion or steam	
<b>SP2</b> Hand Tool Cleaning	Removal of loose rust, mill scale and paint by chipping, scraping, sanding and wire brushing to a specific degree	ISO <b>St 2</b>
<b>SP3</b> Power Tool Cleaning	Removal of loose rust, mill scale and paint by power tool chipping, de-scaling, sanding, wire brushing, and grinding to a specified degree	ISO <b>St 3</b>
<b>SP5</b> White Metal Blast Cleaning	Removal of all visible rust, mill scale, paint and foreign matter by blast cleaning with wheel or nozzle (dry or wet) using sand, grit or shot. (for very corrosive environment where high cost of cleaning is warranted)	ISO <b>Sa 3</b> BS4232 (1 <sup>st</sup> grade quality)
<b>SP6</b> Commercial Blast Cleaning	Blast cleaning until at least two thirds of the surface area is free of all visible residues. (for rather severe conditions of exposure)	ISO <b>Sa 2</b> BS4232 (3 <sup>rd</sup> grade quality)
<b>SP7</b> Brush Off Blast Cleaning	Blast cleaning of all except tightly adhering residues of mill scale, rust and coatings, exposing numerous evenly distributed flecks of underlying metal.	ISO <b>Sa 1</b>
<b>SP8</b> Pickling	Complete removal of rust and mill scale by acid pickling, duplex pickling or electrolytic pickling.	
<b>SP10</b> Near White Blast Cleaning	Blast Cleaning nearly to "White Metal" cleanliness, until at least 95% of the surface area is free of all visible residues. (For high humidity, chemical atmosphere, marine or other corrosive environments)	ISO <b>SA2.5</b> BS4232 (2 <sup>nd</sup> grade quality)

Note: Besides the above standards, "Chemical Treatment", such as Iron, Zinc, or Manganese Phosphate treatment, may also be applied. This method is a combination of pickling and blast cleaning.

The quality of surface preparation seriously affects the performance of paint films. Therefore it is important to make the right choice of both the method and the grade of surface preparation before starting paint work, in order to achieve high paint film performance and durability. Some factors that will influence the selection of pre-treatment method are summarised as follows:

- The physical and chemical cleanliness of the surface
- Surface condition (degree of damage)
- Surface profile
- Characteristics of the paint system to be used
- Safety aspects
- Environmental considerations
- Available tools
- Previous treatments

When the decision regarding the type of pre-treatment and paint system has to be made, the substantial cost involved should always be taken into consideration.

Table 1 below shows the main methods of pre-treatment which can be used to remove rusted paint:

METHOD	RESULT
Blast Cleaning	Ideal
Mechanical Wire Brushing	Acceptable
Mechanical Disk Sanding	Acceptable
Needle Chipping	Fair
Mechanical (air powered) scraping	Fair
Hand Brushing	Poor
Hand Scraping	Poor

Table 1: Main methods of pre-treatment

Nothing can compete with blast cleaning to obtain the best result, it gives an ideal foundation for paint and, combined with a modern, correctly used system, it will make the paint last 4-5 times as long. Air powered (mechanical) tools generally give better results than hand tools.

Mechanical wire brushing using a power tool may be used where blast cleaning is impossible. Needle chipping equipment give good results in the case of smaller jobs, especially in places which are otherwise difficult to reach. Hard metal scrapers can be useful when it is necessary to remove loose paint and thick layers of rust before sand blasting or wire brushing. Brushing by hand normally results in a poor quality pre-treatment.

Mechanical rust chipping is often not recommended because it can cause indentations of the surface.

It is of prime importance to follow an international quality standard for pre-treatment cleaning, such as the highly reputable International Standards ISO 8501-1.

Table 2 below shows definitions of surface preparations according to ISO 8501-1. It is assumed that prior to treatment the steel surface has been cleaned of dirt and grease, and that the heavier layers of rust have been removed by chipping.

PREPARATION BY SCRAPING AND WIRE BRUSHING	
<b>St 2</b>	Through scraping and wire brushing / machine brushing / grinding / etc., the treatment must remove loose mill scale, rust and foreign matter. Finally, the surface is cleaned with a vacuum cleaner, clean dry compressed air or a clean dry brush. It should have a faint metallic sheen. The appearance must correspond to the prints designated St 2.
<b>St 3</b>	Very thorough scraping and wire brushing / machine brushing / grinding / etc. Surface preparation as for St 2 but much more thoroughly treated. After removal of dust, the surface must have a pronounced metallic sheen and correspond to the prints designated St 3.
PREPARATION BY BLAST CLEANING	
<b>Sa 1</b>	Light blast cleaning. Loose mill scale, rust and foreign matter must be removed. The appearance shall correspond to the prints designated Sa 1.
<b>Sa 2</b>	Thorough blast cleaning. Almost all mill scale, rust and foreign matter must be removed. Finally the surface is cleaned with a vacuum cleaner, clean dry compressed air or a clean dry brush. It must then correspond in appearance to the prints designated Sa 2.
<b>Sa 2½</b>	Very thorough blast cleaning. Mill scale, rust and foreign matter must be removed to the extent that the only traces remaining are slight stains in the form of spots or stripes. Finally the surface is cleaned with a vacuum cleaner, clean dry compressed air, or a clean dry brush. It must then correspond in appearance to the prints designated Sa 2½.
<b>Sa 3</b>	Blast cleaning to pure metal. Mill scale, rust and foreign matter must be removed completely. Finally the surface is cleaned with a vacuum cleaner, clean dry compressed air, or a clean dry brush. It must then have a uniform metallic colour and correspond in appearance to the prints designated Sa 3.

Table 2: Definitions of surface preparations

All damaged areas (rusty, worn-out, blistered) should be scraped in order to remove all loose paint, followed by mechanical or manual brushing. Large rusty surfaces should be blast cleaned.

In Collaboration with:

**D. Pre-treatment when painting on top of intact paint**

The surface of old undamaged paint which is not heavily contaminated must first be washed with fresh water, with the addition of synthetic detergent if necessary. High pressure equipment should be used to remove traces of salt and other impurities in order to avoid premature paint film failure.

Surfaces should be absolutely dry before paint is applied, but the drying period shouldn't be over-extended since salt will quickly adhere again to exposed surfaces.

If the old paint has a very hard and glossy surface, roughening with sand paper, sweep blasting, or mechanical disc sanding is recommended, while areas heavily contaminated by oil should be brushed thoroughly. Following, the surface should be washed down with fresh water and if necessary the treatment should be repeated.

The bottom and any submerged areas of the ship's hull, should preferably be cleaned as soon as the vessel has entered the dock. The following procedure is recommended:

- Thorough hosing down by high pressure water spraying of light sand wash. Fresh water should be used to remove salt sediments.
- Scraping and wire brushing followed by fresh water hosing to remove barnacles, fouling etc.
- Grease and oil marks must be removed.

Recommended tools and equipment for daily maintenance work on board are:

- Mobile blast cleaning equipment
- Air driven grinding equipment
- Rotary wire brush
- Needle gun
- Air driven de-scaling apparatus
- Manual scraper with hard metal changeable edge
- Hand wire brush

In Collaboration with:

**NIPPON PAINT**  
**MARINE COATINGS CO., LTD.**