



# SURFACE PREPARATION

## Ferrous Metal

### PURPOSE

This section describes ferrous metal surface preparation methods for general atmospheric exposure. Method selection will be based on the type of metal, condition of the metal, application experience, budget and condition of the current coating system.

### INTRODUCTION

To obtain the best results from a paint system the best possible surface preparation consistent with the degree of sophistication of the system is required. The quality of the paint and surface preparation (i.e. the removal of rust, scale, salt, grease, dirt and loose paint) are the most important factors in determining the lifetime of the paintwork, and therefore the length of time the surface will be protected. First class preparation has the potential to extend the life of any paint system.

There are often several surface preparation methods available - dependent on the type of surface. The methods selected will depend on a number of factors including environmental conditions and cost.

### SURFACE CONTAMINANTS

#### Mill Scale

The complete removal of mill scale and rust is critical in order to limit its corrosive properties. Mill scale is generally found on new steel as a hard brittle coating - it consists of distinct layers of various iron oxides and is formed during the hot rolling process in the manufacture of steel. Painting over mill scale is not satisfactory, as mill scale is not firmly or permanently bonded to the steel. Eventually the scale will lift off, causing paint coatings to flake and corrosion to occur. The cathodic nature of mill scale means that partial removal is not sufficient - the galvanic cells established between the scale and scale free areas induce accelerated corrosion, resulting in pitting of the steel surfaces. This is particularly so in aggressive environments.

#### Rust

Rust is a form of hydrated ferric oxide formed by the action of water and oxygen on iron and steel surfaces and occupies a much greater volume than the original steel. It is for this reason that rust forming beneath a paint layer is able to rupture a coating. All areas of rust should be completely removed - any rust remaining will act as a nucleus for further rusting.

#### Oil, Grease Fat and Perspiration

Oil, grease, fat and perspiration deposits cannot be removed by mechanical methods of cleaning. These contaminants must be removed prior to mechanical surface preparation. The simplest method of removal is to use a solvent emulsifiable degreaser or biodegradable detergent. Apply the degreaser liberally to the contaminated surface, allow to stand for a short time, then hose off with fresh water. Besides liquid solvent degreasing, other methods include:

- Solvent vapour cleaning.
- Alkaline cleaning.
- Biodegradable detergent.

Please refer to AS 1627.1 Metal Finishing - Preparation and Pretreatment of Surfaces - Removal of Oil, Grease and Related Contamination.



# SURFACE PREPARATION

## Ferrous Metal

### SURFACE PREPARATION OF WELDS

One of the most common causes of corrosion is welds and adjacent areas. Proper surface preparation of these areas will ensure a longer protective life for metal parts and equipment. Surface preparation is most important and represents the first stage in weld protection. Breakdown of coatings in areas around welds is generally caused by the failure to remove harmful deposits formed during welding, such as:

- Alkaline slag - from the weld flux - this reduces adhesion and durability of paint films.
- Condensed flux fumes - produces similar alkaline conditions.
- Spatter from welds - it is not uncommon for beads of spatter to reach 600 microns in diameter. Paint coatings of normal film build would not cover these even in multiple coats and hence weld spatter presents vulnerable points for rusting to occur.
- Oxides - produced by the heat of welding.

An effective method of retreating welded areas prior to painting is as follows:

1. Remove weld spatter by grinding with a power tool, or hand filing.
2. Grind all welds and high points smooth.
3. Remove any surface contaminants that result from welding.
4. Rinse thoroughly with fresh water and allow to dry.

### 1. POWER AND HAND TOOL CLEANING

Power and hand tool cleaning are the least effective of all the recognised surface preparation methods for steel. Tightly adherent mill scale, rust in deep pits, angles and corners are difficult to remove by these methods. Power tool and hand tool cleaning methods are questionable economically and must be constantly supervised for the specification to be met. This method of surface preparation is not suitable for aggressive environments. Full details can be found in AS 1627.2 Metal Finishing - Preparation and Pretreatment of Surfaces - Power Tool Cleaning.

#### St2 / Pst2

Most adherent rust and mill scale is removed. The surface is roughened by the impact tool and has a semi-bright (dull silvery) appearance. The remaining mill scale has a slightly burnished appearance. The prepared surface approximates St2 / Pst2 (AS 1627.9).

#### St3 / Pst3

All visible rust and mill scale are removed and the surface has the appearance of bright steel (silvery). This condition is only obtained by the use of a power disc sander and impact tool. The prepared surface approximates St3 / Pst3 (AS 1627.9).

### 2. BLAST CLEANING (ABRASIVE CLEANING)

Blast cleaning is the removal of rust and mill scale by the use of compressed air to project a high velocity stream of abrasive such as aluminium oxide, garnet, grit or steel shot onto the metal surface. The impact of these high speed particles cuts away the mill scale and rust, leaving a clean steel surface. The cutting action leaves small indentations over the entire surface and these are often referred to as 'surface profile'. A blast cleaned surface is well adapted to receive and retain paint coatings. Please note, that the blast profile used must be suit the film build of the coating system to be applied.

Abrasive blast cleaning AS 1627.4 is the recommended standard for this method of surface preparation. Four classes of abrasive blasting are recognised and are summarised as follows:

#### Sa 1 - Light Blast Cleaning

This is often referred to as Whip Blasting. Cleaning to this standard required that loose mill scale, loose rust and foreign matter are removed. Surface preparation to Sa 1 (AS 1627.9).

#### Sa 2 - Medium Blast Cleaning

Cleaning to this standard requires that mill scale, rust and foreign particles are substantially removed and that grey metal is visible. Surface preparation to Sa 2 (AS 1627.9).



## SURFACE PREPARATION Ferrous Metal

### Sa 2½ - 'Near White' Blast Cleaning

Cleaning to this standard requires that mill scale, rust and foreign particles are removed to such a degree that the only traces remaining are slight stains in the form of spots or stripes. Surface preparation to Sa 2½ (AS 1627.9).

### Sa 3 - 'White Metal' Blast Cleaning

Cleaning to this standard requires the entire removal of all mill scale, all rust and all foreign particles. The cleaned surface shall have a uniform metallic colour. Surface preparation to Sa 3 (AS 1627.9).

### 3. PICKLING: (CHEMICAL CLEANING)

Pickling is a method of preparing steel surfaces either by chemical reaction in acid or alkali solutions, electrolysis or a combination of both of these.

Weld spatter and slag should be removed by mechanical abrasion and contaminants such as dirt, oil and grease should be solvent cleansed prior to pickling.

On removal from the pickling bath the object must be well drained, rinsed thoroughly and dried. It should be primed as quickly as possible after drying.

A properly pickled surface can be considered as being almost equivalent to 'White Metal' blast cleaning.

Pickling has a number of disadvantages and restrictions and the most important of which are:

- It can only be conducted as a 'Shop Process'.
- Priming must be conducted on the same day as pickling and prior to erection or fabrication.
- Various pickling methods involve hydrogen - this will embrittle steel and seriously affect high tensile and case hardened steel, particularly in steel sections.
- Incomplete removal of pickling solutions because of article design, poor drainage or poor rinsing will eventually give rise to breakdown of the coating system.
- Although the cleaned surface is almost equivalent to that obtained by 'White Metal' blast cleaning, it does not provide a 'profile surface' necessary for some coating systems.

Relevant standard: AS 1627.5 - "Pickling Steel Surfaces".

For other surface preparation methods refer to AS 1627 and other relevant industry standards.

For the most up to date information contact Wattyl Customer Service Hotline or visit the Wattyl Website.

|                                 |   |   |
|---------------------------------|---|---|
|                                 | <b>Australia</b>  | <b>New Zealand</b>  |
| <b>CUSTOMER SERVICE HOTLINE</b> | <b>132 101</b>  | <b>0800 735 551</b>   |
| <b>WEBSITE</b>                  | <a href="http://www.wattyl.com.au">http://www.wattyl.com.au</a> | <a href="http://www.wattyl.co.nz">http://www.wattyl.co.nz</a> |

Wattyl is a registered trademark of Wattyl Australia Pty Ltd.

1. This information is important to ensure that the listed Wattyl product(s) perform according to the stated application and uses and must be followed to meet Wattyl's warranties express and implied. Wattyl advises that you (a) review the Technical Data Sheets (TDS) and Material Safety Data Sheets (MSDS) before you use or handle the product; (b) ensure that the product be used only in accordance with the information provided by Wattyl and the product(s) be transported, stored and handled in accordance with the information on the MSDS and relevant TDS; and (c) thoroughly test the product, using the recommended application method on a sample of intended substrate, before using the product. 2. While Wattyl endeavours to update this information and maintain the accuracy and currency of its contents, Wattyl does not warrant that the information provided is current when the product is used or is wholly comprehensive. 3. For all product and non-product related information, Wattyl recommends that you conduct such additional investigations as may be necessary to satisfy yourself of the accuracy, currency and comprehensiveness of the information on which you rely in using and handling the product. If you require further information please contact your nearest Wattyl office before using the product(s). 4. To the full extent permitted by law, Wattyl's liability for breach of a condition or warranty implied into the contract for sale between Wattyl and you by law is limited at Wattyl's election to: (a) the replacement of the product; or (b) payment of the cost of replacing the product. If coating rectification is required Wattyl Technical Services shall be contacted prior to commencement.

WATTYL AUSTRALIA PTY LTD (ABN 40 000 035 914)