

1:8 Surface preparation (part 1)

Materials used today in buildings, plant and equipment include mainly mild steel, concrete, brickwork, aluminium, galvanised steel and timber. Steel and concrete are usually selected for areas subject to chemical exposure because of their inherent properties and, furthermore, they may be protected from corrosive action by the proper paint coating. Aluminium, galvanised steel and timber because of their characteristics are used in less demanding areas and they, too, are capable of protection by means of coatings. Irrespective of the material chosen, an adequate degree of surface preparation with due consideration of the environment is essential since it is on this basis that the adhesion of the correct painting system is dependent. It is of supreme importance to consider the following factors in any decision of surface preparation:

- Length of service required.
- The type of exposure:
 - Normal coastal
 - Industrial
 - Rural or tropical atmosphere
 - Exposed to the elements or under cover
- Nature of chemical exposure:
 - Continuous or intermittent contact with:
 - Acids or alkalis
 - Salt solutions
 - Condensation
 - Fumes or fall-out
 - Immersed or underground conditions

Irrespective of the surface chosen, it is mandatory that before painting all dirt, dust, oil, grease or other loose surface contaminants be removed since it is obvious that paint applied to them will have poor adhesion to the underlying surface and the paint will flake off exposing the substrate to attack, resulting in costly maintenance, unsightly appearance and perhaps failure of the structure. Painting must always be carried out as soon as possible after and usually no later than the same day, as the surface preparation.

The following sections deal with each type of surface grouped under the following headings:

- Steel
- Non-ferrous
- Non-metallic

A detailed section covering surface preparation methods for steel is included.

Steel

Mild steel for its strength to weight ratio and cheapness is one of the most widely used construction materials. However, it readily rusts and must be painted to prevent this corrosion and to provide to it a decorative appearance.

Mill scale found on new steel is a hard, brittle coating of several distinct layers of iron oxides formed during processing of steel such as hot rolling girders, tank plates and other structural shapes. Usually bluish black in colour, mill scale cracks and fissures readily, and is permeable to both air and moisture. Rusting at the mill scale steel interface occurs and in time the scale sloughs off due to the pressure created by the rust layer. Mill scale is cathodic to the steel substrate and if left in place, corrosion will occur as a result of the electrical potential difference between them.

Rust is an oxide of iron formed by the action of air and water. It is voluminous and occupies one and three-quarter times the volume of the steel from which it originated. Rust forming under a paint coating or through breaks in the coating can burst through and may creep under the coating resulting in flaking so that repair is both difficult and costly.

It may cost a little more for a better surface preparation, but as the paint coating will last many times longer, the overall cost saving in maintenance will justify the initial expense. Other types of steel, such as low alloy steels (e.g. Austen 50), which are selected in areas requiring increased strength, hardness or improved resistance to corrosion, can also be prepared by the following methods.

The most commonly quoted reference standards for the preparation of steel for painting are given by the Steel Structures Painting Council (USA) or in the Swedish Standard SIS 055900

(a) Blast cleaning

A method of removing rust and mill scale by the physical impact of an abrasive propelled on to the surface by compressed air or by centrifugal force from a multiwheel machine. Non-metallic abrasives sand, ilmenite or copper slag are used for on site blasting, while in the fabricating shop a combination of round steel shot and steel grit may be used, the shot on impact breaks the mill scale and rust while the grit imparts profile or tooth to be abraded surface. If compressed air blasting is used, the air shall be free of detrimental amounts of water and oil. Adequate traps and separators shall be provided at the compressor.

The various methods of preparing steel for subsequent painting are given in the Steel Structures and Painting Council (SSPC) Standards of the U.S.A.

'Light' or 'Brush Off' blast cleaning

1. All surfaces to be coated shall be blast cleaned to a Light or Brush Off finish according to SSPC-SP7 (Sa 1 of Swedish Standards SIS 05 59 00).
2. A Light or Brush Off blast cleaned surface finish is defined as one from which all oil, grease, dirt, rust scale, loose scale, loose rust and loose paint or coatings are removed completely, but tight mill scale and tightly adherent rust, paint and coatings are permitted to remain provided that all mill scale and rust have been exposed to the abrasive blast pattern sufficiently to expose numerous flecks of the underlying metal fairly uniformly distributed over the entire surface. Photographic or other visual standards of surface preparation may be used if required to further define the surface if specified in the contract.

'Medium or Commercial' blast cleaning

1. All surfaces to be coated shall be blast cleaned to a Medium or Commercial finish according to SSPC-SP6 (Sa 2 of Swedish Standard SIS 05 59 00).
2. A Commercial blast cleaned surface finish is defined as a surface from which all oil, grease, dirt, rust scale and foreign matter have been completely removed from the surface and all rust, mill scale and old paint have been removed except for slight shadows, streaks or discolourations caused by rust stain, mill scale, oxides or slight, tight residues of rust or paint may be found in the bottom of pits. At least two-thirds of each square cm of surface area shall be free of all visible residues and the remainder shall be limited to the light discolouration, slight staining or light residues mentioned above. Photographic or other visual standards of surface preparation may be used if required to further define the surface if specified in the contract.

'Near White' metal blast cleaning

1. All surfaces to be coated shall be blast cleaned to a 'Near White' metal finish according to SSPC-SP10 (Sa 2.5 of Swedish Standard SIS 05 59 00).
2. A 'Near White' metal blast cleaned surface finish is defined as a surface from which all oil, grease, dirt, mill scale, rust, corrosion products, oxides, paint or other foreign matter have been completely removed from the surface except for very slight shadows, very slight streaks or slight discolourations caused by rust stain, mill scale, oxides or slight, tight residues of paint or coating that may remain. At least 95% of each square cm of surface area shall be free of all visible residues and the remainder shall be limited to the light discolouration mentioned above. Photographic or other visual standards of surface preparation may be used if required to further define the surface if specified in the contract.