Importance of Surface Preparation

Proper surface preparation is essential for the success of any protective coating system. If contaminants like oil, grease, dirt and chemicals are not removed from the surface, they will prevent the adhesion of the first coat. Rust left on the surface will loosen the coating whereas millscale, if not completely removed, will accelerate corrosion. The most expensive and technologically advanced coating system will fail if the surface is not prepared properly.

Surface Preparation of Steel

Some of the various methods of surface preparation of steel are briefly described below :

DECREASING : This is primarily done to remove oil, grease and other contaminants by the use of special solvents, or compositions such as Bison Degreasing Solution. This is usually done prior to further surface preparation or painting of steel. Contaminants are removed by wiping the surface with rags soaked in the solvent, followed by wiping dry with clean rags.

HAND TOOL CLEANING : This is done with the help of wire brushes, scrapers, chipping hammers or chisels to remove loosely adhering rust, millscale or other contaminants. This method is generally adopted in locations where blast cleaning is not possible. Though this process is the most popular mode of surface cleaning, it always leaves a layer of tightly adhering rust on the surface which will lead to the failure of the paint in the long run.

POWER TOOL CLEANING : This method is somewhat better than Hand Tool Cleaning as it does a better cleaning job at a much higher rate per man-hour. Two critical problems associated with this method are :

a) It does not remove tightly adhering rust.
b) Cleaning with the help of wire brushes tends to polish the surface which inhibits adhesion of the paint film on the substrate.

The tools commonly used are :

1) Grinders
2) Disc Sanders
3) Wire brushes

Flame Cleaning

A high temperature oxyacetylene flame is passed over the surface as a result of which millscale and loose rust are dislodged from the surface due to the differential expansion of steel and surface contaminants. This method is more effective than Power Tool Cleaning but has certain disadvantages such as :

a) May lead to fire and health hazards.
b) May cause damage to adjacent areas,
c) May cause distortion/buckling of lower guage steel.

Pickling

Here the substrate is immersed in a solution of sulphuric or hydrochloric acid. The acid reacts with the rust and dislodges it. At the same time certain gaseous products also evolve. This is followed by a rinse in hot water containing phosphoric acid which acts as a rust inhibitor. The main disadvantages of this method are:

a) It has to be carried out in controlled shop conditions.
b) It is not suitable for large objects which cannot be immersed in tanks.

Abrasive Blast Cleaning

By far the most effective method for removal of millscale, rust and old coatings. The substrate should be degreased and all weld spatters removed prior to blasting. This is because contaminants like grease or oil are not completely removed by this method and they tend to impair the adhesion of the paint film.

In this method, an abrasive (sand grit or shot) is injected into a rapidly moving air stream and propelled at high velocity through a nozzle against the surface.

The profile of the substrate after blasting will depend on the following:

a) The abrasive used.
b) The air-pressure employed.
c) The technique of blasting.

Too low a profile may not provide a sufficient key for a coating while too high a profile may result in uneven coverage with high sharp peaks which may lead to the failure of a coatinc in the long run. The following table gives a brief guide of typical roughness profiles obtained by using various types of abrasives.

Type of abrasive	Mesh size	Maximum height of profile
Very fine sand	80	37 microns
Coarse sand	12	70 microns
Iron shot S390	14	90 microns
Copper slag	-	75/100 microns

Wet Abrasive Blasting

This is a minor variation of the above method. Here the abrasive is mixed with water before being thrown at the substrate. The water is mixed with rust inhibitors to prevent rusting of the surface immediately after blasting. The prime advantages of this method are:

a) The hazards of dust and associated health problems are largely overcome.
b) The chances of fire hazards are eliminated; enabling its use inside working installations.

Blast Cleaning Standards

Description	White Metal	Near-white Metal	Commercial Blast	Brush-off Blast
Swedish Standard SIS 05-5900:1967	Sa3	Sa 2 1/2	Sa2	Sa1
British Standard BS 4232:1967	First Quality	Second Quality	Third Quality	-
Steel Structures Painting Council (USA)	SSPC-SP 5-63	SSPC-SP 10-63T	SSPC-SP 6-63	SSPC-SP 7-63
National Association of Corrosion Engineers (USA)	NACE No. 1	NACE No. 2	NACE No. 3	NACE No. 4
Shipbuilding Research Association of Japan SPSS	JASh3 JASd3	JASh2 JASd2	JASh 1 JASd 1	-

Surface Preparation of Non-ferrous Metals

The surface should be cleaned and made grease free. In case of galvanised surfaces, any white zinc corrosion products if present, should be removed by high pressure water washing or scrubbing. This removes the soluble zinc salts from the surface.

The substrate should then be etch primed by using Bison Wash Primer to facilitate adhesion of the paint film on the substrate.

Surface Preparation of Concrete and Masonry Surfaces

The surface should be clean, dry and free from oil, grease and other contaminants and curing compounds which adversely affect the adhesion of paint. Any loose contaminants like laitance and loose powder formed on concrete may result in peeling off of the paint film. It is always preferable that the concrete is sweep blasted before the application of any paint.