Paint coating stainless steels

Introduction

Stainless steels are used because of their corrosion resistance in a wide variety of service environments, usually without additional coatings. In certain circumstances, however, stainless steel components or structures may require a coated (paint) finish. Examples of this may include company colour schemes or logos, environmental blending and compatibility, and general aesthetic requirements.

Coating systems for stainless steels must be carefully selected to provide sufficient durability to meet the requirements of the service environment and its associated operating conditions. The combination of surface preparation and formulation of the paint system are key factors in meeting these objectives. In certain environments, localised breakdown of the coating can lead to corrosion, which may be more severe than that experienced with un-coated surfaces and may result in high, localised, rates of attack.

In general, stainless steels have flatter and smoother surfaces than carbon steels. This applies particularly to thin cold-rolled products (sheet and coil) and may adversely affect adhesion between the metal surface and the coating system. Roughening of stainless steel surfaces prior to coating is essential and can usually be achieved by abrasive blasting, light hand abrasion or chemical etching.

Surface preparation

Abrasive Blasting

Abrasive blasting can be accomplished by using clean, fine, hard non-metallic abrasive particles (e.g. alumina or silicon carbide). The abrasive medium must be iron-free to avoid contamination, which can result in rust staining on the surface prior to coating and the compressed air carrying the abrasive medium must be free of compressor oil.

Abrasive blasting may be readily confined to specific areas by masking. Support should be given to thin sections or cold-rolled material to avoid distortion or damage during blasting.
Stainless steel surfaces should be prepared to give a surface roughness Ra of approximately 50 micron and a minimum cleanliness of grade 2 in accordance with BS 7079:Part 1A.

Light Hand Abrasion

To avoid distortion to light sections light hand abrasion is an alternative method to blasting. Iron-free, 320 to 400 grit abrasive media are usually satisfactory. Chemical etching treatments can also be considered. Certain paint manufacturers have special primers designed for such applications and it is recommended that details of the surface to be coated are specified when seeking advice on an appropriate coating system.

History of Stainless Steels in Britain by David Dulieu (publications.php?id=474&featured=1)

BSSA Guide to Stainless Steel Specifications - 2nd Edition (publications.php?id=62&featured=1)

Stainless Steel Grades Datasheets (topics.php?article=606&featured=1)

Availability of Stainless Steel Grades (topics.php?article=684&featured=1)

Getting the Best out of Stainless Steel (topics.php?article=379&featured=1)

Special Grades of Stainless Steel - Where to Find Them (topics.php?article=397&featured=1)

Duplex Stainless Steels - A Simplified Guide (topics.php?article=668&featured=1)

Fabricating Duplex Stainless Steel (topics.php?article=647&featured=1)

Importance of Surface Finish in the Design of Stainless Steel (publications.php?id=97&featured=1)

Final Cleaning

Prior to coating, all stainless steel surfaces must be dry and free from rust, other foreign materials, oil and grease. The presence of such contaminants may lead to failure of the coating system. Oil and grease may be removed organic solvents, for example acetone and final drying done with a hot air blower.

Coating application and systems

The table below gives details of paint systems suitable for coating stainless steels and, in accordance with ISO 12944 and ISO 9223, classifies them in terms of the severity of the envisaged service environment.

Exterior Environment			**Coating System**
Category	Corrosion Risk	Location	.
C3	Medium	Rural and urban areas with low sulphur dioxide, acid, alkali and salt pollution	Two pack epoxy or polyurethane primer suitable for stainless steel at 30-50 micron dry, FOLLOWED BY High solids polyurethane finish at 100 micron dry
C4	High	Urban and industrial areas with moderate sulphur dioxide and/or coastal areas with low salinity	Two pack epoxy or polyurethane primer suitable for stainless steel at 30-50 micron dry, FOLLOWED BY High build epoxy MIO* at 100 mm dry, FOLLOWED BY Re-coatable polyurethane finish at 60 micron dry
C5I	Very High	Industrial areas with high humidity and aggressive atmospheres	Two pack epoxy or polyurethane primer suitable for stainless steel at 30-50 micron dry, FOLLOWED BY High build epoxy MIO* at 200 micron dry (one or two coats), FOLLOWED BY Re-coatable polyurethane finish at 60 micron dry
C5M	Very High	Coastal and offshore areas with high salinity	Two pack epoxy or polyurethane primer suitable for stainless steel at 30-50 micron dry, FOLLOWED BY High build epoxy MIO* at 200 micron dry (one or two coats), FOLLOWED BY Re-coatable polyurethane finish at 60 micron dry

MIO = Micaeous Iron Oxide

Cleanliness is extremely important in the successful application of paint coatings to stainless steels surfaces. Paint coatings should be applied in clean, dust-free conditions to clean, dry stainless steel surfaces.

If the correct precautions are taken, the complete coating systems suggested in the table can be applied in 'on-site'.

It may be preferable for some or all of the components of coating systems to be applied under paint shop conditions, where site conditions cannot be carefully controlled. Provided the initial coating stages are done under these conditions, then the final coat can be applied 'on-site' or after final assembly.

The first primer coat can be followed by subsequent coats in strongly contrasting colours to ensure complete coverage of the component or structure by the full coating system. The paint manufacturer's instructions concerning drying times should be followed and coatings must be fully dry before the application of subsequent coats.

Before applying new coatings to painted stainless steel, the original coating system should be identified and advice on surface preparation obtained from the paint system manufacturer. This should help ensure compatibility between the new and existing coating systems.

Paints that contain metallic zinc should not be used on stainless steel as embrittlement of the stainless steel substrate can occur in the event of severe fire damage.

Before commencing any task ensure that you have received the appropriate health and safety literature from the supplier and fully understand it. If in doubt seek advice

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