IMPORTANT NOTES

Structural Steel

DESCRIPTION OF THE SUBSTRATE

Steel is produced by taking mined iron ore and adding a large amount of energy to it in the blast furnace.

We refer to the pure iron ore that forms on the surface as “rust.”

During the rolling process, hot rolled structural steel forms a thin layer of iron oxide on the surface called “mill scale.”

The terms “factory primed” and “shop coated” refer to steel that’s been cleaned and primed at the point of fabrication or manufacture before being shipped to the jobsite.

Shop surface preparation procedures, priming material, and application must be inspected by the assigned paint inspector.

Caution note to the specifier: It cannot be stressed enough that the primer specified in a system be the first coating applied to the steel.

Weldable primers are often used as shop primers.

If a weldable primer has been used, the surface must be carefully examined for rust and to assure compatibility with the specified primer and system.

Care must also be exercised to assure that shop-primed steel is topcoated within the appropriate “recoat window.”

When zinc rich coatings are applied to steel in the shop, the surface must be evaluated prior to on-site painting, as zinc rich coatings can develop a powdery oxidation on the surface during storage and transport.

The painting contractor should always receive particulars of the type of primer used and the date of application.

Considerable and unnecessary damage can be caused to expensively and correctly applied coatings by incorrect or careless handling, transport, and storage between the time a primer is applied in the shop and installation and finishing on site.

Zinc-primed coatings in general have better resistance to mechanical damage.

Areas where the shop coat has been removed or where signs of corrosion are present must be abraded to clean metal, and spot primed.

Noteworthy for the specifier:
All field touch-up on structural steel and miscellaneous steel should be the responsibility of the steel supplier and erector.
The degree of protection required is proportional to the aggressiveness of the environment.

Specifying a shop-applied system has the advantage of knowing surface preparation and application of at least the primer coat will be executed in the controlled conditions of a shop.

In many cases, achieving the required level of surface cleaning (such as abrasive blast grade SSPC-SP 6) is difficult to achieve in the field on an assembled structure.

Quick-setting primers require ideal surface preparation.

All coatings used in any one individual paint system should come from the same manufacturer, including the shop primer.

The specified primer must have a recoat window long enough for the construction schedule to permit topcoating the primed steel within the manufacturer’s required time frame.

Often it is specified that the primer be applied in the fabricating shop, then touched-up and finish-coated on site.

Latex, acrylic, and modified acrylic technology can offer lower VOC protection to steel in non-aggressive environments.

For moderately corrosive commercial, industrial or marine applications, a shop-applied epoxy or inorganic zinc primer provides a tough adhesive bond to the metal surface and creates a more corrosion-resistant system.

Alkyd and waterborne dry fall finishes are most often used on steel ceiling trusses, beams, etc. not exposed to high levels of humidity, condensation or abrasion.

The three-coat system of a zinc primer, epoxy intermediate (midcoat), and polyurethane topcoat is commonly specified for steel in corrosive industrial and marine environments.

Inorganic zinc primers cure to an exceedingly strong rock-like film that provides longer protection than organics; however, they are less tolerant of deficient surface preparation; they’re trickier to mix and apply properly; and are more difficult to topcoat.

Organic zinc rich primers are more tolerant of deficient surface preparation, with a minimum of SSPC-SP 6 Commercial Blast required, and they’re easier to topcoat, especially with the same generic chemistry (i.e. an epoxy zinc-rich primer topcoated with an epoxy coating).

Note that most 2k aliphatic polyurethanes contain strong solvents that could lift conventional primers.

Epoxies will chalk and yellow in direct sunlight, so their use as topcoats is limited to interiors or applications where direct sunlight is not an issue.

The epoxy primer requires a minimum SSPC-SP 6 Commercial Blast and forms a tough, adhesive bond to the metal surface, providing corrosion resistance and a good base for subsequent epoxy finish coatings.
Solvent, chemical, and abrasion resistance is not as high as conventional alkyd finishes, but resistance to moisture is quite high due to the internal structure of the aluminum paint.

SURFACE PREPARATION

Proper surface preparation helps assure good coating performance by...

1. Creating a rough surface that coatings can anchor to.
2. Allowing intimate contact between the primer and the steel surface.

The degree of cleaning required depends on a number of factors.

1. Service Environment
2. Coating system requirements
3. Budget
4. Access
5. Regulatory requirements

It’s the specifier’s job to determine the degree of surface preparation required. It’s the contractor’s job to assure the work is done thoroughly and conform to the relevant standards.

ITEMS TO INCLUDE IN Surface Prep Specs

- Preparing Unseen Edges
- Removing Contaminants
- Cleaning Sequence

Steel Surface Preparation Methods

- Solvent Cleaning
- Hand and Power tools
- Wet Methods of Surface Preparation
- Wet Blasting and Water/Abrasive Blasting
- Waterblasting or Waterjetting
- Wheel (Centrifugal) Blasting
- Air Abrasive Blasting

COATING APPLICATION

When painting steel for new construction, however, blasting and priming starts in the fabricating shop, and this work must also be carried under the proper conditions.

Freshly cleaned steel should be painted as soon as possible after blasting (certainly within the same shift) or it can show flash rusting formation in a very short time. Here are some tips to keep in mind.

Tips for Applying Solvent-Based Coatings:

- Many of these products gain their high-performance properties via a chemical reaction achieved by mixing two separately-packaged components (called ‘parts’ or ‘packs’) just prior to application.
- It is critical to follow the manufacturer’s mixing instructions exactly regarding order of mixing and mix ratios.
- Zinc-rich paints must be constantly stirred or else the zinc dust will settle to the bottom.
• “Pot life” is the length of time from when the coating is mixed to when it becomes unusable.

Tips for Applying Waterborne Coatings:

• Spray equipment that has previously been used for solvent-based paints must be pre-rinsed with clean, potable water.
• Under normal conditions, the film will be water-sensitive for about 6 to 12 hours after application, and must be protected from rain or condensation on the surface.
• For waterborne coatings under standard conditions, recoat times vary from 4 – 12 hours, and these can be coated with themselves with no problem.

INSPECTION & QUALITY CONTROL

Inspectors should monitor and record environmental conditions before and during surface preparation, application, and during drying.

Painted steel should be checked for:

• Correct film thickness
• Dryness: check the condition of the paint to see it has dried properly and in a reasonable time
• Completeness of coverage
• Adhesion of dried paint
• Inaccessible surfaces: were they painted properly?
• Inspect for defects