



# PREPARING STRUCTURAL STEEL SURFACES FOR PAINTING, COATING STANDARDS

Adhesion is the reason for the season

By Kate Bachman

**M**ill scale. Dirt. Laser scale. Rust. Heat-treat scale. Grease. Dust. And did we mention heavy mill scale? When these come between your structural steel and your paint or coating, bad things happen. And when the steel you fabricate holds up bridges, overpasses, buildings, and stadiums, bad things are big bad things.

So what are structural steel fabricators doing about surface preparation, and what options are available? Surface preparation can run from simple chemical cleaning to abrasion methods such as grinding and abrasive blasting. How to know which methods to use?

Many fabricators' projects come with surface specifications prescribed by The Society for Protective Coatings (SSPC) standards (see **Figure 1**). The methods used are specified in the contract or project documents, according to SSPC Certification Program Manager Joe Berish, PCS, MCI, who administers the program. The primary documents are the specification and product data sheets, he said. The data sheets provide the surface preparation that the

coatings manufacturer used when it tested its materials and demonstrated the performance applicable to the intended use and service life, according to Berish.

"The coating systems manufacturers test for adhesion and performance. When they do that, they do it with a specified profile range. For example, if you were using a certain brand's product on a bridge, the data sheet might tell you that it was tested in a laboratory at a 2- to 4-ml profile, and this would mean you might need 3 to 5 ml of paint. It's going to give you the profile range, the thickness of the coating that you can apply, how much thinner you can and cannot use ... whether you can put it over a pickled surface or a chemical-treated surface or an abrasive-blasted surface. It's going to tell you all of that information.

"What that means is that the coating manufacturer, in the laboratory, has taken a piece of metal that met that description and they have actually tested it and here are the test results," Berish continued. "And to get the paint manufacturer to provide a warranty, it has to be known that it was applied under those same conditions."

The surface preparation's standard name indicates the method used, and all surface preparation standards use the prefix SP, he said. "For example [SSPC] SP 5, SP 6, and SP 10 are all defined as abrasive blast cleaning standards. SSPC SP 8 is the standard for pickling as a means of surface preparation. The differences in all of these standards are the cleaning methods, cleanliness levels, and surface profile. Different methods may produce a similar level of cleanliness, but each will still result in differences such as surface profile or flash rusting."

Why would a customer choose abrasive or blast cleaning over pickling or solvent cleaning—or vice versa? "The contract or specification and coating product data sheet may require a surface profile which cannot be achieved by pickling, chemical stripping, or solvent cleaning," Berish said. "Also, the coating being applied may not be compatible with all methods of surface preparation. In addition, some choices may be made dependent on the availability of equipment that the fabricator may have."

Cost is also a consideration, which depends on the amount of surface area to be prepared, Berish continued. "For example, if it is just a few square



feet and does not require a surface profile, chemical stripping may be cost-effective; conversely, if there are several thousand square feet of surface to be prepared, pickling or abrasive blasting would be more cost-effective.”

Whether or not the waste produced would need to be disposed of as hazardous has an effect on the methods used as well.

“The customer will give the fabricator a build sheet, if you will,” Berish said. “We want it to be fabricated like this: the bolts located here, with this diameter.’ It’s the same with the surface condition. Just by the material they’re going to use, they’re going to go to that material data sheet that will tell what surface standard is compatible with that material—SP 1, SP 2 or 3, SP 6 or SP 10.”

### SSPC-SP 1: Solvent Cleaning

The first line of defense is simply cleaning the structural member with acetone, a thinner, or another type of solvent.

“Cleaning with a solvent and a cloth is a precursor to every other surface preparation standard out there. It’s a given,” Berish said.

Cortec® Technical Service Engineer John Wulterkens said that fabricators can remove mill scale, oxides, and corrosion from the metal surface using either VpCI®-422 or VpCI-426 water-based liquids (see **Figure 2**). “VpCI-422 is more ‘ecofriendly’ (biodegradable); VpCI-426 is stronger and works faster. Depending on the application, the gel versions of both products can be used on vertical or overhead surfaces, or on parts that cannot be treated in a dip bath.”

After the scale is removed, cleaning and neutralization should be performed with a water-based alkaline cleaner, he added. “This will leave behind a cleaner surface for painting, coating, and welding. The cleaners (and rust/oxide/scale removers) contain flash corrosion inhibitors, so after the neutralization and cleaning stage, the surface will remain flash rust-free for up to a week, depending on conditions.”



**Figure 1**

The SSPC’s surface preparation’s standard name indicates the method used, and all surface preparation standards use the prefix SP.



**Figure 2**

At left is a metal surface with corrosion removed using VpCI®-422; at right, a metal surface before the corrosion was removed. Photos courtesy of Cortec Corp., St. Paul, Minn.

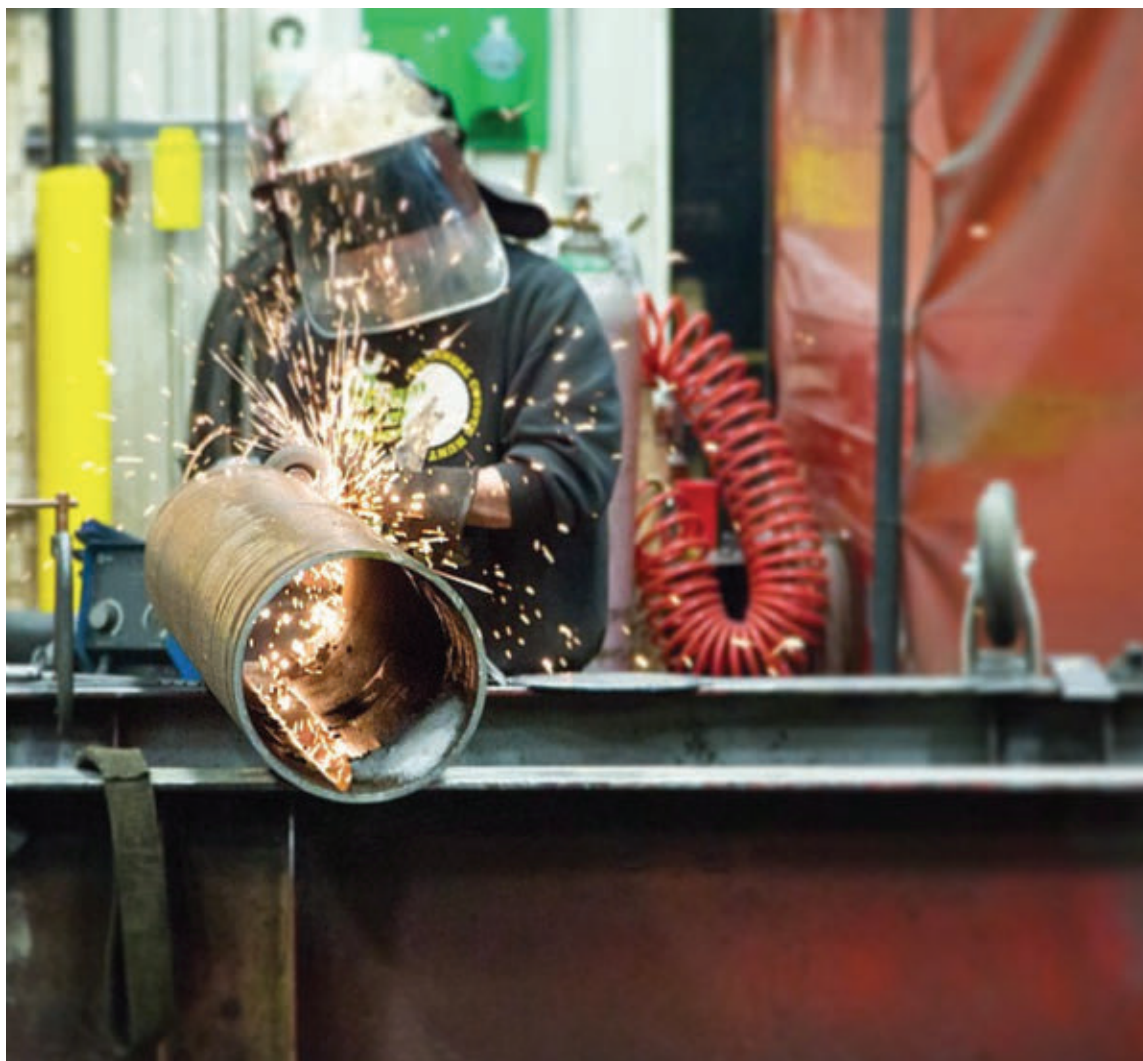
### SSPC 2, SSPC 3: Hand Tool, Power Tool Cleaning

Bass Mechanical, a structural steel fabricator in Elizabethtown, Pa., has 40- by 80-foot drive-through bays that handle both medium- and large-scale structural steel fabrication. The company fabricates and welds carbon steel, aluminum, stainless, and nickel aluminum into trusses, box girders, plate girders, beams, columns, mezzanines, stairways, and railings.

Before sending its products out for coating, the company performs some minimal surface prep, according to Jerry Miller, chief operations officer. “We usually go to an SSPC-SP 2 or SP 3, which requires the steel to be free of grease, moisture, contaminants, heavy mill scale, and rust.” Miller

said the company uses a thinner and a power tool to remove the contaminants. Then it uses high-pressure air to blow the dirt or dust and rust away,” Miller said.

Standards SP 2 and SP 3 require the use of a hand or power tool to satisfy the requirement, Berish said. “By standard, SP 2 means that the surface is clean of all oils and loosely inherent material. So SP 2 is hand cleaning with the use of hand tools—a wire brush or a scraper. The use of a chemical treatment alone cannot make it an SP 2 because you cannot remove inherent materials with chemicals alone.” SP 3 is the standard for cleaning and removing loosely inherent material using a power tool, such as a grinder (see **Figure 3**).



**Figure 3**

SSPC-SP 3 is the standard for cleaning and removing loosely inherent material using a power tool, such as a grinder. Photo courtesy of Bass Mechanical, Elizabethtown, Pa.