

## COATER'S CORNER

Chris McKinnon *Aegis Industrial Finishing*

### Eight degrees of cleanliness: SSPC's surface preparation standards



When I first saw a real coating specification, I was overwhelmed by the amount of information

and references to different industry standards, including the American Water Works Association (AWWA), NACE International (NACE), SSPC: The Society for Protective Coatings (SSPC), Master Painters Institute (MPI), ASTM International (ASTM), International Organization for Standardization (ISO), and so forth.

This article will provide a brief summary of the SSPC standards that you may encounter as a custom coating shop and give you a working knowledge for when you are speaking with customers, engineers, designers, and other coatings professionals.

#### Before we begin

If you are going to reference standards when preparing for jobs, I strongly recommend purchasing them from SSPC directly. Do not reference this article; this is only a summary. SSPC's comprehensive standards can be found at [www.sspc.org](http://www.sspc.org). These standards provide a universal reference point when addressing any disagreements and should be kept at hand.

SSPC also provides visual standards to use as a reference point when determining what an acceptable pretreated surface looks like. If your customer does not have their own reference standard, I would strongly advise becoming familiar with *SSPC-VIS 1: Reference Photographs for Steel Surfaces Prepared by Dry*

*Abrasive Blast Cleaning and SSPC-VIS 3: Reference Photographs for Steel Surfaces prepared by Hand and Power Tool Cleaning.*

#### An overview of applicable standards



Here is a list of the standards that will be covered in this article. In the cases where NACE appears, this indicates that SSPC and NACE have agreed on joint standards in regards to abrasive blasting.

- SSPC-SP 1 Solvent Cleaning
- SSPC-SP 2 Hand Tool Cleaning
- SSPC-SP 3 Power Tool Cleaning
- SSPC-SP 5/NACE No. 1 White Metal Blast Cleaning
- SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning
- SSPC-SP 7/NACE No. 4 Brush Blast Cleaning
- SSPC-SP 10/NACE No. 2 Near-White Blast Cleaning
- SSPC-SP 16 Brush-off Blast Cleaning of Non-Ferrous Metals

#### Hand and power tool cleaning standards

*SSPC-SP 1 Solvent Cleaning.* This surface preparation standard is used for the purpose of removing oils, soils, grease, salts, and other contaminants by wiping with solvent, degreasing, steam cleaning, etc. For a full list of suitable methods, the standard should be referenced. The sole intention is to clean the substrate prior to coating or blasting so as to avoid entrapping any contaminants

that would lead to premature failure. In the case of a part requiring blasting, it is always referenced as a requisite before blasting or tool cleaning. Failure to do so may contribute to premature coating failure.

In most job shop environments the way that this standard will be followed is by use of solvent and a rag. When doing so, be sure to provide a continuous wipe in one direction on the substrate. Once the wipe is completed, observe the rag and turn it to a new area that is clean. Failing to do so will simply result in the smearing of oil across the substrate. The purpose is to remove "visible deposits of oil, grease, and other contaminants..."<sup>1</sup>

*SSPC-SP 2 Hand Tool Cleaning.* While not an ideal method of preparing a surface to receive a powder coated finish, if your customer requires the part to be cleaned to this degree of cleanliness, be aware that to conform to SP2 the part is to be free of all loose material. This means that if there is leftover paint, rust, or mill scale that cannot be removed by "lifting with a dull putty knife"<sup>2</sup> then you've achieved SP2.

As a powder coater, I cannot think of a time when this would ever be satis-

PHOTO 1



*This is an example of how not to solvent wipe a product before coating. The streaks on the surface are residual oil from solvent wiping.*

factory. The only time that I would reference SP2 is when removing weld splatter and slag with a chisel hammer for the purpose of prepping for blasting.

*SSPC-SP 3 Power Tool Cleaning.* The requirements to achieve a surface free of contaminants that cannot be lifted with a dull putty knife applies to SP3 as well. The key difference is that this standard is based on the use of power tools. It is worth mentioning, however, that when employing power tools to prepare a surface, the operator should not remove any more material than what is intended. On certain projects, removal of material could lead to visual defects that result in costly rework.

### Blast cleaning standards

Before diving into the particulars of the SSPC standards that apply to dry abrasive blast cleaning, it is worth mentioning what is applicable to SP5, SP10, SP6, SP7, and SP16.

- Abrasive blast media is not specified.
- Blast profile depth is not specified.
- All standards expect that the substrate conforms to SP1 prior to blasting.
- It is mandatory that the blast system be using clean, dry air.
- If between the time of blasting and coating the part no longer conforms to the required standard, it must be blasted again. (For example, the customer has pipe spooling that is to be blasted to SP5. It flash rusts in the oven during prebake. You must blast it again to SP5 before applying your coating.)
- The condition of the steel prior to coating will have an impact on the appearance of the steel after blasting — deeply pitted and corroded steel will still look pitted after blasting.
- Sharp edges, burrs, weld splatter, and slag should be removed prior to cleaning as abrasive blasting is not an effective means of removing these.

*SSPC-SP 5 / NACE No. 1 White Metal Blast Cleaning.* This is the cleanest degree of blasting that you will encounter. Typically SP5 is referenced when substrates are going to be exposed in a hostile environment such as chemical treatment facilities, oil and gas plants, or marine environments.

SP5 requires that “when viewed without magnification, [the part] shall be free of all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter.”<sup>3</sup> Simply put — it has to be white metal clean. Even the staining that mill scale and rust can leave behind must be cleaned from the substrate.

*SSPC-SP 10 / NACE No. 2 Near-White Blast Cleaning.* At my company, we typically end up blasting to an SP10 even when an SP6 is required. This is the case when working with tightly adherent mill scale that must be removed. According to SSPC-VIS 1, the effort required to remove tightly adherent mill scale typically results in an appearance that is closer to an SP10 than an SP6.<sup>4</sup>

This is our go-to degree of cleanliness any time we are preparing product for long-term use outdoors. The key differentiator between an SP5 and SP10 is that on any surface of the part, there can be no more than 5 percent random staining in each unit area of surface measuring 9 square inches as per the standard.<sup>5</sup> Staining from rust and/or mill scale would show up as discoloration on the surface.

*SSPC-SP 6 / NACE No. 3 Commercial Blast Cleaning.* Most of what would apply to SP6 has been covered in the above discussion. In the case of SP6, we will use this degree of cleanliness when a single coat indoor application is required or a low-cost outdoor two coat system is requested. The key difference is that it allows for up to 33 percent random staining instead of 0 percent (SP5) or 5 percent (SP10).

*SSPC-SP 7 / NACE No. 4 Brush Blast Cleaning and SSPC-SP 16 Brush-off Blast Cleaning of Coated*

PHOTO 2



*A before and after comparison of tightly adherent mill scale being blasted to an SSPC-SP 5 White Metal.*

PHOTO 3



*Here is an example of mill scale staining on tube and blasting to a White Metal on cold rolled steel.*

*and Uncoated Galvanized Steel, Stainless Steel, and Non-Ferrous Metals.* The SP7 degree of cleanliness on steel should result in the removal of all previous coating, mill scale, and rust that cannot be removed with a dull putty knife. Anything that is tightly adherent is considered acceptable by this standard.

It should be noted that in the case of blasting aluminum, stainless steel, or galvanized steel, the same technique would be used by the operator as is used in SP7; however, the technical differences to be considered are contained in SP16. Of particular importance here is the use of blast media. To prevent the potential for creating a corrosion cell by impinging steel into aluminum or stainless steel, new media should be used when changing over to blasting non-ferrous substrates.

### Conclusion

For a comprehensive overview of the standards and more detailed information, SSPC has a document called “Surface Preparation Commentary

for Steel and Concrete Substrates” available on their website. This should be used in conjunction with the standards produced by SSPC.

At the end of the day, the important thing is being able to provide your customer with the basic understanding of how these degrees of cleanliness differ and how to tell the difference. These standards do not define the future success of a coating system, but they do have an impact on the total coating system’s performance.

Consultation with the end user and coating supplier should always take place to determine that the costs and benefits have been weighed out based on the end goal of the project.

**PC**

## Endnotes

1. *Surface Preparation Specification No. 1 Solvent Cleaning*, SSPC: The Society for Protective Coatings, November 1, 2004.
2. *Surface Preparation Specification No. 2 Hand Tool Cleaning*, SSPC: The Society for Protective Coatings, November 1, 2014.
3. *Joint Surface Preparation Standard SSPC-SP 5/NACE No. 1 White Metal Blast Cleaning*, SSPC: The Society for Protective Coatings, January 1, 2007.
4. *SSPC-VIS 1 Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning*, SSPC: The Society for Protective Coatings, 2002.
5. *Joint Surface Preparation Standard SSPC-SP 10/NACE No. 2 Near-White Metal Blast Cleaning*, SSPC: The Society for Protective Coatings, January 1, 2007.

## Editor’s note

For further reading, see *Powder Coating* magazine’s website at [www.pcoating.com](http://www.pcoating.com). Click on Article Index and search by subject category. To submit a question, click on Problem Solving, then scroll to Coater’s Corner.

*Chris McKinnon owns Aegis Industrial Finishing Ltd. with his father in Surrey, BC. As a third generation metal finisher (his grandfather*



*started a plating company in 1948, and his father has worked in powder coating for more than 20 years), he is actively developing new markets for powder coating and providing those*

*who will listen a greater appreciation for powder coating. He has an MA in Business Leadership, holds his NACE CIP Level 3 (#31504), and is a member of PCI’s Custom Coater Steering Committee. His company is focused on providing powder coating and abrasive blasting to the local market and specializes in process-driven quality for pieces up to 38 feet by 9.5 feet by 10 feet and 7,000 pounds. If you would like to contact Chris, he can be reached at [chris@aegisfinishing.com](mailto:chris@aegisfinishing.com).*

*This column discusses problems encountered by powder coaters during the daily operation of their powder coating lines. These are in-the-field experiences from coaters. Its intent is to provide practical information to line personnel who coat all day to help them improve in their work. If you would like to contribute to this column, contact Alicia Tyznik, editor, at 651/287-5620, or email [atyznik@cscpub.com](mailto:atyznik@cscpub.com).*