

SSPC: The Society for Protective Coatings

SURFACE PREPARATION STANDARD NO. 3

Power Tool Cleaning

1. Scope

1.1 This standard contains the requirements for power tool cleaning to remove loose detrimental foreign matter from steel substrates.

1.2 This standard differs from SSPC-SP 2 Hand Tool Cleaning, in that SSPC-SP 2 requires use of hand-held tools without supplemental power.

1.3 This standard differs from SSPC-SP 15, Commercial Grade Power Tool Cleaning, in that SP 15 uses power tools to remove all visible oil, grease, dirt, rust, coating, metallic oxides, mill scale, corrosion products, and other foreign matter from the surface, with the exception of trace amounts of coating, staining and corrosion in pit bottoms.

1.4 Units of Measure: This standard makes use of both the IEEE/ASTM SI 10⁽¹⁾ International System Units (SI) units and U.S. Customary units. The measurements are not exact equivalents; therefore, each system must be used independently of the other without combining in any way. This standard uses SI units with the U.S. Customary conversions shown in parentheses.

2. Definition

2.1 Power tool cleaning is a method of preparing steel surfaces by the use of power-assisted hand tools. It does not include the use of laser and heat-induction technologies.

2.2 A power tool cleaned surface, when viewed without magnification, shall be free of visible deposits of oil and grease and shall be free of all loose mill scale, loose rust, loose paint, and other loose detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Mill scale, rust, and paint are considered adherent if they cannot be removed by lifting with a dull putty knife as described in Section 6.3 (see Notes 8.1 and 8.2).

2.3 DULL PUTTY KNIFE (for use as an inspection tool): A commercially manufactured, straight, flexible metal blade capable of returning to its original shape without permanent distortion after being bent by hand around a 28 to 33-cm (11 to 13-in) diameter mandrel (or pipe or other

curved surface). The blade shall also have the following characteristics: length of approximately 75 to 125 mm (3 to 5 inches); thickness of approximately 760 to 1270 μm (30 to 50 mils); and a straight working edge approximately 40 to 75 mm (1.5 to 3 in) in width. The putty knife is acceptable for use if the thickness at the working edge of the blade is not less than 635 μm (25 mils) or 75% of its original thickness, whichever is greater.⁽²⁾

NOTE: Some commercially manufactured, straight, flexible metal blades are between 500 and 760 μm (20 and 30 mils) in thickness. New blade thicknesses between 500 and 760 μm (20 and 30 mils) are permitted, provided the coating being tested is 20 mils or less in thickness, and the thickness of the blade is not worn to less than 20 mils.

2.4 Reference photographs of power tool cleaned surfaces found in SSPC-VIS 3 are often used to supplement the written definition. In any dispute, the written definition set forth in this standard shall take precedence over reference photographs (see Note 8.3).

3. Referenced Standards

3.1 The latest issue, revision, or amendment of the referenced standards in effect on the date of publication of this standard shall govern unless otherwise specified. Standards marked with an asterisk (*) are not requirements of this standard.

3.2 If there is a conflict between the requirements of any of the cited reference standards and this standard, the requirements of this standard shall prevail.

3.3 ASTM INTERNATIONAL STANDARDS

ASTM D4285 Standard Test Method for Indicating Oil or Water in Compressed Air

3.4 SSPC STANDARDS AND JOINT STANDARDS

SSPC-SP 1	Solvent Cleaning
* SSPC-SP 2	Hand Tool Cleaning
* SSPC-SP 7/ NACE No. 4	Brush-Off Blast Cleaning
* SSPC-SP 11	Power Tool Cleaning to Bare Metal
* SSPC-SP 15	Commercial Grade Power Tool Cleaning

⁽¹⁾ ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

⁽²⁾ Exact dimensions of equipment manufactured using S.I. units may vary slightly from the S.I. values provided.

- * SSPC-VIS 3 Guide and Reference Photographs for Steel Surfaces Prepared by Power- and Hand-Tool Cleaning

4. Tools and Methods for Power Tool Cleaning

4.1 POWER TOOLS: Any hand-held motorized tool on which the media described in Sections 4.1.1 and 4.1.2 are capable of being mounted in accordance with manufacturer's instructions and which will produce a steel surface meeting the requirements of Sections 2.1 and 2.2 is acceptable (see Notes 8.4, 8.5 and 8.6). Sections 4.1.1 and 4.1.2 describe the two main categories of power tools. It is possible for power tools to alter an existing surface profile.

4.1.1 Grinding Tools: Grinding tools use media containing bonded abrasive grains to cut through corroded surfaces and include, but are not limited to, discs or wheels as described in Note 8.7.1.

4.1.2 Impact Tools: Impact tools use media that repeatedly collide with the target surface and include, but are not limited to, various rotary and reciprocating devices as described in Note 8.7.2.

4.2. The use of several different power tools meeting the requirements of Section 4.1 is sometimes necessary to achieve power tool cleaned surface meeting the requirements of Sections 2.1 and 2.2 (see Note 8.4 and subsections).

5. Procedures Prior to Power Tool Cleaning

5.1 Prior to power tool cleaning, visible deposits of oil, grease, or other materials that interfere with coating adhesion shall be removed in accordance with SSPC-SP 1 or other methods as specified.

5.2 Surface imperfections such as slivers and laminations, sharp edges, weld spatter, or burning slag shall be removed from the surface to the extent specified by the procurement documents [project specifications] (see Notes 8.8 and 8.9).

5.3 When air-driven tools are used, cleanliness of the compressed air shall be verified in accordance with the procedure described in ASTM D4285.

6. Procedures Following Power Tool Cleaning and Immediately Prior to Coating

6.1 Visible deposits of oil, grease, or other materials that interfere with coating adhesion shall be removed in accordance with SSPC-SP 1 or as specified.

6.2 Dust and loose residues shall be removed from power tool cleaned surfaces by brushing; blowing off with

clean, dry air per Section 5.3; vacuum cleaning; or other methods.

6.3 When using a dull flexible putty knife to test paint, mill scale, or rust remaining on the surface after cleaning, the straight working edge of the blade shall be held flat against the surface at a maximum of 45 degrees to the surface and pushed with light to moderate pressure so that the end of the blade remains in flat contact with the surface. The corners of the blade shall not be used to dig at the residues.

A putty knife shall not be used as an inspection tool if the working edge of the blade is nicked or gouged, or if dry paint or other material is present along the working edge that would prevent the blade from making intimate contact with the surface.

6.4 After power tool cleaning, any remaining surface imperfections (e.g., laminations, sharp edges, weld spatter, burning slag, scabs, slivers) shall be removed to the extent required by the procurement documents (project specification) (see Note 8.9).

6.5 Immediately prior to coating application, the entire surface to be coated shall comply with the requirements of Section 2.2 (see Note 8.10).

7. Disclaimer

7.1 While every precaution is taken to ensure that all information furnished in SSPC standards and specifications is as accurate, complete, and as useful as possible, SSPC cannot assume responsibility nor incur any obligation resulting from the use of any materials, coatings, or methods specified herein, or of the specification or standard itself.

7.2 This standard does not attempt to address problems concerning safety associated with its use. The user of this standard, as well as the user of all products or practices described herein, is responsible for instituting appropriate health and safety practices and for ensuring compliance with all applicable governmental regulations.

8. Notes

Notes are not requirements of this standard.

8.1 FUNCTION: The type of power tool surface preparation described in this standard removes loosely adherent foreign matter. This standard is suitable where removal of loosely adherent foreign matter is required, but where the effort to remove all tightly adherent rust, mill scale, old coatings, and other tightly adherent foreign matter is not necessary. The surfaces prepared according to this standard should not be compared to surfaces cleaned by brush-off abrasive blast cleaning. Although this method produces surfaces that resemble SSPC-SP 7 (brush-off blast cleaned surfaces), they are not necessarily equivalent

to those surfaces produced by abrasive blast cleaning. The contracting parties should agree on the appropriateness of the finished surface to accept the specified coating system. Selection of power tools and cleaning media should be based on (1) the condition of the surface prior to surface preparation; (2) the extent of cleaning that is required.

The SSPC Surface Preparation Commentary (SSPC-SP COM) provides additional information on subjects related to power tool cleaning. The recommendations contained in SSPC-SP COM are believed to represent good practice, but are not to be considered requirements of this standard.

8.2 STRATIFIED RUST, PACK RUST AND RUST SCALE: As noted in Section 4.3.1 of SSPC-COM, Surface Preparation Commentary for Steel and Concrete Substrates, stratified rust, pack rust or rust scale can adhere so tightly to the base metal that a power wire brush will not remove it. Even though it is considered “tightly adherent” because it cannot be lifted with a dull flexible putty knife, it provides a very poor surface to paint over. Specifiers should consider providing additional instructions in the project specification regarding the acceptable methods for, and the acceptable level of, removal of these types of rust.

8.3 VISUAL GUIDES AND COMPARATORS: Note that the use of visual guides or comparators in conjunction with this standard is required only when they are specified in the procurement documents (project specification) covering the work. It is recommended, however, that the use of visual guides or comparators be made mandatory in the procurement documents. SSPC-VIS 3 provides a suitable comparative visual guide for SSPC-SP 2, SSPC-SP 3, SSPC-SP 11, and SSPC-SP 15. However, visual comparators for blast-cleaned steel (e.g., SSPC-VIS 1) are not suitable for assessing power tool cleaned surfaces. Because power tool cleaning is time- and labor-intensive, it is advisable to prepare a test area of 1 x 1 m (3 x 3 ft) for large areas or 30 x 30 cm (12 x 12 in) for spot cleaning to an acceptable level agreed upon by the contracting parties. A 30 x 30 cm (12 x 12 in) steel test plate can also be power tool cleaned to an acceptable level and photographed or retained to serve as a project standard.

8.4 SELECTION OF TOOLS AND MEDIA

8.4.1 Selection of Tools: Power tools should be selected on the basis of the size and speed rating of the media. These requirements may differ from one type of medium to another and should be taken into consideration if more than one type of medium will be used in the surface preparation process. Power tools should be selected that will produce enough power to perform the cleaning operation efficiently. Operator fatigue should be considered in the selection of power tools.

8.4.2 Selection of Media: When power tool cleaning rusted surfaces, it is important to avoid embedding rust into the substrate. These factors may require employing more

than one type of medium in order to obtain the desired end result.

Power wire brushes or sanding discs when used alone may remove or degrade an existing profile to an unacceptable level. After removal of excessive corrosion, a structural inspection may be warranted to ascertain if the metal thickness remains in compliance with the governing requirements, including applicable codes (e.g. ASME codes for pressure vessels).

8.5 CAUTION: Improper use of power tools can result in damage to the surface being cleaned. Excessive pressure or an overly long dwell time on a surface being cleaned using impact tools can result in formation of burrs and gouges. Rotary or grinding tools that remain over a specific location too long can bend the peaks of an existing profile and damage the anchor pattern. In extreme cases, burnishing of the surface may result. Improper use of tools with embedded abrasive media, including, but not limited to discs, wheels, pads, and flappers, may result in partial melting and smearing of the matrix on the surface. A review of the manufacturer’s literature or a discussion with the technical representative about the tool, its use and the intended substrate should be undertaken if in doubt or if the operator has little or no experience with the tool.

8.6 CLEANING LIMITED ACCESS AREAS: SSPC defines a “limited access area” as a location in which the configuration of a structure or surface or the characteristics of a tool restrict the use or performance of that tool at that location. Alternative methods should be considered for limited access areas.

8.7 SUITABLE TOOLS AND MEDIA: The tools/media in the text of this standard are intended solely to guide the user to typical types of equipment and media that are available to meet the specification. The tools/media cited in this document do not include all of the tools, devices, or products available, nor does their mention constitute an endorsement by SSPC. The presence of hazardous material in the coatings, cleaning media, or in the work area itself, can place restrictions on the methods of cleaning permitted.

8.7.1 Grinding tools/media: Any rotary or reciprocating tool that uses bonded abrasives as the cutting media for generating surfaces described in Section 2. These include, but are not limited to, wire brushes, reciprocating sanders, orbital sanders, or any grinding device, whether right angle or straight shaft, that utilizes abrasive cloths, discs, wheels, or flaps.

8.7.2 Impact tools/media: Any rotary or reciprocating tool that uses repetitious impact for generating surfaces described in Section 2. This includes, but is not limited to: rotary flap, cutter bundle, needle gun, bristle impact, and hammer flail assemblies.

8.8 MAINTENANCE AND REPAIR PAINTING: When this standard is used in maintenance painting, specific instructions should be given on the extent of surface to be power tool cleaned, including any additional requirements for retaining old paint, removing unsound paint, feathering and spot cleaning. If the procurement documents require power tool cleaning to prepare surfaces for subsequent coating, the edges of remaining intact coatings should be feathered to improve the appearance of the repaired coating.

8.9 SURFACE IMPERFECTIONS: Surface imperfections can cause premature failure when the environment is severe. Generally, coatings tend to pull away from sharp edges and projections, leaving little or no coating to protect the underlying steel. Other features that are difficult for a coating to properly cover and protect include crevices, weld porosity, laminations, etc. Poorly adherent contaminants, such as weld slag residues, loose weld spatter, and some minor surface laminations, should be removed during power tool cleaning. Other surface defects

may not be evident until the surface preparation has been completed. Therefore, proper planning for such repair work is essential, since the timing of the repairs may occur before, during, or after power tool cleaning operations.

8.10 DEW POINT: Moisture condenses on any surface that is colder than the dew point of the surrounding air. It is recommended that the temperature of the steel surface be at least 3 °C (5 °F) above the dew point during power tool cleaning. It is advisable to visually inspect for moisture and periodically check the surface temperature and dew point during cleaning. It is equally important to continue to monitor the surface temperature/dew-point relationship until the coating is applied in order to avoid painting over a damp surface, unless the selected coating is specifically intended for application on damp substrates.

This revision replaces the version dated November 1, 1982 (Editorial Revisions November 2004). Content has been reorganized to parallel construction of SSPC-SP 11 and SSPC-SP 15, and definition of a dull putty knife has been added. A redline version is available from SSPC upon request.

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