

SSPC: The Society for Protective Coatings

SURFACE PREPARATION STANDARD SSPC-SP 16

Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals

Foreword

This standard contains requirements for surface preparation of coated or uncoated metal surfaces other than carbon steel surfaces prior to the application of a protective coating system. Surface preparation using this standard is used to uniformly roughen and clean the bare substrate and to roughen the surface of intact coatings on these metals prior to coating application. Substrates that may be prepared by this method include, but are not limited to, galvanized surfaces, stainless steel, copper, aluminum, and brass. For the purpose of this standard, the zinc metal layer of hot-dip galvanized steel, rather than the underlying steel, is considered to be the substrate. This standard is intended for use by coating specifiers, applicators, inspectors, or others who may be responsible for defining a standard degree of surface cleanliness. Information about the function of brush-off blast cleaning as defined in SP 16 is in Section A1 of Appendix A.

This standard represents a degree of cleaning that is similar to that defined for carbon steel substrates in SSPC-SP 7/NACE No. 4 except that a minimum surface profile depth on the bare metal surface is required.

1. Scope

1.1 This standard defines the “Brush-Off Blast Cleaning” end condition of uncoated or coated metal surfaces other than carbon steel that have been prepared using abrasive blast cleaning techniques. The standard also includes requirements for materials and procedures necessary to achieve and verify the end condition.

1.2 Substrates that may be prepared by this method include but are not limited to: galvanized surfaces, copper and copper alloys, aluminum and aluminum alloys, and stainless steel. Sections A2 through A4 of Appendix A include special considerations for three families of alloys. Personnel performing abrasive blasting should be able to identify the alloy family from material test reports, design information, or field testing.

1.3 This standard includes requirements for removal of visible surface contaminants. Information on nonvisible contamination is in nonmandatory Appendix A5.

1.4 This standard provides both IEEE/ASTM⁽¹⁾ SI 10 International System Units (SI) units and U.S. Customary units. SI Units are presented first, with a conversion into approximate U.S. custom units shown in parentheses. The conversions are not exact; therefore, each system must be used independently of the other.

2. Definitions

2.1 A brush-off blast cleaned non-ferrous metal surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, metal oxides (corrosion products), and other foreign matter. Intact, tightly adherent coating is permitted to remain. A coating is considered tightly adherent if it cannot be removed by lifting with a dull putty knife. Bare metal substrates shall have a minimum profile of 20 micrometers (~0.75 mil).

2.2 The entire surface shall be subjected to the abrasive blast to achieve the specified degree of cleaning and to produce a dense and uniform surface profile on the bare metal substrate. The peaks and valleys on the surface shall form a continuous pattern, leaving no smooth, unprofiled areas. Tightly adherent coating is permitted to remain. A coating is considered tightly adherent if it cannot be removed by lifting with a dull putty knife.

2.3 Intact coatings that are present shall be roughened and cleaned as specified in the procurement documents. If the surface profile is not specified in the procurement documents, the abrasive selected shall roughen the cleaned surface to the degree recommended by the product data sheet for the coating to be applied. If the procurement documents and product data sheet are silent on the coating condition, the abrasive selected shall uniformly roughen the coating surface such that the gloss is noticeably reduced. See Appendix A6 for additional information about roughening intact coatings.

This standard was first developed in 2010 by the SSPC C.2.8 Committee on Surface Preparation of Non-Ferrous Metals, and was revised in 2020.

⁽¹⁾ ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, phone int+1-610-832-9500. For referenced ASTM standards, visit the ASTM website <<http://www.astm.org>>

2.4 Immediately prior to coating application, the entire surface shall comply with the degree of cleaning as specified herein.

3. Additional Technical Considerations

3.1 Acceptable variations in appearance that do not affect surface cleanliness as defined in Section 2.1 include variations caused by the metal composition, original surface condition, thickness of the metal, weld metal, fabrication marks, heat-treating, heat-affected zones, blasting abrasive, and differences resulting from the abrasive blast pattern.

3.2 It is possible for aggressive blast cleaning to significantly erode some alloys and soft metals (such as copper and some aluminum alloys). Additional information on specific metals is contained in Sections A2 through A4 of Appendix A. It is also possible for aggressive abrasive blast cleaning to distort thin shapes. Additional information on potential substrate damage is contained in Sections A7 and A8 of Appendix A.

3.3 The appearance of galvanized steel, stainless steels and non-ferrous metals will differ both before and after abrasive blast cleaning. Jobsite mockups are recommended prior to commencing work. Mockups can be used to make sure all parties are in agreement with expectations prior to work taking place. Additional information is contained in Section A9 of Appendix A.

4. Referenced Standards

4.1 The latest issue, revision, or amendment of the standards listed in Sections 4.3 through 4.6 shall govern unless otherwise specified. Standards marked with an asterisk (*) are referenced only in the Notes, which are not requirements of this standard.

4.2 If there is a conflict between the requirements of any of the cited reference documents listed in Sections 4.3, 4.4 and 4.5 and this standard, the requirements of this standard shall prevail.

4.3 SSPC STANDARDS AND JOINT STANDARDS:

SSPC-AB 1	Mineral and Slag Abrasives
SSPC-AB 2	Cleanliness of Recycled Ferrous Metallic Abrasives
SSPC-AB 3	Ferrous Metallic Abrasive
SSPC-AB 4	Recyclable Encapsulated Abrasive Media
SSPC-SP 1	Solvent Cleaning
* SSPC-SP 7/ NACE No. 4	Brush-Off Blast Cleaning

* SSPC-PA 2	Determining Conformance to Dry Coating Thickness Requirements
* SSPC-Guide 15	Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates
* SSPC-SP COM	Surface Preparation Commentary for Steel Substrates

4.4 ASTM INTERNATIONAL STANDARDS

* ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings
* ASTM A153A/153M	Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
* ASTM A780	Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
* ASTM B6	Standard Specification for Zinc
ASTM D4285	Standard Test Method for Indicating Oil or Water in Compressed Air
ASTM D4417	Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM D6386	Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
* ASTM D7127	Standard Test Method for Measurement of Surface Roughness of Abrasive Blast Cleaned Metal Surfaces Using a Portable Stylus Instrument
ASTM F21	Standard Test Method for Hydrophobic Surface Films by the Atomizer Test
* ASTM F22	Standard Test Method for Hydrophobic Surface Films by the Water-Break Test (West Conshohocken, PA: ASTM International)

4.5 NACE INTERNATIONAL STANDARD⁽²⁾

SP0178	Design, Fabrication and Surface Finish Practices for Tanks and Vessels to be Lined for Immersion Service
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4.6 U.S. CODE OF FEDERAL REGULATIONS⁽³⁾

* Title 29 Part 1926.62	Lead
* Title 29 Part 1926.1126	Chromium VI

⁽²⁾ NACE International, 15835 Park Ten Place, Houston, Texas 77084, USA, Phone: +1-281-228-6200

⁽³⁾ CFRs may be obtained online at <https://www.ecfr.gov/>

5. Procedures Before Brush-Off Blast Cleaning of Non-Ferrous Metal Surfaces

5.1 Before blast cleaning of non-ferrous metal surfaces, visible deposits of oil, grease, or other contaminants that would interfere with coating adhesion shall be removed in accordance with SSPC-SP 1 or other specified methods. Section A5 of Appendix A provides information about nonvisible contaminants.

5.2 Surface imperfections shall be corrected to the extent specified in the procurement documents (project specifications). Additional information on surface imperfections is in Section A10 of Appendix A.

5.3 Unique Requirements for Preparation of Galvanized Steel

5.3.1 Before blast cleaning, galvanized surfaces shall be checked for the presence of "wet storage stain." Blast cleaning shall not be used to remove wet storage stain. The "dwell time" necessary for the blast stream to remove wet storage stain can damage the galvanized surface. Additional information on the removal of wet storage stain is in Section A11 of Appendix A. Additional information on blast cleaning of galvanized steel is in Section A12 of Appendix A.

5.3.2 Unless written documentation exists to confirm that a galvanized surface is known to be free of chromates or other passivating treatments, representative areas of galvanized surfaces that will be coated shall be tested as described in Section 5.3.3 for the presence of chromates or other passivating treatments before brush-off blast cleaning is performed. If chromates or other passivating treatments are detected, the surface shall be retested after blast cleaning to confirm complete removal. Observe applicable OSHA requirements for worker protection from toxic metals. Additional information on heavy metal toxicity is in Section A13 of Appendix A.

5.3.3 Test for Presence of Passivating Treatments on Galvanizing (e.g., Chromating): "Chromating" refers to the treatment of galvanized parts to prevent the occurrence of wet storage stain. Most sheet metal and coil stock used to fabricate decking and curtain wall receives chromating treatments. The presence of chromates or other passivating treatments is detected by using a solution of copper sulfate, with the following procedure:

- Ensure that surfaces are free of any visible oxidation or oxidation by-products.
- Prepare the solution by dissolving 2 grams of copper sulfate crystals in 100 ml of deionized water.
- Mark off three adjacent areas on the galvanized part, approximately 6.5 cm² (1 in²).
- Leave one area untouched, solvent wash the second and third areas, and also thoroughly sand the third area using emery paper.

- Using an eyedropper or pipette, saturate a cotton swab with the copper sulfate solution and apply to all three areas, or apply the solution directly to the three areas.

If all three areas turn black immediately, there is no passivation on the surface. If the first area does not turn black within 10 seconds and the second and third areas turn black immediately, there is no passivation on the surface with the possible exception of light oil. If the first and second areas do not turn black within 10 seconds and the third area turns immediately, a passivator of some type is present.

6. Abrasive Blast Cleaning Methods and Operation

6.1 Any of the following methods of surface preparation can be used to brush-off blast clean a non-ferrous metal substrate. Hazardous materials may be present. Section A14 of Appendix A provides additional information regarding hazardous materials.

6.1.1 Dry abrasive blasting using compressed air, blast nozzles, and abrasive.

6.1.2 Dry abrasive blasting using a closed-cycle, recirculating abrasive system with compressed air, blast nozzle, and abrasive, with or without vacuum for dust and abrasive recovery.

6.1.3 Other methods of surface preparation may be used to brush-off blast clean non-ferrous metal surfaces if specified in the contract documents. Additional information on cleaning soft and thin substrates is in Sections A7 and A8 of Appendix A. Additional information on the use of wet abrasive blast cleaning to clean galvanized surfaces is in Section A12.3 of Appendix A.

6.2 Clean, dry compressed air shall be used for nozzle blasting. Cleanliness of the compressed air shall be verified in accordance with the procedure described in ASTM D4285. Moisture separators, oil separators, traps, or other equipment are often necessary to achieve this requirement.

7. Abrasives for Brush-Off Blast Cleaning of Non-Ferrous Metal Substrates

7.1 The selection of abrasive size and type shall be based on the type, grade, and surface condition of the surface to be cleaned, the type of blast cleaning system used, the finished surface to be produced (cleanliness and surface profile [roughness]), and whether the abrasive will be recycled. With the exception of stainless steel, this standard does not permit use of ferrous abrasive media (e.g., carbon steel grit, carbon steel shot, steel slag, and chilled iron abrasives) unless otherwise specified. Explanation is provided in Appendices A2, A3 and A4. Appendix A15 contains additional information on abrasive selection.