SSPC The Society For Protective Coatings

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December 12, 2019

Sam Scaturro
Alpine Painting & Sandblasting Contractors
17 Florida Ave
Paterson NJ 07503

Hi Sam –

Today the three dry abrasive blast cleaning standards for concrete, as well as the new SSPC-PA 19 standard for visual evaluation of pinholes were posted on the SSPC Marketplace

Please accept a **BIG THANKS** for overseeing the development of these 4 documents. As you've experienced, "it ain't always easy!" Without the dedication and patience of subject matter experts like you, SSPC wouldn't be able to develop new standards or update existing ones. Lots of time and effort go into chairing a committee, Congratulations on your appointment to the SRC (and thanks for recruiting Heather to take over C.7.3)! Look forward to seeing you in Long Beach!

Sincerely,

Aimée Beggs
Standards Development Specialist

Kevin P. LaRue
Director of Technical Services

SSPC TECHNICAL COMMITTEE CHAIR

CERTIFICATE OF ACHIEVEMENT

FOR THE 2019 DEVELOPMENT OF

SSPC-PA 19
STANDARD FOR VISUAL EVALUATION OF PINHOLES IN A CONCRETE OR MASONRY COATING

IS AWARDED TO

Sam Scaturro
Alpine Painting and Sandblasting

DECEMBER 21, 2019

KEVIN P. LARUE
DIRECTOR OF TECHNICAL SERVICES

WILLIAM M. WORMS
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SSPC The Society For Protective Coatings

SSPC: The Society for Protective Coatings

SURFACE PREPARATION STANDARD

Abrasive Blast Cleaning of Concrete and Cementitious Materials
SSPC-SP CAB 1 – Thorough Blast Cleaning

Foreword

This standard is one of a set of three standards that define levels of surface cleanliness for concrete substrates prepared using abrasive blast cleaning. The cleanliness levels are based on 1) the extent of removal of the existing coating and 2) the extent to which surface air voids are opened. Thorough Blast Cleaning (SSPC-SP CAB-1), defines the highest level of cleanliness. The other two standards in the set, Intermediate Blast Cleaning (SSPC-SP CAB-2) and Brush Blast Cleaning (SSPC-SP CAB-3), define lesser levels of concrete cleanliness. All three levels of cleanliness require complete removal of all unsound surface materials, all efflorescence and all laitance, and are summarized in Table 1.

See Section 2 of this standard for the full definition of Thorough Blast Cleaning.

In this standard, the terms *shall* and *must* are used to state mandatory requirements. The term *should* is used to state something considered good and is recommended but is not mandatory. The term *may* is used to state something considered optional.

1. Scope

1.1 This standard defines the Thorough Blast Cleaning level of surface cleanliness achieved using abrasive blast cleaning. The standard includes requirements for the resulting condition of the surface as determined by visual inspection and materials and procedures used to achieve and verify the resulting condition.

1.2 This standard is limited to requirements for removal of visible surface contaminants and existing coatings from concrete surfaces, and procedures for verification. Specific requirements for concrete soundness, surface profile range, and repair of the substrate and any exposed reinforcing steel are beyond the scope of this standard (see Notes 11.1, 11.2, and 11.3).

1.3 The requirements of this standard are applicable to all types of concrete as defined in Section 2.2 (see Note 11.4). If a visual guide or comparator is specified to supplement the written standard, determine the initial condition of the concrete prior to blast cleaning before the blast cleaning commences (see Note 11.5).

1.4 UNITS OF MEASURE: This standard provides both IEEE/ASTM[1] SI 10, "American National Standard for Metric Practice" International System Units (SI) and U.S. Customary units. The measurements are not exact equivalents; therefore, each system must be used independently of the other. Where both sets of units are shown, SI units are presented first, with approximate U.S. Customary values shown in parentheses.

2. Definition

2.1 THOROUGH BLAST CLEANING: The surface of a concrete substrate that has been thoroughly blast cleaned, when viewed without magnification, shall be free of all visible deposits of coatings, oil, grease, mildew, curing compounds,

[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>

TABLE 1
COMPARISON OF DEGREES OF CONCRETE ABRASIVE BLAST CLEANING

	Unsound Surface, Efflorescence, Laitance	Opening of Surface Air Voids	Existing Coating	Notes
Thorough Blast Cleaning	Remove All	Fully Opened	Remove All	Full removal and uniform profiling of the surface
Intermediate Blast Cleaning	Remove All	Not Required	Remove Most	Remove all existing coating except for that remaining in surface air voids and uniform profiling of the surface
Brush Blast Cleaning	Remove All	Not Required	Remove Loose	Uniform profiling of the surface

This standard, developed by the SSPC C.7.3 Concrete Surface Preparation Committee, was first issued in December 2019.

form release agents, dust, efflorescence, laitance, concrete spatter, other visible contaminants, and poorly bonded or weak surface layers capable of being removed by abrasive blast cleaning. The entire surface shall be uniformly and completely abraded and profiled by abrasive media. Surface air voids (also called bugholes) shall be abrasive blast cleaned to remove shelled-over cement paste. This effort must open the full surface dimensions of the voids.

2.2 OTHER TERMS USED IN THIS STANDARD

CONCRETE: For the purposes of this standard, the term *concrete* shall refer to all types of cementitious substrates including cast-in-place, precast and prestressed concrete substrates, and shotcrete, cementitious grouts, overlayments and underlayments.

FORM TIE HOLES: Openings left in concrete after tie-rods securing forms in place are removed. Same as "tie-rod holes" or "snap-tie holes."

PROFILE: *(noun)* The topographic contour of the concrete surface as measured or as compared to a replica sample. *(verb)* To roughen the surface of a substrate by abrasive blast cleaning.

SUBSTRATE: Cementitious material that makes up the structure being abrasive blast cleaned.

SURFACE: The top of the substrate being abrasive blast cleaned.

SURFACE AIR VOID: Small regular or irregular cavities, usually not exceeding 15 mm (0.60 in) in diameter, resulting from entrapment of air bubbles in the surface of formed concrete during placement and consolidation (sometimes called a "bughole").

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 color of the concrete, the type and size of aggregates used, surface finishing techniques, original surface profile and condition, abrasive media utilized, and differences resulting from the blast pattern.

3.2 ICRI[2] 310.2R CSP (concrete surface profile) comparators or other visual guides 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 and comparators.

[2] International Concrete Repair Institute (ICRI), 10600 West Higgins Road, Suite 607 Rosemont, IL 60018. Phone: 847-827-0830 <www.icri.org>

4. Associated Documents

4.1 The dates of the referenced standards in effect at the time of publication of this standard shall govern unless otherwise specified. Documents marked with an asterisk (*) are not requirements of this standard.

4.2 When a conflict between the requirements of any of the cited referenced standards and this standard occurs, 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 Abrasives
	SSPC-AB 4	Recyclable Encapsulated Abrasive Media
*	SSPC-SP COM	Surface Preparation Commentary
*	SSPC-SP 13/ NACE No. 6	Surface Preparation of Concrete
*	SSPC-TR 5/ ICRI 710.1/ NACE 02203)	Design, Installation, and Maintenance of Protective Polymer Flooring Systems for Concrete
*	SSPC-PA 7	Applying Thin Film Coatings to Concrete
*	SSPC-PA 14	Application of Thick Film Polyurea and Polyurethane Coatings to Concrete and Steel Using Plural-Component Equipment

4.4 ASTM INTERNATIONAL STANDARD TEST METHODS

	ASTM D4258	Standard Practice for Surface Cleaning of Concrete for Coating
	ASTM D4285	Standard Method for Indicating Oil or Water in Compressed Air
*	ASTM D7682	Standard Test Method for Replication and Measurement of Concrete Surface Profiles Using Replica Putty
	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

4.5 ICRI TECHNICAL GUIDELINES

*	ICRI 210.3R	Guide for Using In-Situ Tensile Pulloff Tests to Evaluate Bond of Concrete Surface Materials
*	ICRI 310.1R	Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion

ICRI 310.2R	Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair

5. Procedures Before Blast Cleaning

5.1 Visible deposits of grease, oil, mildew, and other visible contaminants shall be removed prior to blast cleaning. A black-light test, water-break test per ASTM F22 or atomizer test per ASTM F21 shall be performed for verification of removal of grease and oil contamination.

5.2 If a visual guide or comparator is specified to supplement the written standard, the condition of the concrete prior to blast cleaning shall be determined before the blast cleaning commences (see Note 11.2).

6. Blast Cleaning Methods and Operation

6.1 Perform abrasive blast cleaning operations on all concrete substrates specified in the procurement documents (project specification). Use any of the following methods of surface preparation to achieve a thoroughly blast cleaned surface. (Hazardous materials may be present; see Section 9).

6.1.1 Dry abrasive blast cleaning.

6.1.2 Dry abrasive blast cleaning using a closed-cycle, recirculating abrasive system.

6.1.3 Dry abrasive blast cleaning using abrasive media encapsulated in a compressible non-uniform cellular matrix.

6.1.4 Abrasive blast cleaning using water injection before, within or after the blast nozzle.

6.1.5 Wet (slurry/vapor) abrasive blast cleaning using wet media.

6.1.6 Other methods of abrasive blast cleaning may be used to achieve a thoroughly blast cleaned surface.

6.2 Clean, dry compressed air shall be used for dry abrasive blast cleaning. 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 may be necessary to achieve this requirement.

7. Blast Cleaning Abrasives

7.1 Selection of abrasive size and type shall be based on the type, grade, and surface condition of the concrete to be cleaned, the type of blast cleaning system used, the finished surface to be produced (cleanliness and surface profile), and whether the abrasive will be recycled.

7.2 The blast cleaning abrasive shall be dry (for dry blast cleaning only) and free of oil, grease, and other contaminants as required by SSPC-AB 1, SSPC-AB 2, SSPC-AB 3, and SSPC-AB 4, as applicable.

7.3 The abrasive shall comply with any additionally specified requirements or limitations of the procurement documents (project specification) (see Note 11.6).

7.4 When a coating is specified, the abrasive selected shall clean the surface and produce the surface profile specified in the procurement documents (project specification). If the surface profile is not specified in the procurement documents, the abrasive selected shall profile and clean the surface to the degree required by the manufacturer's product data sheet for the coating to be applied (see Note 11.7).

8. Procedures Following Blast Cleaning and Immediately Prior to Coating

8.1 Mildew and concrete spatter shall be removed from the concrete surface.

8.2 A black-light test, water-break test per ASTM F22, or atomizer test per ASTM F21 shall be performed for verification of removal of contaminants only if oil or other contaminants that penetrate the substrate were found prior to blast cleaning or if testing is required by the procurement documents (project specification).

8.3 Dust and loose residues shall be removed from blast-cleaned substrates by brushing, blowing off with clean compressed dry air, vacuum cleaning, water washing, or other specified methods according to ASTM D4258.

8.3.1 If compressed air is used to clean prior to coating, the cleanliness of the compressed air used for blowing must be verified in accordance with the procedure described in ASTM D4285. Moisture separators, oil separators, traps, or other equipment may be necessary to achieve this requirement.

8.4 Surface air voids (also called bugholes) shall be opened-up to the full surface dimensions of the voids removing shelled over cement paste. Any remaining surface imperfections such as cracks, exposed aggregate, fins, honeycombs, popouts, scaling, spalling, form tie holes and voids shall be removed or repaired to the extent required by the procurement documents (project specification) and are not part of this standard (see Note 11.7).

8.5 Immediately prior to application, the entire surface to be coated shall comply with the degree of cleanliness defined by this standard (see Note 11.8).

9. Safety and Environmental Requirements

9.1 Because abrasive blast cleaning is a hazardous operation, all work shall be conducted in compliance with applicable occupational and environmental health and safety rules and regulations.

9.2 Abrasive blast cleaning of concrete substrates may introduce silica dust into the atmosphere and into the breathing zones of workers and bystanders. Follow all current local and Federal occupational rules and regulations regarding protection from silica dust.

9.3 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. Dry abrasive blast cleaning is often used to remove coatings with hazardous components. Good industrial hygiene practices should be followed.

10. Disclaimer

10.1 This is a consensus standard developed by SSPC: The Society for Protective Coatings. While every precaution is taken to ensure that all information furnished in SSPC standards and specifications is as accurate, complete, and 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.

10.2 This standard does not attempt to address all problems concerning safety and health 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 appropriate governmental regulations.

11. Notes

Notes are not requirements of this standard, unless called out in the procurement documents (project specification).

11.1 SUBSTRATE SOUNDNESS: Abrasive blast cleaning alone may not produce a sound substrate. Soundness of the abrasive blast cleaned surface may be verified using the following procedure: lightly push the flat edge of a flat head screwdriver across the surface of the concrete, maintaining an angle of approximately 30 degrees. If the edge of the screwdriver rides over the surface without loosening any particles and leaves no more than a shiny mark, the surface is sound. If this process gouges the surface or removes loose material, the surface is not sound.

Impact tools such as chipping hammers or other devices may be required to remove unsound substrate. Substrate soundness and repair is beyond the scope of this standard; however, it may be important to be included in the procurement documents (project specification) for a successful project. ICRI (International Concrete Repair Institute) has publications and technical guidelines for inspecting and repairing unsound concrete substrates and may be consulted for further information. See ICRI 210.3R and ICRI 310.2R.

11.2 SURFACE PROFILE: The profile achieved after abrasive blast cleaning is dependent on the type of concrete substrate, existing surface profile of the concrete substrate, size, shape, type, and hardness of the abrasive, particle velocity and angle of impact, dwell time of the abrasive blast cleaning operation, hardness of the substrate, amount of abrasive recycling, and the proper maintenance of working mixtures of grit and/or shot.

If control of surface profile (minimum/maximum) is deemed to be significant to coating performance, it should be addressed in the procurement documents (project specification). Typical surface profile achieved with commercial abrasive media are shown in ICRI 310.2R. Surface profile may be compared visually in accordance with ICRI 310.2R Concrete Surface Profile Comparator coupons or by using ASTM D7682.

Coating removal may cause an excessively deep surface profile. Jobsite mockups are strongly recommended to confirm that the method of surface preparation is capable of achieving the specified profile.

11.3 CORROSION OF REINFORCING STEEL: When concrete is placed around reinforcing bars, a passivation layer forms over the surface to protect it from further corrosion, provided it remains intact. This passive protection film is maintained by the highly alkaline environment of the hydrated portland cement.

The protective film is destroyed when moisture, chloride ions, and oxygen are allowed to penetrate through the air voids or cracks to reach the steel substrate establishing local corrosion cells or resulting in the formation of large amounts of iron oxide with concurrent expansion. Typically, the expansive forces will exceed the tensile strength of the concrete covering the steel bars, causing further cracks in the concrete allowing further ingress of chloride ion and oxygen.

Acids and atmospheric carbonation (CO_2) can also destroy the passive protection of reinforcing steel resulting in cracking and spalling of the concrete.

Additional information on addressing exposed reinforcing steel can be found in ICRI 310.1R.

11.4 MASONRY: Masonry substrates are regularly abrasive blast cleaned for the purpose of cleaning and/or recoating. The definition of masonry is not included in Section 2.2 of this standard. This standard is not meant to exclude masonry from its use, however due to the vast amounts

of masonry materials available and the differing surface conditions that may result from abrasive blast cleaning masonry it was not included in this standard. With a properly worded specification, this standard may be used successfully for abrasive blast cleaning of masonry substrates.

11.5 JOBSITE MOCKUPS: Jobsite mockups are recommended prior to commencing work. Concrete, as defined in Section 2.2 of this standard, can be made up of various types of cements, aggregates and admixtures. Many will look different when abrasive blast cleaned. Mockups can be used to make sure all parties are in agreement of the expectations prior to work taking place.

11.6 ABRASIVE SELECTION: Types of metallic and nonmetallic abrasives are discussed in SSPC-SP COM. Blast cleaning abrasives may become embedded in, or leave residues on, the surface of the concrete during cleaning. While such embedment or residues may not be detrimental, care should be taken to ensure that the abrasive is free from detrimental amounts of water-soluble, solvent-soluble, acid-soluble, or other soluble contaminants (particularly if the cleaned concrete is to be used in an immersion environment). Criteria for selecting and evaluating abrasives are provided in SSPC-AB 1, SSPC-AB 2, SSPC-AB 3, and SSPC-AB 4.

11.7 SURFACE IMPERFECTIONS

11.7.1 Surface imperfections that can cause premature coating failure are often present. Coatings tend to pull away from sharp edges and projections, leaving little or no coating to protect the underlying substrate. Other features that are difficult to properly cover and protect include surface air voids, cracks, fins, honeycombs, form-tie holes, voids and sharp exposed aggregate.

11.7.2 The high cost of the methods to remedy surface imperfections (e.g., patching, grinding and edge rounding) should be compared with the benefits of preventing a premature coating failure. Requirements for repair of surface imperfections should be included in the procurement documents (project specification). An example follows: "Prior to completing blast cleaning, surface imperfections such as bugholes, cracks, exposed aggregate, fins, honeycombs, popouts, scaling, spalling, form-tie holes, and voids shall be removed from the surface and repaired."

11.8 COATING APPLICATION: This surface preparation standard was designed for use prior to coating application on a concrete substrate. This standard may be used for concrete surface preparation only without the need for coatings application; then some procedures listed in this standard may not apply. For more information regarding application of coatings to properly prepared concrete substrates see SSPC-SP 13/NACE No. 6, SSPC-PA 7, SSPC-PA 14, ICRI 310.1R and SSPC-TR 5/ICRI 710.1/NACE 02203.

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SSPC TECHNICAL COMMITTEE CHAIR

CERTIFICATE OF ACHIEVEMENT

FOR THE 2019 DEVELOPMENT OF

SSPC-SP CAB-1, 2, AND 3
ABRASIVE BLAST CLEANING OF CONCRETE AND CEMENTITIOUS MATERIALS (THOROUGH, INTERMEDIATE AND BRUSH)

IS AWARDED TO

Sam Scaturro

Alpine Painting and Sandblasting

DECEMBER 21, 2019

KEVIN P. LARUE
DIRECTOR OF TECHNICAL SERVICES

WILLIAM M. WORMS
SSPC EXECUTIVE DIRECTOR

SSPC The Society For Protective Coatings

SSPC: The Society for Protective Coatings

SURFACE PREPARATION STANDARD

Abrasive Blast Cleaning of Concrete and Cementitious Materials
SSPC-SP CAB-2 – Intermediate Blast Cleaning

Foreword

This standard is one of a set of three standards that define levels of surface cleanliness for concrete substrates prepared using abrasive blast cleaning. The cleanliness levels are based on 1) the extent of removal of the existing coating and 2) the extent to which surface air voids are opened. Intermediate Blast Cleaning (SSPC-SP CAB-2) defines a level of cleanliness between Thorough Blast Cleaning (SSPC-SP CAB-1), which defines the highest level of cleaning and Brush Blast Cleaning, (SSPC-SP CAB-3), which defines the lowest level of cleaning. All three levels of cleanliness require complete removal of all unsound surface materials, all efflorescence and all laitance, and are summarized in Table 1.

See Section 2 of this standard for the full definition of Intermediate Blast Cleaning.

> In this standard, the terms *shall* and *must* are used to state mandatory requirements. The term *should* is used to state something considered good and is recommended but is not mandatory. The term *may* is used to state something considered optional.

1. Scope

1.1 This standard defines the Intermediate Blast Cleaning level of surface cleanliness achieved using abrasive blast cleaning. The standard includes requirements for the resulting condition of the surface as determined by visual inspection and procedures used to achieve and verify the resulting condition.

1.2 This standard is limited to requirements for removal of visible surface contaminants and existing coatings from concrete surfaces, and procedures for verification. Specific requirements for concrete soundness, surface profile range, and repair of the substrate and any exposed reinforcing steel are beyond the scope of this standard (see Notes 11.1, 11.2, and 11.3).

1.3 The requirements of this standard are applicable to all types of concrete as defined in Section 2.2 (see Note 11.4). If a visual guide or comparator is specified to supplement the written standard, determine the initial condition of the concrete prior to blast cleaning before the blast cleaning commences (see Note 11.5).

1.4 UNITS OF MEASURE: This standard provides both IEEE/ASTM[1] SI 10, "American National Standard for Metric Practice" International System Units (SI) and U.S. Customary units. The measurements are not exact equivalents; therefore, each system must be used independently of the other. Where both sets of units are shown, SI units are presented first, with approximate U.S. Customary values shown in parentheses.

2. Definition

2.1 INTERMEDIATE BLAST CLEANING: The surface of a concrete substrate that has been intermediately blast cleaned, when viewed without magnification, shall be free of all visible deposits of oil, grease, mildew, curing compounds,

[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>

TABLE 1
COMPARISON OF DEGREES OF CONCRETE ABRASIVE BLAST CLEANING

	Unsound Surface, Efflorescence, Laitance	Opening of Surface Air Voids	Existing Coating	Notes
Thorough Blast Cleaning	Remove All	Fully Opened	Remove All	Full removal and uniform profiling of the surface
Intermediate Blast Cleaning	Remove All	Not Required	Remove Most	Remove all existing coating except for that remaining in surface air voids and uniform profiling of the surface
Brush Blast Cleaning	Remove All	Not Required	Remove Loose	Uniform profiling of the surface

This standard, developed by the SSPC C.7.3 Concrete Surface Preparation Committee, was first issued in December 2019.

form release agents, dust, efflorescence, laitance, concrete spatter, other visible contaminants, and poorly bonded or weak surface layers capable of being removed by abrasive blast cleaning. The entire surface shall be uniformly and completely abraded and profiled by abrasive media. Surface air voids (also called bugholes) need not be opened. The concrete surface shall be blast cleaned to remove all existing coating except for that remaining in surface air voids and pores.

2.2 OTHER TERMS USED IN THIS STANDARD

CONCRETE: For the purposes of this standard, the term *concrete* shall refer to all types of cementitious substrates including cast-in-place, precast and prestressed concrete substrates, and shotcrete, cementitious grouts, overlayments and underlayments.

FORM TIE HOLES: Openings left in concrete after tie-rods securing forms in place are removed. Same as "tie-rod holes" or "snap-tie holes."

PROFILE: *(noun)* The topographic contour of the concrete surface as measured or as compared to a replica sample. *(verb)* To roughen the surface of a substrate by abrasive blast cleaning.

SUBSTRATE: Cementitious material that makes up the structure being abrasive blast cleaned.

SURFACE: The top of the substrate being abrasive blast cleaned.

SURFACE AIR VOID: Small regular or irregular cavities, usually not exceeding 15 mm (0.60 in) in diameter, resulting from entrapment of air bubbles in the surface of formed concrete during placement and consolidation (sometimes called a "bughole").

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 color of the concrete, the type and size of aggregates used, surface finishing techniques, original surface profile and condition, abrasive media utilized, and differences resulting from the blast pattern.

3.2 ICRI[2] 310.2R CSP (concrete surface profile) comparators or other visual guides 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 and comparators.

[2] International Concrete Repair Institute (ICRI), 10600 West Higgins Road, Suite 607 Rosemont, IL 60018. Phone: 847-827-0830 <www.icri.org>

4. Associated Documents

4.1 The dates of the referenced standards in effect at the time of publication of this standard shall govern unless otherwise specified. Documents marked with an asterisk (*) are not requirements of this standard.

4.2 When a conflict between the requirements of any of the cited referenced standards and this standard occurs, 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 Abrasives
	SSPC-AB 4	Recyclable Encapsulated Abrasive Media
*	SSPC-SP COM	Surface Preparation Commentary
*	SSPC-SP 13/ NACE No. 6	Surface Preparation of Concrete
*	SSPC-TR 5/ ICRI 710.1/ NACE 02203)	Design, Installation, and Maintenance of Protective Polymer Flooring Systems for Concrete
*	SSPC-PA 7	Applying Thin Film Coatings to Concrete
*	SSPC-PA 14	Application of Thick Film Polyurea and Polyurethane Coatings to Concrete and Steel Using Plural-Component Equipment

4.4 ASTM INTERNATIONAL STANDARD TEST METHODS

	ASTM D4258	Standard Practice for Surface Cleaning of Concrete for Coating
	ASTM D4285	Standard Method for Indicating Oil or Water in Compressed Air
*	ASTM D7682	Standard Test Method for Replication and Measurement of Concrete Surface Profiles Using Replica Putty
	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

4.5 ICRI TECHNICAL GUIDELINES

*	ICRI 210.3R	Guide for Using In-Situ Tensile Pulloff Tests to Evaluate Bond of Concrete Surface Materials
*	ICRI 310.1R	Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion
*	ICRI 310.2R	Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair

5: Procedures Before Blast Cleaning

5.1 Visible deposits of grease, oil, mildew, and other visible contaminants shall be removed prior to blast cleaning. A black-light test, water-break test per ASTM F22 or atomizer test per ASTM F21 shall be performed for verification of removal of grease and oil contamination.

5.2 If a visual guide or comparator is specified to supplement the written standard, the condition of the concrete prior to blast cleaning shall be determined before the blast cleaning commences (see Note 11.2).

6: Blast Cleaning Methods and Operation

6.1 Perform abrasive blast cleaning operations on all concrete substrates specified in the procurement documents (project specification). Use any of the following methods of surface preparation to achieve a thoroughly blast cleaned surface. (Hazardous materials may be present; see Section 9).

6.1.1 Dry abrasive blast cleaning.

6.1.2 Dry abrasive blast cleaning using a closed-cycle, recirculating abrasive system.

6.1.3 Dry abrasive blast cleaning using abrasive media encapsulated in a compressible non-uniform cellular matrix.

6.1.4 Abrasive blast cleaning using water injection before, within or after the blast nozzle.

6.1.5 Wet (slurry/vapor) abrasive blast cleaning using wet media.

6.1.6 Other methods of abrasive blast cleaning may be used to achieve a thoroughly blast cleaned surface.

6.2 Clean, dry compressed air shall be used for dry abrasive blast cleaning. 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 may be necessary to achieve this requirement.

7. Blast Cleaning Abrasives

7.1 Selection of abrasive size and type shall be based on the type, grade, and surface condition of the concrete to be cleaned, the type of blast cleaning system used, the finished surface to be produced (cleanliness and surface profile), and whether the abrasive will be recycled.

7.2 The blast cleaning abrasive shall be dry (for dry blast cleaning only) and free of oil, grease, and other contaminants as required by SSPC-AB 1, SSPC-AB 2, SSPC-AB 3, and SSPC-AB 4, as applicable.

7.3 The abrasive shall comply with any additionally specified requirements or limitations of the procurement documents (project specification) (see Note 11.6).

7.4 When a coating is specified, the abrasive selected shall clean the surface and produce the surface profile specified in the procurement documents (project specification). If the surface profile is not specified in the procurement documents, the abrasive selected shall profile and clean the surface to the degree required by the manufacturer's product data sheet for the coating to be applied (see Note 11.7).

8. Procedures Following Blast Cleaning and Immediately Prior to Coating

8.1 Mildew and concrete spatter shall be removed from the concrete surface.

8.2 A black-light test, water-break test per ASTM F22, or atomizer test per ASTM F21 shall be performed for verification of removal of contaminants only if oil or other contaminants that penetrate the substrate were found prior to blast cleaning or if testing is required by the procurement documents (project specification).

8.3 Dust and loose residues shall be removed from blast-cleaned substrates by brushing, blowing off with clean compressed dry air, vacuum cleaning, water washing, or other specified methods according to ASTM D4258.

8.3.1 If compressed air is used to clean prior to coating, the cleanliness of the compressed air used for blowing must be verified in accordance with the procedure described in ASTM D4285. Moisture separators, oil separators, traps, or other equipment may be necessary to achieve this requirement.

8.4 Surface air voids need not be opened by intermediate blast cleaning. Any remaining surface imperfections such as cracks, exposed aggregate, fins, honeycombs, popouts, scaling, spalling, form tie holes and voids shall be removed and/or repaired to the extent required by the procurement documents (project specification) and are not part of this standard (see Note 11.7).

8.5 Immediately prior to application, the entire surface to be coated shall comply with the degree of cleanliness defined by this standard (see Note 11.8).

9. Safety and Environmental Requirements

9.1 Because abrasive blast cleaning is a hazardous operation, all work shall be conducted in compliance with applicable occupational and environmental health and safety rules and regulations.

9.2 Abrasive blast cleaning of concrete substrates may introduce silica dust into the atmosphere and into the breathing zones of workers and bystanders. Follow all current local and Federal occupational rules and regulations regarding protection from silica dust.

9.3 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. Dry abrasive blast cleaning is often used to remove coatings with hazardous components. Good industrial hygiene should be followed.

10. Disclaimer

10.1 This is a consensus standard developed by SSPC: The Society for Protective Coatings. While every precaution is taken to ensure that all information furnished in SSPC standards and specifications is as accurate, complete, and 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.

10.2 This standard does not attempt to address all problems concerning safety and health 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 appropriate governmental regulations.

11. Notes

Notes are not requirements of this standard, unless called out in the procurement documents (project specification).

11.1 SUBSTRATE SOUNDNESS: Abrasive blast cleaning alone may not produce a sound substrate. Soundness of the abrasive blast cleaned surface may be verified using the following procedure: lightly push the flat edge of a flat head screwdriver across the surface of the concrete, maintaining an angle of approximately 30 degrees. If the edge of the screwdriver rides over the surface without loosening any particles and leaves no more than a shiny mark, the surface is sound. If this process gouges the surface or removes loose material, the surface is not sound.

Impact tools such as chipping hammers or other devices may be required to remove unsound substrate. Substrate soundness and repair is beyond the scope of this standard; however, it may be important to be included in the procurement documents (project specification) for a successful project. ICRI (International Concrete Repair Institute) has publications and technical guidelines for inspecting and repairing unsound concrete substrates and may be consulted for further information. See ICRI 210.3R and ICRI 310.2R.

11.2 SURFACE PROFILE: The profile achieved after abrasive blast cleaning is dependent on the type of concrete substrate, existing surface profile of the concrete substrate, size, shape, type, and hardness of the abrasive, particle velocity and angle of impact, dwell time of the abrasive blast cleaning operation, hardness of the substrate, amount of abrasive recycling, and the proper maintenance of working mixtures of grit and/or shot.

If control of surface profile (minimum/maximum) is deemed to be significant to coating performance, it should be addressed in the procurement documents (project specification). Typical surface profiles achieved with commercial abrasive media are shown in ICRI 310.2R. Surface profile may be compared visually in accordance with ICRI 310.2R Concrete Surface Profile Comparator coupons or by using ASTM D7682.

Coating removal may cause an excessively deep surface profile. Jobsite mockups are strongly recommended to confirm that the method of surface preparation is capable of achieving the specified profile.

11.3 CORROSION OF REINFORCING STEEL: When concrete is placed around reinforcing bars, a passivation layer forms over the surface to protect it from further corrosion, provided it remains intact. This passive protection film is maintained by the highly alkaline environment of the hydrated portland cement.

The protective film is destroyed when moisture, chloride ions, and oxygen are allowed to penetrate through the air voids or cracks to reach the steel substrate establishing local corrosion cells or resulting in the formation of large amounts of iron oxide with concurrent expansion. Typically, the expansive forces will exceed the tensile strength of the concrete covering the steel bars, causing further cracks in the concrete allowing further ingress of chloride ion and oxygen.

Acids and atmospheric carbonation (CO_2) can also destroy the passive protection of reinforcing steel resulting in cracking and spalling of the concrete.

Additional information on addressing exposed reinforcing steel can be found in ICRI 310.1R.

11.4 MASONRY: Masonry substrates are regularly abrasive blast cleaned for the purpose of cleaning and/or recoating. The definition of masonry is not included in Section 2.2 of this standard. This standard is not meant to exclude masonry from its use, however due to the vast amounts of masonry materials available and the differing surface conditions that may result from abrasive blast cleaning masonry it was not included in this standard. With a properly worded specification, this standard may be used successfully for abrasive blast cleaning of masonry substrates.

11.5 JOBSITE MOCKUPS: Jobsite mockups are recommended prior to commencing work. Concrete, as defined in Section 2.2 of this standard, can be made up of

various types of cements, aggregates and admixtures. Many will look different when abrasive blast cleaned. Mockups can be used to make sure all parties are in agreement of the expectations prior to work taking place.

11.6 ABRASIVE SELECTION: Types of metallic and nonmetallic abrasives are discussed in SSPC-SP COM. Blast cleaning abrasives may become embedded in, or leave residues on, the surface of the concrete during cleaning. While such embedment or residues may not be detrimental, care should be taken to ensure that the abrasive is free from detrimental amounts of water-soluble, solvent-soluble, acid-soluble, or other soluble contaminants (particularly if the cleaned concrete is to be used in an immersion environment). Criteria for selecting and evaluating abrasives are provided in SSPC-AB 1, SSPC-AB 2, SSPC-AB 3, and SSPC-AB 4.

11.7 SURFACE IMPERFECTIONS

11.7.1 Surface imperfections that can cause premature coating failure are often present. Coatings tend to pull away from sharp edges and projections, leaving little or no coating to protect the underlying substrate. Other features that are difficult to properly cover and protect include surface air voids, cracks, fins, honeycombs, form-tie holes, voids and sharp exposed aggregate.

11.7.2 The high cost of the methods to remedy surface imperfections (e.g., patching, grinding and edge rounding) should be compared with the benefits of preventing a premature coating failure. Requirements for repair of surface imperfections should be included in the procurement documents (project specification). An example follows: "Prior to completing blast cleaning, surface imperfections such as bugholes, cracks, exposed aggregate, fins, honeycombs, popouts, scaling, spalling, form-tie holes, and voids shall be removed from the surface and repaired."

11.8 COATING APPLICATION: This surface preparation standard was designed for use prior to coating application on a concrete substrate. This standard may be used for concrete surface preparation only without the need for coatings application; then some procedures listed in this standard may not apply. For more information regarding application of coatings to properly prepared concrete substrates see SSPC-SP 13/NACE No. 6, SSPC-PA 7, SSPC-PA 14, ICRI 310.1R and SSPC-TR 5/ICRI 710.1/NACE 02203.

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SURFACE PREPARATION STANDARD

Abrasive Blast Cleaning of Concrete and Cementitious Materials
SSPC-SP CAB-3 – Brush Blast Cleaning

Foreword

This standard is one of a set of three standards that define levels of surface cleanliness for concrete substrates prepared using abrasive blast cleaning. The cleanliness levels are based on 1) the extent of removal of the existing coating and 2) the extent to which surface air voids are opened. Brush Blast Cleaning (SSPC-SP CAB-3), defines the lowest level of cleanliness. The other two standards in the set, Intermediate Blast Cleaning (SSPC-SP CAB-2), and Thorough Blast Cleaning (SSPC-SP CAB-1), define higher levels of concrete cleanliness. All three levels of cleanliness require complete removal of all unsound surface materials, all efflorescence and all laitance, and are summarized in Table 1.

See Section 2 of this standard for the full definition of Brush Blast Cleaning.

> In this standard, the terms *shall* and *must* are used to state mandatory requirements. The term *should* is used to state something considered good and is recommended but is not mandatory. The term *may* is used to state something considered optional.

1. Scope

1.1 This standard defines the Brush Blast Cleaning level of surface cleanliness achieved using abrasive blast cleaning. The standard includes requirements for the resulting condition of the surface as determined by visual inspection and materials and procedures used to achieve and verify the resulting condition.

1.2 This standard is limited to requirements for removal of visible surface contaminants from concrete surfaces, and procedures for verification. Requirements for soundness, profiling and repair of the concrete substrate, and any exposed reinforcing steel are beyond the scope of this standard (see Notes 11.1, 11.2, and 11.3).

1.3 The requirements of this standard are applicable to all types of concrete as defined in Section 2.2 (see Note 11.4). If a visual guide or comparator is specified to supplement the written standard, determine the initial condition of the concrete prior to blast cleaning before the blast cleaning commences (see Note 11.5).

1.4 UNITS OF MEASURE: This standard provides both IEEE/ASTM[1] SI 10, "American National Standard for Metric Practice" International System Units (SI) and U.S. Customary units. The measurements are not exact equivalents; therefore, each system must be used independently of the other. Where both sets of units are shown, SI units are presented first, with approximate U.S. Customary values shown in parentheses.

2. Definition

2.1 BRUSH BLAST CLEANING: The surface of a concrete substrate that has been brush blast cleaned, when viewed without magnification, shall be free of all visible deposits of oil, grease, mildew, form release agents, dust, efflorescence, laitance, concrete spatter, and other

[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>

TABLE 1
COMPARISON OF DEGREES OF CONCRETE ABRASIVE BLAST CLEANING

	Unsound Surface, Efflorescence, Laitance	Opening of Surface Air Voids	Existing Coating	Notes
Thorough Blast Cleaning	Remove All	Fully Opened	Remove All	Full removal and uniform profiling of the surface
Intermediate Blast Cleaning	Remove All	Not Required	Remove Most	Remove all existing coating except for that remaining in surface air voids and uniform profiling of the surface
Brush Blast Cleaning	Remove All	Not Required	Remove Loose	Uniform profiling of the surface

This standard, developed by the SSPC C.7.3 Concrete Surface Preparation Committee, was first issued in December 2019

visible contaminants capable of being removed by abrasive blast cleaning. The entire surface shall be uniformly and completely abraded and profiled by abrasive media. Surface air voids (also called bugholes) need not be opened. Loose curing compounds, loose coating, and other loose surface layers shall be removed by abrasive blast cleaning and shall be considered loose if they can be removed by using a dull putty knife as described in Section 8.5.

2.2 OTHER TERMS USED IN THIS STANDARD

CONCRETE: For the purposes of this standard, the term *concrete* shall refer to all types of cementitious substrates, including cast-in-place, precast and prestressed concrete substrates, and shotcrete, cementitious grouts, overlayments and underlayments.

DULL PUTTY KNIFE (for use as an inspection tool): A commercially manufactured straight flexible metal blade with these characteristics: width – approximately [~]40 to 75 mm (1-1/2 to 3 in); length – ~75 to 125 mm (3 to 5 in); thickness – ~760 to 1270 μm (30 to 50 mils); flexibility – able to be bent by hand around an 28- to 33-cm (11- to 13-inch) diameter mandrel (or pipe or bucket) and return to its original shape without permanent deformation.

FORM TIE HOLES: Openings left in concrete after tie-rods securing forms in place are removed. Same as "tie-rod holes" or "snap-tie holes."

PROFILE: *(noun)* The topographic contour of the concrete surface as measured or as compared to a replica sample. *(verb)* To roughen the surface of a substrate by abrasive blast cleaning.

SUBSTRATE: Cementitious material that makes up the structure being abrasive blast cleaned.

SURFACE: The top of the substrate being abrasive blast cleaned.

SURFACE AIR VOID: Small regular or irregular cavities, usually not exceeding 15 mm (0.60 in) in diameter, resulting from entrapment of air bubbles in the surface of formed concrete during placement and consolidation (sometimes called a "bughole").

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 color of the concrete, the type and size of aggregates used, surface finishing techniques, original surface profile and condition, abrasive media utilized, and differences resulting from the blast pattern.

3.2 ICRI[2] 310.2R CSP (concrete surface profile) comparators or other visual guides 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 and comparators.

4. Associated Documents

4.1 The dates of the referenced standards in effect at the time of publication of this standard shall govern unless otherwise specified. Documents marked with an asterisk (*) are not requirements of this standard.

4.2 When a conflict between the requirements of any of the cited referenced standards and this standard occurs, 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 Abrasives
	SSPC-AB 4	Recyclable Encapsulated Abrasive Media
	SSPC-SP COM	Surface Preparation Commentary
*	SSPC-SP 13/ NACE No. 6	Surface Preparation of Concrete
*	SSPC-TR 5/ ICRI 710.1/ NACE 02203)	Design, Installation, and Maintenance of Protective Polymer Flooring Systems for Concrete
*	SSPC-PA 7	Applying Thin Film Coatings to Concrete
*	SSPC-PA 14	Application of Thick Film Polyurea and Polyurethane Coatings to Concrete and Steel Using Plural-Component Equipment

4.4 ASTM INTERNATIONAL STANDARD TEST METHODS

	ASTM D4258	Standard Practice for Surface Cleaning of Concrete for Coating
	ASTM D4285	Standard Method for Indicating Oil or Water in Compressed Air
*	ASTM D7682	Standard Test Method for Replication and Measurement of Concrete Surface Profiles Using Replica Putty
	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

[2] International Concrete Repair Institute (ICRI), 10600 West Higgins Road, Suite 607 Rosemont, IL 60018. Phone: 847-827-0830 <www.icri.org>

4.5 ICRI TECHNICAL GUIDELINES

*	ICRI 210.3R	Guide for Using In-Situ Tensile Pulloff Tests to Evaluate Bond of Concrete Surface Materials
*	ICRI 310.1R	Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion
*	ICRI 310.2R	Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair

5. Procedures Before Blast Cleaning

5.1 Visible deposits of grease, oil, mildew, and other visible contaminants shall be removed prior to blast cleaning. A black-light test, water-break test per ASTM F22 or atomizer test per ASTM F21 shall be performed for verification of removal of grease and oil contamination.

5.2 If a visual guide or comparator is specified to supplement the written standard, the condition of the concrete prior to blast cleaning shall be determined before the blast cleaning commences (see Note 11.2).

6. Blast Cleaning Methods and Operation

6.1 Perform abrasive blast cleaning operations on all concrete substrates specified in the procurement documents (project specification). Use any of the following methods of surface preparation to achieve a thoroughly blast cleaned surface. (Hazardous materials may be present; see Section 9).

6.1.1 Dry abrasive blast cleaning.

6.1.2 Dry abrasive blast cleaning using a closed-cycle, recirculating abrasive system.

6.1.3 Dry abrasive blast cleaning using abrasive media encapsulated in a compressible non-uniform cellular matrix.

6.1.4 Abrasive blast cleaning using water injection before, within or after the blast nozzle.

6.1.5 Wet (slurry/vapor) abrasive blast cleaning using wet media.

6.1.6 Other methods of abrasive blast cleaning may be used to achieve a thoroughly blast cleaned surface.

6.2 Clean, dry compressed air shall be used for dry abrasive blast cleaning. 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 may be necessary to achieve this requirement.

7. Blast Cleaning Abrasives

7.1 Selection of abrasive size and type shall be based on the type, grade, and surface condition of the concrete to be cleaned, the type of blast cleaning system used, the finished surface to be produced (cleanliness and surface profile), and whether the abrasive will be recycled.

7.2 The blast cleaning abrasive shall be dry (for dry blast cleaning only) and free of oil, grease, and other contaminants as required by SSPC-AB 1, SSPC-AB 2, SSPC-AB 3, and SSPC-AB 4, as applicable.

7.3 The abrasive shall comply with any additionally specified requirements or limitations of the procurement documents (project specification) (see Note 11.6).

7.4 When a coating is specified, the abrasive selected shall clean the surface and produce the surface profile specified in the procurement documents (project specification). If the surface profile is not specified in the procurement documents, the abrasive selected shall profile and clean the surface to the degree required by the manufacturer's product data sheet for the coating to be applied (see Note 11.7).

8. Procedures Following Blast Cleaning and Immediately Prior to Coating

8.1 Mildew and concrete spatter shall be removed from the concrete surface.

8.2 A black-light test, water-break test per ASTM F22, or atomizer test per ASTM F21 shall be performed for verification of removal of contaminants only if oil or other contaminants that penetrate the substrate were found prior to blast cleaning or if testing is required by the procurement documents (project specification).

8.3 Dust and loose residues shall be removed from blast-cleaned substrates by brushing, blowing off with clean compressed dry air, vacuum cleaning, water washing, or other specified methods according to ASTM D4258.

8.3.1 If compressed air is used to clean prior to coating, the cleanliness of the compressed air used for blowing must be verified in accordance with the procedure described in ASTM D4285. Moisture separators, oil separators, traps, or other equipment may be necessary to achieve this requirement.

8.4 Surface air voids need not be opened by brush blast cleaning. Any remaining surface imperfections such as cracks, exposed aggregate, fins, honeycombs, popouts, scaling, spalling, form tie holes and voids shall be removed or repaired to the extent required by the procurement documents (project specification) and are not part of this standard (see Note 11.7).

8.5 When using a dull putty knife to test for loose curing compounds, loose coating, and other loose surface layers after cleaning, the narrow end of the blade shall be held flat against the surface and pushed with light to moderate pressure at a maximum of 45 degrees to 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 edge that would prevent the blade from making intimate contact with the surface (see Note 11.8) .

8.6 Immediately prior to application, the entire surface to be coated shall comply with the degree of cleanliness defined by this standard (see Note 11.9).

9. Safety and Environmental Requirements

9.1 Because abrasive blast cleaning is a hazardous operation, all work shall be conducted in compliance with applicable occupational and environmental health and safety rules and regulations.

9.2 Abrasive blast cleaning of concrete substrates may introduce silica dust into the atmosphere and into the breathing zones of workers and bystanders. Follow all current local and Federal occupational rules and regulations regarding protection from silica dust.

9.3 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. Dry abrasive blast cleaning is often used to remove coatings with hazardous components. Good industrial hygiene should be followed.

10. Disclaimer

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10.2 This standard does not attempt to address all problems concerning safety and health 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 appropriate governmental regulations.

11. Notes

Notes are not requirements of this standard, unless called out in the procurement documents (project specification).

11.1 SUBSTRATE SOUNDNESS: Abrasive blast cleaning alone may not produce a sound substrate. Soundness of the abrasive blast cleaned surface may be verified using the following procedure: lightly push the flat edge of a flat head screwdriver across the surface of the concrete, maintaining an angle of approximately 30 degrees. If the edge of the screwdriver rides over the surface without loosening any particles and leaves no more than a shiny mark, the surface is sound. If this process gouges the surface or removes loose material, the surface is not sound.

Impact tools such as chipping hammers or other devices may be required to remove unsound substrate. Substrate soundness and repair is beyond the scope of this standard; however, it may be important to be included in the procurement documents (project specification) for a successful project. ICRI (International Concrete Repair Institute) has publications and technical guidelines for inspecting and repairing unsound concrete substrates and may be consulted for further information. See ICRI 210.3R and ICRI 310.2R.

11.2 SURFACE PROFILE: The profile achieved after abrasive blast cleaning is dependent on the type of concrete substrate, existing surface profile of the concrete substrate, size, shape, type, and hardness of the abrasive, particle velocity and angle of impact, dwell time of the abrasive blast cleaning operation, hardness of the substrate, amount of abrasive recycling, and the proper maintenance of working mixtures of grit and/or shot.

If control of surface profile (minimum/maximum) is deemed to be significant to coating performance, it should be addressed in the procurement documents (project specification). Typical surface profile achieved with commercial abrasive media are shown in ICRI 310.2R. Surface profile may be compared visually in accordance with ICRI 310.2R Concrete Surface Profile Comparator coupons or by using ASTM D7682.

Coating removal may cause an excessively deep surface profile. Jobsite mockups are strongly recommended to confirm that the method of surface preparation is capable of achieving the specified profile.

11.3 CORROSION OF REINFORCING STEEL: When concrete is placed around reinforcing bars, a passivation layer forms over the surface to protect it from further corrosion, provided it remains intact. This passive protection film is maintained by the highly alkaline environment of the hydrated Portland cement.

The protective film is destroyed when moisture, chloride ions, and oxygen are allowed to penetrate through the air

voids or cracks to reach the steel substrate establishing local corrosion cells or resulting in the formation of large amounts of iron oxide with concurrent expansion. Typically, the expansive forces will exceed the tensile strength of the concrete covering the steel bars, causing further cracks in the concrete allowing further ingress of chloride ion and oxygen.

Acids and atmospheric carbonation (CO_2) also can destroy the passive protection of reinforcing steel resulting in cracking and spalling of the concrete.

Additional information on addressing exposed reinforcing steel can be found in ICRI 310.1R.

11.4 MASONRY: Masonry substrates are regularly abrasive blast cleaned for the purpose of cleaning and/or recoating. The definition of masonry is not included in Section 2.2 of this standard. This standard is not meant to exclude masonry from its use, however due to the vast amounts of masonry materials available and the differing surface conditions that may result from abrasive blast cleaning masonry it was not included in this standard. With a properly worded specification, this standard may be used successfully for abrasive blast cleaning of masonry substrates.

11.5 JOBSITE MOCKUPS: Jobsite mockups are recommended prior to commencing work. Concrete, as defined in Section 2.2 of this standard, can be made up of various types of cements, aggregates and admixtures. Many will look different when abrasive blast cleaned. Mockups can be used to make sure all parties are in agreement of the expectations prior to work taking place.

11.6 ABRASIVE SELECTION: Types of metallic and nonmetallic abrasives are discussed in SSPC-SP COM. Blast cleaning abrasives may become embedded in, or leave residues on, the surface of the concrete during cleaning. While such embedment or residues may not be detrimental, care should be taken to ensure that the abrasive is free from detrimental amounts of water-soluble, solvent-soluble, acid-soluble, or other soluble contaminants (particularly if the cleaned concrete is to be used in an immersion environment). Criteria for selecting and evaluating abrasives are provided in SSPC-AB 1, SSPC-AB 2, SSPC-AB 3, and SSPC-AB 4.

11.7 SURFACE IMPERFECTIONS

11.7.1 Surface imperfections that can cause premature coating failure are often present. Coatings tend to pull away from sharp edges and projections, leaving little or no coating to protect the underlying substrate. Other features that are difficult to properly cover and protect include surface air voids, cracks, fins, honeycombs, form-tie holes, voids and sharp exposed aggregate.

11.7.2 The high cost of the methods to remedy surface imperfections (e.g., patching, grinding and edge rounding) should be compared with the benefits of preventing a premature coating failure. Requirements for repair of surface imperfections should be included in the procurement documents (project specification). An example follows: "Prior to completing blast cleaning, surface imperfections such as bugholes, cracks, exposed aggregate, fins, honeycombs, popouts, scaling, spalling, form-tie holes, and voids shall be removed from the surface and repaired."

11.8 DULL PUTTY KNIFE: A putty knife is acceptable for use if the thickness at end of the blade is not less than 635 μm (25 mils) or 75% of its original thickness, whichever is greater. Some commercially manufactured straight flexible metal blades are between 508 and 762 μm (20 and 30 mils) in thickness. New blade thicknesses between 508 and 762 μm (20 and 30 mils) are permitted provided the coating being tested is 508 μm (20 mils) or less in thickness, and the thickness of the blade is not worn to less than 508 μm (20 mils).

11.9 COATING APPLICATION: This surface preparation standard was designed for use prior to coating application on a concrete substrate. This standard may be used for concrete surface preparation only without the need for coatings application; then some procedures listed in this standard may not apply. For more information regarding application of coatings to properly prepared concrete substrates see SSPC-SP 13/NACE No. 6, SSPC-PA 7, SSPC-PA 14, ICRI 310.1R and SSPC-TR 5/ICRI 710.1/NACE 02203.

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COATING APPLICATION STANDARD NO. 19

Standard for Visual Evaluation of Pinholes in a Concrete or Masonry Coating

1. Scope

1.1 This standard contains a procedure for use when examining the final coat of a coating system applied to concrete or masonry surfaces to determine the number of visible pinholes. It also contains a pinhole frequency classification scheme that is used to determine the acceptability of the applied coating. Nonmandatory Note 9.1 describes additional assessment procedures that may be specified when it is necessary to determine whether pinholes extend to the substrate.

Aggregated-filled finishes, stippled finishes, finishes that are intentionally porous, craters and surface imperfections other than pinholes cannot be assessed by this method.

2. Units of Measure

This standard provides both IEEE/ASTM/SI 1[1], International Standards (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 U.S. Customary substitution units shown in parentheses.

3. Definitions

Crater: A small, rounded depression in a coating film that does not expose the previous coat or the substrate.

Pinhole: ***(as used in this standard):*** A minute hole through a coat or coats that exposes an underlying coat or the substrate.[2] *Discussion: Pinholes are often caused by latent solvent release during drying (and lack of flow-out of the coating), the trapping of air or gas in the coating film during drying, or the release of trapped air from voids in the concrete substrate.*

Evaluation Spot: An evaluation spot is ~1000 cm^2 (~1 ft^2) in size. [For U.S. standard size concrete masonry unit (CMU) blocks, 1000 cm^2 is approximately equivalent to the face of one 8 x 18-in or 12 x 12-in masonry block.]

Evaluation Zone: An evaluation zone consists of an easily definable surface such as exterior north wall or the interior south wall on the first floor or other area description agreed to by the contracted parties.

Coating: A generic term for a paint, varnish, lacquer, or other material evenly applied to a surface in a uniform adherent layer to fulfill a protective, functional or decorative purpose.

4. Pinhole Frequency Classification

Pinholes shall be classified by their frequency of occurrence within the evaluation spot (see Section 3). Pinhole frequency shall be represented on a relative scale referred to as None, Low, Moderate, or High as follows:

None – 0 pinholes per evaluation spot
Low – 1 to 10 pinholes per evaluation spot
Moderate – 11 to 20 pinholes per evaluation spot
High – greater than 20 pinholes per evaluation spot

5. Procedure

5.1 Inspection shall be performed without magnification using normal or corrected normal vision, at approximately (~) 1 meter (~40 inches) from the coated surface. To reveal the presence of pinholes, shine a hand-held light across the surface at a low angle. The light shall provide at least 538 lux (~50 foot candles) of illumination at the surface and shall illuminate at least one-third of the evaluation spot at a time from a fixed position.

5.2 Unless otherwise specified in the procurement documents (project specification), coated surfaces shall be inspected as follows:

5.2.1 Select evaluation zones (defined in Section 3) for assessment. Ensure that the evaluation spots selected within each zone in 5.2.1.1 through 5.2.1.3 include all substrate types (e.g., smooth face block, split face block, poured concrete) and environmental conditions present within that zone during application (shade, sunlight exposure, etc.).

5.2.1.1 For evaluation zones not exceeding 30 m^2 (~300 ft^2) select and inspect one (1) evaluation spot for each substrate type in each 10 m^2 (~100 ft^2) area. For example, if both smooth face and split face block are present, select one (1) evaluation spot for each block type.

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[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] NACE SP0188, Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates. NACE International, 15835 Park Ten Place Houston, Texas 77084, USA. Phone: +1-281.-228-6200.

This standard, developed by the SSPC C.8.1, Commercial Cleaning and Coating Committee, was first issued in December 2019.

5.2.1.2 For evaluation zones greater than 30 m^2 (~300 ft^2) and not exceeding 100 m^2 (~1,000 ft^2) arbitrarily select and inspect one (1) evaluation spot for each substrate type in each of three 10 m^2 (~100 ft^2) areas. For example, if both smooth face and split face block are present in the above quantity, the number of evaluation spots applies to each block type.

5.2.1.3 For evaluation zones greater than 100 m^2 (~1,000 ft^2), inspect the first 100 m^2 (~1000 ft^2) area as described in Section 5.2.1.2, then arbitrarily select and inspect three (3) evaluation spots for each substrate type in each 100 m^2 (~1,000 ft^2) area thereafter. For example, if both smooth face and split face block are present in the above quantity, the number of evaluation spots applies to each block type.

5.3 PINHOLE FREQUENCY: Pinhole frequency shall be represented on a relative scale referred to as None, Low, Moderate or High as defined in Section 4.

Report overall pinhole frequency on a structure, based on the average results from each evaluation zone as specified. (Note 9.2 provides optional reporting formats).

6. Acceptability of Results

6.1 The pinhole frequency shall be classified as defined in Section 4. The acceptable level of pinhole frequency shall be as defined in the procurement documents. If the acceptable level of pinhole frequency is not specified, the default level shall be Moderate.

6.2 If the coating manufacturer's restrictions on the number of pinholes are more stringent than the above acceptance criteria category being specified, comply with the manufacturer's requirements, unless otherwise stated in the procurement documents (project specification).

7. Nonconforming Areas

7.1 If the number of pinholes exceeds the acceptance criteria in a single evaluation spot, the procedure described in Sections 7.1.1 and 7.1.2 shall be followed to assess the magnitude of the nonconforming area.

7.1.1 Inspect four additional evaluation spots at each of the following directions, 1 m (~3 ft) from the original nonconformance (0, 90, 180, and 270 degrees). If all additional evaluation spots are compliant, use chalk to circle a 1 m (~3 ft) radius area around the original nonconformance.

7.1.2 If more noncompliant areas are found using the procedure in Section 7.1.1, then continue evaluating spots as described in Section 7.1.1 until an area has been surrounded by all compliant evaluation spots or you have reached the end of an evaluation zone. Circle the area in chalk around all noncompliant evaluation spots to demarcate the noncompliance as described in Section 7.1.1. See Figure 1 for an illustration of this procedure.

7.2 If repairs are made, reevaluate only the repaired areas as described in Sections 7.1.1 and 7.1.2 to confirm overall acceptance.

8. Disclaimer

8.1 This standard is a consensus document developed by SSPC: The Society for Protective Coatings. While every precaution is taken to ensure that all information furnished in SSPC standards is as accurate, complete, and useful as possible, SSPC cannot assume responsibility nor incur any obligation resulting from the use of any materials, coatings, or methods described herein, or of the standard itself.

8.2 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 governmental regulations.

9. Notes:

Notes are not requirements of this standard.

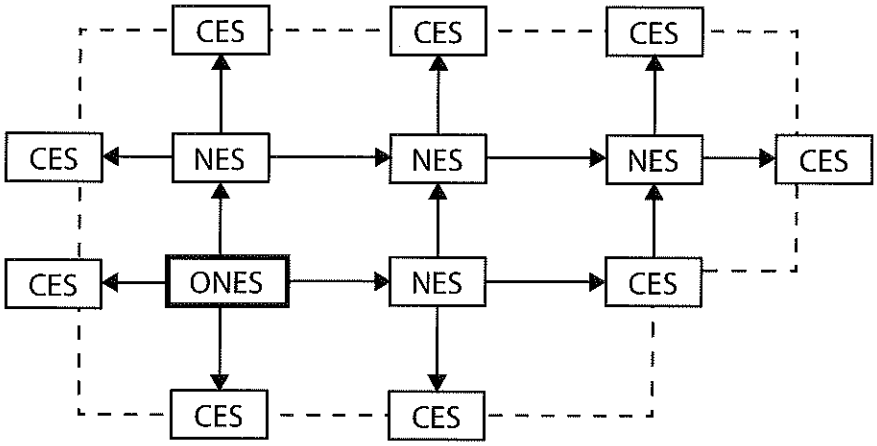
9.1 This standard is used to classify the frequency of pinholes on the surface of a coating when viewed without magnification. Depending on the service environment, pinholes that do not extend through the coating system to the substrate may not be detrimental to coating performance, but an assessment of their potential effect on long-term performance is beyond the scope of this standard. If a judgement regarding the long-term performance of coating systems containing pinholes is required, microscopic examination of selected pinholes may be undertaken to determine if the substrate is exposed.

9.1.1 The specifier should consider the conditions of the surfaces to be coated and the service environment prior to specifying acceptable results. While fewer visible pinholes may increase the service life of the coated substrate, the increased cost associated with achieving a low frequency of visible pinholes should be considered. The increase in cost to achieve a visually pinhole-free surface may be excessive. A protective coatings specialist, the coating contractor and the coating manufacturer may be consulted to make the appropriate choice for the project.

9.1.2 Additional information is available in the following ASTM standards:

- ASTM B926, Standard Method for Pinhole Determination in Aluminum and Aluminum Alloy Plain Foil

FIGURE 1
DETERMINING EXTENT OF NONCONFORMING AREAS



Dashed line indicates boundary of evaluation zone
ONES – Original Nonconforming Evaluation Spot
NES – Nonconforming Evaluation Spot
CES – Conforming Evaluation Spot

- ASTM F1929, Standard Test Method for Detecting Seal Leaks in Porous Medical Packaging
- ASTM G62, Standard Test Methods for Holiday Detection in Pipeline Coatings
- ASTM C1785, Standard Test Method

9.2 Reporting of Results:

9.2.1 Basic Reporting should identify the evaluation zone (e.g., exterior north wall), specified results, actual results and Pass/Fail, as shown in Table A9.1.

TABLE A9.1

Evaluation Zone	Pinhole Frequency		Pass/Fail
	Actual	Specified	
Exterior North Wall	High	Moderate	Fail
Interior South Wall	Low	Moderate	Pass
Interior North Wall	High	Moderate	Fail
Interior East Wall	Moderate	Moderate	Pass
Interior Floor	Low	Moderate	Pass

9.2.2 Detailed Reporting should identify all the items in basic reporting but also include substrate type and evaluation spot and should include a basic map of the location of any evaluation spots, as shown in Table A9.2.

TABLE A9.2

Evaluation Zone		Evaluation Spot	Substrate	Pinhole Frequency		Pass/Fail
Interior/Exterior	Wall Designation			Actual	Specified	
Exterior	Front (south) wall	1	Smooth Face CMU	High	Moderate	Fail
Exterior	Front (south) wall	2	Smooth Face CMU	Low	Moderate	Pass
Exterior	Right (east) wall	1	Split Face CMU	High	Moderate	Fail
Exterior	Rear (north) wall	1	Smooth Face CMU	Moderate	Moderate	Pass
Exterior	Left (west) wall	1	Smooth Face CMU	Low	Moderate	Pass

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