

Joint Surface Preparation Standard

NACE No. 8/SSPC-SP 14 Industrial Blast Cleaning

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Foreword

This joint standard covers the use of blast cleaning abrasives to achieve a defined degree of cleaning of steel surfaces prior to the application of a protective coating or lining system. This standard is intended for use by coating or lining specifiers, applicators, inspectors, or others whose responsibility it may be to define a standard degree of surface cleanliness.

The focus of this standard is industrial blast cleaning. White metal blast cleaning, near-white metal blast cleaning, commercial blast cleaning, and brush-off blast cleaning are addressed in separate standards.

Industrial blast cleaning provides a greater degree of cleaning than brush-off blast cleaning (NACE No. 4/SSPC-SP 7), but less than commercial blast cleaning (NACE No. 3/SSPC-SP 6).

Industrial blast cleaning is used when the objective is to remove most of the coating, mill scale, and rust, but when the extra effort required to remove every trace of these is determined to be unwarranted.

The difference between an industrial blast and a brush-off blast is that the objective of a brush-off blast is to allow as much of an existing coating to remain as possible, while the purpose of the industrial blast is to remove most of the coating.

A commercial blast is free of mill scale, rust, and coatings, and allows only random staining on less than 33% of the surface. The industrial blast allows defined mill scale, coating, and rust to remain on less than 10% of the surface and allows defined stains to remain on all surfaces.

This joint standard was prepared by the SSPC/NACE Task Group A on Surface Preparation by Abrasive Blast Cleaning. This joint task group includes members of both the SSPC Surface Preparation Committee and NACE Unit Committee T-6G on Surface Preparation.

In NACE standards, the terms *shall*, *must*, *should*, and *may* are used in accordance with the definitions of these terms in the *NACE Publications Style Manual*, 3rd ed., Paragraph 8.4.1.8. *Shall* and *must* are used to state mandatory requirements. *Should* is used to state that which is considered good and is recommended but is not mandatory. *May* is used to state that which is considered optional.

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Industrial Blast Cleaning**

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Section 1: General

1.1 This joint standard covers the requirements for industrial blast cleaning of uncoated or coated steel surfaces by the use of abrasives. These requirements include the end condition of the surface and materials and procedures necessary to achieve and verify the end condition.

1.2 This joint standard allows defined quantities of mill scale and/or old coating to remain on the surface.

1.3 The mandatory requirements are described in Sections 1 to 9 as follows:

Section 1	General
Section 2	Definition

Section 3	References
Section 4	Procedures Before Blast Cleaning
Section 5	Blast Cleaning Methods and Operation
Section 6	Blast Cleaning Abrasives
Section 7	Procedures Following Blast Cleaning and Immediately Prior to Coating and Lining
Section 8	Inspection
Section 9	Safety and Environmental Requirements

1.4 Section 10, "Comments," and Appendix A, "Explanatory Notes," are not mandatory requirements of this standard.

Section 2: Definition

2.1 An industrial blast cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dust, and dirt. Traces of tightly adherent mill scale, rust, and coating residues are permitted to remain on 10% of each unit area of the surface (see Paragraph 2.6) if they are evenly distributed. The traces of mill scale, rust, and coating are considered to be tightly adherent if they cannot be lifted with a dull putty knife. Shadows, streaks, and discolorations caused by stains of rust, stains of mill scale, and stains of previously applied coating may be present on the remainder of the surface.

2.2 The shape, configuration, and design of structures can lead to areas of limited accessibility for blast cleaning. Examples include crevices around rivets or fasteners, and behind or between tightly configured back-to-back angles. Because of limited accessibility, these areas are exempt from the 10% restrictions established in Paragraph 2.1. However, all surfaces in limited-access areas shall be subjected to the abrasive blast, and on completion, old coating, rust, and mill scale are permitted to remain provided they are well-adherent as determined using a dull putty knife.

2.3 Acceptable variations in appearance that do not affect surface cleanliness as defined in Paragraph 2.1 include variations caused by type of steel, original surface condition, thickness of the steel, weld metal, mill or fabrication marks, heat treating, heat-affected zones, blasting abrasives, and differences due to blasting technique.

2.4 If coating is specified, the surface shall be roughened to a degree suitable for the specified coating system.

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

2.6 Unit area for determinations shall be approximately 6,400 mm² (9 in.²) (i.e., a square 80 mm x 80 mm [3 in. x 3 in.]).

2.7 ISO⁽¹⁾ 8501-1:(latest edition)/SIS⁽²⁾ SS 05 59 00 (Condition B Sa 2), or other visual standards of surface preparation may be specified to supplement the written definition. NOTE: Additional information on visual standards is available in Paragraph A.4 of

⁽¹⁾ International Organization for Standardization (ISO), 1 rue de Varembe, Case Postale 56, CH-1121 Geneva, Switzerland.
⁽²⁾ Swedish Standards Institute (SIS), Box 6455, S 113-92 Stockholm, Sweden.

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Appendix A. Condition B Sa 2 of ISO 8501-1 does not depict the influence that previously applied coating may have on the appearance of the prepared

surface. It is based on the preparation of a previously uncoated steel surface covered with rust and flaking mill scale.

Section 3: References

3.1 The standards referenced in this standard are listed in Paragraphs 3.4 and 3.5.

3.2 The latest issue, revision, or amendment of the referenced standards in effect on the date of invitation to bid shall govern unless otherwise specified.

3.3 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.

3.4 SSPC: The Society For Protective Coatings

standards:

AB 1	Mineral and Slag Abrasives
AB 2	Cleanliness of Recycled Ferrous Metallic Abrasives
PA Guide 3	A Guide to Safety in Paint Application
SP 1	Solvent Cleaning

3.5 ISO Standard 8501-1:(latest edition): Preparation of steel substrates before application of paints and related products -- Visual assessment of surface cleanliness.

Section 4: Procedures Before Blast Cleaning

4.1 Before blast cleaning, visible deposits of oil or grease or other contaminants shall be removed in accordance with SSPC-SP 1 or other agreed-on methods.

4.2 Before blast cleaning, surface imperfections such as sharp fins, sharp edges, weld spatter, or burning slag should be removed from the surface to the extent required by the procurement documents (project specification). NOTE: Additional

information on surface imperfections is available in Paragraph A.5 of Appendix A.

4.3 If a visual standard or comparator is specified to supplement the written standard, the condition of the steel prior to blast cleaning should be determined before the blasting commences. NOTE: Additional information on visual standards and comparators is available in Paragraph A.4 of Appendix A.

Section 5: Blast Cleaning Methods and Operation

5.1 Clean, dry compressed air shall be used for nozzle blasting. Moisture separators, oil separators, traps, or other equipment may be necessary to achieve this requirement.

5.2 Any of the following methods of surface preparation may be used to achieve an industrial blast cleaned surface:

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

5.2.2 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.

5.2.3 Dry abrasive blasting using a closed-cycle, recirculating abrasive system with centrifugal wheels and abrasive.

5.3 Other methods of surface preparation (such as wet abrasive blast cleaning) may be used to achieve an industrial blast cleaned surface by mutual agreement between those responsible for performing the work and those responsible for establishing the requirements. NOTE: Information on the use of

inhibitors to prevent the formation of rust immediately after wet abrasive blast cleaning is

contained in Paragraph A.9 of Appendix A.

Section 6: Blast Cleaning Abrasives

6.1 The selection of abrasive size and type shall be based on the type, grade, and surface condition of the steel to be cleaned, type of blast cleaning system employed, the finished surface to be produced (cleanliness and roughness), and whether the abrasive will be recycled.

6.2 The cleanliness and size of recycled abrasives shall be maintained to ensure compliance with this standard.

6.3 The blast cleaning abrasive shall be dry and free of oil, grease, and other contaminants as determined

by the test methods found in SSPC-AB 1, AB 2, and AB 3.

6.4 Any limitations on the use of specific abrasives, quantity of contaminants, or degree of embedment shall be included in the procurement documents (project specification) covering the work, because abrasive embedment and abrasives containing contaminants may not be acceptable for some service requirements. NOTE: Additional information on abrasive selection is given in Paragraph A.2 of Appendix A.

Section 7: Procedures Following Blast Cleaning and Immediately Prior to Coating

7.1 Visible deposits of oil, grease, or other contaminants shall be removed according to SSPC-SP 1 or another method agreed on by those parties responsible for establishing the requirements and those responsible for performing the work.

7.2 Dust and loose residues shall be removed from prepared surfaces by brushing, blowing off with clean, dry air, vacuum cleaning, or other methods agreed on by those responsible for establishing the requirements and those responsible for performing the work. Moisture separators, oil separators, traps, or other equipment may be necessary to achieve clean, dry air.

7.3 After blast cleaning, surface imperfections that remain (e.g., sharp fins, sharp edges, weld spatter,

burning slag, scabs, slivers, etc.) shall be removed to the extent required in the procurement documents (project specification). Any damage to the surface profile resulting from the removal of surface imperfections shall be corrected to meet the requirements of Paragraph 2.4. NOTE: Additional information on surface imperfections is contained in Paragraph A.5 of Appendix A.

7.4 Any visible rust that forms on the surface of the steel after blast cleaning shall be removed by recleaning the rusted areas to meet the requirements of this standard before coating. NOTE: Information on rust-back (re-rusting) and surface condensation is contained in Paragraphs A.6, A.7, and A.8 of Appendix A.

Section 8: Inspection

8.1 Work and materials supplied under this standard are subject to inspection by a representative of those responsible for establishing the requirements. Materials and work areas shall be accessible to the inspector. The procedures and times of inspection shall be as agreed on by those responsible for establishing the requirements and those responsible for performing the work.

8.2 Conditions not complying with this standard shall be corrected. In the case of a dispute, an arbitration or settlement procedure established in the procurement documents (project specification) shall be followed. If no arbitration or settlement procedure is established, then a procedure mutually agreeable to purchaser and supplier shall be used.

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8.3 The procurement documents (project specification) should establish the responsibility for

inspection and for any required affidavit certifying compliance with the specification.

Section 9: Safety and Environmental Requirements

9.1 Because abrasive blast cleaning is a hazardous operation, all work shall be conducted in compliance with applicable insurance underwriter, local, state,

and federal occupational and environmental health and safety rules and regulations. NOTE: SSPC-PA Guide 3, "A Guide to Safety in Paint Application," addresses safety concerns for coating work.

Section 10: Comments

10.1 Additional information and data relative to this standard are contained in Appendix A. Detailed information and data are presented in a separate document, the SSPC-SP COM. The recommendations contained in Appendix A and SSPC-SP COM are believed to represent good practice, but are not to be considered requirements of the standard. The sections of SSPC-SP COM that discuss subjects related to industrial blast cleaning are listed below.

<u>Subject</u>	<u>Commentary Section</u>
Abrasive Selection	5
Degree of Cleaning	11.6
Film Thickness	10
Wet Abrasive Blast Cleaning	9
Maintenance Repainting	3.2
Rust-Back (Rerusting)	8
Surface Profile	6
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Weld Spatter	4.1

Appendix A — Explanatory Notes

A.1 FUNCTION: Industrial blast cleaning (NACE No. 8/SSPC-SP14) provides a greater degree of cleaning than brush-off blast cleaning (NACE No. 4/SSPC-SP 7) but less than commercial blast cleaning (NACE No. 3/SSPC-SP 6). It should be specified only when a compatible coating will be applied. The primary functions of blast cleaning before coating are (a) to remove material from the surface that can cause early failure of the coating system and (b) to obtain a suitable surface roughness. The hierarchy of blasting standards is as follows: white metal blast cleaning, near-white metal blast cleaning, commercial blast cleaning, industrial blast cleaning, and brush-off blast cleaning.

A.2 ABRASIVE SELECTION: Types of metallic and nonmetallic abrasives are discussed in the SSPC-SP COM. It is important to recognize that blasting abrasives may become embedded in or leave residues on the surface of the steel during preparation. While normally such embedment or residues are not 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 prepared steel is to be used in an immersion environment). Criteria for selecting and evaluating abrasives are given in SSPC-AB 1, "Mineral and Slag Abrasives," SSPC-AB 2, "Cleanliness of Recycled Ferrous Metallic Abrasives," and SSPC-AB-3, "Newly Manufactured or Re-Manufactured Steel Abrasives."

A.3 SURFACE PROFILE: Surface profile is the roughness of the surface that results from abrasive blast cleaning. The profile depth (or height) is dependent on the size, shape, type, and hardness of the abrasive, particle velocity and angle of impact, hardness of the surface, amount of recycling, and the proper maintenance of working mixtures of grit and/or shot. The allowable minimum/maximum height of profile is usually dependent on the thickness of the coating to be applied. Large, particle-sized abrasives (particularly metallic) can produce a profile that may be too deep to be adequately covered by a single, thin-film coat. Accordingly, it is recommended that the use of larger abrasives be avoided in these cases. However, larger abrasives may be needed for thick-film

coatings or to facilitate removal of thick coatings, heavy mill scale, or rust. If control of profile (minimum/maximum) is deemed to be significant to coating performance, it should be addressed in the procurement documents (project specification). Typical maximum profile heights achieved with commercial abrasive media are shown in Table 8 of the SSPC-SP COM. Surface profile should be measured in accordance with NACE Standard RP0287 (latest edition), "Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using Replica Tape," or ASTM⁽³⁾ D 4417 (latest edition), "Test Method for Field Measurement of Surface Profile of Blast Cleaned Steel."

A.4 VISUAL STANDARDS: ISO 8501-1/SIS SS 05 59 00, Photograph B Sa2, depicts the appearance of a surface that is consistent with the definition of an industrial blast.

A.5 SURFACE IMPERFECTIONS: Surface imperfections can cause premature failure if the service is severe. 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 to properly cover and protect include crevices, weld porosity, laminations, etc. The high cost of the methods to remedy the surface imperfections requires weighing the benefits of edge rounding, weld spatter removal, etc., versus a potential coating failure.

Poorly adhering contaminants, such as weld slag residues, loose weld spatter, and some minor surface laminations, may be removed during the blast cleaning operation. Other surface defects (steel laminations, weld porosities, or deep corrosion pits) may not be evident until the surface preparation has been completed. Therefore, proper planning for such surface repair work is essential because the timing of the repairs may occur before, during, or after the blast cleaning operation. Section 4 of SSPC-SP COM and NACE Standard RP0178 (latest edition), "Fabrication Details, Surface Finish Requirements, and Proper Design Considerations for Tanks and Vessels to Be Lined for Immersion Service," contain additional information on surface imperfections.

A.6 CHEMICAL CONTAMINATION: Steel contaminated with soluble salts (e.g., chlorides and sulfates) develops rust-back rapidly at intermediate and high humidities. These soluble salts can be present on the steel surface prior to blast cleaning as a result of atmospheric contamination. In addition, contaminants can be deposited on the steel surface

during blast cleaning if the abrasive is contaminated. Therefore, rust-back can be minimized by removing these salts from the steel surface, preferably before blast cleaning, and eliminating sources of recontamination during and after blast cleaning. Wet methods of removal are described in NACE No. 5/SSPC-SP 12. Identification of the contaminants along with their concentrations may be obtained from laboratory and field tests as described in SSPC-TU 4, "Technology Update on Field Methods for Retrieval and Analysis of Soluble Salts on Substrates."

A.7 RUST-BACK: Rust-back (rerusting) occurs when freshly cleaned steel is exposed to moisture, contamination, or a corrosive atmosphere. The time interval between blast cleaning and rust-back varies greatly from one environment to another. Under mild ambient conditions, if chemical contamination is not present (see Paragraph A.6), it is best to blast clean and coat a surface the same day. Severe conditions may require more expedient coating application to avoid contamination from fallout. Chemical contamination should be removed prior to coating (see Paragraph A.6).

A.8 DEW POINT: Moisture condenses on any surface that is colder than the dew point of the surrounding air. It is, therefore, recommended that the temperature of the steel surface be at least (3°C) 5°F above the dew point during dry blast cleaning operations. It is advisable to visually inspect for moisture and periodically check the surface temperature and dew point during blast cleaning operations and to avoid the application of coating over a damp surface.

A.9 WET ABRASIVE BLAST CLEANING: Steel that has been wet abrasive blast cleaned may rust rapidly. Clean water should be used for rinsing. It may be necessary that inhibitors be added to the water or applied to the surface immediately after blast cleaning to temporarily prevent rust formation. The use of inhibitors or the application of coating over slight discoloration should be in accordance with the requirements of the coating manufacturer. CAUTION: Some inhibitive treatments may interfere with the performance of certain coating systems.

A.10 FILM THICKNESS: It is essential that ample coating be applied after blast cleaning to adequately cover the peaks of the surface profile. The dry-film thickness above the peaks of the profile should equal the thickness known to be needed for the desired protection. If the dry-film thickness over the peaks is inadequate, premature rust-through or failure will

⁽³⁾ American Society for Testing and Materials (ASTM), 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.

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occur. To assure that coating thicknesses are properly measured, refer to SSPC-PA 2 (latest edition), "Measurement of Dry Paint Thickness with Magnetic Gauges."

A.11 MAINTENANCE AND REPAIR PAINTING:

When this standard is used for maintenance painting, specific instructions should be given on the extent of surface to be blast cleaned or spot blastcleaned to this degree of cleanliness. In these cases, the cleaning shall be performed across the

entire area specified. For example, if all weld seams are to be cleaned in a maintenance operation, this degree of cleaning shall be applied 100% to all weld seams. If the entire structure is to be prepared, this degree of cleaning shall be applied to 100% of the entire structure. SSPC-PA Guide 4 (latest edition), "Guide to Maintenance Repainting with Oil Base or Alkyd Paining System," provides a description of accepted practices for retaining old sound coating, removing unsound coating, feathering, and spot cleaning.