

SSPC: The Society for Protective Coatings

Abrasive Standard No. 1

Mineral and Slag Abrasives

1. Scope

1.1 This standard contains requirements for classification, evaluation, and performance of mineral and slag or other by-product abrasives used for blast cleaning steel and other surfaces for painting and other purposes.

1.2 The abrasives covered by this standard are primarily intended for one-time use without recycling, however, some media are capable of being recycled. Requirements for work mixes containing recycled media are contained in Sections 4.4.1 and 4.4.2.

1.3 Unless otherwise specified, the requirements of this standard are contained in Sections 2 through 6.

1.4 When specified, the requirements of Appendix B become mandatory requirements of this standard in addition to the requirements of Sections 2 through 6, and take precedence over any conflicting requirements in Sections 2 through 6.

2. Description

2.1 The abrasives are categorized into two types, three classes and five grades as described below. Normally the user shall specify the types, classes and grades required. If no abrasive type is specified, then either Type I or Type II is considered acceptable. If no abrasive class is specified, then any class will be considered acceptable. If no abrasive profile grade is specified, the abrasive shall satisfy the requirements of any of the five grades listed.

2.2 The following abrasive types are included:

Type I - Natural Mineral Abrasives: These are naturally occurring minerals, including, but not limited to, quartz sands, flint, garnet, staurolite, and olivine that meet the performance requirements of this standard.

Type II - By-Product or Manufactured Abrasives: Slag, manufactured, or by-product materials that meet the performance requirements of this standard.

2.3 The following abrasive classes are included.

Class A - Crystalline silica less than or equal to 1.0 percent (%)

Class B - Crystalline silica less than or equal to 5.0%

Class C - Unrestricted crystalline silica

The definition and requirements for Classes A, B, and C are given in Section 4.1.7 and subsections.

2.4 The abrasive grades and associated profile ranges are listed below:

Grade 1 - Abrasives that produce surface profiles of 0.5 to 1.5 mils (13 to 38 micrometers [μm]) when tested in accordance with Section 4.1.8.

Grade 2 - Abrasives that produce surface profiles of 1.0 to 2.5 mils (25 to 64 μm) when tested in accordance with Section 4.1.8.

Grade 3 - Abrasives that produce surface profiles of 2.0 to 3.5 mils (51 to 89 μm) when tested in accordance with Section 4.1.8.

Grade 4 - Abrasives that produce surface profiles of 3.0 to 5.0 mils (75 to 127 μm) when tested in accordance with Section 4.1.8.

Grade 5 - Abrasives that produce surface profiles of 4.0 to 6.0 mils (102 to 152 μm) when tested in accordance with Section 4.1.8.

The purchaser has the option to designate other profile ranges.

2.5 Definitions

Qualification tests are tests that are run to qualify that a material meets the requirements of the standard.

Conformance tests are tests that are performed to verify that the material being submitted has the same properties as the material that initially qualified.

Quality control tests are field tests that are performed to verify that the material complies with specified requirements immediately prior to use. A summary of required tests and responsibilities for testing is provided in Appendix D.

3. Referenced Standards

3.1 The latest issue, revision, or amendment of the referenced standards in effect on the date of invitation to bid shall govern unless otherwise stated. Those documents marked with an asterisk (*) are referenced only in the Notes, which are not requirements of this standard.

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

3.3 SSPC STANDARDS:

VIS 1	Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
SP 10	Near-White Blast Cleaning
PA 17	Procedure for Determining Conformance to Specified Steel Profile/Surface Roughness/Peak Count Requirements

3.4 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARDS:¹

C128	Standard Test Method for Density, Relative Density, (Specific Gravity) and Absorption of Fine Aggregate
C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
C566	Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
C702	Standard Practice for Reducing Samples of Aggregate to Testing Size
D75	Standard Practice for Sampling Aggregates
D4940	Standard Test Method for Conductometric Analysis of Water Soluble Ionic Contaminants of Blasting Abrasives
D7393	Standard Practice for Indicating Oil in Abrasives
E18	Standard Test Methods for Rockwell Hardness of Metallic Materials

3.5 NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)²

Method 7500 Silica, crystalline, by XRD (filter redeposition)

4. Requirements

4.1 Qualification Tests: Unless otherwise specified, the supplier shall provide documentation certifying that the abrasive delivered complies with the requirements of Sections 4.1.1 through 4.1.10.3. The required documentation shall be furnished by a testing facility that meets the requirements of Section 6.2. Qualification testing shall be performed every 2 years unless otherwise specified.

4.1.1 Specific Gravity: The specific gravity shall be a minimum of 2.5 as determined by ASTM C128.

4.1.2 Hardness: The hardness shall be a minimum of 6 on the Mohs scale when tested as follows: Examine a random sample of 5 grams (or 2 cubic centimeters) of the

material under low-power microscope (10X) and if grains of different colors or character are present, select a few grains of each color type. Place in succession a minimum of three of the grains thus differentiated between two glass microscope slides. While applying pressure, slowly move one slide over the other with a reciprocating motion for 10 seconds. Examine the glass surface, and if scratched, the material shall be considered as having a minimum hardness of 6 on the Mohs scale. If more than 25% of the grains by count fail to scratch the glass surface, the abrasive does not meet this standard.

4.1.3 Weight Change on Ignition: The maximum permissible loss on ignition is 1.0% and the maximum permissible gain is 5.0% when tested as follows: A representative portion of the sample shall be ground in an agate mortar and thoroughly dried at 105 to 110 degrees centigrade (°C) (220 to 230 degrees Fahrenheit [°F]) for one hour. Transfer approximately 1 gram of the dried sample to a tared crucible with cover and weigh to the nearest milligram. Cautiously heat the crucible with contents, at first partially covered, and then at approximately 750 ± 50 °C (1382 ± 90 °F) covered. Hold at 750 ± 50 °C (1382 ± 90 °F) for 30 minutes, then cool in a desiccator and reweigh. The percent of weight change shall be computed as follows:

$$\text{percent weight change} = \frac{(\text{final weight} - \text{original weight}) \times 100}{\text{original weight}}$$

4.1.4 Water Soluble Contaminants: The conductivity of the abrasive shall not exceed 1000 micromhos/cm (1 mho = 1 siemen) when tested in accordance with ASTM D4940 (see Note 8.1).

4.1.5 Moisture Content: The maximum moisture content shall be 0.5% by weight, when tested in accordance with ASTM C566.

4.1.6 Oil Content: When tested in accordance with ASTM D7393 no oil shall be visible on the surface of the water or as an emulsion.

4.1.7 Crystalline Silica Content: All abrasives shall be classed based on crystalline silica content in accordance with NIOSH Method 7500. Abrasives designated as Class A or B must meet the requirements of Sections 4.1.7.1 or 4.1.7.2, respectively.

4.1.7.1 Class A - Less Than 1% Crystalline Silica: Abrasives shall contain no more than 1.0% by weight of crystalline silica.

4.1.7.2 Class B - Less than 5% Crystalline Silica: Abrasives shall contain no more than 5.0% by weight of crystalline silica.

4.1.7.3 Class C - Unrestricted Crystalline Silica: No restrictions on crystalline silica content.

4.1.8 Surface Profile: Unless otherwise specified, the abrasive supplier shall provide documentation that the average surface profile, when determined in accordance with

¹ ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. For referenced ASTM standards, visit the ASTM website <<https://www.astm.org/>>. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website

² National Institute of Occupational Safety and Health standards are available online from <<http://www.cdc.gov/NIOSH/srhp.html>>. Enter the number of the method at this search page to download a .pdf file.

the description below, is within the ranges specified in Section 2.4 when measured in accordance with SSPC-PA 17 using ASTM D4417 Method C (see Note 8.2). Steel test plates for performance evaluations shall meet a Rockwell hardness of 76 ± 5 HRBW when tested in accordance with ASTM E18. A representative sample of the material shall be obtained in accordance with ASTM D75 and used to abrasive blast a 61-centimeter [cm] x 61-cm x 6-millimeter [mm] (or 2-foot [ft] x 2-ft x 1/4-inch) steel plate having intact mill scale (SSPC-VIS 1 Rust Grade A) to a cleanliness of SSPC-SP 10 (Near-White Metal Blast Cleaning). A minimum 3550-cm² (550-inch² [approximately 4-ft²]) area of the plate shall be blast cleaned. The blasting shall be done using a 9.5-mm (3/8-inch) #6 or 6.3-mm (1/4-inch) #4 venturi nozzle with a nozzle pressure of 670 ± 35 kilopascals [kPa] (95 ± 5 psig) at a distance of 61 ± 15 cm (24 ± 6 inches) from the surface at an angle of 75 to 105 degrees.

4.1.9 Particle Size Distribution

4.1.9.1 The sieves used to characterize an abrasive sample to meet the abrasive grades (or profile ranges) defined in Section 2.4 shall include a combination of a minimum of four mesh sizes, starting with the size that allows 100% passing and ending with the size having 95% retention. Sieve analysis shall be performed in accordance with ASTM C136. The abrasive manufacturer shall designate the maximum and minimum percentage retention on each mesh size used. Upon request, the manufacturer shall substantiate that the abrasive grade designated for a specific product will meet the purchaser's required profile range when tested in accordance with Section 4.1.8.

4.1.9.2 The supplier-designated sieve size distribution and ranges shall become the acceptance standard for the specific abrasive submitted (see Section 6).

4.1.10 Health and Safety Requirements

4.1.10.1 The abrasive material as supplied shall comply with all applicable federal, state, and local regulations (see Note 8.3). The abrasive supplier shall provide a letter stating that the abrasives do not contain any hazardous materials at levels that would cause the abrasive to be classified as a hazardous waste under current guidelines at the location of use (e.g., U.S. EPA limits as listed under Federal Register, Vol. 55, paragraph 261.24, Maximum Concentration of Contaminants for the Toxicity Characteristic).

4.1.10.2 The manufacturer shall provide the purchaser with sufficiently detailed chemical analyses to provide the protective engineering and administrative controls for blast cleaning identified in federal, state, and local codes.

4.1.10.3 Safety Data Sheets shall be furnished for all abrasive materials supplied.

4.2 Conformance Tests: If the purchaser of the abrasive requires batch or lot testing to confirm that the material

delivered is consistent with the material ordered, the abrasive shall meet the requirements of Sections 4.1.2, 4.1.3 (if required by Appendix B), 4.1.4, 4.1.5, 4.1.6, and 4.1.9 (see Appendix D).

4.3 Quality Control Tests for New Media: Unless otherwise specified, the end user of the abrasive (e.g., shop or contractor) shall perform field testing immediately prior to use at a minimum frequency of one test per every 50 bags of abrasive or three tests per bulk shipment of abrasive to verify compliance with Sections 4.1.4 (Conductivity), and 4.1.6 (Oil Contamination) of this standard. Refer to Section 5.3 and subsections for sampling procedures for conductivity and oil contamination testing.

4.4 Quality Control Tests for Recycled Work Mix:

4.4.1 Unless otherwise specified, the cleaned abrasive work mix shall meet the requirements of Sections 4.1.4 and 4.1.6 when tested immediately prior to use at a minimum frequency of once every 8 hours or every work shift, whichever is shorter. Refer to Section 5.3 and subsections for sampling procedures for conductivity and oil contamination testing.

4.4.2 Unless otherwise specified, the cleaned abrasive work mix shall have a particle size distribution capable of producing and maintaining the specified profile range when evaluated by preparing a 61 x 61 cm (2 x 2 ft) test area and determining profile in accordance with SSPC-PA 17 using ASTM D4417 Method C (replica tape).

4.5 Additional Optional Performance Tests: Optional performance tests for abrasive consumption rate and abrasive cleaning rate are described in Appendix A.

5. Qualification Testing and Conformance Testing

The specific responsibilities for qualification testing and conformance testing are normally established in the procurement documents. Unless otherwise specified, the supplier is responsible for performing and documenting the qualification and conformance tests called for in this standard (see Note 8.4).

5.1 Sampling for Qualification Tests

5.1.1 Bagged Abrasive: Three or more sacks of abrasive shall be randomly selected from each inspection lot. The sacks shall be mixed and separated and a 50-kg (110-lb) composite sample prepared in accordance with ASTM C702.

5.1.2 Bulk Abrasive: A 50-kg (110-lb) composite sample shall be obtained from the blended finished product in accordance with ASTM D75 (see Note 8.5).

5.2 Sampling for Conformance Tests

5.2.1 Bagged Abrasive: One sack of abrasive shall be randomly selected from each inspection lot and a 2-kg (4-lb) composite sample prepared in accordance with ASTM D75.