

# New SSPC Visual Standard for Abrasive Blast Cleaning

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**F**ive years of development have come to a conclusion this month with the publication of the new SSPC visual standard for abrasive blast cleaning. SSPC-Vis 1-89, "Visual Standard for Abrasive Blast Cleaned Steel Surfaces (Standard Reference Photographs)," is comprised of 18 photographs representing 4 initial rust grades of steel followed by the appearance of the steel after blast cleaning to Brush-Off, Commercial, Near-White, and White Metal. The influence of the abrasive type on the final appearance is provided in an Appendix to the standard, comprised of 6 additional photographs. Directions on the use of the photos are found in the SSPC Guide to Vis 1-89, printed in the standard.

Many hours were donated by committee members (See side bar.), hundreds of steel plates were blast-cleaned, and nearly 1,000 photographs were taken.

This article describes Vis 1-89 and provides insight into its development.

## Decision to Develop Visual Standards

The original SSPC definitions for blast cleaning (with the exception of Near-White) were developed in 1952, with the major emphasis on the rate of cleaning. In 1963, the specifications were revised, changing the emphasis to the thoroughness of cleaning.

Also in 1963, the Swedish Standards (SIS 05

59 00-1962) were approved for use as a pictorial reference for the appearance of blast-cleaned steel. The purpose of the photographic standards was to supplement the written definitions, not replace them. The SSPC reference number and title for the photographic standards was SSPC-Vis 1-63T, "Pictorial Surface Preparation Standards for Painting Steel Surfaces." In 1963, a written specification for "Near-White" was also developed, but photographs were not available in Vis 1 until 1967 (SSPC-Vis 1-67T).

Other than minor editorial changes, the surface preparation specifications were not substantially revised until November 1982, with the blast cleaning specifications revised a final time in March 1985.

In the early 1980s, concerns surfaced about the lack of correlation between the Vis 1 (Swedish Standards) photographs and the SSPC definitions. In particular, photograph BSa2, referenced in the SSPC specifications as an example of a Commercial Blast, was criticized. The photograph shows islands of mill scale on the surface, in direct conflict with the SSPC definition, which does not allow mill scale to remain.

While the SSPC membership was questioning the photographs, an international effort was underway to designate the Swedish Standards as an international standard (through the auspices of ISO, the International Organization for Standardization).

The US delegates to ISO repeatedly issued their objections to some of the Swedish Standards photographs. The response in the case of BSa2 was that the photograph would not be changed because it was consistent with the Swedish Standards' defi-

inition of BSa2, which allows mill scale to remain. As a result, in 1982, the SSPC Guide to Vis 1 was revised to take exception to photograph BSa2, and to indicate that the photographs for White Metal (A, B, and C Sa3) did not show a texture consistent with that achieved by blast cleaning.

SSPC continued to receive strong objections from US users in 1983. As a result, in June 1984, a questionnaire was circulated to the SSPC surface preparation committee asking whether new visual standards were needed.

Of the 75 respondents, 84 percent said better pictorial standards were desirable, and 89 percent said they would use new standards if developed.

On the basis of the ballot results, the SSPC visual standards committee was charged with developing new visual standards. The original scope of work involved preparing standards for new steel (to replace the Swedish Standards), for new steel cleaned using different abrasives, for previously painted steel, for power tool cleaning to bare metal (issued as SP 11 in 1987), and for wet and water blast cleaning. The scope was ultimately reduced to the first 2 items.

Blast cleaning for the entire standard was accomplished at KTA-Tator, Inc. (Pittsburgh, PA) using 90 psi at the nozzle. SSPC and Mellon Institute provided professional photographers to work at the blast cleaning facilities. Abrasives were provided free of charge. (See side bar.)

A brief history of the work follows.

- May 1985: Work begins. Eighteen abrasives were selected for blast cleaning to White Metal.
- February 1986: Proofs of abrasive photographs were presented to the committee. Six were selected.
- Fall 1986: A complete series of initial steel conditions was obtained from Colonial Iron Works, Inc. (Canonsburg, PA) and blast cleaned to varying degrees of cleanliness.
- January 1987: Photographs of the blast cleaned plates were presented to SSPC membership. There was little consensus on degree of cleaning.
- Summer 1987: A new series of plates was obtained and blast cleaned progressively. Each sample was repeatedly photographed and blast cleaned lightly until White Metal was achieved.
- November 1987: The steering committee accepted the new photographs with the exception of the A (adherent mill scale) series. The mill scale series was not believed to be representative of most field conditions. New mill scale plates were provided by CBI and Cives Steel, blast cleaned at KTA, and photographed.
- November 1988: The complete series of pho-

tographs was reviewed at the SSPC National Convention; minor changes were recommended.

- March 1989: SSPC's steering committee approved the final series of photographs.
- May 18, 1989: The official SSPC ballot was received, with a total of 230 ballots returned, including 223 affirmative (some with comments) and 7 negative. Negatives were resolved by the steering committee and each negative voter was contacted in writing.
- June 1, 1989: SSPC Standards Review Committee and SSPC Board of Governors approved resolution of the negatives and officially approved the visual standard for publication.
- September 1989: Publication of visual standard is scheduled for this date.

## Description of Standards

The photographic standards are comprised of 24 actual size color photographs that represent various conditions of unpainted surfaces prior to and after surface preparation by blast cleaning. Eighteen photographs represent the appearance of blast cleaning over the 4 initial rust grades. Six photographs are printed in an appendix and represent variations in appearance that can be created by the abrasive.

The 4 initial rust grades depicted are

- Rust Grade A—Steel surface completely covered with adherent mill scale; little or no rust;
- Rust Grade B—Steel surface covered with both mill scale and rust;
- Rust Grade C—Steel surface completely covered with rust; little or no pitting visible; and
- Rust Grade D—Steel surface completely covered with rust; pitting visible.

The same steel plates photographed for the initial rust grades were then progressively blast cleaned and photographed to illustrate each of the following degrees of cleaning:

- SSPC-SP 7, Brush-Off Blast Cleaning;
- SSPC-SP 6, Commercial Blast Cleaning;
- SSPC-SP 10, Near-White Blast Cleaning; and
- SSPC-SP 5, White Metal Blast Cleaning.

Each of the 4 degrees of blast cleaning is depicted over rust grades B, C, and D. However, for rust grade A (intact mill scale), only the Near-White and White Metal grades of cleaning are shown. After reviewing many photographs that attempted to depict a Brush-Off Blast, the committee chose not to include a photograph for this condi-

tion. Due to the wide variations in appearance possible when Brush-Off Blast Cleaning adherent mill scale, it was determined that a representative visual standard could not be prepared.

Similarly, the committee decided not to prepare a standard photograph for the Commercial Blast Cleaning of adherent mill scale. The definition of Commercial Blast requires that all mill scale be removed but allows 33 percent of each square inch to contain stains or discoloration. Repeated attempts were made to achieve this end condition on plates bearing mill scale and ranging from 3/16-inch to 1/2-inch thick. In every case, either small islands of mill scale remained on the surface, or the amount of staining that remained after removal of the mill scale covered far less than 33 percent of each square inch and approached a Near-White degree of cleaning. Based on many trial runs and the review of numerous photographs, the committee determined that a Commercial Blast cannot normally be obtained when removing adherent mill scale.

The blast cleaning for the standards was undertaken using silica sand to enable users to make direct comparisons in appearance, if desired, with the Swedish Standards or NACE coupons (TM 01-701), both of which are prepared using silica sand. (Note that NACE coupons are also available prepared with steel shot and steel grit.) Furthermore, it was recognized that the silica sand would impart the least amount of external color or shading to the surface, allowing for a better depiction of the degree of rust staining or mill scale staining permitted by each of the cleaning grades. The committee acknowledged that abrasives other than silica sand are frequently used, but rather than delay the project to prepare 4 or 5 sets of standards using different abrasives, the committee decided to develop sand first. It was agreed, however, that the influence of the abrasives should be addressed on a limited scale by showing the variation in appearance for White Metal.

Six photographs were prepared to achieve this objective. The photographs, included in an appendix to the standard, represent variations in color, texture, and general appearance created by abrasives. Rust Grade A steel (adherent mill scale) was used for this series with 3 metallic and 3 non-metallic abrasives depicted. The abrasive used for each photograph is not specifically identified because wide variations in appearance were observed among the abrasives in a given generic class. For example, all copper slags did not appear similar to one another. The committee determined that if the specific abrasives were identified, the user might

expect that all copper slags, for example, should be of the same appearance. Thus, it was decided to bracket the range in appearance that can be created by abrasive selection. Non-metallic abrasives included silica sand, olivine sand, garnet, flint shot, copper slag, coal slag, and nickel slag. Metallic abrasives were steel shot, steel grit, and combinations and modifications of these 2 abrasive media.

## Comparison with Other Standards

The Swedish Standards were formerly referenced by SSPC as SSPC-Vis 1. They were developed by the Swedish Standards Institution and adopted by both SSPC and ASTM (designated D 2200). In 1988, the Swedish Standards photographs were reprinted (including those objected to by SSPC) along with the addition of 4 photographs of flame-cleaned steel. This new book has been published as an ISO standard (ISO 8501-1: 1988) and will no longer be designated by SSPC as Vis 1. It will be available, however, as ISO-8501-1/SIS 05 59 00 (1988). The newly developed SSPC book of standards has been given the designation Vis 1-89.

The difference between the new Vis 1-89 and its Vis 1 predecessor (Swedish Standards) is in the conformity of the new Vis 1-89 photographs to the SSPC written definitions. The new book also contains the 6 photographs described earlier, which depict the variations in appearance created by the abrasive used. However, the new Vis 1-89 is based strictly upon abrasive blast cleaning, and does not contain photographs of hand or power tool cleaning. Photos of hand and power tool cleaning are still available in the ISO/SIS publication, should users require them.

A notable difference between the SSPC visual standards and the ISO/SIS standard is that the SSPC standard is a supplement to the written specification. The written specification takes precedence, and the photographs are used only as an aid in making judgments. In the case of the ISO/SIS standard, the photograph takes precedence over the words. It is the opinion of the SSPC and its membership that the written word must take precedence because photographic standards will never appear identical to surfaces being cleaned. Varying initial surface conditions, geometry, lighting conditions, profile depths, and so forth have a dramatic influence on the degree of cleaning that is perceived. Accordingly, the written definitions

## Participants in the Development of SSPC's New Visual Standards

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### ABRASIVE SUPPLIERS

Apache Abrasives	International Mineral and Chemicals
Chesapeake Specialty Products	Kleen-Blast Abrasives
E.I. du Pont de Nemours & Co.	MDC Industries, Inc.
Ervin Industries	Minnesota Frac-Sand
Gordon Sand Co.	Ottawa Sand Co.
H.B. Reed Minerals Division	Pioneer Concrete
Independent Gravel Co.	Rocky Mountain Energy
Industrial Garnet Extractives	

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must be followed when determining compliance with the blast cleaning specifications.

## Future Work

Additional photographic standards are under consideration by the SSPC Surface Preparation Committee for the following methods and conditions:

- SSPC-SP 11T, "Power Tool Cleaning to Bare

Metal,"

- Industrial Blast Cleaning (proposed standard),
- Hand and Power Tool Cleaning (SSPC-SP 2 and SP 3),
- Wet Abrasive Blasting (proposed standard),
- Pressurized Water Jetting With and Without Abrasives (proposed standard),
- Preparation of Previously Painted Surfaces, and
- Blast Cleaning Using Other Abrasives.

The committee has made great strides over the last few years in the development of this visual standard book. Its work should greatly expedite the future development of visual standards. □