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Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness —

Part 4:
Initial surface conditions, preparation grades and flash rust grades in connection with water jetting

Préparation des subjectiles d'acier avant application de peintures et de produits assimilés — Évaluation visuelle de la propreté d'un subjectile —

Partie 4: États de surface initiaux, degrés de préparation et degrés de fleurette de rouille après décapage à l'eau sous haute pression

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 12, *Preparation of steel substrates before application of paints and related products*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 139, *Paints and varnishes*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 8501-4:2006), which has been technically revised.

The main changes compared to the previous edition are as follows:

— the definitions of preparation grades have been clarified;

— the definition of Wa3 has been added;

— descriptive notes have been added to Table 2;

— photos showing Wa3 have been added;

— photos for grade C steel have been replaced;

— photos for zinc silicate primer have been replaced.

A list of all parts in the ISO 8501 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The performance of protective coatings of paint and related products applied to steel is significantly affected by the state of the steel surface immediately prior to painting. The principal factors that are known to influence this performance are

a) the presence of rust, mill scale and previous coatings,

b) the presence of surface contaminants, including salts, dust, oils and greases, and

c) the surface roughness.

ISO 8501, ISO 8502 and ISO 8503 have been prepared to provide methods of assessing these factors, while ISO 4628-3 provides guidance on evaluating the degradation of paint coatings by assessing the degree of rusting.

ISO 8501, ISO 8502 and ISO 8503 do not contain provisions on the protective systems to be applied to the steel surface. Neither do they contain provisions on the preparation grades for specific situations even though surface quality can have a direct influence on the choice of protective coating to be applied and on its performance. Such provisions are found in other documents such as national standards and codes of practice. It will be necessary for the users of ISO 8501, ISO 8502 and ISO 8503 to ensure that the surface qualities specified are

— compatible and appropriate both for the environmental conditions to which the steel will be exposed and for the protective coating system to be used;

— compatible with any previous coatings remaining after cleaning;

— within the capability of the cleaning procedure specified.

ISO 8501, ISO 8502 and ISO 8503 deal with aspects of preparation of steel substrates before application of paints and related products.

— The ISO 8501 series is on the visual assessment of surface cleanliness;

— The ISO 8502 series concerns tests for the assessment of surface cleanliness;

— The ISO 8503 series deals with surface roughness characteristics of blast-cleaned steel substrates.

For coatings likely to be exposed to severe environments, such as water immersion and continuous condensation conditions, the assessment of visual cleanliness is supplemented with the physical and chemical methods of the ISO 8502 series and the roughness characteristics of the ISO 8503 series.

This document identifies

— five initial surface conditions, three of them applicable to degraded paint coatings and two of them to damaged pre-fabrication (shop) primer coatings,

— four preparation grades for each initial surface condition, after partial or full removal of previous paint coatings by high-pressure water jetting, and

— three flash rust grades after pre-treatment by high-pressure water jetting.

This document is intended to be a tool for the visual assessment of initial surface conditions, preparation grades and flash rust grades in connection with high-pressure water jetting. It includes 28 representative photographic examples.

Photographs for deteriorated coatings DC A and DC B and deteriorated primer DP I are reproduced by permission of Hempel, Copenhagen, 150 Lundtoftevej, 2800 Lyngby, Denmark.

Photographs for deteriorated coating DC C and deteriorated primer DP Z are reproduced by permission of Lydia Frenzel, Advisory Council, 620 SE 168th Ave. # 103, Vancouver, WA 98684 USA.

Photographs for flash rust FR L, FR M and FR H are reproduced by permission of International Paint Ltd., Akzo Nobel, Stoneygate lane, Felling Gateshead, Tyne & Wear, UK.

Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness —

Part 4:
Initial surface conditions, preparation grades and flash rust grades in connection with water jetting

WARNING — The reference photographs represented in this document can be neither viewed on screen nor printed as true representations. It is important that only the photographs contained in officially printed versions of this document, purchased from ISO or from ISO member bodies or their distributors, are used when carrying out assessments.

1 Scope

This document specifies a series of preparation grades for steel surfaces after removal/partial removal of water-soluble contaminants, rust, previous paint coatings and other foreign matter by high-pressure water jetting. The various grades are defined by written descriptions together with photographs that are representative examples within the tolerances for each grade as described in words.

This document specifies both initial surface conditions and after-cleaning flash rust grades, also defined by written descriptions together with representative photographic examples.

This document applies the cleanliness of the surface to its visual appearance.

Consideration in addition to visual appearance is given to invisible contaminants and roughness or profile. Physical and chemical methods for testing for soluble salts and other invisible contaminants on the visually clean surface are found in the ISO 8502 series. The roughness or profile characteristics of the surface are found in the ISO 8503 series.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
water jetting
cleaning a substrate by directing a high-speed jet of water onto its surface

Note 1 to entry: Synonyms in use by different industry sectors include: hydrojetting, aquajetting, water blast-cleaning (deprecated), hydroblasting (deprecated), aquablasting (deprecated).

3.1.1
high-pressure water jetting
water jetting (3.1) that involves the use of water pressurized to above 70 MPa

Note 1 to entry: Water jetting using higher pressures might remove loose mill scale from a steel surface, but it does not impart a surface profile to the substrate. For further information, see Annex A.

3.2
initial surface condition
visual appearance of a coated steel surface which has been degraded or damaged by rusting, blistering or flaking

3.3
preparation grade
visual appearance of a steel surface after contaminants on the surface have been removed by a preparation method

3.4
flash rust
rapid rusting of waterjet or water-abrasive blasting as the substrate is drying

Note 1 to entry: This definition is more limitative than the one given in ISO 4618:2014, 2.119.

3.5
flash rust grade
visual appearance of a steel surface with respect to *flash rust* (3.5) after the surface has been subjected to *water jetting* (3.1)

3.6
foreign matter
undesirable material

Note 1 to entry: Other than paint residues, examples include salt, grime, dirt, mill scale, oil, grease and marine growth, e.g. algae.

4 Initial surface conditions

Five initial surface conditions are defined.

Three initial surface conditions, designated DC A, DC B and DC C, are specified for steel surfaces that have degraded since being blast-cleaned and, in the case of DC A and DC B, painted with a protective paint system.

NOTE Surface condition DC C is intended for use both in situations when a protective paint system has been applied previously and in situations when no protective paint system has been applied.

Two initial surface conditions, designated DP I and DP Z, are specified for steel surfaces that have degraded since being blast-cleaned and painted with an iron oxide prefabrication primer (DP I) or a zinc silicate primer (DP Z) alone.

The initial surface conditions are defined by written descriptions given in Table 1 together with the representative photographic examples appended to this document.

Table 1 — Descriptions of initial surface conditions

DC A	A surface where the paint coating system has degraded to an extent similar to that illustrated by ISO 4628-3, grade Ri3.
DC B	A surface where the paint coating system has degraded to an extent similar to that illustrated by ISO 4628-3, grade Ri4.
DC C	A surface where the paint coating system has degraded similar to that illustrated by ISO 4628-3, grade Ri5, Or where the surface is completely degraded as illustrated by ISO 8501-1, rust grade C.
DP I	An iron oxide epoxy prefabrication (shop) primer surface that has degraded.
DP Z	A zinc silicate prefabrication (shop) primer surface that has degraded.

5 Preparation grades

Surface preparation grades by waterjet cleaning is designated by the letters Wa. Four preparation grades, designated Wa 1, Wa 2, Wa 2½ and Wa 3, indicating the degree of cleaning, are specified. They are defined by written descriptions of the surface appearance after the cleaning operation together with representative photographic examples.

The descriptions of the surface appearance are given in Table 2 and the representative photographic examples are appended to this document.

Each of these photographs carries a designation combining that of the initial surface condition and that of the preparation grade, e.g. DC B Wa 2½.

Table 2 —Preparation grades of the surface appearance after cleaning water jet-cleaning preparation grades

Wa 1	**Light water jetting** When viewed without magnification, the surface shall be free from visible oil, grease and dirt, loose or defective paint coatings, loose rust and other foreign matter. Any residual contamination shall be dispersed and can consist of firmly adherent coatings, firmly adherent foreign matter and firmly adherent rust.
Wa 2	**Thorough water jetting** When viewed without magnification, the surface shall be free from visible oil, grease and dirt, and most of the rust, previous paint coatings and other foreign matter. Any residual contamination shall be dispersed and can consist of firmly adherent coatings, firmly adherent other foreign matter and firmly adherent traces of rust.
Wa 2½	**Very thorough water jetting** When viewed without magnification, the surface shall be free from all visible rust, oil, grease and dirt. Slight traces of firmly adherent thin previous rust; slight traces of firmly adherent thin paint coatings and slight traces of other foreign matter can remain. Any residual contamination shall be dispersed. Discoloration of the surface can be present where the original coating was not intact.
Wa 3	**Water jetting to bare substrate** When viewed without magnification, the surface shall be free from all visible previous rust, oil, grease, dirt, previous paint coatings, and from all other foreign matter. The steel surface can or cannot, appear uniform. Discoloration of the surface can be present where the original coating was not intact.