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Preparation of steel substrates before application of paints and related products — Surface preparation methods —

Part 5: Water jet cleaning

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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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 document 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).

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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*.

A list of all parts in the ISO 8504 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:

— the presence of rust and mill scale,

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

— the surface profile.

The ISO 8501 series, the ISO 8502 series and the ISO 8503 series provide methods for assessing these factors, while the ISO 8504 series provides requirements and guidance on the preparation methods that are available for cleaning steel substrates, indicating the capabilities of each in attaining specified levels of cleanliness.

The ISO 8504 series is applicable to new and corroded steel surfaces and to steel surfaces that are uncoated or have been previously coated with paints and related products.

The ISO 8501, ISO 8502, ISO 8503 and ISO 8504 series do not contain provisions for the protective coating system to be applied to the steel surface. They do not contain provisions for the surface quality requirements 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. Users of the ISO 8501, ISO 8502, ISO 8503 and ISO 8504 series should ensure the 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, and

— within the capability of the cleaning procedure specified.

The primary objective of surface preparation is to ensure the removal of deleterious matter and to obtain a surface that permits satisfactory adhesion of the priming paint to steel. It is also intended to assist in reducing the amounts of contaminants that initiate corrosion.

Water jetting is an effective method for removing coatings from previously painted surfaces, removing water-soluble contaminants, and producing partially removed coatings. While water jetting by itself can produce a granular profile in metals under some conditions, water jetting is considered a secondary surface preparation method and is not used to provide the primary anchor pattern on the metallic substrate known as “surface profile.” Water jetting is primarily used for surfaces where there is an adequate pre-existing surface profile or for Grade C and Grade D substrates. Water jetting can remove oil, grease, and corrosion-stimulating substances such as chlorides and sulphates. Water jetting is widely applicable because this method of surface preparation has several features listed below.

— The method allows a high production rate.

— Coatings and salts can be removed in one pass.

— Production rates can be similar to conventional abrasive blast cleaning.

— A work atmosphere is present without particulate dust pollution.

— Other trades can work nearby during the surface preparation.

— Surface preparation can generally be performed in unsafe explosive or flammable areas without interruption with suitable control measures, for example, earthing of equipment to prevent static discharges from water jetting guns, pumps, and hoses.

— The equipment can be stationary or mobile and is adaptable to the objects to be cleaned.

— The equipment can be remotely or manually controlled.

— The method is applicable to most types and forms of metal surfaces.

— Different surface preparation grades can be produced.

— It is possible to remove selectively partial failed coatings to leave sound coatings intact.

Representative photographic examples in ISO 8501-4:2020, Clause 8 can be used for assessing some new and previously coated steel surfaces. Owing to the many different situations that arise in the preparation of surfaces, these photographs are not always sufficient to describe specific instances. It is therefore recommended to produce specific photographs of a treated reference area that are acceptable to the interested parties for use as a basis for further surface preparation procedures.

Preparation of steel substrates before application of paints and related products — Surface preparation methods —

Part 5: Water jet cleaning

1 Scope

This document specifies water jet-cleaning methods for the removal of the existing coatings and rust during surface preparation of steel surfaces before application of paints and related products. It provides information on the effectiveness of the individual methods and their fields of application. It also describes the equipment and the procedures to follow.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4628-3, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 3: Assessment of degree of rusting*

ISO 8501-4:2020, *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*

3 Terms and definitions

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

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

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

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

3.1
field test
cleaning of selected surfaces, carried out before the start of work, intended to achieve the specified preparation grades

Note 1 to entry: ISO 8501-4:2020, Clause 5 defines the preparation grades that should be obtained through the field test.

Note 2 to entry: The field test can be referred to as the control specimen.

3.2
flash rust
rapid rusting of the surface prepared by water jet or water-abrasive blast cleaning, which occurs as the substrate is drying

Note 1 to entry: ISO 8501-4:2020, Clause 6 defines the flash rust grades.

Note 2 to entry: Flash rust in this document is more limited than the definition given in ISO 4618:2023, 3.120.

3.3
nozzle
device that modifies the stream of water as it discharges from the system

Note 1 to entry: Nozzle openings can be referred to as bits, tips, or orifices.

3.4
threshold pressure
minimum pressure required to penetrate the material

3.5
water jetting
continuous or discontinuous stream of water in air with defined geometry, velocity and, if discontinuous, frequency

[SOURCE: ISO/TS 19392-3:2018, 3.1]

4 Health and safety

4.1 General requirements

The procedures described in this document shall be carried out by either suitably trained or supervised personnel or both. The substances and procedures used in these methods can be injurious to health if adequate precautions are not taken. Attention is drawn in the text to certain specific hazards. This document refers only to the technical suitability of the methods and does not absolve the user from statutory obligations relating to health and safety.

WARNING — Equipment and materials used for surface preparation can be hazardous. It is important to ensure that adequate instructions are given and that all required precautions are exercised. Only trained or certified operatives or both should use the equipment.

5 Consideration of water jetting pressure and flow parameters

5.1 General

The contract documents describe the final condition of the substrate. Depending on the initial condition of the area and the materials intended to be cleaned, the method to achieve the preparation grades described in ISO 8501-4 can be low-pressure, high-pressure, or ultra high-pressure methods. The methods of water cleaning or water jetting are based on the capabilities of the equipment and its components. Dwell time, traverse rate, pressure, flow, stand-off distances, the number of nozzles, and rotational speed all interact in determining what material remains and what will be removed. Removal of loose material such as dirt, detritus, or bird faeces, which is an example of the preparation grade Wa 1, requires different equipment than the stripping of a coating system which is an example of the preparation grade Wa 2 1/2. Cleaning to a preparation grade of Wa 1 requires a different set of parameters than cleaning to a preparation grade of Wa 2 1/2. See ISO 8501-4:2020, Clause 5 for definitions of Wa preparation grades.

Pressurized water cleans by hydraulic shear (mass) at the lower pressures, and by implosion or cavitation at the upper pressures or both. The removal of material by mass or implosion is a continuum, not a discrete, abrupt change. This mix is discussed in greater depth in Annex B.

5.2 Methods

5.2.1 General

It is important to carefully consider the historic concept of linking the pressure and flow to material removal. The operating parameters specified in Table A.1 shall apply. Ultra high-pressure water jetting can accomplish all of these end results by changing the stand-off distance and traverse time, but it is not economical to use ultra high-pressure water jetting, for purposes such as removing loose dirt or achieving