

Treatment of Steel Surfaces by Abrasive Blasting and Water Jetting

Procedure

This Standard replaces and cancels its previous revision.

The CONTEC - Authoring Subcommittee provides guidance on the interpretation of this Standard when questions arise regarding its contents. The Department of PETROBRAS that uses this Standard is responsible for adopting and applying the sections, subsections and enumerates thereof.

Technical Requirement: A provision established as the most adequate and which shall be used strictly in accordance with this Standard. If a decision is taken not to follow the requirement ("non-conformity" to this Standard) it shall be based on well-founded economic and management reasons, and be approved and registered by the Department of PETROBRAS that uses this Standard. It is characterized by imperative nature.

Recommended Practice: A provision that may be adopted under the conditions of this Standard, but which admits (and draws attention to) the possibility of there being a more adequate alternative (not written in this Standard) to the particular application. The alternative adopted shall be approved and registered by the Department of PETROBRAS that uses this Standard. It is characterized by verbs of a nonmandatory nature. It is indicated by the expression: **[Recommended Practice]**.

Copies of the registered "non-conformities" to this Standard that may contribute to the improvement thereof shall be submitted to the CONTEC - Authoring Subcommittee.

Proposed revisions to this Standard shall be submitted to the CONTEC - Authoring Subcommittee, indicating the alphanumeric identification and revision of the Standard, the section, subsection and enumerate to be revised, the proposed text, and technical/economic justification for revision. The proposals are evaluated during the work for alteration of this Standard.

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The use of this Standard by other companies / organizations / government agencies and individuals is the sole responsibility of the users.."

CONTEC

Comissão de Normalização
Técnica

SC - 14

Painting and Anticorrosive
Coatings

Introduction

PETROBRAS Technical Standards are prepared by Working Groups - WG (consisting specialized of Technical Collaborators from Company and its Subsidiaries), are commented by Company Units and its Subsidiaries, are approved by the Authoring Subcommittees - SCs (consisting of technicians from the same specialty, representing the various Company Units and its Subsidiaries), and ratified by the Executive Nucleus (consisting of representatives of the Company Units and its Subsidiaries). A PETROBRAS Technical Standard is subject to revision at any time by its Authoring Subcommittee and shall be reviewed every 5 years to be revalidated, revised or cancelled. PETROBRAS Technical Standards are prepared in accordance with PETROBRAS Technical Standard [N-1](#). For complete information about PETROBRAS Technical Standards see PETROBRAS Technical Standards Catalog.

Foreword

This Standard is the English version (issued in 05/2014) of PETROBRAS N-9 REV. G 09/2013. In case of doubt, the Portuguese version, which is the valid document for all intents and purposes, shall be used.

1 Scope

1.1 The objective of this Standard is to set out the procedure for preparation of steel surfaces for application of paint systems or other anticorrosive coatings, by means of abrasive blasting or water jetting (with or without abrasives).

NOTE 1 Check the legal provisions described in 4.1.

NOTE 2 For the purposes of this Standard, the term water jetting refers to water jetting with or without abrasives.

1.2 The provisions of this Standard apply to procedures started as of its date of issuance.

1.3 This Standard contains Technical Requirements and Recommended Practices.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies.

Portaria do Ministério do Trabalho nº 99 de 19/10/2004 - Proíbe o processo de trabalho de jateamento que utilize areia seca ou úmida como abrasivo;

Norma Regulamentadora nº 15 (NR-15) - Atividades e Operações Insalubres;

ABNT NBR 15158 - Limpeza de Superfícies de Aço por Compostos Químicos;

ABNT NBR 15185 - Inspeção de Superfícies para Pintura Industrial;

ABNT NBR 15239 - Tratamento de Superfícies de Aço com Ferramentas Manuais e Mecânicas;

ABNT NBR 15488 - Pintura Industrial - Superfície Metálica para Aplicação de Tinta - Determinação do Perfil de Rugosidade;

ISO 8501-1 - Preparation of Steel Substrates before Application of Paints and Related Products - Visual Assessment of Surface Cleanliness - Part 1: Rust Grades and Preparation Grades of Uncoated Steel Substrates and of Steel Substrates after Overall Removal of Previous Coatings;

ISO 8501-3 - Preparation of Steel Substrates before Application of Paints and Related Products - Visual Assessment of Surface Cleanliness - Part 3: Preparation Grades of Welds, Edges and other Areas with Surface Imperfections;

ISO 8502-3 - Preparation of Steel Substrates before Application of Paints and Related Products - Tests for the Assessment of Surface Cleanliness - Part 3: Assessment of Dust on Steel Surfaces Prepared for Painting (pressure-Sensitive Tape Method);

ISO 8502-6 - Preparation of Steel Substrates before Application of Paints and Related Products - Tests for the Assessment of Surface Cleanliness - Part 6: Extraction of Soluble Contaminants for Analysis - The Bresle Method;

ISO 8502-9 - Preparation of Steel Substrates before Application of Paints and Related Products - Tests for the Assessment of Surface Cleanliness - Part 9: Field Method for the Conductometric Determination of Water-Soluble Salts;

ISO [8504-2](#) - Preparation of Steel Substrates before Application of Paints and Related Products - Surface Preparation Methods - Part 2: Abrasive Blast-Cleaning;
 ASTM [D 610](#) - Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces;

ASTM [D 4940](#) - Standard Test Method for Conductimetric Analysis of Water Soluble Ionic Contamination of Blasting Abrasives;

NACE [WJ-1/SSPC-SP WJ 1](#) - Joint Surface Preparation Standard Waterjet Cleaning of Metals-Clean to Bare Substrate (WJ-1);

NACE [WJ-2/SSPC-SP WJ 2](#) - Joint Surface Preparation Standard Waterjet Cleaning of Metals-Very Thorough Cleaning (WJ-2);

NACE [WJ-3/SSPC-SP WJ 3](#) - Joint Surface Preparation Standard Waterjet Cleaning of Metals-Thorough Cleaning (WJ-3);

NACE [WJ-4/SSPC-SP WJ 4](#) - Joint Surface Preparation Standard Waterjet Cleaning of Metals-Light Cleaning (WJ-4);

SSPC [VIS 4/NACE VIS 7](#) - Guide and Reference Photographs for Steel Surfaces Prepared by Waterjetting;

SAE [J-444](#) - Cast Shot and Grit Size Specifications for Peening and Cleaning.

NOTE For documents referred in this Standard and for which only the Portuguese version is available, the PETROBRAS department that uses this Standard should be consulted for any information required for the specific application.

3 Terms and Definitions

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

3.1

abrasive blasting

method for preparing steel surfaces for paint or other coating application by using steel grit, sintered aluminum oxide or other abrasives impelled by means of compressed air or by centrifugal force

3.2

water jetting without abrasive

method for preparing steel surfaces for painting by using water under high pressure [70 MPa to 210 MPa (10 000 psi to 30 000 psi)] or ultra-high pressure [above 210 MPa (30 000 psi)]

NOTE This process does not create an anchor profile.

3.3

water jetting with abrasive

method for preparing steel surfaces for painting by using water ultra-high pressure [above 210 MPa (30 000 psi)] and special abrasives, in order to create an anchor profile or remove adhering mill scale grade A and B

3.4

rust and preparation grades of steel surfaces

the rust grade of a steel surface refers to the conditions of the surface before execution of the cleaning process; the surface preparation grade, on the other hand, corresponds to the final cleaning standard of the surface before painting or other coating is applied.

3.4.1**rust grades of unpainted steel surfaces**according to ISO [8501-1](#)

Grade A	- steel surface largely covered with intact and adhering mill scale with little or any rust;
Grade B	- steel surface on which atmospheric corrosion has begun and from which mill scale has begun to flake;
Grade C	- steel surface on which the mill scale has been removed by atmospheric corrosion or from which it can be scraped out, but with slight pitting visible;
Grade D	- steel surface on which the mill scale has been removed by atmospheric corrosion and on which general pitting is visible.

3.4.2**rust grades of painted surfaces**according to standard ASTM [D 610](#)

Grade 8	- existing painting almost intact, with less than 0.1% of the surface with corrosion;
Grade 6	- calcined finish paint, which may present exposed primer; slight spotting or blistering is permitted after the spots are treated. Less than 1 % of the area may be affected by corrosion, flaking or loose paint;
Grade 4	- paint completely calcined, blistered or with rust spots, which may have up to 10 % of its surface with corrosion, oxidation blisters, loose paint and slight pitting (punctiform corrosion);
Grade 2	- paint completely calcined, blistered or with rust spots, which may have up to 33 % of its surface with corrosion, oxidation blisters, loose paint and slight pitting (punctiform corrosion);
Grade 0	- heavy presence of corrosion, loose paint and severe formation of pitting corrosion.

3.4.3**rust grades of steel surfaces by means of abrasive blasting**according to ISO [8501-1](#) and ISO [8504-2](#)

Grade Sa 1	- light blast cleaning: when seen with the naked eye, surface shall be free of loose mill scale, rust and non-adhesive foreign matter. The final appearance shall correspond to the photographs designated Sa 1. This cleaning process does not apply to surfaces presenting original Rust Grade A. For other ones, the cleaning standards are: BSa 1, CSa 1 and DSa 1;
Grade Sa 2	- commercial blast cleaning: when seen with the naked eye, surface shall be free of almost all mill scale, rust and foreign matter. The surface shall be display a grayish color and correspond in appearance to the photographs designated Sa 2. This cleaning process does not apply to surfaces presenting original Rust Grade A. For other ones, the cleaning standards are: BSa 2, CSa 2 and DSa 2;
Grade Sa 2 1/2	- near-white metal blast cleaning: when seen with the naked eye, surface shall be free of mill scale, rust and foreign matter, to the extent that the only traces remaining are in the form of slight stains or stretch marks. The surface shall be display an aspect corresponding to the photographs designated Sa 2 1/2. The cleaning standards are: ASa 2 1/2, BSa 2 1/2, CSa 2 1/2 and DSa 2 1/2;
Grade Sa 3	- blast cleaning to white metal: when seen with the naked eye, surface shall be completely free of loose mill scale, rust and non-adhesive foreign matter. The surface shall be display a uniform metal coloring, corresponding in appearance to the photographs designated Sa 3. The cleaning standards are: ASa 3, BSa 3, CSa 3 and DSa 3.