

CONTECComissão de Normalização
Técnica**SC-14**Paintwork and
Anticorrosive Coatings**Anticorrosive Coatings for Maintenance of
Offshore Drilling and Production Units****1st Amendment**

This is the 1st Amendment to PETROBRAS N-1374 REV. H, and it is used to alter the text of the Standard in the part(s) indicated below:

NOTE 1 The new(s) page(s) with the performed amendment(s) is (are) placed in its corresponding position(s).

NOTE 2 The amended pages, indicated the date of the amendment, are placed at the end of this standard, in chronological order, and shall not be used.

CONTENTS OF THE 1st AMENDMENT – 02/2019**- Section 2:**

Inclusion of ABNT NBR 10443.

Inclusion of ISO 3233-1.

Inclusion of ISO 6272-1.

Inclusion of ISO 12944-9.

Inclusion of ASTM D4518-91.

Exclusion of ASTM D2794.

Exclusion of ISO 20340.

Exclusion of ISO 3251.

Exclusion of ISO 4624.

- Table 3:

Alteration of the Table.

- Table 4:

Alteration of the Table.

- Table A.1:

Alteration of the Table.

- Table A.2:

Alteration of the Table.

- Table B.1:

Alteration of the Table.

- Table C.1:

Alteration of the Table.

Anticorrosive Coatings for Maintenance of Offshore Drilling and Production Units

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 clauses 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 the verb forms "shall," "it is necessary...," "is required to...," "it is required that...," "is to...," "has to...," "only ... is permitted," and other equivalent expressions having an 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 the verbal form "shall" and equivalent expressions such as "it is recommended that..." and "ought to..." (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 clause(s) 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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CONTEC

Comissão de Normalização
Técnica

SC - 14

Paintwork and Anticorrosive
Coatings

Foreword

PETROBRAS Technical Standards are prepared by Working Groups - WG (consisting of specialists from PETROBRAS and its Subsidiaries), are commented by PETROBRAS Units and PETROBRAS Subsidiaries, are approved by the Authoring Subcommittees - SCs (consisting of specialists from the same specialty, representing the various PETROBRAS Units and PETROBRAS Subsidiaries), and ratified by the Executive Nucleus (consisting of representatives of the PETROBRAS Units and PETROBRAS 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 standard N-1. For complete information about PETROBRAS Technical Standards see PETROBRAS Technical Standards Catalog.

Foreword

This Standard is the English version (issued in 06/2018) of PETROBRAS standard [N-1374](#) Rev. H - Aug/2016. 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 scope of this Standard is to set patterns for the painting and/or anticorrosive coatings to be used on carbon steel substrate in the maintenance of offshore drilling and production units.

1.2 For the purpose of this Standard, the following are considered offshore units: fixed and floating platforms, drilling and production ships, monobuoys, mooring piers, etc.

1.3 This Standard sets out the conditions required to procedures started as of its date of issuance.

1.4 This Standard contains Technical Requirements and Recommended Practices.

2 Supplementary Documents

The documents listed below are indispensable for the application of this Standard. For dated references, only the issues cited apply. For undated references, the most recent issues of these documents apply.

NORMAM-[27/DPC](#) - Normas da Autoridade Marítima para Homologação de Helideques Instalados em Embarcações e em Plataformas Marítimas;

PETROBRAS [N-9](#) - Tratamento de Superfícies de Aço com Jato Abrasivo e Hidrojateamento;

PETROBRAS [N-13](#) - Requisitos Técnicos para Serviços de Pintura;

PETROBRAS [N-1021](#) - Pintura de Aço Galvanizado, Aço Inoxidável, Ferro Fundido, Ligas não Ferrosas, Materiais Compósitos Poliméricos e Termoplásticos;

PETROBRAS [N-1192](#) - Pintura de Embarcações;

PETROBRAS [N-2037](#) - Pintura de Equipamentos Submersos em Água do Mar;

PETROBRAS [N-2231](#) - Tinta de Etil - Silicato de Zinco - Alumínio;

PETROBRAS [N-2288](#) - Tinta de Fundo Epóxi Pigmentada com Alumínio;

PETROBRAS [N-2568](#) - Revestimentos Metálicos por Aspersão Térmica;

PETROBRAS [N-2677](#) - Tinta de Poliuretano Acrílico;

PETROBRAS [N-2680](#) - Tinta Epóxi, sem Solventes, Tolerante a Superfícies Molhadas;

PETROBRAS [N-2912](#) - Tinta Epóxi "Novolac";

PETROBRAS [N-2913](#) - Revestimentos Anticorrosivos para Tanque, Esfera e Cilindro de Armazenamento;

ABNT [NBR 10443](#) - Tintas e vernizes - Determinação da espessura da película seca sobre superfícies rugosas - Método de ensaio;

ABNT [NBR 14847](#) - Inspeção de Serviços de Pintura em Superfícies Metálicas;

ABNT [NBR 15158](#) - Limpeza de Superfície de Aço por Produtos Químicos;

ABNT [NBR 15185](#) - Inspeção de Superfícies para Pintura Industrial;

ABNT [NBR 15488](#) - Pintura Industrial - Superfície Metálica para Aplicação de Tinta - Determinação do Perfil de Rugosidade;

ABNT [NBR 15877](#) - Pintura Industrial - Ensaio de Aderência por Tração;

ABNT [NBR 16172](#) - Revestimentos Anticorrosivos - Determinação de Descontinuidades em Revestimentos Anticorrosivos Aplicados sobre Substratos Metálicos;

ISO [2812-1](#) - Paints and Varnishes - Determination of Resistance to Liquids - Part 1: Immersion in Liquids other Than Water;

ISO [3233-1](#) - Paints and varnishes - Determination of the percentage volume of non-volatile matter- Part 1: Method using a coated test panel to determine non-volatile matter and to determine dry film density by the Archimedes principle;

ISO [6272-1](#) - Interruptores de uso doméstico - Resistência do material isolante ao calor anormal, ao fogo e à corrente de fuga;

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 [12944-9](#) - Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 9: Protective paint systems and laboratory performance test methods for offshore and related structures;

ISO [8503-4](#) - Preparation of Steel Substrates before Application of Paints and Related Products - Surface Roughness Characteristics of Blast-cleaned Steel Substrates - Part 4: Method for the Calibration of ISO Surface Profile Comparators and for the Determination of Surface Profile - Stylus Instrument Procedure;

ISO [8503-5](#) - Preparation of Steel Substrates before Application of Paints and Related Products - Surface Roughness Characteristics of Blast-cleaned Steel Substrates - Part 5: Replica Tape Method for the Determination of the Surface Profile;

ISO [ISO/IEC 17025](#) - General Requirements for the Competence of Testing and Calibration Laboratories;

ASTM [B117](#) - Standard Practice for Operating Salt Spray (Fog) Apparatus;

ASTM [D523](#) - Standard Test Method for Specular Gloss;

ASTM [D610](#) - Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces;

ASTM [D1141](#) - Standard Practice for the Preparation of Substitute Ocean Water;

ASTM [D1308](#) - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes;

ASTM [D1640/D1640M](#) - Standard Test Methods for Drying, Curing or Film Formation of Organic Coatings;

ASTM [D2485](#) - Standard Test Methods for Evaluating Coatings for High Temperature Service;

ASTM [D4060](#) - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser;

ASTM [D4518-91](#) - Standard Test Methods for Measuring Static Friction of Coating Surfaces;

ASTM [D4541](#) - Standard Test Method for Pull-Of Strength of Coatings Using Portable Adhesion Testers;

ASTM [E11](#) - Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves;

ASTM [G8](#) - Standard Test Methods for Cathodic Disbonding of Pipeline Coatings;

ASTM [G154](#) - Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials;

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

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

SSPC-[SP 11](#) - Power-Tool Cleaning to Bare Metal.

3 General Conditions

3.1 The paint schemes specified in this Standard are established by taking into account specific conditions to which they are subject and the operating temperatures.

3.2 Painting schemes (external and/or internal) shall be used on decks, transition zone region and above, service modules (metallic structures and plates), piping and equipment (fixed, rotating, electrical and instrumentation).

3.3 Shop primer, when existing, shall be removed immediately prior to applying painting schemes set forth in this Standard.

3.4 In the painting of helidecks must be applied antiskid floor paint and demarcation paint, according to [NORMAM-27/DPC](#), chapter 3.

3.5 In the event of touching up existing painting the original scheme shall be repeated. Shall there be impossibility to make abrasive blasting or hydroblasting, the surface preparation must be performed by rotary tools as wire bristle impact or rotary flap, according to [SSPC-SP11](#). For the case of a touch-up in maintenance painting services, alternatively primer epoxy pigmented with aluminum according to [PETROBRAS N-2288](#) may be used.

3.6 Before preparing the surface to be painted, perform visual inspection, all over the surface, by following [ABNT NBR 14847](#) e [ABNT NBR 15185](#). Identify points presenting traces of oil, grease, fat or other contaminants, the degree of rusting in which the surface is found (A, B, C or D, according to [ISO 8501-1](#)), as well as points where painting, if existing, is damaged, according to the figures in [ASTM D610](#).

3.7 In any painting schemes set forth in this Standard, submit the surface to be painted to the physical-chemical cleaning process, according to ABNT [NBR 15158](#), in regions where, during inspection, traces of oil, grease, fat or other contaminants were found. Perform the surface treatment, by using abrasive blasting or hydroblasting with or without abrasive, according to Table 1.

NOTE Hydroblasting without abrasive does not generate roughness profile.

Table 1 - Surface Treatment Method

Specific conditions (Chapter 4 of this Standard)	Surface treatment procedure	Finish grade for abrasive blasting (ISO 8501-1)	Finish grade for water jetting NACE WJ-2/SSPC-SP WJ 2)	Roughness profile (ISO 8503-4 or ISO 8503-5 or ABNT NBR 15488) (See Note 4)
All, except 4.3.3.1	Treat with abrasive blasting or hydroblasting according to PETROBRAS N-9	Sa 2 ½ (Minimum)	WJ-2 (Minimum)	70 µm to 100 µm (internal paint)
				50 µm to 100 µm (external paint)
Item 4.3.3.1	Treat with abrasive blasting according to PETROBRAS N-9	Sa 2 ½ (Minimum)	-	50 µm to 100 µm
NOTE 1 In the case of hydroblasting, the use of paint compatible with the condition of the substrate after this treatment shall be provided. The application shall be performed on surfaces presenting even light flash rust. NOTE 2 In the case of hydroblasting, with application of paint on wet surface and/or relative humidity above 85%, the paint to be used must have been previously formally approved by PETROBRAS, as satisfying the PETROBRAS N-2680. NOTE 3 Visual patterns for hydroblasting are set out in SSPC VIS-4/NACE VIS 7. NOTE 4 Use the Replica Tape method according to ISO 8503-5 or needle-type roughness profiler according to ABNT NBR 15488 or Stylus method according to ISO 8503-4 and, in this case, considering the parameter Rz DIN or Ry5 and having angular nature. NOTE 5 Immediately prior to the application of the primer, the measurement of soluble salts according to PETROBRAS N-9 is mandatory.				

3.8 In the case of monobuoys in maintenance during docking, after visual inspection, scraping of marine organisms, as well as the remains of loose paint and corroded parts shall be performed. Then, freshwater washing shall be done at a minimum pressure of 5,000 psi by blasting. After this operation, blast the corroded areas according to PETROBRAS [N-9](#), until at least the grade Sa 2 ½ of ISO [8501-1](#) or the ultra-high pressure hydroblasting according to grade WJ-2 of the NACE [WJ-2/SSPC-SP WJ 2](#). After this preparation apply three layers of 150 µm each of the surface tolerant solvent free epoxy paint specified in PETROBRAS [N-2680](#).

3.9 All paint shall preferably be applied using an airless spray gun. In the technical impossibility of using the airless spray gun, other methods of application may be used, if approved by PETROBRAS.

3.10 Stripe coating at critical points such as welded regions, nuts and bolts, sharp edges, cavities and grooves, crevices and pits, flanges and flanged valves, edges and beam corners shall be performed on the substrate and between each coat applied.

NOTE Depending on the depth and width of cavities, cracks, alveoli and pits, these must be filled and leveled before painting, through welds or specific coating for this purpose, which must be confirmed by previous inspection of surface, according to PETROBRAS [N-13](#).

3.11 Time interval for applying one coat of any paint over another shall consider the recoat interval recommended by the manufacturer of the paint already applied. For epoxy resin-based paint, if the maximum time is exceeded, manual sanding shall be performed for breaking the gloss all over the surface and non-oily solvent cleaning, before applying subsequent coat.

3.12 When applying paints and respective application quality control, prescriptions described in PETROBRAS [N-13](#) shall be followed.

3.13 Continuity control of dry film shall be done by employing a Holiday Detector, when specified in the procedure, after application of the entire painting scheme, according to ABNT [NBR 16172](#). This test, however, is dispensed for forged or cast accessories of piping, electrics, and instrumentation, such as valves, flanges and sight glasses.

3.14 For anticorrosive protection purpose the offshore unit is divided into 3 zones, namely:

- a) submerged zone;
- b) transition zone;
- c) atmospheric zone.

3.15 For Fixed Offshore Units - Transition and atmospheric zones must be painted.

3.16 For Mobile Offshore Units - Submerged, transition and atmospheric zones must be painted

NOTE All submerged region must have cathodic protection by galvanic anodes or impressed current.

4 Specific Conditions

4.1 Submerged Zone

For the submerged zone, PETROBRAS [N-2037](#), shall be followed.

NOTE 1 Continuity control of the film shall be done using a Holiday Detector, according to ABNT [NBR 16172](#).

NOTE 2 All paints and/or coatings used must have resistance to cathodic disbonding.

4.2 Transition Zone

4.2.1 Alternative A - Single Coating

Immediately after surface preparation, apply high-thickness polyamide epoxy putty (2 components) in a continuous and uniform layer, with a thickness comprised between 1 mm and 4 mm

4.2.2 Alternative B - Single Coating

Apply three coats of surface tolerant solvent free epoxy paint, specified in PETROBRAS [N-2680](#), with a minimum film thickness of 150 µm per coat. The paint shall be applied by airless spray or brush. The interval for applying the finish paint shall be, at least, 12 hours and, at most, 120 hours.

NOTE 1 Recoat and full curing intervals may be reduced according to the manufacturer's technical instructions.

NOTE 2 In the case of production ships, monobuoys or where necessary, a silicone-based or a fluoropolymer-based antifouling scheme may be applied over the anticorrosive scheme already applied.

4.2.3 Alternative C - Special Coatings

Apply a single coat of high performance epoxy coating with a minimum dry film thickness of 500 µm, with a minimum solids by volume content of 80%. The coating shall be applied by airless spray or brush. The full curing time shall be, at most, 24 hours at 25°C.

NOTE The paint specified in 4.2.3 shall be pre-qualified in accordance with the performance criteria set out in Annex A by test laboratories certified in accordance with ISO [ISO/IEC 17025](#). Laboratories shall be accredited under the International Accreditation Forum (IAF) or INMETRO.

4.2.4 Alternative D - Underwater Paint

Immediately after surface preparation, apply one or two coats of coating to surfaces that exhibit permanent condensation, as set out in Annex C, with a minimum total dry film thickness of 500 µm. The coating shall be applied by airless spray or brush.

4.2.5 Touch-ups

4.2.5.1 Option 1

Touch-ups shall be made in the regions where the paint scheme has been damaged, using an epoxy putty provided in alternative A, as described in 4.2.1, after localized abrasive blasting or hydroblasting.

4.2.5.2 Option 2

Touch-ups shall be done in the regions where the paint scheme was damaged, using the paint scheme established in Alternative D of 4.2.4.

4.3 Atmospheric Zone for Equipment and Piping without Thermal Insulation and Structures

4.3.1 Operating Temperature, from 0°C to 80°C

4.3.1.1 Option 1

4.3.1.1.1 Primer