

NORSOK STANDARD

SURFACE PREPARATION AND PROTECTIVE COATING

M-501
Rev. 4, December 1999

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FOREWORD

NORSOK (The competitive standing of the Norwegian offshore sector) is the industry initiative to add value, reduce cost and lead-time and remove unnecessary activities in offshore field developments and operations.

The NORSOK standards are developed by the Norwegian petroleum industry as a part of the NORSOK initiative and are jointly issued by OLF (The Norwegian Oil Industry Association) and TBL (Federation of Norwegian Engineering Industries). NORSOK standards are administered by NTS (Norwegian Technology Standards Institution).

The purpose of this industry standard is to replace the individual oil company specifications for use in future petroleum industry developments and operations, subject to the individual company's review and application.

The NORSOK standards make extensive references to international standards. Where relevant, the contents of this standard will be used to provide input to the international standardisation process. Subject to implementation into international standards, this NORSOK standard will be withdrawn.

Annex A specifies coating systems. For those coating systems which are subject to pre-qualification, i.e. coating systems 1, 3B, 4, 5 and 7, the specified coating system is informative. The remaining coating systems are normative.

Annex B is informative.

INTRODUCTION

The main changes included in this revised issue of NORSOK M-501 are:

- The coating system for ballast water has been moved from coating system no. 7 to coating system no. 3B. The requirement that the coating system shall be pre-qualified is maintained.
- Modification of the criteria for use of shop primers.
- Modification of the requirements for pre-qualification of coating systems using shop primers as an integrated part of the final coating system.
- Modification of the requirements for pre-qualification of passive fire protection coatings.
- Modification of the requirements for pre-qualification of topcoats.
- The salt spray test in the coating system pre-qualification has been deleted.
- The condensation chamber test in the coating system pre-qualification is maintained for coating system no. 3B only.
- Modification of method for measuring scribe creep during pre-qualification testing of coating systems. Modification of acceptance criteria for scribe creep.
- The requirements for tank coating systems, coating system no. 3, have been made more specific.

Other smaller changes and modifications are also made. All changes are highlighted with revision marks.

1 SCOPE

This standard gives the requirements for the selection of coating materials, surface preparation, application procedures and inspection for protective coatings to be applied during the construction and installation of offshore installations and associated facilities.

This standard cover both paints, thermally sprayed metallic coatings and application of passive fire protective coatings.

The aim of this standard is to obtain a coating system, which ensures:

- Optimal protection of the installation with a minimum need for maintenance.
- That the coating system is maintenance friendly.
- That the coating system is application friendly.
- That health, safety and environmental impacts are evaluated and documented.

This standard is not applicable to pipelines and pipeline risers.

2 NORMATIVE REFERENCES

The following standards include provisions, which, through reference in this text, constitute provisions of this NORSOK standard. Latest issue of the references shall be used unless otherwise agreed. Other recognised standards may be used provided it can be shown that they meet or exceed the requirements of the standards referenced below.

ASTM D823	Method of producing films of uniform thickness of paint, varnish, lacquer and related products on test panels.
ASTM D1141	Specification for substitute ocean water.
ASTM D1650	Method of sampling and testing shellac varnish.
ASTM G8	Test method for cathodic disbonding of pipeline coatings.
ASTM G 53	Recommended practice for operating light- and water-exposure apparatus (fluorescent UV-condensation type) for exposure of non-metallic materials.
BS 5493	Code of practice for protection of iron and steel structures against corrosion.
DIN 8566	Zusätze für das termische Spritzen.
DIN 32521	Acceptance test and quality control for thermal spraying equipment.
ISO 1461	Metallic coatings - Hot-dip galvanised coating on fabricated ferrous products - Requirements.
ISO 1513	Paints and varnishes - Examination and preparation samples for testing.
ISO 1514	Paints and varnishes - Standard panels for testing.
ISO 2811	Paints and varnishes - Determination of density.
ISO 2812	Paints and varnishes - Determination of resistance to liquids.
ISO 2814	Paints and varnishes - Comparison of contrast ratio (hiding power) of paint of the same type and colour.
ISO 3251	Paints and varnishes - Determination of non-volatile matters of paints, varnishes and binders for paint and varnishes.
ISO 4624	Paints and varnishes - Pull-off test for adhesion.

ISO 4628	Paints and varnishes - Evaluation of degradation of paint coatings - Designation of intensity, quantity and size of common type of defects.
ISO 6270	Paints and varnishes - Determination of resistance to humidity (continuous condensation).
ISO 7253	Paints and varnishes - Determination of resistance to neutral salt spray.
ISO 8501-1	Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness.
ISO 8502-3	Preparation of steel substrates before application of paints and related products - Test for the assessment of surface cleanliness - 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 - Test for the assessment of surface cleanliness - Sampling of soluble impurities on surfaces to be painted - The Bresle method.
ISO 8502-9	Preparation of steel substrates before application of paints and related products - Test for the assessment of surface cleanliness - Field Method for the Conductometric Determination of Water-Soluble Salts.
ISO 8503	Preparation of steel substrates before application of paints and related products - Surface roughness characteristics of blast cleaned substrates.
ISO 8504-2	Preparation of steel substrates before application of paints and related products - Surface preparation methods - Abrasive blast cleaning.
NACE RP0188	Discontinuity (holiday) testing of protective coatings.
NORSOK M-001	Material selection
NORSOK S-002	Working environment
NS 476	Rules for the approval of surface treatment inspectors.
RAL-1K	Farbenübersicht.
SFS 8145	Anticorrosive painting, surface preparation methods of blast cleaned and shop primer coated steel substrates and preparation grades for respective treatments.
SSPC Vol.2	Steel structures painting manual. SP-1 and PA-2

3 DEFINITIONS AND ABBREVIATIONS

3.1 Definitions

Can	Can-requirements are conditional and indicate possibility open to the user of the standard.
Feathered	A gradual taper in thickness from a coated surface to an uncoated surface.
Generic type	Coatings with the same type of binder and active filler (e.g. zinc). Used in this document for shop primers.
Holiday	A discontinuity in a coating, which exhibits electrical conductivity, when exposed to a specific voltage.
Informative references	Shall mean informative in the application of NORSOK standards.
May	May indicate a course of action that is permissible within the limits of the standard (a permission).
Normative references	Shall mean normative in the application of NORSOK standards.

Shall	Shall is an absolute requirement which shall be followed strictly in order to conform to the standard.
Shop primer	A thin protective coating normally applied for protection during transport and storage.
Should	Should is a recommendation. Alternative solutions having the same functionality and quality are acceptable.
Stripe Coat	A supplementary coat applied to ensure adequate protection of critical areas like edges, welds etc.

3.2 Abbreviations

MDFT	Minimum dry film thickness.
NDFT	Nominal dry film thickness.
RAL	Colour definitions issued by RAL, Deutsches Institut für Gütesicherung und Kennzeichnung e.V.
SSPC	Steel Structures Painting Council.

4 GENERAL REQUIREMENTS

4.1 General

Selection of coating systems and application procedures shall be made with due consideration to conditions during fabrication, installation and service of the installation.

4.2 Planning

All activities shall be fully incorporated in the fabrication plan.

Details of management, inspectors, operators, facilities, equipment and qualified procedures shall be established and documented before commencing work.

Steel surfaces shall be blast cleaned and coated, i.e. metal sprayed or coated with primer and the succeeding coat of the applicable system, prior to installation.

4.3 Equipment protection and clean up

All equipment and structures shall be fully protected from mechanical damages, ingress of abrasives and dust from blast cleaning. Sags, droplets and paint over-spray (incl. dry-spray) shall be avoided. Adjacent areas not to be painted or already finished shall be protected. On completion of the work in any area, all masking materials, spent abrasives, equipment etc. shall be removed.

4.4 Ambient conditions

No final blast-cleaning or coating application shall be done if the relative humidity is more than 85% and when the steel temperature is less than 3°C above the dew point. Coating shall only be applied or cured at ambient and steel temperatures above 0 °C.

The coating manufacturer shall specify the maximum and minimum application and curing temperature and other relevant limitations regarding application and curing conditions for each product in any coating system.

4.5 Coating materials

The selected coating materials shall be suitable for the intended use and shall be selected after an evaluation of all relevant aspects such as:

- Corrosion protective properties.
- Requirements to health, safety and environment.
- Properties related to application conditions, equipment and personnel.
- Availability and economics of coating materials.

All coating materials and solvents shall be stored in the original container bearing the manufacturer's label and instructions. Each product shall have a batch number showing year and month of manufacture and giving full traceability of production. Shelf life shall be included in the technical data sheet.

Applicable coating systems are tabulated in Annex A. For those coating systems which are subject to pre-qualification, i.e. coating systems 1, 3B, 4, 5 and 7, the specified coating systems are examples, and alternative coating systems may be used if the requirements of this document are fulfilled. All systems shall be compatible with respect to over-coating and maintenance.

Topcoat colours should be in accordance with Annex B. Light colours shall be used in ballast and fresh water tanks.

4.6 Steel materials

Steel subject to surface preparation on site shall as a minimum requirement be in accordance with rust-grade B according to ISO 8501-1. Shop primers shall be regarded as temporary corrosion protection and shall be removed prior to the application of the coating systems herein unless the requirements in clause 4.7 are fulfilled.

4.7 Shop primer

If a shop primer is considered left on the surface to form an integrated part of the final coating system, it shall be applied in accordance with the following requirements:

- Blast cleaning shall comply with ISO 8501-1 Sa 2½ and the surface shall remain at Sa 2½ until application of the primer. The primer shall consist of 1 coat zinc ethyl silicate primer with 15µm thickness. Measured on a plane polished steel or glass test plate, the dry film thickness shall be maximum 25µm.

Use of shop primer as an integrated part of the final coating system, can only be considered for coating system no. 1, 3B, 4, 5, 7 and 8. For coating systems 1, 3B, 4, 5 and 7, the pre-qualification requirements in clause 10.1 "Pre-qualifications of products" shall apply.

Areas with intact shop primer shall be sweep blasted to minimum lightly in accordance with the SFS 8145, table 1 prior to application of the final coating system. All other areas shall be treated in accordance with the requirements for bare steel.