

NORSOK STANDARD

COMMON REQUIREMENTS

CATHODIC PROTECTION

M-503

Rev. 2, September 1997

Please note that whilst every effort has been made to ensure the accuracy of the NORSOK standards neither OLF nor TBL or any of their members will assume liability for any use thereof.

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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 existing and future petroleum industry developments, 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 Subject to implementation into international standards, this NORSOK standard will be withdrawn.

INTRODUCTION

Revision 2 of this standard is made to reflect an agreement with the authorities regarding cathodic protection for large subsea pipeline systems.

1 SCOPE

This Standard gives requirements for cathodic protection design of submerged installations and seawater containing compartments, and manufacturing of sacrificial anodes.

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 recognized standards may be used provided it can be shown that they meet or exceed the requirements of the standards referenced below.

ASTM D 1141	Specification for Substitute Ocean Water.
AWS D1.1	Structural Welding Code - Steel.
DNV RP B401	Cathodic Protection Design.
EN 287	Approval testing of welders - Fusion welding - Part 1.
EN 288	Specification and approval of welding procedures for metallic materials - Part 1, 2, 3.
EN 10002	Metallic materials. Tensile testing. Part 1: Method of test (at ambient temperature).
EN 10204	Metallic products - Types of inspection documents.
ISO 1461	Metallic coatings - Hot-dip galvanized coating on fabricated ferrous products - Requirements.
ISO 8501	Preparations of steel substrates before application of paints and related products - Visual assessment of surface cleanliness.
NORSOK M-501	Standard for Surface Preparation and Protective Coating.
NORSOK M-505	Standard for Corrosion Monitoring Design (presently M-CR-505).
NACE RP0387	Metallurgical and Inspection Requirements for Cast Sacrificial Anodes for Offshore Applications.
NACE RP0492	Metallurgical and Inspection Requirements for Offshore Pipeline Bracelet Anodes.
U.S. Mil. Spec. MIL-A-18001	Military Specification for Anodes, Corrosion preventive, Zinc; slab disc and rod shaped.

3 DEFINITIONS

Can	Can requirements are conditional and indicates a possibility open to the user of the standard.
May	May indicates 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 with the standard.
Should	Should is a recommendation. Alternative solutions having the same functionality and quality are acceptable.

4 CATHODIC PROTECTION DESIGN

4.1 General

The cathodic protection system shall be designed with due regard to environmental conditions, neighbouring structures and other activities. The cathodic protection system design should be based on sacrificial anodes. Both stand-off, flush-mounted and bracelet anodes may be used. The exact location and distribution of the different types of anodes shall be part of the detailed corrosion protection design. The design shall be subject to verification at the end of the fabrication phase. When stand-off anodes are used precautions shall be taken in the installation and distribution of these anodes so they do not impede subsea intervention operations.

The cathodic protection system shall be capable of polarizing all submerged steel of the installations to a potential between -800 mV and -1050 mV vs the Ag/AgCl/seawater reference electrode, and to maintain the potential in this interval throughout the design life of the installations.

Recommendation:

The use of impressed current cathodic protection systems can be considered for floating production units.

The CP system shall be designed for the lifetime of the installation using the calculation procedure described in DNV RP B401. Retrofitting can be planned for if this is documented to be cost effective. Computer models can be used in the detailed design to verify the protection of parts with complicated geometry e.g. in the pile area for jackets, conductor guide frames and J-tube bellmouths and to evaluate any interference effects between anodes and/or between structures.

In the design calculation, data given in clause 6 of this document shall be used. For calculation of surface areas, the latest revisions of drawings shall be used, and all areas below the mean water level shall be included. Reference to drawings and revision numbers shall be given.

Items covered in the design shall be listed, with description of surface treatment (bare, painted, rubber coated etc.). Items not covered in the design shall also be listed, i.e. temporary items to be removed. Items to which current drain is allowed shall be listed.

For high strength steel materials (minimum specified yield strength >700 MPa, maximum actual yield strength 950 Mpa) a special evaluation is required, with respect to hydrogen impact. The impact can be documented according to EN 10002.

Monitoring of cathodically protected structures shall be according to NORSOK Standard M-505, if used.

4.2 Electrical continuity requirements

All items to be protected shall be electrically connected and should have a welded or brazed connection to an anode. All bolted/clamped components with surface area exceeding 1 m² shall have an all welded/brazed connection to an anode. For all bolted/clamped assemblies without an all welded/brazed electrical grounding, it shall be verified that the electric resistance is less than 0.10 ohm. Coating on contact surfaces shall be removed prior to assembly.