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Petroleum, petrochemical and natural gas industries — External corrosion protection of risers by coatings and linings —

Part 1: Elastomeric coating systems-polychloroprene or EPDM

Industries du pétrole, de la pétrochimie et du gaz naturel — Protection de la corrosion externe des risers par revêtements et doublures —

Partie 1: Systèmes de revêtement élastomère-polychloroprène ou EPDM

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Foreword

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The committee responsible for this document is ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*.

A list of all parts in the ISO 18797 series can be found on the ISO website.

Introduction

This document is based on GSO 2273. This document defines the minimum technical requirements for the external corrosion protection of risers by coatings and linings based on elastomeric coating systems-polychloroprene, EPDM or equivalent elastomeric coatings that are employed in the oil and gas industry and provides technical guidance for developing local standards and specifications in order to ensure compliance in coating and lining material selection and performance with contract requirements.

Users of this document need to be aware that further or differing requirements can be needed for individual applications. This document is not limiting the contractor and/or manufacturer from proposing or company from accepting alternative engineering solutions for the individual application. This can be particularly applicable where there is innovative or developing technology. Where an alternative is proposed, the specification issuer needs to identify any deviations from this document and provide details.

This document does not incorporate any form of passive fireproofing requirements or any related compatibility issues. Any requirements with regards to passive fireproofing are to be addressed separately.

Petroleum, petrochemical and natural gas industries — External corrosion protection of risers by coatings and linings —

Part 1: Elastomeric coating systems-polychloroprene or EPDM

1 Scope

This document specifies the minimum requirements for materials selection, surface preparation, application, inspection, testing, qualification and acceptance criteria of external coating for steel risers pipes used in the splash zone, their field joints and clamps/guides, using an elastomeric protective coating based on polychloroprene, EPDM or equivalent. This is applicable for new construction and repair of applied pipes before installation. Maintenance requirements and field repairs are covered in ISO 18797-2.

This document also specifies the requirements for transportation, handling and storage of riser pipes before and after surface preparation and coating application.

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 34 (all parts), *Rubber, vulcanized or thermoplastic — Determination of tear strength*

ISO 37, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

ISO 813, *Rubber, vulcanized or thermoplastic — Determination of adhesion to rigid substrate — 90 degree peel method* [alternative to ISO 814]

ISO 814, *Rubber, vulcanized or thermoplastic — Determination of adhesion to metal — Two-plate method* [alternative to ISO 813]

ISO 815-1, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 1: At ambient or elevated temperatures*

ISO 815-2, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 2: At low temperatures*

ISO 1431-1, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing*

ISO 1817, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 2781, *Rubber, vulcanized or thermoplastic — Determination of density*

ISO 2812-2, *Paints and varnishes — Determination of resistance to liquids — Part 2: Water immersion method*

ISO 4649, *Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using a rotating cylindrical drum device*

ISO 6502, *Rubber — Guide to the use of curemeters*

ISO 7619-1, *Rubber, vulcanized or thermoplastic — Determination of indentation hardness — Part 1: Durometer method (Shore hardness)*

ISO 8501-1:2007,[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 8502-2, *Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 2: Laboratory determination of chloride on cleaned surfaces*

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 8502-4, *Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 4: Guidance on the estimation of the probability of condensation prior to paint application*

ISO 8502-5, *Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 5: Measurement of chloride on steel surfaces prepared for painting (ion detection tube 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 substrate 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 8503-2, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 2: Method for the grading of surface profile of abrasive blast-cleaned steel — Comparator procedure*

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* [alternative to ISO 8503-5]

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* [alternative to ISO 8503-4]

ISO 10474:2013, *Steel and steel products — Inspection documents*

ISO 11126 (all parts), *Preparation of steel substrates before application of paints and related products — Specifications for non-metallic blast-cleaning abrasives*

ISO 21457, *Petroleum, petrochemical and natural gas industries — Materials selection and corrosion control for oil and gas production systems*

ISO 21809-3, *Petroleum and natural gas industries — External coatings for buried or submerged pipelines used in pipeline transportation systems — Part 3: Field joint coatings*

1) SSPC SP10 is equivalent to ISO 8501-1.

ISO 29601, *Paints and varnishes — Corrosion protection by protective paint systems — Assessment of porosity in a dry film* [alternative to ASTM D5162]

EN 10204:2004, *Metallic products — Types of inspection documents*

EN 12664, *Thermal performance of building materials and products — Determination of thermal resistance by means of guarded hot plate and heat flow meter methods — Dry and moist products of medium and low thermal resistance* [alternative to ISO 29601]

EN 14879-4:2007, *Organic coating systems and linings of protection of industrial apparatus and plants against corrosion caused by aggressive media — Part 4: Linings on metallic components*

API RP 5LW, *Recommended Practice for Transportation of Line Pipe on Barges and Marine Vessels* [alternative to API RP 5L1]

API RP 5L1, *Recommended Practice for Railroad Transportation of Line Pipe* [alternative to API RP 5LW]

ASTM D2084, *Standard Test Method for Rubber Property — Vulcanization Using Oscillating Disc Cure Meter*

ASTM D4285, *Standard Test Method for Indicating Oil or Water in Compressed Air*

ASTM D5162, *Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates* [alternative to ISO 29601]

ASTM D5894, *Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)*

SSPC-AB 2, *Cleanliness of Recycled Ferrous Metallic Abrasive*

SSPC-PA 2, *Procedure for Determining Conformance to Dry Coating Thickness Requirements*

SSPC-SP 1, *Solvent Cleaning*

3 Terms and definitions

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

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

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

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

3.1
atmospheric zone
areas of offshore structures and riser pipes that extend upward from the *splash zone* (3.18) up to top decks of the *platform* (3.12) which are exposed to sun, wind, sprays and rains

3.2
applicator
organization appointed by *contractor* (3.3)/*client* (3.4) to perform application of coatings/linings on riser pipes as per project procedures prepared in accordance with this document

3.3
contractor
organization appointed by the *client* (3.4) to perform the *works* (3.21) in accordance with this document

3.4
client
organization for which professional services are rendered or person that receives a product

3.5
dew point
temperature at which moisture in air will condense out on to a solid surface, like blast-cleaned metal surface or newly coated surfaces

3.6
dust
loose fine particulate matter present on a steel surface prepared for rubber lining, arising from blast cleaning or other grinding activities or from worksite environments

3.7
elastomeric coatings
flexible skins, permanently bonded to *risers* (3.15) and structures

Note 1 to entry: Elastomeric coatings are designed and developed to withstand aggressive environment or conditions affecting platform structures and risers in marine splash zones. These provide add on durability to designed life to structures and risers in offshore environment, while providing resistance to seawater ingression, ozone oxidation, erosion and abrasion.

3.8
ethylene propylene diene monomer
EPDM
elastomeric compound or synthetic rubber applied as a protective coating on riser pipes in *splash zones* (3.18) to withstand erosion of riser pipe material caused by continuous exposure to seawater and wave actions

Note 1 to entry: EPDM provides resistance to outdoor and high temperature services in the range of -35 °C to 120 °C.

3.9
flash rusting
slight rust formation on a freshly blast-cleaned carbon steel surfaces due to humidity in air and if not painted within 4 h from start of blasting

3.10
holiday
discontinuity in a protective coating (cracks, pinholes, voids, etc.) that exhibits electrical conductivity when exposed to specific voltage

Note 1 to entry: Holiday also means a small defect in the lining that would permit corrosion of substrate under service conditions for which lining is designed. The term can be considered synonymous with cracks or mechanical damages occurring in rubber lining, while in services.

3.11
manufacturer
organization responsible for the manufacture of coating material(s)

3.12
platform
offshore structure used to accommodate oil and gas wells related production equipment, pipelines and living quarters

3.13
production batch
one loading capacity of the internal mixer used for preparing the mixed rubber prior to forming strip of sheet

3.14
polychloroprene
light yellow synthetic rubber compound obtained by polymerization of chloroprene

Note 1 to entry: Polychloroprene is commonly known as polychloroprene compound.

Note 2 to entry: Polychloroprene is applied as a protective coating on riser pipes in *splash zones* (3.18) and below to withstand erosion of riser pipe material caused by continuous exposure to seawater and wave actions. It provides resistance to outdoor and services temperature in the range of −35 °C to 90 °C.

3.15
riser
section of pipeline carrying crude/gas between ocean floor and upper decks of *platform* (3.12) on offshore structures

3.16
shore hardness
methods for determining the hardness of materials by means of durometer

3.17
site
lands and waters and other places on, under, in or through which the *works* (3.21) are to be carried out and any other lands, waters or places provided by the *client* (3.4) for the purposes of the contract together with any other places designated in the contract

3.18
splash zone
external surfaces of an offshore structure or pipeline that are, periodically wet and dry by the influence of the astronomical tides, winds and waves, the limits are as defined by the contract specifications

3.19
surface profile
micro-roughness of surface generally expressed as an average of height of highest peaks relative to lowest valleys sometime referred to as amplitude

3.20
vulcanization
curing of elastomeric materials by chemical reaction under heat and pressure to improve strength and elasticity of applied rubber lining

3.21
works
activities to be executed in accordance with the contract, as defined in the specified conditions and including both permanent and temporary activities

4 Abbreviated terms

µm	micrometer (microns)
ASTM	American Society for Testing and Materials
BS	British Standard
DFT	dry film thickness
HSE	health, safety and environment
GSO	Gulf Standardization Organization ITP
MS	method statement
MSDS	material safety data sheet
NACE	National Association of Corrosion Engineers
NPS	nominal pipe size

pphm	parts per hundred million
PPT	pre-production trial
PQT	procedure qualification trial
QA/QC	quality assurance/quality control
SSPC	Society for Protective Coatings

5 Pre-work requirements

5.1 General

5.1.1 All requirements in this document and the referenced documents shall be followed, except if they are modified or supplemented by project specification or datasheet.

5.1.2 The equipment, materials, consumables, spaces and stockpile areas that are necessary to carry out surface preparation, coating application, qualification testing, inspection and QA/QC shall be in accordance with this document and in a manner satisfactory to the client.

5.1.3 Surface preparation, priming, coating application, qualification testing/inspection and QA/QC works shall be carried out in a continuous sequence as per this document and as recommended by the manufacturers, unless otherwise specified by the client.

5.2 Health, safety and environmental (HSE)

5.2.1 All necessary health, safety and environmental (HSE) procedures shall be employed to protect the personnel and the surrounding environment during on-site/field works. The contractors shall submit their HSE manual for client's approval. The approved HSE procedures for the safe coating/lining processes shall be strictly followed.

5.2.2 All relevant international safety requirements, client's safety regulations for contractors and lifting equipment regulations shall be adhered, while performing coating and lining works.

5.2.3 Materials safety data sheets (MSDS) for all chemicals to be used within the client's operation areas shall be submitted to the client for review and approval. Health and safety precautions shall be clearly described on each materials container/package.

5.2.4 All wastes resulting from supply, preparation and application shall be contained, collected and properly disposed of in accordance with international/local environmental protection standards/regulations.

5.3 Qualification of coating/lining application and inspection personnel

5.3.1 The coating/lining operatives shall be competent to undertake the coating application, inspection/testing procedures and repair work. The qualification shall be obtained as agreed with the client or by demonstration at a procedure qualification trial (PQT) during pre-production trial (PPT).

5.3.2 Inspectors and applicator personnel carrying out the coating inspection shall be competent to carry out the requirements of this document. The applicator shall request the manufacturer of the coating/lining material(s) and equipment to provide technical assistance to the coating/lining operatives if necessary.