
**Petroleum and natural gas
industries — External coatings for
buried or submerged pipelines used
in pipeline transportation systems —**

**Part 5:
External concrete coatings**

*Industries du pétrole et du gaz naturel — Revêtements externes
des conduites enterrées ou immergées utilisées dans les systèmes de
transport par conduites —*

Partie 5: Revêtements externes en béton

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 2, *Pipeline transportation systems*.

This second edition cancels and replaces the first edition (ISO 21809-5:2010), which has been technically revised.

A list of all parts in the ISO 21809 series can be found on the ISO website.

Introduction

It is necessary that users of this document be aware that further or differing requirements might be needed for individual applications. This document is not intended to inhibit a vendor from offering or the purchaser from accepting alternative equipment or engineering solutions for the individual application. This can be particularly applicable if there is innovative or developing technology. If an alternative is offered, it is the responsibility of the vendor to identify any variations from this document and provide details.

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Petroleum and natural gas industries — External coatings for buried or submerged pipelines used in pipeline transportation systems —

Part 5: External concrete coatings

1 Scope

This document specifies the requirements for qualification, application, testing and handling of materials required for the application of reinforced concrete coating externally to either bare pipe or pre-coated pipe for use in pipeline transportation systems for the petroleum and natural gas industries as defined in ISO 13623.

The external application of concrete is primarily used for the negative buoyancy of pipes used in buried or submerged pipeline systems and/or for the mechanical protection of the pipe and its pre-coating.

This document is applicable to concrete thicknesses of 25 mm or greater.

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 1920-5, *Testing of concrete — Part 5: Properties of hardened concrete other than strength*

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

ISO 16120-2, *Non-alloy steel wire rod for conversion to wire — Part 2: Specific requirements for general purpose wire rod*

ISO 80000-1:2009, *Quantities and units — Part 1: General*

EN 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

EN 206-1, *Concrete — Part 1: Specification, performance, production and conformity*

EN 450-1, *Fly ash for concrete — Part 1: Definition, specifications and conformity criteria*

EN 934-2, *Admixtures for concrete, mortar and grout — Part 2: Concrete admixtures — Definitions, requirements conformity, marking and labelling*

EN 1008, *Mixing water for concrete — Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete*

EN 10080, *Steel for the reinforcement of concrete — Weldable reinforcing steel — General*

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

EN 10244-2, *Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 2: Zinc or zinc alloy coatings*

EN 12390-2, *Testing hardened concrete — Part 2: Making and curing specimens for strength tests*

- EN 12390-3, *Testing hardened concrete — Part 3: Compressive strength of test specimens*
- EN 12390-7, *Testing hardened concrete — Part 7: Density of hardened concrete*
- EN 12504-1, *Testing concrete in structures — Part 1: Cored specimens — Taking, examining and testing in compression*
- EN 12620, *Aggregates for concrete*
- EN 13055-1, *Lightweight aggregates — Part 1: Lightweight aggregates for concrete, mortar and grout*
- EN 13263-1, *Silica fume for concrete — Part 1: Definitions, requirements and conformity criteria*
- ACI 308.1-98, *Standard specification for curing concrete*
- ASTM A641, *Standard specification for zinc-coated (galvanized) carbon steel wire*
- ASTM A810, *Standard specification for zinc-coated (galvanized) steel pipe winding mesh*
- ASTM A1064, *Standard specification for carbon-steel wire and welded wire reinforcement, plain and deformed, for concrete*
- ASTM C31, *Standard practice for making and curing concrete test specimens in the field*
- ASTM C33, *Standard specification for concrete aggregates*
- ASTM C39, *Standard test method for compressive strength of cylindrical concrete specimens*
- ASTM C40, *Standard test method for organic impurities in fine aggregates for concrete*
- ASTM C42, *Standard test method for obtaining and testing drilled cores and sawed beams of concrete*
- ASTM C128, *Standard test method for density, relative density (specific gravity) and absorption of fine aggregate*
- ASTM C150, *Standard specification for Portland cement*
- ASTM C171, *Standard specification for sheet materials for curing concrete*
- ASTM C172, *Standard practice for sampling freshly mixed concrete*
- ASTM C309, *Standard specification for liquid membrane-forming compounds for curing concrete*
- ASTM C330, *Standard specification for lightweight aggregates for structural concrete*
- ASTM C331, *Standard specification for lightweight aggregates for concrete masonry units*
- ASTM C332, *Standard specification for lightweight aggregates for insulating concrete*
- ASTM C494, *Standard specification for chemical admixtures for concrete*
- ASTM C595, *Standard specification for blended hydraulic cements*
- ASTM C617, *Standard practice for capping cylindrical concrete specimens*
- ASTM C618, *Standard specification for coal fly ash and raw or calcined natural Pozzolan for use in concrete*
- ASTM C637, *Standard specification for aggregates for radiation-shielding concrete*
- ASTM C642, *Standard test method for density, absorption, and voids in hardened concrete*
- ASTM C989, *Standard specification for slag cement for use in concrete and mortars*
- ASTM C1157, *Standard performance specification for hydraulic cement*

ASTM C1176, *Standard practice for making roller-compacted concrete in cylinder molds using a vibrating table*

ASTM C1240, *Standard specification for silica fume used in cementitious mixtures*

ASTM C1435, *Standard practice for molding roller-compacted concrete in cylinder molds using a vibrating hammer*

ASTM C1602, *Standard specification for mixing water used in the production of hydraulic cement concrete*

ASTM C1604, *Standard test method for obtaining and testing drilled cores of shotcrete*

ASTM D2216, *Standard test methods for laboratory determination of water (moisture) content of soil and rock by mass*

ASTM D4643, *Standard test method for determination of water (moisture) content of soil by microwave oven heating*

ASTM D4959, *Standard test method for determination of water content of soil by direct heating*

ASTM D6176, *Standard practice for measuring surface atmospheric temperature with electrical resistance temperature sensors*

3 Terms and definitions

For the purposes 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

aggregate

fine and coarse granular material such as sand, crushed stone, iron blast furnace slag, magnetite, ilmenite, or hematite used with a cement medium to form concrete or mortar

3.2

anode

sacrificial metallic attachment that is electrically connected to the steel pipe

3.3

applicator

company that undertakes the coating application in compliance with the provisions of this document

3.4

cementitious material

inorganic material or a mixture of inorganic materials that sets and develops strength by chemical reaction with water by formation of hydrates and is capable of doing so under water

3.5

compression wrap process

process by which the concrete mix is discharged into a coating head and applied in a continuous helical strip with pressure onto a rotating pipe

3.6

compressive strength

maximum compressive stress at the point of failure