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ISO 24817:2017

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STANDARDS Australia

Petroleum, petrochemical and natural gas industries — Composite repairs for pipework — Qualification and design, installation, testing and inspection

AS ISO 24817:2022

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Preface

This Standard was prepared by the Standards Australia Committee ME-092, Materials, equipment, structures and related services for petroleum, petrochemical and natural gas industries.

The objective of this document is to give requirements and recommendations for the qualification and design, installation, testing and inspection for the external application of composite repair systems to corroded or damaged pipework, pipelines, tanks and vessels used in the petroleum, petrochemical and natural gas industries.

This document is identical with, and has been reproduced from, ISO 24817:2017, *Petroleum, petrochemical and natural gas industries — Composite repairs for pipework — Qualification and design, installation, testing and inspection*.

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The terms "normative" and "informative" are used to define the application of the appendices or annexes to which they apply. A "normative" appendix or annex is an integral part of a Standard, whereas an "informative" appendix or annex is only for information and guidance.

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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 6, *Processing equipment and systems*.

This second edition cancels and replaces the first edition (ISO 24817:2015), which has been technically revised.

This corrected version of ISO 24817:2017 incorporates the following correction:

— in 7.5.7, Formula (15), "$D4$" has been replaced by "D^4".

Introduction

The objective of this document is to ensure that pipework, pipelines, tanks and vessels repaired using composite systems that are qualified, designed, installed and inspected using this document will meet the specified performance requirements. Repair systems are designed for use within the petroleum, petrochemical and natural gas industries, and also within utility service applications. The main users of this document will be plant and equipment owners of the pipework and vessels, design contractors, suppliers contracted to provide the repair system, certifying authorities, installation, maintenance and inspection contractors.

Australian Standard®

Petroleum, petrochemical and natural gas industries — Composite repairs for pipework — Qualification and design, installation, testing and inspection

1 Scope

This document gives requirements and recommendations for the qualification and design, installation, testing and inspection for the external application of composite repair systems to corroded or damaged pipework, pipelines, tanks and vessels used in the petroleum, petrochemical and natural gas industries.

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 75-2, *Plastics — Determination of temperature of deflection under load — Part 2: High-strength ther*

ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles*

ISO 527-4, *Plastics — Determination of tensile properties — Part 4: Test conditions for isotropic and orthotropic fibre-reinforced plastic composites*

ISO 868, *Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness)*

ISO 10952, *Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes and fittings — Determination of the resistance to chemical attack for the inside of a section in a deflected condition*

ISO 11357-2, *Plastics — Differential scanning calorimetry (DSC) — Part 2: Determination of glass transition temperature and glass transition step height*

ISO 11359-2, *Plastics — Thermomechanical analysis (TMA) — Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature*

ISO 14692, *Petroleum and natural gas industries — Glass-reinforced plastics (GRP) piping*

ASTM C581, *Standard Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass-Reinforced Structures Intended for Liquid Service*

ASTM D543, *Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents*

ASTM D696, *Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between Minus 30°C and 30°C with a Vitreous Silica Dilatometer*

ASTM D1598, *Standard Test Method for Time-to-Failure of Plastic Pipe under Constant Internal Pressure*

ASTM D1599, *Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings*

ASTM D2583, *Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor*

ASTM D2992, *Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings*

ASTM D3039, *Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials*

ASTM D3165, *Standard Test Method for Strength Properties of Adhesives in Shear by Tension Loading of Single-Lap-Joint Laminated Assemblies*

ASTM D3681, *Standard Test Method for Chemical Resistance of Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Pipe in a Deflected Condition*

ASTM D5379, *Standard Test Method for Shear Properties of Composite Materials by the V-Notched Beam Method*

ASTM D6604, *Standard Practice for Glass Transition Temperatures of Hydrocarbon Resins by Differential Scanning Calorimetry*

ASTM E831, *Standard Test Method for Linear Thermal Expansion of Solid Materials by Thermomechanical Analysis*

ASTM E1640, *Standard Test Method for Assignment of the Glass Transition Temperature by Dynamic Mechanical Analysis*

ASTM E2092, *Standard Test Method for Distortion Temperature in Three-Point Bending by Thermomechanical Analysis*

ASTM G8, *S*

BS 7910, *Guide to methods for assessing the acceptability of flaws in metallic structures*

EN 59, *Methods of testing plastics — Glass reinforced plastics — Measurement of hardness by means of a Barcol impressor (BS 2782-10, Method 1001, Measurement of hardness by means of a Barcol impresser)*

EN 1465, *Adhesives* — Determination of tensile lap shear strength of rigid-to-rigid bonded assemblies

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
anisotropic
exhibiting different physical properties in different directions

3.2
Barcol hardness
measure of surface hardness using a surface impresser

3.3
blister
air void between layers within the laminate visible on the surface as a raised area

3.4
composite
thermoset resin system that is reinforced by fibres

3.5
crack
split in the laminate extending through the wall (perpendicular to the surface) such that there is actual separation with opposite surfaces visible

3.6
cure
curing
setting of a thermosetting resin system, such as polyester or epoxy, by an irreversible chemical reaction

3.7
cure schedule
time-temperature profile qualified to generate a specified T_g or HDT

3.8
defect type A
defect within the substrate, not through-wall and not expected to become through-wall within the repair design lifetime of the repair system

3.9
defect type B
through-wall defect or a defect within the substrate where at the end of service life the remaining wall thickness is less than 1 mm

3.10
defi
actu

3.11
delamination
area between the repair laminate and the substrate which should be bonded together but where no bond exists, or an area of separation between layers in the repair laminate

3.12
design lifetime
maximum application lifetime of the repair

3.13
differential scanning calorimetry
DSC
method of determining the glass transition temperature of a thermosetting resin

3.14
dry spot or un-impregnated/dry fibre
area of fibre not impregnated with resin, with bare, exposed fibre visible

3.15
engineered repair
repair which has been designed and applied under a specified, controlled process so that under the design conditions, there is a high degree of confidence that the repair will maintain its integrity over the design lifetime

3.16
exposed fibre
area of fibre not impregnated with resin that projects from the body of the repair

3.17
foreign matter
any substance other than the reinforcing fibre or other materials that form part of the repair system

3.18
finishing materials
final layer of material to help compact the repair laminate, typically a polymeric film or a fabric

Note 1 to entry: They should be fully removed after the repair has hardened and before the repair is inspected or painted.