

<b>STN</b>	<b>Ropný, petrochemický a plynárenský priemysel. Opravy potrubí pomocou kompozitov. Posúdenie a konštrukčný návrh, inštalovanie, skúšanie a kontrola (ISO 24817: 2015).</b>	<b>STN EN ISO 24817</b>  45 1671
------------	---	--

Petroleum, petrochemical and natural gas industries - Composite repairs for pipework - Qualification and design, installation, testing and inspection (ISO 24817:2015)

Táto norma obsahuje anglickú verziu európskej normy.  
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 01/16

Obsahuje: EN ISO 24817:2015, ISO 24817:2015

Oznámením tejto normy sa ruší  
STN P CEN ISO/TS 24817 (45 1429) z mája 2011

**122241**

English Version

Petroleum, petrochemical and natural gas industries - Composite repairs for pipework - Qualification and design, installation, testing and inspection (ISO 24817:2015)

Industries du pétrole, de la pétrochimie et du gaz naturel - Réparations en matériau composite pour canalisations: Conformité aux exigences de performance et conception, installation, essai et inspection (ISO 24817:2015)

Erdöl-, petrochemische und Erdgasindustrie - Reparatur von Rohrleitungen mit Verbundwerkstoffen - Bewertung und Ausführung, Montage, Test und Inspektion (ISO 24817:2015)

This European Standard was approved by CEN on 6 June 2015.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

**Contents**

Page

European foreword .....3

## European foreword

This document (EN ISO 24817:2015) has been prepared by Technical Committee ISO/TC 67 "Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries" in collaboration with Technical Committee CEN/TC 12 "Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries" the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2016, and conflicting national standards shall be withdrawn at the latest by February 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN ISO/TS 24817:2011.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

### Endorsement notice

The text of ISO 24817:2015 has been approved by CEN as EN ISO 24817:2015 without any modification.

First edition  
2015-08-01

---

---

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

*Industries du pétrole, de la pétrochimie et du gaz naturel —  
Réparations en matériau composite pour canalisations: Conformité aux  
exigences de performance et conception, installation, essai et inspection*



Reference number  
ISO 24817:2015(E)

© ISO 2015



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

# Contents

Page

<b>Foreword</b> .....	<b>v</b>
<b>Introduction</b> .....	<b>vi</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>2</b>
<b>4 Symbols and abbreviated terms</b> .....	<b>6</b>
4.1 Symbols.....	6
4.2 Abbreviated terms.....	9
<b>5 Applications</b> .....	<b>9</b>
<b>6 Summary of key issues</b> .....	<b>11</b>
<b>7 Qualification and design</b> .....	<b>13</b>
7.1 Repair feasibility assessment.....	13
7.2 Repair class.....	13
7.3 Repair design lifetime.....	14
7.4 Required data.....	15
7.4.1 Background.....	15
7.4.2 Original equipment design data.....	15
7.4.3 Maintenance and operational histories.....	15
7.4.4 Service condition data.....	15
7.4.5 Repair system qualification data.....	15
7.5 Design methodology.....	17
7.5.1 Overview.....	17
7.5.2 Environmental compatibility.....	19
7.5.3 Design temperature effects.....	19
7.5.4 Design based on substrate load sharing (defect type A).....	21
7.5.5 Design based on repair laminate allowable strains (defect type A).....	23
7.5.6 Design based on repair-allowable stresses determined by performance testing (defect type A).....	24
7.5.7 Design of repairs for through-wall defects (defect type B).....	25
7.5.8 Axial extent of repair.....	28
7.5.9 Optional design considerations.....	29
7.5.10 Dent and/or gouge type defects.....	33
7.5.11 Fretting type defects.....	33
7.5.12 Delamination or blister type defects.....	33
7.5.13 Repair of other components.....	34
7.5.14 Design output.....	37
7.6 Re-qualification of the repair system.....	37
7.6.1 Overview.....	37
7.6.2 For type A defect repairs.....	37
7.6.3 For type B defect repairs.....	37
<b>8 Installation</b> .....	<b>38</b>
8.1 Storage conditions.....	38
8.2 Documentation prior to repair application.....	38
8.2.1 Method statement.....	38
8.2.2 Work pack.....	38
8.3 Installer qualifications.....	39
8.4 Installation procedure.....	39
8.5 Repair completion documentation.....	40
8.6 Live repairs.....	41
8.7 Repair of clamps, piping components, tanks, or vessels.....	42
8.8 Environmental considerations.....	42

<b>9</b>	<b>Testing and inspection</b> .....	<b>42</b>
9.1	General .....	42
9.2	Allowable defects for the repair system .....	43
9.3	Repair of defects within the repair system .....	46
9.4	Inspection methods .....	46
9.5	Repair system maintenance and remedial options .....	46
9.5.1	Overview .....	46
9.5.2	Condition of the repair - visual inspection .....	46
9.5.3	Condition of the pipe substrate .....	47
9.5.4	Remedial options .....	47
9.5.5	Extension (re-validation) of repair design lifetime .....	47
9.5.6	Future modifications .....	48
<b>10</b>	<b>System testing</b> .....	<b>48</b>
<b>11</b>	<b>Decommissioning</b> .....	<b>49</b>
<b>Annex A</b> (normative)	<b>Design data sheet</b> .....	<b>50</b>
<b>Annex B</b> (normative)	<b>Qualification data</b> .....	<b>53</b>
<b>Annex C</b> (normative)	<b>Short-term pipe spool survival test</b> .....	<b>57</b>
<b>Annex D</b> (normative)	<b>Measurement of <math>\gamma_{LCL}</math> for through-wall defect calculation</b> .....	<b>59</b>
<b>Annex E</b> (normative)	<b>Measurement of performance test data</b> .....	<b>62</b>
<b>Annex F</b> (normative)	<b>Measurement of impact performance</b> .....	<b>65</b>
<b>Annex G</b> (normative)	<b>Measurement of the degradation factor</b> .....	<b>66</b>
<b>Annex H</b> (informative)	<b>Axial extent of repair look-up table</b> .....	<b>68</b>
<b>Annex I</b> (normative)	<b>Installer qualification</b> .....	<b>70</b>
<b>Annex J</b> (informative)	<b>Installation requirements and guidance</b> .....	<b>73</b>
<b>Annex K</b> (informative)	<b>Design considerations</b> .....	<b>75</b>
<b>Annex L</b> (informative)	<b>Management of the integrity of composite repair systems to pipework and vessels</b> .....	<b>80</b>
<b>Bibliography</b>	.....	<b>84</b>



## 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](http://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](http://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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 6, *Processing equipment and systems*.

This first edition cancels and replaces ISO/TS 24817:2006, which has been technically revised.

## **Introduction**

The objective of this International Standard is to ensure that pipework, pipelines, tanks, and vessels repaired using composite systems that are qualified, designed, installed, and inspected using this International Standard 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 International Standard 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.

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

## 1 Scope

This International Standard 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, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 75-3, *Plastics — Determination of temperature of deflection under load — Part 3: High-strength thermosetting laminates and long-fibre-reinforced plastics*

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, *Standard Test Methods for Cathodic Disbonding of Pipeline Coatings*

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 impressor)*

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

**koniec náhľadu – text ďalej pokračuje v platenej verzii STN**