

GENERAL SPECIFICATION

PIPELINES - RISERS

GS EP PLR 310

Pipeline composite repair systems - Wet tape system according to ISO 24817

Rev.	Date	Purpose of the revision
07	11/2018	Revision
06	12/2017	Review of § 7; 8 and 9
05	05/2015	Organisation change - January 2015
04	10/2014	Fully revised to follow ISO/TS 24817
00	10/2007	First issue

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Other Approving entity(ies):	

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1. Scope

This General Specification is applicable to the design, material selection, qualification and installation of Pipeline Composite Repair Systems by wet tape to be used for repair of pipelines during operations.

The design, material selection, qualification and installation of pipeline composite repair systems shall be performed according to the [ISO 24817](#) with amendments as stated in the following.

The paragraph numbering is identified in the same way as in [ISO 24817:2017](#). Additional provisions that are not covered by [ISO 24817](#) are identified by extrapolation of the numbering chronology.

Paragraphs of [ISO 24817](#) not mentioned in this document are fully applicable.

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published at the effective date of this document.

Reference	Title
ASTM D2583	Standard test method for indentation hardness of rigid plastics by means of a barcol impressor
ASTM D3039/D3039M	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 D5379/D5379M	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 D696	Standard test method for coefficient of linear thermal expansion of plastics between -30°C and 30°C with a vitreous silica dilatometer
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 E831	Standard test method for linear thermal expansion of solid materials by thermomechanical analysis
BS 7910	Guide to methods for assessing the acceptability of flaws in metallic structures

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Reference	Title
DNV-OS-F101	Submarine pipeline systems
DNV-RP-F101	Corroded pipelines
EN 1465	Adhesives - Determination of tensile lap-shear strength of bonded assemblies
EN 59	Glass reinforced plastics: measurement of hardness by means of a barcol impressor
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 21809-1	Petroleum and natural gas industries - External coatings for buried or submerged pipelines used in pipeline transportation systems - Part 1: Polyolefin coatings (3-layer PE and 3-layer PP)
ISO 24817	Petroleum, petrochemical and natural gas industries - Composite repairs for pipework - Qualification and design, installation, testing and inspection
ISO 4624	Paints and varnishes - Pull-off test for adhesion
ISO 527 (Parts 1; 4)	Plastics - Determination of tensile properties - Parts 1; 4
ISO 75-3	Plastics - Determination of temperature of deflection under load - Part 3: High strength thermosetting laminates and long-fibre-reinforced plastics
ISO 868	Plastics and Ebonite - Determination of indentation hardness by means of a durometer (shore hardness)

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and addendums, is the latest revision published.

Reference	Title
GS EP COR 350	External protection of offshore and coastal structures and equipment by painting
GS EP COR 353	Design and application of passive fire protection coatings
GS EP COR 420	External field joint coatings of pipelines

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3. Applicability

This specification applies to onshore and offshore installations.

This General Specification is applicable to the design, material selection, qualification and installation of Pipeline Composite Repair Systems by wet tape to be used for repair of pipelines during operations.

4. Definitions of terms

Definitions and abbreviations used in this General Specification are in accordance with the [ISO 24817](#).

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

Company: Any entity of the TOTAL Group mentioned in the contract or the order.

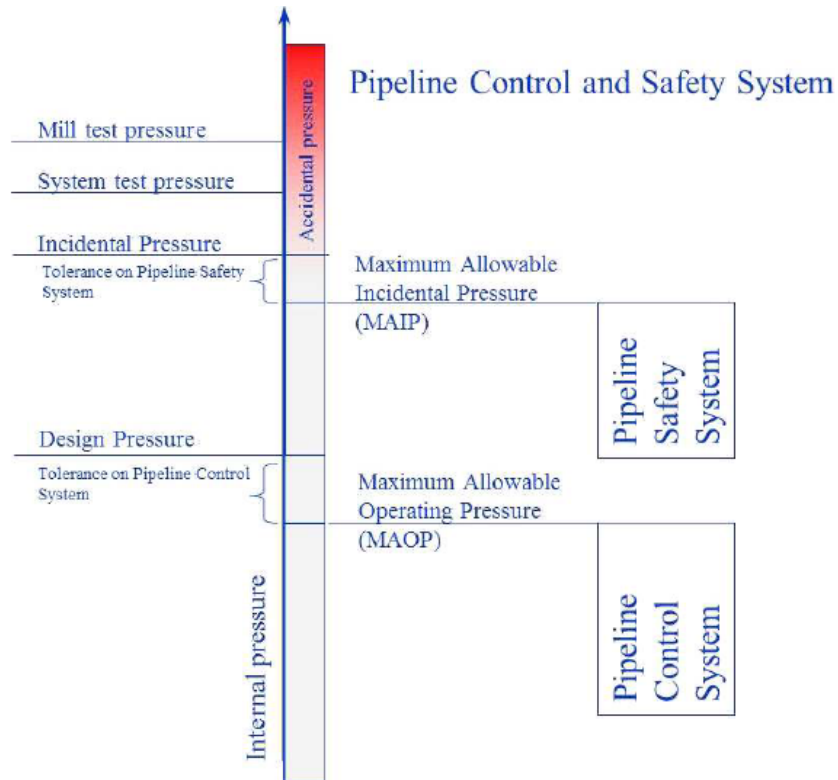
5. Preliminary defect assessment

Before implementing any composite repair it is necessary to perform a defect assessment according to the following method to determine the maximum allowable working pressure " p_s " of the pipe in the damaged conditions.

Type of defect	Assessment method for " p_s " determination
Corrosion	DNV-RP-F101
Dent	Empreinte (Total internal)
Gouge	NG18 method
Crack	BS 7910 level 2B

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The defect assessment procedure shall consider “incidental” and “system pressure” conditions (pressure, temperature ...) as per [DNV-OS-F101](#) definition (see below).



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6. Comments and/or additions to ISO 24817

ISO 24817 paragraphs			Requirements		
5. Applications			(Modification)		
Table 1 - Guide to generic defect types					
Type of defect	Applicability of repair system (metal pipes)	Applicability of repair system (GRP pipes)	Type of defect	Applicability of repair system (metal pipes)	Applicability of repair system (GRP pipes)
General wall thinning	Y	Y	General wall thinning	Y N for internal unless reasons are identified and mitigations are in place	Not applicable
Local wall thinning	Y	Y	Local wall thinning	Y for external N for internal unless reasons are identified and mitigations are in place	Not applicable
Pitting	Y	Y	Pitting	Y for external N for internal unless reasons are identified and mitigations are in place	Not applicable
Gouges/Dents	R	R	Gouges/Dents	Y (provided it does not prevent from in-line inspection)	Not applicable
Blisters	Y	R	Blisters	Y	Not applicable
Laminations	Y	R	Laminations	Y	Not applicable
Circumferential cracks	Y	R	Circumferential cracks	R and in any case limited to temporary repairs	Not applicable
Longitudinal cracks	R	R	Longitudinal cracks	R and in any case limited to temporary repairs	Not applicable
Through wall penetration	Y	R	Through wall penetration	N	Not applicable
Y implies generally appropriate. R implies can be used, but requires extra-consideration. For the case of cracks it will be required to assess whether application of the repair will stop future crack growth or whether a conservative assumption about the ultimate length of the crack is required.			Y implies generally appropriate. N implies not accepted. Can be considered to <u>fix a leak: non structural repair. In that case, the repair shall be temporary (6 months maximum) and implemented after depressurization of the line. The chemical compatibility between the effluent and the resin shall be checked.</u> R implies can be used, but requires extra-consideration. For the case of cracks it will be required to assess whether application of the repair will stop future crack growth or whether a conservative assumption about the ultimate length of the crack is required.		

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ISO 24817 paragraphs	Requirements																
	Composite can also be used for crack of buckle arrestors provided design rules are defined and supported by tests results.																
	(Addition) Whenever, the remaining wall thickness is less than or equal to the corrosion allowance or ≤ 2 mm (the greater), the defect shall be considered to be a through wall defects. Repairs of type B (through wall) defects shall be discussed on a case by case basis. A derogation request shall be issued. It shall include a proper risk assessment.																
7. Qualification and design																	
7.2 Repair class Table 2 - Repair class	(Modification) All repairs on pipelines shall be classified as repair class 3 according to ISO 24817.																
<table><tr><th>Repair class</th><th>Typical service</th><th>Design pressure</th><th>Design temperature</th></tr><tr><td>Class 3</td><td>Produced water and hydrocarbons, flammable fluids, gas systems. Class 3 also covers operating conditions more onerous than described above</td><td>Limited to repair designed in compliance with this standard and of thickness equivalent to < D/12.</td><td>Defined in section 7.5.3</td></tr></table>	Repair class	Typical service	Design pressure	Design temperature	Class 3	Produced water and hydrocarbons, flammable fluids, gas systems. Class 3 also covers operating conditions more onerous than described above	Limited to repair designed in compliance with this standard and of thickness equivalent to < D/12.	Defined in section 7.5.3	<table><tr><th>Repair class</th><th>Typical service</th><th>Design pressure</th><th>Design temperature</th></tr><tr><td>Class 3</td><td>Produced water and hydrocarbons, flammable fluids, gas systems. Class 3 also covers operating conditions more onerous than described above</td><td>Limited to repair designed in compliance with this standard and of thickness equivalent to < D/6.</td><td>Defined in section 7.5.3</td></tr></table>	Repair class	Typical service	Design pressure	Design temperature	Class 3	Produced water and hydrocarbons, flammable fluids, gas systems. Class 3 also covers operating conditions more onerous than described above	Limited to repair designed in compliance with this standard and of thickness equivalent to < D/6.	Defined in section 7.5.3
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Repair class	Typical service	Design pressure	Design temperature														
Class 3	Produced water and hydrocarbons, flammable fluids, gas systems. Class 3 also covers operating conditions more onerous than described above	Limited to repair designed in compliance with this standard and of thickness equivalent to < D/6.	Defined in section 7.5.3														
7.3 Repair design lifetime The repair design lifetime (in years) of the repair system shall be defined by the owner in the repair data sheet (Annex A). It may be limited by the defect type and service conditions, e.g. internal corrosion. .../... Once the repair design lifetime has expired, the owner shall either remove or revalidate the repair system as described in 9.5.	(Addition) If long term performance data are not available (regression testing and representative test coupons as per Annex E), the repair shall be a temporary repair not longer than 2 years. Permanent repair means not more than 20 years. After 20 years, either the pipe section or the composite repair shall be replaced.																