
**Petroleum and natural gas industry —
Pipeline transportation systems
— Pipeline integrity management
specification —**

Part 2:

**Full-life cycle integrity management
for offshore pipeline**
(standards.iteh.ai)

*Industries du pétrole et du gaz naturel — Systèmes de transport par
conduites — Spécification de gestion de l'intégrité des conduites —*

*Partie 2: Gestion de l'intégrité des conduites en mer pendant leur
cycle de vie complet*



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Contents

	Page
Foreword	vii
Introduction	viii
1 Scope	1
2 Normative references	3
3 Terms, definitions and abbreviated terms	3
3.1 Terms and definitions.....	3
3.2 Abbreviated terms.....	7
4 General	8
4.1 Key principles.....	8
4.2 Integrity management program.....	8
4.2.1 General.....	8
4.2.2 Introduction to IMP elements.....	8
4.3 Integrity management process elements.....	11
4.3.1 Data acquisition, review and integration.....	11
4.3.2 Risk assessment.....	11
4.3.3 Inspection and monitoring.....	11
4.3.4 Integrity assessment.....	11
4.3.5 Mitigation activity.....	12
4.3.6 Performance measurement and improvement.....	12
4.3.7 Emergency response plan.....	12
4.3.8 Failure management plan.....	12
4.3.9 Remaining life assessment.....	12
4.4 Management elements.....	13
4.4.1 Policy and commitment.....	13
4.4.2 Scope of integrity management program.....	13
4.4.3 Organization structure, roles and responsibilities.....	13
4.4.4 Records and document control plan.....	13
4.4.5 Communication plan.....	13
4.4.6 Management of change plan.....	13
4.4.7 Management review and audit plan.....	14
4.4.8 Training and skill plan.....	14
5 Integrity management for the pipeline lifecycle phases	14
5.1 General.....	14
5.1.1 Objectives.....	14
5.1.2 Principles.....	14
5.2 Key lifecycle integrity processes.....	15
5.3 Lifecycle phases for integrity management.....	15
5.3.1 General.....	15
5.3.2 Feasibility.....	15
5.3.3 Design.....	16
5.3.4 Procurement.....	16
5.3.5 Fabrication.....	17
5.3.6 Transportation and storage.....	17
5.3.7 Integrity during installation.....	17
5.3.8 Pre-commissioning and commissioning.....	18
5.3.9 Handover — Preparation for operation.....	18
5.3.10 Operation and maintenance.....	19
5.3.11 Modifications during operations.....	20
5.3.12 Abandonment.....	20
6 Risk assessment	20
6.1 Definition of objectives and requirements.....	20
6.1.1 General.....	20

6.1.2	Objectives	21
6.1.3	Requirements	21
6.2	Team definition	22
6.3	Segmentation	22
6.4	Threat identification	23
6.5	Probability of failure assessment	24
6.6	Consequence of failure assessment	24
6.6.1	Consequence assessment	24
6.6.2	Critical consequence areas analysis	25
6.7	Risk determination	25
6.8	Reporting	25
6.9	Reassessment	26
7	Inspection and monitoring	26
7.1	Inspection	27
7.1.1	General	27
7.1.2	Preparation for inspection	28
7.1.3	Requirements of equipment	28
7.1.4	Reporting requirements	29
7.1.5	Review of inspection results	31
7.2	Monitoring	31
7.2.1	Main monitoring activities	31
7.2.2	Identification and follow-up of available technology	31
7.2.3	Current and vibration monitoring	32
7.2.4	Monitoring of ship traffic and fishing activities	32
7.2.5	Leak detection	32
7.2.6	Review of monitoring data	33
8	Integrity assessment	33
8.1	General	33
8.2	Fitness for purpose	33
8.2.1	Assessment data collection	33
8.2.2	Defect data statistics and causation analysis	33
8.2.3	Assessment method selection	34
8.2.4	Residual strength and remaining life assessment	34
8.3	Pressure test	36
8.3.1	General	36
8.3.2	Preconditions for use of pressure-testing on an in-service pipeline	36
8.3.3	Features to be considered for pressure test	37
8.3.4	Pressure test risks	37
8.3.5	Management measures	37
8.3.6	Monitoring of pressure test procedures	38
8.3.7	Review of pressure test results	38
8.3.8	Pressure test report	38
8.4	Direct assessment	38
8.4.1	General	38
8.4.2	Direct assessment process	39
8.4.3	Direct assessment methods	39
8.4.4	Limitations of direct assessment	39
8.5	Other assessment	39
9	Mitigation	39
9.1	General	39
9.2	Internal mitigation methods	42
9.3	External mitigation methods	42
9.4	Corrosion control systems	43
9.4.1	External corrosion	43
9.4.2	Internal corrosion and erosion	43
9.5	Management of unintended releases	44
9.6	MAOP reduction	44

9.7	Emergency response.....	45
9.8	Repair methods.....	45
9.8.1	Repair methods selection.....	45
9.8.2	Detailed procedures.....	46
10	Performance measurement and improvement.....	47
10.1	General.....	47
10.2	Performance measurement.....	47
10.3	Management review.....	47
10.4	System audit.....	47
11	Data management.....	48
11.1	Data acquisition.....	48
11.1.1	Data acquisition content.....	48
11.1.2	Data acquisition method.....	48
11.1.3	Data alignment.....	48
11.2	Data transfer.....	49
11.3	Data integration.....	49
11.3.1	General.....	49
11.3.2	Data integration requirements.....	49
12	Pipeline integrity management within emergency response planning and failure management.....	50
12.1	Emergency response planning.....	50
12.1.1	General.....	50
12.1.2	Emergency plan preparation.....	50
12.1.3	Preparation for emergency data.....	50
12.1.4	Emergency response.....	50
12.2	Failure management.....	51
12.2.1	General.....	51
12.2.2	Failure analysis.....	51
12.2.3	Incident investigation report.....	51
12.2.4	Remedial and preventative measures.....	52
12.2.5	Failure recovery prior to restart.....	52
12.2.6	Trend analysis of pipeline incidents and causes.....	52
13	Pipeline remaining life assessment and abandonment processes.....	53
13.1	General.....	53
13.2	Pipeline remaining life assessment process.....	53
13.2.1	General.....	53
13.2.2	Data collection.....	55
13.2.3	Pipeline segmentation.....	55
13.2.4	Integrity assessment.....	56
13.2.5	Physical life determination.....	56
13.2.6	Economic viability assessment.....	57
13.2.7	Risk assessment.....	58
13.2.8	Remaining life assessment.....	58
13.3	Deactivation and abandonment process.....	58
13.3.1	Guideline for the abandonment of a transportation pipeline.....	58
13.3.2	Preparation before pipeline abandonment.....	59
13.3.3	Pipeline cleaning.....	59
13.3.4	Deactivation of pipeline.....	59
13.3.5	Records.....	59
13.4	Life extension and recycle of pipeline.....	60
13.4.1	Life extension.....	60
13.4.2	Reactivation of pipeline.....	60
13.5	Upgrading.....	60
13.5.1	General requirements.....	60
13.5.2	Limitation on increase in maximum allowable operating pressure.....	61
13.5.3	Upgrading method.....	61

13.6	Reporting.....	62
14	Records and documents management.....	62
15	Communication.....	63
15.1	General.....	63
15.2	Communications.....	63
16	Management of change.....	64
17	Training and skills.....	64
17.1	General.....	64
17.2	Levels of skill.....	64
Annex A	(informative) Example approach of semi-quantitative risk assessment.....	66
Annex B	(informative) Risk matrix.....	68
Annex C	(informative) Example of the threat identification in lifecycle phases.....	70
Annex D	(informative) Establishing performance measures.....	73
Annex E	(informative) Integrity data acquisition list.....	75
Annex F	(informative) Structure of pipeline data tables.....	77
Annex G	(informative) Outline requirements for pipeline management training and skills.....	83
Bibliography	90

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<https://standards.iteh.ai/catalog/standards/sist/1a528734-0bd7-4c81-956e-19149609d331/iso-19345-2-2019>

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 of 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 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*.

A list of all parts in the ISO 19345 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document addresses the integrity of petroleum and natural gas pipelines through their entire life-cycle, from design to eventual abandonment. For this reason, considerations relating to design, construction and abandonment have been included. This approach supports the development and implementation of a holistic and integrated pipeline integrity management program that bridges between life-cycle elements and thereby avoids compartmentalizing of the pipeline life-cycle into essentially independent data and functional silos, which has traditionally been the case. The integrated approach was developed on the basis of extensive research and examination of best practices and results from pipeline integrity audits world-wide.

This document is intended to be used by companies that have not yet developed an official program or are developing a program for new pipelines. This document can also be used to guide continual improvement of existing programs by both operating companies and regulators to evaluate integrity management program effectiveness.

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Petroleum and natural gas industry — Pipeline transportation systems — Pipeline integrity management specification —

Part 2: Full-life cycle integrity management for offshore pipeline

1 Scope

This document specifies requirements and gives recommendations on the management of integrity of a pipeline system throughout its life cycle, which includes design, construction, commissioning, operation, maintenance and abandonment.

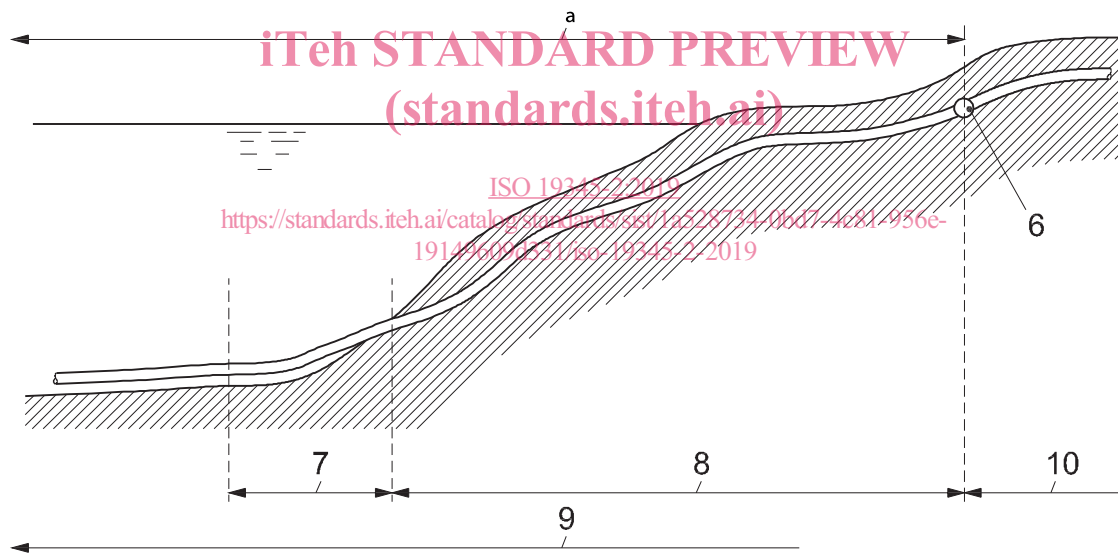
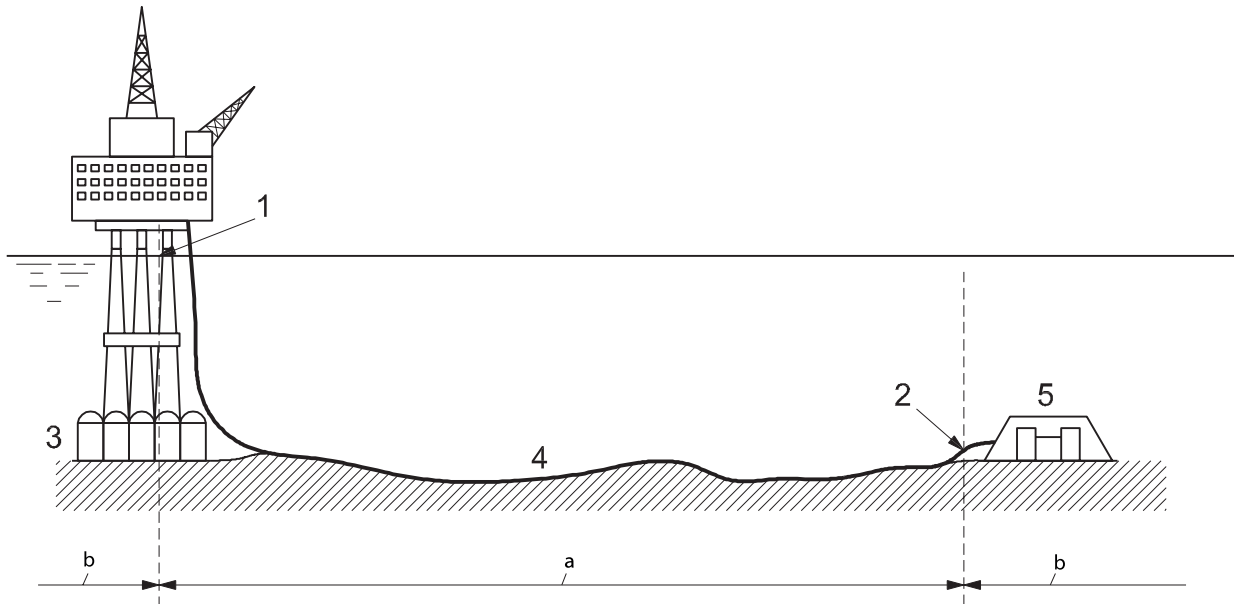
This document is applicable to offshore pipelines for transporting petroleum and natural gas. It is applicable to rigid steel pipelines. It is not applicable to flexible pipelines, dynamic risers or those constructed from other materials, such as glass-reinforced plastics.

NOTE 1 An offshore pipeline system extends to:

- the first valve, flange or connection above water on platform or subsea mechanical connector with subsea structure (i.e. manifold or dynamic riser);
- the connection point to the offshore installation (i.e. piping manifolds are not included);
- the first valve, flange, connection or isolation joint at a landfall, unless otherwise specified by the onshore legislation.

NOTE 2 The components mentioned above (valve, flange, connection, isolation joint) include also any pup pieces, i.e. the offshore pipeline system extends to the weld beyond the pup piece, see [Figure 1](#).

This document is used for integrity management, which is initiated at the design and construction stage of the pipeline. Where requirements of a design and construction standard (e.g. ISO 13623) are different, the provisions of this document will enhance the design and construction from an integrity perspective.



Key

- | | | | |
|---|--|----|------------------------------|
| 1 | first valve, flange, connection or isolation joint | 7 | nearshore section |
| 2 | connector point to subsea piping | 8 | shore approach |
| 3 | topside | 9 | offshore section |
| 4 | pipeline system | 10 | onshore section |
| 5 | pipeline subsea structure | a | covered by this document |
| 6 | first valve, flange, connection or isolation joint | b | not covered by this document |

Figure 1 — Extent of pipeline systems covered by this document

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 13623, *Petroleum and natural gas industries — Pipeline transporting system*

ISO 15589-2, *Petroleum, petrochemical and natural gas industries — Cathodic protection of pipeline transportation systems — Part 2: Offshore pipelines*

ISO 31000, *Risk management — Guidelines*

IEC 31010, *Risk assessment techniques*

3 Terms, definitions and abbreviated terms

3.1 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 <https://www.iso.org/obp>

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

3.1.1

abandonment

activities associated with taking a pipeline permanently out of operation

Note 1 to entry: An abandoned pipeline cannot be returned to operation.

Note 2 to entry: Depending on the legislation abandonment can require cover or removal.

3.1.2

anomaly

possible deviation from pipe material or weld soundness

Note 1 to entry: The identification of an indication of an anomaly can be generated by non-destructive inspection, such as in-line inspection.

3.1.3

baseline assessment

first integrity assessment prior to or after operation

3.1.4

cathodic protection

corrosion control technique to prevent or reduce the external corrosion of metal pipelines by transferring an electrical current onto the pipe to achieve increased negative electrical potentials

3.1.5

corrosion

deterioration of a material, usually a metal that results from an electrochemical reaction with its environment

3.1.6

crack

planar flaw, or linear discontinuity, with a sharp tip radius

3.1.7

critical consequence area

location where a pipeline release might have a significant adverse effect on public safety, property and the environment

Note 1 to entry: The pipeline segments in CCAs are of particular interest in risk assessment and integrity assessment evaluations and prioritizations.

3.1.8

deactivation

removal of a pipeline from service, though the pipeline might be returned to service after a proper assessment

Note 1 to entry: Also defined as decommissioning or suspension.

3.1.9

deformation

change in shape of the pipe or component, such as a bend, buckle, *dent* (3.1.11), ovality, ripple, wrinkle, or any other change that affects the roundness of the pipe or original cross-section or straightness of the pipe or component

3.1.10

defect

imperfection of a type or magnitude exceeding acceptable criteria

3.1.11

dent

depression which produces a disturbance in the curvature of the pipe wall, caused by contact with a foreign body resulting in plastic deformation of the pipe wall

3.1.12

design life

period for which the design basis is planned to remain valid

[SOURCE: ISO 13623:2017, 3.1.2]

3.1.13

failure

event in which a component or system does not perform according to its operational requirements

3.1.14

fitness for purpose

quantitative engineering evaluation that is performed to demonstrate the structural integrity of an in-service component that can contain an imperfection, *defect* (3.1.10) or damage

3.1.15

gouge

surface damage to a pipeline caused by contact with a foreign object that has scraped (gouged) material out of the pipe, resulting in a metal loss defect or imperfection

3.1.16

incident

unintentional release of gas or liquid due to the *failure* (3.1.13) of a pipeline

Note 1 to entry: Some regulatory authorities define “incident” as an event occurring on a pipeline for which the operator is required to make a report to the concerned regulatory authority.

3.1.17

in-line inspection

inspection of a pipe wall from the interior of the pipe using specialized tools

3.1.18**integrity assessment**

process that includes the inspection and testing of a pipeline in order to determine physical characteristics and assess its integrity condition by combination of an analysis of data, use of reliability assessment methodologies of the structure and an evaluation of the safety state of the pipeline

3.1.19**integrity management program**

documented program that specifies the practices used by the operating company to proactively manage the safe, environmentally responsible, and reliable service of a pipeline system throughout its lifecycle and which incorporates a continuous improvement process

3.1.20**life extension**

additional period of time beyond the original design or *service life* (3.1.36) (but within the assessed remnant life) for which permission to continue operating a pipeline system is granted by the regulatory bodies

Note 1 to entry: Life extension is considered as a modification to the design basis.

[SOURCE: ISO/TS 12747:2011, 3.7]

3.1.21**magnetic flux leakage**

type of in-line inspection technology in which a magnetic field is induced in the pipe wall between two poles of a magnet

Note 1 to entry: Anomalies affect the distribution of the magnetic flux in the wall. The magnetic flux leakage pattern is used to detect and characterize anomalies.

3.1.22**management of change**

process that systematically recognizes and communicates to the necessary parties changes of a technical, physical, procedural or organizational nature that can impact system integrity

3.1.23**manufacturing defect**

defect (3.1.10) in the pipe body or coating created during the pipe or component manufacturing or coating processes

3.1.24**maximum allowable operating pressure**

maximum internal pressure at which a pipeline system, or parts thereof, is allowed to be operated

Note 1 to entry: The MAOP is established by the maximum pressure achieved during testing (see ISO 13623).

3.1.25**metal loss**

pipe anomaly in which metal has been removed

Note 1 to entry: Metal loss is usually the result of corrosion, but gouging, manufacturing defects erosion, or mechanical damage can also result in metal loss.

3.1.26**non-destructive testing**

wide group of analysis techniques used to evaluate the properties of a material, component or system without causing damage

Note 1 to entry: “Non-destructive inspection” (NDI) and “non-destructive evaluation” (NDE) are also commonly used to describe this technology.

3.1.27

offshore pipeline

part of a pipeline system that, except for pipeline risers, is laid on the seabed or below it inside a trench

Note 1 to entry: The pipeline might be resting wholly or intermittently on, or buried below, the seabed.

3.1.28

operator

person or organization who owns or operates a pipeline system or facilities who is ultimately responsible for the operation and integrity of the pipeline system

3.1.29

pipeline integrity management

set of processes and procedures that proactively assures incident-free safe and environmentally responsible transportation of fluids through a pipeline system

3.1.30

pipeline integrity management program

continuous improvement closed-loop system using information technology to realize functions such as data acquisition and integration, integrity and *risk assessment* (3.1.33), mitigation and repair activity and maintenance decisions, with comprehensive management of change and continual review and improvement processes

3.1.31

pressure test

means of assessing the integrity of a new or existing pipeline that involves filling the pipeline with water and pressurizing to a level in excess of the MAOP of the pipeline to demonstrate that the pipeline is fit for service at the MAOP for a given time frame dependent on the identified integrity hazards

Note 1 to entry: See ISO 13623:2017, 6.7.

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3.1.32

risk

measure of loss, either qualitative or quantifiable, in terms of both the likelihood of incident occurrence and the magnitude of the consequences of the incident occurrence

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3.1.33

risk assessment

systematic, analytical process in which potential hazards from the pipeline system are proactively identified, and the likelihood and consequences of potential adverse events are determined

3.1.34

risk management

coordinated activities to direct and control an organization with regard to *risk* (3.1.32)

[SOURCE: ISO Guide 73:2009, 2.1]

3.1.35

safe operating pressure

pressure, calculated using the appropriate analysis and mathematical formulas for the specific type of *defect* (3.1.10) identified

EXAMPLE For corrosion defects using recognized remaining strength of corroded pipeline formulas, where all corroded regions will withstand a calculated safe operating pressure.

3.1.36 service life

length of time over which the pipeline system is intended to operate

[SOURCE: ISO/TS 12747:2011, 3.21]

Note 1 to entry: Service life is considered the actual operational life to date, but can include any planned future use of the line. Service life can be less or longer than design life.

3.1.37 sizing accuracy

accuracy with which an anomaly dimension or characteristic is reported

Note 1 to entry: Typically, accuracy is expressed by tolerance and certainty.

EXAMPLE Depth sizing accuracy for metal loss using NDT methods, such as an ILI tool, is commonly expressed as +/-10 % of the wall thickness (the tolerance) and 80 % of the time (the certainty).

3.1.38 third-party damage

damage done to the pipeline as a result of activities by personnel not associated with the pipeline

3.1.39 threat

activity or condition than can adversely affect the pipeline system if not adequately controlled

[SOURCE: ISO/TS 12747:2011, 3.23]

STANDARD PREVIEW

3.2 Abbreviated terms (standards.iteh.ai)

AC	alternating current	ISO 19345-2:2019
CP	cathodic protection	https://standards.iteh.ai/catalog/standards/sist/1a528734-0bd7-4c81-956e-19149609d331/iso-19345-2-2019
CCA	critical consequence area	
CoF	consequence of failure	
DA	direct assessment	
ECDA	external corrosion direct assessment	
FFP	fitness for purpose	
GIS	geographic information system	
HIC	hydrogen-induced cracking	
ICDA	internal corrosion direct assessment	
ILI	in-line inspection	
IMP	integrity management program	
MAOP	maximum allowable operating pressure	
MFL	magnetic flux leakage	
NDT	non-destructive testing	
PIM	pipeline integrity management	