



SLOVENSKI STANDARD
oSIST prEN 14161:2021
01-september-2021

Industrija za predelavo nafte in zemeljskega plina - Transportni cevovodni sistemi (ISO 13623:2017, spremenjen)

Petroleum and natural gas industries - Pipeline transportation systems (ISO 13623:2017, modified)

Erdöl- und Erdgasindustrie - Rohrleitungstransportsysteme (ISO 13623:2017, modifiziert)

Industries du pétrole et du gaz naturel - Systèmes de transport par conduites (ISO 13623:2017, modifié)

iTeh STANDARD PREVIEW
(standards.itteh.ai)

[oSIST prEN 14161:2021](https://standards.ittehs.com/catalog/standards/sist/14161-2021/068733-48ea-48c8-9944-a6876f066788/osist-pren-14161-2021)

Ta slovenski standard je istoveten z: prEN 14161

ICS:

75.200	Oprema za skladiščenje nafte, naftnih proizvodov in zemeljskega plina	Petroleum products and natural gas handling equipment
--------	---	---

oSIST prEN 14161:2021

en,fr,de

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[oSIST prEN 14161:2021](https://standards.iteh.ai/catalog/standards/sist/b2208533-48ea-48c8-9944-a6876f066788/osist-pren-14161-2021)

<https://standards.iteh.ai/catalog/standards/sist/b2208533-48ea-48c8-9944-a6876f066788/osist-pren-14161-2021>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 14161

July 2021

ICS 75.200

Will supersede EN 14161:2011+A1:2015

English Version

Petroleum and natural gas industries - Pipeline transportation systems (ISO 13623:2017, modified)

Industries du pétrole et du gaz naturel - Systèmes de transport par conduites (ISO 13623:2017, modifié)

Erdöl- und Erdgasindustrie - Rohrleitungstransportsysteme (ISO 13623:2017, modifiziert)

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 12.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN 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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents	Page
European foreword	8
Introduction	9
1 Scope.....	10
2 Normative references.....	12
3 Terms, definitions and symbols	13
3.1 Terms and definitions	14
3.2 Symbols	16
4 General.....	17
4.1 Health, safety and the environment.....	17
4.2 Competence assurance	17
4.3 Conformance.....	17
4.4 Records.....	17
5 Pipeline system design	17
5.1 System definition	17
5.2 Categorization of fluids.....	17
5.3 Hydraulic analysis	18
5.4 Pressure control and overpressure protection	18
5.5 Requirements for operation and maintenance	18
5.6 Public safety and protection of the environment.....	19
6 Design of pipeline and primary piping.....	19
6.1 Design principles	19
6.2 Route selection	20
6.2.1 Considerations.....	20
6.2.2 Surveys — On-land pipelines.....	21
6.2.3 Surveys — Offshore pipelines	21
6.3 Loads	22
6.3.1 General.....	22
6.3.2 Functional loads	22
6.3.3 Environmental loads.....	23
6.3.4 Construction loads.....	24
6.3.5 Accidental loads	24
6.3.6 Combination of loads.....	24
6.4 Strength requirements	25
6.4.1 Calculation of stresses.....	25
6.4.2 Strength criteria	25
6.5 Stability.....	29
6.6 Pipeline spanning	30
6.7 Pressure test requirements	30
6.7.1 General.....	30
6.7.2 Test medium	30
6.7.3 Pressure levels and test durations	31
6.7.4 Acceptance criteria.....	31
6.8 Other activities	31
6.8.1 Activities by others.....	31

6.8.2	Pipeline cover	32
6.9	Crossings and encroachments	33
6.9.1	Consultations with authorities	33
6.9.2	Roads.....	33
6.9.3	Railways.....	33
6.9.4	Waterways and landfalls.....	33
6.9.5	Pipeline/cable crossings.....	34
6.9.6	Pipeline bridge crossings.....	34
6.9.7	Sleeved or cased crossings.....	34
6.10	Adverse ground and seabed conditions	34
6.11	Section isolation valves	34
6.12	Integrity monitoring.....	35
6.13	Design for pigging.....	35
6.14	Fabricated components.....	35
6.14.1	Welded branch connections	35
6.14.2	Special components fabricated by welding.....	36
6.14.3	Extruded outlets.....	36
6.14.4	Pig traps	36
6.14.5	Slug catchers.....	36
6.14.6	Fabricated assemblies	36
6.15	Attachment of supports or anchors	36
6.16	Offshore risers	37
7	Design of stations and terminals.....	38
7.1	Selection of location.....	38
7.2	Layout	38
7.3	Security.....	39
7.4	Safety.....	39
7.5	Environment.....	39
7.6	Buildings.....	39
7.7	Equipment.....	39
7.8	Piping.....	40
7.8.1	Primary piping.....	40
7.8.2	Secondary piping	40
7.9	Emergency shutdown system.....	40
7.10	Electrical	41
7.11	Storage and working tankage	41
7.12	Heating and cooling stations	41
7.13	Metering and pressure control stations	41
7.14	Monitoring and communication systems.....	41
7.15	Compressor stations for on-land gas supply systems	42
8	Materials and coatings.....	42
8.1	General material requirements for pipelines and primary piping	42
8.1.1	Selection.....	42
8.1.2	Materials for sour service.....	42
8.1.3	Consistency of requirements.....	42
8.1.4	Chemical composition.....	42
8.1.5	Brittle fracture toughness	43
8.1.6	Shear-fracture toughness	43
8.1.7	Higher-temperature service.....	43
8.1.8	Properties after forming and heat treatment	44
8.1.9	Production qualification programmes	44
8.1.10	Marking	44

STANDARD PREVIEW
(standards.iteh.ai)

oSIST prEN 14161:2021

<https://standards.iteh.ai/catalog/standards/sist/b2208533-48ea-48c8-9944>

[a6876f0666788/osist-pr-en-14161-2021](https://standards.iteh.ai/catalog/standards/sist/b2208533-48ea-48c8-9944/a6876f0666788/osist-pr-en-14161-2021)

prEN 14161:2021 (E)

8.1.11	Inspection documents.....	44
8.1.12	Specifications	44
8.1.13	Reuse of components.....	44
8.1.14	Records	45
8.2	Line pipe.....	45
8.2.1	Carbon steel pipe	45
8.2.2	Stainless steel and non-ferrous metallic pipe	45
8.2.3	Carbon steel pipe with stainless steel or non-ferrous metallic layer	45
8.3	Components other than pipe	45
8.3.1	Flanged connections	45
8.3.2	Bends made from pipe	45
8.3.3	Fittings	46
8.3.4	Valves	46
8.3.5	Fabricated isolating couplings	46
8.3.6	Other components	46
8.4	Coatings	46
8.4.1	External coatings.....	46
8.4.2	Internal coatings/linings	47
9	Corrosion management	48
9.1	General.....	48
9.2	Internal corrosivity evaluation.....	48
9.3	Internal corrosion mitigation.....	49
9.3.1	Methods.....	49
9.3.2	Revision of design conditions.....	49
9.3.3	Chemical additives	49
9.3.4	Internal coatings or linings	50
9.3.5	Cleaning.....	50
9.4	External corrosion evaluation.....	50
9.5	External corrosion mitigation.....	51
9.5.1	Protection requirements	51
9.5.2	External coatings.....	52
9.5.3	Cathodic protection.....	52
9.6	Monitoring programmes and methods.....	52
9.6.1	Requirement for monitoring	52
9.6.2	Monitoring internal corrosion	53
9.6.3	Monitoring external condition.....	53
9.6.4	Monitoring cathodic protection.....	53
9.7	Evaluation of monitoring and inspection results.....	53
9.8	Corrosion-management documentation	54
10	Construction	54
10.1	General.....	54
10.1.1	Construction plan	54
10.1.2	Construction near other facilities.....	54
10.1.3	Plant, equipment and marine vessels.....	55
10.1.4	Transport and handling of materials.....	55
10.2	Preparation of the route on-land	55
10.2.1	Site inspections.....	55
10.2.2	Survey and marking.....	55
10.2.3	Preparation of the working width	55
10.2.4	Blasting.....	55
10.3	Preparation of the route offshore	55
10.3.1	Surveys.....	55

10.3.2	Seabed preparation	55
10.4	Welding and joining.....	56
10.4.1	Welding standard	56
10.4.2	Weld examination	56
10.4.3	Joining other than welding.....	56
10.5	Coating.....	56
10.5.1	Field joint coating.....	56
10.5.2	Coating inspection.....	56
10.6	Installation of on-land pipelines	56
10.6.1	Pipe stringing.....	56
10.6.2	Field pipe bends	56
10.6.3	Excavation	57
10.6.4	Lowering pipe	57
10.6.5	Backfill.....	57
10.6.6	Tie-in	58
10.6.7	Reinstatement.....	58
10.6.8	Crossings.....	58
10.6.9	Markings	58
10.7	Installation of offshore pipelines.....	58
10.7.1	Marine operations.....	58
10.7.2	Survey and positioning systems.....	59
10.7.3	Pipe laying.....	59
10.7.4	Landfalls.....	60
10.7.5	Trenching	60
10.7.6	Backfilling.....	60
10.7.7	Crossings of other pipelines and cables	60
10.7.8	Spans	60
10.7.9	Tie-ins	61
10.8	Cleaning and gauging	61
10.9	As-built surveys.....	61
10.10	Construction records.....	61
11	Testing.....	61
11.1	General	61
11.2	Safety.....	62
11.3	Procedures.....	62
11.3.1	Written procedures	62
11.3.2	Communications	62
11.3.3	Water quality.....	62
11.3.4	Inhibitors and additives.....	63
11.3.5	Filling rate	63
11.3.6	Air content.....	63
11.3.7	Temperature stabilization	63
11.3.8	Temperature effects and correlations	63
11.3.9	Leak-finding.....	63
11.4	Acceptance criteria	63
11.5	Tie-ins following testing.....	63
11.6	Testing equipment	63
11.7	Test documentation and records.....	64
11.8	Disposal of test fluids	64
11.9	Protection following test.....	65
12	Pre-commissioning and commissioning	65
12.1	General	65

prEN 14161:2021 (E)

12.2	Cleaning and gauging procedures.....	65
12.3	Drying procedures.....	65
12.4	Functional testing of equipment and systems.....	66
12.5	Documentation and records	66
12.6	Start-up procedures and introduction of transported fluid.....	66
13	Operation, maintenance and abandonment	67
13.1	Management	67
13.1.1	Objectives and basic requirements.....	67
13.1.2	Operating and maintenance plan.....	67
13.1.3	Operating and maintenance procedures.....	67
13.1.4	Incident and emergency-response plan	68
13.1.5	Permit-to-work system.....	68
13.1.6	Training.....	68
13.1.7	Liaison.....	69
13.1.8	Records.....	69
13.2	Operations.....	69
13.2.1	Fluid parameter monitoring.....	69
13.2.2	Stations and terminals.....	70
13.2.3	Pigging	70
13.2.4	Decommissioning	70
13.2.5	Recommissioning.....	70
13.3	Maintenance	70
13.3.1	Maintenance programme.....	70
13.3.2	Route inspection	71
13.3.3	Mechanical condition monitoring.....	72
13.3.4	Leak detection and surveys.....	72
13.3.5	Facilities, equipment and component monitoring.....	72
13.3.6	Pipeline and piping defects and damage.....	74
13.3.7	Pipeline and piping repairs and modifications.....	75
13.4	Changes to the design condition.....	77
13.4.1	Change control	77
13.4.2	Operating pressure	77
13.4.3	Service conversion	77
13.4.4	New crossings and developments.....	78
13.4.5	Moving in-service pipelines and piping.....	78
13.4.6	Testing of modified pipelines and piping.....	78
13.4.7	Changes to location class.....	78
13.5	Life extension	78
13.6	Abandonment.....	79
	Annex A (informative) Records and documentation	80
	Annex B (normative) Supplementary requirements for public safety of on-land pipelines for category D and E fluids.....	81
B.1	Objective	81
B.2	Location classification.....	81
B.3	Population density	82
B.4	Concentration of people	82
B.5	Maximum hoop stress	82
B.6	Pressure test requirements	83

B.7	Location classification for existing pipelines	83
B.8	MAOP requirements after changes in location class	83
B.9	Third party damage mitigation	86
Annex C (informative) Pipeline route selection process.....		87
C.1	Limits	87
C.2	Constraints.....	87
C.3	Preferred corridors of interest.....	87
C.4	Detailed routing.....	87
Annex D (informative) Examples of factors for routing considerations.....		88
Annex E (normative) Safety evaluation of pipelines.....		90
E.1	Overview.....	90
E.2	General requirements.....	90
E.3	Definition of the scope of the evaluation	90
E.4	Hazard identification and initial evaluation.....	91
E.5	Hazard estimation.....	92
E.5.1	General	92
E.5.2	Frequency analysis.....	92
E.5.3	Consequence analysis	92
E.5.4	Risk calculation	93
E.6	Review of results.....	93
E.7	Documentation	93
Annex F (informative) Scope of procedures for operation, maintenance and emergencies.....		95
F.1	Operating procedures.....	95
F.2	Maintenance procedures	95
F.3	Emergency procedures.....	96
Bibliography		97

iTech STANDARD PREVIEW
(standards.itech.ai)

[oSIST prEN 14161:2021](https://standards.itech.ai/catalog/standards/sist/b2208533-48ea-48c8-9944-a6876f066788/osist-pren-14161-2021)

<https://standards.itech.ai/catalog/standards/sist/b2208533-48ea-48c8-9944-a6876f066788/osist-pren-14161-2021>

prEN 14161:2021 (E)**European foreword**

This document (prEN 14161:2021) has been prepared by Technical Committee CEN/TC 12 “Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries”, the secretariat of which is held by NEN and CYS.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 14161:2011+A1:2015.

The text of ISO 13623:2017 has been adopted by CEN/TC 12 with some modifications to exclude the aspects that are covered by CEN/TC 234 “Gas infrastructure”. These modifications are indicated by a vertical line in the left margin of the text [*note: currently indicated with ‘track changes’*].

**iTeh STANDARD PREVIEW
(standards.iteh.ai)**

[oSIST prEN 14161:2021](https://standards.iteh.ai/catalog/standards/sist/b2208533-48ea-48c8-9944-a6876f066788/osist-pren-14161-2021)

<https://standards.iteh.ai/catalog/standards/sist/b2208533-48ea-48c8-9944-a6876f066788/osist-pren-14161-2021>

Introduction

Significant differences exist between member countries in the areas of public safety and protection of the environment, which cannot be reconciled into a single preferred approach to pipeline transportation systems for the petroleum and natural gas industries. Reconciliation was further complicated by the existence in some member countries of legislation that establishes requirements for public safety and protection of the environment. Recognizing these differences, ISO/TC 67/SC 2 concluded that this document should allow individual countries to apply their national requirements for public safety and the protection of the environment.

This document is not a design manual; rather, it is intended for use in conjunction with sound engineering practice and judgment. This document allows the use of innovative techniques and procedures, such as reliability-based limit state design methods, providing the minimum requirements of this document are satisfied.

This third edition cancels and replaces the second edition (ISO 13623:2009), which has been technically revised.

ISO 13623:2017, developed within ISO/TC 67/SC 2, has been adopted as EN 14161:202X (ISO 13623:2017, modified).

The scope of ISO/TC 67/SC 2 is pipeline transportation systems for the petroleum and natural gas industries without exclusions. However, in CEN the scopes of CEN/TC 12 and CEN/TC 234 overlapped until 1995. This scope overlap caused problems for the parallel procedure for the above-mentioned item. The conflict in scope was resolved when both the CEN Technical Committees concerns and the CEN Technical Board decided to amend the scope of CEN/TC 12 by explicitly excluding "*on-land supply systems used by the gas supply industry excluding gas infrastructure from the input of gas into the on-shore transmission network up to the inlet connection of gas appliances*".

[oSIST prEN 14161:2021](https://standards.iteh.ai/catalog/standards/sist/b2208533-48ea-48c8-9944-a6876f066788/osist-pren-14161-2021)

<https://standards.iteh.ai/catalog/standards/sist/b2208533-48ea-48c8-9944-a6876f066788/osist-pren-14161-2021>

prEN 14161:2021 (E)**1 Scope**

This document specifies requirements and gives recommendations for the design, materials, construction, testing, operation, maintenance and abandonment of pipeline systems used for transportation in the petroleum and natural gas industries.

It applies to pipeline systems on-land and offshore, connecting wells, production plants, process plants, refineries and storage facilities, including any section of a pipeline constructed within the boundaries of such facilities for the purpose of its connection. On-land supply systems used by the European gas supply industry from the input of gas into the on-land transmission network up to the inlet connection of gas appliances are excluded from the scope of this document. The extent of pipeline systems covered by this document is illustrated in Figure 1.

This document applies to rigid, metallic pipelines. It is not applicable for flexible pipelines or those constructed from other materials, such as glass-reinforced plastics.

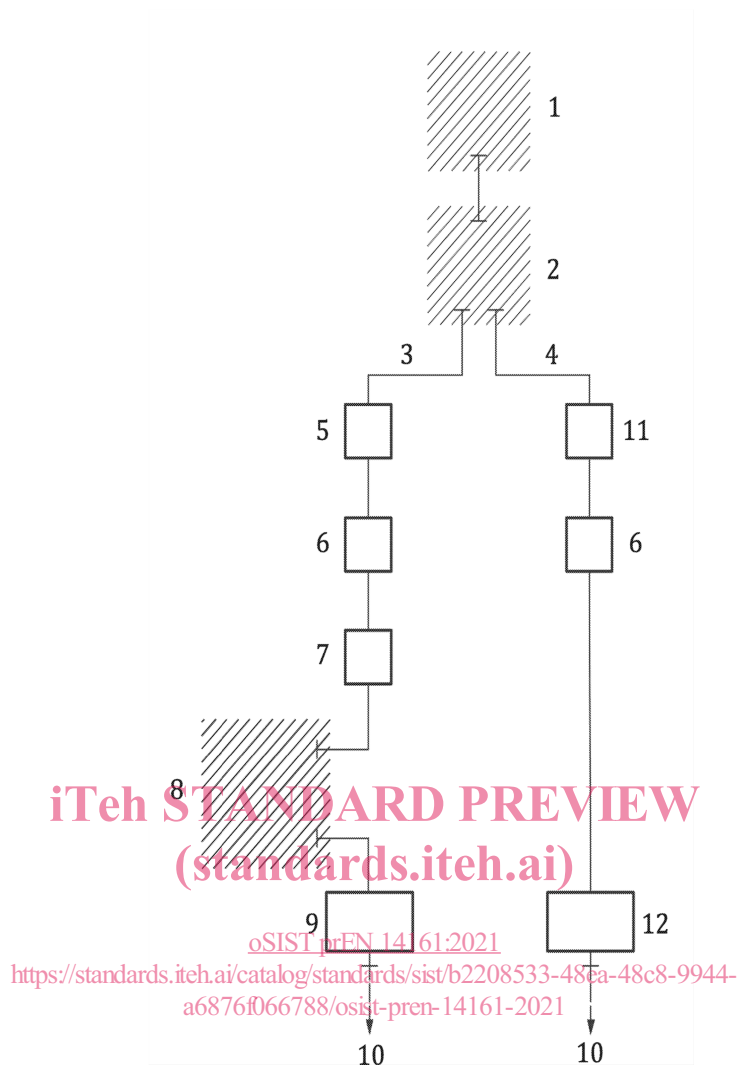
This document is applicable to all new pipeline systems and can be applied to modifications made to existing ones. It is not intended that it applies retroactively to existing pipeline systems.

It describes the functional requirements of pipeline systems and provides a basis for their safe design, construction, testing, operation, maintenance and abandonment.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[oSIST prEN 14161:2021](https://standards.iteh.ai/catalog/standards/sist/b2208533-48ea-48c8-9944-a6876f066788/osist-pren-14161-2021)

<https://standards.iteh.ai/catalog/standards/sist/b2208533-48ea-48c8-9944-a6876f066788/osist-pren-14161-2021>



Key

- | | |
|---|-------------------------------|
| 1 wellsite | 7 tankage |
| 2 gathering station, treatment plant or process plant | 8 refinery |
| 3 liquid | 9 depot |
| 4 gas | 10 distribution |
| 5 pump station | 11 compressor station |
| 6 valve station | 12 pressure-reduction station |

- pipeline elements covered by this document
- | connections with other facilities (the pipeline system should include an isolation valve at connections with other facilities and at branches)
- |- - - pipeline elements not covered by this document
- station/plant area 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 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

ISO 3183:2012, *Petroleum and natural gas industries — Steel pipe for pipeline transportation systems*¹

ISO 3977 (all parts), *Gas turbines — Procurement*

ISO 10439 (all parts), *Petroleum, chemical and gas service industries — Axial and centrifugal compressors and expander-compressors*

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

ISO 12736, *Petroleum and natural gas industries — Wet thermal insulation coatings for pipelines, flow lines, equipment and subsea structures*

ISO 13707, *Petroleum and natural gas industries — Reciprocating compressors*

ISO 13709, *Centrifugal pumps for petroleum, petrochemical and natural gas industries*

ISO 13710, *Petroleum, petrochemical and natural gas industries — Reciprocating positive displacement pumps*

ISO 13847, *Petroleum and natural gas industries — Pipeline transportation systems — Welding of pipelines*

[https://standards.iteh.ai/catalog/standards/sist/b2208533-48ea-48c8-9944-](https://standards.iteh.ai/catalog/standards/sist/b2208533-48ea-48c8-9944-af876d066788/osist-pr-en-14161-2021)

ISO 14313, *Petroleum and natural gas industries — Pipeline transportation systems — Pipeline valves*

ISO 14723, *Petroleum and natural gas industries — Pipeline transportation systems — Subsea pipeline valves*

ISO 15156 (all parts), *Petroleum and natural gas industries — Materials for use in H₂S-containing environments in oil and gas production*

ISO 15589 (all parts), *Petroleum, petrochemical and natural gas industries — Cathodic protection of pipeline systems*

ISO 15590-1:2018, *Petroleum and natural gas industries — Induction bends, fittings and flanges for pipeline transportation systems — Part 1: Induction bends*²

ISO 15590-2, *Petroleum and natural gas industries — Induction bends, fittings and flanges for pipeline transportation systems — Part 2: Fittings*²

ISO 15590-3, *Petroleum and natural gas industries — Induction bends, fittings and flanges for pipeline transportation systems — Part 3: Flanges*²

¹This document is superseded by ISO 3183:2019 after publication of ISO 13623:2017. As ISO 3183:2019 is published as ISO supplement to API Spec 5L, this document maintains the references to particular sections in ISO 3183:2012, which are considered still accurate.

²The ISO 15590 series are adopted by CEN/TC 12 as the EN 14870 series (ISO 15590 modified).

ISO 15590-4:2019, *Petroleum and natural gas industries — Induction bends, fittings and flanges for pipeline transportation systems — Part 4: Factory cold bends*^{2,3}

ISO 15649, *Petroleum and natural gas industries — Piping*

ISO 16440, *Petroleum and natural gas industries — Pipeline transportation systems — Design, construction and maintenance of steel cased pipelines*

ISO 21809 (all parts), *Petroleum and natural gas industries — External coatings for buried or submerged pipelines used in pipeline transportation systems*

IEC 60034-1, *Rotating electrical machines — Part 1: Rating and performance*

IEC 60079-10-1, *Electrical apparatus for explosive gas atmospheres — Part 10-1: Classification of hazardous areas*

IEC 60079-14, *Electrical apparatus for explosive gas atmospheres — Part 14: Electrical installations in hazardous areas (other than mines)*

EN 12583, *Gas infrastructure — Compressor stations — Functional requirements*

API STD 620, *Design and Construction of Large, Welded, Low-Pressure Storage Tanks*

API STD 650, *Welded Steel Tanks for Oil Storage*

ASME B16.5, *Pipe Flanges and Flanged Fittings — NPS 1/2 Through NPS 24*

ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, *Rules for Construction of Pressure Vessels (BPVC)*

<https://standards.iteh.ai/catalog/standards/sist/b2208533-48ea-48c8-9944-a6876f066788/osist-pren-14161-2021>

MSS SP-25, *Standard Marking System for Valves, Fittings, Flanges and Unions*

MSS SP-44, *Steel Pipeline Flanges*

NFPA 30, *Flammable and Combustible Liquids Code*

NFPA 220, *Standard on Types of Building Construction*

3 Terms, definitions and symbols

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:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

³ The first edition of this document was published after publication of ISO 13623:2017.