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Carbon dioxide capture, transportation and geological storage — Pipeline transportation systems



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Communications, Electrical and Plumbing Union - Electrical Division
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How to read this Standard

This page explains the meaning of the language and structure of this Standard.

Refer to Standards Australia's Standardisation Guide 006 for more details about drafting rules.

Australian and Australian/New Zealand Standards are voluntary unless they are referenced in legislation or called up in contracts.

Requirements

To conform to a Standard, all requirements in the Standard need to be met.

A requirement is any statement in the Standard which uses the word "shall".

Recommendations, permissions and possibilities

The following words are commonly used in Standards, but statements using them do not have to be followed to conform to the Standard:

(a) "should" means that something is recommended.

(b) "may" means that something is permitted.

(c) "can" means that something is possible.

Structure of Standards

A Standard always has the following parts:

(i) The Preface states who developed the Standard, what the Standard is aiming to do, and how it relates to other documents.

(ii) The Scope states what the Standard is about, what it covers and what it does not cover.

(iii) The Normative references clause lists other documents that are referenced in the Standard as part of requirements.

(iv) The Terms and definitions clause defines important terms to help with understanding the Standard.

A Standard may also include other parts, such as the following:

(1) A normative appendix sets additional requirements that need to be conformed to.

(2) An informative appendix provides additional information or guidance. They usually do not contain requirements. If an informative appendix does contain requirements, the Standard will explain when those requirements apply.

(3) A Bibliography lists documents referenced in the Standard but not as part of requirements.

Many Standards include notes. Notes provide recommendations and/or guidance only. They never contain requirements.

Preface

This Standard was prepared by the Standards Australia Committee EE-002, Carbon dioxide capture, transportation, and geological storage.

The objective of this document is to specify the requirements and recommendations for the transportation of CO_2 streams from the capture site to the storage facility where it is primarily stored in a geological formation or used for other purposes (e.g. for enhanced oil recovery or CO_2 use).

This document applies to the transportation of CO_2 streams by —

(a) rigid metallic pipelines;

(b) pipeline systems;

(c) onshore and offshore pipelines for the transportation of CO_2 streams;

(d) conversion of existing pipelines for the transportation of CO_2 streams; and

(e) transportation of CO_2 streams in the gaseous and dense phases.

This document is identical to, and has been reproduced from, ISO 27913:2024, *Carbon dioxide capture, transportation and geological storage — Pipeline transportation systems.*

As this document has been reproduced from an international document, a comma is to be read as a full point when referring to a decimal marker.

Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The terms “normative” and “informative” are used in Standards 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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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 265, *Carbon dioxide capture, transportation, and geological storage*.

This second edition cancels and replaces the first edition (ISO 27913:2016), which has been technically revised.

The main changes are as follows:

— the entire text has been editorially revised;

— normative references have been updated;

— a subclause about CO_2 stream flowrate and impurity measurement has been added;

— the level of impurities has been limited to 5 % and a set of 17 requirements are defined to ensure CO_2 stream pipeline integrity;

— Annex A has been added to show example compositions of CO_2 streams for gaseous and dense phase CO_2 streams which fulfil the requirements of this document;

— the latest findings in fracture arrest design have been included in Annex D;

— Annex F has been added to describe the decompression effects on pressure and temperature versus time.

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.

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Introduction

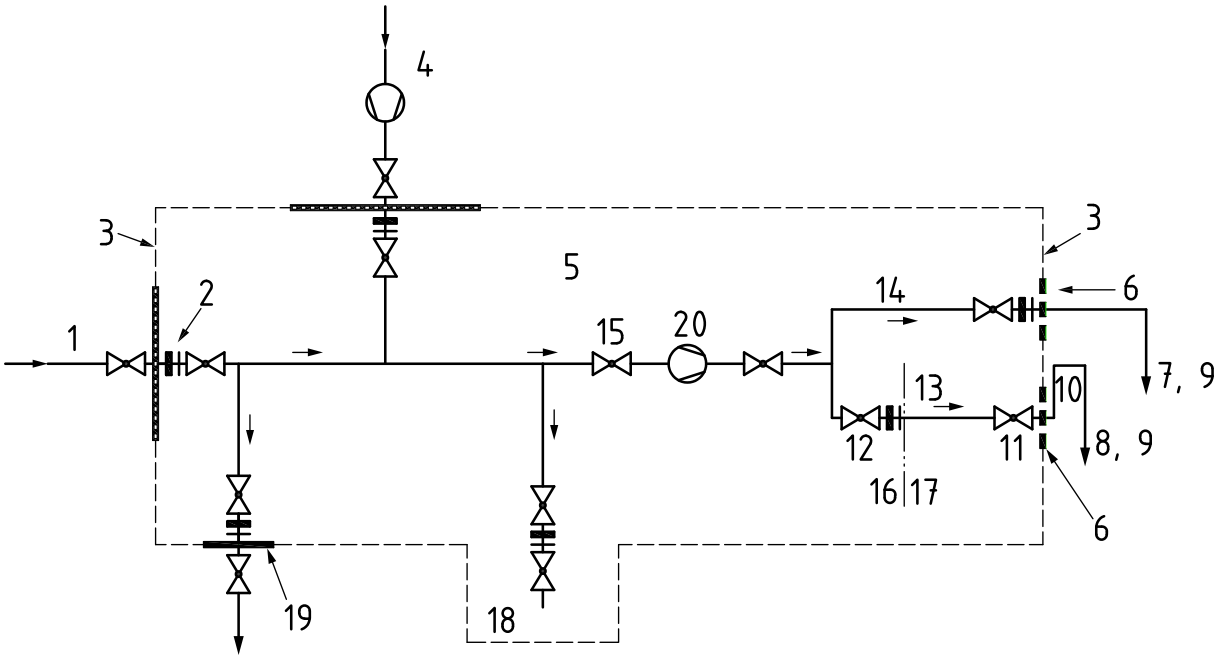
Carbon dioxide (CO_2) capture, carbon dioxide use (CCU) and carbon dioxide storage (CCS) have been identified as key abatement technologies for achieving a significant reduction in CO_2 emissions to the atmosphere. Pipelines are likely to be the primary means of transporting CO_2 from the point-of-capture to storage sites (e.g. depleted hydrocarbon formations, deep saline aquifers), or to usage points (e.g. enhanced oil recovery or utilization) to avoid its release to the atmosphere. While there is a perception that transporting CO_2 via pipelines does not represent a significant barrier to implementing large-scale CCS, there is significantly less industry experience than there is for hydrocarbon service (e.g. natural gas). Furthermore, there are a number of issues that need to be adequately understood and associated risks that need to be effectively managed to ensure safe transport of CO_2. In a CCS or CCU context, there is a need for larger CO_2 pipeline systems in more densely populated areas and with CO_2 coming from multiple sources. Also, offshore pipelines for the transportation of CO_2 to offshore storage sites are likely to become common.

The objective of this document is to provide specific requirements and recommendations on certain aspects of safe and reliable design, construction and operation of pipelines intended for the large-scale transportation of CO_2 that are not already covered in existing pipeline standards such as ISO 13623, ASME B31.4, ASME B31.8, EN 1594, AS 2885 or other standards listed in the Bibliography. Existing pipeline standards cover many of the issues related to the design and construction of CO_2 pipelines. However, there are some CO_2-specific issues (e.g. fracture arrest, internal corrosion protection) that are not adequately covered in these standards but are addressed in this document. The purpose of this document is to cover these issues consistently. Hence, this document is not a standalone standard, but is written to be a supplement to other existing pipeline standards for natural gas or liquids for both onshore and offshore pipelines.

The system boundary (see Figure 1) between capture and transportation is the point at the inlet valve of the pipeline, where the composition, temperature and pressure of the CO_2 stream is within a certain specified range to meet the requirements for transportation as described in this document.

The boundary between transportation and storage or utilization is the point where the CO_2 stream leaves the transportation pipeline infrastructure and enters the downstream infrastructure, which can be permanent geological storage, utilization or buffer storage prior to shipping.

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Key

1 source of CO_2 from capture (e.g. from power plant, industry; see ISO/TR 27912)
2 isolating joint
3 boundary limit
4 other source of CO_2
5 transportation system inside given in this document
6 boundary to storage facility or utilization
7 onshore storage facility
8 offshore storage facility
9 enhanced oil recovery
10 riser (outside transportation scope)
11 subsea valve (inside transportation scope)
12 beach valve
13 offshore pipeline
14 onshore pipeline
15 valve
16 landfall
17 open water
18 third party transport system
19 export to other uses than those of Keys 7, 8 and 9
20 intermediate compression or pumping

Figure 1 — Schematic illustration of the system boundaries of this document

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Carbon dioxide capture, transportation and geological storage — Pipeline transportation systems

1 Scope

This document specifies the requirements and recommendations for the transportation of CO_2 streams from the capture site to the storage facility where it is primarily stored in a geological formation or used for other purposes (e.g. for enhanced oil recovery or CO_2 use).

This document applies to the transportation of CO_2 streams by

— rigid metallic pipelines,

— pipeline systems,

— onshore and offshore pipelines for the transportation of CO_2 streams,

— conversion of existing pipelines for the transportation of CO_2 streams, and

— transportation of CO_2 streams in the gaseous and dense phases.

This document also includes aspects of CO_2 stream quality assurance, as well as converging CO_2 streams from different sources.

Health, safety and environment aspects specific to CO_2 transport and monitoring are also considered in this document.

Transportation of CO_2 via ship, rail or on road is not covered in 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 3183, *Petroleum and natural gas industries — Steel pipe for pipeline transportation systems*

ISO 20765-2, *Natural gas — Calculation of thermodynamic properties — Part 2: Single-phase properties (gas, liquid, and dense fluid) for extended ranges of application*

ISO/TR 27925, *Carbon dioxide capture, transportation and geological storage — Cross cutting issues — Flow assurance*

API SPEC 5L, *Line Pipe, 46th Edition, April 2018*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

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