AS/NZS 2885.1:2018

Australian/New Zealand Standard™

Pipelines—Gas and liquid petroleum

Part 1: Design and construction

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee ME-038, Petroleum Pipelines. It was approved on behalf of the Council of Standards Australia on 31 October 2018 and by the New Zealand Standards Approval Board on 6 November 2018.
This Standard was published on 3 December 2018.

The following are represented on Committee ME-038:

APGA Research and Standards Committee
Australasian Corrosion Association
Australian Industry Group
Australian Institute of Petroleum
Australian Petroleum Production and Exploration Association
Australian Pipelines and Gas Association
Department of Mines, Industry Regulation and Safety (WA)
Department of Natural Resources, Mines and Energy (Qld)
Department of Planning and Environment (NSW)
Department of the Premier and Cabinet (SA)
Department of Primary Industry and Resources (NT)
Energy Networks Australia
Energy Safe Victoria
New Zealand Institute of Gas Engineers
Welds Australia
WorkSafe New Zealand

Keeping Standards up-to-date

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Web Shop at www.saiglobal.com or Standards New Zealand web site at www.standards.govt.nz and looking up the relevant Standard in the on-line catalogue.

For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of Standards Australia or the New Zealand Standards Executive at the address shown on the back cover.

This Standard was issued in draft form for comment as DR AS/NZS 2885.1:2017.

Australian/New Zealand Standard™

Pipelines—Gas and liquid petroleum

Part 1: Design and construction

First published in part as part of AS CB28—1972.
Revised and redesignated AS 1697—1975.
AS 1958 first published 1976.
AS 2018 first published 1977.
Second edition AS 1697—1979.
Third edition 1981.
Second edition AS 1958—1981.
Second edition AS 2018—1981.
AS 1958—1981 and parts of AS 1697—1981 and AS 2018—1981 revised, amalgamated and redesignated AS 2885—1987.
Parts of AS 1697—1981, AS 2018—1981 and AS 2885—1987 revised, amalgamated and redesignated in part as AS 2885.1—1997.
Second edition AS 2885.1—2007.
Third edition AS 2885.1—2012.
Jointly revised and redesignated AS/NZS 2885.1:2018.

Jointly published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001 and by Standards New Zealand, PO Box 1473, Wellington 6140.

ISBN 978 1 76072 257 9

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee ME-038, Petroleum Pipelines, to supersede AS 2885.1—2012, *Pipeline—Gas and liquid petroleum*, Part 1: *Design and construction*.

The inclusion of roles and responsibilities in AS/NZS 2885.1:2018, was approved by the Standards Development Committee on 1 May 2015, as a one-off exemption to the directives of *Standardisation Guide 009: Preparation of Standards for Legislative Adoption*.

The objective of this Standard is to specify requirements for the design and construction of steel pipelines and associated PIPING and components that are used to transmit single-phase and multi-phase hydrocarbon fluids.

This Standard also provides guidelines for use of pipe manufactured from certain non-steel or corrosion-resistant materials, and guidelines for the transport of supercritical carbon dioxide.

The AS(/NZS) 2885 series comprises the following:

AS 2885.0, *Pipelines—Gas and liquid petroleum*, Part 0: *General requirements*

AS/NZS 2885.1, *Pipelines—Gas and liquid petroleum*, Part 1: *Design and construction* (this Standard)

AS/NZS 2885.2, *Pipelines—Gas and liquid petroleum*, Part 2: *Welding*

AS 2885.3, *Pipelines—Gas and liquid petroleum*, Part 3: *Operation and maintenance*

AS 2885.4, *Pipelines—Gas and liquid petroleum*, Part 4: *Submarine pipeline systems*

AS/NZS 2885.5, *Pipelines—Gas and liquid petroleum*, Part 5: *Field pressure testing*

AS/NZS 2885.6, *Pipelines—Gas and liquid petroleum*, Part 6: *Pipeline safety management*

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

Statements expressed in mandatory terms in notes to tables and figures are deemed to be requirements of the Standard.

Small caps have been used in this document to indicate terms which have been defined in AS 2885.0 (for example, PIPELINE SYSTEM).

The terms ‘may’, ‘should’ and ‘shall’ are not in small caps bur are defined terms that are used in this Standard to indicate an option (may, should) or that a requirement is mandatory (shall).

CONTENTS

Page

Page

Page

FOREWORD

AS 2885 was first published in 1987, superseding AS 1697—1981 (gas transmission and distribution) and AS 2018—1981 (liquid petroleum pipelines). A revision in 1997 split the Standard into separate parts (design and construction, welding, and operation and maintenance) and introduced the concept of RISK ASSESSMENT. The 2007 revision of Part 1 included numerous major changes, of which the most significant were provision for upgrading MAOP and substantially expanded requirements for RISK ASSESSMENT which was also relabelled as safety management. A revision in 2012 was primarily to harmonize with other parts of AS 2885 but also added appendices on fiberglass pipe and carbon dioxide pipelines.

This revision is a result of a thorough review of all sections of the Standard.

The greatest change has been the relocation of all details of safety management to a new standard, AS/NZS 2885.6, Pipeline safety management.

Other changes include:

(a) Clarification that AS(/NZS) 2885 series are the standards for complete PIPELINE SYSTEMS, and improving the distinction between MAINLINE PIPE, other PIPING, and non-pipe elements of a PIPELINE SYSTEM. Related is clarification of the distinction between, and the requirements for, PIPING designed to this Standard and PIPING designed to other standards for STATION PIPING. Particular care has been taken with the definition and use of defined terms such as MAINLINE PIPE, PIPELINE ASSEMBLY and COMPONENT, so that the application of requirements for such items is unambiguous. Figure 4.1 (Pipeline system schematic) has been redrawn and expanded to show these distinctions and definitions.

(b) Requirements for environmental management have been minimized in recognition that there are other more appropriate sets of rules such as the APGA *Code of Environmental Practice*.

(c) Removal of all requirements that apply to existing pipelines; such requirements are being transferred to Part 3. Nevertheless, some informative information relevant to existing pipelines remains in Appendix E.

(d) Sections 4 (Pipeline system design) and 5 (Pipeline design) have been restructured so that the content is appropriate to the section heading, although the technical requirements have generally undergone only minor change except for topics specifically mentioned here.

(e) A new clause (see Clause 4.4) on design temperatures has been added in Section 4, and a corresponding clause on temperature control in Section 7 (see Clause 7.2.3).

(f) Requirements for classification of locations have been moved to AS/NZS 2885.6. The former clause dealing with change of LOCATION CLASS creating a HIGH CONSEQUENCE AREA where none existed previously has been moved to Part 3.

(g) The fracture control requirements have been re-written to improve clarity and a new flowchart has been prepared, although the technical details have changed relatively little. Fracture initiation control is required for all PIPING but propagation control is required only for MAINLINE PIPE. Emphasis is given to use of recommended software.

(h) The stress and strain requirements have been re-written to expand coverage and align requirements with overseas standards and software.

(i) Requirements for trenchless crossings have been made more specific, and recognize the distinction between requirements for the design phase (see Section 5) and the construction phase (see Section 10).

(j) The requirements for design for pressure testing has been extensively revised in parallel with revision of AS 2885.5.

(k) The potential for acoustically- and flow-induced vibration is recognized as a design condition.

(l) The corrosion section has been generally revised, with removal of detail that is better covered by reference standards.

(m) The section on upgrade of MAOP has been revised in light of an Energy Pipelines Cooperative Research Centre project to review experience in its application since it was introduced in 2007.

(n) The sections on construction and inspection and testing have undergone editorial changes and restructuring to achieve a more logical and consistent approach.

The appendices have been substantially reorganized. All appendices dealing with safety management have been removed because they are covered by AS/NZS 2885.6.

Three new appendices have been added:

(i) Appendix B (informative), Guidance for use of a design factor above 0.72.

(ii) Appendix K (informative), Land stability and seismic design.

(iii) Appendix M (informative), Test section analysis using engineering software (or FEA methods) (formerly Appendix N of AS/NZS 2885.5).

The former appendix on radiation contours has been moved to Part 6.

The former appendix on bolt tensioning has been removed. Assembly requirements for flanged joints are now addressed through references to ASME and other documents. The remaining appendices have been re-ordered largely into the sequence in which they are cited in the body of the Standard.

All appendices have been reviewed and revised to some extent, with major changes including:

(A) Appendix E, Resistance to penetration—extensive revision, additional guidance and worked examples.

(B) Appendices F, H and I, Stress analysis—substantially or completely re-written.

(C) Appendix J, Fatigue—addition of an important qualification on the validity limits for the simplified screening criterion and recognition of acoustically- and flow-induced vibration.

(D) Appendix S, Fibreglass pipe—Manufacture, design and construction considerations—updated to reflect experience.

(E) Appendix T, Guidelines for pipelines for the transport of CO_2 Carbon dioxide pipelines—updated to reflect research and new knowledge.

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard
Pipelines—Gas and liquid petroleum

Part 1: Design and construction

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements for design and construction of onshore carbon and carbon-manganese steel PIPELINE SYSTEMS that are used to transport single-phase and multi-phase hydrocarbon fluids, such as natural and manufactured gas, liquefied petroleum gas, natural gasoline, crude oil, natural gas liquids and liquid petroleum products.

The principles are expressed in practical rules and guidelines for use by COMPETENT PERSONS.

AS 2885.0 sets out the fundamental principles on which the AS(/NZS) 2885 series is based. These fundamental principles and the practical rules and guidelines set out in AS/NZS 2885.1, AS/NZS 2885.2, AS 2885.3, AS/NZS 2885.5 and AS/NZS 2885.6 are the basis on which an engineering assessment is to be made where these Standards do not provide detailed requirements appropriate to a specific item.

NOTE: AS/NZS 2885.4 for offshore submarine PIPELINE SYSTEMS is a standalone document. AS/NZS 2885.1 applies up to the shoreward limit of AS/NZS 2885.4. Pipelines that start and end onshore but include crossings of large waterways such as rivers, lakes and estuaries fall within the scope of AS/NZS 2885.1.

This Standard does not apply to design and fabrication of the following:

(a) Equipment for instrumentation, telemetering and remote control.

(b) Compressors, pumps and their prime movers and integral PIPING.

(c) Heat exchangers and pressure vessels (refer to AS 1210).

(d) PROPRIETARY items.

(e) Wellhead assemblies and associated metering, valves and PIPING.

(f) Casing, tubing or PIPING used in petroleum wells.

1.2 APPROVAL

Each document prepared for a pipeline in accordance with this Standard shall be APPROVED as required by AS 2885.0.

1.3 APPLICATION

Where this Standard imposes requirements, which add to or override the requirements of a NOMINATED STANDARD or Code, the additional requirements, that are explicitly stated in this Standard shall be met.

Where APPROVED, this Standard may also be used for design and construction of pipelines made with corrosion-resistant alloy steels, fibreglass and other composite materials. Where this Standard is used for pipelines fabricated from these materials, relevant requirements