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Oil and gas pipeline systems



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Preface

This is the fifth edition of CSA Z662, *Oil and gas pipeline systems*. It supersedes the previous editions published in 2003, 1999, 1996, and 1994.

The following are the most significant changes, relative to the previous edition:

- (a) In [Clause 3](#), definitions have been added for horizontal directional drilling (HDD), measuring station, pressure-regulating station, safety and loss management system, and tie-in.
- (b) In [Clause 4](#), additional requirements have been added for HDD; requirements for coating selection and design criteria have been moved to [Clause 9](#).
- (c) In [Clause 6](#), additional requirements have been added for HDD.
- (d) In [Clause 7](#), the essential changes related to proven notch toughness property requirements have been eliminated from [Table 7.3](#), and separate tables ([Tables 7.8](#) and [7.9](#)) have been included specifying image quality indicator selection criteria for X-ray and gamma radiography.
- (e) In [Clause 8](#), the requirements concerning the maximum strength test pressure for pipe grades higher than Grade 555, the maximum strength test pressure for gaseous medium testing, and pressure-test records have been modified; the specific restriction on maximum operating pressure established by gaseous medium testing has been removed.
- (f) In [Clause 9](#), requirements for the selection, design, and application of protective coatings have been consolidated and expanded, and the requirements for the attachment of test leads have been expanded.
- (g) In [Clause 10](#), requirements for a documented safety and loss management system, leak detection requirements for oilfield water pipeline systems, and record retention for abandoned pipelines have been added; requirements for liaison with entities proposing excavation in the vicinity of a pipeline and engineering assessments have been expanded; and requirements for crossings, temporary repairs, and maintenance welding have been modified.
- (h) [Clause 11](#) has been extensively revised, in particular to give improved guidance for design.
- (i) In [Clause 12](#), requirements have been added concerning design of piping incorporating compression fittings having elastomeric gaskets, and the requirements regarding customers' meters and service regulators and trenchless installation have been modified.
- (j) In [Clause 13](#), the requirements for reinforced composite pipes (including the pressure design process), thermoplastic-lined pipelines, and polyethylene pipelines for gas gathering, multiphase, LVP, and oilfield water services (including the pressure design process and joining) have been modified.
- (k) In [Clause 14](#), the requirements for piping supports and joining have been modified.
- (l) The requirements for sour service pipelines, previously appearing as Annex M, now form the new [Clause 16](#).
- (m) Requirements for composite-reinforced steel pipelines are given in the new [Clause 17](#).
- (n) The new [Annex A](#) gives recommendations for a safety and loss management system that conforms to the new requirements of [Clause 10](#).
- (o) In [Annex C](#), a two-tier approach to tensile strain limits has been incorporated.
- (p) [Annex I](#) gives alternative provisions for oilfield steam distribution pipelines that are based on the mechanical design methodology of ASME B31.3, Chapter IX: "High Pressure Piping".
- (q) In [Annex K](#), the requirements for weldment fracture toughness have been modified.
- (r) [Annex M](#) gives guidelines for pipeline integrity management programs for gas distribution pipeline systems.
- (s) [Annex N](#) gives guidelines for pipeline integrity management programs for other than gas distribution pipeline systems.
- (t) [Annex O](#) gives requirements for reliability-based design and assessment of onshore non-sour natural gas transmission pipelines that may be used in place of the piping design requirements in [Clause 4](#) and for integrity assessments required by [Clause 10](#). The philosophy of this approach incorporates the integration of design, operation, and maintenance practices to meet predetermined target reliability levels throughout the life cycle of the piping. [Annex O](#) also includes extensive commentary that provides practical guidance on the application of the method.

- (u) Clause numbering throughout the Standard has been changed, where necessary, in order to restrict the number of digits to four, in accordance with CSA guidelines, and the language used to express requirements, recommendations, permissions, and possibilities has been modified to be consistent with ISO practice.

The requirements of this Standard are considered to be adequate under conditions normally encountered in the oil and natural gas industry. Specific requirements for abnormal or unusual conditions are not prescribed, nor are all details related to engineering and construction prescribed. It is intended that all work performed within the scope of this Standard meet the standards of safety and integrity expressed or implied herein, and that the requirements of this Standard be applied with due regard to the protection of the environment, which includes land, water, plant life, and animal life. Detailed requirements concerning the protection of the environment are not prescribed.

It is expected that changes will be made from time to time, based on new experience and technology. Where necessary, amendments and supplements will be prepared by the Technical Committee and published in accordance with CSA practices.

This Standard was prepared by the Technical Committee on Petroleum and Natural Gas Industry Pipeline Systems and Materials, under the jurisdiction of the Strategic Steering Committee on Petroleum and Natural Gas Industry Systems, and has been formally approved by the Technical Committee. It will be submitted to the Standards Council of Canada for approval as a National Standard of Canada.

June 2007

Notes:

- (1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*
- (2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*
- (3) *This publication was developed by consensus, which is defined by CSA Policy governing standardization — Code of good practice for standardization as “substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity”. It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this publication.*
- (4) *CSA Standards are subject to periodic review, and suggestions for their improvement will be referred to the appropriate committee.*
- (5) *All enquiries regarding this Standard, including requests for interpretation, should be addressed to Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.*
 - Requests for interpretation should*
 - (a) *define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;*
 - (b) *provide an explanation of circumstances surrounding the actual field condition; and*
 - (c) *be phrased where possible to permit a specific “yes” or “no” answer.*

Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization and are published in CSA’s periodical Info Update, which is available on the CSA Web site at www.csa.ca.

Z662-07

Oil and gas pipeline systems

1 Scope

1.1

This Standard covers the design, construction, operation, and maintenance of oil and gas industry pipeline systems that convey

- (a) liquid hydrocarbons, including crude oil, multiphase fluids, condensate, liquid petroleum products, natural gas liquids, and liquefied petroleum gas;
- (b) oilfield water;
- (c) oilfield steam;
- (d) carbon dioxide used in oilfield enhanced recovery schemes; or
- (e) gas.

Note: Designers are cautioned that the requirements in this Standard might not be appropriate for gases other than natural gas, manufactured gas, or synthetic natural gas.

1.2

The scope of this Standard, as shown in [Figures 1.1](#) and [1.2](#), includes

- (a) for oil industry fluids, piping and equipment in offshore pipelines, onshore pipelines, tank farms, pump stations, pressure-regulating stations, and measuring stations;
- (b) oil pump stations, pipeline tank farms, and pipeline terminals;
- (c) pipe-type storage vessels;
- (d) for carbon dioxide pipeline systems, piping and equipment in onshore pipelines, pressure-regulating stations, and measuring stations;
- (e) for gas industry fluids, piping and equipment in offshore pipelines, onshore pipelines, compressor stations, measuring stations, and pressure-regulating stations;
- (f) gas compressor stations; and
- (g) gas storage lines and pipe-type and bottle-type gas storage vessels.

1.3

This Standard does not apply to

- (a) piping with metal temperatures below $-70\text{ }^{\circ}\text{C}$;
- (b) piping (except oilfield steam distribution piping) with metal temperatures above $230\text{ }^{\circ}\text{C}$;
- (c) gas piping beyond the outlet of the customer's meter set assembly (covered by CAN/CSA-B149.1);
- (d) piping in natural gas liquids extraction plants, gas processing plants (except main gas stream piping in dehydration and all other processing plants installed as part of gas pipeline systems), gas manufacturing plants, industrial plants, and mines;
- (e) oil refineries, terminals other than pipeline terminals, and marketing bulk plants;
- (f) abandoned piping;
- (g) in-plant piping for drinking, make-up, or boiler feed water;
- (h) casing, tubing, or pipe in oil or gas wells, wellheads, separators, production tanks, and other production facilities;
- (i) vent piping for waste gases of any kind operating at or near atmospheric pressure;
- (j) heat exchangers;
- (k) liquefied natural gas systems (covered by CSA Z276);
- (l) liquid fuel distribution systems;
- (m) loading/unloading facilities for tankers or barges;
- (n) refuelling facilities; and
- (o) hydrocarbon storage in underground formations and associated equipment (covered by CSA Z341 Series).