

# Boiler, pressure vessel, and pressure piping code



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# Preface

This is the seventeenth edition of CSA B51, *Boiler, pressure vessel, and pressure piping code*. It supersedes the previous editions published in 2003, 1997, 1995, 1991, 1986, 1981, 1975, 1972, 1969, 1965, 1960, 1957, 1955, 1951, 1945, and 1939.

In keeping with CSA's goal of harmonizing its standards with those of other countries to the greatest extent possible, CSA's Technical Committee on Boilers and Pressure Vessels and its Subcommittees have, in the course of developing this Standard, worked closely with the National Board of Boiler and Pressure Vessel Inspectors in the USA and with The American Society of Mechanical Engineers (ASME) committees responsible for producing the *National Board Inspection Code* and ASME's *Boiler and Pressure Vessel Code*.

There are three parts to this Standard.

Part 1 contains requirements for boilers, pressure vessels, pressure piping, and fittings. It is intended mainly to fulfill two objectives: first, to promote safe design, construction, installation, operation, inspection, testing, and repair practices, and second, to facilitate adoption of uniform requirements by Canadian jurisdictions.

Part 2 contains requirements for high-pressure cylinders for the on-board storage of natural gas, blends of natural gas and hydrogen (hydrogen blends), and hydrogen as fuels for automotive vehicles. It has been harmonized with International Organization for Standardization (ISO) Standard 11439:2000, *Gas cylinders — High pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles*. In addition, the CSA Subcommittee responsible for developing Part 2 has consulted with the American National Standards Institute (ANSI) committee responsible for developing ANSI Standard NGV2-2000, *Basic Requirements for Compressed Natural Gas Vehicle (NGV) Fuel Containers*, and the draft *American National Standard/CSA Standard for Compressed Hydrogen Gas Vehicle (HGV) Fuel Containers*. The members of these two committees are dedicated to harmonizing their Standards as far as circumstances allow.

Part 3 contains requirements for compressed natural gas and hydrogen refuelling station pressure piping systems and ground storage vessels. These requirements have been allotted a separate part of the Standard to emphasize the differences between them and the requirements in Part 1, thereby facilitating their application.

This Standard has undergone technical and editorial revisions since the previous edition. The current edition contains all of the revisions published in Update No. 1 to CSA B51-03 and in CSA B51S1-05, *Supplement No. 1 to B51-03*, Boiler, pressure vessel, and pressure piping code. Some of the more noteworthy changes to Part 1 are found in the following clauses:

- (a) [Clause 4.2.4](#) (acceptability of fittings manufactured outside Canada);
- (b) [Clause 4.2.6](#) (documentation supporting registration or reregistration);
- (c) [Clause 4.7.3](#) (new requirement for hot tapping);
- (d) [Clause 4.8.2\(g\)](#) (small pressure vessels registered as Category H fittings are exempt from shop inspection);
- (e) [Clause 4.11](#) (audit requirements for manufacturers outside of Canada);
- (f) [Clause 6.3.1.3](#) (two means for determining the water level for high-pressure steam boilers);
- (g) [Clause 6.8](#) (new requirements for welded staybolts); and
- (h) [Clause 8.2](#) (fittings used in piping systems need to be registered).

In addition, a new definition of "design pressure" has been added to Parts 1 and 2. There have been no significant changes to Part 3.

The users of this Standard should note that it is a recommendatory document only and does not have the force of law except where it has been officially adopted by a Canadian jurisdiction. Users should also note that adoption does not necessarily mean that the Standard has been adopted unchanged. For example, a jurisdiction may decide to make an informative annex normative.

In addition, owners and users of cylinders designed to the requirements of Part 2 should note that the safe operation of such cylinders requires, first, compliance with the service conditions specified by the manufacturer, and second, use of the cylinders only during the service life specified by the manufacturer. Each cylinder is marked with an expiry date, and owners and users are responsible for ensuring that a cylinder is not used after that date.

The Technical Committee intends to meet periodically to review this Standard and, if necessary, to revise it to meet changing conditions and maintain uniformity of practice throughout Canada.

This Standard was prepared by the Technical Committee on Boilers and Pressure Vessels, under the jurisdiction of the Strategic Steering Committee on Mechanical Industrial Equipment Safety, and has been formally approved by the Technical Committee.

January 2009

**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](http://www.csa.ca).*

*CSA Standard*

*B51-09, Part 1*  
***General requirements for boilers,  
pressure vessels, and pressure piping***



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# *B51-09, Part 1*

## ***General requirements for boilers, pressure vessels, and pressure piping***

### **1 Scope**

#### **1.1**

Except as indicated in [Clause 1.2](#), Part 1 of this Standard applies to all boilers, pressure vessels, pressure piping, and fittings, as provided for by the Act (as defined in [Clause 3](#)) and identified in Part 1 of this Standard.

#### **Notes:**

- (1) *It is possible that the size limitations specified in provincial or territorial statutes or regulations will differ from those specified in Part 1 of this Standard. The applicable regulatory authority should be consulted.*
- (2) *The pressures specified in Part 1 of this Standard are gauge pressures above atmospheric pressure.*
- (3) *This Standard applies to all boilers, pressure vessels, pressure piping, and fittings installed subsequent to its adoption.*

#### **1.2**

Requirements for compressed natural gas cylinders and refuelling station pressure piping systems and containers are covered in Parts 2 and 3 of this Standard.

#### **1.3**

This Standard does not apply to

- (a) pressure-retaining components in hydraulic elevators;
- (b) pressure-containment devices for gas-filled switchgear and controlgear; and
- (c) pressure vessels for the transportation of dangerous goods regulated by Transport Canada.

#### **1.4**

Where a clause in Part 1 of this Standard is at variance with a Code or Standard referenced in Part 1 of this Standard, the requirements of Part 1 of this Standard govern.

#### **1.5**

In CSA Standards, “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; “should” is used to express a recommendation or that which is advised but not required; “may” is used to express an option or that which is permissible within the limits of the standard; and “can” is used to express possibility or capability. Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material. Notes to tables and figures are considered part of the table or figure and may be written as requirements. Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

#### **1.6**

The values given in SI (metric) units are the standard. The values given in parentheses are for information only. Nominal pipe sizes are expressed in non-dimensional terms.

## 2 Reference publications

Part 1 of this Standard refers to the following publications, and where such reference is made, it shall be to the edition listed below, including all amendments published thereto.

### **CSA (Canadian Standards Association)**

B52-05

*Mechanical refrigeration code*

CAN/CSA-B149.1-05

*Natural gas and propane installation code*

CAN/CSA-B149.2-05

*Propane storage and handling code*

CAN/CSA-B149.5-05

*Installation code for propane fuel systems and tanks on highway vehicles*

CAN/CSA-ISO 9001-00 (R2005)

*Quality management systems — Requirements*

CAN/CSA-Z180.1-00 (R2005)

*Compressed breathing air and systems*

Z299 series of Standards

CAN3-Z299.1-85 (R2006)

*Quality assurance program — Category 1*

CAN3-Z299.2-85 (R2006)

*Quality assurance program — Category 2*

CAN3-Z299.3-85 (R2006)

*Quality assurance program — Category 3*

CAN3-Z299.4-85 (R2006)

*Quality assurance program — Category 4*

CAN/CSA-Z305.3-M87 (withdrawn)

*Pressure Regulators, Gauges, and Flow-Metering Devices for Medical Gases*

CAN3-Z305.4-M85 (withdrawn)

*Qualification Requirements for Agencies Testing Nonflammable Medical Gas Piping Systems*

Z662-07

*Oil and gas pipeline systems*

CAN/CSA-Z7396.1-06

*Medical gas pipeline systems — Part 1: Pipelines for medical gases and vacuum*

### **ANSI (American National Standards Institute)**

K61.1-1999

*Safety Requirements for the Storage and Handling of Anhydrous Ammonia*