B51-03

Boiler, Pressure Vessel, and Pressure Piping Code

(Reaffirmed 2007)

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T. Tulshi	CSA, Mississauga, Ontario	*Project Manager*

The Technical Committee wishes to acknowledge the substantial contribution of the late A.J. Nathanielsz to the development of this Standard during his tenure as a member of the Committee.

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Preface

This is the sixteenth edition of CSA B51, *Boiler, Pressure Vessel, and Pressure Piping Code*. It supersedes the previous editions published in 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 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 as a fuel 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.* 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 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, and thereby to facilitate their application. To ensure that the designs of new cylinders and refuelling stations are compatible, the filling limits specified in Clause 4.2 of Part 2 provide the basis for the design pressures specified in Clauses 6.1.4 and 6.1.5 of Part 3.

All three parts of this Standard have undergone technical and editorial revisions since the previous edition. Some of the more noteworthy changes are as follows:

- Designs for fittings may now be registered through a central registration process administered by a nationally recognized organization (Part 1, Clause 4.2.3).
- Manufacturers of fittings with more than one plant or facility must now submit proof of a quality control program for each plant or facility where production occurs (Part 1, Clause 4.2.4).
- Organizations wishing to repair boilers, pressure vessels, pressure piping, or fittings must now submit proof that they maintain a satisfactory quality control system (Part 1, Clauses 4.9.2 and 4.9.3).
- The informational requirements for nameplates affixed to boilers, pressure vessels, and fittings have been revised (Part 1, Clause 5).
- Part 2 contains revised requirements concerning fire protection (Clause 6.9), design changes (Clause 6.16), failure to meet test requirements (Clause 6.17), and test methods (Clause 14).
- Part 2 contains a new annex on the procedure for requalifying all-steel natural gas vehicle storage cylinders (Annex B). This annex is referenced in Part 3 as well.

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 a non-mandatory annex mandatory.

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 Public Safety, and has been formally approved by the Technical Committee.

March 2003

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.*

Foreword

The Canadian Standards Association (CSA) develops standards under the name Canadian Standards Association, and provides certification and testing under the name CSA International. CSA International provides certification services for manufacturers who, under license from CSA, wish to use the appropriate registered CSA Marks on certain products of their manufacture to indicate conformity with CSA Standards.

CSA Certification for a number of products is provided in the interest of maintaining agreed-upon standards of quality, performance, interchangeability and/or safety, as appropriate. Where applicable, certification may form the basis for acceptance by inspection authorities responsible for enforcement of regulations. Where feasible, programs will be developed for additional products for which certification is desired by producers, consumers, or other interests. In performing its functions in accordance with its objectives, CSA does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of the Association represent its professional judgement given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed.

Products in substantial accord with this Standard but which exhibit a minor difference or a new feature may be deemed to meet the Standard providing the feature or difference is found acceptable utilizing appropriate CSA International Operating Procedures. Products that comply with this Standard shall not be certified if they are found to have additional features which are inconsistent with the intent of this Standard. Products shall not be certifiable if they are discovered to contravene applicable laws or regulations.

Testing techniques, test procedures, and instrumentation frequently must be prescribed by CSA International in addition to the technical requirements contained in Standards of CSA. In addition to markings specified in the Standard, CSA International may require special cautions, markings, and instructions that are not specified by the Standard.

Some tests required by CSA Standards may be inherently hazardous. The Association neither assumes nor accepts any responsibility for any injury or damage that may occur during or as the result of tests, wherever performed, whether performed in whole or in part by the manufacturer or the Association, and whether or not any equipment, facility, or personnel for or in connection with the test is furnished by the manufacturer or the Association.

Manufacturers should note that, in the event of the failure of CSA International to resolve an issue arising from the interpretation of requirements, there is an appeal procedure: the complainant should submit the matter, in writing, to the Secretary of the Canadian Standards Association.

If this Standard is to be used in obtaining CSA Certification please remember, when making application for certification, to request all current Amendments, Bulletins, Notices, and Technical Information Letters that may be applicable and for which there may be a nominal charge. For such information or for further information concerning CSA Certification, please address your inquiry to Applications and Customer Service, CSA International, 178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3.

CSA Standard

B51-03, Part 1
Boilers, Pressure Vessels, and Pressure Piping

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1-800-463-6727 • 416-747-4044

B51-03, Part 1

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) *In certain provinces there may be variations in the size limitations specified in Part 1 of this Standard. The regulatory authority should be consulted.*

2) *All pressures specified in Part 1 of this Standard are gauge pressures above atmospheric pressure.*

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 any clause of Part 1 of this Standard is at variance with the referenced codes and standards, 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; and "may" is used to express an option or that which is permissible within the limits of the standard. 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. Legends to equations and figures are considered requirements.

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.