



**CSA  
Group**

**CSA B52-13**

## **Mechanical refrigeration code**

Currently in preview, click buy full version

# Legal Notice for Standards

Canadian Standards Association (operating as "CSA Group") develops standards through a consensus standards development process approved by the Standards Council of Canada. This process brings together volunteers representing varied viewpoints and interests to achieve consensus and develop a standard. Although CSA Group administers the process and establishes rules to promote fairness in achieving consensus, it does not independently test, evaluate, or verify the content of standards.

## Disclaimer and exclusion of liability

This document is provided without any representations, warranties, or conditions of any kind, express or implied, including, without limitation, implied warranties or conditions concerning this document's fitness for a particular purpose or use, its merchantability, or its non-infringement of any third party's intellectual property rights. CSA Group does not warrant the accuracy, completeness, or currency of any of the information published in this document. CSA Group makes no representations or warranties regarding this document's compliance with any applicable statute, rule, or regulation.

IN NO EVENT SHALL CSA GROUP, ITS VOLUNTEERS, MEMBERS, SUBSIDIARIES, OR AFFILIATED COMPANIES, OR THEIR EMPLOYEES, DIRECTORS, OFFICERS, BE LIABLE FOR ANY DIRECT, INDIRECT, OR INCIDENTAL DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES, HOWSOEVER CAUSED, INCLUDING BUT NOT LIMITED TO SPECIAL OR CONSEQUENTIAL DAMAGES, LOST REVENUE, BUSINESS INTERRUPTION, LOST OR DAMAGED DATA, OR ANY OTHER COMMERCIAL OR ECONOMIC LOSS, WHETHER BASED IN CONTRACT, TORT (INCLUDING NEGLIGENCE), OR ANY OTHER THEORY OF LIABILITY, ARISING OUT OF OR RESULTING FROM ACCESS TO OR POSSESSION OR USE OF THIS DOCUMENT, EVEN IF CSA GROUP HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, INJURY, LOSS, COSTS, OR EXPENSES.

In publishing and making this document available, CSA Group is not undertaking to render professional or other services for or on behalf of any person or entity or to perform any duty owed by any person or entity to another person or entity. The information in this document is directed to those who have the appropriate degree of experience to use and apply its contents, and CSA Group accepts no responsibility whatsoever arising in any way from any and all use of or reliance on the information contained in this document.

CSA Group is a private not-for-profit company that publishes voluntary standards and related documents. CSA Group has no power, nor does it undertake, to enforce compliance with the contents of the standards or other documents it publishes.

## Intellectual property rights and ownership

As between CSA Group and the users of this document (whether it be in printed or electronic form), CSA Group is the owner, or the authorized licensee, of all works contained herein that are protected by copyright, all trade-marks (except as otherwise noted to the contrary), and all inventions and trade secrets that may be contained in this document, whether or not such inventions and trade secrets are protected by patents and applications for patents. Without limitation, the unauthorized use, modification, copying, or disclosure of this document may violate laws that protect CSA Group's and/or others' intellectual property and may give rise to a right in CSA Group and/or others to seek legal redress for such use, modification, copying, or disclosure. To the extent permitted by license or by law, CSA Group reserves all intellectual property rights in this document.

## Patent rights

Attention is drawn to the possibility that some of the elements of this standard may be the subject of patent rights. CSA Group shall not be held responsible for identifying any or all such patent rights. Users of this standard are expressly advised that determination of the validity of any such patent rights is entirely their own responsibility.

## Authorized use of this document

This document is being provided by CSA Group for informational and non-commercial use only. The user of this document is authorized to do only the following:

If this document is in electronic form:

- load this document onto a computer for the sole purpose of reviewing it;
- search and browse this document; and
- print this document if it is in PDF format.

Limited copies of this document in print or paper form may be distributed only to persons who are authorized by CSA Group to have such copies, and only if this Legal Notice appears on each such copy.

In addition, users may not and may not permit others to

- alter this document in any way, or remove this Legal Notice from the attached standard;
- sell this document without authorization from CSA Group; or
- make an electronic copy of this document.

If you do not agree with any of the terms and conditions contained in this Legal Notice, you may not load or use this document or make any copies of the contents hereof, and if you do make such copies, you are required to destroy them immediately. Use of this document constitutes your acceptance of the terms and conditions of this Legal Notice.



# ***Standards Update Service***

## ***CSA B52-13 December 2013***

**Title:** *Mechanical refrigeration code*

To register for e-mail notification about any updates to this publication

- go to [shop.csa.ca](http://shop.csa.ca)
- click on **CSA Update Service**

The **List ID** that you will need to register for updates to this publication is **242254**

If you require assistance, please e-mail [techsupport@csagroup.org](mailto:techsupport@csagroup.org) or call 416-747-2233.

Visit CSA Group's policy on privacy at [csagroup.org/legal](http://csagroup.org/legal) to find out how we protect your personal information.

*CSA B52-13*  
*Mechanical refrigeration code*



*™A trade-mark of the Canadian Standards Association, operating as "CSA Group"*

*Published in December 2013 by CSA Group  
A not-for-profit private sector organization  
5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6*

*To purchase standards and related publications, visit our Online Store at [shop.csa.ca](http://shop.csa.ca)  
or call toll-free 1-800-463-6727 or 416-747-4044.*

*ISBN 978-1-77139-237-2*

*© 2013 CSA Group*

*All rights reserved. No part of this publication may be reproduced to any form whatsoever without the prior permission of the publisher.*

# Contents

Mechanical Refrigeration Code (B52) 4

Preface 8

## 1 Scope 10

- 1.1 Purpose 10
- 1.2 Application 10
- 1.3 Mandatory language 10
- 1.4 Units of measurement 11

## 2 Reference publications 11

## 3 Definitions and abbreviations 12

- 3.1 Definitions 12
- 3.2 Abbreviations 18

## 4 System selection and application requirements 19

- 4.1 Application procedure 19
- 4.2 Classification by occupancy 19
  - 4.2.1 General 19
  - 4.2.2 Institutional occupancy 19
  - 4.2.3 Public assembly occupancy 19
  - 4.2.4 Residential occupancy 20
  - 4.2.5 Commercial occupancy 20
  - 4.2.6 Industrial occupancy 20
  - 4.2.7 Mixed occupancy 20
  - 4.2.8 Adjacent locations 20
- 4.3 Classification of refrigeration systems 20
  - 4.3.1 Classification by type 20
  - 4.3.2 Classification by leakage probability 23
- 4.4 Classification by refrigerant 24
- 4.5 System application requirements 27
  - 4.5.1 General 27
  - 4.5.2 System application rules 27
  - 4.5.3 Equipment application in a high-probability system 29
- 4.6 Additional requirements for institutional, public assembly, residential, and commercial occupancies 29
  - 4.6.1 Public stairway, stair landing, or exit 29
  - 4.6.2 Public hallway or lobby 29

## 5 Equipment design and construction 29

- 5.1 Drawings, specifications, and data reports 29
  - 5.1.1 Refrigeration systems rated 125 kW or less 30
- 5.2 Filing of drawings 30
  - 5.2.1 Submission of drawings and specifications 30
  - 5.2.2 Contents of drawings 30
- 5.3 Materials 31

5.5	Design pressures	31
5.6	Refrigerant-containing pressure vessels	34
5.7	Refrigerant piping, fittings, evaporator and condenser coils, and associated headers	34
5.7.1	Refrigerant piping and fittings	34
5.7.2	Minimum requirements for unprotected refrigerant piping and tubing	34
5.7.3	Evaporator and condenser coils and associated headers	35
5.8	Components other than pressure vessels, piping, and fittings	35
5.9	Design provisions for service	36
5.10	Pressure testing	37
5.10.1	General	37
5.10.2	Test medium	37
5.10.3	Factory tests	37
5.10.4	Field tests	38
5.11	Marking and labelling	38
5.11.1	Signs (all systems)	38
5.11.2	Nameplates for unit systems, condensing units, compressors, and compressor units	39
5.11.3	Signs for systems containing more than 45 kg (100 lb) of refrigerant	39
5.11.4	New signs for changed refrigerant	39
5.11.5	Posting of instructions	39
5.12	Substitution of refrigerant type	39

## 6 Installation 40

6.1	General	40
6.2	Machinery rooms	40
6.2.1	General	41
6.2.2	Doors	41
6.2.3	Refrigerant vapour detector	41
6.2.4	Explosion protection	41
6.2.5	Ventilation	42
6.3	Class T machinery rooms	43
6.4	Machinery rooms — Electrical requirements for ammonia systems	44
6.4.1	Class T machinery rooms	44
6.4.2	Machinery rooms	44
6.5	Water supply and discharge connections	44
6.6	Electrical wiring	44
6.7	Gas devices	44
6.8	Location of refrigerant piping	45
6.9	Joints and refrigerant-containing parts in air ducts	45
6.10	Emergency discharge	46
6.11	Purge discharge	46

## 7 Overpressure protection 46

7.1	Pressure vessel protection	46
7.1.1	ASME <i>Boiler and Pressure Vessel Code</i> requirements	46
7.1.2	Pressure vessels with an internal gross volume of 0.085 m <sup>3</sup> (3 ft <sup>3</sup> ) or less	46
7.1.3	Pressure vessels with an internal gross volume exceeding 0.085 m <sup>3</sup> (3 ft <sup>3</sup> )	46
7.1.4	Pressure-relief devices for pressure vessels used as, or as part of, evaporators	47
7.2	System protection	47
7.2.1	Pressure-limiting devices	47

7.2.2	Setting of pressure-limiting devices	47
7.2.3	Pressure-imposing device protection	48
7.2.4	Hydrostatic Expansion	49
7.3	Pressure-relief devices	49
7.3.1	General	49
7.3.2	Location of pressure-relief devices	50
7.3.3	Setting of pressure-relief devices	50
7.3.4	Capacity of pressure-relief devices	51
7.3.5	Marking of fusible plugs and other pressure-relief devices	52
7.3.6	Discharge of fusible plugs and other pressure-relief devices	53
<b>8</b>	<b>Maintenance of systems</b>	<b>66</b>
8.1	Charging and withdrawal of refrigerants	66
8.1.1	General	66
8.1.2	Charging R-744 systems	67
8.1.3	Charging or withdrawal of refrigerants into or out of heat transfer systems utilizing secondary heat transfer fluids subject to solidification.	67
8.2	Refrigerants withdrawn from refrigeration systems	67
8.2.2	Secondary refrigerants and lubricants withdrawn from refrigeration systems	68
8.3	Refrigerant storage	68
8.4	Maintenance	68
<b>9</b>	<b>Precautions</b>	<b>70</b>
9.1	Protective equipment	70
9.2	Enclosed spaces	70
<hr/>		
Annex A (informative)	— Maximum allowable concentration of mixtures	71
Annex B (informative)	— Guidelines for emergency discharge of refrigerants	72
Annex C (informative)	— Worst-case composition or fractionation	74
Annex D (informative)	— Conversion factors	75
Annex E (informative)	— A method for calculating the discharge capacity of pressure-relief devices for positive displacement compressors	76
Annex F	— Reserved	73
Annex G	— Reserved	79
Annex H (normative)	— Allowable equivalent length of discharge piping	80
Annex I (informative)	— CSA B52 Information Bulletin on use of hydrocarbon refrigerants in new equipment and as drop-in replacements for other classes of refrigerants in existing systems	82
Annex J (normative)	— Working with R-744 (CO <sub>2</sub> ) systems — Precautions and potential hazards	84
Annex K (informative)	— Characteristics of carbon dioxide	86
Annex L (informative)	— Infrequently used refrigerants: classification, quantity, design pressure, and discharge capacity	87

# Mechanical Refrigeration Code (B52)

<b>L.W. Burgett</b>	Trane a Business of Ingersoll Rand, La Crosse, Wisconsin, USA	<i>Chair</i>
<b>K.T. Lau</b>	ABSA, Edmonton, Alberta	<i>Vice-Chair</i>
<b>S. Ahmed</b>	British Columbia Safety Authority (BCSA), Coquitlam, British Columbia	
<b>A. Ali</b>	Government of Nunavut Community & Government Services, Iqaluit, Nunavut	
<b>S. Alison</b>	Carrier Canada Limited, Mississauga, Ontario	
<b>E. Bergshoeff</b>	Hager Industries Inc., Burlington, Ontario	
<b>W.S. Burnat</b>	Enviroaire Heating & Cooling, Newcastle, Ontario	
<b>P. Christensen</b>	Yukon Government Community Services, Whitehorse, Yukon Territory	
<b>E. Creaser</b>	Province of New Brunswick Dept of Public Safety, Fredericton, New Brunswick	
<b>G. DiFebo</b>	CA Local 787, Joint Apprentice and Training Committee, Brampton, Ontario	
<b>P.L. Dodge</b>	Nova Scotia Department of Labour Advanced Education, Halifax, Nova Scotia	
<b>D. Eastman</b>	Service NL, Newfoundland & Labrador, St. John's, Newfoundland and Labrador	
<b>B.D. Fierheller</b>	Office of the Fire Commissioner, Winnipeg, Manitoba	

<b>I.D. Frost</b>	United Association Local 787, Brampton, Ontario	
<b>K.M. Greenwood</b>	Praxair Canada Inc, Mississauga, Ontario	
<b>A.D. Hantelmann</b>	Alberta Municipal Affairs, Edmonton, Alberta	<i>Associate</i>
<b>Y. Huang</b>	Royal & SunAlliance Insurance Company of Canada, Toronto, Ontario	
<b>J.G. Inglis</b>	ArcelorMittal Dofasco, Hamilton, Ontario	
<b>J. Jakob</b>	CSA Group, Toronto, Ontario	<i>Associate</i>
<b>S. Katz</b>	S. Katz and Associates Inc., North Vancouver, British Columbia	
<b>H. Klaver</b>	British Columbia Safety Authority (BCSA), New Westminster, British Columbia	
<b>B. Krasium</b>	ASFALEIA Inspection & Management Services Ltd, Regina, Saskatchewan	
<b>D. Landry</b>	Department of Labour and Advanced Education, Halifax, Nova Scotia	<i>Associate</i>
<b>M. Mailman</b>	Government of the Northwest Territories, Yellowknife, Northwest Territories	
<b>D. Malinauskas</b>	Cimco Refrigeration Division of Toromont Industries Ltd, Toronto, Ontario	
<b>D. McMorris</b>	Mitsubishi Electric Sales Canada Inc., Markham, Ontario	<i>Associate</i>
<b>F. Morel</b>	Toromont Industries Ltd. / Industries Toromont Ltée, Ville d'Anjou, Québec	<i>Associate</i>

<b>D.A. Murphy</b>	Frick by Johnson Controls, East Berlin, Pennsylvania, USA	
<b>A. Park</b>	Compressed Gas Association, Ottawa, Ontario	
<b>D.P. Reiter</b>	Ontario Power Generation Inc, Pickering, Ontario	<i>Associate</i>
<b>J.P. Scott</b>	Natural Resources Canada, Varenes, Québec	
<b>C. Selinger</b>	Technical Safety Authority of Saskatchewan, Regina, Saskatchewan	
<b>J. Sénéchal</b>	Air Liquide Canada Inc., Montréal, Québec	
<b>D. Srnic</b>	ABSA, Edmonton, Alberta	<i>Associate</i>
<b>P. Sterescu</b>	Boiler Inspection & Insurance Company of Canada, Toronto, Ontario	
<b>M. St-Georges</b>	Régie du bâtiment du Québec, Montréal, Québec	
<b>R.L. Strickland</b>	ISS Facility Services, Virgil, Ontario	
<b>C.S. Sucher</b>	Sucher Consulting Engineering Inc, Toronto, Ontario	
<b>I. Svorinic</b>	British Columbia Safety Authority (BCSA), New Westminster, British Columbia	<i>Associate</i>
<b>S.R. Townsend</b>	Government of Prince Edward Island, Charlottetown, Prince Edward Island	
<b>C. Turlyo</b>	Technical Standards & Safety Authority (TSSA), Toronto, Ontario	
<b>L. VanBerkel</b>	Golen Engineering Inc, Burlington, Ontario	

<b>P. Yeung</b>	ABSA, Edmonton, Alberta	<i>Associate</i>
<b>J. Zimmerman</b>	Emerson Climate Technologies - Canada, Brantford, Ontario	<i>Associate</i>
<b>A. Holbeche</b>	CSA Group, Mississauga, Ontario	<i>Project Manager</i>
<b>O. Simonetta</b>	CSA Group, Mississauga, Ontario	<i>Project Manager</i>

# Preface

This is the eleventh edition of CSA B52, *Mechanical refrigeration code*. It supersedes the previous editions published in 2005, 1999, 1995, 1992, 1991, 1983, 1977, 1965, 1951, and 1939.

The 11th edition of this Standard provides the minimum requirements for the design, construction, installation, inspection, and maintenance of the mechanical refrigeration systems, and is complemented by the practical implementation guidance B52 Handbook, helping to minimize the risk of personal injury. The Code applies to all refrigeration systems installed, whether in new or existing premises, to systems that undergo a substitution of refrigerant, and to parts that are replaced in or added to the system.

Changes to this edition include:

- a) Clause 2 has been updated to add the following definitions:
  - i) Automated control;
  - ii) Fade-out vessel;
  - iii) Gas cooler;
  - iv) Manual control;
  - v) Pressure-regulating relief valve;
  - vi) Primary refrigerant;
  - vii) Secondary refrigerant;
  - viii) Subcritical;
  - ix) Subcritical system;
  - x) Systems;
  - xi) Supercritical;
  - xii) Thermal relief device (or thermal expansion relief device);
  - xiii) Transcritical system; and
  - xiv) Triple point;
- b) Updates to Clause 4.3.1.2.3;
- c) Updates to Clauses 5.5.1, 5.6, 5.7.1, and 5.8.1, addition of Clause 5.9.2.1(c);
- d) The addition of a note to Clause 6.3 and an update to Clause 6.3(d);
- e) Updates to Clauses 7.2.2.1, the addition of Clause 7.2.2.4;
- f) Updates to Clause 7.2.3 to include
  - i) renumbering of Clauses 7.2.3.1.1, 7.2.3.1.2, and 7.2.3.3 of the 2005 edition; and
  - ii) the addition of Clauses 7.2.3.2, 7.2.3.2.1, and 7.2.3.2.2;
- g) Updates to Clause 7.2.4,;
- h) Updates to Table 6;
- i) The addition of Clause 7.3.6.5;
- j) Updates to Clauses 8.1, 8.2, 8.3, 8.4.1, 8.4.3, and the addition of Clause 8.4.4;
- k) Updates to Annex I;
- l) The addition of Annex J;
- m) The addition of Annex K; and
- n) The addition of Annex L.

This Standard contains recommendations only and does not have the force of law until adopted officially by a jurisdiction. The regulatory authorities having jurisdiction, including those that have adopted this Standard, should be consulted on the extent of such adoption, as the Standard could have been adopted with exemptions or with additional requirements.

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

**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 Standard 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 Standard.*
- 4) *To submit a request for interpretation of this Standard, please send the following information to [inquiries@csagroup.org](mailto:inquiries@csagroup.org) and include “Request for interpretation” in the subject line:*
  - 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) *where possible, phrase the request in such a way that a specific “yes” or “no” answer will address the issue.*

*Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization and are available on the Current Standards Activities page at [standardsactivities.csa.ca](http://standardsactivities.csa.ca).*

- 5) *This Standard is subject to review five years from the date of publication, and suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to [inquiries@csagroup.org](mailto:inquiries@csagroup.org) and include “Proposal for change” in the subject line:*
  - a) *Standard designation (number);*
  - b) *relevant clause, table, and/or figure number;*
  - c) *wording of the proposed change; and*
  - d) *rationale for the change.*

*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 B52-13

## Mechanical refrigeration code

### 1 Scope

#### 1.1 Purpose

The purpose of this Standard is to minimize the risk of personal injury by providing minimum requirements for the design, construction, installation, inspection, and maintenance of the mechanical refrigeration systems and volatile direct refrigeration systems specified in Clauses 1.2.1 and 1.2.2.

**Note:** This Standard does not directly address protection of property and preservation of the environment.

#### 1.2 Application

##### 1.2.1

Except as specified in Clause 1.2.3, this Standard applies to the design, construction, installation, inspection, and maintenance of every refrigeration system as provided for by the “Act” (as defined in Clause 3) and identified in this Standard.

##### 1.2.2

This Standard applies to

- a) all refrigeration systems installed subsequent to its adoption. This includes refrigeration systems installed in a new or existing premises. It also applies to all premises, including the machinery room if required, in which a refrigeration system is to be installed;
- b) refrigeration systems that undergo a substitution of refrigerant in a premises defined in Item (a); and
- c) those parts of a refrigeration system that are replaced in, or added to, systems installed prior to its adoption.

**Note:** When adding or replacing parts (see Item (c)), consideration should be given to the premises requirements of Item (a).

##### 1.2.3

This Standard does not apply to the following:

- a) the use of water or air as a refrigerant;
- b) bulk-storage gas tanks not permanently connected to a refrigeration system;
- c) refrigeration systems installed on railroad cars, motor vehicles, motor-drawn vehicles, aircraft, or ships; and
- d) refrigeration systems used for air conditioning in private residences.

#### 1.3 Mandatory language

In this Standard, “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.