B340-02

Selection and Use of Cylinders, Spheres, Tubes, and Other Containers for the Transportation of Dangerous Goods, Class 2

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Note: *General Instructions for CSA Standards are now called Updates. Please contact CSA Information Products Sales or visit* ***www.ShopCSA.ca*** *for information about the* ***CSA Standards Update Service****.*

Title: *Selection and Use of Cylinders, Spheres, Tubes, and Other Containers for the Transportation of Dangerous Goods, Class 2* — originally published October 2002

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If you are missing any General Instruction or Update, please contact CSA Information Products Sales or visit ***www.ShopCSA.ca****.*

The following revisions have been formally approved and are marked by the symbol delta (Δ) in the margin on the attached replacement pages:

Revised	Contents, Clauses 3, 4.2, 4.6.2, 4.6.3, 4.9, 5.6.2.4, 5.6.3.8, 6.4, 6.5, C1, D1, and E1, and Tables 5.2 and 5.6
New	Clause 6.6
Deleted	None

CAN/CSA-B340-02 originally consisted of **53 pages** (viii preliminary and 45 text), each dated **October 2002**. It now consists of the following pages:

October 2002	v–viii, 1, 2, 7, 8, 13–16, 25–28, 35, and 36
January 2004	Cover, title page, and copyright page
February 2005	iii, iv, 3–6B, 9–12, 17–24B, 29–34, and 37–45

- Update your copy by inserting these revised pages.
- Keep the pages you remove for reference.

Δ Contents

Transportation — any mode of conveying dangerous goods on land (including rail and highway) or water or in air.

Tube — a seamless container of cylindrical shape with a water capacity greater than 450 L designed to withstand an internal pressure equal to or greater than 12.4 MPa.

Water capacity — the total mass or volume of water a container can hold at 15°C and a pressure of 101.325 kPa (absolute).

3. Reference Publications

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. Where foreign Standards are referenced, only the technical content applies. Except for the Canadian Regulations, where there is a variance with this Standard, the requirements of this Standard shall prevail. Users of this Standard are advised against attempting a direct application of any of the following reference publications without carefully observing this Standard's reference to that Standard, Specification, or Code.
Note: *See Appendix D for information on the reference organizations.*

CSA Standards
B51-97,
Boiler, Pressure Vessel, and Pressure Piping Code;

B52-99,
Mechanical Refrigeration Code;

B339-02,
Cylinders, Spheres, and Tubes for the Transportation of Dangerous Goods.

Canadian Nuclear Safety Commission Regulations
Packaging and Transport of Nuclear Substances Regulations under the *Nuclear Safety and Control Act*, S.C. 1997, c. 9.

CGA* Publications
C-6-2001,
Standards for Visual Inspection of Steel Compressed Gas Cylinders — Eighth Edition;

C-6.1-1995,
Standards for Visual Inspection of High Pressure Aluminum Compressed Gas Cylinders — Third Edition;

C-6.2-1996,
Guidelines for Visual Inspection and Requalification of Fiber Reinforced High Pressure Cylinders — Third Edition;

C-6.3-1999,
Guidelines for Visual Inspection and Requalification of Low Pressure Aluminum Compressed Gas Cylinders — Second Edition;

C-12-2002,
Qualification Procedure for Acetylene Cylinder Design — Fourth Edition;

C-13-2000,
Guidelines for Periodic Visual Inspection and Requalification of Acetylene Cylinders — Fourth Edition;

C-14-1999,
Procedures for Fire Testing of DOT Cylinder Pressure Relief Device Systems — Third Edition

G-4.1-1996,
Cleaning Equipment for Oxygen Service — Fourth Edition;

S-1.1-2001,
Pressure-Relief Device Standards — Part 1 — Cylinders for Compressed Gases — Ninth Edition;

S-7-1996,
Method for Selecting Pressure-Relief Devices for Compressed Gas Mixtures in Cylinders — Second Edition.

CGSB† Standards
CAN/CGSB-3.13-M88,
Liquefied Petroleum Gas (Butanes);

CAN/CGSB-3.14-M88,
Liquefied Petroleum Gas (Propane).

Government of Canada Legislation
Transportation of Dangerous Goods Act, S.C. 1992, c. 34, and the Regulations thereto, including amendments.

Δ **US Department of Transportation**
Exemptions from the US 49 CFR Hazardous Materials Regulations
http://hazmat.dot.gov/exemptions_index.htm

**Compressed Gas Association, Inc.*
†*Canadian General Standards Board*

4. Container Requirements

4.1 General

4.1.1 Cylinders, Spheres, and Tubes

4.1.1.1

Cylinders, spheres, and tubes used for the transportation of dangerous goods, Class 2, shall be in accordance with the applicable requirements of CSA Standard B339, or shall be equivalent containers with the prefix BTC, CRC, CTC, ICC, or DOT, or any of the following Specification cylinders of Canadian or US manufacture: 3, 3A480X, 3B, 3BN, 4B240FLW, 8, 8AL, or 8WC.

Notes:

(1) *The Transportation of Dangerous Goods Regulations should be consulted for limitations imposed for transportation in Canada of US containers (ICC or DOT prefix).*

(2) *The equivalent specifications referred to are those bearing the following prefixes, representing the corresponding regulatory authority:*

(a) CRC — Canadian Railway Commission;
(b) BTC — Board of Transport Commissioners for Canada;
(c) ICC — US Interstate Commerce Commission;
(d) DOT — US Department of Transportation; and
(e) CTC — Canadian Transport Commission.

4.1.1.2
Cylinders, spheres, and tubes that are not empty and that are due for requalification shall not be refilled, but may
(a) continue in use until empty; and
(b) after passing a visual inspection by the owner, shipper, or filler, be transported for use or re-qualification.

In no case shall a cylinder, sphere, or tube continue in use past its service life limitation as specified in CSA Standard B339.

4.1.1.3
Cylinders, spheres, and tubes shall be altered, repaired, or rebuilt in accordance with CSA Standard B339.

4.1.2 Other Containers
Other containers used for the transportation of dangerous goods, Class 2, shall be in accordance with Clause 6 of this Standard.

Δ 4.2 Valves, Accessories, Means of Protection, and Container Orientation and Securement during Transportation

4.2.1 Valves and Accessories

4.2.1.1
Valves and accessories shall be installed, repaired, and maintained by personnel trained for that purpose.

4.2.1.2
Valves and accessories shall be capable of being tightly closed to prevent leakage of the container's contents.

4.2.2 Means of Protection for Valves and Accessories

4.2.2.1 General
To prevent damage to valves and other accessories that could cause the contents of unmanifolded containers to be released under normal conditions of handling and transportation, the valves and accessories on containers shall be provided with a means of protection specified in Clause 4.2.2.2 or 4.2.2.3, as applicable.

4.2.2.2 Containers Manufactured before October 1, 2007
For containers manufactured before October 1, 2007, a means of protection shall be provided by
(a) equipping each container with a securely attached cap or guard that is not in contact with any part of the valve or accessory and is of sufficient strength to protect the valve or accessory from damage during transportation;
(b) boxing, crating, or cradling the container so that the valves and accessories are protected from damage during transportation;
(c) constructing the containers so that their valves and accessories are recessed into the container or otherwise protected to the extent that they will not be subjected to a blow when the container is dropped onto a flat surface; or
(d) inherent valve protection. A valve shall be considered to have inherent valve protection if it does not leak and remains operational when it is subjected to an impact caused by allowing the container, prepared as it would be for transportation, to fall from an upright position such that the side of the valve strikes a solid steel object projecting not more than 150 mm above the floor level.

4.2.2.3 Containers Manufactured on or after October 1, 2007

4.2.2.3.1

For containers manufactured on or after October 1, 2007, a means of protection meeting the requirements specified in Clauses 4.2.2.3.2 to 4.2.2.3.7 shall be provided by
(a) equipping the containers with securely attached protective devices such as caps or guards that are not in contact with any part of a valve or accessory;
(b) providing the containers with outer packaging; or
(c) inherent valve protection.

4.2.2.3.2

Note: *In performing these tests, proper safety precautions should be taken to protect personnel and property.*
For each means of protection tested:
(a) the container used for testing the means of protection shall be filled with water or an inert solid material or both to a mass equivalent to that of the intended lading;
(b) the container shall be fitted with the valve and the means of protection;
(c) the container shall be dropped at an angle of 30° to the vertical, with the valve directed downwards, from a height of 1.2 m from its lowest point onto a solid flat concrete surface;
(d) a minimum of three assemblies shall be tested; and
(e) the means of protection shall be considered to have passed the test if, for all three assemblies tested, the valve remains operational (i.e., capable of being opened and closed), and there is no leak from the valve itself or from the container-to-valve connection, at a minimum pressure of 0.2 MPa.
Note: *After the test, minor deformation or damage to the valve is acceptable.*

4.2.2.3.3

For inherent valve protection, each valve manufacturer's design shall be tested as specified in Clause 4.2.2.3.2. Differences in the pressure-relief device or configuration of the outlet shall not be considered design variances.

4.2.2.3.4

For means of protection other than valves with inherent protection, having passed the test specified in Clause 4.2.2.3.2, the means of protection shall be acceptable for use with valves of maximum dimensions not exceeding the dimensions of the valves used in the test.

4.2.2.3.5

All means of protection, having passed the test specified in Clause 4.2.2.3.2, shall be acceptable for use with filled containers at a mass equal to or less than the mass tested.

4.2.2.3.6

Means of protection that meet the requirements specified in Clauses 4.2.2.3.2 to 4.2.2.3.5 shall be certified and marked accordingly by the manufacturer or user of the means of protection.

4.2.2.3.7

For a means of protection that is integral to the container design (e.g., welded collar, recessed valve) that meets the test requirements specified in Clauses 4.2.2.3.2 to 4.2.2.3.5, the container specification mark shall indicate compliance without additional marking.

4.2.3 Container Orientation and Securement during Transportation

4.2.3.1
Containers filled with a refrigerated liquid or a liquefied flammable gas shall be transported in an upright position unless they are designed for horizontal service.

4.2.3.2
During transportation, all containers, boxes, crates, and cradles shall be secured to prevent shifting and overturning.

4.2.4
Containers filled with a refrigerated liquid or a liquefied flammable gas shall be transported in an upright position unless they are designed for horizontal service.

4.2.5
During transportation, all containers, boxes, crates, and cradles shall be secured to prevent shifting and overturning.

4.3 Pressure-Relief Devices

4.3.1
Cylinders, spheres, and tubes shall be equipped with one or more pressure-relief devices sized and selected as to type, location, and number, and tested in accordance with CGA Publication S-1.1 and this Standard, except as exempted in Clauses 4.3.3 to 4.3.6 inclusive. Where dangerous goods are not specifically listed, an appropriate equivalent relief device shall be selected in accordance with CGA Publication S-1.1. It shall be permitted to replace pressure-relief devices CG-2 and CG-4 by CG-3 and CG-5 respectively where the containers are designed to withstand the additional pressure.
Note: *As a guide for the selection of pressure-relief devices for mixtures of gases not covered by this Standard or CGA Publication S-1.1, reference may be made to CGA Publication S-7.*

4.3.2
Pressure-relief device systems shall be capable of preventing the rupture of normally filled containers when subjected to a fire test conducted in accordance with CGA Publication C-14 and, in the case of acetylene cylinders, CGA Publication C-12. Pressure-relief devices for composite cylinders shall be tested in accordance with CSA Standard B339.

4.3.3
Pressure-relief devices shall not be required on containers 305 mm or less in length, exclusive of neck, and 115 mm or less in outside diameter, except on containers that are
(a) filled with a liquefied gas for which a service pressure of 12.4 MPa, or higher, is specified;
(b) filled with a compressed gas at a pressure of 12.4 MPa or higher at 15°C; or
(c) manufactured to Specifications TC-39M and CTC-39. Fusible metal pressure-relief devices are not permitted on TC-39M and CTC-39 containers filled with liquefied gases. Where the liquefied gas is flammable, metal-body pressure-relief valves shall be used.

4.3.4
Except for containers manufactured to Specification TC-39M or CTC-39 and cylinders for dissolved acetylene, pressure-relief devices shall not be required on containers filled with compressed gas under a pressure of 2.1 MPa or less at 15°C.

4.3.5

Pressure-relief devices shall not be required on containers filled with
(a) methyl mercaptan, UN1064;
(b) mono-, di-, or trimethylamine, anhydrous, UN1061, UN1032, UN1083;
(c) not more than 4.5 kg of nitrosyl chloride, UN1069; or
(d) less than 75 kg of anhydrous ammonia, UN1005.

4.3.6

Pressure-relief devices shall be prohibited in containers filled with fluorine, compressed, UN1045, or any of the gases listed in Table 5.6.

Note: *For mixtures of fluorine or any of the gases listed in Table 5.6 with other gases, see the Note to Clause 4.3.1.*

location shall meet the following requirements:

(i) the bumper shall be so designed that the force of a collision will be transmitted directly to the chassis of the vehicle;

(ii) the bumper and its attachment to the chassis shall be designed to withstand a load equal to twice the weight of the loaded tube trailer and its attachments, based on a safety factor of 4 on the minimum ultimate strength of the material used, and with such load being applied horizontally and parallel to the ground from any direction at an angle not exceeding 10° to the longitudinal axis of the vehicle;

(iii) the clearance between the effective bottom of the bumper and the ground shall not exceed 760 mm with the vehicle empty;

(iv) the maximum inside distance between bumpers, if more than one is used, shall not exceed 590 mm;

(v) the maximum transverse distance from the widest part of the vehicle at the rear to the bumper shall not exceed 460 mm;

(vi) the bumper shall be located not more than 590 mm forward of the extreme rear of the vehicle;

(vii) the bumper shall be substantially constructed and firmly attached to the vehicle; and

(viii) the bumper, or vertical posts attached to the bumper, shall be located at least 150 mm to the rear of any component that may contain the lading at any time while in transport, and shall extend vertically to a height adequate to protect all valves and fittings forward of the bumper if damage could cause loss of lading.

(c) Road vehicles constructed and maintained so that the body, chassis, or other parts of the vehicle afford an equivalent rear-end protection shall be deemed in compliance with Item (b).

(d) Each discharge outlet of a pressure-relief device on a tube containing a flammable gas shall be directed upward, unobstructed, and protected against contamination, including rain and snow.

4.6 Service Limitations of Certain Containers

4.6.1 Specification TC-3ALM or CTC-3AL Cylinders

4.6.1.1

When used in nitrous oxide service, aluminum cylinders shall comply with the following requirements:

(a) cylinder valves shall be made of brass or stainless steel; and

(b) cylinders shall be cleaned in accordance with CGA Publication G-4.1.

4.6.1.2

When used in oxygen service, aluminum cylinders shall comply with the following requirements:

(a) cylinder valves shall be made of brass or stainless steel;

(b) cylinders shall be cleaned in accordance with CGA Publication G-4.1;

(c) cylinder threads shall be straight threads; and

(d) cylinders shall have a service pressure not greater than 20.7 MPa.

Δ 4.6.2 Specification TC-3FCM or TC-3HWM Cylinders

TC-3FCM and TC-3HWM composite cylinders shall be manufactured for services that are specified in the design qualification test reports. In addition,

(a) these containers shall be used only for

(i) gases in Class 2.2;

(ii) natural gas, compressed, UN1971, in accordance with the requirements of Clause 5.2.6; or

(iii) hydrogen, compressed, UN1049;

(b) when in oxygen service, these containers shall comply with Clause 4.6.1.2; and

(c) these containers shall be removed from service in accordance with Clause 24.2.7 of CSA Standard B339.

Δ 4.6.3 Specification TC-3HTM or CTC-3HT Cylinders

TC-3HTM and CTC-3HT cylinders shall be permitted, provided that
(a) their use is limited to aircraft;
(b) they are equipped with pressure-relief devices of the rupture disc type without fusible metal backing, with a rated bursting pressure of not more than 1.5 times the service pressure of the cylinder; and
(c) they are shipped individually in outer packaging meeting the requirements of Clause 5.6.2.5.

4.6.4 Specification TC-4EM or CTC-4E Cylinders

Unless otherwise specified, TC-4EM and CTC-4E cylinders shall not be permitted for
(a) gases in Classification 2.3;
(b) pyrophoric gases in Classification 2.1;
(c) ethyl chloride UN1037; or
(d) gases having a subsidiary Classification 6.1 or 8.

4.6.5 Specification TC-39M or CTC-39 Containers

4.6.5.1

Containers with a water capacity exceeding 1.25 L shall not be filled with Classification 2.1 gases.

4.6.5.2

Where used in oxygen service, aluminum containers shall comply with the following requirements:
(a) container threads shall be straight threads;
(b) container valves shall be made of brass or stainless steel; and
(c) containers shall be cleaned in accordance with CGA Publication G-4.1.

4.6.5.3

Unless otherwise specified, TC-39M and CTC-39 containers shall not be permitted for
(a) gases in Classification 2.3;
(b) pyrophoric gases in Classification 2.1;
(c) ethyl chloride UN1037; or
(d) gases having a subsidiary Classification 6.1 or 8.

4.6.5.4

TC-39M and CTC-39 containers shall not be refilled.

4.6.5.5

Where used for methylacetylene and propadiene mixture, stabilized (UN1060), the containers shall not be constructed using any material containing more than 65% copper.

4.7 ICC-3 Cylinders

The service pressure of ICC-3 cylinders is 12.4 MPa.
Note: *The service pressure is not marked on ICC-3 cylinders.*

4.8 Markings

Container markings shall not be altered, removed, or added to unless the marking is done in accordance with Clause 24 of CSA Standard B339 by a registered manufacturer, requalifier, repairer, reheat treater, or rebuilder registered in accordance with Clause 25 of CSA Standard B339. Markings shall be maintained in a legible condition.

Δ 4.9 Packaging

Containers manufactured to Specifications TC-3EM, CTC-3E, TC-3FCM, TC-4BAM spheres, CTC-4BA spheres, TC-4DM, CTC-4D, TC-4DAM, CTC-4DA, TC-4DSM, CTC-4DS, TC-39M, and CTC-39 shall be packaged in a box, crate, or cradle. Alternatively, TC-4BAM and CTC-4BA spheres may be securely mounted for shipment on pallets providing an equivalent level of protection to containers and appurtenances.

5. Selection and Filling of Containers for Transportation

5.1 General Requirements

5.1.1

Containers shall not be filled without the consent of the owner of the containers.

5.1.2

Containers shall be filled by personnel trained for that purpose.

5.1.3

Before a container is filled, it shall be inspected to
(a) verify through its markings that
(i) for containers manufactured after 31 December 1992, the cylinder, sphere, or tube has been manufactured in accordance with the requirements of CSA Standard B339; and
(ii) for containers manufactured before 1 January 1993, the cylinder, sphere, or tube has been manufactured in accordance with a TC, CTC, or ICC Specification listed in Table 24.1 of CSA Standard B339, or an equivalent BTC, CRC, ICC, or DOT Specification to the CTC Specifications listed in Table 24.1 and in use in Canada before 1 January 1993;
(b) verify through its markings that the container is not due for requalification;
(c) verify that there is no visible damage to the container that could weaken its pressure retention integrity. The standards of inspection for Specification containers listed in Table 24.1 of CSA Standard B339 are CGA Publications C-6, C-6.1, C-6.2, C-6.3, and C-13;
(d) verify that its accessories and attachments are in good condition;
(e) ensure that the container, pressure-relief devices, valves, and other accessories are suitable for the intended product and pressure; and
(f) verify that the previous service of the container does not exclude filling it with the intended Class 2 dangerous goods.

Note: *The Transportation of Dangerous Goods Regulations should be consulted for limitations imposed for transportation in Canada of US containers (ICC or DOT prefix).*

5.1.4

Containers to be filled shall comply with the following:
(a) containers not in compliance with Clause 5.1.3(a) or Clause 6 shall not be filled unless a permit for equivalent level of safety has been obtained from Transport Canada;
(b) before being filled, containers due for requalification shall be requalified in accordance with the requirements of CSA Standard B339. Containers that do not meet the requirements of the prefill inspection shall be rejected and not filled until the cause for rejection has been corrected.

5.1.5

Where containers with a marked service pressure are specified, other containers manufactured to the same Specification but to a higher service pressure shall be permitted. For example, containers marked TC-4BWM35 or CTC-4BW500 may be used where TC-4BWM17 or CTC-4BW240 are specified.

5.1.6
Containers shall not be filled with any substance where
(a) the containers and their accessories are made of materials that may react with the contents; or
(b) the products contained may react chemically, so as to adversely affect the pressure retention integrity of the containers or their accessories.

5.1.7
Gas filling limits shall apply to mixtures of solids or liquids, or both, with gases (eg, solids or liquids, or both, filled under gas pressure). Mixtures containing gases and insecticides that are nontoxic and nonflammable, and mixtures of nitrogen, carbon dioxide, or air with nonflammable, nontoxic, and noncorrosive liquid(s), shall be filled in containers listed in Clause 5.3.3. Mixtures containing gases and other materials, the mixtures of which are considered toxic or corrosive, shall be filled in accordance with Clause 5.6.

5.1.8
Valves and pressure-relief devices on filled containers shall be inspected after filling to detect leakage. No container shall be shipped with a leaking pressure-relief device or valve, or any other leak. Leaking fusible metal pressure-relief devices shall be replaced. Repair of defective fusible metal pressure-relief devices shall require replacement of fusible metal.
Note: *Clause 5.6 addresses the selection and filling of containers for transportation of specific toxic and corrosive gases. Other toxic and corrosive gases are covered by Clauses 5.2 and 5.3.*

5.2 Filling Cylinders, Spheres, and Tubes with Compressed Gases

5.2.1 Cylinders and Spheres
Compressed gases for which filling requirements for cylinders and spheres are not otherwise specified in this Standard shall be filled in containers manufactured to Specification ICC-3, TC-3AM, CTC-3A, TC-3AAM, CTC-3AA, CTC-3B, TC-3ASM, TC-3HTM, CTC-3HT, TC-3FCM, TC-3HWM, TC-3EM, CTC-3E, TC-4BM, CTC-4B, TC-4BAM, CTC-4BA, TC-4BWM, CTC-4BW, TC-39M, or CTC-39. TC-3HTM and CTC-3HT cylinders shall be filled only with gases of Classification 2.2. Other limitations on the use of TC-3HTM and CTC-3HT cylinders are specified in Clause 4.6.3. Unless otherwise specified in this Standard, TC-3ALM and CTC-3AL cylinders shall only be filled with the gases listed in Table 5.1. Other limitations on the use of TC-3ALM and CTC-3AL cylinders are specified in Clause 4.6.1. Limitations on the use of TC-39M and CTC-39 containers are specified in Clause 4.6.5. TC-3FCM and TC-3HWM shall be used in accordance with Clause 4.6.2.

5.2.2 Tubes

5.2.2.1
The following compressed gases shall be filled in tubes manufactured to Specification TC-3AXM, CTC-3AX, TC-3AAXM, CTC-3AAX, or TC-3TM:
(a) air, compressed, with not more than 23% oxygen, by volume;
(b) argon, compressed;
(c) boron trifluoride, compressed;
(d) helium, compressed;
(e) methane, compressed, with a minimum purity of 98% and commercially free of corroding components;
(f) neon, compressed;
(g) nitrogen, compressed; and
(h) oxygen, compressed.

Table 5.2 (Continued)

Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Carbon dioxide	UN1013	68	TC-3AM138, CTC-3A1800, TC-3AXM138, CTC-3AX1800, TC-3AAM138, CTC-3AA1800, TC-3AAXM138, CTC-3AAX1800, TC-3EM124, CTC-3E1800, ICC-3, TC-3TM138, TC-39M, CTC-39, TC-3HTM138, CTC-3HT2000, TC-3ALM124, CTC-3AL1800, TC-3ASM138
Chlorine†	UN1017	125	TC-3AM33, CTC-3A480, TC-3AAM33, CTC-3AA480, ICC-3, TC-3ANM33, CTC-3BN480, TC-3EM124, CTC-3E1800
1-Chloro-1,1-difluoroethane, or refrigerant gas R142b	UN2517	100	TC-3AM10, CTC-3A150, TC-3AAM10, CTC-3AA150, CTC-3B150, TC-4BM10, CTC-4B150, TC-4BAM16, CTC-4BA225, TC-4BWM16, CTC-4BW225, TC-3EM124, CTC-3E1800, TC-3ALM10, CTC-3AL150, TC-39M, CTC-39, TC-3ASM10
Chlorodifluoromethane, or refrigerant gas R22	UN1018	105	TC-3AM17, CTC-3A240, TC-3AAM17, CTC-3AA240, CTC-3B240, TC-4BM17, CTC-4B240, TC-4BAM17, CTC-4BA240, TC-4BWM17, CTC-4BW240, TC-4BM17ET, CTC-4B240ET, TC-4EM17, CTC-4E240, TC-39M, CTC-39, TC-3EM124, CTC-3E1800, TC-3ALM17, CTC-3AL240, TC-3ASM17
Chlorodifluoromethane and Chloropentafluoroethane mixture with fixed boiling point, with approximately 49% chlorodifluoromethane, or refrigerant gas R502	UN1973	105	TC-3AM18, CTC-3A260, TC-3AAM18, CTC-3AA260, TC-4AAM33, CTC-4AA480, TC-4BAM18, CTC-4BA260, TC-4BWM18, CTC-4BW260, TC-4BWM18, CTC-4BW260, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM18, CTC-3AL260, TC-3ASM18

(Continued)

Table 5.2 (Continued)

Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Chloropentafluoroethane, or refrigerant gas R115	UN1020	110	TC-3AM16, CTC-3A225, CTC-3B225, TC-3AAM16, CTC-3AA225, TC-4BAM16, CTC-4BA225, TC-4BM16, CTC-4B225, TC-4BWM16, CTC-4BW225, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM16, CTC-3AL225, TC-3ASM16
1-chloro-1,2,2,2-tetrafluoroethane, or refrigerant gas R124	UN1021	117	TC-3AM18, CTC-3A260, TC-3AAM18, CTC-3AA260, TC-4AAM33, CTC-4AA480, TC-4BAM18, CTC-4BA260, TC-4BWM18, CTC-4BW260, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM18, CTC-3AL260, TC-3ASM18
Chlorotrifluoromethane, or refrigerant gas R13	UN1022	100	TC-3AM138, CTC-3A1800, ICC-3, TC-3AAM138, CTC-3AA1800, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM124, CTC-3AL1800, TC-3ASM138
Δ Chlorotrifluoromethane and trifluoromethane azeotropic mixture, with approximately 60% chlorotrifluoromethane, or refrigerant gas R503	UN2599	70**	TC-3AM138, CTC-3A1800, TC-3AAM138, CTC-3AA1800, TC-3EM124, CTC-3E1800, TC-3ALM124, CTC-3AL1800, TC-3ASM138
Cyclopropane	UN1027	55	TC-3AM16, CTC-3A225, CTC-3A480X, TC-3AAM16, CTC-3AA225, CTC-3B225, TC-4AAM33, CTC-4AA480, TC-4BM16, CTC-4B225, TC-4BAM16, CTC-4BA225, TC-4BWM16, CTC-4BW225, TC-4BM17ET, CTC-4B240ET, ICC-3, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM16, CTC-3AL225, TC-3ASM16

(Continued)

Table 5.2 (Continued)

Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Dichlorodifluoromethane, or refrigerant gas R12	UN1028	119	TC-3AM16, CTC-3A225, TC-3AAM16, CTC-3AA225, CTC-3B225, TC-4BM16, CTC-4B225, TC-4BAM16, CTC-4BA225, TC-4BWM16, CTC-4BW225, TC-4BM17ET, CTC-4B240ET, TC-4EM16, CTC-4E225, TC-39M, CTC-39, TC-3EM124, CTC-3E1800, TC-3ALM16, CTC-3AL225, TC-3ASM16
Dichlorodifluoromethane and difluoroethane azeotropic mixture, with approximately 74% dichlorodifluoromethane, or refrigerant gas R500	UN2602	Not liquid-full at 55°C	TC-3AM17, CTC-3A240, TC-3AAM17, CTC-3AA240, CTC-3B240, TC-4BM17, CTC-4B240, TC-4BAM17, CTC-4BA240, TC-4BWM17, CTC-4BW240, TC-3EM124, CTC-3E1800, TC-4EM17, CTC-4E240, TC-39M, CTC-39, TC-3ASM17
1,2-Dichloro-1,1,2,2-tetrafluoroethane, or refrigerant gas R114	UN1958	125	TC-3AM18, CTC-3A260, TC-3AAM18, CTC-3AA260, TC-4AAM33, CTC-4AA480, TC-4BAM18, CTC-4BA260, TC-4BWM18, CTC-4BW260, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM18, CTC-3AL260, TC-3ASM18
1,1-Difluoroethane, or refrigerant gas R152a	UN1030	79	TC-3AM10, CTC-3A150, TC-3AAM10, CTC-3AA150, CTC-3B150, TC-4BAM16, CTC-4BA225, TC-4BM10, CTC-4B150, TC-4BWM16, CTC-4BW225, TC-3EM124, CTC-3E1800, TC-3ALM10, CTC-3AL150, TC-3ASM10

(Continued)

Table 5.2 (Continued)

	Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Δ	Difluoromethane, or refrigerant gas R32	UN3252	81	TC-3AM28, CTC-3A400, TC-3AAM28, CTC-3AA400, CTC-3B400, TC-4BM28, CTC-4B400, TC-4BAM28, CTC-4BA400, TC-4BWM28, CTC-4BW400, TC-39M, CTC-39, TC-3EM124, CTC-3E1800, TC-3ALM28, CTC-3AL400, TC-3ASM28
	Dimethylamine, anhydrous	UN1032	59	TC-3AM10, CTC-3A150, TC-3AAM10, CTC-3AA150, CTC-3B150, TC-4BM10, CTC-4B150, TC-4BAM16, CTC-4BA225, TC-4BWM16, CTC-4BW225, TC-3EM124, CTC-3E1800, TC-3ASM10
	Ethane	UN1035	35.8	TC-3AM138, CTC-3A1800, TC-3AXM138, CTC-3AX1800, TC-3AAM138, CTC-3AA1800, TC-3AAXM138, CTC-3AAX1800, ICC-3, TC-3EM124, CTC-3E1800, TC-3TM138, TC-39M, CTC-39, TC-3ALM124, CTC-3AL1800, TC-3ASM138
	Ethane	UN1035	36.8	TC-3AM153, CTC-3A2000, TC-3AXM153, CTC-3AX2000, TC-3AAM153, CTC-3AA2000, TC-3AAXM153, CTC-3AAX2000, TC-39M, CTC-39, TC-3TM153, TC-3ALM138, CTC-3AL2000, TC-3ASM153
	Ethylene, compressed	UN1962	31.0	TC-3AM138, CTC-3A1800, TC-3AXM138, CTC-3AX1800, TC-3AAM138, CTC-3AA1800, TC-3AAXM138, CTC-3AAX1800, ICC-3, TC-3EM124, CTC-3E1800, TC-3TM138, TC-39M, CTC-39, TC-3ALM124, CTC-3AL1800, TC-3ASM138

(Continued)

Table 5.2 (Continued)

	Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
	Ethylene, compressed	UN1962	32.5	TC-3AM153, CTC-3A2000, TC-3AXM153, CTC-3AX2000, TC-3AAM153, CTC-3AA2000, TC-3AAXM153, CTC-3AAX2000, TC-39M, CTC-39, TC-3TM153, TC-3ALM138, CTC-3AL2000, TC-3ASM153
	Ethylene, compressed	UN1962	35.5	TC-3AM184, CTC-3A2400, TC-3AXM184, CTC-3AX2400, TC-3AAM184, CTC-3AA2400, TC-3AAXM184, CTC-3AAX2400, TC-39M, CTC-39, TC-3TM184, TC-3ALM165, CTC-3AL2400, TC-3ASM184
Δ	Heptafluoropropane, or refrigerant gas R227	UN3296	124	TC-3AM11, CTC-3A150, TC-3AAM11, CTC-3AA150, CTC-3B150, TC-4BM11, CTC-4B150, TC-4BAM16, CTC-4BA225, TC-4BWM16, CTC-4BW225, TC-4BM16ET, CTC-4B160ET, TC-39M, CTC-39, TC-3EM124, CTC-3E1800, TC-3ALM11, CTC-3AL150, TC-3ASM11
	Hydrogen chloride, anhydrous	UN1050	65	TC-3AM138, CTC-3A1800, TC-3AXM138, CTC-3AX1800, TC-3AAM138, CTC-3AA1800, TC-3AAXM138, CTC-3AAX1800, ICC-3, TC-3TM138, TC-3EM124, CTC-3E1800
	Hydrogen sulphide‡	UN1053	62.5	TC-3AM33, CTC-3A480, TC-3AAM33, CTC-3AA480, CTC-3B480, TC-4BM33, CTC-4B480, TC-4BAM33, CTC-4BA480, TC-4BWM33, CTC-4BW480, TC-3EM124, CTC-3E1800, TC-3ALM33, CTC-3AL480, TC-3ASM33

(Continued)

Table 5.2 (Continued)

Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Insecticide gas n.o.s.§	UN1968	Not liquid-full at 55°C	TC-3AM21, CTC-3A300, TC-3AAM21, CTC-3AA300, CTC-3B480, TC-4BM21, CTC-4B300, TC-4BAM21, CTC-4BA300, TC-4BWM21, CTC-4BW300, TC-3EM124, CTC-3E1800, TC-3ASM21
Methylacetylene and propadiene mixture, stabilized††	UN1060	50	TC-4BM17 and CTC-4B240 without brazed seams, TC-4BAM17 and CTC-4BA240 without brazed seams, TC-3AM17, CTC-3A240, TC-3AAM17, CTC-3AA240, CTC-3B240, TC-3EM124, CTC-3E1800, TC-4BWM17, CTC-4BW240, TC-4EM17, CTC-4E240, TC-4BM17ET, CTC-4B240ET, TC-3ALM17, CTC-3AL240, TC-3ASM17, TC-39M, CTC-39
Methylamine, anhydrous	UN1061	60	TC-3AM10, CTC-3A150, TC-3AAM10, CTC-3AA150, CTC-3B150, TC-4BM10, CTC-4B150, TC-4BAM16, CTC-4BA225, TC-4BWM16, CTC-4BW225, TC-3EM124, CTC-3E1800, TC-3ASM10
Methyl chloride, or refrigerant gas R40	UN1063	84	TC-3AM16, CTC-3A225, TC-3AAM16, CTC-3AA225, CTC-3B225, TC-4BM16, CTC-4B225, TC-4BAM16, CTC-4BA225, TC-4BWM16, CTC-4BW225, ICC-3, TC-3EM124, CTC-3E1800, TC-4BM17ET, CTC-4B240ET, TC-3ASM16
Methyl mercaptan	UN1064	80	TC-3AM17, CTC-3A240, TC-3AAM17, CTC-3AA240, CTC-3B240, TC-4BM17ET, CTC-4B240ET, TC-4BM17, CTC-4B240, TC-3EM124, CTC-3E1800, TC-4BAM17, CTC-4BA240, TC-4BWM17, CTC-4BW240, TC-3ASM17

(Continued)

Table 5.2 (Continued)

	Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
	Nitrosyl chloride	UN1069	110	TC-3ANM28, CTC-3BN400
	Nitrous oxide	UN1070	68	TC-3AM138, CTC-3A1800, TC-3AXM138, CTC-3AX1800, TC-3AAM138, CTC-3AA1800, TC-3AAXM138, CTC-3AAX1800, ICC-3, TC-3EM124, CTC-3E1800, TC-3HTM138, CTC-3HT2000, TC-39M, CTC-39, TC-3TM138, TC-3ALM124, CTC-3AL1800, TC-3ASM138
	Pentafluoroethane, or refrigerant gas R125	UN3220	104	TC-3AM18, CTC-3A260, TC-3AAM18, CTC-3AA260, TC-4AAM33, CTC-4AA480, TC-4BAM18, CTC-4BA260, TC-4BWM18, CTC-4BW260, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM18, CTC-3AL260, TC-3ASM18
Δ	Refrigerant gas R404a	UN3337	85	TC-3AM21, CTC-3A300, TC-3AAM21, CTC-3AA300, CTC-3B300, TC-4BM21, CTC-4B300, TC-4BAM21, CTC-4BA300, TC-4BWM21, CTC-4BW300, TC-39M, CTC-39, TC-3EM124, CTC-3E1800, TC-3ALM21, CTC-3AL300, TC-3ASM21
Δ	Refrigerant gas R407a	UN3338	98	TC-3AM20, CTC-3A300, TC-3AAM20, CTC-3AA300, CTC-3B300, TC-4BM20, CTC-4B300, TC-4BAM20, CTC-4BA300, TC-4BWM20, CTC-4BW300, TC-39M, CTC-39, TC-3EM124, CTC-3E1800, TC-3ALM20, CTC-3AL300, TC-3ASM20

(Continued)

Table 5.2 (Continued)

	Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Δ	Refrigerant gas R407b	UN3339	98	TC-3AM22, CTC-3A310, TC-3AAM22, CTC-3AA310, CTC-3B310, TC-4BM22, CTC-4B310, TC-4BAM22, CTC-4BA310, TC-4BWM22, CTC-4BW310, TC-39M, CTC-39, TC-3EM124, CTC-3E1800, TC-3ALM22, CTC-3AL310, TC-3ASM22
Δ	Refrigerant gas R407c	UN3340	100	TC-3AM19, CTC-3A270, TC-3AAM19, CTC-3AA270, CTC-3B270, TC-4BM19, CTC-4B270, TC-4BAM19, CTC-4BA270, TC-4BWM19, CTC-4BW270, TC-39M, CTC-39, TC-3EM124, CTC-3E1800, TC-3ALM19, CTC-3AL270, TC-3ASM19
	Refrigerant gas, n.o.s.§	UN1078	Not liquid-full at 55°C	TC-3AM17, CTC-3A240, TC-3AAM17, CTC-3AA240, CTC-3B240, TC-3EM124, CTC-3E1800, TC-4BM17, CTC-4B240, TC-4BAM17, CTC-4BA240, TC-4BWM17, CTC-4BW240, TC-4EM17, CTC-4E240, TC-39M, CTC-39, TC-3ALM17, CTC-3AL240
	Sulphur dioxide	UN1079	125	TC-3AM16, CTC-3A225, TC-3AAM16, CTC-3AA225, CTC-3B225, TC-4BM16, CTC-4B225, TC-4BAM16, CTC-4BA225, TC-4BWM16, CTC-4BW225, TC-4BM17ET, CTC-4B240ET, ICC-3, TC-39M, CTC-39, TC-3EM124, CTC-3E1800, TC-3ALM16, CTC-3AL225, TC-3ASM16

(Continued)

Table 5.2 (Continued)

Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Sulphur hexafluoride	UN1080	120	TC-3AM77, CTC-3A1000, TC-3AAM77, CTC-3AA1000, TC-3AAXM138, CTC-3AAX1800, ICC-3, TC-3TM138, TC-3EM124, CTC-3E1800, TC-3ALM69, CTC-3AL1000, TC-3ASM77
Sulphuryl fluoride	UN2191	106	TC-3AM33, CTC-3A480, TC-3AAM33, CTC-3AA480, TC-3EM124, CTC-3E1800, TC-4BM33, CTC-4B480, TC-4BAM33, CTC-4BA480, TC-4BWM33, CTC-4BW480, TC-3ASM33
1,1,1,2-Tetrafluoroethane, or refrigerant gas R134a	UN3159	104	TC-3AM18, CTC-3A260, TC-3AAM18, CTC-3AA260, TC-4AAM33, CTC-4AA480, TC-4BAM18, CTC-4BA260, TC-4BWM18, CTC-4BW260, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM18, CTC-3AL260, TC-3ASM18
Tetrafluoroethylene, stabilized (also known as R1114)	UN1081	90	TC-3AM92, CTC-3A1200, TC-3AAM92, CTC-3AA1200, TC-3EM124, CTC-3E1800, TC-3ASM92
Tetrafluoromethane, compressed, or refrigerant gas R14, compressed	UN1982	70**	TC-3AM138, CTC-3A1800, TC-3AAM138, CTC-3AA1800, TC-3EM124, CTC-3E1800, TC-3ALM124, CTC-3AL1800, TC-3ASM138
Trifluorochloroethylene, stabilized (also known as R1113)	UN1082	115	TC-3AM21, CTC-3A300, TC-3AAM21, CTC-3AA300, CTC-3B300, TC-4BM21, CTC-4B300, TC-4BAM21, CTC-4BA300, TC-4BWM21, CTC-4BW300, TC-3EM124, CTC-3E1800, TC-3ASM21
Trifluoromethane, or refrigerant gas R23	UN1984	70**	TC-3AM138, CTC-3A1800, TC-3AAM138, CTC-3AA1800, TC-3EM124, CTC-3E1800, TC-3ALM124, CTC-3AL1800, TC-3ASM138

(Continued)

Table 5.2 (Continued)

Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Trimethylamine, anhydrous	UN1083	57	TC-3AM10, CTC-3A150, TC-3AAM10, CTC-3AA150, CTC-3B150, TC-4BM10, CTC-4B150, TC-4BAM16, CTC-4BA225, TC-4BWM16, TC-4BW225, TC-3EM124, CTC-3E1800, TC-3ASM10
Vinyl chloride, stabilized†† (also known as R1140)	UN1086	84	TC-4BM10 and CTC-4B150 without brazed seams, TC-4BAM16 and CTC-4BA225 without brazed seams, TC-4BWM16, CTC-4BW225, TC-3AM10, CTC-3A150, TC-3AAM10, CTC-3AA150, TC-3EM124, CTC-3E1800, TC-3ALM10, CTC-3AL150, TC-3ASM10
Vinyl fluoride, stabilized‡‡ (also known as R1141)	UN1860	62	TC-3AM138, CTC-3A1800, TC-3AAM138, CTC-3AA1800, TC-3EM124, CTC-3E1800, TC-3ALM124, CTC-3AL1800, TC-3ASM138

(Continued)

5.5.2
Additional requirements for hydrogen shall be as follows:
(a) the maximum filling density shall be 6.7% at –253°C (the water capacity shall be corrected to be the actual internal volume of the cylinders at –253°C);
(b) the pressure-limiting device shall be set at not more than 117 kPa;
(c) the cylinder design service temperature shall be –253°C or colder;
(d) the pressure in each cylinder shall be reduced to 55 kPa or lower at least once within 4 h prior to transportation;
(e) the outer cylinder jacket shall be made of steel; and
(f) the total rate of venting shall be marked on the top head or valve protection band in letters at least 12.5 mm high.

5.5.3
Argon, nitrogen, oxygen, and helium refrigerated liquids may be filled in nonspecification vacuum-insulated containers with a pressure of up to 0.3 MPa. When transported, they shall be secured in the upright position.

5.6 Filling Containers with Specific Dangerous Goods, Class 2

5.6.1 Application
Clause 5.6 covers only the selection and filling of containers for the transportation of dangerous goods listed in Table 5.6.

5.6.2 General Requirements

5.6.2.1
Unless otherwise specified, the following requirements for containers and their accessories shall apply:
(a) Valves on containers shall be capable of withstanding the test pressure of the containers and shall be connected directly to the containers with taper-threaded connections. Bushings shall not be used on the connections.
(b) For corrosive gases, valves may be of the packed type, provided that the assembly is made gas-tight by means of a seal cap with a compatible gasketed joint to the valve body or to the container to prevent loss of gas through or past the packing; otherwise, the valves shall be of the packless type with nonperforated diaphragms and equipped with handwheels.
(c) Valve outlets shall be sealed by a threaded cap or a threaded solid plug. The outlet caps and plugs, luting, and gaskets shall be compatible with each other, the valve assembly, and the contents.
(d) Manifolding of containers shall be prohibited.

5.6.2.2
Unless otherwise specified, gases shall be filled in containers manufactured to Specification TC-3AM138, CTC-3A1800, TC-3AAM138, CTC-3AA1800, TC-3EM124, CTC-3E1800, TC-3ALM124, CTC-3AL1800, or TC-3ASM138, subject to the following requirements:
(a) TC-3AM138, CTC-3A1800, TC-3AAM138, CTC-3AA1800, TC-3ALM124, CTC-3AL1800, and TC-3ASM138 containers shall not exceed 57 L water capacity (nominal); and
(b) TC-3EM124 and CTC-3E1800 containers shall be packed in strong wooden or metal boxes that meet the requirements of Clause 5.6.2.5.

5.6.2.3
The pressure of the gas at 55°C shall not exceed the service pressure of the cylinder except that, where the filling is done in TC-3AM, TC-3AAM, or TC-3ASM cylinders, the pressure at 55°C shall not exceed 90% of the service pressure of the cylinder.

Δ **5.6.2.4**

The liquid phase of a liquefied gas or any mixture of liquefied gases and any liquid or solid shall not fill a container at any temperature up to 55°C except as permitted in Clause 5.6.3. Filling of a liquefied gas or a liquid to be pressurized by a gas shall be by mass measurement using an approved scale. After being disconnected from the filling line, containers shall have their mass verified and any overfill shall be removed in a safe manner.

Table 5.6
Dangerous Goods Covered by Clause 5.6

(See Clauses 4.3.6 and 5.6.1.)

	Shipping name and description	PIN
	Arsine	UN2188
	Boron trichloride	UN1741
	Bromine chloride	UN2901
	Carbonyl fluoride, compressed	UN2417
	Carbonyl sulphide	UN2204
	Chlorine pentafluoride	UN2548
	Chlorine trifluoride	UN1749
	Chloropicrin and methyl bromide mixture	UN1581
	Chloropicrin and methyl chloride mixture	UN1582
	Cyanogen	UN1026
	Cyanogen chloride, stabilized	UN1589
	Dichlorosilane	UN2189
	Dinitrogen tetroxide or nitrogen dioxide	UN1067
	Germane	UN2192
	Hexaethyl tetraphosphate and compressed gas mixture	UN1612
	Hexafluoroacetone	UN2420
	Hydrogen bromide, anhydrous	UN1048
	Hydrogen iodide, anhydrous	UN2197
	Hydrogen selenide, anhydrous	UN2202
Δ	Insecticide gas, toxic, flammable, n.o.s.*	UN3355
	Insecticide gas, toxic, n.o.s.*	UN1967
	Methyl bromide	UN1062
	Methylchlorosilane	UN2534
	Nitric oxide, compressed	UN1660
	Nitric oxide and dinitrogen tetroxide mixture, or nitric oxide and nitrogen dioxide mixture	UN1975
	Nitrogen trioxide	UN2421
	Oxygen difluoride, compressed	UN2190
	Perchloryl fluoride	UN3083
	Phosgene	UN1076
	Phosphine	UN2199
	Phosphorus pentafluoride, compressed	UN2198
	Selenium hexafluoride	UN2194
	Silicon tetrafluoride, compressed	UN1859
	Stibine	UN2676
	Sulphur tetrafluoride	UN2418
	Tellurium hexafluoride	UN2195
	Trifluoroacetyl chloride	UN3057

**n.o.s. means not otherwise specified.*

5.6.2.5
When containers are required to be packed in outer packaging such as a box, crate, or cradle, the outer packaging shall be of sufficient strength to protect all parts of the containers from deformation or breakage resulting from a drop of at least 1.85 m onto a solid, concrete floor, impacting at the weakest point. Containers shall be cushioned or braced inside the outer packaging as necessary to prevent damage.

Note: *Containers used for the purpose of testing the protective means or devices in accordance with Clause 5.6.2.5 should be filled with nonpoisonous, nonflammable substances to a pressure and mass equivalent to that of the intended contents. In performing the foregoing tests, proper safety precautions should be taken to protect personnel and property.*

5.6.3 Specific Requirements

5.6.3.1 Phosgene, UN1076
Phosgene shall be filled in containers as follows:
(a) the filling density shall not exceed 125%;
(b) no container shall be filled with more than 68 kg of phosgene; and
(c) each filled container shall be leak tested and show no leakage. This test shall consist of immersing the container and valve, with the protection cap removed, in a bath of water at a temperature of 65°C for at least 30 min, during which time frequent examinations shall be made to note any escape of gas. The valve on the container shall not be opened after this test, before or during transportation.

5.6.3.2 Chloropicrin and Methyl Chloride Mixture, UN1582
Chloropicrin and methyl chloride mixtures may also be filled in containers manufactured to Specification TC-3AM, CTC-3A, TC-3AAM, CTC-3AA, CTC-3B, TC-4BM, CTC-4B, TC-4BAM, CTC-4BA, TC-4BWM, CTC-4BW, TC-3EM, or CTC-3E, subject to the following requirements:
(a) containers shall have a water capacity not greater than 113 L; and
(b) containers with a wall thickness less than 2.54 mm shall be packed in a box, crate, or cradle that meets the requirements of Clause 5.6.2.5.

5.6.3.3 Cyanogen Chloride, Stabilized, UN1589
Cyanogen chloride, stabilized, containing less than 0.9% water may also be filled in containers manufactured to Specification TC-3AM33, CTC-3A480, TC-3AAM33, CTC-3AA480, TC-3ALM124, or CTC-3AL1800, subject to the following requirements:
(a) containers shall have a water capacity not greater than 126 L; and
(b) containers shall have a gas-tight threaded valve protection cap at least 4.75 mm thick and have a 4.75 mm face seat for a gasket.

5.6.3.4 Hexaethyl Tetraphosphate and Compressed Gas Mixture, UN1612
Hexaethyl tetraphosphate and compressed gas mixtures shall be filled in containers manufactured to Specification TC-3AM17, CTC-3A240, CTC-3B240, TC-3AAM17, CTC-3AA240, TC-4BM17, CTC-4B240, TC-4BAM17, CTC-4BA240, TC-4BWM17, or CTC-4BW240, subject to the following requirements:
(a) the compressed gas shall be nonflammable. The mixture shall not contain more than 20% by mass of the organic phosphate;
(b) containers shall not be filled to more than 4.54 kg of the mixture;
(c) the filling density shall not exceed 80%;
(d) containers shall not be equipped with siphon tubes or fusible plugs;
(e) up to 12 containers may be packed in a wooden box that meets the requirements of Clause 5.6.2.5; and
(f) a single-trip, outside fibreboard box may be used for packaging when not more than four such containers are to be packed in one box. Box and valve protection shall meet the requirements of Clause 5.6.2.5.

5.6.3.5 Dinitrogen Tetroxide or Nitrogen Dioxide, UN1067

Dinitrogen tetroxide or nitrogen dioxide may also be filled in containers manufactured to Specification TC-3AM33, CTC-3A480, TC-3AAM33, CTC-3AA480, TC-3ALM124, or CTC-3AL1800, subject to the following requirements:

(a) threaded valve protection caps shall be at least 4.75 mm thick and have a 4.75 mm face seat for a gasket; and

(b) each cylinder shall be cleaned in accordance with the requirements of CGA Publication G-4.1.

5.6.3.6 Chlorine Pentafluoride, UN2548, and Chlorine Trifluoride, UN1749

Chlorine pentafluoride and chlorine trifluoride shall be filled in containers manufactured to Specification TC-3AM10, CTC-3A150, CTC-3B240, TC-3AAM10, CTC-3AA150, TC-3ANM10, CTC-3BN150, TC-4BM17, CTC-4B240, TC-4BAM17, CTC-4BA240, TC-4BWM17, CTC-4BW240, TC-3EM, or CTC-3E.

5.6.3.7 Methyl Bromide, UN1062, and Chloropicrin and Methyl Bromide Mixture, UN1581

Methyl bromide, and chloropicrin and methyl bromide mixtures, may also be filled in containers manufactured to Specification TC-3AM16, CTC-3A225, TC-3AAM16, CTC-3AA225, CTC-3B225, TC-4BM16, CTC-4B225, TC-4BAM16, CTC-4BA225, TC-4BWM16, or CTC-4BW225.

Containers with a wall thickness of less than 2.03 mm shall be packaged in a box, crate, or cradle that meets the requirements of Clause 5.6.2.5.

Δ

5.6.3.8 Phosphine, UN2199

The filling density of phosphine, containing not more than 1% impurities by weight, shall not exceed 45%.

5.6.3.9 Nitric Oxide, Compressed, UN1660

Nitric oxide, compressed shall be filled in containers that comply with the following:

(a) they shall be TC-3AM138, TC-3AAM138, TC-3EM124, TC-3ALM124 cylinders or equivalent containers;

(b) they shall be filled to a pressure not greater than 5.1 MPa at 15°C. Mixtures with up to 10% nitric oxide may be filled to 12.4 MPa;

(c) they shall be equipped with a stainless steel valve and a valve seat of material compatible with nitric oxide and nitrogen dioxide. Valve outlets shall be sealed by a threaded cap or plug with an inert gasketing material;

(d) they shall be cleaned in accordance with the requirements of CGA Publication G-4.1;

(e) Specification TC-3EM and CTC-3E cylinders shall be packed in strong wooden boxes that meet the requirements of Clause 5.6.2.5; and

(f) Specification TC-3AM, TC-3AAM, TC-3ALM, or equivalent containers shall be packed in accordance with Item (e) or have their valves protected by metal caps or other attached protective devices in accordance with Clause 4.2.3.

5.7 Filling Cylinders, Spheres, and Tubes with Radioactive Gases

Radioactive gases shall be filled in Series 3 and 4 containers in accordance with the other filling requirements for the same gases. The radioactive gas packages shall also meet the transport packaging requirements of the Canadian Nuclear Safety Commission Regulations.

6. Other Containers

6.1 Accumulators Transported as Articles, Pressurized, Hydraulic (Containing Nonflammable Gas) or Articles, Pressurized, Pneumatic (Containing Nonflammable Gas), UN3164

Accumulators (pneumatic or hydraulic) with a water capacity not exceeding 41 L filled with a gas and offered for transportation shall be constructed in accordance with the applicable codes. Such accumulators shall only be filled with a nonflammable, nontoxic, and noncorrosive gas, and shall be protected by overpacking. Accumulators that have a water capacity exceeding 41 L offered for transportation shall not be pressurized with a gas.

6.2 Refrigerating Machines Containing Nonflammable, Nontoxic, Liquefied Gas or Ammonia Solutions, UN2857, and Refrigerating Machines Containing Flammable, Nontoxic, Liquefied Gas, UN3358

Refrigerating machines containing nonflammable, nontoxic, liquefied gas or ammonia solutions, and refrigerating machines containing flammable, nontoxic, liquefied gas, shall be exempt from other requirements of this Standard, provided that they meet the following requirements:
(a) containers shall be manufactured, inspected, and tested in accordance with CSA Standard B52;
(b) containers shall not be filled with more than 227 kg of Group I refrigerant as classified in CSA Standard B52 or more than 22.7 kg of refrigerant other than Group I;
(c) machines or components thereof having two or more filled containers shall not contain an aggregate of more than 907 kg of Group I refrigerant or more than 45.4 kg of refrigerant other than Group I;
(d) containers shall be equipped with a shut-off valve at each opening except those openings used for pressure-relief devices; the shut-off valves shall be closed prior to and during transportation;
(e) the liquid portion of the refrigerant, if any, shall not completely fill any container at 55°C; and
(f) the amount of refrigerant, if liquefied, shall not exceed the filling density specified in Clause 5.3.

6.3 Lighters or Lighter Refills (Cigarettes) Containing Flammable Gas and Capable of Passing the Tests Specified in the Hazardous Products (Lighters) Regulations, UN1057

Lighters and lighter refills designed to contain liquefied petroleum gases shall be filled in accordance with the following requirements:
(a) lighters and lighter refills shall not contain more than 70 mL of liquefied gas;
(b) the liquid phase shall not exceed 85% of the volumetric capacity of each fluid chamber at 15°C;
(c) lighters and lighter refills, including their closures, shall be capable of withstanding without leakage an internal pressure of at least two times the vapour pressure of the gas at 55°C; and
(d) lighters and lighter refills shall be packaged so as to prevent their movement within the package.

Δ 6.4 Salvage Containers

Salvage containers used for overpacking damaged or leaking cylinders shall be exempt from the other requirements of this Standard and may be transported by road to the nearest facility for remediation, provided that they
(a) were manufactured before January 1, 2006; and
(b) meet the requirements of one of the following US DOT exemptions from the US 49 CFR Hazardous Materials Regulations:
- (i) E 9507;
- (ii) E 10022;
- (iii) E 10323;
- (iv) E 10504;

(v) E 10519;
(vi) E 10777; or
(vii) E 11257.

Note: *Any salvage container manufactured on or after January 1, 2006, will require a Permit for Equivalent Level of Safety from Transport Canada.*

Δ 6.5 Filling and Handling of Foreign Cylinders for Export

6.5.1

A cylinder manufactured in a foreign country in compliance with that country's statutory requirements, and authorized for filling with a gas, may be filled with that gas in Canada and transported between the filling plant and the port of exit from which the cylinder entered Canada and will be exported from Canada, with or without intermediate storage, if it complies with the following requirements:
(a) the cylinder shall be requalified as specified in CSA Standard B339. This requalification may be omitted only if the cylinder can be identified as having been requalified within the time-frame as specified in Table 24.1 of CSA Standard B339; and
(b) the cylinder shall be filled in accordance with the lesser of the following filling density or pressure requirements:
(i) those specified by the country of origin; or
(ii) those specified in this Standard or otherwise permitted by the regulatory authority for the gas involved.

6.5.2

A cylinder otherwise in compliance with Clause 6.5.1 and filled with a gas may be imported into Canada, stored, and exported full. Such cylinders shall not be transported in Canada except for export.

Δ 6.6 Containers Not Specifically Listed

Containers for the transportation of dangerous goods, Class 2, with a water capacity not greater than 450 L that do not meet the requirements of CSA Standard B339 or Clause 6 of this Standard may be used if they meet the requirements of Part 1 of CSA Standard B51.

Appendix C
List of Compounds Referenced in the Act *But Not Listed in CSA Standard B340*

Note: *This Appendix is not a mandatory part of this Standard.*

Δ C1.

The following compounds are listed in the *Transportation of Dangerous Goods Act*, but are not included in the lists or tables in CSA Standard B340. This list may not be all-inclusive. It is recommended that anyone wishing to transport these compounds should do so in accordance with the applicable general requirements in this Standard.

Shipping name and description	PIN
Ammonia solution, relative density less than 0.880 at 15°C in water, with more than 35% but not more than 50% ammonia	UN2073
Ammonia solution, relative density less than 0.880 at 15°C in water, with more than 50% ammonia	UN3318
Bromotrifluoroethylene	UN2419
Butadienes, stabilized	UN1010
Carbon dioxide and nitrous oxide mixture	UN1015
Carbon dioxide and oxygen mixture, compressed	UN1014
Carbon monoxide and hydrogen mixture, compressed	UN2600
1-Chloro-2,2,2-trifluoroethane, or refrigerant gas R133a	UN1983
Coal gas, compressed	UN1023
Compressed gas, flammable, n.o.s.*	UN1954
Compressed gas, n.o.s.*	UN1956
Compressed gas, oxidizing, n.o.s.*	UN3156
Compressed gas, toxic, corrosive, n.o.s.*	UN3304
Compressed gas, toxic, flammable, corrosive, n.o.s.*	UN3305
Compressed gas, toxic, flammable, n.o.s.*	UN1953
Compressed gas, toxic, n.o.s.*	UN1955
Compressed gas, toxic, oxidizing, corrosive, n.o.s.*	UN3306
Compressed gas, toxic, oxidizing, n.o.s.*	UN3299
Dichlorofluoromethane, or refrigerant gas R21	UN1029
1,1-Difluoroethylene, or refrigerant gas R1132a	UN1959
2,2-Dimethylpropane	UN2044
Ethane, refrigerated liquid	UN1961
Ethylacetylene, stabilized	UN2452
Ethylamine	UN1036
Ethylene, acetylene, and propylene mixture, refrigerated liquid containing at least 71.5% ethylene with not more than 22.5% acetylene and not more than 6% propylene	UN3138

(Continued)

Shipping name and description	PIN
Ethylene oxide and carbon dioxide mixture with more than 87% ethylene oxide	UN3300
Ethylene oxide and carbon dioxide mixture with more than 9% but not more than 87% ethylene oxide	UN1041
Ethylene oxide and carbon dioxide mixture with not more than 9% ethylene oxide	UN1952
Ethylene oxide and chlorotetrafluoroethane mixture with not more than 8.8% ethylene oxide	UN3297
Ethylene oxide and pentafluoroethane mixture with not more than 7.9% ethylene oxide	UN3298
Ethylene oxide and tetrafluoroethane mixture with not more than 5.6% ethylene oxide	UN3299
Ethylene, refrigerated liquid	UN1038
Ethyl fluoride, or refrigerant gas R161	UN2453
Ethyl methyl ether	UN1039
Fertilizer ammoniating solution with free ammonia	UN1043
Fire extinguisher with compressed or liquefied gas	UN1044
Gas, refrigerated liquid, flammable, n.o.s.*	UN3312
Gas, refrigerated liquid, n.o.s.*	UN3158
Gas, refrigerated liquid, oxidizing, n.o.s.*	UN3311
Gas sample, nonpressurized, flammable, n.o.s.,* not refrigerated liquid	UN3167
Gas sample, nonpressurized, toxic, flammable, n.o.s.,* not refrigerated liquid	UN3168
Gas sample, nonpressurized, toxic, n.o.s.,* not refrigerated liquid	UN3169
Hexafluoropropylene, or refrigerant gas R1216	UN1858
Hydrogen chloride, refrigerated liquid	UN2186
Isobutylene	UN1055
Insecticide gas, flammable, n.o.s.*	UN3354
Krypton, refrigerated liquid	UN1970
Liquefied gases, nonflammable, charged with nitrogen, carbon dioxide or air	UN1058
Liquefied gas, flammable, n.o.s.*	UN3161
Liquefied gas, n.o.s.*	UN3163
Liquefied gas, oxidizing, n.o.s.*	UN3157
Liquefied gas, toxic, corrosive, n.o.s.*	UN3308
Liquefied gas, toxic, flammable, corrosive, n.o.s.*	UN3309
Liquefied gas, toxic, flammable, n.o.s.*	UN3160
Liquefied gas, toxic, n.o.s.*	UN3162
Liquefied gas, toxic, oxidizing, corrosive, n.o.s.*	UN3310
Liquefied gas, toxic, oxidizing, n.o.s.*	UN3307
Methane, refrigerated liquid; or natural gas, refrigerated liquid with high methane content	UN1972

(Continued)

Shipping name and description	PIN
Methyl chloride and methylene chloride mixture	UN1912
Methyl fluoride, or refrigerant gas R41	UN2454
Octafluorobut-2-ene, or refrigerant gas R1318	UN2422
Octafluorocyclobutane, or refrigerant gas RC318	UN1976
Octafluoropropane, or refrigerant gas R218	UN2424
Oil gas, compressed	UN1071
Perfluoro (ethylvinyl ether)	UN3154
Perfluoro (methylvinyl ether)	UN3153
Propadiene, stabilized	UN2200
Rare gases and nitrogen mixture, compressed	UN1981
Rare gases and oxygen mixture, compressed	UN1980
Rare gases mixture, compressed	UN1979
1,1,1-Trifluoroethane, or refrigerant gas R143a	UN2035
Trifluoromethane, refrigerated liquid	UN3136
Xenon, refrigerated liquid	UN2591

**n.o.s* means not otherwise specified.*

Appendix D
Reference Organizations

Note: *This Appendix is not a mandatory part of this Standard.*

Δ D1.

Codes, Standards, and Publications of the following organizations are referenced in this Standard.

Canadian Nuclear Safety Commission
270 Albert Street
Ottawa, Ontario
K1P 5S9

CGA
Compressed Gas Association, Inc.
4221 Walney Road, 5th Floor
Chantilly, Virginia 20151
USA

CGSB
Canadian General Standards Board
Ottawa, Ontario
K1A 1G6

CSA
Canadian Standards Association
5060 Spectrum Way, Suite 100
Mississauga, Ontario
L4W 5N6

Transport Canada
Transport Dangerous Goods Directorate
330 Sparks Street, 9th Floor
Ottawa, Ontario
K1A 0N5

US DOT
United States Department of Transportation
Research and Special Programs Administration
Office of Hazardous Materials Safety
400 7th Street, S.W.
Washington, DC 20590
USA

Appendix E
Index of Dangerous Goods in CSA Standard B340

Note: *This Appendix is not a mandatory part of this Standard.*

Δ E1.

Dangerous goods	Text reference	PIN
Articles, pressurized, hydraulic (containing nonflammable gas) or articles, pressurized, pneumatic (containing nonflammable gas)	6.1	UN3164
Acetylene, dissolved	4.3.4, 4.4.9, 5.4, Table 4.1	UN1001
Air, compressed, with not more than 23.5% oxygen, by volume	5.1.7, 5.2.2.1, Table 4.1, Table 5.1	UN1002
Air, refrigerated liquid	5.5	UN1003
Ammonia, anhydrous, or anhydrous ammonia	4.3.5, Table 5.2	UN1005
Argon, compressed	5.2.2.1, Table 4.1, Table 5.1	UN1006
Argon, refrigerated liquid	5.5.1, 5.5.3, Table 5.4, Table 5.5	UN1951
Arsine	Table 5.6	UN2188
Boron trichloride	Table 5.6	UN1741
Boron trifluoride, compressed	5.2.2.1, Table 4.1	UN1008
Bromine chloride	Table 5.6	UN2901
Bromotrifluoromethane, or refrigerant gas R13B1	Table 5.2	UN1009
Butane	Table 4.1	UN1011
Butylene	Table 4.1	UN1012
Carbon dioxide	4.4.7, 5.1.7, Table 4.1, Table 5.2	UN1013
Carbon dioxide, refrigerated liquid	5.5.1, Table 5.4, Table 5.5	UN2187
Carbon monoxide, compressed	5.2.2.3, 5.2.5, Table 4.1, Table 5.1	UN1016
Carbonyl fluoride, compressed	Table 5.6	UN2417
Carbonyl sulphide	Table 5.6	UN2204
Chlorine	Table 5.2	UN1017
Chlorine pentafluoride	5.6.3.6, Table 5.6	UN2548
Chlorine trifluoride	5.6.3.6, Table 5.6	UN1749
Chlorodifluorobromomethane, or refrigerant gas R12B1	5.3.3	UN1974
1-Chloro-1,1-difluoroethane, or refrigerant gas R142b	Table 5.2	UN2517
Chlorodifluoromethane, or refrigerant gas R22	Table 5.2	UN1018
Chlorodifluoromethane and Chloropentafluoroethane mixture with fixed boiling point with approximately 49% chlorodifluoromethane, or refrigerant gas R502	Table 5.2	UN1973

(Continued)

Dangerous goods	Text reference	PIN
Chlorotrifluoromethane and trifluoromethane azeotropic mixture with approximately 60% chlorotrifluoromethane, or refrigerant gas R503	Table 5.2	UN2599
Chloropentafluoroethane, or refrigerant gas R115	Table 5.2	UN1020
Chloropicrin and methyl bromide mixture	5.6.3.7, Table 5.6	UN1581
Chloropicrin and methyl chloride mixture	5.6.3.2, Table 5.6	UN1582
1-Chloro-1,2,2,2-tetrafluoroethane, or refrigerant gas R124	Table 5.2	UN1021
Chlorotrifluoromethane, or refrigerant gas R13	Table 5.2	UN1022
Cyanogen	Table 5.6	UN1026
Cyanogen chloride, stabilized	5.6.3.3, Table 5.6	UN1589
Cyclobutane	5.3.3	UN2601
Cyclopropane	Table 5.2	UN1027
Deuterium, compressed	Table 4.1, Table 5.1	UN1957
Diborane, compressed	5.2.7, Table 5.1	UN1911
Dichlorodifluoromethane, or refrigerant gas R12	Table 5.2	UN1028
Dichlorodifluoromethane and difluoroethane azeotropic mixture with approximately 74% dichlorodifluoromethane, or refrigerant gas R500	Table 5.2	UN2602
Dichlorosilane	Table 5.6	UN2189
1,2-Dichloro-1,1,2,2-tetrafluoroethane, or refrigerant gas R114	Table 5.2	UN1958
1,1-Difluoroethane, or refrigerant gas R152a	Table 5.2	UN1030
Difluoromethane, or refrigerant gas R32	Table 5.2	UN3252
Dimethylamine, anhydrous	4.3.5, Table 5.2	UN1032
Dimethyl ether	5.3.3	UN1033
Dinitrogen tetroxide, or Nitrogen dioxide	Table 5.6, 5.6.3.5	UN1067
Ethane	Table 4.1, Table 5.2	UN1035
Ethyl chloride (R160)	4.6.4, 4.6.5.3, 5.3.3	UN1037
Ethylene, compressed	5.2.4, Table 4.1, Table 5.1, Table 5.2	UN1962
Ethylene oxide and dichlorodifluoromethane mixture with not more than 12.5% ethylene oxide	5.3.6	UN3070
Ethylene oxide, or ethylene oxide with nitrogen up to a total pressure of 1 MPa (10 bar) at 50°C	5.3.5	UN1040
Fluorine, compressed	4.3.6, 5.2.8	UN1045
Germane	Table 5.6	UN2192
Helium, compressed	5.2.2.1, Table 4.1, Table 5.1	UN1046
Helium, refrigerated liquid	5.5.1, 5.5.3, Table 5.4, Table 5.5	UN1963
Heptafluoropropane, or refrigerant gas R227	Table 5.2	UN3296
Hexaethyl tetraphosphate and compressed gas mixture	5.6.3.4, Table 5.6	UN1612
Hexafluoroacetone	Table 5.6	UN2420

(Continued)

Dangerous goods	Text reference	PIN
Hexafluoroethane, compressed, or refrigerant gas R116, compressed	Clause 5.2.9	UN2193
Hydrocarbon gas mixture, compressed, n.o.s.,	Table 4.1	UN1964
Hydrocarbon gas mixture, liquefied, n.o.s.	Table 4.1	UN1965
Hydrogen bromide, anhydrous	Table 5.6	UN1048
Hydrogen chloride, anhydrous	Table 4.1, Table 5.2	UN1050
Hydrogen, compressed	5.2.2.2, 5.2.3.3, Table 4.1, Table 5.1	UN1049
Hydrogen, refrigerated liquid	5.5.1, 5.5.2, Table 5.4	UN1966
Hydrogen iodide, anhydrous	Table 5.6	UN2197
Hydrogen selenide, anhydrous	Table 5.6	UN2202
Hydrogen sulphide	Table 5.2	UN1053
Insecticide gas, n.o.s.	Table 5.2	UN1968
Insecticide gas, toxic, n.o.s.	Table 5.6	UN1967
Isobutane	Table 4.1	UN1969
Krypton, compressed	Table 5.1	UN1056
Lighters or lighter refills (cigarettes) containing flammable gas and capable of passing the tests specified in the Hazardous Products (Lighters) Regulations	6.3	UN1057
Liquefied petroleum gases (see Petroleum gases, liquefied)		
Methane, compressed	5.2.2.1, Table 4.1, Table 5.1	UN1971
Methylacetylene and propadiene mixture, stabilized	Table 5.2	UN1060
Methylamine, anhydrous	4.3.5, Table 5.2	UN1061
Methyl bromide	5.6.3.7, Table 5.6	UN1062
Methyl chloride, or refrigerant gas R40	Table 5.2	UN1063
Methylchlorosilane	Table 5.6	UN2534
Methyl mercaptan	4.3.5, Table 5.2	UN1064
Natural gas, compressed, with high methane content	4.6.2, 5.2.6, Table 4.1	UN1971
Neon, compressed	5.2.2.1, Table 4.1, Table 5.1	UN1065
Neon, refrigerated liquid	5.5.1, Table 5.4, Table 5.5	UN1913
Nitric oxide and dinitrogen tetroxide mixture or nitric oxide and nitrogen dioxide mixture	Table 5.6	UN1975
Nitric oxide, compressed	5.6.3.9, Table 5.6	UN1660
Nitrogen, compressed	5.1.7, 5.2.2.1, Table 4.1, Table 5.1,	UN1066
Nitrogen, refrigerated liquid	5.5.1, 5.5.3, Table 5.4, Table 5.5	UN1977

(Continued)

Dangerous goods	Text reference	PIN
Nitrogen trifluoride, compressed	Table 4.1	UN2451
Nitrogen trioxide	Table 5.6	UN2421
Nitrosyl chloride	4.3.5, Table 5.2	UN1069
Nitrous oxide	4.6.1.1, Table 4.1, Table 5.2	UN1070
Nitrous oxide, refrigerated liquid	5.5.1, Table 5.4, Table 5.5	UN2201
Oxygen, compressed	4.6.1.2, 4.6.2, 4.6.5.2, 5.2.2.1, Table 4.1, Table 5.1	UN1072
Oxygen, refrigerated liquid	5.5.1, 5.5.3, Table 5.4, Table 5.5	UN1073
Oxygen difluoride, compressed	Table 5.6	UN2190
Pentafluoroethane, or refrigerant gas R125	Table 5.2	UN3220
Perchloryl fluoride	Table 5.6	UN3083
Petroleum gases, liquefied	5.3.4, 6.3, Table 4.1, Table 5.3	UN1075
Phosgene	5.6.3.1, Table 5.6	UN1076
Phosphine	5.6.3.8, Table 5.6	UN2199
Phosphorus pentafluoride, compressed	Table 5.6	UN2198
Propane	Table 4.1, Table 5.3	UN1978
Propylene	Table 4.1	UN1077
Refrigerant gas, n.o.s.	Table 5.2	UN1078
Refrigerant gas R404A	Table 5.2	UN3337
Refrigerant gas R407A	Table 5.2	UN3338
Refrigerant gas R407B	Table 5.2	UN3339
Refrigerant gas R407C	Table 5.2	UN3340
Refrigerating machines containing flammable, nontoxic, liquefied gas	6.2	UN3358
Refrigerating machines containing nonflammable, nontoxic, liquefied gas or ammonia solutions	6.2	UN2857
Selenium hexafluoride	Table 5.6	UN2194
Silane, compressed	5.3.3	UN2203
Silicon tetrafluoride, compressed	Table 5.6	UN1859
Stibine	Table 5.6	UN2676
Sulphur dioxide	Table 5.2	UN1079
Sulphur hexafluoride	Table 4.1, Table 5.2	UN1080
Sulphur tetrafluoride	Table 5.6	UN2418
Sulphuryl fluoride	Table 5.2	UN2191
Tellurium hexafluoride	Table 5.6	UN2195
1,1,1,2-Tetrafluoroethane, or refrigerant gas R134a	Table 5.2	UN3159

(Continued)

Dangerous goods	Text reference	PIN
Tetrafluoroethylene, stabilized (R1114)	Table 4.1, Table 5.2	UN1081
Tetrafluoromethane, compressed, or refrigerant gas R14, compressed	Table 5.2	UN1982
Trifluoroacetyl chloride	Table 5.6	UN3057
Trifluorochloroethylene, stabilized (R1113)	Table 5.2	UN1082
Trifluoromethane, or refrigerant gas R23	Table 5.2	UN1984
Trimethylamine, anhydrous	4.3.5, Table 5.2	UN1083
Tungsten hexafluoride	5.3.7	UN2196
Vinyl bromide, stabilized	5.3.3	UN1085
Vinyl chloride, stabilized (R1140)	Table 5.2	UN1086
Vinyl fluoride, stabilized (R1141)	Table 5.2	UN1860
Vinyl methyl ether, stabilized	Table 5.2	UN1087
Xenon, compressed	Table 5.1	UN2036

Update No. 1
B340-02
January 2004

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Deleted	None

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October 2002	iii–viii and 1–45
January 2004	Cover, title page, and copyright page

- Update your copy by inserting these revised pages.
- Keep the pages you remove for reference.

CAN/CSA-B340-02
A National Standard of Canada
(approved January 2004)

Selection and Use of Cylinders, Spheres, Tubes, and Other Containers for the Transportation of Dangerous Goods, Class 2

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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 to judge its suitability for their particular purpose.

National Standard of Canada
(approved January 2004)

CAN/CSA-B340-02
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Prepared by

CANADIAN STANDARDS ASSOCIATION

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Preface

This is the fourth edition of CSA Standard B340, *Selection and Use of Cylinders, Spheres, Tubes, and Other Containers for the Transportation of Dangerous Goods, Class 2.* It supersedes the previous editions, published in 1997, 1988, and 1986.

It should be noted that this Standard, by itself, does not have the force of law unless it is officially adopted by a regulatory authority. Since regulations may adopt the Standard with certain exceptions or additional requirements, it is recommended that the regulations of the relevant jurisdiction be consulted in order to establish the extent to which this Standard has been adopted. Where an industry practice differs from the requirements of this Standard, an application for a permit for equivalent level of safety may be requested from the regulatory authority. Notwithstanding the provisions of this Standard, compliance with the provisions of the *Transportation of Dangerous Goods Act* and the Regulations thereto, may call for additional requirements due to particular characteristics or properties of individual dangerous goods. Any requirements of the Transportation of Dangerous Goods Regulations regarding the handling, the offering for transport, and the transportation of dangerous goods in cylinders, spheres, and tubes shall be fully complied with.

In its review of the Standard to develop this new edition, the CSA Technical Committee on Cylinders, Spheres, and Tubes for the Transportation of Dangerous Goods reviewed and made extensive use of the Transportation of Dangerous Goods Regulations of Transport Canada, the Compressed Gas Association Codes of Good Practice, and the US Code of Federal Regulations. This Standard takes into account proven experience and the current technical advances made in this field. The requirements in this Standard do not deviate fundamentally from the practices in North America; most changes incorporated involve clarification and corrections.

This Standard is written in SI units except for the cylinder marking requirements, where the service pressure and, where applicable (eg, Specification TC-39M), the test pressure are expressed in bar. However, for consistency in the design and test requirements of all containers, MPa and kPa have been retained as units to express service pressure. Considering the use of the "bar" unit by ISO (International Organization for Standardization) to mark service and test pressures, it was decided to use the same unit for marking service pressure. The capital letter "M" is added to each specification designation to identify formally that the container specification is metricated.

This Standard was prepared by the Technical Committee on Cylinders, Spheres, and Tubes for the Transportation of Dangerous Goods, under the jurisdiction of the Strategic Steering Committee on Public Safety, 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.

October 2002

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.*

B340-02
Selection and Use of Cylinders, Spheres, Tubes, and Other Containers for the Transportation of Dangerous Goods, Class 2

1. Scope

1.1
This Standard covers safety requirements for the selection and use of cylinders, spheres, tubes, and other containers for the transportation of dangerous goods, Class 2.

1.2
This Standard covers requirements for the handling and filling of cylinders, spheres, tubes, and other containers for the transportation of dangerous goods, Class 2.

2. Definitions
The following definitions apply in this Standard:

Accessory — any part or device additional to the body of a container that may come into contact with the contents.

Bar — for the purposes of this Standard, a metric (non-SI) measurement unit for marking the service pressure on cylinders, spheres, and tubes for the transportation of dangerous goods. 1 bar = 100 kPa (0.1 MPa).

Compressed gas — a gas that under the filling pressure is entirely in the gaseous form at a temperature of 20°C.

Condemned container — a container not permitted for the transportation of dangerous goods and not to be reconditioned.

Corrosive gas — any gas that has a subsidiary Classification 8 in accordance with the Transportation of Dangerous Goods Regulations.

Cylinder — a container of cylindrical shape with a water capacity not greater than 450 L and designed to withstand an internal pressure greater than 275 kPa (absolute).

Dangerous goods — any product, substance, material, or organism listed in the schedules of the *Transportation of Dangerous Goods Act* or Regulations, or meeting the classification requirements laid out in those Regulations.

Dissolved gas — compressed gas dissolved in a solvent.

Equivalent container —
(a) For containers manufactured to Specifications 3AL, 3E, 3HT, 4L, and 39, a container manufactured to a nonmetric Specification that has a designation composed of the same series number (3, 4, or 39) and the same letters except for the letter "M", and that has the same service pressure when converted and rounded to the nearest bar as a container manufactured in accordance with CSA Standard B339.
(b) For nonmetric containers other than those listed in Item (a), a container manufactured to a nonmetric Specification that has a designation composed of the same series number (3 or 4) and the same letters except for the letter "M", and that has the same test pressure as a container manufactured in accordance with CSA Standard B339. Test pressures are considered the same when they do not differ by more than 100 kPa.

Filling density — the percentage ratio of the mass of a gas in a container to the mass of water that the container will hold at 15°C.

Flammable gas — any gas with a Classification 2.1 in accordance with the Transportation of Dangerous Goods Regulations.

Gas — any product or substance that is included in Class 2 in the Transportation of Dangerous Goods Regulations, or any mixture of such products or substances.

Liquefied gas — a gas other than a dissolved gas that under the filling pressure is partially liquid at a temperature of 20°C.

Liquefied petroleum gas — any Classification 2.1 liquefied hydrocarbon gas.

Manifold — a piping arrangement that interconnects a number of cylinders, spheres, or tubes as a single unit.

Other containers — gas-filled accumulators, gas-filled refrigeration machines, gas lighters, foreign containers other than US containers covered in Clause 24 of CSA Standard B339, Specification 5P drums, and nonpressurized vacuum-insulated containers (dewars) used for refrigerated liquids.

Pressure-relief device — a device intended to prevent the rupture of a container in the event of accidental overpressure or exposure to fire.

Product identification number (PIN) — the number by which a product is identified in accordance with United Nations (UN) practice.

Refrigerated liquid — a gas in the liquid state that has a boiling point colder than –84°C at an absolute pressure of 101.325 kPa, or liquefied carbon dioxide at an absolute pressure of 2.8 MPa or less.

Service pressure — the rated pressure marked on the container.
Note: *Containers designed and manufactured to CSA Standard B339 have their service pressure marked in bar.*

Specification — the complete description of the manufacturing requirements for a cylinder, sphere, or tube under a specific designation (eg, 4AAM33 or 4BWM).
Note: *The prefix of the specification designation (TC, CTC, etc) identifies the regulatory authority responsible at the time of manufacture of the container.*

Sphere — a container of spherical shape with a water capacity not greater than 45.4 L designed to withstand an internal pressure greater than 275 kPa (absolute).

Toxic gas — any gas that has a primary Classification 2.3 or a subsidiary Classification 6.1 in accordance with the Transportation of Dangerous Goods Regulations.

Transportation — any mode of conveying dangerous goods on land (including rail and highway) or water or in air.

Tube — a seamless container of cylindrical shape with a water capacity greater than 450 L designed to withstand an internal pressure equal to or greater than 12.4 MPa.

Water capacity — the total mass or volume of water a container can hold at 15°C and a pressure of 101.325 kPa (absolute).

3. Reference Publications

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. Where foreign Standards are referenced, only the technical content applies. Except for the Canadian Regulations, where there is a variance with this Standard, the requirements of this Standard shall prevail. Users of this Standard are advised against attempting a direct application of any of the following reference publications without carefully observing this Standard's reference to that Standard, Specification, or Code.
Note: *See Appendix D for information on the reference organizations.*

CSA Standards
B51-97,
Boiler, Pressure Vessel, and Pressure Piping Code;

B52-99,
Mechanical Refrigeration Code;

B339-02,
Cylinders, Spheres, and Tubes for the Transportation of Dangerous Goods.

Canadian Nuclear Safety Commission Regulations
Packaging and Transport of Nuclear Substances Regulations under the *Nuclear Safety and Control Act*, S.C. 1997, c. 9.

CGA* Publications
C-6-2001,
Standards for Visual Inspection of Steel Compressed Gas Cylinders — Eighth Edition;

C-6.1-1995,
Standards for Visual Inspection of High Pressure Aluminum Compressed Gas Cylinders — Third Edition;

C-6.2-1996,
Guidelines for Visual Inspection and Requalification of Fiber Reinforced High Pressure Cylinders — Third Edition;

C-6.3-1999,
Guidelines for Visual Inspection and Requalification of Low Pressure Aluminum Compressed Gas Cylinders — Second Edition;

C-12-2002,
Qualification Procedure for Acetylene Cylinder Design — Fourth Edition;

C-13-2000,
Guidelines for Periodic Visual Inspection and Requalification of Acetylene Cylinders — Fourth Edition;

C-14-1999,
Procedures for Fire Testing of DOT Cylinder Pressure Relief Device Systems — Third Edition

G-4.1-1996,
Cleaning Equipment for Oxygen Service — Fourth Edition;

S-1.1-2001,
Pressure-Relief Device Standards — Part 1 — Cylinders for Compressed Gases — Ninth Edition;

S-7-1996,
Method for Selecting Pressure-Relief Devices for Compressed Gas Mixtures in Cylinders — Second Edition.

CGSB† Standards
CAN/CGSB-3.13-M88,
Liquefied Petroleum Gas (Butanes);

CAN/CGSB-3.14-M88,
Liquefied Petroleum Gas (Propane).

Government of Canada Legislation
Transportation of Dangerous Goods Act, S.C. 1992, c. 34, and the Regulations thereto, including amendments.

**Compressed Gas Association, Inc.*
†*Canadian General Standards Board*

4. Container Requirements

4.1 General

4.1.1 Cylinders, Spheres, and Tubes

4.1.1.1

Cylinders, spheres, and tubes used for the transportation of dangerous goods, Class 2, shall be in accordance with the applicable requirements of CSA Standard B339, or shall be equivalent containers with the prefix BTC, CRC, CTC, ICC, or DOT, or any of the following Specification cylinders of Canadian or US manufacture: 3, 3A480X, 3B, 3BN, 4B240FLW, 8, 8AL, or 8WC.

Notes:

(1) *The Transportation of Dangerous Goods Regulations should be consulted for limitations imposed for transportation in Canada of US containers (ICC or DOT prefix).*

(2) *The equivalent specifications referred to are those bearing the following prefixes, representing the corresponding regulatory authority:*

(a) CRC — Canadian Railway Commission;
(b) BTC — Board of Transport Commissioners for Canada;
(c) ICC — US Interstate Commerce Commission;
(d) DOT — US Department of Transportation; and
(e) CTC — Canadian Transport Commission.

4.1.1.2
Cylinders, spheres, and tubes that are not empty and that are due for requalification shall not be refilled, but may
(a) continue in use until empty; and
(b) after passing a visual inspection by the owner, shipper, or filler, be transported for use or re-qualification.

In no case shall a cylinder, sphere, or tube continue in use past its service life limitation as specified in CSA Standard B339.

4.1.1.3
Cylinders, spheres, and tubes shall be altered, repaired, or rebuilt in accordance with CSA Standard B339.

4.1.2 Other Containers
Other containers used for the transportation of dangerous goods, Class 2, shall be in accordance with Clause 6 of this Standard.

4.2 Valves and Other Accessories

4.2.1
Valves and other accessories shall be installed, repaired, and maintained by personnel trained for that purpose.

4.2.2
Valves shall be capable of being tightly closed to prevent leakage of the container's contents.

4.2.3
To prevent damage that could cause the contents of unmanifolded containers to be released under normal conditions of handling and transportation, valves and other accessories on containers shall be provided with adequate protection by having inherent valve protection, by equipping containers with securely attached protective devices such as caps or guards that are not in contact with any part of the valve or an accessory, or by providing containers with outer packaging. The valve protection device, including inherent valve protection, shall meet the following test requirements:
(a) Containers used for the purpose of testing the protective means shall be filled with water and/or inert solid material to a mass equivalent to that of the intended lading.
(b) The container fitted with its valve and means of protection shall be dropped from a height of 1.2 m from its lowest point onto a solid flat concrete surface, at an angle of 30° to the vertical with the valve directed downwards.
Note: *In performing this test, proper safety precautions should be taken to protect personnel and property.*
(c) For each means of protection, a minimum of three assemblies shall be tested.
(d) The means of protection shall be considered to have passed if the valve remains operational (capable of being opened and closed) and there is no leak from the valve itself or from the container-to-valve connection, at a minimum pressure of 0.2 MPa.
Note: *After the test, minor deformation or damage to the valve is acceptable.*
(e) For inherent valve protection, each valve manufacturer's design shall be tested as required. Differences in the pressure relief device or configuration of outlet are not considered design variances.
(f) For means of protection other than valves with inherent protection, the device shall be acceptable for use with valves of maximum dimensions not exceeding the dimensions of the valves used in the test.
(g) All tested protective means shall be acceptable for use with filled containers at a mass equal to or less than the mass tested.

4.2.4
Containers filled with a refrigerated liquid or a liquefied flammable gas shall be transported in an upright position unless they are designed for horizontal service.

4.2.5
During transportation, all containers, boxes, crates, and cradles shall be secured to prevent shifting and overturning.

4.3 Pressure-Relief Devices

4.3.1
Cylinders, spheres, and tubes shall be equipped with one or more pressure-relief devices sized and selected as to type, location, and number, and tested in accordance with CGA Publication S-1.1 and this Standard, except as exempted in Clauses 4.3.3 to 4.3.6 inclusive. Where dangerous goods are not specifically listed, an appropriate equivalent relief device shall be selected in accordance with CGA Publication S-1.1. It shall be permitted to replace pressure-relief devices CG-2 and CG-4 by CG-3 and CG-5 respectively where the containers are designed to withstand the additional pressure.
Note: *As a guide for the selection of pressure-relief devices for mixtures of gases not covered by this Standard or CGA Publication S-1.1, reference may be made to CGA Publication S-7.*

4.3.2
Pressure-relief device systems shall be capable of preventing the rupture of normally filled containers when subjected to a fire test conducted in accordance with CGA Publication C-14 and, in the case of acetylene cylinders, CGA Publication C-12. Pressure-relief devices for composite cylinders shall be tested in accordance with CSA Standard B339.

4.3.3
Pressure-relief devices shall not be required on containers 305 mm or less in length, exclusive of neck, and 115 mm or less in outside diameter, except on containers that are
(a) filled with a liquefied gas for which a service pressure of 12.4 MPa, or higher, is specified;
(b) filled with a compressed gas at a pressure of 12.4 MPa or higher at 15°C; or
(c) manufactured to Specifications TC-39M and CTC-39. Fusible metal pressure-relief devices are not permitted on TC-39M and CTC-39 containers filled with liquefied gases. Where the liquefied gas is flammable, metal-body pressure-relief valves shall be used.

4.3.4
Except for containers manufactured to Specification TC-39M or CTC-39 and cylinders for dissolved acetylene, pressure-relief devices shall not be required on containers filled with compressed gas under a pressure of 2.1 MPa or less at 15°C.

4.3.5
Pressure-relief devices shall not be required on containers filled with
(a) methyl mercaptan, UN1064;
(b) mono-, di-, or trimethylamine, anhydrous, UN1061, UN1032, UN1083;
(c) not more than 4.5 kg of nitrosyl chloride, UN1069; or
(d) less than 75 kg of anhydrous ammonia, UN1005.

4.3.6
Pressure-relief devices shall be prohibited in containers filled with fluorine, compressed, UN1045, or any of the gases listed in Table 5.6.
Note: *For mixtures of fluorine or any of the gases listed in Table 5.6 with other gases, see the Note to Clause 4.3.1.*

4.3.7
Pressure-relief devices on containers filled with liquefied flammable gas shall be in direct contact with the vapour phase only.

4.3.8
Pressure-relief devices shall be installed by personnel trained for that purpose.

4.4 Manifolded Containers

4.4.1
Manifolded containers for the transportation of dangerous goods are permitted, provided that they are filled with the gases listed in Table 4.1 or permitted mixtures thereof, and only when they are selected and filled in accordance with the requirements of Clause 5.

4.4.2
Manifolded containers shall be supported and held together as a unit by structurally adequate means.

4.4.3
Valves and pressure-relief devices shall be protected against impact.

4.4.4
Each container shall be equipped with pressure-relief devices as required by Clause 4.3.

4.4.5
Pressure-relief devices on manifolded horizontal containers filled with Class 2.1 gases shall be arranged to discharge upward and unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the containers.

4.4.6
Branch lines to manifolded containers shall be sufficiently flexible to prevent damage to the equipment.

4.4.7
Manifolded containers shall be equipped with individual shut-off valves, except those containers for carbon dioxide where individual shut-off valves are optional. These valves shall be tightly closed during transportation. Where containers are filled individually in accordance with Clause 4.4.8, valves shall be closed immediately after filling each container.

4.4.8
Manifolded liquefied gas containers equipped with individual shut-off valves shall be filled one by one using a system capable of determining the mass of gas filled into each container. The manifolded group of containers shall be check-weighed on completion of filling. The same precautions shall be extended to compressed gases that are filled under temperature conditions that can result in partial product liquefaction in the containers.

4.4.9
Manifolded cylinders charged with dissolved acetylene shall be removed from the cluster or bank for each prefill inspection and weigh-in where acetone is used as a solvent. This requirement shall not prohibit the filling of acetylene cylinders while manifolded. Where the solvent in service is dimethylformamide, acetylene cylinders may be charged without removal from the manifold, provided that 1 cylinder is removed for prefill inspection and weigh-in for every 70 cylinders in the manifolded

group. Cylinders shall be removed in rotation. Every three years, all cylinders with dimethylformamide as the solvent shall be removed for inspection and full solvent check. Manifolded acetylene cylinders shall be transported in the vertical position only.

Table 4.1
Gases Permitted in Manifolded Containers
(See Clause 4.4.1.)

Shipping name and description	PIN
Acetylene, dissolved	UN1001
Air, compressed, with not more than 23.5% oxygen, by volume	UN1002
Argon, compressed	UN1006
Boron trifluoride, compressed	UN1008
Butane	UN1011
Butylene	UN1012
Carbon dioxide	UN1013
Carbon monoxide, compressed	UN1016
Deuterium, compressed	UN1957
Ethane	UN1035
Ethylene, compressed	UN1962
Helium, compressed	UN1046
Hydrocarbon gas mixture, compressed, n.o.s.*	UN1964
Hydrocarbon gas mixture, liquefied, n.o.s.*	UN1965
Hydrogen, compressed	UN1049
Hydrogen chloride, anhydrous	UN1050
Isobutane	UN1969
Liquefied petroleum gases, *or* petroleum gases, liquefied	UN1075
Methane, compressed, *or* natural gas, compressed, with high methane content	UN1971
Neon, compressed	UN1065
Nitrogen, compressed	UN1066
Nitrogen trifluoride, compressed	UN2451
Nitrous oxide	UN1070
Oxygen, compressed	UN1072
Propane	UN1978
Propylene	UN1077
Sulphur hexafluoride	UN1080
Tetrafluoroethylene, stabilized†	UN1081

**n.o.s. means not otherwise specified.*
†*R1114.*

4.5 Tubes

The following requirements shall apply to tubes mounted on vehicles:
(a) Tubes shall be mounted horizontally and each tube shall be fixed at one end of the vehicle with provision for thermal expansion at the opposite end attachment.
(b) Each tube trailer shall be provided with at least one rear bumper designed to protect the tubes, appurtenances, and piping in the event of a rear-end collision. The bumper design, construction, and

location shall meet the following requirements:

(i) the bumper shall be so designed that the force of a collision will be transmitted directly to the chassis of the vehicle;

(ii) the bumper and its attachment to the chassis shall be designed to withstand a load equal to twice the weight of the loaded tube trailer and its attachments, based on a safety factor of 4 on the minimum ultimate strength of the material used, and with such load being applied horizontally and parallel to the ground from any direction at an angle not exceeding 10° to the longitudinal axis of the vehicle;

(iii) the clearance between the effective bottom of the bumper and the ground shall not exceed 760 mm with the vehicle empty;

(iv) the maximum inside distance between bumpers, if more than one is used, shall not exceed 590 mm;

(v) the maximum transverse distance from the widest part of the vehicle at the rear to the bumper shall not exceed 460 mm;

(vi) the bumper shall be located not more than 590 mm forward of the extreme rear of the vehicle;

(vii) the bumper shall be substantially constructed and firmly attached to the vehicle; and

(viii) the bumper, or vertical posts attached to the bumper, shall be located at least 150 mm to the rear of any component that may contain the lading at any time while in transport, and shall extend vertically to a height adequate to protect all valves and fittings forward of the bumper if damage could cause loss of lading.

(c) Road vehicles constructed and maintained so that the body, chassis, or other parts of the vehicle afford an equivalent rear-end protection shall be deemed in compliance with Item (b).

(d) Each discharge outlet of a pressure-relief device on a tube containing a flammable gas shall be directed upward, unobstructed, and protected against contamination, including rain and snow.

4.6 Service Limitations of Certain Containers

4.6.1 Specification TC-3ALM or CTC-3AL Cylinders

4.6.1.1

When used in nitrous oxide service, aluminum cylinders shall comply with the following requirements:

(a) cylinder valves shall be made of brass or stainless steel; and

(b) cylinders shall be cleaned in accordance with CGA Publication G-4.1.

4.6.1.2

When used in oxygen service, aluminum cylinders shall comply with the following requirements:

(a) cylinder valves shall be made of brass or stainless steel;

(b) cylinders shall be cleaned in accordance with CGA Publication G-4.1;

(c) cylinder threads shall be straight threads; and

(d) cylinders shall have a service pressure not greater than 20.7 MPa.

4.6.2 Specification TC-3FCM and TC-3HWM Cylinders

TC-3FCM and TC-3HWM composite cylinders shall be manufactured for services that are specified in the design qualification test reports. In addition,

(a) these containers shall be used only for

(i) gases in Classification 2.2; or

(ii) natural gas, compressed, UN1971, in accordance with the requirements of Clause 5.2.6;

(b) when in oxygen service, these containers shall comply with Clause 4.6.1.2; and

(c) these containers shall be removed from service in accordance with Clause 24.2.7 of CSA Standard B339.

4.6.3 Specification TC-3HTM or CTC-3HT Cylinders

TC-3HTM and CTC-3HT cylinders shall be permitted, provided that
(a) their use is limited to aircraft;
(b) they are equipped with pressure-relief devices of the rupture disc type without fusible metal backing, with a rated bursting pressure of not more than 1.5 times the service pressure of the cylinder; and
(c) they are shipped individually packed in a sturdy box.

4.6.4 Specification TC-4EM or CTC-4E Cylinders

Unless otherwise specified, TC-4EM and CTC-4E cylinders shall not be permitted for
(a) gases in Classification 2.3;
(b) pyrophoric gases in Classification 2.1;
(c) ethyl chloride UN1037; or
(d) gases having a subsidiary Classification 6.1 or 8.

4.6.5 Specification TC-39M or CTC-39 Containers

4.6.5.1

Containers with a water capacity exceeding 1.25 L shall not be filled with Classification 2.1 gases.

4.6.5.2

Where used in oxygen service, aluminum containers shall comply with the following requirements:
(a) container threads shall be straight threads;
(b) container valves shall be made of brass or stainless steel; and
(c) containers shall be cleaned in accordance with CGA Publication G-4.1.

4.6.5.3

Unless otherwise specified, TC-39M and CTC-39 containers shall not be permitted for
(a) gases in Classification 2.3;
(b) pyrophoric gases in Classification 2.1;
(c) ethyl chloride UN1037; or
(d) gases having a subsidiary Classification 6.1 or 8.

4.6.5.4

TC-39M and CTC-39 containers shall not be refilled.

4.6.5.5

Where used for methylacetylene and propadiene mixture, stabilized (UN1060), the containers shall not be constructed using any material containing more than 65% copper.

4.7 ICC-3 Cylinders

The service pressure of ICC-3 cylinders is 12.4 MPa.
Note: *The service pressure is not marked on ICC-3 cylinders.*

4.8 Markings

Container markings shall not be altered, removed, or added to unless the marking is done in accordance with Clause 24 of CSA Standard B339 by a registered manufacturer, requalifier, repairer, reheat treater, or rebuilder registered in accordance with Clause 25 of CSA Standard B339. Markings shall be maintained in a legible condition.

4.9 Packaging

Containers manufactured to Specifications TC-3EM, CTC-3E, TC-3FCM, TC-3HTM, CTC-3HT, TC-4BAM spheres, CTC-4BA spheres, TC-4DM, CTC-4D, TC-4DAM, CTC-4DA, TC-4DSM, CTC-4DS, TC-39M, and CTC-39 shall be packaged in a box, crate, or cradle. Alternatively, TC-4BAM and CTC-4BA spheres may be securely mounted for shipment on pallets providing an equivalent level of protection to containers and appurtenances.

5. Selection and Filling of Containers for Transportation

5.1 General Requirements

5.1.1

Containers shall not be filled without the consent of the owner of the containers.

5.1.2

Containers shall be filled by personnel trained for that purpose.

5.1.3

Before a container is filled, it shall be inspected to

(a) verify through its markings that

(i) for containers manufactured after 31 December 1992, the cylinder, sphere, or tube has been manufactured in accordance with the requirements of CSA Standard B339; and

(ii) for containers manufactured before 1 January 1993, the cylinder, sphere, or tube has been manufactured in accordance with a TC, CTC, or ICC Specification listed in Table 24.1 of CSA Standard B339, or an equivalent BTC, CRC, ICC, or DOT Specification to the CTC Specifications listed in Table 24.1 and in use in Canada before 1 January 1993;

(b) verify through its markings that the container is not due for requalification;

(c) verify that there is no visible damage to the container that could weaken its pressure retention integrity. The standards of inspection for Specification containers listed in Table 24.1 of CSA Standard B339 are CGA Publications C-6, C-6.1, C-6.2, C-6.3, and C-13;

(d) verify that its accessories and attachments are in good condition;

(e) ensure that the container, pressure-relief devices, valves, and other accessories are suitable for the intended product and pressure; and

(f) verify that the previous service of the container does not exclude filling it with the intended Class 2 dangerous goods.

Note: *The Transportation of Dangerous Goods Regulations should be consulted for limitations imposed for transportation in Canada of US containers (ICC or DOT prefix).*

5.1.4

Containers to be filled shall comply with the following:

(a) containers not in compliance with Clause 5.1.3(a) or Clause 6 shall not be filled unless a permit for equivalent level of safety has been obtained from Transport Canada;

(b) before being filled, containers due for requalification shall be requalified in accordance with the requirements of CSA Standard B339. Containers that do not meet the requirements of the prefill inspection shall be rejected and not filled until the cause for rejection has been corrected.

5.1.5

Where containers with a marked service pressure are specified, other containers manufactured to the same Specification but to a higher service pressure shall be permitted. For example, containers marked TC-4BWM35 or CTC-4BW500 may be used where TC-4BWM17 or CTC-4BW240 are specified.

5.1.6
Containers shall not be filled with any substance where
(a) the containers and their accessories are made of materials that may react with the contents; or
(b) the products contained may react chemically, so as to adversely affect the pressure retention integrity of the containers or their accessories.

5.1.7
Gas filling limits shall apply to mixtures of solids or liquids, or both, with gases (eg, solids or liquids, or both, filled under gas pressure). Mixtures containing gases and insecticides that are nontoxic and nonflammable, and mixtures of nitrogen, carbon dioxide, or air with nonflammable, nontoxic, and noncorrosive liquid(s), shall be filled in containers listed in Clause 5.3.3. Mixtures containing gases and other materials, the mixtures of which are considered toxic or corrosive, shall be filled in accordance with Clause 5.6.

5.1.8
Valves and pressure-relief devices on filled containers shall be inspected after filling to detect leakage. No container shall be shipped with a leaking pressure-relief device or valve, or any other leak. Leaking fusible metal pressure-relief devices shall be replaced. Repair of defective fusible metal pressure-relief devices shall require replacement of fusible metal.
Note: *Clause 5.6 addresses the selection and filling of containers for transportation of specific toxic and corrosive gases. Other toxic and corrosive gases are covered by Clauses 5.2 and 5.3.*

5.2 Filling Cylinders, Spheres, and Tubes with Compressed Gases

5.2.1 Cylinders and Spheres
Compressed gases for which filling requirements for cylinders and spheres are not otherwise specified in this Standard shall be filled in containers manufactured to Specification ICC-3, TC-3AM, CTC-3A, TC-3AAM, CTC-3AA, CTC-3B, TC-3ASM, TC-3HTM, CTC-3HT, TC-3FCM, TC-3HWM, TC-3EM, CTC-3E, TC-4BM, CTC-4B, TC-4BAM, CTC-4BA, TC-4BWM, CTC-4BW, TC-39M, or CTC-39. TC-3HTM and CTC-3HT cylinders shall be filled only with gases of Classification 2.2. Other limitations on the use of TC-3HTM and CTC-3HT cylinders are specified in Clause 4.6.3. Unless otherwise specified in this Standard, TC-3ALM and CTC-3AL cylinders shall only be filled with the gases listed in Table 5.1. Other limitations on the use of TC-3ALM and CTC-3AL cylinders are specified in Clause 4.6.1. Limitations on the use of TC-39M and CTC-39 containers are specified in Clause 4.6.5. TC-3FCM and TC-3HWM shall be used in accordance with Clause 4.6.2.

5.2.2 Tubes

5.2.2.1
The following compressed gases shall be filled in tubes manufactured to Specification TC-3AXM, CTC-3AX, TC-3AAXM, CTC-3AAX, or TC-3TM:
(a) air, compressed, with not more than 23% oxygen, by volume;
(b) argon, compressed;
(c) boron trifluoride, compressed;
(d) helium, compressed;
(e) methane, compressed, with a minimum purity of 98% and commercially free of corroding components;
(f) neon, compressed;
(g) nitrogen, compressed; and
(h) oxygen, compressed.

Table 5.1
Compressed Gases Permitted in TC-3ALM or CTC-3AL Cylinders

(See Clause 5.2.1.)

Shipping name and description	PIN
Air, compressed, with not more than 23.5% oxygen, by volume	UN1002
Argon, compressed	UN1006
Carbon monoxide, compressed (see Clause 5.2.5)	UN1016
Deuterium, compressed	UN1957
Diborane, compressed (see Clause 5.2.7)	UN1911
Ethylene, compressed (see Clause 5.2.4)	UN1962
Helium, compressed	UN1046
Hydrogen, compressed	UN1049
Krypton, compressed	UN1056
Methane, compressed	UN1971
Neon, compressed	UN1065
Nitrogen, compressed	UN1066
Oxygen, compressed	UN1072
Xenon, compressed	UN2036

5.2.2.2
Hydrogen, compressed shall be filled in tubes manufactured to Specification TC-3AXM, CTC-3AX, TC-3AAXM, or CTC-3AAX.

5.2.2.3
Carbon monoxide, compressed shall be filled in tubes in accordance with Clause 5.2.5.

5.2.2.4
Permitted compressed mixtures of the above gases or of any of the above gases with another gas permitted in tubes shall be filled in tubes manufactured to a Specification allowed for each of the mixture components.

5.2.3 Filling Pressures

5.2.3.1
The filling pressure of a TC-3AM, TC-3AAM, TC-3AXM, TC-3AAXM, TC-3ASM, or TC-3TM container, not marked with the letter "K" following the service pressure marking, and equipped with a pressure-relief device(s) of the rupture disc type without fusible metal backing, in Classification 2.2 gas service shall not exceed its service pressure when the container temperature is 15°C and 125% service pressure when the container temperature is 55°C. The same filling pressure shall apply to equivalent containers marked with a "+" following the service pressure marking or the last requalification date mark and also equipped with pressure-relief devices of the rupture disc type without fusible metal backing. The filling pressure and the pressure at 55°C mentioned above are reduced by 10% for any container corresponding to one of the above descriptions and having a service pressure marking greater than 3.5 MPa, but either marked with the letter "K" following the container pressure marking (TC container) or not marked with a "+" as described above (equivalent container), or equipped with a pressure-relief device of another construction.

5.2.3.2
The filling pressure of a TC-3AM, TC-3AAM, TC-3AXM, TC-3AAXM, TC-3ASM, or TC-3TM container in gas service other than Classification 2.2 gas service, with a service pressure greater than 3.5 MPa, shall not exceed 90% service pressure when the container temperature is 15°C and 112.5% service pressure when the container temperature is 55°C. The same filling pressure shall apply to equivalent containers.

5.2.3.3
The filling pressure of TC-3AM, TC-3AXM, TC-3AAM, TC-3AAXM or equivalent containers in hydrogen service shall be as specified in Clause 5.2.3.1 for Classification 2.2 service, except that fusible metal-backed frangible rupture disk pressure-relief devices shall be allowed. The ultimate tensile strength of the steel from which the cylinders or tubes are made shall be verified or certified to be less than 930 MPa, or the Brinell hardness shall be verified to be less than 269.

5.2.3.4
Where containers are not covered in Clauses 5.2.3.1 and 5.2.3.2, the filling pressure of a container with a Specification designation listed in Clause 5.2.1 shall not exceed its service pressure when the container temperature is 15°C and 125% service pressure when the container temperature is 55°C.

5.2.4 Ethylene, Compressed, UN1962
Ethylene, compressed is a compressed gas that for the purpose of this Standard shall be treated as a liquefied gas. See Clauses 4.4.7, 4.4.8, and 5.3.2.

5.2.5 Carbon Monoxide, Compressed, UN1016
Carbon monoxide, compressed shall be filled in containers manufactured to Specification ICC-3, TC-3AM138, CTC-3A1800, TC-3AXM138, CTC-3AX1800, TC-3AAM138, CTC-3AA1800, TC-3AAXM138, CTC-3AAX1800, TC-3ALM124, CTC-3AL1800, TC-3EM124, CTC-3E1800, or TC-3TM138. The pressure in the container shall not exceed 6.9 MPa at 15°C, except that if the gas is dry and sulphur-free, a container may be filled to 1/2 of the container test pressure or 13.8 MPa, whichever is less. TC-3ALM and CTC-3AL containers may be filled to service pressure. Filling of mixtures containing carbon monoxide up to no more than 15% by volume shall be permitted in containers made to Specification TC-4EM, CTC-4E, TC-39M, or CTC-39, inasmuch as the same containers are also permitted for the other components taken individually.

5.2.6 Natural Gas, Compressed, with High Methane Content, UN1971

5.2.6.1
Natural gas, compressed, with high methane content shall be filled in accordance with the requirements of this Standard in

(a) cylinders manufactured to
    (i) Specification TC-3AAM or CTC-3AA;
    (ii) Specification TC-3ALM, TC-3FCM, or TC-3HWM using aluminum alloy 6061; or
    (iii) Specification TC-3EM, CTC-3E, TC-3ASM, or CTC-3A made from austenitic stainless steel; or
(b) tubes manufactured to Specification TC-3AAXM or CTC-3AAX.

The quality of the natural gas, ie, composition and levels of contaminants, shall have been verified to be compatible with the materials of containment under the conditions of use.

5.2.6.2
Notwithstanding Clause 24.2.1.6 and Table 24.1 of CSA Standard B339, containers with a capacity of 1.0 L water or less shall be requalified by internal and external visual inspection, at least every 5 years, to CGA Publication C-6, C-6.1, or C-6.2, as applicable, at a facility registered in accordance with CSA Standard B339.

5.2.7 Diborane, Compressed, UN1911

Diborane, compressed or mixtures containing diborane shall be filled in cylinders manufactured to Specification TC-3AAM138, CTC-3AA1800, TC-3ALM124, or CTC-3AL1800, exclusively, subject to the following requirements:
(a) the filling density of the diborane shall not exceed 7%;
(b) diborane mixed with a compatible gas shall not generate a pressure exceeding 60% of the test pressure of the cylinder based on the complete decomposition of the diborane; and
(c) the cylinder valve shall be protected either by a metal cap or by packing the cylinder in a strong wooden box.

5.2.8 Fluorine, Compressed, UN1045

Fluorine, compressed shall be filled in cylinders manufactured to Specification TC-3AM77, CTC-3A1000, TC-3AAM77, CTC-3AA1000, TC-3ANM28, or CTC-3BN400, subject to the following requirements:
(a) cylinders shall not be equipped with a pressure-relief device;
(b) cylinders shall be equipped with a valve protection cap;
(c) cylinders shall not be filled to a pressure greater than 2.8 MPa at 15°C; and
(d) cylinders shall not be filled with more than 2.7 kg of gas.

5.2.9 Hexafluoroethane, Compressed, or Refrigerant Gas R116, Compressed, UN2193

Hexafluoroethane, compressed (R116) shall be filled in cylinders manufactured to Specification TC-3AM18, CTC-3A260, TC-3AAM18, CTC-3AA260, TC-4AAM33, CTC-4AA480, TC-4BAM18, CTC-4BA260, TC-4BWM18, CTC-4BW260, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM18, CTC-3AL260, or TC-3ASM18.

5.3 Filling Cylinders, Spheres, and Tubes with Liquefied Gases

5.3.1 General Requirements

5.3.1.1

Unless otherwise specified in this Standard, the following filling limits shall apply:
(a) except as specified in Item (c), the pressure in a container at 15°C shall not exceed its service pressure;
(b) except as specified in Item (c), the pressure in a container at 55°C shall not exceed 125% service pressure;
(c) the filling pressure of a TC-3AM, TC-3AAM, TC-3AXM, TC-3AAXM, TC-3ASM, or TC-3TM container, with a service pressure greater than 3.5 MPa, shall not exceed 90% service pressure when the container temperature is 15°C and 112.5% service pressure when the container temperature is 55°C; and
(d) the liquid phase of a liquefied gas or any mixture of liquefied gases and any liquid or solid shall not fill a container at any temperature up to 55°C except as permitted in Clause 5.3.2.

5.3.1.2

The liquid phase of a liquefied gas that has a critical temperature lower than 55°C shall fulfill the requirements of Clause 5.3.1.1(d) at the critical temperature except as permitted in Clause 5.3.2.

5.3.1.3

Filling a liquefied gas shall be by mass measurement using an approved scale or by volume measurement of liquid.

5.3.1.4

After being disconnected from the filling line, filled containers shall have their mass verified. Any overfill shall be removed in a safe manner.

5.3.2 Gases Listed in Table 5.2

Liquefied gases listed in Table 5.2 shall be filled in accordance with Table 5.2 only in the containers described for each gas, and to a filling density not exceeding the corresponding maximum permitted filling density.

Note: *The maximum filling densities are listed in Table 5.2 for certain liquefied gases with critical temperatures below 55°C that result in the container being liquid-full below the critical temperature; because of the compressibility of these gases, the maximum pressure requirements of Clause 5.3.1.1(b) and (c) are met at up to and including 55°C.*

5.3.3 Gases Not Specifically Listed in Clauses 5.3 and 5.6, Except Liquefied Petroleum Gases

Liquefied gases, other than liquefied petroleum gases, for which filling requirements are not specified in Table 5.2 or anywhere else in this Standard, shall be filled in containers manufactured to Specification ICC-3, TC-3AM, CTC-3A, TC-3AAM, CTC-3AA, TC-3ANM, CTC-3BN, TC-3ASM, CTC-3B, TC-3EM, CTC-3E, TC-3HTM, CTC-3HT, TC-4BM, CTC-4B, TC-4BAM, CTC-4BA, TC-4BWM, CTC-4BW, TC-4DM, CTC-4D, TC-4DAM, CTC-4DA, TC-4DSM, CTC-4DS, TC-4EM, CTC-4E, TC-4BM17ET, CTC-4B240ET, TC-39M, or CTC-39.

Limitations on the use of TC-39M and CTC-39 containers are specified in Clause 4.6.5. The use of TC-3HTM, CTC-3HT, TC-4DM, CTC-4D, TC-4DAM, CTC-4DA, TC-4DSM, or CTC-4DS containers shall not be permitted for gases of Classifications other than 2.2. Other limitations on the use of TC-3HTM and CTC-3HT cylinders are specified in Clause 4.6.3. Limitations on the use of TC-4EM and CTC-4E containers are specified in Clause 4.6.4. Filling of chlorodifluorobromomethane (R12B1), cyclobutane, dimethyl ether, silane, compressed, and vinyl bromide, stabilized, shall also be permitted in TC-3ALM or CTC-3AL cylinders. Ethyl chloride shall not be filled in aluminum containers.

Table 5.2
Filling Requirements for Liquefied Gases in Cylinders, Spheres, and Tubes
(See Clauses 5.3.2 and 5.3.3.)

Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Ammonia, anhydrous, or anhydrous ammonia	UN1005	54	ICC-3, TC-3AM33, CTC-3A480, TC-3AAM33, CTC-3AA480, TC-4AAM33, CTC-4AA480, CTC-3A480X, TC-3EM124, CTC-3E1800, TC-3ALM33, CTC-3AL480, TC-3ASM33
Bromotrifluoromethane, or refrigerant gas R13B1	UN1009	124	TC-3AM28, CTC-3A400, TC-3AAM28, CTC-3AA400, CTC-3B400, TC-4AAM33, CTC-4AA480, TC-4BM28, CTC-4B400, TC-4BAM28, CTC-4BA400, TC-4BWM28, CTC-4BW400, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM28, CTC-3AL400, TC-3ASM28

(Continued)

Table 5.2 (Continued)

Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Carbon dioxide	UN1013	68	TC-3AM138, CTC-3A1800, TC-3AXM138, CTC-3AX1800, TC-3AAM138, CTC-3AA1800, TC-3AAXM138, CTC-3AAX1800, TC-3EM124, CTC-3E1800, ICC-3, TC-3TM138, TC-39M, CTC-39, TC-3HTM138, CTC-3HT2000, TC-3ALM124, CTC-3AL1800, TC-3ASM138
Chlorine†	UN1017	125	TC-3AM33, CTC-3A480, TC-3AAM33, CTC-3AA480, ICC-3, TC-3ANM33, CTC-3BN480, TC-3EM124, CTC-3E1800
1-Chloro-1,1-difluoroethane, or refrigerant gas R142b	UN2517	100	TC-3AM10, CTC-3A150, TC-3AAM10, CTC-3AA150, CTC-3B150, TC-4BM10, CTC-4B150, TC-4BAM16, CTC-4BA225, TC-4BWM16, CTC-4BW225, TC-3EM124, CTC-3E1800, TC-3ALM10, CTC-3AL150, TC-39M, CTC-39, TC-3ASM10
Chlorodifluoromethane, or refrigerant gas R22	UN1018	105	TC-3AM17, CTC-3A240, TC-3AAM17, CTC-3AA240, CTC-3B240, TC-4BM17, CTC-4B240, TC-4BAM17, CTC-4BA240, TC-4BWM17, CTC-4BW240, TC-4BM17ET, CTC-4B240ET, TC-4EM17, CTC-4E240, TC-39M, CTC-39, TC-3EM124, CTC-3E1800, TC-3ALM17, CTC-3AL240, TC-3ASM17
Chlorodifluoromethane and Chloropentafluoroethane mixture with fixed boiling point, with approximately 49% chlorodifluoromethane, or refrigerant gas R502	UN1973	105	TC-3AM18, CTC-3A260, TC-3AAM18, CTC-3AA260, TC-4AAM33, CTC-4AA480, TC-4BAM18, CTC-4BA260, TC-4BWM18, CTC-4BW260, TC-4BWM18, CTC-4BW260, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM18, CTC-3AL260, TC-3ASM18

(Continued)

Table 5.2 (Continued)

Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Chloropentafluoroethane, or refrigerant gas R115	UN1020	110	TC-3AM16, CTC-3A225, CTC-3B225, TC-3AAM16, CTC-3AA225, TC-4BAM16, CTC-4BA225, TC-4BM16, CTC-4B225, TC-4BWM16, CTC-4BW225, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM16, CTC-3AL225, TC-3ASM16
1-chloro-1,2,2,2-tetrafluoroethane, or refrigerant gas R124	UN1021	117	TC-3AM18, CTC-3A260, TC-3AAM18, CTC-3AA260, TC-4AAM33, CTC-4AA480, TC-4BAM18, CTC-4BA260, TC-4BWM18, CTC-4BW260, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM18, CTC-3AL260, TC-3ASM18
Chlorotrifluoromethane, or refrigerant gas R13	UN1022	100	TC-3AM138, CTC-3A1800, ICC-3, TC-3AAM138, CTC-3AA1800, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM124, CTC-3AL1800, TC-3ASM138
Cyclopropane	UN1027	55	TC-3AM16, CTC-3A225, CTC-3A480X, TC-3AAM16, CTC-3AA225, CTC-3B225, TC-4AAM33, CTC-4AA480, TC-4BM16, CTC-4B225, TC-4BAM16, CTC-4BA225, TC-4BWM16, CTC-4BW225, TC-4BM17ET, CTC-4B240ET, ICC-3, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM16, CTC-3AL225, TC-3ASM16

(Continued)

Table 5.2 (Continued)

Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Dichlorodifluoromethane, or refrigerant gas R12	UN1028	119	TC-3AM16, CTC-3A225, TC-3AAM16, CTC-3AA225, CTC-3B225, TC-4BM16, CTC-4B225, TC-4BAM16, CTC-4BA225, TC-4BWM16, CTC-4BW225, TC-4BM17ET, CTC-4B240ET, TC-4EM16, CTC-4E225, TC-39M, CTC-39, TC-3EM124, CTC-3E1800, TC-3ALM16, CTC-3AL225, TC-3ASM16
Dichlorodifluoromethane and difluoroethane azeotropic mixture, with approximately 74% dichlorodifluoromethane, or refrigerant gas R500	UN2602	Not liquid-full at 55°C	TC-3AM17, CTC-3A240, TC-3AAM17, CTC-3AA240, CTC-3B240, TC-4BM17, CTC-4B240, TC-4BAM17, CTC-4BA240, TC-4BWM17, CTC-4BW240, TC-3EM124, CTC-3E1800, TC-4EM17, CTC-4E240, TC-39M, CTC-39, TC-3ASM17
1,2-Dichloro-1,1,2,2-tetrafluoroethane, or refrigerant gas R114	UN1958	125	TC-3AM18, CTC-3A260, TC-3AAM18, CTC-3AA260, TC-4AAM33, CTC-4AA480, TC-4BAM18, CTC-4BA260, TC-4BWM18, CTC-4BW260, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM18, CTC-3AL260, TC-3ASM18
1,1-Difluoroethane, or refrigerant gas R152a	UN1030	79	TC-3AM10, CTC-3A150, TC-3AAM10, CTC-3AA150, CTC-3B150, TC-4BAM16, CTC-4BA225, TC-4BM10, CTC-4B150, TC-4BWM16, CTC-4BW225, TC-3EM124, CTC-3E1800, TC-3ALM10, CTC-3AL150, TC-3ASM10
Dimethylamine, anhydrous	UN1032	59	TC-3AM10, CTC-3A150, TC-3AAM10, CTC-3AA150, CTC-3B150, TC-4BM10, CTC-4B150, TC-4BAM16, CTC-4BA225, TC-4BWM16, CTC-4BW225, TC-3EM124, CTC-3E1800, TC-3ASM10

(Continued)

Table 5.2 (Continued)

Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Ethane	UN1035	35.8	TC-3AM138, CTC-3A1800, TC-3AXM138, CTC-3AX1800, TC-3AAM138, CTC-3AA1800, TC-3AAXM138, CTC-3AAX1800, ICC-3, TC-3EM124, CTC-3E1800, TC-3TM138, TC-39M, CTC-39, TC-3ALM124, CTC-3AL1800, TC-3ASM138
Ethane	UN1035	36.8	TC-3AM153, CTC-3A2000, TC-3AXM153, CTC-3AX2000, TC-3AAM153, CTC-3AA2000, TC-3AAXM153, CTC-3AAX2000, TC-39M, CTC-39, TC-3TM153, TC-3ALM138, CTC-3AL2000, TC-3ASM153
Ethylene, compressed	UN1962	31.0	TC-3AM138, CTC-3A1800, TC-3AXM138, CTC-3AX1800, TC-3AAM138, CTC-3AA1800, TC-3AAXM138, CTC-3AAX1800, ICC-3, TC-3EM124, CTC-3E1800, TC-3TM138, TC-39M, CTC-39, TC-3ALM124, CTC-3AL1800, TC-3ASM138
Ethylene, compressed	UN1962	32.5	TC-3AM153, CTC-3A2000, TC-3AXM153, CTC-3AX2000, TC-3AAM153, CTC-3AA2000, TC-3AAXM153, CTC-3AAX2000, TC-39M, CTC-39, TC-3TM153, TC-3ALM138, CTC-3AL2000, TC-3ASM153
Ethylene, compressed	UN1962	35.5	TC-3AM184, CTC-3A2400, TC-3AXM184, CTC-3AX2400, TC-3AAM184, CTC-3AA2400, TC-3AAXM184, CTC-3AAX2400, TC-39M, CTC-39, TC-3TM184, TC-3ALM165, CTC-3AL2400, TC-3ASM184

(Continued)

Table 5.2 (Continued)

Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Hydrogen chloride, anhydrous	UN1050	65	TC-3AM138, CTC-3A1800, TC-3AXM138, CTC-3AX1800, TC-3AAM138, CTC-3AA1800, TC-3AAXM138, CTC-3AAX1800, ICC-3, TC-3TM138, TC-3EM124, CTC-3E1800
Hydrogen sulphide‡	UN1053	62.5	TC-3AM33, CTC-3A480, TC-3AAM33, CTC-3AA480, CTC-3B480, TC-4BM33, CTC-4B480, TC-4BAM33, CTC-4BA480, TC-4BWM33, CTC-4BW480, TC-3EM124, CTC-3E1800, TC-3ALM33, CTC-3AL480, TC-3ASM33
Insecticide gas n.o.s.§	UN1968	Not liquid-full at 55°C	TC-3AM21, CTC-3A300, TC-3AAM21, CTC-3AA300, CTC-3B480, TC-4BM21, CTC-4B300, TC-4BAM21, CTC-4BA300, TC-4BWM21, CTC-4BW300, TC-3EM124, CTC-3E1800, TC-3ASM21
Methylacetylene and propadiene mixture, stabilized††	UN1060	50	TC-4BM17 and CTC-4B240 without brazed seams, TC-4BAM17 and CTC-4BA240 without brazed seams, TC-3AM17, CTC-3A240, TC-3AAM17, CTC-3AA240, CTC-3B240, TC-3EM124, CTC-3E1800, TC-4BWM17, CTC-4BW240, TC-4EM17, CTC-4E240, TC-4BM17ET, CTC-4B240ET, TC-3ALM17, CTC-3AL240, TC-3ASM17, TC-39M, CTC-39
Methylamine, anhydrous	UN1061	60	TC-3AM10, CTC-3A150, TC-3AAM10, CTC-3AA150, CTC-3B150, TC-4BM10, CTC-4B150, TC-4BAM16, CTC-4BA225, TC-4BWM16, CTC-4BW225, TC-3EM124, CTC-3E1800, TC-3ASM10

(Continued)

Table 5.2 (Continued)

Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Methyl chloride, or refrigerant gas R40	UN1063	84	TC-3AM16, CTC-3A225, TC-3AAM16, CTC-3AA225, CTC-3B225, TC-4BM16, CTC-4B225, TC-4BAM16, CTC-4BA225, TC-4BWM16, CTC-4BW225, ICC-3, TC-3EM124, CTC-3E1800, TC-4BM17ET, CTC-4B240ET, TC-3ASM16
Methyl mercaptan	UN1064	80	TC-3AM17, CTC-3A240, TC-3AAM17, CTC-3AA240, CTC-3B240, TC-4BM17ET, CTC-4B240ET, TC-4BM17, CTC-4B240, TC-3EM124, CTC-3E1800, TC-4BAM17, CTC-4BA240, TC-4BWM17, CTC-4BW240, TC-3ASM17
Nitrosyl chloride	UN1069	110	TC-3ANM28, CTC-3BN400
Nitrous oxide	UN1070	68	TC-3AM138, CTC-3A1800, TC-3AXM138, CTC-3AX1800, TC-3AAM138, CTC-3AA1800, TC-3AAXM138, CTC-3AAX1800, ICC-3, TC-3EM124, CTC-3E1800, TC-3HTM138, CTC-3HT2000, TC-39M, CTC-39, TC-3TM138, TC-3ALM124, CTC-3AL1800, TC-3ASM138
Pentafluoroethane, or refrigerant gas R125	UN3220	104	TC-3AM18, CTC-3A260, TC-3AAM18, CTC-3AA260, TC-4AAM33, CTC-4AA480, TC-4BAM18, CTC-4BA260, TC-4BWM18, CTC-4BW260, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM18, CTC-3AL260, TC-3ASM18

(Continued)

Table 5.2 (Continued)

Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Refrigerant gas, n.o.s.§	UN1078	Not liquid-full at 55°C	TC-3AM17, CTC-3A240, TC-3AAM17, CTC-3AA240, CTC-3B240, TC-3EM124, CTC-3E1800, TC-4BM17, CTC-4B240, TC-4BAM17, CTC-4BA240, TC-4BWM17, CTC-4BW240, TC-4EM17, CTC-4E240, TC-39M, CTC-39, TC-3ALM17, CTC-3AL240
Sulphur dioxide	UN1079	125	TC-3AM16, CTC-3A225, TC-3AAM16, CTC-3AA225, CTC-3B225, TC-4BM16, CTC-4B225, TC-4BAM16, CTC-4BA225, TC-4BWM16, CTC-4BW225, TC-4BM17ET, CTC-4B240ET, ICC-3, TC-39M, CTC-39, TC-3EM124, CTC-3E1800, TC-3ALM16, CTC-3AL225, TC-3ASM16
Sulphur hexafluoride	UN1080	120	TC-3AM77, CTC-3A1000, TC-3AAM77, CTC-3AA1000, TC-3AAXM138, CTC-3AAX1800, ICC-3, TC-3TM138, TC-3EM124, CTC-3E1800, TC-3ALM69, CTC-3AL1000, TC-3ASM77
Sulphuryl fluoride	UN2191	106	TC-3AM33, CTC-3A480, TC-3AAM33, CTC-3AA480, TC-3EM124, CTC-3E1800, TC-4BM33, CTC-4B480, TC-4BAM33, CTC-4BA480, TC-4BWM33, CTC-4BW480, TC-3ASM33
1,1,1,2-Tetrafluoroethane, or refrigerant gas R134a	UN3159	104	TC-3AM18, CTC-3A260, TC-3AAM18, CTC-3AA260, TC-4AAM33, CTC-4AA480, TC-4BAM18, CTC-4BA260, TC-4BWM18, CTC-4BW260, TC-3EM124, CTC-3E1800, TC-39M, CTC-39, TC-3ALM18, CTC-3AL260, TC-3ASM18

(Continued)

Table 5.2 (Continued)

Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Tetrafluoroethylene, stabilized (also known as R1114)	UN1081	90	TC-3AM92, CTC-3A1200, TC-3AAM92, CTC-3AA1200, TC-3EM124, CTC-3E1800, TC-3ASM92
Tetrafluoromethane, compressed, or refrigerant gas R14, compressed	UN1982	70**	TC-3AM138, CTC-3A1800, TC-3AAM138, CTC-3AA1800, TC-3EM124, CTC-3E1800, TC-3ALM124, CTC-3AL1800, TC-3ASM138
Trifluorochloroethylene, stabilized (also known as R1113)	UN1082	115	TC-3AM21, CTC-3A300, TC-3AAM21, CTC-3AA300, CTC-3B300, TC-4BM21, CTC-4B300, TC-4BAM21, CTC-4BA300, TC-4BWM21, CTC-4BW300, TC-3EM124, CTC-3E1800, TC-3ASM21
Trifluoromethane, or refrigerant gas R23	UN1984	70**	TC-3AM138, CTC-3A1800, TC-3AAM138, CTC-3AA1800, TC-3EM124, CTC-3E1800, TC-3ALM124, CTC-3AL1800, TC-3ASM138
Trimethylamine, anhydrous	UN1083	57	TC-3AM10, CTC-3A150, TC-3AAM10, CTC-3AA150, CTC-3B150, TC-4BM10, CTC-4B150, TC-4BAM16, CTC-4BA225, TC-4BWM16, TC-4BW225, TC-3EM124, CTC-3E1800, TC-3ASM10
Vinyl chloride, stabilized†† (also known as R1140)	UN1086	84	TC-4BM10 and CTC-4B150 without brazed seams, TC-4BAM16 and CTC-4BA225 without brazed seams, TC-4BWM16, CTC-4BW225, TC-3AM10, CTC-3A150, TC-3AAM10, CTC-3AA150, TC-3EM124, CTC-3E1800, TC-3ALM10, CTC-3AL150, TC-3ASM10
Vinyl fluoride, stabilized‡‡ (also known as R1141)	UN1860	62	TC-3AM138, CTC-3A1800, TC-3AAM138, CTC-3AA1800, TC-3EM124, CTC-3E1800, TC-3ALM124, CTC-3AL1800, TC-3ASM138

(Continued)

Table 5.2 (Concluded)

Liquefied gas, shipping name and description	PIN	Maximum permitted filling density, %	Permitted containers*
Vinyl methyl ether, stabilized††	UN1087	68	TC-4BM10 and CTC-4B150 without brazed seams, TC-4BAM16 and CTC-4BA225 without brazed seams, TC-4BWM16, CTC-4BW225, TC-3AM10, CTC-3A150, TC-3AAM10, CTC-3AA150, CTC-3B150, TC-3EM124, CTC-3E1800, TC-3ASM10

**Cylinders, spheres, or tubes marked as shown in this column, or of the same specification with higher service pressure, shall be used.*
†Cylinders manufactured after October 1, 1944 for the transportation of chlorine shall contain no aperture other than that provided in the neck of the cylinder for the attachment of a valve equipped with an approved pressure-relief device. Cylinders manufactured after November 1, 1935 shall not be filled with more than 68 kg.
‡Valve outlets shall be seated by a threaded cap or a threaded solid plug.
§n.o.s. means not otherwise specified.
***Critical temperature below 55°C or 130°F. Filled as gas.*
††All parts of valves and pressure-relief devices in contact with the contents of the container shall be of a metal or other material, suitably treated if necessary, that will not cause formation of any acetylides.
‡‡Cylinders containing vinyl fluoride, stabilized, UN1860, may be liquid-full at 55°C, provided that the pressure at the critical temperature does not exceed 125% service pressure.

5.3.4 Specific Requirements for Liquefied Petroleum Gases Not Listed in Table 5.2

5.3.4.1

Liquefied petroleum gases shall be filled in containers manufactured to Specification ICC-3, TC-3AM, CTC-3A, TC-3AAM, CTC-3AA, TC-3ALM, CTC-3AL, CTC-3B, TC-3EM, CTC-3E, TC-4BM, CTC-4B, TC-4BAM, CTC-4BA, CTC-4B240FLW, TC-4BM17ET, CTC-4B240ET, TC-4BWM, CTC-4BW, TC-4EM,CTC-4E, TC-39M, or CTC-39. Limitations on the use of TC-39M and CTC-39 containers are specified in Clause 4.6.5. The filling density shall be in accordance with Table 5.3.

5.3.4.2

Liquefied petroleum gases shall be odorized in accordance with the requirements of CGSB Standards CAN/CGSB-3.13 and CAN/CGSB-3.14 except that odorization is not required if harmful in the use or further processing of the liquefied petroleum gas.

5.3.4.3

Containers filled with a nonodorized liquefied petroleum gas shall be legibly marked "NONODORIZED'' and "SANS ODORISANT'' in letters not less than 12 mm in height on a contrasting background near the marked proper shipping name.

5.3.4.4

Valve outlets of liquefied petroleum gas containers, with a capacity of 20 kg or less of product, shall be equipped with an effective seal such as a plug, cap, or a disconnection device.

Table 5.3
Filling Density for Liquefied Petroleum Gases
(See Clause 5.3.4.1.)

Minimum specific gravity of the liquid material at 15°C	Maximum filling density
0.271–0.289	26
0.290–0.306	27
0.307–0.322	28
0.323–0.338	29
0.339–0.354	30
0.355–0.371	31
0.372–0.398	32
0.399–0.425	33
0.426–0.440	34
0.441–0.452	35
0.453–0.462	36
0.463–0.472	37
0.473–0.480	38
0.481–0.488	39
0.489–0.495	40
0.496–0.503	41
0.504–0.510*	42
0.511–0.519	43
0.520–0.527	44
0.528–0.536	45
0.537–0.544	46
0.545–0.552	47
0.553–0.560	48
0.561–0.568	49
0.569–0.576	50
0.577–0.584	51
0.585–0.592	52
0.593–0.600	53
0.601–0.608	54
0.609–0.617	55
0.618–0.626	56
0.627–0.634	57

**Specific gravity of commercial propane.*

5.3.5 Ethylene Oxide, or Ethylene Oxide with Nitrogen up to a Total Pressure of 1 MPa (10 bar) at 50°C, UN1040

Ethylene oxide, or ethylene oxide with nitrogen up to a total pressure of 1 MPa (10 bar) at 50°C, shall be filled in cylinders as follows:

(a) cylinders shall be seamless or welded steel except Specification TC-8WAM, TC-8WM, CTC-8, CTC-8AL, CTC-8WC, TC-4LM, or CTC-4L cylinders. Brazed cylinders shall not be permitted;

(b) cylinders shall have a nominal water capacity not exceeding 113.6 L;

(c) cylinders shall be equipped with pressure-relief devices of the fusible plug type with a threaded straight bore orifice with a yield temperature of 69 to 77°C, having a minimum vent area of 7.82 mm^2/L of water capacity for cylinders not over 3.8 L capacity and 1.71 mm^2/L of water capacity for all cylinders over 3.8 L capacity;

(d) pressurizing valves shall be provided for all cylinders over 3.8 L water capacity;

(e) siphon tubes shall be provided for all cylinders over 18.9 L water capacity;

(f) before each refilling, cylinders shall be tested for leakage with an inert gas, at a pressure of at least 100 kPa;
(g) cylinders with a water capacity in excess of 3.8 L shall be insulated with at least three coats of heat-retardant paint, applied over a primer and finished with a waterproof paint. Other equivalent insulation systems shall be permitted; and
(h) cylinders shall not be liquid-full at 85°C.

5.3.6 Ethylene Oxide and Dichlorodifluoromethane Mixture with Not More than 12.5% Ethylene Oxide, UN3070

Ethylene oxide and dichlorodifluoromethane mixtures with not more than 12.5% ethylene oxide shall be filled in containers that are manufactured to Specification TC-3AM17, CTC-3A240, TC-3AAM17, CTC-3AA240, CTC-4BA240, TC-4BAM17, CTC-4BW240, or TC-4BWM17. Brazed seams in 4BA cylinders shall not be permitted. Containers shall not be liquid-full at 85°C.

5.3.7 Tungsten Hexafluoride, UN2196

Tungsten hexafluoride shall be filled in containers manufactured to Specification TC-3AM, CTC-3A, TC-3AAM, CTC-3AA, TC-3ANM, CTC-3BN, TC-3EM, or CTC-3E. The cylinder opening shall be closed by means of a capped or plugged valve or a threaded metal plug. The cylinder valve protection shall be in accordance with Clause 4.2.3.

5.4 Filling Cylinders with Acetylene, Dissolved, UN1001

5.4.1

Acetylene, dissolved, shall be filled in cylinders manufactured to Specification TC-8WM, TC-8WAM, CTC-8, CTC-8AL, or CTC-8WC, subject to the following requirements:
(a) the amount of solvent added in the filling operation shall not cause the tare of the cylinder to exceed its marked tare;
(b) the acetylene content in excess of the saturation acetylene shall not exceed the cylinder rated capacity; and
(c) the settled pressure shall not be greater than 1.9 MPa at 15°C.

5.4.2

The pressure in a cylinder representative of the previous day's filling shall be checked each day that cylinders are filled to verify that the settled pressure limit has not been exceeded. A record of these data shall be kept for at least 30 days.
Note: *For manifolding requirements, see Clause 4.4.9.*

5.5 Filling Containers with Refrigerated Liquids

5.5.1

Except as permitted in Clause 5.5.2, and subject to the following requirements, the refrigerated liquids and permitted mixtures in Table 5.4 shall be filled as indicated:
(a) cylinders shall be provided with pressure-relief devices in accordance with Clause 4.3, installed and located so that the cooling effect of the contents during venting will not prevent their effective operation;
(b) cylinders shall be provided with pressure-limiting devices that are
(i) sized and set to limit the pressure in the cylinder to not more than 125% marked service pressure when the insulation is other than vacuum;
(ii) sized and set to limit the pressure in the cylinder to not more than 125% marked service pressure less 103 kPa when the insulation is vacuum;
(iii) designed and installed so that they will prevent the cylinder from becoming liquid-full; and
(iv) located so that the inlet of the pressure-limiting device is in the vapour phase;

(c) cylinders shall be filled and transported in the vertical position unless specifically designed for horizontal service;
(d) cylinders shall not be filled with refrigerated liquids colder than their design service temperature;
(e) valves or fittings made of aluminum shall not be installed on any cylinder in oxygen, hydrogen, or nitrous oxide service;
(f) cylinders in oxygen or nitrous oxide service shall be cleaned in accordance with the requirements of CGA Publication G-4.1; and
(g) except for hydrogen, the filling limits shall be in accordance with Table 5.5.

Table 5.4
Refrigerated Liquids and Permitted Mixtures
(See Clause 5.5.1.)

Shipping name and description	PIN	Specification
Argon, refrigerated liquid	UN1951	TC-4LM or CTC-4L
Carbon dioxide, refrigerated liquid	UN2187	TC-4LM or CTC-4L
Helium, refrigerated liquid	UN1963	TC-4LM or CTC-4L
Hydrogen, refrigerated liquid	UN1966	TC-4LM or CTC-4L
Neon, refrigerated liquid	UN1913	TC-4LM or CTC-4L
Nitrogen, refrigerated liquid	UN1977	TC-4LM or CTC-4L
Nitrous oxide, refrigerated liquid	UN2201	TC-4LM or CTC-4L
Oxygen, refrigerated liquid	UN1073	TC-4LM or CTC-4L

Table 5.5
Filling Limits for Refrigerated Liquids
(See Clause 5.5.1.)

Pressure control valve setting (maximum start-to-discharge pressure), kPa	Maximum permitted filling density, % by mass						
	Argon	Carbon dioxide	Helium	Neon	Nitrogen	Nitrous oxide	Oxygen
310	133	not allowed	12.5	109	76	not allowed	108
520	130	not allowed	12.5	104	74	not allowed	105
725	127	108	12.5	100	72	104	103
1170	122	105	12.5	92	70	101	100
1585	119	104	12.5	85	69	99	98
2030	115	102	12.5	77	68	97	96
2500	113	100	12.5	—	65	95	93
3100	111	98	12.5	—	61	83	91
3700	107	92	12.5	—	58	87	88
4300	104	86	12.5	—	55	80	86
Design service temperature, °C	–196	–196	–269	–246	–196	–196	–196

5.5.2
Additional requirements for hydrogen shall be as follows:
(a) the maximum filling density shall be 6.7% at –253°C (the water capacity shall be corrected to be the actual internal volume of the cylinders at –253°C);
(b) the pressure-limiting device shall be set at not more than 117 kPa;
(c) the cylinder design service temperature shall be –253°C or colder;
(d) the pressure in each cylinder shall be reduced to 55 kPa or lower at least once within 4 h prior to transportation;
(e) the outer cylinder jacket shall be made of steel; and
(f) the total rate of venting shall be marked on the top head or valve protection band in letters at least 12.5 mm high.

5.5.3
Argon, nitrogen, oxygen, and helium refrigerated liquids may be filled in nonspecification vacuum-insulated containers with a pressure of up to 0.3 MPa. When transported, they shall be secured in the upright position.

5.6 Filling Containers with Specific Dangerous Goods, Class 2

5.6.1 Application
Clause 5.6 covers only the selection and filling of containers for the transportation of dangerous goods listed in Table 5.6.

5.6.2 General Requirements

5.6.2.1
Unless otherwise specified, the following requirements for containers and their accessories shall apply:
(a) Valves on containers shall be capable of withstanding the test pressure of the containers and shall be connected directly to the containers with taper-threaded connections. Bushings shall not be used on the connections.
(b) For corrosive gases, valves may be of the packed type, provided that the assembly is made gas-tight by means of a seal cap with a compatible gasketed joint to the valve body or to the container to prevent loss of gas through or past the packing; otherwise, the valves shall be of the packless type with nonperforated diaphragms and equipped with handwheels.
(c) Valve outlets shall be sealed by a threaded cap or a threaded solid plug. The outlet caps and plugs, luting, and gaskets shall be compatible with each other, the valve assembly, and the contents.
(d) Manifolding of containers shall be prohibited.

5.6.2.2
Unless otherwise specified, gases shall be filled in containers manufactured to Specification TC-3AM138, CTC-3A1800, TC-3AAM138, CTC-3AA1800, TC-3EM124, CTC-3E1800, TC-3ALM124, CTC-3AL1800, or TC-3ASM138, subject to the following requirements:
(a) TC-3AM138, CTC-3A1800, TC-3AAM138, CTC-3AA1800, TC-3ALM124, CTC-3AL1800, and TC-3ASM138 containers shall not exceed 57 L water capacity (nominal); and
(b) TC-3EM124 and CTC-3E1800 containers shall be packed in strong wooden or metal boxes that meet the requirements of Clause 5.6.2.5.

5.6.2.3
The pressure of the gas at 55°C shall not exceed the service pressure of the cylinder except that, where the filling is done in TC-3AM, TC-3AAM, or TC-3ASM cylinders, the pressure at 55°C shall not exceed 90% of the service pressure of the cylinder.

5.6.2.4

Containers shall not be liquid-full at 55°C. Filling of a liquefied gas or a liquid to be pressurized by a gas shall be by mass measurement using an approved scale. After being disconnected from the filling line, containers shall have their mass verified and any overfill shall be removed in a safe manner.

Table 5.6
Dangerous Goods Covered by Clause 5.6

(See Clauses 4.3.6 and 5.6.1.)

Shipping name and description	PIN
Arsine	UN2188
Boron trichloride	UN1741
Bromine chloride	UN2901
Carbonyl fluoride, compressed	UN2417
Carbonyl sulphide	UN2204
Chlorine pentafluoride	UN2548
Chlorine trifluoride	UN1749
Chloropicrin and methyl bromide mixture	UN1581
Chloropicrin and methyl chloride mixture	UN1582
Cyanogen	UN1026
Cyanogen chloride, stabilized	UN1589
Dichlorosilane	UN2189
Dinitrogen tetroxide or nitrogen dioxide	UN1067
Germane	UN2192
Hexaethyl tetraphosphate and compressed gas mixture	UN1612
Hexafluoroacetone	UN2420
Hydrogen bromide, anhydrous	UN1048
Hydrogen iodide, anhydrous	UN2197
Hydrogen selenide, anhydrous	UN2202
Insecticide gas, toxic, flammable, n.o.s.*	UN3335
Insecticide gas, toxic, n.o.s.*	UN1967
Methyl bromide	UN1062
Methylchlorosilane	UN2534
Nitric oxide, compressed	UN1660
Nitric oxide and dinitrogen tetroxide mixture, or nitric oxide and nitrogen dioxide mixture	UN1975
Nitrogen trioxide	UN2421
Oxygen difluoride, compressed	UN2190
Perchloryl fluoride	UN3083
Phosgene	UN1076
Phosphine	UN2199
Phosphorus pentafluoride, compressed	UN2198
Selenium hexafluoride	UN2194
Silicon tetrafluoride, compressed	UN1859
Stibine	UN2676
Sulphur tetrafluoride	UN2418
Tellurium hexafluoride	UN2195
Trifluoroacetyl chloride	UN3057

**n.o.s. means not otherwise specified.*

5.6.2.5

When containers are required to be packed in outer packaging such as a box, crate, or cradle, the outer packaging shall be of sufficient strength to protect all parts of the containers from deformation or breakage resulting from a drop of at least 1.85 m onto a solid, concrete floor, impacting at the weakest point. Containers shall be cushioned or braced inside the outer packaging as necessary to prevent damage.

Note: *Containers used for the purpose of testing the protective means or devices in accordance with Clause 5.6.2.5 should be filled with nonpoisonous, nonflammable substances to a pressure and mass equivalent to that of the intended contents. In performing the foregoing tests, proper safety precautions should be taken to protect personnel and property.*

5.6.3 Specific Requirements

5.6.3.1 Phosgene, UN1076

Phosgene shall be filled in containers as follows:
(a) the filling density shall not exceed 125%;
(b) no container shall be filled with more than 68 kg of phosgene; and
(c) each filled container shall be leak tested and show no leakage. This test shall consist of immersing the container and valve, with the protection cap removed, in a bath of water at a temperature of 65°C for at least 30 min, during which time frequent examinations shall be made to note any escape of gas. The valve on the container shall not be opened after this test, before or during transportation.

5.6.3.2 Chloropicrin and Methyl Chloride Mixture, UN1582

Chloropicrin and methyl chloride mixtures may also be filled in containers manufactured to Specification TC-3AM, CTC-3A, TC-3AAM, CTC-3AA, TC-3B, TC-4BM, CTC-4B, TC-4BAM, CTC-4BA, TC-4BWM, CTC-4BW, TC-3EM, or CTC-3E, subject to the following requirements:
(a) containers shall have a water capacity not greater than 113 L; and
(b) containers with a wall thickness less than 2.54 mm shall be packed in a box, crate, or cradle that meets the requirements of Clause 5.6.2.5.

5.6.3.3 Cyanogen Chloride, Stabilized, UN1589

Cyanogen chloride, stabilized, containing less than 0.9% water may also be filled in containers manufactured to Specification TC-3AM33, CTC-3A480, TC-3AAM33, CTC-3AA480, TC-3ALM124, or CTC-3AL1800, subject to the following requirements:
(a) containers shall have a water capacity not greater than 126 L; and
(b) containers shall have a gas-tight threaded valve protection cap at least 4.75 mm thick and have a 4.75 mm face seat for a gasket.

5.6.3.4 Hexaethyl Tetraphosphate and Compressed Gas Mixture, UN1612

Hexaethyl tetraphosphate and compressed gas mixtures shall be filled in containers manufactured to Specification TC-3AM17, CTC-3A240, CTC-3B240, TC-3AAM17, CTC-3AA240, TC-4BM17, CTC-4B240, TC-4BAM17, CTC-4BA240, TC-4BWM17, or CTC-4BW240, subject to the following requirements:
(a) the compressed gas shall be nonflammable. The mixture shall not contain more than 20% by mass of the organic phosphate;
(b) containers shall not be filled to more than 4.54 kg of the mixture;
(c) the filling density shall not exceed 80%;
(d) containers shall not be equipped with siphon tubes or fusible plugs;
(e) up to 12 containers may be packed in a wooden box that meets the requirements of Clause 5.6.2.5; and
(f) a single-trip, outside fibreboard box may be used for packaging when not more than four such containers are to be packed in one box. Box and valve protection shall meet the requirements of Clause 5.6.2.5.

5.6.3.5 Dinitrogen Tetroxide or Nitrogen Dioxide, UN1067

Dinitrogen tetroxide or nitrogen dioxide may also be filled in containers manufactured to Specification TC-3AM33, CTC-3A480, TC-3AAM33, CTC-3AA480, TC-3ALM124, or CTC-3AL1800, subject to the following requirements:

(a) threaded valve protection caps shall be at least 4.75 mm thick and have a 4.75 mm face seat for a gasket; and

(b) each cylinder shall be cleaned in accordance with the requirements of CGA Publication G-4.1.

5.6.3.6 Chlorine Pentafluoride, UN2548, and Chlorine Trifluoride, UN1749

Chlorine pentafluoride and chlorine trifluoride shall be filled in containers manufactured to Specification TC-3AM10, CTC-3A150, CTC-3B240, TC-3AAM10, CTC-3AA150, TC-3ANM10, CTC-3BN150, TC-4BM17, CTC-4B240, TC-4BAM17, CTC-4BA240, TC-4BWM17, CTC-4BW240, TC-3EM, or CTC-3E.

5.6.3.7 Methyl Bromide, UN1062, and Chloropicrin and Methyl Bromide Mixture, UN1581

Methyl bromide, and chloropicrin and methyl bromide mixtures, may also be filled in containers manufactured to Specification TC-3AM16, CTC-3A225, TC-3AAM16, CTC-3AA225, CTC-3B225, TC-4BM16, CTC-4B225, TC-4BAM16, CTC-4BA225, TC-4BWM16, or CTC-4BW225.

Containers with a wall thickness of less than 2.03 mm shall be packaged in a box, crate, or cradle that meets the requirements of Clause 5.6.2.5.

5.6.3.8 Phosphine, UN2199

The filling density of phosphine shall not exceed 37%.

5.6.3.9 Nitric Oxide, Compressed, UN1660

Nitric oxide, compressed shall be filled in containers that comply with the following:

(a) they shall be TC-3AM138, TC-3AAM138, TC-3EM124, TC-3ALM124 cylinders or equivalent containers;

(b) they shall be filled to a pressure not greater than 5.1 MPa at 15°C. Mixtures with up to 10% nitric oxide may be filled to 12.4 MPa;

(c) they shall be equipped with a stainless steel valve and a valve seat of material compatible with nitric oxide and nitrogen dioxide. Valve outlets shall be sealed by a threaded cap or plug with an inert gasketing material;

(d) they shall be cleaned in accordance with the requirements of CGA Publication G-4.1;

(e) Specification TC-3EM and CTC-3E cylinders shall be packed in strong wooden boxes that meet the requirements of Clause 5.6.2.5; and

(f) Specification TC-3AM, TC-3AAM, TC-3ALM, or equivalent containers shall be packed in accordance with Item (e) or have their valves protected by metal caps or other attached protective devices in accordance with Clause 4.2.3.

5.7 Filling Cylinders, Spheres, and Tubes with Radioactive Gases

Radioactive gases shall be filled in Series 3 and 4 containers in accordance with the other filling requirements for the same gases. The radioactive gas packages shall also meet the transport packaging requirements of the Canadian Nuclear Safety Commission Regulations.

6. Other Containers

6.1 Accumulators Transported as Articles, Pressurized, Hydraulic (Containing Nonflammable Gas) or Articles, Pressurized, Pneumatic (Containing Nonflammable Gas), UN3164

Accumulators (pneumatic or hydraulic) with a water capacity not exceeding 41 L filled with a gas and offered for transportation shall be constructed in accordance with the applicable codes. Such accumulators shall only be filled with a nonflammable, nontoxic, and noncorrosive gas, and shall be protected by overpacking. Accumulators that have a water capacity exceeding 41 L offered for transportation shall not be pressurized with a gas.

6.2 Refrigerating Machines Containing Nonflammable, Nontoxic, Liquefied Gas or Ammonia Solutions, UN2857, and Refrigerating Machines Containing Flammable, Nontoxic, Liquefied Gas, UN3358

Refrigerating machines containing nonflammable, nontoxic, liquefied gas or ammonia solutions, and refrigerating machines containing flammable, nontoxic, liquefied gas, shall be exempt from other requirements of this Standard, provided that they meet the following requirements:
(a) containers shall be manufactured, inspected, and tested in accordance with CSA Standard B52;
(b) containers shall not be filled with more than 227 kg of Group I refrigerant as classified in CSA Standard B52 or more than 22.7 kg of refrigerant other than Group I;
(c) machines or components thereof having two or more filled containers shall not contain an aggregate of more than 907 kg of Group I refrigerant or more than 45.4 kg of refrigerant other than Group I;
(d) containers shall be equipped with a shut-off valve at each opening except those openings used for pressure-relief devices; the shut-off valves shall be closed prior to and during transportation;
(e) the liquid portion of the refrigerant, if any, shall not completely fill any container at 55°C; and
(f) the amount of refrigerant, if liquefied, shall not exceed the filling density specified in Clause 5.3.

6.3 Lighters or Lighter Refills (Cigarettes) Containing Flammable Gas and Capable of Passing the Tests Specified in the Hazardous Products (Lighters) Regulations, UN1057

Lighters and lighter refills designed to contain liquefied petroleum gases shall be filled in accordance with the following requirements:
(a) lighters and lighter refills shall not contain more than 70 mL of liquefied gas;
(b) the liquid phase shall not exceed 85% of the volumetric capacity of each fluid chamber at 15°C;
(c) lighters and lighter refills, including their closures, shall be capable of withstanding without leakage an internal pressure of at least two times the vapour pressure of the gas at 55°C; and
(d) lighters and lighter refills shall be packaged so as to prevent their movement within the package.

6.4 Filling and Handling of Foreign Cylinders for Export

6.4.1

A cylinder manufactured in a foreign country in compliance with that country's statutory requirements, and authorized for filling with a gas, may be filled with that gas in Canada and transported between the filling plant and the port of exit from which the cylinder entered Canada and will be exported from Canada, with or without intermediate storage, if it complies with the following requirements:
(a) the cylinder shall be requalified as specified in CSA Standard B339. This requalification may be omitted only if the cylinder can be identified as having been requalified within the time-frame as specified in Table 24.1 of CSA Standard B339; and

(b) the cylinder shall be filled in accordance with the lesser of the following filling density or pressure requirements:

(i) those specified by the country of origin; or

(ii) those specified in this Standard or otherwise permitted by the regulatory authority for the gas involved.

6.4.2

A cylinder otherwise in compliance with Clause 6.4.1 and filled with a gas may be imported into Canada, stored, and exported full. Such cylinders shall not be transported in Canada except for export.

6.5 Containers Not Specifically Listed

Containers for the transportation of dangerous goods, Class 2, with a water capacity not greater than 450 L that do not meet the requirements of CSA Standard B339 or Clause 6 of this Standard may be used if they meet the requirements of Part 1 of CSA Standard B51.

Appendix A
Containers Not Covered in This Standard

Note: *This Appendix is not a mandatory part of this Standard.*

A1.

The following containers are not covered in this Standard:

(a) containers of 120 mL or less in water capacity, except gas lighters;

(b) containers of 1 L capacity or less filled to not more than 1150 kPa at 15°C, or 115 L capacity or less filled to not more than 500 kPa at 15°C, when the containers are filled with a material that is not dangerous goods to not more than 90% of their capacity at 15°C, and then filled with a nonflammable, compressed gas;

(c) containers, including aerosol containers of 820 mL or less water capacity, filled with a nontoxic, noncorrosive solution and gas(es) where the pressure in the containers does not exceed 1200 kPa at 55°C;

(d) food, carbonated beverage, soap, and biological material containers; electronic tubes; and audible fire alarm systems;

(e) fire extinguishers partially filled with gases to not more than 1650 kPa at 21°C and having a water capacity not exceeding 18 L;

(f) fuel containers of self-propelled vehicles or machinery;

(g) pressure containers used as component parts of passenger restraint systems in motor vehicles;

(h) tires and pressure containers used as component parts of tire inflation systems in motor vehicles;

(i) water pump system tanks charged with gas;

(j) balls used for sports;

(k) chemical ammunition;

(l) gas identification sets;

(m) portable tanks;

(n) nonrefillable containers other than TC-39M or CTC-39;

(o) glass ampoules and vials;

(p) metal cartridges;

(q) inside containers other than those listed in Clause 4.9;

(r) bulk transportation and storage tanks; and

(s) nonpressured containers except vacuum-insulated containers used for refrigerated liquids.

Appendix B
Determination of Equivalent Containers

Note: *This Appendix is not a mandatory part of this Standard.*

B1. Determination of Equivalency for Containers Manufactured to Specifications 3AL, 3E, 3HT, 4, and 39

Procedure

Step 1: Multiply the service pressure in psi by 0.06895.
Step 2: Round the result to the nearest bar.
Step 3: Add the letter "M" to the specification designation to complete the specification and pressure marking.

Example 1: 3AL1800

Step 1: 1800 psi x 0.06895 = 124.11 bar.
Step 2: 124.11 bar rounds to 124 bar.
Step 3: 3ALM124.
A container stamped 3AL1800 is therefore equivalent to a container stamped 3ALM124.

Example 2: 4BW240

Step 1: 240 psi x 0.06895 = 16.548 bar.
Step 2: 16.548 bar rounds to 17 bar.
Step 3: 4BWM17
A container stamped 4BW240 is therefore equivalent to a container stamped 4BWM17.

B2. Determination of Equivalency for Nonmetric Containers of Series 3 Steel Cylinders Marked with a "+"

Procedure

Step 1: Calculate the test pressure.
Step 2: Multiply the test pressure in psi by 0.006895. This is the test pressure in MPa.
Step 3: Divide the test pressure by 1.5, then multiply by 10.
Step 4: Round the result to the nearest full unit. This is the service pressure in bar.
Step 5: Add the letter M to the specification designation to complete the specification and pressure marking.

Example: 3AA2265+

Step 1: 2265 psi x 5/3 = 3775.0 psi.
Step 2: 3775.0 x 0.006895 = 26.029 MPa.
Step 3: 26.029 ÷ 1.5 x 10 = 173.53 bar.
Step 4: Round the result to 174 bar.
Step 5: A container stamped 3AA2265+ is therefore equivalent to a container stamped 3AAM174.

Appendix C
List of Compounds Referenced in the Act *But Not Listed in CSA Standard B340*

Note: *This Appendix is not a mandatory part of this Standard.*

C1.

The following compounds are listed in the *Transportation of Dangerous Goods Act*, but are not included in the lists or tables in CSA Standard B340. This list may not be all-inclusive. It is recommended that anyone wishing to transport these compounds should do so in accordance with the applicable general requirements in this Standard.

Shipping name and description	PIN
Ammonia solution, relative density less than 0.880 at 15°C in water, with more than 35% but not more than 50% ammonia	UN2073
Ammonia solution, relative density less than 0.880 at 15°C in water, with more than 50% ammonia	UN3318
Bromotrifluoroethylene	UN2419
Butadienes, stabilized	UN1010
Carbon dioxide and nitrous oxide mixture	UN1015
Carbon dioxide and oxygen mixture, compressed	UN1014
Carbon monoxide and hydrogen mixture, compressed	UN2600
1-Chloro-2,2,2-trifluoroethane, or refrigerant gas R133a	UN1983
Chlorotrifluoromethane and trifluoromethane azeotropic mixture with approximately 60% chlorotrifluoromethane, or refrigerant gas R503	UN2599
Coal gas, compressed	UN1023
Compressed gas, flammable, n.o.s.*	UN1954
Compressed gas, n.o.s.*	UN1956
Compressed gas, oxidizing, n.o.s.*	UN3156
Compressed gas, toxic, corrosive, n.o.s.*	UN3304
Compressed gas, toxic, flammable, corrosive, n.o.s.*	UN3305
Compressed gas, toxic, flammable, n.o.s.*	UN1953
Compressed gas, toxic, n.o.s.*	UN1955
Compressed gas, toxic, oxidizing, corrosive, n.o.s.*	UN3306
Compressed gas, toxic, oxidizing, n.o.s.*	UN3299
Dichlorofluoromethane, or refrigerant gas R21	UN1029
1,1-Difluoroethylene, or refrigerant gas R1132a	UN1959
Difluoromethane, or refrigerant gas R32	UN3252
2,2-Dimethylpropane	UN2044
Ethane, refrigerated liquid	UN1961
Ethylacetylene, stabilized	UN2452
Ethylamine	UN1036

(Continued)

Shipping name and description	PIN
Ethylene, acetylene, and propylene mixture, refrigerated liquid containing at least 71.5% ethylene with not more than 22.5% acetylene and not more than 6% propylene	UN3138
Ethylene oxide and carbon dioxide mixture with more than 87% ethylene oxide	UN3300
Ethylene oxide and carbon dioxide mixture with more than 9% but not more than 87% ethylene oxide	UN1041
Ethylene oxide and carbon dioxide mixture with not more than 9% ethylene oxide	UN1952
Ethylene oxide and chlorotetrafluoroethane mixture with not more than 8.8% ethylene oxide	UN3297
Ethylene oxide and pentafluoroethane mixture with not more than 7.9% ethylene oxide	UN3298
Ethylene oxide and tetrafluoroethane mixture with not more than 5.6% ethylene oxide	UN3299
Ethylene, refrigerated liquid	UN1038
Ethyl fluoride, or refrigerant gas R161	UN2453
Ethyl methyl ether	UN1039
Fertilizer ammoniating solution with free ammonia	UN1043
Fire extinguisher with compressed or liquefied gas	UN1044
Gas, refrigerated liquid, flammable, n.o.s.*	UN3312
Gas, refrigerated liquid, n.o.s.*	UN3158
Gas, refrigerated liquid, oxidizing, n.o.s.*	UN3311
Gas sample, nonpressurized, flammable, n.o.s.,* not refrigerated liquid	UN3167
Gas sample, nonpressurized, toxic, flammable, n.o.s.,* not refrigerated liquid	UN3168
Gas sample, nonpressurized, toxic, n.o.s.,* not refrigerated liquid	UN3169
Heptafluoropropane, or refrigerant gas R227	UN3296
Hexafluoropropylene, or refrigerant gas R1216	UN1858
Hydrogen chloride, refrigerated liquid	UN2186
Isobutylene	UN1055
Insecticide gas, flammable, n.o.s.*	UN3354
Krypton, refrigerated liquid	UN1970
Liquefied gases, nonflammable, charged with nitrogen, carbon dioxide or air	UN1058
Liquefied gas, flammable, n.o.s.*	UN3161
Liquefied gas, n.o.s.*	UN3163
Liquefied gas, oxidizing, n.o.s.*	UN3157
Liquefied gas, toxic, corrosive, n.o.s.*	UN3308
Liquefied gas, toxic, flammable, corrosive, n.o.s.*	UN3309
Liquefied gas, toxic, flammable, n.o.s.*	UN3160
Liquefied gas, toxic, n.o.s.*	UN3162
Liquefied gas, toxic, oxidizing, corrosive, n.o.s.*	UN3310

(Continued)

Shipping name and description	PIN
Liquefied gas, toxic, oxidizing, n.o.s.*	UN3307
Methane, refrigerated liquid; or natural gas, refrigerated liquid with high methane content	UN1972
Methyl chloride and methylene chloride mixture	UN1912
Methyl fluoride, or refrigerant gas R41	UN2454
Octafluorobut-2-ene, or refrigerant gas R1318	UN2422
Octafluorocyclobutane, or refrigerant gas RC318	UN1976
Octafluoropropane, or refrigerant gas R218	UN2424
Oil gas, compressed	UN1071
Perfluoro (ethylvinyl ether)	UN3154
Perfluoro (methylvinyl ether)	UN3153
Propadiene, stabilized	UN2200
Rare gases and nitrogen mixture, compressed	UN1981
Rare gases and oxygen mixture, compressed	UN1980
Rare gases mixture, compressed	UN1979
Refrigerant gas R404A	UN3337
Refrigerant gas R407A	UN3338
Refrigerant gas R407B	UN3339
Refrigerant gas R407C	UN3340
1,1,1-Trifluoroethane, or refrigerant gas R143a	UN2035
Trifluoromethane, refrigerated liquid	UN3136
Xenon, refrigerated liquid	UN2591

**n.o.s means not otherwise specified.*

Appendix D
Reference Organizations

Note: *This Appendix is not a mandatory part of this Standard.*

D1.

Codes, Standards, and Publications of the following organizations are referenced in this Standard.

Canadian Nuclear Safety Commission
270 Albert Street
Ottawa, Ontario
K1P 5S9

CGA
Compressed Gas Association, Inc.
4221 Walney Road, 5th Floor
Chantilly, Virginia 20151
USA

CGSB
Canadian General Standards Board
Ottawa, Ontario
K1A 1G6

CSA
Canadian Standards Association
5060 Spectrum Way, Suite 100
Mississauga, Ontario
L4W 5N6

Transport Canada
Transport Dangerous Goods Directorate
330 Sparks Street, 9th Floor
Ottawa, Ontario
K1A 0N5

Appendix E
Index of Dangerous Goods in CSA Standard B340

Note: *This Appendix is not a mandatory part of this Standard.*

E1.

Dangerous goods	Text reference	PIN
Articles, pressurized, hydraulic (containing nonflammable gas) or articles, pressurized, pneumatic (containing nonflammable gas)	6.1	UN3164
Acetylene, dissolved	4.3.4, 4.4.9, 5.4, Table 4.1	UN1001
Air, compressed, with not more than 23.5% oxygen, by volume	5.1.7, 5.2.2.1, Table 4.1, Table 5.1	UN1002
Air, refrigerated liquid	5.5	UN1003
Ammonia, anhydrous, or anhydrous ammonia	4.3.5, Table 5.2	UN1005
Argon, compressed	5.2.2.1, Table 4.1, Table 5.1	UN1006
Argon, refrigerated liquid	5.5.1, 5.5.3, Table 5.4, Table 5.5	UN1951
Arsine	Table 5.6	UN2188
Boron trichloride	Table 5.6	UN1741
Boron trifluoride, compressed	5.2.2.1, Table 4.1	UN1008
Bromine chloride	Table 5.6	UN2901
Bromotrifluoromethane, or refrigerant gas R13B1	Table 5.2	UN1009
Butane	Table 4.1	UN1011
Butylene	Table 4.1	UN1012
Carbon dioxide	4.4.7, 5.1.7, Table 4.1, Table 5.2	UN1013
Carbon dioxide, refrigerated liquid	5.5.1, Table 5.4, Table 5.5	UN2187
Carbon monoxide, compressed	5.2.2.3, 5.2.5, Table 4.1, Table 5.1	UN1016
Carbonyl fluoride, compressed	Table 5.6	UN2417
Carbonyl sulphide	Table 5.6	UN2204
Chlorine	Table 5.2	UN1017
Chlorine pentafluoride	5.6.3.6, Table 5.6	UN2548
Chlorine trifluoride	5.6.3.6, Table 5.6	UN1749
Chlorodifluorobromomethane, or refrigerant gas R12B1	5.3.3	UN1974
1-Chloro-1,1-difluoroethane, or refrigerant gas R142b	Table 5.2	UN2517
Chlorodifluoromethane, or refrigerant gas R22	Table 5.2	UN1018
Chlorodifluoromethane and Chloropentafluoroethane mixture with fixed boiling point with approximately 49% chlorodifluoromethane, or refrigerant gas R502	Table 5.2	UN1973

(Continued)

Dangerous goods	Text reference	PIN
Chloropentafluoroethane, or refrigerant gas R115	Table 5.2	UN1020
Chloropicrin and methyl bromide mixture	5.6.3.7, Table 5.6	UN1581
Chloropicrin and methyl chloride mixture	5.6.3.2, Table 5.6	UN1582
1-Chloro-1,2,2,2-tetrafluoroethane, or refrigerant gas R124	Table 5.2	UN1021
Chlorotrifluoromethane, or refrigerant gas R13	Table 5.2	UN1022
Cyanogen	Table 5.6	UN1026
Cyanogen chloride, stabilized	5.6.3.3, Table 5.6	UN1589
Cyclobutane	5.3.3	UN2601
Cyclopropane	Table 5.2	UN1027
Deuterium, compressed	Table 4.1, Table 5.1	UN1957
Diborane, compressed	5.2.7, Table 5.1	UN1911
Dichlorodifluoromethane, or refrigerant gas R12	Table 5.2	UN1028
Dichlorodifluoromethane and difluoroethane azeotropic mixture with approximately 74% dichlorodifluoromethane, or refrigerant gas R500	Table 5.2	UN2602
Dichlorosilane	Table 5.6	UN2189
1,2-Dichloro-1,1,2,2-tetrafluoroethane, or refrigerant gas R114	Table 5.2	UN1958
1,1-Difluoroethane, or refrigerant gas R152a	Table 5.2	UN1030
Dimethylamine, anhydrous	4.3.5, Table 5.2	UN1032
Dimethyl ether	5.3.3	UN1033
Dinitrogen tetroxide, or Nitrogen dioxide	Table 5.6, 5.6.3.5	UN1067
Ethane	Table 4.1, Table 5.2	UN1035
Ethyl chloride (R160)	4.6.4, 4.6.5.3, 5.3.3	UN1037
Ethylene, compressed	5.2.4, Table 4.1, Table 5.1, Table 5.2	UN1962
Ethylene oxide and dichlorodifluoromethane mixture with not more than 12.5% ethylene oxide	5.3.6	UN3070
Ethylene oxide, or ethylene oxide with nitrogen up to a total pressure of 1 MPa (10 bar) at 50°C	5.3.5	UN1040
Fluorine, compressed	4.3.6, 5.2.8	UN1045
Germane	Table 5.6	UN2192
Helium, compressed	5.2.2.1, Table 4.1, Table 5.1	UN1046
Helium, refrigerated liquid	5.5.1, 5.5.3, Table 5.4, Table 5.5	UN1963
Hexaethyl tetraphosphate and compressed gas mixture	5.6.3.4, Table 5.6	UN1612
Hexafluoroacetone	Table 5.6	UN2420
Hexafluoroethane, compressed, or refrigerant gas R116, compressed	Clause 5.2.9	UN2193
Hydrocarbon gas mixture, compressed, n.o.s.,	Table 4.1	UN1964
Hydrocarbon gas mixture, liquefied, n.o.s.	Table 4.1	UN1965
Hydrogen bromide, anhydrous	Table 5.6	UN1048

(Continued)

Dangerous goods	Text reference	PIN
Hydrogen chloride, anhydrous	Table 4.1, Table 5.2	UN1050
Hydrogen, compressed	5.2.2.2, 5.2.3.3, Table 4.1, Table 5.1	UN1049
Hydrogen, refrigerated liquid	5.5.1, 5.5.2, Table 5.4	UN1966
Hydrogen iodide, anhydrous	Table 5.6	UN2197
Hydrogen selenide, anhydrous	Table 5.6	UN2202
Hydrogen sulphide	Table 5.2	UN1053
Insecticide gas, n.o.s.	Table 5.2	UN1968
Insecticide gas, toxic, n.o.s.	Table 5.6	UN1967
Isobutane	Table 4.1	UN1969
Krypton, compressed	Table 5.1	UN1056
Lighters or lighter refills (cigarettes) containing flammable gas and capable of passing the tests specified in the Hazardous Products (Lighters) Regulations	6.3	UN1057
Liquefied petroleum gases (see Petroleum gases, liquefied)		
Methane, compressed	5.2.2.1, Table 4.1, Table 5.1	UN1971
Methylacetylene and propadiene mixture, stabilized	Table 5.2	UN1060
Methylamine, anhydrous	4.3.5, Table 5.2	UN1061
Methyl bromide	5.6.3.7, Table 5.6	UN1062
Methyl chloride, or refrigerant gas R40	Table 5.2	UN1063
Methylchlorosilane	Table 5.6	UN2534
Methyl mercaptan	4.3.5, Table 5.2	UN1064
Natural gas, compressed, with high methane content	4.6.2, 5.2.6, Table 4.1	UN1971
Neon, compressed	5.2.2.1, Table 4.1, Table 5.1	UN1065
Neon, refrigerated liquid	5.5.1, Table 5.4, Table 5.5	UN1913
Nitric oxide and dinitrogen tetroxide mixture or nitric oxide and nitrogen dioxide mixture	Table 5.6	UN1975
Nitric oxide, compressed	5.6.3.9, Table 5.6	UN1660
Nitrogen, compressed	5.1.7, 5.2.2.1, Table 4.1, Table 5.1,	UN1066
Nitrogen, refrigerated liquid	5.5.1, 5.5.3, Table 5.4, Table 5.5	UN1977
Nitrogen trifluoride, compressed	Table 4.1	UN2451
Nitrogen trioxide	Table 5.6	UN2421
Nitrosyl chloride	4.3.5, Table 5.2	UN1069

(Continued)

Dangerous goods	Text reference	PIN
Nitrous oxide	4.6.1.1, Table 4.1, Table 5.2	UN1070
Nitrous oxide, refrigerated liquid	5.5.1, Table 5.4, Table 5.5	UN2201
Oxygen, compressed	4.6.1.2, 4.6.2, 4.6.5.2, 5.2.2.1, Table 4.1, Table 5.1	UN1072
Oxygen, refrigerated liquid	5.5.1, 5.5.3, Table 5.4, Table 5.5	UN1073
Oxygen difluoride, compressed	Table 5.6	UN2190
Pentafluoroethane, or refrigerant gas R125	Table 5.2	UN3220
Perchloryl fluoride	Table 5.6	UN3083
Petroleum gases, liquefied	5.3.4, 6.3, Table 4.1, Table 5.3	UN1075
Phosgene	5.6.3.1, Table 5.6	UN1076
Phosphine	5.6.3.8, Table 5.6	UN2199
Phosphorus pentafluoride, compressed	Table 5.6	UN2198
Propane	Table 4.1, Table 5.3	UN1978
Propylene	Table 4.1	UN1077
Refrigerant gas, n.o.s.	Table 5.2	UN1078
Refrigerating machines containing flammable, nontoxic, liquefied gas	6.2	UN3358
Refrigerating machines containing nonflammable, nontoxic, liquefied gas or ammonia solutions	6.2	UN2857
Selenium hexafluoride	Table 5.6	UN2194
Silane, compressed	5.3.3	UN2203
Silicon tetrafluoride, compressed	Table 5.6	UN1859
Stibine	Table 5.6	UN2676
Sulphur dioxide	Table 5.2	UN1079
Sulphur hexafluoride	Table 4.1, Table 5.2	UN1080
Sulphur tetrafluoride	Table 5.6	UN2418
Sulphuryl fluoride	Table 5.2	UN2191
Tellurium hexafluoride	Table 5.6	UN2195
1,1,1,2-Tetrafluoroethane, or refrigerant gas R134a	Table 5.2	UN3159
Tetrafluoroethylene, stabilized (R1114)	Table 4.1, Table 5.2	UN1081
Tetrafluoromethane, compressed, or refrigerant gas R14, compressed	Table 5.2	UN1982
Trifluoroacetyl chloride	Table 5.6	UN3057
Trifluorochloroethylene, stabilized (R1113)	Table 5.2	UN1082
Trifluoromethane, or refrigerant gas R23	Table 5.2	UN1984
Trimethylamine, anhydrous	4.3.5, Table 5.2	UN1083

(Continued)

Dangerous goods	Text reference	PIN
Tungsten hexafluoride	5.3.7	UN2196
Vinyl bromide, stabilized	5.3.3	UN1085
Vinyl chloride, stabilized (R1140)	Table 5.2	UN1086
Vinyl fluoride, stabilized (R1141)	Table 5.2	UN1860
Vinyl methyl ether, stabilized	Table 5.2	UN1087
Xenon, compressed	Table 5.1	UN2036

Proposition de modification

N'hésitez pas à nous faire part de vos suggestions et de vos commentaires. Au moment de soumettre des propositions de modification aux normes CSA et autres publications CSA prière de fournir les renseignements demandés ci-dessous et de formuler les propositions sur une feuille volante. Il est recommandé d'inclure

- le numéro de la norme/publication
- le numéro de l'article, du tableau ou de la figure visé
- la formulation proposée
- la raison de cette modification.

Proposal for change

CSA welcomes your suggestions and comments. To submit your proposals for changes to CSA Standards and other CSA publications, please supply the information requested below and attach your proposal for change on a separate page(s). Be sure to include the

- Standard/publication number
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