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**CAN/CGSB-43.149-2023**



# Ton containers for the transportation of dangerous goods

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# Ton containers for the transportation of dangerous goods

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS  
FRANÇAISE ET ANGLAISE.

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## Preface

This is the first edition of the National Standard of Canada CAN/CGSB-43.149.

The following definitions apply in understanding how to implement this National Standard of Canada:

- "shall" indicates a **requirement**;
- "should" indicates a **recommendation**;
- "may" is used to indicate that something is **permitted**;
- "can" is used to indicate that something is **possible**, for example, that an organization is able to do something.

Notes accompanying clauses do not include requirements or alternative requirements. The purpose of a note accompanying a clause is to separate explanatory or informative material from the text. Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

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## Introduction

This first edition of CAN/CGSB-43.149 is derived from TP 14877 – *Containers for Transport of Dangerous Goods by Rail*, a Transport Canada standard published in January 2018.

This standard was created in order to separate ton containers from tank cars, and to maintain consistency with and to incorporate language from other CGSB and Transport Canada publications that pertain to the *Transportation of Dangerous Goods Regulations* (TDG Regulations). This was done in order to facilitate compatibility with the other TDG standards referenced in the TDG Regulations.

This standard is intended for incorporation by reference into the TDG Regulations. Where there are differences between the requirements of the TDG Regulations and this standard, the TDG Regulations prevail, unless specified otherwise, to the extent of the difference. Until the Regulations are amended to adopt this edition of the standard, TP 14877 is the governing standard for ton containers in Canada.

The standard sets out requirements for:

- the design, manufacture, maintenance and qualification of ton containers;
- the selection and use of ton containers used in the handling, offering for transport or transporting of dangerous goods of Classes 2, 3, 4, 5, 6.1, 8 and 9;
- the registration applicable to facilities performing manufacture, inspection, maintenance or qualification of ton containers;
- ton container manufacturer and modification;
- the periodic qualification, testing and maintenance of ton containers;
- special provisions 1 to 25.

The CGSB Committee on Ton Containers for Transport of Dangerous Goods is comprised of members having responsibility and expertise in the design, manufacture, maintenance, qualification, testing, selection and use of ton containers used in the handling, offering for transport or transporting of dangerous goods of Classes 2, 3, 4, 5, 6.1, 8 and 9. The Committee considers this standard, developed by consensus, to be practical, current with respect to technology and industry practices, useful and acceptable to all interested parties.

It is the intent of the CGSB Committee to maintain this standard in a manner that meets the needs of Canada.

# Ton containers for the transportation of dangerous goods

## 1 Scope

### 1.1 Organization and content

This National Standard of Canada sets out requirements for the design, manufacture, maintenance, qualification, selection and use of ton containers used in the handling, offering for transport or transport of dangerous goods of Classes 2, 3, 4, 5, 6.1, 8 and 9. This standard does not apply to large means of containment that are used exclusively for non-dangerous goods.

This standard consists of nine main sets of requirements and one annex.

Sections 1 through 3 specify the general scope, normative references and terms and definitions.

Section 4 sets out general requirements and defines the applicability of the standard and the precedence of each section.

Section 5 outlines the registration requirements applicable to facilities performing manufacture, inspection, maintenance or qualification of ton containers.

Section 6 sets out ton container manufacturer and modification requirements.

Section 7 sets out the requirements for the periodic qualification and maintenance of ton containers.

Section 8 covers the selection and use requirements for ton containers.

Section 9 provides allowances for one time low risk movement of non-conforming ton containers.

Annex A (normative) sets out, in Schedule 1, the requirements applicable to special provisions 1 to 25, and, in Schedule 2, lists dangerous goods and specifies the special provisions that are applicable to each of the listed dangerous goods.

### 1.2 Minimum requirements

This standard sets out certain minimum requirements regarding the design, manufacture, qualification, testing, selection and use of ton containers. It is essential to exercise competent technical, engineering and safety judgment in conjunction with this standard.

### 1.3 Additional requirements

#### 1.3.1 Conflict

The *Transportation of Dangerous Goods Act, 1992* (TDG Act) and the *Transportation of Dangerous Goods Regulations* (TDG Regulations) may set out additional requirements regarding the design, manufacture, testing, selection and use of containers. Where there is an inconsistency between the requirements of this standard and those of the TDG Act or TDG Regulations, the TDG Act or TDG Regulations prevail to the extent of the inconsistency. It is recommended to read the standard in conjunction with the TDG Regulations.

#### 1.3.2 Safety

The testing and evaluation of a product against this standard may require the use of materials and/or equipment that could be hazardous. This standard does not purport to address all the safety aspects associated with its use. Anyone using this standard has the responsibility to consult the appropriate authorities and to establish appropriate health and safety practices in conjunction with any applicable regulatory requirements prior to its use.



### 1.3.3 Units

Quantities and dimensions used in this standard are given in units from the International System of Units (SI units). Imperial equivalents may be shown in brackets, if applicable.

### 1.3.4 Pressures

Pressures of all kinds relating to containers (such as test pressure, internal pressure, pressure-relief device start-to-discharge pressure) are indicated in gauge pressure unless specifically noted otherwise.

### 1.3.5 Classification

Dangerous goods are classified in accordance with Part 2, Classification, of the TDG Regulations and the appropriate shipping names and corresponding particulars (UN number, classification and packing group, as applicable) selected from Schedule 1 of the TDG Regulations.

## 2 Normative references

The following documents contain provisions that, through reference in this text, constitute provisions of this National Standard of Canada. The referenced documents may be obtained from the sources noted below.

Note: The contact information provided below was valid at the date of publication of this standard.

An undated reference is to the latest edition or revision of the reference or document in question, unless otherwise specified by the authority applying this standard. A dated reference is to the specified revision or edition of the reference or document in question.

### 2.1 Transport Canada (TC)

*Transportation of Dangerous Goods Act, 1992* (S.C. 1992, c. 34), including amendments

*Transportation of Dangerous Goods Regulations* (SOR/2001-286), including amendments

#### 2.1.1 Contact information

The above may be obtained from the Publishing and Depository Services, Public Services and Procurement Canada. Telephone: 613-941-5995 or 1-800-635-7943. E-mail: [publications@tpsgc-pwgsc.gc.ca](mailto:publications@tpsgc-pwgsc.gc.ca). Web site: [www.tc.gc.ca/tdg](http://www.tc.gc.ca/tdg) or [www.publications.gc.ca](http://www.publications.gc.ca).

### 2.2 American National Standards Institute

ANSI/ASME B1.20.1-1983 (R2006) — *Pipe Threads, General Purpose (Inch)*

#### 2.2.1 Contact information

The above may be obtained from the American National Standards Institute. Email: [info@ansi.org](mailto:info@ansi.org). Web site: <https://webstore.ansi.org/>.

### 2.3 Association of American Railroads (AAR)

Section C, Part III  
Issue of November 2014  
M-1002 - *Specifications for Tank Cars*

### 2.3.1 Contact information

The above may be obtained from the Transportation Technology Centre Inc. (TTCI), Publications Department. Telephone: 1-877-999-8824. Web site: [www.aar.org](http://www.aar.org).

## 2.4 ASTM International

ASTM A20/A20M-15 — *Standard Specification for General Requirements for Steel Plates for Pressure Vessels*

ASTM A240/A240M-15b — *Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications*

ASTM A262-15 — *Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels*

ASTM A302/A302M-12 — *Standard Specification for Pressure Vessel Plates, Alloy Steel, Manganese-Molybdenum and Manganese-Molybdenum-Nickel*

ASTM A370-15 — *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*

ASTM A515/A515M-10(2015) — *Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service*

ASTM A516/A516M-10(2015) — *Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service*

ASTM A537/A537M-13 — *Standard Specification for Pressure Vessel Plates, Heat-Treated, Carbon-Manganese-Silicon Steel*

ASTM B162-99(2014) — *Standard Specification for Nickel Plate, Sheet, and Strip*

ASTM B209-14 — *Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate*

ASTM B209M-14 — *Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)*

### 2.4.1 Contact information

The above may be obtained from the ASTM International. Telephone: 610-832-9585. Web site: [www.astm.org](http://www.astm.org), or from IHS Global Canada Ltd. Telephone: 613-237-4250 or 1-800-854-8220. Web site: [www.global.ihs.org](http://www.global.ihs.org).

## 2.5 The Chlorine Institute (CI)

Chlorine Institute Emergency Kit “B” for chlorine ton containers

### 2.5.1 Contact information

The above may be obtained from The Chlorine Institute. Telephone: 1-703-894-4140. Web site: [www.chlorineinstitute.org](http://www.chlorineinstitute.org).

## 2.6 Compressed Gas Association (CGA)

Publication C-1— *Methods for Pressure Testing Compressed Gas Cylinders and Tubes*

Publication C-6 — *Standards for Visual Inspection of Steel Compressed Gas Cylinders*

Publication S-1.2 – *Pressure Relief Device Standards – Part 2 – Portable Containers for Compressed Gases*

### 2.6.1 Contact information

The above may be obtained from the Compressed Gas Association, CGA Customer Service. Telephone: 703-788-2700. E-mail: [customerservice@cganet.com](mailto:customerservice@cganet.com). Web site: [www.cganet.com](http://www.cganet.com).

## 2.7 U.S. Department of Transportation (DOT)

Transportation – *Title 49 Code of Federal Regulations* Parts 171-180.2.6.1

### 2.7.1 Contact information

The above may be obtained from U.S. Department of Transportation. Telephone: 202-366-4000. Web site: [www.phmsa.dot.gov/hazmat](http://www.phmsa.dot.gov/hazmat).

## 2.8 U.S. General Services Administration

US-FED-STD-H28 – *Federal standards: screw-thread standards for federal services:*

Section 7A (1984) – *Pipe threads, general purpose*

Section 9 (1989) – *Gas cylinder valve outlet and inlet threads*

### 2.8.1 Contact information

The above may be obtained from the U.S. General Services Administration. Telephone: 1-844-GSA-4111. E-mail: [GSASStandards@GSA.gov](mailto:GSASStandards@GSA.gov). Web site: <https://www.gsa.gov>.

## 3 Terms and definitions

In addition to the definitions, terms and abbreviations given in the *Transportation of Dangerous Goods Act and Regulations*, the following definitions and abbreviations apply in this standard.

### Canadian service

expression used to designate a container used in the handling, offering for transport or transporting of dangerous goods with an origin and a final destination within Canada. (*service canadien*)

### certificate of compliance

certificate from the manufacturer of a ton container certifying that the ton container and service equipment conform to the requirements of section 6. (*certificat de conformité*)

### certificate of inspector's report

certificate and report of an independent inspector, in the form specified by the Director, certifying that the ton container and service equipment conform to the requirements of section 6. (*certificat d'inspection*)

### class

general designation usually including several ton container specifications. The word class is used when the designation embraces several specifications. For example, 106A and 110A are classes. (*classe*)

### closure

device that closes an opening into a container, or an auxiliary device that closes an outlet or inlet connection on a valve or fitting, including pipe plugs, quick disconnect caps, blind flanges, manway covers, outlet caps, education pipe caps, and fill hole covers. (*fermeture*)

**compliance mark**

compliance mark as defined in the TDG Act. (*indication de conformité*)

**container**

large means of containment as defined in the TDG Regulations. (*contenant*)

**cryogenic liquid**

refrigerated liquefied gas that is handled or transported at a temperature equal to or less than -100 °C (-148 °F). (*liquide cryogène*)

**dangerous goods**

dangerous goods as defined in the TDG Act, and includes dangerous goods listed in Schedule 2 of Annex A. (*marchandises dangereuses*)

**dangerous goods toxic by inhalation**

for the purpose of ton container selection, any one of the following:

- a) a liquid, other than a mist, meeting the criteria in the TDG Regulations for Division 6.1, Packing Group I, because of its inhalation toxicity, whether having the classification of Division 6.1 or not, and assigned to Hazard Zone A or B in accordance with 8.4.2;
- b) a Division 2.3 gas assigned to Hazard Zone A, B, C, or D in accordance with 8.4.2; or
- c) any dangerous goods identified as an inhalation hazard by a special provision of Schedule 1 in Annex A. (*marchandises dangereuses toxiques à l'inhalation*)

**Director**

Executive Director, Regulatory Frameworks and International Engagement, Regulatory Affairs Branch, Transportation of Dangerous Goods Directorate, Transport Canada. (*directeur*)

**elevated temperature dangerous goods**

dangerous goods that, when offered for transport or transported:

- a) are in a liquid phase and at a temperature equal to or greater than 100 °C (212 °F);
- b) are in a liquid phase with a flash point equal to or greater than 37.8 °C (100 °F) and that are intentionally heated to a temperature equal to or greater than its flash point; or
- c) are in a solid phase and at a temperature equal to or greater than 240 °C (464 °F). (*marchandises dangereuses à température élevée*)

**filling density**

percent ratio of the mass of the dangerous goods in a tank to the mass of water that the tank will hold at 15.6 °C (60 °F).

- a) For cryogenic liquids, the percent ratio of the mass of the dangerous goods in the tank to the mass of water that the tank will hold at the design service temperature.
- b) For the purpose of determining the water capacity of the tank, the mass of 1 L of water at 15.6 °C (60 °F) is 0.999007 kg (the mass of 1 US gallon of water is 8.33712 lb). (*densité de remplissage*)

**fusible plug**

a non-reclosing pressure-relief device designed to function by the yielding or melting of a plug, at a predetermined temperature, and that provides protection against excessive pressure buildup in a tank developed by exposure to heat, such as from a fire. (*bouchon fusible*)

**hazard zone**

one of four levels of hazard, hazard zones A through D, assigned to gases that are toxic by inhalation, as specified in 8.4.2. A hazard zone is based on the LC50 value for acute inhalation toxicity of gases and vapours. (*zone de risque*)

**independent inspector**

person, class of persons, test facility, or agency, independent of both Transport Canada and the party being inspected, who is registered with the Director. (*inspecteur indépendant*)

**liquid dangerous goods**

dangerous goods that are in liquid or slurry form, including dangerous goods that are under a liquid blanket, at any time during their handling, offering for transport, or transport. (*marchandises dangereuses liquides*)

**maintenance**

upkeep or preservation of a container or any of its components, including repairs. (*entretien*)

**manufacture**

to produce any finished ton container. (*fabrication*)

**marking**

application by stenciling or stamping of symbols or words required by this standard. (*marquage*)

**material compatible with the dangerous goods**

material that does not react physically or chemically with the dangerous goods in a way that under normal conditions of handling or transportation would cause a condition or release of dangerous goods that could endanger public safety, including corrosion, environmental stress cracking, solvation, fusion or chemical or physical reaction with the dangerous goods. (*matériau compatible avec les marchandises dangereuses*)

**modification**

a change to the original design of a previously certified ton container that affects its structural integrity or lading retention capability. (*modification*)

**national gas taper (NGT) thread**

national gas taper thread that conforms to United States Federal Standard US-FED-STD-H28, Sections 7A (1984) and 9 (1989). (*filetage gaz conique américain [NGT]*)

**national pipe taper (NPT)**

tapered pipe thread that conforms to American National Standard ANSI/ASME B1.20.1-1983 (R2006). (*filetage conique américain [NPT]*)

**outage**

for a container containing a liquid, the volumetric fraction of the tank in the vapour space, expressed as a percentage. (*creux*)

**ppm**

parts per million. (*ppm*)

**pressure-relief device**

device that is designed to prevent the rise of internal pressure in excess of a specified value, including a reclosing pressure-relief device, a non-reclosing pressure-relief device, or reclosing and non-reclosing pressure-relief devices in combination. (*dispositif de décharge de pression*)

**psi**

pound-force per square inch. (*lb/po<sup>2</sup>*)

**qualification**

careful and critical examination of an item, including a container, based on a written program, to verify that the item conforms to a standard, followed by a representation that the item conforms to that standard. (*qualification*)

**release**

includes discharge, emission, explosion, or other escape of dangerous goods, or any component or compound evolving from dangerous goods. (*rejet*)

**repair**

returning a ton container to its original design and specification by welding. (*réparation*)

**representation**

certification, in writing or in electronic format on a document or by marking the container, that the container conforms to the requirements set out in this standard. (*attestation*)

**service equipment**

devices attached to and forming part of a container and that are necessary for the purpose of filling, loading, unloading, venting, pressure relief, vacuum relief, heating from within the tank, sampling, and measuring. Such devices include vacuum and pressure-relief devices, valves, excess-flow valves, and closures. (*matériel de service*)

**solid dangerous goods**

dangerous goods which are in solid, granular, crystalline, or powder form during handling, offering for transport, or transport. (*marchandises dangereuses solides*)

**specification**

specific designation within a class. For example, the designation 106A500X is a specification. (*spécification*)

**stamping**

marking method that removes or displaces material leaving a permanent imprint on the surface to be marked. (*estampage*)

**stenciling**

marking method using paint or decal. (*marquage au pochoir*)

**TC**

Transport Canada. (*TC*)

**TDG Act**

*Transportation of Dangerous Goods Act, 1992*, as amended from time to time. (*LTDG*)

**TDG Regulations**

*Transportation of Dangerous Goods Regulations*, as amended from time to time. (*RTDG*)

**ton container**

cylindrical tank having a water capacity of at least 680 kg (1500 lb) and not more than 1179 kg (2600 lb). It is capable of being rolled along its longitudinal axis with all openings protected within the heads. It is also capable of being lifted filled with product. It is designed to be loaded and secured onto a transport vehicle or vessel. (*contenant d'une tonne*)

Note: In Part 179 of US 49 CFR ton containers are referred to as multi-unit tank car tanks.

**WP**

the working pressure (WP) of a container is the sum of the static head, padding pressure, and the dangerous goods vapour pressure at 46.1 °C (115 °F). (*PS*)

## **4 General requirements**

### **4.1 Application**

The requirements set out in this standard apply to containers that are used or may be used in the handling, offering for transport, or transport of dangerous goods in Canada. These requirements do not apply to containers that are used exclusively for commodities that are not dangerous goods. The containers shall conform to:

- a) requirements of the TDG Act, the TDG Regulations, the requirements of this standard, and the requirements of the DOT and the AAR that are specified in this standard, including manufacture, qualification, maintenance, and selection and use;
- b) unless otherwise specified in this standard, the requirements for manufacture set out in the specifications of the containers that were in effect at the time of manufacture and the requirements for maintenance that were in effect during and after manufacture of the containers.

### **4.2 Continued use**

#### **4.2.1 Qualification and maintenance of ton containers in Canadian service**

Subject to 4.1, a ton container that is or may be used in the handling, offering for transport, or transport of dangerous goods shall conform to the requirements for qualification and maintenance set out in section 7 of this standard.

### **4.3 Equivalency**

If the requirements for selection and use set out in this standard permit a ton container with a given class or specification to contain dangerous goods, a ton container equivalent to the given class or specification may be used.

### **4.4 Classification**

Dangerous goods shall be classified in accordance with Part 2 of the TDG Regulations and the appropriate shipping name, UN number, classification, division, and packing group, as applicable, shall be assigned.

### **4.5 Schedule 1 and special provisions**

In addition to the other requirements of this standard, when there is a special provision of Schedule 1 in Annex A for dangerous goods, that special provision applies to the container and the handling, offering for transport, and transporting of the dangerous goods.

### **4.6 Schedule 2 and list of dangerous goods**

In addition to the other requirements of this standard, Schedule 2 in Annex A shall be used when determining the authorized containers and specific conditions applicable to the handling, offering for transport, or transporting of dangerous goods.

### **4.7 Conflict**

If there is a conflict between a special provision of Schedule 1 in Annex A and other provisions of this standard, the special provision applies. If there is a conflict between any requirement of this standard and a requirement in any of the referenced publications listed in section 2, the requirement of this standard applies.

## **4.8 Other containers**

### **4.8.1 Condition or release from a container that could endanger public safety**

A container shall be designed, manufactured, qualified, loaded, unloaded, filled, secured, closed, and maintained so that, under normal conditions of transport, including handling and under all conditions of temperature, pressure and vibration that may be expected to occur, no condition or release of dangerous goods that could endanger public safety occurs or may reasonably be expected to occur.

### **4.8.2 Venting of containers**

Subject to 4.8.1, venting of a container, in order to reduce internal pressure that may develop by the evolution of gas or vapour from the dangerous goods contained within the container, is permitted only when permitted for the specific dangerous goods by a special provision in Annex A or when permitted pressure-relief or pressure-regulating devices are operating as intended.

## **4.9 Closures**

### **4.9.1 Compliance with specification**

Unless otherwise specified in this standard, a closure on a container shall be designed, manufactured, qualified, maintained, secured, and closed so that the closure conforms to the requirements of the specifications of the device and the container.

### **4.9.2 Securing of closure**

Subject to 4.8.2, a closure on a container shall be designed, manufactured, qualified, maintained, secured, and closed so that, under normal conditions of transport, including handling and all conditions of temperature, pressure and vibration that may be expected to occur, the closure remains secured and closed.

### **4.9.3 Gaskets**

Sealants shall not be used in the application of gaskets.

## **5 Registration, approvals and certification**

### **5.1 Registration by manufacturer or independent inspector of ton containers**

#### **5.1.1 General**

This section specifies the Transport Canada registration requirements for manufacturers and independent inspectors of ton containers.

#### **5.1.2 Manufacture of ton container**

Before a ton container is manufactured and marked to a TC specification, the manufacturer's facility and the design of the ton container shall be registered with the Director.

#### **5.1.3 Inspection at manufacturer's facilities**

An independent inspector shall be registered with the Director for the specific purpose of inspections at the manufacturer's registered facilities.



#### 5.1.4 Initial registration

An application for registration shall be submitted to the Director, and at a minimum, shall include the following information:

- a) name of the applicant, name of a contact person, street address and mailing address of the applicant;
- b) in the case of a ton container manufacturer:
  - 1) name and location of the manufacturing facility and a description of the manufacturing process;
  - 2) design information of the ton container, including service equipment;
  - 3) name and address of the independent inspector;
  - 4) copy of a sample certificate of compliance;
- c) in the case of an independent inspector:
  - 1) inspection functions that the applicant intends to perform;
  - 2) statement of the qualifications of the inspection staff based on their experience and training;
  - 3) copy of a sample certificate of inspector's report.

Note: Upon verification by the Director of compliance of the application documentation with the requirements of this standard, arrangements may be made for facility inspections by an officer of the Transportation of Dangerous Goods Directorate, Transport Canada.

#### 5.1.5 Registration and compliance

The Director shall register the ton container manufacturer or independent inspector if the Director is satisfied that:

- a) the manufacturer or inspector conforms to the applicable requirements of this standard; and
- b) the manufacturer or inspector is capable of consistently complying with the applicable requirements of this standard.

#### 5.1.6 Revocation for cause

The Director may revoke the certificate of registration of the ton container manufacturer or independent inspector in one of the following cases:

- a) the ton containers that are manufactured or inspected do not comply to the applicable requirements of this standard;
- b) the manufacturer or inspector is not capable of complying with the applicable requirements of this standard; or
- c) the manufacturer or inspector is not complying with the requirements of this standard.

#### 5.1.7 Application for renewal

An application for renewal of a certificate of registration shall include the information required in 5.1.4 and shall be made no later than 90 calendar days prior to the expiry date.

### 5.1.8 Owner transfer of ton container

At the time of initial ownership transfer of a TC Class 106A or TC Class 110A ton container, the manufacturer shall provide the owner with a copy of the certificate of compliance in accordance with 6.1.21 and a copy of the certificate of inspector's report certifying that the tank and its service equipment conform to the requirements of the specification in accordance with the requirements set out in 6.1.22.

### 5.1.9 Length of validity of certificate of registration

A certificate of registration is valid until the expiry date indicated, unless it is revoked by the Director.

A certificate of registration shall remain valid beyond its expiry date if:

- a) an application for renewal of registration is made in accordance with 5.1.7 and the Director has not requested information supplementary to the original application for renewal;
- b) the certificate due to expire is not revoked by the Director.

### 5.1.10 Transition period

A certificate of registration issued in accordance with the TP 14877 standard shall be deemed to be registration as a manufacturer or independent inspector pursuant to section 5 of this standard unless the certificate has expired or been revoked.

## 5.2 Registration of ton container periodic retest facilities

### 5.2.1 Registration

A ton container periodic retest and inspection facility located in Canada shall be registered with the Director.

A registered facility shall only perform the hydrostatic pressure test, the air-pressure test, or the visual inspection test set out in 7.2.2.1, 7.2.2.2, 7.2.2.3, and 7.2.2.9 as authorized by the Director.

### 5.2.2 Initial registration of a test facility

An application for registration shall be submitted to the Director and, at a minimum, shall include the following information:

- a) name of the applicant, name of a contact person, street address and mailing address of the applicant;
- b) name and location of the test facility;
- c) description of the equipment, inspection and test procedures;
- d) statement of the qualifications of the inspection staff based on their experience and training;
- e) copy of a test report.

Note: Upon verification by the Director of compliance of the application documentation with the requirements of this standard, arrangements may be made for facility inspections by an officer of the Transportation of Dangerous Goods Directorate, Transport Canada.

### 5.2.3 Registration and compliance

The Director shall register the test facility if the Director is satisfied that:

- a) the facility conforms to the applicable requirements of this standard;
- b) the facility is capable of consistently complying with the applicable requirements of this standard.

### 5.2.4 Revocation

The Director may revoke the registration of the test facility in one of the situations below:

- a) the ton containers that are tested do not comply to the applicable requirements of this standard;
- b) the facility is not capable of complying with the applicable requirements of this standard; or
- c) the facility is not complying with the requirements of this standard.

### 5.2.5 Application for renewal

An application for renewal of a certificate of registration shall include the information required in 5.2.2 and shall be made no later than 90 calendar days prior to the expiry date.

### 5.2.6 Length of validity of certificate of registration

A certificate of registration is valid until the expiry date indicated, unless it is revoked by the Director.

A certificate of registration shall remain valid beyond its expiry date if:

- a) an application for renewal of registration is made in accordance with 5.2.5 and the Director has not requested information supplementary to the original application for renewal, and
- b) the Certificate due to expire is not revoked by the Director.

### 5.2.7 Transition period

A certificate of registration issued in accordance with the TP 14877 standard shall be deemed to be registration as a facility pursuant to section 5 of this standard unless the certificate has expired or been revoked.

## 6 Manufacture of ton containers for transport of dangerous goods

### 6.1 General

#### 6.1.1 Scope

The requirements set out in 6.1 outline the responsibilities of manufacturers and owners of ton containers used in Canada for the handling, offering for transport, or transport of dangerous goods, and the requirements for the design and manufacture of TC specification ton containers. Specific requirements may have broader scope when referenced in other sections of this standard.

### 6.1.2 Responsibility of ton container manufacturer

TC specification ton container manufacturers are responsible for obtaining the approval of the Director for the design and manufacture of ton containers and for ensuring that the ton containers conform to all the applicable requirements of this standard.

### 6.1.3 Responsibility of ton container owner

TC specification ton container owners are responsible for obtaining the approval of the Director for the modification of ton containers and for ensuring that the ton containers conform to all the applicable requirements of this standard.

### 6.1.4 General requirements

A TC Class 106A and TC Class 110A ton container shall conform to the requirements set out in this section and any other applicable requirements set out in this standard.

### 6.1.5 TC Class 106A and 110A ton containers

Each ton container shall be cylindrical and circular in cross section. All openings shall be located in the head. Each ton container shall have a water capacity of at least 680 kg (1500 lb) and not more than 1179 kg (2600 lb).

### 6.1.6 Insulation

Insulation is prohibited.

### 6.1.7 Burst pressure

The minimum burst pressure shall conform to the requirements specified in 6.1.23.

### 6.1.8 Minimum shell thickness

The shell thickness shall conform to the following requirements:

**6.1.8.1** For a Class 110A ton container, the shell thickness of the cylindrical portion, shall be the greater of:

- a) the minimum thickness of shell specified in 6.1.23;
- b) the shell thickness calculated using the following formula:

$$t = \frac{Pd}{2SE}$$

where:

$t$  = minimum thickness of shell, in mm (in.), after forming;

$P$  = minimum burst pressure, in MPa (psi), where 1 MPa = 1000 kPa;

$d$  = inside diameter, in mm (in.);

$S$  = minimum tensile strength of plate material, in MPa (psi), as specified in 6.1.9;

$E$  = 1.0, a factor representing the efficiency of welded joints.

**6.1.8.2** For a Class 106A ton container, the shell thickness of the cylindrical portion shall be equal to or greater than that specified in 6.1.23 and shall be such that, at the tank test pressure, the maximum fibre stress in the tank shell is equal to or less than 108.6 MPa (15 750 psi) as calculated using the following formula:

$$s = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where:

$s$  = shell stress, in MPa (psi);

$P$  = tank test pressure, in MPa (psi);

$D$  = outside diameter, in mm (in.);

$d$  = inside diameter, in mm (in.).

**6.1.8.3** If cladding material having a lower tensile strength is used, the thickness of the cladding shall not be included in the calculation of minimum shell thickness.

### 6.1.9 Metal plate

**6.1.9.1** The maximum carbon content for carbon and low alloy steel plate is 0.31%.

**6.1.9.2** All plates shall have their heat number and the name or brand of the manufacturer legibly stamped on them at the rolling mill.

**6.1.9.3** The steel plates shall conform to one of the specifications and corresponding minimum tensile strength set out in Table 1:

**Table 1 – Minimum tensile strength – metal plate**

Specification	Minimum tensile strength MPa (psi)
ASTM A240/A240M, Type 304	517 (75 000)
ASTM A240/A240M, Type 304L	483 (70 000)
ASTM A240/A240M, Type 316	517 (75 000)
ASTM A240/A240M, Type 316L	483 (70 000)
ASTM A240/A240M, Type 321	517 (75 000)
ASTM A285/A285M, Grade A	310 (45 000)
ASTM A285/A285M, Grade B	345 (50 000)
ASTM A285/A285M, Grade C	379 (55 000)
ASTM A515/A515M, Grade 65/450	448 (65 000)
ASTM A515/A515M, Grade 70/485	483 (70 000)
ASTM A516/A516M, Grade 70/485	483 (70 000)

### 6.1.10 Tank heads

#### 6.1.10.1 For a Class 110A ton container:

- a) tank shall have fusion-welded heads, formed concave to pressure;
- b) heads shall be 2:1 ellipsoidal with the major axis equal to the diameter of the shell and the minor axis equal to one-half the major axis;
- c) heads shall be one piece and hot-formed in one heat so as to provide a straight flange having a length equal to or greater than 38.1 mm (1.5 in.);
- d) head thickness shall be equal to or greater than that calculated by the following formula:

$$t = \frac{Pd}{2SE}$$

where symbols are as defined in 6.1.8.1 b).

#### 6.1.10.2 For a Class 106A ton container:

- a) tank shall have forge-welded or fusion-welded heads, formed convex to pressure;
- b) heads shall be torispherical with an inside radius equal to or less than the inside diameter of the shell;
- c) heads shall be one piece and hot-formed in one heat so as to provide a straight flange having a length equal to or greater than 102 mm (4 in.);
- d) for forge welding, heads shall be drive fit into the shell;
- e) wall thickness of the heads, after forming, shall conform to the test requirements set out in 6.1.8.2 and provide for adequate threading of openings.

### 6.1.11 Welding

**6.1.11.1** Welders shall comply with and welding procedures shall conform to the requirements set out in Appendix W of the AAR *Specifications for Tank Cars* publication.

**6.1.11.2** Longitudinal joints in the shell shall be fusion-welded.

**6.1.11.3** Fusion-welded joints shall conform to the requirements set out in Appendix W of the AAR *Specifications for Tank Cars* publication, except that circumferential welds in tanks having an inside diameter less than 914 mm (36 in.) need not be radiographed.

**6.1.11.4** Forge-welded joints shall be hot-hammered or hot-rolled to ensure sound welds and:

- a) flanges of the heads shall be forge lap-welded to the shell and then crimped inwardly toward the centreline at least 25.4 mm (1 in.) on the radius;
- b) welding and crimping shall be accomplished in one heat cycle.

### 6.1.12 Post-weld heat treatment

6.1.12.1 Carbon steel ton containers shall be post-weld heat treated as follows:

- a) Post-weld heat treatment shall be done before the final hydrostatic test and after all attachments to be welded to the tank shell or heads have been welded in place.
- b) Minimum temperatures required by this section shall be temperatures of plate material of shell and heads of the tank.
- c) Thickness referred to as controlling the heating rate and holding time shall be the metal thickness of the thickness shell or head plate in the tank.
- d) The tank shall be post-weld heat treated as a unit in an enclosed furnace at a minimum temperature of 593 °C (1100 °F) for a minimum holding time of one hour per 25.4 mm (1 in.) of tank thickness, with a minimum of one hour for a thickness less than 25.4 mm (1 in.). The maximum temperature during post-weld heat treatment shall not exceed 677 °C (1250 °F).
- e) The furnace shall be designed to prevent direct flame impingement on the tank being heated.
- f) During the heating, holding, and cooling periods, the furnace atmosphere shall be controlled to avoid excessive oxidation of the tank surface.
- g) The temperature of the furnace shall not exceed 427 °C (800 °F) at the time the tank is placed in it.
- h) Above 427 °C (800 °F), the rate of heating shall be not more than 204 °C (400 °F) per hour divided by the tank thickness in inches, but in no case more than 204 °C (400 °F) per hour.
- i) During the heating period, there shall be no greater variation in temperature throughout the portion of the tank being heated than 139 °C (250 °F) within any 4570 mm (15 ft) interval of length.
- j) During the holding period, there shall be no greater difference than 83.3 °C (150 °F) throughout the portion of the tank being heated, except when a smaller difference is specified for a specific material.
- k) Above 427 °C (800 °F), cooling shall be done in a closed furnace or cooling chamber, or in still air, at a rate not greater than 260 °C (500 °F) per hour divided by the tank thickness in inches, but in no case more than 260 °C (500 °F) per hour. Below 427 °C (800 °F), the tank may be cooled in still air or in a cooling chamber.
- l) Holding temperatures and/or holding times in excess of the minimum values specified in this section for specific types of materials may be used, except when otherwise specified, for a specific material.
- m) When it is impractical to post-weld heat treat at the minimum temperature of 593 °C (1100 °F), any of the lower temperatures and corresponding longer times shown in Table 1 may be used.
- n) Nickel-clad tanks shall not be heated to a temperature exceeding 649 °C (1200 °F) and shall be heated in an atmosphere essentially free of sulfur.
- o) Type 304L or 316L clad tanks shall not be heated to a temperature exceeding 566 °C (1050 °F).

**Table 2 – Permissible post-weld heat treatment time-temperature combinations**

Metal temperature <sup>a</sup>		Holding time Hours per 25.4 mm (1 in.) of thickness <sup>b</sup>
°C	°F	
566	1050	2
538	1000	3
510	950	5
482	900	10

<sup>a</sup> For intermediate temperature, the holding time shall be determined by straight-line interpolation.

<sup>b</sup> The holding times shown are minimum for thickness less than 25.4 mm (1 in.).

### 6.1.13 Protection of service equipment

**6.1.13.1** Ton containers shall be designed to provide protection to any service equipment or attachment to the head, including the detachable protective housing referred to in 6.1.13.2. Tank ends shall slope or curve inward toward the axis so that the diameter at each end is at least 50.8 mm (2 in.) less than the maximum diameter.

**6.1.13.2** Loading and unloading valves shall be protected by a detachable housing which shall not project beyond the end of the tank and shall be securely fastened to the tank head. The detachable protective housing shall not cover any pressure-relief devices of the ton container.

### 6.1.14 Venting, loading, and unloading valves

**6.1.14.1** Valves shall be made of metal that is compatible with the dangerous goods and shall withstand tank test pressure without leakage.

**6.1.14.2** Valves shall be screwed directly into or attached to one of the tank heads.

**6.1.14.3** The outlet connections of the valves shall be closed.

**6.1.14.4** Threads for openings shall be NGT tapped to gauge, clean cut, even, and without checks.

### 6.1.15 Attachments not otherwise specified

Siphon pipes and their couplings on the inside of the tank heads, as well as lugs on the outside of the tank heads used for attaching the valve protective housing shall be fusion-welded in place prior to post-weld heat treatment. All other fixtures and appurtenances, except as specifically provided for, are prohibited.

### 6.1.16 Pressure-relief devices

**6.1.16.1** Unless otherwise prohibited in this standard, a tank shall be equipped with one or more pressure-relief devices made of metal that is compatible with the dangerous goods and that are screwed directly into the tank heads.

**6.1.16.2** The total discharge capacity of a pressure-relief device shall be sufficient to prevent a build-up of pressure in the tank equal to or greater than 82.5% of the tank test pressure. If pressure-relief devices of the fusible plug type are used, the required discharge capacity shall be available in each head.



**6.1.16.3** Discharge capacity shall be calculated using the applicable formula specified in Section 6 of CGA S-1.2.

**6.1.16.4** Threads for openings shall be NGT tapped to gauge, clean cut, even, and without checks.

**6.1.16.5** Pressure-relief devices, other than fusible plugs, shall be set for start-to-discharge and rupture discs shall burst at a pressure equal to or less than that specified in 6.1.23.1.

**6.1.16.6** Fusible plugs shall function at a temperature equal to or less than 79.4 °C (175 °F) and shall be vapour-tight at a temperature equal to or greater than 54.4 °C (130 °F).

### **6.1.17 Pressure and leak testing**

**6.1.17.1** After post-weld heat treatment, each ton container shall be subjected to a hydrostatic expansion test in a water jacket or be tested using a direct expansion method. The test method shall conform to the requirements of the CGA Publication C-1 and conformance with that standard's par. 6.5 relative to the use of a calibrated cylinder may be substituted with an alternative method for test system accuracy verification.

**6.1.17.2** No ton container shall have been subjected previously to an internal pressure that is within 689 kPa (100 psi) of the test pressure.

**6.1.17.3** No leaks shall appear, and permanent volumetric expansion shall not exceed 10% of total volumetric expansion at test pressure.

**6.1.17.4** After all service equipment has been installed, each ton container shall be subjected to an air-pressure test at a pressure equal to or greater than 689 kPa (100 psi). A ton container successfully passes an air-pressure test when there is no evidence of yielding or leakage.

**6.1.17.5** Any leaks shall be repaired using the same processes that are employed in the manufacture of the ton container. Caulking, soldering, or similar repairing is prohibited.

### **6.1.18 Testing of pressure-relief devices**

**6.1.18.1** Each reclosing pressure-relief device shall be tested with air or gas and shall open and be vapour-tight at the pressures specified in 6.1.23.1.

**6.1.18.2** Rupture discs of non-reclosing pressure-relief devices shall be tested as follows:

- a) The procedure for the determination of the burst pressure of a rupture disc, including a disc with breather hole, is to test one from each lot of up to 100 discs of the same design and made from the same piece of material.
- b) The test procedure shall employ a pressure rise that reaches 50% of the rated burst pressure within 2 seconds and then continues at a rate of 6.9 to 28 kPa per second (1 to 4 psi per second) to burst.
- c) The permissible tolerance for the burst pressure of a rupture disc shall be 0% to -15%. If this tolerance is exceeded, two additional discs have to be tested, and both shall meet specifications, or the lot shall be rejected. Rupture discs have to be tested at a temperature between 21.1 °C and 23.9 °C (70 °F and 75 °F).

**6.1.18.3** For pressure-relief devices of the fusible plug type, a representative sample of the plug used shall have functioned at the temperatures specified in 6.1.16.6.

**6.1.18.4** The start-to-discharge and vapour-tight pressures shall not be affected by an auxiliary closure or other combination.

### 6.1.19 Permanent markings

**6.1.19.1** The following information shall be plainly and permanently stamped in letters and figures equal to or greater than 9.53 mm (3/8 in.) in height into the metal of the valve end chime of each tank:

- a) specification number;
- b) ton container material and the cladding material designation, if any, stamped immediately below the specification number;
- c) the owner's or manufacturer's identifying symbol and serial number, stamped immediately below the material identification;
- d) mark of the independent inspector referred to in 6.1.20, stamped immediately below the owner's or manufacturer's identifying symbol;
- e) date of original tank test (month and year, such as 1 10 for January 2010), which shall be stamped so as to allow the easy addition of subsequent test dates;
- f) water capacity — in kilograms but may include pounds [for example: 00 kg (00 lb)].

**6.1.19.2** A copy of the above stamping in letters and figures of the specified height may be stamped on a brass plate and secured to one of the tank heads.

**6.1.19.3** The owner or manufacturer's identifying symbol shall be registered with Transport Canada.

### 6.1.20 Inspection

**6.1.20.1** Each ton container shall be inspected during manufacturing by an independent inspector registered under 5.1.

**6.1.20.2** The independent inspector shall verify that all plates from which the ton container are to be made conform to the specification and shall obtain and review the records certifying that the plates conform to the specification.

**6.1.20.3** The independent inspector shall reject plates that do not conform to the requirements set out in 6.1.9.

**6.1.20.4** The independent inspector shall perform the inspections that are required to ensure that each ton container conforms to the requirements set out in this section, including the requirements for the marking, post-weld heat treatment and testing.

**6.1.20.5** The independent inspector shall stamp his official mark in conformance with 6.1.19 on each ton container that is accepted by the inspector as being in conformance with the requirements set out in this section and shall provide the report required under 6.1.22.

### 6.1.21 Certificate of compliance

Before a tank is placed into service, the manufacturer shall provide the ton container owner with a report certifying that the ton container and its equipment conform to the requirements of this standard.

**6.1.21.1** The certificate of compliance shall include:

- a) the title "certificate of compliance" or "manufacturer's certificate";
- b) all information to be marked on the ton container;

- c) the name, address, and registered mark of the manufacturer;
- d) a statement that the ton containers comply with the applicable specifications of this standard;
- e) the name and signature of a representative of the manufacturer.

#### **6.1.22 Certificate of inspector's report**

Before a tank is placed into service, the independent inspector shall provide the manufacturer and the ton container owner with a report certifying that the ton container and its equipment conform to the requirements of this standard.

**6.1.22.1** The certificate of inspector's report shall include:

- a) the ton container manufacturer and address;
- b) the independent inspector's mark;
- c) ton container description:
  - 1) specification;
  - 2) ton container material, and the cladding material designation, if any;
  - 3) serial number(s);
  - 4) water capacity;
  - 5) tare weight;
  - 6) date of manufacture;
- d) records of heat numbers for plates and heads used in the tank;
- e) records and results of testing;
- f) statement that the ton containers described on this report comply with the requirements of this standard;
- g) name and signature of the independent inspector.

#### **6.1.23 Individual specification requirements applicable to TC ton containers**

##### **6.1.23.1 Individual specification requirements**

In addition to the other requirements set out in 6.1, a TC ton container shall conform to the individual specification requirements corresponding to the specification set out in Table 3.

Table 3 – Specification requirements – TC ton containers

TC specification	106A500X/ 106A500W	106A800X/ 106A500W	110A500W	110A600W	110A800W	110A1000W
Minimum burst pressure, kPa (psi) (see 6.1.7)	None specified	None specified	8618 (1250)	10342 (1500)	13789 (2000)	17236 (2500)
Minimum shell thickness, mm (in.)	10.3 (13/32)	17.5 (11/16)	8.73 (11/32)	9.53 (3/8)	11.9 (15/32)	15.1 (19/32)
Tank test pressure, kPa (psi) (see 8.5.14)	3447 (500)	5516 (800)	3447 (500)	4137 (600)	5516 (800)	6895 (1000)
Pressure-relief device Maximum start-to-discharge or burst pressure, kPa (psi)	2586 (375)	4137 (600)	2586 (375)	3103 (450)	4137 (600)	4826 (700)
Pressure-relief device Minimum vapour-tight pressure, kPa (psi)	2068 (300)	3309 (480)	2068 (300)	2482 (360)	3309 (480)	4482 (650)

## 6.2 Quality management system

### 6.2.1 Scope

For the purpose of this section, a quality management system means all of the planned and systematic actions taken by a ton container manufacturing facility to provide adequate confidence that a ton container conforms to the requirements set out in this standard and the TDG Regulations.

### 6.2.2 Application

Each ton container manufacturer shall have a quality management system that includes all the elements and processes specified in 6.2.4.

### 6.2.3 General requirements

The quality management system shall be developed and established in accordance with the requirements of a standard or series of standards and shall be registered, approved, or certified by an organization independent of both Transport Canada and the ton container facility. The standard or series of standards shall be internationally recognized as being capable of meeting or exceeding the requirements of this section.

## **6.2.4 Specific elements and processes of the quality management system**

### **6.2.4.1 Management commitment**

The management of the ton container facility shall appoint a member of management who, irrespective of other responsibilities, shall have the authority and responsibility for overseeing the quality management system of the ton container facility, including:

- a) ensuring the quality management system is established and maintained;
- b) reporting to management on the performance of the quality management system;
- c) promoting awareness of the importance of the requirements of this standard and the TDG Regulations throughout the ton container facility.

### **6.2.4.2 Planning**

A planning process for the products and services provided by the ton container facility for transforming the requirements of this standard and the TDG Regulations into quality objectives for each product or service shall be established and documented. The planning process shall include a means for determining:

- a) processes and documentation and the level of detail required;
- b) verification and validation activities;
- c) records that are necessary to ensure compliance to the requirements of this standard and the TDG Regulations;
- d) if the ton container facility has the ability to meet the determined requirements.

### **6.2.4.3 Human resources**

A human resources management process shall be established and documented. This process shall:

- a) determine competency needs for personnel affecting quality;
- b) provide effective training to ensure competency of personnel;
- c) create and maintain records of education, training, qualification, and certification, as required;
- d) create and maintain awareness and importance of the quality management system to all employees;
- e) assign quality responsibilities to personnel on the basis of their meeting the respective competency needs.

### **6.2.4.4 Purchasing**

A purchasing control process shall be set out to ensure purchased products and services conform to the requirements of this standard and the TDG Regulations. The purchasing control process shall include procedures for the evaluation and selection of suppliers.

#### 6.2.4.5 Product realisation

An operations control process for the products and services provided by the ton container facility shall be established and documented. The operation control process shall require all of the following:

- a) the provision of information to personnel that specifies the quality of the product or service;
- b) the provision of written procedures as determined by the quality planning process;
- c) the availability and good order of equipment used for the realisation of products and services;
- d) the availability and accuracy of monitoring and measuring devices;
- e) the provision of written instructions to employees;
- f) the provision of a description of the manufacturing, inspection, testing, and qualification including the acceptance criteria, so that the characteristics of the ton container, service equipment, and the elements to inspect, examine, and test can be identified;
- g) the provision of procedures for non-destructive inspections for qualification authorized and evaluated by the owner to ensure the inspection and test technique employed, taking into account the accessibility of the area, has the capability of detecting a defect of the minimum rejectable size;
- h) a system for the maintenance of records, inspections, tests, and the interpretation of inspection and test results;
- i) the qualification of personnel involved in performing any non-destructive inspections and tests.

#### 6.2.4.6 Measurement, analysis and improvement

A measurement, analysis, and improvement process shall be established that allows a ton container facility to verify the compliance of the products and services provided to the requirements of this standard and the TDG Regulations, to determine and address the cause of any non-compliance, and, if necessary, to improve the quality management system. The measurement, analysis, and improvement processes shall address all of the following:

- a) the measurement and monitoring of processes;
- b) the evaluation and monitoring of products and services;
- c) the release and delivery of products and services, including post-delivery activities and maintenance of records;
- d) the control of non-compliant products and services;
- e) the determination and elimination of the causes of any non-compliance;
- f) periodic internal audits to determine if the quality management system complies with the requirements of this standard and the TDG Regulations and has been effectively implemented and maintained;
- g) the calibration of inspection and test equipment.

#### 6.2.4.7 Other elements

Procedures shall be established to ensure:

- a) that the applicable drawings, design calculations, specifications, and instructions are used in the manufacturing, repair, inspection, testing, and qualification or maintenance;
- b) that incoming parts and materials are properly identified and segregated when received and in storage;
- c) that any maintenance or modification of a ton container involving welding is documented in the form of a detailed procedure.

## 7 Qualification and maintenance of ton containers

### 7.1 Scope

The requirements specified in this section apply to any person who qualifies, modifies, marks, handles, or maintains ton containers in Canadian service.

### 7.2 Periodic retest and inspection of ton containers

#### 7.2.1 General

A ton container and its pressure-relief devices shall be inspected and retested periodically in conformance with the requirements set out in 7.2. Inspection and retesting may be performed at any time during the calendar year the retest falls due. A ton container that satisfies the inspection and test criteria set out in 7.2 shall be considered qualified.

#### 7.2.2 Inspection and tests

**7.2.2.1** Subject to 7.2.2.9, a ton container shall be subjected to the specified hydrostatic pressure and its permanent expansion shall be determined by a method that conforms to the requirements set out in CGA Publication C-1, except that the use of a calibrated cylinder or ton container may be substituted with an alternative method for test system accuracy verification. A ton container successfully passes a hydrostatic pressure test when the permanent volumetric expansion does not exceed 10% of the total volumetric expansion at the test pressure and the ton container does not show evidence of yielding or leakage.

**7.2.2.2** Subject to 7.2.2.9, and in addition to the hydrostatic pressure test requirements of 7.2.2.1, a ton container shall be subjected to an air-pressure test at a pressure equal to or greater than 689 kPa (100 psi) under conditions favourable to the detection of any leakage. A ton container successfully passes an air-pressure test when there is no evidence of yielding or leakage.

**7.2.2.3** An internal and external visual inspection shall be performed. A ton container successfully passes the visual inspection if it meets the criteria set out in CGA Publication C-6.

**7.2.2.4** A reclosing pressure-relief device shall be tested by pressurizing with air or other gas. A reclosing pressure-relief device installed on a ton container shall conform to the requirements set out in column V and column VI of Table 4. A reclosing pressure-relief device successfully passes the test if the measured start-to-discharge pressure of the device is at or below the specified start-to-discharge pressure and the measured vapour-tight pressure is at or above the specified vapour-tight pressure.

**7.2.2.5** Rupture discs and fusible plugs shall be removed from the tank and visually inspected.

**7.2.2.6** Subject to 7.2.2.7, a ton container shall be retested as specified in Table 4.

Table 4 – Ton container retest requirements

Specification	Maximum retest interval (years)		Retest pressure kPa (psi)	Specified pressure for reclosing pressure-relief device kPa (psi)	
	Tank	Pressure-relief device	Hydrostatic pressure test	Start-to-discharge	Vapour-tight
I	II	III	IV	V	VI
106A500	5	2	3447 (500)	2586 (375)	2068 (300)
106A500X/106A500W	5	2	3447 (500)	2586 (375)	2068 (300)
106A800	5	2	5516 (800)	4137 (600)	3309 (480)
106A800X/106A800W	5	2	5516 (800)	4137 (600)	3309 (480)
106A800NCI	5	2	5516 (800)	4137 (600)	3309 (480)
110A500W	5	2	3447 (500)	2586 (375)	2068 (300)
110A600W	5	2	4137 (600)	3103 (450)	2482 (360)
110A800W	5	2	5516 (800)	4137 (600)	3309 (480)
110A1000W	5	2	6895 (1000)	5171 (750)	4137 (600)

**7.2.2.7** Pressure-relief devices of the spring-loaded type on tanks used exclusively for fluorinated hydrocarbons that do not contain components that are corrosive to the tank or to the pressure-relief device may be retested every five years.

**7.2.2.8** The month and year of the inspections and tests performed in conformance with the requirements set out in 7.2 shall be plainly and permanently stamped into the metal of one head or chime of each ton container which successfully passes the periodic retest and inspection; for example, “01-12” for a retest and inspection performed in January of 2012. If the ton container was visually inspected in conformance with the requirements set out in 7.2.2.9 and the pressure tests set out in 7.2.2.1 and 7.2.2.2 were not performed, the month and date of the retest and inspection shall be followed by a “V”; for example, “01 12 V” for a visual inspection performed in January of 2012. Dates of previous retests and inspections and all specified markings shall be kept legible.

**7.2.2.9** In the case of a ton container that is used exclusively for fluorinated hydrocarbons that do not contain components that are corrosive to the tank, the requirements of 7.2.2.1 and 7.2.2.2 do not apply.

**7.2.2.10** Any leaks shall be repaired by a manufacturer registered with the Director using the same processes that were employed in the manufacture of the ton container. Once repairs are made, the ton container shall then be inspected and retested as set out in 7.2.2 before being placed back into service.

### 7.2.3 Reporting and records retention

**7.2.3.1** The results of the hydrostatic pressure test, air-pressure test, and visual inspection shall be collected and recorded.



**7.2.3.2** A report shall be produced which shall include:

- a) date of inspection and test;
- b) specification number;
- c) ton container identification (registered symbol, serial number, date of manufacture and ownership symbol);
- d) statement pertaining to the need for refinishing or recoating the ton container;
- e) conditions checked (leakage, corrosion, gouges, dents, digs, broken or damaged chime or protective ring, fire damage, internal condition);
- f) test pressures;
- g) results of tests;
- h) disposition of ton container (returned to service, returned to manufacturer for repair, or scrapped);
- i) identification of the facility and person conducting the retest or inspection.

**7.2.3.3** The owner of a ton container shall retain the reports throughout the period of ownership plus one year after the change of ownership. Upon a change of ownership, the owner shall transfer the reports to the new owner. The person or facility performing the hydrostatic pressure test, air-pressure test, and visual inspection shall keep the reports for at least one retest and inspection interval plus one year.

## **8 Selection and use of ton containers for the handling, offering for transport, or transporting of dangerous goods**

### **8.1 Scope**

This section applies to all ton containers handled, offered for transport, or transported in Canada.

### **8.2 Selection and use**

#### **8.2.1 General**

A ton container shall not be used in the handling, offering for transport, or transport of dangerous goods unless Schedules 1 and 2 of Annex A specify that the ton container is permitted to contain the dangerous goods and the container and dangerous goods conform to all other applicable requirements set out in this standard. Where Annex A specifies Class 106A and 110A ton containers, it shall include those designated as TC, DOT and ICC.

#### **8.2.2 Due date for qualification**

Unless otherwise specified in this standard:

- a) subject to 8.2.2 b) when a ton container is due for a qualification, the container shall not be loaded; and
- b) when a ton container becomes due for a qualification after loading, unloading or during transport, the container shall not be transported to one or more destinations, except for the purposes of unloading, cleaning, and qualification.

A container is due for qualification no later than December 31 during the calendar year the retest falls due.

### 8.2.3 Prohibition of old ton containers

A ton container that was manufactured before January 1, 1936, shall not be used in the handling, offering for transport, or transporting of dangerous goods.

### 8.2.4 Minimum test pressure

**8.2.4.1** A ton container shall have a tank test pressure equal to or greater than the greatest of the following:

- a) 133% of the WP;
- b) 133% of the maximum loading or unloading pressure, whichever is greater;
- c) 2068 kPa (300 psi) for dangerous goods toxic by inhalation;
- d) minimum test pressure for the specification in section 6 of this standard;
- e) minimum test pressure specified for the specific dangerous goods in the applicable special provision in Schedule 1 of Annex A.

#### 8.2.4.2 Higher test pressure

Unless otherwise specified in this standard, when a ton container with a given specification and test pressure is authorized, a ton container with the same specification and a higher marked test pressure may be used.

### 8.2.5 Air-enriched mixture

Air pressure in excess of ambient atmospheric pressure shall not be used to load or unload dangerous goods if this could create a flammable mixture within the vapour space of the container.

## 8.3 Loading limits and outage

### 8.3.1 Loading limits

A container shall not be loaded with dangerous goods in excess of the loading limits specified in this standard or those otherwise applicable to the container.

### 8.3.2 Outage

#### 8.3.2.1 Vacant space for outage

Vacant space shall be left in the shell of the container to provide the required outage.

#### 8.3.2.2 Filling limit

When a container is being filled with liquids, outage shall be provided so that, under normal conditions of transport, including handling, no condition or release of dangerous goods that could endanger public safety occurs or may reasonably be expected to occur, including leakage or permanent distortion of the container, because of an expansion of the liquid.

## 8.4 Specific dangerous goods

### 8.4.1 Dangerous goods toxic by inhalation

#### 8.4.1.1 Ton containers for dangerous goods toxic by inhalation other than Class 2, Gases

The following conditions apply to ton containers of any built date that are or may be used in the handling, offering for transport or transport of dangerous goods toxic by inhalation, other than Class 2, Gases:

- dangerous goods that meet the criteria for Hazard Zone A shall be handled, offered for transport or transported in ton containers having a test pressure equal to or greater than 3447 kPa (500 psi) and conform to classes 106 or 110;
- dangerous goods that meet the criteria for Hazard Zone B shall be handled, offered for transport or transported in ton containers having a test pressure equal to or greater than 2068 kPa (300 psi) and conform to classes 106 or 110;
- hydrogen fluoride, anhydrous shall be handled, offered for transport or transported in ton containers having a test pressure equal to or greater than 2068 kPa (300 psi) and conform to classes 106 or 110;
- higher test pressure is required if otherwise specified elsewhere in this standard.

### 8.4.2 Assignment of hazard zones for dangerous goods toxic by inhalation

#### 8.4.2.1 Division 2.3

For the purposes of this standard, the hazard zone of Class 2, Division 2.3 dangerous goods is assigned in Schedule 2 of Annex A.

#### 8.4.2.2 Liquid dangerous goods other than Class 2 gases

For the purposes of this standard, the hazard zone of liquid dangerous goods other than Class 2 gases is assigned in Schedule 2 of Annex A.

#### 8.4.2.3 Determination

- If Schedule 2 in Annex A does not provide a hazard zone or provides more than one hazard zone for Class 2, Division 2.3 dangerous goods, or indicates that the hazard zone shall be determined based on the grouping criteria for Division 2.3, the hazard zone shall be determined by applying the criteria in Table 5.

**Table 5 – Hazard zones for dangerous goods toxic by inhalation - determination**

Hazard zone	Inhalation toxicity
A	LC50 less than or equal to 200 ppm
B	LC50 greater than 200 ppm and less than or equal to 1000 ppm
C	LC50 greater than 1000 ppm and less than or equal to 3000 ppm
D	LC50 greater than 3000 ppm or less than or equal to 5000 ppm

b) If Schedule 2 in Annex A does not provide a hazard zone or provides more than one hazard zone for liquid dangerous goods other than Class 2 gases, or indicates that the hazard zone shall be determined, the hazard zone shall be determined by applying the following criteria:

- 1) Hazard Zone A:  $V \geq 500 \text{ LC}_{50}$  and  $\text{LC}_{50} \leq 200 \text{ mL/m}^3$ ;
- 2) Hazard Zone B:  $V \geq 10 \text{ LC}_{50}$ ;  $\text{LC}_{50} \leq 1000 \text{ mL/m}^3$ ; and the criteria for Hazard Zone A are not met;

where  $V$  is the saturated vapor concentration in air of the material in  $\text{mL/m}^3$  at  $20 \text{ }^\circ\text{C}$  and at  $101.3 \text{ kPa}$ .

## 8.5 Loading of containers

### 8.5.1 Before loading

A container shall not be loaded with dangerous goods if:

- a) container does not conform to the requirements for selection and use set out in this standard;
- b) required dangerous goods safety marks are not in place;
- c) container is past due for qualification (e.g., no later than December 31 during the calendar year the retest falls due);
- d) container is manufactured from a material that is not compatible with the dangerous goods being loaded;
- e) container already contains dangerous goods or other substances that could react with the dangerous goods to be loaded;
- f) dangerous goods are at a temperature outside the design temperature range of the container or outside the service temperature range of the lining or coating.

### 8.5.2 After loading

After loading a dangerous goods container, a person shall conduct an external visual inspection that includes:

- a) ensuring that all closures of openings, as well as the fasteners securing them on the container, are in good condition and secured to achieve conformance with 4.9.2;
- b) for a combination pressure-relief device incorporating a rupture disc, inspecting and opening each detection device including a needle valve, trycock or telltale indicator to ensure the integrity of the rupture disc;
- c) inspecting the compliance markings for legibility and correctness;
- d) inspecting the periodic inspection date markings to ensure that they are within the prescribed intervals.

## 8.6 Before transporting

Before transporting a container containing dangerous goods, the person who will be transporting the container shall conduct an external visual inspection of the container, to the extent practicable, from the ground level to ensure that:

- a) required dangerous goods safety marks are in place and in conformance with the TDG Regulations; and
- b) closures of openings are in good condition and properly secured.

## **9 Provisions for the one-time movement of non-conforming ton containers presenting low safety risks**

### **9.1 Scope**

The purpose of this section is to authorize the one-time movement within Canada of certain non-conforming ton containers where the non-conformance is relatively minor in nature or where measures have been taken to reduce the safety risks to a minimal level. In all cases, the movement shall be for the purposes of cleaning, testing, repairing, dismantling, or unloading ton containers that are not actively leaking and only when it is not possible or unsafe to remedy the non-conformance at the location where it was discovered.

#### **9.1.1 Movement of certain non-conforming ton containers**

##### **9.1.1.1 Service equipment defects**

A ton container that has a leaking or defective service equipment device, other than a reclosing pressure-relief device, may be transported for the purposes of cleaning, repairing, or unloading, and only when it is not possible or unsafe to remedy the situation at the location where it was discovered, under the following conditions:

- a) Chlorine Institute Emergency Kit “B” is applied to a class 106 container or other similarly designed emergency kit is applied to a class 110 container to prevent any leaks;
- b) ton container is tagged to indicate it is defective;
- c) ton container with the emergency kit is tested prior to transport to ensure there is no leak;
- d) ton container is loaded and properly secured to prevent any movement during transport.

## Annex A (normative)

### Schedules

#### A.1 Schedule 1 – special provisions

**A.1.1** This schedule lists the special provisions that apply to dangerous goods and that correspond to the number set out in column VI of Schedule 2. For any given dangerous goods listed in Schedule 2 only the container types listed in the applicable special provision shall be used. When more than one container type is authorized in one or more applicable special provision, the container selected shall be listed in the applicable special provision and shall conform to all other applicable requirements of this standard.

1. The dangerous goods may be handled, offered for transport, or transported in a Class 106A or 110A ton container.
2. The dangerous goods may be handled, offered for transport, or transported in a Class 106A ton container.
3. If the dangerous goods are in dispersion in organic liquid, the organic liquid shall have a flash point greater than 50 °C (122 °F).
4. The container shall be manufactured of steel.
5. The ton container shall not be equipped with pressure-relief devices, and the openings for pressure-relief devices shall be plugged or blank flanged.
6. The container shall be manufactured of one of the following:
  - a) nickel or stainless steel; or
  - b) steel that is lined with nickel, stainless steel, lead, or other such corrosion-resistant metallic material.
7. The container shall be protected from corrosion by one of the following:
  - a) by lining or coating the container with a non-metallic lining or coating compatible with the dangerous goods; or
  - b) by manufacturing the container to a thickness that provides an allowance for the corrosive effects of the dangerous goods such that no danger to public safety occurs or may reasonably be expected to occur.
8. The container shall be manufactured of nickel or nickel-copper alloy or steel that is clad with nickel or nickel-copper alloy.
9. The container shall be manufactured of stainless steel.
10. Valves and pressure-relief devices that are in contact with the dangerous goods shall be manufactured of materials that will not cause the formation of acetylides.
11. Pressure-relief devices shall be equipped with stainless steel or platinum rupture discs.
12. The dangerous goods may be handled, offered for transport, or transported in a Specification 106A500X ton container that is not equipped with any type of pressure-relief device. The ton container shall be filled to an outage capable of preventing the tank from becoming liquid full at 54.4 °C (130 °F).

13. The container shall:
  - a) be equipped with gas-tight valve protection caps;
  - b) have a minimum tank test pressure of 3447 kPa (500 psi);
  - c) be filled to an outage capable of preventing the tank from becoming liquid full at 54.4 °C (130 °F);
  - d) in the case of a Class 110A ton container, be manufactured of stainless steel.
14. The container shall be protected from corrosion by one of the following:
  - a) by lining or coating the container with a non-metallic lining or coating compatible with the dangerous goods; or
  - b) by manufacturing the container to a thickness that provides an allowance for the corrosive effects of sulphuric acid in concentrations up to 65.25% or spent sulphuric acid in concentrations up to 65.25%.
15. The container shall be filled to a filling density less than or equal to 125%.
16. The dangerous goods may be handled, offered for transport, or transported in a Class 106A ton container that is:
  - a) filled to a filling density less than or equal to 110%;
  - b) nickel clad;
  - c) equipped with pressure-relief devices incorporating a fusible plug with a yield temperature of 79.4 °C (175 °F).
17. The container shall be filled to a filling density less than or equal to 120%.
18. A Class 106 or 110 ton container shall be used. In addition, the container shall conform to the following requirements:
  - a) ton container shall be equipped with one or more pressure-relief devices of the fusible plug type having a yield temperature equal to or less than 76.7 °C (170 °F) and equal to or greater than 69.4 °C (157 °F). Each device shall be resistant to extrusion of the fusible alloy and leak-tight at 54.4 °C (130 °F);
  - b) valve outlets shall be sealed by a threaded solid plug;
  - c) all valves shall be protected by a metal cover, and the maximum filling density is 68%.
19. This dangerous goods is toxic by inhalation in Hazard Zone A.
20. This dangerous goods is toxic by inhalation in Hazard Zone B.
21. This dangerous goods is toxic by inhalation in Hazard Zone C.
22. This dangerous goods is toxic by inhalation in Hazard Zone D.
23. This dangerous goods is toxic by inhalation.

24. Liquefied petroleum gas shall be odorized to allow detection of the liquefied petroleum gas in the atmosphere at any concentration above one-fifth of its lower explosive limit in air unless the addition of any odorant would be harmful to further use or processing of the liquefied petroleum gas.
25. The dangerous goods may be handled, offered for transport, or transported in a Class 106A or 110A ton container.

## **A.2 Schedule 2 – list of dangerous goods**

### **A.2.1 Legend**

#### **Column I Shipping name**

This column gives the shipping names for dangerous goods in alphabetical order within each primary class and within each packing group. The alphabetical order has been determined by ignoring all numerical digits and all lower case letters that precede the first capital letter in the shipping name. The most appropriate designation for the dangerous goods shall be selected based on each class, UN number and packing group established as per the classification requirements of 4.5.

#### **Column II Primary class**

This column gives the primary class of the dangerous goods.

#### **Column III Subsidiary class**

This column gives the subsidiary class(es), if applicable, of the dangerous goods.

#### **Column IV UN number**

This column gives the UN number assigned to the dangerous goods under the UN system.

#### **Column V Packing group**

This column gives the packing groups of the dangerous goods.

#### **Column VI Special provisions**

This column gives the special provisions that apply to the dangerous goods.

#### **Symbol P**

The symbol P used in this Schedule means that the handling, offering for transport, and transport of the dangerous goods is prohibited.



Table A.2.1 – Schedule 2 – list of dangerous goods

I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
<b>Class 2.1 dangerous goods</b>					
DIMETHYLAMINE, ANHYDROUS	2.1	—	UN1032	—	2
ETHYLAMINE	2.1	—	UN1036	—	1
ETHYLENE, REFRIGERATED LIQUID	2.1	—	UN1038	—	P
HYDROGEN, REFRIGERATED LIQUID	2.1	—	UN1966	—	P
METHANE, COMPRESSED; or NATURAL GAS, COMPRESSED with high methane content	2.1	—	UN1971	—	P
METHANE, REFRIGERATED LIQUID; or NATURAL GAS, REFRIGERATED LIQUID with high methane content	2.1	—	UN1972	—	P
METHYLACETYLENE AND PROPADIENE MIXTURE, STABILIZED	2.1	—	UN1060	—	1, 10
METHYLAMINE, ANHYDROUS	2.1	—	UN1061	—	2
METHYL CHLORIDE; or REFRIGERANT GAS 40	2.1	—	UN1063	—	2
LIQUEFIED PETROLEUM GASES; or PETROLEUM GASES, LIQUEFIED	2.1	—	UN1075	—	1, 24
VINYL CHLORIDE, STABILIZED	2.1	—	UN1086	—	1, 10
VINYL FLUORIDE, STABILIZED	2.1	—	UN1860	—	P
VINYL METHYL ETHER, STABILIZED	2.1	—	UN1087	—	1, 10
Dangerous goods of Class 2.1, not listed above, non-cryogenic	2.1	—	—	—	1
<b>Class 2.2 dangerous goods</b>					
AIR, REFRIGERATED LIQUID	2.2	5.1	UN1003	—	P

I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
AMMONIA SOLUTION, relative density less than 0.880 at 15 °C (59 °F) in water, with more than 35% but not more than 50% ammonia	2.2	—	UN2073	—	P
ARGON, REFRIGERATED LIQUID	2.2	—	UN1951	—	P
CARBON DIOXIDE, REFRIGERATED LIQUID	2.2	—	UN2187	—	P
GASES, REFRIGERATED LIQUID, N.O.S.	2.2	—	UN3158	—	P
HELIUM, REFRIGERATED LIQUID	2.2	—	UN1963	—	P
KRYPTON, REFRIGERATED LIQUID	2.2	—	UN1970	—	P
NEON, REFRIGERATED LIQUID	2.2	—	UN1913	—	P
NITROGEN, COMPRESSED	2.2	—	UN1066	—	P
NITROGEN, REFRIGERATED LIQUID	2.2	—	UN1977	—	P
NITROUS OXIDE, REFRIGERATED LIQUID	2.2	5.1	UN2201	—	P
OXYGEN, REFRIGERATED LIQUID	2.2	5.1	UN1073	—	P
XENON, REFRIGERATED LIQUID	2.2	—	UN2591	—	P
Dangerous goods of Class 2.2, not listed above, non-cryogenic	2.2	—	—	—	1
<b>Class 2.3 dangerous goods</b>					
AMMONIA, ANHYDROUS; or ANHYDROUS AMMONIA	2.3	8	UN1005	—	2, 22
AMMONIA SOLUTION, relative density less than 0.880 at 15 °C (59 °F) in water, with more than 50% ammonia	2.3	8	UN3318	—	1, 22
BORON TRICHLORIDE	2.3	8	UN1741	—	1, 21
BORON TRIFLUORIDE	2.3	8	UN1008	—	2, 20
CHLORINE	2.3	5.1, 8	UN1017	—	1, 20
CHLOROPICRIN AND METHYL BROMIDE MIXTURE with more than 2% chloropicrin	2.3	—	UN1581	—	1, 20

I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
Dangerous goods of Class 2.3, not specifically listed, meeting the definition of dangerous goods toxic by inhalation, Hazard Zone B	2.3	—	—	—	1, 20
Dangerous goods of Class 2.3, not specifically listed, meeting the definition of dangerous goods toxic by inhalation, Hazard Zone C	2.3	—	—	—	1, 21
Dangerous goods of Class 2.3, not specifically listed, meeting the definition of dangerous goods toxic by inhalation, Hazard Zone D	2.3	—	—	—	1, 22
DINITROGEN TETROXIDE; or NITROGEN DIOXIDE	2.3	5.1, 8	UN1067	—	1, 5, 11, 13, 19
ETHYLENE OXIDE; or ETHYLENE OXIDE WITH NITROGEN up to a total pressure of 1 MPa (10 bar) at 50 °C	2.3	2.1	UN1040	—	P
HYDROGEN CHLORIDE, REFRIGERATED LIQUID	2.3	8	UN2186	—	P
HYDROGEN SULFIDE; or HYDROGEN SULPHIDE	2.3	2.1	UN1053	—	1, 18, 20
METHYL BROMIDE with not more than 2% chloropicrin	2.3	—	UN1062	—	2, 21
METHYLCHLOROSILANE	2.3	2.1, 8	UN2534	—	1, 20
METHYL MERCAPTAN	2.3	2.1	UN1064	—	2, 5, 21
NITROSYL CHLORIDE	2.3	8	UN1069	—	2, 16, 21
PHOSGENE	2.3	8	UN1076	—	2, 5, 12, 19
SULFUR DIOXIDE; or SULPHUR DIOXIDE	2.3	8	UN1079	—	1, 15, 21
TRIFLUOROACETYL CHLORIDE	2.3	8	UN3057	—	1, 20
TRIFLUOROCHLOROETHYLENE, STABILIZED; or REFRIGERANT GAS R 1113	2.3	2.1	UN1082	—	1, 21

I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
Dangerous goods of Class 2.3, not listed above	2.3	—	—	—	P
<b>Class 3 Packing Group I dangerous goods</b>					
ACETALDEHYDE	3	—	UN1089	I	25
ACRYLONITRILE, STABILIZED	3	6.1	UN1093	I	25
ALLYL CHLORIDE	3	6.1	UN1100	I	25
CARBON DISULFIDE; or CARBON DISULPHIDE	3	6.1	UN1131	I	25
CHLOROPRENE, STABILIZED	3	6.1	UN1991	I	25
FLAMMABLE LIQUID, N.O.S.	3	—	UN1993	I	25
ORGANOCHLORINE PESTICIDE, LIQUID, FLAMMABLE, TOXIC, flash point less than 23 °C (73 °F)	3	6.1	UN2762	I	25
PETROLEUM CRUDE OIL	3	—	UN1267	I	25
PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC	3	6.1	UN3494	I	25
Dangerous goods of Class 3, Packing Group I, not listed above	3	—	—	I	25
<b>Class 3 Packing Group II dangerous goods</b>					
ALCOHOLS, N.O.S.	3	—	UN1987	II	25
1,1-DICHLOROETHANE	3	—	UN2362	II	25
1,2-DICHLOROETHYLENE	3	—	UN1150	II	25
ETHANOL AND GASOLINE MIXTURE, with more than 10% ethanol; ETHANOL AND MOTOR SPIRIT MIXTURE, with more than 10% ethanol; or ETHANOL AND PETROL MIXTURE, with more than 10% ethanol	3	—	UN3475	II	25
ETHYLENE DICHLORIDE	3	6.1	UN1184	II	25
FLAMMABLE LIQUID, N.O.S.	3	—	UN1993	II	25

I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
4-METHYLMORPHOLINE; or N-METHYLMORPHOLINE	3	8	UN2535	II	4, 25
METHYLTRICHLOROSILANE	3	8	UN1250	II	4, 25
ORGANOCHLORINE PESTICIDE, LIQUID, FLAMMABLE, TOXIC, flash point less than 23 °C (73 °F)	3	6.1	UN2762	II	25
PETROLEUM CRUDE OIL	3	—	UN1267	II	25
PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC	3	6.1	UN3494	II	25
VINYLTRICHLOROSILANE	3	8	UN1305	II	4, 25
Dangerous goods of Class 3, Packing Group II, not listed above	3	—	—	II	25
<b>Class 3 Packing Group III dangerous goods</b>					
ALCOHOLS, N.O.S.	3	—	UN1987	III	25
CHLOROBENZENE	3	—	UN1134	III	25
ELEVATED TEMPERATURE LIQUID, FLAMMABLE, N.O.S., with flash point above 60 °C, at or above its flash point	3	—	UN3256	III	1
FLAMMABLE LIQUID, N.O.S.	3	—	UN1993	III	25
PETROLEUM CRUDE OIL	3	—	UN1267	III	25
PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC	3	6.1	UN3494	III	25
Dangerous goods of Class 3, Packing Group III, not listed above	3	—	—	III	25
<b>Class 4.1 Packing Group I dangerous goods</b>					
Dangerous goods of Class 4.1, Packing Group I	4.1	—	—	I	P
<b>Class 4.1 Packing Group II dangerous goods</b>					
Dangerous goods of Class 4.1, Packing Group II	4.1	—	—	II	P

I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
<b>Class 4.1 Packing Group III dangerous goods</b>					
Dangerous goods of Class 4.1, Packing Group III, not listed above	4.1	—	—	III	P
<b>Class 4.2 Packing Group I dangerous goods</b>					
ORGANOMETALLIC SUBSTANCE, LIQUID, PYROPHORIC, WATER-REACTIVE	4.2	4.3	UN3394	I	1
PHOSPHORUS WHITE, MOLTEN	4.2	6.1	UN2447	I	1
PHOSPHORUS, WHITE, DRY; PHOSPHORUS, WHITE, IN SOLUTION; PHOSPHORUS, WHITE, UNDER WATER; PHOSPHORUS, YELLOW, DRY; PHOSPHORUS, YELLOW, IN SOLUTION; or PHOSPHORUS, YELLOW, UNDER WATER	4.2	6.1	UN1381	I	1
Pyrophoric liquid, organic, n.o.s.	4.2	—	UN2845	I	1
Dangerous goods of Class 4.2, Packing Group I, not listed above	4.2	—	—	I	P
<b>Class 4.2 Packing Group II dangerous goods</b>					
Dangerous goods of Class 4.2, Packing Group II	4.2	—	—	II	P
<b>Class 4.2 Packing Group III dangerous goods</b>					
Dangerous goods of Class 4.2, Packing Group III	4.2	—	—	III	P
<b>Class 4.3 Packing Group I dangerous goods</b>					
BORON TRIFLUORIDE DIMETHYL ETHERATE	4.3	3, 8	UN2965	I	1
ETHYLDICHLOROSILANE	4.3	3, 8	UN1183	I	1
METHYLDICHLOROSILANE	4.3	3, 8	UN1242	I	1, 4
METHYL MAGNESIUM BROMIDE IN ETHYL ETHER	4.3	3	UN1928	I	1
POTASSIUM METAL ALLOYS, LIQUID	4.3	—	UN1420	I	1
POTASSIUM SODIUM ALLOYS, LIQUID	4.3	—	UN1422	I	1

I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
TRICHLOROSILANE	4.3	3, 8	UN1295	I	1
Dangerous goods of Class 4.3, Packing Groups I, not listed above	4.3	—	—	I	P
<b>Class 4.3 Packing Group II dangerous goods</b>					
Dangerous goods of Class 4.3, Packing Groups II, not listed above	4.3	—	—	II	P
<b>Class 4.3 Packing Group III dangerous goods</b>					
Dangerous goods of Class 4.3, Packing Group III, not listed above	4.3	—	—	III	P
<b>Class 5.1 dangerous goods</b>					
AMMONIUM NITRATE, LIQUID (hot concentrated solution), with not more than 0.2% combustible material, in a concentration exceeding 80%	5.1	—	UN2426	—	1
<b>Class 5.1 Packing Group I dangerous goods</b>					
BROMINE PENTAFLUORIDE	5.1	6.1, 8	UN1745	I	1, 19
BROMINE TRIFLUORIDE	5.1	6.1, 8	UN1746	I	1, 20
HYDROGEN PEROXIDE, AQUEOUS SOLUTION, STABILIZED with more than 60% hydrogen peroxide; or HYDROGEN PEROXIDE, STABILIZED	5.1	8	UN2015	I	1
IODINE PENTAFLUORIDE	5.1	6.1, 8	UN2495	I	1
Dangerous goods of Class 5.1, Packing Group I, not listed above	5.1	—	—	I	P
<b>Class 5.1 Packing Group II dangerous goods</b>					
HYDROGEN PEROXIDE, AQUEOUS SOLUTION with not less than 20% but not more than 60% hydrogen peroxide (stabilized as necessary)	5.1	8	UN2014	II	1
POTASSIUM CHLORATE, AQUEOUS SOLUTION	5.1	—	UN2427	II	1
SODIUM CHLORATE, AQUEOUS SOLUTION	5.1	—	UN2428	II	1, 4

I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
Dangerous goods of Class 5.1, Packing Group II, not listed above	5.1	—	—	II	1
Dangerous goods of Class 5.1, Packing Group II, Solids, not listed above	5.1	—	—	II	P
<b>Class 5.1 Packing Group III dangerous goods</b>					
Dangerous goods of Class 5.1, Packing Group III, Liquids	5.1	—	—	III	1
Dangerous goods of Class 5.1, Packing Group III, Solids	5.1	—	—	III	P
<b>Class 5.2 Packing Group I dangerous goods</b>					
Dangerous goods of Class 5.2, Packing Group I	5.2	—	—	I	P
<b>Class 5.2 Packing Group II dangerous goods</b>					
Dangerous goods of Class 5.2, Packing Group II	5.2	—	—	II	P
<b>Class 5.2 Packing Group III dangerous goods</b>					
Dangerous goods of Class 5.2, Packing Group III	5.2	—	—	III	P
<b>Class 6.1 Packing Group I dangerous goods</b>					
ACETONE CYANOHYDRIN, STABILIZED	6.1	—	UN1541	I	1, 20
ACROLEIN, STABILIZED	6.1	3	UN1092	I	1, 19
ALLYL ALCOHOL	6.1	3	UN1098	I	1, 20
ALLYLAMINE	6.1	3	UN2334	I	1, 20
ALLYL CHLOROFORMATE	6.1	3, 8	UN1722	I	1, 20
ARSENIC TRICHLORIDE	6.1	—	UN1560	I	1, 20
N-BUTYL ISOCYANATE	6.1	3	UN2485	I	1, 20
TERT-BUTYL ISOCYANATE	6.1	3	UN2484	I	1, 19
CHLOROACETONE, STABILIZED	6.1	3, 8	UN1695	I	1, 20
CHLOROACETONITRILE	6.1	3	UN2668	I	1, 20



I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
CHLOROACETYL CHLORIDE	6.1	8	UN1752	I	1, 6, 20
2-CHLOROETHANAL	6.1	—	UN2232	I	1, 12
CHLOROPICRIN	6.1	—	UN1580	I	1, 5, 20
CROTONALDEHYDE; OR CROTONALDEHYDE, STABILIZED	6.1	3	UN1143	I	1, 20
CYCLOHEXYL ISOCYANATE	6.1	3	UN2488	I	1, 20
DIKETENE, STABILIZED	6.1	3	UN2521	I	1, 20
DIMETHYLHYDRAZINE, SYMMETRICAL	6.1	3	UN2382	I	1, 20
DIMETHYLHYDRAZINE, UNSYMMETRICAL	6.1	3, 8	UN1163	I	1, 5, 20
DIMETHYL SULFATE; OR DIMETHYL SULPHATE	6.1	8	UN1595	I	1, 20
ETHYL CHLOROFORMATE	6.1	3, 8	UN1182	I	1, 20
ETHYLDICHLOROARSINE	6.1	—	UN1892	I	1, 20
ETHYL ISOCYANATE	6.1	3	UN2481	I	1, 19
ETHYLENE CHLOROHYDRIN	6.1	3	UN1135	I	1, 20
ETHYLENE DIBROMIDE	6.1	—	UN1605	I	1, 20
ETHYLENEIMINE, STABILIZED	6.1	3	UN1185	I	1, 19
HEXACHLOROCYCLOPENTADIENE	6.1	—	UN2646	I	1, 20
HYDROCYANIC ACID, AQUEOUS SOLUTION with not more than 20% hydrogen cyanide; or HYDROGEN CYANIDE, AQUEOUS SOLUTION with not more than 20% hydrogen cyanide	6.1	—	UN1613	I	1, 20
HYDROGEN CYANIDE, SOLUTION IN ALCOHOL with not more than 45% hydrogen cyanide	6.1	3	UN3294	I	1, 20
HYDROGEN CYANIDE, STABILIZED, containing less than 3% water	6.1	3	UN1051	I	1, 19
IRON PENTACARBONYL	6.1	3	UN1994	I	1, 19

I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
ISOBUTYL ISOCYANATE	6.1	3	UN2486	I	1, 19
ISOPROPYL CHLOROFORMATE	6.1	3, 8	UN2407	I	1, 20
ISOPROPYL ISOCYANATE	6.1	3	UN2483	I	1, 19
METHACRYLONITRILE, STABILIZED	6.1	3	UN3079	I	1, 20
METHANESULFONYL CHLORIDE; or METHANESULPHONYL CHLORIDE	6.1	8	UN3246	I	1, 20
METHOXYMETHYL ISOCYANATE	6.1	3	UN2605	I	1, 19
METHYL BROMIDE AND ETHYLENE DIBROMIDE MIXTURE, LIQUID	6.1	—	UN1647	I	1, 20
METHYL CHLOROFORMATE	6.1	3, 8	UN1238	I	1, 19
METHYL CHLOROMETHYL ETHER	6.1	3	UN1239	I	1, 19
2-METHYL-2-HEPTANETHIOL	6.1	3	UN3023	I	1, 20
METHYLHYDRAZINE	6.1	3, 8	UN1244	I	1, 5, 19
METHYL IODIDE	6.1	—	UN2644	I	1, 20
METHYL ISOCYANATE	6.1	3	UN2480	I	1, 19
METHYL ISOTHIOCYANATE	6.1	3	UN2477	I	1, 20
METHYL ORTHOSILICATE	6.1	3	UN2606	I	1, 20
METHYL VINYL KETONE, STABILIZED	6.1	3, 8	UN1251	I	1, 19
MOTOR FUEL ANTI-KNOCK MIXTURE	6.1	—	UN1649	I	1
ORGANOCHLORINE PESTICIDE, LIQUID, TOXIC	6.1	—	UN2996	I	1
ORGANOCHLORINE PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash point not less than 23 °C (73 °F)	6.1	3	UN2995	I	1
PERCHLOROMETHYL MERCAPTAN	6.1	—	UN1670	I	1, 20
PHENYLCARBYLAMINE CHLORIDE	6.1	—	UN1672	I	1, 20
PHENYL ISOCYANATE	6.1	3	UN2487	I	1, 20

I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
PHENYL MERCAPTAN	6.1	3	UN2337	I	1, 20
PHOSPHORUS OXYCHLORIDE	6.1	8	UN1810	I	1, 20
PHOSPHORUS TRICHLORIDE	6.1	8	UN1809	I	1, 20
N-PROPYL CHLOROFORMATE	6.1	3, 8	UN2740	I	1, 20
N-PROPYL ISOCYANATE	6.1	3	UN2482	I	1, 19
SULFURYL CHLORIDE; or SULPHURYL CHLORIDE	6.1	8	UN1834	I	1, 4, 19
THIOPHOSGENE	6.1	—	UN2474	I	1, 20
TITANIUM TETRACHLORIDE	6.1	8	UN1838	I	1, 5, 20
TOXIC LIQUID, FLAMMABLE, ORGANIC, N.O.S.	6.1	3	UN2929	I	1
TOXIC, LIQUID, ORGANIC, N.O.S.	6.1	—	UN2810	I	1
TOXIC BY INHALATION LIQUID, N.O.S., with an LC <sub>50</sub> lower than or equal to 200 mL/m <sup>3</sup> and saturated vapour concentration greater than or equal to 500 LC <sub>50</sub>	6.1	—	UN3381	I	1, 19
TOXIC BY INHALATION LIQUID, N.O.S., with an LC <sub>50</sub> lower than or equal to 1000 mL/m <sup>3</sup> and saturated vapour concentration greater than or equal to 10 LC <sub>50</sub>	6.1	—	UN3382	I	1, 20
TOXIC BY INHALATION LIQUID, FLAMMABLE, N.O.S., with an LC <sub>50</sub> lower than or equal to 200 mL/m <sup>3</sup> and saturated vapour concentration greater than or equal to 500 LC <sub>50</sub>	6.1	3	UN3383	I	1, 19
TOXIC BY INHALATION LIQUID, FLAMMABLE, N.O.S., with an LC <sub>50</sub> lower than or equal to 1000 mL/m <sup>3</sup> and saturated vapour concentration greater than or equal to 10 LC <sub>50</sub>	6.1	3	UN3384	I	1, 20
TOXIC BY INHALATION LIQUID, WATER REACTIVE, N.O.S., with an LC <sub>50</sub> lower than or equal to 200 mL/m <sup>3</sup> and saturated vapour concentration greater than or equal to 500 LC <sub>50</sub>	6.1	4.3	UN3385	I	1, 19

I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
TOXIC BY INHALATION LIQUID, WATER REACTIVE, N.O.S., with an LC <sub>50</sub> lower than or equal to 1000 mL/m <sup>3</sup> and saturated vapour concentration greater than or equal to 10 LC <sub>50</sub>	6.1	4.3	UN3386	I	1, 20
TOXIC BY INHALATION LIQUID, OXIDIZING, N.O.S., with an LC <sub>50</sub> lower than or equal to 200 mL/m <sup>3</sup> and saturated vapour concentration greater than or equal to 500 LC <sub>50</sub>	6.1	5.1	UN3387	I	1, 19
TOXIC BY INHALATION LIQUID, OXIDIZING, N.O.S., with an LC <sub>50</sub> lower than or equal to 1000 mL/m <sup>3</sup> and saturated vapour concentration greater than or equal to 10 LC <sub>50</sub>	6.1	5.1	UN3388	I	1, 20
TOXIC BY INHALATION LIQUID, CORROSIVE, N.O.S., with an LC <sub>50</sub> lower than or equal to 200 mL/m <sup>3</sup> and saturated vapour concentration greater than or equal to 500 LC <sub>50</sub>	6.1	8	UN3389	I	1, 19
TOXIC BY INHALATION LIQUID, CORROSIVE, N.O.S., with an LC <sub>50</sub> lower than or equal to 1000 mL/m <sup>3</sup> and saturated vapour concentration greater than or equal to 10 LC <sub>50</sub>	6.1	8	UN3390	I	1, 20
TRIMETHYLACETYL CHLORIDE	6.1	3, 8	UN2438	I	1, 20
Dangerous goods of Class 6.1, Packing Group I, Liquids, not listed above	6.1	—	—	I	1
Dangerous goods of Class 6.1, Packing Group I, Solids, not listed above	6.1	—	—	I	P
<b>Class 6.1 Packing Group II dangerous goods</b>					
ALLYL ISOTHIOCYANATE, STABILIZED	6.1	3	UN1545	II	1
BENZYL CHLORIDE	6.1	8	UN1738	II	1
BROMOACETONE	6.1	3	UN1569	II	P
N-BUTYL CHLOROFORMATE	6.1	3, 8	UN2743	II	1, 20
CARBON TETRACHLORIDE	6.1	—	UN1846	II	1
CHLOROCRESOLS SOLUTION	6.1	—	UN2669	II	1
DIBROMOCHLOROPROPANES	6.1	—	UN2872	II	1

I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
DICHLOROISOPROPYL ETHER	6.1	—	UN2490	II	1
ORGANOCHLORINE PESTICIDE, LIQUID, TOXIC	6.1	—	UN2996	II	1
ORGANOCHLORINE PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash point not less than 23 °C (73 °F)	6.1	3	UN2995	II	1
PENTACHLOROETHANE	6.1	—	UN1669	II	1
PHENOL, MOLTEN	6.1	—	UN2312	II	1
TOXIC LIQUID, FLAMMABLE, ORGANIC, N.O.S.	6.1	3	UN2929	II	1
TOXIC LIQUID, ORGANIC, N.O.S.	6.1	—	UN2810	II	1
TOLUIDINES, LIQUID	6.1	—	UN1708	II	1
Dangerous goods of Class 6.1, Packing Group II, Liquids, not listed above	6.1	—	—	II	1
Dangerous goods of Class 6.1, Packing Group II, Solids, not listed above	6.1	—	—	II	P
<b>Class 6.1 Packing Group III dangerous goods</b>					
BROMOFORM	6.1	—	UN2515	III	1
CHLOROCRESOLS SOLUTION	6.1	—	UN2669	III	1
CHLOROFORM	6.1	—	UN1888	III	1
CHLOROPHENOLS, LIQUID	6.1	—	UN2021	III	1
DIBROMOCHLOROPROPANES	6.1	—	UN2872	III	1
DIBROMOMETHANE	6.1	—	UN2664	III	1
O-DICHLOROBENZENE	6.1	—	UN1591	III	1
DICHLOROMETHANE	6.1	—	UN1593	III	1
HEXACHLOROBENZENE	6.1	—	UN2729	III	1
HEXACHLOROBUTADIENE	6.1	—	UN2279	III	1

I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
HEXACHLOROPHENE	6.1	—	UN2875	III	1
ORGANOCHLORINE PESTICIDE, LIQUID, TOXIC	6.1	—	UN2996	III	1
ORGANOCHLORINE PESTICIDE, LIQUID, TOXIC, FLAMMABLE, flash point not less than 23 °C (73 °F)	6.1	3	UN2995	III	1
TETRACHLOROETHYLENE	6.1	—	UN1897	III	1
TOXIC LIQUID, ORGANIC, N.O.S.	6.1	—	UN2810	III	1
1,1,1-TRICHLOROETHANE	6.1	—	UN2831	III	1
TRICHLOROETHYLENE	6.1	—	UN1710	III	1
Dangerous goods of Class 6.1, Packing Group III, Liquids, not listed above	6.1	—	—	III	1
Dangerous goods of Class 6.1, Packing Group III, Solids, not listed above	6.1	—	—	III	P
Dangerous goods of Class 6.1, Packing Group III, not listed above, with a subsidiary classification other than 9	6.1	—	—	III	1
<b>Class 8 Packing Group I dangerous goods</b>					
BORON TRIBROMIDE	8	—	UN2692	I	1, 20
BROMINE; or BROMINE SOLUTION	8	6.1	UN1744	I	P
BROMINE SOLUTION (that does not meet the criteria for Hazard Zone A)	8	6.1	UN1744	I	P
CHROMOSULFONIC ACID (with or without sulfur trioxide); or Chlorosulphonic acid (with or without sulphur trioxide)	8	—	UN1754	I	1, 20
CHROMOSULFURIC ACID; or CHROMOSULPHURIC ACID	8	—	UN2240	I	1, 14
FLUOROSULFONIC ACID; or FLUOROSULPHONIC ACID	8	—	UN1777	I	1, 4
HYDRAZINE, ANHYDROUS	8	3, 6.1	UN2029	I	1

I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
HYDRAZINE, AQUEOUS SOLUTION with more than 37% hydrazine, by mass	8	6.1	UN2030	I	1
HYDROFLUORIC ACID AND SULFURIC ACID MIXTURE; or  HYDROFLUORIC ACID AND SULPHURIC ACID MIXTURE	8	6.1	UN1786	I	1, 7
HYDROFLUORIC ACID with more than 60% hydrogen fluoride	8	6.1	UN1790	I	1, 7
HYDROGEN FLUORIDE, ANHYDROUS	8	6.1	UN1052	I	1, 5, 2
NITRATING ACID MIXTURE with more than 50% nitric acid	8	5.1	UN1796	I	1
NITRIC ACID, other than red fuming, with more than 70% nitric acid	8	5.1	UN2031	I	1
NITRIC ACID, RED FUMING	8	5.1, 6.1	UN2032	I	1, 20
SULFURIC ACID, FUMING; or SULPHURIC ACID, FUMING	8	6.1	UN1831	I	1
SULFUR TRIOXIDE, STABILIZED; or SULPHUR TRIOXIDE, STABILIZED	8	—	UN1829	I	1, 20
THIONYL CHLORIDE	8	—	UN1836	I	1, 4
Dangerous goods of Class 8, Packing Group I, not listed above	8	—	—	I	1
<b>Class 8 Packing Group II dangerous goods</b>					
ALLYLTRICHLOROSILANE, STABILIZED	8	3	UN1724	II	1, 4
AMYLTRICHLOROSILANE	8	—	UN1728	II	1, 4
BATTERY FLUID, ACID; SULFURIC ACID with not more than 51% acid; or SULPHURIC ACID with not more than 51% acid	8	—	UN2796	II	1, 7
BORON TRIFLUORIDE ACETIC ACID COMPLEX, LIQUID	8	—	UN1742	II	1, 4
BUTYLTRICHLOROSILANE	8	3	UN1747	II	1, 4
CHLOROPHENYLTRICHLOROSILANE	8	—	UN1753	II	1, 4

I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
DICHLOROACETYL CHLORIDE	8	—	UN1765	II	1, 4
DICHLOROPHENYLTRICHLOROSILANE	8	—	UN1766	II	1, 4
DIETHYLDICHLOROSILANE	8	3	UN1767	II	1, 4
DIPHENYLDICHLOROSILANE	8	—	UN1769	II	1
DODECYLTRICHLOROSILANE	8	—	UN1771	II	1, 4
ETHYL CHLOROTHIOFORMATE	8	3	UN2826	II	1, 20
FLUOROBORIC ACID	8	—	UN1775	II	1, 7
FLUOSILICIC ACID	8	—	UN1778	II	1, 7
FORMIC ACID WITH MORE THAN 85 % ACID BY MASS	8	3	UN1779	II	1, 9
HEXADECYLTRICHLOROSILANE	8	—	UN1781	II	1, 4
HEXYLTRICHLOROSILANE	8	—	UN1784	II	1, 4
HYDRAZINE AQUEOUS SOLUTION with more than 37% hydrazine, by mass	8	6.1	UN2030	II	1
HYDROBROMIC ACID	8	—	UN1788	II	1, 7
HYDROCHLORIC ACID	8	—	UN1789	II	1, 7
HYDROFLUORIC ACID with not more than 60% hydrogen fluoride	8	6.1	UN1790	II	1, 7
HYPOCHLORITE SOLUTION with more than 7% available chlorine	8	—	UN1791	II	1, 7
NITRATING ACID MIXTURE with not more than 50% nitric acid	8	—	UN1796	II	1
NITRIC ACID, other than red fuming, with at least 65%, but not more than 70% nitric acid	8	5.1	UN2031	II	1
NITRIC ACID, other than red fuming, with less than 65% nitric acid	8	—	UN2031	II	1
NONYLTRICHLOROSILANE	8	—	UN1799	II	1, 4
OCTADECYLTRICHLOROSILANE	8	—	UN1800	II	1, 4



I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
OCTYLTRICHLOROSILANE	8	—	UN1801	II	1, 4
PHENYLPHOSPHORUS DICHLORIDE	8	—	UN2798	II	1, 7
PHENYLPHOSPHORUS THIODICHLORIDE	8	—	UN2799	II	1, 7
PHENYLTRICHLOROSILANE	8	—	UN1804	II	1, 4
PHOSPHORUS OXYBROMIDE, MOLTEN	8	—	UN2576	II	1, 6
PHOSPHORUS TRIBROMIDE	8	—	UN1808	II	1, 8
PROPYLTRICHLOROSILANE	8	3	UN1816	II	1, 4
SILICON TETRACHLORIDE	8	—	UN1818	II	1, 4
SULFURIC ACID, SPENT; or SULPHURIC ACID, SPENT	8	—	UN1832	II	1, 14
SULFURIC ACID with more than 51% acid; or SULPHURIC ACID with more than 51% acid	8	—	UN1830	II	1, 14
THIOPHOSPHORYL CHLORIDE	8	—	UN1837	II	1, 6, 8
TRICHLOROACETYL CHLORIDE	8	—	UN2442	II	1, 20
VANADIUM OXYTRICHLORIDE	8	—	UN2443	II	1
Dangerous goods of Class 8, Packing Group II, Liquids, not listed above	8	—	—	II	1
Dangerous goods of Class 8, Packing Group II, Solids, not listed above	8	—	—	II	P
<b>Class 8 Packing Group III dangerous goods</b>					
FERRIC CHLORIDE SOLUTION	8	—	UN2582	III	1, 7
HYDRAZINE AQUEOUS SOLUTION with more than 37% hydrazine, by mass	8	6.1	UN2030	III	1
HYDROBROMIC ACID	8	—	UN1788	III	1, 7
HYDROCHLORIC ACID	8	—	UN1789	III	1, 7
Dangerous goods of Class 8, Packing Group III, Liquids, not listed above	8	—	—	III	1

I Shipping name and description	II Primary class	III Subsidiary class	IV UN number	V Packing group	VI Special provision
Dangerous goods of Class 8, Packing Group III, Solids, not listed above	8	—	—	III	P
<b>Class 9 Packing Group I dangerous goods</b>					
Dangerous goods of Class 9, Packing Group I, Liquids	9	—	—	I	1
Dangerous goods of Class 9, Packing Group I, Solids	9	—	—	I	P
<b>Class 9 Packing Group II dangerous goods</b>					
POLYCHLORINATED BIPHENYLS, LIQUID, regulated only when the concentration is more than 50 ppm, by mass	9	—	UN2315	II	1
Dangerous goods of Class 9, Packing Group II, Liquids, not listed above	9	—	—	II	1
Dangerous goods of Class 9, Packing Group II, Solids	9	—	—	II	P
<b>Class 9 Packing Group III dangerous goods</b>					
ELEVATED TEMPERATURE LIQUID, N.O.S., at or above 100 °C (212 °F) and below its flash point (including molten metals, molten salts, etc.)	9	—	UN3257	III	1
Dangerous goods of Class 9, Packing Group III, Liquids, not listed above	9	—	—	III	1
Dangerous goods of Class 9, Packing Group III, Solids, not listed above	9	—	—	III	P