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ONTARIO REGULATION 388/97

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FIRE CODE

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PART 4
FLAMMABLE AND COMBUSTIBLE LIQUIDS

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SECTION 4.1 APPLICATION

Subsection 4.1.1. Scope and Application

Scope

4.1.1.1. (1) This Part provides for the storage, handling, processing and use of

(a) **flammable** or **combustible liquids**, and

(b) liquids with **flash points** greater than 93.3°C, when processed, stored, handled or used at temperatures above their **flash points** in **buildings**, structures and open areas.

(2) For the purposes of this Part, "existing" means in existence on November 21, 1997.

Application

4.1.1.2. (1) Areas in **process plants** need not conform to this Part where specific hazards are addressed by design and operational procedures that meet recognized standards and equivalent protection is provided.

(2) Except as specifically provided elsewhere in this Part, this Part does not apply to,

(a) the transportation of **flammable** or **combustible liquids** to which the **Transportation of Dangerous Goods Act (Canada)** and its regulations, or the **Dangerous Goods Transportation Act (Ontario)** and its regulations apply,

(b) the transportation of **flammable** or **combustible liquids** through pipelines to which the **Energy Act** and its regulations apply,

(c) **appliances** and their ancillary equipment (burning hydrocarbons) to which the **Energy Act** apply,

(d) the storage, handling, transportation and use of **flammable** or **combustible liquids** to which the **Gasoline Handling Act** and the **Energy Act** apply,

(e) the storage, handling and use of **flammable** or **combustible liquids** at airports, piers and wharves regulated under Federal law,

(f) underground areas to which the **Occupational Health and Safety Act** and its regulations apply,

(g) the storage of aerosol products which are covered under Subsection 3.2.5. of the National Fire Code, and

(h) the storage of **flammable** or **combustible liquids** on farms for individual farm use.

(3) Where there is a conflict between this Part and the **Boilers and Pressure Vessels Act**, the **Boilers and Pressure Vessels Act** shall apply.

Compliance

4.1.1.3. (1) Except as provided in Article 4.1.1.4.,

(a) this Part, and

(b) for existing facilities, the requirements of Articles 4.1.5.1., 4.1.5.3., 4.1.5.4., 4.1.5.5., 4.1.5.6., 4.1.5.8., 4.1.5.10., 4.1.6.3., 4.1.6.4., 4.1.7.8., 4.1.8.1., 4.1.8.2., 4.2.3.1., 4.2.3.2., 4.2.4.4., 4.2.7.8., 4.2.7.9., 4.2.7.10., 4.2.7.11., 4.2.7.12., 4.2.9.4., 4.2.9.7., 4.2.10.4., 4.2.10.6., 4.3.2.6., 4.3.16.1., 4.3.16.3., 4.4.6.3., 4.4.9.5., 4.5.10.1., 4.5.10.2., 4.6.4.2., 4.6.5.1., 4.7.6.1.,

4.7.6.2. and 4.9.8.1., Subsections 4.1.1., 4.1.2., 4.1.3., 4.1.4., 4.2.2., 4.3.15., 4.4.11., 4.12.1., 4.12.4., 4.12.5., 4.12.6. and 4.12.7., and Sections 4.10, 4.11,

come into force on the 21st day of August, 1998.

Compliance schedule

4.1.1.4. (1) For existing facilities, the requirements of Articles 4.1.5.7., 4.1.5.9., 4.1.6.1., 4.1.6.2., 4.1.7.1., 4.1.7.2., 4.1.7.3., 4.1.7.4., 4.1.7.5., 4.1.7.6., 4.1.7.7., 4.1.8.3., 4.1.8.4., 4.2.3.3., 4.2.3.4., 4.2.4.1., 4.2.4.2., 4.2.4.3., 4.2.4.5., 4.2.4.6., 4.2.7.1., 4.2.7.2., 4.2.7.3., 4.2.7.4., 4.2.7.5., 4.2.7.6., 4.2.7.7., 4.2.7.13., 4.2.9.1., 4.2.9.2., 4.2.9.3., 4.2.9.5., 4.2.9.6., 4.2.9.8., 4.2.10.1., 4.2.10.2., 4.2.10.3., 4.2.10.5. 4.3.16.2. and 4.6.4.5., Subsections 4.2.1., 4.2.5., 4.2.6., 4.2.8., 4.2.11., 4.3.1., 4.3.4., 4.3.5., 4.3.6., 4.3.10., 4.4.6. (except Articles 4.4.6.3. and 4.4.6.7.), 4.12.2., 4.12.3., 4.12.8. and 4.12.9., and Sections 4.5 (except Articles 4.5.10.1. and 4.5.10.2.) and 4.7 (except Articles 4.7.6.1. and 4.7.6.2.), come into force on August 21, 2000.

(2) For existing facilities, the requirements of Articles 4.3.2.4., 4.3.2.5., Subsections 4.3.3., 4.3.7., 4.3.8. (except Sentence 4.3.8.1.(2) and Article 4.3.8.2.), 4.3.9., 4.3.11., 4.3.12., 4.3.13. and 4.3.14., and Sections 4.4 (except Subsections 4.4.11. and 4.4.6. and Article 4.4.9.5.), 4.6 (except Articles 4.6.4.2., 4.6.4.5. and 4.6.5.1.), 4.8 and 4.9 (except Article 4.9.8.1.), come into force on August 21, 2002.

(3) Existing conditions are acceptable with respect to Articles 4.3.2.1., 4.3.2.2., 4.3.2.3. and 4.3.8.2. and Sentence 4.3.8.1.(2) until replacement or relocation of a tank is carried out at which time these requirements shall apply.

Compliance equivalency

4.1.1.5. (1) A requirement of this Part shall be deemed to be complied with if the composition, design, size and arrangement of any material, object, device or thing varies from the composition, design, size or arrangement prescribed in this Part where strength, health and safety are equal to or greater than the strength, health and safety in the composition, design, size or arrangement prescribed, and has been **approved** by the **Chief Fire Official**.

(2) A proposal for compliance equivalency shall bear the signature and seal of a **Professional Engineer** or **Architect** or both.

Compliance equivalency process

4.1.1.6. (1) A proposal for compliance equivalency for an existing facility shall be submitted, allowing sufficient time for the work to be done plus 90 days for review by the **Chief Fire Official**, so that the work can be **approved** and completed by the compliance date set out in Article 4.1.1.4.

(2) The **Chief Fire Official** shall **approve** or reject the compliance equivalency within 90 days of receipt of the request.

- (3) Where the **Chief Fire Official** is unable to comply within the 90 day period in Sentence (2), the **owner** shall be advised as to when a response will be provided. An extension equal to the additional time needed by the **Chief Fire Official** in excess of the 90 days shall be added to the compliance time.
- (4) The **Chief Fire Official** shall notify the **owner** in writing of the decision.
- (5) Where the compliance equivalency is not **approved**, the **Chief Fire Official** shall provide reasons therefor in writing.
- (6) An **owner** who feels aggrieved by the decision not to **approve** a compliance equivalency may, within 30 days of the refusal, appeal the decision in the same manner as though it were an **Order**.
- (7) All notification under this Part shall be served either personally or by ordinary mail.
- (8) Where notification is by mail, it shall be deemed to have been served on the fifth day after the date of mailing.
- (9) A compliance equivalency that has been **approved** and implemented shall be deemed to satisfy the applicable requirements addressed in the compliance equivalency.
- (10) A copy of the **approved** compliance equivalency shall be kept on the premises to which it relates and made available to the **Chief Fire Official** upon request.

Subsection 4.1.2. Classification

Classification

- 4.1.2.1. (1) For the purposes of this Part, **flammable** and **combustible liquids** shall be classified in conformance with Sentences (2) and (3).
- (2) **Flammable liquids** shall be Class I liquids, and shall be subdivided into
 - (a) Class IA liquids, which include those having a **flash point** below 22.8°C and a boiling point below 37.8°C,
 - (b) Class IB liquids, which include those having a **flash point** below 22.8°C and a boiling point at or above 37.8°C, and
 - (c) Class IC liquids, which include those having a **flash point** at or above 22.8°C and below 37.8°C.
- (3) **Combustible liquids** shall be Class II or Class IIIA liquids, and shall be subdivided into
 - (a) Class II liquids, which include those having a **flash point** at or above 37.8°C and below 60°C, and

(b) Class IIIA liquids, which include those having a **flash point** at or above 60°C and below 93.3°C.

Heated liquids

4.1.2.2. When a liquid having a **flash point** at or above 37.8°C is being processed, stored, handled or used at a temperature at or above its **flash point**, it shall be treated as a Class I liquid.

Used lubricating oil

4.1.2.3. (1) Except as provided in Sentence (2), used lubricating oil drained from motor vehicles shall be classified as a Class IIIA liquid.

(2) When Class I or II liquids are added to used oils referred to in Sentence (1), the resulting mixture shall be classified by **tests** conforming to Subsection 4.1.3.

Subsection 4.1.3. Flash Point

Determination of flash point

4.1.3.1. (1) Except as provided in Sentences (3) and (4), the **flash point** of liquids having a **viscosity** less than 6 mm²/s at 37.8°C and a **flash point** below 93.3°C shall be determined in conformance with ASTM D 56, "Flash Point by Tag Closed Tester".

(2) Except as provided in Sentences (3) and (4), the **flash point** of liquids having a viscosity of 6 mm²/s or more at 37.8°C or a **flash point** of 93.3°C or higher shall be determined in conformance with ASTM D 93, "Flash Point by Pensky-Martens Closed Tester".

(3) The **flash point** of aviation turbine fuels may be determined in conformance with ASTM D 3828, "Flash Point by Small Scale Closed Tester".

(4) The **flash point** for paints, enamels, lacquers, varnishes and related products and their components having **flash points** between 0°C and 110°C, and having a viscosity less than 15000 mm²/s (150 stokes) at 25°C may be determined in conformance with ASTM D 3278, "Flash Point of Liquids by Setaflash Closed-Cup Apparatus".

Subsection 4.1.4. Electrical Installations

Hazardous locations

4.1.4.1. Electrical equipment in a location where **flammable** or **combustible liquids** are present shall conform to the **Electrical Safety Code** made under the **Electricity Act, 1998**.

Subsection 4.1.5. Fire Prevention and Protection

Portable extinguishers

4.1.5.1. Portable extinguishers required in this Part shall be in accordance with Section 6.2.

Additional fire protection equipment

4.1.5.2. RESERVED

Ignition sources

4.1.5.3. Unless controlled in a manner that will not create a fire or explosion hazard, a device, operation or activity that produces open flames, sparks or heat shall not be permitted in an area described in Article 4.1.1.1.

Smoking

4.1.5.4. Except for designated safe smoking areas conforming to Subsection 2.4.3., smoking shall not be permitted in areas described in Article 4.1.1.1.

Removal of combustibles

4.1.5.5. (1) Areas described in Article 4.1.1.1. shall be kept clean and free of ground vegetation and accumulations of combustible materials not essential to operations.

(2) Cleaning rags shall be stored in receptacles conforming to Articles 2.4.1.9. and 2.4.1.10.

Fire safety plan

4.1.5.6. The requirements of Section 2.8 shall apply to **buildings** and open areas where the quantities of **flammable** and **combustible liquids** exceeds 500 L in total or exceeds 250 L of Class I liquids.

Access for fire fighting

4.1.5.7. Aisles and other access paths shall be maintained to permit the unobstructed movement of personnel and **fire department** apparatus so that fire fighting operations can be carried out in any part of an area used for the storage, use or handling of **flammable** or **combustible liquids**.

Hot works

4.1.5.8. Hot works shall be performed in conformance with Section 5.17.

Basement storage

4.1.5.9. (1) Except as permitted in Sentences (2), (3) and (4), Class I liquids shall not be stored, handled or used in **basements** or pits.

(2) Class I liquids may be stored in **dwelling units** as described in Article 4.2.4.5. and **mercantile occupancies** as described in Sentence 4.2.5.2.(3).

(3) Up to 5 L of Class I liquids may be stored in **basements**, provided it is stored in safety containers conforming to ULC/ORD-C30, "Safety Containers".

(4) Class I liquids not exceeding 250 L in quantity may be stored, handled or used in existing laboratories described in Subsection 4.12.1. where

(a) continuous mechanical ventilation is provided to ensure that flammable vapour concentrations do not exceed 25 per cent of the **lower explosive limit** in the **basement** or pit,

(b) the continuous mechanical ventilation required in Clause (a) sounds an audible alarm in an attended area upon shut down of the ventilation system,

(c) the Class I liquids are located in a **fire compartment** separated from the rest of the **building** by a **fire separation** having a 1-hr **fire-resistance rating**,

(d) despite Article 4.1.5.6., the **building** has a fire safety plan in conformance with Section 2.8,

(e) Class IA liquids are not stored in containers greater than 4 L in capacity,

(f) except where all dispensing of Class I liquids is carried out in a power ventilated enclosure in conformance with Articles 4.12.8.3. to 4.12.8.5. and where Class IA liquids are stored in storage cabinets in conformance with Article 4.2.10.5., the room is designed to prevent critical structural and mechanical damage from internal explosion in conformance with NFPA 68, "Guide for Venting of Deflagrations", and

(g) except where all sources of ignition within 0.9 m from the floor are eliminated, the room is provided with a flammable vapour detection system that will alarm in an attended location upon detection of vapour concentrations exceeding 10 per cent of the **lower explosive limit**.

(5) Despite Clause (4)(c), existing **fire separations** consisting of lath and plaster or gypsum board shall be deemed to be in compliance with Clause (4)(c).

Routine maintenance

4.1.5.10. Maintenance of any equipment involved in the storage, handling, processing and use of **flammable** or **combustible liquids**, whose failure would significantly increase the fire or explosion hazard and whose maintenance requirements are not addressed in another Part of this Code shall be maintained in accordance with its **listed** requirements and if not **listed**, be maintained in accordance with the manufacturers' recommendations or good engineering practice.

Subsection 4.1.6. Spill Control and Drainage Systems

Spill control

4.1.6.1. (1) A spill of **flammable** or **combustible liquids** shall be prevented from reaching waterways, sewer systems and potable water sources by

- (a) a barrier of **noncombustible construction** of sufficient capacity to contain the spill, or
- (b) grading the site or sloping the floor to divert the spill to a drainage system conforming to Article 4.1.6.2.

(2) Where barriers required in Sentence (1) are provided to contain accidental spillage from aboveground **storage tanks**, they shall conform to the requirements for secondary containment in Subsection 4.3.7.

(3) The fire safety plan required in Article 4.1.5.6. shall include measures to be taken to direct overflow of spilled liquids and fire fighting water away from

- (a) **buildings**,
- (b) isolation valves controlling processes or fire protection systems,
- (c) a **means of egress**,
- (d) adjoining property,
- (e) **fire department** access routes, and
- (f) a water supply used for fire fighting.

Drainage systems

4.1.6.2. (1) A drainage system referred to in Clause 4.1.6.1.(1)(b) shall

- (a) terminate at a location where such a spill will not create a fire hazard or any risk to health or safety or the natural environment, and
- (b) direct the spill away from **buildings, means of egress, fire department** access roadways, or valves controlling the flow of **flammable** or **combustible liquids** or water supplies for fire fighting.

(2) Closed drainage systems shall be equipped with a trap.

Spills and leaks

4.1.6.3. (1) Maintenance and operating procedures shall be established to prevent the escape of **flammable** or **combustible liquids** to areas where they could create a fire or explosion hazard.

(2) Except as provided in Sentence (3), all reasonable steps shall be taken to recover escaped liquid and to remove or treat contaminated soil, surface water, ground water or aquatic sediments.

(3) Liquid spilled or leaked shall be

(a) flushed to a location conforming to Article 4.1.6.2., or

(b) removed with the aid of an absorbent conforming to Sentence (4), deposited in a receptacle conforming to Subsection 2.4.1. and disposed of in a manner that does not create a fire or explosion hazard.

(4) An absorbent required in Sentence (3) shall

(a) be noncombustible, or

(b) conform to ULC/ORD-C410A, "Absorbents for Flammable and Combustible Liquids".

(5) Clean-up shall conform with Part X (Spills) of the **Environmental Protection Act**.

Spill procedure

4.1.6.4. (1) A spill control procedure shall be **approved** and implemented for any **occupancy** where **flammable** or **combustible liquids** are stored, handled, processed or used.

(2) The spill control procedure referred to in Sentence (1) shall include

(a) suitable operating procedures to prevent leaks and spills from piping, pumps, **storage tanks** or process vessels,

(b) ventilation,

(c) control of ignition sources,

(d) spill containment and cleanup (such as dikes and spill control agents such as sand),

(e) personal protective clothing or equipment that should be used (such as rubber gloves, rubber boots and self-contained breathing apparatus),

(f) handling and disposal of waste in accordance with the Ministry of Environment and Energy requirements,

(g) chain of command including notification of affected agencies and management,

(h) a preventive maintenance program, and

(i) training for new staff within 3 months of their being hired and for experienced staff every 6 months.

(3) Spill control procedures shall be prominently posted and maintained where **flammable** or **combustible liquids** are stored, handled, processed or used.

Subsection 4.1.7. Ventilation

Rooms or enclosed spaces

4.1.7.1. Where **flammable** or **combustible liquids** are processed, handled, stored, dispensed or used within rooms or enclosed spaces, ventilation shall conform to this Part and the **Building Code**.

Ventilation measures

4.1.7.2. (1) Except as permitted in Sentence (2), a room or enclosed space referred to in Article 4.1.7.1. shall be provided with a ventilation system having

(a) continuous mechanical ventilation where Class I liquids are processed, dispensed or used in a manner that releases flammable vapours into the room or enclosed space, or

(b) either natural or continuous mechanical ventilation where

(i) Class I liquids are stored, processed, dispensed or used in a manner that does not release flammable vapours into the room or enclosed space, or

(ii) Class II liquids are processed, dispensed or used.

(2) Ventilation referred to in Clause (1)(b) need not be provided for the storage of Class I liquids if

(a) storage consists of only **closed containers**, and

(b) no dispensing operations are performed.

(3) Ventilation required in Sentence (1) shall be sufficient to ensure that flammable vapour concentrations outside the zone identified as Class I, Division I in conformance with Article 4.1.4.1. do not exceed 25 per cent of the **lower explosive limit** of the flammable vapour.

(4) Where a mechanical ventilation system is installed to meet the conditions of Sentence (3), it shall be capable of exhausting at least 18 m³/hr per square metre of room area, but not less than 250 m³/hr.

(5) Where continuous mechanical ventilation is installed in order to meet the conditions of Sentence (1), it shall

(a) be provided with automatic interlocks so that the activity generating flammable vapours cannot be performed when the ventilation system is not in operation, and

(b) sound an audible alarm in an attended area upon shut down of the ventilation system.

(6) Where ventilation to the exterior environment is required, concentrations shall not exceed point of impingement concentrations as specified in Regulation 346 made under the **Environmental Protection Act**.

(7) Despite Sentences (1) and (2), for those **occupancies** of facilities that are covered by the **Regulations for Industrial Establishments** and the **Regulations for Health Care and Residential Facilities** under the **Occupational Health and Safety Act**, ventilation requirements for a room or enclosed space referred to in Article 4.1.7.1. shall be provided with

(a) continuous mechanical ventilation where Class I liquids are processed, dispensed or used in a manner that releases flammable vapours into the room or enclosed space, and

(b) continuous mechanical or natural ventilation to the outdoors by upper and lower vents where

(i) Class I liquids are stored, or

(ii) Class II liquids are processed, dispensed or used.

Location of air inlets and outlets

4.1.7.3. (1) Ventilation air inlets and outlets within a room or enclosed space referred to in Article 4.1.7.1. shall be arranged in conformance with Sentences (2) to (4).

(2) Where the flammable vapour being removed is heavier than air,

(a) at least one air inlet shall be located at a point near a wall, no higher than 300 mm from the floor, and

(b) at least one air outlet shall be located near the opposite wall, no higher than 300 mm from the floor.

(3) Where the flammable vapour being removed is lighter than air,

(a) at least one air inlet shall be located at a point near a wall, no lower than 300 mm from the ceiling, and

(b) at least one air outlet shall be located near the opposite wall, no lower than 300 mm from the ceiling.

(4) When the average air velocity in the room exceeds 0.5 m/s, make-up air shall be provided in conformance with Article 4.1.7.5.

Location of mechanical ventilation exhaust air outlets

4.1.7.4. (1) Except as provided in Article 4.1.7.6., the exhaust air outlet from a mechanical ventilation system required in Article 4.1.7.2. shall be

(a) located outdoors, not less than 3 m from any **building** opening, and

(b) arranged so that the exhaust air does not discharge toward any unprotected opening within 7.5 m of the discharge point.

Make-up air

4.1.7.5. (1) Where make-up air for a mechanical ventilation system is taken from within the **building**, the opening into the room or enclosed space shall be provided with a **fire damper**.

(2) Make-up air for a natural or mechanical ventilation system shall be taken from a point remote from any exhaust air discharge described in Article 4.1.7.4.

(3) Make-up air for a natural ventilation system shall be taken from a point outside the **building**.

Recirculating ventilation systems

4.1.7.6. (1) Where a mechanical ventilation system is installed in conformance with Article 4.1.7.2., and where exhaust air is recirculated, a fail-safe vapour detection and alarm system shall be provided to continuously monitor the flammable vapour concentration in the exhaust air, and if the vapour concentration exceeds 25 per cent of the **lower explosive limit** of the vapour, the system will

(a) sound an alarm,

(b) stop the recirculation of air, and

(c) redirect the exhaust air to an outdoor location.

Exclusive use of ducts

4.1.7.7. Ducts used in a ventilation system as required in Article 4.1.7.2. shall not be used for any other ventilation or exhaust system.

Maintenance

4.1.7.8. Inlet and exhaust openings and associated ducts shall be kept free of any obstructions that may interfere with the operation of the ventilation system.

Subsection 4.1.8. Handling of Flammable and Combustible Liquids

Containers and storage tanks

4.1.8.1. (1) All **flammable** and **combustible liquids** shall be stored in containers conforming to Subsection 4.2.3. or in **storage tanks** conforming to Subsection 4.3.1.

(2) Containers and **storage tanks** for **flammable** or **combustible liquids** shall be kept closed when not in use.

Control of static electric charge

4.1.8.2. (1) When Class I liquids are dispensed into a container or **storage tank**,

(a) if the container or **storage tank** is made of metallic or electrically conducting material, such container or **storage tank** shall be electrically connected to the fill stem, or rest on a conductive floor that is electrically connected to the fill stem, or

(b) if the container or **storage tank** is made of non electrically conducting material, measures shall be taken to minimize the potential for a static electric charge to develop.

(2) Except as provided in Sentence (3), when Class I liquids are transferred into a **storage tank** through the top of the tank, the fill pipe shall terminate within 150 mm of the bottom of the tank.

(3) Sentence (2) shall not apply when

(a) the **storage tank** vapour space cannot exceed 25 per cent of the **lower explosive limit** or is filled with an inert gas that prevents the ignition of the vapour mixture, or

(b) the liquid being transferred has a minimum conductivity that prevents the accumulation of static electricity.

(4) Fill pipes referred to in Sentence (2) shall be installed in such a way as to minimize vibration of the pipe.

Transfer

4.1.8.3. (1) Class I liquids shall be drawn from or transferred into containers or **storage tanks** within a **building**

(a) through a piping or transfer system conforming to Section 4.4,

(b) by means of a pump designed in conformance with good engineering practice on top of the container or **storage tank**, or

(c) by gravity through a self-closing valve designed in conformance with good engineering practice.

(2) Except as provided in Subsection 4.4.10., the transfer of **flammable** or **combustible liquids** by means of pneumatic pressure applied to a container or **storage tank** shall not be permitted.

Fuel tanks of vehicles

4.1.8.4. (1) It is permitted to use movable tanks for dispensing **flammable** or **combustible liquids** into the fuel tanks of vehicles or other motorized equipment provided such movable tanks are used in conformance with the requirements of this Part for **storage tanks**.

(2) Only enclosed pumping equipment designed in conformance with good engineering practice shall be used to transfer Class I liquids to or from the fuel tanks of vehicles inside **buildings**.

SECTION 4.2 CONTAINER STORAGE AND HANDLING

Subsection 4.2.1. Scope

Application

4.2.1.1. (1) Except as provided in Sentence (2), this Section applies to the storage, handling and use of **flammable** or **combustible liquids** in

(a) containers conforming to Clauses 4.2.3.1.(1)(a) to (d) having a capacity of not more than 230 L, or

(b) portable tanks conforming to Clause 4.2.3.1.(1)(e) having an individual capacity of not more than 2500 L.

(2) Except as otherwise stated in this Part, this Section shall not apply to

(a) **fuel dispensing stations**, bulk plants, **refineries** and **distilleries**,

(b) liquids in the fuel tank of motors or engines,

(c) **distilled beverage alcohol** in **closed containers** when stored in conformance with Part 3 of the National Fire Code 1995,

(d) food and pharmaceutical products when in **closed containers** having a capacity of not more than 5 L, or

(e) products containing not more than 50 per cent by volume of water-miscible **flammable** or **combustible liquids** with the remainder of the solution being nonflammable, when in **closed containers** having a capacity of not more than 5 L.

(3) Portable tanks having a capacity greater than 2500 L shall be installed in conformance with Section 4.3.

(4) For the purpose of this Section, **unstable liquids** shall meet the requirements for Class IA liquids.

(5) Except as otherwise stated, requirements for containers in this Part shall also apply to portable tanks described in Sentence (1).

Subsection 4.2.2. General

Storage locations

4.2.2.1. (1) **Flammable** or **combustible liquids** shall not be stored in or adjacent to **exits**, including outdoors, elevators or principal routes that provide **access to exits**.

(2) Where **flammable** or **combustible liquids** are stored, storage shall be in conformance with Subsections 4.2.4. to 4.2.11.

Storage arrangement

4.2.2.2. In addition to the provisions of this Section, the method of storage of **flammable** and **combustible liquids** shall be determined to ensure stability of the stored products.

Separation from other dangerous goods

4.2.2.3. (1) Except as provided in Sentence (2), **flammable** and **combustible liquids** shall be separated from other **dangerous goods** in conformance with Sections 3.2 and 3.3 of the National Fire Code 1995.

(2) For the purposes of applying Table 3.2.7.6. of the National Fire Code 1995, Class IIIA liquids shall be treated as Class 3 dangerous goods.

Subsection 4.2.3. Containers and Portable Tanks

Design and construction

4.2.3.1. (1) Except as permitted in Articles 4.2.3.3. and 4.2.3.4., containers and portable tanks for **flammable** or **combustible liquids** shall be built in conformance with

- (a) the **Transportation of Dangerous Goods Regulations (Canada)**,
- (b) CSA-B376, "Portable Containers for Gasoline and Other Petroleum Fuels",
- (c) CSA-B306, "Portable Fuel Tanks for Marine Use",

(d) ULC/ORD-C30, "Safety Containers", or

(e) Section 6 of CSA-B620, "Highway Tanks and Portable Tanks for the Transportation of Dangerous Goods".

Markings or labels

4.2.3.2. (1) Except as provided in Sentence (2) and Article 4.2.3.1., containers for **flammable** or **combustible liquids** shall be distinctly marked or labelled in easily legible type which is in contrast to any other printed matter on the label with a warning to indicate that

(a) the material in the container is flammable,

(b) it should be kept away from heat, sparks and open flames, and

(c) it should be kept closed when not in use.

(2) Markings referred to in Sentence (1) are not required when the container is labelled in conformance with

(a) the **Transportation of Dangerous Goods Act (Canada)** and its regulations,

(b) the **Hazardous Products Act (Canada)** and its regulations, and

(c) the **Pest Control Products Act (Canada)** and its regulations.

Plastic and glass containers

4.2.3.3. Except as permitted in Articles 4.2.3.1. and 4.2.3.4., the storage, handling and use of **flammable** or **combustible liquids** in a glass or plastic container shall be permitted only if the required liquid purity would be affected by storage in a metal container or if the liquid would cause excessive corrosion of the metal container.

Other containers

4.2.3.4. (1) Except as permitted in Sentences (2) and (3), the storage and use of Class I or II liquids, in containers other than those described in Article 4.2.3.1., shall not be permitted within a **building**.

(2) A container of not more than 1 L capacity for Class I liquids and 5 L capacity for Class II or IIIA liquids need not conform to Article 4.2.3.1.

(3) It is permitted to use sample containers not conforming to Article 4.2.3.1. for quality control or **testing** purposes.

Subsection 4.2.4. Assembly and Residential Occupancies

Application

4.2.4.1. (1) This Subsection applies to the storage and handling of **flammable** and **combustible liquids** in **buildings** classified as **assembly** or **residential occupancies**, except that it shall not apply to nonresidential schools, universities or colleges covered in Subsection 4.2.6.

Maximum quantities

4.2.4.2. (1) Except as provided in Sentence (4) and in Articles 4.2.4.5. and 4.2.4.6., the maximum quantity of **flammable** or **combustible liquids** stored in a **building** shall conform to Sentences (2) and (3).

(2) When a single class of liquid is stored in a **building**, the total quantity of liquid shall not exceed

(a) 30 L of Class I liquids,

(b) 150 L of Class II liquids, or

(c) 600 L of Class IIIA liquids.

(3) When 2 or more classes of liquid are stored in the same **building**, the total quantity permitted for each class of liquid shall be calculated as follows:

$$qI/30 + qII/150 + qIIIA/600 \leq 1$$

where

qI = the actual quantity of Class I liquid present, in litres,

qII = the actual quantity of Class II liquid present, in litres,

qIIIA = the actual quantity of Class IIIA liquid present, in litres.

(4) Quantities of **flammable** or **combustible liquids** exceeding those permitted in Sentence (1) are permitted, provided they are kept

(a) in storage cabinets conforming to Subsection 4.2.10., except that the total quantity of **flammable** and **combustible liquids** stored in such cabinets shall not exceed the quantity permitted for one cabinet, or

(b) in a storage room conforming to Subsection 4.2.9. and having no openings that communicate directly with the public portions of the **building**.

Storage cabinets and storage rooms

4.2.4.3. The storage cabinets and storage rooms referred to in Sentence 4.2.4.2.(4) shall not be located above or below the **first storey**.

Exterior balconies

4.2.4.4. **Flammable and combustible liquids** shall not be stored on exterior balconies.

Dwelling units

4.2.4.5. Not more than 30 L of **flammable and combustible liquids**, of which not more than 10 L shall be Class I liquids, are permitted to be stored in a **dwelling unit**.

Attached garages and sheds

4.2.4.6. Not more than 50 L of **flammable and combustible liquids**, of which not more than 30 L shall be Class I liquids, are permitted to be stored in a garage or shed attached to a **dwelling unit**.

Subsection 4.2.5. Mercantile Occupancies

Maximum quantities

4.2.5.1. (1) Except as provided in Sentence (5), the quantities of **flammable and combustible liquids** stored in **mercantile occupancies** shall not exceed those in Sentences (2) to (4).

(2) In unsprinklered **mercantile occupancies**, the maximum quantity of **flammable and combustible liquids** permitted to be stored in a single **suite** shall be the lesser of

(a) 8 L for every 1 m² of the total area of the **suite**, provided that not more than 2 L per m² is Class I liquid, of which not more than 0.3 L per m² shall be Class IA, Class IB, or any combination of these 2 classes, or

(b) 8000 L, provided that not more than 2000 L is Class I liquid, of which not more than 300 L shall be Class IA or Class IB or any combination of these 2 classes.

(3) In **sprinklered mercantile occupancies**, the maximum quantity of **flammable and combustible liquids** permitted to be stored in a single **suite** shall be the lesser of

(a) 24 L for every 1 m² of the total area of the **suite**, provided that not more than 6 L per m² is Class I liquid, of which not more than 1 L per m² shall be Class IA or Class IB or any combination of these 2 classes, or

(b) 24000 L, provided that not more than 6000 L is Class I liquid, of which not more than 1000 L shall be Class IA or Class IB or any combination of these 2 classes.

(4) For the purposes of calculating permissible quantities in Sentences (2) and (3), **mercantile occupancies** of less than 250 m² **floor area** shall be assumed to be 250 m² in area.

(5) Quantities of **flammable** and **combustible liquids** in excess of those permitted in Sentences (2) to (4) shall be kept in a storage area conforming to Subsection 4.2.7.

Containers

4.2.5.2. (1) **Flammable** and **combustible liquids** in **mercantile occupancies** shall be kept in **closed containers**.

(2) **Closed containers** of Class I and II liquids shall not be stacked more than 1.5 m high on floors, or 1 m high on individual fixed shelves.

(3) Class I liquids in **closed containers** are permitted to be stored in **basements** of **mercantile occupancies**.

Transfer

4.2.5.3. In **mercantile occupancies**, transfer of **flammable** or **combustible liquids** into containers shall only be permitted in a storage room conforming to Subsection 4.2.9.

Subsection 4.2.6. Business and Personal Services, Educational and Institutional Occupancies

Application

4.2.6.1. (1) This Subsection applies to the storage, handling and use of **flammable** and **combustible liquids** in **business and personal services occupancies** and **institutional occupancies** and shall include nonresidential schools, universities and colleges.

Storage cabinets and storage rooms

4.2.6.2. (1) Except as permitted in Article 4.2.6.3., **flammable** and **combustible liquids** shall be kept in **closed containers** and stored

(a) in cabinets conforming to Subsection 4.2.10., except that the total quantity of **flammable** and **combustible liquids** stored in such cabinets shall not exceed the quantity permitted for one cabinet, or

(b) in a room having no openings communicating directly with the public portions of the **building** and conforming to Subsection 4.2.9.

Maximum quantities

4.2.6.3. (1) Except as provided in Sentence (2), the storage of **flammable** and **combustible liquids** outside of a cabinet or room required in Article 4.2.6.2. is permitted, provided such storage does not exceed

(a) 10 L, including not more than 5 L of Class I liquid, in a single room, or

(b) 250 L, including not more than 60 L of Class II liquid, or 10 L of Class I liquid, in a single **fire compartment** having at least a 45-min **fire separation**.

(2) In automotive shop or industrial arts areas of an educational facility, storage of up to 75 L of **flammable** and **combustible liquids**, including not more than 25 L of Class I liquid, shall be permitted outside of a cabinet or room as specified in Article 4.2.6.2.

Containers

4.2.6.4. Where individual containers with a capacity of more than 5 L are required for storage of **flammable** or **combustible liquids** in a **building**, safety containers conforming to ULC/ORD-C30, "Safety Containers", and of not more than 25 L capacity, shall be used.

Separation of dangerous goods

4.2.6.5. **Flammable** or **combustible liquids** stored in cabinets or rooms shall be separated from other **dangerous goods** in conformance with Article 4.2.2.3.

Subsection 4.2.7. Industrial Occupancies

Application

4.2.7.1. This Subsection applies to the storage of **flammable** and **combustible liquids** in **closed containers** in **industrial occupancies**.

Storage facilities

4.2.7.2. (1) **Flammable** and **combustible liquids** in **industrial occupancies** shall be stored

- (a) in storage areas conforming to Article 4.2.7.5.,
- (b) in rooms conforming to Subsection 4.2.9.,
- (c) in cabinets conforming to Subsection 4.2.10., or
- (d) in conformance with Subsection 4.2.8.

Fire compartments

4.2.7.3. **Fire compartments** regulated by this Subsection shall be separated from the remainder of the **building** by a **fire separation** having a **fire-resistance rating** of at least 2 hr.

Dispensing and transfer

4.2.7.4. (1) Except as permitted in Subsection 4.2.8. and in Sentence (2), the dispensing or transfer of Class I or II liquids shall be conducted in rooms conforming to Subsection 4.2.9.

(2) It is permitted to dispense or transfer Class I or II liquids in a storage area conforming to Article 4.2.7.5. provided

(a) the storage area does not exceed 100 m², and

(b) the dispensing or transfer operations conform to the applicable requirements of Subsection 4.2.9.

Maximum quantities

4.2.7.5. (1) Except as provided in Sentence (2), the storage of **flammable** and **combustible liquids** in storage areas specified in Clause 4.2.7.2.(1)(a) shall

(a) conform to Table 4.2.7.A.

(i) where it consists of palletized or solid piled storage, or

(ii) where stored in **racks** in **buildings** not protected in conformance with Article 4.2.7.7., or

(b) conform to Table 4.2.7.B. where stored in **racks** in **buildings** protected in conformance with Article 4.2.7.7.

(2) Where a **building** is designed for the storage of **flammable** or **combustible liquids**, there is no limit on the total quantity of storage per **fire compartment** provided

(a) the **building** is separated from adjacent **buildings** by

(i) a **firewall** having a **fire-resistance rating** of at least 4 hr, or

(ii) spatial separation in conformance with the **Building Code**, and

(b) in protected **rack** storage, the quantities in each **individual storage area** do not exceed those specified in Table 4.2.7.B.

(3) Where containers for 2 or more liquids having different **flash points** are stored together in a single **individual storage area**, the maximum quantity permitted in the **individual storage area** shall equal that permitted for the liquid with the lowest **flash point**.

(4) When 2 or more classes of liquids are stored in a single **fire compartment**, the maximum quantity permitted for each class of liquid shall be calculated as follows:

$$q_{IA}/Q_{IA} + q_{IB}/Q_{IB} + q_{IC}/Q_{IC} + q_{II}/Q_{II} + q_{IIIA}/Q_{IIIA} \leq 1$$

where

$q_{IA,IB}$ = the actual quantity of Class IA, IB

- or IC or IC liquid present
- qII = the actual quantity of Class II liquid present
- qIII A = the actual quantity of Class IIIA liquid present
- QIA,IB or IC = the maximum quantity of Class IA, IB or IC liquid permitted in Table 4.2.7.A. or 4.2.7.B. for the arrangement
- QII = the maximum quantity of Class II liquid permitted in Table 4.2.7.A. or 4.2.7.B. for the arrangement
- QIII A = the maximum quantity of Class IIIA liquid permitted in Table 4.2.7.A. or 4.2.7.B. for the arrangement

TABLE 4.2.7.A.

Indoor Container Storage (Palletized or Solid Piled Storage and Unprotected Rack Storage)
Forming Part of Article 4.2.7.5.

Class of Liquid	Storage Level	Protected Storage ⁽¹⁾			Unprotected Storage		
		Maximum Quantity per I.S.A. ⁽²⁾ , L	Maximum Storage Height, m	Maximum Quantity per Fire Compartment, L	Maximum Quantity per I.S.A. ⁽²⁾ , L	Maximum Storage Height, m	Quantity per Fire Compartment, L
Class IA	First Storey	10000	1.5	50000	2500	1.5	2500
		7500	1.5	30000	2500	1.5	2500
	Storeys above the first storey	Not permitted	Not permitted	Not Permitted	Not Permitted	Not Permitted	Not Permitted
	Basement						
Class IB or IC	First Storey	20000	2.0	60000	10000	1.5	10000
		10000	2.0	50000	10000	1.5	10000
	Storeys above the	Not	Not	Not Permitted	Not	Not	Not Permitted

	first storey	permitted	permitted		Permitted	Permitted	
	Basement						
Class II	First Storey and storeys above the first storey	40000 25000	3.0 1.5	100000 25000	15000 Not Permitted	3.0 Not Permitted	30000 Not Permitted
	Basement						
Class IIIA	First Storey and storeys above the first storey	60000 40000	6.0 3.0	200000 100000	50000 Not Permitted	4.5 Not Permitted	100000 Not Permitted
	Basement						

Notes to Table 4.2.7.A.:

⁽¹⁾See Article 4.2.7.7.

⁽²⁾Individual Storage Area

TABLE 4.2.7.B.

Indoor Container Storage (Protected Rack Storage)⁽¹⁾ Forming Part of Article 4.2.7.5.

Class of Liquid	Storage Level	Maximum Height, m	Maximum Quantity per Fire Compartment, L
Class IA	First Storey	7.5	30000
	Storeys above the first storey	4.5	17000
	Basement	Not permitted	Not permitted
Class IB or IC	First Storey	7.5	60000
	Storeys above the first storey	4.5	35000
	Basement	Not permitted	Not permitted
Class II	First Storey	7.5	100000

	Storeys above the first storey	7.5	100000
	Basement	4.5	35000
Class IIIA	First Storey	12.0	200000
	Storeys above the first storey	6.0	200000
	Basement	6.0	100000

Notes to Table 4.2.7.B.:

⁽¹⁾ See Article 4.2.7.7.

Spill control

4.2.7.6. Measures to control spilled **flammable** or **combustible liquids** shall be provided in conformance with Subsection 4.1.6.

Fire suppression systems

4.2.7.7. (1) Where protection is required by this Part, storage areas for **flammable** and **combustible liquids** shall be

(a) **sprinklered** in conformance with NFPA 30, "Flammable and Combustible Liquids Code", or

(b) protected by an automatic fire suppression system in conformance with an applicable standard listed in Sentence 6.8.1.1.(1).

Clearances

4.2.7.8. (1) The clearance between the top of storage and the lowest structural members, sprinkler head deflectors or other overhead fire protection system components shall be not less than 450 mm.

(2) A clearance of not less than 400 mm shall be maintained between stored **flammable** and **combustible liquids** and walls, except that where the width of storage adjacent to the wall is not more than 1.5 m, such wall clearance is not required.

Aisles

4.2.7.9. Except as provided in Article 4.2.7.10., main aisles, access aisles and aisles defining **individual storage areas** shall be in conformance with Article 3.2.2.2. of the National Fire Code 1995.

Separation from other dangerous goods

4.2.7.10. **Flammable** and **combustible liquids** shall not be stored with other **dangerous goods** unless in conformance with Article 4.2.2.3.

Separation from combustible products

4.2.7.11. Combustible materials, other than those used for the packaging of **flammable** or **combustible liquids**, shall not be stored in the same **individual storage area** with such liquids.

Absorbents

4.2.7.12. Absorbent materials shall be available in the storage area for use in clean-up of spilled **flammable** or **combustible liquids** in conformance with Article 4.1.6.3.

Ventilation

4.2.7.13. Storage areas described in Article 4.2.7.1. shall be ventilated in conformance with Subsection 4.1.7.

Subsection 4.2.8. Incidental Use

Application

4.2.8.1. Except as otherwise noted in this Part, this Subsection applies to **industrial occupancies** where the use, storage and handling of **flammable** or **combustible liquids** is secondary to the principal activity.

Maximum quantities

4.2.8.2. (1) Except as provided in Sentences (2) and (3) and in Article 4.2.8.4., the quantity of **flammable** and **combustible liquids** permitted to be located outside of storage rooms conforming to Subsection 4.2.7., 4.2.9. or 4.3.13., or storage cabinets conforming to Subsection 4.2.10., in any one **fire compartment** of a **building**, shall not be more than

(a) 600 L of **flammable** and **combustible liquids** in **closed containers**, of which not more than 100 L shall be Class IA liquids, and

(b) 5000 L of Class IB, IC, II and IIIA liquids in **storage tanks** or portable tanks.

(2) Where required for normal plant activity, quantities of **flammable** and **combustible liquids** are permitted to exceed those specified in Sentence (1), but shall not be greater than the supply for one day of normal operation.

(3) Where larger quantities than are permitted by Sentence (1) are required, such quantities shall be in **storage tanks** installed in conformance with Sentence 4.3.12.4.(2).

Handling

4.2.8.3. (1) Areas in which **flammable** or **combustible liquids** are transferred from one container or **storage tank** to another, or are used in such a way as to release potentially explosive concentrations of flammable vapours, shall be

(a) separated from possible sources of ignition by a spatial separation of not less than 6 m, or by a **fire separation**,

(b) provided with a drainage system to control spills in conformance with Subsection 4.1.6.,

(c) provided with absorbent materials to assist in clean-up of small liquid spills in conformance with Article 4.1.6.3.,

(d) provided with either natural or mechanical ventilation in conformance with Subsection 4.1.7., and

(e) separated from other **dangerous goods** in conformance with Article 4.2.2.3.

General storage areas

4.2.8.4. (1) In a general storage area covered in Subsection 3.2.3. of the National Fire Code 1995, quantities of **flammable** and **combustible liquids** are permitted to exceed those in Sentence 4.2.8.2.(1) provided the storage area is in conformance with Sentences (2) to (6).

(2) The storage area referred to in Sentence (1) shall be **sprinklered** in conformance with Article 3.2.3.3. of the National Fire Code 1995, providing a level of protection not less than that required for Class IV commodities stored up to a height of 6 m.

(3) The height of storage of **flammable** and **combustible liquids** shall be not more than those permitted for unprotected storage in Table 4.2.7.A.

(4) When a single class of liquid is stored, the total quantity in a single **fire compartment** shall be not more than

(a) 2500 L of Class IB and IC liquid,

(b) 5000 L of Class II liquid, or

(c) 10000 L of Class IIIA liquid.

(5) When 2 or more classes of liquid are stored in the same **fire compartment**, the total quantity permitted for each class of liquid shall be calculated as follows:

$$q_I/2500 + q_{II}/5000 + q_{III A}/10000 \leq 1$$

where

- qI = the actual quantity of Class IB and IC liquid present,
- qII = the actual quantity of Class II liquid present,
- qIIIA = the actual quantity of Class IIIA liquid present.

(6) When 2 or more classes of liquid are stored in the same **individual storage area**, the maximum quantity permitted in the **individual storage area** shall be that permitted for the liquid with the lowest limit listed in Sentence (4).

Subsection 4.2.9. Rooms for Container Storage and Dispensing

Maximum quantities

4.2.9.1. (1) Except as provided in Sentences (2) and (3), where **flammable** and **combustible liquids** are stored in a room required in this Part, the storage densities averaged over the total room area and the total quantities of such liquids shall conform to Table 4.2.9.A.

(2) The maximum quantities and densities of **flammable** and **combustible liquids** shown in Table 4.2.9.A. are permitted to be doubled provided the storage room is protected by an automatic fire suppression system conforming to Article 4.2.7.7.

(3) The maximum quantities of Class I liquids in an unprotected storage room with a **fire separation** having a **fire-resistance rating** of not less than 2 hr shall

- (a) not exceed those specified for unprotected storage in Table 4.2.7.A., and
- (b) comply with Sentences 4.2.7.5.(3) and (4).

TABLE 4.2.9.A.

Rooms for Container Storage and Dispensing Forming Part of Article 4.2.9.1.

Maximum Quantity, L	Minimum Fire Separation Around Room, hr	Maximum Density, L/m ²
1500	1	100

10000	2	200
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Spill control

4.2.9.2. (1) Storage rooms referred to in Article 4.2.9.1. shall be equipped with

(a) liquid-tight seals between interior walls and the floor and a liquid-tight ramped sill at any door opening in an interior wall, and

(b) a drain connected to a dry sump or holding tank for those **occupancies** that are covered by the **Regulations for Industrial Establishments** and the **Regulations for Health Care and Residential Facilities** under the **Occupational Health and Safety Act**.

(2) Storage rooms referred to in Sentence (1) shall be designed to accommodate possible spills of **flammable and combustible liquids** in conformance with Subsection 4.1.6.

Ventilation

4.2.9.3. Storage rooms referred to in Article 4.2.9.1. shall be ventilated in conformance with Subsection 4.1.7.

Aisles

4.2.9.4. The contents of **flammable and combustible liquids** storage rooms referred to in Article 4.2.9.1. shall be arranged to provide aisle widths of not less than 1 m.

Dispensing

4.2.9.5. Dispensing of **flammable** or **combustible liquids** from containers having a capacity of more than 30 L shall be by pumps or through self-closing valves, designed in conformance with good engineering practice.

Explosion venting

4.2.9.6. (1) Except for the storage of distilled beverage alcohol, where Class IA or IB liquids are dispensed or stored in open containers within a storage room, the room shall be designed to prevent critical structural and mechanical damage from an internal explosion in conformance with NFPA 68, "Guide for Venting of Deflagrations".

(2) Despite Sentence (1), where Class IA liquids are stored in **closed containers** or Class I liquids are dispensed or stored in open containers for those **occupancies** or facilities that are covered by the **Regulations for Industrial Establishments** and the **Regulations for Health Care and Residential Facilities** under the **Occupational Health and Safety Act**, the room shall be designed to prevent critical structural and mechanical damage from an internal explosion in conformance with NFPA 68, "Guide for Venting of Deflagrations".

Portable extinguishers

4.2.9.7. Portable extinguishers shall be provided for storage rooms described in Article 4.2.9.1. in conformance with Section 6.2.

Egress doors

4.2.9.8. (1) This Article applies to a dispensing room in **occupancies** covered by the **Regulations for Industrial Establishments** and the **Regulations for Health Care and Residential Facilities** under the **Occupational Health and Safety Act** where the room

(a) has an area greater than 15 m², or

(b) has a distance of travel greater than 4.5 meters from any point in the room to an egress doorway.

(2) A dispensing room shall be equipped with self-closing doors hinged to swing outward on their vertical axis.

(3) A dispensing room shall be located in a **floor area** that has at least two **exits**.

(4) A dispensing room shall have at least two egress doorways that are at least three-quarters of the maximum diagonal dimension of the room from each other.

(5) At least one egress doorway shall be located within 23 m from any point in the dispensing room.

Subsection 4.2.10. Cabinets for Container Storage

Containers

4.2.10.1. **Flammable** and **combustible liquids** stored in cabinets required in this Part shall be in **closed containers** conforming to Article 4.2.3.1.

Maximum quantity per cabinet

4.2.10.2. The maximum quantity of **flammable** and **combustible liquids** stored in a cabinet shall be 500 L, of which not more than 250 L shall be Class I liquids.

Maximum quantity per fire compartment

4.2.10.3. (1) Except as provided in Sentences (2) and (3), the total quantity of **flammable** and **combustible liquids** stored in cabinets in a single **fire compartment** shall not exceed the quantity permitted in Article 4.2.10.2. for 3 cabinets.

(2) In **industrial occupancies**, quantities of **flammable** and **combustible liquids** greater than those specified in Sentence (1) are permitted in a single **fire compartment** where

(a) the total quantity stored in a group of cabinets is not more than the quantity permitted for 3 cabinets, and

(b) the distance between groups of cabinets described in Clause (a) is not less than 30 m.

(3) In **institutional occupancies**, the total quantity of **flammable** and **combustible liquids** stored in cabinets in a single **fire compartment** shall not exceed the quantity permitted for one cabinet.

Labelling

4.2.10.4. Cabinets for container storage shall be labelled in conspicuous lettering to indicate that the cabinet contains flammable materials and that open flames must be kept away.

Storage cabinets

4.2.10.5. (1) Storage cabinets required in this Part shall

(a) conform to ULC-C1275, "Storage Cabinets for Flammable Liquid Containers",

(b) conform to ULI 1275, "Flammable Liquid Storage Cabinets",

(c) be Factory Mutual Research Approved, or

(d) be **listed** as meeting NFPA 30.

Ventilation

4.2.10.6. (1) When a storage cabinet required in this Part is provided with ventilation openings,

(a) the ventilation openings shall be sealed with materials providing fire protection at least equivalent to that required for the construction of the cabinet, or

(b) the cabinet shall be vented outdoors using vent piping providing fire protection at least equivalent to that required in Clause (a) for seals.

Subsection 4.2.11. Outdoor Container Storage

Quantities and clearances

4.2.11.1. (1) Except as provided in Sentence (2), the quantities and clearances for **flammable** and **combustible liquids** stored in containers in outdoor storage areas shall conform to Table 4.2.11.A.

(2) The clearances required in Sentence (1) do not apply where not more than 5000 L of **flammable** or **combustible liquids** are stored adjacent to a **building** on the same property, and

(a) the **building** is one **storey** in **building height** and used primarily for the storage or handling of **flammable** or **combustible liquids**, or

(b) the exposed wall has a **fire-resistance rating** of at least 2 hr and has no openings within 3 m of such outdoor storage.

TABLE 4.2.11.A.

Outdoor Container Storage Forming Part of Article 4.2.11.1.

Class of Liquid	Maximum Total Quantity per Pile, L	Minimum Distance Between Piles, m	Minimum Distance to a Property Line or to a Building on the Same Property, m
Class IA	5000	1.5	6
Class IB or IC	15000	1.5	6
Class II	35000	1.5	6
Class IIIA	85000	1.5	6

Mixed storage

4.2.11.2. Where 2 or more liquids with different **flash points** are stored outdoors in containers that form a single pile, the maximum total quantity permitted in the pile shall be equal to that permitted for the liquid with the lowest **flash point**.

Fire department access

4.2.11.3. An access route not less than 6 m wide, constructed in conformance with Subsection 3.2.5. of the **Building Code**, shall be provided in outdoor storage areas to permit the approach of **fire department** vehicles to within 60 m of any part of a pile.

Spill control

4.2.11.4. Outdoor storage areas for **flammable** or **combustible liquids** shall be designed to accommodate possible spillage in conformance with Subsection 4.1.6.

Fencing

4.2.11.5. (1) An outdoor area used for the container storage of **flammable** or **combustible liquids** shall be surrounded by a firmly anchored fence that is

- (a) substantially constructed to discourage climbing and unauthorized entry,
- (b) not less than 1.8 m high, and
- (c) provided with gates that shall be locked when the storage area is not staffed.

SECTION 4.3 TANK STORAGE

Subsection 4.3.1. Design, Construction and Use of Storage Tanks

Application

4.3.1.1. This Section applies to **storage tanks** for **flammable** and **combustible liquids**.

Atmospheric storage tanks

4.3.1.2. (1) Except as required in Sentences (2), (4), (6) and (8) and permitted in Sentences (3), (5) and (7) and in Section 4.9, **atmospheric storage tanks** shall be built in conformance with

- (a) API 12B, "Bolted Tanks for Storage of Production Liquids",
- (b) API 12D, "Field Welded Tanks for Storage of Production Liquids",
- (c) API 12F, "Shop Welded Tanks for Storage of Production Liquids",
- (d) API 650, "Welded Steel Tanks for Oil Storage",
- (e) ULC-S601, "Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids",
- (f) CAN/ULC-S602, "Aboveground Steel Tanks for Fuel Oil and Lubricating Oil",
- (g) CAN/ULC-S603, "Steel Underground Tanks for Flammable and Combustible Liquids",
- (h) CAN/ULC-S603.1, "Galvanic Corrosion Protection Systems for Steel Underground Tanks for Flammable and Combustible Liquids",
- (i) CAN4-S615, "Reinforced Plastic Underground Tanks for Petroleum Products",
- (j) ULC-S630, "Shop Fabricated Steel Aboveground Vertical Tanks for Flammable and Combustible Liquids",
- (k) CAN/ULC-S643, "Shop Fabricated Steel Aboveground Utility Tanks for Flammable and Combustible Liquids",

(l) ULC-S652, "Tank Assemblies for Collection of Used Oil",

(m) ULC-S653, "Aboveground Steel Contained Tank Assemblies for Flammable and Combustible Liquids",

(n) ULC/ORD-C58.10, "Jacketed Steel Underground Tanks for Flammable and Combustible Liquids",

(o) ULC/ORD-C142.5, "Concrete Encased Steel Above ground Tank Assemblies for Flammable and Combustible Liquids",

(p) ULC-S655, "Aboveground Protected Tank Assemblies for Flammable and Combustible Liquids", or

(q) ULC/ORD-C142.23, "Aboveground Waste Oil Tanks".

(2) Tanks built in conformance with Clauses (1)(a), (b) and (c) shall be used only for the storage of crude petroleum at oil fields.

(3) When necessitated by possible contamination of the liquid to be stored or possible rapid corrosion of the tank, **storage tanks** need not conform to Sentence (1), provided that they are designed and built in conformance with good engineering practice for the material being used.

(4) **Atmospheric storage tanks** shall not be used for the storage of **flammable** or **combustible liquids** at temperatures at or above their boiling points.

(5) Existing aboveground **atmospheric storage tanks** in service that do not comply with Sentence (1) are permitted to remain in service provided that the tank

(a) is not leaking,

(b) has no dents in the tank greater than 30 degrees or 35 mm in depth from the normal configuration,

(c) has no pitting in excess of 3 mm, and

(d) has metal thickness of at least 50 per cent of the minimum permissible thickness specified in an applicable standard referenced in Sentence (1).

(6) Existing aboveground **atmospheric storage tanks** that do not comply with Sentence (1), (3), (5) or (9) shall be refurbished in conformance with Sentence 4.10.4.2.(3) or be replaced.

(7) Existing underground **storage tanks** in service that do not comply with Sentence (1) are permitted to remain in service provided that the tanks are not leaking and steel **storage tanks** and associated piping are protected from external corrosion in conformance with Subsection 4.3.9.

(8) Existing underground **storage tanks** that do not comply with Sentence (1), (3) or (7) shall be refurbished in conformance with Sentence 4.10.4.2.(3) or be replaced.

(9) Existing aboveground **atmospheric storage tanks** that comply to ULC/ORD-C142.16-1994, "Protected Aboveground Tank Assemblies for Flammable and Combustible Liquids" shall be deemed to comply with Clause (1)(p).

Low pressure storage tanks and pressure vessels

4.3.1.3. (1) **Low pressure storage tanks** shall be constructed in conformance with

(a) API 620, "Design and Construction of Large, Welded, Low-Pressure Storage Tanks", or

(b) ANSI/ASME, "Boiler and Pressure Vessel Code".

(2) **Pressure vessels** shall be constructed in conformance with CSA-B51, "Boiler, Pressure Vessel, and Pressure Piping Code".

(3) **Low pressure storage tanks** and **pressure vessels** are permitted to be used as **atmospheric storage tanks**.

Operating pressure

4.3.1.4. The normal operating pressure of a **storage tank** shall not exceed its design pressure.

Corrosion protection

4.3.1.5. The exposed surface of every aboveground **storage tank** for **flammable** or **combustible liquids** which is fabricated of any ferrous substance shall be thoroughly coated with rust-resisting material compatible with the tank.

Floating roofs

4.3.1.6. Except for perimeter sealing material, floating roof assemblies or internal floating covers installed in **storage tanks** shall be constructed of metal, or other materials and design conforming to one of the tank construction standards listed in this Subsection.

Identification

4.3.1.7. A **storage tank** and its filling and emptying connections shall be identified in conformance with CPPI, "Using the CPPI Colour-Symbol System to Mark Equipment and Vehicles for Product Identification" or to CAN/CGSB-24.3, "Identification of Piping Systems".

Overfill protection

4.3.1.8. (1) A **storage tank** shall be prevented from being overfilled by providing

- (a) continuous supervision of the filling operations by personnel qualified to supervise such operations, or
- (b) an overfill protection device conforming to ULC/ORD-C58.15, "Overfill Protection Devices for Flammable Liquid Storage Tanks".

Subsection 4.3.2. Installation of Outside Aboveground Storage Tanks

Location

4.3.2.1. (1) Every outside aboveground **storage tank** for the storage of **flammable** or **combustible liquids** shall be located in conformance with Sentences (2) to (5) with respect to the property line and any **building** on the same property.

(2) Except as provided in Sentences (6) and (7), every aboveground **storage tank** containing stable liquids and having a working pressure of not more than 17 kPa (gauge) shall be separated from a property line and any **building** on the same property by distances

(a) half those in Table 4.3.2.A. where protection is provided against fire or explosion in the tank in conformance with Sentence 4.3.2.5.(2), or

(b) equal to those in Table 4.3.2.A. where protection referred to in Clause (a) is not provided.

(3) Every aboveground **storage tank** containing **unstable liquids** and having a working pressure of not more than 17 kPa (gauge) shall be separated from a property line and any **building** on the same property by distances

(a) equal to those in Table 4.3.2.A., but not less than 7.5 m, where protection is provided against fire or explosion in the tank in conformance with Sentence 4.3.2.5.(2), or

(b) 3 times those in Table 4.3.2.A., but not less than 15 m, where protection referred to in Clause (a) is not provided.

(4) Every aboveground **storage tank** containing boil-over liquids shall be separated from a property line and any **building** on the same property by distances

(a) 0.75 times those in Table 4.3.2.A. where protection is provided against fire or explosion in the tank in conformance with Sentence 4.3.2.5.(2), or

(b) equal to those in Table 4.3.2.A. where protection referred to in Clause (a) is not provided.

(5) Where a **storage tank** containing stable liquids or **unstable liquids** has a working pressure greater than 17 kPa (gauge), the distances from a property line and any **building** on the same property shall be those specified in Sentences (2) and (3) multiplied by 1.5, but shall be not less than 7.5 m.

(6) The minimum distance required in Sentence (2) from a **storage tank** containing only Class II or IIIA liquids to a **building** on the same property is permitted to be reduced to

(a) 1.5 m provided the tank capacity is not more than 50000 L, or

(b) zero provided the tank capacity is not more than 2500 L.

(7) The minimum distance required in Sentence (2) is permitted to be waived provided the **storage tank**

(a) is in conformance with ULC-S655, "Aboveground Protected Tank Assemblies for Flammable and Combustible Liquids", and

(b) has a capacity of not more than 50000 L.

(8) Where end failure of horizontal **storage tanks** may endanger adjacent property, the tanks shall be placed with the longitudinal axis parallel to such property.

TABLE 4.3.2.A.

Location of Aboveground Storage Tanks Forming Part of Article 4.3.2.1.

Maximum Capacity, L	Tank	Minimum Distance to a Property Line or to a Building on the Same Property, m
250000		3
500000		4.5
2500000		9
5000000		12
over 5000000		15

Spacing between storage tanks

4.3.2.2. (1) Except as required in Sentences (2) and (3) and in Article 4.3.2.3., the minimum distance between every combination of two aboveground **storage tanks** shall be 0.25 times the sum of their diameters, but shall be not less than 1 m.

(2) The minimum distance between any two **storage tanks**, neither of which has a capacity of more than 250000 L, shall be 1 m.

(3) Where either of the two aboveground **storage tanks** contains **unstable liquids**, the distance required in Sentences (1) and (2) shall be doubled.

Clearances from liquefied petroleum gas cylinders and tanks

4.3.2.3. (1) The minimum separation between a **flammable** or **combustible liquid storage tank** and a liquefied petroleum gas cylinder or tank shall be 6 m.

(2) Secondary containments for **flammable** or **combustible liquid storage tanks** shall not contain any liquefied petroleum gas cylinder or tank, and the centre line of the secondary containment wall shall be not less than

(a) 3 m away from a liquefied petroleum gas cylinder, and

(b) 7 m away from a liquefied petroleum gas **storage tank**.

Fire department access

4.3.2.4. (1) Except as provided in Sentences (2) and (3), **storage tanks** for **flammable** or **combustible liquids** shall be spaced so that each **storage tank** is accessible for fire fighting purposes.

(2) An access route constructed in conformance with Subsection 3.2.5. of the **Building Code** shall be provided in outdoor storage areas to permit the approach of **fire department** vehicles to within 60 m of any **storage tank**.

(3) Where fire fighting access to **storage tanks** containing Class I or II liquids is not provided, fire extinguishing measures conforming to Sentence 4.3.2.5.(2) shall be provided.

Fire protection systems

4.3.2.5. (1) Where the diameter of a **storage tank** exceeds 45 m, the **storage tank** shall be provided with protection against fire or explosion in conformance with Sentence (2).

(2) Protection against fire or explosion required for a **storage tank** shall consist of fixed protection systems designed in conformance with good engineering practice such as described in

(a) NFPA 11, "Low-Expansion Foam",

(b) NFPA 15, "Water Spray Fixed Systems for Fire Protection", and

(c) NFPA 69, "Explosion Prevention Systems".

Leakage testing

4.3.2.6. At the time of installation, aboveground **storage tanks** and associated piping shall be **tested** for leakage in conformance with Subsections 4.3.15. and 4.4.6.

Subsection 4.3.3. Supports, Foundations and Anchorage for Aboveground Storage Tanks

Foundations and supports

4.3.3.1. (1) **Storage tanks** shall rest on the ground or on foundations, supports or piling made of concrete, masonry or steel in conformance with

(a) Appendix B of API 650, "Welded Steel Tanks for Oil Storage", and

(b) Appendices C and D of API 620, "Design and Construction of Large, Welded, Low Pressure Storage Tanks".

(2) Tank supports shall be installed on firm foundations designed to minimize uneven settling of the tank and to minimize corrosion of the part of the tank resting on the foundation.

(3) Except for steel saddles that are less than 300 mm high at their highest point, supports for **storage tanks** shall provide a **fire-resistance rating** of not less than 2 hr.

(4) Every aboveground **storage tank** shall be supported in a manner that will prevent the allowable design stress of the tank from being exceeded.

Earthquake protection

4.3.3.2. (1) In areas subject to earthquake forces, **storage tanks**, supports and connections shall be designed to resist such forces in conformance with

(a) Part 4 of the **Building Code**, and

(b) Appendix A of ULC-S630, "Shop Fabricated Steel Aboveground Vertical Tanks for Flammable and Combustible Liquids".

Protection against flooding

4.3.3.3. When aboveground **storage tanks** are located in an area that may be subject to flooding, the tanks shall be securely anchored to prevent floating.

Subsection 4.3.4. Normal and Emergency Venting for Aboveground Storage Tanks

Design and installation

4.3.4.1. (1) **Atmospheric and low pressure storage tanks** shall be provided with normal and emergency venting in conformance with

(a) API 2000, "Venting Atmospheric and Low Pressure Storage Tanks", or

(b) the appropriate tank design standard listed in Sentence 4.3.1.2.(1).

Unstable liquids

4.3.4.2. When **unstable liquids** are stored, the effects of heat or gas resulting from polymerization, decomposition, condensation or self-reactivity shall be allowed for in the determination of the total venting capacity.

Subsection 4.3.5. Vent Piping for Aboveground Storage Tanks

Materials and construction

4.3.5.1. Vent piping materials and construction shall conform to Section 4.4.

Location of vent pipe outlets

4.3.5.2. (1) Vent pipe outlets for **storage tanks** of Class I liquids

(a) shall be located outside **buildings**, not less than

(i) 3.5 m above the adjacent ground level, and

(ii) 1.5 m from any **building** opening, and

(b) shall discharge so that flammable vapours will not enter the **building** or be trapped near any part of the **building**.

(2) Vent pipe outlets for Class II or IIIA liquids shall discharge outside **buildings**, not less than

(a) 2 m above the adjacent ground level, and

(b) 1.5 m from any **building** opening.

Interconnection of vent piping

4.3.5.3. (1) Except as provided in Sentence (2), 2 or more **storage tanks** are permitted to be connected to a common vent pipe for normal relief venting provided the vent pipe size is designed to vent the combined vapours produced in the connected tanks without exceeding the allowable stresses of the tanks.

(2) Vent piping for **storage tanks** for Class I liquids shall not be connected to vent piping for **storage tanks** for Class II or IIIA liquids unless an effective arrangement is provided to prevent the vapours from the Class I liquids from entering the other tanks.

Subsection 4.3.6. Openings Other than Vents in Aboveground Storage Tanks

Provision of valves

4.3.6.1. Connections to aboveground **storage tanks** at any level below the highest level to which the liquid will rise shall be provided with valves located as close as practicable to the shell.

Materials

4.3.6.2. (1) Valves and their connections to a **storage tank** shall be made of steel, except that when the chemical characteristics of the liquid stored are incompatible with steel, materials other than steel are permitted to be used.

(2) Materials for valves and their connections to a **storage tank** shall be suitable for the pressures, stresses and temperatures that may be expected, including those of possible fire exposure.

Openings for liquid level measurements

4.3.6.3. Openings for measuring liquid levels in **storage tanks** for Class I liquids shall be equipped with caps or covers which shall be opened only when measuring the liquid level.

Connections for filling and emptying

4.3.6.4. (1) Except as provided in Sentence (3), connections used as part of normal operating conditions for filling or emptying **storage tanks** for **flammable** and **combustible liquids** shall be located

- (a) outside **buildings**,
- (b) at a location free of sources of ignition, and
- (c) not less than 1.5 m from **building** openings.

(2) Connections for filling or emptying **storage tanks** shall be kept closed to prevent leakage when not in use.

(3) A filling connection described in Sentence (1) is permitted to be located inside a **building** where

- (a) made necessary
 - (i) by a process or activity located indoors and to which the tank is directly associated, or
 - (ii) for the collection of used liquids, and
- (b) the fill piping is provided with means to prevent flammable vapours from returning to the **building**.

Subsection 4.3.7. Secondary Containment for Aboveground Storage Tanks

General

4.3.7.1. (1) The area surrounding a **storage tank** or group of **storage tanks** shall be designed to accommodate accidental spillage in conformance with Subsection 4.1.6.

(2) Where barriers described in Sentence 4.1.6.1.(1) are provided to contain accidental spillage from above-ground **storage tanks**, they shall conform to the requirements for secondary containment in this Subsection.

(3) A **storage tank** conforming to Sentence 4.3.7.4.(2) shall be considered as conforming to this Subsection provided it is used and maintained in conformance with Articles 4.3.7.8. and 4.3.7.9.

Construction

4.3.7.2. (1) Except as provided in Sentence (2), the base and walls of a secondary containment shall be made of noncombustible materials, and shall be designed, constructed and maintained to

(a) withstand full hydrostatic head, and

(b) provide a permeability of not more than 10^{-6} cm/s to the **flammable** or **combustible liquids** contained in the **storage tanks**.

(2) Where a membrane provides the level of impermeability required in Sentence (1), the membrane shall

(a) conform to ULC/ORD-C58.9, "Secondary Containment Liners for Underground and Aboveground Flammable and Combustible Liquid Tanks", and

(b) if combustible, be covered with a noncombustible material of such nature and thickness that the membrane will not fail when the secondary containment is exposed to fire.

(3) Except as provided in Sentence (4), openings shall not be permitted in a secondary containment.

(4) Where piping passes through a secondary containment, such passages shall conform to Sentences (1) and (2).

Capacity

4.3.7.3. (1) Except as permitted in Sentence (3), a secondary containment for a single **storage tank** shall have a volumetric capacity of not less than 110 per cent of the capacity of the tank.

(2) Except as permitted in Sentence (3), a secondary containment for more than one **storage tank** shall have a volumetric capacity of not less than the sum of

(a) the capacity of the largest **storage tank** located in the contained space, and

(b) 10 per cent of the greater of

(i) the capacity specified in Clause (a), or

(ii) the aggregate capacity of all other **storage tanks** located in the contained space.

(3) When the secondary containment is designed to prevent the entry of precipitation and water used for fire fighting purposes into the contained space, it shall have a volumetric capacity of not less than the capacity of the largest **storage tank** located in the contained space.

Clearances

4.3.7.4. (1) Except as provided in Sentence (2), no part of a secondary containment wall shall be less than 1.5 m from a **storage tank** shell.

(2) It is permitted to waive the distance required in Sentence (1) provided the **storage tank**

(a) is constructed in accordance with

(i) Clauses 4.3.1.2.(1)(l), (m), (o), (p) or (q), incorporating secondary containment, or

(ii) Clauses 4.3.1.2.(1)(e), (j) or (k) for double-walled **storage tanks**,

(b) has a capacity of not more than 50000 L, and

(c) is protected by posts or guardrails when exposed to collision damage.

Access to storage tanks and ancillary equipment

4.3.7.5. (1) A secondary containment shall permit

(a) access to **storage tanks**, valves and ancillary equipment,

(b) egress from the contained space, and

(c) access for fire fighting as specified in Article 4.3.2.4.

(2) Where a **storage tank** contains Class I liquids, provisions shall be made for the normal operation of valves and for access to the **storage tank** roof without entering the contained space created by the secondary containment when

(a) the average height of the secondary containment exceeds 3.5 m, measured from the ground level of the interior of the contained area, or

(b) the distance between the tank shell and the top inside edge of the secondary containment wall is less than the height of this wall.

Emergency venting

4.3.7.6. Where the secondary containment is not open to the atmosphere, emergency venting shall be provided to relieve any buildup of internal pressure in the contained space when exposed to heat or fire.

Leak detection

4.3.7.7. Where the contained space created by the secondary containment is not accessible for visual examination, a monitoring device shall be provided to indicate the presence of liquid in, or the loss of integrity of the secondary containment.

Drainage

4.3.7.8. (1) Liquids, debris and precipitation shall not be permitted to accumulate in the contained space created by the secondary containment.

(2) Provisions shall be made for removing liquid from the secondary containment in conformance with Subsection 4.1.6.

(3) Controls for the liquid removal system required in Sentence (2) shall be

- (a) normally closed,
- (b) accessible under fire exposure conditions, and
- (c) located so they can be operated from outside the contained space.

Use of secondary containment

4.3.7.9. The contained space created by a secondary containment shall not be used for storage purposes.

Subsection 4.3.8. Installation of Underground Storage Tanks

Location

4.3.8.1. (1) Underground **storage tanks** shall be located so that

- (a) foundations of existing **buildings** will not be undermined during excavation, and
- (b) loads from **building** foundations and supports are not transmitted to the tank.

(2) Underground **storage tanks** shall be located not less than

- (a) 600 mm from adjacent tanks,
- (b) 1 m from a **building** or **street** line, and

(c) 1.5 m from other property lines.

Ground cover

4.3.8.2. (1) Except as required in Sentences (2) to (4), underground **storage tanks** shall be installed with not less than 600 mm of ground cover over the tank.

(2) Except as required in Sentence (3), **storage tanks** subject to vehicular traffic shall be installed not less than 1 m below finished ground level.

(3) Either a 150 mm reinforced concrete slab or a 200 mm unreinforced concrete slab over not less than 450 mm of sand is permitted in lieu of the protection described in Sentence (2) provided the slab extends at least 300 mm beyond the **storage tank**.

(4) Where subsurface conditions make it impractical to install a **storage tank** totally below adjacent ground level, an underground **storage tank** shall be installed so that at least

(a) 75 per cent of its mass is below adjacent ground level provided there is not less than 600 mm of ground cover over the portion of the tank above adjacent ground level, or

(b) 50 per cent of its mass is below adjacent ground level provided there is not less than 1 m of ground cover over the portion of the tank above adjacent ground level.

Damage repair

4.3.8.3. (1) Underground **storage tanks** in the process of being installed shall be **inspected**, and any damage to the protective coating or anodes shall be repaired before they are lowered into the excavation.

(2) Damage to **storage tank** shells shall not be repaired on site.

Damage prevention

4.3.8.4. (1) Underground **storage tanks** shall be lowered into the excavation by the use of lifting lugs and hooks and, where necessary, spreader bars to prevent damage to the protective coating.

(2) Any method of handling that may result in damage to the protective coating of the tank shall not be used.

Installation

4.3.8.5. (1) Underground steel **storage tanks** shall be installed in conformance with Appendix B of CAN/ULC-S603.1, "Galvanic Corrosion Protection Systems for Steel Underground Tanks for Flammable and Combustible Liquids".

(2) Underground reinforced plastic **storage tanks** shall be installed in conformance with Appendix A of CAN4-S615, "Reinforced Plastic Underground Tanks for Petroleum Products".

(3) Underground **storage tanks** shall not be placed in direct contact with reinforced concrete slabs but shall be separated by not less than 150 mm of sand or other suitable material to distribute evenly the weight of the tank on the supporting base.

Leakage testing

4.3.8.6. (1) At the time of installation, underground **storage tanks** and associated piping shall be **tested** for leakage in conformance with Subsections 4.3.15. and 4.4.6.

Filling

4.3.8.7. (1) **Flammable** or **combustible liquids** shall not be placed in an underground **storage tank** until

- (a) the fill pipe and vent line have been installed in the tank, and
- (b) all other openings have been sealed.

Spillage

4.3.8.8. If a spillage occurs, the escaped liquid and all soil contaminated by the spill shall be removed in conformance with Subsection 4.1.6.

Anchorage

4.3.8.9. (1) Where a high water table is anticipated, underground **storage tanks** shall be protected against uplift due to hydrostatic forces when the tanks are empty.

(2) Where anchors and ground straps are used to resist uplift forces referred to in Sentence (1), they shall be

- (a) electrically isolated from the tank, and
- (b) installed in such a manner that they do not damage the protective coating on the tank.

Subsection 4.3.9. Corrosion Protection of Underground Steel Storage Tanks

Corrosion protection

4.3.9.1. (1) Except as provided in Sentence (2), underground steel **storage tanks** and associated piping and fittings subject to corrosion shall be protected in conformance with CAN/ULC-S603.1, "Galvanic Corrosion Protection Systems for Steel Underground Tanks for Flammable and Combustible Liquids".

(2) A steel **storage tank** not conforming to Sentence (1) is permitted provided

(a) it conforms to ULC/ORD-C58.10, "Jacketed Steel Underground Tanks for Flammable and Combustible Liquids", or

(b) it has corrosion protection conforming to good engineering practice such as described in PACE Report No. 87-1, "Impressed Current Method of Cathodic Protection of Underground Petroleum Storage Tanks", published by the Canadian Petroleum Products Institute.

Subsection 4.3.10. Vents for Underground Storage Tanks

Vent design

4.3.10.1. Underground **storage tanks** shall be provided with vent openings and piping of sufficient cross-sectional area designed to vent the tanks during the maximum filling or withdrawal rate without causing the allowable stress for the tank to be exceeded.

Materials and construction

4.3.10.2. Vent piping materials and construction shall conform to Section 4.4.

Installation

4.3.10.3. (1) Vent pipe outlets from underground **storage tanks** for Class I liquids shall

(a) be located outside **buildings** higher than the fill pipe openings but not less than

(i) 3.5 m above the adjacent ground level,

(ii) 1.5 m from any **building** opening, and

(iii) 7.5 m from any dispenser, and

(b) discharge so that flammable vapours will not enter **building** openings or be trapped near any part of the **building**.

(2) Vent pipes from underground **storage tanks** for Class II or IIIA liquids shall be located outside **buildings** at a height that is above the fill pipe opening but not less than 2 m above finished ground level.

(3) Vent pipes from underground **storage tanks** for **flammable** or **combustible liquids** shall not be obstructed by any device that may cause excessive back pressure, except that vent pipes from underground **storage tanks** for Class II or Class IIIA liquids are permitted to be fitted with return bends, coarse screens or other devices to minimize the entry of foreign material.

(4) Vent piping shall enter the **storage tank** through the top of the tank and shall not extend into the tank more than 25 mm except when the vent is equipped with a vent alarm.

(5) Vent piping shall be

(a) installed so that any nominally horizontal run shall slope towards the **storage tank**,

(b) constructed without traps,

(c) adequately supported to prevent sagging, and

(d) where necessary, protected against mechanical damage.

Interconnection of vent pipes

4.3.10.4. (1) Except as permitted in Sentence (2), where vent piping connects 2 or more **storage tanks**, pipe sizes shall be designed to vent the combined vapours produced in the connected underground **storage tanks** without exceeding the allowable stresses of the tanks when being filled simultaneously.

(2) Where it is not possible to fill the connected **storage tanks** referred to in Sentence (1) simultaneously, or where the connected vents have a vapour recovery system, the vent piping shall be sized to accommodate the maximum vapour flow possible in the system.

(3) Vent piping for an underground **storage tank** containing a Class I liquid shall not be connected to the vent piping for a **storage tank** containing a Class II or IIIA liquid unless an effective method is provided to prevent the vapours from the Class I liquid **storage tank** from entering the other tank.

Subsection 4.3.11. Openings Other than Vents in Underground Storage Tanks

Connections

4.3.11.1. Connections for all openings in underground **storage tanks** shall be liquid and vapour tight.

Openings for measuring liquid level

4.3.11.2. Openings for measuring liquid levels in underground **storage tanks** if independent of the fill pipe shall be equipped with a vapour-tight cap or cover which shall be opened only when measuring the liquid level.

Fill piping and discharge piping

4.3.11.3. (1) Fill piping and discharge piping shall enter underground **storage tanks** only through the top of the tank and discharge piping used in suction systems shall be sloped toward the **storage tanks**.

(2) Remote fill outlets from an underground **storage tank** shall not be located higher than other outlets from the tank.

(3) Except as provided in Sentence (5), connections used as part of normal operating conditions for filling or emptying **storage tanks** for **flammable** and **combustible liquids** shall be located

(a) outside **buildings**,

(b) at a location free of sources of ignition, and

(c) not less than 1.5 m away from **building** openings.

(4) Connections for filling or emptying **storage tanks** described in Sentence (3) shall be kept closed to prevent leakage when not in use.

(5) A filling connection described in Sentence (3) is permitted to be located inside a **building** where

(a) made necessary

(i) by a process or activity located indoors and to which the tank is directly associated, or

(ii) for the collection of used liquids, and

(b) the fill piping is provided with means to prevent flammable vapours from returning to the **building**.

Subsection 4.3.12. Installation of Storage Tanks Inside Buildings

Occupancy

4.3.12.1. Except as provided in Article 4.3.12.2., **storage tanks** shall not be permitted in other than **industrial occupancies**.

Stationary combustion engines

4.3.12.2. Installations using Class I liquids as fuel supplies for stationary engines inside **buildings** shall conform to NFPA 37, "Stationary Combustion Engines and Gas Turbines".

Maximum static head

4.3.12.3. The static head imposed on a **storage tank** inside a **building** shall not exceed 70 kPa (gauge) at the bottom of the tank when the vent or fill pipe is filled with liquid unless the tank is designed for greater pressures.

Maximum quantities and location

4.3.12.4. (1) Except as provided in Subsection 4.2.8. and in Sentence (2), **storage tanks for flammable or combustible liquids** shall be

- (a) located in dedicated rooms conforming to Subsection 4.3.13., and
- (b) located in conformance with Table 4.3.12.A.

(2) When quantities greater than are permitted for incidental use in Subsection 4.2.8. are required for special process operations, **storage tanks for flammable or combustible liquids** are permitted to be located outside of a storage room referred to in Sentence (1), provided that

- (a) total quantities per **fire compartment** are not more than one-half the quantities permitted in Table 4.3.12.A.,
- (b) they are located on the **first storey**, and
- (c) the installation conforms to Articles 4.3.12.7. to 4.3.12.10. and Article 4.3.13.4.

(3) Table 4.3.12.A. does not apply to the storage of distilled beverage alcohol.

TABLE 4.3.12.A.

Indoor Tank Storage Forming Part of Article 4.3.12.4.

Class of Liquid	Storage Level	Maximum Quantity per Storage Room ⁽¹⁾ , L, One or More Tanks	
		Protected ⁽²⁾	Unprotected Storage
Class I	First Storey	40000	25000
	Storeys above the first storey	7500	Not Permitted
	Basement	Not permitted	Not Permitted

Class II and IIIA	First Storey	200000	100000
	Storeys above the	20000	Not Permitted
	first storey	20000	Not Permitted
	Basement		

Notes to Table 4.3.12.A.:

⁽¹⁾ See Subsection 4.3.13.

⁽²⁾ See Article 4.2.7.7.

Fire compartments

4.3.12.5. **Fire compartments** regulated by this Subsection shall be separated from the remainder of the **building** by a **fire separation** having a **fire-resistance rating** of not less than 2 hr.

Mixed storage

4.3.12.6. (1) When 2 or more classes of liquids are stored in a single storage room referred to in Sentence 4.3.12.4.(1), the total quantity permitted for each class of liquid shall be calculated as follows:

$$qI/QI + qII+IIIA/QII+IIIA \leq 1$$

where

qI = the actual quantity of Class I liquid present,

qII+IIIA = the actual quantity of Class II and IIIA liquid present,

QI = the maximum quantity of Class I liquid permitted in Table 4.3.12.A.,

QII+IIIA = the maximum quantity of Class II and IIIA liquid permitted in Table 4.3.12.A.

Storage tanks outside storage rooms

4.3.12.7. (1) Where **storage tanks** for **flammable** or **combustible liquids** are located outside of storage rooms conforming to Subsection 4.3.13.,

(a) provision shall be made to contain 100 per cent of the volume of the largest **storage tank**, or to drain away spilled **flammable** or **combustible liquids** in conformance with Subsection 4.1.6.,

(b) all electrical equipment and wiring in the vicinity of the **storage tank** and the exterior vent shall be installed in conformance with Subsection 4.1.4., and

(c) the **floor area** in which the **storage tank** is located shall be ventilated in conformance with Subsection 4.1.7.

Vents

4.3.12.8. (1) Except as provided in Sentence (2), normal and emergency vents for **storage tanks** in **buildings** shall be provided in conformance with

(a) Subsections 4.3.4. and 4.3.5. and the applicable requirements in Subsection 4.3.10., or

(b) good engineering practice for emergency venting of **storage tanks** inside **buildings**.

(2) The use of weak roof-to-side shell seams, designed to rupture before the allowable design stress of the **storage tank** is reached, shall not be permitted as a means of emergency venting of **storage tanks** inside **buildings**.

Supports, foundations and anchorage

4.3.12.9. (1) Except as provided in Sentence (2), where **storage tanks** for **flammable** or **combustible liquids** are installed inside **buildings**, the supports, foundations and anchorage for such **storage tanks** shall be in conformance with Subsection 4.3.3.

(2) Where a **storage tank** is suspended, rather than supported on a foundation, supports shall be designed and installed in conformance with good engineering practice.

Bonding and grounding

4.3.12.10. (1) Where **storage tanks** for **flammable** or **combustible liquids** are installed inside **buildings**, tanks, piping and discharge equipment shall be bonded and grounded.

Subsection 4.3.13. Rooms for Storage Tanks

Design and construction

4.3.13.1. (1) Rooms for **storage tanks** inside **buildings** shall be

- (a) separated from the rest of the **building** by a **fire separation** having a **fire-resistance rating** of at least 2 hr,
- (b) designed to contain 100 per cent of the volume of the largest **storage tank**, or to drain away spilled **flammable** or **combustible liquids** in conformance with Subsection 4.1.6.,
- (c) made liquid-tight where the walls join the floor,
- (d) provided with natural or mechanical ventilation in conformance with Subsection 4.1.7., and
- (e) used for no other purposes than the storage and handling of **flammable** or **combustible liquids**.

Clearances

4.3.13.2. A minimum clear space of 550 mm shall be maintained between the walls of a room described in Article 4.3.13.1. and the sides of any **storage tanks** within the room.

Explosion venting

4.3.13.3. Where Class IA or IB liquids are dispensed within a storage room, the room shall be designed to prevent critical structural and mechanical damage from an internal explosion in conformance with NFPA 68, "Guide for Venting of Deflagrations".

Hose stations and portable extinguishers

4.3.13.4. (1) In **buildings** not required to be equipped with a standpipe system by the **Building Code**, hose stations conforming to **Articles 3.2.9.2. to 3.2.9.7. of Ontario Regulation 403/97** (1997 Ontario Building Code) shall be provided in the vicinity of the storage room, such that all parts of the room are within reach of a hose stream.

(2) Portable extinguishers for **Class B fires** shall be provided in conformance with Section 6.2.

Placards

4.3.13.5. (1) Placards conforming to the **Transportation of Dangerous Goods Regulations (Canada)** shall be posted in a conspicuous location outside the room containing **storage tanks**.

(2) Placards shall identify the

- (a) liquids stored as **flammable** or **combustible liquids**, and
- (b) capacities of the **storage tanks**.

(3) Despite Clause 2(a), where storage consists of a single product, placards that identify the liquid using the UN Product Identification Number (PIN) shall be acceptable.

(4) Despite Clause 2(a), where storage consists of multiple products within the same class, placards that identify the class of liquids as per the **Transportation of Dangerous Goods Regulations (Canada)** shall be acceptable.

(5) Despite Clause 2(a), where storage consists of more than one class of liquid, placards that indicate the danger symbol as per the **Transportation of Dangerous Goods Regulations (Canada)** or individual placards for each class of liquid as per the **Transportation of Dangerous Goods Regulations (Canada)** shall be acceptable.

(6) Rooms for **storage tanks** and the information described in Sentence (2) shall be identified in the fire safety plan required in Article 4.1.5.6.

Subsection 4.3.14. Openings Other than Vents in Storage Tanks in Buildings

Connections

4.3.14.1. (1) Connections for all openings in **storage tanks** in **buildings** shall be liquid and vapour-tight.

(2) Connections to **storage tanks** through which liquid can flow shall be provided with valves located as close as practical to the tank.

Openings for liquid level measurement

4.3.14.2. (1) Openings that are independent of the fill pipe and are used for measuring the liquid level in **storage tanks** containing Class I or II liquids shall be equipped with a vapour-tight cap which shall be opened only when measuring the liquid level.

(2) Openings referred to in Sentence (1) shall be protected against overflow and **vapour pressure** by means of a spring-loaded check valve.

Subsection 4.3.15. Leakage Testing of Storage Tanks

Leakage testing

4.3.15.1. (1) Every **storage tank** shall be **tested** for leakage in conformance with Sentences (2) to (4)

(a) whenever a leak is suspected, and

(b) at the time of installation

(i) before backfilling in the case of an underground tank, or

(ii) before filling or putting into service in the case of an aboveground tank.

(2) When a leakage **test** is required by Sentence (1) on an aboveground **storage tank**, it is permitted to determine the source of leakage

(a) by a visual examination of the tank shell, and

(b) where the bottom is not amenable to such examination, by testing the bottom of the tank in conformance with Sentence (3).

(3) Except as provided in Articles 4.3.15.4. and 4.3.15.5., when a leakage **test** is required by Sentence (1) on an underground **storage tank**, it shall be done by qualified personnel using equipment conforming to

(a) ULC/ORD-C58.12, "Leak Detection Devices (Volumetric Type) for Underground Flammable Liquid Storage Tanks", or

(b) ULC/ORD-C58.14, "Nonvolumetric Leak Detection Devices for Underground Flammable Liquid Storage Tanks".

(4) Where field **test** methods are included in the tank construction standards referred to in Articles 4.3.1.2. and 4.3.1.3., such **tests** shall be permitted for **storage tanks** conforming to those standards.

Retention of records

4.3.15.2. Records of **tests** referred to in Article 4.3.15.1. shall be retained for examination by the **Chief Fire Official**, in conformance with Article 1.1.2.1.

Remedial action

4.3.15.3. (1) When a leak is detected in a **storage tank** by a leakage **test** required in this Subsection or by a leakage detection measure required in Subsection 4.3.16.,

(a) the **storage tank** shall

(i) be replaced, in the case of an underground tank, or

(ii) be repaired or replaced in the case of an aboveground tank, and

(b) the escaped liquid shall be removed in conformance with Article 4.1.6.3.

(2) The **Chief Fire Official** shall be notified within 24 hr of detection of a leak referred to in Sentence (1).

Pneumatic leakage tests

4.3.15.4. (1) Pneumatic leakage **tests** shall not be performed on field-erected aboveground **storage tanks**.

(2) Pneumatic leakage **tests** shall not be performed on **storage tanks** with **flammable** or **combustible liquids** in the tanks.

(3) Where a pneumatic leakage **test** is performed on an underground **storage tank**, the tank shall be considered to be leaking when the **test** indicates a pressure drop within a 2 hr period after steady temperature conditions have been established and the source of pressure has been removed.

(4) Pneumatic **test** pressures applied to underground **storage tanks** shall be measured by an instrument calibrated in increments of not more than 1 kPa.

(5) Where a pneumatic leakage **test** is conducted before an underground tank is backfilled in the case of a new tank, or after the tank is uncovered in the case of a previously installed tank, the **test** pressure shall be in conformance with the production **testing** requirements of

(a) CAN/ULC-S603, "Steel Underground Tanks for Flammable and Combustible Liquids", or

(b) CAN4-S615, "Reinforced Plastic Underground Tanks for Petroleum Products".

(6) Where a pneumatic leakage **test** is performed on a completely buried **storage tank**, the **test** pressure shall be not less than 35 and not more than 70 kPa (gauge).

(7) Measures shall be taken to guard against the hazards associated with pneumatic leakage **testing** where explosive mixtures of vapours from **flammable** or **combustible liquids** and air may be present in the area of a tank that has been in use.

Liquid media leakage tests

4.3.15.5. (1) Where a leakage **test** incorporating a liquid **test** medium, including a **flammable** or **combustible liquid**, is performed on an underground **storage tank**, the tank shall be considered to be leaking when, with compensation for volume differentials caused by effects of temperature and tank shell distortion, the **test** indicates a liquid loss.

(2) The pressure at the bottom of a **storage tank** shall not exceed 70 kPa (gauge) during the leakage **test** referred to in Sentence (1).

Subsection 4.3.16. Leakage Detection of Storage Tanks

Liquid level measurements

4.3.16.1. (1) Except as provided in Article 4.3.16.2., the liquid level in any **storage tank** shall be measured at intervals not greater than 7 days in conformance with Sentences (2) to (4), except that at **fuel dispensing stations** the measurements shall be taken each day the station is in operation.

(2) The level of water at the bottom of an underground **storage tank** shall be measured at intervals not greater than 7 days, except that at **fuel dispensing stations** the measurement shall be taken each day the station is in operation.

(3) A comparison of the measurements described in Sentences (1) and (2) with meter readings and a computation of any gain or loss of liquid shall be done each time a required measurement is taken.

(4) A record for each **storage tank** showing the measurements and computations described in Sentence (3) shall be retained for examination by the **Chief Fire Official**, in conformance with Article 1.1.2.1.

Continuous leakage detection

4.3.16.2. (1) The measurements described in Article 4.3.16.1. are not required for an underground **storage tank** when

(a) it is provided with a continuous leakage detection device conforming to

(i) ULC/ORD-C58.12, "Leak Detection Devices (Volumetric Type) for Underground Flammable Liquid Storage Tanks", or

(ii) ULC/ORD-C58.14, "Nonvolumetric Leak Detection Devices for Underground Flammable Liquid Storage Tanks", and

(b) its associated underground piping is provided with continuous leakage detection conforming to Article 4.4.6.7.

Corrective action

4.3.16.3. (1) Immediate corrective action shall be taken in conformance with Subsection 4.3.15. when

(a) a loss of liquid or a gain of water is indicated by any of the leakage detection measures described in Articles 4.3.16.1. and 4.3.16.2., or

(b) the level of water at the bottom of an underground **storage tank** exceeds 50 mm.

SECTION 4.4 PIPING AND TRANSFER SYSTEMS

Subsection 4.4.1. Scope

Application

4.4.1.1. (1) This Section applies to piping and transfer systems for **flammable** and **combustible liquids**.

(2) Except where otherwise stated in this Part, this Section does not apply to

(a) tubing or casings and piping for oil or gas wells,

- (b) piping for vehicles, aircraft, watercraft and portable or stationary engines,
- (c) piping systems in **fuel dispensing stations** and **distilleries**,
- (d) piping systems on piers and wharves, and
- (e) piping within the scope of the applicable provincial boiler and **pressure vessel** codes.

Subsection 4.4.2. Materials for Piping, Valves and Fittings

Materials

4.4.2.1. (1) Materials for piping systems containing **flammable** or **combustible liquids** shall be suitable for the maximum anticipated working pressures and operating temperatures and for the chemical properties of the contained liquid.

(2) Except as provided in Sentence (3), the use of

- (a) materials that are subject to failure from internal stress or rupture by mechanical damage, or
- (b) combustible or low-melting-point materials that are subject to failure in fires

shall not be permitted for piping systems referred to in Sentence (1).

(3) Non-metallic piping systems are permitted to be used for underground installations provided they conform to

- (a) ULC/ORD-C107.7, "Glass Fibre Reinforced Plastic Pipe and Fittings for Flammable Liquids", or
- (b) ULC/ORD-C107.4, "Ducted Flexible Underground Piping Systems for Flammable and Combustible Liquids".

(4) Except as provided in Sentence (5), where steel piping is used, it shall conform to

- (a) API 5L, "Line Pipe",
- (b) ASTM A 53, "Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless", or
- (c) CSA Z245.1, "Steel Line Pipe".

(5) Where service pressures exceeding 875 kPa (gauge) may occur, piping and fittings shall be designed in conformance with ANSI/ASME B31.3, "Chemical Plant and Petroleum Refinery Piping".

Special materials

4.4.2.2. Where problems of corrosion, contamination or sanitation or standards of purity require special materials, it is permitted to use non-metallic materials for piping, valves and fittings in conformance with Article 4.1.1.5.

Subsection 4.4.3. Corrosion Protection of Piping Systems

Corrosion protection

4.4.3.1. (1) Except as provided in Sentence (2), all exposed and underground piping, valves, couplings, flanges and bolts for **flammable** or **combustible liquids** shall be protected where necessary against external corrosion.

(2) Underground steel piping, valves and fittings shall be protected against corrosion in conformance with

(a) CAN/ULC-S603.1, "Galvanic Corrosion Protection Systems for Steel Underground Tanks for Flammable and Combustible Liquids", or

(b) good engineering practice such as described in PACE Report No. 87-1, "Impressed Current Method of Cathodic Protection of Underground Petroleum Storage Tanks", published by the Canadian Petroleum Products Institute.

Subsection 4.4.4. Identification of Piping Systems

Identification

4.4.4.1. (1) Pipelines for **flammable** or **combustible liquids** shall be marked with the contents of the line, and these markings shall be maintained in a clearly legible form.

(2) Piping for **flammable** or **combustible liquids** shall not be painted red.

(3) Transfer points in piping systems for **flammable** and **combustible liquids** shall be identified in conformance with CPPI, "Using the CPPI Colour-Symbol System to Mark Equipment and Vehicles for Product Identification", or to CAN/CGSB-24.3, "Identification of Piping Systems".

Plans

4.4.4.2. (1) Plans showing piping systems for **flammable** or **combustible liquids**, including tank and pumping arrangements, shall be available to the **fire department** on request.

(2) Sets of plans shall be kept at 2 separate locations.

Subsection 4.4.5. Joints in Piping Systems

Threaded joints

4.4.5.1. Threaded joints in piping systems for **flammable** or **combustible liquids** shall be made using joint compound or polytetrafluoroethylene tape conforming to CAN/ULC-S642, "Compounds and Tapes for Threaded Pipe Joints".

Welded piping

4.4.5.2. (1) Welding of piping for **flammable** or **combustible liquids** shall conform to Section 5.17 and to

(a) API 1104, "Welding Pipelines and Related Facilities", or

(b) API RP 1107, "Recommended Pipeline Maintenance Welding Practices".

(2) Flanged joints for piping shall be provided in welded systems at intervals which will facilitate dismantling and avoid subsequent in-place cutting and welding operations.

Flanged joints

4.4.5.3. (1) Except as permitted in Sentence (2), flanged joints for piping shall be made with forged or cast steel flanges designed, constructed and installed in conformance with ANSI/ASME B16.5, "Pipe Flanges and Flanged Fittings".

(2) Bronze flanges for 50 mm diameter or smaller size piping referred to in Article 4.4.5.2. are permitted to be used where copper and brass piping is permitted.

Bolting materials

4.4.5.4. Bolting materials for flanged connections in steel piping systems for **flammable** or **combustible liquids** shall be of alloy steel equivalent to ASTM A 193/A 193M, "Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service", Grade B-7.

Gaskets

4.4.5.5. Gaskets in flanged connections shall be of a material resistant to the liquid being carried and capable of withstanding temperatures of at least 650_C without damage that would impair its function.

Subsection 4.4.6. Leakage Testing of Piping Systems

Leakage testing

4.4.6.1. (1) Piping systems including those at **fuel dispensing stations** shall be **tested** for leakage in conformance with Sentences (2) and (3)

(a) whenever a leak is suspected, and

(b) at the time of installation

(i) before backfilling in the case of underground piping, or

(ii) before putting into service in the case of exposed piping.

(2) Exposed piping systems in service are permitted to be visually **inspected** for leakage in conformance with Article 4.4.11.5.

(3) When exposed piping systems are subjected to a pneumatic leakage **test**,

(a) it shall be in conformance with Article 4.4.6.4., and

(b) the piping, including the joints, shall be soaped to assist in the detection of leaks.

Retention of records

4.4.6.2. Records of the pressure **tests** on piping systems shall be retained for examination by the **Chief Fire Official**, in conformance with Article 1.1.2.1.

Remedial action

4.4.6.3. If a leak is detected in a piping system during the leakage **test**, the piping system shall be repaired or replaced and the escaped liquid shall be removed in conformance with Subsection 4.1.6.

Pneumatic leakage tests

4.4.6.4. (1) Piping systems referred to in Sentence 4.4.6.1.(3) shall be considered to be leaking when the **test** indicates a pressure drop or a volume loss within a 2 hr period after steady temperature conditions have been established and the source of pressure had been removed.

(2) Pressure measurements referred to in Sentence (1) shall be obtained by using instruments calibrated in increments of not more than

(a) 4 kPa for **test** pressures up to 700 kPa (gauge), and

(b) 1 per cent of the **test** pressure where it exceeds 700 kPa (gauge).

Test pressures

4.4.6.5. (1) Except as provided in Sentences (2) and (3) and Article 4.4.6.6., piping systems shall be pressure **tested** at pressures of not less than 350 kPa (gauge) or 1.5 times the maximum operating pressure, whichever is greater.

(2) **Test** pressures exceeding 700 kPa (gauge) shall not be permitted except when the piping system is designed for such pressures.

(3) Where **test** pressures exceed the design pressures for pumps or similar components included in the piping system being **tested**, such pumps or components shall be isolated from the remainder of the system.

Class I liquids as a test medium

4.4.6.6. Class I liquids shall not be used for pressure **testing** piping systems, except that pressure piping normally containing Class I liquids is permitted to be **tested** with such liquids at pressures not exceeding their maximum operating pressures.

Leakage detection

4.4.6.7. When an underground piping system is provided with continuous leakage detection, it shall be in conformance with ULC/ORD-C107.12, "Line Leak Detection Devices for Flammable Liquid Piping".

Subsection 4.4.7. Location and Arrangement of Piping

Location

4.4.7.1. (1) Piping shall be installed outdoors whenever possible and located so it will not create a hazard to **buildings** or equipment.

(2) Where piping for **flammable** or **combustible liquids** is installed within a **building**, the length of piping shall be as direct and as short as practicable.

Supports for aboveground outdoor piping

4.4.7.2. (1) Aboveground outdoor piping shall be supported and arranged to prevent excessive vibration and stress on equipment connected to it.

(2) When vehicular impact or physical damage is possible, protective guarding devices shall be provided for piping referred to in Sentence (1) and for fill pipes for **storage tanks**.

Arrangement of aboveground outdoor piping

4.4.7.3. (1) Aboveground outdoor piping shall not be located

(a) on the exterior of walls except on those of **noncombustible construction**, or

(b) above windows and doors.

(2) Aboveground outdoor piping shall not be located above roofs except above roofs of impermeable and **noncombustible construction**, with provision for accidental spillage provided in conformance with Subsection 4.1.6.

(3) Where aboveground piping crosses roadways or railway sidings, ample overhead clearance and warning signs indicating the clearance height shall be provided.

(4) Piping passing through secondary containment walls shall be designed to prevent excessive stress resulting from settlement or fire exposure.

Underground piping

4.4.7.4. (1) Underground piping shall be located so it will not be damaged as a result of vibrations or settling of an adjacent **building** or structure.

(2) Underground piping shall be located not less than 300 mm away from the foundations of any **building** or structure, except where such piping enters the **building** as permitted in Article 4.4.7.7.

(3) Piping passing under railway tracks shall be installed in conformance with CTC 1977-3 RAIL, **Pipe Crossings Under Railways (No. E-10) Regulations**, of Transport Canada.

(4) Piping adjacent to railway tracks shall be installed in conformance with General Order No. O-32, **Flammable Liquids Bulk Storage Regulations**, of Transport Canada.

Installation of underground piping

4.4.7.5. (1) Underground piping shall be

(a) supported on undisturbed or compacted soil, and

(b) backfilled on the top and sides with not less than

(i) 300 mm of pea gravel or clean crushed stone, or

(ii) 300 mm of clean sand, free of cinders and stones and compacted in layers not more than 300 mm thick.

(2) Where it is not practicable to support piping as required in Sentence (1) on undisturbed soil, it shall be supported on not less than 150 mm of clean sand, pea gravel or washed, crushed stone.

Piping in service tunnels

4.4.7.6. Piping for **flammable** or **combustible liquids** shall not be located in service tunnels that are used for pedestrian traffic.

Piping at entrances to buildings

4.4.7.7. (1) Piping for **flammable** or **combustible liquids** shall be located aboveground where the piping enters a **building**.

(2) Piping referred to in Sentence (1) shall be provided with inside and outside shut-off valves.

(3) Where piping referred to in Sentence (1) passes through a wall which would restrict the expansion or contraction of the piping, pipe sleeves shall be provided at the wall penetration to facilitate such movement.

Indoor piping

4.4.7.8. (1) Indoor piping for **flammable** or **combustible liquids** shall either be supported overhead or be located in trenches conforming to Article 4.4.7.9.

(2) Piping referred to in Sentence (1) shall not be installed under combustible flooring.

Piping in trenches

4.4.7.9. (1) Where indoor piping for **flammable** or **combustible liquids** is installed in trenches, a trapped drainage system conforming to Subsection 4.1.6. shall be provided.

(2) When piping referred to in Sentence (1) contains Class I liquids, the trench shall be

(a) provided with positive ventilation to the outdoors, or

(b) designed to prevent the accumulation of flammable vapours.

Overhead piping

4.4.7.10. (1) Overhead piping for **flammable** or **combustible liquids** shall be installed close to the ceiling or beams or along wall not less than 1.8 m above the floor to protect it against mechanical damage.

(2) Where practical, overhead piping referred to in Sentence (1) shall be supported from **building** framing members.

(3) In **buildings** of steel frame construction, piping referred to in Sentence (1) shall be fastened to steel beams or columns by pipe hangers attached to the flanges.

(4) Piping under concrete ceilings shall be suspended with the use of through bolts or expansion shields.

Supports for overhead piping

4.4.7.11. (1) Piping shall be supported on pipe hangers or other supports so that allowable stresses in the pipe are not exceeded.

(2) Anchors of the expansion shield type used to suspend piping shall not be used to suspend piping from unsound or lightweight concrete or from gypsum assemblies.

Protection of pipe risers

4.4.7.12. (1) Exposed pipe risers shall be protected against mechanical damage by

- (a) installing such risers
 - (i) adjacent to walls or pilasters,
 - (ii) between flanges of steel columns, or
 - (iii) within securely anchored larger perforated pipe, and
- (b) providing mechanical guards where the risers are exposed to mobile equipment.

Provision for expansion and contraction

4.4.7.13. (1) In the design of **flammable** or **combustible liquid** piping systems, provision shall be made for thermal expansion and contraction.

(2) Flexible hose connectors conforming to CAN/ULC-S633, "Flexible Underground Hose Connectors for Flammable and Combustible Liquids", are permitted to be used where necessary in systems carrying **flammable** or **combustible liquids** to prevent excessive stresses resulting from vibration, settling or temperature changes.

Subsection 4.4.8. Valves in Piping Systems

Design

4.4.8.1. (1) Except as provided in Sentences (2), (3) and (4), valves in piping systems for **flammable** or **combustible liquids** shall be designed to accommodate the temperatures and pressures of those systems and shall conform to ULC-C842, "Valves for Flammable and Combustible Liquids".

(2) Every hose nozzle valve shall conform to CAN/ULC-S620, "Hose Nozzle Valves for Flammable and Combustible Liquids".

(3) Every emergency valve shall conform to CAN/ULC-S651, "Emergency Valves for Flammable and Combustible Liquids".

(4) Existing valves shall be deemed to comply with Sentences (1), (2) and (3), provided they are

- (a) not leaking, and
- (b) constructed of material that is in conformance with Article 4.4.2.1.

Shut-off valves

4.4.8.2. (1) Shut-off valves shall be provided in all **flammable** or **combustible liquid** piping and pumping systems.

(2) Where practical, valves referred to in Sentence (1) shall be located outdoors or be immediately accessible from outdoors.

(3) Except as permitted in Sentence (4), steel shut-off valves shall be provided

(a) at connections to all aboveground **storage tanks**,

(b) on supply piping where it enters **buildings** or structures,

(c) on branch lines from the main supply line,

(d) on supply lines at dispensing locations, and

(e) to isolate one part of a piping system from another.

(4) Stainless steel, monel metal or lined steel bodied valves are permitted to be used when special conditions warrant their use.

Diaphragm valves

4.4.8.3. Diaphragm valves shall have no direct connections between the liquid and air sections that might permit leakage of the liquid past the packing into the air lines.

Globe valves

4.4.8.4. Globe valves shall be arranged so that the packing is on the low pressure side.

Indicating valves

4.4.8.5. Rising stem or other indicating valves shall be used where necessary to determine whether the valves are open or shut.

Meters

4.4.8.6. Where cast iron meters are used, they shall be isolated by the use of steel valves.

Identification

4.4.8.7. (1) All valves shall be identified in conformance with CPPI, "Using the CPPI Colour-Symbol System to Mark Equipment and Vehicles for Product Identification", or to CAN/CGSB-24.3-92, "Identification of Piping Systems".

(2) Every identification tag shall be kept clean so that its colour and inscription are easily recognizable.

Subsection 4.4.9. Heating of Piping Systems

Design

4.4.9.1. Heating equipment for piping systems containing **flammable** or **combustible liquids** shall be designed not to overheat or create an ignition source for the liquids being heated.

Steam heating

4.4.9.2. (1) **Flammable** and **combustible liquid** piping is permitted to be heated by steam lines provided the minimum steam temperature and pressure to make the liquid fluid are used and Sentences (2) and (3) are complied with.

(2) A pressure regulator shall be provided in the steam line with a relief valve on the downstream side of the regulator.

(3) Piping and steam lines shall be enclosed in insulation conforming to the **Building Code**.

Electrical heating cables

4.4.9.3. Electrical heating cables including electrical induction heating, shall conform to Subsection 4.1.4.

Thermal electrical conduction heating

4.4.9.4. (1) Thermal electrical conduction heating conforming to Sentence (2) is permitted to be used by passing a low-voltage alternating current through the pipe.

(2) Systems permitted in Sentence (1) shall be installed and **tested** as complete units and

(a) unheated sections of piping shall be isolated from heated sections by means of nonconductive fittings,

(b) thermostatic controls, high temperature limit controls and fuses shall have the lowest practical rating to ensure satisfactory operation,

(c) all parts of the piping and fittings shall be enclosed by insulating coverings of a type which will prevent accidental grounding of the systems, and

(d) switches, transformers, contactors and other spark-producing equipment shall be located in an area not subject to flammable vapours.

(3) Upon completion of the installation, systems permitted in Sentence (1) shall be **tested** to ensure that all components are functioning as intended.

Open flames

4.4.9.5. (1) Except as permitted in Sentence (2), the use of open flames as a heat source shall not be permitted for heating piping for **flammable** or **combustible** liquids.

(2) Use of open flames shall be permitted for heating piping for **flammable** or **combustible liquids**, when such operations are carried out in furnaces or ovens conforming to NFPA 86, "Ovens and Furnaces".

Subsection 4.4.10. Methods of Transfer in Piping Systems

Location of outdoor pumps

4.4.10.1. (1) Pumps for **flammable** or **combustible liquid** piping systems installed aboveground and outside of **buildings** shall be located not less than

(a) 3 m from the property line, and

(b) 1.5 m from **building** openings.

Pump houses and pump rooms

4.4.10.2. (1) Pumps located indoors shall be in rooms that conform to Subsection 4.2.9.

(2) Pump houses and pump rooms shall not be used for any purpose other than to serve the pumping equipment.

Pits

4.4.10.3. (1) Pits for subsurface pumps for piping systems or for piping connected to submersible pumps shall be designed to withstand the forces to which they may be subjected without causing damage to the system.

(2) Pits provided in conformance with Sentence (1) shall not be larger than necessary for inspection and maintenance and shall be provided with a cover.

Control switches

4.4.10.4. Pumps for piping systems shall be provided with duplicate control switches to shut down the pumps in case of emergency, with one located in the operating area and the other at a remote location.

Hydraulic transfer systems

4.4.10.5. (1) Where **flammable** or **combustible liquids** are transferred by water pressure as a result of displacement, such system shall not be used for liquids that are miscible in water.

(2) All **pressure vessels** for hydraulic transfer systems referred to in Sentence (1) shall be constructed, installed and tested in conformance with ANSI/ASME, "Boiler and Pressure Vessel Code".

(3) Hydraulic transfer systems referred to in Sentence (1) shall be designed to prevent water pressure in excess of the design pressure of the tank or piping.

(4) Operating pressures shall be controlled by a constant-level float valve or a pressure regulating valve on the water supply side of the hydraulic transfer system referred to in Sentence (1).

(5) Hydraulic transfer systems referred to in Sentence (1) shall be arranged so that there is no water pressure on the system except when liquid is being discharged.

(6) Check valves shall be provided for both water and **flammable** or **combustible liquid** piping to prevent back-flow in hydraulic transfer systems referred to in Sentence (1).

Inert gas transfer systems

4.4.10.6. (1) Where **flammable** or **combustible liquids** are transferred as a result of displacement by the expansion of nitrogen, carbon dioxide or other inert gases, all **pressure vessels** involved shall be constructed, installed and tested in conformance with ANSI/ASME, "Boiler and Pressure Vessel Code".

(2) Pressure regulators for inert gas transfer systems referred to in Sentence (1) shall be provided in the gas line to control the pressure of the gas at the minimum pressure required to force the liquid through the piping system at the required rate.

(3) A relief valve with a slightly higher setting than the pressure required in Sentence (2) shall be provided on the downstream side of the regulator or on the tank.

(4) Means of automatically shutting off the gas supply and bleeding the gas pressure in the event of fire shall be provided on all inert gas transfer systems referred to in Sentence (1).

Non-inert gas transfer

4.4.10.7. (1) Except as permitted in Sentence (2), the transfer of **flammable** or **combustible liquids** in a closed piping system by means of compressed air or other non-inert gas pressure shall not be permitted.

(2) A non-inert gas pressure is permitted to be used in a closed piping system referred to in Sentence (1) provided

(a) it is the vapour or gas of the **flammable** or **combustible liquid** being transferred, or

(b) it is a vapour or gas that will not support combustion reaction and is non-reactive with the **flammable** or **combustible liquid** being transferred.

Subsection 4.4.11. Operating Procedures for Piping Systems

Procedures

4.4.11.1. Standard procedures for normal operations and for emergencies shall be given in printed form to all employees engaged in the operation of equipment for the transfer of **flammable** and **combustible liquids** and shall be posted or readily available for convenient reference.

Training

4.4.11.2. (1) All employees concerned with transfer operations involving **flammable** or **combustible liquids** shall be trained in

(a) the emergency procedures referred to in Article 4.4.11.1.,

(b) the importance of constant attendance during all loading or unloading operations,

(c) extinguishing procedures for fires involving **flammable** and **combustible liquids**, and

(d) the **flammable** and **combustible liquid** colour coding and identification system required in Article 4.4.8.7.

(2) Employees engaged in the operation of equipment for the transfer of **flammable** or **combustible liquids** shall be trained in the location, function and operation of valves used for the operation of fire protection equipment and manual emergency shut-off valves.

Emergency valves

4.4.11.3. Signs indicating the location of valves used for the operation of fire protection equipment and manual emergency shut-off valves shall be posted in conspicuous locations.

Portable extinguishers

4.4.11.4. One 80BC rated portable extinguisher or two 40BC units or four 20BC units shall be provided in the vicinity of pumps and ancillary equipment used for the transfer of **flammable** or **combustible liquids**.

Visual inspections

4.4.11.5. (1) A visual **inspection** routine for the prompt detection of obviously abnormal conditions shall be established and shall be performed at least once each shift.

(2) A visual **inspection** shall be made at least once during each day of operation of all aboveground piping systems, pumps and other ancillary equipment, to detect leakage, and any such leakage shall be repaired as quickly as practical.

(3) Where necessary, flammable vapour indicators shall be used to detect leakage.

(4) Open flames and spark-producing devices shall not be used for leakage detection referred to in Sentence (2).

Operational tests

4.4.11.6. To ensure proper operation, frequent **inspections** and **tests** shall be made of all safety shut-off valves and other fire safety devices, with particular attention directed to normally open, fusible-link operated valves, float valves and automatic controls.

Maintenance

4.4.11.7. (1) Except as provided in Sentence (6), maintenance shall not be carried out on piping systems while they are under pressure.

(2) If connections or piping are to be opened, the system shall be drained of flammable and combustible liquids.

(3) Where equipment for handling flammable or combustible liquids has to be repaired, it shall be removed and taken to maintenance areas when possible.

(4) Tags shall be attached to all valves on piping systems that are shut off for maintenance purposes to indicate that such valves are not to be opened.

(5) Piping that has been used for the transfer of flammable or combustible liquids shall be removed or capped when it is no longer intended to be used.

(6) Connections to pressurized piping systems shall be made in conformance with good practice such as described in

(a) API RP 1107, "Recommended Pipeline Maintenance Welding Practices",

(b) API 2200, "Repairs to Crude Oil, Liquefied Petroleum Gas and Products Pipelines", or

(c) API 2201, "Welding or Hot Tapping on Equipment Containing Flammables".

SECTION 4.5 FUEL DISPENSING STATIONS

Subsection 4.5.1. Scope

Application

4.5.1.1. (1) This Section applies to the storage, handling and use of **flammable** and **combustible liquids** at **fuel dispensing stations** except for any property or facility regulated by the **Gasoline Handling Act**.

(2) Except as provided in this Section, the storage and dispensing of Class 2.1 flammable gases at **fuel dispensing stations** shall conform to

(a) Fuels Safety Branch Standard CNG No 1, "Compressed Natural Gas Storage, Handling and Utilization", Nov 20, 1990, and

(b) the **Propane Storage, Handling and Utilization Code** made under the **Energy Act**.

Subsection 4.5.2. Storage and Handling

Outside aboveground storage tanks

4.5.2.1. (1) Except as provided in Sentences (2) and (3), the installation of outside aboveground **storage tanks** at **fuel dispensing stations** shall be in conformance with Subsection 4.3.2.

(2) Outside aboveground **storage tanks** at **fuel dispensing stations** shall have an individual capacity of not more than 50000 L, and their aggregate capacity shall not exceed 150000 L.

(3) Outside aboveground **storage tanks** at **fuel dispensing stations** shall be provided with

(a) physical protection against collision damage,

(b) measures to prevent unauthorized access to the **storage tank** and its ancillary equipment, and

(c) measures to contain accidental spillage in conformance with Subsection 4.3.7.

Class I liquids in buildings

4.5.2.2. (1) Except as provided in Sentence 4.1.8.4.(2), Class I liquids shall not be stored or handled within a **fuel dispensing station** unless the **building** conforms to Subsection 4.2.9.

(2) Class I liquids shall not be stored or handled within any **building** having a **basement**, cellar or pit in which flammable vapours may accumulate.

(3) Facilities for the dispensing of Class I liquid fuels shall not be installed

(a) above any space intended for **occupancy**, or,

(b) in any **building**, except that this requirement does not apply to a canopy which is open on not less than 75 per cent of its perimeter.

Storage tanks in buildings

4.5.2.3. (1) Where Class IIIA liquids are stored and dispensed inside **buildings** from **storage tanks**, the individual tanks shall have a capacity of not more than 2500 L and the aggregate capacity of all the tanks shall not exceed 10000 L.

(2) All fill pipes, vent piping and valves associated with the **storage tanks** referred to in Sentence (1) shall

(a) conform to Subsections 4.3.5. and 4.3.6., and

(b) be permanently marked to indicate the liquid in each tank and the equipment controlled by the valves.

Marine fuel dispensing stations

4.5.2.4. Dispensers at marine **fuel dispensing stations** shall be at a location which will permit safe access by watercraft.

Containers

4.5.2.5. (1) All packaged **flammable** and **combustible liquid** products stored or sold at a **fuel dispensing station** shall be in **closed containers** conforming to Article 4.2.3.1. and distinctly marked with the generic name of the liquid they contain.

(2) At **fuel dispensing stations**, every container for dispensing **flammable** or **combustible liquids** shall be kept tightly closed when disconnected from its pumping apparatus.

(3) Every container referred to in Sentence (2) that is equipped with a pump shall have a vapour-tight connection between the pump and the container.

Empty containers

4.5.2.6. The storage of empty containers which previously contained **flammable** or **combustible liquids** shall conform to Sentences 4.5.2.2.(1) and (2) and 4.5.2.5.(2).

Filling of containers

4.5.2.7. Containers shall not be filled beyond their safe filling level.

Piping

4.5.2.8. All piping for **flammable** or **combustible liquids** at a **fuel dispensing station** shall be in conformance with Article 4.4.2.1.

Corrosion protection for piping

4.5.2.9. All piping, valves and fittings at a **fuel dispensing station** shall be protected against corrosion in conformance with Article 4.4.3.1.

Piping supports and guards

4.5.2.10. Piping shall be firmly supported and protected by installing guards when necessary to prevent vehicle impact or other mechanical damage.

Pits

4.5.2.11. Pits for subsurface pumps or for piping connected to submersed pumps shall conform to Article 4.4.10.3.

Subsection 4.5.3. Dispensing Systems

Dispensers

4.5.3.1. Fixed dispensers for **flammable** or **combustible liquids** shall conform to CSA-B346, "Power-Operated Dispensing Devices for Flammable Liquids".

Location

4.5.3.2. (1) Fixed dispensers for Class I liquids shall be installed outside **buildings** and not less than

(a) 3 m from any right-of-way and any property line,

(b) 3 m from any propane gas dispenser,

(c) 1.5 m from any natural gas dispenser,

(d) 6 m horizontally from any fixed source of ignition, and

(e) 3 m from any **building** opening, except those openings in **buildings** for the shelter of operating personnel in which electrical installations conform to Article 4.1.4.1.

(2) Fixed dispensers for Class II or IIIA liquids are permitted to be installed inside a **building** where

(a) the **building** is not open to public,

(b) the dispensers are located on the **first storey**,

(c) drainage is provided in conformance with Subsection 4.1.6., and

(d) ventilation is provided in conformance with Subsection 4.1.7. and with the requirements for storage garages in Part 6 of the **Building Code**.

Protection against collision damage

4.5.3.3. (1) Fixed dispensers shall be protected against collision damage by

- (a) a concrete island not less than 100 mm high, or
- (b) posts or guardrails.

Subsection 4.5.4. Shut-Off Devices

Location and identification

4.5.4.1. (1) Devices to shut off the power to all dispensers shall be provided at a remote location or shielded from any fire that might occur in the dispensing area.

(2) The shut-off devices required in Sentence (1) shall be clearly identified and easily accessible.

Self service outlets

4.5.4.2. (1) Except as provided in Sentence (2), an emergency shut-off switch to stop all dispensers at **self-service outlets** shall be located at the central control console described in Sentence 4.5.8.2.(2) so that it is readily accessible to the attendant.

(2) At card or key activated **self-service outlets**, the emergency shut-off switch required in Sentence (1) shall be readily accessible to the customer.

Marine fuel dispensing stations

4.5.4.3. At marine **fuel dispensing stations**, a readily accessible valve shall be provided in each pipeline at or within 7.5 m of the pier to shut off the supply from shore.

Subsection 4.5.5. Delivery Hose and Nozzles

Delivery hose

4.5.5.1. (1) Delivery hose shall conform to CAN/ULC-S612, "Hose for Flammable and Combustible Liquids".

(2) Except as permitted in Sentences (3) and (4), hose through which **flammable** or **combustible liquids** are dispensed at a **fuel dispensing station** shall be restricted to a maximum extended length of 4.5 m.

(3) Where a retracting mechanism is used, a maximum extended length of 6 m shall be permitted.

(4) At marine **fuel dispensing stations** or at card or key activated dispensers, the length of extended hose is permitted to exceed the values in Sentences (2) and (3).

Hose nozzle valves

4.5.5.2. (1) Every hose nozzle valve through which a Class I or II liquid is dispensed by a motorized dispenser into a vehicle tank shall

(a) be automatic closing as required in Sentence (2), and

(b) conform to CAN/ULC-S620, "Hose Nozzle Valves for Flammable and Combustible Liquids".

(2) Except as provided in Sentence (3) to (5), a hose nozzle valve shall be constructed so that the valve

(a) can be kept open only by the continuous application of manual pressure, or

(b) is equipped with a hold-open device that is an integral part of the nozzle which will

(i) allow automatic dispensing,

(ii) automatically shut off when the vehicle tank is filled, and

(iii) shut off if the nozzle is dropped or falls from the fill pipe.

(3) A hose nozzle valve at a marine **fuel dispensing station** shall be of the type without a hold-open device, in conformance with Clause (2)(a).

(4) When a hose nozzle valve with a hold-open device is used at an attended **self-service outlet**, a break-away coupling conforming to CAN/ULC-S644, "Emergency Breakaway Fittings for Flammable and Combustible Liquids", shall be provided.

(5) When the flow of liquid can be stopped other than by the hose nozzle valve, a hose nozzle valve with a hold-open device is permitted to be used only if it is provided with a device that will automatically close the hose nozzle valve upon a drop of pressure in the dispensing hose.

Subsection 4.5.6. Remote Pumping Systems

Application

4.5.6.1. This Subsection applies to systems for dispensing **flammable** or **combustible liquids** where such liquids are transferred from bulk storage to individual or multiple dispensers by pumps located elsewhere than at the dispensers.

Pumps and control equipment

4.5.6.2. (1) Pumps, including associated control equipment, shall be designed so that the system will not be subject to pressures above the design working pressure.

(2) Pumps shall be securely anchored and protected against damage from vehicles.

Emergency valves

4.5.6.3. (1) An emergency valve conforming to CAN/ULC-S651, "Emergency Valves for Flammable and Combustible Liquids", shall be installed in the supply line so that the shear point of the valve is at a level not higher than the base of the dispenser nor more than 25 mm below it.

(2) The emergency valve required in Sentence (1) shall be maintained in operating condition and serviced at intervals not greater than 12 months.

Pump location

4.5.6.4. (1) Pumps installed aboveground and outside **buildings** shall be located not less than

(a) 3 m from any property line, and

(b) 1.5 m from any **building** opening.

(2) When an outside pump location is impractical, pumps are permitted to be installed inside **buildings** as provided in Article 4.5.2.2. or in pits as provided in Article 4.5.2.11.

Leakage testing

4.5.6.5. After the completion of the installation, including paving, all underground piping connected to tanks shall be **tested** for leakage in conformance with Subsection 4.4.6.

Marine fuel dispensing stations

4.5.6.6. (1) Except as permitted in Sentence (2), tanks and pumps not integral with the dispenser at marine **fuel dispensing stations** shall be located on the shore or on a pier of the solid-fill type.

(2) Where shore locations would result in excessively long supply lines to the dispenser, **storage tanks** are permitted to be installed on a pier provided that

(a) the applicable portions of Subsection 4.3.7. relating to spacing, secondary containment and piping are complied with, and

(b) the quantity stored does not exceed 5000 L aggregate capacity.

(3) No **storage tank** at a marine **fuel dispensing station** shall be located closer than 4.5 m horizontally from the normal annual high-water mark.

(4) **Storage tanks** located on shore and supplying marine **fuel dispensing stations** are permitted to be located aboveground where rock or a high water table make underground tanks impractical.

(5) Where **storage tanks** at a marine **fuel dispensing station** are at an elevation above the dispenser, an electrically operated solenoid valve, designed to open only when the dispenser is being operated, and to prevent gravity draining of the tank in the event of a rupture of the supply line to the dispenser, shall be provided at the **storage tank** outlet, positioned adjacent to and outside the valve specified in Article 4.3.6.1.

(6) Piping between **storage tanks** located on shore and dispensers at a marine **fuel dispensing station** shall conform to Section 4.4, except that where dispensing is from a floating structure, it is permitted to use suitable lengths of flexible hose designed in conformance with good engineering practice between the piping on shore and the piping on the floating structure.

Subsection 4.5.7. Spill Control

Spill control

4.5.7.1. Areas where **flammable** or **combustible liquids** are dispensed shall be designed to accommodate accidental spillage in conformance with Subsection 4.1.6.

Subsection 4.5.8. Supervision and Dispensing Procedures

Attendants

4.5.8.1. (1) Except as provided in Sentence (2), every **fuel dispensing station** shall have at least one attendant on duty when the station is open for business.

(2) **Fuel dispensing stations** which do not serve the general public do not require an attendant.

(3) Except as permitted at **self-service outlets**, a qualified attendant shall be in constant control of the dispensing of Class I and II liquids into the fuel tanks of motor vehicles or watercraft or into containers.

(4) Duties of attendants and fuel dispensing procedures, as stated in Articles 4.5.8.5. and 4.5.8.6., shall be posted at every **fuel dispensing station**.

Self-service outlets

4.5.8.2. (1) Instructions for the operation of dispensers in **self-service outlets** shall be posted in a conspicuous location.

(2) A control console shall be provided at **self-service outlets** within 25 m of all dispensers so that the attendant has an unobstructed view of all units at the same time.

(3) The control console referred to in Sentence (2) shall be equipped to regulate the operation of each dispenser.

(4) A 2-way communication system between the control console and each pump island shall be provided at **self-service outlets**.

(5) At **fuel dispensing stations** which provide both attended service and self-service, the attendant required in Sentence 4.5.8.1.(1) is permitted to dispense **flammable** or **combustible liquids** at the attended service island, provided that

(a) each island has an emergency shut-off switch as described in Article 4.5.4.2., and

(b) the attendant is never more than 25 m from the self-service island or control console.

Special dispensers

4.5.8.3. Except as provided in Article 4.5.8.4. for card or key activated equipment, special dispensers including coin operated, card operated and preset units, shall not be permitted at **self-service outlets** unless there is at least one qualified attendant on duty for each 12 hoses which can be operated simultaneously while the outlet is open to the public.

Card or key activated dispensers

4.5.8.4. (1) Card or key activated dispensers are permitted at unattended **self-service outlets** and **fuel dispensing stations** that are not open to the general public, in conformance with Sentences (2) to (6).

(2) Except as provided in Sentences (3) to (6), installation of card or key activated dispensers shall conform to the requirements for **self-service outlets** and **fuel dispensing stations** in this Section.

(3) Access to card or key activated dispensers shall be restricted to persons authorized by the supply agent to possess a card or key to operate the dispensers.

(4) Clearly legible operating instructions, visible at all times, shall be posted at every dispenser island.

(5) A telephone or other clearly identified means to notify the **fire department** shall be provided in a location readily accessible to the user.

(6) Emergency instructions, including the telephone number for the local **fire department**, shall be conspicuously posted to advise the user, in the event of a spill or accident,

(a) to use the emergency shut-off switch required in Article 4.5.4.2., and

(b) to call the **fire department**.

Duties of attendants

4.5.8.5. (1) Attendants on duty at **fuel dispensing stations** shall

- (a) supervise the dispensing of **flammable** and **combustible liquids**,
- (b) activate the controls to permit the dispensing of fuel at an individual dispenser only after the customer at the unit is ready to activate the nozzle,
- (c) prevent the dispensing of **flammable** and **combustible liquids** into containers not conforming to Article 4.2.3.1.,
- (d) take appropriate measures to prevent sources of ignition from creating a hazard at the dispensers,
- (e) take appropriate action in the event of a spill to reduce the risk of fire, and
- (f) shut off the power to all dispensers in the event of a spill or fire.

(2) In addition to the requirements in Sentence (1), attendants on duty at marine **fuel dispensing stations** shall

- (a) activate the controls to permit the dispensing of fuel at an individual dispenser only after all ports and hatches on the watercraft have been closed, and
- (b) ensure that containers for **flammable** and **combustible liquids**,
 - (i) are not filled beyond their safe filling level, and
 - (ii) are filled only after they have been removed from the watercraft.

Fuel dispensing procedures

4.5.8.6. (1) Except as provided in Sentence (2), **flammable** and **combustible liquids** shall not be dispensed into the fuel tank of a motor vehicle or watercraft while its engine is running.

(2) It is permitted to dispense a Class II or IIIA liquid into the fuel tank of a motor vehicle while its engine is running provided it is dispensed not less than 6 m away from any Class I liquid dispenser.

(3) Class I and II liquids shall not be dispensed at a **fuel dispensing station** into the fuel tank of a motor vehicle while any part of the motor vehicle or any vehicle attached to it is on a **street**.

(4) Every person dispensing **flammable** and **combustible liquids** shall

- (a) take precautions to prevent overflow or spillage of the liquid being dispensed,

- (b) not knowingly overfill the fuel system,
- (c) subject to Article 4.5.8.5., in the event of spillage immediately apply an absorbent material to soak up the spillage in conformance with Article 4.1.6.3.,
- (d) not dispense Class I or II liquids in proximity to open sources of ignition, and
- (e) not use any object or device that is not an integral part of the hose nozzle valve assembly to maintain the flow of fuel.

Sources of ignition

4.5.8.7. Smoking or any other source of ignition shall not be permitted within 3 m of a dispenser at a **fuel dispensing station**.

Signs

4.5.8.8. (1) At least one weather-resistant sign conforming to Sentences (2) to (4) shall be provided for each dispenser in a location visible to every driver approaching the dispenser.

(2) The sign required in Sentence (1) shall indicate that smoking is not permitted in the vicinity of the dispenser and that the ignition must be turned off while the vehicle is being refueled.

(3) The sign required in Sentence (1) shall

(a) have a minimum dimension of 200 mm, and

(b) except as permitted in Sentence (4), have letters not less than 25 mm high.

(4) The sign required in Sentence (1) is permitted to display the international "No Smoking - Ignition Off" symbol not less than 100 mm in diameter.

Subsection 4.5.9. Leakage Detection

Liquid level measurement

4.5.9.1. The liquid level in **storage tanks** at **fuel dispensing stations** shall be measured in conformance with Subsection 4.3.16.

Subsection 4.5.10. Fire Prevention and Protection

Portable extinguishers

4.5.10.1. At least 2 portable extinguishers, each having a rating of not less than 10BC, shall be provided at every **fuel dispensing station** in conformance with Section 6.2.

Absorbent materials

4.5.10.2. Absorbent material to soak up liquid spillage shall be provided for use by attendants at **fuel dispensing stations** in conformance with Article 4.1.6.3.

SECTION 4.6 BULK PLANTS

Subsection 4.6.1. Scope

Application

4.6.1.1. This Section applies to that portion of a property where **flammable** or **combustible liquids** are received in bulk quantities and are stored or handled for the purpose of being distributed.

Subsection 4.6.2. Storage

Storage

4.6.2.1. (1) **Flammable** and **combustible liquids** shall be stored in

(a) **closed containers** in conformance with Article 4.6.2.4., or

(b) **storage tanks** located outside **buildings** in conformance with Section 4.3

Storage tanks

4.6.2.2. At bulk plant rail loading and unloading facilities, the minimum distance from a **storage tank** to a railway line shall be in conformance with General Order No. O-32, **Flammable Liquids Bulk Storage Regulations**, of Transport Canada.

Shock pressure

4.6.2.3. Bulk **storage tanks**, piping, pumps, valves and associated components shall be designed, installed and maintained to accommodate shock pressure on the system.

Container storage

4.6.2.4. (1) Containers for **flammable** or **combustible liquids** stored indoors shall be arranged in conformance with Subsection 4.2.7.

(2) Containers for **flammable** or **combustible liquids** stored outdoors shall be stored in conformance with Subsection 4.2.11., except that the distance between the piles and property lines and the distance between piles need not apply when the containers are stored in an area that does not present a hazard to neighbouring property.

Spill control

4.6.2.5. An outdoor storage area shall be designed to accommodate accidental spillage in conformance with Subsection 4.1.6.

Fencing

4.6.2.6. (1) An outdoor area used for aboveground **storage tanks**, container storage, ancillary equipment and unloading facilities for **flammable** or **combustible liquids** shall be surrounded by a firmly anchored fence that is

- (a) substantially constructed to discourage climbing and unauthorized entry,
- (b) not less than 1.8 m high, and
- (c) provided with gates that shall be locked when the storage area is not staffed.

Subsection 4.6.3. Dispensing

Interconnection

4.6.3.1. Dispensing systems for Class I liquids shall not be interconnected with dispensing systems for Class II and IIIA liquids.

Dispensing into vehicles

4.6.3.2. (1) Dispensers serving the general public for dispensing Class I liquids into fuel tanks of vehicles shall not be located at a bulk plant unless separated by a fence or equivalent barrier from the area in which the bulk storage operations are conducted.

- (2) Where a dispenser referred to in Sentence (1) is supplied from an aboveground **storage tank**,
 - (a) an electrically-operated solenoid valve, designed to open only when the dispenser is being operated, shall be provided at the tank outlet, and
 - (b) an emergency valve shall be provided for the dispenser in conformance with Sentence 4.5.6.3.(1).

Dispensing and transfer inside buildings

4.6.3.3. Class I liquids shall be dispensed or transferred inside **buildings** only in conformance with Subsections 4.1.7. and 4.1.8.

Dispensing into metal containers or tanks

4.6.3.4. Class I liquids shall not be dispensed into a metal container or **storage tank** unless it is electrically connected in conformance with Article 4.1.8.2.

Subsection 4.6.4. Loading and Unloading Facilities

Clearances

4.6.4.1. (1) At a loading or unloading facility for **tank vehicles** or tank cars, the horizontal distance from the fill stem to an aboveground **storage tank**, a **building** or a property line shall be not less than

(a) 7.5 m for Class I liquids, and

(b) 4.5 m for Class II and IIIA liquids.

(2) At bulk plant rail loading and unloading facilities, the minimum distance from a loading structure to a railway line shall be in conformance with General Order No. O-32, **Flammable Liquids Bulk Storage Regulations**, of Transport Canada.

(3) **Buildings** for the shelter of personnel or pumps shall be considered a part of the loading or unloading facility.

Multi-purpose facilities

4.6.4.2. When piping and pumping systems have been used for the transfer of either **flammable** or **combustible liquids** at loading or unloading facilities, the system shall be cleaned of vapours before the other class of liquid is introduced.

Backflow preventers

4.6.4.3. (1) Systems through which tank cars or **tank vehicles** discharge into **storage tanks** by means of a pump shall be provided with backflow preventers located to prevent spills and inadvertent mixing of liquids.

(2) Systems referred to in Sentence (1) shall be designed, installed and maintained to prevent leakage or spillage.

Control valves

4.6.4.4. (1) Valves installed to control the filling of **tank vehicles** shall be of the self-closing type when used for Class I or II liquids.

(2) Control valves referred to in Sentence (1) shall be held open manually, except where automatic devices are provided for shutting off the flow when the vehicle is full or filled to a preset amount.

Bonding and grounding

4.6.4.5. (1) Bonding, grounding and isolation components for protection against static charges during the loading of **tank vehicles** or tank cars shall be provided when transferring **flammable** or **combustible liquids**.

(2) Where **flammable** or **combustible liquids** are transferred into railway tank cars, railway tracks shall be bonded throughout their length and permanently grounded in conformance with CTC 1982-8 RAIL, **Railway Prevention of Electric Sparks Regulations**, of Transport Canada.

(3) Bonding required in Sentence (1) shall consist of a metallic bond wire connected to the fill stem or to some part of the loading structure in electrical contact with the fill stem in conformance with Subsection 4.1.4.

(4) Bonding wires for **tank vehicles** shall be provided with a pull-off connector attached so as to be in electrical contact with the cargo tank of the **tank vehicle**.

(5) The bonding connection required in Sentence (1) shall be fixed to the **tank vehicle** or **storage tank** before dome covers are raised and shall remain in place until filling is completed and all dome covers have been closed and secured.

Downspouts

4.6.4.6. Filling of **tank vehicles** or tank cars through open domes shall be in conformance with Sentence 4.1.8.2.(2).

Subsection 4.6.5. Fire Protection

Portable extinguishers

4.6.5.1. At least 2 portable extinguishers, each having a rating of not less than 20BC, shall be provided at hazardous locations in bulk storage plants for **flammable** and **combustible liquids**, except that such portable extinguishers are permitted to be provided from the **tank vehicles** operated as part of a bulk plant which is not required in Article 4.6.2.6. to be fenced.

Subsection 4.6.6. Spill Control

Spill control

4.6.6.1. Facilities to control possible spills of **flammable** or **combustible liquids** shall be provided at loading and unloading points in conformance with Subsection 4.1.6.

SECTION 4.7 PIERS AND WHARVES

Subsection 4.7.1. Scope

Application

4.7.1.1. This Section applies to **flammable** and **combustible liquid** installations on piers and wharves, but does not include marine **fuel dispensing stations**.

Subsection 4.7.2. General

Clearances

4.7.2.1. (1) Piers and wharves at which **flammable** or **combustible liquid** cargoes are to be transferred in bulk quantities to or from marine tank vessels shall be not less than 30 m from

(a) any bridge over a navigable waterway, and

(b) an entrance to a superstructure of any vehicular or railroad tunnel under a waterway.

(2) The termination of fixed piping for loading and unloading **flammable** or **combustible liquids** shall be not less than 60 m from a bridge or from an entrance to a tunnel.

Construction

4.7.2.2. The substructure and deck of a pier or wharf shall be designed for its intended use and shall be of **heavy timber construction** or other material that will provide adequate flexibility, resistance to shock, durability, strength and fire resistance.

Subsection 4.7.3. Storage Tanks

Installation

4.7.3.1. (1) Except as permitted in Sentences (2) and (3), **storage tanks** shall be installed on shore in conformance with Subsections 4.3.2. to 4.3.7.

(2) **Storage tanks** are permitted to be located in **buildings** on piers and wharves of solid-fill or **noncombustible construction** provided they conform to Subsections 4.3.12. to 4.3.14.

(3) **Storage tanks** are permitted to be buried in piers and wharves of the solid-fill type provided they conform to Subsections 4.3.8. to 4.3.11.

Subsection 4.7.4. Piping, Valves and Fittings

Installation and materials

4.7.4.1. The method of installation and materials used for piping, valves and fittings shall conform to Section 4.4.

Pipe supports

4.7.4.2. (1) Piping shall be properly supported and arranged to prevent excessive vibration or strain on equipment connected to it.

(2) Piping supports shall consist of

(a) wood having no dimension less than 150 mm,

(b) steel, or

(c) concrete.

(3) Where pipe is supported more than 1.2 m above the pier deck, piping supports shall have a **fire-resistance rating** of at least 2 hr.

Guards

4.7.4.3. In areas where general cargo is handled or where piping might be subject to mechanical damage from vehicles or watercraft, the piping shall be protected by means of guards.

Flexible connections

4.7.4.4. Piping between the shore and piers or wharves shall be provided with swing joints or flexible connections designed in conformance with good engineering practice to permit the independent movement of the pier or wharf and shore piping without strain on the pipe.

Shut-off valves

4.7.4.5. For each pipeline within 7.5 m of piers and wharves, a readily accessible valve to shut off the supply from shore shall be provided.

Access openings for inspection

4.7.4.6. (1) Access openings for **inspection** purposes below deck shall be provided for valves required in Article 4.7.4.5. and for connections to pipelines, and suitable signs shall be posted indicating their locations.

(2) No freight or materials shall be placed on piers and wharves in such a manner as to obstruct the access openings required in Sentence (1).

Identification

4.7.4.7. Identification tags or labels of metal or other material impervious to water and to the **flammable** or **combustible liquids** being transferred shall be attached to and maintained on all pipelines and control valves to designate their use.

Leakage testing

4.7.4.8. (1) Piping systems shall be **tested** for leakage in conformance with Subsection 4.4.6. before being put into service and before reactivation when used on a seasonal basis.

(2) Underground piping systems referred to in Sentence (1) shall be **tested** at intervals not greater than 12 months.

Subsection 4.7.5. Bonding and Grounding

Bonding and grounding

4.7.5.1. (1) Railway tracks on piers and wharves shall be bonded throughout their length and permanently grounded in conformance with CTC 1982-8 RAIL, **Railway Prevention of Electric Sparks Regulations**, of Transport Canada.

(2) Insulating joints shall be placed in all rails where entering upon the pier or wharf.

Subsection 4.7.6. Fire Protection

Portable extinguishers

4.7.6.1. (1) Portable extinguishers having a rated capacity of 20BC shall be provided in the vicinity of Class I liquid pumps and fuel dispensers in conformance with Section 6.2.

(2) Portable extinguishers shall be kept in the pump house or other suitable location where they will be accessible in the event of an emergency, but not accessible to the public.

(3) Where vessels are loading or unloading **flammable** or **combustible liquids** or are being refuelled, portable extinguishers with a rating of not less than 20BC shall be placed on the pier or wharf in the vicinity of loading or unloading operations, so that they will be accessible in the event of a fire emergency.

(4) Portable extinguishers provided in conformance with Sentence (3) shall be in addition to those provided on board the vessels.

Training

4.7.6.2. Operating personnel shall be trained in how to summon the nearest **fire department** in the event of fire.

Subsection 4.7.7. Bulk Transfer Stations

Location

4.7.7.1. (1) Except as permitted in Sentence (2), the bulk transfer of **flammable** or **combustible liquids** shall be permitted only on piers and wharves used exclusively for that purpose.

(2) Where it is not practical to locate bulk transfer stations on separate piers and wharves, such stations are permitted to be located on general purpose piers and wharves provided that guards or fences are installed around valves or pumping equipment to prevent entry of unauthorized personnel.

Leakage and spill control

4.7.7.2. (1) Measures to accommodate possible leakage or spillage from hose couplings shall be provided in conformance with Subsection 4.1.6.

(2) Provision shall be made to prevent spillage resulting from the disconnection of hoses.

Hose connections

4.7.7.3. (1) Except as provided in Sentence (2), hose connections on piping shall be of the bolted flange type, and all such connections shall be provided with shut-off valves.

(2) The use of cam-locking connections up to 100 mm in size shall be permitted.

(3) Hose connections shall not project beyond the face of piers and wharves.

Subsection 4.7.8. Cargo Hose

Cargo hose

4.7.8.1. (1) The transfer of **flammable** or **combustible liquids** between tank vessels and piers or wharves shall be through

(a) flexible cargo hose designed in conformance with good engineering practice, or

(b) jointed tubing or piping

(i) suitable for the cargo to be transferred, and

(ii) designed to withstand the maximum design working pressure.

Maintenance and testing

4.7.8.2. Cargo hose shall be maintained in satisfactory operating condition and be pressure **tested**, at intervals not greater than 12 months, to 1.5 times the maximum working pressure but not less than 350 kPa (gauge).

Supports

4.7.8.3. Cargo hose shall be supported where it is not run on a solid foundation.

Subsection 4.7.9. Cargo Pumps

Design and installation

4.7.9.1. Cargo pumps shall be designed and installed in conformance with Subsection 4.4.10.

Pressure relief

4.7.9.2. Cargo pumps capable of producing pressures in excess of the safe working pressure of the cargo hose shall be provided with pressure relief devices such as return lines or relief valves.

Location

4.7.9.3. (1) Except as permitted in Sentence (2), cargo pumps shall be located

(a) on shore or on piers and wharves either of **noncombustible construction** or of the solid-fill type, and

(b) not less than 3 m from other **buildings** or structures.

(2) Where it is not practical to install cargo pumps as required in Sentence (1), they are permitted to be installed on piers and wharves of **combustible construction** if located in pump houses

(a) conforming to Subsection 4.7.10., and

(b) located not less than 3 m from other **buildings**.

Subsection 4.7.10. Pump Houses

Construction

4.7.10.1. Pump houses shall be of **noncombustible construction** with floors that are chemically resistant to the liquid being handled, liquid-tight and equipped with curbs or flashings around the base of the wall not less than 100 mm in height to contain any spilled liquid.

Ventilation

4.7.10.2. Ventilation shall be provided in pump houses in conformance with Subsection 4.1.7.

Subsection 4.7.11. Transfer Operations

Supervision

4.7.11.1. (1) Transfer operations shall be carried out only under the continuous supervision of a person qualified to supervise such operations.

(2) Cargo shall not be transferred to or from a marine tank vessel unless sufficient personnel are on board to control the operation.

(3) The person responsible for directing the operations shall

(a) prior to transfer of cargo, ascertain that no unauthorized repair work is being carried out on the pier or wharf and that there are no open flames in the vicinity,

(b) during the transfer of cargo, monitor the progress of the loading and unloading to prevent overflow, and

(c) **inspect** the hose and connections for leakage and, if leakage occurs, stop the operations.

Bonding and grounding

4.7.11.2. (1) Tank vessels shall be electrically connected to the shore piping prior to the connecting of cargo hose, except when cathodic protection facilities are operating.

(2) Electrical connections to tank vessels shall be maintained until the cargo hose has been disconnected and any spillage has been removed.

Equipment

4.7.11.3. (1) The cargo hose shall be of adequate length to allow for the movement of the vessel.

(2) Gaskets shall be used in all hose joints and pipe couplings to prevent leakage.

(3) Flanged joints shall be tightly bolted to prevent leakage.

(4) Drip pans shall be placed under hose connections on piers and wharves, except where a sump pit or settling basin is provided.

Spill control

4.7.11.4. (1) When transfer operations are completed,

(a) the valves on the hose connections shall be closed, and

(b) unless the cargo hose is equipped with a device that prevents liquid from draining from the hose, it shall be drained into appropriate containers that shall be emptied in such a fashion as to not create a fire or explosion hazard.

(2) Care shall be taken that no liquid is discharged on a pier or wharf or overboard during draining and emptying operations.

SECTION 4.8 PROCESS PLANTS

Subsection 4.8.1. Scope

Application

4.8.1.1. (1) Except as provided in Sentence (2), this Section applies to those **process plants**, including **refineries**, which contain industrial processes involving **flammable** or **combustible liquids**.

(2) This Section does not apply to **distilleries**.

Subsection 4.8.2. Outdoor Processing Equipment

Location

4.8.2.1. (1) The location of outdoor processing equipment in **process plants** shall be based on its **flammable** and **combustible liquid** capacity as described in Sentences (2) to (4).

(2) Except as provided in Sentence (4), outdoor processing equipment having emergency relief venting and a working pressure of not more than 17 kPa (gauge) shall be separated from property lines and **buildings** on the same property by distances

(a) equal to those in Table 4.3.2.A. for stable liquids, and

(b) 2.5 times those in Table 4.3.2.A. for **unstable liquids**.

(3) Except as provided in Sentence (4), outdoor processing equipment having emergency relief venting and a working pressure more than 17 kPa (gauge) shall be separated from property lines and **buildings** on the same property by distances

(a) 1.5 times those in Table 4.3.2.A. for stable liquids, and

(b) 4 times those in Table 4.3.2.A. for **unstable liquids**.

(4) Where protection is not provided against fires or explosions in processing equipment, the distances in Sentences (2) and (3) shall be doubled.

Subsection 4.8.3. Processing Buildings

Explosion venting

4.8.3.1. Except as provided in Article 4.8.4.2., where Class IA liquids or **unstable liquids** are processed within a room or a **building**, the room or **building** shall be designed to prevent critical structural and mechanical damage from an internal explosion in conformance with NFPA 68, "Guide for Venting of Deflagrations".

Fire separations

4.8.3.2. Areas where **unstable liquids** are handled or where small scale unit chemical processes are carried out shall be separated from the remainder of the **building** by a **fire separation** having a **fire-resistance rating** of not less than 2 hr.

Basements and pits

4.8.3.3. (1) Except as permitted in Article 4.1.5.9., Class I liquids shall not be handled or used in **basements**.

(2) Where Class I liquids are handled or used above **grade** within existing **buildings** that have **basements** or covered pits into which flammable vapours can travel and accumulate, such below **grade** areas shall be provided with mechanical ventilation designed to prevent the accumulation of flammable vapours.

(3) The mechanical ventilation required in Sentence (2) shall be capable of exhausting at least 18 m³/hr per square metre of the room area.

Ventilation

4.8.3.4. (1) Enclosed processing **buildings** handling **flammable** or **combustible liquids** shall be ventilated as specified in Subsection 4.1.7.

(2) Equipment used in a **building** and the ventilation of the **building** shall be designed so as to limit flammable vapour-air mixtures under normal operating conditions to the interior of equipment, and to not more than 1.5 m from such equipment.

Subsection 4.8.4. Fire Prevention and Protection

Spill and vapour control

4.8.4.1. (1) Processing equipment shall be designed and arranged to

- (a) prevent the unintentional escape of liquids and vapours, and
- (b) minimize the quantity escaping in the event of accidental release.

(2) Measures to control spilled **flammable** and **combustible liquids** shall be provided in conformance with Subsection 4.1.6.

Explosion protection

4.8.4.2. Processing equipment where an explosion hazard is present shall be

- (a) designed to withstand the explosion pressure without damage to the equipment,

(b) provided with explosion venting in conformance with NFPA 68, "Guide for Venting of Deflagrations", or

(c) provided with an explosion prevention system in conformance with NFPA 69, "Explosion Prevention Systems".

Fire prevention and protection

4.8.4.3. (1) An evaluation of the fire and explosion risks shall be undertaken to consider the material properties, quantities, operating conditions, storage arrangement, transportation, process design, operating and maintenance procedures.

(2) The evaluation in Sentence (1) shall result in the identifying of means that will minimize fires and explosions from occurring and mitigate the effects of a fire or explosion should it occur.

(3) Measures identified in Sentence (2) shall be implemented to prevent fires and explosions from occurring.

(4) Measures identified in Sentence (2) shall be implemented, in conformance with good engineering practices, and may include but are not limited to

(a) fire detection and alarm,

(b) fire extinguishing systems that conform to NFPA 11, 11A, 12, 12A, 13, 15, 16, 17 and 25,

(c) a reliable water supply with pressure and flow rates capable of meeting the fire demands,

(d) standpipe and hose systems connected to a reliable water supply located such that vessels, pumps and other equipment containing **flammable** or **combustible liquids** can be reached with at least one hose stream,

(e) combination nozzles capable of discharging a straight stream, water spray or fog,

(f) hydrants or monitor nozzles installed in accordance with NFPA 24, "Installation of Private Fire Service Mains and their Appurtenances",

(g) fire-proofing to protect essential equipment and controls,

(h) methods to effect an emergency shut-down of systems, and

(i) methods to protect equipment and structures from fire exposure.

(5) The evaluation and measures shall be put in writing and kept in the **building** for review by the **Chief Fire Official**.

SECTION 4.9 DISTILLERIES

Subsection 4.9.1. Scope

Application

4.9.1.1. (1) This Section applies to those areas or **buildings** in **distilleries** where **distilled beverage alcohols** are concentrated, blended, mixed, stored or packaged.

(2) The storage, handling and use of **flammable** or **combustible liquids** other than **distilled beverage alcohols** in a **distillery** shall conform to this Part.

(3) Where there is a conflict between the requirements of this Section and other requirements in this Part, this Section shall apply.

(4) Where there are conflicts between this Part and the **Federal Excise Regulations (Canada)** with regard to security of the product and measurement methods, the **Federal Excise Regulations (Canada)** shall apply.

Subsection 4.9.2. General

Building classification

4.9.2.1. (1) Except as provided in Sentence (2), **buildings** or parts thereof in which **distilled beverage alcohol** is distilled, processed or stored in bulk shall be classified as **high hazard industrial occupancies**.

(2) **Buildings** or parts thereof used for storage of **closed containers** of **distilled beverage alcohols** shall be classified as Division 2 **industrial occupancies**.

Subsection 4.9.3. Storage Tanks and Containers

Design, fabrication and testing

4.9.3.1. **Storage tanks**, wooden vats, barrels, drums or containers used for the storage or processing of **distilled beverage alcohols** shall be designed, fabricated and **tested** for the anticipated maximum working pressure, operating temperature, internal corrosion conditions and structural stresses to which they could be subjected.

Supports, foundations and anchorage

4.9.3.2. (1) Supports, foundations and anchorage of **storage tanks** shall comply with Subsection 4.3.3., except that timber supports shall be permitted.

(2) **Storage tank** supports having less than a 2-hr **fire-resistance rating** shall be protected by an automatic fire suppression system conforming to an applicable standard listed in Sentence 6.8.1.1.(1).

(3) The area underneath any **storage tank** greater than 1.2 m in diameter shall be protected by an automatic fire suppression system conforming to an applicable standard listed in Sentence 6.8.1.1.(1).

Storage tank vents

4.9.3.3. Normal and emergency vents shall be provided on **storage tanks** in conformance with good engineering practice.

Subsection 4.9.4. Storage

Storage tanks, drums and barrels

4.9.4.1. (1) Where more than 25000 L of **distilled beverage alcohol** in **storage tanks**, drums or barrels are stored inside **buildings**, such **buildings** shall be **sprinklered**.

(2) For **storage tank buildings** protected by automatic sprinklers in conformance with NFPA 13, "Installation of Sprinkler Systems", storage capacities shall not be limited.

Closed containers and storage aids

4.9.4.2. Storage of **closed containers** of **distilled beverage alcohols**, packaging materials and empty bottles, drums, barrels and pallets shall be in conformance with Part 3 of the National Fire Code 1995.

Subsection 4.9.5. Piping and Pumping Systems

Design and installation

4.9.5.1. The design, fabrication, assembly and **inspection** of piping and pumping systems containing **distilled beverage alcohols** shall be suitable for the anticipated maximum working pressures, operating temperatures, internal corrosion conditions and structural stresses to which they could be subjected.

Subsection 4.9.6. Ventilation

Ventilation

4.9.6.1. (1) Natural or mechanical ventilation shall be provided for all areas where alcohol vapours are released from **storage tanks** or process equipment under normal operating conditions, to prevent the concentration of vapours from exceeding 25 per cent of the **lower explosive limit**, measured 1.5 m from any equipment or from any opening subject to vapour release.

(2) Explosion venting as outlined in Sentence 4.2.9.6.(1) is only required in the distillation areas of a **distillery**.

Subsection 4.9.7. Spill Control

Spill control

4.9.7.1. (1) Except as permitted in Sentence (2), emergency drainage systems shall be provided to direct any spills or leakage of **flammable** or **combustible liquids**, together with water used for fire fighting, to a safe location in conformance with Subsection 4.1.6.

(2) Water-miscible effluent from spills and fire fighting operations is permitted to be directed into a sewer system provided it does not create a fire hazard nor any risk to public health or safety.

Subsection 4.9.8. Fire Protection

Portable extinguishers

4.9.8.1. (1) Except as provided in Sentences (2) to (4), portable extinguishers shall be provided in conformance with Section 6.2.

(2) Except as permitted in Sentence (3), in maturing warehouses, at least one 4A:30BC rated fire extinguisher shall be located adjacent to each **exit**.

(3) Hose stations complying with Article 6.2.6.6. are permitted to be installed in lieu of portable extinguishers at locations required in Sentence (2), and spaced so that the travel distance to the nearest hose is not greater than 25 m.

(4) At least one 10BC portable extinguisher shall be located on each industrial lift truck.

Standpipe and hose systems

4.9.8.2. (1) Except as provided in Sentence (2), standpipe and hose systems shall be provided and installed in **distilleries** in accordance with the **Building Code**.

(2) Where a **building** is **sprinklered** in conformance with the **Building Code**, small hose (38 mm) stations are permitted to be supplied from interior sprinkler piping.

SECTION 4.10 WITHDRAWAL OF STORAGE TANKS FROM SERVICE

Subsection 4.10.1. Scope

Application

4.10.1.1. This Section applies to the procedures to be followed when **storage tanks** for **flammable** or **combustible liquids** are removed, abandoned or temporarily taken out of service.

Subsection 4.10.2. Rendering Storage Tanks Temporarily Out of Service

Underground storage tanks

4.10.2.1. (1) When underground **storage tanks** will be out of service for a period not exceeding 180 days,

(a) the liquid level in the **storage tank** shall be measured at intervals not greater than one month and a record of such measurements shall be retained for inspection,

(b) fill pipe covers and covers over openings to measure liquid levels, dispensers and power controls shall be kept locked when not in use, and

(c) vent piping shall be kept open.

(2) Except as provided in Sentence (3), when underground **storage tanks** will be out of service for a period exceeding 180 days,

(a) the **storage tanks**, connected piping and dispensers shall be emptied of Class I liquid,

(b) the **storage tanks**, piping and dispensers shall be refilled with a Class II or IIIA liquid, or not less than 1 kg of dry ice for each 500 L of tank capacity shall be added to the **storage tank**,

(c) measurements of the liquid level of each **storage tank** containing a Class II or IIIA liquid shall be made at intervals not greater than one month, and a record of such measurements shall be retained for inspection, and

(d) fill pipe covers and covers over openings to measure liquid levels, dispensers and power controls shall be locked.

(3) Where underground **storage tank** facilities are operated on a seasonal basis,

(a) at the close of each season of operation,

(i) the liquid level of each **storage tank** shall be measured,

(ii) a record of such measurements shall be retained for inspection, and

(iii) all fill pipe covers and covers over openings for measuring liquid levels, dispensers and power controls shall be locked, and

(b) prior to the start of an operating season,

(i) the liquid level in each **storage tank** shall be measured,

(ii) the measurements shall be compared with those recorded at the close of the previous season, and

(iii) when a loss of liquid or water intrusion is apparent, immediate action shall be taken to determine and correct the condition.

(4) Where a **storage tank** has been out of service for more than 12 months, the tank and piping shall be tested for leakage in conformance with Subsections 4.3.15. and 4.4.6.

Aboveground storage tanks

4.10.2.2. (1) When an aboveground **storage tank** will be out of service for a period not exceeding 180 days, the piping from the tank shall be capped or the valves necessary to achieve similar isolation of the tank shall be closed and securely locked.

(2) When out-of-service **storage tanks** referred to in Sentence (1) contain **flammable** or **combustible liquids**, the liquid level in the tank shall be measured and the readings compared at intervals not greater than one month.

(3) Where an aboveground **storage tank** will be out of service for a period exceeding 180 days,

(a) all liquid and vapours shall be removed from the **storage tank** and its connected piping, and

(b) the **storage tank** markings shall clearly indicate that the tank is empty.

Corrosion protection

4.10.2.3. Corrosion protection systems shall be maintained in operating condition when a **storage tank** is temporarily out of service and during seasonal shutdowns.

Subsection 4.10.3. Removal of Underground Storage Tanks

Removal

4.10.3.1. (1) When underground **storage tanks** have no further use or have been out of service for 2 years or longer, such tanks, together with connected piping and dispensers, shall

(a) have all **flammable** and **combustible liquids** removed from them,

(b) be purged of vapours, and

(c) except as permitted in Article 4.10.3.2., be removed from the ground.

(2) If contaminated, soil surrounding the **storage tanks** described in Sentence (1) shall be replaced with clean fill.

Abandonment in place

4.10.3.2. (1) Where the **Chief Fire Official** determines that it is impractical to remove an underground **storage tank** described in Sentence 4.10.3.1.(1), such tank shall be filled with an inert material.

(2) Where the **Chief Fire Official** determines that it is impractical to remove underground piping described in Sentence 4.10.3.1.(1), such piping shall have the ends permanently sealed by capping or plugging.

Subsection 4.10.4. Disposal and Reuse of Storage Tanks

Disposal

4.10.4.1. Where **storage tanks** are to be disposed of, sufficient openings shall be cut in the tanks to render them unfit for further use.

Reuse

4.10.4.2. (1) Except as permitted in Sentence (2), a **storage tank** shall not be reused for the storage of **flammable** or **combustible liquids**.

(2) A **storage tank** is permitted to be reused for the storage of **flammable** or **combustible liquids** only after having been

(a) refurbished and found to conform to one of the standards in Sentence 4.3.1.2.(1), or

(b) refurbished in conformance with Sentence (3).

(3) A steel **storage tank** is permitted to be refurbished in conformance with

(a) CAN4-S601(A), "Shop Refurbishing of Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids",

(b) CAN4-S603(A), "Refurbishing of Steel Underground Tanks for Flammable and Combustible Liquids", or

(c) CAN4-S630(A), "Shop Refurbishing of Steel Aboveground Vertical Tanks for Flammable and Combustible Liquids".

Riveted storage tanks

4.10.4.3. Riveted **storage tanks** shall not be relocated.

SECTION 4.11 TANK VEHICLES

Subsection 4.11.1. Scope

Application

4.11.1.1. This Section applies to **tank vehicles** when located on a property covered in this Code.

Subsection 4.11.2. General

Portable extinguishers

4.11.2.1. (1) A **tank vehicle** shall be provided with at least one portable extinguisher having a minimum rating of 20BC and conforming to Section 6.2.

(2) When more than one portable extinguisher is provided, each extinguisher shall have a minimum rating of 10BC.

(3) Portable extinguishers on a **tank vehicle** shall be readily accessible.

Hot works

4.11.2.2. Hot works performed on or in close proximity to a **tank vehicle** shall conform to Section 5.17.

Parking inside buildings

4.11.2.3. (1) A **tank vehicle** shall not be parked inside a **building** unless the **building** is specifically designed for that purpose.

(2) A **tank vehicle** parked inside a **building** shall have sufficient space in the tank to compensate for thermal expansion of the **flammable** or **combustible liquid**.

(3) A **tank vehicle** parked inside a **building** shall have no leaks of **flammable** or **combustible liquid**.

Parking outside buildings

4.11.2.4. (1) Except as provided in Sentence (2), a **tank vehicle** is permitted to be left unattended by the vehicle operator outside a **building** for not more than 1 hr.

(2) A **tank vehicle** is permitted to be left unattended by the vehicle operator outside a **building** for more than 1 hr, but only in a parking space

(a) that is located not less than 15 m from a **buildings**, and

(b) where the **tank vehicle** is not exposed to undue hazard from accident or collision.

Subsection 4.11.3. Loading and Unloading

Ignition sources

4.11.3.1. During loading and unloading operations, a **tank vehicle** and its delivery equipment shall be separated from ignition sources by distances conforming to the requirements for dispensers in Articles 4.5.3.2. and 4.5.8.7.

Static electric charges

4.11.3.2. During loading and unloading of a **tank vehicle**, measures shall be taken against static electric charges in conformance with Articles 4.1.8.2. and 4.6.4.5.

Supervision

4.11.3.3. During loading and unloading of a **tank vehicle**, trained personnel shall be in a position to shut off the flow of liquid in an emergency.

Multi-use compartments

4.11.3.4. When a compartment of a **tank vehicle** has been used to carry a Class I liquid, the compartment, piping and accessory delivery equipment shall be drained of liquid before a Class II or IIIA liquid is loaded.

Engine

4.11.3.5. When loading or unloading of Class I liquids is done without the use of the engine of the **tank vehicle**, the engine ignition shall be shut off during the transfer operations.

Unloading

4.11.3.6. (1) Before a **tank vehicle** is unloaded, the volume of liquid in the receiving tank shall be measured to ensure that the tank can accept the volume to be unloaded.

(2) If tank vents are obstructed, the transfer of liquid shall be stopped.

(3) A **tank vehicle** shall not be parked on a **street**, shoulder or sidewalk while unloading at a **fuel dispensing station**.

SECTION 4.12 LABORATORIES

Subsection 4.12.1. Scope

Application

4.12.1.1. This Subsection applies to laboratories where **flammable** and **combustible liquids** are used or handled.

Subsection 4.12.2. Separation

Separation

4.12.2.1. (1) A laboratory shall be separated from other parts of the **building** by a **fire separation** having a **fire-resistance rating** of not less than 1 hr.

(2) Despite Sentence (1), an existing laboratory that has **fire separations** consisting of membranes of lath and plaster or gypsum board shall be deemed to be in compliance with Sentence (1).

Subsection 4.12.3. Maximum Quantities

Maximum quantities

4.12.3.1. (1) Except as provided in Sentence 4.2.6.4.(1), containers used for the storage of **flammable** or **combustible liquids** in a laboratory shall be of not more than 5 L capacity and shall conform to Subsection 4.2.3.

(2) Except as permitted in Sentence (3), not more than 300 L of **flammable** and **combustible liquids**, of which not more than 50 L shall be **flammable liquids**, shall be permitted in the open area of a laboratory.

(3) Quantities in excess of those permitted in Sentence (2) shall be stored in cabinets conforming to Subsection 4.2.10. or in a room conforming to Subsection 4.2.9.

(4) Containers of **flammable** or **combustible liquids** shall be kept closed when not in use.

Subsection 4.12.4. Emergency Planning

Fire safety plan

4.12.4.1. (1) Except as provided in Sentences (2) to (4), a laboratory shall conform with the requirements of Section 2.8.

(2) Fire drills required in Subsection 2.8.3. shall be held at intervals not greater than six months in laboratories.

(3) Personnel working in laboratories shall be trained in the safe handling of **flammable** and **combustible liquids**.

(4) Measures shall be taken to prevent access to laboratories by unauthorized persons.

Subsection 4.12.5. Spill Control

Spill control

4.12.5.1. A written spill procedure shall be provided for laboratories in conformance with Article 4.1.6.4.

Subsection 4.12.6. Electrical Equipment

Electrical equipment

4.12.6.1. Electrical equipment shall conform with Subsection 4.1.4.

Subsection 4.12.7. Inspection and Maintenance

Inspection and maintenance

4.12.7.1. (1) Electrical equipment, mechanical systems, piping, valves, and automatic and manual control and safety devices shall be **inspected** annually and maintained in good operating condition at all times.

(2) The ventilation systems serving a laboratory shall be **inspected** and cleaned as required to prevent the accumulation of combustible or reactive deposits, and the intervals between **inspections** shall be not greater than

(a) twelve months for the ventilation systems of the open laboratory areas, and

(b) six months for the ventilation system of a power-ventilated enclosure required in Article 4.12.8.2.

Subsection 4.12.8. Ventilation

Scope and application

4.12.8.1. (1) Ventilation systems shall conform to Subsection 4.1.7. and Articles 4.12.8.2. to 4.12.8.5.

(2) Despite Sentence (1), existing ventilation systems need not conform with Articles 4.1.7.3., 4.1.7.4. and 4.12.8.2. to 4.12.8.5.

(3) Existing ventilation systems where make up air is provided shall be deemed to be in compliance with Article 4.1.7.5.

(4) Existing ventilation systems that maintain a negative pressure within the ventilation system with respect to the surroundings shall be deemed to be in compliance with Article 4.1.7.7.

Ventilation

4.12.8.2. (1) A laboratory shall be provided with continuous mechanical ventilation designed and maintained to ensure that flammable vapours

- (a) do not accumulate in the laboratory,
 - (b) are prevented from migrating to other parts of the **building**,
 - (c) do not accumulate in the ventilation system,
 - (d) are exhausted to the outdoors, and
 - (e) are not returned to the **building**.
- (2) A ventilation system required in Sentence (1) shall be provided with monitoring devices to
- (a) indicate that the ventilation system is in operation, and
 - (b) sound an alarm if the ventilation system malfunctions.

Power-ventilated enclosure

4.12.8.3. (1) The use and handling of **flammable** or **combustible liquids** in a laboratory shall be confined inside a power-ventilated enclosure conforming to Articles 4.12.8.4. and 4.12.8.5. when

- (a) their use releases flammable vapours which could be potentially explosive,
- (b) liquids are heated to a temperature equal to or greater than their **flash point**, or
- (c) **unstable liquids** are used.

Enclosure exhaust ventilation

4.12.8.4. (1) The ventilation system for a power-ventilated enclosure required in Article 4.12.8.3. shall

- (a) conform to NFPA 91, "Exhaust Systems for Air-Conveying of Materials",
- (b) provide continuous exhaust ventilation at an air velocity sufficient to prevent the accumulation of explosive vapours or of combustible or reactive deposits in the power-ventilated enclosure and its exhaust duct system,
- (c) confine flammable vapours to the area where they are generated and exhaust them to the outdoors,
- (d) not return the exhausted air to the **building**, and
- (e) be provided with well identified control switches that are
 - (i) located outside of the power-ventilated enclosure, and

(ii) readily accessible in case of an emergency.

(2) Where deposits referred to in Clause (1)(b) can accumulate in the power-ventilated exhaust duct system and create a fire or explosion hazard,

(a) provisions shall be made to remove such deposits so they do not create a fire or explosion hazard, or

(b) an automatic fire suppression system shall be provided in conformance with an applicable standard listed in Sentence 6.8.1.1.(1).

Enclosure construction

4.12.8.5. (1) The power-ventilated enclosure required in Article 4.12.8.3. and its exhaust system shall

(a) except as provided in Sentences (2) and (3), be constructed of noncombustible materials compatible with and chemically resistant to vapours being exhausted,

(b) be provided with access doors to permit **inspection** and maintenance of the fan assembly and exhaust ducts,

(c) be provided with instructions for its use and the operation of the ventilation system, and

(d) be provided with means to control accidental spillage in conformance with Subsection 4.1.6.

(2) Combustible materials are permitted in systems described in Clause (1)(a) where

(a) such materials are required by the corrosive or reactive properties of chemicals or liquids being used, and

(b) their **flame-spread rating** is not more than 25.

(3) The **flame-spread rating** required in Sentence (2) is permitted to be greater than 25 if an automatic fire suppression system conforming to an applicable standard listed in Sentence 6.8.1.1.(1) is provided inside the power-ventilated enclosure and its exhaust duct system.

Subsection 4.12.9. Refrigerated Storage

Refrigerated storage

4.12.9.1. (1) Where refrigerators are required to keep Class I liquids at a temperature below normal ambient conditions in a laboratory, such refrigerators shall be designed so that

(a) electrical equipment located within the storage compartment, within the outer shell, on the door and the door frame of the refrigerator is in conformance with Subsection 4.1.4., for Class I, Division 1 hazardous locations, and

(b) electrical equipment mounted on the outside surface of the refrigerator is

(i) in conformance with Subsection 4.1.4., in Class I, Division 2 hazardous locations, or

(ii) located above the top of the storage compartment.

(2) Refrigerators described in Sentence (1) shall be identified as containing **flammable** or **combustible liquids**.

(3) Class I liquids stored in refrigerators shall be kept in **closed containers**.

O Reg. 388/97, Part 4; O. Reg. 302/99, s. 2; O. Reg. 475/00, ss. 4-31.