The attached pages identify revisions and errata to the National Fire Code of Canada 1990. The revisions have been approved by the Canadian Commission on Building and Fire Codes for immediate implementation.

In accordance with the CCBFC Policies and Procedures, the list of referenced documents in Table 1.1.6.A. of the 1990 NFC is updated annually. The revisions contained herein include updates to 30 June 1991. Where significant changes to the title or the issuing body have been made, the relevant requirements have also been updated.

The errata are corrections which have been identified and are included to facilitate the use of the Code. Revisions are identified by an $r$ in the margin nearest the change; $r2$ designates a revision issued in January 1992. Errata are identified by an $e$. 
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Part I
Application and Definitions

Section 1.1 Application

1.1.1. General

1.1.1.1. Responsibility. Unless otherwise specified, the owner or the owner's authorized agent shall be responsible for carrying out the provisions of this Code.

1.1.2. Equivalents

1.1.2.1. Materials, Systems and Equipment

(1) The provisions of this Code are not intended to limit the appropriate use of materials, systems and equipment not specifically described herein.

(2) Materials, systems, equipment and procedures not specifically described herein or that vary from the specific requirements in this Code or for which no recognized test procedure has been established may be used if it can be shown that they are suitable on the basis of past performance, or on the basis of acceptable tests or evaluation.

(3) Where no published test method exists, any test submitted to determine equivalency shall be designed to simulate or exceed anticipated service conditions or shall be designed to compare the performance of the materials, systems or equipment with similar materials, systems or equipment that is known to be acceptable.

1.1.3. Alternate Test Standards

1.1.3.1. Acceptability. The results of tests based on test standards other than as described in this Code may be used provided such alternate test standards will provide comparable results.

1.1.4. Alternatives

1.1.4.1. Acceptability

(1) Alternatives to requirements in this Code may be permitted provided the authority having jurisdiction is satisfied that

(a) the existing fire protection measures provide an acceptable degree of fire safety, or

(b) measures are taken to provide an acceptable degree of fire safety.

(See Appendix A.)

1.1.4.2. Intervals between Inspections and Tests. Longer intervals between the inspections and tests specified in this Code may be permitted provided the authority having jurisdiction is satisfied that such intervals do not reduce the reliability of the system or equipment requiring inspection or testing.

1.1.5. Records

1.1.5.1. Retention Period. Where this Code requires that records of inspections, maintenance procedures or tests be retained for examination by the authority having jurisdiction, such records shall be retained during the required time interval between the inspections, maintenance procedures or tests, or for 2 years, whichever is greater.

1.1.6. Referenced Documents

1.1.6.1. Conflicting Requirements. When a conflict exists between the provisions of this Code and those of a referenced document, the provisions of this Code shall govern.
1.1.6.2. Effective Date

(1) Unless otherwise specified herein, the documents referenced in this Code shall include all amendments, revisions and supplements effective to 30 June 1991.

(2) Where reference is made in this Code to the National Building Code of Canada, such reference is to the 1990 edition.

(3) Documents referenced in this Code shall be the editions designated in Table 1.1.6.A.

### Table 1.1.6.A.
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<td>CAN/ULC-S633-M90</td>
<td>Flexible Underground Hose Connectors for Flammable and Combustible Liquids</td>
<td>4.4.7.13.(2)</td>
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<tr>
<td>ULC</td>
<td>CAN/ULC-S642-M87</td>
<td>Standard for Compounds and Tapes for Threaded Pipe Joints</td>
<td>4.4.5.1.</td>
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<tr>
<td>ULC</td>
<td>CAN/ULC-S643-M90</td>
<td>Standard for Shop Fabricated Steel Above Ground Utility Tanks for Flammable and Combustible Liquids</td>
<td>4.3.1.2.(1)</td>
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<tr>
<td>ULC</td>
<td>CAN/ULC-S651-M90</td>
<td>Standard for Emergency Valves for Flammable and Combustible Liquids</td>
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</table>

**Column 1**  | **Column 2**  | **Column 3**  | **Column 4**  |
---           | ---           | ---           | ---           |
8            | ---           | 92/1          | ---           |
Suite means a single room or series of rooms of complementary use, operated under a single tenancy, and includes dwelling units, individual guest rooms in motels, hotels, boarding houses, rooming houses and dormitories as well as individual stores and individual or complementary rooms for business and personal service occupancies. (See Appendix A.)

Supervisory staff means those occupants of a building who have some delegated responsibility for the fire safety of other occupants under the fire safety plan and may also refer to the local fire department where it assumes these responsibilities.

Tank vehicle means any vehicle, other than railroad tank cars and boats, with a cargo tank having a capacity of more than 450 L, mounted or built as an integral part of the vehicle and used for the transportation of flammable liquids or combustible liquids and including tank trucks, trailers and semi-trailers.

Tent means a shelter or structure the covering of which is made of pliable material.

Unstable liquid means a liquid, including flammable liquids and combustible liquids, which is chemically reactive to the extent that it will vigorously react or decompose at or near normal temperature and pressure conditions or which is chemically unstable when subject to impact.

Vapour pressure means the pressure exerted by a liquid as determined by ASTM D323, “Test Method for Vapor Pressure of Petroleum Products (Reid Method).”

Vertical service space means a shaft oriented essentially vertically that is provided in a building to facilitate the installation of building services including mechanical, electrical and plumbing installations and facilities such as elevators, refuse chutes and linen chutes.

1.2.2. Abbreviations and Symbols

1.2.2.1. Abbreviations of Proper Names.
The abbreviations of proper names in this Code shall have the meanings assigned to them in this Article. The appropriate addresses are shown in brackets following the name.

ACNBC ........ Associate Committee on the National Building Code (National Research Council of Canada, Ottawa, Ontario, K1A 0R6)

ACNFC ........ Associate Committee on the National Fire Code (National Research Council of Canada, Ottawa, Ontario, K1A 0R6)


ASME .......... American Society of Mechanical Engineers (345 East 47th Street, New York, New York 10017 U.S.A.)


CAN .......... National Standard of Canada designation (The number following the CAN designation represents the agency under whose auspices the standard was issued. CAN1 designates CGA, CAN2 designates CGSB, CAN3 designates CSA and CAN4 designates ULC.)

CCME ........ Canadian Council of Ministers of the Environment (formerly CCREM) (Environment Canada, Ottawa, Ontario, K1A 1C8)

CGA .......... Canadian Gas Association (55 Scarsdale Road, Don Mills, Ontario M3B 2R3)

CGSB .......... Canadian General Standards Board (Ottawa, Ontario K1A 1G6)

CPPI .......... Canadian Petroleum Products Institute (formerly PACE) (1202-275 Slater St., Ottawa, Ontario K1P 6H9)

CSA .......... Canadian Standards Association (178 Rexdale Blvd., Rexdale, Ontario M9W 1R3)

NFPA ........ National Fire Protection Association (Batterymarch Park, Quincy, Massachusetts 02269 U.S.A.)

TC .......... Transport Canada (formerly CTC) (Railway Safety Directorate, 344 Slater St., 15th Floor, Ottawa, Ontario K1A 0N5)
1.2.2.2. Symbols and Other Abbreviations.

Symbols and other abbreviations in this Code shall have the meanings assigned to them in this Article.

- cm: centimetre(s)
- °C: degree(s) Celsius
- diam.: diameter
- div.: division
- h: hour(s)
- kg: kilogram(s)
- kN: kilonewton(s)
- kPa: kilopascal(s)
- L: litre(s)
- m: metre(s)
- min: minute(s)
- mm: millimetre(s)
- mm²/s: centistokes
- N: newton(s)
- ppm: parts per million
- rpm: revolutions per minute
- s: second(s)
- t: tonne(s)
- V: volt(s)
- ≤: less than or equal to
required for the interior finish of the area in which they are located.

2.3.1.3. **Decorative Materials.** Decorative materials on walls or ceilings shall have a *flame-spread rating* not greater than that required for the interior finish of the space in which they are located.

2.3.1.4. **Interconnected Floor Spaces.** Combustible contents in *interconnected floor spaces* in which the ceiling is more than 8 m above the floor, shall not exceed the limit specified in Subsection 3.2.8. of the National Building Code of Canada.

2.3.2. **Flame Resistance**

2.3.2.1. **Drapes, Curtains and Decorative Materials**

(1) Drapes, curtains and other decorative materials including textiles and films used in buildings shall meet the requirements of CAN/ULC-S109, "Standard for Flame Tests of Flame-Resistant Fabrics and Films," when such drapes, curtains and other decorative materials are used in

(a) any Group A or Group B, Division 1 occupancy,
(b) any lobby or exit, or
(c) any open floor areas in any Group D, E and F occupancy exceeding 500 m², except when the floor area is divided into fire compartments not exceeding 500 m² in area and separated from the remainder of the floor area by fire separations having at least a 1 h fire-resistance rating.

2.3.2.2. **Flame Retardant Treatments.** Flame retardant treatments shall be renewed as often as required to ensure that the material will pass the match flame test in NFPA 701, "Standard Methods of Fire Tests for Flame-Resistant Fabrics and Films." (See Appendix A.)

2.3.2.3. **Hospital Textiles.** Mattresses, bed linen, window drapes and cubicle curtains used in Group B, Division 2 occupancies shall conform to CAN/CGSB-4.162, "Hospital Textiles – Flammability Performance Requirements."

Section 2.4 **Fire Hazards**

2.4.1. **Combustible Materials**

2.4.1.1. **Accumulation of Combustible Materials**

(1) Combustible waste materials in and around buildings shall not be permitted to accumulate in quantities or locations that will constitute an undue fire hazard. (See Appendix A.)

(2) Combustible materials, other than those for which the location, room or space is designed, shall not be permitted to accumulate in any part of an elevator shaft, ventilation shaft, *means of egress, service room* or *service space*. (See Appendix A.)

(3) Horizontal concealed spaces, such as crawl and ceiling spaces, shall not be used for the storage of combustible materials.

(4) Combustible materials shall not be stored on a roof or adjacent to any building so as to create a fire hazard to the building or its occupants.

2.4.1.2. **Storage Rooms for Combustible Waste Materials.** Where rooms are provided for the storage of combustible waste materials, such rooms shall conform to the National Building Code of Canada.

2.4.1.3. **Absorbent Materials.** Combustible materials shall not be used to absorb flammable liquid or combustible liquid spills within buildings.

2.4.1.4. **Use of Waste Receptacles**

(1) Greasy or oily rags or materials subject to spontaneous heating shall be deposited in a receptacle conforming to Article 2.4.1.5. or be removed from the premises.

(2) All ashes shall be stored in receptacles conforming to Article 2.4.1.5., and combustible materials shall not be stored with ashes in the same container.

(3) Except as permitted in Article 2.4.1.5., noncombustible receptacles as required in Sentences (1) and (2) shall not be placed closer than 1 m from combustible materials.
2.4.1.5. **Waste Receptacles.** A receptacle required in Article 2.4.1.4. shall be constructed of noncombustible materials and have a close-fitting metal cover and, if the flooring material upon which it is placed is combustible, have a flanged bottom or legs not less than 50 mm high.

2.4.1.6. **Lint Traps for Laundry Equipment.** Lint traps in laundry equipment shall be cleaned after each use of the equipment.

2.4.2. **Smoking**

2.4.2.1. **Smoking Areas**

(1) Where conditions are such as to make smoking a fire or explosion hazard, smoking shall be permitted only in acceptable smoking areas.

(2) The areas where smoking is not permitted shall be identified by signs conforming to Article 2.4.2.2.

(3) Where smoking is permitted, an adequate number of ash trays shall be provided.

2.4.2.2. **Signs.** Signs prohibiting smoking shall have black lettering not less than 50 mm high with a 12 mm stroke on a yellow background, except that symbols of not less than 150 mm by 150 mm may be used in lieu of lettering.

2.4.3. **Open Flames**

2.4.3.1. **Open Flames in Processions**

(1) Open flames whose quantity and method of use create a fire hazard shall not be permitted in processions

(a) in buildings used for public assemblies, or

(b) in dining areas in Group B, Division 2 occupancies.

2.4.3.2. **Flaming Meals and Drinks**

(1) In Group B, Division 2 occupancies, flaming meals or drinks shall not be served.

(2) In places of public assembly, flaming meals or drinks shall be ignited only at the location of serving.

(3) Refuelling of appliances and containers used for flaming meals or drinks or for warming food shall be carried out only in an acceptable area.

2.4.3.3. **Portable Extinguishers.** A portable extinguisher with a minimum rating of 5-BC shall be located on the serving cart or table where flaming meals and drinks are being served.

2.4.3.4. **Devices Having Open Flames.** Devices having open flames shall be securely supported in noncombustible holders and shall be located or protected so as to prevent accidental contact of the flame with combustible materials.

2.4.4. **Use of Hazardous Materials**

2.4.4.1. **Flammable Liquids.** Flammable liquids shall not be used for cleaning purposes except where such cleaning is an essential part of the process and the flammable liquids are stored and handled in conformance with Part 4.

2.4.4.2. **Flammable Gases.** Flammable gases shall not be used to inflate balloons unless acceptable.

2.4.5. **Open Air Fires**

2.4.5.1. **Open Air Fires.** Except for fires used for cooking in fireplaces, grills or barbecues, open air fires shall not be set unless appropriate measures are taken to limit their spread. (See Appendix A.)

2.4.6. **Vacant Buildings**

2.4.6.1. **Security.** Vacant buildings shall be secured against unauthorized entry. (See Appendix A.)

### Section 2.5 Fire Department Access to Buildings

2.5.1. **General**

2.5.1.1. **Street Access.** Fire department vehicles shall have direct access to at least one face of every building by means of a street, yard or private roadway in conformance with the requirements of the National Building Code of Canada.
Separation of explosives or radioactive substances from other dangerous goods shall be in conformance with Sections 5.2 and 5.9 of this Code, respectively.

3.3.6.7. Corrosion Protection. Measures shall be taken to prevent or minimize corrosion or deterioration of shelving, racks, and piping system components, due to contact with stored dangerous goods.

3.3.6.8. Flooring Materials. Floors in areas where dangerous goods are stored shall be constructed of impermeable materials to prevent the absorption of chemicals.

3.3.6.9. Fire Suppression Systems

(1) Except as permitted in Sentences (2) and (3), buildings used for the storage of dangerous goods regulated by this Subsection, shall be equipped throughout with a sprinkler or other fire suppression system, designed in conformance with Part 6 and good engineering practice with respect to specific dangerous goods. (See Appendix A.)

(2) Buildings described in Sentence (1) need not be equipped throughout with a sprinkler or other fire suppression system provided that
(a) the sum of individual storage areas in the building used for the storage of dangerous goods does not exceed 100 m², and
(b) the dangerous goods are separated in conformance with the requirements of Table 3.3.6.B. and are stored in fire compartments separated from the remainder of the building by a fire separation having a fire-resistance rating of not less than 2 h.

(3) Buildings described in Sentence (1) need not be equipped throughout with a sprinkler or other fire suppression system provided that storage consists only of containers of non-flammable, non-corrosive, non-poisonous or non-oxidizing compressed gas.

3.3.6.10. Smoke Venting. Where the collective individual storage areas for dangerous goods exceed 10 m² in a fire compartment, means shall be provided for manual or automatic venting of smoke and toxic gases from the storage area under fire conditions. (See Appendix A.)

3.3.6.11. Spill Control

(1) Spills of liquid or solid dangerous goods shall be prevented from entering public sanitary and storm sewer systems, natural waterways or potable water sources, by
(a) constructing noncombustible sills, curbs or dikes of sufficient height to contain the spills, or
(b) grading the site or sloping the floor to divert liquids to a drainage system conforming to Subsection 4.1.6.

(See Appendix A.)

3.3.6.12. Fire Department Access

(1) Except as provided in Sentences (2) and (3), fire department access to buildings described in Article 3.3.6.1. shall be in conformance with Section 2.5.

(2) When the collective individual storage area for dangerous goods exceeds 10 m², buildings regulated by Sentence (1) shall be accessible to fire department vehicles from at least two sides for the purpose of fire fighting. (See Appendix A.)

(3) In buildings regulated by Sentence (1), access openings to each storey provided in conformance with the National Building Code of Canada shall not be less than 750 mm wide by 1100 mm high. (See Appendix A.)

3.3.6.13. Labels. Products classified as dangerous goods shall display appropriate identifying labels from the time they enter a facility until they are issued as finished products or waste material. (See Appendix A.)

3.3.6.14. Placards

(1) Individual storage areas used for storage of dangerous goods shall be clearly designated as such by posted placards conforming to the Transportation of Dangerous Goods Regulations, and in conformance with Sentences (2) to (5). (See Appendix A.)

(2) Where storage consists of a single product, only the UN Product Identification Number (PIN) need be posted.
(3) Where storage consists of multiple products within the same class, the individual class and division placard shall be posted.

(4) Where storage consists of more than one class, a placard for each individual class, or the Transportation of Dangerous Goods Regulations “Danger” symbol shall be posted at the entrance to the storage area.

(5) Individual storage areas described in Sentence (1) shall be identified in the fire safety plan as required in Article 3.3.2.6.

Section 3.4 Industrial Trucks

3.4.1. General

3.4.1.1. Industrial Trucks

(1) Except as provided in Sentences (2) and (3), the designation, use, maintenance and operation of industrial trucks shall conform to NFPA 505, “Fire Safety Standard For Powered Industrial Trucks.”

(2) Fuel-fired industrial trucks shall conform to ULC-C558, “Guide for the Investigation of Internal Combustion Engine-Powered Industrial Trucks.”

(3) Battery-powered industrial trucks shall conform to ULC-C583, “Guide for the Investigation of Electric Battery Powered Industrial Trucks.”

Section 3.5 Salvage Shops and Salvage Yards including Automobile Wrecking Yards

3.5.1. General

3.5.1.1. Roof Storage. The roof of a building located in a salvage yard shall not be used for storage purposes.

3.5.1.2. Open Fires. Fires shall not be permitted in a salvage yard except when used for heating purposes or for operating machinery or equipment.

3.5.1.3. Fencing

(1) Salvage yards of more than 1000 m² shall be surrounded by a firmly anchored fence that is
   (a) substantially constructed to discourage climbing,
   (b) not less than 1.8 m high, and
   (c) provided with gates not less than 3 m wide, to permit the entry of fire department vehicles.

(2) The gates required in Clause (1)(c) shall be locked when the salvage yard is not staffed.

3.5.1.4. Spill Control. Provision shall be made for the safe drainage and disposal of fuel or waste oils emptied from vehicles, tanks or other containers, in conformance with Subsection 4.5.7.

3.5.2. Piling

3.5.2.1. Piles

(1) Piles which include combustible salvage shall be at least 3 m from property lines and not more than 3 m in height and 100 m² in area.

(2) Piles of salvage material shall be separated by a clear space of 3 m, and this space shall be kept clear of all grass and weeds.

(3) Tanks or drums shall be stored in piles separate from piles of other materials.
4.1.9. Liquid Spills and Leaks

4.1.9.1. Liquid Spills and Leaks

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

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

(3) Liquid spilled or leaked shall be removed with the aid of an absorbent and disposed of in an acceptable manner or shall be flushed to a location conforming to Article 4.1.6.2.

Section 4.2 Container Storage and Handling

4.2.1. Application

4.2.1.1. Application

(1) This Section applies to the storage and handling of flammable liquids and combustible liquids in portable tanks, drums, portable containers and prepackaged containers not covered elsewhere in this Part, except that it shall not apply to the following:

(a) containers in service stations, bulk plants, and process plants, including refineries and distilleries,

(b) fuel tanks for motors or engines,

(c) prepackaged containers of alcoholic beverages, foods and pharmaceutical products, and

(d) other products such as detergents, insecticides and fungicides containing not more than 50 per cent by volume of water-miscible flammable liquids or combustible liquids with the remainder of the solution being non-flammable.

4.2.2. General

4.2.2.1. Prohibited Locations. Flammable liquids or combustible liquids shall not be stored in or adjacent to exits, elevators or principal routes that provide access to exits.

4.2.2.2. Fencing. An outside storage area of flammable liquids or combustible liquids shall be fenced in an acceptable manner where necessary to prevent the entry of unauthorized personnel.

4.2.2.3. Separation from Other Dangerous Goods

(1) Except as provided in Sentence (2), flammable liquids and combustible liquids shall be separated from other dangerous goods in conformance with Section 3.3 of this Code.

(2) For the purposes of applying Table 3.3.6.B., Class IIIA combustible liquids shall be treated as Class 3 dangerous goods. (See Appendix A.)

4.2.3. Drums, Portable Containers, Prepackaged Containers and Portable Tanks

4.2.3.1. Containers

(1) Except as permitted in Articles 4.2.3.3. and 4.2.3.4., the storage, handling and use of flammable liquids or combustible liquids in containers having an individual capacity of less than 230 L shall be permitted only in the following containers:

(a) drums and prepackaged containers meeting the requirements of the Transportation of Dangerous Goods Regulations,

(b) portable containers of metal or plastic conforming to CSA-B376, "Portable Containers for Gasoline and Other Petroleum Fuels,"

(c) portable fuel tanks conforming to CSA-B306, "Portable Fuel Tanks for Marine Use," and

(d) safety cans conforming to ULC-C30, "Guide for the Investigation of Metal Safety Containers."

(2) The storage, handling and use of flammable liquids or combustible liquids in portable tanks shall be permitted, provided such tanks are constructed in conformance with CSA Standard B620, "Highway Tanks and Portable Tanks for the Transportation of Dangerous Goods."

4.2.3.2. Markings or Labels

(1) Except as provided in Sentence (2) and Article 4.2.3.1., all drums and prepackaged containers
for flammable liquids 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 the material in the container is flammable, that it should be kept away from heat, sparks and open flames and that it should be kept closed when not in use.

(2) Markings referred to in Sentence (1) are not required when the drum or prepackaged container is labelled in conformance with the requirements of the Transportation of Dangerous Goods Act and its Regulations, or the Hazardous Products Act and its Regulations.

4.2.3.3. Plastic and Glass Containers.

Except as permitted in Article 4.2.3.4, the storage, handling and use of flammable liquids and combustible liquids in glass or plastic prepacked containers shall be permitted only if the required liquid purity (such as ACS analytical reagent grade or higher) would be affected by storage in metal containers or if the liquid would cause excessive corrosion of the metal containers.

4.2.3.4. Other Containers

(1) Except as permitted in Sentence (2), the storage and use of flammable liquids and combustible liquids having a flash point below 60°C, in containers other than those in Article 4.2.3.1, shall not be permitted within a building.

(2) Containers of not more than 1 L capacity in the case of flammable liquids and 5 L in the case of combustible liquids need not conform to Article 4.2.3.1.

4.2.4. Assembly and Residential Occupancies

4.2.4.1. Application. This Subsection shall apply to the storage and handling of flammable liquids 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.

4.2.4.2. Maximum Quantities

(1) Except as provided in Articles 4.2.4.5 and 4.2.4.6, the maximum quantity of flammable liquid or combustible liquid stored in a building described in Article 4.2.4.1 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.

(2) When two 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:

\[ q_I + q_{II} + q_{IIIA} \leq 1 \]  

where

\[ q_I = \text{the actual quantity of Class I liquid present}, \]
\[ q_{II} = \text{the actual quantity of Class II liquid present}, \]
\[ q_{IIIA} = \text{the actual quantity of Class IIIA liquid present}. \]

(3) Quantities of flammable liquids or combustible liquids exceeding those permitted in Sentence (1) are permitted, provided they are kept in a single storage cabinet conforming to Subsection 4.2.10, or in a storage room having no openings that communicate directly with the public portions of the building, and conforming to Subsection 4.2.9.

4.2.4.3. Storage Cabinets and Storage Rooms. The storage cabinet and storage room in Sentence 4.2.4.2.(3) shall not be located above or below the first storey.

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

4.2.4.5. Dwelling Units. Not more than 15 L of flammable liquids and combustible liquids, of which not more than 5 L shall be flammable liquid, are permitted to be stored in each dwelling unit. (See Sentence 4.1.1.1.(3) for oil burning equipment.)

4.2.4.6. Attached Garages and Sheds. Not more than 50 L of flammable liquids and combustible liquids, of which not more than 30 L shall be flammable liquids, are permitted to be stored in a garage or shed attached to a dwelling unit.
a point within 300 mm of the floor near a wall, with at least one make-up air inlet located near the opposite wall.

(5) Where make-up air for a mechanical ventilation system is taken from within the building, the opening shall be protected in conformance with Subsection 2.2.2.

(6) Make-up air for a natural ventilation system shall be supplied directly from outside the building from a source that is remote from any discharge outlet.

(7) Ducts used to ventilate a flammable liquid and combustible liquid storage room shall be used solely for that purpose and shall conform to the National Building Code of Canada.

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

4.2.9.5. Dispensing. Dispensing of flammable liquids or combustible liquids from drums shall be by acceptable pumps or through acceptable self-closing valves.

4.2.9.6. Portable Extinguishers. Portable extinguishers shall be provided for storage rooms described in Article 4.2.9.1. in conformance with Part 6.

4.2.10. Cabinets for Container Storage

4.2.10.1. Containers. Flammable liquids and combustible liquids stored in cabinets required in this Part shall be in containers conforming to Sentence 4.2.3.1.(1).

4.2.10.2. Maximum Quantities. The total quantity of flammable liquids and combustible liquids stored in a cabinet shall be 500 L, of which not more than 250 L may be flammable liquids.

4.2.10.3. Maximum Number of Cabinets

(1) Except as provided in Sentences (2) and (3), not more than 3 cabinets may be located in a fire compartment provided

(2) In industrial occupancies, more than 3 cabinets may be located in a fire compartment provided

(a) not more than 3 cabinets are grouped together in one location, and

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

(3) In Group B institutional occupancies, only one cabinet shall be located in a fire compartment.

4.2.10.4. Labelling. 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.

4.2.10.5. Construction

(1) Except as permitted in Sentence (2), storage cabinets in Article 4.2.10.1. shall be constructed to limit the internal temperature rise to not more than 139°C above ambient temperature for a period of 10 min when the entire cabinet is subjected to a temperature equal to that set forth in CAN/ULC-S101-M "Standard Methods of Fire Endurance Tests of Building Construction and Materials."

(2) When acceptable, wood storage cabinets constructed in conformance with Clauses (a) to (g) may be used in lieu of those described in Sentence (1).

(a) The top, sides and bottom of wood cabinets shall be constructed of an exterior grade of plywood not less than 25 mm thick.

(b) A 50 mm deep liquid-tight metal pan shall be provided at the bottom of wood cabinets.

(c) All joints on wood cabinets shall be rabbeted and fastened in 2 directions with flathead wood screws.

(d) When more than one door is used on wood cabinets, there shall be a rabbeted overlap of not less than 25 mm.

(e) Hinges on wood cabinets shall be mounted so as to maintain their holding capacity due to loosening or burning-out of the screws.

(f) Doors on wooden cabinets shall be provided with latches that will keep them securely closed.
(g) Wood cabinets shall be provided with liquid-tight sills beneath doors, extending not less than 50 mm above the bottom of the cabinet.

4.2.11. Outdoor Container Storage

4.2.11.1. Quantities and Clearances

(1) Except as provided in Sentence (2), the quantities and clearances for flammable liquids and combustible liquids stored in drums, portable containers and prepackaged 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 5 000 L of flammable liquids or combustible liquids are stored adjacent to a building on the same property, provided that either

(a) the building is limited to 1 storey in building height and is used for the storage or handling of flammable liquids or combustible liquids, or

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

4.2.11.2. Mixed Storage. 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.

4.2.11.3. Fire Department Access. A lane not less than 6 m wide constructed in conformance with the National Building Code of Canada 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. (See Appendix A.)

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

| Table 4.2.11.A.  
Forming Part of Article 4.2.11.1.  
Outdoor Container Storage  |
<table>
<thead>
<tr>
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<tr>
<td>Class of Liquid</td>
<td>Maximum Total Quantity, per Pile, L</td>
<td>Minimum Distance Between Piles, m</td>
<td>Minimum Distance to a Property Line or to a Building on the Same Property, m</td>
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| Class IIA  
(Flash point below 22.8°C) | 5 000            | 1.5             | 6              |
| Class IB or IC  
(Flash point at or above 22.8°C and below 37.8°C) | 15 000           | 1.5             | 6              |
| Class II  
(Flash point at or above 37.8°C and below 60°C) | 35 000           | 1.5             | 6              |
| Class IIIA  
(Flash point at or above 60°C and below 93.3°C) | 85 000           | 1.5             | 6              |
| Column 1 | 2 | 3 | 4 |
Section 4.3 Tank Storage

4.3.1. Design, Construction and Use of Storage Tanks

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

4.3.1.2. Atmospheric Storage Tanks

(1) Except as permitted in Sentence (3) and in Section 4.9, atmospheric storage tanks shall be built in conformance with the following:

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

(2) Tanks built in conformance with the standards in Clauses (1)(h), (i) and (j) shall be used only for the storage of crude petroleum at oil fields.

(3) When necessitated for reasons of 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 liquids or combustible liquids at temperatures at or above their boiling points.

4.3.1.3. Low Pressure Storage Tanks and Pressure Vessels

(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) “Pressure Vessels,” Section VIII, Division 1 of the 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 may be used as atmospheric storage tanks.

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

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

4.3.1.6. Floating Roofs. Except for perimeter sealing material, floating roof assemblies or internal floating covers installed in storage tanks shall be constructed of metal or other acceptable materials and design.

4.3.2. Installation of Outside Aboveground Storage Tanks

4.3.2.1. Location

(1) Except as provided in Sentences (2) to (4), every aboveground storage tank for the storage of
flammable liquids or combustible liquids shall be located in conformance with Table 4.3.2.A, with respect to property lines and buildings.

(2) The minimum required distance in Sentence (1) from a storage tank to a property line or to a building on the same property is permitted to be reduced to 1.5 m provided the tank contains only combustible liquids and does not exceed 50 000 L storage capacity.

(3) At bulk plant rail loading and unloading facilities, the minimum distance from a storage tank to a property line or to a building on the same property may be reduced to the limits specified in General Order O-32, “Flammable Liquids Bulk Storage Regulations” of Transport Canada.

(4) The minimum distance from a storage tank to a building on the same property may be reduced to 0.5 m provided the tank
   (a) contains only combustible liquids, and
   (b) does not exceed 5 000 L capacity.

(5) 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. Forming Part of Sentence 4.3.2.1.(1)

<table>
<thead>
<tr>
<th>Location of Aboveground Storage Tanks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Tank Capacity, L</td>
</tr>
<tr>
<td>---------------------------</td>
</tr>
<tr>
<td>250 000</td>
</tr>
<tr>
<td>500 000</td>
</tr>
<tr>
<td>2 500 000</td>
</tr>
<tr>
<td>5 000 000</td>
</tr>
<tr>
<td>over 5 000 000</td>
</tr>
</tbody>
</table>

4.3.2.2. Spacing between Storage Tanks

(1) Except as required in Sentence (2) and Article 4.3.2.3, the minimum distance between aboveground storage tanks shall be half the diameter of the smaller of every 2 adjacent tanks where any one of the tanks has a capacity exceeding 250 000 L, but in no case shall the distance be less than 1 m.

(2) The minimum distance between any 2 storage tanks, neither of which has a capacity of more than 250 000 L shall be 1 m.

4.3.2.3. Clearances from Liquefied Petroleum Gas Containers

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

(2) Diked storage areas for flammable liquids and combustible liquids shall not contain liquefied petroleum gas cylinders or tanks, and the centre line of the dike shall be not less than 3 m away from such cylinders or tanks.

4.3.2.4. Access for Fire Fighting. Storage tanks for flammable liquids or combustible liquids shall be spaced so that each storage tank is accessible for fire fighting purposes.

4.3.2.5. Testing. At the time of installation, aboveground storage tanks and associated piping shall be tested in conformance with Subsection 4.3.16. and 4.4.6.

4.3.3. Supports, Foundations and Anchorages for Aboveground Storage Tanks

4.3.3.1. Foundations and Supports

(1) Storage tanks shall rest on the ground on foundations or on supports made of concrete, masonry, piling or steel in conformance with Appendix B of API-650, “Welded Steel Tanks for Oil Storage” and 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.
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 flammable liquid shall not be connected to the vent piping for a storage tank containing a combustible liquid unless an effective method is provided to prevent the vapours from the flammable liquids storage tank from entering the other tank.

4.3.11. Openings Other than Vents in Underground Storage Tanks

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

4.3.11.2. Openings for Measuring Liquid Level. 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.

4.3.11.3. Fill Piping and Discharge Piping

(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 4.5.7.2.(2), connections used as part of normal operating conditions for filling or emptying storage tanks for flammable liquids and combustible liquids shall be located outside buildings at a location free of sources of ignition and not less than 1.5 m away from building openings.

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

(5) Connections for filling or emptying storage tanks in Sentence (3) shall be identified in conformance with CPPII "Recommended Practice for Product Identification at Service Stations and Distribution Terminals."

4.3.12. Installation of Storage Tanks inside Buildings

4.3.12.1. Occupancy

(1) Except as provided in Articles 4.3.12.2. and 4.3.12.3., storage tanks shall not be permitted in other than industrial occupancies.

(2) Rooms and floor areas used for storage of flammable liquids or combustible liquids in storage tanks inside buildings shall be classified as Group F, Division 1 occupancies in conformance with the National Building Code of Canada. (See Appendix A.)

4.3.12.2. Oil Burning Equipment. Storage tanks for combustible liquids used as a fuel supply for stationary engines shall be installed in conformance with the requirements of CSA B139, "Installation Code for Oil Burning Equipment" for supply tanks installed inside buildings.

4.3.12.3. Stationary Combustion Engines

(1) Except as permitted in Sentence (2), installations using flammable liquids as fuel supplies for stationary engines inside buildings shall conform to NFPA 37, "Installation and Use of Stationary Combustion Engines and Gas Turbines."

(2) In buildings which contain only stationary engines and associated generating or pumping equipment, flammable liquids may be used as fuel supplies provided the installation conforms to this Part.

4.3.12.4. Maximum Quantities and Location

(1) Except as provided in Subsection 4.2.8., and in Article 4.3.12.7., storage tanks for flammable liquids 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 liquids or combustible liquids are permitted to be located outside of a storage room conforming to Subsection 4.3.13., provided that
(a) total quantities 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 4.3.13.3.

(3) Quantities permitted in Sentence (2) to be outside of a storage room shall be included in the total quantity allowed per storey in Table 4.3.12.A.

4.3.12.5. Maximum Static Head. 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.

4.3.12.6. Mixed Storage. When two or more classes of liquids are stored in a single storey, the total quantity permitted for each class of liquid shall be calculated as follows:

\[
\frac{Q_1 + Q_{II} + Q_{IIIA}}{Q_1} \leq 1
\]

where

- \( q_1 \) = the actual quantity of Class I liquid present,
- \( q_{II} \) = the actual quantity of Class II liquid present,
- \( q_{IIIA} \) = the actual quantity of Class IIIA liquid present,
- \( Q_1 \) = the maximum quantity of Class I liquid permitted in Table 4.3.12.A.,
- \( Q_{II} \) = the maximum quantity of Class II liquid permitted in Table 4.3.12.A.,
- \( Q_{IIIA} \) = the maximum quantity of Class IIIA liquid permitted in Table 4.3.12.A.

### Table 4.3.12.A.

Forming Part of Article 4.3.12.4.

<table>
<thead>
<tr>
<th>Class of Liquid</th>
<th>Location of Dedicated Room</th>
<th>Maximum Quantity per Storey(1), L One or more Tanks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLASS I (Flash point below 37.8°C)</td>
<td>First storey</td>
<td>40 000</td>
</tr>
<tr>
<td></td>
<td>Storeys above the first storey</td>
<td>7 500</td>
</tr>
<tr>
<td></td>
<td>Basement</td>
<td>Not Permitted</td>
</tr>
<tr>
<td>CLASS II and IIIA (Flash point at or above 37.8°C and below 93.3°C)</td>
<td>First storey</td>
<td>200 000</td>
</tr>
<tr>
<td></td>
<td>Storeys above the first storey</td>
<td>20 000</td>
</tr>
<tr>
<td></td>
<td>Basement</td>
<td>20 000</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Notes to Table 4.3.12.A.:

(1) See Article 4.2.7.7. for guidance on acceptable protection.
(2) See Article 4.3.13.1.
in conformance with ANSI B16.5, "Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys."

(2) Bronze flanges for 2 in. or smaller size piping in Article 4.4.5.2. may be used where copper and brass piping is permitted.


4.4.5.5. Gaskets. Gaskets in flanged connections shall be of a material resistant to the liquid being carried and capable of withstanding temperatures of 650°C and above without damage.

4.4.6. Leakage Testing of Piping Systems

4.4.6.1. Leakage Testing

(1) Except as provided in Sentence (2), piping systems including those at service stations, shall be tested for leakage by an acceptable test method before backfilling at the time of installation and whenever a leak is suspected.

(2) Exposed piping systems in service may be visually inspected for leakage in conformance with Sentence 4.4.11.3.

(3) When exposed piping systems are subjected to a pneumatic leakage test, the piping, including the joints, shall be soaped to assist in the detection of leaks.

4.4.6.2. Retention of Records. Records of the pressure tests on piping systems shall be retained for examination by the authority having jurisdiction, in conformance with Article 1.1.5.1.

4.4.6.3. Remedial Action. 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 4.1.9.

4.4.6.4. Failure Criteria. Piping systems shall be considered to be leaking when any pressure drop or volume loss is detected within a 2 h period after steady temperature conditions have been established and the source of pressure has been removed.

4.4.6.5. Test Equipment. Pressure measurements in Article 4.4.6.1. shall be obtained by using instruments calibrated in increments of not more than 4 kPa for test pressures up to 700 kPa (gauge) and in increments of not more than 1 per cent of the test pressure where it exceeds 700 kPa (gauge).

4.4.6.6. Test Pressures

(1) Except as provided in Sentences (2) and (3) and Article 4.4.6.7., 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 the 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.

4.4.6.7. Flammable Liquids as a Test Medium. Flammable liquids shall not be used for pressure testing piping systems, except that pressure lines normally containing flammable liquids may be tested with such liquids at pressures not exceeding their maximum operating pressures.

4.4.7. Location and Arrangement of Piping

4.4.7.1. Location

(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 liquids or combustible liquids is installed within a building, the length of piping shall be as direct and as short as practicable.
4.4.7.2. Supports for Aboveground Outdoor Piping

(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 in Sentence (1) and for fill pipes for storage tanks.

4.4.7.3. Arrangement of Aboveground Outdoor Piping

(1) Aboveground outdoor piping shall not be permitted to be located on the exterior of walls except on those of noncombustible construction, and in no case shall such piping be located above windows.

(2) Aboveground outdoor piping located above roofs shall not be permitted except above roofs of noncombustible and impermeable 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 though dike walls shall be designed to prevent excessive stress resulting from settlement or fire exposure.

4.4.7.4. Underground Piping

(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 General Order No. E-10, “Pipe Crossings Under Railways (No. E-10) Regulations,” issued by Transport Canada.

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

4.4.7.5. Installation of Underground Piping

(1) Underground piping shall be supported on undisturbed or compacted soil and shall be backfilled on the top and sides with not less than 300 mm of pea gravel or clean crushed stone or not less than 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.

4.4.7.6. Piping in Service Tunnels.

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

4.4.7.7. Piping at Entrances to Buildings

(1) Piping for flammable liquids 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.

4.4.7.8. Indoor Piping

(1) Indoor piping for flammable liquids 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.

4.4.7.9. Piping in Trenches

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

(2) When piping referred to in Sentence (1) contains flammable liquids, the trench shall be provided with positive ventilation to the outdoors or shall be designed to prevent the accumulation of flammable vapours.
4.4.7.10. Overhead Piping

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

(2) Where practicable, 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 acceptable pipe hangers attached to the flanges.

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

4.4.7.11. Supports for Overhead Piping

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

(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.

4.4.7.12. Protection of Pipe Risers. Exposed pipe risers shall be protected against mechanical damage by installing such risers adjacent to walls or pilasters, between flanges of steel columns or within securely anchored larger perforated pipe, and by providing mechanical guards where the risers are exposed to mobile equipment.

4.4.7.13. Provision for Expansion and Contraction

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

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

4.4.8. Valves in Piping Systems

4.4.8.1. Design

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


4.4.8.2. Shut-Off Valves

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

(2) Where practicable, 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 may be used when special conditions warrant their use.

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

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

4.4.8.5. Indicating Valves. Rising stem or other indicating valves shall be used where necessary to determine whether the valves are open or shut.
4.4.8.6. Meters. Where cast iron meters are used, they shall be isolated by the use of steel valves.

4.4.8.7. Identification

(1) All aboveground valves shall be identified so that:
   (a) valves controlling flammable liquids are identified by an octagonal red tag, and
   (b) valves controlling combustible liquids are identified by a circular tag coloured other than red, green or red-orange.

(2) Identification tags required in Sentence (1) shall be of enamelled metal, anodized aluminum, pressed fibre or solvent resistant plastic.

(3) Identification tags shall indicate the name of the product in clear, legible, permanent characters.

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

4.4.9. Heating of Piping Systems

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

4.4.9.2. Steam Heating

(1) Flammable liquid and combustible liquid piping may 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 requirements of the National Building Code of Canada.

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

4.4.9.4. Thermal Electrical Conduction Heating

(1) Thermal electrical conduction heating conforming to Sentence (2) may 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 shall conform to the following:
   (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 installation, systems permitted in Sentence (1) shall be tested to ensure that all components are functioning as intended.

4.4.9.5. Open Flames. The use of open flames as a heat source shall not be permitted for heating piping for flammable liquids or combustible liquids.

4.4.10. Methods of Transfer in Piping Systems

4.4.10.1. Location of Outdoor Pumps. Pumps for flammable liquid or combustible liquid piping systems installed aboveground and outside of buildings shall be located not less than 3 m from the property line and not less than 1.5 m from building openings.

4.4.10.2. Pump Houses and Pump Rooms

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

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

4.4.10.3. Pits

(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.
4.5.6. Remote Pumping Systems

4.5.6.1. Application. This Subsection shall apply to systems for dispensing flammable liquids or combustible liquids where such liquids are transferred from bulk storage to individual or multiple dispensing units by pumps located elsewhere than at the dispensing units.

4.5.6.2. Pumps and Control Equipment

(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.

4.5.6.3. Emergency Valves

(1) An emergency valve conforming to CAN/ULC-S651-M, "Standard for Emergency Valves for Flammable and Combustible Liquids" and incorporating a fusible element having a maximum temperature rating of 71°C shall be installed in the supply line so that the shear point of the valve is at a level not higher than nor more than 25 mm below the base of the dispensing unit.

(2) Emergency valves required in Sentence (1) shall close automatically in the event of severe impact or fire exposure to the dispensing unit.

(3) The emergency valve required in Sentence (1) shall be maintained in operating condition and serviced at least every 12 months.

4.5.6.4. Pump Location

(1) Pumps installed aboveground and outside buildings shall be located not less than 3 m from any property line and 1.5 m from any building opening.

(2) When an outside pump location is impractical, pumps may be installed inside buildings as provided in Article 4.5.2.2. or in pits as provided in Article 4.5.2.11.

4.5.6.5. Leakage Testing. After the completion of the installation, including paving, all underground lines connected to tanks shall be tested for leakage in conformance with Subsection 4.4.6.

4.5.6.6. Marine Service Stations

(1) Except as permitted in Sentence (2), tanks and pumps not integral with the dispensing unit at marine service 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 may be installed on a pier provided

(a) that the applicable portions of Subsection 4.3.7 relating to spacing, diking and piping are complied with, and

(b) the quantity stored does not exceed 5 000 L aggregate capacity.

(3) No storage tank at a marine service 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 service stations may be located aboveground where rock or a high water table make underground tanks impractical.

(5) Where storage tanks at a marine service station are at an elevation above the dispensing unit, an electrically operated solenoid valve, designed to open only when the dispensing apparatus is being operated, and to prevent gravity draining of the tank in the event of a rupture of the supply line to the dispensing unit, 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 dispensing units at a marine service station shall conform to Section 4.4., except that where dispensing is from a floating structure, suitable lengths of acceptable flexible hose may be employed between the piping on shore and the piping on the floating structure.

4.5.7. Drainage and Waste Disposal

4.5.7.1. Spill Control and Waste Disposal

(1) Provision shall be made in areas where flammable liquids are dispensed to prevent spilled liquid from entering buildings or waterways by providing grading or curbing and drainage.

(2) Flammable liquids and combustible liquids shall not be dumped into sewers but shall be stored outside in tanks or drums conforming to Article 4.5.7.2. until removed from the premises.

4.5.7.2. Waste Oil

(1) Except as provided in Sentences (2) and (3), the storage and handling of waste oil shall conform to the appropriate requirements for the storage and handling of flammable liquids contained in this Part. (See Appendix A.)

(2) A pipe to convey waste oil is permitted to extend inside a building provided that such pipe is equipped with a trap, and extends to the lowest point in a waste oil storage tank.

(3) Not more than 2,500 L of waste oil is permitted to be stored above ground at a service station within 15 m of buildings or areas of the property to which the public has access.

4.5.8. Supervision and Dispensing Procedures

4.5.8.1. Attendants

(1) Except as provided in Sentence (2), every service station shall have at least one attendant on duty when the station is open for business.

(2) Service stations which do not serve the general public do not require an attendant.

(3) Except as permitted at self-service outlets, a competent employee shall be in constant control of the dispensing of flammable liquids and combustible liquids with flash points below 60°C into the fuel tanks of motor vehicles or watercraft or into portable containers.

4.5.8.2. Self-Service Outlets

(1) Instructions for the operation of dispensing units 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 dispensing units so that the attendant has an unobstructed view of all units at the same time.

(3) The control console in Sentence (2) shall be equipped to regulate the operation of each dispensing unit.

(4) A 2-way communication system between the control console and each pump island shall be provided at self-service outlets.

(5) At service stations which provide both attended service and self-service, the attendant required in Sentence 4.5.8.1.(1) is permitted to dispense flammable liquids 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.

4.5.8.3. Special Dispensing Devices.

Except as provided in Article 4.5.8.4. for card or key activated equipment, special type dispensing devices 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.

4.5.8.4. Card or Key Operated Dispensing Devices

(1) Card or key activated dispensing devices are permitted at unattended self-service outlets and service stations that are not open to the general public, in conformance with Sentences (2) to (6). (See Appendix A.)

(2) Except as provided in Sentences (3) to (6), installation of card or key activated dispensing devices shall conform to the requirements for self-service outlets and service stations in this Section.
4.5.8.5. Duties of Attendants

(1) Attendants on duty at self-service outlets, service stations, and marine service stations shall
(a) supervise the dispensing of flammable liquids and combustible liquids,
(b) not activate the controls to permit the dispensing of fuel at an individual dispensing unit until the customer at the unit is ready to activate the nozzle,
(c) prevent the dispensing of flammable liquids and combustible liquids into containers not conforming to Clauses 4.2.3.1.(1)(b), (c) and (d),
(d) take appropriate measure to prevent sources of ignition from creating a hazard at the dispensing units,
(e) take appropriate action in the event of a spill to reduce the risk of fire, and
(f) shut off the power to all dispensing units in the event of a spill or fire.

(2) Attendants on duty at marine service stations shall
(a) not activate the controls to permit the dispensing of fuel at an individual dispensing unit until all ports and hatches on the watercraft have been closed, and
(b) prevent the dispensing of flammable liquids and combustible liquids into portable containers or portable fuel tanks until they have been removed from the watercraft.

4.5.8.6. Fuel Dispensing Procedures

(1) Except as provided in Sentence (2), flammable liquids and combustible liquids shall not be dispensed into the fuel tank of a motor vehicle or watercraft while its engine is running.

(2) Diesel fuel may be dispensed into the fuel tank of a vehicle while the engine is running provided it is dispensed at least 7.5 m from gasoline dispensing units.

(3) Flammable liquids and combustible liquids with a flash point below 60°C shall not be dispensed at a service 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 liquids 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) in the event of spillage immediately apply an acceptable absorbent material to soak up the spillage, except as provided in Article 4.5.8.5. and (d),
(d) not dispense flammable liquids and combustible liquids with a flash point below 60°C in proximity to open sources of ignition.

4.5.9. Smoking

4.5.9.1. Smoking. Smoking shall not be permitted within 7.5 m of dispensing locations at service stations.

4.5.9.2. Signs

(1) At least one weather-resistant sign prohibiting smoking and conforming to Sentences (2) to (5) shall be provided for each dispensing location.

(2) The signs required in Sentence (1) shall indicate that smoking within 7.5 m of the dispensing unit is not permitted and that the ignition must be turned off while the vehicle is being refuelled. (See Appendix A.)

(3) Signs 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.
4.5.9.2.

(4) Signs required in Sentence (1) may be international "No Smoking — Ignition Off" symbols not less than 100 mm in diameter.

(5) Signs in Sentence (1) shall be installed in a location visible to all drivers approaching the dispensing location and at the dispensing unit.

4.5.10. Product Losses

4.5.10.1. Liquid Level Measurement. Except for waste oil storage tanks, the liquid level in storage tanks at service stations shall be measured in conformance with Subsection 4.3.17. (See Article 4.3.16.1. for leakage testing.)

4.5.11. Fire Protection

4.5.11.1. Portable Extinguishers. At least 2 portable extinguishers each having a rating of not less than 10-BC shall be provided at every service station in conformance with Part 6.

4.5.11.2. Absorbent Materials. Absorbent material to soak up liquid spillage shall be provided for use by attendants at service stations.

Section 4.6 Bulk Plants

4.6.1. Application

4.6.1.1. Application. This Section shall apply to that portion of a property where flammable liquids or combustible liquids are received in bulk quantities and are stored or handled for the purpose of distributing such liquids by pipeline, tank vessel, tank vehicle or other container.

4.6.2. Storage

4.6.2.1. Storage. Flammable liquids and combustible liquids shall be stored in closed containers or in storage tanks located outside buildings in conformance with Section 4.3.

4.6.2.2. Shock Pressure. Bulk storage tanks, piping, pumps, valves and associated components shall be designed, installed and maintained to accommodate shock pressure on the system.

4.6.2.3. Container Storage

(1) Containers for flammable liquids or combustible liquids stored indoors shall be arranged in conformance with Subsection 4.2.7.

(2) Containers for flammable liquids 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.

4.6.2.4. Spill Control. Outdoor storage areas shall be graded in conformance with Subsection 4.1.6. to prevent spillage of flammable liquids or combustible liquids to adjacent properties.

4.6.2.5. Fencing

(1) The area occupied by aboveground storage tanks and associated pumps, valves and piping shall be surrounded by a firmly anchored fence.

(2) The fence required in Sentence (1) shall be substantially constructed to discourage climbing, with a minimum height of 1.8 m and with 2 gates which shall be locked when the bulk plant is not in operation or when the enclosure is not staffed.

4.6.3. Heating

4.6.3.1. Heating Appliances

(1) Rooms in which flammable liquids are stored or handled shall not contain fuel-burning appliances or electric heating elements that could be exposed to the room air.

(2) Rooms containing heating appliances shall be located and vented to prevent the entry of flammable vapours.

4.6.4. Ventilation

4.6.4.1. Ventilation

(1) Ventilation shall be provided for all rooms in which flammable liquids are pumped or dispensed.

(2) Natural ventilation shall be permitted where the pumping or dispensing equipment is part of a closed system.
The design of the ventilation system shall take into account the relatively high specific gravity of the vapours.

Natural ventilation may be provided by means of openings located at floor levels in outside walls and unobstructed except for louvres or coarse screens.

Where natural ventilation is inadequate, mechanical ventilation shall be provided.

4.6.4.2. Basements and Pits. Flammable liquids shall not be stored or handled within a building having a basement or pit unless the basement or pit is provided with mechanical ventilation designed to prevent the accumulation of flammable vapours.

4.6.4.3. Electrical Interlocks. Where sufficient mechanical ventilation is provided to prevent dangerous quantities of vapour accumulation, the ventilation system shall be kept in operation while flammable liquids are being handled and shall be electrically interlocked with the lighting system and, where practical, to the dispensing equipment, so that the ventilation system will be actuated during dispensing operations.

4.6.5. Dispensing

4.6.5.1. Interconnection. Dispensing systems for flammable liquids or combustible liquids shall not be interconnected.

4.6.5.2. Dispensing into Vehicles

(1) Apparatus serving the general public for dispensing flammable 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 the dispensing apparatus in Sentence (1) is supplied from an aboveground storage tank

(a) an electrically-operated solenoid valve, designed to open only when the apparatus is being operated, shall be provided at the tank outlet, and

(b) an emergency valve shall be provided for the dispensing apparatus in conformance with Sentence 4.5.6.3.(2).

4.6.5.3. Dispensing and Transferring inside Buildings. Flammable liquids shall be dispensed or transferred inside buildings only in conformance with Subsections 4.1.7. and 4.1.8.

4.6.5.4. Dispensing into Metal Containers. Flammable liquids shall not be dispensed into metal containers unless the containers are electrically connected in conformance with Article 4.1.8.2.

4.6.6. Loading and Unloading Facilities

4.6.6.1. Clearances

(1) The distance from the fill stem of a loading or unloading facility for tank vehicles or tank cars to aboveground storage tanks, buildings and property lines shall be not less than 3 m, measured horizontally, except as otherwise required in General Order O-32, “Flammable Liquids Bulk Storage Regulations” of Transport Canada.

(2) Buildings for the shelter of personnel or pumps shall be considered a part of the loading or unloading facility.

4.6.6.2. Multi-Purpose Facilities. When piping and pumping systems have been used for the transfer of either flammable liquids or combustible liquids at loading or unloading facilities, the system shall be cleaned of vapours before the other class of liquid is introduced.

4.6.6.3. Check Valves

(1) Systems through which tank cars or tank vehicles discharge into aboveground storage tanks by means of pumps shall be provided with check valves conforming to Subsection 4.4.8.

(2) Systems referred to in Sentence (1) shall be designed, installed and maintained to prevent leakage or spillage.

4.6.6.4. Control Valves

(1) Valves installed to control the filling of tank vehicles shall be of the self-closing type when used for flammable liquids or combustible liquids with a flash point below 60°C.

(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.

4.6.6.5. Bonding and Grounding

(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 liquids or combustible liquids.

(2) Where flammable liquids 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. (See Appendix A.)

(3) Bonding required in Sentence (1) shall consist of a metallic bond wire connected to the fill stem or to some part of the rack 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.

4.6.6.6. Downspouts

(1) Except as permitted in Sentence (2), where there is a possibility that tank vehicles or tank cars contain an explosive vapour-air mixture, or where the liquid being filled can form such a mixture, filling through open domes shall be by means of a downspout which extends to near the bottom of the tank and is shaped to minimize turbulence in the liquid during filling.

(2) The downspout required in Sentence (1) shall not be required when the liquid is one which is not subject to accumulation of static charges.

4.6.7. Fire Protection

4.6.7.1. Portable Extinguishers. At least 2 portable extinguishers each having a rating of not less than 20-BC shall be provided at hazardous locations in bulk storage plants for flammable liquids and combustible liquids, except that such portable extinguishers may be provided from the tank vehicles operated as part of a bulk plant which is not required in Article 4.6.2.5. to be fenced.

4.6.8. Drainage and Waste Disposal

4.6.8.1. Spill Control. Facilities to control possible spills of flammable liquids or combustible liquids shall be provided at loading and unloading points in conformance with Subsection 4.1.6.

4.6.8.2. Waste Disposal. Flammable liquids and combustible liquids shall not be dumped into sewers but shall be stored in special tanks or drums until removed from the premises.

Section 4.7 Piers and Wharves

4.7.1. Application

4.7.1.1. Application. This Section applies to flammable liquid and combustible liquid installations on piers and wharves, but does not include marine service stations.

4.7.2. General

4.7.2.1. Clearances

(1) Piers and wharves at which flammable liquid or combustible liquid cargoes are to be transferred in bulk quantities to or from tank vessels shall be not less than 30 m from any bridge over a navigable waterway, or from 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 liquids or combustible liquids shall be not less than 60 m from a bridge or from an entrance to a tunnel.

4.7.2.2. Construction. The substructure and deck of a pier or wharf shall be designed for its intended use and shall be constructed of heavy...
timber or material that will provide adequate flexibility, resistance to shock, durability, strength and fire resistance.

### 4.7.3. Storage Tanks

#### 4.7.3.1. Installation

1. Except as permitted in Sentences (2) to (4), storage tanks shall be installed on shore in conformance with Subsections 4.3.2. to 4.3.11.

2. Storage tanks may be located in buildings on piers and wharves of solid-fill or noncombustible construction subject to the requirements of Subsections 4.3.12. to 4.3.14.

3. Storage tanks may be buried in piers and wharves of the solid-fill type subject to the requirements of Subsections 4.3.8. to 4.3.11.

4. Unenclosed drums and storage tanks not exceeding 250 L individual capacity may be used for fuel supplies to heating equipment on piers and wharves.

### 4.7.4. Piping, Valves and Fittings

#### 4.7.4.1. Installation and Materials

The method of installation and materials used for piping, valves and fittings shall conform to the requirements of Section 4.4.

#### 4.7.4.2. Pipe Supports

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 wood having no dimension less than 150 mm or shall consist of steel or concrete.

3. Where pipe is supported more than 1.2 m above the pier deck, piping supports shall have a minimum fire-resistance rating of 2 h.

#### 4.7.4.3. Guards

In areas where general cargo is handled or where piping might be subject to mechanical damage from vehicles or water craft, the piping shall be protected by means of guards.

#### 4.7.4.4. Flexible Connections

Piping between the shore and piers or wharves shall be provided with swing joints or acceptable flexible connections to permit the independent movement of the pier or wharf and shore piping without strain on the pipe.

### 4.7.4.5. Shut-Off Valves

A readily accessible valve to shut off the supply from shore shall be provided in each pipeline within 7.5 m of piers and wharves.

### 4.7.4.6. Access Openings for Inspection

1. Access openings for inspection purposes below deck shall be provided for valves in Article 4.7.4.5. and 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).

### 4.7.4.7. Identification

Identification tags or labels of metal or other suitable material impervious to water and to the flammable liquids or combustible liquids being transferred shall be attached to and maintained on all pipelines and control valves to designate their use.

### 4.7.4.8. Testing

1. Piping systems shall be tested 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 least annually.

### 4.7.5. Bonding and Grounding

#### 4.7.5.1. Bonding and Grounding

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. (See Appendix A-4.6.6.5.(2).)

2. Insulating joints shall be placed in all rails where entering upon the pier or wharf.
4.7.6. Fire Prevention and Protection

4.7.6.1. Portable Extinguishers

(1) Portable extinguishers having a rated capacity of 20-BC shall be provided in the vicinity of flammable liquid pumps and fueling equipment in conformance with the requirements of Part 6.

(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 liquids or combustible liquids or are being refuelled, suitable portable extinguishers with a rating of not less than 20-BC 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.

4.7.6.2. Instructions to Personnel. Operating personnel shall be provided with instructions on how to summon the nearest fire department in the event of fire.

4.7.7. Bulk Transfer Stations

4.7.7.1. Location

(1) Except as permitted in Sentence (2) the bulk transfer of flammable liquids or combustible liquids shall be permitted only on piers and wharves used exclusively for that purpose.

(2) Where it is not practicable 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.

4.7.7.2. Leakage and Spill Control

(1) A sump pit, settling basin or other acceptable means shall be provided at transfer stations to carry off possible leakage from hose couplings in conformance with the requirements of Subsection 4.1.6.

(2) Provision shall be made to prevent or contain spillage resulting from the disconnection of hoses.

4.7.7.3. Hose Connections

(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.

4.7.8. Cargo Hose

4.7.8.1. Cargo Hose. The transfer of flammable liquids or combustible liquids between tank vessels and piers or wharves shall be through acceptable flexible cargo hose or jointed tubing or piping suitable for the cargo to be transferred and designed to withstand the maximum design working pressure.

4.7.8.2. Maintenance and Testing. Cargo hose shall be maintained in satisfactory operating condition and be pressure tested at least annually to one and one-half times the maximum working pressure but not less than 350 kPa (gauge).

4.7.8.3. Supports. Cargo hose shall be supported where it is not run on a solid foundation.

4.7.9. Cargo Pumps

4.7.9.1. Design and Installation. Cargo pumps shall be designed and installed in conformance with Subsection 4.4.10.

4.7.9.2. Pressure Relief. Cargo pumps capable of building up pressures in excess of the safe working pressure of the cargo hose shall be provided with return lines, relief valves or some other acceptable arrangement.

4.7.9.3. Location

(1) Except as permitted in Sentence (2), cargo pumps shall be located on shore or on piers and wharves either of noncombustible construction or of the solid-fill type and be not less than 3 m from other buildings or structures.
(2) Where it is not practicable to install cargo pumps as required in Sentence (1), they may be installed on piers and wharves of combustible construction if located in pump houses in conformance with Subsection 4.7.10., and provided such pump houses are not less than 3 m from other buildings.

4.7.10. Pump Houses

4.7.10.1. Construction. 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.

4.7.10.2. Ventilation. Ventilation and venting shall be provided in conformance with the requirements of Subsection 4.1.7.

4.7.11. Transfer Operations

4.7.11.1. Supervision

(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 vessel which is normally manned 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.

4.7.11.2. Bonding and Grounding

(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.

4.7.11.3. Equipment

(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.

4.7.11.4. Spill Control

(1) When transfer operations are completed, the valves on the hose connections shall be closed, the cargo hose drained into appropriate containers and then emptied in conformance with Subsection 4.1.6.

(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

4.8.1. Application

4.8.1.1. Application

(1) Except as provided in Sentence (2), this Section applies to those process plants, including refineries, which contain industrial processes involving flammable liquids or combustible liquids.

(2) This Section does not apply to distilleries.

4.8.2. Location

4.8.2.1. Outdoor Processing Equipment

(1) The location of outdoor processing equipment in industrial processing plants shall be based on its flammable liquid or 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.

4.8.3. Processing Buildings

4.8.3.1. Explosion Resistance. Exterior walls of buildings where unstable liquids or flammable liquids having flash points below 22.8°C are processed shall be constructed to accommodate pressures from explosion to the extent that the principal load carrying members will remain intact.

4.8.3.2. Fire Separations. Areas in buildings where unstable liquids are handled or where small scale unit chemical processes are carried on shall be separated from the remainder of the building by a fire separation having a fire-resistance rating of not less than 2 h.

4.8.3.3. Basements and Pits. Buildings where flammable liquids and combustible liquids with flash points below 60°C are handled in chemical processes shall not have basements or covered pits.

4.8.3.4. Ventilation

(1) Enclosed processing buildings handling flammable liquids 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. (See Appendix A.)

4.8.4. Fire Prevention and Protection

4.8.4.1. Spill and Vapour Control. Processing equipment shall be designed and arranged to prevent the unintentional escape of liquids and vapours and to minimize the quantity escaping in the event of accidental release.

4.8.4.2. Explosion Protection. Where space within chemical processing equipment may contain vapour in concentrations sufficiently high to explode, air within the space shall be displaced by inert gas, an automatic explosion suppression system shall be provided or the equipment shall be designed to withstand the explosion pressure without damage to the equipment.

4.8.4.3. Fire Protection Systems

(1) Where the process warrants such protection, industrial process plants shall be supplied with acceptable (a) water supplies with pressure and quantity adequate to meet the probable fire demands, (b) hydrants, (c) hoses connected to a water supply located so that all equipment containing flammable liquids or combustible liquids, including pumps, can be reached with at least one hose stream, (d) nozzles capable of discharging a water spray, and (e) automatic sprinkler systems or other fixed fire suppression systems.

4.8.4.4. Emergency Procedures. Emergency procedures conforming to Article 4.1.5.7. shall be established for refineries and process plants.
facilities and power controls shall be locked.

(3) Where underground storage tank facilities are operated on a seasonal basis
   (a) the liquid level of each storage tank shall be measured at the close of each season of operation, a record of such measurements shall be maintained for inspection and all fill pipe covers and covers over openings for measuring liquid levels, dispensing facilities and power controls shall be locked,
   (b) prior to the start of an operating season, the liquid level in each storage tank shall be measured, the measurements compared with those recorded at the close of the previous season, and when a loss of liquid or water intrusion is apparent, immediate action shall be taken to determine and correct the condition.

(4) When an underground storage tank is reactivated for the storage of flammable liquids or combustible liquids, the authority having jurisdiction shall be notified.

(5) If the storage tank in Sentence (4) has been out of service for more than 12 months, the tank and piping shall be tested in conformance with Subsection 4.3.16.

4.10.2.2. Aboveground Storage Tanks

(1) When an aboveground storage tank will be out of service for 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 in Sentence (1) contain flammable liquids or combustible liquids, the liquid level in the tank shall be measured and the readings compared at least monthly.

(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 the tank is empty.

4.10.3. Removal of Underground Storage Tanks

4.10.3.1. Removal

(1) Except as permitted in Article 4.10.3.2., when underground storage tanks have no further use or have been out of service for 2 years, such tanks, together with connected piping and dispensing equipment, shall have all flammable liquids and combustible liquids removed from them,
   (b) such tanks shall be removed from the ground and purged of vapours, and
   (c) the piping shall be
      (i) removed from the ground, or
      (ii) purged of vapours and the ends permanently sealed by capping or plugging.

(2) If contaminated, soil surrounding the storage tanks in Sentence (1) shall be replaced with clean fill, to an acceptable degree.

4.10.3.2. Abandonment in Place. Where it is impractical to remove an underground storage tank, the owner of the underground storage tank shall apply to the authority having jurisdiction for permission to abandon the tank in place, in conformance with Section 7.4 of the CCME “Environmental Code of Practice for Underground Storage Tank Systems Containing Petroleum Products.”

4.10.4. Disposal and Reuse of Storage Tanks

4.10.4.1. Disposal. Where storage tanks are to be disposed of, sufficient openings shall be cut in the tanks to render them unfit for further use.

4.10.4.2. Reuse

(1) Except as permitted in Sentence (2), underground storage tanks shall not be reused for the storage of flammable liquids or combustible liquids.

(2) Storage tanks may be reused for the storage of flammable liquids or combustible liquids only after having been refurbished and found to meet the requirements of CAN4-S603.1, “Galvanic Corrosion Protection Systems for Steel Underground Tanks for
3. Where inspection or tests of an excavated storage tank reveal excessive denting, pitting or gouging, causing any reduction of shell thickness in excess of 1 mm, or any dents greater than 30° from the normal configuration, the tank shall be rejected for use.

4.10.4.3. Riveted Storage Tanks. Riveted storage tanks shall not be relocated.

Section 4.11 Tank Vehicles

4.11.1. Application

4.11.1.1. Application. This Section applies to tank vehicles used for the transportation of asphalt and stable flammable liquids and combustible liquids but does not apply to aircraft servicing vehicles or to fuel tanks used in the operation of motor vehicles. (See Appendix A.)

4.11.2. Transportation of Containers

4.11.2.1. Drums

(1) Except as provided in Article 4.11.2.2., drums for flammable liquids or combustible liquids shall not be transported unless they conform to the requirements of Shipping Container Specifications 5, 5A, 5B, 5C, 5L or 5M of the Canadian Transport Commission.

(2) Drums for combustible liquids shall not be transported unless constructed of steel not less than 1.14 mm thick.

4.11.2.2. Wooden Barrels. Wooden barrels may be used as containers for flammable liquids or combustible liquids when the liquids are nontoxic and require such containers as part of their conditioning process.

4.11.2.3. Piling of Containers

(1) Except as provided in Sentence (2), containers of flammable liquids and combustible liquids which are in excess of 50 L and are not permanently attached to the chassis of the vehicle shall be piled only a single tier high on the vehicle.

(2) Wooden barrels containing distilled beverage alcohol may be transported in 2 tiers.

4.11.2.4. Container Design

(1) Except as permitted in Sentence (2), containers for the transportation of flammable liquids or combustible liquids having a capacity of 250 L or more shall conform to the requirements for the construction of cargo tanks on tank vehicles as defined in CSA Standard B620, "Highway Tanks and Portable Tanks for the Transportation of Dangerous Goods."

(2) Containers used for the transportation of flammable liquids or combustible liquids on service vehicles, and having a capacity of 2 500 L or less, shall conform to ULC-Subject 342.13, "Guide for Steel Tanks Mounted on Service Truck Platforms for Transport of Flammable and Combustible Liquids."

4.11.2.5. Securing of Containers to Vehicles. Except for the transportation of empty tanks, tanks that are not permanently attached to the chassis of a vehicle shall be secured to a cradle or sill which is anchored to the chassis of the vehicle by means of hook-bolts or other acceptable devices.

4.11.3. Tank Vehicle Design

4.11.3.1. Design and Construction

(1) Tank vehicles shall be designed and constructed taking into account the relationship between the cargo tank, the supporting members, the weight and temperature of the cargo, road performance, braking and durability.

(2) The design of the suspension system for tank vehicles shall incorporate features to ensure stability when turning.

(3) The exhaust system of tank vehicles used for transporting flammable liquids or combustible liquids shall be located remotely from its fuel system and other combustible materials and shall terminate in such a position that heat from the exhaust system shall not create a hazard to the tank contents, the facility being refuelled or the facility from which the tank vehicle is being filled.
5.4.3. Manufacture

5.4.3.1. Storage of Raw Materials
(1) Not more than 450 kg of raw material used for the manufacture of nitrocellulose based products shall be stored in cabinets in any one workroom, not more than 225 kg stored in any one cabinet and not more than 113 kg in any one compartment of the cabinet.
(2) All raw materials in excess of that permitted in Sentence (1) shall be kept in vented vaults not exceeding 40 m³ capacity and protected with an automatic sprinkler system installed in conformance with Article 6.5.1.1.

5.4.3.2. Work Areas
(1) In factories manufacturing nitrocellulose based products, sprinklered and vented cabinets, vaults or storage rooms shall be provided to prevent the accumulation of excessive quantities of such material in workrooms.
(2) In factories where nitrocellulose plastics are processed, workstations shall be separated by a distance of not less than 1 m.
(3) Material for the manufacture of nitrocellulose plastic articles that is not kept in containers may be placed on tables, workbenches or at machines provided the quantity does not exceed a half day’s supply.
(4) In any one workroom the total amount of nitrocellulose plastic materials, including the material in containers and on tables, shall not exceed 70 kg.

5.4.3.3. Waste Handling. All waste nitrocellulose plastic materials, such as shavings, chips, turnings, sawdust, edgings and trimmings, shall be kept under water in metal receptacles until removed from the premises.

5.4.4. Storage of Finished Products

5.4.4.1. Ventilation. Areas where nitrocellulose plastic finished products are stored shall be ventilated so that any decomposition gases produced by the plastics will be vented outdoors to an area where they will not re-enter the building.

5.4.4.2. Heating Equipment. Nitrocellulose plastics shall not be stored or handled in rooms which contain fuel-burning appliances or electric heating elements and shall not be stored within 600 mm of any steam pipe, radiator or chimney.

5.4.4.3. Cabinets and Vaults. Where more than 10 kg of nitrocellulose plastics are stored in any fire compartment in a building, a vented cabinet or vault constructed in conformance with NFPA 40E, “Storage of Pyroxylin Plastic” and Article 5.4.4.4. shall be provided for such storage.

5.4.4.4. Maximum Quantities
(1) Up to 3,400 kg of nitrocellulose plastics shall be permitted to be stored in a vault which
(a) has a fire-resistance rating of not less than 1 h,
(b) is designed to resist an internal pressure of not less than 3.5 kPa,
(c) is not greater than 40 m³ in volume,
(d) has explosion venting to the exterior of not less than 1,000 cm² of venting area for every cubic metre of vault volume, and
(e) is ventilated to the exterior to provide not less than 200 cm² of ventilating area for each cubic metre of vault volume.
(2) Up to 9,000 kg of nitrocellulose plastics shall be permitted to be stored in a vault which
(a) has a fire-resistance rating of not less than 4 h,
(b) is designed to resist an internal pressure of not less than 28 kPa,
(c) has explosion venting to the exterior of not less than 650 cm² of venting area for every cubic metre of vault volume, and
(d) is ventilated to the exterior to provide not less than 200 cm² of ventilating area for each cubic metre of vault volume.
(3) Not more than 9,000 kg of nitrocellulose plastics shall be stored in any vault.

5.4.5. Displays

5.4.5.1. Arrangement. In stores, all displays of nitrocellulose plastic articles that are not in showcases or show windows shall be displayed only when placed on tables or counters not more than 1 m wide and 3 m long, with the spaces underneath such tables or counters kept free of combustible materials.
5.4.5.2. **Luminaires.** Luminaires shall not be located adjacent to any nitrocellulose plastic materials so as to create an ignition hazard.

5.4.6. **Nitrocellulose Motion Picture Film**

5.4.6.1. **Use, Storage and Handling**

(1) Nitrocellulose motion picture film shall be stored and handled in conformance with NFPA 40, “Storage and Handling of Cellulose Nitrate Motion Picture Film.”

(2) Nitrocellulose motion picture film shall not be used, stored or handled in a place of public assembly.

(3) When not in use, all nitrocellulose motion picture film shall be kept in closed, single-reel containers.

5.5. **Ammonium Nitrate**

5.5.1. **General**

5.5.1.1. **Application.** This Section applies to ammonium nitrate mixtures that contain 60 per cent or more by weight of ammonium nitrate in quantities exceeding 1 000 kg.

5.5.2. **Spatial Separation**

5.5.2.1. **Clearance from Property Line.** The distance between an ammonium nitrate storage facility and the nearest property line shall conform to Transport Canada General Order No. 0-36, “Ammonium Nitrate Storage Facilities Regulations,” but in no case shall this distance be less than 8 m.

5.5.3. **Storage Buildings**

5.5.3.1. **Design and Construction**

(1) Ammonium nitrate shall not be stored in buildings that

(a) are more than 1 storey in building height,
(b) contain basements or crawl spaces, or
(c) contain open floor drains, tunnels, elevator pits or other pockets which might trap molten ammonium nitrate.

(See Appendix A.)

(2) Buildings and bins containing bulk storage ammonium nitrate shall be designed to prevent contact with material that will cause the ammonium nitrate to become unstable or with material which may corrode or deteriorate by reason of contact with the ammonium nitrate. (See Appendix A.)

5.5.3.2. **Combustible Floors.** Ammonium nitrate shall not be stored on combustible floors.

5.5.3.3. **Ventilation.** When ammonium nitrate is stored in buildings, such buildings shall be provided with natural or mechanical ventilation to dissipate gases generated by the ammonium nitrate in the event of a fire. (See Appendix A.)

5.5.3.4. **Breathing Apparatus.** Signs indicating that self-contained breathing apparatus shall be used in the building in the event of a fire shall be provided adjacent to the exterior of every entrance door in a building in which ammonium nitrate is stored.

5.5.4. **Storage**

5.5.4.1. **Bagged Storage**

(1) Piles of bagged ammonium nitrate shall not exceed

(a) 6 m in height,
(b) 6 m in width, and
(c) 15 m in length.

(2) Aisles not less than 1 m wide shall be provided in warehouses to separate piles of ammonium nitrate, and at least one aisle not less than 1.2 m wide shall be provided for the entire length of the storage area.

(3) Bags of ammonium nitrate shall not be stored closer than 400 mm from the walls and partitions and not closer than 900 mm from the roof, overhead supporting beams or sprinkler head deflectors.

(4) In palletized storage of bagged ammonium nitrate, pallet channels shall be at right angles to aisles.
5.11.1.4. **Ambient Conditions.** A storage room for oxidizing substances shall be dry, cool and well ventilated.

5.11.1.5. **Fire Suppression Systems.** Notwithstanding the provisions of Sentence 3.3.6.9.(2), oxidizing substances shall be stored only in rooms that are equipped with an acceptable automatic fire suppression system suitable for the hazard. (See Appendix A.)

5.11.1.6. **Refrigerated Storage.** Oxidizing substances, including organic peroxides, shall be stored in refrigerated areas where such refrigeration is necessary to stabilize the substances.

5.11.1.7. **Storage Precautions**

(1) Oxidizing substances shall not be stored with any corrosive substances, or with any flammable, oxidizable or chemically reactive materials.

(2) Oxidizing substances shall not be stored on combustible floors, platforms or pallets.

5.11.1.8. **Containers and Packaging.** Oxidizing substances shall be stored in acceptable packages or containers.

5.11.1.9. **Individual Storage Areas.** Containers of oxidizing substances shall be stored in individual storage areas not greater than 6 m wide and 4.5 m high, except that organic peroxides shall not be piled more than 1.5 m high.

5.11.1.10. **Facilities for Dispensing**

(1) Packages or containers of organic peroxides shall not be opened, or the product dispensed, within the storage room.

(2) Facilities shall be provided outside of storage rooms for opening containers and dispensing organic peroxides.

Section 5.12 Dust Producing Processes

5.12.1. **Dust Collection**

5.12.1.1. **Dust Removal**

(1) Building and machinery surfaces shall be kept clean of accumulations of combustible dusts, in an acceptable manner, using equipment suitable for use in atmospheres containing combustible dusts. (See Appendix A.)

(2) The cleaning equipment required in Sentence (1) and ancillary hoses and tools shall be electrically conductive and shall be bonded to ground.

(3) Tools for vacuum cleaning machines shall be made of materials that will not create electrostatic charges.

(4) Except as permitted in Sentence (1) compressed air or other compressed gases shall not be used to blow dust from surfaces inside buildings.

5.12.1.2. **Dust Collecting Systems and Equipment**

(1) Dust-collecting systems shall be installed where necessary to keep the accumulation of dust at a safe concentration in the interior of buildings.

(2) Dust-collecting equipment shall be made of noncombustible material.

(3) Dust collecting systems shall be of a design which will prevent sparks due to physical contact in the fan assembly. (See Appendix A.)

(4) Dust collector systems shall be designed and maintained for an air velocity in the ducts of not less than 18 m/s.

5.12.1.3. **Dust Collectors**

(1) Except as provided in Sentence (2), dust collectors shall be located outside buildings or shall be equipped with exhaust stacks or ducts leading to the outside.

(2) Dust collectors located inside buildings shall be designed in conformance with good engineering practice such as described in the National Fire Protection Association standards on dust explosion hazards. (See Appendix A.)

(3) Dust collectors within buildings shall be designed with explosion venting to the exterior.

5.12.1.4. **Bonding and Grounding.** All electrically conducting parts of dust systems, dust collectors and the machines they serve shall be bonded and grounded.

5.12.1.5. **Explosion Venting.** Except as provided in Article 5.12.1.7., manufacturing activities that create significant concentrations of combustible
dusts shall be located only in buildings which have explosion venting to the outdoors of not less than 650 cm² for each cubic metre of room or building volume, with the vents designed to release at a pressure of not more than 1 kN/m².

5.12.1.6. Electrical Interlocks. Equipment required to have a dust exhaust system shall not be capable of operating until the dust exhaust system is in operation.

5.12.1.7. Vent Stacks

(1) Permanently open vent stacks may be used to ventilate storage containers where mechanical dust collector systems are not practical provided that the vent stacks

(a) have a cross-sectional area not less than twice that of all spouts discharging into the container,
(b) are installed not more than 30° from the vertical,
(c) extend from the top of the container to a point not less than 1.2 m above the roof, and
(d) are designed to prevent the entry of snow and rain.

5.12.1.8. Separators. Magnetic or pneumatic separators shall be installed as necessary to prevent the entrance of foreign materials that may cause sparks in equipment such as shellers, crackers, crushers, grinding machines, pulverizers or similar machines which produce combustible dusts.

5.12.1.9. Ignition Sources. Smoking, open flame and spark-producing equipment shall not be allowed in areas containing combustible dust producing operations.

Section 5.13 Combustible Fibres

5.13.1. Storage


5.13.1.2. Loose Combustible Fibres

(1) Up to 3 m³ of loose combustible fibres may be kept in any building provided storage is in a metal-lined bin equipped with a self-closing metal-lined cover.

(2) Quantities of loose combustible fibres exceeding 3 m³ but not exceeding 15 m³ shall be stored in rooms separated from the remainder of the building by a fire separation having a fire-resistance rating of not less than 1 h.

(3) Quantities of loose combustible fibres exceeding 15 m³ but not exceeding 30 m³ shall be stored in rooms separated from the remainder of the building by a fire separation having a fire-resistance rating of not less than 2 h.

(4) Quantities of more than 30 m³ of loose combustible fibres shall not be stored in an individual room unless the room is sprinkled and separated from the remainder of the building by a fire separation having a fire-resistance rating of at least 2 h.

5.13.1.3. Baled Combustible Fibres

(1) Except as permitted in Sentences (2), (3) and (4), baled combustible fibres shall be stored so that

(a) no individual storage area exceeds 250 m²,
(b) the height of storage in an individual storage area does not exceed 4.5 m,
(c) subsidiary aisles within individual storage areas are not less than 1 m wide, and
(d) the clearance between piles and building walls is not less than 1 m.

(2) Except as permitted in Sentence (4), where baled combustible fibres are stored in sprinklered buildings, the maximum area of any individual storage area shall be 500 m².

(3) Where baled raw pulp is stored in an unsprinklered building,

(a) the maximum area of any individual storage area shall be 500 m²,
(b) the maximum height of storage shall be 6 m.

(4) Where baled raw pulp is stored in a sprinklered building,

(a) the maximum area of any individual storage area shall be 1 000 m²,
(b) the maximum height of storage shall be 6 m.
for Safety in Welding and Cutting (Requirements for Welding Operators)," and to the requirements in this Section.

5.18.2. Use and Maintenance of Equipment


5.18.2.2. Piping. Acetylene gas shall not be piped through copper tubing or piping.

5.18.2.3. Containers

(1) Containers of compressed gas stored inside buildings shall conform to the requirements in Section 5.6.

(2) Gas fuel cylinders, whether full or empty, whose valves are not in a recessed or protected location shall have their caps in place and their valves tightly closed when in storage.

5.18.2.4. Damaged Equipment. Torches, regulators, hoses and other oxyacetylene welding and cutting equipment which have been damaged shall not be used.

5.18.2.5. Inspection and Maintenance

(1) Except where the amount of use suggests more frequent examinations and testing, cutting and welding equipment shall be examined for leakage with a leak test solution and for other defects
   (a) prior to use, or
   (b) at least daily.
(See Appendix A.)

(2) Defects found in cutting and welding equipment shall be repaired prior to use.

5.18.2.6. Equipment Not in Use. All valves shall be closed and lines bled when equipment is not in actual use.

5.18.2.7. Lubrication. Oil or grease shall not be used for lubrication of welding and cutting equipment.

5.18.3. Prevention of Fires

5.18.3.1. Location of Operations.

(1) Except as provided in Sentence (2), welding and cutting operations in buildings shall be carried out in areas free of combustible and flammable contents, with walls, ceilings and floors of noncombustible construction or lined with noncombustible materials.

(2) When it is not practicable to undertake welding and cutting operations in areas described in Sentence (1), combustible and flammable materials shall either be removed at least 11 m from the work area or otherwise protected against ignition by sheet metal or other noncombustible material.

5.18.3.2. Work Adjacent to Piping. When welding or cutting is to be carried out near piping containing flammable gas, the section of the piping located within 1 m of the torch shall be covered with wet noncombustible insulating material not less than 6 mm thick.

5.18.3.3. Work on Containers

(1) Welding or cutting of metal containers shall not be undertaken until all compartments within such containers have been cleaned of flammable and combustible materials and tested with an acceptable combustible gas detection device to ascertain that such compartments are free of explosive vapours.

(2) Welding or cutting operations shall not be undertaken on a totally enclosed container.
6.2.4.2. Defective Extinguishers
   (1) Portable extinguishers having defects shall be repaired or recharged where necessary to ensure the extinguisher will operate effectively and safely.
   (2) Extinguisher shells, cartridges or cylinders which show leakage or permanent distortion in excess of specified limits or which rupture shall be removed from service.

6.2.4.3. Retests. Retests shall be conducted at the original hydrostatic test pressure as stated on the nameplate.

6.2.4.4. Tags. Each portable extinguisher shall have a tag securely attached to it showing the maintenance or recharge date, the servicing agency and the signature of the person who performed the service.

6.2.4.5. Labels. A label shall be fixed to the extinguisher after testing indicating the month and year the hydrostatic pressure test was performed and including the test pressure used and the name of the person or agency performing the test.

Section 6.3 Fire Alarm and Voice Communication Systems

6.3.1. General

6.3.1.1. Maintenance. Fire alarm and voice communications systems shall be maintained in operable condition at all times.

6.3.1.2. Inspection and Testing
   (1) Except as required in Subsection 6.5.3., fire alarm systems shall be inspected and tested in conformance with CAN/ULC-S536, "Standard for the Inspection and Testing of Fire Alarm Systems."
   (2) Fire alarm and detection system components shall be accessible for purposes of inspection or maintenance.

6.3.1.3. Records. A record shall be kept of all tests required by Article 6.3.1.2., and such records shall be retained for examination by the authority having jurisdiction in conformance with Article 1.1.5.1.

6.3.1.4. Proprietary Signalling Systems. Proprietary signalling systems shall be maintained in conformance with NFPA 72, "Installation, Maintenance and Use of Protective Signalling Systems."

6.3.1.5. Voice Communication Systems
   (1) Voice communication systems that are integrated with a required fire alarm system shall be tested in conformance with Article 6.3.1.2.
   (2) Required voice communications systems that are not integrated with a fire alarm system shall be tested monthly in conformance with Sentences (3) and (4). (See Appendix A.)
   (3) Loudspeakers operated from the central alarm and control facility shall be tested to ensure they can be heard in all parts of the building.
   (4) The 2-way communications system from each floor area to the central alarm and control facility shall be tested to ensure proper operation.

Section 6.4 Standpipe and Hose Systems

6.4.1. General

6.4.1.1. Inspection, Testing and Maintenance. The inspection, testing and maintenance of standpipe and hose systems shall conform to NFPA 14, "Installation of Standpipe and Hose Systems."

6.4.1.2. Protection During Alteration or Demolition. During alteration or demolition of a building required to have a standpipe and hose system, the system shall be installed or dismantled progressively so as to provide protection to all floor areas.

6.4.1.3. Hose Cabinets
   (1) Standpipe hose cabinets shall be used for fire protection equipment only and shall be conspicuously identified.
   (2) Hose cabinets shall be inspected monthly to ensure that the hose is in proper position and that all of the equipment is in place and in operable condition.
6.4.1.4. Defects. Standpipe and hose systems having defects shall be repaired or replaced where necessary to ensure they will operate effectively and safely.

6.4.1.5. Tests after Alteration or Period of Disuse. Standpipe systems that have been modified or extended in conformance with Article 2.1.3.1. or are being restored to service after a period of disuse exceeding one year shall be flow and pressure tested at the highest and most remote hose connection to ensure the availability of the water supply for which the system was designed.

6.4.1.6. Flow Testing

(1) Every 5 years, the standpipe system shall be flow tested to ensure that the design flow can be delivered. (See Appendix A.)

(2) If during the flow test required in Sentence (1) there is any indication of the presence of debris in the piping, the entire system shall be flushed of foreign material.

6.4.1.7. Fire Department Connections

(1) Signs provided to identify which fire department connection serves a particular sprinkler or standpipe system shall be maintained in a legible condition.

(2) Protective caps shall be kept in place at all times on fire department connections.

(3) Where protective caps are missing, the fire department connections shall be examined for accumulated refuse, back flushed when conditions warrant, and the caps replaced.

6.4.1.8. Records. A record shall be kept of all tests required by this Section, and such records shall be retained for inspection by the authority having jurisdiction, in conformance with Article 1.1.5.1.

Section 6.5 Automatic Sprinkler Systems

6.5.1. General

6.5.1.1. Design and Installation. Except as otherwise provided in this Code, an automatic sprinkler system required by this Code shall be designed and installed in conformance with the National Building Code of Canada. (See Appendix A.)

6.5.1.2. Sprinkler Control Valves. Sprinkler control valves shall not be closed in the event of a fire until the fire is extinguished or is considered to be under control by other means, as determined by the fire department.

6.5.1.3. Changes in Ambient Conditions. Changes in equipment or occupancy which might result in temperatures at sprinklers being above 38°C or below 4°C shall not be made without previously making provisions to alter the sprinkler system to prevent premature operation or freezing.

6.5.1.4. Precautions against Freezing. Sections of sprinkler systems subject to freezing shall be converted to dry pipe or antifreeze systems with a separate control valve for that part of the system.

6.5.1.5. Obstructions. No obstructions shall be placed so as to interfere with the effectiveness of water discharge from sprinklers. (See Appendix A.)

6.5.1.6. Sprinkler Guards. Sprinklers shall be protected by acceptable sprinkler guards where there is the possibility of mechanical damage.

6.5.1.7. Protection of Combustible Sprinkler Piping. Protection required by the National Building Code of Canada for combustible sprinkler piping shall be maintained. (See Appendix A.)

6.5.2 Sprinkler System Shutdown

6.5.2.1. Programmed Repairs. Where operations require the temporary shutting down of sprinkler protection, such operations shall be programmed by the contractor working on the system to enable completion in the shortest possible time and protection to be restored as promptly as possible.

6.5.2.2. Protection During Shutdown. During an interruption of normal sprinkler protection, emergency hose lines and portable extinguishers shall be provided, extra watch service shall be placed on duty and temporary water connections shall be made to the sprinkler system where practicable.
Appendix A
Explanatory Material for the National Fire Code 1990

A-1.1.4.1.(1) This requirement is intended as a means for the authority having jurisdiction to accept an arrangement, such as an existing building or fire protection system, that is not exactly equivalent to that required by the Code, but that is considered to provide a reasonable level of fire safety due to its specific qualities.

This Code contains references to the National Building Code for the design, construction and installation of many fire protection features. Some National Building Code requirements are most readily applied to new buildings and their retroactive application to existing situations as prescribed by this Code could result in some difficulty in achieving compliance. It is the intent of this Code that an acceptable level of safety be achieved rather than necessarily achieving strict conformance to the National Building Code.

The application of this Code to the upgrading of existing facilities to provide an acceptable degree of life safety should be based on the judgement of the enforcement authority, who must deal with each case on its merits. The Fire Code states that the owner or the owner’s authorized agent is responsible for carrying out the provisions of the Code. However, the owner is expected to communicate with the authority having jurisdiction, who is in a position to assess the relative significance of variances from the National Building Code requirements. Such authority may then determine that upgrading measures are not necessary, on the basis that the existing arrangement represents an acceptable level of life safety.

This Code presumes that the adopting legislation provides for the exercise of the necessary discretionary judgement on the part of the enforcing officials, along with appropriate rights to appeal. See also Appendix Note A-2.1.3.1.(I).

A-1.2.1. Exit. Exits include doors or doorways leading directly into an exit stair or directly to the outside. In the case of an exit leading to a separate building, exits also include vestibules, walkways, bridges or balconies.

A-1.2.1. Fire separation. A fire separation may or may not have a fire resistance rating.

A-1.2.1. Individual storage area. The width of subsidiary aisles providing access to stored products within an individual storage area may be determined by material handling methods, or other criteria such as minimum width for access to exits or fire protection equipment.

A-1.2.1. Service room. Typical examples of service rooms include boiler rooms, furnace rooms, incinerator rooms, garbage handling rooms, janitors’ closets and rooms to accommodate air-conditioning or heating appliances, pumps, compressors and electrical equipment. Rooms such as elevator machine rooms and common laundry rooms are not considered to be service rooms.

A-1.2.1. Suite. Tenancy in the context of the term suite applies to both rental and ownership tenure. In a condominium arrangement, for example, dwelling units are considered separate suites even though they are individually owned. In order to be of complementary use, a series of rooms that constitute a suite are in reasonably close proximity to each other and have access to each other either directly by means of...
a common doorway or indirectly by a corridor, vestibule or other similar arrangement.

The term suite does not apply to rooms such as service rooms, common laundry rooms and common recreational rooms that are not leased or under a separate tenure in the context of the Code. Similarly, the term suite is not normally applied in the context of buildings such as schools and hospitals, since the entire building is under a single tenure. A rented room in a nursing home could be considered as a suite if the room was under a separate tenure. A hospital bedroom on the other hand is not considered to be under a separate tenure, since the patient has little control of that space, even though he pays the hospital a per diem rate for the privilege of using the hospital facilities, which include the sleeping areas.

For certain requirements in the National Building Code the expression "room or suite" is used (e.g. travel distance). This means that the requirement applies within the rooms of suites as well as to the suite itself and to rooms that may be located outside the suite. In other places the expression "suite, and rooms not located within a suite" is used (e.g. for the installation of smoke and heat detectors). This means that the requirement applies to individual suites as defined, but not to each room within the suite. The rooms "not within a suite" would include common laundry rooms, common recreational rooms and service rooms, that are not considered as tenant occupied space.

**A-2.1.2.1.** The method of determining building height in the National Building Code has been changed from previous editions, and application of the current method to existing buildings for the purposes of this Code could result in certain buildings being reclassified as higher buildings. For this reason, the National Fire Code suggests that building height is that which was established by the applicable building code at the time of construction, whether original construction or subsequent to construction if additional storeys have been added to the building.

**A-2.1.2.2.** Arena-type building are often used for events such as community dances, rallies and trade shows. These events may increase the occupant and fuel loads beyond that for which the space was designed. To ensure safety during such events, additional egress facilities may be required to compensate for the additional occupant load and, in some cases, additional fire suppression measures may be required to compensate for the increased fuel load.

Large public corridors in mercantile occupancies are also used on a temporary basis for community activities, merchandising and for special displays. In these cases, additional egress facilities and fire suppression may be needed, depending on the increase in hazard.

**A-2.1.3.1.(1)** The National Building Code represents the desired minimum acceptable level of safety for all buildings; it is therefore appropriate for the National Fire Code to require existing buildings to comply with the National Building Code as much as possible. It is usually difficult to change structural features of an existing building, but installation of "active" fire protection systems, such as alarms, sprinklers, and standpipes, in existing buildings may be possible. Such systems may be considered as contributing to an adequate degree of life safety in cases where the structural features of a building do not conform to the current National Building Code.

Sentence 2.1.3.1.(1) is intended to require installation of fire alarm, sprinkler and standpipe systems in existing buildings presently not so equipped, and to require upgrading of existing systems that do not provide an acceptable level of safety to meet the current installation standards specified in the National Building Code. It is not intended that existing fire protection systems that provide an acceptable level of life safety be upgraded with each new edition of the National Building Code. The authority having jurisdiction is expected to use discretion in enforcing this requirement. The authority having jurisdiction may accept alternatives to strict compliance with the National Building Code as provided for in Sentence 1.1.4.1.(1) and as clarified in Appendix Note A-1.1.4.1.(1).

**A-2.3.2.2.** The small scale match flame test in NFPA 701 is a relatively simple test that can be used to assess the condition of fire retardant treatments on samples from fabrics that have been in use for a while. It is not intended that NFPA 701 be used as the primary standard for application of fire retardant treatments.
can, and the design of the spray nozzle. The flame projection test measures the susceptibility of the aerosol spray to ignite, which is most important for protecting consumers who, for example, might be smoking while using an aerosol product.

A direct comparison between the flammability hazard symbols used in other Canadian regulations and the Level 1, 2 or 3 classification system used in the NFC is not reliable. The Factory Mutual Engineering Corporation classification system used in this Code measures the overall contribution of flammable base product, combined with flammable gas propellant, to the rate of growth and severity of a fire involving a substantial number of aerosols. It may in some cases be overly conservative to treat all aerosols bearing the highest hazard flammability symbol as determined by the flame projection test as Level 3 aerosols. On the other hand, it may not be conservative enough to treat products that represent a moderate hazard by the flame projection test, because of a fortuitous nozzle design or low can pressure, as only Level 2. This Code has adopted the aerosol classification system developed by Factory Mutual Engineering Corporation in the U.S. because it is most appropriate to fighting moderate to large fires in buildings.

A-3.3.5.6. Factory Mutual Engineering Corporation Data Sheet 7-29S, “Storage of Aerosol Products,” is considered to represent good engineering practice for design of sprinkler systems in aerosol storage areas.

A-3.3.6.3. Parts 4 and 5 of the National Fire Code specify ventilation rates to prevent the buildup of dangerous concentrations of flammable vapours in rooms used for storing certain dangerous goods. Where no guidance is given, the design of the ventilation system should conform to good engineering practice. Recommendations in the National Fire Protection Association standards, or in the Manual of Recommended Practice for Industrial Ventilation, produced by the American Conference of Governmental Industrial Hygienists, would be considered examples of good engineering practice.

A-3.3.6.6.(2) It is assumed that Material Safety Data Sheets (MSDS) will in many cases be provided as part of the documentation for the Transportation of Dangerous Goods Regulations, or the Workplace Hazardous Materials Information System legislation.

A-3.3.6.9.(1) So many types, quantities, and concentrations of dangerous goods could be present in a building that setting maximum quantities allowed in unprotected buildings is very difficult. The hazard presented by the dangerous goods is not necessarily a function of their inherent flammability, but rather a function of their potential for hampering fire fighting. If the area involved in dangerous goods storage is large enough, the owner must provide some degree of built-in automatic fire suppression for the building. Therefore, the point at which installation of an active fire suppression system becomes mandatory is based on the total area involved in dangerous goods storage, regardless of the product stored.

The active suppression system intended is a sprinkler system, installed throughout the building, not just in the area of dangerous goods storage. The objective is to control both a fire originating in a spot remote from the dangerous goods, so that it never threatens the dangerous goods, and a fire involving the dangerous goods themselves. Even if a fire originates in a dangerous good on which water should not be applied (stored pesticides for example), sprinklers may provide better control than alternative fire fighting measures. A sprinkler system should control the fire, limit its spread, and minimize the number of containers that fail. The sprinkler alarm will notify responsible persons who can take corrective action while the fire is small. The amount of water applied to the pesticide by the sprinklers will be small in comparison to what will have to be applied by hose streams once the fire is established.

Article 6.5.1.1. in the Fire Code refers to the National Building Code of Canada, which sets the basic criteria for sprinkler systems in Subsection 3.2.5., “Provisions for Fire Fighting.” These criteria may not be appropriate for specific dangerous goods. For example, water may not be the best extinguishing agent to use on a particular product. In such cases, special arrangements may be required, such as isolating that product in an unsprinklered room protected by a gaseous fire extinguishing agent.

It is assumed that the fire extinguishing system will be designed by persons experienced in such design, using good fire protection engineering practice to establish design criteria, such as type of suppressant to use, and rate of application.
A-3.3.6.10. Venting of smoke and other products of combustion may be achieved by opening roof vents, breaking skylights, removing panels or opening windows. Smoke and hot gases should be vented directly to the outside.

A-3.3.6.11. Measures for control of spills include provision of manhole or catchbasin covers for manual closing, and provision of absorbent materials and portable containment dikes. The containment measures should provide sufficient capacity to retain all of the product likely to be spilled, plus the water used for fire fighting purposes, as far as possible. The fire safety plan should include measures for responding to a situation where the containment area could be overtopped.

A-3.3.6.12.(2) Access to at least two sides of a building used for storage of dangerous goods is required so that, if necessary, fire fighting operations can be set up on the upwind side of the building, to minimize the adverse effects of toxic smoke.

A-3.3.6.12.(3) Protective clothing worn by fire fighters in a fire involving dangerous goods is bulkier than the usual fire fighting turn-out gear. Therefore, Sentence 3.3.6.11.(3) requires access openings into buildings used for the storage of dangerous goods to be wider than otherwise required by the National Building Code of Canada.

A-3.3.6.13. Fire fighters need to identify the substances they may encounter in a building during a fire. Labelling of products to comply with the Workplace Hazardous Materials Information System (WHMIS) or other provincial, territorial or federal legislation is deemed to satisfy this requirement.

A-3.3.6.14.(1) One or more placards at the door into a room used for storage of dangerous goods are required to inform fire fighters that dangerous goods are contained within. In larger storage areas containing a variety of dangerous goods in different individual storage areas, each individual storage area should have placards.

A-4.1.1.1.(1) The all-inclusive phrase "buildings, structures and open areas" includes but is not limited to tank farms, bulk plants, service stations, industrial plants, refineries, process plants, distilleries, and piers, wharves and airports that are not subject to over-riding federal control. Part 4 of the Fire Code applies wherever flammable or combustible liquids are used or stored, except as specifically exempted in Sentence 4.1.1.1.(2).

A-4.1.1.1.(2) Certain areas in refineries, chemical plants and distilleries will not meet all Code requirements because of extraordinary conditions. Design should be based on good fire protection engineering practice and on such factors as manual fire suppression equipment, daily inspections, automated transfer systems, location of processing units, and special diking, piping, controls and materials used.

A-4.1.2.1. The classification system for flammable liquids used by the Transportation of Dangerous Goods Regulations (TDGR) differs from the NFPA classification system used in the Fire Code. In the Fire Code, only liquids with a flash point below 37.8°C are referred to as "flammable" liquids, whereas liquids having flash points at or above 37.8°C are "combustible" liquids. In contrast, the TDG Regulations, which regulate "flammable liquids" as Class 3 Dangerous Goods, define "flammable liquids" as liquids having a flash point below 61°C. Therefore, the TDGR term "flammable liquids" includes Class II liquids (with a maximum flash point of 60°C), which are referred to as "combustible liquids" in the Fire Code terminology. The TDG Regulations do not include Class IIIA liquids that have a flash point above 60°C.

The TDG Regulations further classify flammable liquids into Divisions 1, 2, and 3, depending on their flash points. Division 1 flammable liquids have flash points below -18°C; Division 2 flammable liquids have flash points at or above -18°C but below 23°C; and Division 3 flammable liquids have flash points at or above 23°C but below 61°C. For the purpose of comparing the TDGR classification system with the NFC system, the differences between 23°C and 22.8°C, and between 61°C and 60°C may be ignored. The results of closed-cup flash point tests may vary by as much as 1°C, so nothing is gained by unnecessary precision. The following table compares the two classification systems.

A-4.1.2.1.(3)(b) The NFPA classification system for combustible liquids includes Class IIIB liquids, which have flash points at or above 93.3°C. These liquids are not regulated by Part 4 of the Fire Code.
Table A-4.1.2.1.
Forming Part of A-4.1.2.1.

Comparison of NFC and TDGR Classification Criteria for Flammable and Combustible Liquids

<table>
<thead>
<tr>
<th>Flash Point, °C</th>
<th>Boiling Point, °C</th>
<th>NFC Classification</th>
<th>TDGR Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>below -18°</td>
<td>N/A</td>
<td>IA</td>
<td>3.1</td>
</tr>
<tr>
<td>at or above -18° and below 22.8°&lt;sup&gt;(1)&lt;/sup&gt;</td>
<td>below 37.8°</td>
<td>IA</td>
<td>3.2</td>
</tr>
<tr>
<td>below 22.8°</td>
<td>at or above 37.8°</td>
<td>IB</td>
<td>3.2</td>
</tr>
<tr>
<td>at or above 22.8° and below 37.8°</td>
<td>N/A</td>
<td>IC</td>
<td>3.3</td>
</tr>
<tr>
<td>at or above 37.8° and below 60°&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>N/A</td>
<td>II</td>
<td>3.3</td>
</tr>
<tr>
<td>at or above 60° and below 93.3°</td>
<td>N/A</td>
<td>IIIA</td>
<td>Not Regulated</td>
</tr>
<tr>
<td>at or above 93.3°</td>
<td>N/A</td>
<td>Not Regulated</td>
<td>Not Regulated</td>
</tr>
</tbody>
</table>

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### Note to Table A-4.1.2.1.:

<sup>(1)</sup> For purposes of comparison, 22.8°C is deemed to be equivalent to 23°C, as used in the TDGR.

<sup>(2)</sup> 60°C is deemed to be equivalent to 61°C, as used in the TDGR.

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because they are deemed to represent no greater fire hazard than other combustibles, such as wood or paper products. However, Article 4.1.2.2. clarifies that such liquids are effectively flammable liquids when heated to their flash point temperature.

**A-4.1.3.1.** The kinematic viscosity of a liquid influences the choice of test most appropriate for measuring its flash point. For measurement of kinematic viscosity, the ASTM standards referenced use units of centistokes, or stokes. In Canada, the unit used for kinematic viscosity is mm<sup>2</sup>/s (cgs), not stokes or centistokes. One centistoke has units of 1 millimetre squared per second (1 mm<sup>2</sup>/s).

For purposes of comparison, the kinematic viscosity of water is 1.0038 mm<sup>2</sup>/s at 20°C; of glycerine, approximately 1.185 mm<sup>2</sup>/s; and of some common motor oils, near 1,000 mm<sup>2</sup>/s. Some paints, lacquers and glues have much higher kinematic viscosities, as indicated by the upper limit of 15,000 mm<sup>2</sup>/s in ASTM D 3278.

The viscosity at which a liquid should no longer be treated as a liquid is addressed in NFPA 30, “Flammable and Combustible Liquids Code.” The definition of “liquid” in that document states that “any material that has a fluidity greater than that of 300 penetration asphalt, when tested in accordance with ASTM D 5, ‘Test for Penetration for Bituminous Materials,’” may be considered to be a liquid.

**A-4.1.4.1.** Additional information on determining the extent of Division 1 or 2 zones in Class I locations may be found in “Hazardous Locations, A Guide for the Design, Construction and Installation of Electrical Equipment,” published by the Canadian Standards Association, in NFPA 30, “Flammable and Combustible Liquids Code,” and in NFPA 497A, “Classification of Class I Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas.”

**A-4.1.5.10.** Limited quantities of flammable liquids may be stored or used in basements where it is clear they do not create a fire hazard. Such factors as the size of basement, ventilation, wiring, and proximity to sources of ignition should be taken into account in determining whether an unsafe condition exists.
A-4.1.7.1. Article 3.3.1.14. in the National Building Code of Canada specifies that ventilation must be provided in conformance with the relevant portions of Part 6 of that Code if flammable vapour, gas, or dust could create a fire or explosion hazard. However, Part 6 of the NBC does not provide specific information on the design of ventilation systems to prevent an accumulation of dangerous concentrations of flammable vapours. It refers instead to "good engineering practice" and directs the user to a number of NFPA standards for examples of good practice, depending on the nature of the vapours or dusts. The requirements in Subsection 4.1.7. of the Fire Code represent a minimum level of "good practice" for preventing an accumulation of explosive concentrations of vapours from flammable or combustible liquids.

A-4.1.7.2.(3) Natural ventilation is normally adequate for the storage of flammable liquids and combustible liquids, or the dispensing of combustible liquids. Such ventilation should consist of permanent openings at ceiling and floor levels leading to the outside. At least 0.1 m² each of free inlet and outlet openings per 50 m² of floor area should be provided. A mechanical ventilation rate of at least 18 m³/h per square metre of room area, but not less than 250 m³/h, is normally adequate for rooms where flammable liquids are dispensed into portable containers. Ventilation for process areas must be designed to suit the nature of the hazard in accordance with good engineering practice.

A-4.1.7.2.(5) Failure of the mechanical ventilation system would include any condition that would prevent the systems from meeting the minimum ventilation rate specified in Sentence (4), i.e. 18 m³/h per square metre, or 250 m³/h. The velocity of air in the exhaust duct, or the rpm of the fan, would be two indicators of whether the ventilation system was operating properly.

A-4.1.8.2.(1)(b) Build-up of static electric charges near the surface of liquids being poured into non-conducting containers may be controlled or eliminated by: limiting the filling rate to velocities less than 1 m/s, using a grounded lance or nozzle extension to the bottom of the container, limiting free fall, or using antistatic additives.

A-4.2.2.3.(2) Flammable and combustible liquids are classified as Class 3 dangerous goods in accordance with the Transportation of Dangerous Goods Regulations (TDGR). However, Class 3 dangerous goods include liquids with flash points up to 61°C, which means that Class IIIA combustible liquids with flash points above 61°C are not treated as dangerous goods. For the purposes of this Article, Class IIIA combustible liquids should be treated as Class 3 dangerous goods as described in Table 3.3.6.B.

A-4.2.5.3. Article 4.2.5.3. addresses the potential hazard where flammable vapours are released during transfer operations in an improperly ventilated area, and where sources of ignition may not be adequately controlled. It is not intended to prohibit the opening of small containers in retail areas of paint stores for the purpose of tinting paints.

A-4.2.7.5.(2) Requirements pertaining to spatial separation of buildings are found in Subsection 3.2.3., "Spatial Separation and Exposure Protection of Buildings," in the National Building Code of Canada.

A-4.2.7.7. Options for acceptable fixed fire suppression systems for protection of flammable or combustible liquid storage areas include: automatic sprinkler, foam sprinkler, water spray, carbon dioxide, dry chemical or halon systems. Appendix D of NFPA 30, "Flammable and Combustible Liquids Code," represents good engineering practice for design of sprinkler or foam water systems for flammable and combustible liquid storage areas.

A-4.2.7.8.(2) Containers of flammable or combustible liquids could be punctured or deformed by being pushed up against a protrusion from a wall. The required wall clearance is intended to prevent such damage, and to permit visual inspection of the sides of the individual storage area. The clearance may be omitted for narrow shelves along a wall, where the backs of the shelves can be inspected from the aisle.

A-4.2.8.1. Subsection 4.2.8. applies to those portions of an industrial plant where the use and handling of liquids is only incidental, or secondary to the principal business. The word "incidental" does not imply "small quantity," or "insignificant amount." An automobile assembly plant is one example of a location where use of flammable or combustible
liquids is secondary to the principal activity. Cleaners, protective coatings, or paints are used at various locations along the assembly line. The principal activity is production of automobiles, but flammable liquids are used in certain portions of that activity. Other examples include plants for construction of electronic equipment, furniture manufacturing industries, and fabricators of reinforced plastic tanks or boats.

A-4.2.8.4.(a) Sources of ignition include, but are not limited to, open flames, lightning, smoking, cutting and welding, hot surfaces, frictional heat, static, electrical and mechanical sparks, spontaneous ignition, heat producing chemical reactions, and radiant heat. The fire separation required in the article should also prevent the passage of vapours.

A-4.2.11.3. Requirements for location and design of access routes for fire department vehicles are contained in Subsection 3.2.5. of the National Building Code of Canada.

A-4.3.7.2.(1) The primary function of a diked enclosure is to contain the maximum anticipated liquid spill, but sufficient distance between dike and tank shell is also required so that a jet of liquid issuing from a puncture will not over-shoot the dike.

A-4.3.7.2.(2) The reduction of the tank to dike distance should be made only after consideration of such factors as the proximity of the tanks to buildings and other hazards, the risk associated with the product in the tanks, the location of sewers or water courses and the height of the tank.

A-4.3.7.5.(2) When the height of a dike exceeds 1.8 m, there is an increased potential for heavier-than-air vapour to accumulate at ground level within the dike enclosure. Depending on the nature of such a vapour accumulation, it may be of an explosive nature or may be of sufficient toxicity to seriously endanger personnel. Entry into such an enclosure should always be preceded by sufficient testing for such a vapour accumulation.

A-4.3.7.7. Guidelines for the protection of storage tanks may be found in standards published by the National Fire Protection Association, Insurers’ Advisory Organization of Canada, Industrial Risk Insurers and the Factory Mutual System. Such guidelines may be considered as good engineering practice in assessing the protection necessary for tanks.

A-4.3.8.9.(1) The purpose of anchoring or providing overburden on top of underground storage tanks is to prevent them from lifting out of the ground in the event of a rise in the water table or a flood. Any proposed means of anchorage or overburden must be sufficient to resist the uplift forces on tanks when they are empty and completely submerged.

Means which have been employed successfully to protect tanks against uplift are

(a) anchor straps to concrete supports beneath them,

(b) ground anchors, and

(c) reinforced concrete slabs or planks on top of them.

A-4.3.9.1.(2) PACE Report No. 87-1 “Guideline Specification for the Impressed Current Method of Cathodic Protection of Underground Petroleum Storage Tanks” published by the Canadian Petroleum Products Institute is considered good engineering practice for this application.

A-4.3.11.3.(5) (Appendix Note deleted)
the tank surface, or drainage rates for spilled liquids, should not be used to calculate the emergency venting rate of a storage tank installed inside a building. The effects of water spray cooling, and room drainage on the calculated emergency venting rate must be worked out according to good engineering practice. Increased emergency venting capacity may be required.

A-4.3.12.9.(2) Good engineering practice for design of supports for suspended storage tanks should meet the intent of Subsection 4.3.3. as far as possible. Such factors as the provision of adequate fire resistance for supports, the need to prevent over-stressing the tank shell or its supports, and resistance to earthquake forces in areas subject to earthquake forces, should be taken into consideration.
A-4.3.1.3.(1) The small diameter hose stations permitted in Article 6.2.3.4. are not intended for fighting a flammable or combustible liquid fire. Such fires should be fought using fog nozzles rather than solid water streams, because solid streams may spread the liquid fuel and worsen the situation. The small diameter hoses permitted in lieu of extinguishers are intended to be used for prompt suppression of a small fire in ordinary combustibles, and for prompt wash-down of spilled flammable or combustible liquids, before any fire occurs.

A-4.3.14.4. Examples of devices to prevent overflow include liquid level monitoring devices with alarms, float valves, preset meters on the fill line, valves actuated by the weight of the tank contents, low head pumps which are incapable of producing overflow or liquid-tight overflow pipes at least one pipe size larger than the fill pipe and discharging by gravity back to the outside source of liquid or to a safe location.

A-4.3.16.1.(2) Methods for testing to determine the location of leaks include ultrasonic, magnetic particle and videographic testing. The location of leaks in the bottom of a tank shell may also be determined by the vacuum box method. It is anticipated that all such testing will be conducted by individuals or companies experienced in these test procedures.

A-4.4.7.11.(1) It is good practice to space hangers for pipe having a nominal diameter of 50 mm or less not more than 3.5 m apart.

A-4.5.2.2.(2) This requirement is intended to prevent the accumulation of flammable vapours in low areas of buildings. If low areas are equipped with suitable continuously operating mechanical ventilation, flammable vapours would not be expected to accumulate.

A-4.5.2.9.(2) PACE Report No. 87-1, “Guideline Specification for the Impressed Current Method of Cathodic Protection of Underground Petroleum Storage Tanks” published by the Canadian Petroleum Products Institute is considered good engineering practice for this application.

A-4.5.3.2.(2)b Acceptable measures to ensure proper safety in the use of fixed dispensing equipment include the measures described in NFPA-30, “Flammable and Combustible Liquids Code.”

A-4.5.7.2.(1) Waste oils often contain both oil and more volatile flammable liquids, such as gasoline and solvents. The hazard presented by the mixture is governed by the more volatile component. Since there is no way to ensure that more volatile liquids are not mixed with the oil, waste oils should be treated as flammable liquids.

A-4.5.8.4.(1) The authorized holder of a card or key, having received adequate instruction in the safe and responsible operation of the equipment, is not considered a member of the “general public.” Such is not the case for coin operated or preset dispensing units, which could be operated by anyone.

A-4.5.9.2.(2) Examples of signs for use at service stations are shown below.

![Signs example](image)


A-4.8.3.4.(2) Examples of such equipment are dispensing stations, open centrifuges, plate and frame filters, open vacuum filters and surfaces of open equipment.

A-4.9.1.1.(1) Beer, wine, and spirits which contain less than 20 per cent by volume alcohol, are not
considered to be flammable liquids and are not regulated by this Section. Section 4.9 does not apply to wineries where distilled beverage alcohol is used to fortify wine.

A-4.9.3.2. Exposed steel supports do not have a 2 h fire-resistance rating, and need protection as much as timber supports for tanks. Due to the water miscibility of beverage alcohols, automatic sprinklers provide an effective means of achieving the necessary protection, provided there is sufficient space under the tank to permit their installation.

A-4.9.3.3. The use of "good engineering practice" in the design of normal and emergency venting is intended to prevent an accumulation of flammable vapours inside the building that may present an explosion hazard. For new tank installations, this may be achieved by directing breather vents and emergency vents, equipped with flame arrestors or pressure/vacuum valves, to the outside of the building. However, on existing tank installations, installation of such vents may be impractical. Venting into the interior space may not constitute an undue hazard where certain measures are taken to ensure an acceptable degree of fire safety. Such measures include, but are not limited to: installation of automatic sprinklers throughout the tank room and under any raised tanks greater than 1.2 m in diameter; classification of electrical equipment and wiring according to the zone classifications of the Canadian Electrical Code; provision of adequate natural or mechanical ventilation meeting the objectives of Article 4.9.6.1.; and training of personnel in safe operating procedures.

A-4.9.4.3. Article 3.3.2.4. to, which refers to combustible pallets and storage aids, applies also to the storage of empty combustible barrels.

A-4.9.5.1. Piping and pumping systems should be designed to recognized engineering standards and accepted industry practice.

A-4.11.1.1. Additional safeguards may be necessary for tank vehicles used for the transportation of flammable or combustible liquids having properties which introduce unusual factors, such as high rates of expansion, instability, corrosion and toxicity. Attention is directed to the fact that some cutback asphalts have flash points below 37.8°C, and liquids having a flash point higher than 93.3°C, such as asphalt may assume the characteristics of lower flash point liquids when heated.

A-4.11.4.1.2 Ontario Fuels Safety Branch standards may be obtained from: Ontario Fuels Safety Branch, Ministry of Consumer and Commercial Relations, 3300 Bloor St. W., 4th Floor West Tower, Toronto, Ontario M8X 2X2.

A-5.1.3.2. In addition to the general requirements of CSA C22.1, "Canadian Electrical Code, Part I," special attention must be given to Sections 18, 20 and 22. Section 18 specifies wiring requirements for Class I, II and III hazardous locations. Section 20 provides specific requirements for areas where flammable or combustible liquids are stored or dispensed. Section 22 specifies wiring requirements for areas where corrosive liquids or vapours or excessive moisture are present.

A-5.5.3.1.1 The purpose of this requirement is to prevent the storage of ammonium nitrate in facilities which contain a space below the floor where molten ammonium nitrate could pool in the event of a fire.

A-5.5.3.1.2 Copper or its alloys should not be used where they may come in contact with ammonium nitrate as they may react with it to form potentially explosive mixtures.

A-5.5.3.3. The purpose of the ventilation is to remove and dissipate the gases from burning ammonium nitrate. One of the major gases given off by such combustion is nitrous oxide which, in sufficient quantities, can create problems for fire fighters.

A-5.6.1.1. For purposes of this exemption, a distributor is deemed to be a commercial enterprise regularly handling or storing more than 1500 kg of compressed gases for purposes of resale. Such distributors are expected to follow the same good engineering practices as their suppliers. The document CGA P-1, “Safe Handling of Compressed Gases in Containers,” represents good engineering practice for the handling of compressed gases. It may be obtained from The Compressed Gas Association Incorporated, 1235 Jefferson Davis Highway, Arlington, VA, 22202.

A-5.6.1.4.2 Methods of preventing valve damage include the use of valve caps, storage in crates