

**Maximum Size and Aggregate Capacities of Aboveground Storage Tank Systems
at Fuel Dispensing Stations**

ISSUE

The Alberta Fire Code (AFC) limits the individual capacity of aboveground storage tanks at fuel dispensing stations to 50 000 L and in addition, restricts the aggregate storage capacity to 150 000 L.

The Petroleum Tank Management Association of Alberta (PTMAA) and local fire authorities (AHJ) are continually being asked to accept aboveground, secondarily contained storage tanks that exceed the permitted capacities. A large number of these tanks are being installed by the issuance of a local variance making it difficult to apply consistent provisions.

The PTMAA has submitted proposals to establish a province- wide Variance that will provide uniform acceptable conditions for permitting the use of larger tanks at fuel dispensing stations.

BACKGROUND

The 1995 National Fire Code of Canada (NFC) and the AFC 1997 limited the capacity of aboveground storage tanks to 50 000 L and addressed this in two separate Articles of the Code.

The first Article (4.3.7.4.) addressed the issue of clearance between the shell of an aboveground tank and the dike wall of a secondary containment system. This is the first time the Fire Codes permitted the use of secondarily contained aboveground tanks. These tanks are also referred to as double-walled tanks, intended to provide a level of secondary containment equivalent to the requirements set out for a conventional diking system. The capacity of 50 000 L was based on the maximum size of tanks that were permitted for underground storage in the 1990 NFC. Partly because of stricter environmental legislation, where possible, the industry began to replace underground tanks with aboveground tanks.

The second Article (4.5.2.1.) involved a major code change from NFC 1990 and AFC 1992. The Codes, to this point, only permitted underground storage tanks at service stations and limited aboveground storage tanks to 250 L for flammable liquids and 2 500 L for combustible liquids. Aboveground tanks were required to be in a diked secondary containment system and set back from buildings or property lines by a distance of 15 m. This 15 m restriction was originally applied only to service stations and was intended to deal with vehicular traffic and collision hazards encountered at service stations. However, the same collision risks were also present at other aboveground storage tank sites where the distances to buildings could be as little as 1.5 m.

The 1997 Code change removed the 15 m distance requirement, permitted unlimited underground storage and arbitrarily chose 150 000 L as an aggregate capacity based on having three 50 000 L storage tanks fit on a smaller service station site.

In the past 15 years NFC and AFC requirements for aboveground tanks at fuel dispensing stations have not changed but they also have not responded to the widespread acceptance and use of larger contained tanks at these facilities. The changes in fuel storage and delivery practices have identified significant safety issues where spills and overfilling is occurring due to capacity limitations on the tanks.

The PTMAA has demonstrated that fuel delivery practices are resulting in more frequent connections to tanks under the capacity of 50 000 L at fuel dispensing stations. This increases the frequency of risk for accidental spills at the connections and the potential of overfilling of tanks. This is viewed as causing harm under the objective of Health (OH5) by releasing product into the environment. It also exposes fuel delivery personnel to hazardous substance vapours causing harm under the objective of Safety in Use (OS3.4). An increased frequency of overfills and spills creates a greater potential for ignition of the vapours which could result in a tank fire. These concerns are currently addressed under the assigned objectives of Fire Safety (OS1.2) and Fire Protection of Buildings and Facilities (OP1.2)

The oil industry and tank manufacturers have requested a national Code change be made to permit the use of larger aboveground storage tanks and aggregate capacities at fuel dispensing stations. The purpose of these changes is to make more efficient use of delivery vehicles, storage and inventory systems, and to address the environmental and fire safety concerns of overfilling and spill control.

Proposals to address industry practices and safety issues have been vetted through the National Research Council (NRC) as changes to NFC 2010. In addition, other provinces have amended their storage tank requirements and permit larger tanks and aggregate capacities. Their rationalization to do so follows the same direction and intent that is being proposed in the NFC 2010.

The NFC 2010 has three code change proposals that directly effect the requirements for storage tank capacities.

1. NFC 4.3.7.4. Clearances Proposed 2010 Code Change
 - a. Increases the maximum tank capacity for double walled tanks and tanks incorporating a secondary containment design from 50 000 L to 80 000 L.
 - b. Permits the 80 000 L individual tank capacities to be exceeded provided the tank is constructed to ULC-S655 standard "Aboveground Protected Tank Assemblies for Flammable and Combustible Liquids" and only to the maximum capacity permitted in the standard.
 - c. Requires the tanks to have a positive shut off device in conformance with ULC S661, Overfill Protection Devices for Flammable and Combustible Liquid Storage Tanks".
2. NFC 4.6.2.1. Outside Aboveground Storage Tanks Proposed 2010 Code Change
 - a. Increases the maximum tank capacity from 50 000 L to 80 000 L.

- b. Increases the maximum aggregate capacity from 150 000 L to 200 000 L.
 - c. Permits the 80 000 L individual tank capacity to be exceeded provided the tank is constructed to ULC-S655, "Aboveground Protected Tank Assemblies for Flammable and Combustible Liquids", but restricts the aggregate capacity to 200 000 L.
 - d. An appendix note clarifies that the maximum size of a tank applies to a single tank with or without multiple compartments - that multiple compartments are not treated as separate tanks.
 - e. Requires the tanks to have a positive shut off device in conformance with ULC S661, "Overfill Protection Devices for Flammable and Combustible Liquid Storage Tanks".
3. NFC 4.3.1.8. Overfill Protection Proposed 2010 Code Change
 - a. Clarifies the requirement for tanks located outside of a conventional dike to be equipped with a positive shut off device in conformance with ULC S661, "Overfill Protection Devices for Flammable and Combustible Liquid Storage Tanks".

These technical Code changes are approved by the Standing Committee and will be published for the fall 2008 public review prior to adoption in the 2010 NFC.

CODE REQUIREMENTS:

4.6.2. Storage and Handling

4.6.2.1. Outside Aboveground Storage Tanks

- 1) Except as permitted by Sentence (3), outside aboveground *storage tanks* at *fuel dispensing stations* shall have an individual capacity of not more than 50 000 L, and their aggregate capacity shall not exceed 150 000 L.

Variance: To AFC 2006 Division B – Article 4.6.2.1.

Based on the direction of the proposed NFC 2010 Code changes and the submission presented by the PTMAA to make more efficient use of delivery vehicles, storage and inventory systems, and to address environmental and fire safety concerns of overfilling and spill control, this variance permits the installation of secondarily contained aboveground tanks to have an individual capacity larger than 50 000 L and an aggregate capacity of more than 150 000 L at fuel dispensing stations.

The following conditions apply to secondarily contained storage tanks at fuel dispensing stations under this Variance:

1. Part 4 requirements apply to the approval and installation.
2. Only storage tanks conforming to Underwriters' Laboratories of Canada (ULC) standards are permitted for use.¹
3. Except as permitted by item (5), the maximum capacity of an individual storage tank at a fuel dispensing station is not permitted to exceed 80 000 L whether there are one or more compartments as part of the tank design.
4. The aggregate capacity of product storage at a fuel dispensing station shall not exceed 200 000 L.

5. A single tank with a 2-hour fire-protection rating conforming to ULC-S655, "Aboveground Protected Tank Assemblies for Flammable and Combustible Liquids", is permitted to exceed the 80 000 L single tank capacity but shall not exceed the aggregate capacity of 200 000 L.
6. The *storage tank* is equipped with a spill containment device meeting the requirements of ULC/ORD-C142.19, "Spill Containment Devices for aboveground Flammable and Combustible Liquid Storage Tanks." ²
7. The tank is equipped with an *overflow protection device* that is compatible with the intended method of filling and meets the requirements of ULC/ORD-C58.15, "Overflow Protection Devices for Flammable Liquid Storage Tanks." ³
8. Each fill opening to the storage tank shall be equipped with a tight fill adapter.
9. Tanks equipped with remote fill openings that are located lower than the liquid level in the tank shall be equipped with a check valve to prevent siphoning of liquid from the tank and a manual shut-off valve on the delivery line.
10. The tank dispensing system is provided with a metallic sump meeting the requirements of ULC/ORD-C107.21, "Under-Dispenser Sumps."
11. The tank is provided with a means of detecting leakage within the interstitial space.
12. The tank is inspected every 7 days for any loss if equipped with vacuum gauges that monitor the interstitial space.
13. The tank has all piping connections made above the normal maximum liquid level.
14. The tank has a means to prevent the release of *flammable liquids* and *combustible liquids* by siphon flow.
15. The tank has a means for determining the level of *flammable liquids* and *combustible liquids* that is readily accessible to the delivery operator.
16. The tank is protected by posts or guardrails where exposed to collision damage.
17. The fill point location for dispensing into vehicles shall be separated from the storage tank by a minimum distance of 6 m and where aboveground piping is used it shall be protected from physical damage.

1: Only storage tanks constructed in accordance with Clauses 4.3.1.2. (1)(j), (k), (m) and (o) incorporating secondary containment and constructed in accordance with Clauses 4.3.1.2. (1)(b) and (g), for double-walled storage tanks are permitted.

2: ULC/ORD-C142.19, "Spill Containment Devices for aboveground Flammable and Combustible Liquid Storage Tanks," is now replaced by ULC S663, "Spill Containment Devices for Flammable and Combustible Liquid Storage Tanks."

3: ULC/ORD-C58.15, "Overflow Protection Devices for Flammable Liquid Storage Tanks," is now replaced by ULC S661, "Overflow Protection Devices for Flammable and Combustible Liquid Storage Tanks".

Assigned Objectives:

4.6.2.1. Outside Aboveground Storage Tanks

2) Except as permitted by Sentence (3), outside aboveground *storage tanks* at *fuel-dispensing stations* shall have an individual capacity of not more than 50 000 L, and their aggregate capacity shall not exceed 150 000 L.

4.6.2.1. Outside Aboveground Storage Tanks

(2) [F02–OP1.2] [F02–OS1.2]

Achieved Objectives:**[F02-OP1.2]**

This objective is exceeded with the added safety appurtenances to prevent overfilling, controlling the potential for spills and preventing the siphoning of product from the tank to expose buildings on the same property or adjacent properties from product leakage beyond its point of origin. Current use of listed secondarily contained tank assemblies meets the objective.

[F02-OS1.2]

This objective is exceeded with the added safety appurtenances to prevent overfilling, controlling the potential for spills and preventing the siphoning of product from the tank to expose persons from product leakage beyond its point of origin.

[F43 –OS3.4]

The benefit of having added a safety appurtenance to prevent overfilling, controlling the potential for spills and preventing the siphoning of product from the tank reduces harm to persons exposed to handling hazardous substances.

[F43, F44-OH5]

The benefit of having added a safety appurtenance to prevent overfilling, controlling the potential for spills and preventing the siphoning of product from the tank reduces potential harm to person's health from the release of hazardous substances beyond their point of origin and migrating through the environment.