CSA – B149.5 - 2020 – V9 Major Revisions

INSTALLATION CODE FOR PROPANE FUEL SYSTEMS AND CONTAINERS ON MOTOR VEHICLES

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
CSA B149.5 – 2020 – Major Revisions		
References – ISO and UL Standards		
Definitions - Purge		
Fuel Tanks – - Compliance to codes - fittings - manifolded - nameplates - removal of moisture - corrosion resistant materials - compatible materials		
Shut-off and stop-fill valves - liquid / vapour and return lines - New technology - Accessibility		
Container Installation - Location - Material - Filling connections - Tank attachment hardware		
Container and equipment protection – Road clearance (performance based)		

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
Piping and tubing systems, hose, and fittings - Protection from damage - Worm gears - Fill fittings		
Vent termination - location		
Fuel Lock-offs – multi fuelled vehicles		
Annex A (informative) Purging air and moisture using propane vapour		
Annex C (informative) Recommended vehicle labels		
CSA – B149.5 – 2020	**CSA – B149.5 - 2015**	**INTERPRETATIONS AND RATIONALE**
2 Reference publications		
ISO (International Organization of Standardization ISO 19825 (2018) *Fuel system components and refuelling connector for vehicles propelled by liquefied petroleum Gas (LPG)*	**New**	As referenced in the new clause 5.3.5.3 related to ISO 19825 Type K15 fill valve connections.
UL 1337 Investigations For Lp-Gas, Natural Gas, And Manufactured Gas Devices For Engine Fuel Systems	**New**	UL 1337 was added to Annex E and covers various devices, such as liquid level control valves, automatic shutoff valves, manual/automatic shut off valves, carburetors, regulators, vaporizers, filters/strainers, etc., for engine fuel systems for use with LP-Gas

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
3.1 Definitions **Purge** - to replace the existing fluid (gaseous or liquid) in piping, tubing, equipment, a container, or an appliance with a desired fluid.	**New**	Referenced in Clauses 4.5, 5.2.6 and Annex A
5 Installation of propane fuel systems and tanks on motor vehicles		
5.2 Fuel Tanks		
5.2.1 A fuel tank mounted on a vehicle to supply fuel to an engine on that vehicle shall meet the requirements of the CSA B51 Code and be suitable for propane vehicle use. **Note:** *Canadian Registration Numbers are not required for fittings as defined in CSA B51.*	**Revised** The fuel tank shall be approved by the inspection authority of the province or territory in which it is to be installed, in accordance with CSA B51 and applicable provincial or territorial regulations covering unfired pressure vessels,	The current wording requires the approval of the tank, not for the compliance of the tank to B51.
5.2.2 Except for fittings specifically required by this Code to have an internal excess flow valve, valves, gauges, and other fittings with openings greater than the diameter of a 1.4 mm (No. 54) drill shall be protected from shearing off and releasing the contents of the tank by being fully recessed within the body of the tank; by being enclosed within a substantial fitting securely welded to, and forming part of, the tank structure; or by having an internal excess flow valve integral to the fitting. A substantial fitting shall have a wall thickness at least equal to the wall thickness of the tank wall and shall not create crevices that provide corrosion sites.	**New**	Move the installation requirements and design inputs to B149.5 and leave the design requirements in B51. Changes to any nameplate markings will be coordinated between the two standards. • The requirement for the protection of vessel openings is moved to the installation code since it is the installer who needs to ensure the openings with internal excess flow are adequately protected. • Similar for vessel appurtenances, the installer will need to ensure the proper material is used at the time of the vehicle conversion. • These change will also help clarify tank requirements and nameplate stamping for the industry, since all conversion shops have a copy of the B149.5, but few, if any, have a copy of the B51. *previous 5.2.2 has been relocated to 5.2.5

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
5.2.3 Manifold tanks mounted between the rear axle and the rear bumper, or along the chassis of the vehicle shall meet the crush test requirements of Annex G of CSA B51. Manifold tanks in the trunk of a vehicle that are forward of the rear axle, or in the bed of a truck need not comply with the crush test requirements of Annex G of CSA B51.	**New**	Move the installation requirements and design inputs to B149.5 and leave the design requirements in B51. Changes to any nameplate markings will be coordinated between the two standards. • The requirement for the protection of vessel openings is moved to the installation code since it is the installer who needs to ensure the openings with internal excess flow are adequately protected. • Similar for vessel appurtenances, the installer will need to ensure the proper material is used at the time of the vehicle conversion. • These change will also help clarify tank requirements and nameplate stamping for the industry, since all conversion shops have a copy of the B149.5, but few, if any, have a copy of the B51. *previous 5.2.3 has been relocated to 5.2.6

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
5.2.4 In addition to the nameplate requirements specified in Clause 5.1 of CSA B51, the maximum allowable working pressure given on the nameplate shall include the following stamping: SI Units — Imperial units MAWP =Q kPa (No C.A.) — MAWP =Q psi (No C.A.) MAWP =S kPa (C.A. = R mm) — MAWP =S psi (C.A. = R in) Where: Q = maximum allowable working pressure per CSA B149.5 S = a value equal or less than 0.8 times Q C.A. = corrosion allowance R = the value for corrosion allowance and calculated using equation R = 0.2 x T_{min}, where T_{min} is minimum thickness calculated for pressure Q. Nameplates shall be mounted on standoffs or seal-welded to the tank wall to minimize corrosion between the tank wall and the nameplate. The integrity of the seal weld shall be tested using methods such as the liquid dye penetrant or magnetic particle method. Compliance with this Clause shall be recorded on the manufacturer's data report for the tank. Tanks that comply with the requirements of Annex G of CSA B51, with the exception of Clause G.1 of that Code, shall have "B51 ANX G" stamped on the tank nameplate. Tanks that comply with all of the requirements of Annex G of CSA B51 shall have "B51 ANX G/CT" stamped on the tank nameplate. **Notes:** **1) "***CT" means crush tested.* **2)** *This requirement is identical to a clause in CSA B51.*	**New**	Synchronizes the nameplate requirements with Clause G.6 of CSA B51 Code. ASME requires the design conditions to be presented on the nameplate and in the Manufacturer's Data Report (MDR). If the pressure vessel is designed and constructed for two conditions (e.g. $MAWP_1$ with no corrosion allowance (CA) and $MAWP_2$ with CA), the both design conditions shall be presented on the nameplate and in the MDR. In CSA B51, Clause 5, Annex D and Annex G of CSA B51 provide requirements for nameplates and MDRs. When pressure vessels are designed and constructed under Annex G of the CSA B51 code, the present B51 system partially address the ASME requirements for presenting design conditions on nameplates and MDRs. The present B51 system shows MAWP of 312 psi with no CA and an implied MAWP and CA based upon the additional marking (B51 ANX G) on the nameplate. The current practice is not in compliance with ASME requirements because it does not provide for the second set of design conditions to be presented on the nameplate. Note: If pressure vessel is designed, constructed and stamped for non-corrosive service (CA=0), this vessel cannot be put in corrosive service without official alteration unless the nameplate and MDR shows two conditions. Without applying the proposal provided in this RFC, manufacturers of tanks that will be stamped with ASME stamp and constructed in accordance with Annex G will need to produce two types of tanks: - One type of tanks for installation in enclosed space of a vehicle where MDR will show $MAWP_1$ (current Clause G.1.1 in B51 and new Clause 5.4.2 of CSA B149.5 per ballot 3931) and CA = 0 mm. The tank nameplate will show $MAWP_1$. - Other type of tanks for installation outside of the vehicle or in locations not protected from the corrosive or erosive effects where MDR will show $MAWP_2$ (80 % $MAWP_1$ of the tank type above) and correlated corrosion allowance. The vessel nameplate will show $MAWP_2$. In reality, the both tank types are identical (material, thickness, etc.). The difference is MAWP and CA. The proposed approach should allow manufacturers to produce one type of tanks with dual marking on the nameplate. The MDR should address the second combination of MAWP and CA in remarks of the MDR. *previous 5.2.4 has been relocated to 5.2.7

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
5.2.9 New and reconditioned propane containers, as well as containers that have had their interior exposed to atmosphere (such as would occur during a service valve change), shall be purged of air and moisture. Procedures for the removal of air and moisture are described in Annex A. Containers containing internal electrical components shall not be purged with propane unless the air and moisture has been removed from the container.	**Revised/Relocated** A new or reconditioned propane tank, or a tank that has had its interior exposed to the atmosphere (such as would occur during a service valve change), shall be purged of air in accordance with (a) the procedure described in Annex A; or (b) an alternative method that ensures that moisture is removed and that the tank contains no more than 4% air by volume. Tanks containing internal electrical components shall not be purged with propane.	Tank was changed to containers as the requirements for purging apply equally to both tanks and cylinders. Requirements for purging containers are located in Annex A *previous 5.2.9 has been relocated to new clause 5.2.13
5.2.10 Tank appurtenances shall be made of corrosion-resistant materials compatible with the tank For example, aluminum fittings cannot be used in a carbon steel tank.	**New**	Move the installation requirements and design inputs to B149.5 and leave the design requirements in B51. Changes to any nameplate markings will be coordinated between the two standards. • The requirement for the protection of vessel openings is moved to the installation code since it is the installer who needs to ensure the openings with internal excess flow are adequately protected. • Similar for vessel appurtenances, the installer will need to ensure the proper material is used at the time of the vehicle conversion. • These change will also help clarify tank requirements and nameplate stamping for the industry, since all conversion shops have a copy of the B149.5, but few, if any, have a copy of the B51. *previous 5.2.10 has been relocated to new clause 5.2.14
5.3.1 Containers		
5.3.1.3 Container appurtenances shall be rated at least equal to the set pressure of the container relief valve.	**New**	Prescribes a minimum pressure rating for container appurtenances.

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
5.3.5 Shut-off and stop-fill valves		
5.3.5.1 Propane liquid/vapour withdrawal and return connections on a fuel tank shall be equipped with a shut-off valve that incorporates an internal excess-flow valve.	**Revised** A propane withdrawal connection on a fuel ***tank*** shall be equipped with a ***shut-off valve*** that incorporates an ***internal excess-flow valve***.	Revised to ensure that safe guards are in place for the tank service port. This will provide the same safety factor for fuel return valves that currently exist for fuel withdrawal valves.
5.3.5.3 After December 31, 2025 propane fill valves connections shall be designed to and manufactured to ISO 19825 Type K 15. **Note:** *During the transition, adaptors from the ACME fill system will be allowed, provided they are marked for the service, pressure, and manufacturer's name.*	**New**	New technology will result in increased user safety and lower emissions during refueling. New reference publication. Subsequent clauses will be renumbered accordingly.
5.3.5.7 A shut-off valve on a container shall be accessible, and the removal of any cover shall not require the use of tools.	**Revised** A ***shut-off valve*** on a ***container*** shall be accessible	To clarify that the use of tools to remove any cover is not allowed.

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
5.3.6 Float gauges Where a float gauge is used, it shall be installed in accordance with this Code.	**<u>Revised</u>** Where a float gauge is used, it shall be installed in accordance with Annex G of CSA B51and with this Code.	Move the installation requirements and design inputs to B149.5 and leave the design requirements in B51. Changes to any nameplate markings will be coordinated between the two standards. • The requirement for the protection of vessel openings is moved to the installation code since it is the installer who needs to ensure the openings with internal excess flow are adequately protected. • Similar for vessel appurtenances, the installer will need to ensure the proper material is used at the time of the vehicle conversion. • These change will also help clarify tank requirements and nameplate stamping for the industry, since all conversion shops have a copy of the B149.5, but few, if any, have a copy of the B51.
5.4 Container Installation		

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
5.4.1 For a tank located outside of an enclosed space on any vehicle, or in locations not protected from the corrosive or erosive effects of the automotive environment, the design pressure for the tank (MAWP as defined in Clause 5.2.4 of this Code) shall be not less than 1.72 MPa (250 psig). The set pressure of the relief valve shall be equal to the design pressure of the tank. The corrosion allowance shall be in accordance with Clause 5.2.4 of this Code.	**Revised** For a ***tank*** located outside of an enclosed space on any vehicle, the design pressure for the ***tank*** and the set pressure of its relief valve shall each be not less than 250 psig (1725 kPa). The set pressure of the relief valve shall be equal to the ***design pressure*** of the ***tank***.	Values are now shown in SI metric units yard/pound equivalents are provided so the code may be used in these units also. Move the installation requirements and design inputs to B149.5 and leave the design requirements in B51. Changes to any nameplate markings will be coordinated between the two standards. • The requirement for the protection of vessel openings is moved to the installation code since it is the installer who needs to ensure the openings with internal excess flow are adequately protected. • Similar for vessel appurtenances, the installer will need to ensure the proper material is used at the time of the vehicle conversion. • These change will also help clarify tank requirements and nameplate stamping for the industry, since all conversion shops have a copy of the B149.5, but few, if any, have a copy of the B51.
5.4.2 For a tank located in an enclosed space on any vehicle, the design pressure for the tank (MAWP as defined in Clause 5.2.4 of this Code) shall be not less than 2.15 MPa (312 psig). The set pressure of the relief valve shall be equal to the design pressure of the tank. There is no corrosion allowance as per Clause 5.2.4 of this Code.	**Revised** For a ***tank*** located in an enclosed space on any vehicle, the ***design pressure*** for the ***tank*** and the set pressure of its relief ***valve*** shall each be not less than 312 psig (2150 kPa) . The set pressure of the relief ***valve*** shall be equal to the ***design pressure*** of the ***tank***.	Same rational as 5.4.1

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
5.4.3 Tanks fabricated from 300 series stainless steel or 5000 or 6000 series aluminum shall be exempt from the corrosion allowance requirements of Clause 5.2.4 provided the tank is protected from the erosive effects of the automotive environment.		Same rationale as 5.4.1
5.4.4 When multiple tanks are installed on a vehicle, they shall have either separate fill connections or be designed to prevent overfilling or over-pressurization of any of the tanks in the system, and in either case shall be connected to the engine using a pressure-balanced tee.		The current wording restricts alternatives to separate fill connections. This change will also harmonize the requirements of CSA B149.5 and NFPA 58. Subsequent clause will be renumbered accordingly.
5.4.8 All tank attachment bolts shall have self-locking nuts or equivalent, protruding through any nut with a minimum of one diameter of threads exposed. No bolts shall be cut to size in a manner that would affect the strength of the bolt in the clamping area and shall be a minimum of grade 5 type. Where a bolt passes through a sheet metal portion of the vehicle, a backup metallic reinforcing plate shall be provided. The backup metallic reinforcing plate shall be compatible with the vehicle material. This plate shall be a minimum 2.5 mm (0.1 in) thick with an area of at least 3870 mm² (6 in²) 6 in^2. Sheet metal screws shall not be used as an attaching component, and where attachment is to a chassis of a unibody vehicle, existing frame holes shall be used where possible. Support to prevent the weakening of the frame members shall be provided. Material used for reinforcement shall be of steel and have a minimum thickness of 3.0 mm (0.125 in) and a diameter four times the diameter of the hole. Corrosion protection shall be applied to drilled and metal-reinforced areas. See Annex B and Figure B.1.	**Revised** All ***tank*** attachment bolts shall have self-locking nuts or equivalent. Where a bolt passes through a sheet metal portion of the vehicle, a backup steel reinforcing plate shall be provided. This plate shall be a minimum 0.1 in (2.5 mm) thick with an area of at least 6 in^2 (3870 mm^2). Sheet metal screws shall not be used as an attaching ***component***, and where attachment is to a chassis of a unibody vehicle, existing frame holes shall be used where possible. Support to prevent the weakening of the frame members shall be provided. Material used for reinforcement shall be of steel and have a minimum thickness of 0.125 in (3.2 mm) and a diameter four times the diameter of the hole. Corrosion protection shall be applied to drilled and metal-reinforced areas. See Annex B and Figure B.1.	There have been many installations when bolts that have no threads exposed or very few threads exposed, this has been changed to maintain the tank in place and in accordance with “best practices” for bolts. “no bolts shall be cut to size” to ensure that no bolts are cut by use of heat such as torches and therefore compromising the bolt integrity. The minimum bolt grade is specified to ensure a minimum hardness of bolts. The direct attachment of steel to aluminum will result in galvanic corrosion; a vehicle manufacturer has released a bulletin that provides a work around, however the preferred method is not to use steel with aluminum. The change is to allow for the use of aluminum back up plate(s). Values are now shown in SI metric units yard/pound equivalents are provided so the code may be used in these units also. Subsequent clauses will be renumbered accordingly.

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
5.5 Container and equipment protection		
5.5.3 Tanks and any other components of the fuel system shall be installed with as much road clearance as practicable. This clearance shall be measured from the bottom of the tank or the lowest fitting, support, or attachment on the tank or fuel system or its housing (if any), whichever is lowest, as follows: a) Tanks and any component of the fuel system installed between axles shall be no lower than the lowest point forward of the tank or fuel system on i) the lowest structural component of the body; ii) the lowest structural component of the frame or subframe, if any; iii) the lowest point of the engine; and iv) the lowest point of the transmission (including the clutch housing or torque converter housing, as applicable). b) Tanks and fuel system components installed behind the rear axle and extending below frame shall be no lower than the lowest point of the following points and surfaces when the vehicle is loaded to the gross vehicle weight rating as follows: i) not lower than the lowest point of the structural component of the body, engine, transmission (including clutch housing or torque converter housing, as applicable), forward of the tank or fuel system;	**Revised** A ***tank*** or any other portion of the fuel system located outside a vehicle shall be installed with as much road clearance as practicable, but never less than the minimum road clearance of the vehicle when loaded to its gross vehicle weight rating. This minimum clearance shall be measured from the bottom of the ***tank*** or from the lowest portion of any part of the fuel system when installed, whichever is lower, and shall not be less than the following: (a) between the axles (i) 7 in (178 mm) on vehicles having a wheel base of 127 in (3225 mm) or less; or (ii)9 in (229 mm) on vehicles having a wheel base in excess of 127 in (3225 mm); and (b) behind the rear axle, 8 in (203 mm). The ***tank*** shall be installed above the plane formed by the bottom of the rear tires and the lowest most rearward part of the vehicle as received from the manufacturer or as modified in accordance with the vehicle manufacturer's guidelines.	Performance based requirements ensure the vehicle's structure protects the propane tank and components, as there are vehicles on the road that could not comply with prescriptive measurements. Cont.

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
5.5.3 Continued. ii) no lower than the lines extending rearward from each wheel at the point where the wheels contact the ground directly below the centre of the axle to the lowest and most rearward structural interference; and **Note:** *Some examples of structural components include bumper, bumper frame, frame mounted trailer hitch less attachments, extensions, etc.)* iii) where there are two or more rear axles, the lines shall be made from the rearmost axle.		Cont.
5.7 Piping and tubing systems, hose, and fittings		
5.7.3 Hose		
5.7.3.2 ***Hose*** and ***hose fittings*** used for vapour service shall be constructed of a material resistant to the action of propane (e.g., neoprene) and shall be rated by the manufacturer of the hose for the function and a minimum pressure of 450 kPa (65 psi) . The hose shall be marked with the pressure rating. Hoses shall be clamped in a manner to be leak free and in accordance with Clause 5.7.8.9.	**Revised** ***Hose*** and ***hose fittings*** used for vapour service shall be constructed of a material resistant to the action of propane (e.g., neoprene) and shall be rated by the manufacturer of the hose for the function and a minimum pressure of 65 psi (450 kPa) . The hose shall be marked with the pressure rating.	Values are now shown in SI metric units yard/pound equivalents are provided so the code may be used in these units also. By not securing the hoses they can leak propane or become disconnected from the fitting causing a safety concern. (example) Securing vapor hoses to fittings such as injectors and regulators.
5.7.6 Piping, tubing, and hose practices		

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
5.7.6.6 A supply line of a vehicle or a return line from the engine to the tank shall be installed to maintain a clearance of at least 50 mm (2 in) from any positive unfused terminal.	**New**	Fuel lines should never be in direct contact with any electrical lines or batteries, as the fuel line would become a conductor.
5.7.7 Joints and connections		
5.7.7.8 A supply line that pierces a panel of a vehicle shall be protected from damage by a grommet, bulkhead fitting or a similar device	**New**	Clarify the protection required for the installation of a supply line.
5.7.8 General requirements and Prohibitions	**5.7.8 Prohibited practices**	
5.7.8.9 Worm gear clamps shall not be used on propane hoses	**New**	Propane hoses installed in vapor connections to fittings, equipment, and other appurtenances with “Worm gear” style hose clamp were associated with the leak.
5.7.8.10 The fill fitting shall be located such that the tank filler nozzle can be attached without opening the trunk, passenger door, or hood.	**New**	The fill fitting should be not be installed too close to any vehicle openings, an unintended release /accumulation of propane within a vehicle during the refueling process is a safety concern.
5.8 Discharge lines from tank relief valves and hydrostatic relief valves		

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
5.8.1 The discharge from a relief valve shall (a) be directed to the outside of any enclosed space; (b) be directed as far as practicable from possible sources of ignition; (c) be located in such a manner as to prevent contact between propane and any tank or vehicle; (d) be directed upward or downward within 45 degrees of vertical; and (e) have a rain cap or other protector, where required.	**Revised** The discharge from a relief ***valve*** shall (a) be directed to the outside of any enclosed space; (b) be directed as far as practicable from possible sources of ignition; (c) be located in such a manner as to prevent contact between propane and any ***tank*** or vehicle; (d) be directed downward to an angle not less than 15° from the horizontal; and (e) have a rain cap or other protector, where required.	In some installations it may be safer to allow the propane to vent vertically up and disperse.
5.10 Fuel lock-offs		
5.10.2 On vehicles with multiple fuel types, liquid fuel pumps shall be de-energized when not in use.	**New**	When diesel or direct injection gasoline engines are converted to run on a propane vapor system, both fuels are injected into the combustion chamber at the same time. This is a controlled process that does not impair the safety of the vehicle. Both fuels are shut off when the engine is not running and when the vehicle is running on gasoline or diesel alone, the propane fuel supply is shut off. Subsequent Code Clause will be renumbered accordingly.

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
Annex A (informative) ***Purging air and moisture using propane vapour*** **Note:** *This informative (non-mandatory) Annex has been written in normative (mandatory) language to facilitate adoption where users of the Code or regulatory authorities wish to adopt it formally as additional requirements to this Code.* **A.1 General** New and reconditioned propane containers and propane containers that have had their interiors exposed to the atmosphere, such as during a valve change, shall be purged of air and moisture. Both air and moisture are contaminants that seriously interfere with the operation of a propane system. Air in a container prevents it from being properly filled and interferes with the fuel system. **Note**: *Air and moisture in a container can react with the odorant that is added to the propane. This can cause a chemical reaction that can accelerate odour fade and thus diminish a person's ability to detect a leak in the container, piping, or fuel system to which the container is connected.* **A.2 Moisture removal** Even if a careful inspection (using a pen flashlight) reveals no visible moisture, the container shall still be dried, since dew can form on the walls. Additionally, the contained air can have relative humidity up to 100%. *Continued…*	**Revised** To remove air and moisture from a container being prepared for propane service using a purging assembly as shown in Figure A.1, complete the following steps: (a) Open the container service ***valve*** and blow down air trapped in the container to atmospheric pressure. (b) Inject into the container through the service ***valve*** 1/4 tsp (1 mL) of anhydrous methanol per 1 lb (0.45 kg) capacity of the container being purged and rotate the container until all its interior metal has been exposed to the anhydrous methanol. (c) Drain all liquid residues from the container. (d) Connect the vapour purge line to the service ***valve*** on the container and pressure to 15 psig (105 kPa) . (e) Close the vapour purge line and blow the contents to atmosphere. (f) Repeat the steps in Items (d) and (e) four more times. (g) Open the vapour purge supply line and pressure the container to 15 psig (105 kPa) (h) Close the vapour purge supply ***valve*** and the container service **valves** and retain the last 15 psig (105 kPa) filled into the container. (i) Disconnect the vapour purge supply line. (j) Connect the liquid supply line to the container service ***valve***. Open the liquid supply and ***tank*** service ***valves*** and charge to vapour pressure. (k) Apply leak-detection solution to all surfaces of the service ***valve***, service ***valve*** threads, and all welded seams of the ***tank***. (l) If no bubble leaks are apparent, the container may be filled and placed in service. **CAUTION**: When purging containers, never use liquid propane. Use only vapour and always purge in a safe, ignition-free location.	Values are now shown in SI metric units yard/pound equivalents are provided so the code may be used in these units also. Information related to vacuum purging was updated to reflect the information in CSA B149.2 Propane Storage and Handling Code. *Continued…*

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
A rule of thumb for removing moisture in a container calls for the introduction of at least 0.6 L (1 pint) of genuine absolute anhydrous methanol (99.85% pure) for each 450 L (100 gal) of water capacity of the container. Substitutes shall not be used; they will not work. The superior effectiveness of methanol, compared to all other alcohols, is due to its high affinity for water and has a boiling point, which is lower than for all other alcohols and, most importantly, lower than water. To be effective, the methanol shall come in contact with the water. Rotating the container so that the entire interior surface of the container has been wetted by the methanol will speed up the absorption process. If the container is not rotated, it will take about a week for the methanol to absorb the moisture. In either case, the resulting solution of methanol and water shall be drained before the container is put into service. On this basis, the minimum volumes for typical containers would be as shown in Table A.1.	**Revised**	

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE

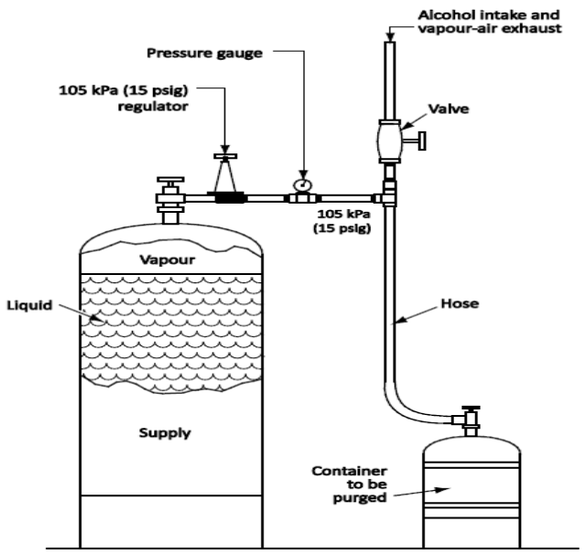
Table A.1
Minimum volumes of methanol for typical containers
(See Clause A.2)

Container type	Minimum volume of methanol required
Up to 9 kg (20 lb)	20 mL (1/40 pt)
45 kg (100 lb)	0.1 L (1/8 pt)
2250 L (500 gal) tank	3 L (5 pt)
4500 L (1000 gal) tank	7 L (10pt)
9000 L (2000 gal) tank	11 L (20 pt)

Revised

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
A.3 Purging air and moisture using propane vapour or inert gas To remove air and moisture from a container being prepared for propane service using a purging assembly as shown in Figure A.1, complete the following steps: (a) If a quick disconnect is present, connect the appropriate adapter. Open the container service valve and blow down to atmospheric pressure air trapped in the container. (b) Inject 1 mL (1/4 tsp) of anhydrous methanol per 1 L (454 g) capacity of the container being purged into the container through the service valve and rotate the container until all interior metal of the container has been exposed to the anhydrous methanol. (c) Drain all liquid residues from the container. (d) Connect the vapour purge line to the service valve on the container and pressure to 105 kPa (15 psig). (e) Close the vapour purge line and blow the contents to atmosphere. (f) Repeat the steps in Items (d) and (e) four more times. (g) Open the vapour purge supply line and pressure the container to 105 kPa (15 psig). (h) Close the vapour purge supply valve and container service valves and retain the last 105 kPa (15 psig) filled into the container.	**Revised**	*Continued…*

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
(i) Disconnect the vapour purge supply line. (j) Connect the liquid supply line to the container service valve. Open the liquid supply and container service valves and charge to vapour pressure. (k) Apply leak detection solution to all surfaces of the service valve, the service valve threads, and all welded seams of the container. (l) If no bubble leaks are apparent, the container may be filled and placed in service. When purging containers, never use liquid propane. Use only vapour and always purge in a safe, ignition-free location.		

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
Figure A.1 **Typical container purging system** (See Clause A.3)  	**Revised**	*Continued…*

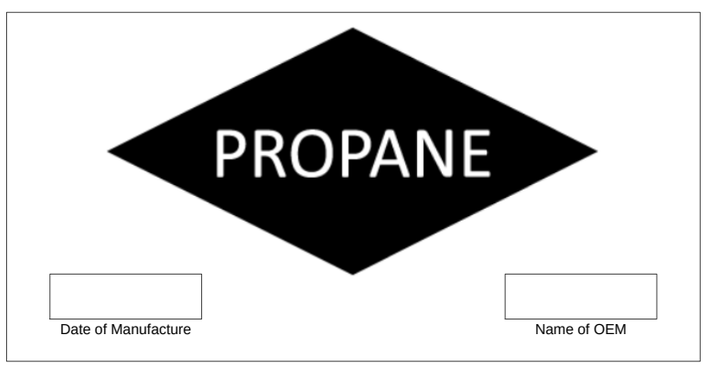
DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
A.4 Vacuum purging Ensure that the container is designed for the vacuum to which it will be subjected. To remove air and moisture from a container being prepared for propane service using vacuum purging, complete the following steps: (a) Connect the suction side of an LP-gas compressor to the container being purged. Open the container valve and turn the compressor on. (b) Ensure that any container opening is capped. (c) Ensure that the outlet of the compressor is venting the air to atmosphere. (d) Using an appropriate manometer, stop the process when the negative pressure reaches the value stated in Table A.2, according to the altitude above sea level of the location where the purging is taking place. (e) Shut the container valve off. (f) Connect the vapour line from the storage tank to the container. Open the valve and allow the flow of propane until a pressure of approximately 105 kPa (15 psig) is reached. (g) Add methanol as required and shut off the valve. The container is ready to be filled with propane.	**Revised**	*Continued…*

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE

Table A.2
Negative pressure required for vacuum purging
(See Clause A.4**)**

Altitude above Sea level, m (ft)	Gauge reading, mm Hg (in Hg)
0	660 (25.85)
152 (500)	643 (25.31)
305 (1000)	629 (24.78)
457 (1500)	616 (24.26)
610 (2000)	603 (23.75)
762 (2500)	590 (23.24)
914 (3000)	578 (22.74)
1067 (3500)	565 (22.25)
1210 (4000)	553 (21.77)
1372 (4500)	541 (21.29)
1524 (5000)	529 (20.82)
1676 (5500)	517 (20.35)
1829 (6000)	505 (19.90)

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
A.5 Container Decommissioning Containers and fittings to be decommissioned should be isolated from any process, container or equipment, usually by disconnecting and removing adjoining pipework or blocking it off with spades or blanks. The closing of only shut-off valves does not meet the intention of this clause. Prior to decommissioning, (a) As much liquid should be removed from the container as possible by normal use or by controlled transfer to other containers, or by controlled flaring. If it is necessary to vent residual vapor, this should be kept to the absolute minimum possible. (b) The container should be purged i) with inert gas until the propane content remains less than 10% LEL; or ii) by displacement with water or other suitable method. Care should be taken to ensure that no flammable vapors are generated from residual heavy ends. **Note:** *facilities registration with Transport Canada is required for decommissioning a propane container.*	**Revised**	*Continued…*

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE
Annex C (informative) ***Recommended vehicle labels*** **Notes:** *1) This Annex is not a mandatory part of this Code.* *2) See Clause 5.12.1 and 5.12.2 and Annex E*		
Figure C.2 Recommended Original Equipment Manufacturer (OEM) vehicle label  **Window Label**	**New**	Currently, there is a gap in the propane industry with OEM (Original Equipment Manufacturer) vehicles that are manufactured with a propane autogas fuel system that do not meet the labeling requirements of CSA B149.5. Under the Canadian Federal Government Standard MVSS301, OEMs are not required to apply any special propane identification labels that have become industry standard through the automotive propane conversion code B149.5. This presents an issue where attendants cannot (should not) refuel the propane vehicles in Canada. Adding this figure to the existing code will not force any OEM to comply but this will serve as an example of what should be applied. There has been a positive response from certain OEM's that they would apply a label to help address the issue.
End		

DRAFT - CSA - B149.5 - 2020	CURRENT - CSA - B149.5 - 2015	INTERPRETATIONS AND RATIONALE