Subchapter M
ALTERNATE FUEL SYSTEMS AND CONTROLS

175.241. Compressed and Liquefied Gas Fuel Systems

(a) Reference Publications - Regulatory, statutory, and informational publications may be obtained at the addresses indicated:

(1) ASME Code - The American Society of Mechanical Engineers codes for boilers and pressure vessels may be obtained from:

United Engineering Center
345 East 47th Street
New York, New York 10017

(2) ASTM Standards - The American Society for Testing and Materials Standards may be purchased from:

American Society for Testing and Materials
1916 Race Street
Philadelphia, Pennsylvania 19103

(3) Bureau of Explosives - Information on approval of safety devices by the Bureau of Explosives may be obtained from:

Bureau of Explosives
Association of American Railroads
1920 L Street N.W.
Washington, D.C. 20036

(4) CGA Pamphlet - The Compressed Gas Association pamphlet may be obtained from:

Compressed Gas Association, Inc.
500 Fifth Avenue
New York, New York 10036

(5) Code of Federal Regulations - The Code of Federal Regulations, Title 49, “Transportation,” Parts 100 to 199, may be purchased from:

Superintendent of Documents
United States Government
Printing Office
Washington, D.C. 20402

(6) National Fire Protection Association Pamphlet - 58. This pamphlet may be obtained from:

NFPA
470 Atlantic Avenue
Boston, Massachusetts 02210

(b) Liquefied Petroleum Gas - A fuel system using liquefied petroleum gas (LPG) shall meet the following requirements in addition to those in subsection (e).

(1) **Fuel Supply Contained.** An LPG fuel supply container shall be constructed, inspected, and permanently marked in accordance with the appropriate DOT regulation or ASMF code. A container constructed to the DOT regulations shall have a minimum service pressure of 240 psi. Containers constructed to the ASME shall have a minimum working pressure of 250 psi. That containers installed in enclosed space, including automobile trunks or cabinets on vehicles and all engine fuel containers shall be constructed for at least a 312.5 psig design pressure. A container shall be equipped with a fixed liquid level gauge to indicate when the container is 79.8% full. A float gauge does not meet the requirements for an outage valve or a fixed liquid level gauge.

(2) **Two or More Containers.** When two or more containers are used, a backflow check valve shall be installed in each fuel line to prevent passing of fuel between tanks during filling operations. A hydrostatic relief valve with a pressure setting not lower than 350 psi nor higher than 500 psi shall be installed

between the backflow check valves and the fuel cutoff valve to the carburetor and between two positive liquid shut-off points in the liquid piping and hose.

(3) **Identification Markings.** An LPG fuel supply container shall be permanently marked as follows:

(i) Markings on the containers constructed to the ASTM Code shall include all the following:

(A) An official ASME Code U symbol.

(B) The manufacturer's name, initials or trademark.

(C) The maximum allowable working pressure (psi at F).

(D) The serial number.

(E) The year built.

(F) The words "FOR LP GAS ONLY" in letters not less than 1/4 inch high and visible after installation. Decals are acceptable.

(ii) Permanent markings on containers constructed to DOT regulations shall include:

(A) The letters "DOT" or "ICC" with the appropriate specification and service pressure.

(B) The serial number.

(C) The year tested.

(D) The manufacturer's name, initials, or trademark, as registered with DOT.

(E) The words "FOR LP GAS ONLY" or "FOR LPG ONLY" in letters not less than 1/4 inch high and visible after installation. Decals and stencils are acceptable.

(iii) A container inlet and outlet except those for relief valves and gauging devices shall be marked to designate whether they communicate with vapor or liquid space.

(4) **Valves.** A valve shall be of a type that has been tested and listed by UL or by other nationally recognized testing laboratories as meeting the UL requirements for LPG. All valves shall be securely mounted and shielded or installed in a protected location to prevent damage from vibration and unsecured objects.

(i) **Safety Relief Valves.** One or more spring-loaded internal safety valves shall be installed directly in each fuel container in communication with the vapor space. The markings showing "set to discharge pressure" shall be visible after the valves are installed in the container. Safety relief valves for DOT fuel supply containers shall be approved by the Bureau of Explosives, and the valve setting shall be as required by the Bureau. The safety relief valve setting shall be as required by the Bureau. The safety relief valve setting for ASME containers shall not be less than 100% nor more than 110% of the maximum allowable service pressure of the container.

(A) Safety relief valves for ASME fuel containers shall be so constructed so as to discharge at not less than the following rates before the pressure is in excess of 120% of the maximum allowable working pressure of the container:

TANK SURFACE AREA (sq ft.)	AIR FLOW RATE(cfm)
20 or less	626
25	751
30	872
35	990
40	1,100
45	1,220
50	1,330
55	1,430
60	1,540
65	1,640
70	1,750
75	1,850
80	1,950
85	2,050

90	2,150
95	2,240
100	2,340
105	2,440
110	2,530
115	2,630
120	2,720
125	2,810
130	2,900
135	2,990
140	3,080
145	3,170
150	3,260
155	3,350
160	3,440
165	3,530
170	3,620
175	3,700
180	3,790
185	3,880
190	3,960
195	4,050
200	4,130

(B) Permanent markings on safety relief valves in ASME containers shall include all of the following:

(I) The manufacturer's name, initials, or trademark.

(II) The manufacturer's design or type numbers.

(III) The discharge pressure (___psi).

(IV) The discharge capacity (cfm air at 60°F and 14.7 psia).

(V) The ASME or UL symbol.

(C) Permanent markings on safety relief valves in DOT containers shall include all of the following:

(I) The manufacturer's name, initials, or trademark.

(II) The catalog number.

(III) The discharge pressure (___psi).

(IV) The discharge capacity (cfm air at 60°F and 14.7 psia).

(ii) **Excess Flow Valve.** An internal excess flow valve, designed to close when maximum volume escapes through the smallest connection in the supply line system, shall be installed in every fuel supply container outlet except the relief valve or gauging device outlets. The excess flow valve shall have a bypass not to exceed a Number 60 drill size opening to allow equalization of pressure.

(iii) **Check Valve.** Inlet connections in the fuel supply container shall be fitted with an internal and external check valve or an internal check valve with an adjacent or remote manual shut off valve. The inlet of the filling system shall be capped, except when filling, to withstand the maximum service pressure of the container. A container installed after January 1, 1973 shall be equipped for remote filling exterior to the vehicle compartment with an internal and external check valve installed in the container.

(iv) **Shut-off valve**. A manually operated shut-off valve shall be installed directly into the fuel supply container outlet connection serving the supply line and shall be marked with the words, "SHUT-OFF VALVE." Decals or stencils are acceptable.

(5) **Gauge.** An LPG containers shall be equipped with a liquid volume gauge, which shall be designed and installed as follows:

(i) The gauging device shall be of a type that has been listed by UL or by other nationally recognized testing laboratories as meeting the UL requirements for LPG.

(ii) The gauge shall be securely mounted and shielded or installed in a protected location to prevent damage from excessive vibration and unsecure objects.

(iii) A gauge that requires bleeding of the product shall be bled to outside of the vehicle compartment and shall be equipped with a bleeder valve. A restricting orifice not larger than Number 54 drill size shall be inside the fuel supply container.

(6) **Vaporizer and pressure reducing regulator.** Devices which supply heat directly to the fuel container shall be equipped with an automatic device to cut off the supply of heat before the pressure in the container reaches 200 psig. A vaporizer shall be fabricated of materials suitable for LPG service and resistant to any action of the LPG under service conditions. Such vaporizers shall be designed for engine fuel service and shall comply with the following:

(i) The vaporizer, any part of it, or any devices used with it which may be subjected to container pressure shall have a design pressure of at least 250 psig and shall be plainly and permanently marked at a readily visible point:

(A) With the design pressure of the fuel containing portion in psig.

(B) With the water capacity of the fuel-containing portion in pounds.

(ii) A vaporizer shall not be equipped with fusible plugs.

(iii) A vaporizer shall have a valve or suitable plug located at or near the lowest portion of the section occupied by the water or other heating liquid to permit substantially complete drainage. The engine cooling system drain or water hoses may serve this purpose, if effective.

(iv) Vaporizers and regulators shall be securely fastened in position.

(v) Engine exhaust gases may be used as a direct source of heat to vaporize the fuel if the materials of construction of those parts of the vaporizer in contact with the exhaust gases are resistant to corrosion from these gases and if vaporizer system is designed to prevent excessive pressures.

(vi) Approved automatic pressure- reducing equipment, properly secured, shall be installed between the fuel supply container and the gas air mixer to regulate the pressure of the fuel delivered to the gas-air mixture.

(vii) An approved automatic shut-off valve shall be installed in the fuel system at some point ahead of the inlet of the gas regulator, designed to prevent the flow of fuel to the gas-air mixer when the engine is not running. Atmospheric type regulators–zero governors–shall not be considered as automatic shut-off valves.

(7) **Vents.** A compartment in which an LPG container is installed shall be vented to the atmosphere unless all piping and connectors are exterior to the compartment. The vent or vents shall be installed at the lowest practicable point of the compartment and shall have an open area totaling not less than 3 square inches.

(8) **LPG hose for high pressure liquid or vapor use.** The hose and hose assemblies shall have a working pressure of not less than 350 psi and a burst pressure of not less than 1750 psi. The hose shall be reinforced with corrosion-resistant wire braid and shall be of a type that has been tested and listed by UL or by other nationally recognized testing laboratories as meeting the UL requirements for LPG. Hose shall have the following permanent identification markings in letters and numerals at least 1/5 inch in height at intervals of 24 inches or less:

(i) The manufacturer's name, initials, or trademark,

(ii) LPG or LP GAS

(iii) The working pressure

(iv) The burst pressure

(9) **Hydrostatic Relief Valve.** Hydrostatic relief valves designed to relieve the hydrostatic pressure that might develop shall be installed in sections of piping or hose between closed shut-off valves and have a pressure setting of not less than 350 psig, or more than 500 psig.

(c) Compressed Natural Gas - A fuel system using compressed natural gas (CNG) shall meet the following requirements in addition to those in subsection (e):

(1) **Fuel Supply Container.** A CNG fuel supply container shall be constructed and inspected in accordance with DOT regulations and shall have a rated service pressure of not less than 2250 psi at 70°F. It shall not be filled beyond the working pressure stamped on the tank and marked near the filler connection, corrected for the ambient temperature at time of filling as prescribed by DOT.

(2) **Identification Markings.** Each CNG fuel supply container shall have the following identification markings:

(i) The letters “DOT” with the appropriate specification and working pressure.

(ii) The serial number.

(iii) The year tested.

(iv) The manufacturer’s name, initials, or trademark.

(v) The words “FOR CNG ONLY” in letters at least 1/4 inch high and visible after installation. Decals or stencils are acceptable.

(3) **Shut-Off Valve.** A manually operated shut-off valve shall be in direct communication with the container and shall be marked with the words, “SHUT-OFF VALVE.” Decals or stencils are acceptable. A normally closed automatic shut-off valve that is held open by electrical current may be used in addition to a manual shut-off valve and shall be marked with the words, “AUTOMATIC SHUT-OFF VALVE.” The automatic shut-off valve shall be wired so that it shuts off when the ignition switch is in the off or accessory positions or when engine vacuum or oil pressure is not present. A valve may not be used for CNG unless it has been certified for that purpose by the manufacturer. The shut-off valve shall be securely mounted and shielded or installed in a protected location to prevent damage from vibration and unsecured objects.

(4) **Safety Relief Valve.** One or more safety relief devices shall be installed in the fuel supply container in communication with the fuel and vented to the outside of the vehicle compartment. A relief device shall be approved as to type, size, quantity and location by the Bureau of Explosives and shall have the following permanent identification markings:

(i) The manufacturer’s name, initials or trademark.

(ii) The flow capacity *(____cf)*.

(iii) The yield temperature rating *(____F)*.

(5) **Gauges.** Gauges used in CNG systems shall be designed and installed as follows:

(i) A gauging device shall be designed for the most severe pressure and temperature conditions to which the devices may be subjected with a pressure safety factor of not less than four.

(ii) Gauges shall be securely mounted and shielded or installed in a protected location to prevent damage from vibration and unsecured objects.

(6) **Pressure Reducing Regulators.** An automatic pressure reducing regulator shall be installed in CNG systems to reduce container pressure to a value consistent with the working pressure required by the carburetor. Means shall be provided to prevent malfunction due to refrigeration effects. Regulators shall be installed so that their weight is not placed on or supported alone by the attaching lines. Regulators shall be designed to a container’s maximum working pressure and temperature with a pressure safety factor of not less than four.

(7) **Vents.** Every compartment in which a CNG container is installed shall be vented to the atmosphere, unless all piping and connections are exterior to the compartment or vapor sealed and vented to the atmosphere. The vents shall be installed at the highest practicable point of the compartment and shall have an open area totalling not less than 3 square inches.

(d) Liquefied Natural Gas - A fuel system using liquefied natural gas (LNG) shall meet the following requirements in addition to those in subsection (e).

(1) **Fuel supply container.** An LNG fuel supply container shall be constructed and inspected in accordance with 49 CFR §178.57 (relating to specification 4L; welded cylinders insulated), specification 4L for welded insulated cylinders, with the exception of 49 CFR 178.57-13 and 178.57-20 (relating to pressure relief

devices pressure control valves; and markings) and the report to the Bureau of Explosives in §178.57-4(d) (relating to duties of inspector). Each LNG container shall meet the following additional requirements:

(i) The unrelieved fuel pressure inside the container shall not exceed 100 psi within a total 72-hour period consisting of 48 hours at 60ºF and 12 hours at 90°F ambient temperatures when the container has been filled with LNG conditioned at one atmosphere.

(ii) The container shall be equipped with a liquid level gauging device and a dip tube to prevent filling beyond 90% by volume at atmospheric pressure.

(iii) Each completed container, including its supporting structure and valves, enclosures, and lines normally attached thereto, shall have structural integrity to withstand damage from deceleration and acceleration forces resulting from a 30 miles per hour front-end and rear-end collision of the type of vehicle in which the container is installed. A test or other means shall demonstrate that the container and its openings do not rupture in such collisions.

(iv) Each LNG fuel supply container shall have the following permanent identification markings:

(A) The numbers indicating the service pressure.

(B) The serial number.

(C) The manufacturer's name, initials, or trademark.

(D) The inspector's mark.

(E) The date tested.

(F) The words, "FOR LNG ONLY" in letters not less than 1/4 inch high and visible after installation. Decals or stencils are acceptable.

(v) An inlet and outlet except relief valves and gauging devices shall be marked to designate whether they communicate with vapor or liquid space.

(2) **Valves.** A valve shall be certified for LNG use by the manufacturer or certified for cryogenic service at temperatures down to and including 320° F. A valve shall be securely mounted and shall be shielded or installed in a protected location to prevent damage from vibration and unsecured objects.

(i) **Safety Relief Valve.** A container shall be equipped with one or more safety relief valves. The safety relief valve shall be installed in a line that communicates with the vapor space of the container. A safety relief valve shall be installed between two shut-off valves in a supply line to prevent a buildup of pressure between the valves in the off position. The discharge pressure of safety relief valves shall not exceed 125% of the service pressure of the container. A relief valve shall have sufficient capacity to meet the requirement of either the Bureau of Explosives for approval of safety relief valves or NFPA 59(A) Appendix A and be capable of preventing explosion of the normally charged cylinder when it is placed in a fire. A relief valve shall have the following permanent identification markings:

(A) The manufacturer's name, initials or trademark.

(B) The catalog number.

(C) The discharge pressure *(_____psi)*.

(D) The discharge capacity *(_____cfm air at 60°F and 14.7 psia)*.

(ii) **Shut-Off Valves.** One manually operated shut-off valve shall be secured directly to the tank vapor outlet with no intervening fitting other than the relief valve and shall be marked with the words, "VAPOR SHUT-OFF VALVE." Another manually operated shut-off valve and shall be secured directly to the tank liquid outlet and shall be marked with the words, "LIQUID SHUT-OFF VALVE." Decals or stencils are acceptable. Normally closed automatic shut-off valves that are held open by electrical current may be used in lieu of manual shut-off valves at either the tank vapor port or tank liquid port, or both. An automatic shut-off valve shall be wired so it shuts off when the ignition switch is in the off and accessory positions and when engine vacuum is not present.

(iii) **Control Valve.** A positive shut-off control valve shall be installed in the fuel supply lines as close to the containers as possible, automatically closing off and preventing the flow of fuel to the carburetor when the ignition switch is off or in the accessory position.

(3) **Gauges.** Gauges used in LNG systems shall be designed and installed as follows:

(i) A gauging device shall be designed for the most severe pressure and temperature conditions to which the devices may be subjected with a pressure safety factor of not less than four.

(ii) The gauges shall be securely mounted and shall be shielded or installed in a protected location to prevent damage from vibration and unsecured objects.

(iii) A gauging device that requires bleeding of the product shall be bled to the outside of the vehicle compartment.

(4) **Pressure Reducing Regulators.** An LNG system shall be equipped with one- or two-stage pressure-reducing regulators. The regulators shall be installed so that their weight is not placed on or supported alone by the attaching tubing or flexible lines.

(5) **Vents.** A compartment in which an LNG container is installed shall be vented to the atmosphere unless all piping and connectors are exterior to the compartment. The vents shall be installed at the highest practicable point of the compartment and shall have an open area totalling not less than 3 square inches.

(e) Installation - The installation of liquefied petroleum gas, compressed natural gas or liquefied natural gas fuel systems on motor vehicles shall be in accordance with the following requirements:

(1) **Driver, passenger, and luggage compartments.** A fuel supply container on a bus may not be located in or above the passenger compartment, except that a fuel supply container for compressed natural gas may be located above the driver and passenger compartment(s).

A fuel supply container on a vehicle shall be installed and fitted so that no gas from fueling and gauging operations or from relief valves can be released inside the driver, passenger or luggage compartments.

(2) **Fuel Supply Containers** - A fuel supply container shall meet all appropriate requirements of the ASME code, the DOT regulations, and this chapter and shall be marked in accordance with subsections (b) - (d). A fuel supply container shall comply with the following requirements:

(i) Each container and container cradle shall be mounted in protected locations to minimize damage from collision.

(ii) To prevent damage from road hazards, slippage, loosening or rotation, each container or cradle shall be secured to the vehicle body, bed or frame by:

(A) Attaching bolts not less than 7/16 inch in diameter to at least four securement points and, where the bolts pierce body metal but not the frame, by reinforcing both sides of each securement point with metal plates at least 1/5 inch thick and 7 square inches in area.

(B) Using other means capable of withstanding in any direction a static force of eight times the weight of the fully loaded container.

(iii) Each container in a cradle shall be secured to its cradle by means capable of withstanding in any direction a static force of eight times the weight of the fully loaded container.

(iv) No portion of the container or container valves in communication with the liquid or vapor shall be located behind the rear frame crossmember of the vehicle.

(v) The weight of the container shall not in any way be supported by outlets, valves, manifold or other fuel connections.

(vi) No part of the container shall be field welded. Only saddle plates, brackets or other nonpressure parts that were provided and installed by the manufacturer of the container may be field welded.

(vii) No container shall be repaired until the contemplated repair has been authorized by a certified inspector. A DOT container shall be repaired under DOT regulations and control. The replacement of valves, fittings and accessories intended for the same purpose is not considered a repair.

(viii) A container located less than 8 inches from the engine or exhaust system shall be shielded against direct heat.

(ix) Where a container is installed above the driver or passenger compartment of a vehicle, the container, its piping, fittings and valves shall be protected from damage by:

(A) A guardrail or similar device which is designed to absorb the impact of a collision with a

stationary object when the vehicle is moving either forward or backward at 8 kilometers per hour (5 miles per hour). The guardrail, or similar device, shall be free of projections that could damage the container, its valves and fittings.

(B) A shield designed to absorb impacts that may occur during loading, unloading or use of the vehicle. The shield shall be free of projections that could damage the container, its valves and fittings.

(x) A part of a fuel container or its appurtenances may not project beyond the sides and ends or above the highest structural point of a vehicle.

(xi) The devices, bolts and nuts attaching a fuel container to the outside of a vehicle shall have a corrosion resistant coating.

(3) **Visibility of Required Markings.** Markings of set-to-discharge pressure for safety relief devices and working pressure of fuel supply containers required by subsections (b), (c), and (d) shall be visible either directly or by use of a mirror after installation. Remote filling inlets shall be visibly marked with the lowest working pressure of any fuel supply container in the system.

(4) **Discharge Lines and Outlets.** All safety devices that may discharge to the atmosphere shall be vented to the outside of the vehicle, and all discharge lines and outlets shall be installed as follows:

(i) Lines shall be constructed of metal other than aluminum and shall be of a size and so located and maintained as not to restrict the maximum gas flow of the safety device. Flexible metallic lines shall be used when necessary.

(ii) The discharge line of a container installed inside a compartment shall extend to the outside of the compartment.

(iii) Lines shall be located as far from the exhaust outlet as is practicable and shall direct escaping gas upward within 45 degrees of the vertical. Escaping gas shall not impinge upon fuel supply containers and shall not be directed into wheel wells, at other vehicles in traffic, or at engine air intake inlets.

(iv) The discharge line from the safety relief valve on all buses shall be directed upward and extended to the top of the roof.

(v) Outlets shall be protected by caps, covers or other means to keep water or dirt from collecting in the lines. Protective devices shall not restrict the flow of gas.

(vi) Each line and its connectors shall withstand the pressure caused by the discharge of vapor or liquid from a safety device in fully open position.

(vii) A CNG container may be vented to the outside of the vehicle with a flexible bag. The bag shall be constructed of material that is non–flammable or self-extinguishing. The bag and attachments shall be capable of withstanding an internal pressure produced by a flow rate of 300 cfm with a safety factor of not less than four. The bag shall be shielded or installed in a protected location to prevent damage from unsecured objects and abrasion.

(5) **Manifolds.** Manifolds connected to fuel containers shall be supported to minimize vibration and shall be installed in a protected location or shielded to prevent damage from unsecured objects.

(i) A manual shut-off valve shall be installed in the outlet of the manifold and marked with the words “MANUAL SHUT-OFF VALVE.” Decals or stencils are acceptable.

(ii) A normally closed automatic shut-off valve that is held open by electrical current may be used in lieu of a manual shut-off valve and shall be marked with the words, “AUTOMATIC SHUT-OFF VALVE.” The automatic shut-off valve shall be wired so it shuts off when the ignition switch is in the off or accessory positions and when engine vacuum is not present.

(6) **Pipes, Tubing, Hose and Fittings.** Pipes, tubing, hose and fittings shall meet the following requirements:

(i) Materials and assemblies shall be designed for the widest pressure and temperature ranges to which they may be subjected with a pressure safety factor of at least four.

(ii) Materials, including gasket and packing material, shall be compatible with the fuel used in the system and its service conditions. Aluminum pipe, tubing or fittings shall not be used between the container and first-stage regulator. Copper tubing, when used, shall be seamless and conform to

ASTM B88 types K or L.

(iii) A pipe thread sealant impervious to the action of the fuel used in the system shall be applied to all male pipe threads prior to assembly. Only tin-silver (95% tin, 5% silver) or silver braze alloy is permitted on sweat type joints of fittings.

(7) **Supply Lines.** Supply lines passing through a panel shall be protected by grommets or similar devices, which shall snugly fit both the supply lines and the holes in the panel. Supply lines shall have a minimum clearance of 8 inches from the engine exhaust system unless they are shielded from exhaust heat. Supply lines shall be supported at least every 24 inches and shall be prevented from sagging. Damaged lines shall be replaced, not repaired.

(8) **Automatic Fuel Supply Shut-Off.** An automatic fuel supply shut-off valve shall be installed in a protected location adjacent to the manual shut-off valve on all buses and shall be activated by engine vacuum or oil pressure.

(9) **Gaseous Fuel Cutoff.** Means shall be provided in the system to prevent the flow of gaseous fuel to the carburetor when the ignition is in the off or accessory position or from the carburetor when engine vacuum is not present.

(10) **Liquid Fuel Cutoff.** A dual fuel systems using liquid and gaseous fuel shall have an approved automatic shut-off valve installed in the liquid fuel line to the carburetor.

(11) **Bypass Relief Valve.** A bypass relief device shall be installed in the fuel pump or between the fuel pump and the automatic shut-off valve in the liquid fuel line to the carburetor on vehicles equipped with dual fuel systems for the use of gasoline and gaseous fuel. The relief device need not be installed on fuel pumps containing a bypass relief device as original equipment.

(12) **Engine Exhaust Outlet.** The engine exhaust system shall extend to the outer edge of the vehicle body or bed on passenger cars, station wagons, house cars, pickup trucks with campers, buses, and delivery vans.

(13) **Electrical Equipment.** Radio transmitters, radio receivers, electric motors or other electrical equipment except vehicle lamps and wiring shall not be mounted in a compartment with fuel supply containers unless one of the following conditions is met:

(i) All piping and all connectors and valves on the fuel supply containers are exterior to and sealed from the compartment containing electrical equipment.

(ii) All piping, connectors and valves within the compartment are contained in a vapor-tight enclosure and vented to the atmosphere exterior of the vehicle.

(iii) The electrical equipment is contained in a vapor-tight enclosure that is vented to the atmosphere exterior of the vehicle.

(14) **Road Clearance.** The fuel system including the fuel supply container shall be installed with as much road clearance as practicable but not less than the minimum road clearance of vehicle under maximum spring deflection. The clearance shall be measured to the bottom of the container or to the lowest fitting, support or attachment on the container or container housing, whichever is lower.

(15) **Vehicle Weight Distribution.** The total weight of the vehicle with the fuel containers filled to capacity may not do one or more of the following:

(i) Exceed the manufacturer's load rating for an axle, wheel or tire, or gross weight limitations.

(ii) Create another unsafe load distribution that would increase the risk of a hazardous operating condition, such as vehicle rollover.

(iii) Adversely affect the driving characteristics of the vehicle.

175.242. Inspection of Fuel System and Controls

Alternate Fuel Systems - LNG, CNG, LPG -include approved and marked supply containers and valves, gauges, vaporizers, regulators, vents, hoses, and manifolds. The components of the alternate fuel system shall be inspected. The vehicle shall be **REJECTED IF** the alternate fuel system does not comply with all applicable requirements of §175.241 (relating to compressed and liquefied gas fuel systems).