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Regulations for the
Design, Construction and Operation of

Automobile Tank Trucks and Tank Trailers

for the Transportation of

Liquefied Petroleum Gases

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National Fire Protection Association

Committee on Gases.

H. E. NEWELL, *Chairman*,
National Board of Fire Underwriters.

N. E. BERTL,
American Gas Association.

A. L. COBB,
Associated Factory Mutual Fire Insurance Companies.

W. K. ESTEP,
Middle Department Rating Association.

W. J. FAIRBAIRN,
Western Factory Insurance Association.

H. L. MINER,
Manufacturing Chemists' Association of the United States.

W. A. RADSPINNER,
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M. J. REED,
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H. F. REINHARD,
International Acetylene Association.

A. G. SMITH,
Conference of Special Risk Underwriters.

E. J. SMITH,
Underwriters' Laboratories.

H. S. SMITH,
Compressed Gas Manufacturers' Association.

H. EMERSON THOMAS,
American Petroleum Institute.

E. R. WEAVER,
National Bureau of Standards.

Note.

These regulations, prepared by the N.F.P.A. Committee on Gases, were adopted by the Association at the 1935 annual meeting following consideration over a period of several years.

REGULATIONS FOR THE DESIGN, CONSTRUCTION AND OPERATION OF AUTOMOBILE TANK TRUCKS AND TANK TRAILERS FOR THE TRANSPORTATION OF LIQUEFIED PETROLEUM GASES.

Foreword.

The rapid increase in the use of liquefied petroleum gases for domestic and industrial use has brought about a fire hazard problem incident to the transportation of various liquefied petroleum gases by pipe lines, tank cars, drums, cylinders, and by tank trucks and trailers. The movement of these commodities in tank cars, drums and cylinders by railroads is handled under the regulations of the Interstate Commerce Commission. The economics of distribution with particular reference to breaking down the bulk of pipe and tank car movements for final distribution to the ultimate user have called the motor truck more and more into the picture, particularly on short hauls where rail facilities are not available for tank car movements.

Existing regulations applicable to motor trucks for the handling and transportation of petroleum products such as gasoline, kerosene, naptha, fuel oil, etc., are not applicable to liquefied petroleum gases, hence there is a distinct need for suitable regulations to govern the design, construction, capacity and operation of liquefied petroleum gas tank trucks and trailers.

Reference is made to Bureau of Explosives Pamphlet No. 9 and supplements thereto, "Interstate Commerce Commission Regulations for the Transportation by Rail of Explosives and Other Dangerous Articles in Freight, Express, and Baggage Services, Including Specifications for Shipping Containers," and to Regulations for the Design, Installation and Construction of Containers and Pertinent Equipment for the Storage and Handling of Liquefied Petroleum Gases. It is intended that these tank truck and trailer regulations shall be consistent with, and supplementary to, the references above mentioned.

1. Application of Rules:

(a) The following regulations and specifications are intended to apply to permanently mounted or detachable truck and trailer tanks for the transportation of liquefied petroleum gases.

(b) When reference is made to gas in these regulations it shall refer to liquefied petroleum gases in either the liquid or gaseous state.

2. Truck Tank Classifications:

Truck tanks shall be classified as follows:

Class A—For gases with vapor pressure at 100° F. Not in excess of 80 pounds per square inch gauge.

Class B—For gases with vapor pressure at 100° F. greater than 80 pounds per square inch gauge, and not more than 125 pounds per square inch gauge.

Class C—For gases with vapor pressure at 100° F. greater than 125 pounds per square inch gauge, and not more than 200 pounds per square inch gauge.

Note: Class A containers are suitable for commercial butane having an approximate vapor pressure of 65 pounds per square inch gauge at 100° F.

Class B containers are suitable for 40 per cent propane, 60 per cent butane mixture having an approximate vapor pressure at 100° F. of 113 pounds per square inch gauge.

Class C containers are suitable for commercial propane having an approximate vapor pressure of 195 pounds per square inch gauge at 100° F.

3. Working Pressure of Truck Tanks:

The minimum working pressure for each class (see Section 2) shall be according to the following schedule:

For Class A containers—80 pounds per square inch gauge.
For Class B containers—125 pounds per square inch gauge.
For Class C containers—200 pounds per square inch gauge.

4. Requirements for Construction and Test of Truck Tanks:

Storage containers should be constructed in accordance with the Unfired Pressure Vessel Code of the American Society of Mechanical Engineers or the A.P.I.-A.S.M.E. "Rules for Design, Construction, Inspection and Repair of Unfired Pressure Vessels for Petroleum Liquids and Gases"; or in accordance with the rules of the state in which the vessels are installed, provided such rules are in substantial conformity with the rules of the A.S.M.E. or A.P.I.-A.S.M.E., provided, however, that vessels may be constructed of high tensile strength alloy steels or other suitable metal alloys with proper physical and chemical characteristics, provided that the fibre stress at working pressure and the carbon content of the metal do not exceed those permitted in the A.S.M.E. and/or A.P.I.-A.S.M.E. Code. Provided also that such vessels are tested as prescribed by the A.S.M.E. code, or A.P.I.-A.S.M.E. regulations, and provided further that such vessels must be inspected and approved by a recognized boiler insurance company.

NOTE: The latest edition of the Unfired Pressure Vessel Code of the A.S.M.E. was issued in 1932. However, changes are now proposed by the Boiler Code Committee covering the use of special steels.

As a result, it is expected that the next edition of the Unfired Pressure Vessel Code of the A.S.M.E. will make suitable provision for the use of special steels, the use of which appear to be essential in order that motor transport vehicles shall not exceed the allowable weight limits prescribed by state laws.

5. Marking of Truck Tanks:

Truck and trailer tank shall be permanently marked to indicate the maximum allowable weight capacity at 60° F. of the liquefied petroleum gas for which the tank is designed. Each tank shall also be permanently marked at a point in close proximity to the valve connection as follows: "Do not fill with liquefied gas having a vapor pressure over .... lbs. per square inch at 100° F."

6. Filling Pipes and Discharge Pipes:

(a) The discharge outlet shall be provided with a suitable automatic excess flow valve or in lieu thereof the discharge outlet may be fitted with a quick closing internal valve, which, except during delivery operations, shall remain closed. The control mechanism for such valve may be provided with

a secondary control remote from the delivery connections and such control mechanism shall be provided with a fusible section (melting point 212° to 220° F.) which will cause the internal valve to close automatically in case of fire.

(b) The filling connection shall be provided with a suitable automatic excess flow valve to prevent any appreciable back flow in case the filling connection is broken, excepting that where the filling and discharge connect to a common opening in the tank shell and that opening is fitted with a quick-closing internal valve as specified in (a) the automatic excess flow valve shall not be required.

(c) Filling and discharge lines shall be provided with shut-off valves located as close to tank as possible.

(d) Gauge glasses are prohibited.

(e) Pressure gauge and other connections, excepting safety valves, shall be fitted with suitable automatic excess flow valves.

(f) Each truck and/or trailer shall be provided with a suitable pressure gauge.

7. Safety Devices:

(a) Every container shall be provided with one or more safety relief valves, of spring-loaded or equivalent type, arranged to afford free vent of vapor to the outer air, and with a discharge area sufficient to prevent building up of pressure in excess of 150 per cent of the tank working pressure.

(b) Safety relief valves shall be so arranged that tampering will be minimized, and, if pressure setting or adjustment is external, the relief valves shall be provided with suitable means for sealing the adjustment.

(c) Safety relief valves shall be set at not to exceed 135 per cent of the tank working pressure.

(d) Effective discharge area required for safety relief valves shall be determined by the method described in Appendix.

(e) No shut-off valve shall be installed between tanks and safety valves.

8. Piping:

(a) All piping shall be standard full-weight wrought iron, steel, copper or brass pipe or approved seamless drawn non-ferrous tubing or seamless drawn copper tubing having a wall thickness of not less than 0.049 inches for sizes up to the equivalent of ½-inch iron pipe size, and not less than 0.065 inches for sizes above ½-inch but not exceeding 1¼-inch equivalent iron pipe size.

(b) Joints on iron and steel piping should preferably be of welded construction. Where fittings are used they shall be capable of withstanding a safe working pressure of at least 125 pounds for pressures less than 100 pounds per square inch. Extra heavy fittings shall be used for pressures exceeding 100 pounds per square inch. Cast iron fittings shall be prohibited.

(c) Joints on copper tubing may be of the sweated solder joint type or of the approved metal union joint type.

(d) After installation, piping, valves and fittings shall be tested and proved tight at a pressure equal to the test pressure prescribed for the tank.

9. Protection against Collision:

Each tank truck and trailer shall be provided with properly attached steel bumpers or chassis extension at the rear which shall be so arranged as to adequately protect the tank, piping, valves and fittings in case of collision.

10. Smoking Prohibited:

Smoking by truck drivers or their helpers shall not be permitted while they are driving their trucks on the road, while they are making deliveries, filling truck tanks, or making any repairs to trucks.

11. Extinguishers Required:

Each truck and trailer shall be provided with at least one hand fire extinguisher of a type suitable for extinguishing oil fires.

12. Filling Densities:

The "filling density" is defined as the per cent ratio of the weight of the gas in a container to the weight of water the container will hold at 60° F. The filling density for truck tanks shall not exceed the ratios referred to in Section 16, page 12 of the Regulations for the Design, Installation and Construction of Containers and Pertinent Equipment for the Storage and Handling of Liquefied Petroleum Gases. Each container or gauging device shall be permanently marked in increments of 20° F., with the maximum levels to which it can be filled with liquid at temperatures between 20° F. and 130° F

13. Tank Truck Fuel Systems:

(a) FUEL TANKS: The main fuel tank shall not be placed over or adjacent to the engine. It shall be constructed and mounted in such a manner as to present no unusual hazard. Tanks shall be arranged to vent during filling operations and to permit draining without removal from the mounting.

(b) FUEL FEED SYSTEM: Fuel feed system shall be constructed and located as to minimize fire hazard. When necessary, a pressure release device shall be provided.

(c) FUEL LINE: The fuel line shall be of proper material, having all connections made with suitable fittings; it shall be equipped with shut-off valve, and shall be supported to prevent chafing and vibration.

(d) CARBURETOR: The carburetor shall be so constructed and installed that the fire hazards involved by its use shall be reduced to a minimum. Direct drainage of overflow gasoline shall be provided for.

(c) CONSTRUCTION AND INSTALLATION: All parts of the fuel feed system shall be constructed and installed in a workmanlike manner.

14. Electrical Equipment and Lighting:

Tank trucks, tank trailers, and tank semi-trailers shall not be equipped with any artificial light other than electricity. Lighting circuits shall have suitable over current protection (fuses or automatic circuit breakers); the wiring shall have sufficient carrying capacity and mechanical strength, and shall be suitably secured, insulated and protected against physical damage.

15. Exhaust Systems:

(a) The exhaust system, including muffler and exhaust line, shall have ample clearance from the fuel system and combustible materials, and shall not be exposed to accumulations of grease, oil or gasoline.

(b) The exhaust system, including all units, shall be constructed and installed in a workmanlike manner. Muffler cut-out shall not be used.

16. Transfer of Liquid:

(a) LOADING TRUCK AND TRAILER TANKS: Truck and trailer tanks must be loaded by weight or by suitable liquid level gauge device. If the weighing method is used the tanks may be detachable from the trucks or trailers, such tanks to be suspended by suitable means from a crane scale or mounted on a platform scale during the operation. If tanks are to be filled according to liquid level, each tank should have a thermometer well so that the internal liquid temperature can be easily determined and the amount of liquid in the tank corrected to a 60° F. basis. Liquid levels may be determined by slip tube gauging devices or any other suitable and safe means. If a fixed length dip tube or fixed maximum liquid level device is provided it shall be so arranged to function at the maximum permitted loading level in the tank as determined by the table in Section 12 hereof, but based on liquid temperature of not to exceed 40° F.

Truck tanks may be loaded by (1) pressure differential, (2) pumping, and (3) gravity.

(b) UNLOADING: Trucks and trailer tanks may be unloaded by (1) pressure differential, (2) pumping and (3) gravity.

Pumps of suitable design and properly protected may be mounted upon liquefied petroleum gas tank trucks and trailers and may be driven by the truck motor power take-off or proper mechanical means. The pumps shall be equipped with suitable pressure actuated by-pass valves permitting flow from pump discharge to pump suction when the pump discharge pressure rises above a predetermined point. Pump discharge (on wet hose systems) shall also be equipped with a spring-loaded safety valve of non-leaking type, set at a pressure not to exceed 35 per cent higher than the predetermined setting of the by-pass valve.

17. Metallic Connection:

Tank, chassis, axles and springs shall be metallically connected.

18. Drag Chains:

Tank trucks and trailers shall be equipped with drag chains long enough to reach the ground in order to drain off such static charges as may be generated by splashing of the contents or other causes. Spare links for drag chains should be carried in the tool box, and the driver held responsible for keeping the chain in working order.

19. Trailers and Semi-Trailers:

(a) All trailers shall be firmly and securely attached to the vehicle drawing them by means of suitable draw-bars, supplemented by safety chains.

(b) Every trailer or semi-trailer shall be equipped with a reliable system of brakes, and adequate provision shall be made for its efficient operation from the driver's seat of the vehicle drawing the trailer.