



• <b>Part Number:</b>	1910
• <b>Part Title:</b>	Occupational Safety and Health Standards
• <b>Subpart:</b>	H
• <b>Subpart Title:</b>	Hazardous Materials
• <b>Standard Number:</b>	<a href="#">1910.106</a>
• <b>Title:</b>	Flammable liquids.

## 1910.106(a)

"Definitions." As used in this section:

## 1910.106(a)(1)

Aerosol shall mean a material which is dispensed from its container as a mist, spray, or foam by a propellant under pressure.

## 1910.106(a)(2)

Atmospheric tank shall mean a storage tank which has been designed to operate at pressures from atmospheric through 0.5 p.s.i.g.

## 1910.106(a)(3)

Automotive service station shall mean that portion of property where flammable liquids used as motor fuels are stored and dispensed from fixed equipment into the fuel tanks of motor vehicles and shall include any facilities available for the sale and service of tires, batteries, and accessories, and for minor automotive maintenance work. Major automotive repairs, painting, body and fender work are excluded.

## 1910.106(a)(4)

Basement shall mean a story of a building or structure having one-half or more of its height below ground level and to which access for fire fighting purposes is unduly restricted.

## 1910.106(a)(5)

Boiling point shall mean the boiling point of a liquid at a pressure of 14.7 pounds per square inch absolute (p.s.i.a.) (760 mm.). Where an accurate boiling point is unavailable for the material in question, or for mixtures which do not have a constant boiling point, for purposes of this section the 10 percent point of a distillation performed in accordance with the Standard Method of Test for Distillation of Petroleum Products, ASTM D-86-62, which is incorporated by reference as specified in Sec. 1910.6, may be used as the boiling point of the liquid.

## 1910.106(a)(6)

Boilover shall mean the expulsion of crude oil (or certain other liquids) from a burning tank. The light fractions of the crude oil burnoff producing a heat wave in the residue, which on reaching a water strata may result in the expulsion of a portion of the contents of the tank in the form of froth.

## 1910.106(a)(7)

Bulk plant shall mean that portion of a property where flammable liquids are received by tank vessel, pipelines, tank car, or tank vehicle, and are stored or blended in bulk for the purpose of distributing such liquids by tank vessel, pipeline, tank car, tank vehicle, or container.

## 1910.106(a)(8)

Chemical plant shall mean a large integrated plant or that portion of such a plant other than a refinery or distillery where flammable liquids are produced by chemical reactions or used in chemical reactions.

## 1910.106(a)(9)

Closed container shall mean a container as herein defined, so sealed by means of a lid or other device that neither liquid nor vapor will escape from it at ordinary temperatures.

## 1910.106(a)(10)

Crude petroleum shall mean hydrocarbon mixtures that have a flash point below 150 deg. F. and which have not been processed in a refinery.

## 1910.106(a)(11)

Distillery shall mean a plant or that portion of a plant where flammable liquids produced by fermentation are concentrated, and where the concentrated products may also be mixed, stored, or packaged.

Each connection to a tank inside of buildings through which liquid can normally flow shall be provided with an internal or an external valve located as close as practical to the shell of the tank. Such valves, when external, and their connections to the tank shall be of steel except when the chemical characteristics of the liquid stored are incompatible with steel. When materials other than steel are necessary, they shall be suitable for the pressures, structural stresses, and temperatures involved, including fire exposures.

## 1910.106(b)(4)(iv)(c)

flammable liquid tanks located inside of buildings, except in one-story buildings designed and protected for flammable liquid storage, shall be provided with an automatic-closing heat-actuated valve on each withdrawal connection below the liquid level, except for connections used for emergency disposal, to prevent continued flow in the event of fire in the vicinity of the tank. This function may be incorporated in the valve required in (b) of this subdivision, and if a separate valve, shall be located adjacent to the valve required in (b) of this subdivision.

## 1910.106(b)(4)(iv)(d)

Openings for manual gaging, if independent of the fill pipe (see (f) of this subdivision), shall be provided with a vaportight cap or cover. Each such opening shall be protected against liquid overflow and possible vapor release by means of a spring loaded check valve or other approved device.

[1910.106\(b\)\(4\)\(iv\)\(e\)](#)

For Category 2 flammable liquids and Category 3 flammable liquids with a flashpoint below 100 °F (37.8 °C), other than crude oils, gasoline, and asphalts, the fill pipe shall be so designed and installed as to minimize the possibility of generating static electricity by terminating within 6 inches of the bottom of the tank.

## 1910.106(b)(4)(iv)(f)

The fill pipe inside of the tank shall be installed to avoid excessive vibration of the pipe.

## 1910.106(b)(4)(iv)(g)

The inlet of the fill pipe shall be located outside of buildings at a location free from any source of ignition and not less than 5 feet away from any building opening. The inlet of the fill pipe shall be closed and liquidtight when not in use. The fill connection shall be properly identified.

## 1910.106(b)(4)(iv)(h)

Tanks inside buildings shall be equipped with a device, or other means shall be provided, to prevent overflow into the building.

## 1910.106(b)(5)

"Supports, foundations, and anchorage for all tank locations" -

## 1910.106(b)(5)(i)

"General." Tank supports shall be installed on firm foundations. Tank supports shall be of concrete, masonry, or protected steel. Single wood timber supports (not cribbing) laid horizontally may be used for outside aboveground tanks if not more than 12 inches high at their lowest point.

[1910.106\(b\)\(5\)\(ii\)](#)

"Fire resistance." Steel supports or exposed piling shall be protected by materials having a fire resistance rating of not less than 2 hours, except that steel saddles need not be protected if less than 12 inches high at their lowest point. Water spray protection or its equivalent may be used in lieu of fire-resistive materials to protect supports.

## 1910.106(b)(5)(iii)

"Spheres." The design of the supporting structure for tanks such as spheres shall receive special engineering consideration.

## 1910.106(b)(5)(iv)

"Load distribution." Every tank shall be so supported as to prevent the excessive concentration of loads on the supporting portion of the shell.

## 1910.106(b)(5)(v)

"Foundations." Tanks shall rest on the ground or on foundations made of concrete, masonry, piling, or steel. Tank foundations shall be designed to minimize the possibility of uneven settling of the tank and to minimize corrosion in any part of the tank resting on the foundation.

## 1910.106(b)(5)(vi)

"Flood areas." Where a tank is located in an area that may be subjected to flooding, the applicable precautions outlined in this subdivision shall be observed.

## 1910.106(b)(5)(vi)(a)

No aboveground vertical storage tank containing a flammable liquid shall be located so that the allowable liquid level within the tank is below the established maximum flood stage, unless the tank is provided with a guiding structure such as described in (m), (n), and (o) of this subdivision.

## 1910.106(b)(5)(vi)(b)

Independent water supply facilities shall be provided at locations where there is no ample and dependable public water supply available for loading partially empty tanks with water.

## 1910.106(b)(5)(vi)(c)

In addition to the preceding requirements, each tank so located that more than 70 percent, but less than 100 percent, of

its allowable liquid storage capacity will be submerged at the established maximum flood stage, shall be safeguarded by one of the following methods: Tank shall be raised, or its height shall be increased, until its top extends above the maximum flood stage a distance equivalent to 30 percent or more of its allowable liquid storage capacity: "Provided, however," That the submerged part of the tank shall not exceed two and one-half times the diameter. Or, as an alternative to the foregoing, adequate noncombustible structural guides, designed to permit the tank to float vertically without loss of product, shall be provided.

## 1910.106(b)(5)(vi)(d)

Each horizontal tank so located that more than 70 percent of its storage capacity will be submerged at the established flood stage, shall be anchored, attached to a foundation of concrete or of steel and concrete, of sufficient weight to provide adequate load for the tank when filled with flammable liquid and submerged by flood waters to the established flood stage, or adequately secured by other means.

## 1910.106(b)(5)(vi)(e)

[Reserved]

## 1910.106(b)(5)(vi)(f)

At locations where there is no ample and dependable water supply, or where filling of underground tanks with liquids is impracticable because of the character of their contents, their use, or for other reasons, each tank shall be safeguarded against movement when empty and submerged by high ground water or flood waters by anchoring, weighting with concrete or other approved solid loading material, or securing by other means. Each such tank shall be so constructed and installed that it will safely resist external pressures due to high ground water or flood waters.

## 1910.106(b)(5)(vi)(g)

At locations where there is an ample and dependable water supply available, underground tanks containing flammable liquids, so installed that more than 70 percent of their storage capacity will be submerged at the maximum flood stage, shall be so anchored, weighted, or secured by other means, as to prevent movement of such tanks when filled with flammable liquids, and submerged by flood waters to the established flood stage.

## 1910.106(b)(5)(vi)(h)

Pipe connections below the allowable liquid level in a tank shall be provided with valves or cocks located as closely as practicable to the tank shell. Such valves and their connections to tanks shall be of steel or other material suitable for use with the liquid being stored. Cast iron shall not be permitted.

## 1910.106(b)(5)(vi)(i)

At locations where an independent water supply is required, it shall be entirely independent of public power and water supply. Independent source of water shall be available when flood waters reach a level not less than 10 feet below the bottom of the lowest tank on a property.

## 1910.106(b)(5)(vi)(j)

The self-contained power and pumping unit shall be so located or so designed that pumping into tanks may be carried on continuously throughout the rise in flood waters from a level 10 feet below the lowest tank to the level of the potential flood stage.

## 1910.106(b)(5)(vi)(k)

Capacity of the pumping unit shall be such that the rate of rise of water in all tanks shall be equivalent to the established potential average rate of rise of flood waters at any stage.

## 1910.106(b)(5)(vi)(l)

Each independent pumping unit shall be tested periodically to insure that it is in satisfactory operating condition.

## 1910.106(b)(5)(vi)(m)

Structural guides for holding floating tanks above their foundations shall be so designed that there will be no resistance to the free rise of a tank, and shall be constructed of noncombustible material.

## 1910.106(b)(5)(vi)(n)

The strength of the structure shall be adequate to resist lateral movement of a tank subject to a horizontal force in any direction equivalent to not less than 25 pounds per square foot acting on the projected vertical cross-sectional area of the tank.

## 1910.106(b)(5)(vi)(o)

Where tanks are situated on exposed points or bends in a shoreline where swift currents in flood waters will be present, the structures shall be designed to withstand a unit force of not less than 50 pounds per square foot.

## 1910.106(b)(5)(vi)(p)

The filling of a tank to be protected by water loading shall be started as soon as flood waters reach a dangerous flood stage. The rate of filling shall be at least equal to the rate of rise of the floodwaters (or the established average potential rate of rise).

## 1910.106(b)(5)(vi)(q)

Sufficient fuel to operate the water pumps shall be available at all times to insure adequate power to fill all tankage with water.

## 1910.106(b)(5)(vi)(r)

All valves on connecting pipelines shall be closed and locked in closed position when water loading has been completed.

## 1910.106(b)(5)(vi)(s)

Where structural guides are provided for the protection of floating tanks, all rigid connections between tanks and pipelines shall be disconnected and blanked off or blinded before the floodwaters reach the bottom of the tank, unless control valves and their connections to the tank are of a type designed to prevent breakage between the valve and the tank shell.

## 1910.106(b)(5)(vi)(t)

All valves attached to tanks other than those used in connection with water loading operations shall be closed and locked.

## 1910.106(b)(5)(vi)(u)

If a tank is equipped with a swing line, the swing pipe shall be raised to and secured at its highest position.

## 1910.106(b)(5)(vi)(v)

Inspections. The Assistant Secretary or his designated representative shall make periodic inspections of all plants where the storage of flammable liquids is such as to require compliance with the foregoing requirements, in order to assure the following:

## 1910.106(b)(5)(vi)(v)(1)

That all flammable liquid storage tanks are in compliance with these requirements and so maintained.

## 1910.106(b)(5)(vi)(v)(2)

That detailed printed instructions of what to do in flood emergencies are properly posted.

## 1910.106(b)(5)(vi)(v)(3)

That station operators and other employees depended upon to carry out such instructions are thoroughly informed as to the location and operation of such valves and other equipment necessary to effect these requirements.

## 1910.106(b)(5)(vii)

"Earthquake areas." In areas subject to earthquakes, the tank supports and connections shall be designed to resist damage as a result of such shocks.

[1910.106\(b\)\(6\)](#)

"Sources of ignition." In locations where flammable vapors may be present, precautions shall be taken to prevent ignition by eliminating or controlling sources of ignition. Sources of ignition may include open flames, lightning, smoking, cutting and welding, hot surfaces, frictional heat, sparks (static, electrical, and mechanical), spontaneous ignition, chemical and physical-chemical reactions, and radiant heat.

[1910.106\(b\)\(7\)](#)

"Testing" -

## 1910.106(b)(7)(i)

"General." All tanks, whether shop built or field erected, shall be strength tested before they are placed in service in accordance with the applicable paragraphs of the code under which they were built. The American Society of Mechanical Engineers (ASME) code stamp, American Petroleum Institute (API) monogram, or the label of the Underwriters' Laboratories, Inc., on a tank shall be evidence of compliance with this strength test. Tanks not marked in accordance with the above codes shall be strength tested before they are placed in service in accordance with good engineering principles and reference shall be made to the sections on testing in the codes listed in subparagraphs (1) (iii) (a), (iv) (b), or (v) (b) of this paragraph.

## 1910.106(b)(7)(ii)

"Strength." When the vertical length of the fill and vent pipes is such that when filled with liquid the static head imposed upon the bottom of the tank exceeds 10 pounds per square inch, the tank and related piping shall be tested hydrostatically to a pressure equal to the static head thus imposed.

## 1910.106(b)(7)(iii)

"Tightness." In addition to the strength test called for in subdivisions (i) and (ii) of this subparagraph, all tanks and connections shall be tested for tightness. Except for underground tanks, this tightness test shall be made at operating pressure with air, inert gas, or water prior to placing the tank in service. In the case of field-erected tanks the strength test may be considered to be the test for tank tightness. Underground tanks and piping, before being covered, enclosed, or placed in use, shall be tested for tightness hydrostatically, or with air pressure at not less than 3 pounds per square inch and not more than 5 pounds per square inch.

## 1910.106(b)(7)(iv)

"Repairs." All leaks or deformations shall be corrected in an acceptable manner before the tank is placed in service. Mechanical caulking is not permitted for correcting leaks in welded tanks except pinhole leaks in the roof.

## 1910.106(b)(7)(v)

"Derated operations." Tanks to be operated at pressures below their design pressure may be tested by the applicable provisions of subdivision (i) or (ii) of this subparagraph, based upon the pressure developed under full emergency venting of the tank.

## 1910.106(c)

"Piping, valves, and fittings" -

## 1910.106(c)(1)

"General" -