

**SUBDIVISION B  
TANK STORAGE**

**Ind 8.20 Storage tanks; design and construction.** (1) **GENERAL.** The tanks shall be built of steel or concrete unless character of liquid stored requires other materials. Tanks built of materials other than steel shall be designed to specifications embodying safety factors equivalent to those herein specified for steel tanks. Steel tanks shall be built in accordance with the provisions of this section, Ind 8.20.

(2) **ABOVEGROUND VERTICAL TANKS, FIELD ERECTED.** Vertical tanks erected in the field shall be built in accordance with American Petroleum Institute Standard No. 12A, 7th Edition, reissued September 1951, "Specifications for Oil Storage Tanks With Riveted Shells", or, American Petroleum Institute Standard No. 12C, 13th Edition, September, 1955, "Specifications for Welded Oil Storage Tanks", and supplemental, October, 1956, or, American Petroleum Institute Standard No. 620, 1st Edition, February 1956, "Recommended Rules for the Design and Construction of Large Welded Low Pressure Storage Tanks."

(These references are available in the offices of the industrial commission, the secretary of state, and the revisor of statutes.)

(3) **ABOVEGROUND TANKS, SHOP BUILT.** (a) *Small vertical tanks.* Vertical tanks not over 1100 gallons capacity shall meet the following:

Capacity Gallons	Minimum Thickness of Steel Mfrs. Std. Gauge No.
1- 60	18
61- 350	16
351- 560	14
561-1100	12

(b) *Large vertical tanks.* Vertical tanks over 1100 gallons capacity shall meet the following:

1. For tanks up to 25 feet in height, the shell shall not be less than  $\frac{3}{8}$  inch thick. For tanks from 25 to 30 feet high, the bottom ring shall be not less than  $\frac{1}{4}$  inch thick and the remainder of the shell not less than  $\frac{3}{8}$  inch thick. For tanks between 30 and 35 feet high, the first two rings shall be not less than  $\frac{1}{4}$  inch thick and the remainder of the shell not less than  $\frac{3}{8}$  inch thick. All  $\frac{1}{4}$  inch thick rings shall be not less than 5 feet wide.

2. The tops of tanks shall be either dished or cone-shaped and of not less than No. 10 Manufacturers Standard Gauge Steel.

3. **Tanks shall be welded, or riveted and caulked, or otherwise made tight in a workmanlike manner.** The roof of the tank shall be securely fastened to the top ring of the shell with a joint having the same tightness as the joints between rings. The joint between roof and shell

shall be weaker than any other joints in the shell of the tank. Joints in the roof shall be welded or riveted or made tight by other process satisfactory to the commission. Roofs of tanks shall have no unprotected openings.

(c) *Horizontal tanks.* Horizontal tanks shall be constructed in accordance with accepted engineering practice and shall meet the following minimum requirements: Joints shall be riveted and caulked, riveted and welded, or welded. Tank heads over 6 feet in diameter shall be dished, stayed, braced or reinforced.

(d) *Small horizontal tanks.* Horizontal tanks not over 1100 gallons capacity shall meet the following:

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Capacity Gallons	Minimum Thickness of Steel
	Mfrs. Std. Gauge No.
1- 60	18
61- 275	14
276- 550	12
551-1100	10

*Handwritten notes:* 61 to 275, 276 to 550, 551-1100

(e) *Large horizontal tanks.* Horizontal tanks over 1100 gallons capacity having a diameter of not over 6 feet shall be  $\frac{3}{8}$  inch or greater nominal thickness. Tanks having a diameter of over 6 feet and not more than 12 feet shall be  $\frac{1}{4}$  inch or greater nominal thickness.

(4) UNDERGROUND TANKS OR ENCLOSED TANKS INSIDE OF BUILDINGS.

(a) Tanks shall be designed and constructed to withstand safely the service to which subjected. Tanks shall be of a minimum gauge in accordance with the following:

Capacity Gallons	Minimum Nominal Thickness	
	Mfrs. Std. Gauge No.	Pounds Per Square Foot
1- 285	14	3.125
286- 560	12	4.375
561- 1,100	10	5.625
1,101- 4,000	7	7.50
4,001-12,000	$\frac{1}{4}$ in.	10.00
12,001-20,000	$\frac{3}{16}$ in.	12.50
20,001-30,000	$\frac{3}{8}$ in.	15.00

(b) If adequate internal bracing is provided, tanks of 12,001 to 30,000 gallons capacity may be built of  $\frac{1}{4}$  inch plate.

*Note:* Underground tanks smaller than 2,500 gallons capacity, above-ground tanks and inside storage tanks (labeled for oil burners by Underwriters' Laboratories, Inc., or Underwriters' Laboratories of Canada) may be considered as meeting the requirements of this section.

*Note:* Tanks labeled "Underground Storage Tanks" by Underwriters' Laboratories, Inc., or Underwriters' Laboratories of Canada may be considered as meeting the requirements of section Ind 8.20 (4).

(5) UNENCLOSED TANKS INSIDE OF BUILDINGS. Tanks of this category used for Class III flammable liquids shall not exceed 275 gallons individual capacity. They may be cylindrical or of a special form which has been demonstrated by appropriate test to possess strength and tightness of an acceptable degree. Tanks shall be of a minimum gauge in accordance with the following:

Capacity Gallons	Minimum Nominal Thickness of Material	
	Mfrs. Std. Gauge No.	Pounds Per Square Foot
1-180.....	16	2.50
181-275.....	14	3.125

Note: Tanks in this category labeled "Inside Storage Tanks for Oil Burners" by Underwriters' Laboratories, Inc., or Underwriters' Laboratories of Canada may be considered as meeting the requirements of section Ind 8.20 (5).

(6) CONCRETE TANKS. Concrete tanks shall be built in accordance with sound engineering practice. Unlined concrete tanks shall only be used for storage of liquids having a gravity of 40 degrees (American Petroleum Institute scale) or heavier. Concrete tanks with special linings may be used for other services provided the design is approved by the commission.

History: Cr. Register, May, 1959, No. 41, eff. 6-1-59.

**Ind 8.21 Installation of outside aboveground tanks. (1) LOCATION WITH RESPECT TO PROPERTY LINES.**

(a) The minimum distance from any part of an aboveground tank for the storage of flammable liquids other than crude petroleum to the nearest line of adjoining property which may be built upon shall be not less than the distance indicated in Table 1.

**TABLE 1**

Capacity of Tank (Gallons)	Class of Flammable Liquid	Minimum Distance (Feet)
0- 275.....	III	0
276- 750.....	III	5
0- 750.....	I and II	10
751-12,000.....	III	10
751-12,000.....	I and II	15
12,001-24,000.....	I, II and III	15
24,001-30,000.....	I, II and III	20
30,001-50,000.....	I, II and III	25

1. BUILDINGS. The distance between aboveground tanks and buildings of same ownership shall be one-half the distance shown in Table 1.

(b) All gas-tight tanks including conservation type tanks with capacities in excess of 50,000 gallons and all tanks for the storage of crude petroleum shall be located in accordance with Table 2.

TABLE 2

Products Stored	Tank Protection	Distance from Line of Adjoining Property Which May Be Built Upon Shall Be Not Less Than
Refined Petroleum Products or Other Flammable Liquids not Subject to Boilover	(1) An approved attached extinguishing system, or (2) An approved floating roof	Greatest dimension of diameter or height of tank, except that such distance need not exceed 120 feet.
	Not equipped with either of the above	1½ times the greatest dimension, diameter or height of tank, except that such distance need not exceed 175 feet.
Crude Petroleum	(1) An approved attached extinguishing system, or (2) An approved floating roof	2 times the greatest dimension, diameter or height of tank, except that such distance shall not be less than 20 feet and need not exceed 175 feet.
	Not equipped with either of the above	3 times the greatest dimension, diameter or height of tank, except that such distance shall not be less than 20 feet and need not exceed 350 feet.

*Note:* The term "approved attached extinguishing system", as used, may be interpreted to apply to (1) a fixed foam or other extinguishing system embodying a supply of the extinguishing medium, or (2) a system employing a pipe line for conveying foam from a point outside the dike to the tank, or (3) portable over-shot devices for applying foam over the rim of the tank, plus, in case (2) or (3), both (a) approved foam generating equipment of sufficient capacity available either on the property, by response of a municipal or other public fire department or otherwise readily available and (b) on hand or otherwise readily available a sufficient supply of foam-producing materials as specified in National Fire Protection Association Standard for Foam Extinguishing Systems, Pamphlet No. 11. Where reliance is placed on a pipe line for conveying foam, a condition of approval shall be that the pipe line be so installed and attached as to be an integral part of the tank. Where reliance is placed on a portable over-shot device, a condition of approval shall be a demonstration of the practicability of its use.

(The above reference is available in the offices of the industrial commission, the secretary of state, and the revisor of statutes.)

(c) Where 2 tank locations of diverse ownership have a common boundary, the commission may, with the written consent of the owners of the 2 properties, substitute distances provided in section Ind 8.21 (2) for the minimum distances set forth in tables 1 and 2 of this section.

(d) In particular installations the provisions under section Ind 8.21 (1) of this section may be altered at the discretion of the commission after consideration of the special features such as topographical conditions, nature of occupancy and proximity to buildings on adjoining property and height and character of construction of such buildings, capacity and construction of proposed tanks and character of liquids to be stored, degree of private fire protection to be provided, and adequacy of facilities of the fire department to cope with flammable liquid fires.

(2) SPACING BETWEEN TANKS. (a) The location of a tank for the storage of any flammable liquid with respect to any such other tank

shall be such that the distance between them shall be not less than 3 feet.

(b) For tanks above 50,000 gallons individual capacity storing any flammable liquid, except crude petroleum in producing areas, the distance shall be not less than  $\frac{1}{2}$  the diameter of the smaller tank.

(c) The minimum separation between a liquefied petroleum gas container and a flammable liquid tank shall be 20 feet. Suitable means shall be taken to prevent the accumulation of flammable liquids under adjacent liquefied petroleum gas containers, such as by diking, diversion curbs or grading. When flammable liquid tanks are diked, the liquefied petroleum gas containers shall be outside the diked area and at least 10 feet away from the center of the dike. The foregoing provisions shall not apply when liquefied petroleum gas containers of 125 gallons or less capacity are installed adjacent to Class III flammable liquid tanks of 275 gallons or less capacity.

(3) **VENTS.** (a) *Normal breathing.* Tanks shall have normal venting capacity sufficient to permit the filling and emptying of such tanks, plus their breathing due to temperature changes, without distortion of tank shell or roof. Tanks storing Class I and Class II flammable liquids shall be equipped where practical with either venting devices which shall be normally closed when not under pressure or vacuum, or with approved flame arresters, except that tanks under 2,500 gallons capacity for Class I liquids and tanks under 3,000 barrels capacity for crude oil in producing areas may have open vents.

*Note:* Condensation, corrosiveness and crystallization of certain products and freezing in winter may make conservation vents and particularly flame arresters impractical for those products and for use in very cold weather.

Where the liquids stored have flash points in the range of normal summer temperatures, the vapor space above the liquid in the tank will normally contain vapors in the explosive range. On such tanks flame arresters have their most important application.

(b) *Emergency relief.* Every aboveground storage tank shall have some form of construction or device that will relieve excessive internal pressure, caused by exposure fires, that might cause the rupture of the tank shell or bottom. In a vertical tank, this construction may take the form of a weakened seam in the roof. The joint between the roof and the shell of a tank 36 feet or more in diameter, if designed and built as an atmospheric storage tank in accordance with section Ind 8.20 (2) of this code, shall be deemed to be a weakened seam for this purpose. Where entire dependence for such additional relief is placed upon some device other than a weak roof seam or joint, the total venting capacity of both normal and emergency vents shall be enough to prevent rupture of the shell or bottom of the tank if vertical, or of the shell or heads if horizontal. Such device may be a self-closing man-hole cover, or one using long bolts that permit the cover to lift under internal pressure, or an additional or larger relief valve or valves. For the purpose of computing the number and area of such vents and emergency relief devices, refer to table 3.

(c) *Vent outlet and drains.* The outlet of all vents and vent drains on tanks designed for 0.5 pounds per square inch or greater pressure shall be arranged to discharge in such a way as to prevent localized overheating of any part of the tank, in the event vapors from such vents are ignited.

TABLE 3

(Venting equipment installed for normal operation may serve as emergency relief provided it has the requisite capacity under the pressure limitation fixed by this table.)

Required Total Pressure Relief Capacity of Vents						
Capacity of Tank		Minimum Total Pressure Relief Capacity	Approximate Diameter in Inches of Free Circular Opening for Various Pressures			
Gallons	42-Gallon Barrels	(Cu. Ft. of Free Air Per Hour)	3 in. of Water	1 PSI	2½ PSI	5 PSI
1,000		25,300	4	2½	2	1½
or less	23.8					
4,000	95.2	69,500	6¾	3¾	3	2½
18,000	428	139,000	9½	5½	4½	3¾
25,000	595	166,000	10½	6	4¾	4
56,000	1,330	253,000	12¾	7¼	5¾	5
100,000	2,380	363,000	15¼	8¾	7	6
155,000	3,690	458,000	17¼	9¾	7¾	6½
222,000	5,290	522,000	18¾	10½	8¾	7
475,000	11,300	624,000	20	11¼	9	7¾
735,000	17,500	648,000	20	11½	9½	7¾
Unlimited		648,000	20	11½	9½	7¾

Note: See American Petroleum Institute Guide for Tank Venting—R.P. 2000, October 1952, for additional venting information.

(This reference is available in the offices of the industrial commission, the secretary of state, and the revisor of statutes.)

(4) **DIKES AND WALLS.** (a) *Crude petroleum.* Tanks or groups of tanks containing crude petroleum shall be diked or other suitable means taken to prevent discharge of liquid from endangering adjoining property or reaching waterways. Where a dike enclosure is required under this section, it shall have a capacity not less than that of the tank or tanks served by the enclosure.

Note: Certain products, not petroleum products, handled in special process and chemical plants may have boilover characteristics somewhat like those of crude petroleum.

(b) *Flammable liquids other than crude petroleum.* Individual tanks or groups of tanks, where deemed necessary by the commission on account of proximity to waterways, character of topography, or nearness to structures of high value, or to places of habitation or assembly, shall be diked or the yard shall be provided with a curb or other suitable means taken to prevent the spread of liquid onto other property or waterways. Where a diked enclosure is required under this section, it shall have a net capacity not less than that of the largest tank within the diked area.

(c) *Dike construction.* Except where protection is provided by natural topography, dikes or retaining walls required under the foregoing sections Ind 8.21 (4) (a) and (b) shall be of earth, steel, concrete or solid masonry designed to be liquid tight and to withstand a full hydraulic head, and so constructed as to provide the required protection. Earthen dikes 3 feet or more in height shall have a flat section at the top not less than 2 feet wide. The slope shall be consistent with the angle of repose of the material of which the dikes are constructed. Dikes shall be restricted to average height of 6 feet above the exterior grade. Unless means are available for extinguishing a fire in any tank containing crude petroleum, dikes and walls enclosing such tanks shall

be provided at the top with a flareback section designed to turn back a boilover wave, provided however, that a flareback section shall not be required for dikes and walls enclosing approved floating roof tanks.

(d) *Drainage.* Where provision is made for draining rain water from diked areas, such drains shall normally be kept closed and shall be so designed that when in use they will not permit flammable liquids to enter natural water courses, public sewers, or public drains, if their presence would constitute a hazard. Where pumps control drainage from the diked area, they shall not be self-starting.

(e) *Housekeeping.* No loose combustible material, empty or full drums or barrels, shall be permitted within the diked area.

(5) FOUNDATIONS AND SUPPORTS. Tanks shall rest directly on the ground or on the foundations or supports or concrete, masonry, piling or steel. Exposed piling or steel supports shall be protected by fire resistive materials to provide a fire resistance rating of not less than 2 hours.

(6) ANCHORAGE. Where a tank is located in an area that may be subjected to flooding, tanks shall be effectively anchored.

(7) STAIRS, PLATFORMS, AND WALKWAYS. Stairs, platforms, and walkways shall be of steel, concrete, or wood.

(8) TANK VALVES. (a) *External valves.* Each connection to an aboveground tank storing flammable liquids, located below normal liquid level, shall be provided with an external control valve located as close as practicable to the shell of the tank. Except for flammable liquids whose chemical characteristics are incompatible with steel, such valves and their tank connections installed after effective date of these regulations shall be of steel.

(b) *Emergency internal valves.* In addition to any normal valves, there must be an extra valve at each pipe line connection to any tank below normal liquid level, which valve is effective inside the tank shell and is operated both manually and by an effective heat actuated device which, in case of fire, will automatically close the valve to prevent the flow of liquid from the tank even though the pipe lines are broken from the tank. These extra valves are not required in crude oil tanks in oil fields, on tanks at refineries, or on tanks at terminals which are equipped with a swing line or where facilities are provided to transfer the contents of the tank to another tank in case of fire.

(9) TANKS LABELED. Aboveground tanks for Class I and II liquids, other than at refineries, or marine or pipeline terminals shall have painted conspicuously thereon in letters at least 5 inches high, the wording "FLAMMABLE—KEEP FIRE AWAY".

**History:** Cr. Register, May, 1959, No. 41, eff. 6-1-59; cr. (1) (a) 1., Register, December, 1960, No. 60, eff. 1-1-61.

**Ind 8.22 Installation of underground tanks.** (1) LOCATION. Underground tanks or tanks under buildings shall be so located with respect to existing building foundations and supports that the loads carried by the latter cannot be transferred to the tank. The distance from any part of a tank storing Class I or II liquids to the nearest wall of any basement, pit, or cellar shall be not less than one foot and from any property line that may be built upon, not less than 3 feet. The distance from any part of a tank storing Class III liquids to the

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nearest wall of any basement, pit, cellar, or property line shall be not less than one foot.

(2) **DEPTH AND COVER.** Excavation for underground storage tanks shall be made with due care to avoid undermining of foundations of existing structures. Underground tanks shall be set on firm foundation and surrounded with soft earth or sand well tamped in place. Tanks shall be covered with a minimum of 2 feet of earth, or shall be covered with not less than one foot of earth, on top of which shall be placed a slab of reinforced concrete not less than 4 inches thick. When underground tanks are or are likely to be subjected to traffic, they shall be protected against damage from vehicles passing over them by at least 3 feet of earth cover, or 18 inches of well tamped earth plus 6 inches of reinforced concrete or 8 inches of asphaltic concrete. When asphaltic or reinforced concrete paving is used as part of the protection it shall extend at least one foot horizontally beyond the outline of the tank in all directions. Where a tank cannot be entirely buried, it shall be covered with earth to a depth of at least 2 feet with a slope on all sides not steeper than  $1\frac{1}{2}$  feet horizontal to one foot vertical.

(3) **VENTS. LOCATION AND ARRANGEMENT.**

(a) *Class I or II.* Vent pipes from tanks storing Class I or Class II flammable liquids shall be so located that the discharge point is outside of buildings, higher than the fill pipe opening, and not less than 12 feet above the adjacent ground level. Vent pipes shall discharge only upward or horizontally (not downward) in order to disperse vapors. Vent pipes 2 inches or less in nominal inside diameter shall not be obstructed by devices that will reduce their capacity and thus cause excessive back pressure. Vent pipe outlets shall be so located that flammable vapors will not enter building openings, or be trapped under eaves or other obstructions.

(b) *Class III.* Vent pipes from tanks storing Class III flammable liquids shall terminate outside of building and higher than the fill pipe opening. Vent outlets shall be above normal snow level. They may be fitted with return bends, coarse screens or other devices to minimize ingress of foreign material.

(c) *Size of vents.* Each tank shall be vented through piping adequate in size to prevent blow-back of vapor or liquid at the fill opening while tank is being filled. Vent pipes shall be not less than  $1\frac{1}{4}$  inches nominal inside diameter.

(d) *Vent piping.* Vent pipes shall be so laid as to drain toward the tank without sags or traps in which liquid can collect. They shall be located so that they will not be subjected to physical damage above ground. Vent pipes from tanks storing the same class of flammable liquids may be connected into one outlet pipe. The outlet pipe shall at least be one pipe-size larger than the largest individual vent pipe connected thereto. In no case shall the point of connection between vent lines be lower than the top of any fill pipe opening. The lower end of a vent pipe shall enter the tank through the top and shall not extend into the tank more than one inch.

(4) **FILL AND DISCHARGE PIPING.** Filling and discharge lines for Class I and Class II liquids, and for Class III liquids where practicable, shall enter tanks only through the top and shall be graded toward the tank.



**Ind 8.51 Buildings.** (1) **GENERAL CONSTRUCTION.** Class I and Class II flammable liquids shall not be stored or handled within a building having a basement or pit into which flammable vapors may travel, unless such basement or pit is provided with ventilation designed to prevent the accumulation of flammable vapors therein.

(2) **EXITS.** Rooms storing flammable liquids or in which flammable liquids are handled by pumps shall have exit facilities arranged to prevent occupants being trapped in the event of fire.

(3) **HEATING.** Rooms in which Class I or Class II flammable liquids are stored or handled shall be heated only by means not constituting a source of ignition, such as steam or hot water. Rooms containing heating appliances involving sources of ignition shall be located and arranged to prevent entry of flammable vapors.

(4) **VENTILATION.** Ventilation shall be provided for all rooms, buildings, or enclosures in which Class I or Class II flammable liquids are pumped or dispensed. Design of ventilation systems shall take into account the relatively high specific gravity of the vapors. Ventilation may be provided by adequate openings in outside walls at floor level unobstructed except by louvers or coarse screens. Where natural ventilation is impracticable, mechanical ventilation shall be provided.

*Note:* National Fire Protection Association No. 91, Standards for the Installation of Blower and Exhaust Systems, provides information on the installation of mechanical exhaust systems.

(This reference is available in the offices of the industrial commission, the secretary of state, and the revisor of statutes.)

(5) **FILLING AND EMPTYING CONTAINERS.** Containers of Class I or Class II flammable liquids shall not be drawn from or filled within buildings unless provision is made to prevent the accumulation of flammable vapors in hazardous concentrations.

**History:** Cr. Register, May, 1959, No. 41, eff. 6-1-59.

**Ind 8.52 Loading and unloading facilities.** (1) **TRUCK LOADING RACKS.**

(a) *Location.* Truck loading racks installed after effective date of these regulations dispensing Class I or Class II flammable liquids shall where practicable be separated from tanks, warehouses, other plant buildings, and nearest line of property that may be built upon by a clear distance of not less than 25 feet, measured from the nearest position of any fill stem. A truck loading rack for Class I or II liquids shall not be erected nearer than 10 feet, measured as aforesaid from any of the aforementioned objects. Buildings for pumps or for shelter of loading personnel may be part of the loading rack.

(b) *Static protection.* The following types of truck loading racks shall be equipped with protection against static sparks during truck filling: Racks dispensing Class I or Class II flammable liquids into open domes of tank trucks which may contain flammable vapors from previous cargoes of Class I or Class II flammable liquids. Protection shall consist of a flexible metallic bond-wire permanently electrically connected to the fill stem or some part of the fill stem piping. The free end of such wire shall be provided with a clamp or similar device for convenient attachment to some metallic part of the cargo tank of the tank truck. The bond-wire connection shall be made prior to opening the dome covers. It shall be maintained in place during the entire

filling operation and the dome covers shall be securely closed before the bond-wire is disconnected from the cargo tank.

*Note:* Drag chains and straps formerly specified for the purpose of eliminating static charges have been shown to be ineffective and their elimination is recommended.

(2) TANK CAR RACKS. Class I and Class II flammable liquids shall not be discharged from or loaded into tank cars unless protection against stray currents has been provided and is used.

(a) Liquids having a flash point below 150° F. shall not be withdrawn from tank cars from bottom outlets, but shall be unloaded through dome (manhole) only.

1. **Exception.** Bottom outlet unloading of fuel oil will be permitted subject to the written approval of the industrial commission.

(b) The use of compressed air to discharge the contents of tank cars shall be prohibited, but this shall not be construed to prevent the use of an approved system employing an inert gas, such as carbon dioxide or nitrogen, as pressure generating medium for this purpose.

(c) Unloading from tank cars into tank trucks or any portable container is prohibited.

(d) 1. Before unloading operations are started and before any connection or contact is made with piping or other unloading equipment, the tank car or other transport shall be electrically bonded in an effective manner.

2. Permanent electrical connection of not less than No. 0 copper cable shall be made between the rails on which the tank cars stand and the piping system used in connection with handling of flammable liquids.

*Note:* This connection may be accomplished in one of two ways: The rails may be bonded by means of standard rail bonds, and connected to the permanent piping system with No. 0 electric cable connections at each end of the loading or unloading section; or a similar connection may be made between each rail on which cars stand and the permanent piping system.

(3) CONTAINER FILLING FACILITIES. Class I and Class II flammable liquids shall not be run into containers unless the nozzle and container are electrically interconnected. Where the metallic floorplate on which the container stands while filling is electrically connected to the fill stem or where the fill stem is bonded to the container during filling operations by means of a bond-wire, the provisions of this section shall be deemed to have been complied with.

**History:** Cr. Register, May, 1959, No. 41, eff. 6-1-59; cr. (2) (d), Register, December, 1960, No. 60, eff. 1-1-61.

**Ind 8.53 Electrical equipment.** All wiring and electrical equipment including motors and electrical switch gear for pumps handling flammable liquids, having a flash point below 100° F. and located within the possible path of vapor travel shall be designed and installed so as not to create an ignition hazard.

*Note:* The Wisconsin state electrical code provides information on the design and installation of electrical equipment for hazardous locations.

**History:** Cr. Register, May, 1959, No. 41, eff. 6-1-59.

**Ind 8.54 Sources of ignition.** Class I or Class II flammable liquids shall not be handled, drawn or dispensed where flammable vapors may reach a source of ignition. Smoking shall be prohibited except in designated localities. "NO SMOKING" signs shall be conspicuously posted where hazard from flammable liquid vapors is normally present.

**History:** Cr. Register, May, 1959, No. 41, eff. 6-1-59.

Register, December, 1960, No. 60  
Flammable Liquids

**Ind 8.55 Drainage and waste disposal.** Provisions shall be made to prevent flammable liquids which may be spilled at loading or unloading points from entering public sewers and drainage systems, or natural waterways. Connection to such sewers, drains, or waterways by which flammable liquids might enter shall be provided with separator boxes or other approved means whereby such entry is precluded. Crankcase drainings and flammable liquids shall not be dumped into sewers, but shall be stored in tanks or tight drums outside of any building until removed from the premises.

**History:** Cr. Register, May, 1959, No. 41, eff. 6-1-59.

**Ind 8.56 Fire control.** (1) One or more suitable first aid fire control devices, such as a smothering agent or a portable extinguisher shall be available to locations where fires are likely to occur. Portable extinguishers shall be a minimum size of Class 4B. Sand buckets shall have a minimum capacity of 12 quarts. The total number of such devices shall be the ratio of one to each 3 tank truck or tank car loading and unloading positions, plus one for each 2500 square feet of warehouse area or greater part thereof. One warehouse unit is an acceptable substitute for one required unit at a loading or unloading position and vice versa, providing the separation is not greater than 50 feet. Fire resistive blankets or covers may be used for smothering at dome or other openings in tanks or containers.

(2) Additional fire control equipment may be required where a tank of more than 50,000 gallons individual capacity contains Class I or Class II flammable liquids and where an unusual exposure hazard exists because of surrounding property. Such additional fire control equipment shall be sufficient to extinguish a fire in the largest tank. The design and amount of such equipment shall be in accordance with approved engineering standards.

**Note:** Reference—National Fire Protection Association Pamphlet No. 10 contains classification of fire extinguishers.

(This reference is available in the offices of the industrial commission, the secretary of state, and the revisor of statutes.)

**History:** Cr. Register, May, 1959, No. 41, eff. 6-1-59.

**Ind 8.57 Care and attendance of property.** Plant and tank yard shall be kept free from weeds, high grass, rubbish and litter, and shall be kept neat, clean and orderly throughout.

**History:** Cr. Register, May, 1959, No. 41, eff. 6-1-59.

#### SUBDIVISION F SERVICE STATIONS

**Ind 8.61 General construction.** Class I and Class II flammable liquids shall not be stored or handled within a building having a basement or pit into which flammable vapors may travel, unless such area is effectively vented and constructed in accordance with Wis. Adm. Code, section Ind 57.51, (Wisconsin state building code).

**History:** Cr. Register, May, 1959, No. 41, eff. 6-1-59.

**Ind 8.62 Storage and handling.** (1) GENERAL PROVISIONS. (a) Class I and Class II flammable liquids shall be stored in closed containers *not exceeding 60 gallons capacity* or in tanks located underground or in special enclosures as described in section Ind 8.62 (2).

(b) Class III flammable liquids shall be stored in containers or in tanks located underground or in special enclosures as described in section Ind 8.62 (2).

(c) Aboveground tanks, located in an adjoining bulk plant, may be connected by piping to service station underground tanks if, in addition to valves at aboveground tanks a valve is also installed within control of service station personnel.

(d) The provisions of section Ind 8.62 (1) (a) and (b) shall not prohibit the temporary use of portable or semi-portable tanks in conjunction with the dispensing of flammable liquids into the fuel tanks of motor vehicles or other motorized equipment on premises not normally accessible to the public.

(2) **SPECIAL ENCLOSURES.** When installation of tanks in accordance with section Ind 8.23 is impractical because of property or building limitations, tanks for flammable liquids may be installed in buildings if enclosed as follows: Enclosure shall be substantially liquid and vapor tight without backfill. Sides, top and bottom of the enclosure shall be of reinforced concrete at least 6 inches thick, with openings for inspection through the top only. Tank connections shall be so piped or closed that neither vapors nor liquid can escape into the enclosed space. Means shall be provided whereby portable equipment may be employed to discharge to the outside any vapors which might accumulate should leakage occur.

(3) **INSIDE BUILDINGS.** (a) Except where stored in tanks as provided in section Ind 8.62 (2), no Class I flammable liquids shall be stored or handled within any service station building except packaged items, for example: cleaning fluid received and resold in unbroken metallic containers of not over one gallon capacity each, or in approved non-metallic containers of not more than one quart capacity each. Class II flammable liquids in closed containers may be stored inside the station building. A closed container equipped with an approved pump shall be considered a closed container for purposes of storage only.

(b) No Class I or Class II flammable liquids shall be dispensed, or transferred from one container to another, inside of a service station building, provided, however, that flammable anti-freeze liquids may be dispensed in rooms of a service station building provided such rooms have approved heating devices and provided also that there is no open flame in such room lower than 8 feet above floor level.

(c) Class III liquids may be stored and dispensed inside service station buildings from approved containers of not more than 120 gallons capacity each.

(4) **LABELING.** (a) Except when sold in the original sealed container as put up for package sale or distribution by the manufacturer or packager with suitable and generally recognized precautionary labeling, no gasoline or benzene nor any naphtha having a flash point at or below 70°F. (closed cup tester) shall be sold or filled into any drum, can or other portable container unless the container is of metal and is colored red and labeled with the common name of the product and with the word "FLAMMABLE".

(b) No kerosene, fuel oil or similar liquid shall be filled into any portable container colored red.

(5) **DISPENSING CONTAINERS.** No delivery of any Class I or Class II flammable liquids shall be made into portable containers of 5 gallons capacity or less unless the container is of sound metal construction, has a tight closure with screwed or spring cover and is fitted with a spout or so designed that the contents can be poured without spilling.

**History:** Cr. Register, May, 1959, No. 41, eff. 6-1-59; am. (1) (a) and cr. (1) (d), Register, December, 1960, No. 60, eff. 1-1-61.

**Ind 8.63 Dispensing systems.** (1) **LOCATION.** Dispensing devices at automotive service stations shall be so located that all parts of the vehicle being served will be on the premises of the service station.

(a) *Inside location.* Approved dispensing units may be located inside garages upon specific approval of the industrial commission. The dispensing area shall be separated from motor vehicle repair areas in a manner approved by the industrial commission. The dispensing unit shall be protected against physical damage from vehicles by mounting on a concrete island or by equivalent means and shall be located in a position where it cannot be struck by a vehicle descending a ramp or other slope out of control. The dispensing area shall be provided with an approved mechanical or gravity ventilation system. A clearly identified switch readily accessible in case of fire or physical damage to any dispensing unit, shall be provided to shut off the power to dispensing units. When dispensing units are located below grade only approved mechanical ventilation shall be used and the entire dispensing area shall be protected by an approved automatic sprinkler system.

(2) **DISPENSING UNITS.** (a) Class I and Class III flammable liquids shall be transferred from underground tanks by means of fixed pumps so designed and equipped as to allow control of the flow and to prevent leakage or accidental discharge. Class I or Class II flammable liquids shall not be transferred from any storage tank by any equipment or procedure which subjects the shell of the storage tank to pressures above its allowable working pressure. Air or gas pressure shall not be used for this purpose.

(b) Supplemental means shall be provided outside of the dispensing device whereby the source of power may be readily disconnected in the event of fire or other accident.

(c) Dispensing devices for Class I or Class II flammable liquids shall be of approved type. Devices listed by Underwriters' Laboratories shall be deemed to be in compliance with this section.

(d) Class I or Class II flammable liquids shall not be dispensed by pressure or gravity from drums, barrels, and similar containers. Gear pumps or similar positive displacement devices taking suction through the top of the container shall be used.

(3) **REMOTE PUMPING SYSTEMS.** (a) *Scope.* This section shall apply to systems for dispensing Class I flammable liquid to the fuel tanks of motor vehicles at automotive service stations where such liquid is transferred from underground storage to individual or multiple dispensing units by pumps located elsewhere than at the dispensing units.

(b) *Pumps.* Pumps shall be designed or equipped so that no part of the system will be subjected to pressures above its allowable working pressure. Pumps installed above grade, outside of buildings, shall be

located not less than 10 feet from lines of adjoining property which may be built upon, and not less than 5 feet from any building opening. When an outside pump location is impractical, pumps may be installed inside of garages as provided for dispensers in section Ind 8.63 (1) (a), or in pits as provided in section Ind 8.63 (3) (c). Pumps shall be substantially anchored and protected against physical damage by vehicles.

(c) *Pits.* Pits for subsurface pumps or piping manifolds of submersible pumps shall withstand the external forces to which they may be subjected without damage to the pump, tank, or piping. The pit shall be no larger than necessary for inspection and maintenance and shall be provided with a tight fitting cover.

(d) *Controls.* 1. A control shall be provided that will permit the pump to operate only when a dispensing nozzle is removed from its bracket on the dispensing unit and the switch on this dispensing unit is manually actuated. This control shall also stop the pump when all nozzles have been returned to their brackets.

2. There shall be a means, visible from the operating area, to indicate when the pump motor is running.

3. A clearly identified switch, readily accessible in case of fire or physical damage at any dispensing unit, shall be provided to shut off the power to the pump motors.

4. An approved automatic device shall be provided at each dispensing unit that will stop the flow of fuel at the dispensing unit in case of fire or physical damage to the dispensing unit.

(e) *Testing.* After the completion of the installation including any paving, that section of the pressure piping system between the pump discharge and the connection for the dispensing facility shall be tested for at least 30 minutes at a pressure 50% above the maximum operating pressure.

(4) **AUTOMATIC DISPENSING UNITS.** The installation and use of coin-operated dispensing devices for Class I flammable liquids is prohibited.

(5) **DELIVERY.** (a) *Manual nozzle.* The dispensing of Class I flammable liquids into the fuel tank of a vehicle or into a container shall at all times be under the control of a competent person. The use of any device which permits the dispensing of Class I flammable liquid when the hand of the operator of the discharge nozzle is removed from the nozzle control lever is hereby forbidden except when using an automatic nozzle as provided in section Ind 8.63 (5) (b).

(b) *Automatic nozzle with latch-open devices.* In lieu of being held open by hand, an approved automatic nozzle may be used for dispensing Class I flammable liquid into the fuel tank of a vehicle. Such a nozzle shall have the latch-open device as an integral part of the assembly and shall shut off the liquid reliably and positively when the gasoline tank is filled, when it falls from the filling neck of an automobile tank, when it is subject to rough usage, such as dropping or lack of proper lubrication or when an automobile is driven away while the nozzle is still in the tank. A competent attendant shall be in the immediate vicinity of the vehicle being filled by such an approved nozzle.

(c) *Self service.* Only owners, operators, or trained employees shall dispense gasoline to the general public, except that the commission

**Ind 8.985 Tests of tanks and piping.** (1) After installation and before an underground tank is covered, tests shall be made for leaks. Piping shall be tested hydrostatically, or with equivalent air pressure, at not less than  $1\frac{1}{2}$  times the maximum working pressure but not less than 5 pounds per square inch at the highest point of the system. The test shall be made so as not to impose a pressure on any connected tank to exceed the working pressure for which the tank is designed. Instead of a pressure test, suction lines may be tested under a vacuum of not less than 20 inches of mercury.

(2) When the vertical length of the fill and vent pipes is such that, when filled with liquid, the static head imposed exceeds 10 psig, the tank and related piping shall be tested hydrostatically to a pressure equal to the static head thus imposed.

**History:** Cr. Register, May, 1959, No. 41, eff. 6-1-59.

## PART V

### Storage and Handling of Flammable Liquids on Farms and Construction Projects

**Ind 8.991 Storage and handling of flammable liquids on farms and construction projects.** (1) **SCOPE.** (a) The provisions of section Ind 8.991 apply to the storage and handling of flammable liquids on farms. They also apply to storage and handling of flammable liquids at road construction, earth moving projects, gravel pits and borrow pits, or wherever it is customary to obtain fuels in bulk and dispense or transfer them under control of the owner or contractor and where isolation from other structures make it unnecessary to require compliance with the more rigid standards of section Ind 8.01 through section Ind 8.92 of this code.

(b) The provisions of section Ind 8.991 shall not apply to the storage of fuel oil for oil burning equipment.

(2) **TYPES OF APPROVED STORAGE.** Storage of flammable liquids on farms and construction projects for private use shall be permitted in any of the following:

(a) In above ground or underground tanks in accordance with sections Ind 8.20, Ind 8.21, and Ind 8.22.

(b) In containers of 60 gallons or less capacity each, in accordance with the provisions of section Ind 8.991 (3).

(c) In tanks of 61 to 1100 gallons capacity each, in accordance with the provisions of section Ind 8.991 (4).

#### (3) INDIVIDUAL CONTAINERS OF 60 GALLONS OR LESS CAPACITY EACH.

(a) Containers shall be substantial closed metal drums. Discharge devices requiring pressure on the container are prohibited. Pumping devices or faucets used for dispensing flammable liquids shall be well maintained to prevent leakage. Individual containers shall not be interconnected.

(b) Containers as provided in this section shall be stored outside at least 40 feet from any building or may be stored inside of a building used exclusively for the storage of flammable liquids and located at least 40 feet from any other building. Buildings used for storage of flammable liquids shall be provided with cross ventilation with at least 2 vents of 64 square inches in area each, placed at floor level.

(4) TANKS OF 61 TO 1100 GALLONS CAPACITY EACH. (a) Flammable liquids in aboveground tanks of 61 to 1100 gallons capacity shall be stored outside buildings in tanks of single compartment design constructed in accordance with accepted engineering practice. Joints shall be riveted and caulked, riveted and welded, or welded. Tank heads over 6 feet in diameter shall be dished, stayed, braced or reinforced. Tanks shall meet the following:

Capacity Gallons	Minimum Thickness of Steel Mfrs. Std. Gauge No.
61 to 275	14
276 to 550	12
551 to 1100	10

*Handwritten notes: 560 above 275; 561 to 1100 above 551 to 1100; 12 above 10.*

(b) A fill opening shall be provided and shall be equipped with a closure designed so that it may be locked.

(c) A vent having a free opening of at least 1½ inches diameter shall be provided to relieve such vacuum or pressure as will develop in normal operation or from exposure to fire.

(d) Aboveground tanks as described in section Ind 8.991 (4) shall be kept outside and at least 40 feet from any building and shall be so located or such additional distance from buildings shall be maintained to insure that any vehicle, equipment or vessel being filled directly from such tank will be at least 40 feet from any building.

(e) Tanks as described in section Ind 8.991 (4) may be of either of the following types: 1. Tanks with top openings only. Tanks constructed and located as provided in section Ind 8.991 (4) (a) (b) (c) and (d) may be designed with all openings in the top of the tank and in such event shall be mounted and equipped as follows: a. Stationary tanks shall be mounted on timbers or blocks approximately 6 inches in height in a stable position. Portable tanks may be equipped with attached metal legs resting on shoes or runners to be at least one tank diameter apart, which in turn rest upon the ground, designed so that the tank is supported in a stable position and so that the entire tank and its supports may be moved as a unit.

b. Tanks shall be equipped with a tightly and permanently attached approved pumping device having an approved hose of sufficient length for filling vehicles, equipment or vessels to be served from the tank. Either the pump or the hose shall be padlocked to its hanger when not in use. An effective anti-siphoning device shall be included in the pump discharge. Siphons or internal pressure discharge devices are prohibited.

2. Tanks elevated for gravity discharge. Tanks constructed and located as provided in section Ind 8.991 (4) (e) 1. may be provided with an opening in the bottom or the end of the tank for gravity dispensing of flammable liquids and shall be mounted and equipped as follows:

a. Supports to elevate the tank for gravity discharge shall be of adequate strength and design to provide stability.

b. Alternately the tank may be placed on a pile of earth or near the edge of a cut bank to provide the necessary elevation, and may be supported on timbers or blocks to provide stability.

c. Bottom opening for gravity discharge shall be equipped with an internal valve that will close automatically in the event of fire through the operation of an effective heat actuated releasing device, and shall



be supplemented by a second valve that can be operated manually. The gravity discharge outlet shall be provided with an approved hose equipped with a self-closing valve at the discharge end, of a type that can be padlocked to its hanger to prevent tampering.

(5) MARKING OF TANKS AND CONTAINERS. (a) Containers for the storage of flammable liquids shall be conspicuously marked with the name of the product contained. Tanks of 61 to 1100 gallon capacity shall bear the words FLAMMABLE—KEEP FIRE AWAY and the additional marking KEEP 40 FEET FROM BUILDINGS. All lettering required shall be at least 1 inch in height.

(b) Clearance of 40 feet from buildings shall also apply to other combustible structures, hay stacks, and similar hazards.

(c) Tanks and containers of 275 gallons or less capacity for the storage of flammable liquids which flash at 110° F. or below shall be painted a bright red.

**History:** Cr. Register, December, 1960, No. 60, eff. 1-1-61.