

Chapter Ind 8

FLAMMABLE LIQUIDS

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History: Chapter Ind 8 as it existed on May 31, 1959 was repealed and a new chapter Ind 8 was created effective June 1, 1959.

PART I

GENERAL PROVISIONS

Ind 8.01 Scope. (1) This code covers flammable liquids as herein-after defined. Other liquids of a flash point above 200°F. may, when heated to temperatures equal to or higher than their flash points,

assume the characteristics of flammable liquids, and where these conditions obtain, the commission may apply thereto appropriate provisions of this code.

(a) The provisions of this code that cause a hardship on experimental and research laboratories may be modified by the industrial commission on request.

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

Ind 8.02 Definitions. (1) **AIRCRAFT SERVICE STATION** shall mean that portion of an airport where flammable liquids used as aircraft fuel are stored or dispensed from fixed equipment and shall include all facilities essential thereto.

(2) **APARTMENT HOUSE** shall mean a building occupied as a residence for 3 or more families living independently or occupied by 2 such families and used also for business purposes or occupied for sleeping or lodging purposes by 3 or more persons not members of the same family.

(3) **APPROVED** is defined as being acceptable to the commission.

(4) **ASSEMBLY OCCUPANCY** shall mean the occupancy or use of a building or structure or any portion thereof by a gathering of 100 persons or more for civic, political, travel, religious or recreational purposes. (For computing capacity of places of assembly, see Wisconsin state building code.)

(5) **AUTOMOTIVE SERVICE STATION** shall mean that portion of a property where flammable liquids used as motor fuels are stored and dispensed from fixed equipment into the fuel tanks of motor vehicles.

(6) **BAFFLE.** A non-liquid tight transverse partition in a cargo tank.

(7) **BARREL** shall mean a volume of 42 U. S. gallons.

(8) **BASEMENT** is a story whose floor line is below grade at any entrance or exit and whose ceiling is not more than 5 feet above grade at any such entrance or exit.

(9) **BULK PLANT** shall mean that portion of a property where flammable liquids are received by tank vessel, pipe lines, tank car, or tank vehicle, and are stored or blended in bulk for the purpose of distributing such liquids by tank vessel, pipe line, tank car, tank vehicle, or container.

(10) **CARGO TANK.** Any container having a liquid capacity in excess of 100 gallons, used for the carrying of flammable liquids and mounted permanently or otherwise upon a tank vehicle. The term "cargo tank" does not apply to any container used solely for the purpose of supplying fuel for the propulsion of the tank vehicle upon which it is mounted.

(11) **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.

(12) **COMMERCIAL OR INDUSTRIAL ESTABLISHMENT** shall mean a place wherein the storage, handling, or use of flammable liquids is incidental to but not the principal business or process.

(13) **COMMISSION** means the Industrial Commission of Wisconsin.

(14) **COMPARTMENT.** A liquid-tight division in a cargo tank.

(15) CONTAINER shall mean any can, bucket, barrel, drum or portable tank, except stationary tanks, tank vehicles, and tank cars.

(16) CRUDE PETROLEUM shall mean hydrocarbon mixtures that have a flash point below 150°F. and which have not been processed in a refinery.

(17) DWELLING shall mean a building occupied exclusively for residence purposes and having not more than 2 dwelling units or as a boarding or rooming house serving not more than 2 persons with meals or sleeping accommodations, or both.

(18) DWELLING UNIT shall mean one or more rooms arranged for the use of one or more individuals living together as a single house-keeping unit, with cooking, living, sanitary and sleeping facilities.

(19) EDUCATIONAL OCCUPANCY shall mean the occupancy or use of a building or structure or any portion thereof by persons assembled for the purpose of learning or of receiving educational instruction.

(20) FLAMMABLE LIQUIDS shall mean any liquid having a flash point below 200°F. and having a vapor pressure not exceeding 40 pounds per square inch (absolute) at 100°F. Flammable liquids shall be divided into 3 classes as follows:

(a) Class I shall include those having flash points at or below 20°F.

(b) Class II shall include those having flash points above 20° F. but at or below 70°F.

(c) Class III shall include those having flash points above 70°F.

(21) FLASH POINT shall mean the minimum temperature in degrees Fahrenheit at which a flammable liquid will give off flammable vapor as determined by appropriate test procedure and apparatus.

(a) The flash point of flammable liquids having a flash point below 175°F. (79°C.) shall be determined in accordance with the Standard Method of Test for Flash Point by Means of the Tag Closed Tester.

(b) The flash point of flammable liquids having a flash point of 175°F. or higher shall be determined in accordance with the Standard Method of Test for Flash Point by Means of the Pensky-Martens Closed Tester.

(c) Any compound liquid or fluid commodity, such as paint, varnish, drier, cleaning solution, and polishing liquids which contains flammable liquids shall be classed by section Ind 8.02 according to the flash point of the mixture.

(22) HEAD AND BULKHEAD. A liquid-tight transverse closure at the end of a cargo tank or between compartments of a cargo tank.

(23) HOTEL shall mean buildings or groups of buildings, not dwellings, under the same management in which there are sleeping accommodations for hire, primarily used by transients who are lodged with or without meals, including but not limited to inns, clubs, motels and apartment hotels.

(24) INSTITUTIONAL OCCUPANCY shall mean the occupancy or use of a building or structure or any portion thereof by 3 or more persons harbored or detained to receive medical, charitable or other care or treatment, or by any number of persons involuntarily detained.

(25) **MARINE SERVICE STATION.** That portion of a property where flammable liquids used as motor fuels are stored and dispensed from fixed equipment on shores, piers, wharves, or barges into the fuel tanks of floating craft, and shall include all facilities used in connection therewith.

(26) **MERCANTILE OCCUPANCY** shall mean the occupancy or use of a building or structure or any portion thereof for the displaying, selling or buying of goods, wares, or merchandise.

(27) **NFPA** means the National Fire Protection Association.

(28) **OFFICE OCCUPANCY** shall mean the occupancy or use of a building or structure or any portion thereof for the transaction of business, or the rendering or receiving of professional services.

(29) **PROCESSING PLANT** shall mean that portion of a property in which flammable liquids are mixed, heated, separated or otherwise processed as principal business, but shall not include plants defined herein as refineries.

(30) **REFINERY** shall mean a plant in which flammable liquids are produced on a commercial scale from crude petroleum, natural gasoline, or other hydrocarbon sources.

(31) **SAFETY CAN** shall mean an approved container, of not over 6 gallons capacity, having a spring-closing lid and spout cover.

(32) **TANK FULL TRAILER.** Any vehicle with or without auxiliary motive power, equipped with a cargo tank mounted thereon or built as an integral part thereof and used for the transportation of flammable liquids and so constructed that practically all of its weight and load rests on its own wheels.

(33) **TANK TRUCK.** Any single self-propelled motor vehicle equipped with a cargo tank mounted thereon and used for the transportation of flammable liquids.

(34) **TANK SEMI-TRAILER.** Any vehicle with or without auxiliary motive power, equipped with a cargo tank mounted thereon or built as an integral part thereof, and used for the transportation of flammable liquids and so constructed that when drawn by a tractor by means of a fifth wheel connection, some part of its load and weight rests upon the towing vehicle.

(35) **TANK VEHICLE.** Any tank truck, tank full trailer, or tractor and tank semi-trailer combination.

(36) **VAPOR PRESSURE** shall mean the pressure, measured in pounds per square inch (absolute) exerted by a volatile liquid as determined by the Standard Method of Test for Vapor Pressure of Petroleum Product (Reid Method).

(37) **SWITCH LOADING** shall mean the loading of Class III flammable liquid (such as kerosene or diesel fuel) when the previous load was a Class I or II flammable liquid (such as gasoline).

History: Cr. Register, May, 1959, No. 41, eff. 6-1-59; cr. (37), Register, August, 1969, No. 164, eff. 9-1-69.

Ind 8.03 Enforcement. The regulations in this code shall be enforced by the commission and its authorized agents under the procedure prescribed in chapter 101, Wis. Stats., and by all local officials or bodies having jurisdiction to approve plans or specifications or issue permits for construction, alterations or installations within the purview of this

code or having authority to investigate and eliminate related fire hazards.

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

Ind 8.04 Modification. (1) Modification of any rule in this chapter may be requested of the commission in writing.

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

PART II

STORAGE, HANDLING AND USE

SUBDIVISION A

GENERAL PROVISIONS

Ind 8.10 Application. (1) All persons, firms, corporations, co-partnerships, voluntary associations and governmental agencies except federal, storing, handling or using flammable liquids are subject to the provisions of Wisconsin Administrative Code, Ch Ind 8.

(2) (a) Sections Ind 8.10 through Ind 8.92 do not apply to transportation of flammable liquids in bulk, nor to transportation in conformity with regulations of or on file with the Interstate Commerce Commission. (See Part III for Tank Vehicle Regulations.)

(b) Except to the extent specifically provided for, Part II does not apply to oil burning equipment. (See Part IV for Oil Burning Equipment Regulations.)

(3) Insofar as sections Ind 8.10 to Ind 8.92 cover operational practice or use of containers, they shall apply and be enforced as to all plants, stations, establishments and facilities, wherein or whereon flammable liquids are stored, handled or used, whether existing and in service as of the effective date of this code or subsequently established or placed in service. Rules covering physical installations shall apply to all plants, stations, establishments and facilities erected or installed or first devoted to flammable liquid storage, handling, or use on or after the effective date of these rules and, to the extent specifically provided for or to the extent necessary to eliminate any distinct hazard to life or adjoining property, shall apply to establishments and facilities existing and devoted to storage, handling or use of flammable liquid prior to the effective date of these rules. For purposes of section Ind 8.10, nonconformity with the rules existing as of the effective date thereof,

(a) With respect to the location or arrangement of buildings, tanks, platforms or docks, or to spacing or clearances between these installations or between these installations and adjoining property lines, shall not be deemed to be distinctly hazardous and may be allowed to continue;

(b) With respect to vents or pressure relief devices on tanks, control valves on tanks or in piping systems, ventilation or sources of ignition shall be deemed distinctly hazardous and shall be corrected or eliminated.

(4) At any plant, station or establishment existing and devoted to flammable liquid use as of the effective date of these rules, existing nonconformity the continuance of which is allowed under section Ind 8.10 (1) (2) and (3) shall not prevent the installation of additional or replacement facilities which in and of themselves are in conformity with these rules.

(5) Where, under sections Ind 8.10 to Ind 8.92, the application of a requirement to an establishment or facility is conditioned upon a determination of need or upon a determination of whether the continuance of a nonconformity existing as of the effective date of these rules will or will not constitute a distinct hazard, then before any determination is made or order issued in the premises, the proprietor of the establishment or facility to be affected shall be given an opportunity to be heard with at least 10 days written notice of time and place. In the evaluation, due consideration shall be given to all existing protection and fire safety devices and the extent to which they eliminate or modify the need or hazard.

(6) Where required correction or elimination of existing nonconformity necessitates the obtaining and installation of additional devices or structural protection or the emptying or temporary non-use of one or more facilities a reasonable time, considering the amount of work to be done, the availability of materials, and the need for continued operation of the facility, shall be allowed therefor. Provided that when work involving reconstruction or modernization of storage facilities is undertaken at a location then any required elimination or correction of nonconformity thereat shall be made in the course of such work. Provided, further, however, that where practical difficulties are encountered in accomplishing required elimination of nonconformity at any location, an extension or further extension beyond the time specified in any order therefore may be obtained upon written application to the industrial commission setting forth supporting facts.

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

Ind 8.12 Approval of proposed construction or installation. (1) Except as otherwise provided in section Ind 8.12 (1) (c), before any construction or new or additional installation for the storage, handling or use of flammable liquid is undertaken, approval in writing of the authority hereinafter designated shall be obtained.

(a) If the installation to be undertaken is one in which one or more tanks for storage, handling, or use of flammable liquid will have individual capacity of 8000 gallons or larger, full information in writing and plans, either drawings or blueprints made to scale shall be submitted at least in triplicate to and the approval of the industrial commission obtained.

(b) If the installation to be undertaken is one in which all tanks for storage, handling, or use of flammable liquid will have an individual capacity of less than 8000 gallons, the approval in writing of the chief of the local fire department shall be obtained except that if by local ordinance another official is empowered to issue permits or approve plans for the proposed flammable liquid installations, his approval shall be obtained. If the installation is not within a governmental subdivision having an organized fire department or an official designated by local ordinance as aforesaid, the approval of the commission shall be obtained.

(c) The local official having approval jurisdiction under section Ind 8.12 shall require an application form SB-9 and that the proposed installation comply with the applicable requirements of these regulations as written or as modified by the commission, and if the information submitted with the application shows compliance, he shall issue

approval in writing. In the event of a dispute as to whether the information submitted shows compliance as aforesaid, it shall be submitted to the commission and the decision of the commission shall control.

(d) Form SB-9—Application for Installation Bulk Storage Flammable Liquid Tanks is furnished by the Industrial Commission, 1 West Wilson Street, Madison (2), Wisconsin.

(2) The submitted information or plans shall show the following:

(a) The name of the person, firm or corporation proposing the construction or installation, the location thereof and the adjacent streets and highways.

(b) For bulk plants, the plans shall show, in addition to any applicable features required under section Ind 8.12 (2) (d) and (e), the plot of ground to be utilized and its immediate surroundings and property lines on all sides, layout of buildings, tanks, loading and unloading docks, type of construction of each building and the type and location of ventilation in pump houses.

(c) For service stations, the plans, in addition to any applicable features required under section Ind 8.12 (2) (e) shall show the plot of ground to be utilized and the layout of buildings, drives and dispensing equipment.

(d) For aboveground storage, the information or plans shall show the location, size and capacity of each tank, the class of liquid to be stored in each tank, the type of tank supports, the clearances as covered in section Ind 8.21 (1) (2), the type of venting and pressure relief relied upon and the combined capacity of all venting and pressure relief valves on each tank, as covered in section Ind 8.21 (3) (8), and the location of any stream or body of water within 150 feet of the tanks.

(e) For underground storage, the information or plans shall show the location and capacity of each tank, class of liquid to be stored therein, together with the clearances, location of fill, gauge and vent pipes, and openings, as covered in section Ind 8.22.

(f) For installation of storage, handling or use of flammable liquids within buildings or enclosures at an establishment or occupancy covered in sections Ind 8.10 through Ind 8.985, the information and plans shall be in such detail as will show whether applicable requirements are to be met.

(g) For oil burning equipment and incidental storage, covered in sections Ind 8.971 through Ind 8.985, the information and plans shall show the relative location of burners, tanks, pumps, piping, and control valves as well as the elevations of buildings and their lowest floors or pits in relation to the proposed installation.

(3) Exceptions. Approval of plans shall not be required for installation of the following:

(a) Replacement with approved equipment of existing facilities other than storage tanks.

(b) Class III flammable liquid tanks of a capacity not exceeding 275 gallons, each appurtenant to the heating of any building.

(c) Container of a capacity not in excess of 60 gallons each.

(d) Fuel supply tanks of a motor vehicle, aircraft, watercraft, mobile power plant or mobile heating plant.

Note: Section Ind 8.12 (3) does not apply to required rooms, enclosures or buildings for inside tanks or container storage.

(4) Approval of plans as to compliance with the requirements of this section covers only the uniform state-wide fire safety and technical controls for storage, handling and use of flammable liquids and is subject to compliance by applicant with other requirements in applicable building codes, local zoning, and similar ordinances.

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

Ind 8.13 Inspection before covering installations. Before an installation, for which approval of plans is required, is covered from sight, the installer shall notify in writing the official having authority under this code or local ordinance to approve plans or issue permits for flammable liquid installations. The local official shall within 48 hours after receipt of the notice inspect the installation and give his written approval or disapproval. If he fails to make this inspection within the time specified, the installation may be covered.

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

Ind 8.14 General provisions for dispensing or use of Class I and II flammable liquids. (1) A Class I or II flammable liquid when used in starting an engine or as fuel for a small heating appliance, lighting appliance, power tool or gasoline engine—shall be dispensed only from an approved, properly identified safety can or screwed cover spout can approved for that specific use.

(a) Except as permitted under specific regulations, a Class I or II flammable liquid shall not be dispensed into the fuel supply tank of any type internal combustion engine while the engine is running.

(b) Repair and maintenance work involving a possible source of ignition shall not be performed in a room or area containing or likely to contain an ignitable mixture of hydrocarbon vapors and air.

(c) A Class I and II flammable liquid shall not be used for degreasing or cleaning any engine, machine, equipment or part thereof, or for cleaning a floor, pit, or any part of a building or premises. See section Ind 8.75.

1. Industrial processes requiring use of Class I or II flammable liquids for degreasing or cleaning any engine, machine or part thereof shall be designed to incorporate a ventilation system to reduce vapor concentration below safe fire and explosive limits.

(d) Clothing saturated with a Class I or II flammable liquid shall not be worn longer than the time required for removal and shall not be worn or taken into a building where a source of ignition exists.

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

Ind 8.15 Race track fueling stations. Tanks of racing vehicles shall be filled from safety cans, or pumps, or approved systems or approved containers as provided by section Ind 8.63 (2) (a) or section Ind 8.63 (2) (d). During a race in which a vehicle is competing it may be refueled while its engine is running. Signs prohibiting smoking in fueling areas shall be posted as provided in section Ind 8.66 and an approved fire extinguisher of at least 8B classification shall be provided at each fueling location.

History: Cr. Register, May, 1959, No. 41, eff. 6-1-59; renum. from Ind 8.637 to be Ind 8.15, and am. Register, December, 1960, No. 60, eff. 1-1-61.

**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 $\frac{5}{16}$ 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 $\frac{5}{16}$ 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 $\frac{5}{16}$ 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:

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

(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- 300.....	14	3.125
301- 560.....	12	4.375
561- 1,100.....	10	5.625
1,101- 4,000.....	7	7.50
4,001-12,000.....	$\frac{1}{4}$ "	10.00
12,001-20,000.....	$\frac{5}{16}$ "	12.50
20,001-30,000.....	$\frac{3}{8}$ "	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 indi-

vidual 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; am. (3) (d) and (4) (a), Register, February, 1962, No. 74, eff. 3-1-62.

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 ½ 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 or less	23.8	25,800	4	2½	2	1½
4,000	95.2	69,600	6¾	3¾	3	2½
18,000	428	139,000	9½	5½	4¼	3¾
25,000	595	166,000	10¾	6	4¾	4
56,000	1,380	258,000	12¾	7¼	5¾	5
100,000	2,360	363,000	15¼	8¾	7	6
155,000	3,690	458,000	17¼	9¾	7¾	6½
222,000	5,290	522,000	18¾	10½	8¼	7
475,000	11,800	624,000	20	11¼	9	7¾
735,000	17,500	648,000	20	11½	9¼	7¾
Unlimited		648,000	20	11½	9¼	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 foundations or supports of 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.

(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; am. (8) (a), Register, February, 1962, No. 74, eff. 3-1-62.

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

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.

(5) **FILL OPENINGS.** The fill pipe opening shall be located outside of any building. For Class I or II flammable liquid storage the fill pipe opening shall be not less than 5 feet from any door or cellar opening. For Class III flammable liquid storage, the fill opening shall be not less than 2 feet from any building opening at the same or lower level. The fill pipe opening shall be closed and liquid tight when not in use. Fill pipe for filling by tank car or tank truck shall be not larger than 4 inches nominal inside diameter and shall not be constricted. Fill pipe openings shall be identified by a definite color scheme or other means.

(6) **GAUGE OPENINGS.** Gauge openings, if independent of fill pipe, shall be provided with liquid-tight cap or cover. Where Class I or Class II liquids are stored within a building, such gauge opening shall be protected against vapor release or liquid overflow by means of a springloaded check valve or other approved device.

(7) **ANCHORAGE.** Where a tank may become buoyant due to a rise in the level of the water table or due to location in an area that may be subjected to flooding, the tank shall be effectively anchored.

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

Ind 8.23 Installation of tanks inside of buildings. (1) **CLASS I OR II LIQUIDS.** (a) Tanks for storage of Class I and II flammable liquids shall not be installed inside buildings except as provided under sections Ind 8.62 to Ind 8.985. Tanks for storage of Class I and II flammable liquids may be installed under a building as an underground tank complying with section Ind 8.22.

(2) **CLASS III LIQUIDS.** (a) Tanks or barrels shall be located as provided in the state building code in enclosure or outside.

(b) Tanks larger than 60 gallons capacity shall not be located in buildings above the lowest story, cellar or basement, except in commercial, industrial or processing plants where storage on a higher floor is required by the process.

(c) Tanks exceeding 275 gallons individual capacity or 1,100 gallons aggregate capacity in an individual building or in a section of a building separated by fire walls shall be installed in an enclosure constructed as follows: The walls of the enclosure shall be constructed of reinforced concrete at least 6 inches thick or of brick at least 8 inches thick. Such enclosures shall be installed only on concrete or other fire resistive floors and shall be bonded to the floors. Enclosures shall have tops of reinforced concrete at least 5 inches thick or equivalent fire resistive construction, except that where floor or roof construction above the enclosure is concrete or other fire resistive construction, the walls may be extended to and bonded to the underside of the construction above in lieu of the provision of a separate top. Any openings to such enclosures shall be provided with fire doors or other approved closures and 6-inch non-combustible liquid-tight sills or ramps.

(d) In buildings of ordinary construction, the nominal gross capacity of tanks shall not exceed 10,000 gallons. In fire resistive buildings the nominal gross capacity of the tanks shall not exceed 15,000 gallons. In any building, if in a fire resistive or detached room cut off vertically and horizontally in an approved manner from other floors

of the main building, the nominal gross capacity of tanks shall not exceed 50,000 gallons, with an individual tank capacity not exceeding 25,000 gallons.

(3) **VENTS AND OTHER OPENINGS.** Vents, fill and discharge piping, fill openings and gauge openings shall be provided as required in section Ind 8.22 (3) (4) (5) and (6).

(4) **SUPPORT OF TANKS IN BUILDINGS.** Inside storage tanks shall have supports of incombustible materials to prevent settling, sliding or lifting.

(5) **DRAINAGE OF TANKS IN BUILDINGS.** Inside storage tanks for Class III flammable liquids shall be provided with draw-off or drain openings. Tanks shall be installed so that the bottom pitches to the draw-off or drain openings at a slope of not less than $\frac{1}{4}$ inch per foot of length. The draw-off or drain opening shall be provided with suitable connection to provide a sump from which water or sediment can be drained readily.

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

Ind 8.24 Testing of tanks and piping. (1) Aboveground tanks, built in accordance with the cited standards of the American Petroleum Institute, shall be tested as specified in those standards. 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."

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

(2) Except for tanks covered in section Ind 8.24 (1), all piping connected thereto shall pass a test for tightness before being placed in use. Tanks and piping shall be tested hydrostatically or with air pressure, at not less than $1\frac{1}{2}$ times the maximum working pressure but not less than 5 pounds per square inch and not more than 10 pounds per square inch, measured at highest point in the system except as provided in section Ind 8.24 (3).

(3) When the vertical length of the fill and vent pipes is such that when filled with liquid the static head imposed 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. In special cases where the height of the vent above the top of the tank is excessive, the hydrostatic test pressure shall be specified by the authority having jurisdiction.

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

Ind 8.25 Provisions for underground tanks temporarily out of service, abandoned, or removed. (1) Underground tanks taken out of service shall be safeguarded by (a) placing in a "temporarily out of service" condition, (b) abandoning in place with appropriate other safeguarding, or (c) removal.

(a) *Rendering tanks "temporarily out of service"*. Tanks shall be rendered "temporarily out of service" only when it is planned that they will be returned to active service at the location or pending their removal within 90 days. The following steps shall be carried out successively:

1. Removal of all flammable liquids which can be pumped out with a service pump.
2. Cap or plug the fill line, gauge opening, and pump suction, using appropriate sealing compound on pipe fittings. If fill line and gauge opening are equipped with caps which can be properly locked, the secure locking of these caps is sufficient.
3. Leave the vent line open.

(b) *Abandonment of underground tanks in place*. The following steps shall be carried out successively:

1. Remove all flammable liquid from the tank and from all connecting lines.
2. Disconnect the suction, inlet, gauge, and vent lines.
3. Flood the tank to overflowing with water and close all tank openings with pipe plugs sealed with appropriate sealing compound. As an alternative, a tank may be filled with sand or other inert solid material and sealed in the same manner.

(c) *Removal of underground tanks*. The following steps shall be taken successively:

1. Remove all flammable liquid from connecting lines.
2. Disconnect and remove insofar as possible the suction, inlet, gauge, and vent lines.
3. Cap or plug open ends of remaining lines.
4. Close all openings in the tank with pipe plugs before the tank is removed from the ground. If prompt removal from the premises is not possible, flush the tank to overflowing with water or take necessary steps to make it gas-free.
5. Keep the tank tightly sealed with plugs or caps until it is removed from the premises and during transportation upon its removal.

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

Ind 8.26 Leaking tanks. Tanks found to be leaking shall be taken temporarily out of service, abandoned in place, or removed as provided in section Ind 8.25.

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

SUBDIVISION C

CLOSED CONTAINER STORAGE

Ind 8.30 Storage in closed containers inside buildings. (1) **SCOPE.**

(a) This section shall apply to the storage of flammable liquids in drums or other portable closed containers not exceeding 60 gallons individual capacity inside buildings.

(b) This section shall not apply to the storage of closed containers in bulk plants, service stations, and refineries. These requirements are covered separately in sections Ind 8.50, Ind 8.61 and Ind 8.90.

(c) This section shall not apply to areas where containers are opened for dispensing, mixing or handling. Section Ind 8.70, commercial and industrial establishments, and section Ind 8.80, processing plants, shall apply to such areas as applicable.

(2) DESIGN AND CONSTRUCTION OF INSIDE STORAGE ROOMS. (a) Inside storage rooms shall comply with the following general construction requirements: Walls, floors and ceilings shall be of non-combustible construction having a fire resistive rating of not less than 2 hours. Openings to other rooms or buildings shall be provided with non-combustible liquid-tight sills or ramps at least 6 inches in height and with approved fire doors arranged to close automatically in case of fire. A permissible alternate to either sills and ramps is open trenches covered with steel grating which are drained to a safe location. Where other portions of the building or other properties are exposed, windows shall comply with the provisions of the Wisconsin state building code. Wood at least one inch nominal thickness may be used for shelving, racks, dunnage, scuffboards, floor overlay and similar installations. Exhaust ventilation shall be provided for all such storage rooms by means of gravity vent extending from the floor line, through the roof of the building, and capped with an approved type siphon ventilator. The vent shall have sufficient capacity to exhaust 10 air changes per hour. Heating shall be restricted to low pressure steam or hot water or to electrical units bearing approved Underwriters' Laboratories label for Class I hazardous locations.

(b) Electrical wiring and equipment located in inside storage rooms used for Class I or Class II flammable liquids shall bear approved Underwriters' Laboratories label for Class I, Division 2, hazardous locations; for Class III flammable liquids, shall be approved for general use.

(c) Rooms or portions of buildings, affording a type of building construction and other features equivalent to that required for inside storage rooms may be utilized for storage of flammable liquids if not used for any other storage or operation which, in combination, create a greater fire hazard.

(d) Storage rooms shall be located and arranged to minimize damage in the event of an explosion.

(3) STORAGE CABINETS. (a) Storage cabinets shall be constructed as follows or built to equivalent requirements. The bottom, top, door and sides of cabinet shall be at least No. 18 gauge sheet iron and double walled with 1½ inch air space. Joints shall be riveted, welded or made tight by some equally effective means. The door shall be provided with a 3-point lock, kept closed when not in use, and the door sill shall be raised at least 2 inches above the bottom of the cabinet. When deemed necessary by the industrial commission, cabinets shall be vented. The cabinet shall be conspicuously labeled in red letters "FLAMMABLE—KEEP FIRE AWAY."

(b) Storage cabinets may be used where it is desired to keep more than 10 gallons of flammable liquids inside buildings. No individual container shall exceed 5 gallons capacity and not over 50 gallons shall be stored in any one cabinet.

(4) MANNER OF STORAGE AND LIMITATIONS. (a) Flammable liquids shall not be stored (including stock for sale) near exits, stairways or areas normally used for the safe egress of people.

(b) The storage of flammable liquids in closed containers shall comply with the following occupancy schedule except that the industrial commission may impose a quantity limitation or require greater protection where, in its opinion, unusual hazard to life or property is

involved, or it may authorize increase of these amounts where the type of construction, fire protection provided or other factors substantially reduce the hazard:

1. Apartment houses containing not more than 4 dwelling units. Storage other than fuel oil shall be prohibited except that which is required for maintenance or equipment operation which shall not exceed 6 gallons. Such flammable liquid shall be stored in metal closed containers or safety cans.

2. Assembly and office occupancies, apartment houses containing more than 4 dwelling units, and hotels. Storage shall be prohibited except that which is required for maintenance and operation of building and operation of equipment. Such storage shall be kept in closed metal containers stored in a storage cabinet or in safety cans or in an inside storage room not having a door that opens into that portion of the building used by the public.

3. Educational and institutional occupancies. Storage shall be limited to that required for maintenance, demonstration, treatment and laboratory work. Flammable liquids in the laboratories and at other points of use shall be in containers not larger than one quart or in safety cans or in storage cabinets.

4. Mercantile occupancies. In rooms or areas accessible to the public, storage shall be in closed containers and limited to quantities needed for display and normal merchandising purposes. Where the aggregate quantity of additional stock exceeds 180 gallons of which not more than 60 gallons may be Class I, it shall be stored in rooms or portions of buildings that comply with the construction requirements of section Ind 8.30 (2), except that one story retail stores may have walls, floors and ceilings having a fire resistance rating of not less than one hour.

5. General purposes and public warehouses. Storage shall be in accordance with Table 4 in fire resistive buildings or in portions of such buildings cut off by standard fire walls. Non-combustible material creating no hazard to the flammable liquids may be stored in the same area.

6. Flammable liquid warehouses or storage buildings. Storage shall be in accordance with Table 4. Storage buildings shall be of non-combustible construction. If storage building is located 30 to 50 feet from a building or line of adjoining property that may be built upon, the exposing wall shall be a non-combustible blank wall having a fire resistance rating of at least 2 hours. If storage building is located 10 to 30 feet from a building or line of adjoining property that may be built upon, the exposing wall shall be a blank wall having a fire resistance rating of at least 3 hours. If storage building is less than 10 feet from the line of adjoining property that can be built upon, the exposing wall shall be a blank wall having a fire resistance rating of at least 4 hours. In particular installations, the distance requirements between the storage building and other buildings may be altered at the discretion of the industrial commission after consideration of the height, size and character of construction and occupancy of the exposed buildings.

(5) FIRE CONTROL. (a) One or more approved first aid fire control devices shall be available at a location where flammable liquids are stored.

TABLE 4
ARRANGEMENT OF CONTAINER STORAGE

Class of Flammable Liquid	Storage Level	Sprinklered or Equivalent Protection Maximums per Pile					Unprotected Maximums per Pile				
		Total	Width	Height	Aisle Width		Total	Width	Height	Aisle Width	
					Main	Side				Main	Side
		Gals.	Feet	Feet	Feet		Gals.	Feet	Feet	Feet	
I	Ground and Upper Floors.....	2,640 (48)	8 (4)	6 (2)	8	5	660 (12)	4 (2)	3 (1)	8	7
	Basement*.....	0	0	0	0	0	0	0	0	0	0
II	Ground and Upper Floors.....	5,280 (96)	8 (4)	6 (2)	8	4	1,320 (24)	4 (2)	3 (1)	8	5
	Basement*.....	0	0	0	0	0	0	0	0	0	0
III	Ground and Upper Floors.....	11,000 (200)	12 (6)	3 ft. under sprinkler heads	8	4	2,640 (48)	8 (4)	12 (4)	8	4
	Basement*.....	5,500 (100)	8 (4)	9 (3)	8	4	0	0	0	0	0

*A basement is a story whose floor line is below grade at any entrance or exit and whose ceiling is not more than 5 feet above grade at any such entrance or exit.
Note: The figures in the column, Total Gallons, represent the number of gallons that may be stored per pile and the figures in parentheses are the corresponding number of 55 gallon drums. The figures in the Width and Height Columns are the width and height of the pile in feet and the figures in parentheses are the corresponding number of 55 gallon drums which when stored on end will produce this size pile.

(b) When sprinklers are required, they shall be installed in an approved manner.

Note: Approval is granted if the standards of fire underwriters are adhered to, National Fire Protection Association, Pamphlet No. 13.

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

(c) Open flames, smoking and other sources of ignition shall not be permitted in flammable liquid storage rooms.

(d) Materials which will react with water to produce a flammable vapor or gas shall not be stored in the same room with flammable liquids.

History: Cr. Register, May, 1959, No. 41, eff. 6-1-59; am. (4) (b) 1., Register, December, 1960, No. 60, eff. 1-1-61.

Ind 8.31 Storage in closed containers outside buildings. (1) **SCOPE.**

(a) This section applies to the storage of flammable liquids in drums or other portable closed containers not exceeding 60 gallons individual capacity in areas used solely for such storage.

(b) This section shall not apply to the storage of flammable liquids in drums or portable closed containers in bulk plants, service stations, and refineries.

(2) **BASIC SAFEGUARDS.** (a) Drums bearing ICC label or containers of equivalent construction may be stored out of doors.

(b) Drums stored outside shall not be located within 10 feet of any building.

(c) Storage of over 100 drums of Class I and II flammable liquids shall be limited to groups of 100 and in these quantities shall be located at least 30 feet from the nearest building or line of adjoining property which may be built upon and each group shall be separated by at least 20 feet. Storage of over 300 drums of Class III flammable liquids shall be limited to groups of 300 and in these quantities shall be located at least 25 feet from nearest building or line of adjoining property that may be built upon and each group shall be separated by at least 15 feet. These distances may be reduced 50% if sprinklers and drainage away from exposure are provided. In particular installations the distance requirements to buildings may be altered at the discretion of the industrial commission after consideration of the height, size and character of construction and occupancy of the exposed buildings.

(d) The drum storage shall be located to prevent "runoff" or drainage toward other storage or buildings. The area shall be kept clear of grass, weeds and other foreign combustibles. Signs shall be posted prohibiting open flames and smoking.

History: Cr. Register, May, 1959, No. 41, eff. 6-1-59; r. and recr. (2) (b) and (c), Register, December, 1960, No. 60, eff. 1-1-61.

SUBDIVISION D

PIPES—VALVES—FITTINGS

Ind 8.40 Material and design. (1) **MATERIAL AND DESIGN SHALL BE OF APPROVED MATERIAL AND CONSTRUCTION.** All threaded joints and connections shall be made up tight with suitable lubricant or piping compound.

Note: References, Section 3 of the American Standard Code for Pressure Piping, American Standard Association B31.1 and American Standard Association B36.10 in American Standard for Wrought-Steel and Wrought-Iron Pipe.

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

(2) **PIPE JOINTS.** Pipe joints dependent upon the friction characteristics of combustible materials for mechanical continuity of piping shall not be used inside buildings. They may be used outside of buildings above or below ground. If used aboveground, the piping shall either be secured to prevent disengagement at the fitting or the piping system shall be so designed that any spill resulting from such disengagement could not unduly expose persons, important buildings or structures, and could be readily controlled by remote valves.

(3) **PROTECTION AGAINST CORROSION.** All piping for flammable liquids both aboveground and underground where subject to external corrosion, shall be effectively protected.

(4) **SUPPORTS.** Pipe systems shall be substantially supported and protected against physical damage and excessive stresses arising from settlement, vibration, expansion or contraction. Supports for aboveground piping shall be of incombustible material.

(5) **VALVES.** Pipe systems shall contain a sufficient number of valves to operate the system properly and to protect the plant. Pipe systems in connection with pumps shall contain a sufficient number of valves to control properly the flow of liquid in normal operation and in the event of physical damage. Connections to pipe lines, by which equipment such as tank cars or tank trucks discharge flammable liquids by means of pumps into aboveground storage tanks, shall be provided with check valves for automatic protection against back flow.

(6) **PUMPS AND PIPING.** (a) In intra-plant systems, pump or piping connected for handling Class I or Class II liquids shall not be so connected or manifolded as to permit their intermittent or alternate use for Class III liquids.

(b) The piping shall have a definite scheme of identification, such as stenciling, tagging or coloring of either the lines or the control valves or both to distinguish the class of product which is being carried by each line.

(c) Pumps delivering to or taking suction from tanks or tank car shall be provided with a valve on both suction and discharge of pump.

(d) Provisions of section Ind 8.40 (6) do not apply to pipe line systems operating between or within refineries, boat or barge docks, marine terminals or pipe line terminals or tank farm storage adjunctive thereto.

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

SUBDIVISION E

BULK PLANTS

Ind 8.50 Storage. (1) Class I and Class II flammable liquids shall be stored in closed containers, or in storage tanks aboveground outside of buildings or underground.

(2) Class III flammable liquids shall be stored in containers, or in tanks within buildings or aboveground outside of buildings, or underground.

(3) Containers of flammable liquids when piled one upon the other shall be separated by dunnage, sufficient to provide stability and to prevent excessive stress on container walls. The height of pile shall be consistent with stability and strength of containers.

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

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.

(c) *Equipment; procedures.* Every new and existing bulk plant and terminal loading at a rate of 250 gallons per minute or more shall have the following equipment for top loading, and follow the below specified procedures:

1. All fill tubes shall be of metal or other suitable material with an equivalent electrical conductance.

2. All fill tubes delivering at or above a velocity of 15 feet per second shall be equipped with a deflector made of metal or other suitable material with an equivalent electrical conductance, so as to maintain the fill tube in place during the loading operation.

3. All compartment dome covers shall be closed when compartment is not being loaded.

4. On a switch load, the bottom of the fill tube shall be placed as near as possible to the bottom of the tank.

5. On a switch load, the fill tubes shall be in approximately the vertical position at all times during loading.

6. On a switch load, the velocity shall not exceed 15 feet per second until the top of the fill tube deflector is covered.

7. On a switch load, all compartments shall be drained before loading.

8. There shall be established for each bulk plant and terminal safety procedures for the filling and discharging of cargo tanks (as may be appropriate for the particular operations of the bulk plant or terminal) and such safety procedures, along with a copy of subsection (1) (c), shall be readily available or conspicuously posted at each bulk plant and terminal.

(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.

(4) **VEHICLE REFUELING AT BULK PLANTS.** No motor fuel or special fuel as defined in chapter 78, Wis. Stats., shall be dispensed at any bulk plant directly into the fuel tanks of customers' motor vehicle when such tanks are connected to the carburetor system of such vehicle; except that such vehicles may be serviced by qualified bulk plant personnel through an approved dispensing pump connected with an underground storage tank.

History: Cr. Register, May, 1959, No. 41, eff. 6-1-59; cr. (2) (d), Register, December, 1960, No. 60, eff. 1-1-61; cr. (4), Register, February, 1962, No. 74, eff. 3-1-62; r. and recr. (4), Register, August, 1962, No. 80, eff. 9-1-62; cr. (1) (c), Register, August, 1969, No. 164, eff. 9-1-69.

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.

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. Gasoline dispensing or vending devices, however, shall not be directly connected to aboveground storage tanks.

(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.

(6) **ATTENDANCE OF SUPERVISION OF DISPENSING.** (a) Each service station open to the public shall have an attendant or supervisor on duty whenever the station is open for business. The attendant shall supervise individual dispensing devices except as provided in section Ind 8.63 (4).

(b) Service stations not accessible to or open to the public do not require an attendant or supervisor. Such station shall be used only by commercial, industrial or manufacturing establishments.

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; am. (1) (c), Register, February, 1962, No. 74, eff. 3-1-62; cr. (6), Register, December, 1969, No. 168, eff. 1-1-70.

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 II 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.

(e) *Self-service.* Only owners, operators, or trained employes shall dispense gasoline to the general public, except that the commission may approve self-service if construction and supervision standards are as outlined in section Ind 8.63 (4).

1. Approval of the department must be obtained for all service stations to be converted to self-service and all newly constructed self-service stations. Applicants must submit full information and plans in triplicate.

(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. (a) Underwriters' Laboratories approved special dispensing devices such as, but not limited to, money operated, card operated, and remote preset types are permitted at self-service stations, provided that dispensing of class I liquids is under the observation of an authorized attendant at all times and provided that emergency controls are clearly identified, easily acces-

sible and located within 15 feet of the attendant's control station. Instructions for operation of dispensing devices shall be conspicuously posted.

(b) The observation and control of the special dispensing devices shall be the sole function of the attendant. The attendant shall be regularly instructed in all appropriate regulations pertaining to dispensing, use of approved containers, and smoking restrictions.

(c) A reliable 2-way communication system shall be installed between the attendant's observation station and each set of pumps or island.

(5) **DELIVERY NOZZLES.** (a) Hose nozzle valves of either the manual or automatic-closing type for dispensing class I liquids into a fuel tank or into a container shall be manually held open during the dispensing operation except as provided in paragraph (5)(b).

(b) On any service station dispenser accessible to the public a listed automatic-closing type nozzle with latch-open device is permitted only when all dispensing of class I liquids is to be done by the service station attendant.

(c) If the dispensing of class I liquids at a self-service station available and open to the public is to be done by a person other than the service station attendant, the nozzle shall be a listed automatic-closing type without a latch-open device.

(6) **MARINE SERVICE STATIONS.** (a) Tanks and pumps, other than those integral with approved dispensing units, supplying class I or class II flammable liquids at marine service stations shall be located only on shore, or upon express permission of the authority having jurisdiction on a pier of solid-fill type. Approved dispensing units with or without integral pumps may be located on shore, piers of solid-fill type, open piers, wharves or floating docks.

(b) Class I or class II flammable liquids shall be dispensed into fuel tanks of marine craft from safety cans, or by means of a hose, equipped with a self-closing nozzle and with a valve which must be held open by manual control while making a delivery.

(c) Tanks and pumps supplying class III flammable liquids at marine service stations may be located on shore, on a pier of solid-fill type or on open piers, wharves or floating docks. Class III flammable liquid tanks which are located other than on shore or on piers of the solid-fill type shall be limited to 550 gallons aggregate capacity. Pumps not a part of the dispensing unit shall be located adjacent to the tanks.

(d) Pipelines attached to piers, wharves or floating docks shall be protected against physical damage. A readily accessible valve to shut off the supply from shore shall be provided in each pipe line at or near the approach to the pier, wharf or floating dock.

(e) Pipe lines to floating docks shall be so designed and installed as to make appropriate provision for changes in water level or tide. Transition from the fixed portion of the installation to the floating unit shall provide product control, flexibility, and protection against physical damage.

History: Cr. Register, May, 1959, No. 41, eff. 6-1-59; (7) renum. to be Ind. 8.15 and am. Register, December, 1960, No. 60, eff. 1-1-61; r. and recr. (4), Register, December, 1967, No. 144, eff. 1-1-68; r. and recr. (4), Register, June, 1968, No. 150, eff. 7-1-68; am. (2) (a), cr. (2) (e), r. and recr. (4) and (5), Register, December, 1969, No. 168, eff. 1-1-70.

Ind 8.64 Electrical equipment. All electrical equipment and wiring, including lighting fixtures, and motors and switch gear for pumps handling Class I or Class II flammable liquids and located where flammable vapors may accumulate, 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 8.65 Drainage and waste disposal. Provision shall be made in the area where Class I flammable liquids may be spilled to prevent liquids from flowing into interior of service station buildings. Such provision may be by grading driveway, raising door sills, or other equally effective means. Crankcase drainings and flammable liquids shall not be dumped into sewers but shall be stored in underground tanks, or tight drums not exceeding 55 gallons individual capacity outside of any building until removed from the premises. Not to exceed 110 gallons of crankcase drainage shall be stored above ground.

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

Ind 8.66 Sources of ignition. There shall be no smoking on the driveway of service stations in the area used for fueling motor vehicles, dispensing flammable antifreeze or the receipt of products by tank vehicles, or in those portions of the building used for servicing automobiles, tractors, or internal combustion engines. Conspicuous signs prohibiting smoking shall be posted within sight of the customer being served. Letters on such signs shall be not less than 4 inches high. The motors of all vehicles being fueled shall be shut off during the fueling operation.

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

Ind 8.67 Fire control. An approved fire extinguisher of at least 4-B classification shall be provided at any service station.

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

SUBDIVISION G

COMMERCIAL AND INDUSTRIAL ESTABLISHMENTS

Ind 8.70 Storage. (1) Flammable liquids shall be stored in tanks, closed containers or approved safety cans.

(2) Flammable liquids stored in tanks shall conform to the applicable requirements of sections Ind 8.20 to Ind 8.24, inclusive.

(3) Flammable liquids stored in drums and other closed containers shall conform to applicable provisions of sections Ind 8.30 and Ind 8.31.

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

Ind 8.71 Handling and use. (1) **LOCATION.** Class I or Class II flammable liquids in excess of 6 gallons and Class III flammable liquids in excess of 25 gallons shall be used only in buildings, portions of buildings or rooms constructed and designed in accordance with the provisions for inside mixing and handling rooms.

(2) **DESIGN AND CONSTRUCTION OF INSIDE MIXING AND HANDLING ROOMS.** Rooms shall have at least one exterior wall. Walls, floors and ceilings shall be of non-combustible construction having at least a 2-hour, fire-resistive rating. Doors shall be provided with non-combustible, liquid-tight sills at least 6 inches high and provided with an approved Class B or equal fire door of the self-closing type. (A permissible alternate to either sills and ramps is open trenches covered with steel grating.) Adequate drainage to a safe location shall be provided. Adequate natural or mechanical ventilation shall be provided. Heating shall be by low pressure steam or hot water or by electrical units approved for Class I hazardous locations. Lighting and electrical devices shall be approved for Class I hazardous locations. All equipment such as mixers, filters, pumps, motors, shafting shall be permanently and effectively grounded.

Note: National Fire Protection Association Pamphlet No. 91, Standards on Blower and Exhaust Systems for Dust, Stock and Vapor Removal, provides information on the design and installation of mechanical ventilation as does the Wisconsin state electrical code for the design and installation of electrical equipment in hazardous locations.

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

(3) **STORAGE LIMITS FOR INSIDE MIXING AND HANDLING ROOMS.** An inside mixing and handling room not protected by an approved automatic fire extinguishing system shall contain not more than (a) 1,100 gallons total of Class I, II and III flammable liquids of which not more than (b) 550 gallons may be of Class I and II flammable liquids of which not more than (c) 275 gallons may be of Class I flammable liquids. An inside mixing and handling room protected by an approved automatic fire extinguishing system shall not contain more than (a) 11,000 gallons total of Class I, II and III flammable liquids, of which not more than (b) 2,750 gallons may be of Class I and II flammable liquids of which not more than (c) 550 gallons may be of Class I flammable liquids.

(4) **DAILY CONSUMPTION.** The quantities referred to in section Ind 8.71 may be increased to not more than one day's supply where daily consumption exceeds the above limits.

Note: Where applicable, installations made in accordance with the Wisconsin cleaning and dyeing code, National Fire Protection Association Standard for Dip Tanks Containing Flammable or Combustible Liquids, No. 34, and Spray Finishing Using Flammable Materials, No. 33, may be deemed to be in compliance with this code.

(These references are 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; am. (2), Register, December, 1960, No. 60, eff. 1-1-61.

Ind 8.72 Dispensing. (1) Dispensing of Class I or Class II flammable liquids inside buildings shall be only in an inside mixing and storage room as defined in section Ind 8.71 (2).

(2) Class I or Class II flammable liquids shall not be drawn from or dispensed into vessels or containers within a building except by means of a device drawing from top of the tank or the container. Gravity discharge within a building of Class I or Class II flammable liquids from tanks, drums, or containers other than safety cans, is forbidden, except where the nature of the manufacturing process requires gravity flow. Upon approval of the commission, such gravity flow shall be permitted only from vessels storing flammable liquids sufficient for not more than one day's operation.

(3) Class I or Class II flammable liquids shall not be dispensed within a room or building which normally contains source of ignition within the possible path of vapor travel. Dispensing devices shall be provided with iron or steel valves where compatible with the flammable liquid handled. Where practicable, there shall be, in addition to the outlet valve, a secondary control device or valve outside of the immediate area, by which the flow may be stopped in the event of fire or other accident at the outlet. Outlet valves, where practicable, shall be of the self-closing type and kind of product shall be identified.

(4) Class I and Class II flammable liquids shall not be run into containers unless the nozzle and container are electrically interconnected. Where the metallic floor plate 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.

(5) Exit facilities shall be provided to prevent occupants being trapped in the event of fire.

History: Cr. Register, May, 1959, No. 41, eff. 6-1-59; am. (3), Register, December, 1960, No. 60, eff. 1-1-61.

Ind 8.73 Ventilation. (1) Buildings, or rooms or other enclosures in which Class I or Class II flammable liquids are used or stored in open vats or dip tanks shall be provided with ventilation sufficient at all times to prevent accumulation of flammable vapors. Where natural ventilation is insufficient under all conditions to prevent the accumulation of flammable vapors, mechanical ventilation shall be provided and used. The accumulation of flammable vapors within the combustible or explosive range under normal operating conditions, as determined by an approved flammable-vapor indicator, shall be evidence of the violation of this section.

(2) Design of ventilating systems shall take into account the relatively high specific gravity of the vapors. Openings to the outside for

natural ventilation shall be at floor level and shall be unobstructed except by louvers or coarse screens.

Note: National Fire Protection Association Pamphlet No. 91, Standards for the Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal, provides information on the design and installation of mechanical ventilation systems.

(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 8.74 Electrical equipment. Artificial lighting shall be by electricity only. Electrical devices located within the possible path of vapor travel shall be of a type approved for such locations.

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

Ind 8.75 Sources of ignition. Open flames, heating devices and processes employing temperatures capable of igniting the vapors of the flammable liquids are prohibited in buildings or parts of buildings in which ignition could occur by reason of proximity or vapor concentrations. This applies to the use of Class I or Class II flammable liquids in the open, and to Class III flammable liquids used for the purpose of saturating, coating or otherwise treating goods or materials. Smoking shall be prohibited and suitable signs to that effect shall be displayed.

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

Ind 8.76 Housekeeping. (1) Wherever flammable liquids are stored in containers provision shall be made and maintained for the detection of leakage. Leaking containers shall be immediately removed or made tight.

(2) Access shall be provided by unobstructed aisles whereby first aid fire control apparatus may be brought to bear on any part of such flammable liquids storage.

(3) In buildings, rooms or other confined spaces in which flammable liquids are stored, combustible waste materials shall not be allowed to accumulate, except in closed metal containers.

(4) 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 8.77 Fire control. Where flammable liquids are used or dispensed, approved portable fire extinguishers shall be provided.

Note: National Fire Protection Association Pamphlet No. 10, Portable Fire Extinguishers, provides information as to the suitability of various types of extinguishers and their number and location.

(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.

SUBDIVISION H PROCESSING PLANTS

Ind 8.80 Storage. (1) Flammable liquids shall be stored in tanks, closed containers or approved safety cans.

(2) Flammable liquids stored in tanks shall conform to the applicable provisions of sections Ind 8.20, Ind 8.24 or Ind 8.62 (2).

(3) Flammable liquids stored in drums or other closed containers

shall conform to the provisions of sections Ind 8.30, Ind 8.31 or Ind 8.80 (4).

(4) Flammable liquids within rooms or buildings not complying with the provisions of sections Ind 8.30, Ind 8.31 shall be limited as follows:

(a) Within wood frame buildings, Class I and Class II flammable liquids shall be prohibited and Class III flammable liquids shall be limited to 60 gallons in any container.

(b) In other than wood frame buildings, Class I flammable liquids may be stored in closed containers or safety cans of not more than 5 gallons individual capacity and not exceeding a total of 25 gallons. Class II flammable liquids may be stored in closed containers or safety cans of not more than 5 gallons individual capacity, and in barrels or drums of not more than 60 gallons individual capacity. The total quantity that may be stored in this manner shall be limited to 220 gallons. Class III flammable liquids may be stored in closed containers of not more than 5 gallons individual capacity, or in barrels or drums, not exceeding 120 gallons individual capacity. The total quantity stored in this manner shall be limited to 220 gallons.

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

Ind 8.81 Blending and mixing. (1) Mixing and blending rooms or buildings shall meet the design standards of section Ind 8.71 (2). Mixing and blending rooms or buildings shall be provided with natural or mechanical ventilation that will prevent the accumulation of flammable vapors in hazardous concentrations. Design of ventilating systems shall take into account the relatively high specific gravity of the vapors. Openings in outside walls for natural ventilation shall be at floor level and shall be unobstructed except by louvers or coarse screens.

Note: National Fire Protection Association Pamphlet No. 91, Standards for the Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal provides information on the design and installation of mechanical ventilation systems.

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

(2) Vessels used for mixing or blending of Class I flammable liquids shall be provided with self-closing tight-fitting non-combustible lids that will control a fire within such vessel when applied thereto. Where such devices are impracticable, automatic or manually controlled chemical or other fire extinguishing devices approved by the industrial commission shall be provided.

(3) Open flames and other sources of ignition shall not be used within the possible path of vapor travel where flammable liquids are mixed or blended in open containers.

(4) Vessels shall be electrically connected by bond-wires, piping, or similar means, where differences of potential could otherwise be created by accumulation of static-electrical charges.

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

Ind 8.82 Dispensing from containers within buildings. (1) Class I or Class II flammable liquids may be dispensed from approved safety cans, provided that there are no open flames or other sources of ignition within the possible path of vapor travel.

(2) Class III flammable liquids may be dispensed from containers

not exceeding 60 gallons in individual capacity by means of a pump or similar device taking suction through the top of the container.

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

Ind 8.83 Electrical equipment. Artificial lighting shall be by electricity only. Electrical devices located within the possible path of vapor travel shall be of a type approved for such locations.

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 8.84 Sources of ignition. Open flames, heating devices and processes employing temperatures capable of igniting the vapors of the flammable liquid used shall be prohibited in buildings, rooms and other confined spaces in which Class I or Class II flammable liquids are used in the open, or in which Class III flammable liquids are heated above their flash point in open containers.

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

Ind 8.85 Housekeeping. (1) Wherever flammable liquids are stored in containers, provision shall be made and maintained for the detection of leakage. Leaking containers shall be immediately removed and the contents transferred to a tight container.

(2) Access shall be provided by unobstructed aisles whereby first aid fire control apparatus may be brought to bear on any part of such flammable liquids storage.

(3) In buildings, rooms or other confined spaces in which flammable liquids are stored, combustible waste materials shall not be allowed to accumulate except in closed metal containers.

(4) Crankcase drainings and flammable liquids shall not be dumped into sewers, but shall be stored in tanks or tight drums outside of any buildings until removed from the premises.

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

Ind 8.86 Fire control. Where flammable liquids are stored, or are used in open vessels, or are dispensed within buildings or other enclosures, approved portable fire control equipment shall be provided.

Note: National Fire Protection Association Pamphlet No. 10, Portable Fire Extinguishers, provides information as to the suitability of various types of extinguishers and their number and location.

(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.

SUBDIVISION I

REFINERIES AND OTHER PLANTS STORING AND HANDLING CRUDE PETROLEUM

Ind 8.90 Storage. (1) Crude petroleum shall be stored in tanks above ground or underground in accordance with sections Ind 8.20 to Ind 8.24, inclusive.

(2) Other flammable liquids shall be stored in tanks above ground or underground or in containers. Tanks shall be installed in accordance with sections Ind 8.20 to Ind 8.24, inclusive.

(3) Tanks for the storage of flammable liquids in tank farms and in locations other than process areas shall be located in accordance with section Ind 8.21 (1) and (2).

Note: Unfired pressure vessels shall be constructed in accordance with the Wisconsin boiler and unfired pressure vessel code.

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

Ind 8.91 Location of process units. Process units shall be located so that they are accessible from at least one side for the purpose of fire control. Where topographical conditions are such that flammable liquids may flow from a processing area so as to constitute a fire hazard to property of others, provisions shall be made to divert or impound the flow by curbs, drains, or other suitable means.

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

Ind 8.92 Fire control. Water shall be available in pressure and quantity sufficient to provide cooling streams for any unit or any tank in the processing area. Hose and hydrants shall be available in sufficient number to provide application of cooling streams as required in this section. Fire control chemicals and suitable application devices shall be available sufficient to extinguish a fire in any tank in the processing area, other than approved floating roof tanks.

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

PART III

VEHICLE CARGO TANKS FOR FLAMMABLE LIQUIDS

Ind 8.951 Scope. (1) This standard applies to tank vehicle cargo tanks to be used for the transportation and distribution of flammable liquids. It is in the interest of fire safety to provide adequate requirements for the design, construction and operation of tank motor vehicles, their appurtenances, and certain features of tank motor vehicle chassis.

(2) The provisions of part III shall not apply to tank vehicles especially designed and used for servicing aircraft with fuel.

Note: For recommended criteria, see Appendix B of National Fire Protection Association Pamphlet No. 407 (1957 Edition), Fueling Aircraft on the Ground.

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

Note: Additional safeguards may be necessary for tank vehicles used for the transportation of flammable liquids having characteristics introducing additional factors such as high rates of expansion, stability, corrosiveness and toxicity.

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

Ind 8.953 Cargo tanks, piping and connections. (1) **CARGO TANKS CONSTRUCTED OF MILD STEEL MATERIALS.** (a) *Properties.* All sheets for such cargo tanks shall be of mild steel to meet the following requirements:

Yield Point, minimum _____ 25,000 pounds per square inch
 Ultimate Strength, minimum _____ 45,000 pounds per square inch
 Minimum Elongation, standard 2-inch sample _____ 20%

(b) *Thickness of sheets.* The minimum thickness of tank sheets shall be limited by the volume capacity of the tank expressed in terms of gallons per inch of length, and by the distance between bulkheads, baffles, or other shell stiffeners, as well as by the radius of shell curvature in case of shell sheets, as follows:

MINIMUM THICKNESS OF HEAD, BULKHEAD AND Baffle SHEETS*

Mild Steel

Heads, Bulkheads, or Baffles	(Dished, Corrugated, Reinforced or Rolled)			
Volume Capacity of Tank in Gallons per Inch of Length-----	10 or Less	Over 10 to 14	Over 14 to 18	Over 18
Manufacturers Standard Gauge No.-----	14	13	12	11

MINIMUM THICKNESS OF SHELL SHEETS

Mild Steel

Volume Capacity of Tank in Gallons Per Inch of Length	Distance Between Attachments of Bulkheads, Baffles or Other Shell Stiffeners					
	36 inches or less		Over 36 inches to 54 inches		Over 54 inches	
	Gauge** No.	Approx. Thick. Decimals of in.	Gauge** No.	Approx. Thick. Decimals of in.	Gauge** No.	Approx. Thick. Decimals of in.
Maximum Shell Radius of less than 70 inches:						
10 gallons or less-----	14	0.0747	14	0.0747	14	0.0747
Over 10 to 14 gals.-----	14	0.0747	14	0.0747	13	0.0897
Over 14 to 18 gals.-----	14	0.0747	13	0.0897	12	0.1046
Over 18 gallons-----	13	0.0897	12	0.1046	11	0.1196
Maximum Shell Radius of 70 inches or more, but less than 90 inches:						
10 gallons or less-----	14	0.0747	14	0.0747	13	0.0897
Over 10 to 14 gals.-----	14	0.0747	13	0.0897	12	0.1046
Over 14 to 18 gals.-----	13	0.0897	12	0.1046	11	0.1196
Over 18 gallons-----	12	0.1046	11	0.1196	10	0.1345
Maximum Shell Radius of 90 inches or more but less than 125 inches:						
10 gallons or less-----	14	0.0747	13	0.0897	12	0.1046
Over 10 to 14 gals.-----	13	0.0897	12	0.1046	11	0.1196
Over 14 to 18 gals.-----	12	0.1046	11	0.1196	10	0.1345
Over 18 gallons-----	11	0.1196	10	0.1345	9	0.1495
Maximum Shell Radius of 125 inches or more:						
10 gallons or less-----	13	0.0897	12	0.1046	11	0.1196
Over 10 to 14 gals.-----	12	0.1046	11	0.1196	10	0.1345
Over 14 to 18 gals.-----	11	0.1196	10	0.1345	9	0.1495
Over 18 gallons-----	10	0.1345	9	0.1495	8	0.1685

*Thickness of exterior head sheets shall never be less than the maximum requirements for shell sheets in any specific unit.

**Manufacturers Standard Gauge and approximate equivalent thickness in decimals of inch.

(2) CARGO TANKS CONSTRUCTED OF LOW ALLOY LOW CARBON (HIGH TENSILE) STEEL.

(a) *Material.* All sheets for such cargo tanks shall be of low alloy, low carbon steel, commonly known as high tensile, meeting the following requirements:

Yield Point, minimum ----- 50,000 pounds per sq.in.
 Ultimate Strength, minimum ----- 65,000 " " " "
 Minimum Elongation, standard 2-inch sample 20%

(b) *Thickness of sheets.* The minimum thickness of tank sheets shall be limited by the volume capacity of the tank, expressed in terms

of gallons per inch of length; and by the distance between bulkheads, baffles, or other shell stiffeners, as well as by the radius of shell curvature in the case of shell sheets, as follows:

**MINIMUM THICKNESS OF HEAD, BULKHEAD AND
BAFFLE SHEETS***

Low Alloy Low Carbon (High Tensile) Steel

Heads, Bulkheads, or Baffles (Dished, Corrugated, Reinforced, or Rolled)

Volume Capacity of Tank in Gallons per inch of Length.....	10 or Less	Over 10 to 14	Over 14 to 18	Over 18
Manufacturers Standard Gauge No.....	15	14	13	12

*Thickness of exterior head sheets shall never be less than the maximum requirements for shell sheets in any specific unit.

MINIMUM THICKNESS OF SHELL SHEETS

Low Alloy Low Carbon (High Tensile) Steel

Volume Capacity of Tank in Gallons Per Inch of Length	Distance Between Attachments of Bulkheads, Baffles or Other Shell Stiffeners					
	36 inches or less		Over 36 inches to 54 inches		Over 54 inches	
	Gauge* No.	Approx. Thick. Decimals of in.	Gauge* No.	Approx. Thick. Decimals of in.	Gauge* No.	Approx. Thick. Decimals of in.
Maximum Shell Radius of less than 70 inches:						
10 gallons or less.....	16	0.0588	16	0.0588	15	0.0673
Over 10 to 14 gals.....	16	0.0588	15	0.0673	14	0.0747
Over 14 to 18 gals.....	15	0.0673	14	0.0747	13	0.0897
Over 18 gallons.....	14	0.0747	13	0.0897	12	0.1046
Maximum Shell Radius of 70 inches or more, but less than 90 inches:						
10 gallons or less.....	16	0.0588	15	0.0673	14	0.0747
Over 10 to 14 gals.....	15	0.0673	14	0.0747	13	0.0897
Over 14 to 18 gals.....	14	0.0747	13	0.0897	12	0.1046
Over 18 gallons.....	13	0.0897	12	0.1046	11	0.1196
Maximum Shell Radius of 90 inches or more, but less than 125 inches:						
10 gallons or less.....	15	0.0673	14	0.0747	13	0.0897
Over 10 to 14 gals.....	14	0.0747	13	0.0897	12	0.1046
Over 14 to 18 gals.....	13	0.0897	12	0.1046	11	0.1196
Over 18 gallons.....	12	0.1046	11	0.1196	10	0.1345
Maximum Shell Radius of 125 inches or more:						
10 gallons or less.....	14	0.0747	13	0.0897	12	0.1046
Over 10 to 14 gals.....	13	0.0897	12	0.1046	11	0.1196
Over 14 to 18 gals.....	12	0.1046	11	0.1196	10	0.1345
Over 18 gallons.....	11	0.1196	10	0.1345	9	0.1495

*Manufacturers Standard Gauge and approximate equivalent thickness in decimals of inch.

(3) CARGO TANKS CONSTRUCTED OF ALUMINUM ALLOYS FOR HIGH STRENGTH WELDED CONSTRUCTION.

(a) *Material.* 1. All sheets for shell, heads and bulkheads of such cargo tanks shall be of approved aluminum alloys.

Note: Aluminum alloys GR20A (5052 commercial designation), GR40A (5154 commercial designation), or GM40A (5086 commercial designation), conforming to American Society for Testing Materials Specification B 209-57T will be acceptable.

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

2. All heads, bulkheads, baffles and other shell stiffeners may use 0 temper (annealed) or stronger tempers. All shells shall be of H32 temper or H34 temper, except that when shell thicknesses of 0.250 inch or thicker are used, the H112 temper is additionally permitted.

(b) *Thickness of sheets.* The minimum nominal thicknesses of tank sheets shall be limited by the volume capacity of the tank, expressed in terms of gallons per inch of length; and by the distance between bulkheads, baffles, or other shell stiffeners, as well as by the radius of shell curvature in the case of shell sheets as follows:

MINIMUM THICKNESS OF HEAD, BULKHEAD AND Baffle SHEETS*

Approved Aluminum Alloys

Heads, Bulkheads or Baffles (Dished, Corrugated, Reinforced or Rolled)

Volume Capacity of Tank in Gallons per Inch of Length.....	10 or less	Over 10 to 14	Over 14 to 18	Over 18
Thickness in decimals of inches.....	.096	.109	.130	.151

*Thickness of exterior head sheets shall never be less than the maximum requirements for shell sheets.

MINIMUM THICKNESS OF SHELL SHEETS

Approved Aluminum Alloys

Volume Capacity of Tank in Gallons Per Inch of Length	Distance Between Attachments of Bulkheads, Baffles or Other Shell Stiffeners		
	36 inches or less	Over 36 inches to 54 inches	Over 54 inches
Inch Decimal Thickness for Maximum Shell Radius of less than 70 inches:			
10 gallons or less.....	.087	.087	.096
Over 10 to 14 gallons.....	.087	.096	.109
Over 14 to 18 gallons.....	.096	.109	.130
Over 18 gallons.....	.109	.130	.151
Inch Decimal Thickness for Maximum Shell Radius of 70 inches or more, but less than 90 inches:			
10 gallons or less.....	.087	.096	.109
Over 10 to 14 gallons.....	.096	.109	.130
Over 14 to 18 gallons.....	.109	.130	.151
Over 18 gallons.....	.130	.151	.173
Inch Decimal Thickness for Maximum Shell Radius of 90 inches or more, but less than 125 inches:			
10 gallons or less.....	.096	.109	.130
Over 10 to 14 gallons.....	.109	.130	.151
Over 14 to 18 gallons.....	.130	.151	.173
Over 18 gallons.....	.151	.173	.194
Inch Decimal Thickness for Maximum Shell Radius of 125 inches or more:			
10 gallons or less.....	.109	.130	.151
Over 10 to 14 gallons.....	.130	.151	.173
Over 14 to 18 gallons.....	.151	.173	.194
Over 18 gallons.....	.173	.194	.216

(4) **JOINTS.** Joints shall be made in accordance with recognized good practice and the efficiency of any joint shall be not less than 85% of that of the adjacent metal in the tank. Low alloy low carbon (high tensile) steel sheets, however, shall be joined by fusion welding.

(5) **TANK SECTIONS.** Mild steel and low alloy low carbon steel may be used in the construction of a single tank, provided each material,

where used, shall comply with the minimum requirements of its respective specifications for that section of the tank.

(6) **WELDED ALUMINUM JOINTS.** In cargo tanks constructed of aluminum alloys, all joints in and to tank shells, heads and bulkheads shall be welded. All welded aluminum joints shall be made in accordance with recognized good practice, and the efficiency of a joint shall not be less than 85% of the annealed properties of the material in question. Aluminum alloys for high strength welded construction shall be joined by an inert gas arc welding process using approved filler metals.

Note: Filler metals R-GR40A, E-GR40A, (5154 alloy) and R-GM50A, E-GM50A (5356 alloy) as conforming to American Society of Testing Materials Specification No. B285-57T, American Welding Society Specification No. A5, 10-54, will be acceptable.

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

(7) **TEST.** At the time of manufacture every cargo tank shall be tested by a minimum air or hydrostatic pressure of 3 pounds per square inch applied to each compartment, or to the whole tank if it be not divided into compartments. Such pressure shall be maintained for a period of at least 5 minutes, during which, if the test is by air pressure, the entire exterior surface of all the joints shall be coated with a solution of soap and water, heavy oil, or other material suitable for the purpose, foaming or bubbling of which will indicate the presence of leaks. Hydrostatic pressure, if used, shall be gauged at the top of the tank, and the tank shall be inspected at the joints for leaks. Any leakage discovered by either of these methods, or by any other method shall be deemed to be evidence of failure to meet requirements.

(8) **TANK OUTLETS.** Tank outlets shall be substantially made and substantially attached to the tank.

(9) **BULKHEADS AND BAFFLES.** (a) Every cargo tank used for the distribution of Class I and Class II flammable liquids to automotive or marine service stations to which the public is invited shall be divided into compartments, no one of which shall exceed 2500 gallons provided that any cargo tank in use in this state as of the effective date of this order may be used in aforesaid distribution if no compartment thereof has a capacity exceeding 3000 gallons. A construction tolerance of 10% shall be allowed for capacities of individual compartments or tanks.

Recommendation: The normal traffic and other hazards inherent in the distribution of motor fuel and other flammable liquids by tank vehicles can be minimized by curtailing the number of trips over the streets and highways and the number of cargo tank loading and unloading operations. Restrictions limiting cargo tank capacity or the quantity that may be distributed per load tend to increase these hazards.

(b) Bulkheads or compartments shall not be required in any cargo tank used for transportation service, regardless of total capacity, which when loaded and transporting its cargo over streets and highways will contain not less than 80% of the total tank capacity, and will discharge its entire contents at one unloading point, provided such cargo tank is not used for the delivery of flammable liquids to automotive or marine service stations to which the public is invited.

Note: In areas requiring seasonal reduction in sizes of cargo, the 80% requirement shall be waived during the period in which such restriction is in effect.

(c) Every cargo tank, and every compartment over 90 inches in length, shall be provided with baffles, the number of which shall be such that the linear distance between any two adjacent baffles, or between any tank head or bulkhead and the baffles nearest it, shall in no case exceed 60 inches.

(d) The cross sectional area of each baffle shall be not less than 80% of the cross sectional area of the tank and the thickness of such baffle shall be not less than that required for heads and bulkheads of the cargo tank in which installed.

(e) Cargo tanks with compartments carrying flammable liquids of different classes shall be provided with an air space between compartments and this air space shall be equipped and maintained with drainage facilities operative at all times.

History: Cr. Register, May, 1959, No. 41, eff. 6-1-59; am. (9), Register, December, 1960, No. 60, eff. 1-1-61.

Ind 8.954 Vents, valves and faucet connections. (1) Each cargo tank or compartment shall be provided with a vacuum and pressure operated vent with a minimum effective opening of 0.44 square inch, and shall also be provided with an emergency venting facility so constructed as to provide a minimum free-venting opening having a net area in square inches equal to 1.25 plus 0.0025 times the capacity of the cargo tank or compartment in gallons. If the emergency venting facility operates in response to elevated temperatures, the critical temperature for such operation shall not exceed 200° F.

(2) Draw-off valves and faucets shall have discharge ends threaded, or they shall be designed so as to permit being tightly connected to hose extending to fill pipe.

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

Ind 8.955 Emergency-discharge control. (1) The outlets of each cargo tank or compartment used for transportation of Class I and Class II flammable liquids, and cargo tanks constructed hereafter for transportation of Class III flammable liquids having a viscosity less than 45 seconds Saybolt Universal at 100° F., shall be equipped with a reliable and efficient shut-off valve located inside the shell; or in the sump when it is an integral part of the shell, and designed so that the valve must be kept closed except during loading and unloading operations.

(2) The operating mechanism for the valve shall be provided with a secondary control, remote from the fill openings and discharge faucets for use in the event of accidents or fire during delivery operations.

(3) The control mechanism shall be provided with a fusible section which will permit valves to close automatically in case of fire.

(4) There shall be provided, between the shut-off valve seat and discharge faucet, a shear section which will break under strain unless the discharge piping is so arranged as to afford the same protection and leave the shut-off valve seat intact.

(5) The requirements of this order do not apply to a cargo tank no compartment of which has a capacity in excess of 400 gallons.

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

Ind 8.956 Cargo tank mounting, appurtenances and protection. (1) **STATIC PROTECTION.** Cargo tanks, and vehicle chassis, shall be electrically bonded.

(2) **GROUNDING.** Provision shall be made in the tank structure of the vehicle for the bonding of vehicle to the fill pipe during truck loading operations.

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.

(3) **PROTECTION AGAINST COLLISION OR OVERTURN.** Draw-off valves or faucets projecting beyond the frames at the rear of a tank shall be reasonably protected against damage by bumpers or similar means.

(4) **CLOSURE PROTECTION.** On cargo tanks constructed hereafter, all closures for filling openings shall be protected from damage in the event of overturning of the tank vehicle by being enclosed within the body of the tank or a dome attached thereto, or by the use of suitable metal guards securely attached to the tank or the frame of the tank vehicle.

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

Ind 8.957 Electrical circuits. (1) No lighting device other than electric lights shall be used on tank vehicles. Lighting circuits shall have suitable overcurrent protection (fuses or automatic circuit breakers).

(2) All wiring shall have sufficient carrying capacity and mechanical strength, and shall be secured, insulated, and protected against physical damage in keeping with recognized good practice.

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

Ind 8.958 Fuel system. (1) Fuel tanks shall be so designed, constructed and installed as to present no unusual hazard and shall be so arranged as to vent during filling operations and permit drainage without removal from their mountings. The venting requirement does not apply to liquefied petroleum gas fuel tanks.

(2) All portions of the fuel-feed system, including carburetor, pumps, and all auxiliary mechanisms and connections shall be so constructed, installed and located as to minimize the fire hazard with no readily combustible materials used therein, and shall, except for Diesel fuel connections, be well separated from the engine exhaust system. A pressure-release device shall be provided where necessary. The fuel-feed lines shall be made of materials not adversely affected by the fuel to be used or by other materials likely to be encountered, of adequate strength for their purpose, well secured to avoid chafing or undue vibration, having a readily accessible and reliable shut-off valve, or valve, or stop-cock. Joints depending upon solder for mechanical strength and liquid tightness shall not be used in the fuel system at or near the engine, or its accessories, unless the solder has a melting point of not less than 340° F., or unless a self-closing, thermally controlled valve set to operate at not exceeding 300° F., or other equivalent automatic device, shall be installed in the fuel line on the fuel-tank side of such joint.

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

Ind 8.959 Exhaust system. (1) The exhaust system, including muffler (or silencer) and exhaust line shall have effective clearance from the fuel system and combustible materials, and shall not be exposed to leakage or spillage of product or accumulations of grease, oil or gasoline.

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

Ind 8.960 Fire extinguishers. Each tank vehicle shall be provided with at least one portable fire extinguisher. In each case after the effective date of these orders, when a new tank vehicle is placed in service or when a tank vehicle chassis or cargo tank is replaced or cargo tank is reconstructed, or when the existing extinguishing equipment on a tank vehicle is replaced, not less than 12-B, C units of first aid fire protection shall be provided. When more than one extinguisher is provided to meet this provision, each extinguisher shall have a rating of not less than 6-B, C.

Note: Ratings referred to are contained in Standards for the Installation, Maintenance and Use of Portable Fire Extinguishers, National Fire Protection Association, Pamphlet No. 10.

(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 8.961 Auxiliary combustion engines. (1) Internal combustion engines, other than those providing propulsive power, installed or carried upon a tank vehicle transporting Class I and Class II flammable liquids for the purpose of providing power for the operation of pumps or other devices, shall meet the following requirements.

(2) The engine air intake shall be equipped with an effective flame arrester, or an air cleaner having effective flame arrester characteristics, substantially installed and capable of preventing emission of flame from the intake side of the engine in event of backfiring.

(3) The fuel system shall be so located or constructed as to minimize the fire hazard. If the fuel tank is located above or immediately adjacent to the engine, suitable shielding shall be provided to prevent spillage during the filling operation, or leakage from the tank or fuel system from coming in contact with the engine or any parts of the ignition and exhaust systems. All parts of the fuel system shall be constructed and installed in a workmanlike manner.

(4) Pumps and other appurtenances carrying or containing flammable liquids shall be so located in relation to the engine that spillage or leakage from such parts shall be prevented from coming in contact with the engine or any parts of the ignition and exhaust system, or adequate shielding shall be provided to attain the same purpose. The engine cooling fan shall be so positioned, rotated or shielded as to minimize the possibility of drawing flammable vapors toward the engine.

(5) When the engine is located in a position where spillage from the cargo tank or its appurtenances or from side racks might constitute a hazard, suitable shielding shall be provided to prevent such spillage from contacting the engine or engine exhaust system and for draining such spillage away from the vicinity of the engine.

(6) Where the engine is carried within an enclosed space adequate provision shall be made for air circulation at all times to prevent accumulation of explosive vapors and to avoid overheating.

(7) The exhaust system shall be substantially constructed and installed and free from leaks. The exhaust line and muffler shall have adequate clearance from combustible materials and the exhaust gases shall be discharged at a location which will not constitute a hazard. When engines are carried as in section Ind 8.961 (6), the exhaust gases shall be discharged outside of each such closed space.

(8) The ignition wiring shall be substantially installed with firm connections and spark plug and all other terminals shall be suitably insulated to prevent sparking in event of contact with conductive materials. The ignition switch shall be of the enclosed type.

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

Ind 8.962 Auxiliary electric generators and motors. (1) Electrical equipment installed or carried upon a tank vehicle transporting Class I and Class II flammable liquids, for the operation of pumps or other devices used for the handling of product and operating product handling accessories shall meet the following requirements:

(a) Generators which are mounted on the engine providing propulsive power for the vehicle or an auxiliary engine, or located in the immediate vicinity of such engine or its exhaust system, may have general purpose enclosure. Generators located elsewhere shall be provided with explosion-proof enclosure.

(b) Motors having sparking contacts shall be provided with explosion-proof enclosures.

(c) Wiring shall be adequate for maximum loads to be carried and shall be installed so as to be protected from mechanical damage and contact with possible product spill either by location or by being enclosed in metal conduit or other oil-resistant protective covering. Junction boxes shall be sealed.

(d) Switches, overload protection devices and other sparking equipment shall be located and enclosed as provided for generators in section Ind 8.962 (1) (a).

(e) Where the generator or motor is located within an enclosed space adequate provision shall be made for air circulation to prevent overheating and possible accumulation of explosive vapor.

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

Ind 8.963 Filling and discharging cargo tanks. (1) **PROPER REPAIR.** Tank vehicles shall not be operated unless they are in proper repair, devoid of accumulation of grease, oil or other flammables, and free of leaks.

(2) **ATTENDANCE.** The driver, operator, or attendant of any tank vehicle being loaded or unloaded shall not leave the valves controlling the flow of the product until the operation is completed.

(3) **ENGINE SHUT-DOWN.** Motors of tank trucks or tractors shall be shut down during making and breaking hose connections. If loading or unloading is done without the use of a power pump, the tank truck or tractor motor shall be shut down throughout such operations.

(4) **GROUNDING.** The cargo tank shall be bonded to the fill-stem or some part of fill-stem piping when loading Class I or Class II flammable liquids through open domes into a cargo tank, or when loading Class III flammable liquids through open domes into a cargo tank which may contain flammable vapors from previous cargoes of Class I or Class II flammable liquids.

Note: Neither an external bond-wire connection nor a bond-wire integral with a hose is required for the unloading of flammable liquids into underground tanks.

(5) **EXPANSION PROTECTION.** No cargo tank or compartment thereof used for the transportation of any flammable liquid shall be loaded liquid full. The vacant space (outage) in a cargo tank or compartment thereof used in the transportation of flammable liquids shall be not less than 1%; sufficient space (outage) shall be left vacant in every case to prevent leakage from or distortion of such tank or compartment by expansion of the contents due to rise in temperature in transit.

(6) **MULTIPLE HOSE DELIVERY.** Simultaneous delivery to underground tanks from 2 or more hoses shall be made by means of tight connections between the hose and the fill pipe.

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

Ind 8.964 No smoking. Smoking by tank vehicle drivers, helpers, repairmen, or other personnel is prohibited while they are driving, making deliveries, filling, or making any repairs to tank vehicles.

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

Ind 8.965 Protection against intermixing. (1) **CONVERSION.** No cargo tank compartment, the last preceding use of which was for Class I or Class II flammable liquid, shall be used for Class III flammable liquid until all Class I or Class II liquid has been completely drained from the compartment and from all piping and any pump, meter or hose connected thereto. If the compartment or any connected piping, pump, meter or hose will not drain completely, the Class I or Class II liquid shall be completely removed by other means.

(2) **SEPARATION.** If Class I or Class II flammable liquid and Class III flammable liquid are to be delivered by pump, meter or hose from different compartments of one cargo-tank load, separate withdrawal or measuring equipment, whatever it may be, from the point where it is attached to the compartment outlet pipe to and including the dispensing nozzle or connection, shall be provided for Class I or Class II flammable liquid; and separate equipment, as aforesaid, shall be provided for Class III flammable liquid.

(a) **Exception.** Tank vehicles manufactured prior to June 1, 1959 may be continued in use without being so equipped if (a) lines into the common outlets or to common manifolds are provided with valves which will permit only one compartment at a time to be emptied; and (b) the common outlet, pump, meter or hose, following use for Class I or Class II liquid, shall be cleared as required in section Ind 8.965 (1) before being used for Class III flammable liquid.

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

PART IV

OIL BURNING EQUIPMENT

Ind 8.971 Application and scope. (1) Sections Ind 8.971 through Ind 8.985 apply to fuel storage, piping and connections to stationary and portable oil-burning equipment, except internal combustion engines, oil lamps and portable devices such as blow torches, melting pots, and weed burners.

(2) These sections are intended to prescribe reasonable requirements for safety to life and property from fire in the installation of fuel storage, piping and connections to oil burners and the equipment used in connection with them, including tanks, piping, pumps, control devices, and accessories.

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

Ind 8.972 Use of approved equipment. (1) Oil burning equipment shall be approved. Devices listed for a specific purpose by a nationally recognized testing agency may be considered as meeting the requirements for oil burning equipment.

(2) Where required, a diagram of an oil burning system showing the main oil lines and controlling valves shall be posted at the oil burning equipment, also at some point which will be accessible in case of emergency.

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

Ind 8.973 Design and construction of tanks. Tanks shall meet the standards set forth in section Ind 8.20.

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

Ind 8.974 Installation of underground tanks. Installations shall comply with the provisions of section Ind 8.22.

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

Ind 8.975 Installation of unenclosed supply tanks inside buildings.

(1) Where provisions of the Wisconsin state building code require a fire resistive enclosure for the isolation of hazards, fuel oil storage shall be isolated according to the enclosure provisions of that code.

(2) Installations where unenclosed supply tanks are permitted shall comply with the provisions of section Ind 8.23 in addition to the following:

(a) A supply tank not larger than 10 gallons shall be constructed of steel; 18 gauge if not galvanized, or 20 gauge if galvanized.

(b) An approved safety can may be used as a storage tank.

(c) A supply tank larger than 10 gallons but not larger than 275 gallons capacity shall comply with the provisions of section Ind 8.20 (5).

(3) The size and location of unenclosed tanks inside of any building or one portion of a building separated from other portions by a standard fire wall shall be in accordance with the following:

(a) Not more than 6 supply tanks having an individual capacity of 10 gallons or less or not more than 6 safety cans may be located in one or more stories.

(b) A supply or storage tank located not higher than the first story, cellar or basement shall not exceed 10 gallons capacity.

(c) A supply tank shall be not larger than 275 gallons. Not more than 4 such tanks may be installed in the lowest story, cellar or basement of a building except as permitted by paragraph (d) below. Not more than 2 such tanks shall be connected to one oil burning appliance.

(d) In the case of buildings with multiple units of occupancy, each occupancy may contain not more than two 275-gallon tanks provided there is separation between each occupancy with a fire resistive rating of 2 hours.

(4) An unenclosed supply tank not an integral part of an approved heater and not larger than 10 gallons shall be placed not less than 2 feet horizontally from any source of heat either in or external to the appliance being served but in any case shall be located so that the temperature of the oil in tank will not exceed 25° F. above room temperature.

(5) An unenclosed supply tank larger than 10 gallons shall be placed not less than 5 feet horizontally from any fire or flame either in or external to the appliance being served by the tank.

(6) An unenclosed supply tank shall be securely supported by rigid non-combustible supports to prevent settling, sliding or lifting.

(7) When a drain opening is provided in a supply tank larger than 10 gallons, the bottom of the tank shall be pitched toward the drain opening with a slope of not less than $\frac{1}{4}$ inch per foot of length.

(8) A shut-off valve shall be provided immediately adjacent to the burner supply connection at the bottom of a supply tank.

(9) A supply tank larger than 10 gallons capacity shall be provided with an open vent pipe not smaller than 1 $\frac{1}{4}$ inch pipe size and a fill pipe, both terminating outside the building.

Note: Where tanks are filled by the use of a pump through tight connections, special consideration should be given to the size of the vent pipe to insure that it is adequate to prevent the development of abnormal pressure in the tank during filling. This may be accomplished by providing a vent pipe not less in size than the discharge of the pump.

(10) A supply tank provided with fill and vent pipes shall be equipped with a gauging device designed and installed so that no oil or vapor will be discharged through the gauging device.

(11) A glass gauge or sight feed, the breakage of which will allow the discharge of fuel and the gauging of a tank by inserting a measuring stick are pronounced hazards and shall not be used.

(12) Any unused opening in a tank equipped with fill and vent pipes shall be closed vapor-tight by a pipe plug or cap screwed up tightly.

(13) Two supply tanks connected to the same burner, as permitted by section Ind 8.975 (3) (c) and (d) may be cross-connected and provided with a single fill and single vent pipe in accordance with approved standard practice.

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

Ind 8.976 Installation of enclosed supply tanks inside buildings. (1) Installations shall comply with the provisions of section Ind 8.23 in addition to the following:

(a) A supply tank larger than 275 gallons capacity shall be enclosed when installed inside of a building.

(b) Tankage inside of a building in excess of that permitted in unenclosed tanks by section Ind 8.975 (3) (c) and (d) shall be enclosed.

(c) Only a tank complying with the provisions of section Ind 8.20 (4) may be installed enclosed inside of a building.

(d) A tank shall be supported at least 4 inches above the floor by masonry saddles at least 12 inches thick, spaced not more than 8 feet on centers and extending the full width of the tank.

(e) All connections to an enclosed supply tank having a capacity of more than 275 gallons shall be made through the top of the tank, and the transfer of oil shall be by pump and through continuous piping to and from the consuming appliance.

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

Ind 8.977 Installation of outside aboveground tanks not larger than 275 gallons. (1) Tankage not in excess of that permitted by section Ind 8.975 (3) may be installed outside aboveground and may be adjacent to buildings or the line of adjoining property. Such tanks shall be suitably protected from the weather and from physical damage incident to outside location. The tanks shall not block normal means of egress.

(2) A tank not larger than 60 gallons capacity may be a drum identified as ICC-5 and so marked, a listed safety can, or a tank meeting the requirements of section Ind 8.20 (5). A tank not so identified and having a capacity of not more than 275 gallons shall comply with the provisions of section Ind 8.20 (5).

(3) Not more than 2 tanks shall be connected to one oil-burning appliance.

(4) Two supply tanks connected to the same burner as permitted by (3) above may be cross-connected and provided with a single fill and a single vent but when so connected, they shall be on a common slab and rigidly secured one to the other.

(5) Tanks having a capacity of 275 gallons or less shall be securely supported by rigid non-combustible supports to prevent settling, sliding or lifting.

(6) A shut-off valve shall be provided in the burner supply line immediately adjacent to the gravity feed connection of a supply tank.

(7) A tank not larger than 275 gallons capacity shall be equipped with an open vent not smaller than $1\frac{1}{4}$ inch pipe size.

(8) A tank shall be provided with a means to determine the liquid level. A test opening shall be closed tight, when not in use, by a metal cover designed to discourage tampering. No glass gauge or any gauge which, when broken, will permit the escape of oil from the tank shall be used.

(9) The fill opening shall be of such size and so located as to permit ready filling in a manner which will avoid spillage.

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

Ind 8.978 Installation of outside aboveground tanks larger than 275 gallons. Installations shall comply with the provisions of section Ind 8.21.

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

Ind 8.979 Installation of fill and return piping. (1) A fill pipe shall terminate outside of a building at a point at least 2 feet from any building opening at the same or lower level. Fill terminal shall be equipped with a tight metal cover designed to discourage tampering.

(2) A return line from a burner or pump to a supply tank shall enter the top of the tank. If the top of the supply tank is located above the level of the burner or piping, the return line shall extend into the tank not more than 1 inch.

(3) Cross connections, except between two supply tanks not exceeding 275 gallons individual capacity, permitting gravity flow from one tank to another shall be prohibited. This, however, shall not be construed as prohibiting the filling of an outside tank by gravity.

(4) An auxiliary tank shall be filled by a pump transferring the oil through continuous piping from the supply tank.

(5) An auxiliary tank shall be located at a level above the top of the supply tank from which it is filled.

(6) An auxiliary tank shall be provided with an overflow pipe draining to the supply tank and extending into the top of the supply tank not more than one inch. This requirement does not apply to an approved auxiliary tank designed for use without an overflow pipe.

(7) An overflow pipe from an auxiliary tank and a return line from a burner or pump shall have no valves or obstructions.

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

Ind 8.980 Installation of supply piping. (1) Connections to tanks shall be as follows:

(a) All piping, except the burner supply line from a 275 gallon tank and the cross connection between 2 such tanks, shall be connected into the top of a supply tank.

(b) The burner supply connection to tankage having a capacity of more than 550 gallons shall be connected into the top of the tank, except as permitted by paragraph (2) of this section.

(c) A transfer pump may be used to deliver oil from a supply tank to a burner or to an auxiliary tank. Except as permitted by paragraph (2) of this section, such a pump shall be connected to tankage having a capacity of not more than 550 gallons.

(2) For commercial and industrial installations, the oil supply from tankage of any capacity permitted by sections Ind 8.971 through Ind 8.985 shall be in accordance with the following: (a) The burner supply line may be connected to an outside supply tank for Nos. 5 and 6 oil at a point below the liquid level. (b) A transfer pump may be used.

Note: For such installations, devices should be provided to automatically shut off the oil supply in case of breakage of the oil supply or return piping.

(3) For commercial and industrial installations, connections to outside aboveground tanks may be located below the normal liquid level, but each such connection shall be provided with an internal or external shut-off valve located as close as practicable to the shell of the tank. The valves and their connections to the tank shall be of steel.

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

Ind 8.981 Oil gauging. (1) All tanks in which a constant oil level is not maintained by an automatic pump shall be equipped with a method of determining the oil level.

(2) Test wells shall not be installed inside buildings. For outside service they shall be equipped with a tight metal cover designed to discourage tampering.

(3) Gauging devices such as liquid level indicators or signals shall be designed and installed so that oil or vapor will not be discharged into a building from the fuel supply system.

(4) No tank used in connection with any oil burners shall be equipped with a glass gauge or any gauge which, when broken, will permit the escape of oil from the tank.

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

Ind 8.982 Oil pumps. (1) An oil pump not a part of an approved burner shall be a positive displacement type which automatically shuts off the oil supply when stopped.

(2) An automatic pump not an integral part of a burner shall be an approved type installed in an approved manner.

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

Ind 8.983 Piping. (1) All piping shall be standard steel or brass pipe with standard fittings, or brass or copper tubing with fittings of an approved type, except that approved flexible metal hose may be used for reducing the effects of jarring and vibration or where rigid connections are impracticable. Cast iron fittings shall not be used.

(2) Aluminum tubing shall not be used between the fuel oil tank and the burner unit.

(3) Pipe used in the installation of all burners and appliances other than conversion range oil burners shall be not smaller than $\frac{3}{8}$ inch iron pipe size or $\frac{3}{8}$ inch OD tubing. Copper or brass tubing shall have 0.035 inch nominal and 0.032 inch minimum wall thickness.

(4) Piping shall be substantially supported and protected against physical damage and where necessary protected against corrosion. All buried piping shall be protected against corrosion. Drop pipes from shop piping mains to burners are subject to physical damage and it may be necessary to enclose them in heavier pipe or the equivalent means to safeguard against breakage.

(5) Pipe joints and connection shall be made tight with suitable lubricant or pipe compound. Unions requiring gaskets or packing, right and left couplings, and sweat fittings shall not be used in oil lines.

(6) Proper allowance shall be made for expansion, contraction, jarring and vibration. Piping, other than tubing, connected to underground tanks, except straight fill lines and test wells, shall be provided with double swing joints arranged to permit the tanks to settle without impairing the tightness of the pipe connections.

(7) Where supply tanks are set below the level of the burner, the oil piping shall be so laid as to pitch toward the supply tank without traps.

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

Ind 8.984 Valves. (1) A readily accessible manual shut-off valve shall be installed at each point where required to avoid oil spillage during servicing. The valve shall be installed to close against the supply.

Note: An automatically operated device designed to shut off the oil supply in case of fire in the immediate vicinity of the burner should be provided.

(2) Where a shut-off is installed in the discharge line of an oil pump not an integral part of a burner, a pressure relief valve shall be connected into the discharge line between the pump and the shut-off valve and arranged to return surplus oil to the supply tank or to bypass it around the pump, unless the pump includes an internal bypass.

(3) Where oil is supplied to a burner requiring uniform flow by gravity feed and a constant level valve is not incorporated in the burner assembly or the oil is not supplied by an automatic pump, a constant level valve shall be installed in the supply line at the gravity tank or as close thereto as practicable, to insure uniform delivery of oil to the burner. The vent opening of such constant level valve shall be connected by piping or tubing to the outside of the building, unless the constant level valve is provided with an anti-flooding device. Vent piping or tubing of constant level valves shall not be connected to tanks or tank vents.

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

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- 560.....	14
561-1100.....	12

(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) (a) 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; am. (4), Register, February, 1962, No. 74, eff. 3-1-62.