

Chapter Ind 8

FLAMMABLE AND COMBUSTIBLE LIQUIDS

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History: Chapter Ind 8 as it existed on August 31, 1971 was repealed and a new chapter Ind 8 was created effective September 1, 1971.

Ind 8.01 Scope and application. (1) This code applies specifically to flammable and combustible liquids with a flash point below 200° F. There are many liquids which have a flash point above 200° F. and are accordingly exempt from this code. Such liquids, however, involve some degree of hazard, which may be controlled by application of certain provisions of this code, with appropriate modifications. Attention is directed to the fact that some liquids of flash point higher than 200° F. assume the characteristics of lower flash liquids when heated, and under such conditions the department shall apply the provisions of the code to liquids with flash point above 200° F.

(2) Additional requirements may be necessary for the safe storage and use of liquids which have unusual burning characteristics, which are subject to self-ignition when exposed to the air, which are highly reactive with other substances, which are subject to explosive decomposition, or have other special properties which dictate safeguards over and above those specified here.

(3) *Notes* used in connection with any rules in this code are only intended for explanatory material and not a part of the rule.

(4) The provisions of this code may be modified for experimental and/or research laboratories providing written approval is obtained from the department.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.02 Definitions. (1) **AEROSOL** shall mean a material which is dispensed from its container as a mist, spray or foam by a propellant under pressure.

(2) **APARTMENT HOUSE**—see Wis. Adm. Code, Chs. Ind 50-59, Building and Heating, Ventilating and Air Conditioning.

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

(4) **ASPHALT** shall include other materials having similar characteristics when heated above ambient temperatures. (See Wis. Adm. Code section 8.951 (3).)

(5) **ASSEMBLY OCCUPANCY**—see Wis. Adm. Code, Chs. Ind 50-59, Building and Heating, Ventilating and Air Conditioning.

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(6) **ATMOSPHERIC TANK** shall mean a storage tank which has been designed to operate at pressures from atmospheric through 0.5 psig.

(7) **BAFFLE**. A nonliquid tight transverse partition in a cargo tank.

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

(9) **BASEMENT**—see Wis. Adm. Code, Chs. Ind 50–59, Building and Heating, Ventilating and Air Conditioning.

(10) **BOILING POINT** shall mean the boiling point of a liquid at a pressure of 14.7 psia (760 mm). Where an accurate boiling point is unavailable for the material in question, or for mixtures which do not have a constant boiling point, for purposes of this code the 10% point of a distillation performed in accordance with approved methods Test for Distillation of Petroleum Products, ASTM D-86, may be used as the boiling point of the liquid.

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

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

(13) **CARGO TANK**. Any container or aggregate quantity of containers having a liquid capacity in excess of 100 gallons, used for the carrying of flammable or combustible liquids or asphalt 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.

(14) **CHEMICAL PLANT** shall mean a large integrated plant or that portion of such a plant other than a refinery or distillery where flammable or combustible liquids are produced by chemical reactions or used in chemical reactions.

(15) **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.

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

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

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

(19) **DEPARTMENT** means the Department of Industry, Labor and Human Relations.

(20) **DISTILLERY** shall mean a plant or that portion of a plant where flammable or combustible liquids produced by fermentation are con-

centrated, and where the concentrated products may also be mixed, stored, or packaged.

(21) 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.

(22) 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.

(23) EDUCATIONAL OCCUPANCY—see Wis. Adm. Code, Chs. Ind 50-59, Building and Heating, Ventilating and Air Conditioning.

(24) FIRE AREA shall mean an area of a building separated from the remainder of the building by construction having a fire resistance rating of at least one hour and having all communicating openings properly protected by an assembly having a fire resistance rating of at least one hour.

(25) FLAMMABLE AEROSOL shall mean an aerosol which is required to be labeled "Flammable" under the U. S. Federal Hazardous Substances Labeling Act. For the purposes of this code (Ind 8.40) such aerosols are considered Class IA liquids.

(26) FLASH POINT of the liquid shall mean the temperature at which it gives off vapor sufficient to form an ignitable mixture with the air near the surface of the liquid or within the vessel used as determined by appropriate test procedure and apparatus as specified below.

(a) The flash point of liquids having a viscosity less than 45SSU at 100° F. (37.8° C.) and a flash point below 175° F. (79.4° C.), shall be determined in accordance with the Standard Method of Test for Flash Point by the Tag Closed Tester, ASTM D-56.

(b) The flash point of liquids having a viscosity of 45SSU or more at 100° F. (37.8° C.) or a flash point of 175° F. (79.4° C.) or higher shall be determined in accordance with the Standard Method of Tester for Flash Point by the Pensky-Martens Closed Tester, ASTM D-93.

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

(28) 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.

(29) INSTITUTIONAL OCCUPANCY—see Wis. Adm. Code, Chs. Ind 50-59, Building and Heating, Ventilating and Air Conditioning.

(30) LIQUID shall mean, for the purpose of this code, any material which has a fluidity greater than that of 300 penetration asphalt when tested in accordance with Test for Penetration for Bituminous Materials, ASTM D-5. When not otherwise identified, the term liquid shall include both flammable and combustible liquids.

(a) *Combustible liquids* shall mean any liquid having a flash point at or above 140° F. (60° C.), and shall be known as class III liquids.

Class IIIA shall include those having flash points at or above 140° F. (60° C.) and below 200° F. (93.4° C.). Class IIIB shall include those having flash points at or above 200° F. (93.4° C.).

This code does not cover class IIIB liquids (see 8.01 (1)). Where the term combustible liquids or class III liquids is used in this code, it shall mean only class IIIA liquids.

(b) *Flammable liquids* shall mean any liquid having a flash point below 140° F. and having a vapor pressure not exceeding 40 psia at 100° F. Flammable liquids shall be divided into 2 classes of liquids as follows:

1. Class I liquids shall include those having flash points below 100° F. and may be subdivided as follows:

a. Class IA shall include those having flash points below 73° F. and having a boiling point below 100° F.

b. Class IB shall include those having flash points below 73° F. and having a boiling point at or above 100° F.

c. Class IC shall include those having flash points at or above 73° F. and below 100° F.

2. Class II liquids shall include those having flash points at or above 100° F. and below 140° F.

(c) *Stable liquid*. Normally stable liquids are those having the relative capacity to resist changes in their chemical composition which would produce violent reactions or detonations despite exposure to air, water, heat, including the normal range of conditions encountered in handling, storage, or transportation.

(d) *Unstable (reactive) liquid* shall mean a liquid which in the pure state or as commercially produced or transported will vigorously polymerize, decompose, condense or will become self-reactive under conditions of shock, pressure or temperature.

(31) **KEY OPERATED DISPENSING DEVICE** is a refueling device designed for purpose of restricting its use to authorized personnel only. For purposes of this code, the device must be provided with gallonage totalizer panel and made operable by use of a special key or keys issued only to authorized personnel. Further, the keys are to be only obtainable from the manufacturer of the device. The device is not intended for sale of petroleum products unless it includes a monetary totalizer.

(32) **LOW-PRESSURE TANK** shall mean a storage tank which has been designed to operate at pressures above 0.5 psig but not more than 15 psig.

(33) **MARINE SERVICE STATION** shall mean that portion of a property where flammable or combustible liquids used as fuels are stored and dispensed from fixed equipment on shore, piers, wharves, or floating docks into the fuel tanks of self-propelled craft and shall include all facilities used in connection therewith.

(34) **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.

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

(36) **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.

(37) **OWNER** shall be as defined in chapter 101, Wis. Stats. (Also see "Place of Employment" or "Public Building.")

(38) **PLACE OF EMPLOYMENT** as referred to in definition of owner shall, for purposes of this code, include any location within the jurisdiction of this department stated in chapter 101, Wis. Stats. at which flammable and combustible liquid tanks, their products and attached pumping systems are considered to be integral and indispensable parts of the place of employment or public building.

(39) **PUBLIC BUILDING** shall be as defined in chapter 101, Wis. Stats.

(40) **PORTABLE TANKS** shall mean a closed container having a liquid capacity over 60 U. S. gallons and not intended for fixed installations.

(41) **PIPING SYSTEMS** consist of pipe, tubing, flanges, bolting, gaskets, valves, fittings, the pressure containing parts of other components such as expansion, joints and strainers, and devices which serve such purposes as mixing, separating, snubbing, distributing, metering or controlling flow.

(42) **PRESSURE VESSEL** shall mean a storage tank or vessel which has been designed to operate at pressures above 15 psig.

(43) **PROTECTION FROM EXPOSURES** shall mean fire protection for structures on property adjacent to tanks. When acceptable to the department of industry, labor and human relations such structures located 1) within the jurisdiction of any fire department or 2) within or adjacent to plants having private fire brigades shall be considered as having adequate protection for exposures.

(44) **PUBLIC WAY** shall mean public thoroughfare, dedicated alley, railroad right-of-way or waterway.

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

(46) **SAFETY CAN** shall mean an approved container, of not more than 6 gallons capacity, having a spring closing lid and spout cover and so designed that it will safely relieve internal pressure when subjected to fire exposure.

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

(48) **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 flam-

mable and combustible liquids or asphalt so constructed that practically all of its weight and load rests on its own wheels.

(49) **TANK SEMITRAILER.** 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 and combustible liquids or asphalt 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.

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

(51) **TANK VEHICLE.** Any tank truck, tank full trailer, or tractor and tank semitrailer combination.

(52) **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) ASTM D-323.

(53) **VENTILATION** as specified in this code is for the prevention of fire and explosion.

Note: The above standards may be obtained for personal use from American Society of Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103. The standards are available for inspection in the office of the department, the secretary of state and the revisor of statutes.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.03 Adopted standard specifications. (1) The following list of standard specifications of American Society for Testing and Materials have been adopted as part of this code.

(a) Fire Tests of Building Construction and Materials. Part 14 ASTM designation E119-69.

(b) Specifications for Aluminum-Alloy Sheet and Plate. Part 6 ASTM designation B209-70.

(c) Specifications for Ferretic Ductile Iron Castings for Valves, Flanges, Pipe Fittings, and other Piping Components. Part 2 ASTM designation A445-66.

(d) Distillation of Petroleum Products. Part 11, 17 and 20 ASTM designation D86-67.

(e) Flash Point by Tag Closed Tester. Part 17 and 20 ASTM designation D56-70.

(f) Flash Point by Pensky-Martens Closed Tester. Part 11, 16, 17 and 20 ASTM designation D93-66.

(g) Penetration of Bituminous Materials. Part 11 ASTM designation D5-65.

(h) Vapor Pressure of Petroleum Products (Reid Method). Part 17 and 29 ASTM designation D323-58 (reapproved 1968).

Note: The above standards may be obtained for personal use from American Society of Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103. The standards are available for inspection in the office of the department, the secretary of state and the revisor of statutes.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.04 Enforcement. The regulations in this code will be enforced by the department and its authorized agents under the procedure prescribed in chapter 101, Wis. Stats., and by all local officials or bodies

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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, August, 1971, No. 188, eff. 9-1-71.

STORAGE, HANDLING AND USE OF FLAMMABLE AND COMBUSTIBLE LIQUIDS

GENERAL PROVISIONS

Ind 8.10 Application. (1) All persons, firms, corporations, copartnerships, voluntary associations and governmental agencies except federal, storing, handling or using flammable or combustible liquids are subject to the provisions of Wis. Adm. Code, chapter Ind 8.

(2) Sections Ind 8.10 through 8.93 do not apply to transportation of flammable or combustible liquids in bulk, nor to transportation in conformity with regulations of or on file with the U. S. Department of Transportation (formerly I.C.C.). (See section Ind 8.950, vehicle cargo tanks for flammable and combustible liquids.)

(a) Except to the extent specifically provided for, sections Ind 8.10 through Ind 8.93 apply to oil burning equipment. (See section Ind 8.970 for oil burning equipment regulations.)

(3) Ind 8.10 through Ind 8.93 does not apply to:

(a) Liquids without flash points that may be flammable under some conditions, such as certain halogenated hydrocarbons and mixtures containing halogenated hydrocarbons.

(b) Mists, sprays or foams except flammable aerosols in containers are included in section Ind 8.40.

(4) Insofar as sections Ind 8.10 through Ind 8.957 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 or combustible liquids are stored, handled or used, whether existing and in service prior to 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 or combustible 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 or combustible 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 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 provided however that vents or pressure relief devices on tanks prior to effective date of this code and meeting the size requirements of the February 1962, Wisconsin flammable and combustible liquids code may be allowed to continue.

(5) At any plant, station or establishment existing and devoted to flammable or combustible liquid use as of the effective date of these

rules, existing nonconformity and continuance of which is allowed under subsections 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.

(6) Where, under sections Ind 8.10 to Ind 8.957, the application of a requirement to an establishment or facility is conditioned 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 on the premises, the owner 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.

(7) Where required correction or elimination of existing nonconformity necessitates the obtaining and installation of additional devices or structural protection or the emptying or temporary nonuse 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 therefor may be obtained upon written application to the department setting forth supporting facts.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.12 Approval of proposed construction or installation. (1) Except as otherwise provided in subsection (1) (c), before any construction of new or additional installation for the storage, handling or use of flammable or combustible liquid is undertaken, written approval shall be obtained from the department.

(a) If the installation to be undertaken is one in which one or more tanks for storage, handling, or use of flammable or combustible liquid will have individual capacity of 8,000 gallons or larger; full information in writing, with plans consisting of prints of drawings made to scale, shall be submitted at least in triplicate and the approval of the department obtained.

(b) If the installation to be undertaken is one in which all tanks for storage, handling, or use of flammable or combustible liquid will have an individual capacity of less than 8,000 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 or combustible 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 department shall be obtained.

1. Exception. Permits for oil burning installations are excluded for one and 2 family residences. Also, aboveground tanks of 300 gallon

capacity or less located on farms are excluded from these requirements.

(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 department, 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 department and the decision of the department shall control.

(d) Form SB-9—Application for Installation Bulk Storage Flammable or Combustible Liquid Tanks is furnished by the Department of Industry, Labor and Human Relations; Division of Industrial Safety and Buildings, P. O. Box 2209, Madison, Wisconsin 53701.

(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 subsections (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 subsection (2) (e) shall show the plot of ground to be utilized and an outline of buildings, drives and dispensing equipment.

Note: 1. For installation of new equipment at existing stations—see subsection (3).

Note: 2. Buildings converted for use as a service station—see subsection (1) and Wis. Adm. Code, chapters 50-59, Building and Heating, Ventilating and Air Conditioning.

Note: 3. Plans for service stations involving use of automatic dispensing units should indicate location of emergency controls—see subsection Ind 8.73 (3).

(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 subsections Ind 8.21 (1) and (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 subsections Ind 8.21 (3) and (5), 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 or combustible liquids within buildings or enclosures at an establishment or occupancy covered in sections Ind 8.10 through Ind 8.957, 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 8.970 through Ind 8.986, 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 at approved existing facilities other than storage tanks.

(b) Class II and class III flammable or combustible 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.

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

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.13 Inspection before covering installations. (1) 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 or combustible 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, August, 1971, No. 188, eff. 9-1-71.

Ind 8.14 General provisions for sale, purchase, dispensing or use of flammable liquids. (1) Labeling. No sale or purchase of any class I, II or III liquids shall be made in containers unless such containers are clearly marked with the name of the product contained therein.

Note: Also see subsection Ind 8.40 (2).

(2) A class I 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 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 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 8.52, 8.54 and 8.70 (1) (e).

1. Industrial processes requiring use of class I 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.

(e) Except as permitted under specific regulations, class I flammable liquids shall not be dispensed from a tank vehicle into the fuel supply tank of any type of internal combustion engine.

(3) No dispensing of any liquids having a flash point of less than 110° F. shall be made into portable containers or portable tanks unless that such container or tank is substantially a bright red color, bears a U. L. label or is constructed of metal having 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.

(a) No kerosene, fuel oil or similar liquids having a flash point of 110° F. or more shall be filled into any portable container or portable tank colored red.

Note: Also see section 168.11, Wis. Stats.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.15 Race track fueling stations. (1) Tanks of racing vehicles shall be filled from safety cans, or pumps, or approved systems or approved containers as provided by subsections Ind 8.72 (3) (c) through (e). 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 and an approved fire extinguisher of at least 8B classification shall be provided at each fueling location.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.16 Motor vehicle exhibition. (1) Vehicles with internal combustion engines may be exhibited in buildings classified under Wis. Adm. Code, chapters 50-59, Building and Heating, Ventilating and Air Conditioning providing the following requirements are satisfied: These requirements are not applicable to places where such vehicles are normally sold and/or serviced.

(a) A specific area shall be designated for display of such vehicles.

(b) The vehicles shall not be displayed in any required passageway, corridor or exit way leading to an exit.

(c) The vehicle engine shall not be started or run while the building is occupied by the general public.

1. Vehicle may be driven in and out of the building under its own power but only when the building is not occupied by the general public.

(d) The fuel supply in tanks shall be limited to not more than one gallon of fuel per vehicle when entering the building.

1. When it is necessary to drain the excess fuel from the tank, the operation shall take place outside of the building.

(e) The gas fill cap shall be of a lock type or the cap shall be securely taped with a material that is not soluble in a petroleum fuel.

(f) The fuel line between fuel tank and fuel pump shall be disconnected and the engine operated until the carburetor is emptied of fuel.

1. The fuel line shall then be reconnected.

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2. The air filter shall always remain in place.

(g) The throttle linkage to the carburetor shall be disconnected.

(h) The battery terminal cables shall be disconnected and wrapped with a nonconductor tape or capped with a rubber or plastic cap.

(i) One approved hand fire extinguisher of 12BC rating shall be located within 75 feet travel distance of any displayed vehicle.

(j) The local fire departments or the department shall be notified 5 days in advance of the date the vehicle is to be displayed.

(k) The local agency having jurisdiction or the department shall inspect the vehicles before the general public is permitted to occupy the building.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.20 Tank storage. (1) Design and construction of tanks. (a) *Materials.* 1. Underground tanks shall be built of steel or other approved material provided the material is compatible with the liquid stored.

2. Tanks located aboveground or inside building shall be of non-combustible construction.

3. Unlined concrete tanks may be used for storing flammable or combustible liquids having a gravity of 40 degrees (American Petroleum Institute Scale) or heavier. Concrete tanks with special lining may be used for other services provided the design is in accordance with sound engineering practice.

4. Tanks may have combustible or noncombustible linings.

5. Special engineering consideration shall be required if the specific gravity of the liquid to be stored exceeds that of water or if the tanks are designed to contain flammable or combustible liquids at a liquid temperature below zero degrees F.

(b) *Fabrication.* 1. Tanks may be of any shape or type consistent with sound engineering design.

2. Metal tanks shall be welded, riveted and caulked, brazed, or bolted, or constructed by use of a combination of these methods. Filler metal used in brazing shall be nonferrous metal or an alloy having a melting point above 1000° F. and below that of the metal joined.

(c) *Atmospheric tanks.* 1. Atmospheric tanks shall be built in accordance with approved standards of design.

Note: The department will accept tanks designed and constructed according to the following standards: Underwriters' Laboratories, Inc., Subjects No. 142, Standard for Aboveground Tanks for Flammable Liquids Third Edition, July 1969; No. 58, Standard for Underground Storage Tanks, Fifth Addition, June 1969; or No. 80, Standard for Inside Tanks for Oil-Burner Fuel, Sixth Edition, August 1968.

American Petroleum Institute Standards No. 12A, Specification for Oil Storage Tanks with Riveted Shells, Seventh Edition, September 1951, or No. 650, Welded Steel Tanks for Oil Storage, Fourth Edition, 1970.

American Petroleum Institute Standards No. 12B, Specification for Bolted Production Tanks, Eleventh Edition, May 1958, and Supplement 1, April 1962; No. 12D, Specification for Large Welded Production Tanks Seventh Edition, August 1957, and Supplement March 1965; or No. 12F, Specification for Small Welded Production Tanks, Sixth Edition, March 1968. Tanks built in accordance with these standards shall be used only as production tanks for storage of crude petroleum in oil-producing areas.

2. Low-pressure tanks and pressure vessels may be used as atmospheric tanks.

3. Atmospheric tanks shall not be used for the storage of a flammable or combustible liquid at a temperature at or above its boiling point.

(d) *Low-pressure tanks.* 1. The normal operating pressure of the tank shall not exceed the design pressure of the tank.

2. Low-pressure tanks shall be built in accordance with approved standards of design.

Note: The department will accept tanks designed and constructed according to the following standards:
American Petroleum Institute Standard No. 620, Recommended Rules for the Design and Construction of Large, Welded, Low-Pressure Storage Tanks, Fourth Edition, 1970.

3. Atmospheric tanks built according to requirements in subsection (1) (c), may be used for operating pressures not exceeding 1 psig and shall be limited to 2.5 psig under emergency venting conditions.

4. Pressure vessels may be used as low-pressure tanks.

(e) *Pressure vessels.* 1. The normal operating pressure of the vessel shall not exceed the maximum allowable working pressure of the vessel.

2. Steel pressure vessels shall be built in accordance with Wis. Adm. Code, chapter 41, Boiler and Unfired Pressure Vessel.

(2) TESTING NEW INSTALLATIONS. (a) All tanks, whether shop built or field erected, shall be strength tested before they are placed in service in accordance with the applicable paragraphs of the code under which they were built. The ASME code stamp, API monogram, or the label of the Underwriters' Laboratories' Inc. on a tank shall be evidence of compliance with this strength test. Tanks not marked in accordance with the above codes shall be strength tested before they are placed in service in accordance with good engineering principles and reference shall be made to the sections on testing in the codes listed in subsections (1) (c) 1. and (1) (d) 2. or (1) (e) 2.

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

(c) In addition to the strength test called for in subsections (2) (a) and (b), all tanks and connections shall be tested for tightness by owner of tank(s). Except for underground tanks, this tightness test shall be made at operating pressure with air, inert gas or water prior to placing the tank in service. In the case of field erected tanks the strength test may be considered to be the test for tank tightness. Underground tanks and piping, before being covered, enclosed, or placed in use, shall be tested for tightness hydrostatically, or with air pressure at not less than 3 pounds per square inch and not more than 5 pounds per square inch.

Note: See section Ind 8.37 for testing pressure piping.

(d) All leaks or deformations shall be repaired before the tank is placed in service. Mechanical caulking is not permitted for correcting leaks in welded tanks except pin hole leaks in the roof.

(e) Tanks to be operated at pressures below their design pressure may be tested by the applicable provisions of subsection (2) (a) and (b) based upon the pressure developed under full emergency venting of the tank.

(3) TESTING OF EXISTING STORAGE TANKS. (a) *Areas of responsibility.* 1. The owner of storage tanks for flammable and combustible liquids shall be responsible for the integrity of each and all tanks at the location, together with the piping and dispensing systems connected thereto.

2. In an emergency involving hazard to public health and safety duly declared after proper investigation by constituted authority, the owner (operator) of said location shall be responsible for taking directed and necessary action including, if required, the emptying of all station tankage and the deactivation of all systems until tested and declared safe by the authorities concerned.

3. The department and its authorized agents are authorized to determine the integrity of tanks with their attached dispensing systems, and to notify owners thereof of conditions regarding such tanks and systems which may indicate potential danger to the public or the environment.

(b) *Orders for testing.* 1. When the department concludes, after conducting an investigation of the actual and probable physical details of a tank or of an appurtenant piping or dispensing system, that testing is necessary in the interest of public health, it shall thereupon issue an order to the owner (operator) requiring subject tanks and equipment to be tested. This test shall be conducted in the presence of, and to be certified by, a member of the department or by one of its duly authorized agents. Corrective procedures shall be dictated by the facts disclosed and as directed by the certifying authority.

2. The owner shall be consulted and advised regarding any determination of tank and/or system integrity in connection with the issuance of a department order requiring testing.

3. Findings under the certified test shall be binding, and the owner shall exercise his responsibility through compliance with the recommendations forthcoming.

(c) *Method of testing.* 1. *Testing* of tanks and attached systems shall be considered to be subjection of the tanks and systems to a properly witnessed and certified test procedure as performed with use of an approved tank system tightness tester or its equivalent.

Note: Nationally recognized test standards will be accepted by the department.

2. The owner shall not be responsible for costs incurred by the department or its authorized agents in witnessing or certifying the test results.

(d) *Requirement for inventory records.* 1. Since tank and system leakage can first be detected by reference to daily inventories, it is hereby directed that such an inventory be kept on a daily basis for each tank system at each location by the owner (operator); such record shall be available at the location for inspection at any time by proper authority and shall cover at least a year prior to the date of inspection.

2. The inventory referred to in 1. above shall be based on the actual measurement of tank liquid levels daily, with weekly use of a water detector. The written record of such testing shall include a computation of gain or loss for the period. The owner (operator) of

the location shall be responsible for taking action to correct and notify local fire chief of any abnormal loss or gain not explainable by spillage, temperature variations or other causes.

3. The mere recording of pump meter readings combined with in-shipment records shall not constitute adequate inventory records for the purpose of this section.

4. *Exemptions.* The requirements for daily inventory records will not apply for the following conditions:

a. On those days an installation is not in operation, such as a weekend, but not to exceed 3 days.

b. Those installations that permit visual detection of leaks in all surfaces of tanks and the entire piping system connected thereto.

c. Storage tanks connected to oil burning equipment.

Note: While the test procedures in this section are designed to determine and fix responsibility for the integrity of tanks and systems, it is not assumed that the hazards inherent in such tanks and systems to both human life and to the environment are thereby lessened and/or eliminated. These hazards can only be reduced through continuing vigilance by the responsible parties. For additional requirements see section 144.025, Wis. Stats.

(4) **SUPPORTS, FOUNDATIONS AND ANCHORAGE FOR ALL TANK LOCATIONS.** (a) Tank supports shall be installed on firm foundations. Tank supports shall be of concrete, masonry or protected steel. Single wood timber supports (not cribbing) laid horizontally may be used for outside aboveground tanks if not more than 12 inches high at their highest point.

(b) Steel supports or exposed piling shall be protected by materials having a fire resistance rating of not less than 2 hours, except that steel saddles need not be protected if less than 12 inches high at their highest point. At the discretion of the department, approved water spray protection or its equivalent may be used in lieu of fire-resistant materials to protect supports.

(c) The design of the supporting structure for tanks such as spheres shall require engineering consideration.

(d) Every tank shall be so supported as to prevent the excessive concentration of loads on the supporting portion of the shell.

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

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

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.21 Installation of outside aboveground tanks. (1) LOCATION WITH RESPECT TO ELECTRICAL LINES. Location with respect to electrical lines shall be in accordance with provisions in the Wis. Adm. Code Vol. II, Electrical.

(2) LOCATION WITH RESPECT TO PROPERTY LINES AND PUBLIC WAYS.

(a) Every aboveground tank for the storage of flammable or combustible liquids, except those liquids with boil over characteristics and unstable liquids, operating at pressures not in excess of 2.5 psig and equipped with emergency venting which will not permit pressures to exceed 2.5 psig shall be located in accordance with table 1.

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TABLE 1

Type of Tank	Protection	Minimum Distance in Feet from Property Line which May be Built Upon, Including the Opposite Side of a Public Way	Minimum Distance in Feet from Nearest Side of Any Public Way or from Nearest Important Building and Shall be Not Less than 5 feet
Floating Roof	Protection for Exposures*	1/2 times diameter of tank but need not exceed 90 feet	1/2 times diameter of tank but need not exceed 30 feet
	None	Diameter of tank but need not exceed 175 feet	1/2 times diameter of tank but need not exceed 30 feet
Vertical with Weak Roof to Shell Seam	Approved foam or inerting system on the tank	1/2 times diameter of tank but need not exceed 90 feet and shall not be less than 5 feet	1/2 times diameter of tank but need not exceed 30 feet
	Protection for Exposures*	Diameter of tank but need not exceed 175 feet	1/2 times diameter of tank but need not exceed 60 feet
	None	2 times diameter of tank but need not exceed 350 feet	1/2 times diameter of tank but need not exceed 60 feet
Horizontal and Vertical, with Emergency Relief Venting to Limit Pressures to 2.5 psig	Approved inerting system on the tank or approved foam system on vertical tanks	1/2 times Table 5 but shall not be less than 5 feet	1/2 times Table 5
	Protection for Exposures*	Table 5	Table 5
	None	2 times Table 5	Table 5

*Protection for exposures shall mean fire protection for structures on property adjacent to tanks. When acceptable to the authority having jurisdiction, such structures located (1) within the jurisdiction of any fire department or (2) within or adjacent to plants having private fire brigades shall be considered as having adequate protection for exposures.

(b) Every aboveground tank for the storage of flammable or combustible liquids, except those liquids with boil over characteristics and unstable liquids, operating at pressures exceeding 2.5 psig or equipped with emergency venting which will permit pressures to exceed 2.5 psig shall be located in accordance with table 2.*

TABLE 2

Type of Tank	Protection	Minimum Distance in Feet from Property Line which May be Built Upon, Including the Opposite Side of a Public Way	Minimum Distance in Feet from Nearest Side of Any Public Way or from Nearest Important Buildings
Any Type	Protection for Exposures	1 1/2 times Table 5 but need not exceed 175 feet and shall not be less than 25 feet	1 1/2 times Table 5 but shall not be less than 25 feet
	None	3 times Table 5 but need not exceed 350 feet and shall not be less than 50 feet	1 1/2 times Table 5 but shall not be less than 25 feet

*Special consideration may be given to tanks equipped with automatic depressuring systems.

(c) Every aboveground tank for the storage of flammable or combustible liquids with boil over characteristics shall be located in accordance with table 3.

TABLE 3

Type of Tank	Protection	Minimum Distance in Feet from Property Line which May be Built Upon, Including the Opposite Side of a Public Way	Minimum Distance in Feet from Nearest Side of Any Public Way or from Nearest Important Building
Floating Roof	Protection for Exposures	Diameter of tank but need not exceed 175 feet	$\frac{1}{2}$ times diameter of tank but need not exceed 60 feet
	None	2 times diameter of tank but need not exceed 350 feet	$\frac{1}{2}$ times diameter of tank but need not exceed 60 feet
Fixed Roof	Approved foam or inerting system	Diameter of tank but need not exceed 175 feet	$\frac{1}{2}$ times diameter of tank but need not exceed 60 feet
	Protection for Exposures	2 times diameter of tank but need not exceed 350 feet	$\frac{2}{3}$ times diameter of tank but need not exceed 120 feet
	None	4 times diameter of tank but need not exceed 350 feet	$\frac{2}{3}$ times diameter of tank but need not exceed 120 feet

(d) Every aboveground tank for the storage of unstable liquids shall be located in accordance with table 4.

TABLE 4

Type of Tank	Protection	Minimum Distance in Feet from Property Line which May be Built Upon, Including the Opposite Side of a Public Way	Minimum Distance in Feet from Nearest Side of Any Public Way or from Nearest Important Building
Horizontal and Vertical Tanks with Emergency Relief Venting to Permit Pressure Not in Excess of 2.5 psig	Tank protection with any one of the following: Approved water spray, Approved inerting, Approved insulation and refrigeration, Approved barricade	Table 5 but not less than 25 feet	Not less than 25 feet
	Protection for Exposures	$2\frac{1}{2}$ times Table 5 but not less than 50 feet	Not less than 50 feet
	None	5 times Table 5 but not less than 100 feet	Not less than 100 feet
Horizontal and Vertical Tanks with Emergency Relief Venting to Permit Pressure over 2.5 psig	Tank protection with any one of the following: Approved water spray, Approved inerting, Approved insulation and refrigeration, Approved barricade	2 times Table 5 but not less than 50 feet	Not less than 50 feet
	Protection for Exposures	4 times Table 5 but not less than 100 feet	Not less than 100 feet
	None	8 times Table 5 but not less than 150 feet	Not less than 150 feet

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(e) Reference table for minimum distance used in tables 1 to 4 inclusive shall be as follows:

TABLE 5

Capacity Tank Gallons	Minimum Distance in Feet from Property Line which May be Built Upon, Including the Opposite Side of a Public Way	Minimum Distance in Feet from Nearest Side of Any Public Way or from Nearest Important Building or Group of Buildings
275 or less.....	5	5
276 to 750.....	10	5
751 to 12,000.....	15	5
12,001 to 30,000.....	20	5
30,001 to 50,000.....	30	10
50,001 to 100,000.....	50	15
100,001 to 500,000.....	80	25
500,001 to 1,000,000.....	100	35
1,000,001 to 2,000,000.....	135	45
2,000,001 to 3,000,000.....	165	55
3,000,001 or more.....	175	60

(f) Where two tank properties of diverse ownership have a common boundary, the department may, with the written consent of the owners of the 2 properties, substitute the distances provided in subsections Ind 8.21 (2) (a) and 8.21 (3) (a) through (f).

(g) Where end failure of horizontal pressure tanks and vessels may expose property, the tank shall be placed with the longitudinal axis parallel to the nearest important exposure.

(3) SPACING (SHELL-TO-SHELL) BETWEEN ABOVEGROUND TANKS, (a.) The distance between any 2 flammable or combustible liquid storage tanks shall not be less than 3 feet.

(b) Except as provided in subsections Ind 8.21 (3) (c) through (3) (d) inclusive, the distance between any 2 tanks shall be not less than one-sixth the sum of their diameters except when the diameter of one tank is less than one-half the diameter of the adjacent tank, the distance between the 2 tanks shall be not less than one-half the diameter of the smaller tank.

(c) Crude petroleum in conjunction with production facilities located in noncongested areas and having capacities not exceeding 126,000 gallons (3,000 barrels), the distance between such tanks shall not be less than 3 feet.

(d) Unstable liquids, the distance between such tanks shall not be less than one-half the sum of their diameters.

(e) When tanks are compacted in 3 or more rows or in an irregular pattern, greater spacing or other means shall be provided at the discretion of the department so that inside tanks are accessible for fire fighting purposes.

(f) The minimum separation between a liquefied petroleum gas container and a flammable or combustible liquid storage tank shall be 20 feet, except in the case of flammable or combustible liquid tanks operating at pressures exceeding 2.5 psig or equipped with emergency venting which will permit pressures to exceed 2.5 psig in which case the provisions of section Ind 8.21 (3) (a) and (b) shall apply. Suitable means shall be taken to prevent the accumulation of flam-

mable or combustible liquids under adjacent liquefied petroleum gas containers such as by diversion curbs or grading. When flammable or combustible liquid storage tanks are within a diked area, the liquefied petroleum gas containers shall be outside the diked area. The foregoing provisions shall not apply when liquefied petroleum gas containers of 125 gallons or less capacity are installed adjacent to fuel oil supply tanks of 550 gallons or less capacity.

(4) NORMAL VENTING FOR ABOVEGROUND TANKS. (a) Atmospheric storage tanks shall be adequately vented to prevent the development of vacuum or pressure sufficient to distort the roof of a cone roof tank or exceeding the design pressure in the case of other atmospheric tanks, as a result of filling or emptying and atmospheric temperature changes.

Note: See subsection Ind 8.10 (4) (a) for further requirements.

(b) Normal vents shall be at least as large as the filling or withdrawal connection, whichever is larger, but in no case less than 1¼ inch nominal inside diameter.

1. Exception. The size of vents designed and constructed according to standards approved by the department will be accepted.

Note: The department will accept vents designed and constructed according to American Petroleum Institute Guide for Tank Venting, STD-2000—1968.

(c) Low-pressure tanks and pressure vessels shall be adequately vented to prevent development of pressure or vacuum, as a result of filling or emptying and atmospheric temperature changes, from exceeding the design pressure of the tank or vessel. Protection shall also be provided to prevent over-pressure from any pump discharging into the tank or vessel when the pump discharge pressure can exceed the design pressure of the tank or vessel.

(d) If any tank or pressure vessel has more than one fill or withdrawal connection and simultaneous filling or withdrawal can be made, the vent size shall be based on the maximum anticipated simultaneous flow.

(e) Unless the vent is designed to limit the internal pressure 2.5 psi or less, the outlet of vents and vent drains shall be arranged to discharge in such a manner as to prevent localized overheating of any part of the tank in the event vapors from such vents are ignited.

(f) Tanks and pressure vessels storing class IA and IB liquids shall be equipped with venting devices which shall be normally closed except when venting to pressure or vacuum conditions. Tanks and pressure vessels storing class IB and IC liquids shall be equipped with venting devices which shall be normally closed except when venting under pressure or vacuum conditions, or with approved flame arresters.

1. Exception: Tanks of 3,000 bbls. capacity or less containing crude petroleum in crude-producing areas; and, outside aboveground atmospheric tanks under 1,000 gallons capacity containing other than class IA flammable liquids may have open vents. (See subsection Ind 8.21 (6) (b).)

(g) Flame arresters or venting devices required in subsection Ind 8.21 (4) (f) may be omitted for class IB and IC liquids where conditions are such that their use may in case of obstruction, result in tank damage.

(5) EMERGENCY RELIEF VENTING FOR FIRE EXPOSURE FOR ABOVE-GROUND TANKS. (a) Every aboveground storage tank shall have some form of construction or device that will relieve excessive internal pressure caused by exposure fires.

Note: See subsection Ind 8.10 (4) (a) for further requirements.

(b) In a vertical tank the construction referred to in Ind 8.21 (5) (a) may take the form of a floating roof, lifter roof, a weak roof-to-shell seam or other approved pressure relieving construction. The weak roof-to-shell seam shall be constructed to fail preferential to any other seam.

(c) Where entire dependence for emergency relief is placed upon pressure relieving devices, 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. If unstable liquids are stored, the effects of heat or gas resulting from polymerization, decomposition, condensation, or self-reactivity shall be taken into account. The total capacity of both normal and emergency venting devices shall be not less than that derived from table 6 through 9 except as provided in section Ind 8.21 (5) (d) or (e). Such device may be of a self-closing manhole cover, or one using long bolts that permit the cover to lift under internal pressure, or an additional or larger relief valve or valves. The wetted area of the tank shall be calculated on the basis of 55% of the total exposed area of a sphere or spheroid, 75% of the total exposed area of a sphere or spheroid, 75% of the total exposed area of a horizontal tank and the first 30 feet above grade of the exposed shell area of a vertical tank.

Note: See tables 6 through 9 for the square footage of typical tank sizes.

TABLE 6
WETTED AREA VERSUS CUBIC FEET FREE AIR PER HOUR
(14.7 psia and 60° F.)

Sq. Ft.	CFH	Sq. Ft.	CFH	Sq. Ft.	CFH
20	21,100	200	211,000	1,000	524,000
30	31,600	250	239,000	1,200	557,000
40	42,100	300	265,000	1,400	587,000
50	52,700	350	288,000	1,600	614,000
60	63,200	400	312,000	1,800	639,000
70	73,700	500	354,000	2,000	662,000
80	84,200	600	392,000	2,400	704,000
90	94,800	700	428,000	2,800	742,000
100	105,000	800	462,000	end over	
120	126,000	900	493,000		
140	147,000	1,000	524,000		
160	168,000				
180	190,000				
200	211,000				

Note: 1. Interpolate for intermediate values.
2. For reference see N.F.P.A. No. 30.

The wetted area of the tank shall be calculated on the basis of 55% of the total exposed area of a sphere or spheroid, 75% of the total exposed area of a horizontal tank and the first 30 feet abovegrade of the exposed shell area of a vertical tank.

(d) For tanks and storage vessels designed for pressures over 1 psig, the total rate of venting shall be determined in accordance with table 6, except that when the exposed wetted area of the surface is greater than 2,800 square feet, the total rate of venting shall be calculated by the following formula:

$$CFH = 1,107A^{0.82}$$

Where: CFH = venting requirement, in cubic feet of free air per hour.

A = exposed wetter surface in square feet.

Note: The foregoing formula is based on

$$Q = 21,000 A^{0.82}$$

(e) The total emergency relief venting capacity for any specific stable liquid may be determined by the following formula:

Cubic feet of free air per hour equals

$$\frac{V \sqrt{1337}}{L \sqrt{M}}$$

Where: V = cubic feet of free air per hour from table 6.

L = latent heat of vaporization of specific liquid in BTU per lb.

M = molecular weight of specific liquids.

Note: The following information is given to correlate with requirements of above rule:

Emergency Relief Venting for Fire Exposure
For Aboveground Tanks

The requirements for emergency venting given in Table 6 and the modification factors section in Ind 8.21 (5) (e) are derived from a consideration of:

1. Probable maximum rate of heat transfer per unit area;
2. Size of tank and the percentage of total area likely to be exposed;
3. Time required to bring tank contents to boil;
4. Time required to heat unwet portions of the tank shell or roof to a temperature where the metal will lose strength;
5. Effect of drainage, insulation and the application of water in reducing fire exposure and heat transfer.

Table 6 is based on a composite curve which is considered to be composed of three straight lines when plotted on log-log paper. The curve may be defined in the following manner:

The first straight line is drawn on log-log paper between the point 400,000 Btu/hr., at 20 sq. ft. exposed surface area and the point 4,000,000 Btu/hr., 200 sq. ft. exposed surface area. The equation for this portion of the curve is $Q = 20,000A$.

The second straight line is drawn on log-log graph paper between the

TABLE 7

Q=20,000 A		Q=199,800 A ^{.566} & .338		Q=968,400 A ^{.566} & .338	
A	Q	A	Q	A	Q
20	400,000	200	4,000,000	1,000	10,000,000
30	600,000	250	4,589,000	1,200	10,598,000
40	800,000	300	5,032,000	1,400	11,122,000
50	1,000,000	350	5,491,000	1,600	11,601,000
60	1,200,000	400	5,922,000	1,800	12,040,000
70	1,400,000	500	6,719,000	2,000	12,449,000
80	1,600,000	600	7,450,000	2,400	13,188,000
90	1,800,000	700	8,129,000	2,800	14,000,000
100	2,000,000	800	8,768,000	and over	
120	2,400,000	900	9,372,000		
140	2,800,000	1,000	10,000,000		
160	3,200,000				
180	3,600,000				
200	4,000,000				

points 4,000,000 Btu/hr., at 200 sq. ft. exposed surface area and 9,950,000 Btu/hr., at 1,000 sq. ft. exposed surface area. The equation for this portion of the curve is $Q = 199,300A^{0.509}$.

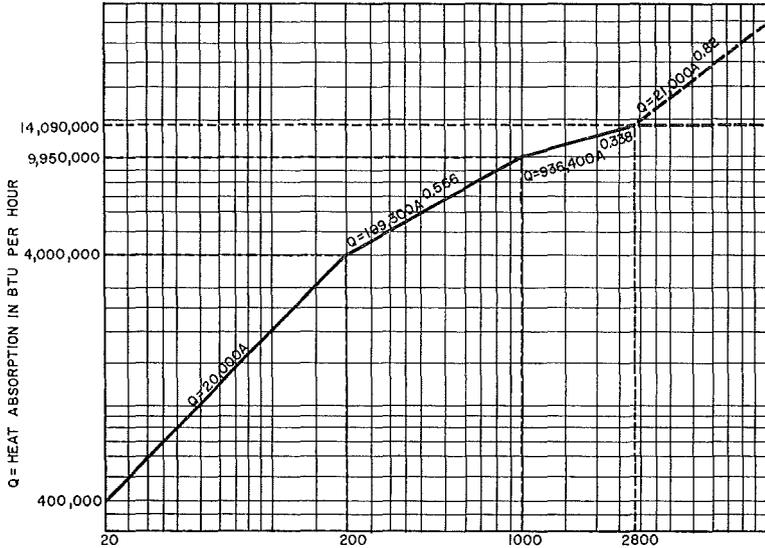
The third straight line is plotted on log-log graph paper between the points 9,950,000 Btu/hr., at 1,000 sq. ft. exposed surface area and 14,090,000 Btu/hr., at 2,800 sq. ft. exposed surface area. The equation for this portion of the curve is $Q = 963,400A^{0.338}$.

For areas exceeding 2,800 square feet it has been concluded that complete fire involvement is unlikely, and loss of metal strength from overheating will cause failure in the vapor space before development of maximum possible vapor evolution rate. Therefore, additional venting capacity beyond the vapor equivalent of 14,090,000 Btu/hr. will not be effective or required.

For tanks and storage vessels designed for pressures over 1 psig, additional venting for exposed surfaces beyond 2,800 sq. ft. is believed to be desirable because, under these storage conditions, liquids are stored close to their boiling points. Therefore, the time to bring the container contents to boiling conditions may not be significant. For these situations a heat input value should be determined on the basis of $Q = 21,000A^{0.53}$

The flow capacities are based on the assumption that the stored liquid will have the characteristics of hexane, and the vapor liberated has been transposed to equivalent free air at 60°F. and 14.7 psia by using appropriate factors in:

$CFH = \frac{70.5 Q}{L \sqrt{M}}$ where 70.5 is the factor for converting pounds of gas to cubic feet of air; Q = the total heat input per hour expressed in Btu; L = latent heat of vaporization; and M = molecular weight.



A = EXPOSED WETTED SURFACE AREA IN SQUARE FEET

Curve for Determining Requirements for Emergency Venting During Fire Exposure

No consideration has been given to possible expansion from the heating of the vapor above the boiling point of the liquid, its specific heat, or the difference in density between the discharge temperature and 60°F., since some of these changes are compensating.

Since tank vent valves are ordinarily rated in CFH standard air, the figures derived from table 6 may be used with the appropriate tank pressure as a basis for valve selection.

The attached table gives for a variety of chemicals the constants which can be used to compute the vapor generated and equivalent free air for liquids other than hexane, where greater exactness is desired. Inspection of the table will show that the use of hexane in deriving table 6 provides results which are within an acceptable degree of accuracy for the listed liquids.

TABLE 8

Chemical	$L \sqrt{M}$	Molecular Weight	Heat of Vaporization Btu per Lb. at Boiling Point
Acetaldehyde	1673	44.05	252
Acetic acid	1350	60.05	174
Acetic anhydride	1792	102.09	177
Acetone	1708	58.08	224
Acetonitrile	2000	41.05	312
Acrylonitrile	1930	53.05	265
n-Amyl alcohol	2025	88.15	216
iso-Amyl alcohol	1990	88.15	212
Aniline	1795	93.12	186
Benzene	1493	78.11	169
n-Butyl acetate	1482	116.16	193
n-Butyl alcohol	2185	74.12	254
iso-Butyl alcohol	2135	74.12	248
Carbon disulfide	1310	76.13	150
Chlorobenzene	1422	112.56	134
Cyclohexane	1414	84.16	154
Cyclohexanol	1953	100.16	195
Cyclohexanone	1625	98.14	164
o-Dichlorobenzene	1455	147.01	120
cis-Dichloroethylene	1350	96.96	137
Diethyl amine	1403	73.14	164
Dimethyl acetamide	1997	87.12	214
Dimethyl amine	1676	45.08	250
Dimethyl formamide	2120	73.09	248
Dioxane (diethylene ether)	1665	88.10	177
Ethyl acetate	1477	88.10	157
Ethyl alcohol	2500	46.07	368
Ethyl chloride	1340	64.52	167
Ethylene dichloride	1363	98.97	137
Ethyl ether	1310	74.12	152
Furan	1362	68.07	165
Furfural	1962	96.08	200
Gasoline	1370-1470	96.0	140-150
n-Heptane	1333	100.20	138
n-Hexane	1337	86.17	144
Hydrogen cyanide	2290	27.03	430
Methyl alcohol	2680	32.04	474
Methyl ethyl ketone	1623	72.10	191
Methyl methacrylate	1432	100.14	143
n-Octane	1412	114.22	132
n-Pentane	1300	72.15	153
n-Propyl acetate	1468	102.13	145
n-Propyl alcohol	2295	60.09	296
iso-Propyl alcohol	2225	60.09	287
Tetrahydro furan	1428	72.10	168
Toluene	1500	92.13	156
Vinyl acetate	1532	86.09	165
o-Xylene	1538	106.16	149

Note: For data on other chemicals, see chemistry handbook.

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TABLE 9
APPROXIMATE WETTED AREAS FOR HORIZONTAL TANKS
 (Wetted Area Equals 75 Percent Total Area)

Tank Diameter, Feet	3	4	5	6	7	8	9	10	11	12	
Tank Length, Feet	APPROXIMATE WETTED AREA OF TANKS WITH FLAT HEADS										
3	32										
4	39	55									
5	46	65	88								
6	53	74	100	128							
7	60	84	112	142	173						
8	67	93	124	156	190	226					
9	74	102	136	170	206	245	286				
10	81	112	147	184	223	264	308	353			
11	88	121	159	198	239	283	329	377	428		
12	95	131	171	218	256	301	350	400	454	509	
13	102	140	183	227	272	320	371	424	480	537	
14	109	150	194	241	289	339	393	447	506	565	
15	116	159	206	255	305	358	414	471	532	594	
16	126	169	218	269	322	377	435	495	558	622	
17	130	178	230	283	338	395	456	518	584	650	
18	137	188	242	298	355	414	477	542	610	678	
19		197	253	312	371	433	499	565	636	707	
20		206	265	326	388	452	520	589	662	735	
21		216	277	340	404	471	541	612	688	763	
22		225	289	354	421	490	562	636	714	792	
23		235	300	368	437	508	584	659	740	820	
24			312	383	454	527	605	683	765	848	
25			324	397	470	546	626	706	791	876	
26			336	411	487	565	647	730	817	905	
27			347	425	503	584	668	754	843	933	
28			359	440	520	603	690	777	869	961	
29			371	454	536	621	711	801	895	989	
30			383	468	553	640	732	824	921	1018	
31			395	482	569	659	753	848	947	1046	
32				496	586	678	775	871	973	1074	
33				510	602	697	796	895	999	1103	
34				524	619	715	817	918	1025	1131	
35				539	635	734	838	942	1051	1159	
36				553	652	753	860	966	1077	1187	
37				567	668	772	881	989	1103	1216	
38					685	791	902	1013	1129	1244	
39					701	810	923	1036	1155	1272	
40					718	828	944	1060	1181	1301	
41					734	847	966	1083	1207	1329	
42					751	866	987	1107	1233	1357	
43					767	885	1008	1130	1259	1385	
44						904	1029	1154	1284	1414	
45						923	1051	1178	1310	1442	
46						941	1072	1201	1336	1470	
47						960	1093	1225	1362	1498	
48						979	1114	1248	1388	1527	
49						998	1135	1272	1414	1555	
50							1157	1295	1440	1583	
51							1178	1319	1466	1612	
52							1199	1342	1492	1640	
53							1220	1366	1518	1668	
54							1246	1389	1544	1696	
55							1263	1413	1570	1725	
56								1437	1593	1753	
57								1460	1622	1781	
58								1484	1648	1809	
59								1507	1674	1839	
60								1531	1700	1866	
61									1726	1894	
62									1752	1923	
63									1778	1951	
64									1803	1979	
65									1829	2007	
66									1855	2036	
67										2064	
68										2092	
69										2120	
70										2149	
71										2177	
72										2206	

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(f) The required air flow rate of Ind 8.21 (5) (c) or (d) may be multiplied by the appropriate factor listed in the following schedule when protection is provided as indicated. Only one factor may be used for any one tank.

0.5 for drainage in accordance with Ind 8.21 (7) (d) 2. for tanks over 200 square feet of wetted area.

0.3 for approved water spray

0.3 for approved insulation.

0.15 for approved water spray with approved insulation.

(g) The outlet of all vents and vent drains on tanks equipped with emergency venting to permit pressures exceeding 2.5 psig 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.

(h) Each commercial tank venting device shall have stamped on it the opening pressure, the pressure at which the valve reaches the full open position, and the flow capacity at the latter pressure, expressed in cubic feet per hour of air at 60° F. and at a pressure of 14.7 psia.

(i) The flow capacity of tank venting devices 12 inches and smaller in nominal pipe size shall be determined by actual test of each type and size of vent. These flow tests may be conducted by the manufacturer if certified by a qualified impartial observer, or may be conducted by an outside agency. The flow capacity of tank venting devices larger than 12 inches nominal pipe size, including manhole covers with long bolts or equivalent, may be calculated provided that the opening pressure is actually measured, the rating pressure and corresponding free orifice area are stated, the word "calculated" appears on the nameplate, and the computation is based on a flow coefficient of 0.5 applied to the rated orifice area.

(6) VENT PIPING. (a) Vent piping shall be constructed in accordance with section Ind 8.30, Pipes, Valves and Fittings.

(b) Where vent pipe outlets for tanks storing class I liquids are adjacent to buildings or public ways, they shall be located so that the vapors are released at a safe point outside of buildings and not less than 12 feet above the adjacent ground level. In order to aid their dispersion, vapors shall be discharged upward or horizontally away from closely adjacent walls. Vent outlets shall be located so that flammable vapors will not be trapped by eaves or other obstructions and shall be at least 5 feet from building openings.

(c) When tank vent piping is manifolded, pipe sizes shall be such as to discharge, within the pressure limitations of the system, the vapors they may be required to handle when manifolded tanks are subject to the same fire exposure.

1. The manifolding of tank vent piping shall be avoided except where required for special purposes such as vapor recovery, vapor conservation or air pollution control.

2. The possible hazards of cross-contamination of tank contents shall be avoided when tanks are manifolded through vent piping.

(7) 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 adjoin-

ing 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.

(b) *Flammable and combustible liquids other than crude petroleum.* Flammable and combustible liquids other than crude petroleum individual tanks or groups of tanks, where deemed necessary by the department because 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 subsections Ind 8.21 (7) (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 to satisfy the structural requirements of the Wis. Adm. Code, chapters 50-59, Building and Heating, Ventilating and Air Conditioning. 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 interior 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 boil over wave, provided however, that a flareback section shall not be required for dikes and walls enclosing approved floating roof tanks.

(d) *Drainage.* 1. Where provision is made for draining rainwater from diked areas, such drains shall normally be kept closed and shall be so designed that when in use they will not permit flammable or combustible 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.

2. Where protection of adjoining property or waterways is by means of a natural or man-made drainage system, such systems shall comply with the following:

a. A slope of not less than 1% away from the tank toward the drainage system shall be provided.

b. The drainage system shall terminate in vacant land or other approved area or in an impounding basin having a capacity not smaller than that of the largest tank served. This termination area and the route of the drainage system shall be so located that, if the flammable or combustible liquids in the drainage system are ignited, the fire will not seriously expose tanks or adjoining property.

c. The drainage system, including approved automatic drainage pumps, shall not discharge to adjoining property, natural water courses, public sewers, or public drains unless the discharge of flammable or combustible liquids would not constitute a hazard, or the system shall be designed with separator boxes or other approved

means to prevent flammable or combustible liquids to flow uncontrolled outside the diked area.

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

(8) **STAIRS, PLATFORMS**. Stairs, platforms, and walkways shall be constructed to satisfy Wis. Adm. Code, chapter 1, Safety.

(9) **TANK OPENINGS OTHER THAN VENTS**. (a) *Connections*. Connections for all tank openings shall be vapor and liquid tight. Vents are covered in subsections Ind 8.21 (4) through 8.21 (6).

(b) *Tank valves*. 1. External valves. Each connection to an above-ground tank storing flammable or combustible 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.

2. Emergency internal valves. In addition to any normal valves, there must be an extra valve at each pipeline 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 pipelines are broken from the tank. These extra valves are not required in crude or residual 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. These valves shall be inspected and manually operated annually by the owner (operator). Exemptions to above requirements are as follows:

a. On tanks installed prior to the effective date of these regulations this valve may be external if the size of the opening makes it impractical to use an internal valve, provided the valve used incorporates a shear section and is so installed that any undue strain beyond the valve will not cause failure between the valve and the tank. Any enlargement of opening in tank will require installation of interval valve.

b. These extra valves are not required for crude or residual oil tanks.

c. Internal valves are not required in tank openings with less than nominal $\frac{3}{4}$ inch inside diameter.

(c) The use of one valve to fulfill the requirements of subsections Ind 8.21 (9) (a) and (b) 1. and 2. shall be permissible provided the combination valve affords manual control equivalent to that of the external valve and provides effective closure inside the tank shell when the heat actuated control device functions.

(d) Each connection below the liquid level through which liquid does not normally flow shall be provided with a liquid tight closure. This may be a valve, plug or blind, or a combination of these.

(e) Openings for gauging shall be provided with a vapor tight cap or cover.

(f) For class IB and class IC liquids other than crude oils, gasolines and asphalts, the fill pipe shall be so designed and installed as to minimize the possibility of generating static electricity. A fill pipe entering the top of a tank shall terminate within 6 inches of the

bottom of the tank and shall be installed to avoid excessive vibration.

(g) Filling and emptying connections which are made and broken shall be located outside of buildings at a location free from any source of ignition and not less than 5 feet away from any building opening. Such connection shall be closed and liquid tight when not in use. The connections shall be properly identified.

(10) 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."

(11) TANKS NOT IN USE. Aboveground tanks temporarily out of service or abandoned shall be equipped with valves and vents in accordance with Ind 8.21 or made gas free and have pipe plugs installed in all tank openings.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.22 Installation of underground tanks. (1) LOCATION. Excavation for underground storage tanks shall be made with due care to avoid undermining of foundations of existing structures. 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 transmitted to the tank. The distance from any part of a tank storing class I liquids to the nearest wall of any basement or pit shall be not less than one foot, and to any property line that may be built upon, not less than 3 feet. The distance from any part of a tank storing class II or class III liquids to the nearest wall of any basement, pit or property line shall be not less than one foot.

(2) **DEPTH AND COVER.** Underground tanks shall be set on firm foundations and surrounded with at least 6 inches of noncorrosive, inert materials such as clean sand, earth or gravel well tamped in place. The tank shall be placed in the hole with care since dropping or rolling of the tank into the hole can break a weld, puncture or damage the tank or scrape off the protective coating of coated tanks. 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 the depth of at least 2 feet with a slope on all sides not steeper than 1-½ feet horizontal to one foot vertical.

(3) **CORROSION PROTECTION.** Corrosion protection for the tank and its piping shall be provided by one or more of the following methods:

- (a) Use of protective coatings or wrappings.
- (b) Cathodic protection or

(c) Corrosion resistant materials of construction.

(4) VENTS. (a) *Location and arrangement of vents for class I liquids.* Vent pipes from tanks storing class I liquids shall be so located that the discharge point is outside the buildings, higher than the fill pipe opening, and not less than 12 feet above the adjacent ground level. Vent pipes shall discharge only upward in order to disperse vapors. Vent pipes 2 inches or less in nominal inside diameter shall not be obstructed by devices that will 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. If the vent pipe is less than 10 feet in length or greater than 2 inches in nominal inside diameter, the outlet shall be provided with a vacuum and pressure relief device or there shall be an approved flame arrester located in the vent line at the outlet or within the approved distance from the outlet.

Note: See subsection Ind 8.10 (4) (b) for further requirements.

(b) *Size of vents.* Each tank shall be vented through piping adequate in size to prevent blowback of vapor or liquid at the fill opening while tank is being filled. Vent pipes shall be not less than 1¼ inch nominal inside diameter.

TABLE 10
VENT LINE DIAMETERS

Maximum Flow GPM	Pipe Length*		
	50 Ft.	100 Ft.	200 Ft.
100.....	1¼ inch	1¼ inch	1¼ inch
200.....	1¼ inch	1¼ inch	1¼ inch
300.....	1¼ inch	1¼ inch	1½ inch
400.....	1¼ inch	1½ inch	2 inch
500.....	1½ inch	1½ inch	2 inch
600.....	1½ inch	2 inch	2 inch
700.....	2 inch	2 inch	2 inch
800.....	2 inch	2 inch	3 inch
900.....	2 inch	2 inch	3 inch
1,000.....	2 inch	2 inch	3 inch

*Note: Vent lines of 50 feet, 100 feet, and 200 feet of pipe plus 7 ells.

Note: The vent size depends upon the filling or withdrawal rate whichever is larger, the vent line length and tank design pressure. Vent piping sized in accordance with this table will prevent the pressure in the tank from exceeding 2.5 psig.

(c) *Location and arrangement of vents for class II or class III liquids.* Vent pipes from tanks storing class II or class III flammable liquids shall terminate outside of buildings 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.

(d) *Vent piping.* Vent piping shall be constructed in accordance with section Ind 8.30, Pipes, Valves and Fittings. 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 subject to physical damage. The tank end of the vent pipe shall enter the tank through the top.

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(e) *Tank vent piping manifolded.* When tank vent piping is manifolded, pipe sizes shall be such as to discharge, within the pressure limitations of the system, the vapors they may be required to handle when manifolded tanks are filled simultaneously.

1. The manifolding of tank vent piping shall be avoided except where required for special purposes such as vapor recovery, vapor conservation or air pollution control.

2. The possible hazards of cross-contamination of tanks shall be considered when tanks are manifolded through vent piping.

(5) **TANK OPENINGS OTHER THAN VENTS.** (a) Connections for all tank openings shall be vapor or liquid tight. (b) Openings for manual gauging, if independent of the fill pipe, shall be provided with a liquid tight cap or cover. If inside a building, each such opening shall be protected against liquid overflow and possible vapor release by means of a spring loaded check valve or other approved device.

(c) Fill and discharge lines shall enter tanks only through the top. Fill lines shall be sloped toward the tank.

(d) For class IB and class IC liquids other than crude oils, gasolines and asphalts, the fill pipe shall be so designed and installed as to minimize the possibility of generating static electricity by terminating within 6 inches of the bottom of the tank.

(e) Filling and emptying connections which are made and broken shall be located outside of buildings at a location free from any source of ignition and not less than 5 feet away from any building opening. Such connection shall be closed and liquid tight when not in use. The connection shall be properly identified.

(6) **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, August, 1971, No. 188, eff. 9-1-71.

Ind 8.23 Installation of tanks inside of buildings. (1) **CLASS I LIQUIDS.** Tanks for storage of class I flammable liquids shall not be installed inside buildings except as provided under sections Ind 8.70 to 8.985. Tanks for storage of class I flammable liquids may be installed under a building as an underground tank complying with section Ind 8.22.

(2) **CLASS II AND III LIQUIDS.** (a) Tanks or barrels with aggregate capacity of 1,100 gallons or less shall be located in an enclosure as required by Wis. Adm. Code chapters 50-59, Building and Heating, Ventilating and Air Conditioning.

(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 equi-

valent fire-resistive construction, except that where floor or roof construction above the enclosures is concrete or other fire-resistive construction, the walls may be extended to and sealed 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 noncombustible 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. Vents for tanks inside of buildings shall be as provided in subsections Ind 8.21 (4), (5), (6) and 8.22 (4), except that emergency venting by the use of weak roof seams on tanks shall not be permitted. Vents shall discharge vapors outside the buildings.

Note: See subsection Ind 8.10 (4) (b) for further requirements.

(4) VENT PIPING. Vent piping shall be constructed in accordance with section Ind 8.30, Pipes, Valves and Fittings.

(5) TANK OPENINGS OTHER THAN VENTS. (a) Connections for all tank openings shall be vapor or liquid tight.

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

(c) Flammable or combustible liquid tanks located inside of buildings, except in one-story buildings designed and protected for flammable or combustible liquid storage, shall be provided with an automatic closing heat actuated valve on each withdrawal connection below the liquid level, except for connections used for emergency disposal, to prevent continued flow in the event of fire in the vicinity of the tank. This function may be incorporated in the valve required in subsection (5) (b) and if a separate valve, it shall be located adjacent to the valve required in subsection (5) (b).

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

(e) For class IB and class IC liquids other than crude oils, gasolines and asphalts, the fill pipe shall be so designed and installed as to minimize the possibility of generating static electricity by terminating within 6 inches of the bottom of the tank.

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

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

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

(i) Inside storage tanks for class III flammable liquids shall be provided with drawoff or drain openings. Tanks shall be installed so that the bottom pitches to the drawoff or drain openings at a slope of not less than $\frac{1}{4}$ inch per foot of length. The drawoff 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, August, 1971, No. 188, eff. 9-1-71.

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; c) removal; or d) tanks stored aboveground.

Note: Also see section Ind 8.20 (3).

(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 or combustible liquids.
2. Cap or plug the fill line, gauge opening, and pump suction, using appropriate sealing compound on pipe fittings. If fill line and gauge openings 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 or combustible liquid from the tank and from all connecting lines.
2. Disconnect the suction, inlet, gauge, and vent lines.
3. Fill the tank completely with an inert solid material. Cap remaining underground piping.

(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.

(d) *Removed underground tanks stored aboveground.* The following steps shall be taken before tanks are stored:

1. Remove all flammable liquid from tank.
2. Flush the tank to overflowing with water or take necessary steps to make it gas free.
3. Install pipe plugs in all openings.

4. If deemed necessary by the department, the tank storage area shall be enclosed with no less than 6 foot high industrial type fence to minimize trespassing or tampering.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.26 Removal or dismantling of aboveground field erected storage tanks. The procedures for the removal or dismantling of aboveground field erected storage tanks shall be approved by the department.

Note: The Department will accept recommended practice for cleaning petroleum storage tanks covered by API RP 2015 1st Edition 1968 in satisfying above requirements.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.27 Leaking tanks. Tanks found to be leaking shall be repaired, taken temporarily out of service, abandoned in place, or removed as provided in section Ind 8.25 and 8.26.

Note: For additional requirements see subsection Ind 8.20 (3).

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.28 Sources of ignition. (1) In locations where flammable or combustible vapors may be present, precautions shall be taken to prevent ignition by eliminating or controlling sources of ignition. Sources of ignition may include open flames, lightning, smoking, cutting and welding, hot surfaces, frictional heat, sparks (static, electrical and mechanical), spontaneous ignition, chemical and physical chemical reactions and radiant heat.

Note: See section Ind 8.10 (4) (b) for further requirements.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

PIPES, VALVES AND FITTINGS

Ind 8.30 General. (1) The design (including selection of materials), fabrication, assembly, test and inspection of piping systems containing flammable or combustible liquids shall be suitable for the expected working pressures and structural stresses.

Note: 1. Conformity with the applicable provisions of ASA B31 American Standard Code for Pressure Piping, and the provisions of this chapter, will be considered prima facie evidence of compliance with the foregoing provisions.

Note: 2. See section Ind 8.10 (4) (b) for further requirements.

(2) Exceptions:

(a) Tubing or casing on any oil or gas wells and any piping connected directly thereto.

(b) Motor vehicle, aircraft, boat or portable or stationary engine.

(c) Piping within the scope of any applicable boiler and pressure vessel code.

(d) Pipeline systems operating between or within refineries, boat or barge docks, marine terminals or pipeline terminals, or tank farm storage adjunctive thereto.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.31 Materials. (1) Materials for piping, valves or fittings shall be steel or nodular iron except as provided in subsection (2), (3) and (4).

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(a) Nodular iron shall meet requirements of section Ind 8.03 (1) (c) with reference to ferritic ductile iron castings for valves, flanges, pipe fittings and other piping components.

(2) Materials other than steel or nodular iron may be used underground if required by the properties of the flammable or combustible liquid handled.

Note: In case of doubt, the supplier, producer of the flammable or combustible liquid, or other competent authority should be consulted as to the suitability of the material of construction to be used.

(3) Material other than steel or nodular iron shall be designed to specifications embodying principles recognized as good engineering design for the material used and shall be approved by the department.

(4) Piping, valves and fittings may have combustible or noncombustible linings.

Note: When low melting point materials such as aluminum and brass or materials that soften on fire exposure such as plastics, or nonductile materials such as cast iron, are used, special consideration should be given to their behavior on fire exposure. If such materials are used in aboveground piping systems or inside buildings, they should be suitably protected against fire exposure or so located that any spill resulting from the failure of these materials could not unduly expose persons, important buildings or structures or can be readily controlled by remote valves.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.32 Pipe joints. (1) Joints shall be made liquid tight. Welded or threaded metal connectors shall be used. Threaded joints and connections shall be made up tight with a suitable lubricant or piping compound and be maintained in a liquid tight condition.

(a) Pipe joints dependent upon the friction or compression characteristics of either combustible or noncombustible materials for mechanical continuity of piping shall not be used.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.33 Supports. (1) Piping systems shall be substantially supported and protected against physical damage and excessive stresses arising from settlement, vibration, expansion or contraction, by use of swing joints at underground tank and directly below dispensing unit. Supports for aboveground piping shall be of noncombustible material.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.34 Protection against corrosion. (1) All piping for flammable or combustible liquids, both aboveground and underground, where subject to external corrosion, shall be painted or otherwise protected.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.35 Valves. (1) Piping systems shall contain a sufficient number of valves to operate the system properly and to protect the plant. Piping 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. Each connection to pipelines, by which equipment such as tank cars or tank vehicles discharge liquids by means of pumps into storage tanks, shall be provided with a check valve for automatic protection against backflow.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.36 Pumps and piping. (1) In intraplant systems, pump or piping connected for handling class I liquids shall not be so con-

nected or manifolded as to permit their intermittent or alternate use for class II or class III liquids.

(2) 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.

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

(4) Pumps shall be maintained liquid tight.

(5) Provisions of section Ind 8.36 do not apply to pipeline systems operation between or within refineries, boat or barge docks, marine terminals or pipeline terminals or tank farm storage adjunctive thereto.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.37 Testing. All piping before being covered, enclosed or placed in use shall be hydrostatically tested to 150% of the maximum anticipated pressure of the system, or pneumatically tested to 110% of the maximum anticipated pressure of the system, but not less than 5 pounds per square inch gauge at the highest point of the system. This test shall be maintained for a sufficient time to complete visual inspection of all joints and connections, but for at least 10 minutes.

Note: Also see subsection Ind 8.20 (3).

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

CONTAINER AND PORTABLE TANK STORAGE

Ind 8.40 Container and portable tank storage. (1) **SCOPE.** This section shall apply only to the storage of flammable or combustible liquids in drums or other containers (including flammable aerosols) not exceeding 60 gallons individual capacity and those portable tanks not exceeding 660 individual capacity.

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

(b) This section shall not apply to the following:

1. Storage of containers in bulk plants, service stations, refineries, chemical plants and distilleries.

2. Flammable liquids in the fuel supply tank permanently connected to an internal combustion engine.

3. Flammable liquids in the fuel supply tank which is structurally a part of any appliance or device consuming the fuel.

4. Flammable or combustible paints, oils, varnishes and similar mixtures used for painting or maintenance when not kept for a period in excess of 30 days.

5. Beverages when packaged in individual containers not exceeding one gallon in size.

(2) **DESIGN, CONSTRUCTION, AND CAPACITY OF CONTAINERS.** (a) Only approved containers and portable tanks shall be used.

Note: 1. Metal containers and portable tanks meeting the requirements of and containing products authorized by Code of Federal Regulations, chapter I, Title 49—Transportation, will be accepted by the department.

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Note: 2. The department will accept containers or portable tanks approved for use, with the product to be contained, by Underwriters' or other nationally recognized testing laboratories for the product to be contained therein.

Note: 3. For other requirements see section 168.11, Wis. Stats.

(b) Each portable tank shall be provided with one or more devices installed in the top with sufficient emergency venting capacity to limit internal pressure under fire exposure conditions to 10 psig, or 30% of the bursting pressure of the tank, whichever is greater. The total venting capacity shall be not less than that specified in sections Ind 8.21 (5) (c) or (e). At least one pressure actuated vent having a minimum capacity of 6,000 cu. ft. of free air (14.7 psia and 60° F.) shall be used. It shall be set to open at not less than 5 psig. If fusible vents are used, they shall be actuated by elements that operate at a temperature not exceeding 300° F.

(c) Flammable and combustible liquids packaged for sale or use shall conform to table 11.

**TABLE 11
MAXIMUM ALLOWABLE SIZE OF CONTAINERS
AND PORTABLE TANKS**

Container Type	Flammable Liquids				Combustible Liquids Class III
	Class IA	Class IB	Class IC	Class II	
Glass or Approved Plastic.....	1 pt.	1 qt.	1 gal.	1 gal.	1 gal.
Metal (Other than DOT Drums).....	1 gal.	5 gal.	5 gal.	5 gal.	5 gal.
Safety Cans.....	2 gal.	5 gal.	5 gal.	5 gal.	5 gal.
Metal Drums (DOT Spec.).....	60 gal.	60 gal.	60 gal.	60 gal.	60 gal.
Approved Portable Tanks.....	660 gal.	660 gal.	660 gal.	660 gal.	660 gal.

1. Container exemptions:

a. Medicines, beverages, foodstuffs, cosmetics, and other common consumer items, when packaged according to commonly accepted practices, shall be exempt from the requirements of subsections (2) (a) and (c).

b. Upon presentation of satisfactory proof that storage of flammable or combustible liquids in metal containers would affect their chemical purity or result in excessive corrosion of the container, the department may approve other containers.

(3) DESIGN, CONSTRUCTION AND CAPACITY OF STORAGE CABINETS. (a) Not more than 60 gallons of flammable or 120 gallons of combustible liquids may be stored in a storage cabinet. When approved by the department, 3 such cabinets may be located in a single fire area.

(b) Storage cabinets shall be designed and constructed to limit the internal temperature to not more than 325° F. when subjected to a 10 minute fire test using the standard time temperature curve as set forth in ASTM Standard adopted under section Ind 8.03 (1) (a). All joints and seams shall remain tight and the door shall remain securely closed during the fire test. Cabinets shall be labeled in conspicuous lettering, "FLAMMABLE—KEEP FIRE AWAY."

(c) Metal cabinets constructed in the following manner shall be deemed to be in compliance with section Ind 8.40 (3) (b). 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 three-point lock, and the door shall be raised at least 2 inches above the bottom of the cabinet.

(d) Wooden cabinets constructed in the following manner shall be deemed in compliance with section Ind 8.40 (3) (b). The bottom, sides and top shall be constructed of an approved grade of plywood at least 1 inch in thickness, which shall not break down or delaminate under fire conditions. All joints shall be rabbeted and shall be fastened in 2 directions with flathead wood screws. When more than one door is used, there shall be a rabbeted overlap of not less than 1 inch. Hinges shall be mounted in such a manner as to not lose their holding capacity due to loosening or burning out of the screws when subjected to the fire test.

(4) DESIGN AND CONSTRUCTION OF INSIDE STORAGE ROOMS. The design and construction of inside storage rooms shall comply with the following general requirements:

(a) The room shall have at least one exterior wall.

(b) Walls, floors and roof or floor assemblies above shall be non-combustible with at least a 2-hour fire-resistive rating.

1. Openings in above construction shall be protected with approved 1½ hour time rated fire doors or better equipped with a self-closing device.

2. Where other portions of the building or other properties are exposed, windows, where permitted, in exterior wall shall be approved fire window assemblies time rated as ¾ hour.

Note: See Wis. Adm. Code, chapters 50-59, Building and Heating, Ventilating and Air Conditioning for specific construction details.

(c) An open trench covered with steel grating shall be provided inside of the room and shall be located so as to provide complete drainage.

1. The trench shall be connected to an underground tank by means of a horizontal drain line and provided with a horizontal clapper type check valve located outside of the building. (See section Ind 8.40 (4) (d) for alternate design.)

(d) An acceptable alternate to requirements of subsection (4) (c) above may be a room constructed with liquid tight floor, depressed at least 4 inches below the surrounding floor, or a 4 inch high liquid tight curb including a raised door sill or ramp at opening to room.

1. A floor drain shall be provided and connected with underground tank as required under subsection (4) (c) 1.

(e) Wood at least one inch nominal thickness may be used for shelving, racks, dunnage, scuffboards, floor overlay and similar installations.

(f) 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 with other operations provided the combination in use does not create a greater fire hazard.

(g) The inside storage room shall be located and arranged to minimize damage in the event of an explosion.

(h) Every inside storage room shall be provided with either gravity or a mechanical exhaust ventilation system. Such system shall be designed to provide for a complete change of air within the room at least 10 times per hour.

1. Where a mechanical ventilation system is used it shall,
 a. Be controlled by a switch located outside the door.
 b. Have lighting fixtures operated by the switch required in a. above.

c. Have a pilot light installed adjacent to switch required in a. above if class I flammable liquids are dispensed within the room.

2. Where gravity ventilation system is used it shall,
 a. Have the fresh air intake and the exhaust outlet located in the exterior wall of room.

b. The exhaust air shall be drawn from a level not more than 18 inches above the floor.

c. Gravity vents shall extend at least 2 feet above the high point of the roof or parapet wall and shall be capped with an approved siphon type roof ventilator.

(i) The heating system for room shall be restricted to low-pressure steam or hot water or to electrical units bearing approved Underwriters' Laboratories label for class I hazardous locations.

(j) Electrical wiring, lighting and electrical devices located in inside storage rooms used for class I liquids shall be approved for class I division 2, Hazardous Locations unless written approval is granted by the department for use of less hazardous liquids permitting less stringent requirements as covered under the Wis. Adm. Code, volume II, Electrical. Class II and class III liquids shall be approved for general use. (Also see section Ind 8.64).

(5) STORAGE IN INSIDE STORAGE ROOMS. (a) In every inside storage room there shall be maintained one clear aisle at least 3 feet wide. Containers over 30 gallons capacity shall not be stacked one upon the other. Dispensing shall be by approved pump.

(6) STORAGE INSIDE BUILDINGS. (a) Flammable or combustible liquids, including stock for sale, shall not be stored so as to limit use of exits, stairways or areas normally used for the safe egress of people.

(b) The storage of flammable or combustible liquids in approved containers or portable tanks shall comply with subsections (6) (b) through (i) 6., except that the department may impose a quantity limitation or require greater protection where unusual hazard to life or property is involved. Increase of these amounts shall only be by written authorization where the type of construction, fire protection provided, or other factors substantially reduce the hazard.

(c) Dwellings and apartment houses containing not more than 3 dwelling units and accompanying attached and detached garages or accessory buildings: Storage in excess of 10 gallons shall be prohibited.

1. The above limitation does not include tanks supplying fuel directly to engine.

Note: Auxiliary boat tanks are not considered as tanks supplying fuel directly to engine.

(d) Assembly occupancies, apartment houses and hotels. Storage in excess of 10 gallons shall be in containers stored in a storage cabinet or in safety cans or in an inside storage room not having an opening communication with that portion of the building used by the public.

1. No portable container containing fuel for internal combustion engines shall be permitted.

(e) Office occupancies. 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.

(f) Educational and institutional occupancies. Storage shall be limited to that required for maintenance, demonstration, treatment, and laboratory work. All liquids in laboratories and at other points of use shall meet the following storage provisions:

1. No container shall exceed a capacity of one gallon except that safety cans can be of two gallon capacity.

2. Not more than 10 gallons of flammable or combustible liquids shall be stored outside of a storage cabinet or storage room, except in safety cans.

3. Not more than 25 gallons of flammable or combustible liquids shall be stored in safety cans outside of a storage room or storage cabinet.

4. Quantities of flammable and combustible liquids in excess of those set forth in this section shall be stored in an inside storage room or storage cabinet.

(g) Mercantile occupancies and other retail stores. 1. In rooms or areas accessible to the public, storage shall be limited to quantities needed for display and normal merchandising purposes but shall not exceed 2 gallons per square foot of gross floor area. The gross floor area used for computing the maximum quantity permitted shall be considered as that portion of the store actually being used for merchandising flammable and combustible liquids.

a. Materials needed for display and normal merchandising purposes shall be restricted to 5 cases of each brand name and each size displayed.

2. Where the aggregate quantity of additional stock exceeds 60 gallons of class IA, 120 gallons of class IB, 180 gallons of class IC, 240 gallons of class II, or 500 gallons of combustible liquids or any combination of flammable liquids exceeding 240 gallons shall be stored in a room or portion of the building that complies with the construction provisions for an inside storage room as provided in section Ind 8.40 (4). For water miscible liquids, these quantities may be doubled.

3. Containers in display area shall not be stacked more than 3 feet or 2 containers high, whichever is the greater, unless on fixed shelving or otherwise satisfactorily secured.

4. Shelving shall be of stable construction, of sufficient depth and arrangement such that containers displayed thereon shall not be easily displaced.

5. Leaking containers shall be removed to a storage room or taken to a safe location outside the building and the contents transferred to an undamaged container.

(h) General purpose public warehouses. Storage shall be in accordance with table 12 or table 12A and in buildings or in portions of such buildings cut off by standard fire walls. Material creating no fire exposure hazard to the flammable or combustible liquids may be stored in the same area.

(i) Flammable and combustible liquid warehouses or storage buildings.

1. If storage building is located 50 feet or less from a building or line of adjoining property that may be built upon, the exposing wall shall have a fire resistance rating of at least 2 hours noncombustible construction.

2. The total quantity of liquids within a building shall not be restricted, but the arrangement of storage shall comply with table 12 or table 12A.

3. Containers in piles shall be separated by pallets of dunnage where necessary to provide stability to prevent excessive stress on container walls.

4. Portable tanks stored over one tier high shall be designed to nest securely, without dunnage, and adequate materials handling equipment shall be available to handle tanks safely at the upper tier level.

5. No pile shall be closer than 3 feet to the nearest beam, chord, girder or other obstructions, and shall be 3 feet below sprinkler deflectors or discharge orifices of water spray, or other overhead fire protection systems.

6. Aisles at least 3 feet wide shall be provided where necessary for reasons of access to doors, windows or standpipe connections.

(j) Indoor container storage.

**TABLE 12
INDOOR CONTAINER STORAGE**

Class Liquid	Storage Level†	Protected Storage‡ Maximum Per Pile		Unprotected Storage Maximum Per Pile	
		Gals. (See 3. below)	Height (See 3. below)	Gals. (See 3. below)	Height (See 3. below)
IA.....	Ground & Upper Floors	2,750 (50)*	3 ft. (1)	660 (12)	3 ft. (1)
	Basement	NOT PERMITTED		NOT PERMITTED	
IB.....	Ground & Upper Floors	5,500 (100)	6 ft. (2)	1,375 (25)	3 ft. (1)
	Basement	NOT PERMITTED		NOT PERMITTED	
IC.....	Ground & Upper Floors	16,500 (300)	6 ft. (2)	4,125 (75)	3 ft. (1)
	Basement	NOT PERMITTED		NOT PERMITTED	
II.....	Ground & Upper Floors	16,500 (300)	9 ft. (3)	4,125 (75)	9 ft. (3)
	Basement	5,500 (100)	9 ft. (3)	NOT PERMITTED	
Combustible.	Ground & Upper Floors	55,000 (1,000)	15 ft. (5)	13,750 (250)	12 ft. (4)
	Basement	8,250 (450)	9 ft. (3)	NOT PERMITTED	

*Note: Numbers in parentheses indicate corresponding number of 55-gal. drums.

†Note: For definition of building levels see Wis. Adm. Code, chapters 50-59, Building and Heating, Ventilating and Air Conditioning.

‡Note: Built-in fire protection systems employing the use of water, CO2, or dry chemical installed in accordance with NFPA No. 13 recommended practices for flammable and combustible liquids will be accepted by the department.

1. When 2 or more classes of materials are stored in a single pile, the maximum gallonage permitted in that pile shall be the smallest of the 2 or more separate maximum gallonages.

2. Aisles shall be provided so that no container is more than 12 feet from an aisle. Main aisles shall be at least 8 feet wide and side aisles at least 4 feet wide.

3. Each pile shall be separated from each other pile by at least 4 feet. When stored on suitably protected racks or when the storage is suitably protected, containers may be piled up to the height limits in subsection (6) (i) 5. where approved by the department.

(k) Indoor portable tank storage.

TABLE 12A
INDOOR PORTABLE TANK STORAGE

Class Liquid	Storage Level*	Protected Storage† Maximum Per Pile		Unprotected Storage Maximum Per Pile	
		Gals.	Height	Gals.	Height
IA-----	Ground & Upper Floors	NOT PERMITTED		NOT PERMITTED	
	Basement	NOT PERMITTED		NOT PERMITTED	
IB-----	Ground & Upper Floors	20,000	7 ft.	2,000	7 ft.
	Basement	NOT PERMITTED		NOT PERMITTED	
IC-----	Ground & Upper Floors	40,000	14 ft.	5,500	7 ft.
	Basement	NOT PERMITTED		NOT PERMITTED	
II-----	Ground & Upper Floors	40,000	14 ft.	5,500	7 ft.
	Basement	20,000	7 ft.	NOT PERMITTED	
Combustible.	Ground & Upper Floors	60,000	14 ft.	22,000	7 ft.
	Basement	20,000	7 ft.	NOT PERMITTED	

*Note: For definitions of building levels see Wis. Adm. Code, chapters 50-59, Building and Heating, Ventilating and Air Conditioning.

†Note: A sprinkler or equivalent fire protection system installed in accordance with the applicable NFPA standard and approved by the department.

1. When 2 or more classes of materials are stored in a single pile, the maximum gallonage permitted in that pile shall be the smallest of the two or more separate maximum gallonages.

2. Aisles shall be provided so that no portable tank is more than 12 feet from an aisle. Main aisles shall be at least 8 feet wide and side aisles at least 4 feet wide.

3. Each pile shall be separated from each other pile by at least 4 feet. When stored on suitably protected racks or when the storage is suitably protected, portable tanks may be piled up to the height limits in subsection (6) (i) 5. where approved by the department.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.41 Storage outside buildings. (1) Storage outside buildings shall be in accordance with table 13 or 13A and subsections (2) and (5).

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**TABLE 13
OUTDOOR CONTAINER STORAGE**

1 Class	2 Maximum Per Pile Gallons (See (a) below)	3 Distance Between Piles (See (b) below)	4 Distance to Property Line that Can Be Built Upon (See (c) & (d) below)	5 Distance to Street, Alley, Public Way (See (d) below)
IA.....	1,100	5 ft.	20 ft.	10 ft.
IB.....	2,200	5 ft.	20 ft.	10 ft.
IC.....	4,400	5 ft.	20 ft.	10 ft.
II.....	8,800	5 ft.	10 ft.	5 ft.
Combustible.	22,000	5 ft.	10 ft.	5 ft.

(a) When 2 or more classes of materials are stored in a single pile, the maximum gallonage in that pile shall be the smallest of the two or more separate gallonages.

(b) Within 200 feet of each container, there shall be a 12 foot wide access way to permit approach of fire control apparatus.

(c) The distances listed apply to properties that have protection for exposures as defined. If there are exposures, and such protection for exposures does not exist, the distances in column 4 shall be doubled.

(d) When total quantity stored does not exceed 50% of maximum per pile, the distances in columns 4 and 5 may be reduced 50%, but not less than 3 feet.

(2) A maximum of 1,100 gallons of flammable or combustible liquids may be located adjacent to buildings located on the same premises and under the same management provided the provisions of (2) (a) and (2) (b) are complied with.

(a) The building shall be a one-story building devoted principally to the handling and storing of flammable or combustible liquids or the buildings shall have noncombustible 2-hour fire-resistive exterior walls having no opening within 10 feet of such storage.

(b) Where quantity stored exceeds 1,100 gallons, or provisions of (2) (a) cannot be met, a minimum distance of 10 feet between buildings and nearest container of flammable or combustible liquid shall be maintained.

(3) The storage area shall be graded in a manner to divert possible spills away from buildings or other exposures or shall be surrounded by a curb at least 6 inches high. When curbs are used, provisions shall be made for drainage of accumulations of ground or rain water or spills of flammable or combustible liquids. Drains shall terminate at a safe location and shall be accessible to operation under fire conditions.

(4) Outdoor portable tank storage.

(a) When 2 or more classes of materials are stored in a single pile, the maximum gallonage in that pile shall be the smallest of the two or more separate gallonages.

(b) Within 200 feet of each portable tank, there shall be a 12-foot wide access way to permit approach of fire control apparatus.

**TABLE 13A
OUTDOOR PORTABLE TANK STORAGE**

1 Class	2 Maximum Per Pile Gallons	3 Distance Between Piles	4 Distance to Property Line that Can Be Built Upon	5 Distance to Street, Alley, Public Way
IA.....	2,200	5 ft.	20 ft.	10 ft.
IB.....	4,400	5 ft.	20 ft.	10 ft.
IC.....	8,800	5 ft.	20 ft.	10 ft.
II.....	17,600	5 ft.	10 ft.	5 ft.
Combustible	44,000	5 ft.	10 ft.	5 ft.

(c) The distances listed apply to properties that have protection for exposures as defined. If there are exposures, and such protection for exposures does not exist, the distances in column 4 shall be doubled.

(d) When total quantity stored does not exceed 50% of maximum per pile, the distances in columns 4 and 5 may be reduced 50%, but not less than 3 feet.

(5) Storage area shall be protected against tampering or trespassers where necessary and shall be kept free of weeds, debris and other combustible material not necessary to the storage.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.42 Fire control. (1) **FIRE CONTROL DEVICES.** Fire control devices such as small hose or portable fire extinguishers, shall be available at locations where flammable or combustible liquids are stored.

(a) At least one portable fire extnguisher having a rating of not less than 12-B units shall be located outside of, but not more than 10 feet from, the door opening into any room used for storage.

(b) At least one portable fire extinguisher having a rating of not less than 12-B units shall be located not less than 10 feet, nor more than 25 feet, from any flammable liquid storage area located outside of a storage room but inside a building.

(2) **SPRINKLERS.**

Note: Built-in sprinkler systems installed in accordance with NFPA No. 13 "Recommended practice for flammable and combustible liquids" will be accepted by the department.

(3) **SOURCES OF IGNITION.** Open flames and smoking shall be prohibited in flammable or combustible liquid storage areas.

(4) **REACTIVE MATERIALS.** Materials which will react with water shall not be stored in the same room with flammable or combustible liquids.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

**COMMERCIAL
AND
INDUSTRIAL PLANTS**

Ind 8.50 Scope. (1) This chapter shall apply to those commercial and industrial plants where (a) the use of flammable or combustible liquids is incidental to the principal business, see sections Ind 8.14

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and Ind 8.51 where flammable or combustible liquids are handled or used, only in unit physical operations such as mixing, drying, evaporating, filtering, distillation, and similar operations which do not involve chemical reaction, see section Ind 8.52. This chapter shall not apply to chemical plants, refineries or distilleries, as defined, which are covered by section Ind 8.90 refineries, chemical plants and distilleries.

(2) Where portions of such plants involve chemical reactions such as oxidation, reduction, halogenation, hydrogenation, alkylation, polymerization, and other chemical processes, those portions of the plant shall be in accordance with section Ind 8.80, processing plants.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.51 Incidental storage or use of flammable or combustible liquids. (1) This section shall be applicable to those portions of commercial and industrial plants where the use and handling of flammable or combustible liquids is only incidental to the principal business, such as automobile assembly, construction of electronic equipment, furniture manufacturing or other similar activities.

(2) Flammable or combustible liquids shall be stored in approved tanks or closed containers.

(a) Except as provided in subsections (2) (b) and (c), all storage shall comply with sections Ind 8.40 (2) or (4).

(b) The quantity of liquid that may be located outside of an inside storage room or storage cabinet in a building or in any one fire area of a building shall not exceed that given in 1., 2., and 3. below:

1. 25 gallons of class IA liquids in containers.
2. 120 gallons of class IB, IC, II or III liquids in containers.
3. 660 gallons of class IB, IC, II or III liquids in a single portable tank.

(c) Where large quantities of flammable or combustible liquids are necessary, storage may be in tanks which shall comply with the applicable requirements of section Ind 8.20, tank storage.

(3) Mixing and handling. The design and construction of inside mixing and handling rooms shall comply with the following general requirements:

(a) The room shall have at least one exterior wall.

(b) Walls, floors and roof or floor assemblies above shall be non-combustible with at least a 2-hour fire-resistive rating.

1. Openings in above construction shall be protected with approved 1½ hour time rated fire doors or better equipped with a self-closing device.

2. Where other portions of the building or other properties are exposed, windows, where permitted, in exterior wall shall be approved fire window assemblies time rated as ¾ hour.

Note: See Wis. Adm. Code, chapters 50-59, Building and Heating, Ventilating and Air Conditioning for specific construction details.

(c) An open trench covered with steel grating shall be provided inside of the room and shall be so located so as to provide complete drainage.

1. The trench shall be connected to an underground tank by means of a horizontal drain line and provided with a horizontal, clapper type check valve located outside of the building.

(d) Wood at least one inch nominal thickness may be used for shelving, racks, dunnage, scuffboards, floor overlay and similar installations.

(e) Rooms or portions of buildings, affording a type of building construction and other features equivalent to that required for mixing and handling rooms may be utilized with other operations provided the combination in use does not create a greater fire hazard.

(f) The mixing and handling room shall be located and arranged to minimize damage in the event of an explosion.

(g) Every mixing and handling room shall be provided with either gravity or a mechanical exhaust ventilation system. Such system shall be designed to provide for a complete change of air within the room at least 10 times per hour.

1. Where a mechanical ventilation system is used it shall,

a. Be controlled by a switch located outside the door.

b. Have lighting fixtures operated by the switch required by a. above.

c. Have a pilot light installed adjacent to switch required in a. above if class I flammable liquids are dispensed within the room.

2. Where gravity ventilation system is used it shall,

a. Have the fresh air intake and the exhaust outlet located in the exterior wall of room.

b. The exhaust air shall be drawn from a level not more than 18 inches above the floor.

c. Gravity vents shall extend at least 2 feet above the high point of the roof or parapet wall and shall be capped with an approved siphon type roof ventilator.

(h) The heating system for room shall be restricted to low-pressure steam or hot water or to electrical units bearing approved Underwriters' Laboratories label for class I hazardous locations.

(i) Electrical wiring, lighting and electrical devices located in inside storage rooms used for class I liquids shall be approved for class I division 2, Hazardous Locations unless written approval is granted by the department for use of less hazardous liquids permitting less stringent requirements as covered under the Wis. Adm. Code, volume II, Electrical, Class II and Class III liquids shall be approved for general use. (Also see section Ind 8.64).

(4) Handling liquids at point of final use. (a) Flammable liquids shall be kept in covered containers when not actually in use.

(b) Where flammable or combustible liquids are used or handled, except in closed containers, means shall be provided to dispose promptly and safely of leakage or spills.

(c) Class I liquids may be used only where there are no open flames or other sources of ignition within the possible path of vapor travel.

(d) Flammable or combustible liquids shall be drawn from or transferred into vessels, containers or portable tanks within a building only through a closed piping system, from safety cans, by means of a device drawing through the top, or from a container or portable tanks through an approved pump. Transferring by means of air pressure on the container or portable tanks shall be prohibited.

(5) Dip tanks. The design, construction and installation shall be according to standards approved by the department.

Note: The department will accept designs, construction and installation of tanks satisfying requirements of NFPA pamphlet No. 34, Dip Tanks.

(6) Explosion venting. The design and construction shall be according to standards approved by the department.

Note: The department will accept venting designed and constructed according to NFPA No. 68, Explosion Venting.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.52 Unit physical operations. (1) This section shall be applicable in those portions of commercial and industrial plants where flammable or combustible liquids are handled or used in unit physical operation such as mixing, drying, evaporating, filtering, distillation and similar operations which do not involve chemical change. Examples are plants compounding cosmetics, pharmaceuticals, solvents, cleaning fluids, insecticides and similar types of activities.

(2) Commercial and industrial plants shall be located so that each building or unit of equipment is accessible from at least one side for fire fighting and fire control purposes. Buildings shall be located with respect to lines of adjoining property which may be built upon as set forth in section Ind 8.81 (1) and (1) (a), except that the blank wall referred to in Ind 8.81 (1) (a) shall be not less than 2-hour non-combustible fire-resistive construction.

(3) Areas where unstable liquids are handled or small scale unit chemical processes are carried on shall be separated from the remainder of the plant by not less than 2-hour noncombustible fire-resistive construction.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.53 Drainage. (1) Emergency drainage systems shall be provided to direct flammable or combustible liquid leakage and fire protection water to a safe location. This may require curbs, scuppers, or special drainage systems to control the spread of fire.

(2) Emergency drainage systems, if connected to public sewers or discharged into public waterways, shall be equipped with traps or separators.

(3) The industrial plant shall be designed and operated to prevent the normal discharge of flammable or combustible liquids into public waterways, public sewers, or adjoining property.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.54 Ventilation. (1) Areas as defined in section Ind 8.52 (1) using class I liquids shall be ventilated at a rate of not less than one cubic foot per minute per square foot of gross floor area. This shall be accomplished by natural or mechanical ventilation with discharge of exhaust to a safe location outside the building. Provision shall be made for introduction of make-up air in such a manner as not to short-circuit the ventilation. Ventilation shall be arranged to include all floor areas or pits where flammable vapors may collect.

(2) Equipment used in a building and the ventilation of the building shall be designed so as to limit flammable vapor-air mixtures under normal operating conditions to the interior of equipment, and to not more than 5 feet from equipment which exposes class I liquids to the

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air. Examples of such equipment are dispensing stations, open centrifuges plate and frame filters, open vacuum filters and surfaces of open equipment.

(3) The storage, transfer and handling of liquids shall comply with section Ind 8.83.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.55 Tank vehicle and tank car loading and unloading. (1) Tank vehicle and tank car loading or unloading facilities shall be separated from aboveground tanks, warehouses, other plant buildings or nearest line of adjoining property which may be built upon by a distance of 25 feet for class I liquids and 15 feet for class II and class III liquids measured from the nearest position of any fill stem. Buildings for pumps or shelters for personnel may be a part of the facility. Operations of the facility shall comply with the appropriate portions of section Ind 8.62, bulk plants.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.56 Fire control. (1) Portable fire extinguishment and control equipment shall be provided in such quantities and types as are needed for the special hazards of operation and storage.

Note: Portable fire extinguishers, NFPA No. 10, provides information as to the suitability of various types of extinguishers and their number and location.

(2) Water shall be available in volume and at adequate pressure to supply water hose streams, foam-producing equipment, automatic sprinklers or water spray systems as the need is indicated by the special hazards of operation, dispensing and storage.

Note: For more specific applications see National Fire Protection Association volumes No. 6 and No. 7, National Fire Codes.

(3) Special extinguishing equipment such as that utilizing foam, inert gas or dry chemical shall be provided as the need is indicated by the special hazards of operation, dispensing and storage.

(4) Where the need is indicated by special hazards of operation, flammable or combustible liquid processing equipment, major piping and supporting steel shall be protected by approved water spray systems, deluge systems, approved fire-resistant coatings, insulation or any combination of these.

(5) All plant fire protection facilities shall be adequately maintained and periodically inspected and tested to make sure they are always in satisfactory operating condition, and they will serve their purpose in time of emergency.

Note: An approved fire alarm system is recommended for prompt notification of fire. Where service is available, it is recommended that a public fire alarm box be located nearby. It may be advisable to connect the plant system with the public system.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.57 Sources of ignition. (1) Adequate precautions shall be taken to prevent the ignition of flammable vapors. Sources of ignition include but are not limited to open flames; lightning; smoking; cutting and welding; hot surfaces; frictional heat; static, electrical and mechanical sparks; spontaneous ignition, including heat producing chemical reactions and radiant heat.

(2) Class I liquids shall not be dispensed into containers unless the nozzle and container are electrically interconnected. Where the

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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.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.58 Electrical. (1) Equipment. (a) All electrical wiring and equipment shall be installed in accordance with Wis. Adm. Code, vol. 2, Electrical.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.59 Repairs to equipment. (1) Hot work, such as welding or cutting operations, use of spark producing power tools, and chipping operations shall be permitted only under supervision of an authorized person. The authorized person shall make an inspection of the area to be sure that it is safe for the work to be done and that safe procedures will be followed for the work specified.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.591 Housekeeping. (1) Maintenance and operating practices shall be in accordance with established procedures which will tend to control leakage and prevent the accidental escape of flammable or combustible liquids. Spills shall be cleaned up.

(2) Unobstructed aisles at least 3 feet wide shall be provided and maintained where necessary for reasons of access to doors, windows or standpipe connections so that fire protection equipment can be brought to bear on any part of flammable or combustible liquid storage, use or any unit physical operation.

(3) Combustible waste material and residues in a building or unit operating area shall be kept to a minimum, stored in covered metal receptacles and disposed of daily.

(4) Ground area around buildings and unit operating areas shall be kept free of weeds, trash or other unnecessary combustible materials.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

BULK PLANTS

Ind 8.60 Storage. (1) Class I liquids shall be stored in closed containers, or in storage tanks aboveground outside of buildings, or underground in accordance with sections Ind 8.20 through 8.28.

(2) Class II and class III liquids shall be stored in containers, or in tanks within buildings or aboveground outside of buildings, or underground in accordance with sections Ind 8.20 through Ind 8.28.

(3) Containers of flammable or combustible 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.

(4) Where applicable section Ind 8.14 shall govern.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

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Ind 8.61 Buildings. (1) **GENERAL CONSTRUCTION.** Class I 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 and combustible 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 flammable and combustible 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 flammable and combustible 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 gravity ventilation is inadequate, mechanical ventilation shall be provided. Where mechanical ventilation is required it shall be kept in operation while flammable and combustible liquids are being handled.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.62 Loading and unloading facilities. (1) **TANK VEHICLE AND TANK CAR LOADING.** Tank vehicle and tank car loading or unloading facilities installed after effective date of these regulations shall be separated from aboveground tanks, warehouses, other plant buildings or nearest line of adjoining property that may be built upon by a distance of 25 feet for class I liquids and 15 feet for class II and class III liquids measured from the nearest position of any fill spout. Buildings for pumps or shelters for personnel may be part of the facility.

(a) Equipment such as piping, pumps and meters used for the transfer of class I liquids between storage tanks and the fill spout of the loading rack shall not be used for the transfer of class II or class III liquids.

(b) Valves used for the final control for filling tank vehicles shall be of the self-closing type and manually held open except where automatic means are provided for shutting off the flow when the vehicle is full or after filling of a preset amount. This shall not apply to loading tank cars.

(2) **EXISTING BULK PLANT FACILITIES.** Existing bulk plant facilities with less clearances than specified in subsection (1) above may be renovated or updated but no additional storage capacity shall be permitted in violation of the clearances specified in subsection (1).

(3) **STATIC PROTECTION.** (a) Bonding facilities for protection against static sparks during the loading of tank vehicles through open domes shall be provided where class I liquids are loaded, or where class II or class III liquids are loaded into vehicles which may contain vapors from previous cargoes of class I liquids.

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(b) Protection as required in subsection (3) (a) shall consist of a metallic bond wire permanently electrically connected to the fill spout or to some part of the rack structure in electrical contact with the fill spout. The free end of such wire shall be provided with a clamp or equivalent device for convenient attachment to some metallic part in electrical contact with the cargo tank of the tank vehicle.

(c) Such bonding connection shall be made fast to the vehicle or tank before dome covers are raised and shall remain in place until filling is completed and all dome covers have been closed and secured.

(d) Bonding as specified in subsections (3) (a), (b) and (c) is not required where,

1. Vehicles are loaded exclusively with products not having a static accumulating tendency, such as asphalt, most crude oils, residual oils and water soluble liquids; and

2. No class I liquids are handled at the loading facility and the tank vehicles loaded are used exclusively for class II and class III liquids; and

3. Vehicles are loaded or unloaded through closed bottom or top connections.

(e) Top loading. 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 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 (3) (e) shall be readily available or conspicuously posted at each bulk plant and terminal.

(4) STRAY CURRENTS. Tank car loading facilities where class I liquids are loaded through open domes shall be protected against stray currents by bonding the pipe to at least one rail and to the rack structure if of metal. Multiple lines entering the rack area shall be electrically bonded together. In addition, in areas where excessive stray currents are known to exist, all pipe entering the rack area shall be provided with insulating sections to electrically isolate the rack piping from the pipelines. No bonding between the tank car and rack

or piping is required during either loading or unloading of class II or III liquids.

(5) **TANK CAR UNLOADING.** (a) Liquids having a flash point below 115° F. shall not be withdrawn from tank cars from bottom outlets, but shall be unloaded through dome (manhole) only.

(b) Liquids having a flash point between 115°-150° F. shall have written approval from the department before unloading from the bottom outlet.

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

(d) When tank cars are connected for the purpose of loading or unloading, a sign reading "Tank Car Connected" shall be displayed.

Note: For further details see requirements covered in code of Federal Regulations, chapter I, title 49—Transportation.

(6) **CONTAINER FILLING FACILITIES.** Class I 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 provision of this section shall be deemed to have been complied with.

(7) **FILLING AND EMPTYING CONTAINERS.** Containers of class I 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.

(8) **VEHICLE REFUELING AT BULK PLANTS.** (a) 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.

(b) Approved key operated pumps without monetary totalizer panels and other dispensing devices shall not be installed nearer than 25 feet of any pump house, loading rack and/or adjoining property lines. The dispensing device shall be installed as required by section Ind 8.72.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.63 Wharves. (1) The term wharf shall mean any wharf, pier, bulkhead or other structure over or contiguous to navigable water used in conjunction with a bulk plant, the primary function of which is the transfer of flammable or combustible liquid cargo in bulk between the bulk plant and any tank vessel, ship, barge, lighter boat or other mobile floating craft; and this section shall apply to all such installations except marine service stations as covered in section Ind 8.73.

(a) Package cargo of flammable and combustible liquids, including full and empty drums, bulk fuel and stores may be handled over a wharf and at such times and places as may be agreed upon by the wharf superintendent and the senior deck officer on duty.

(b) Wharves at which flammable or combustible liquid cargoes are to be transferred in bulk quantities to or from tank vessels shall be

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at least 100 feet from any bridge over a navigable waterway, or from an entrance to or superstructure of any vehicular or railroad tunnel under a waterway. The termination of the wharf loading or unloading fixed piping shall be at least 200 feet from a bridge or from an entrance to or superstructure of a tunnel.

(2) Substructure and deck shall be substantially designed for the use intended. Deck may employ any material which will afford the desired combination of flexibility, resistance to shock, durability, strength and fire resistance. Heavy timber construction is acceptable.

Note: The general principles of the standard for the construction and protection of piers and wharves, NFPA No. 87, should be followed where applicable, particularly as to fixed fire protection systems and structural barriers against the spread of fire.

(3) Tanks used exclusively for ballast water or class II or class III liquids may be installed on suitably designed wharves.

(4) Loading pumps capable of building up pressures in excess of the safe working pressure of cargo hose or loading arms shall be provided with bypasses, relief valves or other arrangement to protect the loading facilities against excessive pressure. Relief devices shall be tested at not more than yearly intervals to determine that they function satisfactorily at the pressure at which they are set.

(a) All pressure hoses and couplings shall be inspected at intervals appropriate to the service. With the hose extended, test the hose and couplings using the "in service maximum operating pressures." Any hose showing material deteriorations, signs of leakage or weakness in its carcass or at the couplings shall be withdrawn from service and repaired or discarded.

(5) Piping, valves and fittings shall be in accordance with section Ind 8.30, with the following exceptions and additions:

(a) Flexibility of piping shall be assured by appropriate layout and arrangement of piping supports so that motion of the wharf structure resulting from wave action, currents, tides or the mooring of vessels will not subject the pipe to repeated strain beyond the elastic limit.

(b) Pipe joints dependent upon the friction or compression characteristics of either combustible or noncombustible materials for mechanical continuity of piping shall not be used.

(c) Swivel joints may be used in piping to which hoses are connected, and for articulated swivel joint transfer systems, provided that the design is such that the mechanical strength of the joint will not be impaired if the packing material should fail, as by exposure to fire.

(d) Piping systems shall contain a sufficient number of valves to operate the system properly and to control the flow of liquid in normal operation and in the event of physical damage.

(e) In addition to the requirements of (d), each line conveying flammable liquids leading to a wharf shall be provided with a readily accessible block valve located on shore near the approach to the wharf and outside of any diked area. Where more than one line is involved, the valves shall be grouped in one location.

(f) Means of easy access shall be provided for cargo line valves located below the wharf deck.

(g) Pipe lines on flammable or combustible liquids wharves shall be adequately bonded and grounded. If excessive stray currents are encountered, insulating joints shall be installed. Bonding and grounding connections on all pipelines shall be located on wharf side of hose riser insulating flanges, if used, and shall be accessible for inspection.

(h) Hose or articulated swivel joint pipe connections used for cargo transfer shall be capable of accommodating the combined effects of change in draft and maximum tidal range, and mooring lines shall be kept adjusted to prevent surge of the vessel from placing stress on the cargo transfer system.

(i) Hose shall be supported so as to avoid kinking and damage from chafing.

(6) Suitable portable fire extinguishers with a rating of not less than 12-BC shall be located within 75 feet of those portions of the facility where fires are likely to occur, such as hose connections, pumps and separator tanks.

(a) Where piped water is available, ready connected fire hose in size appropriate for the water supply shall be provided so that manifolds where connections are made and broken can be reached by at least one hose stream.

(b) Material shall not be placed on wharves in such a manner as to obstruct access to fire fighting equipment or important pipeline control valves.

(c) Where the wharf is accessible to vehicle traffic, an unobstructed roadway to the shore end of the wharf shall be maintained for access of fire fighting apparatus.

(7) Loading or discharging shall not commence until wharf superintendent and officer in charge of tank vessel agree that tank vessel is properly moored and all connections are properly made.

(a) Mechanical work shall not be performed on the wharf during cargo transfer, except under special authorization based on a review of the area involved, methods to be employed and precautions necessary.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.64 Electrical equipment. (1) This section shall apply to areas where class I, class II and class III flammable and combustible liquids are stored or handled.

(2) All electrical equipment and wiring shall be of a type specified by and shall be installed in accordance with the Wis. Adm. Code, Vol. 2, Electrical.

(3) So far as it applies table 14 shall be used to delineate and classify hazardous areas for the purpose of installation of electrical equipment under normal circumstances. In table 14 a classified area shall not extend beyond an unpierced wall, roof or other solid partition.

(4) The area classifications listed in subsection (3) shall be based on the premise that the installation meets the applicable requirements of the flammable and combustible liquids code in all respects.

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TABLE 14
ELECTRICAL EQUIPMENT HAZARDOUS AREAS--BULK PLANTS

Location	WEC Class I, Group D Division	Extent of Classified Area
Tank Vehicle and Tank Car* Loading through Open Dome-----	1	Within 3 feet of edge of dome, extending in all directions.
	2	Area between 3 feet and 5 feet from edge of dome, extending in all directions.
Loading through Bottom Connections with Atmospheric Venting---	1	Within 3 feet of point of venting to atmosphere extending in all directions.
	2	Area between 3 feet and 5 feet from point of venting to atmosphere, extending in all directions. Also up to 18 inches above grade within a horizontal radius of 10 feet from point of loading connection.
Loading through Closed Dome with Atmospheric Venting-----	1	Within 3 feet of open end of vent, extending in all directions.
	2	Area between 3 feet and 5 feet from open end of vent, extending in all directions. Also within 3 feet of edge of dome, extending in all directions.
Loading through Closed Dome with Vapor Recovery-----	2	Within 3 feet of point of connection of both fill and vapor lines, extending in all directions.
Bottom Loading with Vapor Recovery or Any Bottom Unloading..	2	Within 3 feet of point of connections extending in all directions. Also up to 18 inches above grade within a horizontal radius of 10 feet from point of connection.
Drum and Container Filling Outdoors, or Indoors with Adequate Ventilation-----	1	Within 3 feet of vent and fill opening, extending in all directions.
	2	Area between 3 feet and 5 feet from vent or fill opening, extending in all directions. Also up to 18 inches above floor or grade level within a horizontal radius of 10 feet from vent or fill opening.
Outdoors, or Indoors with Adequate Ventilation-----	1	Within 3 feet of vent and fill opening, extending in all directions.
	2	Area between 3 feet and 5 feet from vent or fill opening, extending in all directions. Also up to 18 inches above floor or grade level within a horizontal radius of 10 feet from vent or fill opening.
Tank--Aboveground† Shell, Ends, or Roof and Dike Area	2	Within 10 feet from shell, ends, or roof of tank. Area inside dikes to level of top of dike.
Vent-----	1	Within 5 feet of open end of vent, extending in all directions.
	2	Area between 5 feet and 10 feet from open end of vent, extending in all directions.
Floating Roof-----	1	Area above the roof and within the shell.

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TABLE 14—(Continued)

Location	WEC Class I, Group D Division	Extent of Classified Area
Pits		
Without Mechanical Ventilation ..	1	Entire area within pit if any part is within a Division 1 or 2 classified area.
With Mechanical Ventilation	2	Entire area within pit if any part is within a Division 1 or 2 classified area.
Containing Valves, Fittings or Piping, and Not Within a Division 1 or 2 Classified Area	2	Entire pit.
Pumps, Bleeders, Withdrawal Fittings, Meters and Similar Devices		
Indoors	2	Within 5 feet of any edge of such devices, extending in all directions. Also up to 3 feet above floor or grade level within 25 feet horizontally from any edge of such devices.
Outdoors	2	Within 3 feet of any edge of such devices, extending in all directions. Also up to 18 inches above grade level within 10 feet horizontally from any edge of such devices.
Storage and Repair Garage for Tank Vehicles	1	All pits or spaces below floor level.
	2	Area up to 18 inches above floor or grade level for entire storage or repair garage.
Drainage Ditches, Separators, Impounding Basins	2	Area up to 18 inches above ditch, separator or basin. Also up to 18 inches above grade within 15 feet horizontally from any edge.
Garages for Other Than Tank Vehicles	Ordinary	If there is any opening to these rooms within the extent of an outdoor classified area, the entire room shall be classified the same as the area classification at the point of the opening.
Outdoor Drum Storage	Ordinary	
Indoor Warehousing Where There Is No Flammable Liquid Transfer	Ordinary	If there is any opening to these rooms within the extent of any indoor classified area, the room shall be classified the same as if the wall, curb or partition did not exist.
Office and Rest Rooms	Ordinary	

*When classifying extent of area, consideration shall be given to fact that tank cars or tank vehicles may be spotted at varying points. Therefore, the extremities of the loading or unloading positions shall be used.

†For Tanks—Underground, see section Ind 8.75.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.65 Sources of ignition. (1) Class I 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 or combustible liquids vapor is normally present.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.66 Drainage and waste disposal. (1) Provision shall be made to prevent flammable or combustible liquids which may be spilled at

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loading or unloading points from entering public sewers and drainage systems, or natural waterways. Connection to such sewers, drains, or waterways by which flammable or combustible liquids might enter shall be provided with separator boxes or other approved means whereby such entry is precluded. Crankcase drainings and flammable or combustible 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, August, 1971, No. 188, eff. 9-1-71.

Ind 8.67 Fire control. (1) One or more fire control devices, such as a portable extinguisher shall be available to locations where fires are likely to occur. Portable extinguishers shall be a minimum size of class 8BC. The total number of such devices shall be the ratio of one to each 3 tank truck or tank car loading or unloading positions, plus one of each 2,500 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 and combustible 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: The department will accept designs, construction and installation as covered in National Fire Protection Association, Vol's No. 6 and No. 7, National Fire Codes.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.68 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, August, 1971, No. 188, eff. 9-1-71.

SERVICE STATIONS

Ind 8.70 Storage and handling. (1) **GENERAL PROVISIONS.** (a) Liquids shall be stored in approved closed containers not exceeding 60 gallons capacity, in tanks located underground, in tanks in special enclosures as described in subsection (2), or in aboveground as provided for in section Ind 8.73 (2) (a), (b) and (c).

(b) Existing 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. No future installations of this type shall be permitted after the effective date of this order.

(c) The provisions of subsection (a) shall not prohibit the temporary use of movable tanks in conjunction with the dispensing of flammable or combustible liquids into the fuel tanks of motor vehicles or other motorized equipment on premises not normally accessible to the public. Such installations shall only be made with written per-

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mission from the department. The permission shall include a definite time limit not to exceed 10 days.

(d) The provisions of section Ind 8.70 (1) (a) shall not prohibit the dispensing of flammable liquids in the open from a tank vehicle to a motor vehicle. Such dispensing shall be permitted provided:

1. The tank vehicle complies with the requirements covered in section Ind 8.951, standard on tank vehicles for flammable liquids.
2. The dispensing is done on premises not open to the public.
3. The motor vehicles are owned or operated by a commercial, industrial or governmental agency.
4. The dispensing hose does not exceed 150 feet in length.
5. The dispensing nozzle is a listed automatic closing type without a latch open device.
6. An inspection of the premises and operations has been made and approval granted by the department.

(e) Class I 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 provided with ventilation designed to prevent the accumulation of flammable vapors therein as required by Wis. Adm. Code, chapters 50-59, Building and Heating, Ventilating and Air Conditioning.

(f) Daily inventory records shall be maintained and reconciled on all flammable liquid storage tanks for possible indication of leakage from tanks or piping. These records shall be made available to the department upon request.

Note: For additional requirements see section Ind 8.20 (3).

(2) SPECIAL ENCLOSURES. (a) When installation of tanks in accordance with section Ind 8.22 is impractical because of property or building limitations, tanks for flammable or combustible liquids may be installed in buildings if enclosed and upon specific approval of the department.

(b) Enclosure shall be 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 liquid or vapors which might accumulate should leakage occur.

(c) At automotive service stations provided in connection with tenant or customer parking facilities at or below grade level in large buildings of commercial, mercantile or residential occupancy, tanks containing class I liquids, installed of necessity in accordance with section (b), shall not exceed 6,000 gallons individual or 18,000 gallons aggregate capacity.

(3) INSIDE BUILDINGS. (a) Except where stored in tanks as provided in section (2), no class I liquid shall be stored within any service station building except in closed containers of aggregate capacity not exceeding 120 gallons. One container not exceeding 60 gallons capacity equipped with an approved pump is permitted.

(b) Class I liquids may be transferred from one container to another in lubrication or service rooms of a service station building provided the electrical installation complies with table 15 and pro-

vided that any heating equipment complies with section Ind 8.75. See also section Ind 8.77 (1) for other possible sources of ignition.

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

(4) LABELING. For labeling requirements see section Ind 8.14.

(5) DISPENSING INTO PORTABLE CONTAINERS. (a) Class I or II liquids shall not be dispensed into or from any tank vehicle not meeting the requirements of sections Ind 8.951 through Ind 8.957 or Ind 8.991.

Note: Also see section Ind 8.14.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.71 Attendance or supervision of dispensing. (1) 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 8.62 (8) (a) and (b).

(2) Service stations not accessible to or open to the public do not require an attendant or supervisor. Such stations shall be used only by commercial, industrial, governmental or manufacturing establishments; however, this does not include fraternal clubs and association memberships.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.72 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 of buildings upon specific approval of the department providing:

1. The dispensing area is separated from other areas in a manner approved by the department.

2. The dispensing unit and its piping is mounted either on a concrete island or protected against collision damage by suitable means and is located in a position where it cannot be struck by a vehicle descending a ramp or other slope out of control.

3. The dispensing area is provided with an approved mechanical ventilation system.

a. The ventilation system shall be electrically interlocked with gasoline dispensing units so that the dispensing units cannot be operated unless the ventilating fan motors are energized.

b. The intake to the exhaust duct shall be located within 25 feet of the dispensing unit and within 18 inches of the floor.

4. When dispensing units are located below grade the entire dispensing area shall be protected by an approved automatic sprinkler system.

(2) EMERGENCY POWER CUTOFF. A clearly identified and easily accessible switch(es) or a circuit breaker(s) shall be provided at a location remote from dispensing devices, including remote pumping systems, to shut off the power to all dispensing devices in the event of an emergency.

(a) For inside located dispensing systems, the required switch or circuit breaker shall be located within 25 feet from the dispensing unit.

(3) DISPENSING UNITS. (a) Automatic dispensing units shall be Underwriters' Laboratories approved special devices such as, but not limited to, money operated, card operated, and remote preset types located at 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 accessible and located within 15 feet of the attendant's control station. Instruction for operation of dispensing devices shall be conspicuously posted.

1. The observation and control of the special dispensing device 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.

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

(b) Key operated dispensing units shall be Underwriters' Laboratories approved and shall be permitted for fueling vehicles operated for commercial, industrial or manufacturing establishments provided dispensing of fuel is only by authorized personnel of these establishments.

1. Key operated dispensing units used by the general public shall only be permitted where installations meet those requirements covered under subsection (3) (a) or regular service station requirements.

(c) Class I liquids shall be transferred from tanks by means of fixed pumps so designed and equipped as to allow control of the flow and to prevent leakage or accidental discharge.

(d) Dispensing devices for class I liquids shall be of approved type.

(e) Class I liquids shall not be dispensed by pressure from drums, barrels, and similar containers. Approved pumps taking suction through the top of the container shall be used.

(f) The dispensing units, except those attached to containers, shall be mounted either on a concrete island or protected against collision damage by suitable means.

(4) REMOTE PUMPING SYSTEMS. (a) This section shall apply to systems for dispensing class I liquids where such liquids are transferred from storage to individual or multiple dispensing units by pumps located elsewhere than at the dispensing units.

(b) 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 buildings as provided for dispensers in subsection (7) (a) 1., or in pits as provided in (c). Pumps shall be substantially anchored and protected against physical damage by vehicles.

(c) 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 fitted cover

(d) 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.

(e) An approved impact valve, incorporating a fusible link, designed to close automatically in event of severe impact or fire exposure shall be properly installed in the dispensing supply line at the base of each individual dispensing device.

(f) There shall be a means, visible from any operating area, such as lube room, office and pump island, to indicate when the pump motor is running.

(5) **TESTING.** 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 the maximum operating pressure of the system. Such tests shall be conducted as follows:

- (a) After completion of the installation but before backfilling.
- (b) Upon completion of all paving.
- (c) At 3 year intervals thereafter.

(6) **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 subsection (6) (b).

(b) On any service station dispenser accessible to the public a listed automatic closing type nozzle with hold 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 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 hold open device.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.73 Marine service stations. (1) The dispensing area shall be located from other structures so as to provide room for safe ingress and egress of craft to be fueled. Dispensing units shall in all cases be at least 20 feet from any activity involving fixed sources of ignition.

(a) Dispensing shall be by approved dispensing units with or without integral pumps and may be located on open piers, wharves or floating docks or on shore or on piers of the solid fill type.

(b) Dispensing nozzles shall be automatic closing without a hold open device.

(2) Tanks and pumps not integral with the dispensing unit, shall

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be on shore or on a pier of the solid fill type, except as provided in subsection (2) (a) and (2) (b).

(a) Where shore location would require excessively long supply lines to dispensers, the department may authorize the installation of tanks on a pier provided that applicable portions of sections Ind 8.20 and 8.21 relative to spacing, diking and piping are complied with and the quantity so stored does not exceed 1,100 gallons aggregate capacity.

(b) Shore tanks supplying marine service stations may be located aboveground where rock ledges or high water table make underground tanks impractical, and such tanks shall be installed according to section Ind 8.21.

(c) Where tanks are at an elevation which would produce gravity head on the dispensing unit, the tank outlet shall be equipped with a pressure control valve positioned adjacent to and outside the tank block valve specified in section Ind 8.21 (9) (b) 1., so adjusted that liquid cannot flow by gravity from the tank in case of piping or hose failure.

(3) Piping between shore tanks and dispensing units shall be as specified in section Ind 8.30, except that, where dispensing is from a floating structure, suitable lengths of oil resistant flexible hose may be employed between the shore piping and the piping on the floating structure as made necessary by change in water level or shoreline.

(a) A readily accessible valve to shut off the supply from shore shall be provided in each pipeline at or near the approach to the pier and at the shore end of each pipeline adjacent to the point where flexible hose is attached.

(b) Piping shall be located so as to be protected from physical damage.

(c) Piping handling class I liquids shall be grounded to control stray currents.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.74 Electrical equipment. (1) EQUIPMENT. All electrical wiring and equipment shall be installed in accordance with Wis. Adm. Code, Vol. 2. Electrical.

(2) So far as it applies, table 15 shall be used to delineate and classify hazardous areas for the purpose of installation of electrical equipment under normal circumstances. In the following, a classified area shall not extend beyond an unpierced wall, roof or other solid partition.

(3) The area classifications listed in subsection (2) shall be based on the premise that the installation meets the applicable requirements of this code in all respects. Should this not be the case, the department shall have the authority to classify the extent of the hazardous area.

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TABLE 15
ELECTRICAL EQUIPMENT HAZARDOUS AREAS—
SERVICE STATIONS

Location	WEC Class I, Group D Division	Extent of Classified Area
Underground Tank Fill Opening-----	1	Any pit, box or space below grade level, any part of which is within the Division 1 or 2 classified area.
	2	Up to 18 inches above grade level within a horizontal radius of 10 feet from a loose fill connection and within a horizontal radius of 5 feet from a tight fill connection.
Vent—Discharging Upward-----	1	Within 3 feet of open end of vent, extending in all directions.
	2	Area between 3 feet and 5 feet of open end of vent, extending in all directions.
Dispenser Pits-----	1	Any pit, box or space below grade level, any part of which is within the Division 1 or 2 classified area.
	1	The area 4 feet vertically above base within the enclosure and 18 inches horizontally in all directions.
	2	Up to 18 inches above grade level within 20 feet horizontally of any edge of enclosure.
	2	Up to 18 inches above grade or floor level within 20 feet horizontally of any edge of enclosure.
	2	Up to 18 inches above grade or floor level within 25 feet horizontally of any edge of enclosure.
Remote Pump—Outdoor-----	1	Any pit, box or space below grade level if any part is within a horizontal distance of 10 feet from any edge of pump.
	2	Within 3 feet of any edge of pump, extending in all directions. Also up to 18 inches above grade level within 10 feet horizontally from any edge of pump.
Remote Pump—Indoor-----	1	Entire area within any pit.
	2	Within 5 feet of any edge of pump, extending in all directions. Also up to 3 feet above floor or grade level within 25 feet horizontally from any edge of pump.
Lubrication or Service Room-----	1	Entire area within any pit.
	2	Area up to 18 inches above floor or grade level within entire lubrication room.
Dispenser for Class I Liquids-----	2	Within 3 feet of any fill or dispensing point, extending in all directions.

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TABLE 15—(Continued)

Location	WEC Class I, Group D Division	Extent of Classified Area
Special Enclosure Inside Building Per Subsection Ind 8.60 (2)-----	1	Entire enclosure.
Sales, Storage and Rest Rooms-----	Ordinary	If there is any opening to these rooms within the extent of a Division 1 area, the entire room shall be classified as Division 1.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.75 Heating equipment. The heating equipment and installation shall satisfy the requirements of the Wis. Adm. Code, chapters 50-59, Building and Heating, Ventilating and Air Conditioning.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.76 Drainage and waste disposal. (1) Provision shall be made in the area where class I liquids are dispensed to prevent spilled liquids from flowing into the interior of service station buildings. Such provision may be by grading driveways, raising door sills, or other equally effective means. Crankcase drainings and flammable or combustible liquids shall not be dumped into sewers but shall be stored in tanks or drums outside of any building until removed from the premises.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.77 Sources of ignition. (1) In addition to the previous restrictions of this chapter, the following shall apply:

(a) There shall be no smoking or open flames in the areas used for fueling, servicing fuel systems for internal combustion engines, receiving or dispensing of flammable or combustible liquids.

(b) Conspicuous and legible signs reading "No Smoking—Stop Motor While Fueling" shall be posted within sight of the customer being served.

1. Letters on such signs shall be not less than 2 inches high.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.78 Fire control. (1) Each service station opening or reopening after the effective date of this code shall be provided with at least one fire extinguisher having a minimum classification of 6 B, C located so that an extinguisher will be within 75 feet of each pump, dispenser, underground fill pipe opening, and lubrication or service room.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

PROCESSING PLANTS

Ind 8.80 Scope. (1) Processing plants include those plants or buildings which contain chemical operations such as oxidation, reduction, halogenation, hydrogenation, alkylation, polymerization, and other chemical processes but shall not apply to chemical plants, refineries

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or distilleries as defined which are covered in section Ind 8.90, refineries, chemical plants and distilleries.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.81. Location. (1) The location of each processing vessel shall be based upon its flammable or combustible liquid capacity. Processing vessels shall be located, with respect to distances to lines of adjoining property which may be built upon, in accordance with table 16, except when the processing plant is designed in accordance with subsection (1) (a).

TABLE 16

Processing Vessels with Emergency Relief Venting to Permit Pressure	Stable Liquids	Unstable Liquids
Not in excess of 2.5 psig.....	Table 5*	2½ times Table 5*
Over 2.5 psig.....	1½ times Table 5*	4 times Table 5*

*Double distances where protection of exposure is not provided.

(a) The distances required in subsection (1) may be waived when the vessels are housed within a building and the exterior wall facing the line of adjoining property which may be built upon is a blank wall having a fire resistance rating of not less than 4 hours. When class IA or unstable liquids are handled, the blank wall shall have explosion resistance in accordance with good engineering practice, see section Ind 8.82 (4).

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.82 Processing building. (1) **CONSTRUCTION.** (a) Processing buildings shall be of fire-resistive or noncombustible construction, except heavy timber construction with load-bearing walls may be permitted for plants utilizing only stable class II or class III liquids. Except as provided in section Ind 8.81 (1) (a) or in the case of explosion resistant walls used in conjunction with explosion relieving facilities, see subsection (4), load-bearing walls shall be prohibited. Buildings shall be without basements or covered pits.

(b) Areas shall have adequate exit facilities arranged to prevent occupants from being trapped in the event of fire. Exits shall not be exposed by the drainage facilities described in subsection (2).

(2) **DRAINAGE.** (a) Emergency drainage systems shall be provided to direct flammable or combustible liquid leakage and fire protection water to a safe location. This may require curbs, scuppers, or special drainage systems to control the spread of fire.

(b) Emergency drainage systems shall not be connected to public sewers or discharged into public waterways.

(c) The processing plant shall be designed and operated to prevent the normal discharge of flammable or combustible liquids to public waterways, public sewers or adjoining property.

(3) **VENTILATION.** (a) Enclosed processing buildings shall be ventilated at a rate of not less than one cubic foot per minute per square foot of gross floor area. This shall be accomplished by natural or

mechanical ventilation with discharge of exhaust to a safe location outside of the building. Provision shall be made for introduction of make-up air in such a manner as not to short circuit the ventilation. Ventilation shall be arranged to include all floor areas or pits where flammable vapors may collect.

(b) Equipment used in a building and the ventilation of the building shall be designed so as to limit flammable vapor air mixtures under normal operating conditions to the interior of equipment, and to not more than 5 feet from equipment which exposes class I liquids to the air. Examples of such equipment are dispensing stations, open centrifuges, plate and frame filters, open vacuum filters and surfaces of open equipment.

(4) EXPLOSION RELIEF. (a) Areas where class IA or unstable liquids are processed shall have explosion venting through one or more of the following methods:

1. Open air construction;
2. Lightweight walls and roof;
3. Lightweight wall panels and roof hatches;
4. Windows of explosion venting type. (Also see section Ind 8.51

(6).)

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.83 Liquid handling. (1) STORAGE. (a) The storage of flammable or combustible liquids in tanks shall be in accordance with the applicable provisions of section Ind 8.20, tank storage.

(b) If the storage of flammable or combustible liquids in outside aboveground or underground tanks is not practical because of government regulations, temperature considerations or production considerations, tanks may be permitted inside of buildings or structures in accordance with the applicable provisions of section Ind 8.20, tank storage.

(c) Storage tanks inside of buildings shall be permitted only in areas at or above grade which have adequate drainage and are separated from the processing area by construction having a fire resistive rating of at least 2 hours except as noted below.

1. Processing equipment including any integral day tanks, running tanks, surge tanks and feed tanks shall not contain excess quantities of flammable or combustible liquids beyond what is essential to continuity of daily operation.

(d) The storage of flammable or combustible liquids in containers shall be in accordance with the applicable provisions of section Ind 8.40, container storage and portable tank storage.

(2) PIPING, VALVES AND FITTINGS. (a) Piping, valves and fittings shall be in accordance with section Ind 8.30, piping, valves and fittings.

(b) Approved flexible connectors may be used where vibration exists or where frequent movement is necessary. Approved hose may be used at transfer stations.

(c) Piping containing flammable or combustible liquids shall be identified as required by section Ind 8.36 (2).

(3) TRANSFER. (a) The transfer of large quantities of flammable or combustible liquids shall be through piping by means of pumps or water displacement. Except as required in process equipment, grav-

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ity flow shall not be used. The use of compressed air as a transferring medium shall be prohibited.

(b) Positive displacement pumps shall be provided with pressure relief discharging back to the tank or to pump suction.

(4) **EQUIPMENT.** (a) Equipment shall be designed and arranged to prevent the unintentional escape of liquids and vapors and to minimize the quantity escaping in the event of accidental release.

(b) Where the vapor space of equipment is usually within the flammable range, the probability of explosion damage to the equipment can be limited by inerting, by providing an explosion suppression system, or by designing the equipment to contain the peak explosion pressure which may be modified by explosion relief. Where the special hazards of operation, sources of ignition, or exposures indicate a need, consideration shall be given to providing protection by one or more of the above means.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.84 Tank vehicle and tank car loading and unloading. (1) Tank vehicle and tank car loading or unloading facilities shall be separated from aboveground tanks, warehouses, other plant buildings or nearest line of adjoining property which may be built upon by a distance of 25 feet for class I liquids and 15 feet for class II and class III liquids measured from the nearest position of any fill stem. Buildings for pumps or shelters for personnel may be a part of the facility. Operations of the facility shall comply with the appropriate portions of sections Ind 8.60 through Ind 8.68, bulk plants.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.85 Fire control. (1) Portable fire extinguishment and control equipment shall be provided in such quantities and types as are needed for the special hazards of operation and storage.

(2) Water shall be available in volume and at adequate pressure to supply water hose streams, foam producing equipment, automatic sprinklers or water spray systems as the need is indicated by the special hazards of operation and storage.

(3) Special extinguishing equipment such as that utilizing foam, inert gas, or dry chemical shall be provided as the need is indicated by the special hazards of operation and storage.

(4) Where the need is indicated by special hazards of operation, flammable or combustible liquid processing equipment, major piping, and supporting steel shall be protected by approved water spray systems, deluge systems, approved fire-resistant coatings, insulation or any combination of these.

(5) All plant fire protection facilities shall be adequately maintained and periodically inspected and tested to make sure they are always in satisfactory operating condition, and they will serve their purpose in time of emergency.

Note: An approved fire alarm system is recommended for prompt notification of fire. Where service is available, it is recommended that a public fire alarm box be located nearby. It may be advisable to connect the plant system with the public system.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.86 Sources of ignition. (1) GENERAL. (a) Precautions shall be taken to prevent the ignition of flammable vapors. Sources of ignition include but are not limited to open flames; lightning; smoking; cutting and welding; hot surfaces; frictional heat; static; electrical and mechanical sparks; spontaneous ignition, including heat producing chemical reactions; and radiant heat.

(b) Class I liquids shall not be dispensed 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.

(2) MAINTENANCE AND REPAIR. (a) When necessary to do maintenance work in a flammable or combustible liquid processing area, the work shall be authorized by a responsible member of supervision.

(b) Hot work, such as welding or cutting operations, use of spark producing power tools, and chipping operations shall be permitted only under supervision of an individual in responsible charge. The individual in responsible charge shall make an inspection of the area to be sure that it is safe for the work to be done and that safe procedures will be followed for the work specified.

(3) ELECTRICAL. (a) All electrical wiring and equipment within storage or processing areas shall be installed in accordance with Wis. Adm. Code, Vol. 2, Electrical.

(b) Locations where flammable vapor air mixtures may exist under normal operations shall be classified class I, division 1. For those pieces of equipment installed in accordance with section Ind 8.82 (3) (b), the division 1 area shall extend 5 feet in all directions from all points of vapor liberation. All areas within pits shall be classified division 1 if any part of the pit is within a division 1 or 2 classified area, unless the pit is provided with mechanical ventilation.

(c) Locations where flammable vapor air mixtures may exist under abnormal conditions and for a distance beyond division 1 locations shall be classified division 2. These locations include an area within 20 feet horizontally, 3 feet vertically beyond a division 1 area, and up to 3 feet above floor or grade level within 25 feet, if indoors, or 10 feet if outdoors, from any pump, bleeder, withdrawal fitting, meter, or similar device handling class I liquids. Pits provided with adequate mechanical ventilation within a division 1 or 2 area shall be classified division 2. If class II or class III liquids only are handled, then ordinary electrical equipment is satisfactory though care shall be used in locating electrical apparatus to prevent hot metal from falling into open equipment.

(d) Where the provisions of section Ind 8.86 (3) (a), (b) and (c) require the installation of explosion proof equipment, ordinary electrical equipment including switch gear may be used if installed in a room or enclosure which is maintained under positive pressure with respect to the hazardous area. Ventilation make-up air shall be uncontaminated by flammable vapors.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

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Ind 8.87 Housekeeping. (1) Maintenance and operating practices shall be in accordance with established procedures which will tend to control leakage and prevent the accidental escape of flammable or combustible liquids. Spills shall be cleaned up promptly.

(2) Adequate aisles shall be maintained for unobstructed movement of personnel and so that fire protection equipment can be brought to bear on any part of the processing equipment.

(3) Combustible waste material and residues in a building or operating area shall be kept to a minimum, stored in closed metal waste cans, and disposed of daily.

Note: See Wis. Adm. Code, chapter NR 151, department of Natural Resources.

(4) Ground area around buildings and operating areas shall be kept free of tall grass, weeds, trash or other combustible materials.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

REFINERIES, CHEMICAL PLANTS AND DISTILLERIES

Ind. 8.90 Storage. (1) Flammable or combustible liquids shall be stored in tanks or in containers or in portable tanks. Tanks shall be installed in accordance with section Ind 8.20 of this code.

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

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.91 Wharves. (1) Wharves handling flammable or combustible liquids shall be in accordance with section Ind 8.62

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.92 Fired and unfired pressure vessels. (1) Fired pressure vessels shall be constructed in accordance with the Wis. Adm. Code, chapter 41, Boiler and Unfired Pressure Vessels.

(2) Unfired pressure vessels shall be constructed in accordance with the Wis. Adm. Code, chapter 41, Boiler and Unfired Pressure Vessels.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71

Ind 8.93 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 or combustible liquids may flow from a processing area so as to constitute a fire hazard to property of others, provision shall be made to divert or impound the flow by curbs, drains or other suitable means.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.94. Fire control. (1) Portable fire extinguishment and control equipment shall be provided in such quantities and types as are needed for the special hazards of operation and storage.

(2) Water shall be available in volume and at adequate pressure to supply water hose streams, foam producing equipment, automatic sprinklers or water spray systems as the need is indicated by the special hazards of operation and storage.

(3) Special extinguishing equipment such as that utilizing foam, inert gas or dry chemical shall be provided as the need is indicated by the special hazards of operation and storage.

(4) Where the need is indicated by special hazards of operation, flammable or combustible liquid processing equipment, major piping and supporting steel shall be protected by approved water spray systems, deluge systems, approved fire-resistant coatings, insulation or any combination of these.

(5) All plant fire protection facilities shall be adequately maintained and periodically inspected and tested to make sure they are always in satisfactory operating condition, and they will serve their purpose in time of emergency.

Note: An approved fire alarm system is recommended for prompt notification of fire. Where service is available, it is recommended that a public fire alarm box be located nearby. It may be advisable to connect the plant system with the public system.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

FLAMMABLE AND COMBUSTIBLE LIQUID TANK VEHICLES

Ind 8.950 Scope. (1) This standard applies to tank motor vehicles to be used for the transportation of asphalt or normally stable flammable and combustible liquids with a flash point below 200° F. It is intended to provide minimum requirements for the design, construction and operation of tank motor vehicles, their appurtenances and certain features of tank motor vehicle chassis.

(2) Additional safeguards may be necessary for tank vehicles used for the transportation of flammable and combustible liquids having characteristics introducing additional factors such as high rates of expansion, instability, corrosiveness and toxicity.

(3) Attention is directed to the fact that cutback asphalts can have flash points in the range of class I liquids. Also liquids having a flash point higher than 200° F., such as asphalt, may assume the characteristics of lower flash point liquids when heated. Under such conditions it shall be appropriate to apply the provisions of this standard unless otherwise specifically exempted.

Note: The requirements for aircraft fuel servicing tank vehicles are contained in NFPA No. 407, Aircraft Fueling on the Ground.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.951 Basic design. (1) Design of the tank vehicle shall give engineering consideration to the structural relationship between the cargo tank, the propulsion equipment and the supporting members of any, with due regard to the weight and temperature of the cargo, road performance, braking and required ruggedness. The metal thicknesses specified in this section are minimum thicknesses dictated by

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the structure of the tank itself, and it may be necessary that these thicknesses be increased where the tank shell is to be subjected to additional stress.

(2) Any tank vehicle designed or used for transporting materials at liquid temperatures above ambient temperature shall have a red warning sign permanently attached to the vehicle containing at least the following: "Maximum allowable cargo temperature is _____° F." This maximum allowable cargo temperature shall be specified by the manufacturer of the vehicle.

(3) Cargo tanks used for transporting flammable and combustible liquids at temperatures equal to or above their boiling points shall be constructed in accordance with section Ind 8.952.

(4) Cargo tanks used for transporting flammable liquids at a temperature below their boiling points shall be constructed in accordance with the provisions of section Ind 8.952 or Ind 8.953.

(5) The material used in the construction of the cargo tanks shall be compatible with the chemical characteristics of the flammable and combustible liquid to be transported.

Note: Cargo tanks, piping and connections designed for transporting flammable and combustible liquids above their boiling points built in accordance with specifications MC-304, MC-330, or MC-331 of part 78 of title 49 Transportation, code of Federal Regulations will be approved by the department.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.952 Cargo tanks, piping and connections designed for transfer of flammable and combustible liquids at temperatures below their boiling points. (1) **CARGO TANK CONSTRUCTION.** (a) *Cargo tanks constructed of mild steel.* 1. Material. 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%

2. Thickness of sheet. The minimum 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, ring, or other shell stiffeners, as well as by the radius of shell curvature in case of shell sheets. Thickness of exterior head sheets shall never be less than the maximum requirements for shell sheets in any specific unit.

TABLE 17
MINIMUM THICKNESS OF HEAD, BULKHEAD
AND BAFFLE SHEETS

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

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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 gallons.....	14	0.0747	14	0.0747	13	0.0897
Over 14 to 18 gallons.....	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 gallons.....	14	0.0747	13	0.0897	12	0.1046
Over 14 to 18 gallons.....	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 gallons.....	13	0.0897	12	0.1046	11	0.1196
Over 14 to 18 gallons.....	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 gallons.....	12	0.1046	11	0.1196	10	0.1345
Over 14 to 18 gallons.....	11	0.1196	10	0.1345	9	0.1495
Over 18 gallons.....	10	0.1345	9	0.1495	8	0.1685

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

(b) Cargo tanks constructed of low alloy low carbon (high tensile) steel and stainless steel.

1. All low alloy low carbon (high tensile) steel sheets for such cargo tanks shall meet the following requirements:

Yield point, minimum ----- 45,000 pounds per square inch
 Ultimate strength, minimum ----- 60,000 pounds per square inch
 Minimum elongation, standard 2 inch sample ----- 25%

2. All stainless steel sheets for such cargo tanks shall meet the following minimum requirements:

Yield point, minimum ----- 32,000 pounds per square inch
 Ultimate strength, minimum ----- 75,000 pounds per square inch
 Minimum elongation, standard 2 inch sample ----- 20%

3. Thickness of high tensile and stainless steel sheets:

The minimum thickness of high tensile and stainless steel tank sheets shall be limited by the volume and capacity of the tank ex-

pressed in terms of gallons per inch of length; and by the distance between bulkheads, baffles, ring or other shell sheets; as follows:

**LOW ALLOY LOW CARBON (HIGH TENSILE) STEEL
AND STAINLESS STEEL SHEETS
MINIMUM THICKNESS OF HEAD, BULKHEAD
AND BAFFLE SHEETS**

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
Manufacturer's Standard Gauge No.....	15	14	18	12

**TABLE 18
MINIMUM THICKNESS OF SHELL SHEETS
Low Alloy Low Carbon (High Tensile) Steel
and Stainless Steel**

Volume Capacity of Tank in Gallons Per Inch of Length	Distance Between Attachments of Bulkheads, Baffles, Ring, 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 gallons.....	16	0.0588	15	0.0673	14	0.0747
Over 14 to 18 gallons.....	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 gallons.....	15	0.0673	14	0.0747	13	0.0897
Over 14 to 18 gallons.....	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 gallons.....	14	0.0747	13	0.0897	12	0.1046
Over 14 to 18 gallons.....	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 gallons.....	13	0.0897	12	0.1046	11	0.1196
Over 14 to 18 gallons.....	12	0.1046	11	0.1196	10	0.1345
Over 18 gallons.....	11	0.1196	10	0.1345	9	0.1495

*Other than circular cross section, the radius used shall be the maximum for that portion of the cross section under consideration.
†Manufacturers Standard Gauge and approximate equivalent thickness in decimals of inch.

(c) Cargo tanks constructed of aluminum alloys for high strength welded construction.

1. Material. All sheets for shell, heads and bulkheads of such cargo tanks shall be of aluminum alloys GR20A (5052 commercial designation), GM31A (5454 commercial designation), GR40A (5154 commercial designation) or GM40A (5086 commercial designation), conforming to subsection Ind 8.03 (1) (b) Specifications for Aluminum-Alloy.

a. All heads, bulkheads, baffles and other shell stiffeners may use 0 temper (annealed) or stronger tempers. All shells shall be of H32

or H34 temper, except that when shell thicknesses of 0.250 inch or thicker are used, the H112 temper is additionally permitted.

2. 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 stiffeners, as well as by the radius of shell curvature in the case of shell sheets. Thickness of exterior head sheets shall never be less than the maximum requirements for shell sheets.

3. When aluminum is used for cargo tanks intended to transport cargoes at liquid temperatures above 250° F. the minimum thicknesses in the following tables shall be increased by one percent for each 10° F. or portion thereof above 250° F. When the liquid temperatures are above 500° F. there shall be an additional one percent for each 10° F. or portion thereof above 500° F. Aluminum shall not be used for cargo tanks transporting cargoes at temperatures above 550° F.

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

Aluminum Alloys GR20A, GM31A, GR40A, and GM40A

Heads, Bulkheads, or Baffles	(Dished, Corrugated, Reinforced or Rolled)			
	10 or less	Over 10 to 14	Over 14 to 18	Over 18
Volume Capacity of Tank in Gallons per Inch of Length.....				
Thickness of Decimals of Inch.....	.096	.109	.130	.151

**TABLE 19
MINIMUM THICKNESS OF SHELL SHEETS
Aluminum Alloys GR20A, GM31A, GR40A and GM40A**

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

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(2) JOINTS. (a) Joints shall be welded 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.

(b) Mild steel sheets as specified in section Ind 8.952 (1) (a) may be used in combination with high tensile steel sheets or stainless steel sheets as specified in section Ind 8.952 (1) (b) in the construction of a single tank, provided each material, where used, shall comply with the minimum requirements for the material used in the construction of that section of the tank. Whenever stainless steel sheets are used in combination with sheets of other types of steel, joints made by welding shall be formed by the use of stainless steel electrodes or filler rods on condition that the stainless steel electrodes or filler rods used in the welding be suitable for use with the grade of stainless steel concerned, according to the recommendations of the manufacturer of the stainless steel electrodes or filler rods.

(c) In cargo tanks constructed of aluminum alloys, all joints in and to tank shells, heads and bulkheads shall be welded. 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 filler metals R-GR40A, E-GR40A (5154 alloy) and R-GM50A, E-GM50A (5356 alloy) as conforming to standards approved by the department.

Note: The department will accept welded construction satisfying American Welding Society specification No. A5.10-69.

(3) BULKHEADS AND BAFFLES. (a) Each cargo tank having a total capacity in excess of 3,000 gallons and used for the distribution of class I liquids at locations to which the public is invited shall be divided into compartments no one of which shall exceed 2,500 gallons, except when the entire contents of the cargo tank is to be discharged into one storage tank, such compartmentation is not required. A construction tolerance of 10% shall be allowed for capacities of individual compartments or tanks.

(b) Bulkheads or compartments shall not be required in any cargo tank used for the transportation service, regardless of total capacity, provided such cargo tank is not used for the delivery of flammable liquids to locations to which the public is invited. Bulkheads or compartments shall not be required in any cargo tank used for asphalt service.

(c) Every cargo tank and every compartment of a cargo tank over 90 inches in length, except those used in asphalt service shall be provided with either baffles, ring or other shell stiffeners, so located that the maximum linear distance between any two baffles or stiffeners, or between any baffle or stiffener and the nearest tank head or bulkhead, shall not exceed 60 inches.

1. Ring stiffeners shall be continuous around the circumference of the tank shell and shall have at least the section modulus shown in the following table:

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**MINIMUM SECTION MODULUS REQUIRED
FOR RING STIFFENERS**

Width of Tank	Section Modulus	
	Steel	Aluminum
42" or less	0.0104L ¹	0.0180L ¹
Over 42" to 60"	0.0162L ¹	0.0280L ¹
Over 60" to 96"	0.0284L ¹	0.0400L ¹

Note: L¹ is the maximum distance from the midpoint of the unsupported shell on one side of the ring stiffener to the midpoint of the unsupported shell on the opposite side of the ring stiffener. See section Ind 8.952 (3) (d) for minimum thickness of ring stiffeners.

2. If a ring stiffener is welded to the shell, a portion of the shell may, for the purposes of computing the section modulus, be considered as a part of the ring section. If welded at one side of the ring stiffener only, such portion shall not exceed 20 times the shell thickness adjacent to the weld. If welded at both sides of the ring stiffener, such portion shall not exceed 40 times the shell thickness adjacent to the weld, or the width of the ring stiffener between welds plus 20 times the shell thickness adjacent to the welds, whichever is less.

(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 class II or class III liquids adjacent to compartments carrying class I liquids shall be provided with an air space between compartments. This air space shall be equipped and maintained with drainage facilities operative at all times.

(4) **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 the issuance of liquid to indicate leaks. Any leakage discovered by either of the methods above described, or by any other method shall be deemed as evidence of failure to meet the requirements of this specification.

(5) **OUTLET VALVE AND FAUCET CONNECTIONS.** (a) Outlets shall be made and so attached to the tank to prevent leakage.

(b) Drawoff 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.

(6) **VENTS FOR TANK VEHICLES IN OTHER THAN ASPHALT SERVICES.** (a) *Normal venting.* Each cargo tank or tank compartment, except those used in asphalt service, shall be provided with a normal vent or

vents having a minimum through area of 0.44 square inches. The pressure vent shall be set to open at no more than 1 psig. Pressure and vacuum vents shall be designed to prevent loss of liquid through the vent in case of vehicle upset. If the tank is designed to be loaded or unloaded with the dome cover closed, the vent or vents shall be designed to limit the vacuum to one pound per square inch and the tank pressure to 3 psig on the basis of the maximum product transfer rate.

(b) *Emergency venting for fire exposure.* 1. Total capacity. Each cargo or tank compartment, except those used in asphalt service, shall be provided with one or more devices with sufficient capacity to limit the tank internal pressure to 5 psig. This total emergency venting capacity shall be not less than that determined from table 20, using the external surface of the cargo tank or tank compartment as the exposed area.

TABLE 20
MINIMUM EMERGENCY VENT CAPACITY IN CUBIC FEET
FREE AIR/HOUR (14.7 PSIA AND 60° F.)

Exposed Area Square Feet	Cubic Feet Free Air Per Hour	Exposed Area Square Feet	Cubic Feet Free Air Per Hour
20	15,800	275	214,300
30	23,700	300	225,100
40	31,600	350	245,700
50	39,500	400	265,000
60	47,400	450	283,200
70	55,300	500	300,600
80	63,300	550	317,300
90	71,200	600	333,300
100	79,100	650	348,800
120	94,900	700	363,700
140	110,700	750	378,200
160	126,500	800	392,200
180	142,300	850	405,900
200	158,100	900	419,300
225	191,300	950	432,300
250	203,100	1,000	445,000

Note: Interpolate for intermediate sizes.

2. Pressure actuated venting. Each cargo tank or tank compartment shall be equipped with pressure actuated vent or vents set to open at not less than 3 psig. The minimum venting capacity for pressure actuated vents shall be 6,000 cubic feet of free air per hour (14.7 psia and 60° F.) at 5 psig. Pressure actuated devices shall be designed so as to prevent leakage of liquid past the device in case of surge or vehicle upset but shall function in case of pressure rise when in upset position.

3. Fusible venting. If the pressure actuated venting required by 2. does not provide the total venting capacity required by 1., additional capacity shall be provided by adding fusible venting devices each having a minimum area of 1.25 square inches. The fusible vent or vents shall be actuated by elements which operate at a temperature not exceeding 250° F. when the tank pressure is between 3 and 5 psig. When fusible venting devices are used no less than 2 such devices shall be used on any cargo tank or tank compartment over

2,500 gallons in capacity, and at least one such device shall be located close to each end of the cargo tank or tank compartment.

(c) *Flow testing and marking of vents.* 1. Each venting device shall be flow tested in the ranges specified in the applicable preceding paragraphs. The actual rated flow capacity of the vent in cubic feet of free air per hour at the pressure in psig at which the flow capacity is determined shall be stamped on the device. The fusible vent or vents shall have their flow rating determined at 5 psig differential.

2. These flow tests may be conducted by the manufacturer, if certified by a qualified impartial observer, or may be delegated to an outside agency.

(7) **INSTALLATION OF VENTS.** All vents shall be arranged to provide direct flow from the vapor space of the tank. Shutoff valves shall not be installed between the tank opening and the vent.

(8) **VENTS FOR TANK VEHICLES IN ASPHALT SERVICE.** (a) Each cargo tank used in asphalt service shall be provided with a vent having an effective opening at least equivalent to a nominal 2 inch pipe.

(b) Each cargo tank for asphalt service shall be provided with a manhole having a free opening of at least 15 inches in diameter designed to relieve internal pressure at between 2 and 3 pounds per square inch gauge or an equivalent relief device.

(9) **EMERGENCY DISCHARGE CONTROL—LIQUIDS HAVING VISCOSITIES LESS THAN 45 SSU.** (a) The outlets of each cargo tank or compartment used for transportation of class I liquids, and trucks constructed hereafter for transportation of class II and class III combustible liquids having a viscosity less than 45 second Saybolt Universal at 100° F., shall be equipped with a reliable and efficient shutoff 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.

Note: The 45 second viscosity limit is included for the purposes of requiring internal valves when transporting free flowing distillate oils, such as kerosene, diesel oil and domestic heating oil, and of excluding this requirement when transporting viscous oils such as residual fuel oil, bunker fuel oil and asphalt products which may congeal and cause malfunctioning of the valve.

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

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

(d) In every case there shall be provided, between the shutoff 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 shutoff valve seat intact.

(e) The requirement of section Ind 8.952 (9) does not apply to cargo tanks with any one compartment having a capacity of 400 gallons or less. A design tolerance of 5% shall be allowed.

(10) **LIQUIDS OF VISCOSITIES OF 45 SSU OR MORE.** (a) The outlets of each cargo tank used for the transportation of liquids having a viscosity equal to or greater than 45 seconds Saybolt Universal of

100° F. shall be equipped with a suitable shutoff valve, located internally, designed so that the valve will remain operable if the external connection is sheared off; or a front or rear head mounted valve securely reinforced and protected against shock or road hazards.

(11) OVERFLOWS AND DRAINS FOR ASPHALT TANK VEHICLES. (a) Overflow protection for asphalt tank vehicles shall be provided in the form of reservoirs or flashing around fill and vent pipes. Overflow and drain pipes shall have thicknesses heavier than the tank shell and shall be designed so that hot asphalt will not spill onto tires, brakes, burner equipment or vehicles' exhaust system.

(12) SEPARATION TO PREVENT INTERMIXING. (a) Tank vehicles transporting class I liquid in one or more compartments and class II or class III liquid in other compartment or compartments shall be equipped with separate piping, pumps, meters and hoses for such classes of product.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.953 Tank vehicle chassis, assembly and appurtenances. (1) ANCHORING OF CARGO TANKS. (a) Hold-down devices shall be provided to anchor each cargo tank in a manner that will not introduce stresses beyond design and shall be built to withstand loadings in any direction equal to the weight of the tank and attachments when filled with water. These devices on vehicles with frames shall all incorporate turnbuckles or similar positive action devices for drawing the tank down tight on the frame of the tank vehicle.

(b) Stops and anchors shall be attached to the tank vehicle and the tank to prevent movement between them due to starting, stopping and turning. These stops or anchors shall be installed so as to be readily accessible for inspection and maintenance except that insulation for insulated tanks is permitted to cover such stops and anchors.

(c) Whenever any cargo tank is so designed and constructed that the cargo tank constitutes, in whole or in part, the stress member used in lieu of a frame, then such cargo tanks shall be designed so as to successfully withstand the stresses thereby imposed in addition to those otherwise imposed on the tank.

(d) Paragraphs (a), (b) and (c) shall not be so construed as to prohibit the installation between the tank and the chassis or undercarriage, devices, such as wood or rubber blocks, intended to provide for expansion or cushioning of the tank; provided, however, that such devices shall be installed so as to comply with section Ind 8.954 (1).

(2) STATIC PROTECTION. (a) Cargo tanks and vehicle chassis shall be electrically bonded.

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.

(b) Provisions shall be made in the tank structure of the vehicle for the bonding of vehicle to the fill pipe during truck loading operations.

(3) PROTECTION AGAINST COLLISION OR OVERTURN. (a) Drawoff valves or faucets projecting beyond the frame at the rear of a tank vehicle shall be adequately protected against collision by bumpers or similar means.

(b) On tank vehicles 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.

(4) LIGHTING. No lighting device other than electric lights shall be used on tank vehicles. Lighting circuits shall have suitable over-current protection (fuses or automatic circuit breakers). The wiring shall have sufficient carrying capacity and mechanical strength, and shall be secured, insulated, and protected against physical damage, in keeping with recognized good practice.

(5) FUEL SYSTEM. (a) Liquid 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. Liquefied petroleum gas fuel containers shall be designed, constructed and installed in accordance with the requirements of the Wis. Adm. Code, chapter 9, Liquefied Petroleum Gases.

(b) All portions of the fuel feed system, including carburetor, pumps, and all auxiliary mechanisms and connections shall be constructed and installed in a workmanlike manner, and so constructed 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 material strength designed for the purpose, well secured to avoid chafing or undue vibration, having a readily accessible and reliable shutoff valve or stopcock. 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., shall be installed in the fuel line on the fuel tank side of such joint.

(c) Fuel tanks for the vehicle engine and fuel tanks for the burners on asphalt trucks shall be located remotely from the burner or protected by a noncombustible shield from the burner to prevent flashback.

(6) EXHAUST SYSTEM. (a) The exhaust system, including muffler (or silencer) and exhaust line shall have ample 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.

(7) FULL TRAILERS AND SEMITRAILERS (EXISTING AND NEW). (a) Trailers shall be firmly and securely attached to the vehicle drawing them.

(b) Each full trailer, and semitrailer, shall be equipped with reliable brakes on all wheels, and provision shall be made for their operation from the driver's seat of the vehicle drawing the trailer, or semitrailer.

(c) Trailer connections shall be designed to follow in the path of the towing vehicle.

Note: For further vehicle requirements see section 347.49, Wis. Stats.

(8) **MARKING.** Every existing and new tank vehicle used for the transportation of any flammable liquid, regardless of the quantity being transported, or whether loaded or empty, shall be conspicuously and legibly marked on each side of the rear thereof, with the word "flammable" in letters at least 4 inches high and not less than $\frac{5}{8}$ inch wide brush stroke on a background of sharply contrasting color.

(9) **FIRE EXTINGUISHERS.** (a) All existing and new tank vehicles shall be provided with at least one portable fire extinguisher of not less than 12-B, C unit. When more than one extinguisher is provided to meet this provision, each extinguisher shall have a rating of not less than 6-B, C.

(b) Fire extinguishers shall be kept in good operating condition at all times, and they shall be located in an accessible place on each tank vehicle. Drivers shall be thoroughly instructed in proper method of operating extinguishers.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.954 Auxiliary equipment. (1) **AUXILIARY INTERNAL COMBUSTION ENGINES.** (a) Internal combustion engines, other than those providing propulsive power, installed or carried upon a tank vehicle transporting class I liquids for the purpose of providing power for the operation of pumps or other devices, shall meet the following requirements:

1. The engine air intake shall be equipped with a flame arrester, or an air cleaner having flame arrester characteristics, securely installed and capable of preventing emission of flame from the intake side of the engine in event of backfiring.

2. The fuel system shall be so located as to prevent a fire hazard. If the fuel tank is located above or immediately adjacent to the engine, 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 system.

3. Pumps and other appurtenances 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 shielding shall be provided to attain the same purpose. The engine cooling fan shall be so positioned, rotated or shielded as to eliminate the drawing of flammable vapors toward the engine.

4. When the engine is located in a position where spillage might constitute a hazard, 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.

5. Where the engine is carried within an enclosed space provision shall be made for air circulation at all times.

6. The exhaust system shall be securely anchored and free from leaks. The exhaust line and muffler shall have safe clearance from combustible materials. When engines are carried as in paragraph 5,

the exhaust gases shall be discharged outside of each such closed space.

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

(2) AUXILIARY ELECTRIC GENERATORS AND MOTORS. (a) Electrical equipment installed or carried upon a tank vehicle transporting class I 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:

1. 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, shall have no less than a general purpose enclosure. Generators located elsewhere shall be provided with explosion proof enclosure.

2. Motors having sparking contacts shall be provided with explosion proof enclosures.

3. Wiring shall be designed for maximum loads to be carried, and shall be installed so as to be protected from physical damage and contact with possible product spill either by location or by being enclosed in metal conduit or other oil-resistant protective covering.

4. Junction boxes shall be sealed.

5. Switches, overload protection devices and other sparking equipment shall be located and enclosed as provided for generators in paragraph 1.

6. Where the generator or motor is located within an enclosed space provision shall be made for air circulation.

(3) BURNER AND BURNER TUBES FOR ASPHALT TANK VEHICLES. (a) Burner tubes shall be securely installed.

(b) The bottom of internal burner tubes shall be located as low in the tank as design and functioning will permit.

(c) Instructions for the method of operating the burner equipment and the pumping equipment, if so equipped, shall be provided. These instructions shall accompany the vehicle at all times.

(d) A legible red warning sign shall be permanently attached near the burners on any tank vehicle equipped with burners and shall contain at least the following information:

"W A R N I N G"

This burner equipment must not be operated while the vehicle is being loaded or is in transit, or when the burner tubes are not completely submerged.

(4) PUMPS AND HOSE. (a) When a pump is used to deliver products, automatic means shall be provided to prevent pressure in excess of the design working pressures of the accessories, piping and hose.

(b) For delivery of product by pump, the hose shall be marked to indicate the manufacturer's design working pressure.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.955 Operation of tank vehicles. (1) Operating conditions.

(a) Drivers shall be instructed in the method of operating tank vehicles.

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(b) Tank vehicles shall not be operated unless they are in safe repair, devoid of accumulation of grease, oil or flammables and free of leaks.

(c) Dome covers shall be closed and latched while the tank vehicle is in transit.

(d) No tank vehicle shall be operated with a cargo temperature above the maximum allowable cargo temperature specified on the warning sign required by section Ind 8.951 (2).

(e) No material shall be loaded into or transported in a tank vehicle at a temperature above its ignition temperature.

(f) Flammable and combustible liquids which are loaded at or above their boiling points or may reach their boiling point temperature during transit shall be loaded only into cargo tanks constructed in accordance with approved standards. (See note under section Ind 8.951 (5).)

(g) Flammable and combustible liquids shall be loaded only into cargo tanks whose material are compatible with the chemical characteristics of the liquid. The flammable and combustible liquid being loaded shall also be chemically compatible with the liquid hauled on the previous load unless the cargo tank has been cleaned.

(h) No class II or class III liquid shall be loaded into any tank vehicle, or any compartment thereof, which has been utilized for class I liquid, until such tank or compartment and all piping, pumps, meters and hose connected thereto have been completely drained. A tank, compartment, piping, pump, meter or hose which does not drain completely shall be flushed at the loading point with a quantity of class II or class III liquid equal to twice the capacity of piping, pump, meter and hose, to clear any residue of class I liquid from the system.

(2) FILLING AND DISCHARGE TANK VEHICLES. (a) Attendance. The driver, operator, or attendant of any tank vehicle shall not remain in cab of vehicle being loaded or unloaded and shall not leave the valves controlling the flow of the product until the operation is completed.

(b) Motors of tank trucks or tractors shall be shut off 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 off throughout such operations.

(c) The cargo tank shall be bonded to the fill stem or some part of the rack structure which is electrically interconnected with the fill stem piping. Exceptions: Tank vehicles handling asphalt; tank vehicles loading any flammable liquid through bottom connections; and tank vehicles used exclusively for transporting class II and class III liquids when loaded at locations where no class I liquids are handled.

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

(d) 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.

(e) No cargo tank or compartment thereof used for the transportation of any flammable or combustible liquid or asphalt shall be loaded liquid full. 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 and in no case less than 1%.

(f) 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.

(g) Cargo tanks shall be free of all water before they are loaded with hot asphalt.

(3) **IGNITION SOURCES.** (a) 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.

(b) Open flames shall not be used near manholes or vents.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71

OIL BURNING EQUIPMENT

Ind 8.970 Application and scope. (1) Sections Ind 8.970 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 minimum 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, August, 1971, No. 188, eff. 9-1-71.

Ind 8.971 Use of approved equipment. Oil burning equipment shall be approved according to the Wis. Adm. Code, chapters 50-59, Building and Heating, Ventilating and Air Conditioning. Where referenced code does not apply, equipment shall be listed by U. L.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.972 Design and construction of tanks. Tanks shall meet the standards set forth in section Ind 8.20.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.973 Installation of underground tanks. Installations shall comply with the provisions of section Ind 8.22.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.974 Installation of unenclosed supply tanks inside buildings. (1) Where provisions of the Wis. Adm. Code, chapters 50-59, Building and Heating, Ventilating and Air Conditioning 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 or heavier if not galvanized, or 20 gauge or heavier if galvanized.

(b) An approved safety can will be acceptable for a storage tank.

(c) A supply tank larger than 10 gallons but not larger than 550

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gallons capacity shall comply with the provisions of appropriate sections under Ind 8.20.

(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 or not more than 6 safety cans may be located in any one or more stories of a building. No such supply tank or safety can shall have an individual capacity exceeding 10 gallons.

(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). 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 in accordance with provisions of Wis. Adm. Code, chapters 50-59, Building and Heating, Ventilating and Air Conditioning.

(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 noncombustible 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 ¼ inch per foot of length.

(8) A shutoff 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 the pipe size specified in table 21, and a fill pipe, both terminating outside the building.

TABLE 21

Capacity of Tank U. S. Gallons	Approximate Imperial Gallons	Diameter of Vent. Iron Pipe Size
500 or less	500 or less	1½ inches
501 to 3,000	501 to 2,500	1½ inches
3,001 to 10,000	2,501 to 8,800	2 inches
10,001 to 20,000	8,801 to 16,600	2½ inches
20,001 to 35,000	16,601 to 29,000	3 inches

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(a) Where tanks are filled by the use of a pump through tight connections, the vent pipe shall be of adequate size to prevent the development of abnormal pressure in the tank during filling. The vent pipe shall therefore have more free area than the fill pipe.

(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 8.974 (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, August, 1971, No. 188, eff. 9-1-71.

Ind 8.975 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 550 gallons capacity shall be enclosed in accordance with section Ind 8.23 when installed inside of a building.

(b) Tankage inside of a building in excess of that permitted in unenclosed tanks by section Ind 8.974 (3) (c) and (d) shall be enclosed in accordance with section Ind 8.23.

(c) Only a tank complying with the provisions of appropriate sections under section Ind 8.20 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 550 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 appliances.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.976 Installation of outside aboveground tanks not larger than 275 gallons. (1) Tankage not in excess of that permitted by section Ind. 8.974 (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 incidental 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 appropriate sections under Ind 8.20. A tank not so identified and having a capacity of not more than 275 gallons shall comply with the provisions of appropriate sections under Ind 8.20.

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(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 subsection (3) may be cross-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 noncombustible supports to prevent settling, sliding or lifting.

(6) A shutoff 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 as provided in table 21.

(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, August, 1971, No. 188, eff. 9-1-71.

Ind 8.977 Installation of outside aboveground tanks larger than 275 gallons. Installations shall comply with the provisions of section Ind 8.21.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.978 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 opening 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 2 supply tanks not exceeding 550 gallons individual capacity, permitting gravity flow from one tank to another shall be prohibited.

(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, August, 1971, No. 188, eff. 9-1-71.

Ind 8.979 Installation of supply piping. (1) Connections to tanks shall be as follows: (a) All piping, except burner supply line from a tank having a capacity not over 550 gallons (500 Imp. gallons) and the cross connection between 2 tanks having an aggregate capacity of 550 gallons or less, shall be connected into the top of a supply tank.

1. When 2 tanks are cross-connected, the tops of the tanks shall be on the same horizontal plane. See figures on page 88.

(b) The burner supply connection to a tank having a capacity of more than 550 gallons (500 Imp. gallons) or to 2 or more tanks having an aggregate capacity of more than 550 gallons (500 Imp. gallons) shall be connected into the top of each tank, except as permitted by section Ind 8.979 (1) (e) or (2).

(c) A transfer pump or an automatic pump shall be used to deliver oil from a supply tank to a burner or to an auxiliary tank. Except as permitted by section Ind 8.979 (2) (b) and (3) a transfer pump shall not be connected to a tank having a capacity over 550 gallons (500 Imp. gallons) or to 2 tanks having an aggregate capacity of over 550 gallons (500 Imp. gallons).

(d) The pressure at the oil supply inlet to an appliance shall be not greater than 3 psi.

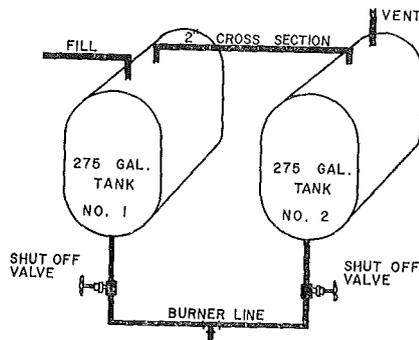


Figure 1

ARRANGEMENT OF TWO FUEL OIL TANKS OF NOT MORE THAN 550 GALLONS (500 IMP. GALLONS) AGGREGATE CAPACITY

In this arrangement of two tanks only one fill pipe and one vent pipe are used. During filling oil enters tank No. 1. The displaced vapors pass through the cross-connection at top into tank No. 2. The expansion zone for both tanks is obviously in tank No. 2 until the tanks equalize after filling is completed.

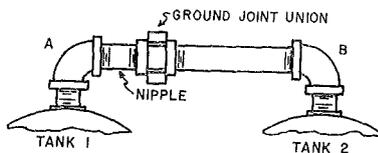


Figure 2

This shows the detail of the cross-connection which can be used in Figure 1.

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

(2) For commercial and industrial installations, the oil supply from tankage of any capacity, permitted by sections Ind 8.970 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.

(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 shutoff valve located as close as practicable to the shell of the tank. The valves and their connections to the tank shall be of metal.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.980 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, August, 1971, No. 188, eff. 9-1-71.

Ind 8.981 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 listed by Underwriters' Laboratories and installed in full compliance with its listing.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.982 Piping materials and designs. (1) All piping shall be wrought iron, steel or brass pipe, or brass or copper tubing.

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

(b) Approved flexible metal hose shall be used where rigid connections are likely to be subjected to jarring and vibration.

Note: The department will accept Underwriters' Laboratories approved listing.

1. Installation shall be in full compliance with its listing.

(2) Piping used in the installation of oil burners and appliances other than conversion range oil burners shall be not smaller than ¾ inch iron pipe size or ¾ OD tubing.

(a) Copper tubing shall have 0.035 inch nominal and 0.032 inch minimum wall thickness.

(3) Pipe shall be connected with approved standard fittings and tubing with fittings.

(a) Pipe connectors made of combustible materials or depending upon the frictional characteristics of combustible materials shall not be used inside of buildings or aboveground outside of buildings.

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1. The above connectors shall only be used for underground installations outside of buildings.

Note: The department will accept Underwriters' Laboratories approved listing.

(b) All threaded joints and connections shall be made tight with approved lubricant or pipe compound.

(c) Unions requiring gaskets or packings, right or left couplings, and sweat fittings employing solder having a melting point of less than 1,000° F. shall not be used in oil lines.

(d) Cast iron fittings shall not be used.

(4) Piping shall be supported and protected against physical damage and corrosion. (a) Drop pipes from shop piping shall be enclosed in heavier pipe in such a manner as to protect drop piping against breakage.

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

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.983 Valves. (1) A readily accessible manual shutoff valve shall be installed within 6 inches of the outlet at each supply tank to avoid oil spillage during servicing.

(2) Where a shutoff 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 shutoff 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) Any fuel oil line incorporating a heater shall be provided with a relief valve arranged to discharge to the return line when any valve, pump or other device may prevent the release of excessive pressure because of the expansion of the oil when heated.

(4) Where oil is supplied to a burner requiring uniform flow by gravity feed and a constant level 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 of 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 antiflooding device. Vent piping or tubing of constant level valves shall not be connected to tanks or tank vents.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.984 Tests of tanks and piping. (1) After installation and before being covered, piping shall be tested for leaks.

(a) Piping shall be tested hydrostatically, or with equivalent air pressure, at not less than 1½ times the maximum working pressure but not less than 5 psi at the highest point of the system.

(b) The test shall be made so as not to impose a pressure of more than 10 psi on the tank.

(c) The test shall be maintained for at least 30 minutes or longer time to complete visual inspection of all joints and connections.

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(d) If suction lines are tested under a vacuum the vacuum shall not be less than 20 inches of mercury maintained for at least 30 minutes.

(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.

Note: Also see section Ind 8.20 (3).

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.985 Centralized oil distribution systems. (1) A centralized oil distribution system shall comply to this section and all other applicable provisions of this code.

(2) The installation and maintenance of the distribution system shall be supervised by a qualified company acceptable to the department. Accurate inventory records shall be maintained and reconciled on all storage tanks for possible indication of leakage from tanks or piping.

(3) Plans showing the relative location of tanks, pumps, valves, piping and structure to be supplied by the system shall be approved by and filed with the department.

(4) Oil shall be fed from the supply tank or tanks by gravity or by transfer pump.

(a) All distribution piping outside of diked areas shall be underground.

(5) The capacity of a single tank or the aggregate capacity of 2 or more tanks supplying a centralized oil distribution system shall be not more than 20,000 gallons except that underground tanks installed in accordance with section Ind 8.22 will be acceptable.

(6) Atmospheric tanks located entirely aboveground shall be built in accordance with the requirements for aboveground tanks included in section Ind 8.20 (1) (c) 1.

(a) Atmospheric tanks located underground or practically underground shall be built in accordance with the requirements for underground tanks included in section Ind 8.20 (1) (c) 1.

(7) Aboveground and partially buried tanks shall be diked in accordance with section Ind 8.21 (7) except that the volumetric capacity of the diked area shall be not less than the total volume above the adjacent grade level of all tanks within the diked area.

(8) A distribution main shall be connected to a tank or tanks having aggregate capacity of not more than 20,000 gallons at a point below the liquid level.

(a) A readily accessible internal or external shutoff valve shall be installed in the main as close as practicable to the tank.

(b) Connections between the tank(s) and the distribution main shall be made with double swing joints, flexible connectors or otherwise arranged to permit the tank(s) to settle without damaging the system.

1. Connections made aboveground shall be located within the diked area.

(9) Only appliances equipped with primary safety controls specifically listed for the appliance shall be connected to a centralized oil distribution system.

(10) A readily accessible manual shutoff valve shall be installed in each branch line which enters a building, mobile home, travel trailer or other structure.

(a) Valve located outside the structure shall be protected from weather and damage.

(b) Valve located inside the structure shall be located directly adjacent to the point at which the supply line enters the structure.

(11) A device shall be provided which will automatically shut off the oil supply at or ahead of the point where it enters the interior of the structure if the supply line between this device and the appliance is broken.

(a) This device shall be located on the appliance side of the manual shutoff valve required in paragraph (10).

1. The device shall be solidly supported and protected from damage.

(12) Means shall be provided to limit the oil pressure at the appliance inlet to a maximum of 3 psig.

(a) Where a pressure reducing valve is used it shall be of the type approved for the service.

(13) A manual reset device shall be provided to shut off automatically the oil supply to the appliance if the oil pressure at the appliance inlet exceeds 8 psig. Exception to this requirement will be permitted if one of the following conditions is satisfied:

(a) The distribution system is supplied from a gravity tank in which the maximum level of oil (hydrostatic head) is such that the pressure in the system at the appliance inlet cannot exceed 3 psig.

(b) The pressure limiting device provided in accordance with paragraph (12) is such that if the device fails to regulate the pressure to not more than 3 psig, the oil supply automatically will be shut off.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

Ind 8.986 Inside heating oil tanks taken out of service. Inside heating oil tanks that are removed or taken out of service will require the fill and vent pipe connected thereto to be removed from the exterior of the building.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.

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 on farms of flammable and combustible liquids having a flash point below 200° F. It is also applicable to storage and handling of flammable and combustible liquids at road construction sites, 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 sections Ind 8.01 through Ind 8.92 of this code.

(b) The provision of section Ind 8.991 shall not apply to the storage, handling and use of fuel oil tanks and containers connected with oil burning equipment.

(2) TYPES OF APPROVED STORAGE. Storage of flammable and com-

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bustible liquids on farms and construction projects for private use shall be permitted in any of the following:

(a) In aboveground 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 1,100 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 and combustible 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 and combustible liquids and located at least 40 feet from any other building. Buildings used for storage of flammable and combustible 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 1,100 GALLONS CAPACITY EACH. (a) Flammable and combustible liquids in aboveground tanks of 61 to 1,100 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 1,100 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 less than 110° F. shall be painted a bright red.

History: Cr. Register, August, 1971, No. 188, eff. 9-1-71.