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4-8.2.1 The quantity of liquids stored adjacent to a building protected in accordance with 4-8.2(b) may exceed that permitted in 4-8.2, provided the maximum quantity per pile does not exceed 1,100 gal (4163.5 L) and each pile is separated by a 10 ft (3.05 m) minimum clear space along the common wall.

4-8.2.2 Where the quantity stored exceeds the 1,100 gal (4163.5 L) permitted adjacent to the building given in 4-8.2(a), or the provisions of 4-8.2(b) cannot be met, a minimum distance in accordance with column 4 of Table 4-8 shall be maintained between buildings and nearest container or portable tank.

4-8.3 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 in. (152.4 mm) high. When curbs are used, provisions shall be made for draining of accumulations of ground or rain water or spills of liquids. Drains shall terminate at a safe location and shall be accessible to operation under fire conditions.

4-8.4 Storage area shall be protected against tampering or trespassers where necessary and shall be kept free of weeds, debris and other combustible materials not necessary to the storage.

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Chapter 5 Industrial Plants

5-1 Scope.

5-1.1 This chapter shall apply to those industrial plants where (1) the use of liquids is incidental to the principal business (*see Section 5-2*), or (2) where 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 5-3*). This chapter shall not apply to chemical plants, refineries or distilleries, as defined, which are covered in Chapter 9, Refineries, Chemical Plants and Distilleries.

5-1.2 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 Chapter 8, Processing Plants.

5-2 Incidental Storage or Use of Liquids.

5-2.1 Section 5-2 shall be applicable to those portions of an industrial plant where the use and handling of liquids is only incidental to the principal business, such as automobile assembly, construction of electronic equipment, furniture manufacturing or other similar activities.

5-2.2 Liquids shall be stored in tanks or closed containers.

5-2.2.1 Except as provided in 5-2.2.2 and 5-2.2.3, all storage shall comply with Chapter 4, Container Storage.

5-2.2.2 The quantity of liquid that may be located outside of an inside storage room or storage cabinet or in any one fire area of a building shall not exceed the greater of that given in (a) or (b), (c) and (d) below:

(a) A supply for one day, or

(b) 25 gal (94.6 L) of Class 1A liquids in containers, and

(c) 120 gal (454.2 L) of Class 1B, 1C, II or III liquids in containers, and

(d) One portable tank not exceeding 660 gal (2498.1 L) of Class 1B, 1C, Class II or Class III liquids.

5-2.2.3 Where large quantities of liquids are necessary, storage may be in tanks, which shall comply with the applicable requirements of Chapter 2, Tank Storage, and Sections 5-3, 5-4, 5-5, 5-6, 5-7 and 5-8.

5-2.3 Areas in which liquids are transferred from one tank or container to another container shall be separated from other operations in the building by adequate distance or by construction having adequate fire resistance. Drainage or other means shall be provided to control spills. Adequate natural or mechanical ventilation shall be provided. NFPA 91, *Standard for the Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying*, provides information on the design and installation of mechanical ventilation.

5-2.4 Handling Liquids at Point of Final Use.

5-2.4.1 Class I and Class II liquids shall be kept in covered containers when not actually in use.

5-2.4.2 Where liquids are used or handled, except in closed containers, means shall be provided to dispose promptly and safely of leakage or spills.

5-2.4.3 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.

5-2.4.4 Class I and Class II liquids shall be drawn from or transferred into vessels, containers, or portable tanks within a building only from (1) original shipping containers with a capacity of 5 gal (18.92 L) or less, or (2) from safety cans, or (3) through a closed piping system, or (4) from a portable tank or container by means of a device drawing through an opening in the top of the tank or container, or (5) by gravity through a listed self-closing valve or self-closing faucet.

5-2.4.5 Transferring liquids by means of pressurizing the container with air is prohibited. Transferring liquids by pressure of inert gas is permitted only if controls, including pressure relief devices, are provided to limit the pressure so it cannot exceed the design pressure of the vessel, tank or container.

5-3 Unit Physical Operations.

5-3.1 Section 5-3 shall be applicable in those portions of industrial plants where liquids are handled or used in unit physical operations 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.

5-3.2 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 8-2.1 and 8-2.1.1, except that the blank wall referred to in 8-2.1.1 shall have a fire resistance rating of at least 2 hr.

5-3.3. 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 a fire wall having a fire resistance rating of not less than 2 hr.

5-3.4 Drainage.

5-3.4.1 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 (*see 2-2.3.1*). Appendix A of NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, provides information on such protection. DON'T HAVE

5-3.4.2 Emergency drainage systems, if connected to public sewers or discharged into public waterways, shall be equipped with traps or separators.

5-3.4.3 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.

5-3.5 Ventilation.

5-3.5.1 Areas as defined in 5-3.1 using Class I liquids shall be ventilated at a rate of not less than 1 cu ft (0.028 m^3) per min per sq ft (0.0929 m^2) of solid floor area. This shall be accomplished by natural or mechanical ventilation with discharge or 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 can collect. Local or spot general ventilation may be needed for the control of special fire or health hazards. Such ventilation, if provided, may be utilized for up to 75 percent of the required ventilation. NFPA 91, *Standard for the Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying*, and NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems*, of other than residence type, provide information on this subject.

5-3.5.2 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 ft (1.5 m) 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.

5-3.6 The storage, transfer and handling of liquids shall comply with Section 8-4 of Chapter 8, Processing Plants.

5-4 Tank Vehicle and Tank Car Loading and Unloading.

5-4.1 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 can be built upon by a distance of 25 ft (7.62 m) for Class I liquids and 15 ft (4.57 m) for Class II and Class III liquids, measured from the nearest position of any fill stem. Buildings for pumps or shelters for personnel can be a part of the facility. Operations of the facility shall comply with the appropriate portions of Section 6-3 of Chapter 6, Bulk Plants.

5-5 Fire Control.

5-5.1 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. NFPA 10, *Standard for Portable Fire Extinguishers*, provides information as to the suitability of various types of extinguishers and their number and location.

5-5.2 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.

5-5.3 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.

5-5.4 Where the need is indicated by special hazards of operation, 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. NFPA 13, *Standard for the Installation of Sprinkler Systems*, and NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, provide information on this subject.

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5-5.5 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. NFPA 72D, *Standard for the Installation, Maintenance and Use of Proprietary Protective Signaling Systems for Watchman, Fire Alarm and Supervisory Sevice*, provides information on this subject.

5-5.6 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.

5-6 Sources of Ignition.

5-6.1 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.

5-6.2 Class I liquids or Class II or Class III liquids at a temperature above their flash points (*see 1-1.3*) shall not be dispensed into metal containers unless the nozzle or fill pipe is in electrical contact with the container. This can be accomplished by maintaining metallic contact during filling, by a bond wire between them, or by other conductive path having an electrical resistance not greater than 10^6 ohms. Bonding is not required where a container is filled through a closed system, or the container is made of glass or other nonconducting material. NFPA 77, *Recommended Practice on Static Electricity*, provides information on static protection; NFPA 78, *Lightning Protection Code*, provides information on lightning protection.

5-7 Electrical Equipment.

5-7.1 This Section, 5-7, shall apply to areas where Class I liquids are stored or handled or where Class II or Class III liquids are stored or handled at a temperature above their flash points (*see 1-1.3*.) For areas where Class II or Class III liquids only are stored or handled at a temperature below their flash points, the electrical equipment may be installed in accordance with provisions of NFPA 70, *National Electrical Code*, for ordinary locations; however, care shall be used in locating electrical apparatus to prevent hot metal from falling into open equipment.

5-7.2 All electrical equipment and wiring shall be of a type specified by and shall be installed in accordance with NFPA 70, *National Electrical Code*.

5-7.3 So far as it applies, Table 5-7.3 shall be used to delineate and classify areas for the purpose of installation of electrical equipment under normal circumstances. In the application of classified areas, a classified area shall not extend beyond an unpierced floor, wall, roof or other solid partition. The designation of classes and divisions is defined in Chapter 5, Article 500, of NFPA 70, *National Electrical Code*.

5-7.4 The area classifications listed in Table 5-7.3 are based on the premise that the installation meets the applicable requirements of this code in all respects. Should this not be the case, the authority having jurisdiction shall have the authority to determine the extent of the classified areas.

5-7.5 Extent of classified areas shall be as shown in Table 5-7.3.

5-7.6 Where the provisions of 5-7.1, 5-7.2, 5-7.3, 5-7.4 and 5-7.5 require the installation of electrical equipment suitable for Class I, Division 1 or Division 2 locations, ordinary electrical equipment including switchgear may be used if installed in a room or enclosure which is maintained under positive pressure with respect to the classified area. Ventilation makeup air shall be uncontaminated by flammable vapors. NFPA 496, *Standard for Purged Enclosures for Electrical Equipment in Hazardous Locations*, provides details for these types of installations.

5-8 Repairs to Equipment.

5-8.1 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 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. NFPA 327, *Standard Procedures for the Standard for Cleaning or Safeguarding Small Tanks and Containers*, and NFPA 36, *Standard for Solvent Extraction Plants*, provide information on such operations.

5-9 Housekeeping.

5-9.1 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.

5-9.2 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 flammable or combustible liquid storage, use, or any unit physical operation.

5-9.3 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.

5-9.4 Ground area around buildings and unit operating areas shall be kept free of weeds, trash or other unnecessary combustible materials.