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Flammable Liquids

FLAMMABLE LIQUIDS CODE

June
1959

Sixty Cents*

NATIONAL FIRE PROTECTION ASSOCIATION
International
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National Fire Protection Association

International

Executive Office: 60 Batterymarch St., Boston 10, Mass.

The National Fire Protection Association was organized in 1896 to promote the science and improve the methods of fire protection and prevention, to obtain and circulate information on these subjects and to secure the cooperation of its members in establishing proper safeguards against loss of life and property by fire. Its membership includes two hundred national and regional societies and associations (list on outside back cover) and seventeen thousand individuals, corporations, and organizations. Anyone interested may become a member; membership information is available on request.

This pamphlet is one of a large number of publications on fire safety issued by the Association including periodicals, books, posters and other publications; a complete list is available without charge on request. All NFPA standards adopted by the Association are published in six volumes of the **National Fire Codes** which are re-issued annually and which are available on an annual subscription basis. The standards, prepared by the technical committees of the National Fire Protection Association and adopted in the annual meetings of the Association, are intended to prescribe reasonable measures for minimizing losses of life and property by fire. All interests concerned have opportunity through the Association to participate in the development of the standards and to secure impartial consideration of matters affecting them.

NFPA standards are purely advisory as far as the Association is concerned, but are widely used by law enforcing authorities in addition to their general use as guides to fire safety.

Definitions

The official NFPA definitions of shall, should and approved are:

SHALL is intended to indicate requirements.

SHOULD is intended to indicate recommendations, or that which is advised but not required.

APPROVED refers to approval by the authority having jurisdiction.

Units of measurements used here are U. S. standard. 1 U. S. gallon = 0.83 Imperial gallons = 3.785 liters.

Approved Equipment

The National Fire Protection Association does not "approve" individual items of fire protection equipment, materials or services. The standards are prepared, as far as practicable, in terms of required performance, avoiding specifications of materials, devices or methods so phrased as to preclude obtaining the desired results by other means. The suitability of devices and materials for installation under these standards is indicated by the listings of nationally recognized testing laboratories, whose findings are customarily used as a guide to approval by agencies applying these standards. Underwriters' Laboratories, Inc., Underwriters' Laboratories of Canada and the Factory Mutual Laboratories test devices and materials for use in accordance with the appropriate standards, and publish lists which are available on request.

Flammable Liquids Code.

NFPA No. 30—June 1959

Foreword

This standard, known as the Flammable Liquids Code, is recommended for use as the basis of legal regulation. Its provisions are intended to reduce the hazard to a degree consistent with reasonable public safety, without undue interference with public convenience and necessity which requires the use of flammable liquids. Thus compliance with this standard does not eliminate all hazard in the use of flammable liquids.

Provisions will be found in the Appendix, which are intended as an advisory guide for use when this text is utilized as a basis for a municipal ordinance. It suggests a title, a statement of its application, defines restricted locations, and gives a basis for approvals. It includes suggested wording relating to retroactivity, inspections, modifications, penalties, repeal of conflicting ordinances, and severability.

This the 1959 edition of the Flammable Liquids Code supersedes the 1958 edition and all previous editions. This standard was prepared by the Sectional Committee on General Storage of Flammable Liquids, approved by the NFPA Flammable Liquids Committee, and adopted by the National Fire Protection Association at its meeting, June 1-5, 1959.

From 1913 to 1957 this standard was written in the form of a municipal ordinance known as the Suggested Ordinance for the Storage, Handling and Use of Flammable Liquids. In 1957 the format was changed from a municipal ordinance to a Code although the technical provisions were retained. During the 46 year existence of this suggested ordinance and Code, numerous editions have been published as conditions and experiences have dictated; for details see NFPA Advance Reports and Proceedings.

Certain other standards cover special uses of flammable liquids. Among them are:

No. 32 — Dry Cleaning Plants
No. 33 — Spray Finishing
No. 34 — Dip Tanks
No. 393 — Gasoline Blow Torches and Plumbers' Furnaces
No. 395 — Farm Storage of Flammable Liquids

The storage of oil in connection with oil burning equipment in fixed containers connected by piping with the oil burner, or in containers which are an integral part of the stove or heater, is not covered by the Code, but is treated in detail in No. 31, Standard for the Installation of Oil Burning Equipment.

Transportation of flammable liquids by tank truck is covered by No. 385, Tank Vehicles for Flammable Liquids.

The following additional NFPA standards or recommended practices may be referred to for information on special problems in this field.

No. 304L — Petroleum Wharves
No. 306 — Gas Hazards on Vessels
No. 325 — Fire Hazard Properties of Flammable Liquids
No. 325A — Flashpoint Index of Trade Name Liquids
No. 326 — Warning Labels for Containers of Flammable Liquids
No. 327 — Procedures for Cleaning or Safeguarding Small Tanks and Containers
No. 328M — Flammable Liquids and Gases in Manholes and Sewers
No. 329M — Leakage from Underground Flammable Liquid Tanks
No. 407 — Fueling Aircraft
No. 413M — Properties Aviation Fuels

CHANGES IN 1959 EDITION

The major change made in the 1959 edition was to include chemical plants and distilleries in Chapter IX. As a result of this expansion of the scope of this chapter it was necessary to add or change several definitions.

In addition, in the definitions section a new concept of tanks has been included in accordance with their pressures. To answer questions brought to the attention of the Committee a note was added to Paragraph 2032 and a change made in the explanatory material following the table in Section 2040.

In the Chapter on Service Stations, clarification was made in Paragraph 6211 and a new Paragraph 6214 was added. Additional material was also included in Paragraphs 6232 and 6311.

Minor changes, principally editorial, were made to the Recommended Safeguards and Safe Practices for the Protection of Tanks Containing Flammable Liquids in Locations That May be Flooded, NFPA No. 30A, which is published as a part of this Code.

COMMITTEE ON FLAMMABLE LIQUIDS.

C. H. Bunn, Jr., *Chairman, Executive Committee,*
Esso Research and Engineering Co., P.O. Box 121, Linden, N. J.

Miles E. Woodworth, † *Secretary,*
National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass.

R. H. Albisser, Manufacturing Chemists' Assn.

W. J. Baker, Conference of Special Risk Underwriters.

C. V. Batley, Bethlehem Steel Co. (Personal)

Herbert R. Bogardus, Fire Insurance Rating Organization of New Jersey.

David Hugh Bottrill, Oil-Heat Institute of America.

W. S. Brooks, Oklahoma Inspection Bureau.

Harold Crouch, Eastman Kodak Co.

V. L. Crusinberry, International Assn. of Fire Chiefs.

W. H. Doyle, Factory Insurance Assn.

James J. Duggan, Manufacturing Chemists' Assn., Inc.

Harold J. Dunn, Oil Heating Assn.

D. M. Dymond, CSA Approvals Laboratories, Div. of Canadian Standards Assn.

E. H. Fallin, National Petroleum Assn.

H. D Fincher, National Cottonseed Products Assn.

G. G. Fleming, Manufacturing Chemists' Assn., Inc.

Parker C. Folse, American Petroleum Institute.

Roger D. Freriks, Federation of Paint & Varnish Production Clubs.

J. E. Goold, National Paint, Varnish & Lacquer Assn.

Fred Hague, American Petroleum Institute.

O. C. Haier, American Petroleum Institute.

S. L. Halac, National Soybean Processors Assn.

James E. Hill, Western Oil & Gas Assn.

Raymond M. Hill, NFPA Fire Marshals' Section.

John Hommes, Western Actuarial Bureau.

Charles H. Howe, Jr., NFPA Fire Marshals' Section.

Rodger R. Jackson, Laundry & Cleaners Allied Trades Assn.

O. W Johnson, American Petroleum Institute.

C. L. Jones, National Paint, Varnish & Lacquer Assn.

Hugh V. Keepers, Fire Prevention and Engineering Bureau of Texas.

George F. Kennedy, NFPA Fire Marshals' Section.

A. J. Kraemer, U. S. Bureau of Mines.

†Non-voting member.

Paul C. Lamb, Lever Brothers Co. (Personal)

Louis F. Langhurst, Vegetable Oil Extraction (Personal)

Dr. A. Ernest MacGee, The American Oil Chemists' Society.

W. S. Marsh, Factory Mutual Engineering Div.

C. H. Mayhood, Manufacturing Chemists' Assn., Inc.

J. F. McKenna, American Petroleum Institute.

W. G. McKenna, Bureau of Explosives, Association of American Railroads.

L. S. Miller, Oil Insurance Assn.

J. W. Morris, Jr., South-Eastern Underwriters Assn.

J. H. Myers, American Petroleum Institute.

C. D. Norris, American Petroleum Institute.

Dean Olds, Institute of Appliance Mfrs.

W R. Powers, NFPA Committee on Fur Cleaning and Storage (ex-officio).

George A Quandee, Swift & Co. (Personal)

J. Sharp Queener, National Paint, Varnish & Lacquer Assn.

Rudolph Schmidt, Jr., Assn. of Casualty & Surety Cos.

E. J. Sestak, Factory Insurance Assn.

Allan R. Smith, National Truck Tank and Trailer Tank Institute, Steel Tank Institute.

S. F. Spence, Manufacturing Chemists' Assn.

G. H. Steel, Ralston Purina Co. (Personal)

C. Austin Sutherland, National Tank Truck Carriers, Inc.

R. A. W. Switzer, NFPA Fire Marshals' Section.

E. F. Tabisz, Underwriters' Laboratories of Canada.

Wm. H. Van Arnum, National Board of Fire Underwriters.

Wm. B. White, National Institute of Drycleaning.

J H. Witte, Underwriters' Laboratories.

Maurice Wolf, Assn. of Industrial Oil Burner Contractors, Inc.

Clarence R. Woodward, New England Fire Insurance Rating Assn.

J. Milton Wright, American Reciprocal Insurers.

T. H. Wright, Ohio Inspection Bureau.

CONTENTS

The numbering system of this code is predicated on the following: Articles are two digit numbers; Sections are four digit numbers which end in a zero; Paragraphs are all other four digit numbers; and Sub-paragraphs are parenthesized letters. For example: Chapter II, Article 21, Section 2130, Paragraph 2131, and Sub-paragraph 2131(a).

FLAMMABLE LIQUIDS CODE.

NFPA No. 30

CHAPTER I.

GENERAL PROVISIONS.

10. Scope and Application.

1010. This Code applies specifically to 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 liquids of flash point higher than 200° F. may assume the characteristics of lower flash liquids when heated, and under such conditions it may be appropriate to apply the provisions of the Code to liquids with flash point above 200° F.

1020. This Code is intended to apply to ordinary flammable liquids such as gasoline, kerosene, acetone, alcohol, cleaning fluids and the like. 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.

1030. This code shall not apply to:

1031. Transportation of flammable liquids when in conformity with Interstate Commerce Commission regulations, or regulations lawfully on file with and approved by the Interstate Commerce Commission.

1032. Transportation of flammable liquids in bulk.

NOTE: These requirements are covered separately in the Standard on Tank Vehicles for Flammable Liquids, No. 385.

1033. Storage, handling and use of fuel oil tanks and containers connected with oil burning equipment.

NOTE: These requirements are covered separately in the Standard for the Installation of Oil Burning Equipment, No. 31.

11. Definitions.

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

APARTMENT HOUSE shall mean a building or that portion of a building containing more than two dwelling units.

APPROVED signifies acceptance, by the authority having jurisdiction, of design, equipment, installation, or intended use as required by this code.

NOTE: Devices having been tested and accepted for a specific purpose by a nationally recognized testing laboratory may be deemed to be acceptable.

ASSEMBLY OCCUPANCY shall mean the occupancy or use of a building or structure or any portion thereof by a gathering of persons for civic, political, travel, religious or recreational purposes.

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

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

BARREL shall mean a volume of 42 U. S. gallons.

BASEMENT shall mean a story of a building or structure having ½ or more of its height below ground level and to which access for fire fighting purposes is unduly restricted.

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.

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

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

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.

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

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

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

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

DWELLING shall mean a building occupied exclusively for residence purposes and having not more than two dwelling units or as a boarding or rooming house serving not more than 15 persons with meals or sleeping accommodations or both.

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

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

FLAMMABLE LIQUIDS shall mean any liquid having a flash point below 200° F. and having a vapor pressure not exceeding 40 pounds per square inch (absolute) at 100° F.

Flammable liquids shall be divided into three classes as follows:

CLASS I shall include those having flash points at or below 20° F.

CLASS II shall include those having flash points above 20° F. but at or below 70° F.

CLASS III shall include those having flash points above 70° F.

The volatility of flammable liquids is increased when artificially heated to temperatures equal to or higher than their flash points. When so heated Class II and III liquids shall be subject to the applicable requirements for Class I or II liquids. This code may also be applied to high flash point liquids when so heated even though these same liquids when not heated are outside of its scope.

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

The flash point of flammable liquids having a flash point below 175° F. (79° C.) shall be determined in accordance with the Standard Method of Test for Flash Point by Means of the Tag Closed Tester (A.S.T.M. D56-56).*

The flash point of flammable liquids having a flash point of 175° F. or higher shall be determined in accordance with the Standard Method of Test for Flash Point by Means of the Pensky-Martens Closed Tester (A.S.T.M. D93-52).*

HOTEL shall mean buildings or groups of buildings 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.

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

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.

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

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*Available from American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

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.

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.

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

PROCESS AREA shall mean that location where flammable liquids are processed, or stored as a part of the current production, and may include working storage.

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

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

SAFETY CAN shall mean an approved container, of not over five gallons capacity, having a spring-closing lid and spout cover.

UNSTABLE (REACTIVE) FLAMMABLE 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.

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 Products (Reid Method)," (A.S.T.M. D323-56).*

*Available from American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

CHAPTER II.

TANK STORAGE.

20. Design and Construction of Tanks.

2010. General: Tanks shall be built of steel or concrete unless character of liquid stored requires other materials. Tanks built of materials other than steel shall be designed to specifications embodying safety factors equivalent to those herein specified for steel tanks. Steel tanks shall be built in accordance with the requirements of the following paragraphs.

2020. Aboveground, Field Erected Vertical Tanks Built to American Petroleum Institute Standards:*

2021. ATMOSPHERIC TANKS: Atmospheric tanks shall be built in accordance with American Petroleum Institute Standards No. 12A, Specification for Oil Storage Tanks with Riveted Shells, 7th Edition, September, 1951, or No. 12C, Specification for Welded Oil Storage Tanks, 15th Edition, March, 1958.

2022. LOW PRESSURE TANKS: Low pressure tanks shall be built in accordance with American Petroleum Institute Standard No. 620, Recommended Rules for the Design and Construction of Large, Welded, Low-Pressure Storage Tanks, 1st Edition, February, 1956 and Addenda, February, 1958.

2023. PRODUCTION TANKS: Production tanks not exceeding 126,000 gallons (3,000 bbls.) individual capacity, when used for crude petroleum storage in oil producing areas, shall be built in accordance with American Petroleum Institute Standards No. 12B, Specification for Bolted Production Tanks, 10th Edition, September, 1957; or No. 12D, Specification for Large Welded Production Tanks, 7th Edition, August, 1957; or No. 12F, Specification for Small Welded Production Tanks, 4th Edition, August, 1957.

2030. Aboveground Tanks, Shop Built.

2031. SMALL VERTICAL TANKS: Vertical tanks not over 1,100 gallons capacity shall meet the following:

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*Available from the American Petroleum Institute, 50 West 50th St., New York 20, N. Y.

CAPACITY Gallons	MINIMUM THICKNESS OF STEEL Mfrs. Std. Gauge No.
1 to 60	18
61 to 350	16
351 to 560	14
561 to 1,100	12

2032. LARGE VERTICAL TANKS: Vertical tanks over 1,100 gallons capacity shall meet the following:

For tanks up to 25 feet in height the shell shall be not less than 3/16 inch thick. For tanks from 25 to 30 feet high the bottom ring shall be not less than ¼ inch thick and the remainder of the shell not less than 3/16 inch thick. For tanks between 30 and 35 feet high, the first two rings shall be not less than ¼ inch thick and the remainder of the shell not less than 3/16 inch thick. All ¼ inch thick rings shall be not less than five feet wide.

The roofs of tanks shall be either dished or cone-shaped and of not less than No. 10 Manufacturers Standard gauge steel.

Tanks shall be welded, or riveted and caulked, or otherwise made tight in a workmanlike manner. The roof of the tank shall be securely fastened to the top ring of the shell with a joint having the same tightness as the joints between rings. The joint between roof and shell shall be weaker than any other joints in the shell of the tank. Joints in the roof shall be welded or riveted or made tight by other process satisfactory to the authority having jurisdiction. Roofs of tanks shall have no unprotected openings.

Note: Tanks built in accordance with American Petroleum Institute Standard 12C, Specification for Welded Oil Storage Tanks, may be considered as meeting the requirements of Paragraph 2032.

2033. SMALL HORIZONTAL TANKS: Small horizontal tanks shall be 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 not over 1,100 gallons shall meet the following:

CAPACITY Gallons	MINIMUM THICKNESS OF STEEL Mfrs. Std. Gauge No.
1 to 60	18
61 to 275	14
276 to 550	12
551 to 1,100	10

2034. LARGE HORIZONTAL TANKS: Large horizontal tanks shall be 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 over 1,100 gallons capacity having a diameter of not over six feet shall be 3/16 inch or greater nominal thickness. Tanks having a diameter of over 6 feet and not more than 12 feet shall be ¼ inch or greater nominal thickness.

NOTE: Underground tanks smaller than 2,500 gallons capacity, aboveground tanks and inside storage tanks for oil burners labeled by Underwriters' Laboratories, Inc. may be considered as meeting the requirements of Section 2030.

2040. Underground Tanks or Enclosed Tanks Inside of Buildings: Underground tanks or enclosed tanks inside of buildings shall be designed and constructed to withstand safely the service to which subjected. Tanks shall be of a minimum gauge in accordance with the following:

CAPACITY Gallons	MINIMUM NOMINAL THICKNESS OF STEEL Mfrs. Std. Gauge No.	Pounds per Square Foot
1 to 285	14	3.125
286 to 560	12	4.375
561 to 1,100	10	5.625
1,101 to 4,000	7	7.50
4,001 to 12,000	3(¼ in.)	10.00
12,001 to 20,000	0(5/16 in.)	12.50
20,001 to 30,000	000(⅜ in.)	15.00

If adequate internal bracing is provided, tanks of 12,001 to 30,000 gallons capacity may be built of ¼ in. plate. Tanks larger than 30,000 gallons shall be built in accordance with sound engineering practice.

NOTE: Tanks in this category labeled "Underground Storage Tanks" by Underwriters' Laboratories, Inc. and Underwriters' Laboratories of Canada may be considered as meeting the requirements of Section 2040.

2050. Unenclosed Tanks Inside of Buildings: Unenclosed tanks inside of buildings used for Class III flammable liquids shall not exceed 275 gallons individual capacity. They may be cylindrical or of a special form which has been demonstrated by appropriate tests to possess strength and tightness of an acceptable degree. Tanks shall be of a minimum gauge in accordance with the following:

CAPACITY Gallons	MINIMUM NOMINAL THICKNESS OF STEEL Mfrs. Std. Gauge No.	Pounds per Square Foot
1 to 180	16	2.50
181 to 275	14	3.125

NOTE: Tanks in this category labeled "Inside Storage Tanks for Oil Burners" by Underwriters' Laboratories, Inc. and Underwriters' Laboratories of Canada may be considered as meeting the requirements of Section 2050.

Table 2

Product Stored	Tank Protection	Distance from line of adjoining property which may be built upon shall be not less than
Refined Petroleum Products or other flammable liquids not subject to boil-over	1) An approved attached extinguishing system or 2) An approved floating roof	Greatest dimension of diameter or height of tank, except that such distance need not exceed 120 feet
	Not equipped with either of the above	1½ times the greatest dimension, diameter or height of tank, except that such distance need not exceed 175 feet
Crude Petroleum	1) An approved attached extinguishing system or 2) An approved floating roof	2 times the greatest dimension, diameter or height of tank, except that such distance shall not be less than 20 feet and need not exceed 175 feet
	Not equipped with either of the above	3 times the greatest dimension, diameter or height of tank, except that such distance shall not be less than 20 feet and need not exceed 350 feet

NOTE: The term "approved attached extinguishing system", as used may be interpreted to apply to (1) a fixed foam or other recognized extinguishing system embodying a supply of the extinguishing medium, or (2) a system employing a pipe line for conveying foam from a point outside the dike to the tank, or (3) portable over-shot devices for applying foam over the rim of the tank. Where reliance is placed on a pipe line for conveying foam, the pipe line shall be so installed and attached as to be an integral part of the tank. Where reliance is placed on a portable over-shot device, the practicability of its use shall be demonstrated before approval. Approved foam generating equipment of sufficient capacity should be available on the property, by response of a municipal or other public fire department, or otherwise readily available; and there should be on hand or otherwise readily available a sufficient supply of foam-producing materials as specified in Standard for Foam Extinguishing Systems, No. 11.

2060. Concrete Tanks: Concrete tanks shall be built in accordance with sound engineering practice. Unlined concrete tanks shall only be used for storage of liquids having a gravity of 40 degrees A.P.I. or heavier. Concrete tanks with special linings may be used for other services provided the design is approved by the authority having jurisdiction.

21. Installation of Outside Aboveground Tanks.

2110. Location with Respect to Property Lines.

2111. The distance from any part of an aboveground tank for the storage of flammable liquids other than crude petroleum to the nearest line of adjoining property which may be built upon, shall be not less than the distances indicated in Table 1.

Table 1

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

2112. All gas-tight tanks including conservation type tanks with capacities in excess of 50,000 gallons and all tanks for the storage of crude petroleum shall be located in accordance with Table 2.

2113. Where two tank locations of diverse ownership have a common boundary, the authority having jurisdiction may, with the written consent of the owners of the two properties, substitute the distances provided in Section 2120 for the minimum distances set forth in the foregoing tables of this section.

2114. In particular installations these provisions may be altered at the discretion of the authority having jurisdiction after consideration of the special features such as topographical conditions; nature of occupancy and proximity to buildings on adjoining property and height and character of construction of such buildings; capacity and construction of proposed tanks and character of liquids to be stored; degree of private fire protection to be provided, and adequacy of facilities of the fire department to cope with flammable liquid fires.

Table 3

REQUIRED TOTAL PRESSURE RELIEF CAPACITY OF VENTS

Capacity of Tank Gallons	Capacity of Tank 42-Gallon Barrels	Minimum Total Pressure Relief Capacity (Cu. Ft. of Free Air Per Hour)	Approximate Diameter in Inches of Free Circular Opening for Various Pressures 3 In. of Water	1 PSI	2½ PSI	5 PSI
1,000 or less	23.8	25,300	4	2⅓	2	1½
4,000	95.2	69,500	6¾	3¾	3	2½
18,000	428	139,000	9½	5½	4¼	3¾
25,000	595	166,000	10¼	6	4¾	4
56,000	1,330	253,000	12¾	7¼	5¾	5
100,000	2,380	363,000	15¼	8¾	7	6
155,000	3,690	458,000	17¼	9¾	7¾	6½
222,000	5,290	522,000	18¼	10½	8¼	7
475,000	11,300	624,000	20	11¼	9	7¾
735,000	17,500	648,000	20	11½	9¼	7¾
Unlimited		648,000	20	11½	9¼	7¾

NOTE: Venting equipment installed for normal operation may serve as emergency relief, provided that it has the requisite capacity under the pressure limitation fixed by this table. Responsibility for selecting the limiting pressure is placed on the owner or operator.

2120. Spacing Between Tanks.

2121. The distance between two flammable liquid storage tanks shall be not less than three feet.

2122. For tanks above 50,000 gallons individual capacity storing any flammable liquid, except crude petroleum in producing areas, the distance shall be not less than one-half the diameter of the smaller tank.

2123. In producing areas, for tanks storing crude petroleum and having capacities not to exceed 126,000 gallons (3,000 bbls.), the distance between tanks shall not be less than three feet; in excess of 126,000 gallons (3,000 bbls.), the distance shall be not less than the diameter of the smaller tank.

2124. The minimum separation between a liquefied petroleum gas container and a flammable liquid tank shall be 20 feet. Suitable means shall be taken to prevent the accumulation of flammable liquids under adjacent liquefied petroleum gas containers such as by diking, diversion curbs or grading. When flammable liquid tanks are diked, the liquefied petroleum gas containers shall be outside the diked area and at least ten feet away from the center line of the dike. The foregoing provisions shall not apply when liquefied petroleum gas containers of 125 gallons or less capacity are installed adjacent to Class III flammable liquid tanks of 275 gallons or less capacity.

2130. Vents:

2131. NORMAL BREATHING:

(a) Tanks shall have normal venting capacity sufficient to permit the filling and emptying of such tanks, plus their breathing due to temperature changes, without distortion of tank shell or roof.

(b) Tanks storing Class I and Class II flammable liquids shall be equipped where practical with either venting devices which shall be normally closed when not under pressure or vacuum, or with approved flame arresters, except as provided in subparagraph (c) below.

(c) Tanks under 2,500 gallons capacity for Class I liquids and tanks under 3,000 barrels capacity for crude petroleum in producing areas may have open vents.

2132. EMERGENCY RELIEF:

(a) Every aboveground storage tank shall have some form of construction or device that will relieve excessive internal

pressure, caused by exposure fires, that might cause the rupture of the tank shell or bottom.

(b) In a vertical tank, this construction may take the form of a weakened seam in the roof. The joint between the roof and the shell of a tank 36 feet or more in diameter, if designed and built as an atmospheric storage tank in accordance with Paragraph 2021, shall be deemed to be a weakened seam for this purpose.

(c) Where entire dependence for such additional relief is placed upon some device other than a weak roof seam or joint, the total venting capacity of both normal and emergency vents shall be enough to prevent rupture of the shell or bottom of the tank if vertical, or of the shell or heads if horizontal. Such device may be a self-closing manhole cover, or one using long bolts that permits the cover to lift under internal pressure, or an additional or larger relief valve or valves. For the purpose of computing the number and area of such vents and emergency relief devices, reference may be made to Table 3.

2133. The outlet of all vents and vent drains on tanks designed for 0.5 pounds per square inch or greater pressure shall be arranged to discharge in such a way as to prevent localized overheating of any part of the tank, in the event vapors from such vents are ignited.

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

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

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

2140. Dikes and Walls.

2141. CRUDE PETROLEUM: Tanks or groups of tanks containing crude petroleum shall be diked or other suitable means taken to prevent discharge of liquid from endangering adjoining property or reaching waterways. Where a diked enclosure is required under this paragraph, it shall have a capacity not less than that of the tank or tanks served by the enclosure.

NOTE: Certain products, not petroleum products, handled in special process and chemical plants may have boil-over characteristics somewhat like those of crude petroleum.

*Copies of this standard available from American Petroleum Institute, 50 West 50th Street, New York 20, N. Y.

2142. FLAMMABLE LIQUIDS OTHER THAN CRUDE PETROLEUM: Individual tanks or groups of tanks, where deemed necessary by the authority having jurisdiction on account of proximity to waterways, character of topography, or nearness to structures of high value, or to places of habitation or assembly, shall be diked or the yard shall be provided with a curb or other suitable means taken to prevent the spread of liquid onto other property or waterways. Where a diked enclosure is required under this paragraph, the volumetric capacity of the diked area shall be not less than the capacity of the largest tank within the diked area.

2143. DIKE CONSTRUCTION: Except where protection is provided by natural topography, dikes or retaining walls required under the foregoing paragraphs shall be of earth, steel, concrete or solid masonry designed to be liquid tight and to withstand a full hydraulic head, and so constructed as to provide the required protection. Earthen dikes three feet or more in height shall have a flat section at the top not less than two 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 an average height of not more than six feet above the exterior grade. Unless means are available for extinguishing a fire in any tank containing crude petroleum, dikes and walls enclosing such tanks shall be provided at the top with a flareback section designed to turn back a boil-over wave, provided, however, that a flareback section shall not be required for dikes and walls enclosing approved floating roof tanks.

2144. DRAINAGE: Where provision is made for draining rain water from diked areas, such drains shall normally be kept closed and shall be so designed that when in use they will not permit flammable liquids to enter natural water courses, public sewers, or public drains, if their presence would constitute a hazard. Where pumps control drainage from the diked area, they shall not be self-starting.

2145. No loose combustible material, empty or full drum or barrel, shall be permitted within the diked area.

2146. In particular installations these provisions may be altered at the discretion of the authority having jurisdiction after consideration of the special features such as topographical conditions; nature of occupancy and proximity to buildings on adjoining property and height and character of construction of such buildings; capacity and construction of proposed tanks and char-

acter of liquids to be stored; degree of private fire protection to be provided, and adequacy of facilities of the fire department to cope with flammable liquid fires.

2150. Foundations and Supports: Tanks shall rest directly on the ground or on foundations or supports of concrete, masonry, piling, or steel. Exposed piling or steel supports shall be protected by fire-resistive materials to provide a fire-resistance rating of not less than two hours.

2160. Anchorage: Where a tank is located in an area that may be subjected to flooding, the applicable precautions outlined in No. 30A, Tanks in Locations Subject to Floods, shall be observed. See page 30A-1.

2170. Stairs, Platforms and Walkways: Stairs, platforms and walkways shall be of metal, concrete, or wood.

2180. Tank Valves: Each connection to an aboveground tank storing flammable liquids, located below normal liquid level, shall be provided with an internal or external control valve located as close as practicable to the shell of the tank. Except for flammable liquids whose chemical characteristics are incompatible with steel, such valves, when external, and their connections to the tank shall be of steel.

22. Installation of Underground Tanks.

2210. Location: Underground tanks or tanks under buildings shall be so located with respect to existing building foundations and supports that the loads carried by the latter cannot be transmitted to the tank. The distance from any part of a tank storing Class I or Class II liquids to the nearest wall of any basement, pit, or cellar shall be not less than one foot, and from any property line that may be built upon, not less than three feet. The distance from any part of a tank storing Class III liquids to the nearest wall of any basement, pit, cellar, or property line shall be not less than one foot.

2220. Depth and Cover: Excavation for underground storage tanks shall be made with due care to avoid undermining the foundations of existing structures. Underground tanks shall be set on firm foundation and surrounded with soft earth or sand well tamped in place. Tanks shall be covered with a minimum of two 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 four 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 three feet of earth cover, or 18 inches of well-tamped earth, plus six inches of reinforced concrete or eight 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.

2230. Vents.

2231. LOCATION AND ARRANGEMENT OF VENTS FOR CLASS I OR CLASS II LIQUIDS: Vent pipes from tanks storing Class I or Class II flammable liquids shall be so located that the discharge point is outside of buildings, higher than the fill pipe opening, and not less than 12 feet above the adjacent ground level. Vent pipes shall discharge only upward or horizontally (not downward) in order to disperse vapors. Vent pipes two inches or less in nominal inside diameter shall not be obstructed by devices that will reduce their capacity and thus cause excessive back pressure. Vent pipe outlets shall be so located that flammable vapors will not enter building openings, or be trapped under eaves or other obstructions. If the vent pipe is less than ten feet in length or greater than two 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. In no case shall a flame arrester be located more than 15 feet from the outlet end of the vent line.

2232. LOCATION AND ARRANGEMENT OF VENTS FOR CLASS III LIQUIDS: Vent pipes from tanks storing Class III flammable liquids shall terminate outside of building and higher than the fill pipe opening. Vent outlets shall be above normal snow level. They may be fitted with return bends, coarse screens or other devices to minimize ingress of foreign material.

2233. SIZE OF VENTS: Each tank shall be vented through piping adequate in size to prevent blow-back of vapor or liquid at the fill opening while tank is being filled. Vent pipes shall be not less than 1¼ inch nominal inside diameter.

2234. VENT PIPING: Vent pipes shall be so laid as to drain toward the tank without sags or traps in which liquid can collect.

They shall be located so that they will not be subjected to physical damage above ground. Vent pipes from tanks storing the same class of flammable liquids may be connected into one outlet pipe. The outlet pipe shall at least be one pipe-size larger than the largest individual vent pipe connected thereto. In no case shall the point of connection between vent lines be lower than the top of any fill-pipe opening. The lower end of a vent pipe shall enter the tank through the top and shall not extend into the tank more than one inch.

2240. Fill and Discharge Piping: Filling and discharge lines for Class I and Class II liquids, and for Class III liquids where practicable, shall enter tanks only through the top and shall be graded toward the tank.

2250. Fill Openings: The fill pipe opening shall be located outside of any building. For Class I or Class II flammable liquid storage the fill pipe opening shall be not less than five feet from any door or cellar opening. For Class III flammable liquid storage the fill pipe opening shall be not less than two feet from any building opening at the same or lower level. The fill-pipe opening shall be closed and liquid tight when not in use. Fill-pipe for filling by tank car or tank truck shall be not larger than four inches nominal inside diameter and shall not be constricted. Fill-pipe openings shall be identified by a definite color scheme or other means.

2260. Gauge Openings: Gauge openings, if independent of fill-pipe, shall be provided with liquid-tight cap or cover. Where Class I or Class II liquids are stored within a building, such gauge opening shall be protected against vapor release or liquid overflow by means of a spring-loaded check valve or other approved device.

2270. 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 applicable precautions outlined in Standard No. 30A (see page 30A-1) shall be observed to anchor the tank in place.

23. Installation of Tanks Inside of Buildings.

2310. Class I or Class II Liquids.

2311. Tanks for storage of Class I and Class II flammable liquids shall not be installed inside buildings except as provided under Chapters VI and VIII. Tanks for storage of Class I and Class II flammable liquids may be installed under a building as an underground tank complying with Article 22.

2320. Class III Liquids.

2321. Unenclosed tanks shall not be located within 5 feet, horizontally, of any fire or flame.

2322. 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.

2323. 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 firewalls shall be installed in an enclosure constructed as follows: The walls of the enclosure shall be constructed of reinforced concrete at least six inches thick or of brick at least eight 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 five inches thick or equivalent fire-resistive construction, except that where floor or roof construction above the enclosure is concrete or other fire-resistive construction, the walls may be extended to and bonded to the underside of the construction above in lieu of the provision of a separate top. Any openings to such enclosures shall be provided with fire doors or other approved closures and six-inch noncombustible liquid-tight sills or ramps. Provision shall be made for adequate ventilation of such enclosures prior to entering for inspection or repairs to tanks.

2324. 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.

2330. Vents and Other Openings: Vents, fill and discharge piping, fill openings and gauge openings shall be provided as required in Sections 2230, 2240, 2250 and 2260.

2340. Support of Tanks in Buildings: Inside storage tanks shall be securely supported to prevent settling, sliding or lifting.

2350. Drainage of Tanks in Buildings: Inside storage tanks for Class III flammable liquids shall be provided with draw-off or drain openings. Tanks shall be installed so that the bottom pitches to the draw-off or drain openings at a slope of not less than ¼ inch per foot of length. The draw-off or drain opening shall be provided with suitable connection to provide a sump from which water or sediment can be drained readily.

24. Testing of Tanks and Piping.

2410. Aboveground tanks built in accordance with the cited standards of the American Petroleum Institute shall be tested as specified in those standards.

2420. Except for tanks covered in Section 2410, all tanks and piping connected thereto shall pass a test for tightness before being placed in use. Before being covered, enclosed or placed in use, tanks and piping shall be tested hydrostatically or with air pressure, at not less than 1½ times the maximum working pressure but not less than five pounds per square inch and not more than ten pounds per square inch, measured at highest point in the system except as provided in Section 2430.

2430. When the vertical length of the fill and vent pipes is such that when filled with liquid the static head imposed exceeds 10 pounds per square inch, the tank and related piping shall be tested hydrostatically to a pressure equal to the static head thus imposed. In special cases where the height of the vent above the top of the tank is excessive the hydrostatic test pressure shall be specified by the authority having jurisdiction.

CHAPTER III.

CLOSED CONTAINER STORAGE.

30. Storage in Closed Containers Inside Buildings.

3010. Scope.

3011. This Article 30 shall apply to the storage of flammable liquids in drums or other portable closed containers not exceeding 60 gallons individual capacity inside buildings.

3012. This Article 30 shall not apply to the storage of closed containers in bulk plants, service stations, and refineries. These requirements are covered separately in Chapters V, VI and IX respectively.

3013. This Article 30 shall not apply to areas where containers are opened for dispensing, mixing or handling. Container Storage in such locations is covered separately in Chapter V — Bulk Plants, Chapter VI — Service Stations, and Chapter IX — Refineries and Other Plants Storing and Handling Crude Petroleum.

3020. Design and Construction of Inside Storage Rooms.

3021. Inside Storage Rooms shall comply with the following general construction requirements: Walls, floors and ceilings shall be of noncombustible construction having a fire-resistive rating of not less than two hours. Openings to other rooms or buildings shall be provided with noncombustible liquid-tight raised sills or ramps at least six inches in height and with approved fire doors arranged to close automatically in case of fire. A permissible alternate to either sills and ramps is open trenches covered with steel grating which are drained to a safe location. Where other portions of the building or other properties are exposed, windows shall be protected in a standard manner. Wood at least one inch nominal thickness may be used for shelving, racks, dunnage, scuffboards, floor overlay and similar installations. Proper ventilation shall be provided and natural ventilation is preferred over mechanical ventilation. Heating shall be restricted to low pressure steam or hot water or to electrical units approved for Class I Hazardous Locations.

3022. Electrical wiring and equipment located in Inside Storage Rooms used for Class I or Class II Flammable Liquids.

shall be approved for Class I, Division 2 Hazardous Locations; for Class III Flammable Liquids, shall be approved for general use.

NOTE: No. 70, National Electrical Code provides information on the design and installation of electrical equipment. See article 500.

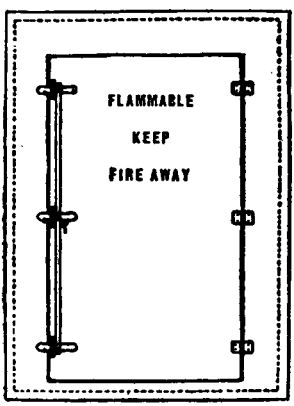
3023. Rooms or portions of buildings, affording a type of building construction and other features equivalent to that required for Inside Storage Rooms (Paragraphs 3021 and 3022) may be utilized for storage of flammable liquids if not used for any other storage or operation which, in combination, create a greater fire hazard.

3024. Storage rooms shall be located to minimize damage in the event of an explosion.

3025. Where practical, Inside Storage Rooms shall be equipped with large vents to provide fire and explosion relief.

3030. Storage Cabinets.

3031. Storage cabinets shall be constructed as follows or built to equivalent requirements. The bottom, top, door and sides of cabinet shall be at least No. 18 gauge sheet iron and double walled with 1½-inch air space. Joints shall be riveted, welded or made tight by some equally effective means. The door shall be provided with a 3-point lock, kept closed when not in use, and the door sill shall be raised at least two inches above the bottom of the cabinet. When deemed necessary by the authority having jurisdiction, cabinets shall be vented. The cabinet shall be conspicuously labeled in red letters "FLAMMABLE—KEEP FIRE AWAY". See Figure 1.



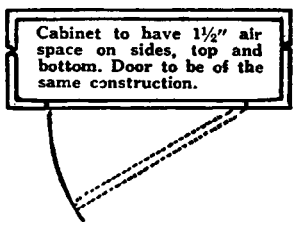


Fig. 1
Typical storage cabinet recommended for quantities less than 50 gals. Material is 18 gauge sheet iron, tight joints.

3032. Storage cabinets may be used where it is desired to keep more than ten gallons of flammable liquids inside buildings. No individual container shall exceed five gallons capacity and not over 50 gallons shall be stored in any one cabinet.

3040. Manner of Storage and Limitations.

3041. Flammable liquids shall not be stored (including stock for sale), near exits, stairways or areas normally used for the safe egress of people.

3042. The storage of flammable liquids in closed containers shall comply with the following occupancy schedule except that the authority having jurisdiction may impose a quantity limitation or require greater protection where, in his opinion, unusual hazard to life or property is involved, or he may authorize increase of these amounts where the type of construction, fire protection provided or other factors substantially reduce the hazard.

3043. DWELLINGS AND APARTMENT HOUSES CONTAINING NOT MORE THAN THREE DWELLING UNITS AND ACCOMPANYING ATTACHED AND DETACHED GARAGES: Storage other than fuel oil shall be prohibited except that which is required for maintenance or equipment operation which shall not exceed ten gallons. Such flammable liquid shall be stored in metal closed containers or safety cans.

3044. ASSEMBLY AND OFFICE OCCUPANCIES, APARTMENT HOUSES CONTAINING MORE THAN THREE DWELLING UNITS, AND HOTELS: Storage shall be prohibited except that which is required for maintenance and operation of building and operation of equipment. Such storage shall be kept in closed metal containers stored in a storage cabinet or in safety cans or in an Inside Storage Room not having a door that opens into that portion of the building used by the public.

3045. EDUCATIONAL AND INSTITUTIONAL OCCUPANCIES: Storage shall be limited to that required for maintenance, demonstration, treatment and laboratory work. Flammable liquids in the laboratories and at other points of use shall be in containers not larger than one quart or in safety cans or in storage cabinets.

NOTE: Inside Storage Rooms preferably should be at ground level with at least one exterior wall.

TABLE 4. ARRANGEMENT OF CONTAINER STORAGE

CLASS OF FLAMMABLE LIQUID	STORAGE LEVEL	SPRINKLERED OR EQUIVALENT PROTECTION					UNPROTECTED				
		Maximums Per Pile			AISLE WIDTH		Maximums Per Pile			AISLE WIDTH	
		TOTAL Gallons	WIDTH Feet	HEIGHT Feet	Main Feet	Side Feet	TOTAL Gallons	WIDTH Feet	HEIGHT Feet	Main Feet	Side Feet
I	Ground and Upper Floors	2,640 (48)	8 (4)	6 (2)	8	5	660 (12)	4 (2)	3 (1)	8	7
	Basement	not permitted					not permitted				
II	Ground and Upper Floors	5,280 (96)	8 (4)	6 (2)	8	4	1,320 (24)	4 (2)	3 (1)	8	5
	Basement	not permitted					not permitted				
III	Ground and Upper Floors	11,000 (200)	12 (6)	3 ft. under sprinkler heads	8	4	2,640 (48)	8 (4)	12 (4)	8	4
	Basement	5,500 (100)	(8) (4)	9 (3)	8	4	not permitted				

NOTE: The figures in the column, Total Gallons, represent the number of gallons that may be stored per pile and the figures in parenthesis are the corresponding number of 55 gallon drums. The figures in the Width and Height Columns are the width and height of the pile in feet and the figures in parenthesis are the corresponding number of 55 gallon drums which when stored on end will produce this size pile.

3046. MERCANTILE OCCUPANCIES: In rooms or areas accessible to the public, storage shall be in closed containers and limited to quantities needed for display and normal merchandising purposes. Where the aggregate quantity of additional stock exceeds 180 gallons of which not more than 60 gallons may be Class I it shall be stored in rooms or portions of buildings that comply with the construction requirements of Section 3020, except that one story retail stores may have walls, floors and ceilings having a fire resistance rating of not less than one hour.

3047. GENERAL PURPOSE AND PUBLIC WAREHOUSES: Storage shall be in accordance with Table 4 in fire resistive buildings or in portions of such buildings cut off by standard fire walls. Noncombustible material, creating no hazard to the flammable liquids, may be stored in the same area.

3048. FLAMMABLE LIQUID WAREHOUSES OR STORAGE BUILDINGS: Storage shall be in accordance with Table 4. Storage buildings shall be of noncombustible construction. If storage building is located 30 to 50 feet from a building or line of adjoining property that may be built upon, the exposing wall shall be a noncombustible blank wall having a fire resistance rating of at least two hours. If storage building is located 10 to 30 feet from a building or line of adjoining property that may be built upon, the exposing wall shall be a blank wall having a fire resistance rating of at least three hours. If storage building is less than ten feet from the line of adjoining property that can be built upon, the exposing wall shall be a blank wall having a fire resistance rating of at least four hours. In particular installations the distance requirements between the storage building and other buildings may be altered at the discretion of the authority having jurisdiction after consideration of the height, size and character of construction and occupancy of the exposed buildings.

NOTE: At the discretion of the authority having jurisdiction, approved Class A fire doors may be installed in a standard manner on the otherwise blank walls.

3050. Fire Control.

3051. Suitable fire-control devices, such as small hose or portable fire appliances, shall be available at locations where flammable liquids are stored.

3052. When sprinklers are required, they shall be installed in an approved manner.

NOTE: No. 13, Standard for the Installation of Sprinkler Systems, provides information on the installation of sprinkler systems.

3053. Open flames, smoking and other sources of ignition shall not be permitted in flammable liquid storage rooms.

3054. Materials which will react with water to produce flammable vapors shall not be stored in the same room with flammable liquids.

31. Storage in Closed Containers Outside Buildings.

3110. Scope.

3111. This Article 31 applies to the storage of flammable liquids in drums or other portable closed containers not exceeding 60 gallons individual capacity outside of buildings in areas used solely for such storage.

3112. This Article 31 shall not apply to the storage of flammable liquids in drums or portable closed containers in bulk plants, service stations, and refineries. These requirements are covered separately in Chapters V, VI and IX respectively.

3120. Basic Safeguards.

3121. Drums constructed in accordance with ICC Specifications or containers of equivalent construction may be stored out of doors.

3122. Drums shall not be stored outside on building platforms or between buildings, or in locations adjacent thereto, in such a manner that they would contribute to the spread of fire.

3123. Storage of over 100 drums of Class I and Class II flammable liquids shall be limited to groups of 100 drums, located at least 60 feet from the nearest building or line of adjoining property that may be built upon and each group shall be separated by at least 40 feet. Storage of over 300 drums of Class III flammable liquids shall be limited to groups of 300 drums located at least 50 feet from nearest building or line of adjoining property that may be built upon and each group shall be separated by at least 30 feet. These distances may be reduced 50 per cent if

sprinklers and drainage away from exposures are provided. In particular installations the distance requirements to buildings may be altered at the discretion of the authority having jurisdiction after consideration of the height, size and character of construction and occupancy of the exposed buildings.

3124. The drum storage shall be located to prevent "run-off" or drainage toward other storage or buildings. The area shall be kept clear of grass, weeds and other foreign combustibles. Signs shall be posted prohibiting open flames and smoking.

CHAPTER IV.

PIPING, VALVES AND FITTINGS.

40. Materials and Design.

4010. Piping, valves, and fittings for flammable liquids shall be designed for the working pressures and structural stresses to which they may be subjected. They shall be of steel or other material suitable for use with the liquid being handled. Pipe wall thicknesses shall be in accordance with Section 3 of the American Standard Code for Pressure Piping (ASA B31.1-1955*) ; except that carbon steel pipe shall not be thinner than Standard Wall thickness listed in the American Standard for Wrought-Steel and Wrought-Iron pipe (ASA B36.10-1950*). All threaded joints and connections shall be made up tight with suitable lubricant or piping compound.

NOTE: These provisions shall apply to all piping for flammable liquids which falls within the scope of this code, even though the code of reference does not refer specifically to each type of installation.

41. Pipe Joints.

4110. Pipe joints dependent upon the friction characteristics of combustible materials for mechanical continuity of piping shall not be used inside buildings. They may be used outside of buildings above or below ground. If used aboveground, the piping shall either be secured to prevent disengagement at the fitting or the piping system shall be so designed that any spill resulting from such disengagement could not unduly expose persons, important buildings or structures, and could be readily controlled by remote valves.

42. Protection Against Corrosion.

4210. All piping for flammable liquids, both aboveground and underground, where subject to external corrosion, shall be painted or otherwise protected.

43. Supports.

4310. Pipe systems shall be substantially supported and protected against physical damage and excessive stresses arising from settlement, vibration, expansion or contraction.

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*Available from the American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y.

44. Valves.

4410. Pipe systems shall contain a sufficient number of valves to operate the system properly and to protect the plant. Pipe systems in connection with pumps shall contain a sufficient number of valves to control properly the flow of liquid in normal operation and in the event of physical damage. Connections to pipe lines, by which equipment such as tank cars or tank trucks discharge flammable liquids by means of centrifugal pumps into aboveground storage tanks, shall be provided with check valves for automatic protection against back-flow.

NOTE: See also Section 2180, Tank Valves.

CHAPTER V.

BULK PLANTS.

50. Storage.

5010. Class I and Class II flammable liquids shall be stored in closed containers, or in storage tanks aboveground outside of buildings, or underground in accordance with Chapter II.

5020. Class III flammable liquids shall be stored in containers, or in tanks within buildings or aboveground outside of buildings, or underground in accordance with Chapter II.

5030. Containers of flammable liquids when piled one upon the other shall be separated by dunnage. Sufficient to provide stability and to prevent excessive stress on container walls. The height of pile shall be consistent with stability and strength of containers.

51. Buildings.

5110. General Construction: Buildings shall be constructed so that rooms in which flammable liquids are handled or stored comply with the requirements of the zone or area in which located. Class I and Class II flammable liquids shall not be stored or handled within a building having a basement or pit into which flammable vapors may travel, unless such area is provided with ventilation designed to prevent the accumulation of flammable vapors therein.

5120. Exits: Rooms in which flammable liquids are stored or handled by pumps, shall have exit facilities arranged to prevent occupants being trapped in the event of fire.

NOTE: NFPA No. 101, Building Exits Code provides information on the number and location of exits.

5130. Heating: Rooms in which Class I or Class II flammable liquids are stored or handled shall be heated only by means not constituting a source of ignition, such as steam or hot water. Rooms containing heating appliances involving sources of ignition shall be located and arranged to prevent entry of flammable vapors.

5140. Ventilation: Ventilation shall be provided for all rooms, buildings, or enclosures in which Class I or Class II flammable liquids are pumped or dispensed. Design of ventilation systems shall take into account the relatively high specific gravity of the vapors. Ventilation may be provided by adequate openings in outside walls at floor level unobstructed except by louvers or coarse screens. Where natural ventilation is impracticable, mechanical ventilation shall be provided.

NOTE: No. 91, Standard for the Installation of Blower and Exhaust Systems, provides information on the installation of mechanical exhaust systems.

5150. Filling and Emptying Containers: Containers of Class I or Class II flammable liquids shall not be drawn from or filled within buildings unless provision is made to prevent the accumulation of flammable vapors in hazardous concentrations.

52. Loading and Unloading Facilities.

5210. Truck Loading Racks.

5211. LOCATION: Truck loading racks dispensing Class I or Class II flammable liquids shall be separated from tanks, warehouses, other plant buildings, and nearest line of property that may be built upon by a clear distance of not less than 25 feet, measured from the nearest position of any fill stem. Buildings for pumps or for shelter of loading personnel may be part of the loading rack.

5212. STATIC PROTECTION: The following types of truck loading racks shall be equipped with protection against static sparks during truck filling:—racks dispensing Class I or Class II flammable liquids into open domes of tank trucks, and racks dispensing Class III flammable liquids into open domes of tank trucks which may contain flammable vapors from previous cargoes of Class I or Class II flammable liquids. Protection shall consist of a metallic bond-wire permanently electrically connected to the fill stem or some part of the fill-stem piping. The free end of such wire shall be provided with a clamp or similar device for convenient attachment to some metallic part of the cargo tank of the tank truck. The bond-wire connection shall be made prior to opening the dome covers. It shall be maintained in place during

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

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

5220. Tank Car Racks: Class I and Class II flammable liquids shall not be discharged from or loaded into tank cars unless protection against stray currents has been provided and is used. Protection shall be designed and installed in accordance with Circulars of the Association of American Railroads, No. 17-D, dated August 1, 1947,* and No. 17-E, dated August 1, 1947.*

5230. Container Filling Facilities: Class I and Class II flammable liquids shall not be run into containers unless the nozzle and container are electrically interconnected. Where the metallic floorplate on which the container stands while filling is electrically connected to the fill stem or where the fill stem is bonded to the container during filling operations by means of a bond-wire, the provisions of this section shall be deemed to have been complied with.

53. Electrical Equipment.

5310. All wiring and electrical equipment including motors and electrical switch gear for pumps handling Class I or Class II flammable liquids and located within the possible path of vapor travel shall be designed and installed so as not to create an ignition hazard.

NOTE: No. 70, National Electrical Code, provides information on the design and installation of electrical equipment for hazardous locations.

54. Sources of Ignition.

5410. Class I or Class II flammable liquids shall not be handled, drawn, or dispensed where flammable vapors may reach a source of ignition. Smoking shall be prohibited except in designated localities. "NO SMOKING" signs shall be conspicuously posted where hazard from flammable liquids vapors is normally present.

55. Drainage and Waste Disposal.

5510. Provision shall be made to prevent flammable liquids which may be spilled at loading or unloading points from entering public

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*Available from the Association of American Railroads, 59 East Van Buren St., Chicago, Ill.

sewers and drainage systems, or natural waterways. Connection to such sewers, drains, or waterways by which flammable liquids might enter shall be provided with separator boxes or other approved means whereby such entry is precluded. Crankcase drainings and flammable liquids shall not be dumped into sewers, but shall be stored in tanks or tight drums outside of any building until removed from the premises.

56. Fire Control.

5610. Suitable fire-control devices, such as small hose or portable fire extinguishers, shall be available to locations where fires are likely to occur. Additional fire-control equipment may be required where a tank of more than 50,000 gallons individual capacity contains Class I or Class II flammable liquids and where an unusual exposure hazard exists from 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: This code does not cover the design or operation of petroleum wharves, found in bulk terminals (shore). A guide to regulation of petroleum wharves is published by the NFPA under the title "Suggested Ordinance for Petroleum Wharves", NFPA No. 304-L, and may be consulted for applicable sections.

CHAPTER VI.

SERVICE STATIONS.

60. Location.

6010. Apparatus dispensing Class I flammable liquids into the fuel tanks of motor vehicles of the public shall not be located at a bulk plant unless separated by a fence or similar barrier from the area in which bulk operations are conducted.

61. General Construction.

6110. Buildings shall be constructed so that rooms in which flammable liquids are handled or stored comply with the requirements of the zone or area in which located. Class I and Class II flammable liquids shall not be stored or handled within a building having a basement or pit into which flammable vapors may travel, unless such area is provided with ventilation designed to prevent the accumulation of flammable vapors therein.

62. Storage and Handling.

6210. General Provisions.

6211. Class I and Class II flammable liquids shall be stored in closed containers not exceeding 60 gallons capacity, in tanks located underground or in tanks in special enclosures as described in Section 6220.

6212. Class III flammable liquids shall be stored in containers, in tanks located underground or in tanks in special enclosures as described in Section 6220 or as provided in Section 6420.

6213. 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.

6214. The provisions of Paragraphs 6211 and 6212 shall not prohibit the temporary use of portable or semi-portable tanks in conjunction with the dispensing of flammable liquids into the fuel tanks of motor vehicles or other motorized equipment on premises not normally accessible to the public. Such installations shall only be made under permit from the enforcing authority. The permit shall include a definite time limit.

6220. Special Enclosures.

6221. When installation of tanks in accordance with Article 22 is impractical because of property or building limitations, tanks for flammable liquids may be installed in buildings if enclosed and upon specific approval of the authority having jurisdiction.

6222. Enclosure shall be substantially liquid and vapor tight without backfill. Sides, top and bottom of the enclosure shall be of reinforced concrete at least six inches thick, with openings for inspection through the top only. Tank connections shall be so piped or closed that neither vapors nor liquid can escape into the enclosed space. Means shall be provided whereby portable equipment may be employed to discharge to the outside any vapors which might accumulate should leakage occur.

6223. At automotive service stations provided in connection with tenant or customer parking facilities at or below grade level beneath large buildings of commercial, mercantile or residential occupancy, tanks containing Class I flammable liquids installed of necessity in accordance with Paragraph 6222, shall not exceed 5,000 gallons individual or 10,000 gallons aggregate capacity.

6230. Inside Buildings.

6231. Except where stored in tanks as provided in Section 6220, no Class I flammable liquids shall be stored within any service station building except packaged items, for example: cleaning fluid received and resold in unbroken metallic containers of not over one (1) gallon capacity each, or in approved non-metallic containers of not more than one quart capacity each. Class II flammable liquids may be stored in closed containers inside the station building. A container equipped with an approved pump or an approved self-closing faucet shall be considered a closed container for purposes of storage only.

6232. No Class I or Class II flammable liquids shall be dispensed, or transferred from one container to another, inside of a service station building, except flammable anti-freeze liquids. Such anti-freeze may be dispensed in rooms of a service station building provided such rooms have approved heating devices and there is no open flame in such room lower than eight feet above floor level. Service station areas other than lubritoriums or rooms in which flammable liquids are transferred or dispensed may be heated in any conventional manner.

6233. Class III liquids may be stored and dispensed inside service station buildings from approved containers of not more than 120 gallons capacity each.

6240. Labeling: No sale or purchase of any Class I, II or III flammable liquids shall be made in containers unless such containers are clearly marked with the name of the product contained therein.

6250. Dispensing Containers: No delivery of any Class I or Class II flammable liquids shall be made into portable containers of five gallons capacity or less unless the container is of sound metal construction, has a tight closure with screwed or spring cover and is fitted with a spout or so designed that the contents can be poured without spilling.

63. Dispensing Systems.

6310. 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.

6311. INSIDE LOCATION: Approved dispensing units may be located inside garages upon specific approval of the authority having jurisdiction. The dispensing area shall be separated from motor vehicle repair areas in a manner approved by the authority having jurisdiction. The dispensing unit and its piping shall be protected against physical damage by vehicles either by mounting on a concrete island or by equivalent means and shall be located in a position where it cannot be struck by a vehicle descending a ramp or other slope out of control. The dispensing area shall be provided with an approved mechanical or gravity ventilation system. A clearly identified switch, readily accessible in case of fire or physical damage to any dispensing unit, shall be provided to shut off the power to dispensing units. When dispensing units are located below grade only approved mechanical ventilation shall be used and the entire dispensing area shall be protected by an approved automatic sprinkler system. The ventilating systems shall be electrically interlocked with the gasoline dispensing units so that the dispensing units cannot be operated unless the ventilating fan motors are energized.

6320. Dispensing Units.

6321. Class I and Class II flammable liquids shall be transferred from underground tanks by means of fixed pumps so designed and equipped as to allow control of the flow and to prevent leakage or accidental discharge. Class I or Class II flam-

mable liquids shall not be transferred from any storage tank by any equipment or procedure which subjects the shell of the storage tank to pressures above its allowable working pressure. Air or gas pressure shall not be used for this purpose.

6322. Supplemental means shall be provided outside of the dispensing device whereby the source of power may be readily disconnected in the event of fire or other accident.

6323. Dispensing devices for Class I or Class II flammable liquids shall be of approved type. Devices meeting the standards of the Underwriters' Laboratories, Inc., shall be deemed to be in compliance with this Section.

6324. Class I or Class II flammable liquids shall not be dispensed by pressure from drums, barrels, and similar containers. Approved pumps taking suction through the top of the container or approved self-closing faucets shall be used.

6330. Remote Pumping Systems.

6331. SCOPE: This Section shall apply to systems for dispensing Class I flammable liquid where such liquid is transferred from underground storage to individual or multiple dispensing units by pumps located elsewhere than at the dispensing units.

6332. PUMPS: Pumps shall be designed or equipped so that no part of the system will be subjected to pressures above its allowable working pressure. Pumps installed above grade, outside of buildings, shall be located not less than ten feet from lines of adjoining property which may be built upon, and not less than five feet from any building opening. When an outside pump location is impractical, pumps may be installed inside of buildings as provided for dispensers in Paragraph 6311, or in pits as provided in Paragraph 6333. Pumps shall be substantially anchored and protected against physical damage by vehicles.

6333. PITS: Pits for subsurface pumps or piping manifolds of submersible pumps shall withstand the external forces to which they may be subjected without damage to the pump, tank, or piping. The pit shall be no larger than necessary for inspection and maintenance and shall be provided with a tight fitting cover.

6334. CONTROLS.

(a) 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.

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

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

6335. TESTING: After the completion of the installation including any paving, that section of the pressure piping system between the pump discharge and the connection for the dispensing facility, shall be tested for at least thirty minutes at a pressure fifty per cent above the maximum operating pressure. Such tests shall be repeated at five year intervals thereafter.

6340. Automatic Dispensing Units: The installation and use of coin-operated dispensing devices for Class I flammable liquids is prohibited.

6350. Delivery Nozzles.

6351. MANUAL NOZZLE: The dispensing of Class I flammable liquid into a fuel tank or into a container shall be under the control of a competent person at all times. The use of any device which permits the dispensing of Class I flammable liquid when the hand of the operator of the discharge nozzle is removed from the nozzle control lever is hereby forbidden except when using an automatic nozzle at an automotive service station as provided in Paragraph 6352.

6352. AUTOMATIC NOZZLES WITH LATCH-OPEN DEVICES: In lieu of being held open by hand, an approved automatic nozzle may be used at automotive service stations for dispensing Class I flammable liquid into the fuel tank of a vehicle. Such a nozzle shall have the latch-open device as an integral part of the assembly and shall shut off the liquid reliably and positively when the gasoline tank is filled, when it falls from the filling neck of an automobile tank, when it is subject to rough usage such as dropping or lack of proper lubrication, or when an automobile is driven away while the nozzle is still in the tank. A competent attendant shall be in the immediate vicinity of the vehicle being filled by such an approved nozzle.

64. Marine Service Stations.

6410. Tanks and pumps, other than those integral with approved dispensing units, supplying Class I or Class II flammable liquids at marine service stations shall be located only on shore, or upon

express permission of the authority having jurisdiction on a pier of solid-fill type. Approved dispensing units with or without integral pumps may be located on shore, piers of solid-fill type, open piers, wharves or floating docks.

NOTE: Floating marine service stations are not covered by this Code. They are subject in the U.S.A. to the Tank Vessel Regulations of the United States Coast Guard.

6420. *Tanks and pumps supplying* Class III flammable liquids at marine service stations may be located on shore, on a pier of solid-fill type or on open piers, wharves or floating docks. Class III flammable liquid tanks which are located other than on shore or on piers of the solid-fill type shall be limited to 550 gallons aggregate capacity. Pumps not a part of the dispensing unit shall be located adjacent to the tanks.

6430. Pipe lines attached to piers, wharves or floating docks shall be protected against physical damage. A readily accessible valve to shut off the supply from shore shall be provided in each pipe line at or near the approach to the pier, wharf or floating dock.

6431. Pipe lines to floating docks shall be so designed and installed as to make appropriate provision for changes in water level or tide. Transition from the fixed portion of the installation to the floating unit shall provide product control, flexibility, and protection against physical damage.

65. Electrical Equipment.

6510. Electrical equipment and wiring, including lighting fixtures, and motors and switch gear for pumps handling Class I or Class II flammable liquids and located where flammable vapors may accumulate, shall be designed and installed so as not to create an ignition hazard.

NOTE: No. 70, National Electrical Code, provides information on the design and installation of electrical equipment for hazardous locations.

66. Drainage and Waste Disposal.

6610. Provision shall be made in the area where Class I flammable liquids may be spilled to prevent liquids from flowing into interior of service-station buildings. Such provision may be by grading driveway, raising door sills, or other equally effective means. Crankcase drainings and flammable liquids shall not be dumped into sewers, but shall be stored in tanks or tight drums outside of any building until removed from the premises.

67. Sources of Ignition.

6710. In addition to the previous restrictions of this chapter, the following shall apply: There shall be no smoking or open flames in the areas used for fueling, servicing internal combustion engines, receiving or dispensing of flammable liquids. Conspicuous signs prohibiting smoking shall be posted within sight of the customer being served. Letters on such signs shall be not less than four inches high. The motors of all equipment being fueled shall be shut off during the fueling operation.

68. Fire Control.

6810. Suitable fire-control devices, such as small hose or portable fire extinguishers, shall be available to locations where fires are likely to occur.

CHAPTER VII.

COMMERCIAL AND INDUSTRIAL ESTABLISHMENTS.

70. Storage.

7010. General: Flammable liquids shall be stored in tanks, closed containers or approved safety cans.

7020. Tanks: The storage of flammable liquids in tanks shall conform to the applicable requirements of Chapter II.

7030. Containers: The storage of flammable liquids in drums and other closed containers shall conform to the applicable requirements of Chapter III.

71. Handling and Use.

7110. Location: The indoor handling and use of Class I or Class II flammable liquids in excess of six gallons and Class III flammable liquids in excess of 25 gallons shall be limited to buildings, portions of buildings or rooms designed and constructed in accordance with the requirements of Section 7120 and limits designated in Section 7130.

7120. Design and Construction of Inside Mixing and Handling Rooms: Rooms shall have at least one exterior wall. Walls, floors and ceilings shall be of noncombustible construction having at least a two hour fire resistive rating. Doors shall be provided with noncombustible liquid-tight sills at least six inches high and provided with an approved Class B fire door of the self-closing type. Adequate drainage to a safe location shall be provided. Adequate natural or mechanical ventilation shall be provided. Heating shall be by low pressure steam or hot water or by electrical units approved for Class I hazardous locations. Lighting and electrical devices shall be approved for Class I Hazardous Locations. All equipment such as mixers, filters, pumps, motors, shafting shall be permanently and effectively grounded.

NOTE: No. 91, Standard on Blower and Exhaust Systems for Dust, Stock and Vapor Removal, provides information on the design and installation of mechanical ventilation as does No. 70, National Electrical Code, for the design and installation of electrical equipment in hazardous locations.

7130. Storage Limits for Inside Mixing and Handling Rooms.

7131. An Inside Mixing and Handling Room not protected by an approved automatic fire extinguishing system shall contain not more than

(a) 1,100 gallons total of Class I, II and III flammable liquids of which not more than,

(b) 550 gallons may be of Class I and Class II flammable liquids of which not more than,

(c) 275 gallons may be of Class I flammable liquids.

7132. An Inside Mixing and Handling Room protected by an approved automatic fire extinguishing system shall not contain more than

(a) 11,000 gallons total of Class I, II and III flammable liquids of which not more than,

(b) 2,750 gallons may be of Class I and Class II flammable liquids of which not more than,

(c) 550 gallons may be of Class I flammable liquids.

(d) These amounts may be increased to not more than one day's supply where daily consumption exceeds the above limits.

7140. Installations made in accordance with the applicable requirements of Standards for Dry Cleaning Plants, No. 32; for Dip Tanks Containing Flammable or Combustible Liquids, No. 34; and Spray Finishing Using Flammable Materials, No. 33 shall be deemed to be in compliance with this code.

72. Dispensing.

7210. Class I or Class II flammable liquids shall be dispensed only in an Inside Mixing and Handling Room.

7220. Class I or Class II flammable liquids shall not be drawn from or dispensed into vessels or containers within a building except by means of a device drawing from top of the tank or the container. Gravity discharge within a building of Class I or Class II flammable liquids from tanks, drums, or containers other than safety cans, is forbidden, except where the nature of the manufacturing process requires gravity flow. Upon approval of the authority having jurisdiction, such gravity flow shall be permitted only from vessels storing flammable liquids sufficient for not more than one day's operation.

7230. Class I or Class II flammable liquids shall not be dispensed within a room or building which normally contains source of ignition, within the possible path of vapor travel. Dispensing devices shall be provided with iron or steel valves where compatible with the flammable liquid handled. Where practicable, there shall be, in addition to the outlet valve, a secondary control device or valve outside of the immediate area, by which the flow may be stopped in the event of fire or other accident at the outlet. Outlet valves, where practicable, shall be of the self-closing type.

7240. Container Filling Facilities: Class I and Class II flammable liquids shall not be run into containers unless the nozzle and container are electrically interconnected. Where the metallic 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.

7250. Exits: Exit facilities shall be provided to prevent occupants being trapped in the event of fire.

73. Ventilation.

7310. Buildings, or rooms or other enclosures in which Class I or Class II flammable liquids are used or stored in open vats or dip tanks shall be provided with ventilation sufficient at all times to prevent accumulation of flammable vapors. Where natural ventilation is insufficient under all conditions to prevent the accumulation of flammable vapors, mechanical ventilation shall be provided and used. The accumulation of flammable vapors within the combustible or explosive range under normal operating conditions, as determined by an approved flammable-vapor indicator, shall be evidence of the violation of this Section.

7320. Design of ventilating systems shall take into account the relatively high specific gravity of the vapors. Openings to the outside for natural ventilation shall be at floor level and shall be unobstructed except by louvers or coarse screens.

NOTE: No. 91, Standard for the Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal, provides information on the design and installation of mechanical ventilation systems.

74. Electrical Equipment.

7410. Artificial lighting shall be by electricity only. Elec-

trical devices located within the possible path of vapor travel shall be of a type approved for such locations.

NOTE: No. 70, National Electrical Code, provides information on the design and installation of electrical equipment for hazardous locations.

75. Sources of Ignition.

7510. Open flames, heating devices and processes employing temperatures capable of igniting the vapors of the flammable liquids used shall be prohibited in buildings, rooms and other confined spaces in which Class I or Class II flammable liquids are used in the open, or in which Class III flammable liquids are used for the purpose of saturating, coating or otherwise treating goods or materials. Smoking shall be prohibited and suitable signs to that effect shall be displayed.

76. Housekeeping.

7610. Wherever flammable liquids are stored in containers, provisions shall be made and maintained for the detection of leakage. Leaking containers shall be immediately removed or made tight.

7620. Access shall be provided by unobstructed aisles whereby first-aid fire-control apparatus may be brought to bear on any part of such flammable liquids storage.

7630. In buildings, rooms or other confined spaces in which flammable liquids are stored, combustible waste materials shall not be allowed to accumulate, except in closed metal containers.

7640. Crankcase drainings and flammable liquids shall not be dumped into sewers unless they are designed for this purpose, but shall be stored in tanks or tight drums outside of any building until removed from the premises.

77. Fire Control.

7710. Inside Mixing and Handling Rooms may be sprinklered or unsprinklered. Where flammable liquids are used or dispensed, portable fire extinguishers shall be provided.

NOTE: No. 10, Portable Fire Extinguishers, provides information as to the suitability of various types of extinguishers and their number and location.

CHAPTER VIII.

PROCESSING PLANTS.

80. Storage.

8010. General: Flammable liquids shall be stored in tanks, closed containers or approved safety cans.

8020. Tanks: The storage of flammable liquids in tanks shall conform to the applicable requirements of Chapter II or Section 6220.

8030. Containers.

8031. The storage of flammable liquids in drums or other closed containers shall conform to the requirements of Chapter III or Paragraph 8032.

8032. The storage of flammable liquids within rooms or buildings not meeting the requirements of Chapter III shall be limited as follows:

(a) The storage of Class I and Class II flammable liquids within wood frame buildings is prohibited. The storage of Class III flammable liquids within wood frame buildings shall be limited to 60 gallons in any container.

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

81. Blending and Mixing.

8110. Mixing or blending rooms or buildings shall meet the design standards of Section 7120. Mixing or blending rooms or buildings shall be provided with natural or mechanical ventilation

that will prevent the accumulation of flammable vapors in hazardous concentrations. Design of ventilating systems shall take into account the relatively high specific gravity of the vapors. Openings in outside walls for natural ventilation shall be at floor level and shall be unobstructed except by louvers or coarse screens.

NOTE: No. 91, Standard for the Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal, provides information on the design and installation of mechanical ventilation systems.

8120. Vessels used for mixing or blending of Class I flammable liquids shall be provided with self-closing tight-fitting noncombustible lids that will control a fire within such vessel when applied thereto. Where such devices are impracticable, automatic or manually controlled chemical or other fire-extinguishing devices approved by the authority having jurisdiction shall be provided.

8130. Open flames and other sources of ignition shall not be used within the possible path of vapor travel where flammable liquids are mixed or blended in open containers.

8140. Vessels shall be electrically connected by bond-wires, piping, or similar means, where differences of potential could otherwise be created by accumulation of static-electrical charges.

82. Dispensing from Containers Within Buildings.

8210. Class I or Class II flammable liquids may be dispensed from approved safety cans, provided that there are no open flames or other sources of ignition within the possible path of vapor travel.

8220. Class III flammable liquids may be dispensed from containers not exceeding 60 gallons in individual capacity by means of an approved pump or similar device taking suction through the top of the container.

83. Electrical Equipment.

8310. Artificial lighting shall be by electricity only. Electrical devices located within the possible path of vapor travel shall be of a type approved for such locations.

NOTE: No. 70, National Electrical Code, provides information on the design and installation of electrical equipment for hazardous locations.

84. Sources of Ignition.

8410. Open flames, heating devices and processes employing temperatures capable of igniting the vapors of the flammable