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STATE OF IOWA

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FIRE SAFETY RULES AND REGULATIONS
for
**Governing the Handling, Storage and
Transportation of Flammable Liquids**

Robert D. Ray
Governor

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DIVISION OF FIRE PROTECTION
Department of Public Safety

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Iowa. Dept. of Pub. Safety.

Div. of Fire Protec-

tion

Fire safety rules and
regulations for governing
the handling, storage and
transportation of flammable
liquids

ROBERT D. RAY
GOVERNOR

MICHAEL M. SELLERS
COMMISSIONER

STATE OF IOWA

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Governing the Handling, Storage and Transportation of Flammable Liquids

WILBUR R. JOHNSON
State Fire Marshal

DEPARTMENT OF PUBLIC SAFETY

LUCAS STATE OFFICE BUILDING

DES MOINES, IOWA

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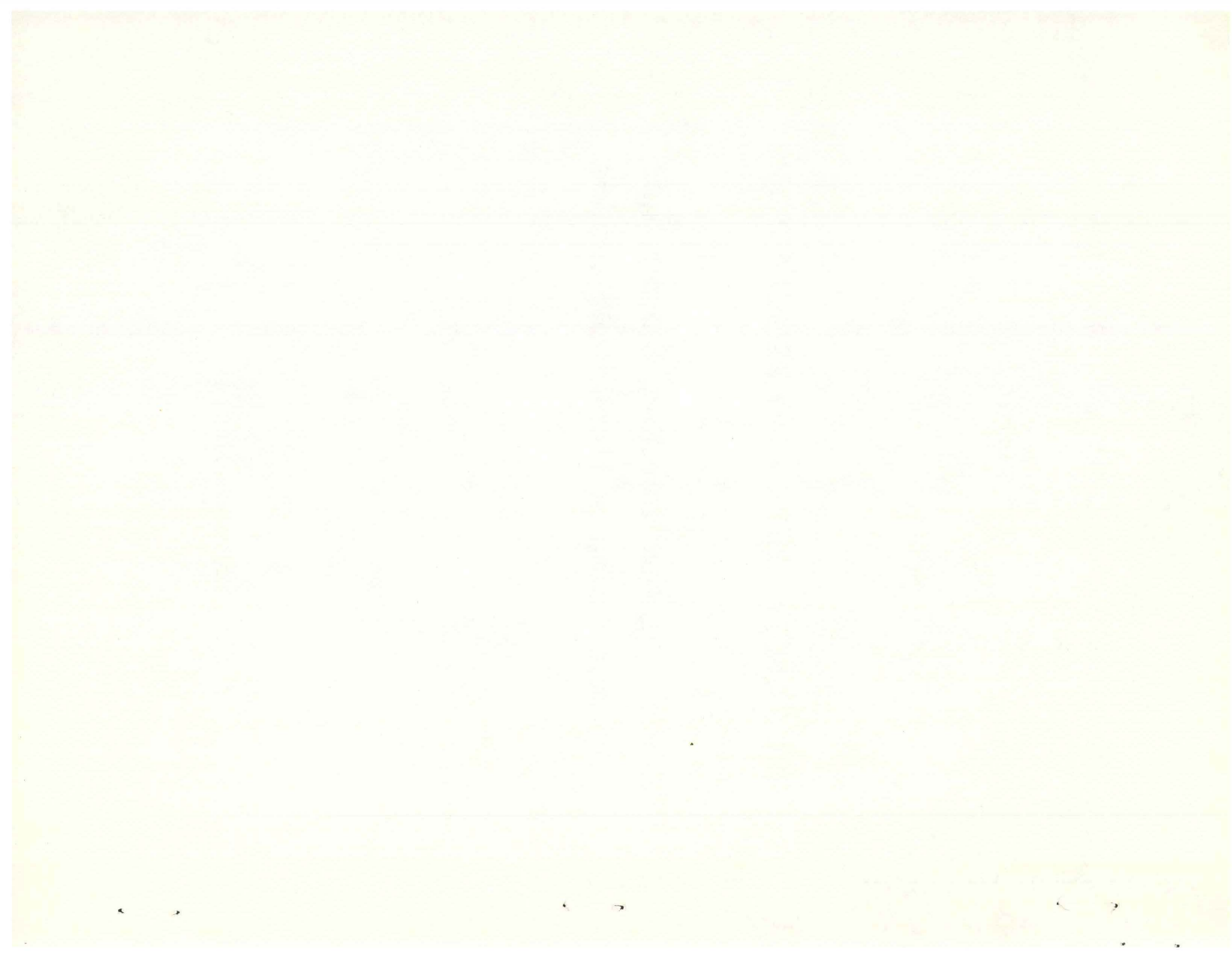


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CHAPTER 14

FLAMMABLE LIQUIDS CODE

14.1(101)T.III The standard of "Flammable and Combustible Liquids Code", No. 30, 1969 edition of the National Fire Protection Association with the exception of the following six sections: 2192, 7253, 7261, 7262, 7263, and 7264, together with its references to other specific pamphlets referred to and contained within the volumes of the National Fire Code, 1969-70 edition of the National Fire Protection Association published in 1969, shall be the rules governing flammable liquids in the State of Iowa.

14.2(101)T.III Storage, handling & use--plans approved.

14.2(1) Before any construction or new or additional installation for the storage, handling or use of flammable liquids is undertaken in bulk plants, service stations and processing plants, drawings or blueprints thereof made to scale shall be submitted to the state fire marshal with an application, all in duplicate, for his approval. Within a reasonable time (ten days) after receipt of the application with drawings or blueprints, the state fire marshal will cause the same to be examined and if he finds that they conform to the applicable requirements of this chapter as written or as modified, shall forthwith signify his approval of the application either by endorsement thereon or by attachment thereto, retain one copy for his files and return to the applicant the other copy plus any additional copies submitted by the applicant. If the drawings or blueprints do not conform to the applicable requirements of this chapter as written or modified as aforesaid, he shall within the time aforesaid notify the applicant accordingly.

14.2(2) If proposed construction or installation is to be located within a local jurisdiction which requires that a local permit be first obtained, the drawings or blueprints shall be submitted to the appropriate local official or body with the application for permit and then except in case of dispute need not be submitted to the state fire marshal. The local official or body, as a condition to the issuance of the permit, shall require compliance with the applicable requirements of this chapter as written or as modified. In the event of dispute as to whether the drawings or blueprints show conformity with the applicable requirements of this chapter as aforesaid the plans and drawings shall forthwith be submitted to the state fire marshal whose decision in the matter shall be controlling.

14.2(3) Drawings shall show the name of the person, firm or corporation proposing the installation, the location thereof and the adjacent streets or highways.

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14.2(4) In the case of bulk plants the drawings shall show, in addition to any applicable features required under subrules 14.2(6) and 14.2(7) of this rule, the plot of ground to be utilized and its immediate surroundings on all sides; complete layout of buildings, tanks, loading and unloading docks; heating devices therefor, if any.

14.2(5) In the case of service stations, the drawings, in addition to any applicable features required under subrule 14.2(6) and 14.2(7) of this rule, shall show the plot of ground to be utilized; the complete layout of buildings, drives, dispensing equipment, greasing or washing stalls and the type and location of any heating device.

14.2(6) In the case of aboveground storage the drawing shall show the location and capacity of each tank; dimensions of each tank the capacity of which exceeds 50,000 gallons; the class of liquid to be stored in each tank; the type of tank supports; the clearances as covered in NFPA Pamphlet No. 30, 1969 Edition; the type of venting and pressure relief relied upon and the combined capacity of all venting and pressure relief valves on each tank, as covered in NFPA Pamphlet No. 30, 1969 Edition; the tank control valves as covered in Pamphlet No. 30, 1969 Edition; and the location of the pumps and other facilities by which liquid is filled into and withdrawn from the tanks.

14.2(7) In the case of underground storage, the drawings shall show the location and capacity of each tank, class of liquid to be stored therein, together with the clearances and requirements covered in NFPA Pamphlet No. 30, 1969 Edition; and the location of fill, gauge and vent pipes and openings as covered in NFPA Pamphlet No. 30, 1969 Edition.

14.2(8) In the case of an installation for storage, handling or use of flammable liquids within buildings, or enclosure at any establishment or occupancy covered in this chapter, the drawings shall be in such detail as will show whether applicable requirements are to be met.

14.3(101)T.III Storage, handling & use.

14.3(1) Flammable liquid in fuel tanks of display vehicles not to include agency showrooms. Where flammable liquid fueled vehicles are to be displayed at shows, or displays, the following safety precautions shall be taken:

a. Fuel tanks shall contain a minimum amount of fuel, not more than one gallon.

b. Fuel tanks fill cap shall be locked or sealed shut with gummed tape.

c. Batteries shall be disconnected, or removed.

d. Vehicles shall be displayed in roped off areas, and kept locked, unless an attendant is in the immediate area.

e. Drapes, curtains, and decorative materials shall be of flame-proofed material.

14.3(2) Tank valves.

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

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

14.3(3) Venting. With respect to vents or pressure relief devices on aboveground tanks, control valves on tanks or in piping systems, ventilation or sources of ignition shall be deemed distinctly hazardous and shall be corrected or eliminated; except tanks that were in compliance with the 1957 venting regulations as of the effective date of this amendment need not be corrected until such time of major remodeling.

14.4(101)T.III Bulk plants. Property shall be kept free from weeds, high grass, rubbish and litter, and shall be kept neat, clean and orderly throughout.

14.5(101)T.III Service stations--buildings.

14.5(1) Basements.

a. No basement or excavation shall hereafter be constructed under any service station building. Steps shall be taken to eliminate existing basements upon the occasion of any major remodeling of a service station. This restriction shall not apply to garages.

b. Floor shall preferably be of concrete or other fire resisting materials.

14.5(2) Service pits.

a. Except as otherwise provided in 14.5(2), "c", no service station or filling station shall be constructed or remodeled after the effective date of these regulations in such a manner as to include a service pit.

b. Service pits existing as of the effective date of these regulations shall comply with the following:

(1) No sewer connection shall be permitted from any pit, unless protected with an approved grease trap which will effectively intercept greases and oils, and prevent their entry into the sewer.

(2) If service pits are electrically lighted, lights and switches shall be of explosion-proof construction and wiring in conduit.

c. In an establishment where greasing or other services are to be regularly rendered to vehicles of such type, size or weight or for other good reason, it would be impracticable to utilize ramp or hoist type equipment for these services, a pit may be installed but only after written approval from the state fire marshal upon application in writing accompanied by plans and specifications for the proposed installation. Every such approval shall be on the condition that the proposed installation be constructed and maintained in conformity with the following requirements:

(1) Each pit must be constructed of poured concrete.

(2) All electrical wiring and electric equipment in each pit or used in connection therewith must be explosion-proof and all such equipment shall bear the Underwriters Laboratories label.

(3) Each pit must be equipped with a mechanical exhaust system capable of exhausting five cubic feet of air per minute per square foot of floor area within the pit and shall have a capacity of not less than 1,400 cubic feet per minute. The exhaust system shall be wired electrically so that the system will be in full operation when pit lights are lighted.

(4) The discharge from the exhaust system shall be to the outside atmosphere and located in such a manner that the exhaust air will not re-enter the building.

(5) No sewer connection shall be permitted from any pit, unless protected with an approved grease trap which will effectively intercept greases and oils, and prevent their entry into the sewer.

14.6(101)T.III Handling.

14.6(1) Bulk sales prohibited. No motor fuels shall be dispensed from storage at any service station except directly into the fuel tanks of motor vehicles, when such tanks are connected with the carburetion systems of such vehicles provided, however, that individual sales up to ten gallons may be made in containers meeting the requirements of NFPA Pamphlet No. 30, 1969 Edition.

14.6(2) No self-service permitted. No person other than the service station proprietor or an authorized employee shall use or operate any motor fuel dispensing equipment at any service station.

14.7(101)T.III Safety.

14.7(1) Premises shall be kept neat and clean, and free from rubbish or trash.

14.7(2) Cleaning with gasoline, naphtha, or other highly flammable liquids of Class I shall not be permitted in or around the service station.

14.8(101)T.III Commercial and Industrial Establishments.

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

14.9(101)T.III Fire control. Cleaning with gasoline, naphtha, or other highly flammable liquids of Class I shall not be permitted.

14.10(101)T.III Processing plants.

14.10(1) Wherever flammable liquids are stored in containers, provision shall be made and maintained for the detection of leakage. Leaking containers shall be immediately removed and the contents transferred to a tight container.

14.10(2) Access shall be provided by unobstructed aisles whereby first aid fire control apparatus may be brought to bear on any part of such flammable liquids storage.

14.10(3) In buildings, rooms or other confined spaces in which flammable liquids are stored, combustible waste materials shall not be allowed to accumulate, except in closed metal containers.

14.10(4) Crankcase drainings and flammable liquids shall not be dumped into sewers, but shall be stored in tanks or tight drums outside of any building until removed from the premises.

14.10(5) Cleaning with gasoline, naphtha, or other highly flammable liquids of Class I shall not be permitted.

Chapters 15 through 24 inclusive, are reserved for future use.

CHAPTER 25

OIL BURNING EQUIPMENT

25.1(101)T.III Oil burners. Heating and other devices using oil burners shall be installed, maintained and operated in accordance with recognized safe practice. Burners and accessories such as piping, tanks, vents, control devices, etc., installed in compliance with the then current edition of National Fire Protection Association Standards for the installation of Oil Burning Equipment (NFPA No. 31), shall be deemed prima-facie evidence of compliance with the installation requirements of this rule.

25.2(101)T.III Fuel oil. The grade of fuel oil used in a burner shall be that for which the burner is listed and as stipulated by the manufacturer. Crankcase oil or any oil containing gasoline shall not be used.

CHAPTER 26

STORAGE OF FLAMMABLE LIQUIDS AND COMBUSTIBLE LIQUIDS ON FARMS AND ISOLATED CONSTRUCTION PROJECTS

26.1(101)T.III Scope. The standards are intended to apply to flammable liquids used for fuel for internal combustion engines and for agricultural processes such as spraying, flame cultivation, etc. It does not apply to the storage of fuel oil for heating purposes, which is covered by chapter 25.T.III.

26.2(101)T.III Types of approved storage. Storage of flammable liquids in rural districts for private use shall be permitted in any of the following ways:

26.2(1) Underground storage as provided in chapter 17, T.III.

26.2(2) Aboveground storage in tanks the capacity of which exceeds 500 gallons as provided in chapter 16, T.III and located at least forty feet from any building.

26.2(3) Containers of sixty gallons or less capacity each, in accordance with applicable standards set forth in this chapter.

26.2(4) Containers of 60 to 550 gallons capacity each, in accordance with applicable standards set forth in this chapter.

26.3(101)T.III Individual containers of sixty gallons or less capacity each. Flammable liquids in containers of sixty gallons or less capacity shall be stored outside buildings in substantial closed metal drums of sixty gallons or less capacity each. Discharge devices requiring pressure on the container are prohibited. Pumping devices or faucets used for dis-

penssing flammable liquids shall be well maintained to prevent leakage. Individual containers shall not be interconnected.

Containers as provided in this rule shall be stored outside at least forty feet from any building or may be stored inside of a building used exclusively for the storage of flammable liquids and located at least forty feet from any other building. Buildings used for storage of flammable liquids shall be provided with cross ventilation with at least two vents of sixty-four square inches area each, placed at floor level.

26.4(101)T. III Containers of sixty to five hundred fifty gallons capacity each.

26.4(1) Flammable liquids in aboveground containers of 60 to 550 gallons capacity shall be stored outside buildings in containers of single compartment design and constructed throughout of fourteen-gauge metal or heavier and made vapor tight by welding or equivalent construction.

26.4(2) A fill opening shall be provided and shall be equipped with a closure designed so that it may be locked.

26.4(3) A vent shall be provided to relieve such vacuum or pressure as will develop in normal operation or from exposure to fire. Such vent shall have a free opening of 1½ inches diameter.

26.4(4) Containers as provided in this rule shall be kept outside and at least forty feet from any building and shall be so located or such additional distance to buildings shall be provided as will insure that no vehicle, equipment or vessel being filled directly from such container shall be closer than forty feet to any building.

26.4(5) Containers as above may be of either of the following types:

a. Containers with top openings only. Containers constructed and located as provided above may be designed with all openings in the top of the tank and in such event shall be mounted and equipped as follows:

Stationery containers shall be mounted on timbers or blocks approximately six inches in height so as to protect the bottom of the container from corrosion from contact with the ground and when so placed to be in a stable position; or portable containers may be equipped with attached metal legs resting on shoes or runners to be at least one tank diameter apart, which in turn rests upon the ground, designed so that the container is supported in a stable position and so that the entire container and its support may be moved as a unit.

Containers shall be equipped with a tightly and permanently attached approved pumping device having an approved hose of sufficient length for filling vehicles, equipment or vessels to be served from the container. Either the pump or the hose shall be equipped with a padlock to its hanger to prevent tampering. An effective antisiphoning device shall be included in the pump discharge. Siphons or internal pressure discharge devices are prohibited.

b. Containers elevated for gravity discharge. Containers constructed and located as above may be designed with an opening in the bottom or the end of the tank for gravity dispensing of flammable liquids and shall be mounted and equipped as follows:

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

On containers installed after the effective date of these regulations, each bottom opening for gravity discharge shall be equipped with an internal safety valve, which will close automatically in the event of fire through the operation of an effective heat releasing device and which likewise may be quickly operated manually. The gravity discharge outlet shall be provided with an approved hose equipped with a self-closing valve at the discharge end, of a type that can be padlocked to its hanger to prevent tampering.

26.5(101)T.III Marking of containers. Containers for the storage of flammable liquids in rural districts shall be conspicuously marked with the name of the product which they contain and "FLAMMABLE-KEEP FIRE AND FLAME AWAY." If any such containers are portable and are used for the storage of class I or class II flammable liquids, they shall be painted red and labeled with the common name of the product and with the word "FLAMMABLE." No kerosene, fuel oil or similar liquids shall be placed in a red container.

CHAPTER 27

TRANSPORTATION AND DELIVERY OF FLAMMABLE LIQUIDS BY TANK VEHICLES

27.1(101)T.III Scope. This regulation applies to tank motor vehicles to be used for the transportation or delivery of flammable liquids. It is intended to provide requirements for the design, construction and operation of tank motor vehicles, their appurtenances, and certain features of tank motor vehicle chassis.

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

Nothing in this regulation shall be construed to prevent any shipment made in accordance with the interstate commerce commission regulations.

27.2(101)T.III Definitions.

27.2(1) Tank truck. Any single self-propelled motor vehicle equipped with a cargo tank mounted thereon, and used for the transportation of flammable liquids.

27.2(2) Tank full trailer. Any vehicle with or without auxiliary motive power, equipped with a cargo tank mounted thereon or built as an integral part thereof and used for the transportation of flammable liquids, and so constructed that practically all of its weight and load rests on its own wheels. (Note: Not permitted under Iowa law.)

27.2(3) Tank semitrailer. Any vehicle with or without auxiliary motive power, equipped with a cargo tank mounted thereon or built as an integral part thereof, and used for the transportation of flammable liquids, and so constructed that, when drawn by a tractor by means of a fifth wheel connection, some part of its load and weight rests upon the towing vehicle.

27.2(4) Tank vehicle. Any tank truck, tank full trailer, or tractor and tank semitrailer combination.

27.2(5) Cargo tank. Any container having a liquid capacity in excess of one hundred gallons, used for the carrying of flammable liquids, and mounted permanently or otherwise upon a tank vehicle. The term "cargo tank" does not apply to any container used solely for the purpose of supplying fuel for the propulsion of the tank vehicle upon which it is mounted.

27.2(6) Baffle. A non-liquid-tight transverse partition in a cargo tank.

27.2(7) Compartment. A liquid-tight division in a cargo tank.

27.2(8) Head and bulkhead. A liquid-tight transverse closure at the end of a cargo tank or between compartments of a cargo tank.

27.3(101)T.III Cargo tanks, piping and connections.

27.3(1) Cargo tanks constructed of mild steel.

a. Material. All sheets for such cargo tanks shall be of mild steel to meet the following requirements:

Yield point, minimum- 25,000 pounds per square inch.

Ultimate strength, minimum- 45,000 pounds per square inch.

Minimum elongation, standard two-inch sample- twenty percent.

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

MINIMUM THICKNESS OF HEAD, BULKHEAD AND BAFFLE SHEETS*

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

MINIMUM THICKNESS OF SHELL SHEETS

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

*Thickness of exterior head sheets shall never be less than the maximum requirements for shell sheets in any specific unit.
**Manufacturers Standard Gauge and approximate equivalent thickness in decimals of inch.

27.3(2) Cargo tanks constructed of low alloy low carbon (high tensile) steel.

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

Yield point, minimum- 50,000 pounds per square inch.

Ultimate strength, minimum- 65,000 pounds per square inch.

Minimum elongation, standard two-inch sample- twenty percent.

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

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

Heads, Bulkheads, or Baffles Volume Capacity of Tank in Gallons per Inch of Length Manufacturers Gauge No.	(Dished, Corrugated, Reinforced or Rolled)			
	10 or Less	Over 10 to 14	Over 14 to 18	Over 18
	15	14	13	12

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

MINIMUM THICKNESS OF SHELL SHEETS
LOW ALLOY LOW CARBON (HIGH TENSILE) STEEL

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

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

27.3(3) Cargo tanks constructed of aluminum alloys for high strength welded construction.

a. Material. All sheets for shell, heads and bulkheads of such cargo tanks shall be of aluminum alloys GR20A (5052 commercial designation) GR40A (5154 commercial designation) or GM40A (5086 commercial designation), conforming to American Society for Testing Materials Specifications B178-54T.

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

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

MINIMUM THICKNESS OF HEAD, BULKHEAD AND RAFFLE SHEETS*
ALUMINUM ALLOYS GR20A, GR40A, AND GM40A

Heads, Bulkheads, or Baffles Volume Capacity of Tank in Gallons per Inch of Length Thickness in Decimals of Inches	(Dished, Corrugated, Reinforced or Rolled)			
	10 or Less	Over 10 to 14	Over 14 to 18	Over 18
	.096	.109	.130	.151

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

MINIMUM THICKNESS OF SHELL SHEETS
ALUMINUM ALLOYS GR20A, GR40A AND GM40A

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

27.3(4) Joints.

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

b. Mild steel and low alloy carbon steel may be used in the construction of a single tank, provided each material, where used, shall comply with the minimum requirements of its respective specifications for that section of the tank.

c. In cargo tanks constructed of aluminum alloys, all joints in and to tank shells, heads and bulkheads shall be welded. All welded aluminum joints shall be made in accordance with recognized good practice, and the efficiency of a joint shall not be less than eighty-five percent of the annealed properties of the material in question. Aluminum alloys for high strength welded construction shall be joined by an inert gas arc welding process using filler metals R-GR40A, E-GR40A (5154 alloy) and R-GM50A, E-GM50A (5356 alloy) as conforming to American Society of Testing Materials Specification No. B285-54T (American Welding Society Specification No. A5, 10-54T).

27.3(5) Test. At the time of manufacture every cargo tank shall be tested by a minimum air or hydrostatic pressure of three pounds per square inch applied to each compartment, or to the whole tank if it be not divided into compartments. Such pressure shall be maintained for a period of at least five minutes, during which, if the test is by air pressure, the entire exterior surface of all the joints shall be coated with a solution of soap and water, heavy oil, or other material suitable for the purpose, foaming or bubbling of which will indicate the presence of leaks. Hydrostatic pressure, if used, shall be gauged at the top of the tank; and the tank shall be inspected at the joints for the issuance of liquid to indicate leaks. Any leakage discovered by either of the methods above described, or by any other method shall be deemed as evidence of failure to meet the requirements of this subrule.

27.3(6) Tank outlets. Outlets shall be substantially made and so attached to the tank.

27.3(7) Bulkheads and baffles.

a. Every cargo tank having a total capacity in excess of 3000 gallons and used for the distribution of class I and class II flammable liquids to automotive and marine service stations to which the public is invited shall be divided into compartments, no one of which shall exceed 2500 gallons. A designed tolerance of ten percent shall be allowed for capacities of individual compartments or tanks.

b. Except as provided in 27.3(7)"a", bulkheads or compartments shall not be required in any cargo tank used for transportation service, regardless of total capacity, which, when loaded and transporting its' cargo over streets and highways will contain not less than eight percent of the total tank capacity and will discharge its entire contents at one unloading point. As to tank vehicles operating from, to, or within areas requiring seasonal reduction in size of cargo, the eighty percent requirements shall be waived during the period in which such restrictions are in effect.

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

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

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

27.3(8) Vents. Each cargo tank or compartment shall be provided with a vacuum and pressure operated vent with a minimum effective opening of 0.44 square inch, and shall also be provided with an emergency venting facility so constructed as to provide a minimum free-venting opening having a net area in square inches equal to 1.25 plus 0.0025 times the capacity of the cargo tank or compartment in gallons. If the emergency venting facility operates in response to elevated temperatures, the critical temperature for such operation shall not exceed 200^oF.

27.3(9) Valve and faucet connections. Draw-off valves and faucets shall have discharge ends threaded, or they shall be designed so as to permit being tightly connected to hose extending to fill pipe.

27.3(10) Emergency-discharge control.

a. Every outlet from any cargo tank any compartment of which has a capacity in excess of 500 gallons, if used for transportation of class I or II flammable liquids, shall be equipped with a reliable and efficient shut-off valve located inside the shell; or in the sump when it is an integral part of the shell; and designed so that the valve must be kept closed except during loading and unloading operations.

b. The operating mechanism for the valve shall be provided with a secondary control, remote from the fill openings and discharge fau-

cets, for use in the event of accidents or fire during delivery operations.

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

d. In every case there shall be provided, between the shut-off valve seat and discharge faucet, a shear section which will break under strain unless the discharge piping is so arranged as to afford the same protection and leave the shut-off valve intact.

27.4(101)T. III Tank-vehicle chassis, assembly and appurtenances.

27.4(1) Tires. All tank motor vehicles shall be equipped with rubber tires on all wheels.

27.4(2) Assembly. Every cargo tank shall be adequately supported upon and securely attached to or be a part of the tank vehicle upon which it is carried.

27.4(3) Static protection.

a. Cargo tanks, and vehicle chassis, shall be electrically bonded.

b. Provision shall be made in the tank structure of the vehicle for the bonding of vehicle to the fill pipe during truck loading operations.

c. All hoses used on transports (4000 gallon capacity or larger) for unloading class I or II liquids shall be wire-filled.

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

27.4(4) Protection against collision. Draw-off valves or faucets projecting beyond the frame at the rear of a tank vehicle shall be adequately protected against collision by bumpers or similar means.

27.4(5) Lighting and marking.

a. No lighting device other than electric lights shall be used on tank vehicles. Lighting circuits shall have suitable over-current protection (fuses or automatic circuit breakers). The wiring shall have sufficient carrying capacity and mechanical strength, and shall be secured, insulated, and protected against physical damage, in keeping with recognized good practice.

b. Every tank vehicle used for the transportation of any flammable liquid regardless of the quantity being transported, or whether loaded or empty, shall be conspicuously and legibly marked on each side and the rear thereof, in letters at least three inches high on a background of sharply contrasting color, optionally as follows:

(1) With a sign or lettering on the motor vehicle with the word "Flammable".

(2) With the common name of the flammable liquid being transported.

(3) With the name of the carrier or his trademark, when and only when such name or mark plainly indicated the flammable nature of the cargo.

27.4(6) Fuel system.

a. Fuel tanks shall be so designed, constructed and installed as to present no unusual hazard, and shall be so arranged as to vent during filling operations and permit drainage without removal from their mountings.

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

c. The engine of a tank vehicle shall not be connected so as to allow its fuel supply to be part of the cargo tank, but shall be connected to its own fuel supply completely independent of the cargo tank.

27.4(7) Exhaust system.

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

b. The exhaust system, including all units, shall be constructed and installed in a workmanlike manner. A muffler (or silencer) cutout shall not be used.

27.4(8) Semitrailers.

a. Semitrailers shall be firmly and securely attached to the vehicle drawing them, in a manner conforming with recognized good practice.

b. Each semitrailer, shall be equipped with reliable brakes on all wheels, and adequate provision shall be made for their efficient operation from the driver's seat of the vehicle drawing the trailer, or semitrailer.

c. Trailer connections shall be such as to prevent the towed vehicle from whipping or swerving from side to side dangerously or unreasonably and shall cause the trailer to follow substantially in the path of the towing vehicle.

27.4(9) Fire extinguishers. Each tank vehicle shall be provided with at least one portable fire extinguisher having at least a 12-B,C rating or when more than one is provided, each extinguisher shall have at least a 6-B rating. Fire extinguishers shall be kept in good condition at all times, and they shall be located in an accessible place on each tank vehicle.

27.4(10) Auxiliary internal combustion engines. Internal combustion engines, other than those providing propulsive power, installed or carried upon a tank vehicle transporting classes I and II flammable liquids for the purpose of providing power for the operation of pumps or other devices, shall meet the following requirements:

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

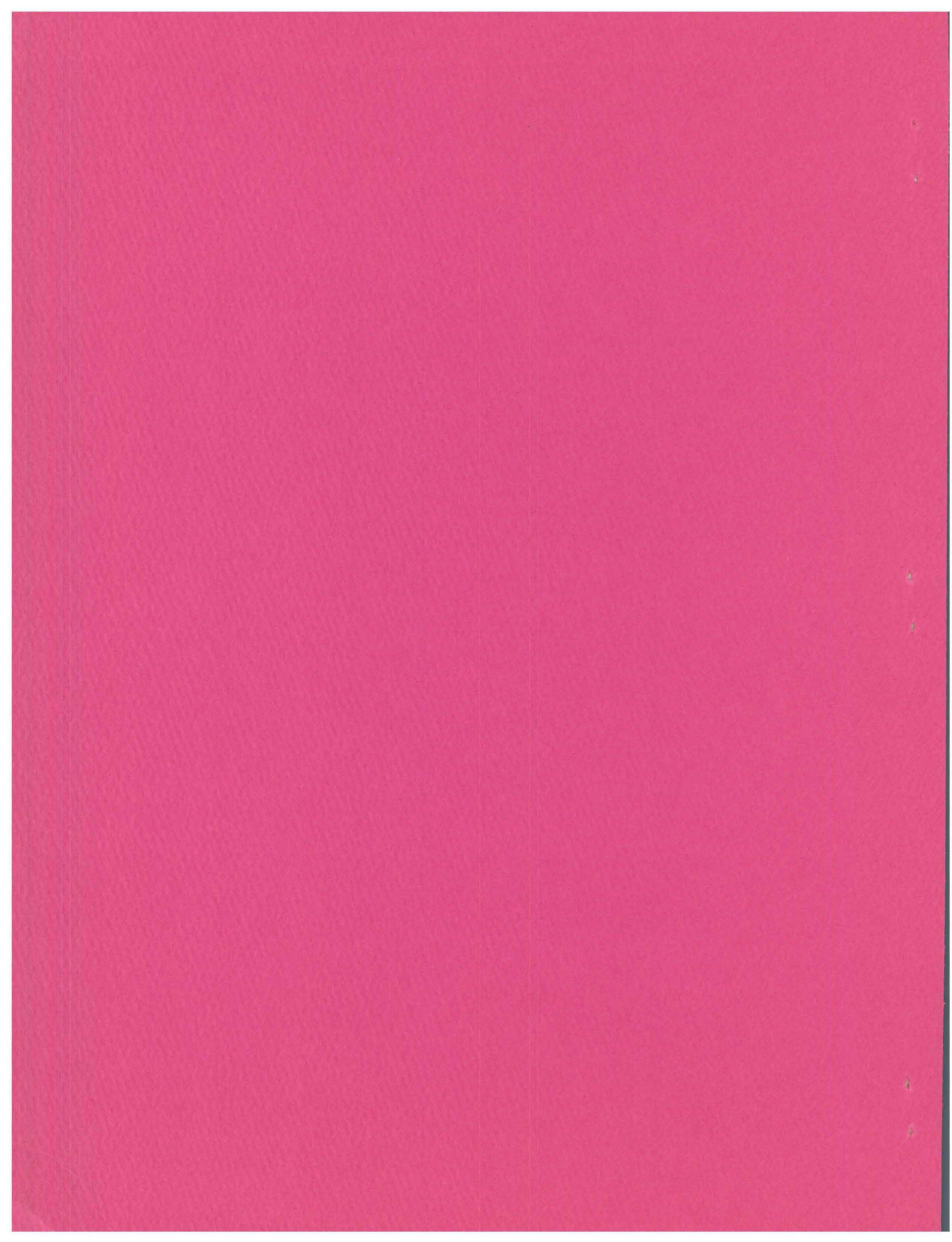
b. The fuel system shall be so located or constructed as to minimize the fire hazard. If the fuel tank is located above or immediately adjacent to the engine, suitable shielding shall be provided to prevent spillage during the filling operation, or leakage from the tank or fuel system, from coming in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

c. Pumps and other appurtenances carrying or containing flammable liquids shall be so located in relation to the engine that spillage or leakage from such parts shall be prevented from coming in contact with the engine or any parts of the ignition and exhaust system, or adequate shielding shall be provided to attain the same purpose. The engine

b. Separation. If class I or II flammable liquid and class III flammable liquid are to be delivered by pump, meter or hose from different compartments of one cargo-tank load, separate withdrawal or metering equipment, whatever it may be, from the point where it is attached to the compartment outlet pipe to and including the dispensing nozzle or connection, shall be provided for class I or II flammable liquid; and separate equipment, as aforesaid, shall be provided for class III flammable liquid. Exception: Tank vehicles manufactured prior to the effective date of this standard may be continued in use without being so equipped if (1) lines into the common outlets or to common manifolds are provided with valves which will permit only one compartment at a time to be emptied; and (2) the common outlet, pump, meter or hose, following use for class I or II liquid, shall be cleared as required in 27.5(4) "a" before being used for class III flammable liquid.

EFFECTIVE DATE OF REGULATIONS

SEPTEMBER 30, 1971



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