PART II

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TITLE 49—TRANSPORTATION

Chapter I—Interstate Commerce Commission

PARTS 71–78—EXPLOSIVES AND OTHER DANGEROUS ARTICLES

REVISION AND REPUBLICATION OF REGULATIONS

At a session of the Interstate Commerce Commission, Division 3, held at its office in Washington, D. C., on the 19th day of July, A. D. 1950.

The matter of reprinting in revised form the publication entitled "Regulations for Transportation of Explosives and Other Dangerous Articles by Land and Water in Rail Freight, Express, and Baggage Services, and by Motor Vehicle (Highway), and Water, including Specifications for Shipping Containers" being under consideration:

It appearing, that by order issued on August 16, 1940, the Commission, by Division 3, published in revised form and brought up to date the aforementioned regulations and specifications theretofore approved by the Commission;

It further appearing, that since August 16, 1940, the Commission has issued supplemental orders approving further amendments to said regulations and specifications;

And it further appearing, that because of the numerous requests for copies of said regulations and specifications, as amended, and in order to simplify them for ready reference, it is desirable and appropriate that the said regulations and specifications as supplemented since August 16, 1940, be published in a consolidated issue.

It is ordered, That the regulations and specifications published by order of the Commission entered August 16, 1940, as later amended by supplemental orders, be consolidated and published in revised form.

By the Commission, Division 3.

[SEAL] W. P. BARTEL, *Secretary.*

Part II of this issue contains Title 49, Chapter I, Parts 71–78, the regulations governing explosives and other dangerous articles issued by the Interstate Commerce Commission.

CODIFICATION GUIDE

Title 49

PART 71—GENERAL INFORMATION AND REGULATIONS

AUTHORITY: §§ 71.1 to 71.13 issued under sec. 204, 49 Stat. 546, as amended, sec. 835, 62 Stat. 739; 49 U. S. C. 304, 18 U. S. C., Sup., 835.

§ 71.1 *Plan of the regulations in Parts 71–78 of this chapter.* (a) Regulations in Parts 71–78 of this chapter cover preparation of explosives and other dangerous articles for transportation by common carriers by rail freight, rail express, rail baggage, highway or water, construction of containers, packing, weight, marking, labeling when required, billing, and shipper's certificate of compliance with these regulations; also cars, loading, storage, billing, placarding, and movement thereof by carriers by rail.

(b) Regulations for equipment and operation of motor vehicles on the highways are published in separate issue of the Commission.

§ 71.2 *Act of Congress.* (a) Section 834, Title 18 of the United States Code, approved June 25, 1948 (Pub. Law 772, 80th Cong.), provides that whoever knowingly delivers to any common carrier engaged in interstate or foreign commerce by land or water, or carries upon any car or vehicle operated by any common carrier engaged in interstate or foreign commerce by land, any explosive or other dangerous article specified in section 832, under any false or deceptive marking, description, invoice, shipping order or declaration, or does not inform the agent of such carriers, in writing, of the true character of such explosive or other dangerous article, or does not plainly mark on the outside of every package containing explosives or other dangerous articles the contents thereof, shall be fined or imprisoned, or both.

§ 71.3 *Changes in the regulations, shippers by rail, highway, and water, and carriers by rail and highway.* (a) Section 835 of the act of June 25, 1948, authorizes the Commission to formulate regulations for the safe transportation of explosives and other dangerous articles and either upon its own motion, or upon application by any interested party, to make changes or modifications in such regulations, made desirable by new information or altered conditions. It further provides that in the execution of sections 831–835 of the act the Commission may utilize the services of the Bureau for the Safe Transportation of Explosives and Other Dangerous Articles (hereinafter called Bureau of Explosives). The Bureau of Explosives will make inspections and conduct investigations and will confer with manufacturers and shippers with a view to determining what regulations will within reasonable limits afford the highest degree of safety in preparing and packing explosives and other dangerous articles for transportation by carriers by rail, highway, or water. The Commission will give due weight to the expert opinions thus ob-

tained. Reports of these investigations will be made to the Commission with recommendations.

(b) Specifications for shipping containers, methods of packing for shipment, and other regulations will be considered and prescribed from time to time by orders effective as conditions may appear to warrant.

§ 71.4 *Changes in tank car specifications.* (a) Proposals of changes in or additions to specifications for tanks to be mounted on or to form part of a car and to be classified as tank cars should be submitted to the Secretary, Mechanical Division, Association of American Railroads, for thorough investigation and consideration by its committee on tank cars, that committee to report its recommendations, together with objections offered to its proposals, with explanations and reasons for desired approval thereof, through said secretary to the Commission, and such reports may be submitted to the Bureau of Explosives, as circumstances appear to warrant, for comments and suggestions before appropriate action by the Commission.

§ 71.5 *Procedure covering tank car construction.* (a) Complete detailed prints of new or improved types of tank-car tanks and detailed prints or samples of new or improved types of equipment therefor should be submitted to the Secretary, Mechanical Division, Association of American Railroads, for thorough investigation and laboratory tests of samples by its committee on tank cars.

(b) When in the opinion of the committee such tanks or equipment therefor are in full compliance with effective specifications of the Commission and no increase in hazard is involved, their use should be permitted.

(c) When in the opinion of the committee such tanks or equipment therefor are in full compliance with effective specifications of the Commission and a possible increase in hazard is involved, service trials should be agreed upon among interested parties before more extended use is permitted.

(d) When in the opinion of the committee such tanks or equipment therefor do not comply with effective specifications of the Commission and service trials are desirable, approval by the Commission of the conditions of such trials must be obtained.

(e) Prompt reports of the tank car committee on these matters should be made to the Commission through said mechanical division secretary and should include objections to proposed modifications of the specifications and advice of any extensions of pending investigations found necessary. The committee's expert opinions thus obtained will be given due weight by the Commission in determining upon appropriate final action to be taken. The merits of controversies arising under the foregoing procedure will be considered and changes in or additions to the specifications, or authorizations of service trials, will be made by the Commission as conditions appear to warrant.

§ 71.6 *Approved changes; notice.* (a) The act of June 25, 1948, requires that notice of 90 days after formulation and publication should be given of the effective date of new or modified regulations, unless a shorter time is authorized by the Commission. The authority to establish amended regulations upon less than 90 days' notice will be exercised only in instances where special and peculiar circumstances or conditions fully justify it.

§ 71.7 *Public hearings.* (a) Public hearings concerning regulations contained in Parts 71–78 of this chapter will be held by the Commission at sufficiently frequent intervals. At these hearings evidence may be introduced in favor of proposed changes or additions and protest against the adoption thereof will also be heard. Final action also may be taken by the Commission without hearing, following 20 days' notice by the Commission of proposed changes or additions, or without such notice, as conditions appear to warrant.

§ 71.8 *Definitions.* (a) The word "must" or "shall" is used in Parts 71–78 of this chapter in mandatory regulations. The word "should" indicates recommendatory provisions.

(b) In section 832 of the act of June 25, 1948: *It is provided,* That whoever knowingly transports certain explosives on any car or vehicle of any description operated in the transportation of passengers by a common carrier engaged in interstate or foreign commerce, which car or vehicle is carrying passengers for hire, shall be fined or imprisoned or both. *It is further provided,* That under limited conditions, certain explosives may be transported in a single car or vehicle but such explosives shall not be carried in that part of a car or vehicle which is being used for the transportation of passengers for hire. As used in Parts 71–78 of this chapter the term "car or vehicle of any description operated in the transportation of passengers * * * for hire" means any railroad car of a passenger train, or highway vehicle, with passengers for hire in the same such railroad car or highway vehicle.

(c) Whenever use of a container type is prescribed in the packing regulations but without specification number, the authorized type of container, either specification or nonspecification, may be used for the shipment.

(d) Numbering and lettering. The terms used in the numbering and lettering system employed in Parts 71–78 of this chapter, and adhered to in references made from one requirement to another, are as follows:

(1) Section: A major subdivision of a part, as § 73.193 of this chapter.

(2) Paragraph: A subdivision of a section, as paragraph (a) of this section, or § 73.193 (a).

(3) Subparagraph: A subdivision of a paragraph, as paragraph (a) (1) of this section, or § 73.193 (a) (1).

(e) Tank motor vehicle. The term "tank motor vehicle" means any motor vehicle designed or used for the transportation of liquids or gases covered by Parts 71–78 of this chapter in any cargo tank.

(f) Cargo tank. The term "cargo tank" means:

(1) *Permanently attached tank.* Any tank designed to be permanently attached to any motor vehicle and in which is to be transported any flammable liquid, corrosive liquid, or compressed gas, hereby designated "cargo tank."

(2) *Fuel tank not a cargo tank.* A fuel tank is not a cargo tank, but one used to transport flammable liquid or compressed gas solely for the purpose of supplying fuel for the propulsion of a vehicle.

(3) T[illegible] any tan[illegible] porarily [illegible] other v[illegible] tank ca[illegible] skids, m[illegible] cilitate handling of the tank by mechanical means. The term "portable tank" shall not be construed to include any cargo tank, any tank car tank, or any tank of the ICC 106A (§§ 78.275 or 78.276 of this chapter) type.

§ 71.9 *Vessels stores.* (a) Vessels stores are regulated by the regulations prescribed by the Commandant of the Coast Guard (46 CFR Part 147) and are not included in Parts 71–78 of this chapter.

§ 71.10 *Flammable or combustible liquids in bulk on board vessels.* (a) Nothing in Parts 71–78 of this chapter shall be construed as affecting the transportation of flammable or combustible liquids in bulk on board vessels which transportation is governed by the rules and regulations promulgated under R. S. 4417a; 47 U. S. C. 391a (46 CFR Part 146).

§ 71.11 *Transportation by carriers by water.* (a) When the transportation of a shipment involves movement by carrier by water, the applicable provisions of Parts 71–78 of this chapter must be observed by the shipper.

§ 71.12 *Export shipments by domestic carriers by rail and motor vehicles.* (a) Explosives and other dangerous articles authorized to be exported from the United States when packed, marked, labeled, and described, in accordance with rules and regulations in force at destination ports, must not be offered to any common carrier by rail or motor vehicle for domestic transportation unless in full accordance with the regulations in Parts 71–78 of this chapter.

(b) The requirements of Parts 71–78 of this chapter do not apply to such transportation by motor vehicle or water as may be necessary to effect transfer of export shipments from place of shipment to other places within the same port area or delivery to a water carrier within the same port area (including contiguous harbors); further transportation of such export shipments by connecting water carrier shall be subject to the regulations prescribed by the Commandant of the Coast Guard.

§ 71.13 *Emergency regulations.* (a) Until further order of the Commission, shipments of explosives may be made upon request of the Departments of the Army, Navy, and Air Force of the United States Government complying with the following:

(b) Explosives by rail freight or motor vehicle.

(1) Shippers' and carriers' regulations; handling detonating agents and explosives and explosive ammunition in same car or vehicle. Detonating fuzes, primer-detonator assemblies or other detonating elements containing explosive components, if of a safe type, may be shipped either assembled in bombs, depth charges, mines, projectiles, or torpedoes (torpedo warheads) or in properly packed containers in the same car or vehicle with bombs, depth charges, mines, projectiles, boosters, or torpedoes (torpedo warheads) when separated from the explosive bombs, depth charges, mines, projectiles, boosters, or torpedoes (torpedo warheads) by not less than 3 feet. The intervening space of 3 feet must be filled with dry sand or dry earth in bags or in a crib so constructed or lined as to prevent sifting of the sand or earth. The crib must be secured against movement.

(2) When bomb fuzes are packed with bomb fin assemblies, either crated or boxed in wooden or metal containers, the sand or earth filled space between bombs and the fuzes may be omitted provided adequate blocking and bracing is supplied to prevent the bombs from crushing and injuring the detonating fuzes due to ordinary shocks incident to transportation.

(3) Shipments of explosive bombs, unfuzed explosive projectiles, and large containers of incendiary bombs weighing 500 pounds or more, each, may be loaded in stock cars or in gondola cars (flat bottom) when adequately braced. When necessary wooden boxed bombs must be protected against accidental ignition.

PART 72—COMMODITY LIST OF EXPLOSIVES AND OTHER DANGEROUS ARTICLES CONTAINING THE SHIPPING NAME OR DESCRIPTION OF ALL ARTICLES SUBJECT TO PARTS 71–78 OF THIS CHAPTER

Sec.

AUTHORITY: §§ 72.1 to 72.5 issued under sec. 204, 49 Stat. 546, as amended, sec. 835, 62 Stat. 739; 49 U. S. C. 304, 18 U. S. C., Sup., 835.

§ 72.1 *Proper shipping name.* (a) The proper shipping name which must be used and shown on outside shipping containers appears in Roman type (not italics). The abbreviations N. O. I. and N. O. I. B. N. may be used in lieu of the abbreviation n..o. s. where it appears in the list of explosives and other dangerous articles.

§ 72.2 *Articles not described.* (a) For an article not described by name shown in § 72.5 of this part, when such article is classified as dangerous by §§ 73.115, 73.150, 73.151, 73.240, 72.300, 73.326, 73.343, 73.381, or 73.391 of this chapter, the article must be prepared and offered for shipment in compliance with the regulations for the group within which it is properly classified.

§ 72.3 *Labels required and prohibited articles.* (a) Section 72.5 of this part also shows the kind of label when required on shipments of explosives and other dangerous articles and the articles which are prohibited for transportation.

§ 72.4 *Explanation of signs and abbreviations.* (a) An asterisk indicates that articles may or may not be classed as flammable liquids, flammable solids, compressed gases, poisons, or corrosive liquids by Parts 71–78 of this chapter. If so classed such articles are subject to the regulations prescribed for articles within these definitions.

F. L.—Flammable liquid.
F. S.—Flammable solid.
Oxy. M.—Oxidizing material.
Cor. L.—Corrosive liquid.
Nonf. G.—Nonflammable compressed gas.
F. G.—Flammable compressed gas.
Pois. A.—Poison gas or liquid, class A.
Pois. B.—Poisonous liquid or solid, Class B.
Pois. C.—Tear gas, class C.
Pois. D.—Radioactive materials, class D.
Expl. A.—Class A explosives.
Expl. B.—Class B explosives.
Expl. C.—Class C explosives.
Not accepted—Means not to be offered or accepted for transportation.
Forbidden—Means prohibited by law.
ϕ Indicates that articles may be transported as rail baggage.
Required for rail express shipments only.
Required for rail express and water shipments only.
N. O. S.—Means not otherwise specified.
N. O. I.—Means not otherwise indexed.
N. O. I. B. N.—Means not otherwise indexed by name.

NOTE 1: Where the word "INFLAMMABLE" is now painted, stencilled, or otherwise permanently marked on tank cars, cargo tank motor vehicles, portable tanks, or other containers, it may be so continued until such tanks or other containers are repainted, restencilled, or both, and at such times shall be replaced with the word "FLAMMABLE" unless otherwise ordered by the Commission.

§ 72.5 *List of explosives and other dangerous articles.* (a) For explanation of signs and abbreviations see § 72.4 of this part.

Article	Classed as—	Exemptions and packing (see sec.)	Label required if not exempt	Maximum quantity in 1 outside container by rail express
Acetaldehyde (*ethyl aldehyde*)	F. L.	73.118, 73.119	Red	10 gallons.
Acetone	F. L.	73.118, 73.119	do	Do
Acetone cyanhydrin	Pois. B.	73.345, 73.346	Poison	55 gallons.
Acetone oils	F. L.	73.118, 73.119	Red	10 gallons.
Acetyl benzoyl peroxide, solid	Not accepted			Not accepted.
Acetyl benzoyl peroxide, solution	Oxy. M.	73.153 (b), 73.222	Yellow	1 quart.
Acetyl chloride	Cor. L.	73.244, 73.247	White	1 gallon.
Acetyl peroxide, solid	Not accepted			Not accepted.
Acetyl peroxide, solution	Oxy. M.	73.153 (b), 73.222	Yellow	1 quart.
Acetylene	F. G.	73.302, 73.309	Red Gas	300 pounds.
Acid carboys, empty	See § 73.29 (c)			
*Acids, liquids, n. o. s.	Cor. L.	73.244, 73.245	White	5 pints.
Acid picric. *See* Picric acid.				
Acid sludge. *See* Sludge acid.				
Acrolein	F. L.	No exemption, 73.122	Red	Not accepted.
Acrylonitrile	F. L.	73.118, 73.119	do	10 gallons.
Aeroplane flares. *See* Special fireworks.				
Air, compressed	Nonf. G.	73.302, 73.307	Green	300 pounds.
Alcohol or alcohol, n. o. s.	F. L.	73.118, 73.125	Red	10 gallons.
Alcohol, allyl, liquid	Pois. B.	73.345, 73.346	Poison	55 gallons.
*Alcohol, butyl. *See* Alcohol or alcohol, n. o. s.				
Alcohol, denatured. *See* Alcohol or alcohol, n. o. s.				
Alcohol, ethyl. *See* Alcohol or alcohol, n. o. s.				
*Alcohol, propyl. *See* Alcohol or alcohol, n. o. s.				
*Alcohol, tertiary. *See* Alcohol or alcohol, n. o. s.				
Alcohol, wood (methanol). *See* Alcohol or alcohol, n. o. s.				
*Alkaline caustic liquids, n. o. s.	Cor. L.	73.244, 73.249	White	10 gallons.
Alkaline corrosive battery fluid	Cor. L.	73.244, 73.249	do	55 gallons.
Alkaline corrosive battery fluid with storage battery.	Cor. L.	No exemption, 73.258	White	400 pounds.
Alkaline corrosive liquids, n. o. s.	Cor. L.	73.244, 73.249	do	10 gallons.
Allyl alcohol. *See* Alcohol, allyl, liquid.				
Allyl bromide	F. L.	73.118, 73.119	Red	10 gallons.
Allyl chlorocarbonate. *See* Allyl chloroformate.				
Allyl chloroformate	Cor. L.	No exemption, 73.288	White	5 pints.
Aluminum dross	See § 73.173			
*Aluminum liquid (or paint). *See* *Paint, enamel, lacquer, stain, shellac, varnish, etc.				
Aluminum nitrate	Oxy. M.	73.153, 73.182, 73.183	Yellow	100 pounds.
Amatol. *See* High explosives.				
Ammonia, anhydrous. *See* Anhydrous ammonia.				
Ammonium arsenate, solid	Pois. B.	73.364, 73.365	Poison	200 pounds.
Ammonium bichromate	F. S.	73.153, 73.154	Yellow	100 pounds.
Ammonium nitrate	Oxy. M.	73.153, 73.182, 73.183	do	Do.
Ammonium nitrate fertilizer	Oxy. M.	73.153, 73.182, 73.183	do	Do.
Ammonium perchlorate	Oxy. M.	73.153, 73.154	do	Do.
Ammonium permanganate	Oxy. M.	73.153, 73.154	do	Do.
Ammonium picrate. *See* High explosives.				
Ammonium picrate, wet (not to exceed 16 ounces)	See § 73.192			
Ammunition, chemical (containing class A poisons, liquids, or gases). See Chemical ammunition.				
Ammunition, chemical (containing class B poisons, liquids, or gases). See Chemical ammunition.				
Ammunition, chemical (containing class C poisons, liquids, or solids). See Chemical ammunition.				
Ammunition, chemical, explosive	See § 73.59			

Article	Classed as—	Exemptions and packing (see sec.)	Label required if not exempt	Maximum quantity in 1 outside container by rail express
Ammunition material	See § 73.55			
Ammunition non-explosive	See § 73.55			
Ammunition for cannon with empty projectiles.	Expl. B	No exemption, 73.89		Not accepted.
Ammunition for cannon with explosive projectiles.	Expl. A	No exemption, 73.54		Do.
Ammunition for cannon with gas projectiles.	Expl. A	No exemption, 73.54		Do.
Ammunition for cannon with illuminating projectiles.	Expl. A	No exemption, 73.54		Do.
Ammunition for cannon with incendiary projectiles.	Expl. A	No exemption, 73.54		Do.
Ammunition for cannon with inert-loaded projectiles.	Expl. B	No exemption, 73.89		Do.
Ammunition for cannon with smoke projectiles.	Expl. A	No exemption, 73.54		Do.
Ammunition for cannon with solid projectiles.	Expl. B	No exemption, 73.89		Do.
Ammunition for cannon without projectiles.	Expl. B	No exemption, 73.89		Do.
Ammunition, rocket. See Rocket ammunition.				
Ammunition, small-arms. See Small-arms ammunition				
Ammunition for small-arms with explosive bullets.	Expl. A	No exemption, 73.58		Not accepted.
Ammunition for small-arms with explosive projectiles.	Expl. A	No exemption, 73.58		Do.
*Amyl acetate	F. L	73.118, 73.119	Red	10 gallons.
Amyl chloride	F. L	73.118, 73.119	do	Do.
Amyl nitrite	F. L	73.118, 73.119	do	Do.
Amyl trichlorosilane	Cor. L	No exemption, 73.280	White	Do.
Anhydrous ammonia	Nonf. G	73.302, 73.308, 73.314, 73.315	Green	300 pounds.
Anhydrous hydrazine. See Hydrazine, anhydrous.				
Anhydrous hydrofluoric acid. See Hydrofluoric acid, anhydrous.				
Aniline oil drums, empty	See § 73.347 (d)			
Aniline oil, liquid	Pois. B	No exemption, 73.347	Poison	55 gallons.
Anisoyl chloride	Cor. L	73.244, 73.279	White	1 quart.
*Anti-freeze compounds, liquid	F. L	73.118, 73.119	Red	10 gallons.
*Anti-freeze preparations proprietary, liquid.	F. L	73.118, 73.119	do	Do.
Antimony pentachloride	Cor. L	73.244, 73.247	White	1 quart.
Antimony pentafluoride	Cor. L	No exemption, 73.246	do	25 pounds.
Apparatus. See *Refrigerating machines, comp. gas or flammable liquid.*				
Argon	Nonf. G	73.302, 73.307, 73.314	Green	300 pounds.
Arsenate of lead. See Lead arsenate.				
Arsenic acid, liquid	Pois. B	73.345, 73.348	Poison	55 gallons.
Arsenic acid, solid	Pois. B	73.364, 73.366	do	200 pounds.
Arsenic bromide, solid	Pois. B	73.364, 73.365	do	Do.
Arsenic chloride (arsenous), liquid	Pois. B	73.345, 73.346	do	55 gallons.
Arsenic iodide, solid	Pois. B	73.364, 73.365	do	200 pounds.
Arsenic pentoxide, solid	Pois. B	73.364, 73.365	do	Do.
Arsenic solid	Pois. B	73.364, 73.366	do	Do.
Arsenic sulfide (powder), solid	Pois. B	73.364, 73.365	do	Do.
Arsenic trichloride, liquid	Pois. B	73.345, 73.346	do	55 gallons.
Arsenic trioxide, solid (arsenic, white, solid, arsenous acid, solid)	Pois. B	73.364, 73.366, 73.368	do	200 pounds.
Arsenic, white, solid	Pois. B	73.364, 73.366	do	Do.
Arsenical compounds or mixtures, n. o. s., liquid.	Pois. B	73.345, 73.346	do	55 gallons.
Arsenical compounds or mixtures, n. o. s., solid.	Pois. B	73.364, 73.367	do	200 pounds.
Arsenical dip, liquid (sheep dip)	Pois. B	73.345, 73.346	do	55 gallons.
Arsenical dust	Pois. B	73.364, 73.368	do	200 pounds.
Arsenical flue dust	Pois. B	73.364, 73.368	do	Do.
Arsenous acid, solid	Pois. B	73.364, 73.365	do	Do.
Arsenous and mercuric iodide solution, liquid.	Pois. B	73.345, 73.346	do	55 gallons.
Asphalt, cut-back. See *Road asphalt, or tar, liquid.				
Automobiles, motorcycles, tractors or other self-propelled vehicles.	See § 73.120			
Automobiles, motorcycles, tractors or other self-propelled vehicles with charged electric storage batteries.	See § 73.250			
Bags, nitrate of soda, empty and unwashed.	F. S	No exemption, 73.155 (a)	Yellow	25 pounds.
Barium chlorate	Oxy. M	73.153, 73.163	do	100 pounds.
Barium chlorate, wet	Oxy. M	73.153, 73.163 (a) (6)	do	200 pounds.
Barium cyanide, solid	Pois. B	73.370	Poison	Do.
Barium nitrate	Oxy. M	73.153, 73.182, 73.183	Yellow	100 pounds.
Barium perchlorate	Oxy. M	73.153, 73.154	do	Do.
Barium permanganate	Oxy. M	73.153, 73.154	do	Do.
Barium peroxide (*binoxide, dioxide*)	Oxy. M	73.153, 73.156	do	100 pounds.
Barrels, empty. See Drums, empty.				
Batteries, dry	Not regulated			
Batteries, electric storage, wet	Cor. L	73.244 (c) (31), 73.260	White	600 pounds.
Batteries, electric storage, wet, with automobiles or auto parts.	Cor. L	73.250, 73.260	do	No limit.
Batteries, electric storage, wet, with containers of corrosive battery fluid.	Cor. L	No exemption, 73.258	do	2 gallons.
Battery charger with electrolyte (acid), or alkaline corrosive liquid.	Cor. L	No exemption, 73.259	do	3 quarts.
Battery fluid. See Electrolyte (acid) or Alkaline corrosive battery fluid.				
Benzene (benzol)	F. L	73.118, 73.119	Red	10 gallons.
Benzine	F. L	73.118, 73.119	do	Do.
Benzol (benzene)	F. L	73.118, 73.119	do	Do.
Benzoyl chloride	Cor. L	73.244, 73.247	White	1 quart.
Benzoyl peroxide	Oxy. M	No exemption, 73.157, 73.158	Yellow	25 pounds
Benzyl bromide. See a-Bromotoluene.				
Benzyl chloride	Cor. L	73.244, 73.247	White	1 quart.
Benzyl chlorocarbonate. See Benzyl chloroformate.				
Benzyl chloroformate	Cor. L	No exemption, 73.288	White	5 pints.
Black blasting powder. See Black powder.				
Black pellet powder. See Black powder.				
Black powder	Expl. A	No exemption, 73.60		Not accepted.
Black powder igniters with empty cartridge bags.	Expl. C	No exemption, 73.106		150 pounds.
Black rifle powder. See Black powder.				
Blasting caps—1,000 or less	Expl. C	No exemption, 73.103		See § 73.86.
Blasting caps—more than 1,000	Expl. A	No exemption, 73.66		Not accepted.
Blasting caps with safety fuse—1,000 or less.	Expl. C	No exemption, 73.103		See § 73.86.
Blasting caps, electric. See Electric blasting caps.				
Blasting gelatin. See High explosives.				
Blasting powder. See Black powder.				
*Boiler compound, liquid	Cor. L	73.244, 73.249	White	10 gallons.
Bombs, explosive. See Explosive bomb.				
Bombs, explosive, with gas, smoke, or incendiary material. See Explosive bomb.				
Bombs, fireworks. See Special fireworks.				
Bombs, gas, smoke or incendiary, non-explosive. See *Chemical ammunition.*				
Bombs, explosive, incendiary. See Explosive bombs.				
Bombs, sand-loaded or empty	See § 73.55			
Boosters (explosive)	Expl. A	No exemption, 73.69		Not accepted.
Bordeaux arsenites, liquid	Pois. B	73.345, 73.346	Poison	55 gallons.
Bordeaux arsenites, solid	Pois. B	73.364, 73.365	do	200 pounds.
Boron trichloride	Cor. L	No exemption, 73.251	White	1 quart.
Boron trifluoride	Nonf. G	73.302, 73.306	Green	300 pounds.
Bottles, *acid or other corrosive liquids,* empty.	See § 73.29			
*Box toe gum	F. L	73.118, 73.119	Red	10 gallons.

Article	Classed as—	Exemptions and packing (see sec.)	Label required if not exempt	Maximum quantity in 1 outside container by rail express
Boxes, reused	See § 73.28			
Bromacetone, liquid	Pois. A	No exemption, 73.329	Poison Gas	Not accepted.
Brombenzyl cyanide, liquid	Pois. C	No exemption, 73.382	Tear Gas	20 pounds.
Bromine	Cor. L	No exemption, 73.252	White	1 quart.
Bromine pentafluoride	Cor. L	No exemption, 73.284	do	1 pound.
Bromine trifluoride	Cor. L	No exemption, 73.283	do	25 pounds.
a-Bromotoluene	Cor. L	No exemption, 73.281	do	5 pints.
*Bronze liquid (or paint). *See* *Paint, enamel, lacquer, stain, shellac, varnish, etc.				
Brucine, solid (dimethoxy strychnine).	Pois. B	73.364, 73.365	Poison	200 pounds.
Burnt cotton (not repicked)	F. S	No exemption, 73.159	Yellow	Not accepted.
Burnt fiber	F. S	No exemption, 73.169	do	Do.
Butadiene, inhibited	F. G	73.302, 73.306, 73.314	Red Gas	300 pounds.
Butane. See Liquefied petroleum gas.				
*Butyl alcohol. *See* Alcohol or alcohol, n. o. s.				
Butyl trichlorosilane	Cor. L	No exemption, 73.280	White	10 gallons.
Butyraldehyde	F. L	73.118, 73.119	Red	Do.
Cacodylic acid, solid (dimethylarsenic).	Pois. B	73.364, 73.365	Poison	200 pounds.
Calcium arsenate, solid	Pois. B	73.364, 73.367	do	Do.
Calcium arsenite, solid	Pois. B	73.364, 73.365	do	Do.
Calcium chlorate	Oxy. M	73.153, 73.163	Yellow	100 pounds.
Calcium chlorite	Oxy. M	No exemption, 73.160	do	Do.
Calcium cyanide. *See* Cyanide of calcium.				
Calcium hypochlorite compounds, dry, containing more than 8.80 percent available oxygen (39 percent available chlorine).	Oxy. M	73.217	Yellow	100 pounds.
Calcium, metallic	F. S	73.153, 73.154	do	Do.
Calcium nitrate	Oxy. M	73.153, 73.182, 73.183	do	Do.
Calcium peroxide	Oxy. M	73.153, 73.156	do	Do.
Calcium permanganate	Oxy. M	73.153, 73.154	do	Do.
Calcium phosphide	F. S	No exemption, 73.161	do	25 pounds.
Calcium resinate	F. S	No exemption, 73.166	do	125 pounds.
Calcium resinate, fused	F. S	No exemption, 73.166	do	Do.
Cannon primers	Expl. C	No exemption, 73.107		150 pounds.
Caps, blasting. See Blasting caps.				
Caps, toy. See Toy caps.				
Caprylyl peroxide solution	Oxy. M	73.153 (b), 73.221	Yellow	1 quart.
Carbolic acid, fused solid. *See* Carbolic acid (phenol), solid.				
Carbolic acid (phenol), liquid, (liquid tar acid containing over 50 percent benzo-phenol).	Pois. B	73.345, 73.349	Poison	55 gallons.
Carbolic acid (phenol), solid	Pois. B	73.364, 73.369	do	250 pounds.
Carbon bisulfide (disulfide)	F. L	No exemption, 73.121	Red	Not accepted.
Carbon dioxide	Nonf. G	73.302, 73.308, 73.314, 73.315	Green	300 pounds.
Carbon dioxide—nitrous oxide mixture.	Nonf. G	73.302, 73.308	do	Do.
Carbon dioxide—oxygen mixture	Nonf. G	73.302, 73.306	do	Do.
Carbon monoxide	F. G	73.302, 73.307	Red Gas	150 pounds.
*Carbon remover, liquid	F. L	73.118, 73.119	Red	10 gallons.
Carbonyl chloride. See Phosgene.				
Carbopropoxide, stabilized	Cor. L	No exemption, 73.282	White	Not accepted.
Carbopropoxide, unstabilized	F. S	No exemption, 73.218	Yellow	Do.
Carboys, acid, empty	See § 73.29 (e)			
Carboys, empty. *See* Acid carboys, empty.				
Cartridge bags, empty, with black powder igniters.	Expl. C	No exemption, 73.106		150 pounds.
Cartridge cases, empty, primed	Expl. C	No exemption, 73.107		Do.
Case oil. *See* Gasoline, *Naphtha.				
Casinghead gasoline. See Gasoline.				
Casks, empty. *See* Drums, empty.				
Caustic potash, liquid	Cor. L	73.244, 73.249	White	10 gallons.
Caustic soda, liquid	Cor. L	73.244, 73.249	do	Do.
*Cement, leather	F. L	73.118, 73.119	Red	12 gallons.
*Cement, liquid, n. o. s	F. L	73.118, 73.119	do	15 gallons.
*Cement, pyroxylin	F. L	73.118, 73.132	do	Do.
*Cement, roofing, liquid	F. L	73.118, 73.119	do	12 gallons.
*Cement, rubber	F. L	73.118, 73.132	do	15 gallons.
Charcoal, activated	F. S	73.162	Yellow #	200 pounds.
Charcoal briquettes	F. S	73.162		Do.
Charcoal, shell	F. S	73.162	Yellow #	Do.
Charcoal, wood, ground, crushed, granulated or pulverized.	F. S	73.162	Yellow	200 pounds.
Charcoal, wood, lump	F. S	73.162	do	100 pounds.
Charcoal screenings, *made from "pinon", wood.*	F. S	73.162	Yellow #	200 pounds.
Charcoal, wood screenings *other than "pinon" wood screenings.*	F. S	No exemption, 73.162	Yellow	Not accepted.
Charcoal screenings, wet	Not accepted			Do.
Charcoal, wet	Not accepted			Do.
*Chemicals, n. o. s. *See* *Drugs, chemicals, medicines or cosmetics, n. o. s.				
Chemical ammunition (containing class A poisons, liquids, or gases).	Pois. A	No exemption, 73.330	Poison Gas	Not accepted.
Chemical ammunition (containing class B poisons, liquids, or gases).	Pois. B	73.345, 73.350	Poison	55 gallons
Chemical ammunition (containing class C poisons, liquids, or solids).	Pois. C	No exemption, 73.383	Tear Gas	20 pounds
Chemical ammunition, explosive	See § 73.59			
*Chemical kits	See § 73.286			
Chloracetophenone, gas, liquid, or solid.	Pois. C	No exemption, 73.382	Tear Gas	20 pounds.
Chloracetyl chloride	Cor. L	No exemption, 73.253	White	1 quart.
*Chlorate and borate mixtures	Oxy. M	73.153, 73.229	Yellow	100 pounds.
Chlorates, n. o. s.	Oxy M	73.153, 73.163	do	Do.
Chlorates, n. o. s., wet	Oxy. M	73.153, 73.163 (a) (6)	do	200 pounds.
Chlorate explosives, dry. See High explosives.				
Chlorate of potash	Oxy. M	73.153, 73.163	Yellow	100 pounds.
Chlorate of soda	Oxy. M	73.153, 73.163	do	Do.
Chlorate powders. See High explosives.				
*Chlorbenzene. *See* *Chlorobenzol.				
Chloride of phosphorus. *See* Phosphorus trichloride.				
*Chlorbenzol. *See* *Chlorobenzol.				
Chloride of sulfur. *See* Sulfur chloride.				
ø Chlorine	Nonf. G	73.302, 73.308, 73.314	Green	150 pounds.
Chlorine trifluoride	Cor. L	No exemption, 73.285	White	25 pounds.
*Chlorobenzene. *See* * Chlorobenzol.				
*Chlorobenzol	F. L	73.118, 73.119	Red	10 gallons.
Chlorobenzoyl peroxide (para)	Oxy. M	No exemption, 73.157, 73.158	Yellow	25 pounds.
Chlorosulfonic acid	Cor. L	73.244, 73.254	White	1 quart.
Chlorosulfonic acid-sulfur trioxide mixture.	Cor. L	73.244, 73.254	White	Do.
Chlorpicrin, liquid	Pois. A	No exemption, 73.329	Poison Gas	24 pounds.
Chlorpicrin, absorbed	Pois. A	No exemption, 73.329 (c) and (d).	do	75 pounds.
Chlorpicrin mixtures	Pois. A	No exemption, 73.329	do	Do.
Chromic acid	Oxy. M	73.153, 73.164	Yellow	100 pounds.
Chromic acid solution	Cor. L	73.244, 73.245, 73.287	White	1 gallon.
*Cleaning fluid or liquid	F. L	73.118, 73.119	Red	10 gallons.
Cloud gas cylinders. See Chemical ammunition.				
Coal briquettes, hot	Not accepted			Not accepted.
Coal gas. See Hydrocarbon, nonliquefied.				
Coal, ground bituminous, sea coal, coal facings, etc.	See §73.165			
*Coal tar distillate	F. L	73.118, 73.119	Red	10 gallons.
*Coal tar light oil	F. L	73.118, 73.119	do	Do.
*Coal tar naphtha	F. L	73.118, 73.119	do	Do.
*Coal tar oil	F. L	73.118, 73.119	do	Do.
Cobalt resinate, precipitated	F. S	No exemption, 73.166	Yellow	125 pounds.
Cocculus, solid *(fish berry)*	Pois. B	73.364, 73.365	Poison	200 pounds.
Coke, hot	Not accepted			Not accepted.
Collodion	F. L	73.118, 73.119	Red	10 gallons.
Collodion cotton, wet. *See* Wet nitrocellulose.				
Cologne spirits *(alcohol)*	F. L	73.118, 73.119	Red	10 gallons.
Colored fire. See Common fireworks.				
Columbian spirits *(wood alcohol)*	F. L	73.118, 73.119	Red	10 gallons.
Combination fuzes	Expl. C	No exemption, 73.105		150 pounds.
Combination primers	Expl. C	No exemption, 73.107		Do.
Commercial shaped charges. See High explosives.	See § 73.65 (h)			

Article	Classed as—	Exemptions and packing (see sec.)	Label required if not exempt	Maximum quantity in 1 outside container by rail express
Common fireworks	Expl. C	No exemption, 73.100 (r), 73.108.		200 pounds.
•Compounds, cleaning, liquid	Cor. L	73.244, 73.245	White	1 quart.
•Compounds, cleaning liquid	F. L	73.118, 73.119	Red	10 gallons.
Compounds, cleaning, liquid (*containing hydrofluoric acid*).	Cor. L	73.244, 73.255	White	10 pints.
•Compounds, enamel	F. L	73.118, 73.128	Red	55 gallons.
•Compounds, iron or steel rust preventing or removing.	Cor. L	73.244, 73.245	White	1 gallon.
•Compounds, lacquer, paint, or varnish, etc., removing, reducing or thinning, liquid.	F. L	73.118, 73.128	Red	55 gallons.
•Compounds, lacquer, paint, or varnish removing, liquid.	Cor. L	73.244, 73.245	White	1 gallon.
•Compounds, polishing, liquid	F. L	73.118, 73.129	Red	55 gallons.
•Compounds, type-cleaning, liquid	F. L	73.118, 73.119	do	10 gallons.
•Compounds, vulcanizing, liquid	Cor. L	73.244, 73.245	White	1 quart.
•Compounds, vulcanizing, liquid	F. L	73.118, 73.119	Red	10 gallons.
Compressed gases, n. o. s.	Nonf. G	73.302, 73.306, 73.307, 73.308	Green	300 pounds.
Compressed gases, n. o. s.	F. G	73.302, 73.306, 73.307	Red Gas	Do.
Containers, empty, See Acid carboys, empty; bottles empty, drums empty, cylinders empty.	See § 73.29			
Containers, reused	See § 73.28			
Copper acetoarsenite, solid (*emerald green, imperial green, Kings green, moss green, meadow green, mitis green, parrot green, Vienna green*).	Pois. B	73.364, 73.367	Poison	200 pounds.
Copper arsenite, solid (*Scheele's green, cupric green, copper orthoarsenite, mineral green, Swedish green*).	Pois. B	73.364, 73.365	do	Do.
Copper cyanide	See § 73.370			
Cordeau detonant fuse	Expl. C	No exemption, 73.104		300 pounds.
Corrosive battery fluid. *See* Electrolyte acid or alkaline battery fluid.				
Corrosive liquid, n. o. s.	Cor. L	73.244, 73.245	White	1 quart.
Cotton, burnt. *See* Burnt cotton.				
Cotton waste, oily *with more than 5 percent of animal or vegetable oil.*	F. S	No exemption, 73.167	Yellow	Not accepted.
Crotonaldehyde	F. L	73.118, 73.119	Red	10 gallons.
•Crude nitrogen fertilizer solution	Nonf. G	73.302, 73.306, 73.314	Green	300 pounds.
•Crude oil, petroleum	F. L	73.118, 73.119	Red	10 gallons.
Cumene hydroperoxide	Oxy. M	73.153, (b), 73.224	Yellow	1 quart.
Cuprietylene-diamine solution	Cor. L	73.244, 73.249	White	1 gallon.
Cyanide of calcium, solid	Pois. B	73.370	Poison	200 pounds.
Cyanides of copper, zinc, lead, and silver.	See § 73.370			
Cyanides or cyanide mixtures, dry	Pois. B	73.364, 73.370	Poison	200 pounds.
Cyanide of potassium, liquid	Pois. B	73.345, 73.352	do	55 gallons.
Cyanide of potassium, solid	Pois. B	73.370	do	200 pounds.
Cyanide of sodium, liquid	Pois. B	73.345, 73.352	do	55 gallons.
Cyanide of sodium, solid	Pois. B	73.370	do	200 pounds.
Cyanogen chloride containing less than 0.9 percent water.	Pois. A	No exemption, 73.328	Poison Gas	Not accepted.
Cyanogen gas	Pois. A	No exemption, 73.328	do	Do.
Cyclohexane	F. L	73.118, 73.119	Red	10 gallons.
Cyclopentane	F. L	73.118, 73.119	do	Do.
Cyclopentane, methyl	F. L	73.118, 73.119	do	Do.
Cyclopropane	F. G	73.302, 73.312, 73.314, 73.315	Red Gas	300 pounds.
Cylinders, empty	See § 73.29			
Delay electric igniters	Expl. C	No exemption, 73.106		150 pounds.
Depth bombs. See Explosive bomb.				
Detonating fuzes	Expl. A	No exemption, 73.69		Not accepted.
Detonating primers	Expl. A	No exemption, 73.68		Do.
Diazodinitrophenol. See Initiating explosive.				
Dichlorethylene	F. L	73.118, 73.119	Red	10 gallons.
ø Dichlorodifluoromethane	Nonf. G	73.302, 73.306, 73.314	Green	300 pounds.
Dichlorodifluoromethane and difluoroethane mixture (*constant boiling mixture*).	Nonf. G	73.302, 73.308, 73.314	do	Do.
Diethyl dichlorosilane	Cor. L	No exemption, 73.280	White	10 gallons.
Diethylamine	F. L	73.118, 73.119	Red	Do.
Diethylene glycol dinitrate	See § 73.51 (d)			
Difluoroethane	F. G	73.302, 73.308, 73.314	Red Gas	300 pounds.
Difluoromonochloroethane	F. G	73.302, 73.308, 73.314	do	Do.
Difluorophosphoric acid, anhydrous.	Cor. L	No exemption, 73.275	White	1 gallon.
Dimethylamine, anhydrous	F. G	73.302, 73.306, 73.314	Red Gas	300 pounds.
Dimethylamine, aqueous solution	F. L	73.118, 73.119	Red	10 gallons.
Dimethyl ether	F. G	73.302, 73.306, 73.314	Red Gas	300 pounds.
Dimethyl sulfate	Cor. L	No exemption, 73.255	White	1 quart.
Dimethyl sulfide	F. L	73.118, 73.119	Red	10 gallons.
Dinitrobenzol, solid	Pois. B	73.364, 73.371	Poison	200 pounds.
Dinitrobenzol, liquid	Pois. B	73.345, 73.346	do	55 gallons.
Dinitrochlorbenzol, solid (*dinitrochlorobenzene*).	Pois. B	73.364, 73.365	do	200 pounds.
Diphenyl dichlorosilane	Cor. L	No exemption, 73.280	White	10 gallons.
Diphenylaminechlorarsine, gas, liquid or solid.	Pois. C	No exemption, 73.382	Tear Gas	20 pounds.
Diphenylchlorarsine, solid	Pois. C	No exemption, 73.382	do	Do.
Diphosgene. *See* Phosgene.				
Dispersant gas, n. o. s.	Nonf. G	73.302, 73.308, 73.314	Green	300 pounds.
•Distillate	F. L	73.118, 73.119	Red	10 gallons.
•Dressing, leather	F. L	73.118, 73.119	do	Do.
•Driers, paint, varnish, enamel, etc. *See* •Paint driers, liquid.				
Drill cartridges	See § 73.55			
•Drugs, chemicals, medicines or cosmetics, n. o. s.	F. L	73.118, 73.119	Red	10 gallons.
•Drugs, chemicals, medicines or cosmetics, n. o. s.	F. S	73.153, 73.154	Yellow	100 pounds.
•Drugs, chemicals, medicines or cosmetics, n. o. s.	Oxy. M	73.153, 73.154	do	Do.
•Drugs, chemicals, medicines or cosmetics, n. o. s.	Cor. L	73.244, 73.245	White	1 quart.
•Drugs, chemicals, medicines or cosmetics, n. o. s. (liquid).	Pois. B	73.345, 73.346	Poison	55 gallons.
•Drugs, chemicals, medicines or cosmetics, n. o. s. (solid).	Pois. B	73.364, 73.365	do	200 pounds.
Drums, empty	See § 73.29			
Dummy cartridges	See § 73.55			
Dusts, by-product, poisonous. *See* Arsenical dust.				
Dynamite. See High explosives.				
Electric blasting caps—more than 1,000.	Expl. A	No exemption, 73.66		Not accepted.
Electric blasting caps—1,000 or less	Expl. C	No exemption, 73.103		See § 73.86.
Electric squibs	Expl. C	No exemption, 73.106		150 pounds.
Electric storage batteries, wet. *See* Batteries, electric storage, wet.				
Electrolyte (acid), battery fluid	Cor. L	73.244, 73.257	White	5 gallons.
Electrolyte (acid) or alkaline corrosive battery fluid packed with storage batteries.	Cor. L	No exemption, 73.258	do	2 gallons.
Electrolyte (acid) or alkaline corrosive battery fluid packed with battery charger or radio current supply device or parts thereof.	Cor. L	No exemption, 73.259	do	3 quarts.
Empty cartridge bags with black powder igniters.	Expl. C	No exemption, 73.106		150 pounds.
Empty cartridge cases, primed	Expl. C	No exemption, 73.107		Do.
•Enamel. *See* •Paint, enamel, lacquer, stain, shellac, varnish, etc.				
•Eradicators, paint or grease, liquid	F. L	73.118, 73.119	Red	10 gallons.
Ethane	F. G	73.302, 73.308	Red Gas	300 pounds.
Ether	F. L	73.118, 73.119	Red	10 gallons.
Ether, ethyl (*sulfuric*). *See* Ether.				
Ethyl acetate	F. L	73.118, 73.119	Red	10 gallons.
Ethyl alcohol. *See* Alcohol or alcohol, n. o. s.				
Ethyl aldehyde. *See* Acetaldehyde.				
Ethyl chloride	F. L	No exemption, 73.123	Red	300 pounds in cylinders, 15 pounds in other containers.
Ethyl chlorocarbonate. *See* Ethyl chloroformate.				
Ethyl chloroformate	Cor. L	No exemption, 73.288	White	5 pints.
Ethyldichlorarsine	Pois. A	No exemption, 73.328	Poison Gas	Not accepted.
ø Ethylene	F. G	73.302, 73.308	Red Gas	300 pounds.

Article	Classed as—	Exemptions and packing (see sec.)	Label required if not exempt	Maximum quantity in 1 outside container by rail express
Ethylene dichloride	F. L.	73.118, 73.119	Red	10 gallons.
Ethylene oxide	F. L.	No exemption, 73.124	do	300 pounds in cylinders, 15 pounds in other containers.
Ethyl formate	F. L.	73.118, 73.119	do	10 gallons.
Ethyl phenyl dichlorosilane	Cor. L.	No exemption, 73.280	White	Do.
Ethyl methyl ether	F. L.	73.118, 73.119	Red	Do.
Ethyl methyl ketone	F. L.	73.118, 73.119	do	Do.
Ethyl nitrato (*nitric ether*)	F. L.	73.118, 73.119	do	Do.
Ethyl nitrite (*nitrous ether*)	F. L.	73.118, 73.119	do	Do.
Ethyl trichlorosilane	F. L.	No exemption, 73.135	do	Do.
Explosive bomb	Expl. A.	No exemption, 73.56		Not accepted.
Explosive cable cutters	Expl. C.	No exemption, 73.102		150 pounds.
Explosives, class A	See § 73.53			
Explosives, class B	See § 73.88			
Explosives, class C	See § 73.100			
Explosive compositions	Expl. A. or B.	No exemption, 73.53, 73.61 to 73.94 inclusive.		10 pounds.
Explosive mine	Expl. A.	No exemption, 73.56		Not accepted.
Explosive projectile	Expl. A.	No exemption, 73.56		Do.
Explosive rivets	Expl. C.	No exemption, 73.100 (q)		150 pounds.
Explosives, samples for laboratory examination.	See § 73.86			
Explosive torpedo	Expl. A.	No exemption, 73.56		Not accepted.
*Extracts, liquid, flavoring	F. L.	73.118, 73.119	Red	10 gallons.
Fabrics or fibers *with animal or vegetable oil.* *See* Fibers or fabrics *with animal or vegetable oil.*				
Felt waste, wet. *See* Waste wool, wet.				
Ferric arsenate, solid	Pois. B.	73.364, 73.365	Poison	200 pounds.
Ferric arsenite, solid	Pois. B.	73.364, 73.365	do	Do.
Ferrous arsenato (*iron arsenate*), solid.	Pois. B.	73.364, 73.365	do	Do.
*Fertilizer ammoniating solution *containing free ammonia.*	Nonf. G.	73.302, 73.306, 73.314	Green	300 pounds.
Fertilizer, tankage. *See* Garbage, tankage.				
Fiber, burnt	F. S.	No exemption, 73.169	Yellow	Not accepted.
Fibers or fabrics, with animal or vegetable oil.	F. S.	No exemption, 73.170	do	Do.
Film, motion-picture and toy pieces of. *See* Motion-picture film, toy and motion-picture film scrap.				
Firecrackers. *See* Common fireworks or Special fireworks.				
Firecracker salutes. *See* Common fireworks or Special fireworks.				
Fire extinguisher charges	Cor. L.	73.261	White	1 gallon.
Fire extinguisher charges containing not to exceed 50 grains of smokeless powder per unit.	See § 73.88 (f) Note 1.			
Fire extinguishers	Nonf. G.	73.310	Green	300 ponnds.
Fireworks, common	Expl. C.	No exemption, 73.100 (r), 73.108.		200 pounds.
Fireworks, exhibition display pieces. *See* Special fireworks.				
Fireworks, special	Expl. B.	No exemption, 73.88 (d), 73.91.	Special Fireworks##.	200 pounds.
Fish meal. *See* Fish scrap or fish meal.				
Fish scrap or fish meal *containing less than 6 percent or more than 12 percent moisture.*	F. S.	No exemption, 73.153 (c) (16), 73.171.	Yellow	Not accepted.
*Flame retardant compound, liquid	Cor. L.	73.244, 73.291	White	10 gallons.
Flammable liquids, n. o. s.	F. L.	73.118, 73.119	Red	Do.
Flammable solids, n. o. s.	F. S.	73.153, 73.154	Yellow	25 pounds.
Flares. *See* Common fireworks.				
Flares, aeroplane. *See* Special fireworks.				
Flares, signal. *See* Common fireworks.				
Flash cartridges. *See* Special fireworks and Low explosives.				
Flash crackers. *See* Common fireworks or Special fireworks.				
Flash powder. *See* Special fireworks and Low explosives.				
Flash sheets. *See* Special fireworks and Low explosives.				
Fluo dust, poisonous	Pois. B.	73.364, 73.368	Poison	200 pounds.
Fluorine	F. G.	73.302, 73.311	Red Gas	6 pounds.
Fluosulfonic acid	Cor. L.	No exemption, 73.274	White	10 pints.
Formic acid	Cor. L.	73.244, 73.245, 73.289	do	5 gallons.
Fulminate of mercury, dry	Forbidden explosive.			Forbidden explosive.
Fulminate of mercury, wet. *See* Initiating explosive.				
**Fumigants*	See § 73.152 (a) Note 1.			
*Furniture polish. *See* *Polishes, metal, stove, furniture, and wood, liquid.				
*Furniture or wood stains, liquid. *See* *Paint, enamel, lacquer, stain, shellac, varnish, etc.				
Fuse igniters	Expl. C.	No exemption, 73.106		150 pounds.
Fuse instantaneous. *See* Instantaneous fuse.				
Fuse lighters	Expl. C.	No exemption, 73.106		150 pounds.
Fuse, safety. *See* Safety fuse.				
Fusees, railway. *See* Common fireworks.				
Fuzes, combination	Expl. C.	No exemption, 73.105		150 pounds.
Fuzes, detonating	Expl. A.	No exemption, 73.69		Not accepted.
Fuzes, percussion	Expl. C.	No exemption, 73.105		150 pounds.
Fuzes, time	Expl. C.	No exemption, 73.105		Do.
Fuzes, tracer	Expl. C.	No exemption, 73.105		Do.
Garbage tankage *containing less than 8 percent of moisture.*	F. S.	No exemption, 73.153 (c) (49), 73.209.	Yellow	Not accepted.
Gas cylinders, empty	See § 73.29			
*Gas drips, hydrocarbon	F. L.	73.118, 73.119	Red	10 gallons.
Gas identification sets	Pois. A. and C.	No exemption, 73.331	Poison Gas	See § 73.331.
Gasoline	F. L.	73.118, 73.119	Red	10 gallons.
Gelatine dynamite. *See* High explosives.				
*Gold paint. *See* *Paint, enamel, lacquer, stain, shellac, varnish, etc.				
Grenades, empty, primed	Expl. C.	No exemption, 73.107		150 pounds.
Grenades, hand. *See* Hand grenades.				
Grenades, hand or rifle, explosive, with gas, smoke or incendiary material. *See* Hand or Rifle grenades.				
Grenades, hand or rifle, nonexplosive, with gas, smoke or incendiary material.	See §§ 73.330, 73.350.			
Grenades, police. *See* Police grenades, poison gas, class A.				
Grenades, rifle. *See* Rifle grenades.				
Grenades, tear gas. *See* Tear gas grenades.				
Guanidine nitrate	Oxy. M.	73.154, 73.183	Yellow	100 pounds.
Guanyl nitrosamino guanylidene hydrazine. *See* Initiating explosive.				
Guanyl nitrosamino guanyl tetrazene. *See* Initiating explosive.				
Guncotton. *See* High explosives.				
Hair, wet	F. S.	No exemption, 73.172	Yellow	Not accepted.
Hand grenades	Expl. A.	No exemption, 73.56		Do.
Helium	Nonf. G.	73.302, 73.307, 73.314	Green	300 pounds.
Helium—oxygen mixture	Nonf. G.	73.302, 73.307	do	Do.
Heptane	F. L.	73.118, 73.119	Red	10 gallons.
Hexaethyl tetraphosphate and compressed gas mixture.	Pois. A.	No exemption, 73.334	Poison gas	Not accepted.
Hexafluorophosphoric acid	Cor. L.	No exemption, 73.275	White	1 gallon.
Hexamethyleno diamine solution	Cor. L.	73.244, 73.249	do	10 gallons.
Hexane	F. L.	73.118, 73.119	Red	Do.
Hexyl trichlorosilane	Cor. L.	No exemption, 73.280	White	Do.
High explosives	Expl. A.	No exemption, 73.61 to 73.87.		See § 73.86.
High explosives, liquid	Expl. A.	No exemption, 73.62		Not accepted.

Article	Classed as—	Exemptions and packing (see sec.)	Label required if not exempt	Maximum quantity in 1 outside container by rail express
Highway signals. See Common fireworks.				
High wines. See Alcohol or alcohol, n. o. s.				
Hydrazine, anhydrous	Cor. L	No exemption, 73.276	White	5 pints.
Hydrazine solution containing 50 percent or less of water.	Cor. L	No exemption, 73.276	do	Do.
Hydriodic acid	Cor. L	73.244, 73.245	do	1 gallon.
Hydrobromic acid	Cor. L	73.244, 73.262	do	Do.
Hydrobromic acid, anhydrous. See Hydrogen bromide.				
Hydrocarbon gas, liquefied	F. G	73.302, 73.306, 73.314	Red Gas	300 pounds.
Hydrocarbon gas, nonliquefied	F. G	73.302, 73.307	do	Do.
Hydrochloric (*muriatic*) acid	Cor. L	73.244, 73.263	White	10 pints.
Hydrochloric acid, anhydrous. See Hydrogen chloride.				
Hydrochloric acid mixtures	Cor. L	73.244, 73.263	White	10 pints
Hydrocyanic acid, liquefied	Pois. A	No exemption, 73.332	Poison Gas	Not accepted.
Hydrocyanic acid (*prussic*), liquid	Pois. A	No exemption, 73.332	do	Do.
Hydrocyanic acid (*prussic*), unstabilized.	Not accepted			Do.
Hydrocyanic acid solutions	Pois. B	No exemption, 73.351	Poison	25 pounds.
Hydrofluoric acid	Cor. L	73.244, 73.264 (a)	White	10 pints.
Hydrofluoric acid, anhydrous	Cor. L	No exemption, 73.264 (b)	do	110 pounds.
Hydrofluoric and sulfuric acids, mixtures. See Mixtures of hydrofluoric and sulfuric acids.				
Hydrofluosilicic acid	Cor. L	73.244, 73.265	White	10 pints.
Ø Hydrogen	F. G	73.302, 73.307, 73.314	Red Gas	300 pounds.
Hydrogen bromide	Nonf. G	73.302, 73.306, 73.308	Green	Do.
Hydrogen chloride	Nonf. G	73.302, 73.306, 73.308	do	Do.
Hydrogen, liquefied	Not accepted			Not accepted.
Hydrogen peroxide (*hydrogen dioxide*) *solution in water containing over 8 percent hydrogen peroxide by weight.*	Cor. L	73.244, 73.266	White	1 gallon.
Hydrogen sulfide	F. G	73.302, 73.308, 73.314	Red Gas	300 pounds.
Hypochlorite solutions containing more than 7 percent available chlorine by weight.	Cor. L	No exemption, 73.277	White	4 gallons.
Igniters	Expl. C	No exemption, 73.106		150 pounds.
Illuminating projectiles fuzed and with expelling charges. See Explosive projectiles.				
Illuminating projectiles not fuzed and without expelling charges. See Special fireworks.				
Inflammable liquids, n. o. s. See Flammable liquids, n. o. s.				
Inflammable solids, n. o. s. See Flammable solids, n. o. s.				
Initiating explosive	Expl. A	No exemption, 73.70 to 73.78 incl.		Not accepted.
Diazodinitrophenol		No exemption, 73.70		
Fulminate of mercury		No exemption, 73.71		
Guanyl nitrosamino guanylidene hydrazine.		No exemption, 73.72		
Lead azide, dextrinated type only		No exemption, 73.73		
Lead styphnate (lead trinitroresorcinate).		No exemption, 73.74		
Nitro mannite		No exemption, 73.75		
Nitrosoguanidine		No exemption, 73.76		
Pentaerythrite tetranitrate		No exemption, 73.77		
Tetrazene (guanyl nitrosamino guanyl tetrazene).		No exemption, 73.78		
*Ink	F. L	73.118, 73.119	Red	10 gallons.
*Insecticide, dry	Pois. B	73.364, 73.365	Poison	200 pounds.
*Insecticide, liquid	Pois. B	73.345, 73.346	do	55 gallons.
Insecticide, liquefied gas	Nonf. G	73.302, 73.306, 73.308	Green	300 pounds.
*Insecticide, liquid (*vermin exterminator*).	F. L	73.118, 73.119	Red	10 gallons.
Instantaneous fuse	Expl. C	No exemption, 73.100 (m)		150 pounds.
Iron mass, spent	F. S	No exemption, 73.174	Yellow	Not accepted.
Iron sponge *not properly oxidized*	F. S	No exemption, 73.174	do	Do.
Iron sponge, spent	F. S	No exemption, 73.174	do	Do.
Isobutane. See Liquefied petroleum gas.				
Isobutylene. See Liquefied petroleum gas.				
Isooctane	F. L	73.118, 73.119	Red	10 gallons.
Isooctene	F. L	73.118, 73.119	do	Do.
Isopentane	F. L	73.118, 73.119	do	Do.
Isoprene	F. L	73.118, 73.119	do	Do.
*Isopropanol	F. L	73.118, 73.119	do	Do.
Jet thrust unit (*jato*) class A	Expl. A	No exemption, 73.79		Not accepted.
Jet thrust unit (*jato*) class B	Expl. B	No exemption, 73.92		Do.
Kegs, reused	See § 73.28			
*Lacquer. *See* *Paint, enamel, lacquer, stain, shellac, varnish, etc.				
*Lacquer base, liquid. *See* *Paint, enamel, lacquer, stain, shellac, varnish, etc.				
*Lacquer base or lacquer chips, dry	F. S	73.153, 73.175	Yellow	100 pounds.
*Lacquer base or lacquer chips, plastic (*wet with alcohol or solvent*).	F. L	73.118, 73.127	Red	25 pounds.
*Lacquer removing, reducing and thinning compounds. *See* *Compounds, lacquer, paint, or varnish removing, reducing, or thinning, liquid.				
Lauroyl peroxide	Oxy. M	73.153 (b), 73.157, 73.158	Yellow	25 pounds.
Lead arsenate, solid	Pois. B	73.364, 73.367	Poison	200 pounds.
Lead arsenite, solid	Pois. B	73.364, 73.365	do	Do.
Lead azide, dextrinated type only. See Initiating explosive.				
Lead cyanide	See § 73.370			
Lead nitrate	Oxy. M	73.153, 73.182, 73.183	Yellow	100 pounds.
Lead styphnate (lead trinitroresorcinate). See Initiating explosive.				
*Leather bleach	F. L	73.118, 73.119	Red	10 gallons.
*Leather dressing	F. L	73.118, 73.119	do	Do.
Lewisite	Pois. A	No exemption, 73.328	Poison Gas	Not accepted.
Ø Liquefied carbon dioxide	Nonf. G	73.302, 73.308, 73.314	Green	300 pounds.
Liquefied hydrocarbon gas	F. G	73.302, 73.306, 73.314	Red Gas	Do.
Liquefied nonflammable gases *charged with nitrogen, carbon dioxide, or air.*	Nonf. G	73.302, 73.308	Green	30 pounds.
Ø Liquefied petroleum gas	F. G	73.302, 73.312, 73.314, 73.315	Red Gas	300 pounds.
Liquids other than those classified as flammable, corrosive, or poisonous charged with nitrogen, carbon, dioxide or air. See Compressed gases, n. o. s.				
Lithium aluminum hydride, ethereal.	F. L	No exemption, 73.137	Red	1 quart.
Lithium amide, powdered	F. S	73.153, 73.168	Yellow	100 pounds.
Lithium hydride	F. S	No exemption, 73.206	do	25 pounds.
Lithium metal	F. S	No exemption, 73.206	do	Do.
Lithium metal, in cartridges	See § 73.206			
Lithium peroxide	Oxy. M	73.153 (a), 73.154	Yellow	100 pounds.
Lithium silicon	F. S	No exemption, 73.206	do	25 pounds.
London purple, solid	Pois. B	73.364, 73.365	Poison	200 pounds.
Low explosives	Expl. A	No exemption, 73.60		Not accepted.
Low blasting explosives. See Low explosives.				
Machines or apparatus	See § 73.130, 73.313.			
Magnesium arsenate, solid	Pois. B	73.364, 73.367	Poison	200 pounds.
Magnesium, metallic, powdered	F. S	73.153, 73.154	Yellow	100 pounds.
Magnesium nitrate	Oxy. M	73.153, 73.182, 73.183	do	Do.
Magnesium perchlorate	Oxy. M	73.153, 73.154	do	Do.
Magnesium peroxide, solid	Oxy. M	73.153, 73.154	do	50 pounds.
Magnesium scrap (*shavings, borings, or turnings*).	F. S	73.153, 73.220	do	100 pounds.
Matches, block. See Strike-anywhere matches.	F. S	No exemption, 73.176	do	50 pounds.
Matches, book, card, or strike-on-box, *with other articles.*	See § 73.176 (g)			
Matches, book, card, or strike-on-box.	Not regulated			
Matches, strike-anywhere	F. S	No exemption, 73.176	Yellow	50 pounds.
*Medicines, n. o. s. *See* *Drugs, chemicals, medicines, or cosmetics, n. o. s.				
Mercuric acetate	Pois. B	73.364, 73.365	Poison	200 pounds.
Mercuric-ammonium chloride, solid	Pois. B	73.364, 73.365	do	Do.
Mercuric benzoate, solid	Pois. B	73.364, 73.365	do	Do.
Mercuric bromide, solid	Pois. B	73.364, 73.365	do	Do.

Article	Classed as—	Exemptions and packing (see sec.)	Label required if not exempt	Maximum quantity in 1 outside container by rail express
Mercuric cyanide, solid	Pois. B	73.370	Poison	200 pounds.
Mercuric iodide, solid	Pois. B	73.364, 73.365	do	Do.
Mercuric iodide solution	Pois. B	73.345, 73.346	do	55 gallons.
Mercuric oleate, solid	Pois. B	73.364, 73.365	do	200 pounds.
Mercuric oxide (red), solid	Pois. B	73.364, 73.365	do	Do.
Mercuric oxide (yellow), solid	Pois. B	73.364, 73.365	do	Do.
Mercuric oxycyanide, solid	Pois. B	73.364, 73.365	do	Do.
Mercuric-potassium cyanide, solid	Pois. B	73.364, 73.365, 73.370	do	Do.
Mercuric-potassium iodide, solid	Pois. B	73.364, 73.365	do	Do.
Mercuric salicylate, solid	Pois. B	73.364, 73.365	do	Do.
Mercuric subsulfate, solid	Pois. B	73.364, 73.365	do	Do.
Mercuric sulfate, solid	Pois. B	73.364, 73.365	do	Do.
Mercuricyanamid, solid	Pois. B	73.364, 73.365	do	Do.
Mercuric sulfo cyanate, solid	Pois. B	73.364, 73.365	do	Do.
Mercurol (*mercury nucleate*), solid	Pois. B	73.364, 73.365	do	Do.
Mercurous bromide, solid	Pois. B	73.364, 73.365	do	Do.
Mercurous gluconate, solid	Pois. B	73.364, 73.365	do	Do.
Mercurous iodide, solid	Pois. B	73.364, 73.365	do	Do.
Mercurous nitrate, solid	Pois. B	73.364, 73.365	do	Do.
Mercurous oxide, black, solid	Pois. B	73.364, 73.365	do	Do.
Mercurous sulfate, solid	Pois. B	73.364, 73.365	do	Do.
Mercury acetate, solid	Pois. B	73.364, 73.365	do	Do.
Mercury biehloride, solid	Pois. B	73.364, 73.372	do	Do.
Mercury bisulfate, solid	Pois. B	73.364, 73.365	do	Do.
Mercury compounds, n. o. s. (solid)	Pois. B	73.364, 73.365	do	Do.
Mercury cyanide, solid	Pois. B	73.370	do	Do.
Mercury fulminate. See Initiating explosive.				
Metal keys, reused	See § 73.28			
*Metal polish. See *Polishes, metal, stove, furniture and wood, liquid.				
Metallic sodium or potassium. See Sodium or potassium, metallic.				
Methanol (*methyl alcohol*). See Alcohol, wood.				
Methane	F. G	73.302, 73.306	Red Gas	300 pounds.
Methyl acetate	F. L	73.118, 73.119	Red	10 gallons.
Methyl acetone	F. L	73.118, 73.119	do	Do.
Methyl bromide, liquid (*bromomethane*).	Pois. B	No exemption, 73.353	Poison	55 gallons.
ϕ Methyl chloride	F. G	73.302, 73.308, 73.314	Red Gas	300 pounds.
Methyl chloroformate	Cor. L	No exemption, 73.288	White	5 pints.
Methyldichlorarsine	Pois. A	No exemption, 73.328	Poison Gas	Not accepted.
Methyl formate	F. L	73.118, 73.119	Red	10 gallons.
Methyl mercaptan	F. G	73.302, 73.308, 73.314	Red Gas	300 pounds.
Mine rescue equipment	See §§ 73.302 (a) (2) and 76.703 (d).			
Mines, empty	See § 73.55			
Mines, explosive. See Explosive mine.				
Mixed acid. See Nitrating (mixed) acid.				
Mixtures of hydrofluoric and sulfuric acids.	Cor. L	No exemptions, 73.290	White	10 pints.
Mixtures or solutions of liquefied nonflammable gases and liquids other than those classified as flammable, corrosive, or poisonous charged with nitrogen, carbon dioxide, or air. See Compressed gases, n. o. s.				
Monochloracetone, stabilized	Pois. C	No exemption, 73.384	Tear Gas	5 gallons.
Monochloracetone (unstabilized)	Not accepted			Not accepted.
Monochlorobenzene. See *Chlorobenzol.				
Monochlorbenzol. See *Chlorobenzol.				
Monochlorobenzol. See *Chlorobenzol.				
Monochlorodifluoromethane	Nonf. G	73.302, 73.308, 73.314	Green	300 pounds.
Monochloroethylene. See Vinyl chloride.				
Monochlorotetrafluoroethane	Nonf. G	73.302, 73.306, 73.314	Green	300 pounds.
Monochlorotrifluoromethane	Nonf. G	73.302, 73.308	do	Do.
Monofluorophosphoric acid, anhydrous.	Cor. L	No exemption, 73.275	White	1 gallon.
Monomethylamine, anhydrous	F. G	73.302, 73.306, 73.314	Red Gas	300 pounds.
Monomethylamine, aqueous solution.	F. L	73.118, 73.119	Red	10 gallons.
*Mortar stain, liquid	F. L	73.118, 73.128	do	55 gallons.
ϕ Motion-picture film, *nitrocellulose base, including mixed shipments with nonflammable film.*	F. S	No exemption, 73.177	Yellow	200 pounds.
Motion-picture film, old and worn out (*nitrocellulose*).	F. S	No exemption, 73.178	do	Do.
Motion-picture film, old and worn out (*slow-burning*).	See § 73.181 (a) (1).			
ϕ Motion-picture outfits, toy	See § 73.181 (a) (4).			
ϕ Motion-picture film (*processed, positive or negative, nitrocellulose*).	F. S	No exemption, 73.177	Yellow	200 pounds.
ϕ Motion-picture film (*processed, positive or negative, slow-burning*).	See § 73.181 (a) (1).			
Motion-picture film scrap (*nitrocellulose*), samples of.	F. S	No exemption, 73.196	Yellow	25 pounds.
Motion-picture film scrap (*nitrocellulose*), *other than samples.*	F. S	No exemption, 73.195	do	Not accepted.
Motion-picture film scrap (*slow-burning*).	See § 73.181 (a) (2).			
ϕ Motion-picture film, toy, (*nitrocellulose*).	F. S	No exemption, 73.179	Yellow	200 pounds.
ϕ Motion-picture film, toy (*slow-burning*).	See § 73.181 (a) (1).			
ϕ Motion-picture film, toy pieces (*nitrocellulose*).	See § 73.181 (a) (3).			
Motion-picture film, nnexposed (*nitrocellulose base*).	F. S	73.180	Yellow ##	250 pounds.
Motion-picture film, unexposed (*slow-burning*).	See § 73.181 (a) (1).			
Motorcycles	See § 73.120			
Motor fuel antiknock compound	Pois. B	No exemption, 73.354	Poison	55 gallons.
*Motor fuel, n. o. s.	F. L	73.118, 73.119	Red	10 gallons.
Muriatic acid. See Hydrochloric acid.				
Mustard gas	Pois. A	No exemption, 73.328	Poison Gas	Not accepted.
*Naphtha	F. L	73.118, 73.119	Red	10 gallons.
*Naphtha distillate	F. L	73.118, 73.119	do	Do.
*Naphtha, petroleum. See *Petroleum naphtha.				
Naphtha, solvent	F. L	73.118, 73.119	Red	10 gallons.
Natural gasoline. See Gasoline.				
Negative cotton. See High explosives.				
Neohexane	F. L	73.118, 73.119	Red	10 gallons.
Neon gas	Nonf. G	73.302, 73.307	Green	300 pounds.
Nickel carbonyl	F. L	No exemption, 73.126	Red	Not accepted.
Nickel cyanide, solid	Pois. B	73.370	Poison	200 pounds.
Nicotine hydrochloride	Pois. B	73.345, 73.346	do	55 gallons.
Nicotine, liquid	Pois. B	73.345, 73.346	do	Do.
Nicotine salicylate	Pois. B	73.364, 73.365	do	200 pounds.
Nicotine sulfate, liquid	Pois. B	73.345, 73.346	Poison	55 gallons.
Nicotine sulfate, solid	Pois. B	73.364, 73.365	do	200 pounds.
Nicotine tartrate	Pois. B	73.364, 73.365	do	Do.
Nitrate of aluminum. See Aluminum nitrate.				
Nitrate of ammonia. See Ammonium nitrate.				
Nitrate of ammonia explosives. See High explosives.				
Nitrate of ammonia fertilizer. See Ammonium nitrate fertilizer.				
Nitrate of barium. See Barium nitrate.				
Nitrate of lead. See Lead nitrate.				
Nitrate of potash. See Potassium nitrate.				
Nitrate of soda. See Sodium nitrate.				
Nitrate of soda bags, empty, unwashed. See Bags, nitrate of soda, empty and unwashed.				
Nitrate of strontia. See Strontium nitrate.				
Nitrates, n. o. s.	Oxy. M	73.153, 73.182, 73.183	Yellow	100 pounds.
Nitrating (mixed) acid	Cor. L	No exemption, 73.267	White	2½ pints.
Nitric acid	Cor. L	No exemption, 73.268	do	5 pints.

Article	Classed as—	Exemptions and packing (see sec.)	Label required if not exempt	Maximum quantity in 1 outside container by rail express
Nitrite of soda. *See* Sodium nitrite.				
Nitrobenzol, liquid (*oil of mirbane*)	Pois. B	73.345, 73.346	Poison	55 gallons.
Nitro carbo nitrate	Oxy. M	73.153, 73.182, 73.183	Yellow	100 pounds.
Nitrocellulose, colloided, granular, or flake, wet with alcohol or solvent. *See* Wet nitrocelliulose colloided, granular or flake—20 percent alcohol or solvent.				
Nitrocellulose, colloided, granular, or flake, wet with 20 percent water. *See* Wet nitrocelliulose, colloided, granular or flake—20 percent water.				
Nitrocellulose (collodion cotton), wet with water. *See* Wet nitrocelliulose—20 percent water.				
Nitrocellulose (collodion cotton), wet with alcohol or solvent. *See* Wet nitrocelliulose—30 percent alcohol or solvent.				
Nitrocellulose, dry. *See* High explosives.				
Nitrochlorbenzene, ortho, liquid	Pois. B	73.345, 73.346	Poison	55 gallons.
Nitrochlorbenzene, meta or para, solid.	Pois. B	73.364, 73.374	do	200 pounds.
Nitrogen	Nonf. G	73.302, 73.307, 73.314	Green	300 pounds.
Nitrogen dioxide, liquid	Pois. A	No exemption, 73.336	Poison Gas	Not accepted.
Nitrogen peroxide (*tetroxide*)	Pois. A	No exemption, 73.336	do	Do.
Nitroglycerin, liquid	See § 73.51 (d)			
Nitroglycerin liquid, desensitized. *See* High Explosive, liquid.				
Nitroglycerin, spirits of. *See* Spirits of nitroglycerin.				
Nitrohydrochloric acid	Cor. L	No exemption, 73.278	White	5 pints.
Nitrohydrochloric acid, diluted	Cor. L	do	do	Do.
Nitro mannite. *See* Initiating explosive.				
Nitroguanidine, dry. *See* High explosives.				
Nitroguanidine, wet with water *See* Wet nitroguanidine—20 percent water.				
Nitrosoguanidine. *See* Initiating explosive.				
Nitrostarch, dry. *See* High explosives.				
Nitrostarch, wet with alcohol or solvent. *See* Wet nitrostarch—30 percent alcohol or solvent.				
Nitrostarch, wet with water. *See* Wet nitrostarch — 20 percent water.				
Nitrosyl chloride	Nonf. G	73.302, 73.308, 73.314	Green	300 pounds.
Nitrourea. *See* High explosives.				
Ø Nitrous oxide	Nonf. G	73.302, 73.308	Green	300 pounds.
Nitroxylol	Pois. B	73.345, 73.346	Poison	55 gallons.
Nonliquefied gases. *See* Compressed gases, n. o. s.				
Nonliquefied hydrocarbon gas	F. G	73.302, 73.307	Red Gas	300 pounds.
Octyl trichlorosilane	Cor. L	No exemption, 73.280	White	10 gallons.
•Oil, *described as* oil, oil, n. o. s., petroleum oil, or petroleum oil, n. o. s.	F. L	73.118, 73.119	Red	Do.
Oil of vitriol. *See* Sulfuric acid.				
Oleum. *See* Sulfuric acid.				
Oxide, spent. *See* Spent oxide.				
Oxidizing material, n. o. s	Oxy. M	73.153, 73.154	Yellow	25 pounds.
Oxidizing materials with other articles—fumigants.	See § 73.152 (a) Note 1.			
Ø Oxygen	Nonf. G	73.302, 73.307, 73.314	Green	300 pounds.
•Paint driers, liquid	F. L	73.118, 73.128	Red	55 gallons.
•Paint, enamel, lacquer, stain, shellac, varnish, aluminum, bronze, gold, wood filler, liquid, and lacquer base liquid.	F. L	73.118, 73.128	do	Do.
•Paint, lacquer and varnish removing, reducing or thinning compounds. *See* •Compounds, lacquer, paint, or varnish, reducing or thinning liquid, etc.				
Paper cap ammunition for toy pistols. *See* Toy caps.				
Paper caps. *See* Toy caps.				
Paper stock, wet	F. S	No exemption, 73.185	Yellow	Not accepted.
Paper waste, wet. *See* Waste paper, wet.				
Para chlorobenzoyl peroxide. *See* Chlorobenzoyl peroxide, (para).				
Paranitraniline, solid	Pois. B	73.364, 73.373	Poison	200 pounds.
Parathion and compressed gas mixture.	Pois. A	No exemption, 73.334	Poison Gas	Not accepted.
Paris green, solid	Pois. B	73.364, 73.367	Poison	200 pounds.
Pentaborane	F. L	No exemption, 73.138	Red	Not accepted.
Pentane	F. L	73.118, 73.119	Red	10 gallons.
Pentane, methyl	F. L	73.118, 73.119	do	Do.
Pentaerythrite tetranitrate. *See* Initiating explosive.				
Pentolite, dry. *See* High explosives.				
Peracetic acid	Oxy. M	No exemption, 73.223	Yellow	5 pints.
Perchlorate of ammonia. *See* Ammonium perchlorate.				
Perchlorate of potash. *See* Potassium perchlorate.				
Perchlorates, n. o. s	Oxy. M	73.153, 73.154	Yellow	100 pounds.
Perchloric acid *in excess of 72 percent*	See § 73.269			
Perchloric acid *not in excess of 72 percent.*	Cor. L	73.244, 73.269	White	7 pounds.
Perchloro-methyl-mercaptan	Pois. B	73.364, 73.376	Poison	10 pounds.
Percussion caps	Expl. C	No exemption, 73.107		150 pounds.
Percussion fuzes	Expl. C	No exemption, 73.105		Do.
Permanganate of potash	Oxy. M	73.153, 73.154, 73.194	Yellow	100 pounds
Permanganate of soda	Oxy. M	73.153, 73.154	do	Do.
Permanganates, n. o. s	Oxy. M	73.153, 73.154	do	Do.
Peroxide of sodium. *See* Sodium peroxide.				
Peroxides, organic, liquids, n. o. s	F. L	No exemption, 73.119 (m)	Red	1 quart.
Peroxides, organic, liquids, n. o. s	Oxy. M	73.153, 73.221	Yellow	Do.
Petroleum, crude. *See* Crude oil.				
•Petroleum distillate	F. L	73.118, 73.119	Red	10 gallons.
Petroleum ether	F. L	73.118, 73.119	do	Do.
Petroleum gas, liquefied. *See* Liquefied petroleum gas.				
•Petroleum naphtha	F. L	73.118, 73.119	Red	10 gallons.
Phenol. *See* Carbolic acid.				
Phenylcarbylamine chloride	Pois. A	No exemption, 73.328	Poison Gas	Not accepted.
Phenyldichlorarsine, liquid	Pois. B	No exemption, 73.355	Poison	30 gallons.
Phenyl trichlorosilane	Cor. L	No exemption, 73.280	White	10 gallons.
Phosgene (*diphosgene*)	Pois. A	No exemption, 73.333	Poison Gas	Not accepted.
Phosphoric anhydride	F. S	No exemption, 73.188	Yellow	100 pounds.
Phosphorus, amorphous, red	F. S	No exemption, 73.189	do	11 pounds.
Phosphorus oxychloride	Cor. L	No exemption, 73.271	White	1 quart.
Phosphorus pentachloride	F. S	No exemption, 73.191	Yellow	5 pounds.
Phosphorus sesquisulfide	F. S	No exemption, 73.225	Yellow	11 pounds.
Phosphorus tribromide	Cor. L	No exemption, 73.270	White	1 quart.
Phosphorus trichloride	Cor. L	No exemption, 73.271	do	Do.
Phosphorus, white or yellow, dry	F. S	No exemption, 73.190 (d) and (e).	Yellow	Not accepted.
Phosphorus, white or yellow, in water.	F. S	No exemption, 73.190 (b) and (c).	do	25 pounds.
Photographic film scrap, X-ray film scrap.	F. S	No exemption, 73.195	do	See § 73.196.
Photographic flash powder. *See* Special fireworks.				
Picrates, dry. *See* High explosives.				
Picrate of ammonia. *See* High explosives.				
Picric acid, dry. *See* High explosives.				
Picric acid, wet, not exceeding 16 ounces.	See § 73.192			

Article	Classed as—	Exemptions and packing (see sec.)	Label required if not exempt	Maximum quantity in 1 outside container by rail express
Picric acid, wet, with not less than 10 percent water, over 25 pounds. See High explosives.				
Picric acid, wet, with not less than 10 percent water, *in excess of 16 ounces but not exceeding 25 pounds.*	F. S.	No exemption, 73.193	Yellow	25 pounds.
Pinwheels. See Common fireworks.				
*Plastic solvent, n. o. s.	F. L.	73.118, 73.119	Red	10 gallons.
Poisonous liquid or gas, n. o. s.	Pois. A	No exemption, 73.328	Poison Gas	Not accepted.
Poisonous liquids, n. o. s.	Pois. B	73.345, 73.346	Poison	55 gallons.
Poisonous liquids, n. o. s.	Pois. C	No exemption, 73.382	Tear Gas	75 pounds.
Poisonous solids, n. o. s.	Pois. B	73.364, 73.365	Poison	200 pounds.
Poisonous solids, n. o. s.	Pois. C	No exemption, 73.382	Tear Gas	75 pounds.
Police grenades, poison gas, class A	Pois. A	No exemption, 73.335	Poison Gas	Not accepted.
*Polishes, metal, stove, furniture and wood, liquid.	F. L.	73.118, 73.129	Red	55 gallons.
Potash, caustic, solution. See Caustic potash, liquid.				
Potassium arsenate, solid	Pois. B	73.364, 73.365	Poison	200 pounds.
Potassium arsenite, solid	Pois. B	73.364, 73.365	do	Do.
Potassium bromate	Oxy. M	73.153, 73.154	Yellow	100 pounds.
Potassium chlorate (*potash chlorate*). See Chlorate of potash.				
Potassium cyanide. See Cyanide of potassium.				
Potassium hydroxide solution. See Caustic potash, liquid.				
Potassium, metallic	F. S.	No exemption, 73.206	Yellow	25 pounds.
Potassium, metallic liquid alloy	F. S.	No exemption, 73.202	do	1 pound.
Potassium nitrate	Oxy. M	73.153, 73.182, 73.183	do	100 pounds.
Potassium nitrate mixed (fused) with sodium nitrite.	Oxy. M	73.182 (b)		
Potassium nitrite	Oxy. M	73.153, 73.154	Yellow	100 pounds.
Potassium perchlorate	Oxy. M	73.153, 73.219	do	Do.
Potassium permanganate. See Permanganate of potash.				
Potassium peroxide	Oxy. M	No exemption, 73.154	Yellow	100 pounds.
Potassium sulfide	F. S.	73.153, 73.207	do	300 pounds.
Potato spray (*arsenical*), liquid. See *Insecticide, liquid.				
Primers. See Cannon, combination, or small-arm primers.				
Primers, detonating. See Detonating primers.				
Projectiles, explosive. See Explosive projectile.				
Projectiles, gas, smoke, or incendiary, with burster or booster with or without detonating fuze. See Explosive projectile.				
Projectiles, gas, smoke, or incendiary, nonexplosive. See *Chemical ammunition, class* A, B, or C.				
Projectiles, illuminating. See § 73.56 (d) *and* Special fireworks.				
Projectiles, sand-loaded, empty, or solid.	See § 73.55			
Propane. See Liquefied petroleum gas.				
Propyl trichlorosilane	Cor. L	No exemption, 73.280	White	10 gallons.
Propylene	F. G.	73.302, 73.308	Red Gas	300 pounds.
Prussic acid. See Hydrocyanic acid.				
*Pyridine	F. L.	73.118, 73.119	Red	10 gallons.
Pyro sulfuryl chloride	Cor. L	73.244, 73.247	White	1 quart.
*Pyroxylin cement. See Cement, pyroxylin.				
Pyroxylin plastic scrap	F. S.	No exemption, 73.195, 73.196	Yellow	See § 73.196.
Pyroxylin plastics, rods, sheets, rolls, tubes.	F. S.	73.197	Yellow ##	350 pounds.
Pyroxylin solution	F. L.	73.118, 73.119	Red	10 gallons.
*Pyroxylin solvent, n. o. s.	F. L.	73.118, 73.119	do	Do.
Radio battery chargers	See § 73.259			
Radio current supply devices	See § 73.259			
Radioactive materials	Pois. D	73.392, 73.393, 73.394	Poison Radioactive materials (Blue or Red)	2000 millicuries. See § 73.391 (c).
Rags, oily	F. S.	No exemption, 73.153 (c) (38), 73.199.	Yellow	Not accepted.
Rags, wet	F. S.	No exemption, 73.200	do	Do.
Railway fusees. See Common fireworks.				
*Reducing compounds, paint, varnish, lacquer, etc. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.				
Refrigerating machines	See § 73.130, 73.313.			
*Removing compounds, paint, varnish, lacquer, etc. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.				
Resinate of cobalt, precipitated. See Cobalt resinate, precipitated.				
Rifle grenades	Expl. A	No exemption, 73.56		Not accepted.
Rifle powder. See Black powder.				
*Road asphalt or tar, liquid	F. L.	73.118, 73.131	Red	10 gallons.
Rocket fireworks. See Common fireworks.				
Rocket ammunition with empty projectiles.	Expl. B	No exemption, 73.90		Not accepted.
Rocket ammunition with explosive projectiles.	Expl. A	No exemption, 73.57		Do.
Rocket ammunition with illuminating projectiles.	Expl. A	No exemption, 73.57		Do.
Rocket ammunition with gas projectiles.	Expl. A	No exemption, 73.57		Do.
Rocket ammunition with incendiary projectiles.	Expl. A	No exemption, 73.57		Do.
Rocket ammunition with inert-loaded projectiles.	Expl. B	No exemption, 73.90		Do.
Rocket ammunition with smoke projectiles.	Expl. A	No exemption, 73.57		Do.
Rocket ammunition with solid projectiles.	Expl. B	No exemption, 73.90		Do.
Rocket ammunition without projectiles.	Expl. B	No exemption, 73.90		Do.
Roman candles. See Common fireworks.				
Rough ammoniate tankages	F. S.	No exemption, 73.153 (c) (50), 73.210.	Yellow	Do.
*Rubber cement. See *Cement, rubber.				
*Rubber scrap or rubber buffings	F. S.	73.153, 73.201	Yellow	10 pounds.
*Rubber shoddy, regenerated rubber, or reclaimed rubber.	F. S.	73.153, 73.203	do	Do.
*Rum, denatured	F. L.	73.118, 73.119	Red	10 gallons.
Safety fuse	Sec § 73.100 (o)			
Safety squibs	Expl. C	No exemption, 73.106		150 pounds.
Saltpeter. See Potassium nitrate.				
Saltpeter, Chile. See Sodium nitrate.				
Salutes. See Common fireworks and Special fireworks.				
Samples of explosives	See § 73.86			
Samples, New explosives	See § 73.86			
Samples of explosives and explosive articles.	See § 73.86			
Scheele's green. See Copper arsenite.				
Self-propelled vehicles	See § 73.120			
Shaped charges, commercial. See High explosives.	See § 73.65 (h)			
*Shellac. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.				
Shellac, liquid	F. L.	73.118, 73.128	Red	55 gallons.
Shells, fireworks. See Common fireworks or Special fireworks.				
Signals, highway. See Common fireworks.				
Silicon chloride (*tetrachloride*)	Cor. L.	73.244, 73.247	White	1 gallon.
Silver cyanide	See § 73.370			
Sludge acid	Cor. L.	No exemption, 73.248	White	1 quart.
Small-arms ammunition	Expl. C	No exemption, 73.101		150 pounds.

Article	Classed as—	Exemptions and packing (see sec.)	Label required if not exempt	Maximum quantity in 1 outside container by rail express
Small-arms ammunition, tear gas cartridges.	Expl. C	No exemption, 73.101	Tear gas	150 pounds.
Small-arms primers	Expl. C	No exemption, 73.107		Do.
Smoke candles. See Common fireworks.				
Smoke generators. See *Chemical ammunition, class* B or C.				
Smoke pots. See Common fireworks.				
Smoke signals. See Common fireworks.				
Smokeless powder for cannon	Expl. B	No exemption, 73.93	Red##	10 pounds.
Smokeless powder for cannon in water.	Expl. B	No exemption, 73.93		Not accepted.
Smokeless powder for cannon in water, *unstable, condemned, or deteriorated.*	Expl. B	No exemption, 73.93		Do.
Smokeless powder for small-arms *in quantity not exceeding 50 pounds net weight.*	Expl. B	No exemption, 73.94	Red ##	10 pounds.
Smokeless powder for small-arms *in quantity exceeding 50 pounds net weight.*	Expl. A	No exemption, 73.65(l), 73.94		Not accepted.
Smokeless powder for small-arms in water, *unstable, condemned, or deteriorated.*	Expl. B	No exemption, 73.94		Do.
Smokeless powder for small-arms in water.	Expl. B	No exemption, 73.94		Do.
Sodium amide	F. S	No exemption, 73.206	Yellow	25 pounds.
Sodium azide	Pois. B	73.364, 73.375	Poison	200 pounds.
Soda, caustic solution. See Caustic soda, liquid.				
Sodium arsenate, solid	Pois. B	73.364, 73.365, 73.368	Poison	200 pounds.
Sodium arsenite (solution), liquid	Pois. B	73.345, 73.346	do	55 gallons.
Sodium cacodylate, solid (*sodium dimethyl arsenate*).	Pois. B	73.364, 73.365	do	200 pounds.
Sodium chlorate (*soda chlorate*)	Oxy. M	73.153, 73.163	Yellow	100 pounds.
Sodium chlorite	Oxy. M	No exemption, 73.160	do	Do.
Sodium chlorite solution (not exceeding 40 percent sodium chlorite).	Cor. L	73.244, 73.263	White	4 gallons.
Sodium cyanide. See Cyanide of sodium.				
Sodium hydride	F. S	No exemption, 73.198	Yellow	25 pounds.
Sodium hydrosulfite	F. S	73.153, 73.204	do	100 pounds.
Sodium hydroxide solution. See Caustic soda, liquid.				
Sodium, metallic	F. S	No exemption, 73.206	Yellow	25 pounds.
Sodium, metallic, dispersion in organic solvent.	F. S	No exemption, 73.230	do	10 pounds.
Sodium, metallic liquid alloy	F. S	No exemption, 73.202	do	1 pound.
Sodium nitrate	Oxy. M	73.153, 73.182, 73.183	do	100 pounds.
Sodium nitrite	Oxy. M	73.153, 73.154	do	Do.
Sodium nitrite mixed (fused) with potassium nitrate.	Oxy. M	73.182 (b)		
Sodium permanganate	Oxy. M	73.153, 73.154	Yellow	100 pounds.
Sodium peroxide	Oxy. M	No exemption, 73.187	do	Do.
Sodium picramate wet with 20 percent of water.	F. S	No exemption, 73.205	do	25 pounds.
Sodium sulfide	F. S	73.153, 73.207	do	300 pounds.
*Solvents, n. o. s.	F. L	73.118, 73.119	Red	15 gallons.
Sparklers. See Common fireworks.				
Special fireworks	Expl. B	No exemption, 73.88 (d), 73.91	Special Fireworks ##	200 pounds.
Spent iron mass. See Iron mass, spent.				
Spent iron sponge. See Iron sponge, spent.				
Spent mixed acid	Cor. L	No exemption, 73.248	White	1 quart.
Spent oxide	F. S	No exemption, 73.174	Yellow	Not accepted.
Spent sulfuric acid	Cor. L	No exemption, 73.248	White	1 quart.
Spirits of nitroglycerin	F. L	73.133	Red	6 quarts.
Sporting powder. See Black powder or Smokeless powder for small-arms.				
Spreader cartridges. See Special fireworks.				
Squibs, electric or safety. See Electric squibs or Safety squibs.				
*Stain. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.				
Storage batteries, wet. See Batteries, storage, wet.				
Stores, ship or vessels	See § 71.9			
*Stove polish. See *Polishes, metal, stove, furniture and wood, liquid.				
Strike-anywhere matches. See Matches, strike-anywhere.				
Strike-on-box matches. See Matches, strike-on-box.				
Strontium arsenite, solid	Pois. B	73.364, 73.365	Poison	200 pounds.
Strontium chlorate	Oxy. M	73.153, 73.163	Yellow	100 pounds.
Strontium chlorate, wet	Oxy. M	73.153, 73.163 (a) (6)	do	200 pounds.
Strontium nitrate	Oxy. M	73.153, 73.182, 73.183	do	100 pounds.
Strontium peroxide	Oxy. M	73.153 (a), 73.154	do	Do.
Strychnine and salts thereof, solid	Pois. B	73.364, 73.365	Poison	200 pounds.
Styphnate of lead. See Initiating explosive.				
Succinic acid peroxide	Oxy. M	73.153 (b), 73.157, 73.158	Yellow	25 pounds.
Sulfide of sodium. See Sodium sulfide.				
Sulfide of potassium. See Potassium sulfide.				
Sulfur chloride (*mono and di*)	Cor. L	No exemption, 73.247	White	1 gallon.
ø Sulfur dioxide	Nonf. G	73.302, 73.308, 73.314, 73.315	Green	300 pounds.
Sulfur hexafluoride	Nonf. G	73.302, 73.308	do	Do.
Sulfur trioxide, stabilized	Cor. L	73.244, 73.273	White	1 gallon.
Sulfuric acid (*oil of vitriol*)	Cor. L	73.244, 73.272	do	10 pints.
Sulfuric acid, *fuming (oleum) (Nordhausen).* See Sulfuric acid.				
Tankage. See Garbage tankage.				
Tankage fertilizers	F. S	No exemption, 73.153 (c) (49), 73.209.	Yellow	Not accepted.
Tankages, rough ammoniate	F. S	No exemption, 73.153 (c) (50), 73.210.	do	Do.
Tank cars, gas (must not contain gases that combine chemically).	See § 73.301(a)			
Tank truck, empty	See § 73.29			
Tanks, empty	See § 73.29			
*Tar, liquid	F. L	73.118, 73.131	Red	10 gallons.
Tear gas candles	Pois. C	No exemption, 73.385	Tear Gas	75 pounds.
Tear gas cartridges. See Small-arms ammunition tear gas cartridges.				
Tear gas grenades	Pois. C	No exemption, 73.385	Tear Gas	75 pounds.
Tear gas material, liquid or solid, n. o. s.	Pois. C	No exemption, 73.382	do	Do.
Tertiary butylisopropyl benzene hydroperoxide.	Oxy. M	73.153 (b), 73.224	Yellow	1 quart.
Tetraethyl lead, liquid	Pois. B	No exemption, 73.354	Poison	55 gallons.
Tetraethyl pyrophosphate and compressed gas mixture.	Pois. A	No exemption, 73.334	Poison Gas	Not accepted.
Tetrafluorethylene, inhibited	Nonf. G	73.302, 73.308	Green	300 pounds.
Tetrazene (guanyl nitrosamino guanyl tetrazene). See Initiating explosive.				
Tetryl. See High explosives.				
Textile waste, wet	F. S	No exemption, 73.211	Yellow	Not accepted.
*Thallium salts, solid	Pois. B	73.364, 73.365	Poison	200 pounds.
Thallium sulfate, solid	Pois. B	73.364, 73.365	do	Do.
*Thinning compounds, paint, varnish, lacquer, etc. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.				
Thionyl chloride	Cor. L	No exemption, 73.247	White	1 gallon.
Thiophosphoryl chloride	Cor. L	No exemption, 73.271	do	1 quart.
Thorium metal, powdered	F. S	No exemption, 73.226	Yellow	25 pounds.
Time fuzes	Expl. C	No exemption, 73.105		150 pounds.
Tin tetrachloride, anhydrous	Cor. L	73.244, 73.247	White	1 quart.
Titanium metal powder, wet, with not less than 20 percent water.	F. S	No exemption, 73.208	Yellow	150 pounds.
Titanium tetrachloride	Cor. L	73.244, 73.247	White	10 gallons.
Toluol (*toluene*)	F. L	73.118, 73.119	Red	Do.
Torches. See Common fireworks.				

Article	Classed as—	Exemptions and packing (see sec.)	Label required if not exempt	Maximum quantity in 1 outside container by rail express
Torpedoes, cap. See Special fireworks.				
Torpedoes, empty	See § 73.55			
Torpedoes, explosive. See Explosive torpedoes.				
Torpedoes, toy, railway or track. See Special fireworks.				
Toy caps	Expl. C	No exemption, 73.109		150 pounds.
Tracers	Expl. C	No exemption, 73.105		Do.
Tracer fuzes	Expl. C	No exemption, 73.106		Do.
Tractors	See § 73.120			
Trichlorosilane	F. L	No exemption, 73.136	Red	10 gallons.
Trifluorochloroethylene	Nonf. G	73.302, 73.308	Green	300 pounds.
Trimethylamine, anhydrous	F. G	73.302, 73.308, 73.314	Red Gas	Do.
Trimethylamine, aqueous solution	F. L	73.118, 73.119	Red	10 gallons.
Trinitrobenzene. See High explosives.				
Trinitrobenzene, wet (*not to exceed 16 ounces*).	F. S	73.212		16 ounces.
Trinitroresorcinol. See High explosives.				
Trinitrotoluene. See High explosives.				
Trinitrotoluene, wet (*not to exceed 16 ounces*).	F. S	73.212		16 ounces.
*Turpentine substitutes	F. L	73.118, 73.119	Red	10 gallons.
Urea nitrate wet with not less than 10 percent of water, over 25 pounds. See High explosives.				
Urea nitrate wet *with not less than 10 percent of water, in excess of 16 ounces but not exceeding 25 pounds.*	F. S	No exemption, 73.193	Yellow	25 pounds.
Urea nitrate, dry. See High explosives.				
Urea nitrate, wet, *with not less than 10 percent water, not exceeding 16 ounces.*	See § 73.192			16 ounces.
Urea peroxide	Oxy. M	73.153 (b), 73.227	Yellow	25 pounds.
*Varnish. See *Paint, enamel, lacquer, stain, shellac, varnish, etc.				
*Varnish driers. See *Paint driers, liquid.				
*Varnish remover or reducer. See *Compounds, lacquer, paint, or varnish removing, reducing, or thinning, liquid.				
*Varnish thinning compounds. See *Compounds, lacquer, paint, or varnish removing, reducing, or thinning, liquid.				
Very signal cartridge. See Special fireworks.				
Vinyl acetate, inhibited	F. L	73.118, 73.119	Red	10 gallons.
Vinyl chloride, inhibited	F. G	73.302, 73.308, 73.314	Red Gas	20 pounds.
Vinylidene chloride, inhibited	F. L	73.118, 73.119	Red	10 gallons.
Vinyl methyl ether, inhibited	F. G	73.302, 73.308	Red Gas	20 pounds.
Waste paper, wet	F. S	No exemption, 73.186	Yellow	Not accepted.
Waste textile, wet	F. S	No exemption, 73.211	do	Do.
Waste wool, wet	F. S	No exemption, 73.213	Yellow	Not accepted.
*Water treatment compound, liquid.	Cor. L	73.244, 73.249	White	10 gallons.
Wet hair. *See* Hair wet.				
Wet nitrocellulose, colloided, granular or flake—20 percent alcohol or solvent.	F. L	73.118, 73.127	Red	25 pounds.
Wet nitrocellulose, colloided, granular or flake—20 percent water.	F. S	73.153, 73.184	Yellow	100 pounds.
Wet nitrocellulose (collodion cotton)—30 percent alcohol or solvent.	F. L	73.118, 73.127	Red	25 pounds.
Wet nitrocellulose (collodion cotton)—20 percent water.	F. S	73.153, 73.184	Yellow	100 pounds.
Wet nitroguanidine—20 percent water.	F. S	73.153, 73.184	do	Do.
Wet nitrostarch—20 percent water	F. S	73.153, 73.184	do	Do.
Wet nitrostarch—30 percent alcohol or solvent.	F. L	73.118, 73.127	Red	25 pounds.
Wet paper stock. *See* Paper stock, wet.				
Wet rags. *See* Rags, wet.				
Wet textile waste. *See* Waste textile, wet.				
Wet waste paper. *See* Waste paper, wet.				
Wet waste wool. *See* Waste wool, wet.				
*Wood filler. *See* *Paint, enamel, lacquer, stain, shellac, varnish, etc.				
*Wood polish. *See* *Polishes, metal, stove, furniture and wood, liquid.				
*Wood stain, liquid. *See* *Paint, enamel, lacquer, stain, shellac, varnish, etc.				
Wool waste, wet. *See* Waste wool, wet.				
X-ray film (*nitrocellulose base*)	F. S	No exemption, 73.177	Yellow	200 pounds.
X-ray film (*slow-burning*)	See § 73.181 (a) (1).			
X-ray film scrap (*nitrocellulose base*), samples of.	F. S	No exemption, 73.196	Yellow	25 pounds.
X-ray film scrap (*nitrocellulose base*), other than samples.	F. S	No exemption, 73.195	do	Not accepted.
X-ray film scrap (*slow-burning*)	See § 73.181 (a) (2).			
X-ray film, unexposed (*nitrocellulose base*).	F. S	73.180	Yellow ##	250 pounds.
Xylidene	Pois. B	73.345, 73.346	Poison	55 gallons.
*Xylol (*xylene*)	F. L	73.118, 73.119	Red	10 gallons.
Xylyl bromide	Pois. C	No exemption, 73.382	Tear Gas	75 pounds.
Zinc ammonium nitrite	Oxy. M	No exemption, 73.228	Yellow	100 pounds.
Zinc arsenate	Pois. B	73.364, 73.365	Poison	200 pounds.
Zinc arsenite, solid	Pois. B	73.364, 73.365	do	Do.
Zinc chlorate	Oxy. M	73.153, 73.163	Yellow	100 pounds.
Zinc cyanide	See § 73.370			
Zinc ethyl	F. L	No exemption, 73.134	Red	Not accepted.
Zinc nitrate	Oxy. M	73.153, 73.182, 73.183	Yellow	100 pounds.
Zinc permanganate	Oxy. M	73.153, 73.154	do	Do.
Zinc peroxide	Oxy. M	73.153, 73.154	do	50 pounds.
Zirconium, metallic, dry	F. S	No exemption, 73.215	do	75 pounds.
Zirconium metallic, wet or sludge	F. S	No exemption, 73.214	do	150 pounds.
Zirconium picramate, wet *with 20 percent of water.*	Oxy. M	No exemption, 73.216	do	25 pounds.

PART 73—SHIPPERS

AUTHORITY: §§ 73.1 to 73.432 issued under sec. 204, 49 Stat. 546, as amended, sec. 835, 62 Stat. 739; 49 U. S. C. 304, 18 U. S. C., Sup., 835.

NOTE 1: Because of the present emergency and until further order of the Commission, the following regulations shall apply to transportation of flammable liquids by private carriers of property in interstate or foreign commerce:

All regulations heretofore applying to common or contract carriers by motor vehicle shall apply to such private carriers, except:

Cargo tanks of tank motor vehicles constructed previous to June 15, 1943, may be continued in service if maintained in safe operating condition and sufficiently frequent inspections are maintained to determine compliance with all requirements as specified in this note.

Any defect or deficiency, due to accident or otherwise, that is likely to cause serious hazard must be corrected before any such tank is continued in or returned to service; see however, § 77.856 of this chapter.

Requirements applying to tests of tanks, and provisions for markers thereon except that indicating the flammable nature of the cargo, are waived.

Outages for shipments shall be those provided for by this part, except that filling of tanks to outage markers already incorporated in tanks, having due regard for safety in the transportation of the flammable liquids, need not be changed.

Section 77.815 of this chapter, labels, and § 77.819 of this chapter, certification of packages, of these regulations, need not be complied with by such private carriers, except as

to packages transferred from one carrier to another.

§ 73.1 *Purpose of the regulations in Parts 71–78 of this chapter.* (a) To promote the uniform enforcement of law and to minimize the dangers to life and property incident to the transportation of explosives and other dangerous articles by common carriers engaged in interstate or foreign commerce, the regulations in Parts 71–78 of this chapter are prescribed to define these articles for transportation purposes, to state the precautions that must be observed by the shipper in preparing them for shipment by rail freight, rail express, rail baggage, highway, or by carrier by water. It is the duty of each such shipper to make the prescribed regulations effective and to thoroughly instruct employees in relation thereto.

(b) Explosives and other dangerous articles may be offered to carriers for transportation provided the articles are in proper condition for transportation, are as defined, and are packed, marked, labeled, described, certified, and otherwise as provided for in Parts 71–78 of this chapter for acceptable articles for transportation by rail freight, rail express, rail baggage, highway, or water. Articles must be loaded and stayed according to regulations in Parts 71–78 of this chapter applying to carriers by rail. Methods of manufacture, packing, and storage, insofar as they affect safety in transportation, must be open to inspection by a duly authorized representative of the initial carrier or of the Bureau of Explosives. Shipments that do not comply with the regulations in Parts 71–78 of this chapter must not be offered for transportation.

§ 73.2 *Classification; dangerous articles.* (a) Dangerous articles other than explosives having more than one hazardous characteristic as defined by the regulations in Parts 71–78 of this chapter must be classified according to the greatest hazard present.

§ 73.3 *Motor carrier regulations.* (a) The packing required for shipments to be offered for transportation by motor carrier is as specified in this part.

§ 73.4 *Water carrier regulations.* (a) The packing required for shipments to be offered to common carriers by water is as specified in this part.

§ 73.5 *Shipments by rail express.* (a) The packing required for shipments to be forwarded by rail express will be, unless otherwise indicated, as prescribed for shipments by rail freight, provided the quantity limitations in one outside container, as shown in § 72.5 of this chapter, are observed.

§ 73.6 *Shipments as baggage by rail.* (a) For shipments of explosives and other dangerous articles acceptable as baggage by rail carriers see Part 76 of this chapter, Regulations Applying to Rail Carriers in Baggage Service.

§ 73.7 *United States Government shipments.* (a) Shipments of explosives or other dangerous articles offered by or consigned to the Departments of the Army, Navy, and Air Force of the United States Government, must be packed, including limitations of weight, in accordance with the regulations in this part or in containers of equal or greater strength and efficiency as required by their regulations.

(b) Shipments of radioactive materials, made by the Atomic Energy Commission, or under its direction or supervision, which are escorted by personnel specially designated by the Atomic Energy Commission, are exempt from the regulations in Parts 71–78 of this chapter.

§ 73.8 *Canadian shipments.* (a) Explosives and other dangerous articles, as defined in Parts 71–78 of this chapter which are packed, marked, labeled, and loaded, in conformity with the regulations of the Board of Transport Commissioners for Canada, may be transported from point of entry in the United States to their destination in the United States or through the United States en route to a point in Canada.

(b) Specification containers made and maintained in full compliance with corresponding specifications prescribed by the Board of Transport Commissioners for Canada in its Regulations for the Transportation of Explosives and Other Dangerous Articles by Freight, and Specifications for Shipping Containers, and marked in accordance therewith, CRC etc., may be used for shipment of explosives and other dangerous articles offered for transportation by carriers by rail freight, rail express, highway, or water.

§ 73.9 *Import and export shipments.* (a) Import shipments of explosives and other dangerous articles offered in the United States in original packages for transportation by carriers by rail freight, rail express, motor vehicle, or water must comply with all requirements of the regulations in Parts 71–78 of this chapter. The importer must furnish with the order to the foreign shipper, and also to the forwarding agent at the port of entry, full and complete information as to the packing, marking, labeling, and other requirements, as prescribed in Parts 71–78 of this chapter. The forwarding agent must file with the initial carrier in the United States a properly certified shipping order or other shipping paper as prescribed in this part. These requirements do not apply to such transportation by motor vehicle or water as may be necessary to effect transfer of import shipments from place of discharge to other places within the same port area or delivery to a water carrier within the same port area (including contiguous harbors); further transportation of such import shipments by connecting water carrier shall be subject to the regulations prescribed by the Commandant of the Coast Guard.

(b) Shipments of explosives and other dangerous articles offered for transportation by common carrier by water from the United States, its insular possessions, or dependencies, destined to such insular possessions or territory, dependencies, or to a foreign country, must be packed, marked, labeled and described in accordance with the rules and regulations in force at destination ports or as prescribed in Parts 71–78 of this chapter.

§ 73.10 *Inefficient containers.* (a) The results of experience gained by examination of broken or leaking containers must be recorded by the Bureau of Explosives to the end that further use of any particular kind of container shown by experience to be inefficient, may be prohibited by the Commission.

§ 73.11 *Violations and accidents to be reported.* (a) Consignees must report promptly to the Bureau of Explosives all instances of improper staying and broken, leaking, or defective containers of explosives or other dangerous articles in shipments received by them.

(b) The Bureau of Explosives, upon receipt of reports from consignees, should promptly report to the shipper full particulars covering all such cases.

SUBPART A—PREPARATION OF ARTICLES FOR TRANSPORTATION BY CARRIERS BY RAIL FREIGHT, RAIL EXPRESS, HIGHWAY, OR WATER

§ 73.21 *Prohibited mixed packing.* (a) The offering of packages of dangerous articles in outside packages containing in the same compartment interior packages the mixture of contents of which would be liable to cause a dangerous evolution of heat or gas or produce corrosive materials is prohibited for transportation by common carriers by rail freight, rail express, highway, or water, except as specified in §§ 73.152 (a), 73.242 (a), (b), and 73.301 (a) of this part.

§ 73.22 *Specification containers prescribed.* (a) Shipping containers, unless otherwise provided in this part, used hereafter in shipping explosives or other dangerous articles must have been made and marked in compliance with specifications prescribed in Part 78 of this chapter or with specifications of the Commission in effect at date of manufacture of container.

(1) Because of the present emergency and until further order of the Commission, containers approved for emergency or experimental shipments may be authorized in the discretion of, and upon special permit to be issued by the Director, Bureau of Service, Washington, D. C.

(b) Containers that do not comply with the specifications must not be marked to indicate such compliance.

(c) Containers not specified in this part, made before the effective date of the regulations in Parts 71–78 of this chapter and authorized for use under the regulations effective October 1, 1930, which may be continued in use, are as follows:

When these regulations call for specification numbers—	These specification containers may also be used—	
1A	1	Boxed carboy, glass or earthenware.
1B	1	Boxed carboy, lead.
1C	1	Carboy in keg, glass or earthenware.
3A	3, 25, 26	Cylinder.
3B	26	Do.
3C	7	Do.
3D	33	Do.
3E	3	Do.
4A	26	Do.
4B	26, 38	Do.
4BA	26, 38	Do.
4C	7	Do.

(d) Metal barrels and drums manufactured previous to March 31, 1912, of not to exceed 55 gallons nominal capacity, and made of metal not lighter than 16 gauge, may be continued in service after each metal barrel or drum has been subjected to and has passed a hydrostatic interior pressure test of not less than 30 pounds per square inch for at least five minutes, without bulging either head beyond the chime and without leakage of liquid contents, and after each such metal barrel or drum passing the test has been plainly and permanently marked:

Mfd. before 3-31-12
ICC-5
Tested ----------
(Date)

and with the date of the retest, by stamping into the metal or by means of a plate securely attached to the container.

§ 73.23 *Closures for containers.* (a) Containers must be closed for shipment as prescribed in the specifications for the container unless otherwise authorized for the particular article being shipped. Gasketed closures must be fitted with gaskets of efficient material which will not be deteriorated by the contents of the container.

§ 73.24 *Design of containers.* (a) In addition to standing the tests prescribed, the design and construction of containers must be such as to prevent the occurrence in individual packages of defects that permit leakage of their contents under ordinary conditions incident to transportation.

(b) Articles for which detailed specifications for packing are not given in this part must be securely packed in containers strong enough to stand, without rupture or leakage of contents, all shocks ordinarily incident to handling during transit.

§ 73.25 *Specification containers in outside containers.* (a) Outside specification shipping containers containing no corrosive liquids, except as provided in §§ 73.258 to 73.261 of this part, may be shipped when tightly packed in specification boxes or barrels or in nonspecification boxes, barrels or crates complying with governing tariffs. The outside package must be marked with the prescribed name of contents and labeled as required. Packages required by this part to be marked "This Side Up" must be packed in the outside package with their filling holes up, and the outside package must be marked "THIS SIDE UP." The outside container must also be marked "INSIDE PACKAGES COMPLY WITH PRESCRIBED SPECIFICATIONS" unless the specification markings on the inside packages are visible through openings in the outside package.

§ 73.26 *Quantity limitations.* (a) When quantity limitations are specified in Parts 71-78 of this chapter by United States liquid measure or by avoirdupois weight it is authorized that quantities measured by the metric system may be substituted, up to but not exceeding 1 gallon for liquids and 10 pounds for solids, on the basis of 1 liter per quart specified and 500 grams per pound specified.

(b) When quantity limitations do not appear in the packing requirements, the permitted gross weight or capacity authorized for a container to be offered for transportation by carrier by rail freight, rail express, highway, or water is shown in the container specification. (See also § 73.27 of this part.)

§ 73.27 *Rail express limitations.* (a) Dangerous articles other than explosives, except such as are not accepted for transportation, and except where special packing is prescribed in this part for rail express shipments, must, when offered for shipment by rail express, be packed, marked and labeled in compliance with this part.

(b) The maximum quantity of any explosive or other dangerous article that may be offered for transportation by rail express in one outside container must not exceed that as shown in § 72.5 of this chapter.

(c) When several dangerous articles are placed in one outside package without violating the regulations, the combined quantity of any one group must not exceed the lowest limit prescribed for any one of the articles of that group that is included.

§ 73.28 *Reused containers.* (a) Containers used more than once (refilled and reshipped after having been previously emptied) must be in such condition, including closing devices and cushioning materials, that they will protect their contents during transit as efficiently as new containers. Repairs must be made in an efficient manner and parts that are weak, broken, or otherwise deteriorated must be replaced (see paragraphs (e), (f), (g), and (h) of this section, for containers that cannot be reused).

NOTE 1: Because of the present emergency and until further order of the Commission, metal drums not marked to indicate compliance with an I. C. C. specification but otherwise meeting the requirements of containers authorized may be approved by the Bureau of Explosives for service and appropriate specification marking. Application for such approval must include description of container and details of closure, and be made to the Bureau of Explosives, 30 Vesey Street, New York 7, N. Y.

(b) Markings applied as prescribed by the specifications must be maintained in a legible condition.

(c) If, on account of painting or any other reason, the markings as prescribed for any container cannot be kept plain and legible, a metal plate, brazed or soldered, or otherwise securely fastened to the container, with a reproduction of the prescribed markings plainly stamped thereon, will be permitted.

(d) Containers previously used for the shipment of any explosive or other dangerous article must have old marks of contents, addresses, and labels, if any, thoroughly removed or obliterated before being used for the shipment of other articles.

(e) Boxes previously used for high explosives containing a liquid explosive ingredient not contained in an inside metal container must not be again used for shipments of any character.

(f) Boxes that have been contaminated by liquid explosive compositions must not again be used for shipments of any character.

(f) Kegs previously used for any chlorate must not be again used for shipments of any character.

(g) Metal kegs previously used for black powder not contained in an interior package must not be again used for shipment of any explosive.

NOTE 1: Because of the present emergency and until further order of the Commission, metal kegs, previously used for the shipment of black powder not contained in an interior package, may be used provided the kegs are in good physical condition and are not liable to permit escape of contents during transportation. Empty kegs previously used for shipment of black powder must be entirely free of black powder on the inside and outside before being offered for transportation.

(h) Single-trip containers made under specifications prescribed in Part 78 of this chapter from which contents have once been removed following use for shipment of any article, must not be again used as shipping containers for explosives, flammable liquids, flammable solids, oxidizing materials, corrosive liquids, or poisons, class B or C, as defined in this part: *Provided,* That during the present emergency and until further order of the Commission, single-trip containers may be reused if retested and approved for service by the Bureau of Explosives. Applications for permission for reuse should be made to the Bureau of Explosives, 30 Vesey Street, New York 7, N. Y.

§ 73.29 *Empty containers.* (a) Empty cylinders, barrels, kegs, drums, or other containers, previously used for the shipment of any explosive or other dangerous article, as defined in this part, if authorized for reuse must have all openings including removable heads, filling and vent holes, tightly closed before being offered for transportation.

(b) They may be loaded in open or stock cars when desired. Cars should not be placarded but lighted open-flame lanterns or other open-flame lights should be kept away.

(c) Carboys previously used for the shipment of corrosive liquids when offered to carriers for transportation as "empty" carboys, must have been thoroughly (completely) drained. Whenever practicable they should not be loaded with valuable or perishable freight.

(d) Empty bottles previously used for the shipment of acids or other corrosive liquids must be securely stoppered.

(e) All containers and accessories which have been used for shipments of radioactive materials when shipped as empty must be sufficiently free of radioactive contamination so as to conform to the conditions of paragraph (a) (1), (2), and (3) of § 73.392 of this part.

(f) Containers shipped as "empty" must have the old labels prescribed by this part removed, obliterated, destroyed, or completely covered by a square white label as described in § 73.413 of this part, measuring not less than six inches on each side, and bearing thereon the word "EMPTY" in letters not less than one-inch high. This does not apply to car-

load or truckload shipments to be unloaded by consignee.

§ 73.30 *Loading and placarding of cars by shippers.* (a) When shipments of explosives or other dangerous articles are loaded into cars by shippers, the applicable provisions of Part 74 of this chapter must be complied with. See § 74.538 of this chapter for loading and storage chart.

§ 73.31 *Qualification, maintenance, and use of tank cars.* (a) Tanks mounted on or forming part of a car and built in compliance with the American Railway Association's specifications for tank cars prior to July 1, 1927; or built in compliance with the Commission's specifications for tanks of tank cars in force prior to the effective date of Parts 71–78 of this chapter, including tanks already constructed or under construction on the effective date hereof in compliance with trial specifications for fusion-welded tanks of tank cars; or tanks built in compliance with specifications for fusion-welded tanks of tank cars made effective in Part 78 of this chapter are authorized for service, until further order of the Commission, as follows:

Where these regulations call for specification Nos.—	These specifications containers may also be used—
103[4, 5]	A. R. A. II[1, 4, 5], III[4, 5], IV[4, 5], I.C.C. 103W
103A [4]	A. R. A. II[3, 4], and III[3, 4], I.C.C. 103A–W
103B [4]	A. R. A. II[4], and III[4], rubber lined, I.C.C. 103B–W
103C [4]	I. C. C. 103C–W
104[4]	A. R. A. IV[4], I. C. C. 104W
104A	I. C. C. 104A–W
105A300	A. R. A. V[2]–I. C. C. 105[2], I. C. C. 105A–300W
105A400	I. C. C. 105A400W
105A500	I. C. C. 105A500W
105A600	I. C. C. 105A600W
106A500	I. C. C. 106A500X, I. C. C. 27 cylinders mounted on or forming part of a car and classified as multi-unit tank car prior to October 1, 1930 [6]
106A800	None
107A	None
108	Wooden tanks built and authorized prior to July 1, 1927
108A	Wooden tanks built and authorized prior to July 1, 1927

[1] Tank must be tested to a pressure of 60 pounds per square inch and safety valves must be set to open at a pressure of 25 pounds per square inch. Tank cars having head block anchorage must not be used for the transportation of flammable liquids.

[2] Tanks and their appurtenances must have been originally designed or subsequently reconstructed for the transportation of acids.

[3] Safety valves on these cars must be set to open at pressure not exceeding 225 pounds per square inch.

[4] Tank cars equipped with safety vents must have the vent closure so chained or otherwise fastened as to prevent misplacement.

[5] These cars must not be used for shipments of smokeless powder in water unless equipped with positive closure type bottom outlet valves.

[6] Cylinders made under specification B.E. 27 mounted on or forming part of a car, and classified as multi-unit tank cars prior to October 1, 1930, may be continued in service until further order of the Commission, provided they have been properly retested and are fitted with valves, valve protection devices, and safety devices, of approved type.

(b) Any riveted tank car after repairs requiring extensive riveting or calking must be retested as prescribed in paragraph (g) of this section, before the tank is returned to service.

(c) For repairs to forge-welded tanks of ICC–105A series (§§ 78.271 to 78.274 of this chapter), or fusion-welded tanks of ICC–W classes (§§ 78.280 to 78.289 of this chapter), or equipment therefor, requiring welding, the owner of the tank, or party authorized by the owner, must secure approval of such repairs from the Association of American Railroads' committee on tank cars. Fusion welds for repairs must be performed, inspected, and tested in the manner described by currently effective specification for the class of tank concerned, or the specification under which the tank was originally constructed. X-raying and stress relieving are required and must be done in an approved manner. Caulking of welded joints is prohibited. Tanks must be retested, as prescribed in paragraph (g) of this section, before being returned to service. For repairs to forge-welded tanks of ICC–105A series, or fusion-welded tanks of ICC–W classes, involving hot or cold working of the shell to restore contours as near as practicable to original design and construction, the owner of the tank, or party authorized by the owner, must render a detailed report of such repairs to the Secretary, Mechanical Division, Association of American Railroads.

(d) For repairs to ICC–106A type of tank or equipment (see §§ 78.275 and 78.276 of this chapter) therefor requiring welding, the owner of the tank, or party authorized by the owner, must secure approval from the Association of American Railroads' committee on tank cars of such repairs, and the welding and the stress-relieving must be the same as authorized for manufacture of tank. Tank must be retested as prescribed in paragraph (g) of this section, before being returned to service.

(e) A tank car other than of the ICC–106A (§§ 78.275 and 78.276 of this chapter) and 107A (§ 78.277 of this chapter) type that bears evidence of damage to the metal by fire must be withdrawn from transportation service: *Provided, however,* That where the damage to the tank is local only or confined to a section not exceeding 25 percent of the tank surface, the damaged material may be replaced.

(1) Tanks of ICC–106A and ICC–107A (§§ 78.275, 78.276, and 78.277 of this chapter) type exposed to the action of fire must not again be placed in service until they have been inspected inside and outside, to determine that no reduction in wall thickness has resulted, and properly heat-treated and retested. These operations must be carried out, supervised, and reported, as prescribed by these specifications for original heat treatment and test.

(f) After alterations of tank cars or equipment therefor from original design, a certificate of compliance with the specifications, similar to that required in specifications 103, 104A, 105A300, 106A500, 107A, and 108 (§§ 78.265, 78.270, 78.271, 78.275, 78.277, and 78.278 of this chapter), respectively, must be furnished to the car owner, to the Bureau of Explosives, and to the Secretary, Mechanical Division, Association of American Railroads.

(g) Metal tanks and safety valves of tank cars listed in the table in paragraph (a) of this section, must be retested within the periods and by methods prescribed in the respective specifications. For cars listed in second column of table, retests must conform to footnotes, and to specifications for cars listed on corresponding lines in first column of table. Retests of all tanks and safety valves must be certified by party making tests to owners of tank cars and to the Bureau of Explosives. Certifications must show initials and numbers of cars, pressure to which tested, date of test, place of test, and by whom test is made.

NOTE 1: Periodic retests of metal tanks, safety valves, and heater systems of tank cars authorized for transportation of flammable liquids and liquefied petroleum gases, now required to be made as prescribed in paragraph (g) of this section, may be waived because of the present emergency and until December 31, 1951, or until further order of the Commission.

(h) Before a tank car may be used for the transportation of any commodity other than that commodity for which it is currently equipped and authorized as indicated by the name of the commodity stenciled on the tank in accordance with the marking requirements of the specification, the owner of the car, or party authorized by the owner, must secure approval for changes in the stenciled name, manhole closure, safety valve, induction and eduction valves and pipes, and such other changes as are necessary to make the car suitable for the new service. The party making the changes must file with the Bureau of Explosives and the Secretary, Mechanical Division, Association of American Railroads, a certificate showing the approved changes made and the date same were performed in the following form:

CERTIFICATE OF CHANGES ACCOUNT LADING SERVICE TRANSFER

To Bureau of Explosives; to Car Owner; to Secretary, Mechanical Division, A. A. R.:

It is hereby certified that changes as listed below, approved by the A. A. R. Committee on Tank Cars under Application No. ------ Revision ------ on ------ (a) have been made on cars ------ (b) and these cars, changed as shown, comply with all applicable requirements prescribed as of this date by the I. C. C. Regulations for Transportation of Explosives and Other Dangerous Articles and the A. A. R. Specifications for Tank Cars, for tank cars authorized to be used for shipments of ------ (c)

Item	Existing Drawing No. (d)	Revision	Changed to Drawing No. (d) (e)	Revision
1. Manhole closure				
2. Safety valve				
3. Induction valves				
4. Eduction valves				
5. Check valves				
6. Eduction pipes				
7. Gauging device				
8. Thermometer well				
9. Sampling valve				
10. Dome fittings; arrangement				
11. Protective housing; arrangement				
	Obliterated		Applied	
12. Lading service stenciling				

The above described changes were made by ----------at ----------, ----------
(Name of company) (Place) (Date)
(By) ----------
(Title) ----------;
(Date) ----------

(a) Insert date of A. A. R. approval.
(b) Insert initials and numbers of cars being reported on.
(c) Insert proper shipping name as listed in § 72.5 of this chapter.
(d) Insert "None" opposite items not used on the tanks.
(e) Insert "No change" opposite items not changed.

NOTE 1: For qualification of cylinders and tank cars for compressed gases see §§ 73.34, 73.301 (g), and 73.314 of this part.

(i) A tank car that leaks, or that has any defect which would make leakage during transit probable, or that has not been properly tested and marked, must not be used for the transportation of dangerous articles.

(j) Before tank cars are loaded, the shipper must examine the tanks and their appurtenances to see that the safety and outlet valves, the safety vents, the excess flow valves (if any), the closures of all openings, and the protective covers of all appurtenances are in proper condition. Tanks with bottom discharge outlets must have their outlet caps off during entire time tanks are being loaded. After loading, tanks which show any dropping of liquid contents at the seams or rivets, or with bottom outlet valves which permit more than a dropping of the liquid with the outlet caps off, must not be offered for transportation until proper repairs have been made.

(k) Tank cars equipped with interior heater coils must be loaded with heater coil inlet and outlet caps off during entire time tanks are being loaded and show no leakage with these caps off.

(l) All closures of openings in tank cars and of their protective housings must be properly secured in place by the use of a bar, wrench, or other suitable tool. A wrench having a handle at least 36 inches long must be used to apply the outlet valve cap. Manhole covers and outlet valve caps must be made tight against leakage of vapor and liquid, by use of gaskets of suitable materials, before cars are tendered to carrier for transportation. Luting materials must not be used in outlet cap or on threads of bottom outlet.

NOTE 1: Safety valves, now used on tank cars, A. R. A. classes II [1], III [1], and IV [1] and I. C. C. specifications 103 and 104 (§§ 78.265 and 78.269 of this chapter) are reported to permit slow leakage of vapor and it appears that material changes in the design and construction of these valves are necessary to make them tight. The Commission has notified the Association of American Railroads, representing the carriers, and the American Petroleum Institute, representing the shippers, that the necessary changes must be made with the least possible delay. To accomplish this result, new designs must be devised and tested experimentally, and in the meantime necessary shipments must be made in tank cars now available. Pending the accomplishment of these changes, tank cars with safety valves which permit only a slow leakage of vapor may be used.

[1] Use of existing tank cars authorized, but new construction not authorized.

§ 73.32 *Qualification, maintenance, and use of portable tanks.* (a) Except as otherwise provided in this section, every portable tank container used for the transportation of dangerous articles shall fulfill the requirements of the specification and regulations for the transportation of the particular commodity. A manufacturer's data report of the portable tank container shall be procured and retained in the files of the owner during the time that such portable tank container is used for such service.

(1) When a portable tank container is used as a cargo tank container, it shall comply with all the requirements prescribed for cargo tank containers. (See § 73.33 of this part.)

(2) Portable tank containers for transportation as cargo on vessels in commerce subject to the jurisdiction of the United States Coast Guard shall not exceed a loaded weight of 8,000 pounds. Nothing contained in this section shall be so construed as to pertain to transportation on car floats or car ferries.

(b) Any portable tank container constructed prior to May 15, 1950, complying with the requirements of either the A. S. M. E. Code for Unfired Pressure Vessels, 1946 Edition, or the A. P. I.–A. S. M. E. Code for Unfired Pressure Vessels, 1943 Edition, may be used for the transportation of liquefied compressed gas, provided it fulfills all the requirements of this part and specifications for the particular gas or gases to be transported therein and shall be marked "ICC Specification 51X" on the plate required by the specification, except as modified by any or all of the following:

(1) Tanks designed and constructed in accordance with Pars. U-68, U-69, or U-201 of the A. S. M. E. Code may be used. Tanks designed and constructed in accordance with Pars. U-68 or U-69 may be re-rated at a working pressure 25 percent in excess of the design working pressure for which the tank was originally constructed. If advantage is taken of the increased rating, the re-rated pressure shall be marked on the plate as follows:

Re-rated working pressure ------ psig.

NOTE 1: For purposes of setting safety relief valves, pressure control valves, and establishing retest pressure, and for purposes of establishing maximum and minimum design working pressures, the re-rated working pressure shall be considered as the equivalent of the design working pressure as defined in the specification.

(2) Loading and unloading accessories, valves, piping, fittings, safety and gauging devices, do not have to comply with the requirements for the particular location on the tank.

(3) Tanks having capacities of between 750 pounds and 1,000 pounds of water shall be considered as portable tank containers for the purposes of this part. In lieu of using safety relief valves on such containers they may be equipped with fusible plugs only when the container is filled by weight. Size, number, and location, as well as character and physical properties of fusible plugs shall be approved by the Bureau of Explosives. These containers shall be marked "ICC Specification 51S".

(4) Specification requirements as to stress-relieving and radiographing are waived.

(c) Any portable tank container of ICC Specification 50 [2] fulfilling the requirements of that specification may be continued in service for transportation of a liquefied petroleum gas if it is retested every five years in accordance with the requirements of paragraph (e) (3), (4), and (5) of this section: *Provided,* That it is in and can be maintained in safe operating condition for the transportation of that gas. In this case the container may retain its original markings.

(d) Fusion welded portable tanks manufactured prior to July 19, 1948 in complete compliance with specifications included in ICC Authority No. 3666 dated December 28, 1939 (235 I. C. C. 595),[2] are authorized for the transportation of commercial butane: *Provided,* That they are in and can be maintained in safe operating condition for the transportation of that gas and are retested every five years in accordance with the requirements of paragraph (e) (3), (4), and (5) of this section. Certificate of manufacture for each tank and record of each required five year retest is filed with the Bureau of Explosives, and in addition to the markings prescribed by the aforementioned authority each tank is permanently marked "ICC–50X." (See Appendix A to Subpart C of Part 78 of this chapter.)

(e) Portable tank containers used for the transportation of dangerous articles shall be retested in accordance with the following and shall not be kept in or returned to transportation service unless they shall have successfully withstood the following prescribed tests, as appropriate in each instance:

(1) Every portable tank container manufactured in accordance with ICC Specification 60 (§ 78.255 of this chapter) shall be tested at the end of the first 4 year period after the original test and each 2 years thereafter up to 12 years of service and annually thereafter. Except that retests are not required on such tanks equipped with rubber lining but retests must be made before such tanks are relined. Retest of Specification 60 tanks (see § 78.255 of this chapter) to be as required in § 78.255–12 of Specification 60 (§ 78.255 of this chapter) for new tank.

(2) Every portable tank container which is constructed in accordance with ICC Specification 51 (§ 78.245 of this chapter), or qualified for transporting compressed gases as prescribed in these regulations shall be tested at least once in every five years in accordance with paragraph (e) (3), (4), and (5) of this section.

(3) The tank less any fittings shall be subjected to a hydrostatic pressure of one and one half times the design working pressure (maximum permitted working pressure or re-rated pressure) of the tank.

[2] Use of existing portable tanks authorized, but new construction not authorized.

(4) While under test pressure the tank shall be inspected for leakage, corroded areas, bad dents or other conditions which indicate weakness that might render the tank unsafe for transportation service and shall be rejected if evidence of any such unsafe condition is discovered.

(5) The tank lagging, if any, and its jacket need not be removed from lagged tanks unless it is found to be impossible to reach test pressure and maintain a condition of pressure equilibrium after test pressure is reached during tank retesting.

(f) Every tank not complying in all respects with the prescribed specifications, but otherwise allowable under this part, shall successfully withstand the identical tests at test periods required for "specification tanks" by paragraph (e) (3), (4), and (5) of this section. Tanks constructed in accordance with paragraph U-68 or U-69 of the A. S. M. E. Code, and which have not been re-rated, must be retested at a hydrostatic pressure of twice the design working pressure.

(g) Without regard to any other retest requirement, any tank that shows evidence at any time of bad dents, corroded areas, leakage or other conditions that indicate weakness which might render the tank unsafe for transportation service, shall be retested as prescribed by the requirements of paragraph (e) (3), (4), and (5) of this section.

(h) Any tank which has been in an accident and which has been damaged to an extent likely to cause it to be in unsafe condition or to an extent where such a condition is suspected, shall be tested as prescribed by the requirements of paragraph (e) (3), (4), and (5) of this section.

(i) Any tank which has been out of transportation service for a period of one year or more shall not be returned to or placed in such service until it shall have successfully fulfilled the testing requirements prescribed in paragraph (e) (3), (4), and (5) of this section.

(j) The Commission may require the testing under prescribed conditions of any tank when probable cause appears for suspecting that such tank is in unsafe operating condition.

(k) The repair of tanks is authorized, provided such repairs are made under requirements prescribed in the "Code" for the original design and construction.

(l) In addition to any other provisions of the specification, no tank shall be repaired, or remodeled, as to cause leakage or cracks or likelihood of leakage or cracks, by areas of stress concentration due to shrinkage of cooling metal in welding operations, sharp fillets, reversal of stresses, or otherwise.

(2) No field welding shall be done except to non-pressure parts.

(1) The bursting strength of any piping and fittings shall be not less than four times the design working pressure of the tank, and not less than four times that pressure to which, in any instance, it may be subjected in service, by the action of a pump or other device (not including safety relief valves) the action of which may be to subject certain portions of the tank piping to pressures greater than the design working pressure of the tank.

(1) Welded pipe joints shall be used wherever possible. Joints in copper tubing where permitted shall be of the brazed type or of any equally strong metal union type. Melting point of brazing material must be not less than 1,000° F. Such joints shall in any event be of such a character as not to decrease the strength of the tubing, as by the cutting of threads.

(2) Fittings shall be extra heavy. Non-malleable metals shall not be employed in the construction of valves or fittings.

(3) Suitable provision shall be made in every case to allow for expansion, contraction, jarring and vibration of all pipe. Slip joints shall not be used for this purpose.

(4) Piping and fittings shall be grouped in the smallest practicable space and shall be protected from damage as required by the specification.

(5) All piping, valves and fittings on every tank shall be leakage tested with gas or air after installation and proved tight at not less than the design working pressure of the tank on which they are used. In the event of replacement, all such piping, valves, or fittings so replaced shall be tested in accordance with the requirements of this section before the tank is returned to transportation service. The requirements of this section shall apply with equal force to all hose used on such tanks, except that such hose may be so tested either before or after installation on the tank.

(m) All materials of construction used in portable tank containers and their appurtenances shall not be subject to destructive attack by the contents of the tank.

(1) All parts of tanks and appurtenances for anhydrous ammonia shall be steel. No copper, silver, zinc, nor their alloys shall be permitted. Brazed joints shall not be permitted.

(n) Each outlet of portable tanks used for the transportation of liquefied compressed gases, except carbon dioxide, shall be provided with a suitable automatic excess-flow valve. These valves shall be located inside the tank or at a point outside the tank where the line enters or leaves the tank. The valve seat shall be located inside the tank or shall be located within a welded flange or its companion flange, or within a nozzle, or within a coupling. The installation shall be made in such a manner as reasonably to assure that any undue strain which causes failure requiring functioning of the valve shall cause failure in such a manner that it will not impair the operation of the valve.

Exception. Safety device connections and liquid level gauging devices which are so constructed that the outward flow of tank contents shall not exceed that passed by a No. 54 drill size opening are not required to be equipped with excess-flow valves.

(1) Excess-flow valves shall close automatically at the rated flows of gas or liquid as specified by the valve manufacturer. The connections or lines on each side of the excess-flow valve, including valves, fittings, etc., shall have a greater capacity than the rated flow of the excess-flow valve.

(2) Excess-flow valves may be designed with a by-pass, not to exceed a No. 60 drill size opening, to allow equalization of pressures.

(3) Filling and discharge lines shall be provided with manually operated shut-off valves located as close to the tank as is practicable. The use of so-called "Stop-Check" valves to satisfy with one valve the requirements of this subparagraph and of paragraph (n) of this section, is forbidden.

(o) Each tank for carbon dioxide and nitrous oxide shall be lagged with a suitable insulation material of such thickness that the overall thermal conductance is not more than 0.08 Btu per square foot per degree F. differential in temperature per hour. The conductance shall be determined at 60° F. In no event shall less than 4 inches of thickness of insulation be used. Insulation material used on tanks, for nitrous oxide shall be noncombustible.

(p) A refrigerating and/or heating coil or coils may be installed in tanks for carbon dioxide and nitrous oxide. Such coils must be tested externally to at least the same pressure as the test pressure of the tank. The coils must also be tested internally to at least twice the working pressure of the heating or refrigerating system to be used but in no case less than the test pressure of the tank. Such coils shall be securely anchored. The refrigerant or heating medium to be circulated through the coil or coils must be such as to cause no adverse chemical reaction with the tank or tank contents in case of leakage.

§ 73.33 *Qualification, maintenance, and use of cargo tanks.* (a) Except as otherwise provided in this section, every cargo tank used for the transportation of dangerous articles shall fulfill the requirements of the specification and regulations for the transportation of the particular commodity. A manufacturer's data report of the cargo tank shall be procured and retained in the files of the motor carrier during the time that such cargo tank is used for such service.

(1) Cargo tank containers for transportation as cargo on vessels in commerce subject to the jurisdiction of the United States Coast Guard shall not exceed a loaded weight of 8,000 pounds. Nothing contained in this section shall be so construed as to pertain to transportation on car floats or car ferries.

(2) Cargo tanks to be used for the transportation of corrosive or flammable liquids shall be of the types prescribed by the regulations and maintained or retested in accord with the requirements appearing in such specifications.

(b) Any cargo tank constructed prior to May 15, 1950, complying with the requirements of either the A. S. M. E. Code for Unfired Pressure Vessels, 1946 Edition, or the A. P. I.-A. S. M. E. Code for Unfired Pressure Vessels, 1943 Edition, for the transportation of liquefied compressed gases, may be used in that service, if it is retested every five years in accordance with the requirements of paragraph (k) (2), (3), and (4) of this

section: *Provided,* It fulfills all the requirements of the regulations and specifications for cargo tanks for the transportation of the particular gas or gases to be transported therein, except in regard to the provisions of paragraph (b) (1) or (2) of this section, and shall be marked "ICC Specification MC330X" on the plate required by Specification MC330 (§ 78.336 of this chapter).

(1) Tanks designed and constructed in accordance with pars. U-68 or U-69 of the A. S. M. E. Code for the transportation of liquefied compressed gases may be used and may be re-rated at a working pressure 25 percent in excess of the design working pressure for which the tank was originally constructed. If advantage is taken of the increased rating, the re-rated pressure shall be marked on the plate as follows:

Re-rated working pressure ------ psig.

NOTE 1: For purposes of setting safety relief valves and pressure control valves, and for purposes of establishing maximum and minimum design working pressures, the re-rated working pressure shall be considered as the equivalent of the design working pressure as defined in the specification.

(2) Loading and unloading accessories, valves, piping, fittings, safety and gauging devices, do not have to comply with the requirements for the particular location on the tank.

(c) Any cargo tank of ICC Specification MC320 [1] constructed or put in service on and after February 1, 1942, and prior to May 15, 1950, fulfilling the requirements of that specification may be continued in service for the transportation of a liquefied petroleum gas if it is retested every five years in accordance with the requirements of paragraph (k) (2), (3), and (4) of this section: *Provided,* That it is in and can be maintained in safe operating condition for the transportation of that gas, and shall be marked "ICC Specification MC320" on the plate required by Specification MC330 (§ 78.336 of this chapter).

(d) Any cargo tank of ICC Specification 7.6–S–1.2,[1] constructed or put into service on and after June 15, 1940, and prior to February 1, 1942, fulfilling the requirements of that specification may be continued in service for the transportation of a liquefied petroleum gas if it is retested every five years in accordance with the requirements of paragraph (k) (2), (3), and (4) of this section: *Provided,* That it is in and can be maintained in safe operating condition for the transportation of that gas, and shall be marked "ICC Specification MC–7.6–S–1.2" on the plate required by Specification MC330 (§ 78.336 of this chapter).

(e) Any cargo tank constructed prior to June 15, 1940, in accordance with either the A. S. M. E. or A. P. I.-A. S. M. E. Code for Unfired Pressure Vessels effective at the time of fabrication, and previously authorized under ICC Specification MC320,[1] may be continued in service for the transportation of a liquefied petroleum gas if retested annually in accordance with paragraph (k) (2), (3), and (4) of this section: *Provided,* That it is in and can be maintained in safe operating condition for the transportation of that gas and shall be marked "ICC Specification MC320Y" on the plate required by Specification MC330 (§ 78.336 of this chapter).

(f) Any cargo tank constructed other than prescribed in paragraphs (c), (d), and (e) of this section, and previously authorized under ICC Specification MC320,[1] may remain in service for the transportation of a liquefied petroleum gas only: *Provided,* That it is retested annually in accordance with the requirements of paragraph (k) (2), (3), and (4) of this section: *Provided,* That it is in and can be maintained in safe operating condition for the transportation of that gas: *Further provided,* That it must be equipped with all the safety devices and fittings required under this section and ICC Specification MC330 (§ 78.336 of this chapter) for the transportation of that gas, although they need not be mounted all in one place as required therein but must be adequately protected against the hazards of collision, overturn, or both, and, in addition, must be marked "ICC Specification MC320Z" on the plate required by Specification MC330 (§ 78.336 of this chapter).

(g) Cargo tanks made prior to May 15, 1950, and authorized for use under regulations of the Commission effective March 1, 1935, or those effective June 15, 1940, may be continued in use until further order of the Commission, in accordance with Specifications MC300 to MC303, and MC310 (§§ 78.321 to 78.324 and § 78.330 of this chapter).

Where these regulations call for specification numbers:	These containers made under specifications effective June 15, 1940, may also be used:
MC 200	7.2–S–1
MC 201	7.2
MC 300	7.3–S–1.2
MC 301	7.3–S–1.3
MC 302	7.3–S–1.4
MC 303	7.3–S–1.5
MC 310	7.5–S–1.2

(h) Any novel cargo tank which has been or may be authorized for the transportation of a particular dangerous article may be continued in or placed in service only under the terms specifically prescribed by the Commission.

(i) Notwithstanding any of the provisions of paragraphs (a) to (h) of this section, any cargo tank constructed prior to May 15, 1950, which can qualify under and fulfill all of the requirements of any of the specifications and regulations for cargo tanks prescribed for the transportation of a particular dangerous article may be put into service and marked under the terms of such specification.

(j) The Commission may, upon written request for such authorization by a motor carrier, authorize the use of limited numbers, and for limited times, of new cargo tanks which fail to meet the requirements of the specification for cargo tanks contained in Part 78 of this chapter. In the event of such request for authorization, the carrier shall furnish those details concerning the design and construction of the tank motor vehicle and the cargo tank as seem necessary for the determination of its ability to transport safely the proposed commodity.

(k) Cargo tanks used for transportation of liquefied compressed gases shall be retested in accordance with the following and shall not be kept in or returned to transportation service unless they shall have successfully withstood the following prescribed tests, as appropriate in each instance:

(1) Every cargo tank which is constructed in accordance with the specifications prescribed in Part 78 of this chapter shall be tested as prescribed in paragraph (k) (2), (3), and (4) of this section.

(2) The tank less any fittings shall be subjected to a hydrostatic pressure of one and one-half times the design working pressure (maximum permitted working pressure or re-rated pressure) of the tank.

(3) While under test pressure the tank shall be inspected for leakage, corroded areas, bad dents, or other conditions which indicate weakness that might render the tank unsafe for transportation service and shall be rejected if evidence of any such unsafe condition is discovered.

(4) The tank lagging, if any, and its jacket need not be removed from lagged tanks unless it is found to be impossible to reach test pressure and maintain a condition of pressure equilibrium after test pressure is reached during tank retesting.

(5) Every tank not complying in all respects with the prescribed specifications, but otherwise allowable under this part, shall successfully withstand the identical tests at test periods required for "specification tanks" by paragraph (k) (2), (3), and (4) of this section. Non-specification tanks (paragraphs (e) and (f) of this section) shall be tested at least once in every calendar year as required in paragraph (k) (2), (3), and (4) of this section. Tanks constructed in accordance with Pars. U-68 or U-69 of the A. S. M. E. Code, and which have not been re-rated, must be retested at a hydrostatic pressure of twice the design working pressure.

(6) Every cargo tank which shall have been authorized by the Commission to transport dangerous articles under the provisions of paragraph (j) of this section shall be tested under requirements specifically set forth in the terms of such authorization.

(7) Without regard to any other retest requirement, any tank that shows evidence at any time of bad dents, corroded areas, leakage, or other conditions that indicate weakness which might render the tank unsafe for transportation service, shall be retested as prescribed by paragraph (k) (2), (3), and (4) of this section.

(8) Any tank which has been in an accident and which has been damaged to an extent likely to cause it to be in unsafe condition or to an extent where such a condition is suspected, shall be tested as prescribed by paragraph (k), (2), (3), and (4) of this section.

(9) Any tank which has been out of transportation service for a period of one year or more shall not be returned to

[1] Use of existing cargo tanks authorized, but new construction not authorized.

or placed in such service until it shall have successfully fulfilled the testing requirements prescribed by paragraph (k) (2), (3), and (4) of this section.

(10) The Commission may require the testing under prescribed conditions of any tank when probable cause appears for suspecting that such tank is in unsafe condition.

(11) Every cargo tank authorized for the transportation of flammable liquids and/or corrosive liquids under specifications MC 300 to MC 303 inclusive, or MC 310 (§§ 78.321 to 78.324, or § 78.330 of this chapter) must be retested as provided in the applicable specification, except that retests not required on tanks equipped with rubber lining but retests must be made before such tanks are relined.

(l) The repair of tanks is authorized, provided such repairs are made under requirements prescribed in the "Code" for its original design and construction.

(1) In addition to any other provisions of the specification, no tank shall be repaired, or remodeled, as to cause leakage or cracks or likelihood of leakage or cracks, by areas of stress concentration due to shrinkage of cooling metal in welding operations, sharp fillets, reversal of stresses, or otherwise.

(2) No field welding shall be done except to non-pressure parts.

(m) The bursting strength of any piping and fittings shall be not less than four times the design working pressure of the tank, and not less than four times that pressure to which, in any instance, it may be subjected in service, by the action of a pump or other device (not including safety relief valves) the action of which may be to subject certain portions of the tank piping to pressures greater than the design working pressure of the tank.

(1) Welded pipe joints shall be used wherever possible. Joints in copper tubing shall be of the brazed type where permitted or of any equally strong metal union type. Melting point of brazing material must be not less than 1000° F. Such joints shall in any event be of such a character as not to decrease the strength of the tubing, as by the cutting of threads.

(2) Fittings shall be extra heavy. Non-malleable metals shall not be employed in the construction of valves or fittings.

(3) Suitable provision shall be made in every case to allow for expansion, contraction, jarring, and vibration of all pipe. Slip joints shall not be used for this purpose.

(4) Piping and fittings shall be grouped in the smallest practicable space and shall be protected from damage as required by the specification.

(5) All hose, wherever used, shall be designed for a bursting pressure not less than four times the design working pressure of the tank with which it is used, and not less than four times that pressure to which, in any instance, it may be subjected in service by the action of a pump or other device, the action of which may be to subject the hose to pressures greater than the design working pressure of the tank. Any coupling used on hose to make connections shall be designed for a working pressure, not less than 20 percent in excess of the design working pressure of the hose, and shall be so designed that there will be no leakage when connected.

(6) All piping, valves, and fittings on every tank shall be leakage tested with gas or air after installation and proved tight at not less than the design working pressure of the tank on which they are used. In the event of replacement, all such piping, valves, or fittings so replaced shall be tested in accordance with the requirements of this section before the tank is returned to transportation service. The requirements of this section shall apply with equal force to all hose used on such tanks, except that such hose may be so tested either before or after installation on the tank.

(7) Liquid pumps or gas compressors, wherever used, must be of suitable design, adequately protected against breakage by collisions, and kept in good condition. They may be driven by motor vehicle power take-off or other mechanical, electrical, or hydraulic means. Unless they are of the centrifugal type, they shall be equipped with suitable pressure actuated by-pass valves permitting flow from discharge to suction or to the tank. Liquid pumps shall not be used on tanks for the shipment of sulphur dioxide.

(8) Each tank used for the shipment of carbon dioxide or nitrous oxide shall be provided with a suitable pressure gauge. A shut-off valve must be installed between the pressure gauge and the tank. This gauge need be used only during the filling operation.

(n) All materials of construction used in cargo tanks and their appurtenances shall not be subject to destructive attack by the contents of the tank.

(1) All parts of tanks and appurtenances for anhydrous ammonia shall be steel. No copper, silver, zinc, nor their alloys shall be permitted. Brazed joints shall not be permitted.

(o) Each outlet of cargo tanks used for the transportation of liquefied compressed gases, except carbon dioxide, shall be provided with a suitable automatic excess-flow valve or in lieu thereof may be fitted with quick closing internal valves. The quick closing internal valve shall be operated by an independent fluid medium. These valves shall be located inside the tank or at a point outside the tank where the line enters or leaves the tank. The valve seat shall be located inside the tank or shall be located within a welded flange or its companion flange, or within a nozzle, or within a coupling. The installation shall be made in such a manner as reasonably to assure that any undue strain which causes failure requiring functioning of the valve shall cause failure in such a manner that it will not impair the operation of the valve.

Exception. Safety device connections and liquid level gauging devices which are so constructed that the outward flow of tank contents shall not exceed that passed by a No. 54 drill size opening are not required to be equipped with excess-flow valves.

(1) Excess-flow valves shall close automatically at the rated flows of gas or liquid as specified by the valve manufacturer. The connections or lines on each side of the excess-flow valve, including valves, fittings, etc., shall have a greater capacity than the rated flow of the excess-flow valve.

(2) Excess-flow valves may be designed with a by-pass, not to exceed a No. 60 drill size opening, to allow equalization of pressures.

(3) Filling and discharge lines shall be provided with manually operated shut-off valves located as close to the tank as is practicable. The use of so-called *"Stop-Check"* valves to satisfy with one valve the requirements of this rule and of paragraph (o) of this section, is forbidden.

(p) Each tank for carbon dioxide and nitrous oxide shall be lagged with a suitable insulation material of such thickness that the over-all thermal conductance is not more than 0.08 Btu per square foot per degree F. differential in temperature per hour. The conductance shall be determined at 60° F. In no event shall less than 4 inch of thickness of insulation be used. Insulation material used on tanks for nitrous oxide shall be non-combustible.

(q) A refrigerating and/or heating coil or coils may be installed in tanks for carbon dioxide and nitrous oxide. Such coils must be tested externally to at least the same pressure as the test pressure of the tank. The coils must also be tested internally to at least twice the working pressure of the heating or refrigerating system to be used but in no case less than the test pressure of the tank. Such coils shall be securely anchored. The refrigerant or heating medium to be circulated through the coil or coils must be such as to cause no adverse chemical reaction with the tank or tank contents in case of leakage. If desired, the unit furnishing refrigeration may be mounted on the motor vehicle.

§ 73.34 *Qualification, maintenance, and use of cylinders.* (a) Cylinders in domestic use previous to the date upon which specifications therefor were first made effective may be used if the cylinders have been properly tested and otherwise comply with the requirements of paragraphs (b) to (k) of this section.

(b) Cylinders of foreign manufacture, received from foreign countries for charging with compressed gas, may be charged and shipped for export only:

(1) *Provided,* They are retested in accordance with paragraph (j) of this section. This retest may be omitted only if the cylinder can be definitely identified as having been retested under this provision within the prescribed retest period.

(2) *Provided further,* That the maximum filling density and service pressure for each cylinder shall be in accordance with all packing requirements of this part for the compressed gas involved and the test pressure established by the retest of the cylinder.

(3) Records giving data showing the results of the tests made on all cylinders must be preserved for inspection for at least 5 years.

(4) Bill of lading or other shipping paper shall, when possible, identify the cylinder and shall carry the following certification: "These cylinders have

been retested and refilled in accordance with the I. C. C. requirements for export."

(c) Cylinders previously used in any service in accordance with this part may be transferred to a service requiring less strength and for which they are suitable, upon application to the Bureau of Explosives and receipt of advice to change the marking on the cylinders.

(d) Cylinders made prior to October 1, 1930, for which steel manufacturer's certificates are not available but for which physical and chemical tests on samples taken from one out of each 200 cylinders are in proper form, each cylinder having been satisfactorily tested in water-jacket apparatus to 2 times the service pressure (see § 73.301 (g) of this part), properly reported as otherwise in full compliance with spec. 7 [1] effective at date of manufacture, and lawfully marked ICC–7–150,[1] are authorized for use under the provisions of this part.

(e) When containers with a marked pressure limit are prescribed, other containers made under the same specification, but with a higher marked pressure limit are authorized. For example, containers marked ICC–4B500 (§ 78.50 of this chapter) may be used where ICC–4B300 (§ 78.50 of this chapter) is specified.

(f) *Safety devices.* Each cylinder, unless excepted in this paragraph, containing compressed gas must be equipped with one or more safety devices approved, as to type and location, by the Bureau of Explosives and found to prevent explosion of the normally charged cylinder when it is placed in a fire. Cylinders shall not be shipped with leaking safety devices. Safety devices must be tested for leaks before the charged cylinder is shipped from the cylinder filling plant; it is expressly forbidden to repair leaking fuse plug devices, where leak is through the fusible metal or between the fusible metal and the opening in the plug body, except by removal of the device and replacement of the fusible metal.

(1) Cylinders, other than those made under specification ICC–9 (§ 78.63 of this chapter) or ICC–40 (§ 78.66 of this chapter), not over 12 inches long, exclusive of neck, nor over 4½ inches outside diameter, unless containing a liquefied gas for which this part prescribes a service pressure of 1,800 pounds per square inch or higher or containing a nonliquefied gas having a pressure in the cylinder of 1,800 pounds per square inch or higher at 70° F.

NOTE 1: Cylinders manufactured prior to July 1, 1949, and not originally equipped with a safety device may be continued in service without device until July 1, 1951.

(2) Cylinders containing nonliquefied gas under pressure of 300 pounds per square inch or less at 70° F.

(3) Cylinders containing poisonous gas or liquid as defined in § 73.326 (a) of this part.

(4) Cylinders containing fluorine, methyl mercaptan, or mono, di, or trimethylamine, anhydrous. Cylinders containing not over 10 pounds of nitrosyl chloride, or cylinders containing less than 165 pounds of anhydrous ammonia.

(5) Drums containing liquefied petroleum gas as provided for in § 73.312 (a) (5) and (6) of this part.

(g) Marking on cylinders must not be changed except as follows:

(1) By application of additional marks not affecting the test pressure or filling pressure; these must not obliterate previously applied marks.

(2) By application of test pressure or filling pressure marks, or alteration of such marks, to indicate a reduced test and filling pressure; authorized only for cylinders that have not failed in the quinquennial test.

(3) By change of serial numbers or ownership marks or both; report in sufficient detail so that previous serial number and ownership marks can be determined for each cylinder, arranged by lot numbers or by consecutive serial numbers, must be filed with the Bureau of Explosives.

(4) By change in marks which indicate compliance with specifications and charging and testing pressures (such as ICC–3, ICC–3A–1800) to indicate a higher test and filling pressure; authorized only upon written instructions from the Bureau of Explosives.

(5) When restrictions imposed by § 73.304 of this part will result in condemnation of cylinders previously in authorized use, the Bureau of Explosives shall, upon application, approve change in marks for pressures not greater than as follows: ICC–7–70 for change to ICC–7–116; ICC–26–150 for change to ICC–26–300; ICC–26–300 for change to ICC–26–450; ICC–26–600 for change to ICC–26–900; ICC–26–1000 for change to ICC–26–1200.

(6) When the space originally provided for dates of subsequent retests becomes filled, the stamping of additional test dates into the external surface of footrings of cylinders is authorized.

(7) Marking on cylinders must be kept plain. All prescribed markings on cylinders must be maintained in a readable condition, or a copy of said markings reproduced by stamping on brass plates permanently secured to the cylinders is permitted.

(h) Cylinders exposed to the action of fire. Cylinders which have been in a fire must not again be placed in service until they have been properly heat treated and retested as prescribed in paragraph (i) of this section: *Provided*, That cylinders made of plain carbon steel with not over 0.25 percent carbon need not be heat treated, and may be used after passing the pressure test prescribed. Acetylene cylinders, except those authorized in specification ICC–8 (§ 78.59 of this chapter), to be made of 4130X steel and those made to comply with specification 8AL (§ 78.60 of this chapter), need not be heat treated or tested, provided porous filling is found to be unchanged and intact.

(i) Reheat treatment and retest of cylinders. The reheat treatment of cylinders must be followed by hydrostatic retest and these operations must be carried out, supervised, and reported, as prescribed for the original heat treatment and hydrostatic test by the specification covering the manufacture of the type of cylinder in question. The retest pressure shall be as prescribed for the quinquennial retesting of cylinder: *Provided*, That increased retest pressure is authorized under testing procedure approved in writing by the Bureau of Explosives. In the case of cylinders of outside diameter exceeding 4 inches, a permanent expansion of not less than 3 percent or more than 10 percent of the total expansion must be shown in the retest: *Provided*, That if the cylinders can be segregated into lots having practically the same chemical composition, the allowable permanent expansion in the retest may be from zero to 10 percent of the total expansion, if one cylinder out of each such lot of 100 cylinders or less is subjected to and passes the requirements of the flattening and physical tests as specified by the specification for the manufacture of the type of cylinder in question.

(j) Quinquennial retest of cylinders. Each cylinder, except as specifically exempted in paragraph (k) of this section, must be subjected, at least once in five years, to a test by interior hydrostatic pressure in a water jacket, or other apparatus of suitable form, for the determination of the expansion of the cylinder. The test apparatus must be approved as to type and operation by the Bureau of Explosives. This periodic retest must include a visual internal and external examination, except that the internal inspection may be omitted for cylinders of the type and in the service described under paragraph (k) (11) of this section: *Provided*, That without regard to date of previous test, cylinders of ICC–4 type (§ 78.48 of this chapter) that show bad dents or other evidence of rough usage, or that are corroded locally to such extent as to indicate possible weakness, or that have lost as much as 5 percent of their official tare weight, must be retested before being again charged and shipped. After any retest, the actual tare weight for those cylinders passing the test may be recorded as their new official tare weight.

(1) In hydrostatic retesting of a cylinder the pressure must be maintained for at least 30 seconds and as much longer as may be necessary to secure complete expansion of the cylinder. The gauge indicating the total expansion of the cylinder must be such that the total expansion can be read with an accuracy of 1 percent, except that a reading to 0.1 cubic centimeter shall be acceptable. The gauge indicating the pressure must be capable of being read to within 1 percent of the test pressure. Any internal pressure applied previous to the test pressure shall not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower value.

(2) A cylinder must be condemned when it leaks, or when internal or external corrosion, denting, bulging, or evidence of rough usage exists to the ex-

[1] Use of existing cylinders authorized, but new construction not authorized.

tent that the cylinder is likely to be weakened appreciably or when the permanent expansion exceeds 10 percent of the total expansion. A cylinder condemned for excessive permanent expanpansion may be re-heat-treated. (See paragraph (i) of this section). ICC–4 series cylinders (§ 78.48 of this chapter), condemned for other than excessive permanent expansion may be repaired or rebuilt as prescribed in paragraphs (m), (n), (o), and (p), of this section.

(3) Records giving data showing the results of the tests made on all cylinders must be kept, and each cylinder passing the test must be marked with the date (month and year) plainly and permanently stamped into the metal of the cylinder. For example, 4–50 for April 1950. Dates of previous tests must not be obliterated.

(k) The tests prescribed by paragraph (j) of this section, must be (for exceptions see paragraph (k) (1) to (11) of this section):

Specification under which cylinders were made	*Minimum retest pressure (pounds per square inch)*
ICC–3	3,000 pounds.
ICC–3A; ICC–3D; ICC–4A; ICC–26 marked for filling at over 450 pounds.	5/3 times the service pressure. (See § 73.301 (g).)
ICC–3B; ICC–3BN; ICC–4B; ICC–4BA; ICC–26 marked for filling at 450 pounds and below.	2 times the service pressure. (See § 73.301 (g).)
ICC–3C; ICC–3E; ICC–4C; ICC–8; ICC–8AL	Quinquennial test not required.
ICC–7 when used as authorized in § 73.312 (a) (4).	300 pounds.
ICC–7 when not used under authority of § 73.312 (a) (4).	Quinquennial test not required.
ICC–4	700 pounds.
ICC–9	400 pounds.
ICC–25; ICC–38	500 pounds.
ICC–33	800 pounds.

Exceptions. (1) All cylinders of outside diameter less than 2 inches and length less than 2 feet are exempted from retest.

(2) All cylinders marked with a test pressure must be retested at that pressure.

(3) High-pressure cylinders (designed for pressures in excess of 300 pounds at 70° F.) made before March 31, 1912, and not marked with a test pressure or with an allowable filling pressure, must be retested at 3,000 pounds per square inch.

(4) Low-pressure cylinders of the I. C. C. 7[1] type (designed for nonliquefied gas at not over 300 pounds at 70° F.) made before March 31, 1912, must be tested once at two times the filling pressure for which they were designed. Further tests not required.

(5) Acetylene cylinders of the I. C. C. 8 type (§ 78.59 of this chapter) made before March 31, 1912, must be tested once at 500 pounds. Further tests not required.

(6) Anhydrous ammonia cylinders of the I. C. C. 4 type (§ 78.48 of this chapter) made before March 31, 1912, and having heads of small or flat curvature that will not stand a test of 900 pounds without showing more than 10 percent permanent expansion, and wrought iron cylinders of the same type made before 1895 that have been annealed so as to put them in proper condition, must be retested at 500 pounds per square inch.

(7) Cylinders made in compliance with specification I. C. C. 4 (§ 78.48 of this chapter), and other cylinders of that type made before March 31, 1912, may be retested decennially instead of quinquennially if the test is made at a pressure of not less than 700 pounds per square inch.

(8) Chlorine and sulfur dioxide cylinders made before April 20, 1915, must be retested at 500 pounds per square inch.

(9) Cylinders of not over 10 pounds water capacity and authorized for a service pressure (see § 73.301 (g) of this part) of not over 300 pounds per square inch may be tested by application of required test pressure without the use of special apparatus and without determination of total or permanent expansion.

(10) ICC–9 (§ 78.63 of this chapter) cylinders must be tested in accordance with the requirements of §§ 78.63–13 (a) and 78.63–17 (b) of this chapter.

(11) Cylinders made in compliance with specifications ICC–4B (§ 78.50 of this chapter), ICC–4BA (§§ 78.51 of this chapter), and ICC–26–300,[1] used exclusively for dichlorodifluoromethane, difluoroethane, difluoromonochloroethane, monochlorodifluoromethane, monochlorotetrafluoroethane, monochorotrifluoroethylene, or mixtures thereof, or mixtures of one or more with trichloromonofluoromethane, methyl chloride, or liquefied petroleum gas, commercially free from corroding components, and protected externally by suitable corrosion resisting coatings (such as galvanizing, painting, etc)., may be retested decennially instead of quinquennially, or, such cylinders may be subjected to an internal hydrostatic pressure equal to at least 2 times the marked service pressure without determination of expansions (see Note 1), but this type of test must be repeated quinquennially after expiration of the first ten-year period. When subjected to this latter test cylinders must be carefully examined under test pressure and removed from service if leaks or other harmful defects exist. All tests must be supplemented by a very careful examination of the cylinder at each filling, and must be rejected if evidence is found of bad dents, corroded areas, a leak or other conditions that indicate possible weakness which would render the cylinder unfit for service.

NOTE 1: Cylinders tested by the modified hydrostatic method shall be marked after each retest with the date of test as otherwise required but followed by the symbol S; for example, 8–46S indicating retest by the modified method in August 1946.

(l) Repair of specifications ICC–3A, 3B, or 3C (§§ 78.36, 78.38, or 78.40 of this chapter) cylinders by welding or brazing authorized, but only for the removal and replacement of neckrings and footrings attached to cylinders originally manufactured to conform to § 78.36–9 (a) of this chapter. Removal and replacement must be done by a regular manufacturer of this type of cylinder. After removal and before replacement of such parts, cylinders must be inspected, and defective ones rejected. Cylinders, neckrings, footrings, and method of replacement must conform to § 78.36–9 (a) of this chapter. Replacement must be followed by reheat treating, testing, inspection, and supervised and reported as prescribed by the specification covering their original manufacture. Inspector's reports must comform to § 78.36–22 (a) of this chapter and substitute the word repaired in place of manufactured. Show original markings and the new additional markings added, and statement: "Cylinders were carefully inspected for defects after removal of neckrings and footrings and after replacement, which replacement was made by process of_____."

(Welding-brazing)

(m) Repairs on ICC–4 series (§ 78.48 of this chapter), and ICC–8 (§ 78.59 of this chapter), welded or brazed cylinders are authorized to be made by welding or brazing. Such repairs must be made by a manufacturer of this type of ICC cylinder and by a process similar to that used in its manufacture and under the following specific requirements:

(1) Cylinders with injurious defects in welded joints in or on pressure parts must be repaired by completely removing the defect prior to rewelding.

(2) Cylinders with injurious defects in brazed joints in or on pressure parts must be repaired by rebrazing.

(3) Cylinders during welding must be free of materials in contact with the welded joint that may impair the serviceability of the metal in or adjacent to the weld. (Precautions must be taken to prevent acetylene cylinder steels from picking up carbon during repair.)

(4) Neckrings, footrings, or other nonpressure attachments authorized by the specification may be replaced or repaired.

(5) After removal, and before replacement of attachments, cylinders must be inspected and defective ones rejected, repaired or rebuilt.

(6) After repair, cylinders must be reheat-treated, tested, inspected and reported when and as prescribed by the specification covering their original manufacture when welding or brazing seams in a pressure part of a cylinder; or when welding or brazing on pressure parts of cylinders of plain carbon steels with carbon over 0.25 percent or manganese over 1.00 percent or of alloy steels.

NOTE 1: The physical and flattening tests may be omitted when the cylinders are not reheat-treated.

(7) Repair of cylinders must be followed by a proof pressure leakage test at prescribed test pressure and visual examination for weld quality when welding or brazing on pressure parts of cylinders of plain carbon steel with carbon 0.25 percent or less and manganese 1.00 percent or less.

(n) Repair of nonpressure attachments by welding or brazing without affecting a pressure part of the cylinder must be followed by visual examination for weld quality.

(o) Walls, heads or bottoms of cylinders with injurious defects or leaks in base metal shall not be repaired, but may be replaced as provided for in paragraph (p) of this section.

(p) Rebuilding of ICC–4 series (§ 78.48 of this chapter), and ICC–8 (§ 78.59 of this chapter), welded or brazed cylinders is authorized. Such rebuilding must be done by a manufacturer of this type of ICC cylinder and by

[1] Use of existing cylinders authorized, but new construction not authorized.

a process similar to that used its original manufacture and under the following specific requirements:

(1) The replacement of a pressure part such as wall, heads, or bottoms of cylinders or the replacement of the porous filling material, shall be considered as rebuilding.

(2) Rebuilt cylinders shall be considered as new cylinders and shall conform to all the requirements of the specifications applying, including verification of material, examination, inspection, etc., and the rendering of the proper reports to the purchaser, cylinder rebuilder, and the Bureau of Explosives.

(3) Information in sufficient detail regarding previous serial numbers and identification symbols must be filed with the Bureau of Explosives.

(q) A cylinder must be condemned when it leaks, or when internal or external corrosion, denting, bulging, or evidence of rough usage exists to the extent that the cylinder is likely to be weakened appreciably. Condemned cylinders, ICC–4 series (§ 78.48 of this chapter), and ICC–8 (§ 78.59 of this chapter), may be repaired and rebuilt as prescribed in paragraphs (m), (n), (o), and (p), of this section.

SUBPART B—EXPLOSIVES; DEFINITIONS AND PREPARATION

§ 73.50 *An explosive.* (a) For the purpose of Parts 71–78 of this chapter an explosive is defined as any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion, i. e., with substantially instantaneous release of gas and heat, unless such compound, mixture, or device is otherwise specifically classified in Parts 71–78 of this chapter.

§ 73.51 *Forbidden explosives.* (a) The offering of the following explosives for transportation by common carriers by rail freight, rail express, highway, or water is forbidden.

(b) Explosive compositions that ignite spontaneously or undergo marked decomposition when subjected for 48 consecutive hours to a temperature of 75° C. (167° F.).

(c) Explosives containing an ammonium salt and a chlorate.

(d) Liquid nitroglycerin, diethylene glycol dinitrate or other liquid explosives not authorized by § 73.53 (e) and (h) of this part. (For shipment by carrier by motor vehicle other than common carriers, see § 77.822 (b) of this chapter).

(e) Explosives condemned by the Bureau of Explosives (except properly packed samples for laboratory examinations). Appeal may be made to the Commission from such condemnations.

(f) Leaking or damaged packages of explosives.

(g) Condemned or leaking dynamite must not be repacked and offered for shipment unless the repacking is done by a competent person in the presence of, or with the written consent of, an inspector, or with the written authority of the chief inspector of the Bureau of Explosives.

(h) Firecrackers, flash crackers or salutes, the explosive contents of which exceed 12 grains each in weight.

(i) Fireworks that combine an explosive and a detonator or blasting cap.

(j) Fireworks containing an ammonium salt and a chlorate.

(k) Fireworks containing yellow or white phosphorus.

(l) Fireworks or fireworks compositions that ignite spontaneously or undergo marked decomposition when subjected for 48 consecutive hours to a temperature of 75° C. (167° F.).

(m) Fireworks, properly condemned by the Bureau of Explosives, except properly repacked samples for laboratory examinations.

(n) Toy torpedoes, the maximum outside dimension of which exceeds ⅞ inch, or toy torpedoes containing a mixture of potassium chlorate, black antimony and sulfur with an average weight of explosive composition in each torpedo exceeding four grains.

(o) Toy torpedoes containing a cap composed of a mixture of red phosphorus and potassium chlorate exceeding an average of one-half (0.5) grain per cap.

§ 73.52 *Acceptable explosives.* (a) For the purpose of Parts 71–78 of this chapter, acceptable explosives are divided into three classes as defined in this section, viz. (see § 72.5 of this chapter for restrictions for shipments by rail express).

(1) Class A explosives; detonating or otherwise of maximum hazard.

(2) Class B explosives; flammable hazard.

(3) Class C explosives; minimum hazard.

CLASS A EXPLOSIVES; DEFINITIONS

§ 73.53 *Definition of class A explosives.* (a) *Type 1.* Solid explosives which can be caused to deflagrate by contact with sparks or flame such as produced by safety fuse or an electric squib, but can not be detonated (See Note 1) by means of a No. 8 test blasting cap (See Note 2). Example: Black powder, low explosives, and certain types of smokeless powder.

(b) *Type 2.* Solid explosives which contain a liquid explosive ingredient, and which, when unconfined (See Note 3), can be detonated by means of a No. 8 test blasting cap (See Note 2); or which can be exploded in at least 50 percent of the trials in the Bureau of Explosives' Impact Apparatus (See Note 4) under a drop of 4 inches or more, but cannot be exploded in more than 50 percent of the trials under a drop of less than 4 inches. Example: Commercial dynamite containing a liquid explosive ingredient and some types of smokeless powder.

(c) *Type 3.* Solid explosives which contain no liquid explosive ingredient and which can be detonated, when unconfined (See Note 3), by means of a No. 8 test blasting cap (See Note 2); or which can be exploded in at least 50 percent of the trials in the Bureau of Explosives' Impact Apparatus (See Note 4) under a drop of 4 inches or more, but cannot be exploded in more than 50 percent of the trials under a drop of less than 4 inches. Example: Commercial dynamite containing no liquid explosive ingredient, trinitrotoluene, amatol, tetryl, picric acid, urea nitrate, pentolite, and commercial boosters.

(d) *Type 4.* Solid explosives which can be caused to detonate, when unconfined (See Note 3), by contact with sparks or flame such as produced by safety fuse or an electric squib; or which can be exploded in the Bureau of Explosives' Impact Apparatus (See Note 4) in more than 50 percent of the trials under a drop of less than 4 inches. Example: Initiating and priming explosives, lead azide, fulminate of mercury, etc.

(e) *Type 5.* Desensitized liquid explosives are explosives which may be detonated separately or when absorbed in sterile absorbent cotton, by a No. 8 test blasting cap (See Note 2); but which cannot be exploded in the Bureau of Explosives' Impact Apparatus (See Note 4) by a drop of less than 10 inches. The desensitizer must not be significantly more volatile than nitroglycerin and the desensitized explosive must not freeze at temperatures above minus 10° F. Example: Desensitized nitroglycerin.

(f) *Type 6.* Liquid explosives that can be exploded in the Bureau of Explosives' Impact Apparatus (See Note 4), under a drop of less than 10 inches. Example: Nitroglycerin. (See § 73.51 (d) of this part.)

(g) *Type 7.* Blasting caps (see Note 5) are small tubes, usually made of an alloy of either copper or aluminum, closed at one end and loaded with a charge of initiating or priming explosives, class A—Type 4, either with or without other suitable explosives. The total weight of explosives per unit shall not exceed 150 grains. Blasting caps (see Note 5) which have been provided with a means for firing by an electric current, and sealed, are known as electric blasting caps.

(1) Detonating primers are devices for commercial use which contain a detonator and an additional charge of explosives, all assembled in a suitable envelope. The total weight of explosives is more than 150 grains per unit.

(2) Detonating fuzes are used in the military service to detonate the high explosive bursting charges of projectiles, mines, bombs, torpedoes, and grenades. In addition to a powerful detonator, they may contain several ounces of a high explosive, such as tetryl or dry nitrocellulose, all assembled in a heavy steel envelope.

(h) *Type 8.* Any solid or liquid compound, mixture or device which is not specifically included in any of the above types, and which under special conditions may be so designated and approved by the Bureau of Explosives. Example: Shaped charges, commercial.

(i) A shaped charge, commercial, consists of a plastic, paper, or other suitable container comprising a charge of not to exceed 8 ounces of a high explosive containing no liquid explosive ingredient and with a hollowed out portion (cavity) lined with a rigid material. This device shall not contain a detonator.

NOTE 1: The detonation test is performed by placing the sample in an open-end fiber tube which is set on the end of a lead block approximately 1½ inches in diameter and 4 inches high which, in turn, is placed on a solid base. A steel plate may be placed between the fiber tube and the lead block.

NOTE 2: A No. 8 test blasting cap is one containing two grams of a mixture of 80 percent mercury fulminate and 20 percent potassium chlorate, or a cap of equivalent strength.

NOTE 3: "Unconfined" as used in this section does not exclude the use of a paper or soft fiber tube wrapping to facilitate tests.

NOTE 4: The Bureau of Explosives Impact Apparatus is a testing device designed so that a guided 8-pound weight may be dropped from predetermined heights so as to impact specific quantities of liquid or solid materials under fixed conditions. Detailed prints may be obtained from the Bureau of Explosives, 30 Vesey Street, New York 7, New York.

NOTE 5: Blasting caps, blasting caps with safety fuse, or electric blasting caps in quantities of 1,000 or less are classified as class C explosives.

(i) *Ammunition for cannon.* Ammunition for cannon is fixed, semi-fixed or separate loading ammunition which is fired from a cannon, mortar, gun or howitzer.

(j) *Ammunition for cannon with projectiles.* Ammunition for cannon with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles, or shell is fixed ammunition assembled in a unit consisting of the cartridge case containing the propelling charge and primer, and the projectiles, or shell, fuzed or unfuzed. Detonating fuzes, tracer fuzes, explosive or ignition devices, or fuze parts with explosives contained therein must not be assembled in ammunition or included in the same outside package unless shipped by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government or unless of a type approved by the Bureau of Explosives.

(k) *Explosive projectiles.* Explosive projectiles are shells or projectiles loaded with explosives or bursting charges, with or without other materials, for use in cannon, guns, or mortars.

(l) *Grenades.* Grenades, hand or rifle, are small metal or other containers designed to be thrown by hand or projected from a rifle. They are filled with an explosive or a liquid, gas or solid material such as a toxic or tear gas or an incendiary or smoke producing material and a bursting charge. When shipped without explosives or bursting charges, see §§ 73.330, 73.350, and 73.383 of this part.

(m) *Explosive bombs.* Explosive bombs are metal or other containers filled with explosives. They are used in warfare and include aeroplane bombs and depth bombs.

(n) *Explosive mines.* Explosive mines are metal containers filled with a high explosive.

(o) *Explosive torpedoes.* Explosive torpedoes, such as are used in warfare, are metal devices containing a means of propulsion and a quantity of high explosives.

(p) *Rocket ammunition.* Rocket ammunition is fixed ammunition which is fired from a tube, launcher, rails, trough, or other device as distinguished from cannon ammunition which is fired from a cannon, gun, or mortar. It consists of an igniter and propelling charge, commonly described as a motor, and explosive projectile, gas projectile, smoke projectile, incendiary projectile, or illuminating projectile, fuzed or unfuzed.

(q) *Ammunition for small arms with explosive bullets or explosive projectiles.* Ammunition for small arms with explosive bullets or ammunition for small arms with explosive projectiles is fixed ammunition to be used in machine guns or similar fire arms and consists of a metallic cartridge case, the primer and the propelling charge, with explosive bullet or explosive projectile with or without detonating fuze, the component parts necessary for one firing being all in one assembly. Detonating fuzes, tracer fuzes, explosive or ignition devices or fuze parts with explosives contained therein must not be assembled in ammunition or included in the same outside package unless shipped by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government or unless of a type approved by the Bureau of Explosives.

(r) *Chemical ammunition.* Chemical ammunition used in warfare is all kinds of explosive chemical projectiles, shells, bombs, grenades, etc., loaded with toxic, tear, or other gas, smoke or incendiary agent, also such miscellaneous apparatus as cloud-gas cylinders, smoke generators, etc., that may be utilized to project chemicals.

(s) *Boosters.* Boosters consist of a casing containing a high explosive and are used to increase the intensity of explosion of the detonator of a detonating fuze.

(t) *Jet thrust units (jato), Class A.* Jet thrust units (jato), class A, are metal cylinders containing a mixture of chemicals capable of burning rapidly and producing considerable pressure. Under certain conditions the chemical fuel with which the unit is loaded may explode. Jet thrust units are designed to be ignited by an electric igniter. They are used to assist aeroplanes to take off.

§ 73.54 *Ammunition for cannon.* (a) Ammunition for cannon with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles or shell must be well packed and properly secured in strong wooden or metal containers.

(b) Each outside package must be plainly marked "AMMUNITION FOR CANNON WITH EXPLOSIVE PROJECTILES," "AMMUNITION FOR CANNON WITH GAS PROJECTILES" (see § 73.409 (a) (1) of this part for required label), "AMMUNITION FOR CANNON WITH SMOKE PROJECTILES," "AMMUNITION FOR CANNON WITH INCENDIARY PROJECTILES," or "AMMUNITION FOR CANNON WITH ILLUMINATING PROJECTILES", as the case may be.

(c) Ammunition for cannon must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.55 *Ammunition, nonexplosive.* (a) Material relating to ammunition for cannon, but containing no explosive or other dangerous article, such as cartridge cases, "dummy" or "drill" cartridges, etc., sand-loaded projectiles, sand-loaded bombs, empty projectiles, empty mines, empty bombs, solid projectiles, or empty torpedoes, is exempt from Parts 71–78 of this chapter. Rotating bands should be protected against deformation by method of packing or loading.

§ 73.56 *Ammunition, projectiles, grenades, bombs, mines and torpedoes.* (a) Detonating fuzes, tracer fuzes, explosive or ignition devices, bouchons, or fuze parts with explosives contained therein, must not be assembled in explosive projectiles, grenades, explosive bombs, explosive mines, or explosive torpedoes, or included in the same outside package with them unless shipped by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government or unless of a type approved by the Bureau of Explosives.

(b) Explosive projectiles, explosive torpedoes, explosive mines, explosive bombs, or explosive grenades except as provided in paragraph (c) of this section, must be packed and properly secured in strong wooden or metal boxes.

(c) Explosive projectiles, explosive torpedoes, explosive mines, or explosive bombs, exceeding 90 pounds in weight, may be shipped without being boxed only by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government.

(d) Gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles, gas bombs, smoke bombs, incendiary bombs, gas grenades, smoke grenades, and incendiary grenades, containing a bursting or expelling charge must be packed and properly secured in strong wooden boxes. Detonating fuzes, bouchons or ignition elements must not be assembled in these articles unless shipped by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government or unless of a type approved by the Bureau of Explosives. (See §§ 73.190, 73.330, 73.350, and 73.383 of this part for nonexplosive chemical or poisonous ammunition.)

(e) The gross weight of a box containing more than one projectile, mine, grenade, or bomb must not exceed 250 pounds.

(f) Each exterior package or projectile, bomb, or mine must be plainly marked "EXPLOSIVE PROJECTILE", "EXPLOSIVE TORPEDO", "EXPLOSIVE MINE", "EXPLOSIVE BOMB", "HAND GRENADES", or "RIFLE GRENADES", as the case may be.

(g) Ammunition for cannon with gas projectiles, and bombs, projectiles, grenades or other containers loaded with a poisonous gas or liquid, class A, and an explosive charge, either boxed or unboxed (see paragraph (c) of this section), must bear the white "Poison Gas" label.

(h) For regulations for shipping ammunition containing chemicals but no explosives or bursting charges, see chemical ammunition, §§ 73.330, 73.350, and 73.383 of this part.

(i) Articles described in paragraphs (a), (b), (c), (d) and (g) of this section must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.57 *Rocket ammunition.* (a) Rocket ammunition with explosive projectiles, gas projectiles, smoke projectiles,

incendiary projectiles, or illuminating projectiles must be well packed and properly secured in strong wooden or metal containers.

(b) Each outside package must be plainly marked "ROCKET AMMUNITION WITH EXPLOSIVE PROJECTILES", "ROCKET AMMUNITION WITH GAS PROJECTILES" (see § 73.402 (a) (6) of this part for required label), "ROCKET AMMUNITION WITH SMOKE PROJECTILES", "ROCKET AMMUNITION WITH INCENDIARY PROJECTILES", or "ROCKET AMMUNITION WITH ILLUMINATING PROJECTILES", as the case may be.

(c) Rocket ammunition must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.58 *Ammunition for small arms.* (a) Ammunition for small arms with explosive bullets and ammunition for small arms with explosive projectiles must be well packed and properly secured in strong wooden or metal containers. The gross weight of the outside package must not exceed 150 pounds.

(b) Each outside package must be plainly marked "AMMUNITION FOR SMALL ARMS WITH EXPLOSIVE BULLETS" or "AMMUNITION FOR SMALL ARMS WITH EXPLOSIVE PROJECTILES".

(c) Ammunition for small arms with explosive bullets or ammunition for small arms with explosive projectiles must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.59 *Chemical ammunition, explosive.* (a) When chemical elements of chemical ammunition are shipped assembled with their ignition elements, bursting charges, detonating fuzes or explosive components they must be shipped in conformity with the regulations prescribed for explosive articles, class A, see § 73.56 of this part. For shipment of these articles not containing ignition elements, bursting charges, detonating fuzes, or other explosive components, see §§ 73.330, 73.350, and 73.383 of this part.

(b) Chemical ammunition, explosive must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.60 *Black powder and low explosives.* (a) Black powder and low explosives must be packed in containers complying with the following specifications:

(1) Spec. 10B (§ 78.156 of this chapter). Wooden barrels or kegs. Not over 200 pounds gross weight.

(2) Spec. 13 (§ 78.140 of this chapter). Metal kegs, not less than 7 inches long. Net weight not less than 6¼ pounds nor more than 150 pounds.

(3) Bundles of metal kegs, spec. 13 (§ 78.140 of this chapter), firmly tied together with rope and wrapped in strong burlap, canvas, or similar material, securely sewed and roped, authorized. Net weight of powder must not exceed 100 pounds.

(4) Spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes with inside containers which must be spec. 13 (§ 78.140 of this chapter), metal kegs, or fiber or metal containers not over 1½ pounds capacity each, or cotton bags of at least 4 ounce cotton duck not over 25 pounds capacity each. The gross weight of spec. 14 boxes not to exceed 140 pounds and the gross weight of spec. 15A or 16A boxes not to exceed 200 pounds.

(5) Spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes with inside cylindrical fiber cartridges not over 5 inches diameter nor over 18 inches long with fiber at least 0.05 inch thick paraffined on outer surface with joints securely glued or cemented, or strong paraffined paper cartridges not over 12 inches long authorized only for compressed pellets (cylindrical block) ⅞ inch or more in diameter. Boxes must be completely lined with strong paraffined paper or other suitable waterproofed material without joints or other openings at the bottom or sides. Authorized gross weight not to exceed 75 pounds.

(6) Spec. 23F (§ 78.214 of this chapter). Fiberboard boxes with inside cylindrical fiber cartridges not over 5 inches diameter nor over 18 inches long with fiber at least 0.05 inch thick paraffined on outer surface with joints securely glued or cemented, or strong paraffined paper cartridges not over 12 inches long authorized only for compressed pellets (cylindrical block) ⅞ inch or more in diameter. Boxes must be completely lined with strong paraffined paper or other suitable waterproofed material without joints or other openings at the bottom or sides. Authorized gross weight not to exceed 65 pounds.

(b) Black powder (not low explosives) in addition to containers specified in paragraph (a) of this section, must be shipped in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes with inside containers which must be cloth or paper bags of capacity not exceeding 25 pounds net weight, provided the completed shipping package shall be capable of standing a drop of 4 feet without rupture of inner or outer containers. The completed package must not exceed 50 pounds, net weight, of black powder.

(2) Spec. 23F (§ 78.214 of this chapter). Fiberboard boxes with inside containers which must be cloth or paper bags of capacity not exceeding 25 pounds, net weight, provided the completed shipping package shall be capable of standing a drop of 4 feet without rupture of inner or outer containers. The tubes of the box may be eliminated and a single tube as specified in spec. 23F may be substituted. The completed package shall not contain more than 50 pounds, net weight, of black powder.

(c) Black pellet powder primed with an electric squib secured inside the coaxial hole of the pellet powder with loose ends of the wires of the squib effectively short-circuited may be shipped in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 78.165, 78.168 or 78.185 of this chapter). Wooden boxes with inside cartridges which must be strong paraffined paper cartridges not over 12 inches long authorized only for compressed pellets (cylindrical block) ⅞ inch or more in diameter. Boxes must be lined as prescribed for cylindrical fiber cartridges. Gross weight not to exceed 65 pounds.

(d) Low explosives (not black powder) may in addition to the containers specified in paragraph (a) of this section, be shipped in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes with inside containers which must be strong paper bags of capacity not exceeding 25 pounds. Gross weight of spec. 14 box must not exceed 140 pounds. Gross weight of spec. 15A or 16A box must not exceed 200 pounds.

(2) Spec. 23F (§ 78.214 of this chapter). Fiberboard boxes with inside containers which must be strong paper bags of capacity not exceeding 25 pounds. Gross weight must not exceed 65 pounds.

(3) Spec. 15A (§78.168 of this chapter). Wooden boxes, lined, spec. 2L (§ 78.30 of this chapter). Authorized only for low explosives in the form of hard nonplastic rods or cylinders not less than ⅝-inch diameter.

(e) Each outside package must be plainly marked, stamped, or stenciled "BLACK POWDER" or "LOW EXPLOSIVES," and may also show "BLASTING," "RIFLE," etc., as "BLACK BLASTING POWDER," "BLACK RIFLE POWDER," "LOW BLASTING EXPLOSIVE," or "BLACK PELLET POWDER".

(1) Inside containers of over 1½ pounds capacity each in boxes, must be packed with filling holes up, and the boxes must be marked on top "THIS SIDE UP."

(2) Additional marks, trade names, etc., may appear if desired, but such additional marking must not be more conspicuous than nor obscure the marking prescribed herein.

(f) Black powder and low explosives must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.61 *High explosives.* (a) High explosives (dynamite), except gelatin dynamite, when offered for transportation by rail freight or highway must not contain in excess of 60 percent of liquid explosive ingredient and when offered for transportation by carrier by water must not contain in excess of 75 percent of liquid explosive ingredient. Maximum limit of liquid explosive ingredient specified for transportation by carrier by water applies only for such explosives as consist principally of wood pulp or other satisfactory absorbent and liquid explosive, which are comparable with good commercial dynamite under tests as to leakage of liquid ingredient and sensitiveness to the shocks of transportation, and for shipments that are otherwise in compliance with the regulations in Parts 71–78 of this chapter, for the transportation of high explosives.

(b) High explosives consisting of a liquid mixed with an absorbent material must have the absorbent (wood pulp or similar material) in sufficient quan-

tity and of satisfactory quality, properly dried at the time of mixing; nitrate of soda must be dried at the time of mixing to less than 1 percent of moisture; and the ingredients must be uniformly mixed so that the liquid will remain thoroughly absorbed under the most unfavorable conditions incident to transportation.

(c) High explosives containing nitroglycerin or other liquid explosive ingredients must have uniformly mixed with an absorbent material a satisfactory antacid, which must be in quantity sufficient to have the acid neutralizing power of an amount of magnesium carbonate equal to 1 percent of the nitroglycerin or other liquid explosive ingredient.

(d) Cartridges shall consist of a column of explosives completely inclosed in a shell made of strong paper, so treated that it will not absorb the liquid ingredient of the explosive.

(e) Bags shall be made of strong paper so treated that it will not absorb the liquid ingredient of the explosive.

(f) All boxes in which high explosives are packed must be lined with strong paraffined paper or other suitable material, except as provided in paragraph (j) of this section, § 73.64 (a) (5), and § 73.65 (a) (5) of this part. Lining must be without joints or other openings or with cemented joints at the bottom, ends, or sides of boxes, and for explosives with liquid ingredients must be impervious to such ingredient and also to water. Covers of boxes must be protected from contact with explosives by lining paper or other suitable material. (See spec. 2L (§ 78.30 of this chapter), for authorized lining material.)

(g) Before cartridges or bags of explosives are packed in boxes, lined in accordance with paragraph (f) of this section, dry fine wood pulp or sawdust at least ¼ inch in depth must be spread over the bottom of boxes to be used for all gelatin explosives. Dry fine wood pulp or sawdust must also be used in similar manner for packing all non-gelatinous types of explosives containing 30 percent or more liquid explosive ingredient.

(h) All cartridges exceeding 4 inches in length except gelatin dynamite, or high explosives containing more than 10 percent of a liquid explosive ingredient, must be placed horizontally in boxes. Bags must be packed with their filling holes up.

(i) Movement of cartridges and bags of high explosives within the boxes shall be prevented by sufficiently tight packing.

(j) High explosives (dynamite), except gelatin dynamite, packed in bags or in cartridges in excess of 2 inches in diameter and containing not more than 30 percent liquid explosive ingredients may be packed in outside containers without sawdust and without lining paper provided either each inside or outside container is sift-proof and is so treated as to prevent penetration by the commodity with which the container is filled for shipping.

§ 73.62 *High explosives, liquid.* (a) Liquid explosives as defined in § 73.53 (e) of this part, must be packed in containers made in compliance with spec. 15L (§ 78.176 of this chapter). Boxes must be plainly marked on top and on one side or end "HIGH EXPLOSIVES—DANGEROUS" in letters not less than 7/16 inch in height. The tops of boxes must be marked "THIS SIDE UP".

(b) High explosives, liquid, must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.63 *High explosive with liquid explosive ingredient.* (a) High explosives (dynamite) containing not more than 30 percent liquid explosive ingredients must be prepared as prescribed in § 73.61 of this part, except as otherwise specified, and packed in containers complying with the following specifications:

(1) Spec. 23G (§ 78.218 of this chapter). Fiberboard boxes. Not more than one cartridge in each box. High explosives packed in boxes consisting of more than one tube joined circumferentially are exempt from the requirements of § 73.61 (f) and (g) of this part. High explosives packed in boxes consisting of one tube closed at the ends are exempt from the requirements of § 73.61 (d), (f), and (g) of this part. Gross weight of boxes not to exceed 65 pounds.

(2) Spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes, or spec. 23F (§ 78.214 of this chapter) fiberboard boxes, with inside containers which must be cartridges not exceeding 12 inches in diameter or 50 pounds in weight with length not to exceed 36 inches, or bags not exceeding 50 pounds each securely closed so as to prevent leakage therefrom. Gross weight of wooden boxes not to exceed 75 pounds and gross weight of fiberboard boxes not to exceed 65 pounds.

(b) High explosives (dynamite) containing 10 percent or less of a liquid explosive ingredient in cartridges or bags as prescribed in § 73.61 (d) and (e) of this part, may be packed in wooden boxes spec. 14, 15A, or 16A (§§ 78.165, 17.168, or 78.185 of this chapter), gross weight not to exceed 140 pounds, or fiberboard boxes spec. 23F (§ 78.214 of this chapter), gross weight not to exceed 65 pounds.

(1) High explosives (dynamite) containing 10 percent or less of a liquid explosive ingredient may be packed in fiberboard boxes, spec. 23G (§ 78.218 of this chapter). Not more than one cartridge in each box. High explosive packed in boxes consisting of more than one tube joined circumferentially are exempt from the requirements of § 73.61 (f) and (g) of this part. High explosives packed in boxes consisting of one tube closed at the ends are exempt from the requirements of § 73.61 (d), (f), and (g) of this part. Gross weight of boxes not to exceed 65 pounds.

(c) High explosives (dynamite) containing more than 30 percent liquid explosive ingredients must be prepared as prescribed in § 73.61 (a) to (i), inclusive, of this part, except as otherwise specified, and in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes, or spec. 23F (§ 78.214 of this chapter) fiberboard boxes, with inside containers which must be cartridges not exceeding 4 inches in diameter or 8 inches in length, or cartridges not exceeding 5 inches in diameter or 10 inches in length, provided each such cartridge is enclosed alone, or with other cartridges in another strong paper shell and the resulting cartridge dipped in melted paraffin or equivalent material. The length of such completed cartridge shall not exceed 30 inches. Gross weight of wooden boxes not to exceed 75 pounds and gross weight of fiberboard boxes not to exceed 65 pounds.

(d) High explosives (gelatin dynamite and blasting gelatin) must be prepared as prescribed in § 73.61 (a) to (i) inclusive of this part, except as otherwise specified, and in containers complying with the following specifications:

(1) When individual shipments are approved by the Bureau of Explosives in spec. 23G (§ 78.218 of this chapter), fiberboard boxes. Not more than one cartridge in each box. High explosives packed in boxes consisting of more than one tube joined circumferentially are exempt from the requirements of § 73.61 (f) and (g) of this part. High explosives packed in boxes consisting of one tube closed at the ends are exempt from the requirements of § 73.61 (d), (f), and (g) of this part. Gross weight of boxes not to exceed 65 pounds.

(2) Spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes, or spec. 23F (§ 78.214 of this chapter) fiberboard boxes, with inside containers which must be cartridges not exceeding 12 inches in diameter or 50 pounds in weight with length not to exceed 36 inches, or bags not exceeding 12½ pounds each packed with filling holes up. Gross weight of wooden boxes not to exceed 75 pounds and gross weight of fiberboard boxes not to exceed 65 pounds.

(e) High explosives (straight gelatin dynamites of 80 percent strength and over and blasting gelatin) must be packed in cartridges or in bulk in outside boxes. When packed in bulk in boxes double lining paper throughout must be used. Containers must comply with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes.

(2) Spec. 23F (§ 78.214 of this chapter), Fiberboard boxes.

(3) Gross weight of wooden boxes not to exceed 75 pounds. Gross weight of fiberboard boxes not to exceed 65 pounds.

(f) Boxes containing high explosives must be plainly marked on top and on one side or end, and kegs, drums, or barrels containing high explosives must be marked on both ends, "HIGH EXPLOSIVES—DANGEROUS" in letters not less than 7/16 inch in height. The tops of boxes, except those made in compliance with spec. 23G, must be marked "THIS SIDE UP".

(g) High explosives with liquid explosive ingredient must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.64 *High explosives with no liquid explosive ingredient.* (a) High explosives containing no liquid explosive ingredients if their sensitiveness to per-

cussion is not greater than that measured by the blow delivered by an 8-pound weight dropping from a distance of 7 inches on a compressed pellet of the explosive three-hundredths of an inch thick and two-tenths of an inch in diameter, confined rigidly between hard steel surfaces as in the standard Impact Testing Apparatus of the Bureau of Explosives, must be packed in cartridges or in bags in outside boxes. They must be packed in cartridges when their sensitiveness is greater than the limit prescribed herein. Such explosives when dry may be packed in strong sift-proof cloth or paper bags of capacity not exceeding 25 pounds. These explosives must be packed in outside containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes.

(2) Spec. 23F (§ 78.214 of this chapter). Fiberboard boxes.

(3) Spec. 10B (§ 78.156 of this chapter). Wooden barrels or kegs.

(4) Gross weight of wooden boxes not to exceed 140 pounds. Gross weight of fiberboard boxes not to exceed 65 pounds.

(5) When such explosives contain over 5 percent moisture, boxes must be lined with strong paraffined paper or other authorized material, spec. 2L (§ 78.30 of this chapter).

(6) When such explosives are in combination cartridges, consisting of column of explosives with core of dynamite, they may be shipped when packed in outside boxes with 65 pounds as the maximum gross weight. The column of explosives must be completely inclosed in waterproofed cloth or strong waterproofed paper and must not exceed 6 inches in diameter, 20 inches in length, or gross weight of 25 pounds.

(7) Spec. 23G (§ 78.218 of this chapter). Fiberboard boxes. Such explosives when packed in boxes consisting of more than one tube joined circumferentially are exempt from requirements of § 73.61 (f) and (g) of this part or when packed in boxes consisting of one tube closed at the ends are exempt from requirements of § 73.61 (d) to (g) inclusive, of this part. The gross weight of boxes not to exceed 65 pounds.

(b) Boxes containing high explosives must be plainly marked on top and on one side or end, and kegs, drums, or barrels containing high explosives must be marked on both ends, "HIGH EXPLOSIVES—DANGEROUS" in letters not less than 7/16 inch in height.

(c) High explosives with no liquid explosive ingredient must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.65 *High explosives with no liquid explosive ingredient nor any chlorate.* (a) High explosives containing no liquid explosive ingredient nor any chlorate if their sensitiveness to percussion is not greater than that measured by the blow delivered by an 8-pound weight dropping from a distance of 7 inches on a compressed pellet of the explosive three-hundredths of an inch thick and two-tenths of an inch in diameter, confined rigidly between hard steel surfaces as in the standard Impact Testing Apparatus of the Bureau of Explosives, must be packed in cartridges, or in bags or metal containers in outside boxes. They must be packed in cartridges when their sensitiveness is greater than the limit prescribed in this section. Such explosives when dry may be packed in strong sift-proof cloth or paper bags or metal containers of capacity not exceeding 25 pounds. These explosives must be packed in outside containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§78.165, 78.168, or 78.185 of this chapter). Wooden boxes.

NOTE 1: Wooden boxes, having inside metal containers which are tightly and securely closed, may be equipped with hand holes in each end which must be not more than one inch by four inches and centered laterally not nearer 1⅝ inches from top edge of end of box.

(2) Spec. 23F (§ 78.214 of this chapter). Fiberboard boxes.

(3) Spec. 10B (§ 78.156 of this chapter). Wooden barrels or kegs.

(4) Gross weight of wooden boxes not to exceed 140 pounds. Gross weight of fiberboard boxes not to exceed 65 pounds.

(5) When such explosives contain over 5 percent moisture, boxes must be lined with strong paraffined paper or other authorized material, spec. 2L (§ 78.30 of this chapter).

(6) When such explosives are in combination cartridges, consisting of column of explosives with core of dynamite, they may be shipped when packed in outside boxes with 65 pounds as the maximum gross weight. The column of explosives must be completely inclosed in waterproofed cloth or strong waterproofed paper and must not exceed 6 inches in diameter, 20 inches in length, or gross weight of 25 pounds.

(7) Spec. 23G (§ 78.218 of this chapter). Fiberboard boxes. Such explosives when packed in boxes consisting of more than one tube joined circumferentially are exempt from requirements of § 73.61 (f) and (g) of this part or when packed in boxes consisting of one tube closed at the ends are exempt from requirements of § 73.61 (d) to (g) inclusive, of this part. The gross weight of boxes not to exceed 65 pounds.

(b) Ammonium picrate, nitroguanidine, nitrourea, urea nitrate, picric acid, tetryl, trinitroresorcinol, trinitrotoluene and pentolite, in dry condition, in addition to containers prescribed in paragraph (a) (1) to (5) of this section, may be shipped in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes with strong paper or cloth bags of capacity not exceeding 50 pounds, packed with filling holes up.

(2) Spec. 21A (§ 78.222 of this chapter). Fiber drums. Net weight not to exceed 200 pounds.

(c) Trinitrotoluene and pentolite, in dry condition, in addition to containers prescribed in paragraphs (a) (1) to (5) and (b) (1) and (2) of this section, may be shipped in specification containers as follows:

(1) Spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes with strong paper or cloth bags of capacity not exceeding 100 pounds, packed with filling holes up.

(2) Spec. 14, 15A, or 16A (§§ 78.165, 78.168 or 78.185 of this chapter). Wooden boxes with strong siftproof liners, spec. 2L (§ 78.30 of this chapter).

(d) Ammonium picrate, dry, picric acid, dry, trinitrobenzene, dry, and trinitrotoluene, dry, in quantity not exceeding 4 ounces in one outside package for medicinal purposes, may be shipped by carriers by rail freight, rail express, highway, or water as drugs, medicines, or chemicals, without other restrictions, when in securely closed glass bottles properly cushioned to prevent breakage.

(e) Ammonium picrate, picric acid, urea nitrate, trinitrobenzene, trinitroresorcinol, and trinitrotoluene when wet with not less than 10 pounds of water to each 90 pounds of dry material must be shipped in containers complying with the following specifications:

(1) Spec. 10B (§ 78.156 of this chapter). Wooden barrels or kegs. Not over 50 gallons nominal capacity.

(2) (See § 73.192 of this part for shipments of wet ammonium picrate or wet picric acid not in excess of 16 ounces and § 73.193 of this part for shipment of wet picric acid not in excess of 25 pounds.) (See § 73.212 of this part for shipments of wet trinitrobenzene and wet trinitrotoluene not in excess of 16 ounces.)

(f) Amatol when cast in a solid block or column, in addition to containers prescribed in paragraph (a) (1) to (5) of this section, may be shipped in specification containers as follows:

(1) Spec. 13A (§ 78.141 of this chapter). Metal drums not exceeding 90 pounds gross weight.

(g) Nitrocellulose must be packed in wooden boxes complying with specs. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter), with inside packages which must be:

(1) Inside packages containing not more than 1 pound each of dry, uncompressed nitrocellulose, wrapped in strong paraffined paper or suitable sparkproof material. Completed outside package not to contain more than 10 pounds dry nitrocellulose.

(2) Inside packages containing compressed sticks or blocks of dry nitrocellulose wrapped in strong paraffined paper. Gross weight not to exceed 75 pounds.

(h) Shaped charges, commercial, must be packed in containers complying with specifications 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter), wooden boxes, or spec. 23F (§ 78.214 of this chapter) fiberboard boxes, with inside containers which must be strong fiber tubes. Shaped charges having exposed lined conical cavities must have such cavities effectively filled. Shaped charges having conical cavities that are covered shall be paired together with the cavities facing each other and with one or more pairs in a fiber tube, or so arranged that the conical cavities of the shaped charges at the ends of the column face toward the center of the tube. The shaped charges in the fiber tube must fit snugly with no excess space and the fiber tubes containing the shaped charges must be packed snugly with no excess space in

the outside fiberboard or wooden box. Gross weight of wooden boxes not to exceed 140 pounds. Gross weight of fiberboard boxes not to exceed 65 pounds.

(i) Boxes containing high explosives must be plainly marked on top and on one side or end, and kegs, drums, or barrels containing high explosives must be marked on both ends, "HIGH EXPLOSIVES—DANGEROUS" in letters not less than 7/16 inch in height. The tops of boxes, except those referred to in paragraph (a) (1) to (a) (7) of this section, must be marked "THIS SIDE UP".

(j) Smokeless powder for small arms in quantity exceeding 50 pounds, net weight, must be packed and marked as required by § 73.94 of this part.

(k) High explosives with no liquid explosive ingredient nor any chlorate must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.66 *Blasting caps and electric blasting caps.* (a) Blasting caps, blasting caps with safety fuse or electric blasting caps in quantity of 1,000 or less are classified as class C explosives. See § 73.103 of this part.

(b) The outside of all blasting caps and electric blasting caps must be free from fulminate or other explosive compositions.

(c) Blasting caps containing not to exceed 50 grains of explosive composition each must be placed in strong interior containers, in which they must fit snugly. When caps are loaded vertically in interior metal containers, they must be covered by suitable elastic material placed over the caps. Not more than 100 such blasting caps may be packed in a single container. All inside containers must then be packed snugly in cartons or wrappings made of paper or pasteboard.

(d) Not more than 5,000 blasting caps, not exceeding 50 grains of explosive composition each, packed in inner containers as prescribed in paragraph (c) of this section, must be packed in outside containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes (see § 73.67 (a) (1), Note 1, of this part) with inside containers which must be cartons or wrappings with inside containers, as prescribed in paragraph (c) of this section, which must be separated from the outside wooden box by at least one inch of tightly packed sawdust, excelsior or equivalent cushioning material. Gross weight not to exceed 150 pounds.

NOTE 1: Because of the present emergency and until further order of the Commission, fiberboard boxes, spec. 23F (§ 78.214 of this chapter), may be used in lieu of prescribed wooden boxes, spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter).

(e) More than 5,000 blasting caps, not exceeding 50 grains of explosive composition each, packed in inner containers as prescribed in paragraph (c) of this section, must be packed in outside containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes (see § 73.67 (a) (1), Note 1, of this part) with inside containers which must be cartons or wrappings with inner containers as prescribed in paragraph (c) of this section, packed in an inside box made of sound lumber or a hermetically sealed metal box of metal not less than 30 gauge United States standard. The inside wooden or metal box must be separated at all points from the outside wooden box by at least one inch of tightly packed sawdust, excelsior, or equivalent cushioning material. Gross weight not to exceed 150 pounds.

NOTE 1: Because of the present emergency and until further order of the Commission, fiberboard boxes, spec. 23F (§ 78.214 of this chapter), may be used in lieu of prescribed wooden boxes, spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter).

(2) More than 20,000 blasting caps containing not to exceed 50 grains of explosive composition each, must not be placed in one outside package.

(f) Blasting caps containing in excess of 50 grains of explosive composition each must be packed in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A. (§§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes (see § 73.67 (a) (1), Note 1, of this part) with inside containers which must have strong interior containers, in which they must fit snugly. When caps are loaded vertically in interior metal containers, they must be covered by suitable elastic material placed over the caps. Not more than 10 such blasting caps may be packed in a single inside container. All inside containers must then be packed snugly in cartons or wrappings made of paper or pasteboard. The cartons or wrappings must be separated from outside box by at least 1 inch of tightly packed sawdust, excelsior, or equivalent cushioning material. Not more than 500 caps containing in excess of 50 grains of explosive composition each may be placed in one outside package. Gross weight not to exceed 150 pounds.

(g) Electric blasting caps must be packed in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes (see § 73.67 (a) (1), Note 1, of this part) or spec. 23F (§ 78.214 of this chapter) fiberboard boxes, with inside containers which must be pasteboard cartons containing not more than 100 caps each, or pasteboard tube inclosing each cap with wires or with the wires wrapped around the tube. Gross weight of wooden boxes containing pasteboard cartons must not exceed 150 pounds, except for export shipment. Gross weight of wooden boxes containing pasteboard tube must not exceed 75 pounds.

(h) Each outside container must be plainly marked "(number) BLASTING CAPS—HANDLE CAREFULLY", or "(number) ELECTRIC BLASTING CAPS—HANDLE CAREFULLY", as the case may be.

NOTE 1: The number of caps must be shown in the marking.

(i) Blasting caps and electric blasting caps must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.67 *Blasting caps with safety fuse.* (a) Ten or less of the interior containers of not more than 100 blasting caps each, containing not to exceed 50 grains of explosive composition each, packed as prescribed in § 73.66 (c) of this part, in the same outside container with safety fuse must be shipped in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A §§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes (see Note 1 of this subparagraph) with inside containers which must be cartons or wrappings with inner containers as prescribed in § 73.66 (c) of this part, placed in the center of a coil of fuse and secured and cushioned therein to prevent movement therefrom. Gross weight not to exceed 150 pounds.

NOTE 1: Closing of outside boxes by nailing tops in place with uncoated nails, at not over 3-inch centers into ends, and at not over 6-inch centers into sides, is authorized. Sizes of these nails must be not less than the following:

3-penny into ends and sides not over 3/8 inch thick.

4-penny into ends and sides over 3/8 but not over 1/2 inch thick.

5-penny into ends and sides over 1/2 but not over 5/8 inch thick.

6-penny into ends and sides over 5/8 but not over 13/16 inch thick.

7-penny into ends and sides over 13/16 inch thick.

NOTE 2: Because of the present emergency and until further order of the Commission, fiberboard boxes, spec. 23F (§ 78.214 of this chapter), may be used in lieu of prescribed wooden boxes, spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter).

(b) Each outside container must be plainly marked "(number) BLASTING CAPS WITH SAFETY FUSE—HANDLE CAREFULLY".

NOTE 1: The number of caps must be shown in the marking.

(c) Blasting caps with safety fuse must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.68 *Detonating primers.* (a) Detonating primers must be packed in containers complying with the following specifications:

(1) Spec. 14, 15A, or 16A (§§ 78.165, 78.168, or 78.185 of this chapter). Wooden boxes (see § 73.67 (a) (1), Note 1, of this part), or spec. 23F (§ 78.214 of this chapter) fiberboard boxes, with inside containers which must be pasteboard cartons containing not more than 50 primers each, or pasteboard or plastic tube inclosing each primer with wires, or pasteboard, wooden, metal or plastic tubes or spools with wires wrapped around the tube or spool. Gross weight of wooden boxes containing pasteboard cartons must not exceed 150 pounds, except for export shipment. Gross weight of wooden boxes containing pasteboard or plastic tube inclosing each primer with wires, or pasteboard, wooden, metal or plastic tubes or spools with the wires wrapped around the tube or spool, must not exceed 75 pounds.

(b) Each outside container must be plainly marked "DETONATING PRIMERS—HANDLE CAREFULLY".

(c) Detonating primers must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.69 *Detonating fuzes, boosters, or other detonating fuze parts containing an explosive.* (a) Detonating fuzes, boosters, or other detonating fuze parts containing an explosive, when shipped separately, must be packed and well secured in strong, tight wooden boxes.

(b) The gross weight of one outside package containing detonating fuzes must not exceed 190 pounds. For boosters shipped separately, the gross weight must not exceed 300 pounds.

(c) Each outside package must be plainly marked "DETONATING FUZES—HANDLE CAREFULLY", or "BOOSTERS (EXPLOSIVE)—HANDLE CAREFULLY—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE".

(d) Detonating fuzes and boosters must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.70 *Diazodinitrophenol.* (a) The offering of diazodinitrophenol in a dry condition for transportation by common carriers by rail freight, rail express, highway, or water is forbidden, except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders, the transportation of which is authorized in this part.

(b) Diazodinitrophenol must be packed wet with not less than 40 percent by weight of water in specification containers 5 or 5B (§§78.80 or 78.82 of this chapter) metal barrels or drums, 10B (§ 78.156 of this chapter) wooden barrels or kegs, with inside containers which must be bags made of at least 10-ounce cotton duck, rubber or rubberized cloth, which must be securely closed. These bags containing the diazodinitrophenol must then be placed in a rubber bag, rubberized cloth bag, or bag made of suitable watertight material and then placed in the barrel, keg, or drum. Any empty space in the outside bag must be filled with water and this bag securely closed.

(c) Sufficient outage in outside container must be allowed to prevent rupturing of container in freezing weather, or a mixture of denatured alcohol and water may be used to prevent freezing in transit.

(d) Each barrel, drum, or keg must be plainly marked "INITIATING EXPLOSIVE—DANGEROUS—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE".

(e) Diazodinitrophenol, wet, must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.71 *Fulminate of mercury.* (a) The offering of fulminate of mercury in a dry condition for transportation by common carriers by rail freight, rail express, highway, or water is forbidden, except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders, the transportation of which is authorized in this part.

(b) Fulminate of mercury must be packed wet with not less than 25 percent by weight of water in specification containers 5 or 5B (§§ 78.80 or 78.82 of this chapter) metal barrels or drums, 17H (§ 78.118 of this chapter) metal drums (single-trip), or 10B (§ 78.156 of this chapter), wooden barrels or kegs, with inside container which must be a bag made of 4-ounce duck. Inside the bag and over the fulminate there must be placed a cap of the same fabric, of the same diameter as the bag. The bag must be securely tied and placed in a strong grain bag. This grain bag must also be securely tied. The dry weight of fulminate in one container must not exceed 150 pounds. The bag and contents must be packed in the center of the wooden barrel or keg, metal barrel or drum, and must be entirely surrounded by not less than 3 inches of well-packed sawdust saturated with water. The wooden barrel or keg, or metal barrel or drum, must be lined with a heavy, close-fitting, jute bag closed by secure sewing to prevent escape of sawdust. The barrel, keg, or drum must be inspected carefully and all leaks stopped.

(c) If shipment of fulminate is to take place at a time that freezing weather is to be anticipated, a mixture of denatured ethyl alcohol and water of such proportions that freezing will not occur in transit must be used.

(d) Each barrel, keg or drum must be plainly marked "INITIATING EXPLOSIVE—DANGEROUS—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE".

(e) Fulminate of mercury, wet, must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.72 *Guanyl nitrosamino guanylidene hydrazine.* (a) The offering of guanyl nitrosamino guanylidene hydrazine in a dry condition for transportation by common carriers by rail freight, rail express, highway, or water is forbidden, except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders, the transportation of which is authorized in this part.

(b) Guanyl nitrosamino guanylidene hydrazine must be packed wet with not less than 30 percent by weight of water in specification containers 5 or 5B (§§ 78.80 or 78.82 of this chapter) metal barrels or drums, 17H (§ 78.118 of this chapter) metal drums (single-trip), or 10B (§ 78.156 of this chapter) wooden barrels or kegs, with inside container which must be a bag made of 4-ounce duck. Inside the bag and over the guanyl nitrosamino guanylidene hydrazine there must be placed a cap of the same fabric, of the same diameter as the bag. The bag must be securely tied and placed in a strong grain bag. This grain bag must also be securely tied. The dry weight of guanyl nitrosamino guanylidene hydrazine in one container must not exceed 75 pounds. The bag and contents must be packed in the center of the wooden barrel or keg, metal barrel or drum, and must be entirely surrounded by not less than 3 inches of well-packed sawdust saturated with water. The wooden barrel or keg, or metal barrel or drum, must be lined with a heavy, close-fitting, jute bag closed by secure sewing to prevent escape of sawdust. The barrel, keg, or drum must be inspected carefully and all leaks stopped.

(c) If shipment of guanyl nitrosamino guanylidene hydrazine is to take place at a time that freezing weather is to be anticipated, a mixture of denatured ethyl alcohol and water of such proportions that freezing will not occur in transit must be used.

(d) Each barrel, keg, or drum must be plainly marked "INITIATING EXPLOSIVE — DANGEROUS — DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE".

(e) Guanyl nitrosamino guanylidene hydrazine, wet, must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.73 *Lead azide.* (a) The offering of lead azide in a dry condition for transportation by common carriers by rail freight, rail express, highway, or water is forbidden, except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders, the transportation of which is authorized in this part.

(b) Lead azide of the dextrinated type only must be packed wet with not less than 20 percent by weight of water in specification containers 5 or 5B (§§ 78.80 or 78.82 of this chapter) metal barrels or drums, 17H (§ 78.118 of this chapter) metal drums (single-trip), or 10B (§ 78.156 of this chapter) wooden barrels or kegs, with inside container which must be a bag made of 4-ounce duck. Inside the bag and over the lead azide there must be placed a cap of the same fabric, of the same diameter as the bag. The bag must be securely tied and placed in a strong grain bag. This grain bag must also be securely tied. The dry weight of lead azide in one container must not exceed 150 pounds. The bag and contents must be packed in the center of the wooden barrel or keg, metal barrel or drum, and must be entirely surrounded by not less than 3 inches of well-packed sawdust saturated with water. The wooden barrel or keg, or metal barrel or drum, must be lined with a heavy, close-fitting, jute bag closed by secure sewing to prevent escape of sawdust. The barrel, keg, or drum must be inspected carefully and all leaks stopped.

(c) If shipment of lead azide is to take place at a time that freezing weather is to be anticipated, a mixture of denatured ethyl alcohol and water of such proportions that freezing will not occur in transit must be used.

(d) Each barrel, keg, or drum must be plainly marked "INITIATING EXPLOSIVE—DANGEROUS—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE".

(e) Lead azide, wet, must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.74 *Lead styphnate.* (a) The offering of lead styphnate (lead trinitroresorcinate) in a dry condition for transportation by common carriers by rail freight, rail express, highway, or water is forbidden, except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders, the transportation of which is authorized in this part.

(b) Lead styphnate (lead trinitroresorcinate) must be packed wet with not less than 20 percent by weight of water in specification containers 5 or 5B (§§ 78.80 or 78.82 of this chapter) metal barrels or drums, 17H (§ 78.118 of this chapter) metal drums (single-trip), or 10B (§ 78.156 of this chapter), wooden barrels or kegs, with inside container which must be a bag made of rubber cloth. The lead styphnate within this bag should be divided into a number of smaller packages. There must be a cap of the same fabric and of the same diameter as the bag over the lead styphnate and inside the bag. The dry weight of lead styphnate in one outer container must not exceed 150 pounds. The bag and contents must be packed in the center of the wooden barrel or keg, metal barrel or drum, and must be entirely surrounded by not less than 3 inches of well-packed sawdust saturated with water. The wooden barrel or keg, or metal barrel or drum, must be lined with a heavy, close-fitting, jute bag closed by secure sewing to prevent escape of sawdust. The barrel, keg, or drum must be inspected carefully and all leaks stopped.

(c) If shipment of lead styphnate is to take place at a time freezing weather is to be anticipated, it must be wet with a mixture of denatured ethyl alcohol and water of such proportions that freezing will not occur in transit.

(d) Each barrel, keg, or drum must be plainly marked "INITIATING EXPLOSIVE—DANGEROUS—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE".

(e) Lead styphnate (lead trinitroresorcinate), wet, must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.75 *Nitro mannite.* (a) The offering of nitro mannite in a dry condition for transportation by common carriers by rail freight, rail express, highway, or water, is forbidden, except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders, the transportation of which is authorized in this part.

(b) Nitro mannite must be packed wet with not less than 40 percent by weight of water in specification containers 5 or 5 B (§§ 78.80 or 78.82 of this chapter) metal barrels or drums, or 10B (§ 78.156 of this chapter) wooden barrels or kegs, with inside containers which must be bags made of at least 10-ounce cotton duck, rubber or rubberized cloth, which must be securely closed. These bags containing the nitro mannite must then be placed in a rubber bag, rubberized cloth bag or bag made of suitable watertight material and then placed in the barrel, keg, or drum. Any empty space in the outside bag must be filled with water and this bag securely closed.

(c) Sufficient outage in outside container must be allowed to prevent rupturing of container in freezing weather, or a mixture of denatured ethyl alcohol and water may be used to prevent freezing in transit.

(d) Each barrel, keg, or drum must be plainly marked "INITIATING EXPLOSIVE—DANGEROUS—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE".

(e) Nitro mannite, wet, must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.76 *Nitrosoguanidine.* (a) The offering of nitrosoguanidine in a dry condition for transportation by common carriers by rail freight, rail express, highway, or water is forbidden, except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders, the transportation of which is authorized in this part.

(b) Nitrosoguanidine must be packed wet with not less than 10 percent by weight of water in specification containers 5 or 5B (§§ 78.80 or 78.82 of this chapter) metal barrels or drums, 17H (§ 78.118 of this chapter) metal drums (single-trip), or 10B (§ 78.156 of this chapter) wooden barrels or kegs, with inside container which must be a bag made of strong cloth, which must in turn be placed in the wooden barrel, or keg, or metal barrel or drum. The dry weight of nitrosoguanidine in one container must not exceed 75 pounds.

(c) Each barrel, keg, or drum must be plainly marked "INITIATING EXPLOSIVE — DANGEROUS — DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE".

(d) Nitrosoguanidine, wet, must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.77 *Pentaerythrite tetranitrate.* (a) The offering of pentaerythrite tetranitrate in a dry condition for transportation by common carriers by rail freight, rail express, highway or water is forbidden, except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders, the transportation of which is authorized in this part.

(b) Pentaerythrite tetranitrate must be packed wet with not less than 40 percent by weight of water in specification containers 5 or 5B (§§ 78.80 or 78.82 of this chapter) metal barrels or drums, or 10B (§ 78.156 of this chapter) wooden barrels or kegs, with inside containers which must be bags made of at least 10-ounce cotton duck, rubber or rubberized cloth, which must be securely closed. These bags containing the pentaerythrite tetranitrate must then be placed in a rubber bag, rubberized cloth bag or bag made of suitable watertight material and then placed in the barrel, keg or drum. Any empty space in the outside bag must be filled with water and this bag securely closed.

(c) Sufficient outage in outside container must be allowed to prevent rupturing of container in freezing weather, or a mixture of denatured ethyl alcohol and water may be used to prevent freezing in transit.

(d) Each barrel, keg, or drum must be plainly marked "INITIATING EXPLOSIVE—DANGEROUS—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE".

(e) Pentaerythrite tetranitrate, wet, must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.78 *Tetrazene.* (a) The offering of tetrazene (guanyl nitrosamino guanyl tetrazene) in a dry condition for transportation by common carriers by rail freight, rail express, highway, or water is forbidden, except as a component of manufactured articles such as percussion caps, detonators, blasting caps, and exploders, the transportation of which is authorized in this part.

(b) Tetrazene (guanyl nitrosamino guanyl tetrazene) must be packed wet with not less than 30 percent by weight of water in specification containers 5 or 5B (§§ 78.80 or 78.82 of this chapter) metal barrels or drums, 17H (§ 78.118 of this chapter) metal drums (single-trip), or 10B (§ 78.156 of this chapter) wooden barrels or kegs, with inside container which must be a bag made of 4-ounce duck. Inside the bag and over the tetrazene there must be placed a cap of the same fabric, of the same diameter as the bag. The bag must be securely tied and placed in a strong grain bag. This grain bag must also be securely tied. The dry weight of tetrazene in one container must not exceed 75 pounds. The bag and contents must be packed in the center of the wooden barrel or keg, metal barrel or drum, and must be entirely surrounded by not less than 3 inches of well-packed sawdust saturated with water. The wooden barrel or keg, or metal barrel or drum, must be lined with a heavy, close-fitting, jute bag closed by secure sewing to prevent escape of sawdust. The barrel, keg, or drum must be inspected carefully and all leaks stopped.

(c) If the shipment of tetrazene is to take place at a time that freezing weather is to be anticipated, it must be wet with a mixture of denatured ethyl alcohol and water of such proportions that freezing will not occur in transit.

(d) Each barrel, keg, or drum must be plainly marked "INITIATING EXPLOSIVE—DANGEROUS—DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVE".

(e) Tetrazene (guanyl nitrosamino guanyl tetrazene), wet, must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.79 *Jet thrust units (jato), class A.* (a) Jet thrust units (jato), class A, must be well packed and properly secured in strong wooden containers. Igniters must not be shipped assembled in the units.

(b) Each outside package must be plainly marked "JET THRUST UNITS, CLASS A".

(c) Jet thrust units must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.86 *Samples of explosives and explosive articles.* (a) New explosives, including fireworks and explosive devices, must be examined and approved by the Bureau of Explosives as safe for transportation before being offered for shipment, except that a sample of such explosives, fireworks and explosive devices, not to exceed 5 pounds net weight,

may be offered for transportation by carriers by rail freight, highway, or water for this examination. Samples of explosives, except liquid nitroglycerin, other than new explosives for laboratory examination not exceeding 5 pounds net weight may be offered for transportation by carriers by rail freight, highway, or water. For the purpose of Parts 71–78 of this chapter a new explosive, including fireworks and explosive devices, is the product of a new factory or an explosive or explosive device of an essentially new composition or character made by any factory.

(b) Before being offered for shipment, explosive articles in the experimental state must be made safe by removal of ignition elements or otherwise.

(c) Shipments of samples of explosives, fireworks and explosive devices must be packed, marked, and described as required by this part for the explosive contained therein.

(d) *Samples of explosives and explosive articles for transportation by rail express.* Samples of explosives (except liquid nitroglycerin), including fireworks and explosive devices for examination in a laboratory only and not intended for use or demonstration, when properly packed and not exceeding a net weight of one-half pound for each sample, and not exceeding 20 one-half pound samples transported at one time in a single car or vehicle may be offered for transportation by rail express when packed as follows:

(1) Samples of explosives including fireworks and explosive devices for laboratory examination must be packed in well-secured metal cans or glass bottles, or in strong waterproof paper or cardboard packages; each sample must consist of not more than one-half pound of explosive, and the interior package must be placed in sawdust or similar cushioning material, at least 2 inches thick, in a wooden box, spec. 14 or 15A (§§ 78.165 or 78.168 of this chapter).

(2) Whenever these samples of explosives for laboratory examination are contained in a metal envelope or receptacle, this receptacle must be properly cushioned with sawdust or similar cushioning material in a strong wooden box, and this interior box must be packed in a wooden box, spec. 14 or 15A (§§ 78.165 or 78.168 of this chapter), with at least 2 inches of cushioning material separating the boxes.

(3) Not more than 100 blasting caps may be shipped in one outside package for laboratory examination, and they must be packed and cushioned as provided in paragraph (d) (2) of this section.

(4) Not more than 20 half-pound samples of explosives for laboratory examination may be packed in one outside box or transported at one time.

(5) The net weight of the explosive contents must be plainly marked by the shipper on the outside of each box offered for transportation.

(6) *Label.* Each outside package containing samples of explosives for laboratory examination must have securely and conspicuously attached to it a square red label as described in § 73.411 of this part.

§ 73.87 *Explosives in mixed packing.* (a) Unless specifically authorized by Parts 71–78 of this chapter, explosives must not be packed in the same outside package with each other or with other articles. Explosives, except blasting caps and other initiating explosives, in separate interior containers, may be shipped when packed in the same outside package of gross weight not exceeding 50 pounds, provided the weight of any interior package of explosives does not exceed 8 ounces, and provided the interior packages are so cushioned and protected as to insure their transportation without rupture or leakage of contents. The package must be marked and described with the name of the most dangerous explosive included such as "HIGH EXPLOSIVE", or "BLACK POWDER".

CLASS B EXPLOSIVES; DEFINITIONS

§ 73.88 *Definitions of class B explosives.* (a) Explosives, class B, are defined as those explosives which in general function by rapid combustion rather than detonation and include some explosive devices such as special fireworks, flash powders, some pyrotechnic signal devices and certain forms of smokeless powder. These explosives are further specifically described in paragraphs (b) to (f) of this section.

(b) Ammunition for cannon with empty projectiles, inert-loaded projectiles, solid projectiles or without projectiles, or shell, is fixed ammunition assembled in a unit consisting of the cartridge case containing the propelling charge and primer with empty, inert-loaded, or solid projectiles, or without projectiles, which is fired from a cannon, mortar, gun or howitzer.

(c) Rocket ammunition is fixed ammunition which is fired from a tube, launcher, rails, trough, or other device as distinguished from cannon ammunition which is fired from a cannon, gun, or mortar. It consists of an igniter and propelling charge, commonly described as a motor, and empty projectile, inert-loaded projectile or solid projectile, or without projectile.

(d) Special fireworks are manufactured articles designed primarily for the purpose of producing visible or audible pyrotechnic effects by combustion or explosion. (See § 73.100 (r) of this part for common fireworks.) Examples are toy torpedoes, railway torpedoes, some firecrackers and salutes, exhibition display pieces, aeroplane flares, illuminating projectiles not fuzed and without expelling charges, flash powders in inner units not exceeding 2 ounces each, flash sheets in interior packages, flash powder or spreader cartridges containing not over 72 grains of flash powder each, (see § 73.60 of this part for shipments made as low explosives) and flash cartridges, consisting of a paper cartridge shell, small-arms primer, and flash composition, not exceeding 180 grains all assembled in one piece. Fireworks must be in a finished state, exclusive of mere ornamentation, as supplied to the retail trade and must be so constructed and packed that loose pyrotechnic composition will not be present in packages in transportation.

(e) Jet thrust units (jato), class B, are metal cylinders containing a mixture of chemicals capable of burning rapidly and producing considerable pressure. Jet thrust units are designed to be ignited by an electric igniter. They are used to assist aeroplanes to take off.

(f) Smokeless powders are propellant explosives from which there is little or no smoke when fired. They include smokeless powder for cannon and smokeless powder for small arms. Smokeless powder for cannon used in the United States at the present time consists of a nitrocellulose colloid and is comparatively safe to handle and transport. Smokeless powder for small arms may consist of nitrocellulose or nitrocellulose combined with nitroglycerin. So-called smokeless powders which are composed of picrate or chlorate mixtures are classed as high explosives.

NOTE 1: Fire-extinguisher charges containing not to exceed 50 grains of smokeless powder per unit are exempt from the regulations in Parts 71–78 of this chapter.

§ 73.89 *Ammunition for cannon with empty projectiles, inert-loaded projectiles, solid projectiles, or without projectiles or shell.* (a) Ammunition for cannon with empty projectiles, inert-loaded projectiles, solid projectiles, or without projectiles or shell, must be well packed and properly secured in strong wooden or metal containers.

(b) Each outside package must be plainly marked "AMMUNITION FOR CANNON WITH EMPTY PROJECTILES", "AMMUNITION FOR CANNON WITH INERT-LOADED PROJECTILES", "AMMUNITION FOR CANNON WITH SOLID PROJECTILES", or "AMMUNITION FOR CANNON WITHOUT PROJECTILES", as the case may be.

(c) Ammunition for cannon with empty projectiles, inert-loaded projectiles, solid projectiles, or without projectiles or shell, must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.90 *Rocket ammunition with empty projectiles, inert-loaded or solid projectiles or without projectiles.* (a) Rocket ammunition with empty projectiles, inert-loaded or solid projectiles or without projectiles must be well packed and properly secured in strong wooden or metal containers.

(b) Each outside package must be plainly marked "ROCKET AMMUNITION WITH EMPTY PROJECTILES", "ROCKET AMMUNITION WITH INERT-LOADED PROJECTILES", "ROCKET AMMUNITION WITH SOLID PROJECTILES", or "ROCKET AMMUNITION WITHOUT PROJECTILES", as the case may be.

(c) Articles as defined in § 73.88 (c) of this part must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.91 *Special fireworks.* (a) Special fireworks, except as otherwise authorized, must be securely packed in containers complying with the following specifications:

(1) Spec. 11B (§ 78.161 of this chapter). Strong, tight, sparkproof wooden barrels.

(2) Spec. 15A, 15B, 16A, or 19A (§§ 78.168, 78.169, 78.185, or 78.190 of this chapter). Wooden boxes. Gross weight not to exceed 500 pounds.

(3) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes. Gross weight not to exceed 65 pounds. Not permitted for illuminating projectiles, toy torpedoes, aeroplane flares, and fireworks shells or fireworks bombs of which the mortar or firing device is not an integral part.

(4) Fireworks that can be exploded en masse, by dropping the completed shipping container from a height of six feet or by the impact of a rifle bullet, if found safe for transportation, may be shipped in accordance with the regulations in this part applying to high explosives.

(b) Flash or spreader cartridges not exceeding 72 grains of flash powder each must be packed in containers complying with the following specifications:

(1) Spec. 15A, 15B, 16A, or 19A (§§ 78.168, 78.169, 78.185, or 78.190 of this chapter). Wooden boxes, or spec. 12B (§ 78.205 of this chapter) fiberboard boxes, with inside containers which must be cartons or tin cans containing not over 6 cartridges and not to exceed 150 cartons or cans to an outer box.

(c) Flash cartridges consisting of a paper cartridge shell, small arms primer, and flash composition, not exceeding 180 grains each, all assembled in one piece ready for firing must be packed in containers complying with the following specifications:

(1) Spec. 15A, 15B, 16A, or 19A (§§ 78.168, 78.169, 78.185, or 78.190 of this chapter). Wooden boxes, or spec. 12B (§ 78.205 of this chapter) fiberboard boxes, with inside containers which must be cartons containing not to exceed 12 cartridges each and not more than 12 such cartons in one outside box.

(2) Flash cartridges, in quantity not exceeding 5 pounds, when in small interior wooden boxes, may be packed with nonexplosive, nonflammable, or noncorrosive articles.

(d) Flash sheets must be packed in containers complying with the following specifications:

(1) Spec. 15A, 15B, 16A, or 19A (§§ 78.168, 78.169, 78.185, or 78.190 of this chapter). Wooden boxes, or spec. 12B (§ 78.205 of this chapter) fiberboard boxes, with inside containers which must be an inner package or envelope containing not more than 6 flash sheets and not more than one dozen inner envelopes or packages inclosed in each inner pasteboard box or carton. Gross weight of wooden box not to exceed 150 pounds. Gross weight of fiberboard box not to exceed 65 pounds.

(2) Flash sheets, in quantity not exceeding 5 pounds, when in small interior wooden boxes, may be packed with nonexplosive, nonflammable, or noncorrosive articles.

(e) Photographic flash powder must be packed in containers complying with the following specifications:

(1) Spec. 15A, 15B, 16A, or 19A (§§ 78.168, 78.169, 78.185, or 78.190 of this chapter). Wooden boxes, or spec. 12B (§ 78.205 of this chapter) fiberboard boxes, with inside containers which must be any inside container sufficiently strong to retain contents not exceeding 2 ounces each. If bottles are used, each bottle must be packed in a fiber mailing tube with a tin bottom and tin screw cap. Not more than 4 dozen 2-ounce bottles may be packed in an outer wooden box. When packed in units not exceeding 1 ounce each without bottles in similar fiber mailing tubes and outer wooden boxes, the gross weight of one outside wooden box must not exceed 150 pounds. Gross weight of fiberboard box not to exceed 65 pounds.

(2) Photographic flash powder, in quantity not exceeding 5 pounds, when in small interior wooden boxes, may be packed with nonexplosive, nonflammable, or noncorrosive articles.

(f) Railway torpedoes (track torpedoes) must be packed in containers complying with the following specifications:

(1) Spec. 15A, 15B, 16A, or 19A (§§ 78.168, 78.169, 78.185, or 78.190 of this chapter). Wooden boxes. Net weight not to exceed 125 pounds.

(2) Spec. 23F (§78.214 of this chapter). Fiberboard boxes. Gross weight not to exceed 65 pounds.

(3) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes, with inside containers which must be cartons containing not to exceed one-half gross track torpedoes each. Gross weight of outside fiberboard box not to exceed 65 pounds.

(g) Toy torpedoes must be securely packed as prescribed in this section in containers complying with the following specifications:

(1) Spec. 15A, 15B, 16A, or 19A (§§ 78.168, 78.169, 78.185, or 78.190 of this chapter). Wooden boxes. Gross weight not to exceed 65 pounds.

(2) Toy torpedoes of any kind must not be packed with other fireworks.

(3) Toy torpedoes containing a cap must be packed in sawdust, in inside paper or cardboard cartons. The size of the carton must be not less than 4 cubic inches for each grain of explosive.

(4) Toy torpedoes containing a mixture of potassium chlorate, black antimony and sulfur, must be packed in an inner container, containing not more than one-fourth gross. The capacity of this inner container must be not less than 105 cubic inches, and it must be divided into 12 equal compartments. All vacant space inside the container must then be filled with sawdust or fine shavings.

(5) The gross weight of a container of toy torpedoes must not exceed 65 pounds.

(h) Except as otherwise specified in this section the gross weight of one outside container of special fireworks must not exceed 500 pounds.

(i) *Marking.* Each outside container of special fireworks must be plainly marked in letters not less than seven-sixteenths inch in height "SPECIAL FIREWORKS—HANDLE CAREFULLY—KEEP FIRE AWAY".

(1) Outside containers of toy torpedoes must in addition be marked "TOY TORPEDOES".

(j) *Label.* Each outside container of special fireworks when offered for transportation by carriers by rail express or water must have securely and conspicuously attached to it a square red label as described in § 73.419 of this part.

§ 73.92 *Jet thrust units (jato), class B.* (a) Jet thrust units (jato) class B, must be well packed and properly secured in strong wooden containers. Igniters must not be shipped assembled in the units.

(b) Each outside container must be plainly marked "JET THRUST UNITS, CLASS B".

(c) Jet thrust units must not be offered for transportation by rail express, except as provided in § 73.86 of this part

§ 73.93 *Smokeless powder for cannon.* (a) Smokeless powder for cannon when offered for transportation by carriers by rail freight, highway, or water must be packed in containers complying with the following specifications (see paragraph (f) (1) and (2) of this section for shipments by rail express):

(1) Spec. 10B (§ 78.156 of this chapter). Wooden barrels or kegs. Gross weight not to exceed 200 pounds.

(2) Spec. 13 (§ 78.140 of this chapter). Metal kegs. Gross weight not to exceed 150 pounds.

(3) Tight metal cases in tight wooden boxes free from loose knots and cracks or tight metal containers. Gross weight not to exceed 200 pounds.

(4) Spec. 15A (§ 78.168 of this chapter). Wooden boxes, lined, spec. 2L (§ 78.30 of this chapter).

(5) Spec. 21A (§ 78.222 of this chapter). Fiber drums. Use of this container will be permitted because of the present emergency and until further order of the Commission.

(b) Smokeless powder for cannon in water when offered for transportation by carriers by rail freight, highway, or water must be packed in containers complying with the following specifications:

(1) Spec. 5, 5A, 5B, 6A, 6B, or 6C (§§ 78.80, 78.81, 78.82, 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(2) Spec. 10A or 10B (§§ 78.155 or 78.156 of this chapter). Wooden barrels or kegs.

(3) Spec. 15A (§ 78.168 of this chapter). Wooden boxes, metal-lined, spec. 2F (§ 78.25 of this chapter).

(c) Igniters composed of black powder may be included in shipments of smokeless powder for cannon.

(d) Unstable, condemned, or deteriorated smokeless powder for cannon must be packed submerged in water in containers complying with the following specifications:

(1) Spec. 5, 5A, 5B, 6A, 6B, or 6C (§§ 78.80, 78.81, 78.82, 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(2) Spec. 10A or 10B (§§ 78.155 or 78.156 of this chapter). Wooden barrels or kegs.

(3) Spec. 15A (§ 78.168 of this chapter). Wooden boxes, metal-lined, spec. 2F (§ 78.25 of this chapter).

(4) Spec. 103 (§ 78.265 of this chapter). Tank cars.

(5) Unstable, condemned, or deteriorated smokeless powder for cannon must

not be offered for transportation by rail express.

(e) Each outside container must be plainly marked "SMOKELESS POWDER FOR CANNON", or "SMOKELESS POWDER FOR CANNON IN WATER", as the case may be.

(f) Smokeless powder for cannon when offered for transportation by rail express must be packed as follows (also authorized for transportation by carriers by rail freight, highway, or water):

(1) In tightly closed metal cans or fiber containers, not exceeding one pound each, packed in outside wooden boxes, spec. 15C (§ 78.170 of this chapter), or outside fiberboard boxes, spec. 12B or 23F (§§ 78.205 or 78.214 of this chapter). Not more than 10 one-pound cans or 10 one-pound fiber containers may be shipped in one outside container. Each outside container must be plainly marked "SMOKELESS POWDER FOR CANNON".

(2) *Label.* Each outside container of smokeless powder for cannon, when offered for transportation by rail express or water must have securely and conspicuously attached to it a square red label as described in § 73.412 (a) (2) of this part.

§ 73.94 *Smokeless powder for small arms.* (a) Smokeless powder for small arms when offered for transportation by carriers by rail freight, highway, or water must be packed in containers complying with the following specifications (see paragraph (i) (1) and (2) of this section for shipments by rail express):

(1) Spec. 10B (§ 78.156 of this chapter). Wooden barrels or kegs. Gross weight not to exceed 200 pounds.

(2) Spec. 13 (§ 78.140 of this chapter). Metal kegs at least 8 inches long. Gross weight not to exceed 150 pounds.

(3) Spec. 14 or 15A (§§ 78.165 or 78.168 of this chapter). Wooden boxes, metal-lined, spec. 2F (§ 78.25 of this chapter). Gross weight not to exceed 200 pounds.

(b) Spec. 14, 15A, 15B, 15C, 16A, or 19A (§§ 78.165, 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes, or spec. 23F (§ 78.214 of this chapter) fiberboard boxes, with inside containers which must be:

(1) Spec. 13 (§ 78.140 of this chapter). Metal kegs. Gross weight not to exceed 200 pounds in wooden boxes or 65 pounds in fiberboard boxes.

(2) Fiber or metal containers of not more than 1½ pounds capacity each. Gross weight not to exceed 200 pounds in wooden boxes or 65 pounds in fiberboard boxes.

(3) Not to exceed four metal containers, spec. 2A (§ 78.20 of this chapter), of not more than 25 pounds each. Gross weight in fiberboard boxes not to exceed 65 pounds.

(c) Spec. 14 or 15A (§§ 78.165 or 78.168 of this chapter). Wooden boxes, or spec. 23F (§ 78.214 of this chapter) fiberboard boxes, with inside containers which must be cloth or paper bags, of capacity not exceeding 25 pounds, net weight, each capable of withstanding, when filled to shipping content, at least two drops on end from a height of 4 feet, without breakage or sifting of contents. Outside container not to exceed more than 50 pounds, net weight.

(d) Bundles of metal kegs, spec. 13 (§ 78.140 of this chapter), firmly tied together with rope and wrapped in strong burlap, canvas, or similar material, securely sewed and roped, authorized. Net weight of powder must not exceed 100 pounds.

(e) Spec. 21A (§ 78.222 of this chapter). Fiber drums. Drums having wooden heads must be provided with a strong sift-proof liner. Use of this container will be permitted because of the present emergency and until further order of the Commission.

(f) Smokeless powder for small arms in water when offered for transportation by carriers by rail freight, highway, or water must be packed in containers complying with the following specifications:

(1) Spec. 5, 5A, 5B, 6A, 6B, or 6C (§§ 78.80, 78.81, 78.82, 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(2) Spec. 10A or 10B (§§ 78.155 or 78.156 of this chapter). Wooden barrels or kegs.

(3) Spec. 15A (§ 78.168 of this chapter). Wooden boxes, metal-lined, spec. 2F (§ 78.25 of this chapter).

(g) Unstable, condemned or deteriorated smokeless powder for small arms must be packed submerged in water in containers complying with the following specifications:

(1) Spec. 5, 5A, 5B, 6A, 6B, or 6C (§§ 78.80, 78.81, 78.82, 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(2) Spec. 10A or 10B (§§ 78.155 or 78.156 of this chapter). Wooden barrels or kegs.

(3) Spec. 15A (§ 78.168 of this chapter). Wooden boxes, metal-lined, spec. 2F (§ 78.25 of this chapter).

(4) Spec. 103 (§ 78.265 of this chapter). Tank cars.

(5) Unstable, condemned or deteriorated smokeless powder for small arms must not be offered for transportation by rail express.

(h) Each outside container must be plainly marked "SMOKELESS POWDER FOR SMALL ARMS", or "SMOKELESS POWDER FOR SMALL ARMS IN WATER", as the case may be.

(i) Smokeless powder for small arms when offered for transportation by rail express must be packed as follows (also authorized for transportation by carriers by rail freight, highway, or water):

(1) In tightly closed metal cans or fiber containers, not exceeding one pound each, packed in outside wooden boxes, spec. 15C (§ 78.170 of this chapter), or outside fiberboard boxes, spec. 12B or 23F (§ 78.205 or 78.214 of this chapter). Not more than 10 one-pound cans or 10 one-pound fiber containers may be shipped in one outside container. Each outside container must be plainly marked "SMOKELESS POWDER FOR SMALL ARMS".

(2) *Label.* Each outside container of smokeless powder for small arms when offered for transportation by rail express or water must have securely and conspicuously attached to it a square red label as described in § 73.412 (a) (1) of this part.

CLASS C EXPLOSIVES; DEFINITIONS

§ 73.100 *Definitions of class C explosives.* (a) Explosives, class C, are defined as certain types of manufactured articles which contain class A, or class B explosives, or both, as components but in restricted quantities, and certain types of fireworks. These explosives are further specifically described in paragraphs (b) to (r) of this section.

(b) Small-arms ammunition, designed to be fired from a pistol, revolver, rifle, or shotgun held by the hand or by the hand and shoulder, is fixed ammunition consisting of a metallic or paper cartridge case, a primer and a propelling charge, with or without bullet or shot, tear gas material, or pyrotechnics.

(c) Explosive cable cutters are used for cutting cables, etc. They consist of a metal device containing a knife-edged component which is propelled by a small charge of an explosive compound.

(d) Cordeau detonant fuse is a fuse containing a core of pentaerythrite tetranitrate or cyclotrimethylene trinitramine not exceeding 110 grains per linear foot, overspun with yarns, tapes and waterproofing compounds. Wire countering is permissible.

(e) Percussion fuzes, combination fuzes, and time fuzes are devices used to ignite the powder charges of ammunition or the black powder bursting charges of projectiles.

(f) Tracer fuzes and tracers are devices which are attached to projectiles and contain a slow-burning composition to show the flight of projectiles at night.

(g) Cartridge bags, empty, with black powder igniters consist of empty bags having attached thereto an igniter composed of black powder. (See § 73.93 (b), (c), and (d) of this part when shipped with smokeless powder for cannon.)

(h) Igniters consist of fiberboard, paper or metal tubes containing a small quantity of igniting compound which is ignited by the action of a primer, pull wire or scratch composition.

(i) Delay electric igniters consist of small metal tubes containing a wire bridge in contact with a small quantity of ignition compound. The ignition compound is in contact with or in close proximity to a short piece of safety fuse.

(j) Electric squibs consist of small tubes or blocks containing a small quantity of ignition compound in contact with a wire bridge.

(k) Fuse lighters and fuse igniters are small cylindrical hollow pasteboard or metal tubes containing an igniting composition in one end, the other end being open to permit it to be placed on safety fuse.

(l) Safety squibs are small paper tubes containing a small quantity of black powder. One end of each tube is usually twisted and tipped with sulfur.

(m) Instantaneous fuse is cotton yarn impregnated with meal powder. No restrictions other than packing in strong wooden boxes or barrels plainly marked "INSTANTANEOUS FUSE" are prescribed in this part.

(n) Primers are devices used to ignite the powder charges of ammunition or the black powder bursting charges of

projectiles. For small-arms ammunition the primers are "small-arm primers" or "percussion caps".

(o) Safety fuse, consisting of a core of black powder overspun with yarns, tapes, and/or waterproofing compounds must be packed in outside fiberboard boxes, wooden boxes, wooden barrels, bales, or metal containers, and must be described for shipping purposes as "SAFETY FUSE". No other restrictions apply in this part.

(p) Toy paper caps, consisting of paper cap ammunition for toy pistols, in sheets, strips, rolls, or individual caps, must not contain more than an average of twenty-five hundredths of a grain of explosive composition per cap and must be packed in inside packages constructed of cardboard not less than 0.013 inch in thickness or of metal not less than 0.008 inch in thickness which shall provide a complete enclosure and the minimum dimensions of each side or end of such package shall be not less than ⅛ inch in height. Unless greater weight of composition is approved by the Bureau of Explosives, the number of caps in these inside packages shall be limited so that not more than 10 grains of explosive composition shall be packed into one cubic inch of space and not exceeding 17.5 grains of the explosive composition of toy caps shall be packed in any inside container. These inner containers must be packed in outside containers as specified in § 73.109 of this part.

(q) Explosive rivets each containing not more than 75 milligrams of explosive composition, are exempt from specification packaging and labeling requirements when packed in pasteboard or other inside boxes in securely closed strong wooden boxes, fiberboard boxes or metal containers. Each outside container must be marked "EXPLOSIVE RIVETS". No other restrictions apply in this part.

(r) Common fireworks are manufactured articles designed primarily for the purpose of producing visible or audible pyrotechnic effects by combustion or explosion. Fireworks other than those specifically enumerated in this paragraph are classed as special fireworks (see § 73.88 (d) of this part). Common fireworks must be in the finished state exclusive of mere ornamentation, as supplied to the retail trade and must be so constructed and packed that loose pyrotechnic composition will not be present in packages in transportation:

(1) Roman candles, total pyrotechnic composition not to exceed twenty grams each in weight.

(2) Sky rockets with sticks, total pyrotechnic composition not to exceed twenty grams each in weight. The rocket sticks must be securely fastened to the casing.

(3) Helicopter type rockets, total pyrotechnic composition not to exceed twenty grams each in weight.

(4) Cylindrical fountains, total pyrotechnic composition not to exceed seventy-five grams each in weight. The inside tube diameter shall not exceed ¾ inch.

(5) Cone fountains, total pyrotechnic composition not to exceed fifty grams each in weight.

(6) Wheels, total pyrotechnic composition not to exceed sixty grams in weight, for each driver unit, but there may be any number of drivers on any one wheel. The inside bore of driver tubes shall not be over ½ inch.

(7) Railway fusees, truck flares, hand ship distress signals and illuminating torches. Total pyrotechnic composition of illuminating torches not to exceed one hundred grams each in weight.

(8) Sparklers and dipped sticks, total pyrotechnic composition not to exceed one hundred grams each in weight. Pyrotechnic composition containing any chlorate or perchlorate shall not exceed five grams.

(9) Colored box and cone fire, total pyrotechnic composition not to exceed one hundred grams each in weight.

(10) Mines and shells of which the mortar is an integral part, except those designed to produce an audible effect, total pyrotechnic composition not to exceed forty grams each in weight.

(11) Firecrackers and salutes with casings, the external dimensions of which do not exceed one and one-half inches in length or one quarter inch in diameter, and all articles designed to produce audible effect, total pyrotechnic composition not to exceed two grains each in weight.

§ 73.101 *Small-arms ammunition.* (a) Small-arms ammunition must be packed in pasteboard or other inside boxes packed in securely closed strong wooden boxes, fiberboard boxes, or metal containers.

(b) Small-arms ammunition in pasteboard or other inside boxes, in addition to containers prescribed in paragraph (a) of this section, may be shipped when packed in the same outside container with nonexplosive and nonflammable articles; or with small-arms primers or percussion caps in quantity not to exceed 5 pounds. The weight of the small-arms ammunition packed with other articles must not exceed 55 pounds in outside fiberboard box, or 75 pounds in outside wooden box. The outside package must be a securely closed strong wooden or fiberboard container.

(c) Each outside package must be plainly marked "SMALL-ARMS AMMUNITION".

(d) Outside containers of cartridges with tear gas material must in addition to marking prescribed herein be marked "TEAR GAS CARTRIDGES" and must be labeled with "TEAR GAS" label. (See § 73.409 (a) (3) of this part for label.)

(e) No restrictions, other than proper description, packing and marking for small-arms ammunition and additional marking and labeling for tear gas cartridges are prescribed in this part for the transportation of small-arms ammunition and tear gas cartridges.

§ 73.102 *Explosive cable cutters.* (a) Explosive cable cutters must be packed in strong wooden boxes.

(b) Each outside container must be plainly marked "EXPLOSIVE CABLE CUTTERS—HANDLE CAREFULLY".

§ 73.103 *Blasting caps not exceeding 1,000 caps.* (a) Blasting caps, blasting caps with safety fuse and electric blasting caps in quantities not exceeding 1,000 caps must be packed and marked as prescribed in § 73.66 and § 73.67 of this part.

(b) Blasting caps must not be offered for transportation by rail express, except as provided in § 73.86 of this part.

§ 73.104 *Cordeau detonant fuse.* (a) Cordeau detonant fuse must not be packed in the same package with detonators or with any high explosive.

(b) Cordeau detonant fuse must be packed in wooden boxes or fiberboard boxes.

(c) Each outside container must be plainly marked "CORDEAU DETONANT FUSE—HANDLE CAREFULLY".

§ 73.105 *Percussion, tracer, combination, time fuzes and tracers.* (a) Percussion, tracer, combination, time fuzes and tracers must be packed in strong, tight, outside wooden boxes, with special provision for securing individual packages of fuzes or tracers against movement in the box.

(b) The gross weight of one outside package must not exceed 150 pounds.

(c) Each outside container must be plainly marked with proper descriptive name and also "HANDLE CAREFULLY".

(d) No restrictions other than proper description, packing, and marking are prescribed in this part for the transportation of percussion, tracer, time, or combination fuzes, or tracers.

§ 73.106 *Cartridge bags, empty, with black powder igniters; igniters, safety squibs, electric squibs, delay electric igniters, and fuse lighters or fuse igniters.* (a) Cartridge bags, empty, with black powder igniters, igniters, safety squibs, electric squibs, delay electric igniters, and fuse lighters or fuse igniters must be packed in strong fiberboard or wooden boxes or wooden or metal barrels or drums properly described and properly marked with the name of the article packed therein.

§ 73.107 *Primers, percussion caps, and empty grenades, primed.* (a) Primers (cannon, combination and small-arms), percussion caps, and empty grenades, primed, must be packed in strong, tight, outside wooden boxes, with special provision for securing individual packages against movement in the box.

(b) Empty cartridge cases, primed, must be packed in strong, tight, outside wooden or fiberboard boxes.

(c) Small-arms primers containing anvils must be packed in cellular inside packages, with partitions separating the layers and columns of the primers, so that the explosion of a portion of the primers in the completed shipping package will not cause the explosion of all the primers.

(d) Percussion caps must be packed in metal or other inside boxes containing not more than 500 caps; the construction of the cap or packing and the kind and quantity of explosives in each must be such that the explosion of a part of the caps in the completed shipping package will not cause the explosion of all the caps.

(e) Small-arms primers and/or percussion caps may be packed with nonexplosive and/or nonflammable articles, or with small-arms ammunition as pro-

vided in § 73.101 (b) of this part, the weight of the small-arms primers or percussion caps must not exceed 5 pounds in any such outside container.

(f) The gross weight of one outside package must not exceed 150 pounds.

(g) Each outside container must be plainly marked with proper descriptive name and also "HANDLE CAREFULLY".

(h) No restrictions other than proper shipping name, packing and marking are prescribed in this part for the transportation of percussion caps, cannon primers, small-arms primers, combination primers, empty cartridge cases primed, or empty grenades primed.

§ 73.108 *Common fireworks.* (a) Common fireworks, except as otherwise authorized, must be securely packed in containers complying with the following specifications:

(1) Spec. 11B (§ 78.161 of this chapter). Strong, tight, sparkproof wooden barrels.

(2) Spec. 15A, 15B, 16A, or 19A (§§ 78.168, 78.169, 78.185 or 78.190 of this chapter). Wooden boxes. Gross weight not to exceed 100 pounds.

(3) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes. Gross weight not to exceed 65 pounds.

(4) Firecrackers, Chinese, in addition to containers specified in paragraph (a) (1), (2), and (3) of this section, may also be transported in the package in which they are imported, provided these packages consist of wooden boxes, or fiberboard boxes, spec. 12B (§ 78.205 of this chapter), in good condition, completely covered with strong matting and do not weigh more than 100 pounds, gross.

(5) Fireworks, such as sparklers or fusees, with match tip or head, or similar igniting point or surface, must have each individual tip, head, or similar igniting point or surface entirely covered and securely protected against accidental contact or friction.

(b) Railway fusees, flares or highway signals must be packed in containers complying with the following specifications:

(1) Spec. 15A, 15B, 16A, or 19A (§§ 78.168, 78.169, 78.185, or 78.190 of this chapter). Wooden Boxes. Gross weight not to exceed 200 pounds.

(2) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes, provided that ends of boxes are reinforced to prevent penetration of spikes through the outside container when the completed package, prepared for shipment, is subjected to two drops from a height of 4 feet on a solid surface and so as to strike diagonally with the spikes in a downward position. Gross weight not to exceed 65 pounds, except that gross weight not to exceed 75 pounds is authorized in boxes made in accordance with § 78.205-24 (a) of this chapter.

(3) Spec. 29 (§ 78.226 of this chapter). Mailing tubes, provided the penetration of the spikes of fusees (flares or highway signals), through the outside container is prevented by one of the methods specified for fiberboard boxes, spec. 12B (§ 78.205 of this chapter), in paragraph (b) (2) of this section. Gross weight not to exceed 5 pounds.

(4) Fusees, flares, pyrotechnic, or highway signals without spikes, or torches, pyrotechnic, when offered for shipment may be packed in containers prescribed in this paragraph, omitting the protection required for these articles when equipped with spikes.

(5) Fusees, flares, or highway signals may be packed with nonexplosive or nonflammable articles provided the outside packages are marked as prescribed in this section.

(c) Except as otherwise specified herein the gross weight of one outside package containing common fireworks must not exceed 100 pounds.

(d) Each outside package must be plainly marked in letters not less than seven-sixteenths inch in height "COMMON FIREWORKS—HANDLE CAREFULLY—KEEP FIRE AWAY".

§ 73.109 *Toy caps.* (a) Toy caps must be packed in containers complying with the following specifications:

(1) Spec. 15A, 15B, 16A, or 19A (§§ 78.168, 78.169, 78.185, or 78.190 of this chapter). Wooden boxes. Gross weight not to exceed 150 pounds.

(2) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes. Gross weight not to exceed 65 pounds.

(b) Toy caps may be packed with nonexplosive or nonflammable articles provided the outside containers are marked as prescribed herein.

(c) Toy paper caps of any kind must not be packed with fireworks.

(d) Each outside container must be plainly marked "TOY CAPS—HANDLE CAREFULLY".

SUBPART C—FLAMMABLE LIQUIDS; DEFINITION AND PREPARATION

§ 73.115 *Flammable liquids; definition.* (a) A flammable liquid for the purpose of Parts 71–78 of this chapter is any liquid which gives off flammable vapors (as determined by flash point from Tagliabue's open-cup tester, as used for test of burning oils) at or below a temperature of 80° F.

§ 73.116 *Outage.* (a) Outage for containers offered for transportation by carriers by rail freight, rail express, highway, or water, except as otherwise specifically provided in this part, must be as prescribed in paragraphs (b) to (h) of this section.

(b) Containers must not be entirely filled. Sufficient interior space must be left vacant to prevent leakage or distortion of containers due to the expansion of the contents from increase of temperature during transit. This outage must be calculated to the total capacity of the container.

(c) In packages containing alcohol, cologne spirits, high wines, or other distilled spirits of 150 proof or over, the vacant interior space must be the maximum permitted by the United States Internal Revenue regulations.

(d) Flammable liquids must not be loaded into domes of tank cars, except as follows:

(1) Because of the present emergency and until further order of the Commission, and only for shipments made during the months of October to April, inclusive, flammable liquids having a vapor pressure not exceeding 16 pounds per square inch, absolute, at 100° F. may be loaded not to exceed 98 percent of the combined shell and dome capacity of the tank car.

(e) The outage for tank cars must be not less than 2 percent. If the dome of the tank car does not provide sufficient outage, then vacant space must be left in the shell to make up the required outage.

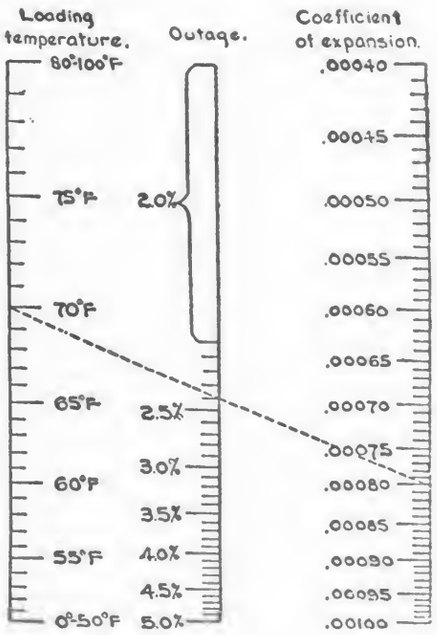
(f) When uninsulated tank cars are used for the shipment of flammable liquids having a vapor pressure exceeding 16 pounds per square inch absolute at 100° F. for which minimum outage is not specifically provided in this part, outage must be the greatest of the following values:

(1) Dome capacity.

(2) Two percent of total capacity of tank and dome.

(3) Outage as shown in paragraph (g) of this section.

(g) Outage chart for flammable liquids:



Example: Suppose the temperature of the liquid at time of loading is 70° F. and its coefficient of expansion is 0.00080; lay a ruler on the chart running from 70° to 0.00080 as shown by the dotted line and the required outage is 2.4 percent where the ruler crosses the outage scale.

The following coefficients of expansion per degree Fahrenheit, of the principal flammable liquids shall be used in determining outages:

Acetone	0.00085
Amyl acetate	.00066
Benzol (benzene)	.00071
Carbon bisulfide	.00070
Ether	.00098
Ethyl acetate	.00079
Ethyl (grain) alcohol	.00062
Methyl (wood) alcohol	.00072
Toluol (toluene)	.00063
Gasoline or naphtha:	
50–55° A. P. I.[1]	.00055
55.1–60° A. P. I.[1]	.00060
60.1–65° A. P. I.[1]	.00065
65.1–70° A. P. I.[1]	.00070
70.1–75° A. P. I.[1]	.00075

Gasoline or naphtha—Continued	
75.1–80° A. P. I.[1]	.00080
80.1–85° A. P. I.[1]	.00085
85.1–90° A. P. I.[1]	.00090

[1] °A. P. I. (American Petroleum Institute), according to the following formula:

$$°\text{A. P. I.} = \frac{141.5}{\text{specific gravity}} - 131.5$$

(h) No cargo tank or compartment thereof used for the transportation of any flammable liquid shall be completely filled. The vacant space (outage) in a cargo tank or compartment thereof used in the transportation of flammable liquids for distances of 100 miles or more shall be not less than 3 percent of its volume, and in any case the free space shall be not less than 1 percent; sufficient space shall be left vacant in every case to prevent leakage from or distortion of such tank or compartment by expansion of the contents due to rise in temperature in transit.

§ 73.117 *Closing and cushioning.* (a) All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed, or in any case when necessary to prevent breakage or leakage.

§ 73.118 *Exemptions for flammable liquids.* (a) Flammable liquids, except those enumerated in paragraph (c) of this section, in inside glass or earthenware containers having a capacity not over 1 pint or 16 ounces by weight each, or inside metal containers not over 1 quart capacity each, packed in strong outside containers, except as otherwise provided, are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements.

(b) Flammable liquids, except those enumerated in paragraph (c) of this section, in inside containers having a capacity not over 1 pint or 16 ounces by weight each, packed in strong outside containers, are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, rail express, or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements.

(c) The following articles in any quantity are not exempt from any of the provisions of this part.

(1) Acrolein.
(2) Carbon bisulfide (disulfide).
(3) Ethyl chloride.
(4) Ethyl trichlorosilane.
(5) Ethylene oxide.
(6) Flammable liquids which are also corrosive liquids or oxidizing materials under this part.
(7) Lithium aluminum hydride (ethereal).
(8) Nickel carbonyl.
(9) Pentaborane.
(10) Spirits of nitroglycerin in excess of one percent by weight.
(11) Trichlorosilane.
(12) Zinc ethyl.

§ 73.119 *Flammable liquids not specifically provided for.* (a) *Flammable liquids with flash point 20° F. or below.* Flammable liquids with flash point 20° F. or below and having vapor pressure (Reid[1] test) not over 16 pounds per square inch, absolute, at 100° F., other than those for which special requirements are prescribed in this part, must be prepared for shipment in specification containers as follows. (See paragraphs (c) to (i) of this section for high pressure liquids, and paragraphs (j) to (l) of this section for viscous liquids, and paragraph (m) of this section for flammable liquids which are also oxidizing materials or corrosive liquids):

(1) Spec. 1A, 1C, or 1D (§§ 78.1, 78.3, or 78.4 of this chapter). Carboys, glass, boxed or in barrels or kegs, capacity not over 5 gallons, except capacity not over 6.5 gallons authorized for Spec. 1D. Must be closed, and when reused must be reconditioned and tested, as provided in the specification.

(2) Spec. 5, 5A, 5B, 5C, 5G, or 5M (§§ 78.80, 78.81, 78.82, 78.83, 78.86, or 78.90 of this chapter). Metal barrels or drums, with openings not exceeding 2.3 inches in diameter.

(3) Spec. 17E (§ 78.116 of this chapter). Metal drums (single trip), not over 5 gallons capacity, without opening except bunghole not exceeding 2.3 inches in diameter. (See also paragraph (a) (16) this section.)

(4) Spec. 17C (§ 78.115 of this chapter). Metal drums (single-trip), with openings not exceeding 2.3 inches in diameter.

(5) Spec. 10A (§ 78.155 of this chapter). Wooden barrels or kegs.

(6) Spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter). Wooden barrels or kegs with inside containers which must be glass or earthenware, not over 1 gallon each; metal pails, kits, or cans, not over 2 gallons each.

(7) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with inside containers which must be glass or earthenware, not over 1 quart each; metal cans, not over 1 gallon each. Packages containing glass or earthenware containers must not weigh over 65 pounds gross.

(8) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 73.190 of this chapter). Wooden boxes with inside containers which must be glass or earthenware, not over 1 gallon each, except that inside containers up to 3 gallons each are authorized when only one inside container is packed in each outside container; or metal pails, kits, or cans, not over 10 gallons each.

(9) Spec. 21A, 22A, or 22B (§§ 78.222, 78.196, or 78.197 of this chapter). Fiber drums and plywood drums with a single inside glass, earthenware, or metal container of not over 1 gallon capacity in each drum. Inside container must be so cushioned at top, sides, and bottom, as to prevent breakage or leakage in transit.

(10) Spec. 42B (§ 78.107 of this chapter) or 42C (§ 78.108 of this chapter). Aluminum barrels or drums.

(11) Cylinders as prescribed for any compressed gas, except acetylene.

(12) Spec. 103, 103–W, 104, 104–W, 104A, 104A–W, 105A300, 105A300–W, 105A400, 105A400–W, 105A500, 105A500–W, 105A600, 105A600–W,[2] ARA–II,[2] ARA–III,[2] ARA–IV,[2] or ARA–IV–A.[2] Tank cars. (§§ 78.265, 78.280, 78.269, 78.284, 78.270, 78.285, 78.271, 78.286, 78.272, 78.287, 78.273, 78.288, 78.274, and 78.289 of this chapter). For cars equipped with expansion domes, manhole closures must be so designed that pressure will be released automatically by starting the operation of removing the manhole cover. (See § 73.432 of this part for shipping instructions.)

(13) The use of special aluminum tank cars for test service is also provided for by I. C. C. authority in docket 3666 dated November 5, 1937, and February 1, 1939, for the shipment of gasoline, ethyl acetate, acetone, methanol, or butyraldehyde. Special order Nov. 5, 1937, amended Feb. 1, 1939, spec. 103AL[2] riveted aluminum tanks of tank cars for gasoline, ethyl acetate, acetone, methanol or butyraldehyde (see Appendix D to subpart I of part 78 of this chapter).

(14) Spec. 15X (§ 78.181 of this chapter). Wooden boxes with inside metal containers. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side by rail freight in carload lots only and by motor vehicle in truckload lots only.

(15) Spec. 17X (§ 78.119 of this chapter). Metal drums (single-trip). For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side by rail freight in carload lots only and by motor vehicle in truckload lots only.

(16) Spec. 17E (§ 78.116 of this chapter). Metal drums (single-trip), not over 55 gallons capacity, not less than full 19 gauge body and head sheets for not over 30-gallon drums, and not less than full 18 gauge body and head sheets for not over 55-gallon drums, with openings not exceeding 2.3 inches in diameter. When transported by rail or highway, authorized only for carload and truckload shipments.

NOTE 1: Because of the present emergency and until further order of the Commission, l. c. l. and l. t. l. shipments will be permitted.

(17) Spec. MC 300, MC 301, MC 302, or MC 303 (§§ 78.321, 78.322, 78.323, or 78.324 of this chapter). Tank motor vehicles.

(18) Because of the present emergency and until further order of the Commission, the use of additional-type tank cars, specification Emergency—USG–A,[2] USG–B,[2] or USG–C[2] (§ 78.290 of this chapter), is also provided for by I. C. C. authority in docket 3666 dated December 12, 1942, for the transportation of liquids weighing not over 8 pounds per gallon, and having vapor pressures not exceed-

[1] American Society for Testing Materials Method of Test for Vapor Pressure of Petroleum Products (D–323).

[2] Use of existing tank cars authorized, but new construction not authorized.

ing 16 pounds per square inch, absolute, at 100° F.

(19) Spec. 5L (§ 78.89 of this chapter). Metal barrels or drums for gasoline shipments offered by or consigned to the Departments of the Army, Navy, and Air Force of the United States Government or Allies. Use of this container will be permitted because of the present emergency and until further order of the Commission.

(20) Spec. 12D (§ 78.207 of this chapter). Fiberboard boxes with inside containers which must be glass or earthenware not over one gallon each; authorized for not more than 75 pounds gross weight; not to contain more than 4 such inside containers if their capacity is greater than 5 pints each. Use of this container will be permitted because of the present emergency and until further order of the Commission.

(21) Gasoline samples in boxes of metal not lighter than 20 gauge, United States standard, having hinged cover securely closed, and containing not more than 5 inside rectangular metal cans with screw cap closure, each having a capacity not to exceed ½ gallon, may be shipped when consigned to state laboratories for examination.

(b) *Flammable liquids with flash point above 20° F. to 80° F.* Flammable liquids, with flash point above 20° F. to 80° F., and having vapor pressure (Reid [1] test) not over 16 pounds per square inch, absolute, at 100° F., other than those for which special requirements are prescribed in this part, must be prepared for shipment in specification containers as follows (see paragraphs (c) to (i) of this section for high pressure liquids, and paragraph (m) of this section for flammable liquids which are also oxidizing materials or corrosive liquids):

(1) Containers as specified in paragraph (a) of this section, except that full removable head drums are authorized when permitted by specification, and also the following.

(2) Spec. 17E or 17H (§§ 78.116 or 78.118 of this chapter). Metal drums (single-trip).

(3) Spec. 10B (§ 78.156 of this chapter). Wooden barrels or kegs.

NOTE 1: Because of the present emergency and until further order of the Commission, wooden whiskey barrels, with char removed and properly recoopered, which comply with all the provisions of spec. 10B, are also authorized. Marking is required on the head of each container, by the reconditioner, by hot branding iron, as follows:

ICC–10B.

Name or symbol (letters) of reconditioner; this must be registered with the Bureau of Explosives and located just above, below, or following the mark ICC–10B.

Size of markings (minimum): ¾-inch high.

(4) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with inside containers which must be glass, earthenware, or metal, not over 1 gallon each. Packages containing inside glass or earthenware containers must not weigh over 65 pounds gross nor contain more than 4 such inside containers if their capacity is greater than 5 pints each.

NOTE 1: Because of the present emergency and until further order of the Commission, fiberboard boxes, spec. 12B, § 78.205–26 (a) of this chapter, with one inside rectangular metal can, spec. 2F (§ 78.25 of this chapter), not to exceed 5 gallons capacity, are authorized. Gross weight of completed package not over 65 pounds.

(5) Spec. 12E (§ 78.208 of this chapter). Fiberboard box with 1 or 2 rectangular metal inside containers of not over 5 gallons capacity each.

(c) *Flammable liquids for which other special packing requirements are not prescribed.* Flammable liquids for which other special packing requirements are not prescribed in this part, must be shipped, depending upon their Reid [1] vapor pressures as prescribed in paragraphs (d) to (i) of this section.

(d) *When the vapor pressure does not exceed 16 pounds per square inch, absolute, at 100° F.* When the vapor pressure does not exceed 16 pounds per square inch, absolute, at 100° F., as prescribed in paragraphs (a) and (b) of this section.

(e) *When the vapor pressure exceeds 16 pounds per square inch, absolute, at 100° F.* When the vapor pressure exceeds 16 pounds per square inch, absolute, at 100° F., but does not exceed 27 pounds per square inch, absolute, at 100° F., flammable liquids must be packed in specification containers as follows:

(1) As prescribed in paragraph (a) (1) to (11) of this section, except spec. 10A and 17E (§§ 78.155 and 78.116 of this chapter). Bung labels required, for metal barrels and drums, as prescribed in paragraph (i) of this section.

(2) Spec. 103, 103–W, 104, 104–W, 104A, 104A–W, 105A300, 105A300–W, 105A400, 105A400–W, 105A500, 105A500–W, 105A600, 105A600–W, ARA–II,[2] ARA–III,[2] ARA–IV,[2] or ARA–IV–A.[2] Tank cars. (§§ 78.265, 78.280, 78.269, 78.284, 78.270, 78.285, 78.271, 78.286, 78.272, 78.287, 78.273, 78.288, 78.274, and 78.289 of this chapter). Cars having expansion domes must be equipped with manhole closures, identification marks, and dome placards as prescribed in paragraphs (f) (4), (g), (h), and (h) (1) of this section. (See Note 1 of paragraph (f) (3) of this section).

(3) Spec. MC 300, MC 301, MC 302, or MC 303 (§§ 78.321, 78.322, 78.323, or 78.324 of this chapter). Tank motor vehicles.

(f) *When the vapor pressure exceeds 27 pounds per square inch, absolute, at 100° F.* When the vapor pressure exceeds 27 pounds per square inch, absolute, at 100° F., but does not exceed 40 pounds per square inch (see note 2), absolute, at 100° F., flammable liquids must be packed in specification containers as follows:

(1) Spec. 5 or 5A (§§ 78.80 or 78.81 of this chapter). Metal barrels or drums, with openings not exceeding 2.3 inches in diameter. Bung labels required as prescribed in paragraph (i) of this section.

(2) Cylinders as prescribed for any compressed gas except acetylene.

(3) Spec. 104A, 104A–W, 105A300, 105A300–W, 105A400, 105A400–W, 105A500, 105A500–W, 105A600, 105A600–W, or ARA–IV–A.[2] Tank cars. (§§ 78.270, 78.285, 78.271, 78.286, 78.272, 78.287, 78.273, 78.288, 78.274, and 78.289 of this chapter) (see Note 1 of this subparagraph.) Spec. 104 (§ 78.269 of this chapter) and ARA–IV [2] tank cars are authorized under the conditions prescribed in paragraphs (f) (4), (g), (h), and (h) (1) of this section and Note 3 of this subparagraph.

NOTE 1: Tanks built in compliance with American Railway Association specifications for class IV–A [2] tank cars authorized for use effective October 1, 1925, may be continued in service for the transportation of ethyl chloride and other liquids which do not have a vapor pressure exceeding 28 pounds per square inch, gauge pressure, at 100° F., provided there is stenciled on each side of the tank immediately below the valve protecting housing the words "Liquids having vapor pressure exceeding 28 pounds per square inch at 100° F. must not be loaded into this tank" in letters and figures at least 1 inch high. These tank cars must be retested as prescribed in current spec. 104A (§ 78.270 of this chapter), except that safety valves must open at pressure not exceeding 35 pounds, and be vapor tight at 28 pounds per square inch.

NOTE 2: When the vapor pressure exceeds 40 pounds per square inch, absolute, at 100° F., these flammable liquids are classed as flammable compressed gases and must be described, packed, and shipped as prescribed for such articles.

NOTE 3: Spec. 104 (§ 78.269 of this chapter) or ARA–IV [2] tank cars are authorized provided that they are equipped with approved fittings designed to provide for the loading, unloading, gauging, sampling, and taking temperature of the contents without removing the manhole closure; that safety valves are set to open at pressure of 35 pounds (with a tolerance of plus or minus 3 pounds), and are vapor tight at 28 pounds per square inch, gauge pressure; that bottom discharge outlets are of the same type as authorized for specification 104 tank cars; and that there is stenciled on each side of the tank above the specification mark, in letters and figures at least 1 inch high, "For vapor pressures not exceeding 40 pounds per square inch, absolute, at 100° F." Because of the present emergency and until further order of the Commission, spec. ICC–104 (§ 78.269 of this chapter) tank cars, equipped with safety valves set to open at pressure of 35 pounds (with a tolerance of plus or minus 3 pounds) and which are vapor tight at 28 pounds per square inch, gauge pressure, are authorized provided they are stenciled as required above.

(4) Spec. 103, 103–W, 104, 104–W, ARA–II,[2] ARA–III,[2] or ARA–IV.[2] Tank cars. (§§ 78.265, 78.280, 78.269, and 78.284 of this chapter). Cars must have their manhole closures equipped with approved safeguards making removal of closures from manhole openings practically impossible while car interior is subjected to vapor pressure of lading. These cars must be stenciled on each side of domes in line with the ladders, and in a color contrasting to the color of the dome, with the identification

[1] American Society for Testing Materials Method of Test for Vapor Pressure of Petroleum Products (D–323).

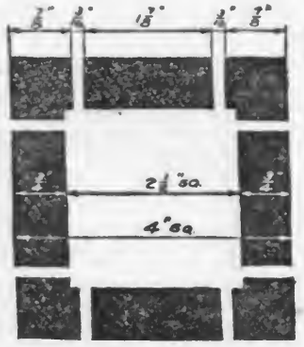
[2] Use of existing tank cars authorized, but new construction not authorized.

mark as prescribed in paragraph (g) of this section.

(5) Spec. MC 300, MC 301, MC 302, or MC 303 (§§ 78.321, 78.322, 78.323, or 78.324 of this chapter). Tank motor vehicles.

(g) *Manhole closure identification mark.*

(Reduced size)



(h) Dome placards. Spec. 103, 103–W, 104, 104–W, ARA–II,[1] ARA–III,[1] or ARA–IV.[1] Tank cars. (§§ 78.265, 78.280, 78.269, and 78.284 of this chapter.) Cars loaded with materials described in paragraphs (e) and (f) of this section must, in addition to the "Dangerous" placard, be protected by special dome placards, at least 4⅛ by 10⅞ inches, with legible wording as follows:

DOME PLACARD

(Reduced Size)

(Black printing on white)

10⅞ Inches

4⅛ Inches

AVOID ACCIDENTS

DO NOT REMOVE THIS DOME COVER WHILE GAS PRESSURE EXISTS IN TANK

KEEP LIGHTED LANTERNS AWAY

NOTE 1: For tank car equipped with both inner and outer manhole covers, and when removal of inner cover is not necessary to unload the car, the word "inner" may be substituted for the word "this" in the dome placard.

(1) Dome placards must be applied one on each side of dome and one on the top near the manhole in line with the ladders. Dome placards may be of white paper securely pasted to the dome, or of strong tag board for use in suitable holders; or the wording of the dome placard may be stenciled on the dome of car and remain thereon as long as it is used in the service which requires these special placards.

(i) *Bung label.* Flammable liquids as described in paragraphs (e) and (f) of this section, shipped in metal drums or barrels, in addition to the standard red caution label prescribed in § 73.405 of this part, must be labeled near the bung with a white rectangular label or tag measuring 5 by 3 inches, bearing the following wording:

[1] Use of existing tank cars authorized but new construction not authorized.

BUNG LABEL

(Reduced Size)

(Black printing on white)

5 Inches

3 Inches

CAUTION Unscrew This Bung SLOWLY

Do not unscrew entirely until all interior pressure has escaped through the loosened threads.

REMOVE BUNG IN OPEN AIR. Keep all open flame lights and fires away. Inclosed Electric Lights are safe.

(j) *Viscous flammable liquids.* Flammable liquids having a viscosity as determined by one of the following methods, must be shipped in specification containers as prescribed in this section:

(1) The viscosity of the liquids must be determined in a Stormer viscosimeter with an actuating weight of 400 grams and with the liquid maintained at a temperature of 28° C. The cylinder of the viscosimeter must be immersed in the liquid.

(2) For transparent liquids the sample may be tested in a vertical glass tube, 1 inch inside diameter by approximately 13 inches long, having two marks 10 inches apart engraved thereon, the lower mark being 2 inches above the bottom of the tube; the liquid to be tested shall be poured into the tube until its surface rises one-half inch above the upper mark and must be maintained at a temperature of 28° C. during the test; a polished steel ball one-fourth inch in diameter shall be supported one-half inch above the surface of the liquid at the center of the tube and dropped therein.

(3) When the speed of the cylinder in the first test does not exceed 10 revolutions per 13 seconds, or the time required in the second test for the steel ball to fall the vertical distance between the two lines upon the glass tube is not less than 4 seconds the material is classed as "viscous".

(k) *Viscous flammable liquids having a vapor pressure which does not exceed 16 pounds per square inch, absolute, at 100° F.* (See paragraphs (c) to (i) of this section for higher pressure liquids) must be prepared for shipment in containers as follows:

(1) As prescribed in paragraphs (a) and (b) of this section.

(2) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chaper). Metal barrels or drums.

(3) Spec. 37D (§ 78.125 of this chapter). Metal drums (single-trip) not over 5 gallons with welded side seams.

(l) *Viscous flammable liquids with flash point above 20° F. to 80° F. and having a vapor pressure which does not exceed 18 pounds per square inch, absolute, at 100° F.* Viscous flammable liquids with flash point above 20° F. to 80° F. and having a vapor pressure which does not exceed 18 pounds per square inch, absolute, at 100° F. must be prepared for shipment in containers as follows:

(1) As prescribed in paragraphs (e) to (i) of this section.

(2) Spec. 17E or 17H (§ 78.116 or 78.118 of this chapter). Metal drums (single-trip).

(m) *Flammable liquids which are also oxidizing materials or corrosive liquids.* Flammable liquids which are also oxidizing materials or corrosive liquids as defined in §§ 73.151 and 73.240 of this part must be packed as follows:

(1) Spec. 1A or 1D (§§ 78.1 or 78.4 of this chapter). Carboys, glass, boxed, capacity not over 5 gallons for spec. 1A, and 6.5 gallons for spec. 1D.

(2) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside containers which must be glass or earthenware, not over 1 gallon each, cushioned with incombustible packing material in sufficient quantity to absorb the contents of the inner container.

(3) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with inside containers which must be glass or earthenware, not over 1 quart each, cushioned with incombustible packing material in sufficient quantity to absorb the contents of the inner container.

(4) Spec. 5, 5A, 5B, 5C, 5G, 17C (single-trip), or 17E (single-trip) (§§ 78.80, 78.81, 78.82, 78.83, 78.86, 78.115, or 78.116 of this chapter). Metal barrels or drums not over 15 gallons capacity. Authorized only for materials which will not react dangerously with the drum metal, or be decomposed by contact with it.

§ 73.120 *Automobiles, motorcycles, tractors, or other self-propelled vehicles.* (a) Automobiles, motorcycles, tractors, or other self-propelled vehicles, equipped with acetylene gas cylinders or gasoline or other fuel tanks are exempt from specification packaging, marking, and labeling requirements, provided such cylinders and tanks are securely closed, for transportation by rail freight, rail express or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements. When offered for transportation by carriers by rail freight or highway, drainage of fuel tanks is not required. When offered for transportation by rail express, fuel tanks must have been drained and securely closed.

§ 73.121 *Carbon bisulfide (disulfide).* (a) Carbon bisulfide must be packed in specification containers as follows:

(1) Spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter). Wooden barrels or kegs with glass, earthenware, or metal inside containers not over 5 pints capacity each.

(2) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with inside containers which must be glass or earthenware, not over 1 pint each, or metal cans, not over 1 quart each. Outside containers not to exceed 65 pounds gross weight.

(3) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with

inside metal containers, spec. 2A (§ 78.20 of this chapter); or with inside glass or earthenware containers not over 5 pints capacity each.

(4) Spec. 17E (§ 78.116 of this chapter). Metal drums (single-trip) not over 5 gallons capacity each, with openings not exceeding 2.3 inches in diameter.

(5) Spec. 5, 5A, or 17C (single-trip) (§§ 78.80, 78.81, or 78.115 of this chapter). Metal barrels or drums not over 55 gallons capacity each, with openings not exceeding 2.3 inches in diameter.

(6) Tank cars as prescribed in § 73.119 (a) (12) of this part. (See § 73.432 of this part for shipping instructions.)

(b) Carbon bisulfide (disulfide) must not be offered for transportation by rail express.

§ 73.122 *Acrolein.* (a) Acrolein must be inhibited and packed in specification containers as follows:

(1) Spec. 5A (§ 78.81 of this chapter). Metal drums not over 55 gallon capacity each.

(2) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside metal containers, spec. 2A (§ 78.20 of this chapter), not over 5 gallons capacity each.

(b) Acrolein must not be offered for transportation by rail express.

§ 73.123 *Ethyl chloride.* (a) Ethyl chloride must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass, earthenware, or metal inside containers not over 1 pound capacity each.

(2) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with glass, earthenware, or metal inside containers not over 1 pound capacity each. Outside containers not to exceed 65 pounds gross weight.

(3) Spec. 5A (§ 78.81 of this chapter). Metal barrels or drums not over 33 gallons capacity each.

(4) Cylinders as prescribed for any compressed gas, except acetylene.

(5) Spec. 104A, 104A–W, 105A300, 105A300–W, 105A400, 105A400–W, 105A500, 105A500–W, 105A600, 105A600–W, or ARA–IV–A.[1] Tank cars. (§§ 78.270, 78.285, 78.271, 78.286, 78.272, 78.287, 78.273, 78.288, 78.274, and 78.289 of this chapter.) See Note 1 of § 73.119 (f) (3) of this part. (See § 73.432 of this part for shipping instructions.)

(b) Outage for all containers except lagged tank cars, must be 7.5 percent or more at 70° F. For lagged tank cars, 4 percent or more at 70° F.

§ 73.124 *Ethylene oxide.* (a) Ethylene oxide must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass, earthenware, or metal inside containers not over 1 pound capacity each.

(2) Cylinders as prescribed for any compressed gas, except acetylene.

(3) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with glass, earthenware, or metal inside containers not over 1 pound capacity each. Outside containers not to exceed 65 pounds gross weight.

(4) Spec. 5P (§ 78.92 of this chapter). Lagged steel drums not over 61 gallons capacity each. Drums must be equipped with safety devices of the fusible plug type with yield temperature not to exceed 165° F. approved by the Bureau of Explosives; each drum must be tested for leakage at a pressure of at least 15 psi gauge with an inert gas before each refilling; top head of each drum must be plainly marked with paint "Keep This End Up". Filling shall be such that the container will not be liquid full below 165° F. and the maximum filling for 61 gallon drums must not exceed 55 gallons of ethylene oxide at 60° F.

(5) Spec. 104A, 104A–W, or ARA–IV–A.[1] Tank cars. (§§ 78.270 or 78.285 of this chapter). See Note 1 § 73.119 (f) (3) of this part. (See § 73.432 of this part for shipping instructions.)

NOTE 1: Because of the present emergency and until further order of the Commission, specification ARA–IV[1] and ICC–104 (§ 78.269 of this chapter) tank cars, converted as follows, are authorized for use. Tanks must be tested to 75 pounds per square inch hydrostatic pressure and show no leakage with lagging removed. Bottom discharge outlet must be removed, the opening closed with a riveted plate and a sump applied. Safety valves must be removed and replaced by two safety valves of the type and size used on ICC–104A (§ 78.270 of this chapter) tank cars but set to open at 60 pounds per square inch instead of 75 pounds. The various approved dome fittings now required on ICC–104A (§ 78.270 of this chapter) tank cars must be installed in an approved manner to provide for the loading, unloading, gauging, sampling, and taking of temperature of contents without removing the manhole closure. Tank jacket must be stenciled immediately above the mark ARA–IV[1] or ICC–104 (§ 78.269 of this chapter) with the words "FOR ETHYLENE OXIDE ONLY".

(b) Outage must be sufficient to prevent tank car from becoming entirely filled with liquid at 105° F.

§ 73.125 *Alcohol.* (a) Alcohol must be packed as follows:

(1) In containers as prescribed in § 73.119 (a) and (b) of this part.

(2) Securely closed metal tanks of not exceeding 16 gallons capacity, made of metal not lighter than 20 gauge, United States standard, packed in strong outside wooden boxes, may be used for the transportation of natural history or laboratory specimens preserved in alcohol, when shipped by or for the United States Government.

(3) Spec. 12B (§ 78.205 of this chapter). Because of the present emergency and until further order of the Commission, inside glass containers not over 1.21 gallons capacity each are authorized when only one inside container is packed in each outside container.

(4) Because of the present emergency and until further order of the Commission, existing tank cars complying with spec. 103, 103W (§§ 78.265, 78.280 of this chapter), ARA–III,[1] AAR 203,[1] or AAR 203W,[1] previously used for the transportation of wine, are authorized when stenciled "Alcohol Only" and equipped with safety valves of the type required on spec. 103 (§ 78.265 of this chapter) tank cars.

§ 73.126 *Nickel carbonyl.* (a) Nickel carbonyl must be packed in specification cylinders as prescribed for any compressed gas, except acetylene.

(b) Nickel carbonyl must not be offered for transportation by rail express.

§ 73.127 *Nitrocellulose or collodion cotton, fibrous, or nitrostarch, wet; colloided nitrocellulose, granular or flake, and lacquer base or lacquer chips, wet.* (a) Nitrocellulose or collodion cotton, fibrous, or nitrostarch, wet with alcohol or a solvent, must contain at least 30 percent by weight of alcohol or a solvent with flash point not lower than 30° F.; colloided nitrocellulose, granular or flake, and lacquer base or lacquer chips, wet with alcohol or a solvent, must contain at least 20 percent by weight of alcohol or a solvent with flash point not lower than 30° F.; must be packed in specification containers as follows:

(1) Containers, except tank cars, as prescribed in § 73.119 of this part.

(2) Spec. 6A, 6B, 6C, or 37D (§§ 78.97, 78.98, 78.99, or 78.125 of this chapter) single-trip not over 5 gallons capacity. Metal barrels or drums.

(b) Gross weight of any container must not exceed 450 pounds.

§ 73.128 *Paints and related materials.* (a) Paint, enamel, lacquer, stain, shellac, varnish, aluminum, bronze, gold, wood filler, liquid, and lacquer base liquid, and thinning, reducing and removing compounds therefor, and driers, liquid, therefor, must be packed in specification containers as follows:

(1) As prescribed in § 73.119 of this part, according to flash point, pressure, or viscosity.

(2) Spec. 37D (§ 78.125 of this chapter). Metal drums (single-trip) not over 5 gallons capacity with welded side seams, irrespective of flash point or viscosity.

(3) Spec. 37E (§78.126 of this chapter). Metal drums (single-trip). Because of the present emergency and until further order of the Commission, spec. 37E (§ 78.126 of this chapter) metal drums of 8½ gallons capacity, with welded side seams and made of 24 gauge metal, are authorized provided flash point of material shipped is above 20° F.

(b) Paint, enamel, lacquer, stain, shellac, varnish, aluminum, bronze, gold, wood filler, liquid, and lacquer base liquid, and thinning, reducing and removing compounds therefor, and driers, liquid, therefor, with flash point above 20° F., may, in addition to containers prescribed in paragraph (a) of this section, be shipped in specification containers as follows:

(1) Spec. 10C (§ 78.157 of this chapter). Wooden barrels or kegs.

(c) Paint, enamel, lacquer, stain, shellac, varnish, aluminum, bronze, gold, wood filler, liquid, and lacquer base liquid, and thinning, reducing and removing compounds therefor, and driers, liquid, therefor, in glass or earthenware containers of not over 1 quart capacity each, or metal containers of not over 5 gallons capacity each, packed in strong outside containers are exempt from specification packaging, marking, and labeling requirements for transportation by

[1] Use of existing tank cars authorized, but new construction not authorized.

rail freight and highway. Unless exempt by § 73.118 of this part, when offered for transportation by rail express such shipments are exempt from specification packaging requirements but must be marked with name of contents and bear the red label as prescribed in § 73.405 of this part. When offered for transportation by carrier by water such shipments are exempt from specification packaging, marking other than name of contents, and labeling requirements. When fiberboard box is used for such shipments by rail freight, rail express, highway, or water, gross weight must not exceed 65 pounds.

(1) Because of the present emergency and until further order of the Commission, paint, varnish and lacquer may be shipped under the conditions prescribed in paragraph (c) of this section, in containers not exceeding 1 gallon capacity with fiberboard bodies and metal tops and bottoms made leakproof in lieu of glass, earthenware, or metal containers as specified.

§ 73.129 *Polishes, metal, stove, furniture and wood, liquid.* (a) Polishes, metal, stove, furniture and wood, liquid, must be packed in specification containers as follows:

(1) As prescribed in § 73.119 of this part, according to flash point, pressure, or viscosity.

(2) Spec. 37D (§ 78.125 of this chapter). Metal drums (single-trip) not over 5 gallons capacity with welded side seams, irrespective of flash point or viscosity.

(b) Polishes, metal, stove, furniture and wood, liquid, in glass or earthenware containers of not over 1 quart capacity each, or metal containers not over 5 gallons capacity each, packed in strong outside containers are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements. (See § 73.118 (b) of this part for rail express exemptions.)

§ 73.130 *Refrigerating machines.* (a) Refrigerating machines assembled for shipment and containing not over 15 pounds of a flammable liquid for their operation are exempt from specification packaging, marking and labeling requirements for transportation by rail freight, rail express, or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements.

§ 73.131 *Road asphalt, or tar, liquid.* (a) Road asphalt, or tar, liquid, must be packed in specification containers as follows:

(1) As prescribed in § 73.119 of this part, according to flash point, pressure, or viscosity.

(2) Spec. 10C (§ 78.157 of this chapter). Wooden barrels or kegs, authorized only for material with flash point above 20° F.

§ 73.132 *Rubber cement and pyroxylin cement.* (a) Rubber cement and pyroxylin cement must be packed in specification containers as follows:

(1) As prescribed in § 73.119 of this part, except that spec. 10A or 10B (§§ 78.155 or 78.156 of this chapter) wooden barrels and kegs, must not be used.

NOTE 1: Because of the present emergency and until further order of the Commission, rubber cement containing no carbon bisulfide may be shipped in specification 10A (§ 78.155 of this chapter) wooden barrels or kegs.

(2) Spec. 17E or 17H (§§ 78.116 or 78.118 of this chapter). Metal drums (single-trip).

§ 73.133 *Spirits of nitroglycerin.* (a) Spirits of nitroglycerin must consist of not over 10 percent by weight of nitroglycerin in ethyl alcohol. Solutions of nitroglycerin must consist of not over 10 percent by weight of nitroglycerin in acetone. They must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes lined with paraffined paper, spec. 2L (§ 78.30 of this chapter), and with metal inside containers, securely closed with rubber stoppers tied in place. The inside containers must be entirely surrounded by at least 2 inches of dry, fine sawdust or kieselguhr. There must be not over 6 quarts of the mixture in each outside container.

NOTE 1: Because of the present emergency and until further order of the Commission, spirits of nitroglycerin, consisting of not over 10 percent by weight of nitroglycerin in ethyl alcohol, may be shipped in glass bottles not over 2 quarts capacity, securely closed with rubber stoppers tied in place. Each inside container must be entirely surrounded by at least 2 inches of dry fine sawdust or kieselguhr. There must be not over 8 quarts of the mixture in each outside container.

(b) Spirits of nitroglycerin consisting of not over 1 percent by weight of nitroglycerin in ethyl alcohol, in addition to containers specified in paragraph (a) (1) of this section, may be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes, with glass inside containers not over 1 quart capacity each, cushioned by at least 2 inches of dry, fine sawdust or kieselguhr.

§ 73.134 *Zinc ethyl.* (a) Zinc ethyl must be shipped in cylinders as prescribed for any compressed gas, except acetylene.

(b) Zinc ethyl must not be offered for transportation by rail express.

§ 73.135 *Ethyl trichlorosilane.* (a) Ethyl trichlorosilane must be packed in specification containers as follows:

(1) Spec. 15A or 16B (§§ 78.168 or 78.186 of this chapter). Wooden boxes with glass inside containers not over 1 gallon capacity each securely closed and cushioned with incombustible absorbent material.

(2) Spec. 17H or 37D (§§ 78.118 or 78.125 of this chapter). Metal drums (single-trip) with glass inside containers not over 1 gallon capacity each securely closed and cushioned with incombustible absorbent material.

(3) Spec. 5A (§78.81 of this chapter). Metal drums not over 55 gallons capacity.

(4) Spec. 5F (§ 78.85 of this chapter). Metal drums not over 11 gallons capacity.

(5) Spec. 5, 5B, 5C, and 17E (single-trip) (§§ 78.80, 78.82, 78.83, and 78.116 of this chapter). Metal drums. These containers not authorized for shipments by rail express.

(6) Specification cylinders as prescribed for any compressed gas, except acetylene.

§ 73.136 *Trichlorosilane.* (a) Trichlorosilane must be packed in specification containers as follows:

(1) Spec. 15A or 16B (§§ 78.168 or 78.186 of this chapter). Wooden boxes with glass inside containers not over 1 quart capacity each securely closed and cushioned with incombustible absorbent material.

(2) Spec. 17H or 37D (§§ 78.118 or 78.125 of this chapter). Metal drums (single-trip) with glass inside containers not over 1 quart capacity each securely closed and cushioned with incombustible absorbent material.

(3) Spec. 5A (§ 78.81 of this chapter). Metal drums not over 55 gallons capacity. This container not authorized for shipment by rail express.

(4) Spec. 5F (§ 78.85 of this chapter). Metal drums not over 11 gallons capacity. This container not authorized for shipment by rail express.

(5) Specification cylinders as prescribed for any compressed gas, except acetylene.

§ 73.137 *Lithium aluminum hydride, ethereal.* (a) Lithium aluminum hydride, ethereal, must be packed in specification containers as follows:

(1) Spec. 15A (§ 78.168 of this chapter). Wooden boxes with inside glass or earthenware containers not over 1 quart each enclosed in air-tight metal cans and cushioned with sufficient incombustible cushioning material to completely absorb contents in event of breakage.

(2) Spec. 6A, 6B, 6C, or 17H (single-trip) (§§ 78.97, 78.98, 78.99, or 78.118 of this chapter). Metal barrels or drums with not more than one inside glass container not exceeding 2 gallons capacity. The inside container must be completely cushioned in sufficient incombustible cushioning material to completely absorb the contents in event of breakage.

(3) Specification cylinders as prescribed for any compressed gas, except acetylene. Valves or fittings must be protected from injury by a cap or equally efficient device.

§ 73.138 *Pentaborane.* (a) Pentaborane must be packed in specification cylinders as prescribed for any compressed gas, except acetylene. Cylinders must be protected with valve protection caps.

(b) Pentaborane must not be offered for transportation by rail express.

SUBPART D—FLAMMABLE SOLIDS AND OXIDIZING MATERIALS—DEFINITION AND PREPARATION

§ 73.150 *Flammable solid; definition.* (a) A flammable solid for the purpose of Parts 71–78 of this chapter is a solid

substance other than one classified as an explosive, which is liable, under conditions incident to transportation, to cause fires through friction, through absorption of moisture, through spontaneous chemical changes, or as a result of retained heat from the manufacturing or processing.

§ 73.151 *Oxidizing material; definition.* (a) An oxidizing material for the purpose of Parts 71–78 of this chapter is a substance such as a chlorate, permanganate, peroxide, or a nitrate, that yields oxygen readily to stimulate the combustion of organic matter.

§ 73.152 *Packing.* (a) Flammable solids or oxidizing materials must not be packed in the same outside container with corrosive liquids unless the corrosive liquids are in bottles, cushioned by incombustible absorbent material, in tightly closed metal containers.

NOTE 1: Oxidizing or other materials in quantity not exceeding 4 ounces, in securely closed metal cans, packed in the same compartment with other securely packed materials necessary for a complete fumigant, are acceptable for transportation.

(b) Closing and cushioning. All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed or in any case when necessary to prevent breakage or leakage.

§ 73.153 *Exemptions for flammable solids and oxidizing materials.* (a) Flammable solids, and oxidizing materials, except those as enumerated in paragraph (c) of this section, in inside containers not over 1 pound net weight each, in outside containers not exceeding 25 pounds net weight each, are exempt from specification packaging, marking, and labeling requirements, unless otherwise provided, for transportation by rail freight, rail express, or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements. (See paragraph (c) of this section for articles not exempted, § 73.183 of this part for exemptions for nitrates, and paragraph (b) of this section for exemptions for organic peroxides.)

(b) Liquid or solid organic peroxides, except hydrogen peroxide (see § 73.244 (a) of this part), acetyl benzoyl peroxide, and benzoyl peroxide, in an inside container not over 1 pint or 1 pound capacity, not more than one such container in an outside package, securely packed with incombustible cushioning in strong outside container, are exempt from specification packaging, marking and labeling requirements unless otherwise provided, for transportation by rail freight, rail express or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements.

(c) The following articles in any quantity are not exempt from any of the provisions of this part:

(1) Bags, nitrate of soda, empty and unwashed.
(2) Benzoyl peroxide.
(3) Burnt cotton.
(4) Calcium chlorite.
(5) Calcium phosphide.
(6) Calcium resinate. (See § 73.166 of this part).
(7) Calcium resinate, fused.
(8) Carbopropoxide, unstabilized.
(9) Charcoal, wood, screenings, except see § 73.162 (a) (4) of this part.
(10) Chlorobenzoyl peroxide (para).
(11) Coal, ground bituminous, sea coal and coal facings. (See § 73.165 of this part)
(12) Cobalt resinate, precipitated.
(13) Cotton waste, oily with more than 5 percent of vegetable or animal oil.
(14) Fiber burnt.
(15) Fibers or fabrics impregnated or saturated with animal or vegetable oils which are liable to spontaneous heating or combustion in transit.
(16) Fish scrap or fish meal containing less than 6 or more than 12 percent moisture (does not include wet acidulated fish scrap with moisture 40 to 55 percent) or which has not been sufficiently cooled after manufacture, or is liable to spontaneous heating in transit.
(17) Hair, wet.
(18) Iron sponge that has not been properly oxidized during manufacture.
(19) Lithium hydride.
(20) Lithium metal. (See § 73.206 (d) of this part)
(21) Lithium silicon.
(22) Matches, strike-anywhere.
(23) Motion-picture film (exposed), and motion-picture film scrap (nitrocellulose base).
(24) Motion-picture film old and worn out (nitrocellulose base).
(25) Paper stock, wet.
(26) Paper waste, wet.
(27) Paracetic acid.
(28) Phosphoric anhydride.
(29) Phosphorus, amorphous, red.
(30) Phosphorus pentachloride.
(31) Phosphorus seisquisulfide.
(32) Phosphorus, white or yellow.
(33) Photographic film scrap.
(34) Picric acid, wet, exceeding 16 ounces.
(35) Potassium, metallic and potassium, metallic liquid alloy.
(36) Potassium peroxide.
(37) Pyroxylin plastic scrap.
(38) Rags, oily, with more than 5 percent of vegetable or animal oil.
(39) Rags, wet.
(40) Sodium amide.
(41) Sodium chlorite.
(42) Sodium hydride.
(43) Sodium, metallic and sodium, metallic liquid alloy.
(44) Sodium, metallic, dispersion in organic solvent.
(45) Sodium peroxide.
(46) Sodium picramate.
(47) Spent iron mass or spent iron sponge.
(48) Spent oxide.
(49) Tankage, garbage, tankage fertilizers, containing less than 8 percent moisture or having a temperature exceeding 100° F. when loaded.
(50) Tankages, rough ammoniate (tankages made from ammoniates such as leather scrap, horns, hoofs, hair, hair waste, felt waste), containing less than 7 percent moisture or having a temperature exceeding 100° F. when loaded.
(51) Textile waste, wet.
(52) Thorium metal, powdered.
(53) Titanium metal powder, wet.
(54) Urea nitrate, wet with not less than 10 percent water, in excess of 16 ounces but less than 25 pounds.
(55) Wool waste, wet.
(56) X-ray film (exposed) and X-ray film scrap (nitrocellulose base).
(57) Zinc ammonium nitrite.
(58) Zirconium, metallic, dry, wet or sludge.
(59) Zirconium picramate.

§ 73.154 *Flammable solids and oxidizing materials not specifically provided for.* (a) Flammable solids and oxidizing materials, as defined in §§ 73.150 and 73.151 of this part, other than those for which special requirements are prescribed must be packed in specification containers as follows:

(1) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.
(2) Spec. 17E, 17H, 37D, 37E, or 37F (§§ 78.116, 78.118, 78.125, 78.126, or 78.127 of this chapter). Metal drums (single-trip).
(3) Spec. 10A, 10B, or 10C (§§ 78.155, 78.156, or 78.157 of this chapter). Wooden barrels or kegs.
(4) Spec. 11A (§ 78.160 of this chapter). Wooden barrels or kegs with inside containers or with suitable lining for bulk shipments.
(5) Spec. 11B (§78.161 of this chapter). Wooden barrels or kegs with inside containers; or metal lined, spec. 2F, (§ 78.25 of this chapter) for bulk shipments.
(6) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with inside containers which must be metal cans; sliding-lid wooden boxes; fiber cans or boxes, spec. 2G (§ 78.26 of this chapter), not over 5 pounds capacity each; or glass bottles not over 1 pound capacity each. Packages containing glass containers must not weigh over 65 pounds gross.
(7) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes lined, spec. 2F or 2M (§§ 78.25 or 78.31 of this chapter).
(8) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside containers.
(9) Spec. 21A (§ 78.222 of this chapter). Fiber drums.
(10) Spec. 22A (§ 78.196 of this chapter). Plywood drums.
(11) Spec. 22B (§78.197 of this chapter). Plywood drums with inside metal drums, spec. 2F (§ 78.25 of this chapter).

§ 73.155 *Bags, nitrate of soda, empty and unwashed.* (a) Bags, nitrate of soda, empty and unwashed, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes.
(2) Spec. 10A, 10B, 10C, 11A, or 11B (§§ 78.155, 78.156, 78.157, 78.160 or 78.161 of this chapter). Wooden barrels.

(b) Bags in carload and truckload lots loaded by consignor and to be unloaded by consignee may also be shipped loose or baled, provided the car or highway vehicle is lined with paper and doors of cars are properly stripped after sealing and provision is made on highway vehicle to prevent entrance of sparks.

§ 73.156 *Barium peroxide and calcium peroxide.* (a) Barium peroxide and calcium peroxide must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185 or 78.190 of this chapter). Wooden boxes with inside glass containers not over 1 pound capacity each; or with inside glass containers not over 5 pounds capacity each cushioned with incombustible cushioning material; or with inside metal containers or lining, spec. 2F (§ 78.25 of this chapter).

(2) Spec. 6A (§ 78.97 of this chapter). Metal barrels or drums. Gross weight not to exceed 880 pounds.

(3) Spec. 6B or 6C (§§ 78.98 or 78.99 of this chapter). Metal barrels or drums with not more than 1400 pounds net weight in each container.

(4) Spec. 17E, 17H, or 37D (§§ 78.116, 78.118, or 78.125 of this chapter). Metal drums (single-trip).

(5) Spec. 21A (§ 78.222 of this chapter). Fiber drums.

§ 73.157 *Benzoyl peroxide, chlorobenzoyl peroxide (para), lauroyl peroxide, or succinic acid peroxide, wet.* (a) Benzoyl peroxide, chlorobenzoyl peroxide (para), lauroyl peroxide, and succinic acid peroxide, wet with at least 30 percent of water by weight must be packed in specification containers as follows:

(1) Spec. 15A, 15B, or 15C (§§ 78.168, 78.169, or 78.170 of this chapter). Wooden boxes with inside metal containers or lining, spec. 2F (§ 78.25 of this chapter); or aluminum drums of at least 16 gauge United States standard, tightly sealed. Gross weight not over 200 pounds.

§ 73.158 *Benzoyl peroxide, dry, lauroyl peroxide, dry, chlorobenzoyl peroxide (para), dry, or succinic acid peroxide, dry.* (a) Benzoyl peroxide, dry, lauroyl peroxide, dry, chlorobenzoyl peroxide (para), dry, or succinic acid peroxide, dry, may be shipped when packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes, with inside fiber containers securely closed by taping or gluing, not over 1 pound capacity each. Each inside container surrounded by asbestos or fire-resistant cushioning material which will protect contents with equal efficiency; net weight in outside container must not exceed 50 pounds.

§ 73.159 *Burnt cotton.* (a) "Burnt cotton" is cotton that has been on fire and from which the burnt portions have not been removed by repicking. It must not be offered for transportation until not less than 10 days have elapsed since the last evidence of fire in it. It must be marked and described on shipping orders and bills of lading as "Burnt Cotton, Yellow Label", and cars containing any quantity of it must be protected by the "Dangerous" placard.

(b) Burnt cotton must not be offered for transportation by rail express.

(c) When burnt cotton is picked and baled the separated cotton is not classed as a dangerous article and is not subject to Parts 71–78 of this chapter.

§ 73.160 *Calcium chlorite and sodium chlorite.* (a) Calcium chlorite and sodium chlorite must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A or 19A (§§ 78.168, 78.169, 78.170, 78.185 or 78.190 of this chapter). Wooden boxes with inside containers which must be glass or earthenware not over 2¼ pounds capacity each or metal not over 5 pounds capacity each.

(2) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(3) Spec. 17E, 17H, or 37D (§§ 78.116, 78.118, or 78.125 of this chapter). Metal drums (single-trip).

§ 73.161 *Calcium phosphide.* (a) Calcium phosphide must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes lined, spec. 2F (§ 78.25 of this chapter), and with hermetically sealed inside containers.

(2) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

§ 73.162 *Charcoal.* (a) Charcoal as described in this paragraph is exempt from specification packaging, marking, and labeling requirements for transportation by rail freight or highway, but when for transportation by carrier by water it is exempt from specification packaging, marking other than name of contents, and labeling requirements.

(1) Charcoal, activated.

(2) Charcoal made from pine wood and processed so that it is not liable to heat dangerously or cause fires in transportation.

(3) Charcoal briquettes made from wood charcoal with starch and water, or tar, for a binder, which have been screened and cooled to a temperature below 100° F., before being offered for transportation.

(4) Charcoal screenings made from "pinon" wood.

(5) Charcoal made from walnut shells, corn cobs, peach pits, and similar material, must be cooled and held not less than five days before shipment, and shipped in bags, barrels, or boxes.

(6) Charcoal, lump, made by the old kiln or pit method by which long air exposure is provided before shipment.

(7) Charcoal, wood, except charcoal screenings, when packed in boxes or barrels.

(8) Charcoal, wood, when in bags in less-than-carload or less-than-truckload shipments of not exceeding 2,000 pounds.

(9) When offered for transportation by rail express, charcoal, except charcoal briquettes, must be packed in barrels, bags, or boxes, and must bear the yellow label.

(b) Charcoal made in round retorts must be transferred to air-tight metal cans for cooling, and must be kept in these cans for 24 hours or more. The charcoal after removal from these cans should be aired by spreading on a floor to a depth not exceeding 1 foot. This air exposure must last not less than 44 hours. Not less than 72 hours should elapse from the time the air exposure of the charcoal commences before a car loaded with it is closed for shipment, or before the lump charcoal is placed in paper bags.

(1) The charcoal during this airing period must be protected from the weather, and exposed to good circulation of air. When the charcoal is aired on the floor for only 24 hours and then placed in burlap bags, it must be kept in the bags 60 hours before shipment. If the charcoal is not aired on the floor for at least 24 hours, it must be kept in the burlap bags for at least 96 hours before loading for shipment.

(c) Charcoal made in ovens in slatted cars should be kept for two periods of 24 hours each in first and secondary air-tight cooling chambers respectively. After removing the charcoal from the secondary coolers it must be exposed to good air circulation but protected from the weather for a period of not less than 44 hours.

(1) Not less than 72 hours must elapse from the time the air exposure of the charcoal commences before a car loaded with it is closed for shipment, or before the lump charcoal is placed in paper bags.

(d) When fire occurs in charcoal during air exposure period, it should be extinguished with as little water as possible. Any charcoal wet in this way or otherwise must be dried, by again heating in the retorts or ovens, and cooled and aired in the usual way described in paragraphs (b) and (c) of this section, or the charcoal must be set aside and allowed to dry for not less than 30 days before shipment.

(e) Charcoal, lump, must be dry and free from screenings and brands.

(1) Shipments must be loaded into tight box cars, tight container cars, or into tight closed-top hopper cars, except that lump charcoal made from soft wood may be shipped in open or stock cars.

(2) When a chute is used in loading the car, the chute must contain a properly constructed screen which must be kept clean. This screen shall be not less than ¾ inch mesh. Forks with prongs not less than 1 inch apart must be used instead of shovels to handle the charcoal. The screenings which accumulate in the doorway of the car must be removed before loading the doorway. The car should be swept before loading, and a car which has contained lime must be thoroughly cleaned before loading with charcoal. The doors of the car must be closed tightly before the car is forwarded.

(3) Lump charcoal may be shipped in bags, barrels or boxes, or bulk in cars.

(4) Lump charcoal, dry and free from screenings and brands, may be shipped in bulk in motor vehicles. Vehicle must be swept before loading and if it contained lime it must be thoroughly cleaned.

(f) Charcoal screenings consist of small pieces of charcoal varying from about one-half inch in the maximum dimension to grains of dust. These screenings are more liable to produce fires than other forms of charcoal. Charcoal screenings from wet charcoal or wet screenings or screenings which have been wet must not be offered for shipment unless they have been dried for not less than 12 hours in a retort or oven, and then subjected to not less than 10 days airing and cooling before shipment.

(1) Charcoal screenings must be stored in a dry place, in loosely piled bags, freely exposed to the air for not less than 20 days after separation from the lump before shipment.

(2) Screenings from pine-wood charcoal must be stored as above described for not less than five days before shipment.

(3) Charcoal screenings must be packed in cotton or jute bags of not greater than 4 bushels capacity.

(4) Charcoal screenings, except screenings made from "pinon" wood, must not be offered for transportation by rail express.

(g) Charcoal ground, crushed, granulated, or pulverized is prepared from either lump charcoal or screenings.

(1) Lump charcoal used for the preparation of ground, crushed, granulated, or pulverized charcoal must be stored subject to ventilation, and protected from the weather for not less than 20 days after its removal from the coolers before milling; or the ground, crushed, granulated or pulverized charcoal must be stored in bags, subject to ventilation and protected from the weather for not less than 20 days before shipment. Lump charcoal made from pine wood must be stored as above described not less than 5 days before milling.

(2) Charcoal screenings used for the preparation of ground, crushed, granulated, or pulverized charcoal must be stored in a dry place in loosely piled cotton or jute bags freely exposed to air for a period of not less than 20 days after separation from the lump charcoal, and before milling; or the ground, crushed, granulated, or pulverized charcoal must be stored in bags, subject to ventilation and protected from the weather for not less than 20 days before shipment. Charcoal screenings made from pine wood charcoal must be stored as above described not less than 5 days before milling.

(3) Ground, crushed, granulated, or pulverized charcoal must be packed in tight sift-proof wooden barrels or boxes containing not more than 4 bushels each; or in fiberboard boxes; or in unlined jute bags, or in strong unlined cotton bags, containing not more than 4 bushels each; or in paper-lined jute bags, or in paper bags, containing not more than 2½ bushels each. Whenever practicable, all boxes, barrels, or bags, after filling, should be allowed to remain open and freely exposed to the air, and protected from the weather for not less than 24 hours before being closed. Ground, crushed, granulated, or pulverized charcoal made from pine-wood charcoal should be so stored for not less than 72 hours before the packages are closed.

(h) Charcoal, screenings or ground, crushed, granulated or pulverized charcoal, in bags, when loaded in cars for shipment by rail must be so loaded that the bags are laid horizontally in the car, and so piled that there will be spaces for efficient air circulation. These spaces must be not less than 4 inches wide. If the bags are not compactly filled and closed so as to avoid free space within, transverse wooden strips must be laid between the bags and extending the full width of the car; these strips should be approximately 2 feet apart vertically and longitudinally. The bags must not be piled closer than 6 inches from the top of the car, and no more than 26,000 pounds of screenings, ground, granulated, crushed, or pulverized charcoal, shall be loaded in a 36-foot, 6-inch car, 27,000 pounds in a 37-foot, 6-inch car, 28,000 pounds in a 38-foot, 6-inch car, 29,000 pounds in a 39-foot, 6-inch car, 36,000 pounds in a 40-foot, 6-inch car, and 40,000 pounds in a 50-foot, 6-inch car. A tight car must be used, and any loose material must be swept up and removed from the doorway of the car before completing the loading. On recommendation of the Bureau of Explosives, other methods of loading shown to be at least equally efficient in securing the necessary ventilation will be authorized.

(i) See § 77.838 of this chapter for loading in motor vehicles.

(j) Charcoal burned in pits or kilns must be thoroughly cooled in the sealed kilns. After the kilns are opened, the charcoal must be allowed to stand in the open kiln or elsewhere exposed to the air for not less than 24 hours before loading in a freight car. Charcoal burned in kilns may be loaded in open cars or in box cars, but after loading in box cars, the cars must be allowed to stand not less than 24 hours with doors open before shipment.

(k) Screenings, or ground, crushed, granulated, or pulverized charcoal, from pit or kiln burned charcoal, are considered as non-hazardous, provided the screenings or the material from which the ground charcoal is made has been exposed to the air for not less than 5 days prior to shipment or grinding.

(l) Reburned charcoal must be cooled and exposed to good fresh-air circulation for not less than five days after removal from the reburning furnaces and before being shipped or ground to produce ground or pulverized charcoal.

§ 73.163 *Chlorate of soda, chlorate of potash, and other chlorates.* (a) Chlorate of soda, chlorate of potash, and other chlorates must be packed in specification containers as follows:

(1) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(2) Spec. 17E, 17H, 37D, 37E, or 37F (§§ 78.116, 78.118, 78.125, 78.126, or 78.127 of this chapter). Metal drums (single-trip).

NOTE 1: Spec. 37E and 37F (§§ 78.126, and 78.127 of this chapter). Metal drums for export service, marked for an authorized gross weight of 160 pounds, must be at least 24 gauge metal throughout.

(3) Spec. 21A, 22A, or 22B (§§ 78.222, 78.196, or 78.197 of this chapter). Fiber or plywood drums with inside metal drums, spec. 2F (§ 78.25 of this chapter.

(4) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185 or 78.190 of this chapter). Wooden boxes, or spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter), wooden barrels or kegs, with tightly closed inside containers which must be of metal not over 10 pounds capacity each; or of glass not over 5 pounds each; or of fiber, spec. 2G (§ 78.26 of this chapter), not over 6 pounds capacity each.

(5) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with inside metal cans not over 5 pounds capacity each, closed air tight and with not over 25 pounds of chlorate in the outside container.

(6) Chlorates wet with 10 percent or more of water are authorized for shipment in tank cars, spec. 103 (§ 78.265 of this chapter), when equally distributed therein.

(7) Chlorate of soda is authorized for shipment in tank cars, spec. 103 (§ 78.265 of this chapter). Cars must be thoroughly cleaned before loading.

§ 73.164 *Chromic acid.* (a) Chromic acid must be packed in specification containers as follows:

(1) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(2) Spec. 17E, 17H, 37D, or 37E (§§ 78.116, 78.118, 78.125, or 78.126 of this chapter). Metal drums (single-trip).

(3) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes, with inside glass bottles of not greater than 5 pounds capacity each, with closures securely fastened, each bottle individually packed in a tight metal container, and cushioned therein with incombustible mineral packing material; or with tightly closed metal inside containers, not over 10 pounds capacity each.

§ 73.165 *Coal, ground bituminous, sea coal, coal facings.* (a) Coal, ground bituminous, sea coal, coal facings, 90 percent of which will pass through a 100-mesh sieve, must be stored for at least six days after grinding, or if not so stored must be shipped in tight metal tank cars or in tight metal containers on container cars, or in permanently covered metal hopper cars, or in other tight metal containers, or in tight, metal-bodied, covered motor vehicles.

(b) Coal, ground bituminous, which has been dried by heating before grinding must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

§ 73.166 *Cobalt resinate, precipitated, calcium resinate, and calcium resinate fused.* (a) Cobalt resinate, precipitated, calcium resinate, and calcium resinate fused, must be packed in specification containers as follows:

(1) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(2) Spec. 17E, 17H, 37D, 37E, 37F, or 37G (§§ 78.116, 78.118, 78.125, 78.126, 78.127, or 78.128 of this chapter). Metal drums (single-trip).

(3) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes with air-tight metal inside containers.

§ 73.167 *Cotton waste, oily.* (a) Cotton waste, oily with more than 5 percent of vegetable or animal oil must be packed as follows:

(1) In hermetically sealed metal-lined wooden boxes or air-tight metal containers.

(b) Such cotton waste must not be offered for transportation by carriers by rail express.

§ 73.168 *Lithium amide, powdered.* (a) Lithium amide, powdered, must be packed as follows:

(1) As prescribed in § 73.154 (a) (1), (2), (5), (8) and (11) of this part.

(2) Spec. 21A (§ 78.222 of this chapter). Fiber drums with inside metal drums, spec. 2F (§ 78.25 of this chapter).

§ 73.169 *Fiber, burnt.* (a) Fiber, burnt, must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

(b) Such fiber must not be offered for transportation by rail express.

§ 73.170 *Fibers or fabrics impregnated, saturated or coated.* (a) Fibers or fabrics impregnated, saturated or coated with animal or vegetable oils, or organic substances, manufactured articles or processed materials which are liable to spontaneous heating or combustion in transit must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

(b) Such materials, substances or articles must not be offered for transportation by rail express.

§ 73.171 *Fish scrap or fish meal.* (a) Fish scrap or fish meal containing less than 6 or more than 12 percent moisture (does not include wet acidulated fish scrap with moisture 40 to 55 percent), or which has not been sufficiently cooled after manufacture, or is liable to spontaneous heating in transit, must be packed in air-tight metal containers.

(b) Such fish scrap or fish meal must not be offered for transportation by rail express.

§ 73.172 *Hair, wet.* (a) Hair, wet, must not be offered for transportation except in gondola cars or in open motor vehicles with metal bodies.

(b) Hair, wet, must not be offered for transportation by carriers by rail express.

§ 73.173 *Aluminum dross.* (a) Aluminum dross must not be shipped when hot or when containing moisture liable to cause heating or fire during transportation.

§ 73.174 *Iron sponge, spent oxide, spent iron mass, or spent iron sponge.* (a) Iron sponge that has not been properly oxidized during manufacture must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

(b) Iron sponge not properly oxidized must not be offered for transportation by carriers by rail express.

(c) Spent oxide, spent iron mass, or spent iron sponge must be loaded in open steel cars or open highway vehicles with steel bodies. After exposure to air for a period of not less than 10 days, these articles may be offered for transportation by carrier by water in bulk in all-steel barges having open holds.

(d) Spent oxide, spent iron sponge, or spent iron mass must not be offered for transportation by carrier by rail express.

§ 73.175 *Lacquer base, or lacquer chips, dry.* (a) Lacquer base, or lacquer chips, dry, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside metal containers, spec. 2F (§ 78.25 of this chapter).

(2) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(3) Spec. 17E, 17H, or 37D (§§ 78.116, 78.118, or 78.125 of this chapter). Metal drums (single-trip).

(4) Spec. 21A (§ 78.222 of this chapter). Fiber drums.

§ 73.176 *Matches.* (a) Matches, when offered for transportation, must be of a type that will not ignite spontaneously when subjected for eight consecutive hours to a temperature of 200° F., in a properly conducted laboratory test. They must not exceed 3 inches in length, nor have a stick exceeding .015 square inch in cross-section area.

(b) For the purpose of Parts 71–78 of this chapter, matches are divided into two classes, viz: (1) "strike-anywhere" and block matches and (2) "strike-on-box," book, and card matches. Strike-anywhere and block matches are those for the ignition of which a prepared surface is not required. Strike-on-box, book, and card matches are those matches intended to be ignited on a prepared surface. Book and card matches may be fastened to a cover or folder, or the prepared match strips may not be so attached or covered.

(c) Packing. Matches, strike-anywhere, must not be packed in the same outside package with any other article, except that book, card and "strike-on-box" matches may be included when packed in separate inside containers.

(1) Matches, strike-anywhere, must be placed in individual containers consisting of an outer sliding shuck or cover and an inner holding tray or box. Individual containers consisting of a holding tray or box with a top that telescopes over the box may be used. Boxes of suitable "hang-up" type may also be used, if approved by the Bureau of Explosives. All match boxes, covers, and trays must be made of cardboard, wood, or metal except that paper wrappings may be used for block or card matches.

(2) Individual containers must be wrapped in paper with not more than 12 boxes or individual containers in each paper-wrapped package. These packages must be secured on the ends and on the lapping side with glue, or similar satisfactory adhesive, making each 12 boxes or less of matches a serviceably wrapped and well-secured package.

(3) No individual container (not including card or block matches) shall contain more than 700 strike-anywhere matches in any one container, box, or package. When more than 300 matches are packed in any individual container, box, or package, the matches must be arranged in two nearly equal portions with the heads of the two portions placed in opposite directions. All individual containers containing 350 or more matches must have placed over the matches a center holding or protecting strip made of cardboard, which can be scored or bent without fracture. This protecting strip shall be not less than 1¼ inches wide and shall be flanged down at least five-eighths inch on each end to hold the matches in position when the container is nested into the shuck or cover or withdrawn therefrom.

(d) Matches, unless exempted in paragraph (g) of this section, when offered for transportation by carriers by rail freight, highway, or water must be packed in specification containers as follows:

(1) Spec. 15A (§ 78.168 of this chapter). Wooden boxes, with inside containers; not over 100 pounds each.

(2) Spec. 12B or 12C (§§ 78.205 or 78.206 of this chapter). Fiberboard boxes with inside containers; not over 60 pounds each.

(3) The maximum number of match boxes contained in any one case shall be as follows:

Number of boxes	Nominal number of matches per box
½ gross	Not over 700.
1 gross	Not over 500.
2 gross	Not over 400.
3 gross	Not over 300.
5 gross	Not over 200.
12 gross	Not over 100.
20 gross	Over 50.
	Under 100.
25 gross	Not over 50.

(e) All individual containers of strike-anywhere matches when offered for transportation by rail express must be packed in a wooden box, spec. 15A (§ 78.168 of this chapter) lined, spec. 2F (§ 78.25 of this chapter). Gross weight not to exceed 50 pounds.

NOTE 1: Because of the present emergency and until further order of the Commission, asbestos board, lapped at all joints and all joints sealed air-tight, may be used in lieu of spec. 2F (§ 78.25 of this chapter), lining.

(f) Marking. Outside containers of strike-anywhere matches shall show the name of the importer, distributor, or manufacturer and the brand or trademark under which such matches are manufactured and distributed to the trade. The name shall be printed in English.

(1) In addition, and separate therefrom, all outside containers shall have plainly marked thereon the words "STRIKE-ANYWHERE MATCHES".

(g) Matches, strike-on-box, book and card, in outside fiberboard or wooden boxes, or matches, strike-on-box, book and card when packed with nonflammable articles provided they are included in a tightly closed cardboard or fiberboard container, or are securely wrapped and packed so as to prevent accidental ignition, before being packed in the outside containers, are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, rail express, or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements.

(1) Each outside container shall be marked "BOOK MATCHES", "STRIKE-ON-BOX MATCHES", or "CARD MATCHES", as the case may be.

§ 73.177 *Motion-picture film and X-ray film.* (a) Motion-picture film and X-ray film (nitrocellulose base) (ex-

posed) must be packed in specification containers as follows:

(1) Spec. 32A or 32B (§§ 78.146 or 78.147 of this chapter). Metal cases.

(2) Spec. 15A, 15B, or 15C (§§ 78.168, 78.169, or 78.170 of this chapter). Wooden boxes with each reel in a tightly closed metal can, or strong carboard or fiberboard box with cover held in place by adhesive tape or paper; gross weight not over 200 pounds.

(3) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes complying with § 78.205–22 (a) (1) of this chapter; authorized for a single tightly closed inside metal can or strong cardboard or fiberboard box with cover held in place by adhesive tape or paper, not over 2,000 feet of film. Taped closure authorized.

(4) Spec. 12B (§ 78.205 of this chapter). One-piece fiberboard boxes complying with § 78.205–22 (a) (2) of this chapter; authorized only when each film is in a tightly closed metal film-reel can or strong cardboard or fiberboard box with cover held in place by adhesive tape or paper containing not over 2,000 feet (approximately) of film; cans or boxes to be adequately braced in center of box by fiberboard, at least 175-pound test, extending full depth of box. Gross weight not over 65 pounds. Closing of box must be effected by coating entire contact surfaces of flaps with efficient adhesive; stitched closure not authorized. Boxes that have been filled, shipped, and opened, are not authorized for reuse.

NOTE 1: Because of the present emergency and until further order of the Commission, containers authorized under § 73.180 (a) (2) of this part may be reused provided original shipment consisted of unexposed motion-picture film in carload or truckload quantities and that boxes were crated and had closing flaps held in place by paper tape.

(5) Spec. 32C (§ 78.148 of this chapter). Trunks with each film in standard metal film-reel can or strong cardboard or fiberboard box with cover held in place by adhesive tape or paper. Trunks to contain no material other than films in cans or boxes and projecting apparatus. The apparatus, as packed, must not be capable of creating an electric current.

(6) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes complying with § 78.205–27 of this chapter; authorized only for not more than two square inside metal cans containing not over 200 feet (approx.) of film each; gross weight not over 15 pounds. Taped closure authorized.

(b) Advertising matter must not be attached to outside of container. Slow burning (nonflammable) motion-picture film is exempt (§ 73.181 (a) (1) of this part), but when packed with flammable film all requirements must be complied with as if all contents were flammable film.

§ 73.178 *Motion-picture film, old and worn out (not scrap).* (a) Motion-picture film, old and worn out (not scrap), when shipped, must be no longer exhibitable (with value only for reclamation of material) and must be packed in specification containers as follows: (See §§ 73.195 and 73.196 of this part for film scrap.)

(1) Spec. 15A (§ 78.168 of this chapter). Wooden boxes lined, spec. 2F (§ 78.25 of this chapter), or 2M (§ 78.31 of this chapter); gross weight not over 450 pounds.

(2) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside metal cans containing not over 1,000 feet of film; the cover of each can must fit tightly; gross weight not over 450 pounds.

(3) Spec. 32A or 32B (§§ 78.146 or 78.147 of this chapter). Metal boxes.

(4) Spec. 32D (§ 78.149 of this chapter). Metal boxes. Net weight of film not over 250 pounds.

(5) Spec. 6A, 6B, 6C, 6J, or 37E (§§ 78.97, 78.98, 78.99, 78.100, or 78.126 of this chapter) (single-trip). Metal barrels or drums.

(6) Spec. 21A (§ 78.222 of this chapter). Fiber drums.

§ 73.179 *Motion-picture film, toy.* (a) Motion-picture film, toy, of standard width (1⅜"), on metal reels, each containing 200 feet or less of film, when shipped must be inclosed in spark-proof metal cans packed in outside specification containers as follows:

(1) Spec. 15A, 15B, or 15C (§§ 78.168, 78.169, or 78.170 of this chapter). Wooden boxes; maximum gross weight 250 pounds. (See § 73.181 (a) (3) of this part for toy motion-picture film pieces.)

§ 73.180 *Motion-picture film, and X-ray film, unexposed.* (a) Motion-picture film, and X-ray film, unexposed (nitrocellulose base), when offered for transportation by rail express or by carrier by water must bear the yellow label prescribed in § 73.406 of this part and must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, or 16A (§§ 78.168, 78.169, 78.170, or 78.185 of this chapter). Wooden boxes, provided it is in tight rolls of not over 3,000 feet; each roll must be in a tightly closed metal can with cover held in place by adhesive tape or paper, or each roll must be in a strong cardboard or fiberboard box with cover held in place by adhesive tape or paper. Gross weight not over 250 pounds.

(2) Spec. 12B (§ 78.205 of this chapter). One-piece fiberboard boxes complying with § 78.205–22 (a) (2) of this chapter; authorized only when each film is in a tightly closed metal can or in a strong cardboard or fiberboard box with cover of can or box held in place by adhesive tape or paper and containing not over 2,000 feet (approx.) of film; interior packing required, of double-wall corrugated fiberboard pads at least 275-pound test, so arranged as to prevent can or box from touching the 6 faces of the outside box. Gross weight not over 75 pounds. Boxes that have been filled, shipped and opened are not authorized for reuse.

(b) Motion-picture film and X-ray film, unexposed (nitrocellulose base), are exempt from specification packaging, marking other than name of contents, and labeling requirements for transportation by rail freight and highway.

§ 73.181 *Motion-picture film; exemptions.* (a) Motion-picture film as follows is exempt from specification packaging, marking, and labeling requirements for rail freight, rail express, or highway transportation, but when for transportation by carrier by water is exempt from specification packaging, marking other than name of contents, and labeling requirements:

(1) Motion-picture film and X-ray film, slow-burning (nonflammable) and old and wornout motion-picture film, slow-burning (nonflammable).

(2) Motion-picture film scrap and X-ray film scrap, slow-burning (nonflammable).

(3) Motion-picture film, toy pieces of, exposed, of approximately ¾ inch by 1⅜ inches in size and not to exceed 1,000 such pieces inclosed in a tightly closed metal box and packed with other articles.

(4) Motion-picture outfits, toy, consisting of one projecting apparatus and not to exceed one roll of motion-picture film 12 feet or less in length, may be accepted without further restrictions, provided the film is packed in a securely closed metal can or box, this inclosed in a wooden box and packed with the projection apparatus in an outside fiberboard, corrugated strawboard, or wooden box.

§ 73.182 *Nitrates.* (a) Nitrates, when offered for transportation by carriers by rail freight, rail express, water, or highway, must be packed in containers as follows (see § 73.183 of this part for exemptions):

(1) In bulk or in bags in clean closed cars which shall be free of loose boards, cracks, holes, or exposed decayed spots. Interior of cars must be swept clean and free of any projections capable of injuring bags. Doors of cars must have tight closure. Journals and boxes must be in good condition. Ammonium nitrate, ammonium nitrate fertilizer, or guanidine nitrate must not be shipped in all-metal cars.

(2) In bags in closed or open type motor vehicles which must be swept clean and free of any projections capable of injuring bags. Ammonium nitrate, ammonium nitrate fertilizer, or guanidine nitrate must not be shipped in all-metal motor vehicles of the closed type. Nitrates, including ammonium nitrate, ammonium nitrate fertilizer, or guanidine nitrate when transported in open type motor vehicles shall be suitably covered.

(3) In bulk or in bags on freight vessels subject to the Regulations for Explosives or Other Dangerous Articles on Board Vessels prescribed by the Commandant United States Coast Guard (46 CFR Part 146).

(4) In containers as prescribed in § 73.183 of this part.

NOTE 1: Nitrate of soda in bulk (not in containers) in cars, and in bags may be shipped in the same car.

(b) Nitrate of potassium mixed (fused) with nitrite of sodium may be shipped when packed in specification containers as follows:

(1) Spec. 103–W (§ 78.280 of this chapter). Tank cars specially designed,

equipped and approved for this service without bottom discharge outlet and with heavier plate thicknesses than the minimum prescribed for cars built under this specification. For specification 103–W tank cars made of plates having the minimum prescribed thicknesses, internal reinforcement of the upper sheets of tank in the region of the dome and reinforcing plates attached to the bottom sheet of the tank which rests on bolsters is required, and these tanks must be equipped with baffle plates. Heater pipes must be of welded construction designed for a test pressure of 500 pounds per square inch. A 1-inch woven asbestos lining must be placed between bolster slabbing and bottom of tank to prevent heat transmission. Safety vents of the frangible disc type may be used and if used the frangible discs must be perforated with ⅛ inch hole. If safety valves are used a vacuum relief valve must be installed on the dome. Tanks must be stenciled on both sides "FUSED POTASSIUM NITRATE AND SODIUM NITRITE ONLY".

§ 73.183 *Exemptions for nitrates.* (a) Nitrate of aluminum, nitrate of barium, nitrate of lead, nitrate of potash, nitrate of soda, nitrate of strontia, nitro carbo nitrate, nitrate of ammonia, nitrate of ammonia fertilizer, calcium nitrate and guanidine nitrate are exempt from specification packaging and labeling requirements for transportation by rail freight, rail express, highway and by carrier by water when packed as follows:

(1) In metal cans, glass bottles, or other inside containers in outside fiberboard or wooden boxes; in kegs or barrels; in metal cans; in metal drums or fiber drums; calcium nitrate or nitrate of soda in bags not exceeding 200 pounds net weight, moisture proof, made tight against sifting and of strength not less than bags made of 8-ounce burlap.

(b) Ammonium nitrate, ammonium nitrate fertilizer, and guanidine nitrate in bags not exceeding 200 pounds net weight, moisture proof, made tight against sifting and of strength not less than bags made of 8-ounce burlap are exempt from specification packaging requirements for transportation by rail freight, rail express, highway and by carrier by water.

§ 73.184 *Nitrocellulose or collodion cotton, wet, or nitrocellulose, colloided, granular, or flake, wet, or nitrostarch, wet, or nitroguanidine, wet.* (a) Nitrocellulose or collodion cotton, wet, or nitrocellulose, colloided, granular, or flake, wet, or nitrostarch, wet, or nitroguanidine, wet, must be uniformly wet with at least 20 pounds of water to 80 pounds of dry material and must be packed in specification containers as follows:

(1) Spec. 10A or 10B (§§ 78.155 or 78.156 of this chapter). Wooden barrels or kegs.

(2) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes lined, spec. 2M (§ 78.31 of this chapter).

(3) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums not over 55 gallons capacity.

(4) Spec. 37D (§ 78.125 of this chapter). Metal drums (single-trip) not over 5 gallons capacity, welded side seams required.

(5) Spec. 17E or 17H (§§ 78.116 or 78.118 of this chapter). Metal drums (single-trip).

(b) Gross weight of any container must not exceed 450 pounds.

§ 73.185 *Paper stock, wet.* (a) Paper stock, wet, must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

(b) Paper stock, wet, must not be offered for transportation by rail express.

§ 73.186 *Paper waste, wet.* (a) Paper waste, wet, must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

NOTE 1: Because of the present emergency and until further order of the Commission, paper waste, wet, free from oil or other foreign matter liable to cause spontaneous ignition may be shipped in bales.

(b) Paper waste, wet, must not be offered for transportation by rail express.

§ 73.187 *Peroxide of sodium.* (a) Peroxide of sodium must be packed in specification containers as follows:

(1) Spec. 11A, 11B, 15A, 15B, 15C, 16A, or 19A (§§ 78.160, 78.161, 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden barrels, kegs, or boxes, with inside containers which must be glass stoppered bottles, not to exceed 1 ounce net of material, each bottle inclosed in a metal can; or metal cans.

(2) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(3) Spec. 17E, 17H, or 37D (§§ 78.116, 78.118, or 78.125 of this chapter). Metal drums (single-trip).

§ 73.188 *Phosphoric anhydride.* (a) Phosphoric anhydride must be packed in specification containers as follows:

(1) Spec. 11A, 11B, 15A, 15B, or 15C (§§ 78.160, 78.161, 78.168, 78.169, or 78.170 of this chapter). Wooden barrels, kegs, or boxes, with inside containers which must be tightly stoppered glass bottles not over 1 pound capacity each; or metal cans, not over 3 pounds capacity each, hermetically sealed (soldered) or closed with cork securely held in place by metal strap soldered in position. All inside containers must be cushioned with elastic incombustible packing material.

NOTE 1: Because of the present emergency and until further order of the Commission, metal cans not over 6 pounds capacity each are authorized.

(2) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(3) Spec. 17E, 17H, or 37D (§§ 78.116, 78.118, or 78.125 of this chapter). Metal drums (single-trip).

(4) Spec. 6K (§ 78.101 of this chapter). Metal drums. Authorized only for carload or truckload shipments by rail freight or highway when loaded by the shipper and unloaded by the consignee or his duly authorized agent. Each drum must be air tested for leakage at not less than 7 p. s. i. before each refilling.

§ 73.189 *Phosphorus, amorphous, red.* (a) Phosphorus, amorphous, red, must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes, with metal inside containers, with closures sealed air-tight and positively fastened.

(2) Spec. 6A or 6B; also 37D (§§ 78.97, or 78.98; also 73.125 of this chapter), single-trip container, for gross weight not over 160 pounds. Metal barrels or drums.

§ 73.190 *Phosphorus, white or yellow.* (a) Phosphorus, white or yellow, when offered for transportation by carriers by rail freight, highway, or water may only be packed in water or dry.

(b) When placed in water it must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes with inside containers, which must be hermetically sealed (soldered) metal cans, inclosed in other hermetically sealed (soldered) metal cans; or hermetically sealed (soldered) metal cans, containing not over 1 pound each, inclosed in other, watertight, metal cans with screw-top closures; or hermetically sealed (soldered) metal cans, inclosed in hermetically sealed (soldered) metal box-lining, spec. 2F (§ 78.25 of this chapter).

(2) Spec. 6A or 6B (§§ 78.97 or 78.98 of this chapter). Metal barrels or drums, not over 30 gallons capacity each.

(3) Spec. 103 or 103W (§§ 78.265 or 78.280 of this chapter). Tank cars, without bottom discharge outlet and with approved dome fittings, external heater systems, and with insulation at least 4 inches in thickness, except that thickness of insulation may be reduced to 2 inches over external heater coils. The material must be immersed in water and must be loaded at a temperature not exceeding 140° F. and then cooled until the water has a temperature not exceeding 105° F. before car is offered to carrier. The water must be loaded in the dome to not more than 50 percent of the capacity of the dome. After unloading, the tank must be filled to its entire capacity and the dome to not more than 50 percent of its capacity with water having a temperature not less than 105° F. and not over 140° F. before car is offered for return movement.

NOTE 1: Because of the present emergency and until further order of the Commission, Specification ARA-III[1] tank cars, converted as follows, are authorized for use: Without bottom discharge outlet, with insulation at least 2 inches in thickness, internal heater coils, at least one safety valve or frangible disc safety vent of approved design, and dome equipped for top unloading. Cars to be loaded and unloaded as prescribed in paragraph (b) (3) of this section. Cars to be stenciled immediately above the mark ARA-III[1] with the words "FOR PHOSPHORUS ONLY".

(4) Spec. MC–310 (§ 78.330 of this chapter). Tank motor vehicles, without bottom outlet and with insulation at least 4 inches in thickness, except that 2 inches of insulation is authorized for tanks equipped with an exterior heating jacket. Interior heating coils are not authorized. The material must be im-

[1] Use of existing tank cars authorized, but new construction not authorized.

mersed in water and must be loaded at a temperature not exceeding 140° F. and then cooled until the water has a temperature not exceeding 105° F. before being offered for transportation.

(c) Phosphorus, white or yellow, when offered for transportation by rail express must be packed in water in specification containers as follows (also authorized for transportation by carriers by rail freight, highway, or water):

(1) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes with inside containers which must be hermetically sealed (soldered) metal cans, containing not over 1 pound each, inclosed in other, water-tight, metal cans with screw-top closures, or with soldered closures.

(2) Samples of phosphorus, white or yellow, not to exceed 4 ounces each, placed in water in sealed metal cylinders or cans, inclosed in a wooden box, spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter), may be transported only when consigned to the laboratory of the Internal Revenue Bureau or to the Hygienic Laboratory of the Public Health Service, Washington, D. C.

(d) Phosphorus, white or yellow, when dry must be cast solid and shipped in containers as follows:

(1) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums not over 30 gallons capacity each.

(2) In projectiles or bombs when shipped by, for, or to the Departments of the Army, Navy, and the Air Force of the United States Government, without bursting elements.

(e) Phosphorus, white or yellow, when dry must not be offered for transportation by rail express.

§ 73.191 *Phosphorus pentachloride.* (a) Phosphorus pentachloride must be packed in specification containers as follows:

(1) Spec. 11B, 15A, 15B, 15C, 16A, or 19A (§§ 78.161, 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden barrels, kegs, or boxes, with inside containers which must be glass or glazed earthenware containers, not over 25 pounds capacity each, cushioned with mineral packing; when inside containers are packed in the same outside container with other articles or when they are less than 10 pounds capacity each they must also be inclosed in tightly closed metal cans. Net weight of phosphorus pentachloride not over 50 pounds in each outside container.

(2) Spec. 6A, 6B, 6C, or 37D (§§ 78.97, 78.98, 78.99, or 78.125 of this chapter). (Single-trip). "Black iron" metal barrels or drums.

(3) Spec. 10A (§ 78.155 of this chapter). Wooden barrels or kegs asphaltum lined.

(4) Spec. 28A (§ 78.9 of this chapter). Metal-jacketed lead carboys.

§ 73.192 *Picrate of ammonia (ammonium picrate), picric acid and urea nitrate, wet.* (a) Picrate of ammonia (ammonium picrate), picric acid and urea nitrate, wet with not less than 10 percent water, in quantity not exceeding 16 ounces in one outside package, may be shipped as drugs, medicines, or chemicals, when in glass bottles securely stoppered, each bottle inclosed in a strong fiber carton properly cushioned in the outside shipping case. No restrictions other than packing prescribed by this section are required when these materials are offered for transportation.

§ 73.193 *Picric acid or urea nitrate, wet.* (a) Picric acid or urea nitrate wet with not less than 10 percent water must be packed in specification containers as follows:

(1) Spec. 15A (§ 78.168 of this chapter). Wooden box with inside containers of tightly closed glass or earthenware, cushioned, in outside container. The net weight in an outside package must not exceed 25 pounds dry weight. (See § 73.65 (e) of this part for shipment of wet picric acid in excess of 25 pounds, and § 73.192 of this part for exemption up to 16 ounces.)

§ 73.194 *Potassium permanganate.* (a) Potassium permanganate must be packed in specification containers as follows:

(1) In containers as prescribed in § 73.154 of this part.

(2) Spec. 37G (§ 78.128 of this chapter). Metal barrels or drums (single-trip).

§ 73.195 *Pyroxylin plastic scrap, photographic film scrap, X-ray film scrap, motion-picture film scrap, or pieces of exposed or unexposed film.* (a) Pyroxylin plastic scrap, photographic film scrap, X-ray film scrap, motion-picture film scrap, or pieces of exposed or unexposed film, when offered for transportation by carrier by rail freight, highway, or water must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes lined, spec. 2F or 2M (§§ 78.25 or 78.31 of this chapter); gross weight not over 450 pounds each.

(2) Spec. 6A, 6B, 6C, 6J; or 37E (§§ 78.97, 78.98, 78.99, 78.100; or 78.126 of this chapter). (Single-trip). Metal barrels or drums.

(3) Spec. 11B (§ 78.161 of this chapter). Wooden barrels or kegs with paper bags, spec. 2J (§ 78.28 of this chapter) as inside containers of the material; gross weight not over 375 pounds.

(4) Spec. 12B (§ 78.205 of this chapter). Fiber boxes, Use of this container will be permitted because of the present emergency and until further order of the Commission.

(5) Spec. 21A (§ 78.222 of this chapter). Fiber drums. Must be externally treated to provide protection against moisture.

§ 73.196 *Pyroxylin plastic scrap, photographic film scrap, X-ray film scrap, motion-picture film scrap, or pieces of exposed or unexposed film, shipments by rail express.* (a) Pyroxylin plastic scrap, photographic film scrap, X-ray film scrap, motion-picture film scrap, or pieces of exposed or unexposed film, except samples for laboratory examination, must not be offered for transportation by rail express.

(b) Samples for laboratory examination when offered for transportation by rail express must be packed in specification containers as follows:

(1) Spec. 15A, 15B, or 15C (§§ 78.168, 78.169, or 78.170 of this chapter). Wooden boxes with inside metal container, hermetically sealed by soldering or with tape. Net weight not over 25 pounds; shipments must be marked "Sample of (name of article) for laboratory examination".

§ 73.197 *Pyroxylin plastics, in sheets, rolls, rods, or tubes.* (a) Pyroxylin plastics, in sheets, rolls, rods, or tubes containing nitrocellulose is not subject to Parts 71–78 of this chapter when offered for transportation by carriers by rail freight or highway but when offered for transportation by carriers by rail express or water must be packed in specification containers as follows and must bear the yellow label:

(1) Spec. 15A, 15B, or 19A (§§ 78.168, 78.169, or 78.190 of this chapter). Wooden boxes.

(2) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes. Special boxes §§ 78.205–20 and 78.205–21 authorized only for pyroxylin in sheets, rods or tubes.

(3) Sheets, rolled, in fiber drums, spec. 21A (§ 78.222 of this chapter), having 2 straps applied lengthwise and 1 or more circumferentially; straps at least ½ by 0.02 inch steel.

(4) Sheets, rolled, not over 15 pounds net weight in fiber tubes lined throughout with singlefaced corrugated fiberboard at least 0.2 inch thick and securely closed; tube material at least 0.115 inch thick for side walls and 0.05 inch thick for ends with strength, Mullen or Cady test, at least 245 and 220 pounds respectively; metal ends for tubes acceptable when lined with fiber discs at least 0.05 inch thick.

(b) Pyroxylin plastics in manufactured articles or articles made therefrom is not subject to Parts 71–78 of this chapter.

§ 73.198 *Sodium hydride.* (a) Sodium hydride must be packed in specification containers as follows:

(1) In containers as prescribed in §73.206 (a) (1) and (a) (2) of this part.

(2) Spec. 17H (§ 78.118 of this chapter). Metal drums (single-trip).

(3) Spec. 37D (§ 78.125 of this chapter). Metal drums (single-trip) with welded side seams and hermetically sealed closure or closure made fast by positive pressure of the lid against a rubber gasket with edge of the lid crimped over the lip of the drum and a protective metal ring fastened around the crimped edge, packed in strong outside wooden boxes.

§ 73.199 *Rags, oily.* (a) Rags, oily, with more than 5 percent of vegetable or animal oil, must be packed in hermetically sealed metal-lined wooden boxes, or air-tight metal containers.

(b) Rags, oily, as described above, must not be offered for transportation by rail express.

§ 73.200 *Rags, wet.* (a) Rags, wet, must be packed in hermetically sealed metal-lined wooden boxes, or air-tight metal containers.

(b) Rags, wet, must not be offered for transportation by rail express.

§ 73.201 *Rubber scrap.* (a) Rubber scrap, without cotton or fabric insertion, if ground, powdered, or granulated, and the rubber content of which exceeds 45 percent, as determined by subtracting the sum of the percentage of ash and the percentage of acetone extract from 100, and rubber buffings from any grade of rubber, irrespective of the percentage of rubber content, must be packed in specification containers as follows (see paragraph (b) of this section for rubber scrap, not ground):

(1) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(2) Spec. 15A (§ 78.168 of this chapter). Wooden boxes lined, spec. 2F (§ 78.25 of this chapter), or 2M (§ 78.31 of this chapter).

(3) Spec. 10A (§ 78.155 of this chapter). Wooden barrels or kegs.

(4) Spec. 12B (§ 78.205 of this chapter). Fiber boxes.

(5) Spec. 21A (§ 78.222 of this chapter). Fiber drums.

(6) Spec. 22A (§ 78.196 of this chapter). Wooden drums.

(7) Tank cars tightly and securely closed.

(8) Spec. 36A or 44B (§ 78.230 or 78.236 of this chapter). Bags.

(b) Rubber scrap, not ground, is not subject to Parts 71–78 of this chapter.

§ 73.202 *Sodium and potassium, metallic liquid alloy.* (a) Sodium and potassium, metallic liquid alloy must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes with inside metal containers of a type approved by the Bureau of Explosives cushioned with incombustible cushioning material. Each container must have been tested hydrostatically to a pressure of not less than 60 pounds per square inch. Closing devices must be protected from injury.

(2) Not more than 250 pounds of sodium or potassium liquid alloy may be shipped in one outside container.

§ 73.203 *Rubber shoddy, regenerated rubber, or reclaimed rubber.* (a) Rubber shoddy, regenerated rubber, or reclaimed rubber, must be packed in specification containers as follows:

(1) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(2) Spec. 15A (§ 78.168 of this chapter). Wooden boxes lined, spec. 2F (§ 78.25 of this chapter), or 2M (§ 78.31 of this chapter).

(b) When in the form of dense homogeneous nonporous sheets or rolls, the sheets of thickness of one-eighth inch or greater, packed flat or in rolls, the material is nonhazardous and not subject to Parts 71–78 of this chapter.

§ 73.204 *Sodium hydrosulfite.* (a) Sodium hydrosulfite must be packed in specification containers as follows:

(1) Spec. 11A, 11B, 15A, 15B, 15C, 16A, or 19A (§§ 78.160, 78.161, 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden barrels, kegs, or boxes with inside glass bottles of capacity not exceeding 5 pounds each, or metal containers.

(2) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(3) Spec. 17E, 17H, or 37K (§§ 78.116, 78.118, or 78.130 of this chapter). Metal drums (single-trip).

(4) Spec. 37D, 37E, or 37F (§§ 78.125, 78.126, or 78.127 of this chapter). Metal drums (single-trip). These containers are not authorized for transportation by carriers by water.

(5) Spec. 21A (§ 78.222 of this chapter). Fiber drums with inside metal drums.

(6) Spec. 21A (§ 78.222 of this chapter). Fiber drums, net weight not over 250 pounds; drums must have a metal foil (laminated between two sheets of kraft paper with thermoplastic adhesive) moisture and water barrier wound into the sidewall of the drum and located not more than 2 plies from the interior of drum but not to be wound as the first ply; a metal foil moisture and water barrier must also be present in the fiber or wood heading; exterior of drum sidewall must be protected with a water resistant coating; in addition to the tests prescribed by § 78.222–4 of this chapter, a drum having been given a 4-foot diagonal bottom chime drop must, after being emptied, withstand complete immersion of the bottom in 6 inches of water for 4 hours without leakage to the interior; drums must not be offered for transportation by carriers by water.

(7) Spec. 22B (§ 78.197 of this chapter). Plywood drums with inside metal drums.

NOTE 1: Because of the present emergency and until further order of the Commission, the use of inside metal drums will not be required but in lieu thereof the drum must be lined or otherwise treated so as to prevent the entrance of moisture in quantities sufficient to create a hazardous condition in transportation. Maximum loaded capacity 110 pounds net.

§ 73.205 *Sodium picramate, wet.* (a) Sodium picramate must be wet with not less than 20 percent of water by weight and packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with well stoppered glass inside containers of not exceeding 1 quart capacity each, cushioned in the boxes.

(2) Spec. 10A or 10B (§§ 78.155 or 78.156 of this chapter). Wooden barrels, or kegs.

§ 73.206 *Sodium or potassium, metallic, sodium amide, lithium metal, lithium silicon, and lithium hydride.* (a) Sodium or potassium, metallic, sodium amide, lithium metal, lithium silicon, and lithium hydride, must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes, with air-tight metal inside containers which must have closing device securely fastened by positive means (not friction).

(2) Spec. 5, 6A, 6B, or 6C (§§ 78.80, 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(3) Spec. 17E, 17H, or 37D (§§ 78.116, 78 118, or 78.125 of this chapter). Metal drums (single-trip) authorized only for sodium which must be fused solid in the container.

(b) Sodium or potassium, metallic, sodium amide, and lithium metal, immersed in neutral oil may also be shipped when packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes with inside metal drums, spec. 37D (§ 78.125 of this chapter) (single-trip), having welded side seams, net weight not over 30 pounds, or with inside glass containers, each enclosed in a tin container.

(c) Sodium, metallic, may also be shipped when packed in specification containers as follows:

(1) Spec. 105A300 (§ 78.271 of this chapter). Tank cars, having exterior heater coils fusion welded to tank shell and properly stress-relieved, the material to be in molten condition when loaded into the tank and allowed to solidify before car is offered to carrier.

(2) Spec. 37D (§ 78.125 of this chapter). Metal drums (single-trip) authorized for cylindrical blocks at least 2 inches in diameter and not less than 6 inches in length. Net weight not over 30 pounds.

(d) Lithium metal in cartridges, when packed and described as follows is exempt from specification packaging and labeling requirements:

(1) In inside hermetically sealed metal cartridges not exceeding 18 grams net weight each, packed in strong outside containers with net weight of lithium metal not exceeding one pound.

§ 73.207 *Sulfide of sodium or sulfide of potassium, fused or concentrated, when ground.* (a) Sulfide of sodium or sulfied of potassium, fused or concentrated, when ground, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, or 16A (§§ 78.168, 78.169, 78.170, or 78.185 of this chapter). Wooden boxes with inside containers which must be glass bottles enclosed in tightly closed metal cans, or hermetically sealed (soldered) metal cans.

(2) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(3) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes, with inside containers which must be hermetically sealed (soldered) metal cans of not over 5 pounds capacity.

(b) When fused or concentrated, but not ground (may be chipped, flaked, or broken), may be shipped in specification containers as follows:

(1) Spec. 15A, 15B, 15C, or 16A (§§ 78.168, 78.169, 78.170, or 78.185 of this chapter). Wooden boxes with inside bottles of not more than 5 pounds capacity each, or metal cans, with tight covers.

(2) Spec. 12B (§78.205 of this chapter). Fiberboard with inside containers which must be metal cans of not over 5 pounds net weight each or glass bottles of not over 1 pound net weight each. Packages containing glass or earthenware containers must not weigh over 65 pounds gross.

(3) Spec. 17E, 17H, 37D, 37E, 37F, or 37G (§§ 78.116, 78.118, 78.125, 78.126, 78.127, or 78.128 of this chapter). Metal drums (single-trip).

(4) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, 78.99 of this chapter). Metal barrels or drums.

(5) Spec. 21A (§ 78.222 of this chapter). Fiber drums which must be lined or coated, or otherwise treated so as to prevent the entrance of moisture in quantities sufficient to create a hazardous condition in transportation; drums to withstand two drops from height of 4 feet in same spot or one 6-foot drop in place of drop test as provided in spec. 21A (§ 78.222 of this chapter); maximum loaded capacity 250 pounds net. Use of this container will be permitted because of the present emergency and until further order of the Commission.

(c) Sulfide of potassium, crystallized, is not subject to Parts 71–78 of this chapter.

(d) Sodium sulfide when shipped fused in one solid mass in a metal barrel or drum and sodium sulfide, crystallized, are not subject to Parts 71–78 of this chapter.

(e) Sodium sulfide containing 35 percent or more combined water by weight, fused or concentrated but not ground (may be chipped, flaked, or broken), is exempt from specification packaging and labeling requirements, when packed in steel barrels or drums that are equipped with moisture-tight closures.

§ 73.208 *Titanium metal powder, wet.* (a) Titanium metal powder, wet, with not less than 20 percent water, must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes with inside metal can of not less than 22-gauge, not to exceed 10 gallons capacity, tightly and securely closed. Not more than one such inside container may be packed in one outside container.

§ 73.209 *Tankage, garbage, and tankage fertilizers.* (a) Tankage, garbage, and tankage fertilizers, containing less than 8 percent moisture or having a temperature exceeding 100° F. when loaded, must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

(b) Such tankage, garbage, and tankage fertilizers, must not be offered for transportation by rail express.

§ 73.210 *Tankages, rough ammoniate.* (a) Tankages, rough ammoniate (tankages made from ammoniates such as leather scrap, horns, hoofs, hair, hair waste, felt waste), containing less than 7 percent moisture or having a temperature exceeding 100° F. when loaded, must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

(b) Tankages, rough ammoniate, must not be offered for transportation by rail express.

§ 73.211 *Textile waste, wet.* (a) Textile waste, wet, must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

(b) Textile waste, wet, must not be offered for transportation by rail express.

§ 73.212 *Trinitrobenzene and trinitrotoluene, wet.* (a) Trinitrobenzene and trinitrotoluene, wet with not less than 10 percent water, in quantity not exceeding 16 ounces in one outside package, may be shipped as drugs, medicines, or chemicals, when in glass bottles securely stoppered, each bottle inclosed in a strong fiber carton properly cushioned in the outside shipping case and are not subject to any other requirement of Parts 71–78 of this chapter.

§ 73.213 *Wool waste, wet.* (a) Wool waste, wet, must be packed in hermetically sealed metal-lined wooden boxes or air-tight metal containers.

(b) Wool waste, wet, must not be offered for transportation by rail express.

§ 73.214 *Zirconium, metallic, wet or sludge.* (a) Zirconium, metallic, wet or sludge, must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes with inside metal cans, spec. 2A (§ 78.20 of this chapter), of screw-cap type, or tightly and securely closed by push-in covers held in place by soldering at least at four points. Inside containers must not exceed 10 pounds net weight each. Gross weight of such outside containers must not exceed 150 pounds each.

NOTE 1: Because of the present emergency and until further order of the Commission, inside metal drums, 26 gauge bodies and heads, welded side seams, open-head type, rubber gasketed lug type closures, and capacity not over 50 pounds net weight are authorized. Interior of drums must be so treated as to prevent chemical reaction between contents and drum. Each drum must be packed separately in an outside wooden box, spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). The top of the box must fit tightly against the cover of the drum and be marked "THIS SIDE UP."

(2) Spec. 10A (§ 78.155 of this chapter). Wooden kegs containing not to exceed 75 pounds net each.

§ 73.215 *Zirconium, metallic, dry.* (a) Zirconium, metallic, dry, must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes with inside metal containers, tightly and securely closed by push-in covers held in place by soldering at least at four points, or in screw-cap type metal cans. Inside containers must not exceed 10 pounds net each. Gross weight of outside packages must not exceed 75 pounds each.

§ 73.216 *Zirconium picramate, wet.* (a) Zirconium picramate must be wet with not less than 20 percent of water by weight and packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with well stoppered glass inside containers of not exceeding 1 quart capacity each, cushioned in the boxes.

(2) Spec. 10A or 10B (§§ 78.155 or 78.156 of this chapter). Wooden barrels or kegs.

§ 73.217 *Calcium hypochlorite compounds, dry.* (a) Calcium hypochlorite compounds, dry, containing more than 8.80 percent available oxygen (39 percent available chlorine) must be packed in specification containers as follows:

(1) Spec. 6A, 6B, or 6C (§§78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(2) Spec. 17E, 17H, 37D, 37E, or 37F (§§ 78.116, 78.118, 78.125, 78.126, or 78.127 of this chapter). Metal drums (single-trip).

(b) Outside packages containing inside containers of glass or metal not over five pounds capacity each are exempt from Parts 71–78 of this chapter.

§ 73.218 *Carbopropoxide, unstabilized.* (a) Carbopropoxide, unstabilized, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass or earthenware inside containers of not over 2 gallons capacity each which must be maintained at a temperature below 32° F. Shipments are authorized for transportation by carrier by motor vehicle only.

§ 73.219 *Potassium perchlorate.* (a) Potassium perchlorate must be packed as follows:

(1) As prescribed in § 73.154 (a) (1) to (11) of this part.

(2) In tight bags which will not permit sifting in transit.

§ 73.220 *Magnesium scrap (shavings, borings, or turnings).* (a) Magnesium scrap (shavings, borings, or turnings), when shipped in car loads or truck loads, must be packed in tightly and securely closed metal barrels, wooden barrels, metal pails, or four-ply paper bags. In less-than-carload or less-than-truckload quantities it must be packed in tightly and securely closed metal drums, metal pails, or wooden barrels.

§ 73.221 *Liquid peroxides other than acetyl peroxide solution, hydrogen peroxide, peracetic acid and cumene hydroperoxide.* (a) Liquid peroxides other than acetyl peroxide solution, hydrogen peroxide, peracetic acid and cumene hydroperoxide must be packed in specification containers as follows:

(1) Spec. 1A or 1D (§§ 78.1 or 78.4 of this chapter). Carboys, glass, boxed, capacity not over 5 gallons for spec. 1A (§78.1 of this chapter), and 6.5 gallons for spec. 1D (§ 78.4 of this chapter).

(2) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside containers which must be glass or earthenware, not over 1 gallon each, cushioned with incombustible packing material in sufficient quantity to absorb the contents of the inner container.

(3) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with inside containers which must be glass or earthenware, not over 1 gallon each, cushioned with incombustible packing material in sufficient quantity to absorb the contents of the inner container. Not more than one 1-gallon inside container shall be packed in one outside fiberboard box.

(4) Spec. 42B (§ 78.107 of this chapter). Aluminum drums not over 15 gallons capacity. Authorized only for peroxides which will not react dangerously

with the aluminum or be decomposed by contact with it.

(5) Spec. 17C or 17E (§§ 78.115 or 78.116 of this chapter). Metal drums (single-trip) not over 15 gallons capacity. Authorized only for material which will not react dangerously with the drum metal, or be decomposed by contact with it.

§ 73.222 *Acetyl peroxide and acetyl benzoyl peroxide.* (a) Acetyl peroxide must be shipped in solution in a non-volatile solvent and must contain not more than 25 percent by weight of the peroxide. Acetyl benzoyl peroxide must be shipped in solution in a non-volatile solvent and must contain not more than 40 percent by weight of the peroxide. They must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside containers which must be glass or earthenware, not over 1 gallon each, cushioned with incombustible packing material in sufficient quantity to absorb the contents of the inner container.

(2) Spec. 1A or 1D (§§ 78.1 or 78.4 of this chapter). Carboys, glass, boxed, capacity not over 5 gallons for spec. 1A (§ 78.1 of this chapter), and 6.5 gallons for spec. 1D (§ 78.4 of this chapter).

(3) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with inside containers which must be glass or earthenware, not over 1 gallon each, cushioned with incombustible packing material in sufficient quantity to absorb the contents of the inner container. Not more than one 1-gallon inside container shall be packed in one outside fiberboard box.

§ 73.223 *Peracetic acid.* (a) Peracetic acid must be shipped in solution not exceeding 40 percent strength and must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside containers which must be glass or earthenware, not over one gallon capacity each, cushioned with sterile absorbent cotton or other cushioning material which will not react with the contents to generate heat. Cushioning material must be in sufficient quantity to completely absorb the contents of the inner container.

(2) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with inside containers which must be glass or earthenware, not over one quart capacity each, cushioned with sterile absorbent cotton or other cushioning material which will not react with the contents to generate heat. Cushioning material must be in sufficient quantity to completely absorb the contents of the inner container.

(3) Spec. 1A or 1C (§§ 78.1 or 78.3 of this chapter). Carboys not over 5 gallons capacity, or spec. 1D (§ 78.4 of this chapter) carboys.

(4) Spec. 42D (§ 78.109 of this chapter). Aluminum drums, not over 30 gallons capacity each.

§ 73.224 *Cumene hydroperoxide and tertiary butylisopropyl benzene hydroperoxide.* (a) Cumene hydroperoxide of strength not exceeding 75 percent in a non-volatile solvent and tertiary butylisopropyl benzene hydroperoxide not exceeding 60 percent strength must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside containers which must be glass or earthenware, not over 1 gallon each, cushioned with incombustible packing material in sufficient quantity to absorb the contents of the inner container.

(2) Spec. 17E (§ 78.116 of this chapter). Metal drums (single-trip), with interiors so treated that they will be resistant to the contents.

§ 73.225 *Phosphorus sesquisulfide.* (a) Phosphorus sesquisulfide must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes with metal inside containers hermetically sealed (soldered), or in water-tight metal cans with screw-top closures.

(2) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums, not over 30 gallons capacity each.

(3) Spec. 37D (§ 78.125 of this chapter). Metal drums (single-trip). Gross weight not over 425 pounds.

§ 73.226 *Thorium metal, powdered.* (a) Thorium metal, powdered, must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes with inside metal containers, tightly and securely closed by push-in covers held in place by soldering at least at four points, or in screw-cap type metal cans. Inside containers must not exceed 10 pounds net each. Gross weight of outside packages must not exceed 75 pounds each.

§ 73.227 *Urea peroxide.* (a) Urea peroxide must be packed in specification containers as follows:

(1) Spec. 12B (78.205 of this chapter). Fiberboard boxes with inside containers which must be rubber or plastic containers not exceeding 4 ounces each. Gross weight not over 65 pounds.

(2) Spec. 21A (§ 78.222 of this chapter). Fiber drums completely coated on the inside with a suitable wax.

(3) Spec. 22A (§ 78.196 of this chapter). Plywood drums with paper bags, spec. 2J (§ 78.28 of this chapter) coated with suitable wax on the inner surface.

§ 73.228 *Zinc ammonium nitrite.* (a) Zinc ammonium nitrite must be packed in specification containers as follows:

(1) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(2) Spec. 17E, 17H, or 37D (§§ 78.116, 78.118, or 78.125 of this chapter). Metal drums (single-trip). Gross weight not over 300 pounds.

§ 73.229 *Chlorate and borate mixtures.* (a) Chlorate and borate mixtures when containing no other ingredient must be packed as follows:

(1) When containing more than 50 percent chlorate, as prescribed in § 73.163 of this part.

(2) When containing more than 25 percent chlorate but less than 50 percent chlorate, as prescribed in § 73.154 of this part.

(b) When containing 25 percent or less chlorate the material is not subject to the regulations in Parts 71–78 of this chapter.

(c) Chlorate and borate mixtures containing no other ingredient and containing less than 50 percent chlorate, packed in strong tight metal or fiber drums or in wooden boxes with tight inside metal containers are exempt from specification packing, marking, and labeling requirements for transportation by rail freight or highway.

§ 73.230 *Sodium, metallic, dispersion in organic solvent.* (a) Sodium, metallic, dispersion in organic solvent must be packed in specification containers as follows:

(1) Spec. 15A (§ 78.168 of this chapter). Wooden boxes with inside containers which must be metal cans not exceeding one quart capacity, and each such can must be packed in another metal can and cushioned on all sides with at least one inch of soda ash. Both the inner and outer metal can shall be equipped with an airtight closing device secured by positive means (not friction). Gross weight of completed package must not exceed 100 pounds.

SUBPART E—ACIDS AND OTHER CORROSIVE LIQUIDS; DEFINITION AND PREPARATION

§ 73.240 *Acids and other corrosive liquids; definition.* (a) Corrosive liquids for the purpose of Parts 71–78 of this chapter are those acids, alkaline caustic liquids and other corrosive liquids which, when in contact with living tissue, will cause severe damage of such tissue by chemical action; or in case of leakage, will materially damage or destroy other freight by chemical action; or are liable to cause fire when in contact with organic matter or with certain chemicals.

§ 73.241 *Outage.* (a) Outage for containers of acids or other corrosive liquids for transportation by carriers by rail freight, rail express, highway, or water, must be as follows:

(1) Containers must not be entirely filled. Sufficient interior space must be left vacant to prevent leakage or distortion of containers due to the expansion of the contents from increase of temperature during transit.

(2) The proper vacant space (outage) in a tank car or other shipping container depends on the coefficient of expansion of the liquid and the maximum increase of temperature to which it will be subjected in transit. Outage must be calculated to the total capacity of the container.

(3) Acids and other corrosive liquids must not be loaded into domes of tank cars.

(4) In tank cars, outage must be calculated to percentage of the total capacity of the tank, i. e., shell and dome capacity combined. If the dome of the tank car does not provide sufficient out-

age, then vacant space must be left in the shell to make up the required outage.

(5) The outage for tank cars must be not less than 1 percent.

(6) No cargo tank or portable tank or compartment thereof used for the transportation of any corrosive liquid shall be completely filled; sufficient space, not to exceed 2 percent, shall be left vacant in every case.

§ 73.242 *Bottles containing acid or other corrosive liquids.* (a) Bottles containing acid or other corrosive liquids, as defined by § 73.240 of this part, must not be packed in the same outside container with any other article, except as specifically provided in this part.

(b) When bottles containing acid or other corrosive liquids are cushioned by incombustible absorbent material and securely packed in tightly closed metal containers, except hydrofluoric acid which must be packed in a container other than a metal container, they may be packed with other articles. This exception does not apply to nitric or perchloric acids, hydrogen peroxide exceeding 52 percent strength by weight, nitrohydrochloric acid, or nitrohydrochloric acid diluted, which must not be packed in the same outside container with any other article under any circumstances.

§ 73.243 *Closing and cushioning.* (a) All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed or in any case when necessary to prevent breakage or leakage.

§ 73.244 *Exemptions for acids and other corrosive liquids.* (a) Acids and other corrosive liquids except those enumerated in paragraph (c) of this section in quantity not exceeding 1 pound bottles each inclosed in a metal can in the outside container are exempt from specification packaging, marking, and labeling requirements unless otherwise provided, for transportation by rail freight or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements, unless otherwise provided.

(b) Other exemptions from specification packaging, marking, and labeling requirements for rail freight, rail express and highway transportation and exemptions from specification packaging, marking other than name of contents, and labeling requirements for transportation by carrier by water, are shown with the packing requirements for the article.

(c) The following articles in any quantity, except as otherwise specified, are not exempt from any of the provisions of this part:

(1) Acid sludge.
(2) Allyl chloroformate.
(3) Amyl trichlorosilane.
(4) Antimony pentafluoride.
(5) Benzyl bromide.
(6) Benzyl chloroformate.
(7) Boron trichloride.
(8) Bromine.
(9) Bromine pentafluoride.
(10) Bromine trifluoride.
(11) a-Bromotoluene.
(12) Butyl trichlorosilane.
(13) Carbopropoxide, stabilized.
(14) Chloracetyl chloride.
(15) Chlorine trifluoride.
(16) Diethyl dichlorosilane.
(17) Difluorophosphoric acid, anhydrous.
(18) Dimethyl sulfate.
(19) Diphenyl dichlorosilane.
(20) Electrolyte or alkaline corrosive battery fluid packed with storage batteries, battery chargers, or radio current supply devices.
(21) Ethyl chloroformate.
(22) Ethyl phenyl dichlorosilane.
(23) Fluosulfonic acid.
(24) Hexafluorophosphoric acid.
(25) Hexyl trichlorosilane.
(26) Hydrazine, anhydrous.
(27) Hydrazine solution containing 50 percent or less of water.
(28) Hydrofluoric acid, anhydrous.
(29) Hydrogen peroxide over 52 percent strength by weight.
(30) Hypochlorite solutions containing more than 7 percent available chlorine by weight.
(31) Less-than-carload and less-than-truckload shipments of wet electric storage batteries.
(32) Methyl chloroformate.
(33) Mixtures of hydrofluoric and sulfuric acid.
(34) Monofluorophosphoric acid, anhydrous.
(35) Nitrating (mixed) acid.
(36) Nitric acid.
(37) Nitrohydrochloric acid.
(38) Nitrohydrochloric acid diluted.
(39) Octyl trichlorosilane.
(40) Phenyl trichlorosilane.
(41) Phosphorus oxychloride.
(42) Phosphorus tribromide.
(43) Phosphorus trichloride.
(44) Propyl trichlorosilane.
(45) Spent acid (sulfuric or mixed).
(46) Sulfur chloride.
(47) Thionyl chloride.
(48) Thiophosphoryl chloride.

§ 73.245 *Acids or other corrosive liquids not specifically provided for.* (a) Acids or other corrosive liquids, as defined in § 73.240 of this part, other than those for which special requirements are prescribed, must be packed in specification containers as follows:

(1) Spec. 1A, 1B, or 1C (§§ 78.1, 78.2, or 78.3 of this chapter). Carboys in boxes or kegs which must be closed, and when reused must be reconditioned and tested, as provided in the specification.

(2) Spec. 1X (§ 78.5 of this chapter). Boxed carboys of 5 to 6 gallons capacity; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side by rail freight in carload lots only and by motor vehicle in truckload lots only.

(3) Spec. 1D (§ 78.4 of this chapter). Boxed glass carboys of not over 6.5 gallons nominal capacity which must be closed, and when reused must be reconditioned and tested, as provided in the specification; means shall be provided so that accumulated pressure in bottles shall not exceed 10 pounds per square inch gauge at 130° F., or shall vent at a pressure not to exceed 10 pounds per square inch gauge.

(4) Spec. 5A (§ 78.81 of this chapter). Metal barrels or drums.

(5) Spec. 10A (§ 78.155 of this chapter). Wooden barrels or kegs; these containers must be asphalt lined.

(6) Spec. 11A or 11B (§ 78.160 or 78.161 of this chapter). Wooden barrels or kegs with inside containers which must be glass or earthenware, not over 2 gallons each.

(7) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside containers which must be glass or earthenware, not over 1 gallon each, except that inside containers up to 3 gallons are authorized when only one is packed in each outside container.

(8) Spec. 28 (§ 78.8 of this chapter). Metal-jacketed lead carboys.

§ 73.246 *Antimony pentafluoride.* (a) Antimony pentafluoride must be commercially anhydrous and must be packed in specification containers as follows:

(1) Spec. 3A1800, 3E1800, 3B240, 4B240, or 4BA240 (§§ 78.36, 78.42, 78.38, 78.50, or 78.51 of this chapter). Cylinders closed by means of iron or steel threaded plugs.

§ 73.247 *Acetyl chloride, antimony pentachloride, benzoyl chloride, benzyl chloride, pyro sulfuryl chloride, silicon chloride, sulfur chloride (mono and di), thionyl chloride, tin tetrachloride (anhydrous), and titanium tetrachloride.* (a) Acetyl chloride, antimony pentachloride, benzoyl chloride, benzyl chloride, pyro sulfuryl chloride, silicon chloride, sulfur chloride (mono and di), thionyl chloride, tin tetrachloride (anhydrous), and titanium tetrachloride, must, except as indicated, be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass or earthenware inside containers not over 1 gallon each, except that inside containers up to 3 gallons each are authorized when only one is packed in an outside container.

(2) Spec. 11A or 11B (§§ 78.160, or 78.161 of this chapter). Wooden barrels or kegs, with glass or earthenware inside containers not over 2 gallons each.

(3) Spec. 1A, 1C, or 1D (§§ 78.1, 78.3, or 78.4 of this chapter). Glass carboys in boxes or kegs (not permitted for antimony pentachloride or tin tetrachloride, anhydrous).

(4) Spec. 1X (§ 78.5 of this chapter). Boxed carboys of 5 to 6 gallons capacity; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side by rail freight in carload lots only and by motor vehicle in truckload lots only (not permitted for antimony pentachloride or tin tetrachloride, anhydrous).

(5) Spec. 5A (§ 78.81 of this chapter). Metal barrels or drums. Benzyl chloride

must be stabilized when packed in unlined containers.

(6) Spec. 103A (§ 78.266 of this chapter). Tank cars except that for tin tetrachloride (anhydrous) spec. 105A300 (§ 78.271 of this chapter), tank cars must bs used. Benzyl chloride must be stabilized when loaded in unlined tanks.

(7) Spec. 5H (§ 78.87 of this chapter). Metal barrels or drums, lead-lined, authorized for benzyl chloride only.

(8) Sulfur chloride packed in glass or earthenware bottles or carboys must be cushioned in the outside container by means of incombustible elastic packing material of such nature that a mixture of the liquid and the packing material will not cause fires or heating.

(9) Spec. MC310 (§ 78.330 of this chapter). Tank motor vehicles. Benzyl chloride must be stabilized when loaded in unlined tanks.

(10) Spec. 5K (§ 78.88 of this chapter). Nickel drums, authorized for acetyl chloride, benzyl chloride, benzoyl chloride, pyro sulfuryl chloride and thionyl chloride only. When shipped in unstabilized condition, the lading must be anhydrous and must be free from impurities such as iron.

(11) Spec. 103A or 103A–W (§§ 78.266 or 78.281 of this chapter). Tank cars, authorized for benzyl chloride only. When shipped in unstabilized condition, the lading must be anhydrous and must be free from impurities such as iron. Tanks for these cars must be made of solid nickel at least 99 percent pure and all cast metal parts of the tank in contact with the lading have a minimum nickel content of approximately 96.7 percent.

(12) Spec. 60 (§ 78.255 of this chapter). Portable tanks. Benzyl chloride must be stabilized when loaded in unlined tanks.

§ 73.248 *Acid sludge, sludge acid, spent sulfuric acid, or spent mixed acid.* (a) Acid sludge, sludge acid, spent sulfuric acid, or spent mixed acid, resulting from the use of sulfuric acid in various processes, except when containing hydrofluoric acid, which will not corrode interior of tanks cars at sufficiently rapid rate to cause leakage during transportation, must be packed in specification containers as follows:

(1) Spec. 1A or 1D (§§ 78.1 or 78.4 of this chapter). Boxed carboys. (For spent sulfuric acid only).

(2) Spec. 1X (§ 78.5 of this chapter). Boxed carboys of 5 to 6 gallons capacity; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side by rail freight in carload lots only and by motor vehicle in truckload lots only.

(3) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185 or 78.190 of this chapter). Wooden boxes with inside containers which must be glass or earthenware, not over 1 gallon each, except that inside containers up to 3 gallons are authorized when only one is packed in each outside container.

(4) Spec. 103A (§ 78.266 of this chapter). Tank cars, provided the product is sufficiently liquid to be unloaded through the dome.

(5) Spec. 103 (§ 78.265 of this chapter). Tank cars, provided the product is too viscous to be unloaded through the dome.

(6) Spec. MC 310 (§ 78.330 of this chapter). Tank motor vehicles.

(7) Spec. 60 (§ 78.255 of this chapter). Portable tanks.

§ 73.249 *Alkaline corrosive liquids, n. o. s., alkaline caustic liquids, n. o. s., and alkaline battery fluids.* (a) Alkaline corrosive liquids, n. o. s., alkaline caustic liquids, n. o. s., and alkaline battery fluids when offered for transportation by carriers by rail freight, highway, or water must be packed in specification containers as follows:

(1) In containers prescribed in § 73.245 of this part.

(2) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass or earthenware inside containers, not over 2 gallons each, or with metal inside containers, not over 5 gallons each.

(3) Spec. 5 or 5A (§§ 78.80 or 78.81 of this chapter). Metal barrels or drums, with openings not exceeding 2.3 inches in diameter.

(4) Spec. 17E or 17H (§§ 78.116 or 78.118 of this chapter). Metal drums (single-trip). Authorized only for liquid boiler compounds or liquid water treatment compounds.

(5) Spec. 103, 103W, 103A, 103A–W, 104, 104W, 104A, or 104A–W (§§ 78.265, 78.280, 78.266, 78.281, 78.269, 78.284, 78.270, or 78.285 of this chapter). Tank cars.

(6) Spec. MC 310 (§ 78.330 of this chapter). Tank motor vehicles, marked "For Caustic Soda, Liquid Only", or "For Caustic Potash Liquid Only".

(7) Spec. 60 (§ 78.255 of this chapter). Portable tanks, marked "For Caustic Soda, Liquid, Only", or "For Caustic Potash, Liquid, Only".

(b) Alkaline corrosive liquids, n. o. s., alkaline caustic liquids, n. o. s., and alkaline battery fluids when offered for transportation by rail express must be packed in specification containers as follows:

(1) Spec. 15C, 16A, or 19A (§§ 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside containers of earthenware or glass vessels, capacity 1 gallon or less, well stoppered and well cushioned with excelsior, hay, straw, or other equally effective cushioning material.

(2) Spec. 15C, 16A, or 19A (§§ 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside containers of metal cans, capacity 2 gallons or less.

(3) Spec. 5 or 5A (§§ 78.80 or 78.81 of this chapter). Metal barrels or drums, capacity 10 gallons or less, with openings not exceeding 2.3 inches in diameter.

(4) Spec. 12B (§ 78.205 of this chapter). Fiberboard container with inside glass bottle, capacity not over 16 ounces, well stoppered and well cushioned with excelsior or other equally effective cushioning material. Not more than one bottle may be packed in an outside container.

(5) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with inside containers made of polyethylene, or other material resistant to lading, except glass bottles. Inside containers must not exceed 16 ounces capacity each and be adequately cushioned against breakage.

(c) Inside containers of not more than 8-fluid ounces capacity each, resistant to lading, packed in strong outside containers, and cushioned with absorbent material in sufficient quantity to completely absorb liquid contents in the event of breakage, are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, rail express or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements.

§ 73.250 *Automobiles or other self-propelled vehicles.* (a) Automobiles or other self-propelled vehicles equipped with charged electric storage batteries, or with charged electric storage batteries removed from vehicles; and charged electric storage batteries when included in carload or truckload shipments of automobile parts or assembled material are exempt from specification packaging, marking, and labeling requirements as follows:

(1) When batteries are removed from automobiles and loaded into car or motor vehicle therewith, the batteries must be so loaded, blocked, and braced in car as to prevent movement therein during transit, and the load must be so arranged that loose articles cannot come into contact with the batteries.

(2) When batteries are shipped with automobile parts or assembly material, the batteries must be boxed or crated and so loaded, blocked, and braced in the car or motor vehicle as to prevent movement therein during transit, and the load must be so arranged that loose articles cannot come into contact with the batteries.

(3) When batteries are installed in the vehicle they must be completely protected so that short circuits will be prevented under conditions normal to transportation.

§ 73.251 *Boron trichloride.* (a) Boron trichloride must be packed in specification containers as follows:

(1) Cylinders as prescribed for any compressed gas, except acetylene.

§ 73.252 *Bromine.* (a) Bromine must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes with glass inside containers not over 1 quart each; or with stone or earthenware jugs not over 1 gallon each.

(2) Spec. 5H (§ 78.87 of this chapter). Lead-lined metal barrels or drums not over 10 gallons each.

(3) Spec. 105A300–W (§ 78.286 of this chapter). Tank cars. The tank must be nickel clad at least 20 percent or must be lined with lead at least $\frac{3}{16}$" thick; openings in tank heads to facilitate application of lead lining are authorized and must be closed in an approved manner; all closures and appurtenances

which are in contact with the lading must be lead lined or must be made of metal not subject to rapid deterioration by contact with the lading; all interior welds in nickel clad tanks must be protected by pure nickel butt straps to eliminate iron contamination. The water weight capacity of the tank must not be more than 20,400 pounds, and the maximum quantity of liquid bromine loaded into the tank must not be more than 60,000 pounds or 300 percent of the water weight capacity of the tank, whichever quantity is the lesser. In no case shall the quantity loaded be less than 98 percent of the quantity the tank is authorized to carry.

(b) Outage (vacant space above liquid) for inside containers must be not less than 15 percent of capacity of container.

(c) For other authorized containers an outage of not less than 10 percent is required.

(d) Inside containers must be closed by glass, earthenware, or stone stoppers ground to fit and securely fastened; or bottles may have necks with molded screw threads which must be closed by threaded-type caps with lead or other efficient bromine-resistant gaskets and cushioned by elastic material to insure tight closure. Sealed glass ampoules are also authorized.

(e) Bottles or jugs must be securely cushioned on all sides with incombustible packing material, such as whiting, mineral wood, infusorial earth (kieselguhr), sifted ashes, powdered china clay, or similar material, at least 1 inch thick, which will not produce heat when mixed with bromine. The use of hay, sawdust, excelsior, or other organic material, either treated or untreated, as a cushioning or packing material, is prohibited.

(f) Not more than 15 quarts of bromine in bottles, nor more than 12 quarts in jugs, may be packed in one box.

(g) Bromine which has been dried in accordance with good commercial practice may also be packed in specification containers as follows:

(1) Spec. 5K or 5M (§§ 78.85 or 78.90 of this chapter). Nickel or monel drums of not over 10 gallons capacity each and containing not more than 225 pounds net weight of bromine. Drums must be of metal at least 14 gauge United States standard throughout and must have chime reinforcement adequate for their protection. All openings must be in one head and closing parts (plug, cap, flange, etc.) must be of the same metal as the drum. One opening not over 2.3 inch diameter and one opening not over ¾ inch standard pipe size are permitted. Each drum must be completely emptied and dried before reuse and must be equipped with gaskets of a material approved by the Bureau of Explosives.

§ 73.253 *Chloracetyl chloride.* (a) Chloracetyl chloride must be packed in specification containers as follows:

(1) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes, with inside glass containers not over 5 pints capacity each, cushioned with incombustible material.

(2) Spec. 28 (§ 78.8 of this chapter). Metal-jacketed lead carboys.

(3) Spec. 5H (§ 78.87 of this chapter). Lead-lined metal barrels or drums.

(4) Spec. 1A, 1C, or 1D (§§ 78.1, 78.3, or 78.4 of this chapter). Carboys in boxes or kegs. Use of these containers will be permitted because of the present emergency and until further order of the Commission.

§ 73.254 *Chlorosulfonic acid and mixtures of chlorosulfonic acid-sulfur trioxide.* (a) Chlorosulfonic acid and mixtures of chlorosulfonic acid-sulfur trioxide must be packed in specification containers as follows:

(1) Spec. 5A or 5C (§§ 78.81 or 78.83 of this chapter). Metal barrels or drums.

(2) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes, with inside containers which must be glass or earthenware, not over 1 gallon each, except that inside containers up to 3 gallons are authorized when only one is packed in each outside container.

(3) Spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter). Wooden barrels, with inside glass or earthenware containers not over 2 gallons each.

(4) Spec. 103A (§ 78.266 of this chapter). Tank cars.

§ 73.255 *Dimethyl sulfate.* (a) Dimethyl sulfate must be packed in specification containers as follows:

(1) Spec. 5A (§ 78.81 of this chapter). Metal barrels or drums not over 55 gallons each.

(2) Spec. 5 (§ 78.80 of this chapter). Metal barrels or drums not over 15 gallons each, with openings not exceeding 2.3 inches in diameter, inclosed in strong crates made of lumber at least ⅝ inch thick.

(3) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with each box containing a single glass inside container not over 1 quart capacity, closed by ground glass stopper securely fastened in place, and cushioned with incombustible absorbent material in hermetically sealed (soldered) metal can, the can then being cushioned with incombustible cushioning material in the outside container.

(4) Spec. 103A (§ 78.266 of this chapter). Tank cars.

§ 73.256 *Compounds, cleaning, liquid.* (a) Compounds, cleaning, liquid, containing not more than 60 percent hydrofluoric acid, must be packed in specification containers as follows:

(1) As prescribed in § 73.264 (a) (1) and (2) of this part.

(2) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with inside containers of India rubber, ceresine, lead, or other material of equal strength and not subject to destruction by the lading.

§ 73.257 *Electrolyte (acid) or corrosive battery fluid.* (a) Electrolyte (acid) must not be over 47 percent strength (39° Baumé). Electrolyte or corrosive battery fluid must be packed in specification containers as follows:

(1) As prescribed in § 73.272 of this part except that unlined tank cars and metal barrels or drums must not be used.

(2) Spec. 43A (§ 78.18 of this chapter). Rubber drums.

(3) When the material is alkaline it may also be shipped when packed in containers as prescribed in § 73.249 of this part.

(4) Spec. MC 310 (§ 78.330 of this chapter). Tank motor vehicles, except that unlined tanks must not be used.

(5) Spec. 60 (§ 78.255 of this chapter). Portable tanks, except that unlined tanks must not be used.

§ 73.258 *Electrolyte, acid, or alkaline corrosive battery fluid, packed with storage batteries.* (a) Electrolyte, acid, or alkaline corrosive battery fluid, packed with storage batteries must be in specification containers as follows:

(1) Spec. 15D or 16B (§§ 78.171 or 78.186 of this chapter). Wooden boxes with inside containers of glass bottles not over 1 gallon each nor over 2 gallons total in each outside container. Inside containers must be well cushioned and separated from batteries by a strong solid wooden partition.

§ 73.259 *Electrolyte, acid, or alkaline corrosive battery fluid, packed with battery charger or radio current supply device.* (a) Electrolyte, acid, or alkaline corrosive battery fluid, packed with battery charger or radio current supply device, or parts thereof, with only one device or outfit in each such package, may be shipped in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes, provided the liquid is in bottles securely closed and cushioned and separated from charger supply device, and parts by a strong solid wooden partition.

(2) Spec. 12B (§ 78.205 of this chapter). Fiberboard box when the liquid is in a strong, 8-fluid-ounce or smaller bottle securely closed and cushioned. Not more than 12 such packages may be packed under the provisions of § 73.25 of this part.

§ 73.260 *Electric storage batteries.* (a) Electric storage batteries containing electrolyte, acid, or alkaline corrosive battery fluid, must be completely protected so that short circuits will be prevented; they must not be packed with other articles except electrolyte or corrosive battery fluid as provided in § 73.258 of this part, portable searchlights properly cushioned, battery parts or hydrometers, securely packed in a separate container. The batteries either with or without other articles must be packed in specification containers as follows:

(1) Spec. 15D or 16B (§§ 78.171 or 78.183 of this chapter). Wooden or wirebound wooden boxes except as provided in paragraphs (b) and (c) of this section.

(2) Spec. 12B (§ 78.205 of this chapter). Fiberboard box as authorized by §§ 73.205–25 (a) and 78.205–28 (a) of this chapter.

(3) Electric storage batteries of the wooden-battery-box type, or steel case type protected against short circuits and firmly secured to skids or pallets capable of withstanding the shocks normally in-

cident to transportation are exempt from specification packing requirements for transportation by rail freight, highway, or water. Not more than one layer of batteries may be loaded on a skid or pallet. The height of the completed unit must not exceed 1½ times the width of the skid or pallet. The unit must weigh not less than 500 pounds gross, and must not fail under a superimposed weight equal to two times the weight of the unit or a superimposed weight of 4,000 pounds if the weight of the unit exceeds 2,000 pounds. Battery terminals must not be relied upon to support any part of the superimposed weight.

(4) Electric storage batteries weighing 500 pounds or more, with case of impregnated rubber, asphaltum composition, wooden battery box type, or steel case type, consisting of carriers' equipment may be shipped by rail freight when mounted on suitable skids and protected against short circuits. Such shipments must not be offered in interchange.

(b) Electric storage batteries with case of impregnated rubber, asphaltum composition, wooden-battery-box type, or steel-case type; packing authorized as follows:

(1) 1 to 3 batteries not over 20 pounds each in outside box, gross weight not over 75 pounds; specification container not required.

(c) Single batteries not exceeding 75 pounds each may be shipped in 5-sided slip covers as prescribed in this paragraph, of solid or double-faced corrugated fiberboard complying with the following: (See paragraph (a) (1) of this section for more than one battery in an outside container.)

(1) Slip cover must fit snugly and provide inside top clearance of at least ½ inch above battery terminals and filler caps with reinforcement in place. Assembled for shipment, the bottom edges of the slip cover must not extend to the base of the battery but must not expose more than ½ inch thereof.

(2) Top of slip cover must have interior reinforcement (insert or saddle) of fiberboard, wood, or other material of equal strength and rigidity so formed that any superimposed weight will bear only and directly downward on the top edges of the battery case or intercell connectors (straps). When top of slip cover consists of only one thickness of material, reinforcement must have a plane surface of same interior dimensions and thickness. Reinforcement must be of a height to provide minimum clearance required above and must be constructed to remain securely in place or be fastened to slip cover.

(3) All fiberboard must be at least 200 pound test (Mullen) and completed package (battery and slip cover) must be capable of withstanding top-to-bottom compression test of at least 500 pounds without damage to battery terminals or filler caps.

(d) Electric storage batteries, containing electrolyte or corrosive battery fluid, of the nonspillable type, protected against short circuits and completely and securely boxed are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, rail express, or highway, but when for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements.

(e) Carload or truckload shipments of electric storage batteries containing electrolyte or battery fluid, loaded or braced to prevent damage in transit and short circuits, are exempt from specification packaging, marking, and labeling requirements.

(f) Electric storage batteries containing electrolyte or corrosive battery fluid, other than those of the nonspillable type, when shipped in less-than-carload and less-than-truckload lots, must be marked and labeled as required by §§ 73.401 (a), (c), and 73.402 (a) (3) of this part.

§ 73.261 *Fire-extinguisher charges.* (a) Fire-extinguisher charges consisting of sulfuric acid in glass inside containers securely closed may be packed with bicarbonate of soda in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass inside containers not over 5 pints each, cushioned.

(2) Spec. 21A (§ 78.222 of this chapter). Fiber drums with a single inside container consisting of a glass bottle not over 64 fluid ounces capacity filled with not over six pounds by weight of sulfuric acid (approximately 50 fluid ounces by volume). Bottle must be suspended in center of outside container by means of adequate supports and surrounded by bicarbonate of soda in sufficient quantity to fill drum and neutralize contents in the event of breakage.

(b) Fire-extinguisher charges as described in subparagraphs (1) to (3) of this paragraph are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, rail express, or highway, but when for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements:

(1) Fire-extinguisher charges consisting of sulfuric acid in strong 8-fluid ounce or smaller bottles, securely closed and packed with bicarbonate of soda completely surrounding the bottles of acid in outside fiberboard or wooden boxes. Closure must consist of a metal cap lined with an acid-resistant washer or a composition stopper of material that will not be attacked by the acid.

(2) Fire-extinguisher charges, consisting of chlorosulfonic acid in a hermetically sealed bottle not exceeding 2 ounces capacity, securely packed in a metal container inclosed in another metal container, the inner metal container being cushioned in the outer metal container with asbestos fabric and the completed package embedded in potassium carbonate in outside fiberboard or wooden boxes.

(3) Fire-extinguisher charges, consisting of sulfuric acid in 10-ounce or smaller bottles, securely closed, packed in a tight fiber carton. Closure must consist of a metal cap lined with an acid-resistant washer or a composition stopper of material that will not be attacked by the acid. The bottle and carton packed in either potassium carbonate or potassium carbonate and alkali packed in a cylindrical tin can, with slip cover, secured by tape in outside fiberboard or wooden boxes.

§ 73.262 *Hydrobromic acid.* (a) Hydrobromic acid must be not over 49 percent strength, and must be packed in specification containers as follows:

(1) Spec. 1A, 1C, or 1D (§§ 78.1, 78.3, or 78.4 of this chapter). Carboys in boxes, barrels or kegs.

(2) Spec. 1X (§ 78.5 of this chapter). Boxed carboys of 5 to 6 gallon capacity; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side by rail freight in carload lots only and by motor vehicle in truckload lots only.

(3) Spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter). Wooden barrels or kegs with glass or earthenware inside containers, not over 2 gallons each.

(4) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside containers which must be glass or earthenware, not over 1 gallon each, except that inside containers up to 3 gallons are authorized when only one is packed in each outside container.

(5) Spec. 43A (§ 78.18 of this chapter). Rubber drums. Any such container showing evidence of damage must be tested to 20 pounds hydrostatic pressure, without leakage, before using.

(6) Spec. 103B (§ 78.267 of this chapter). Tank cars.

§ 73.263 *Hydrochloric (muriatic) acid, hydrochloric acid mixtures, and sodium chlorite solution.* (a) Hydrochloric (muriatic) acid, hydrochloric acid mixtures, and sodium chlorite solution not exceeding 40 percent sodium chlorite must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass or earthenware inside containers not over 1 gallon each, except that inside containers up to 3 gallons each are authorized when only one is packed in each outside container.

(2) Spec. 5D (§ 78.84 of this chapter). Rubber-lined metal barrels or drums. Any such container that shows evidence of damage must be tested, before shipment, for defect in lining in the manner prescribed in spec. 5D (§ 78.84 of this chapter).

(3) Spec. 43A (§ 78.18 of this chapter). Rubber drums.

(4) Spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter). Wooden barrels or kegs with glass or earthenware inside containers not over 2 gallons each.

(5) Spec. 1A or 1C (§§ 78.1 or 78.3 of this chapter). Carboys in boxes or kegs.

(6) Spec. 1X (§ 78.5 of this chapter). Boxed carboys of 5 to 6 gallons capacity; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions

of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side by rail freight in carload lots only and by motor vehicle in truckload lots only.

(7) Spec. 1D (§ 78.4 of this chapter). Boxed glass carboys of not over 6.5 gallons nominal capacity. Means shall be provided so that accumulated total pressure in bottle shall not exceed 10 p. s. i. gauge at 130° F. or shall vent at a pressure not to exceed 10 p. s. i. gauge.

(8) Spec. 10A (§ 78.155 of this chapter). Rubber-lined wooden barrels or kegs.

(9) Spec. 103B, 103B–W, 108, or 108A (§§ 78.267, 78.282, 78.278, or 78.279 of this chapter). Tank cars.

NOTE 1: Because of the present emergency and until further order of the Commission, hydrochloric acid may be offered for transportation by carriers by water in conformity with Regulations for Explosives or Other Dangerous Articles on Board Vessels, 46 CFR 146.23–13, issued by the Commandant of the Coast Guard.

(10) Spec. MC 310 (§ 78.330 of this chapter). Tank motor vehicles, lined with rubber or equally acid-resistant material of equivalent strength and durability.

(11) Spec. 60 (§ 78.255 of this chapter). Portable tanks, rubber-lined.

(b) Hydrochloric acid of not over 20 percent strength (13.25° Baumé) and other corrosive liquids containing not over 20 percent hydrochloric acid in addition to containers prescribed in paragraph (a) of this section may be shipped in specification containers as follows:

(1) Spec. 10A (§ 78.155 of this chapter). Asphaltum-lined wooden barrels or kegs.

(2) Inside containers of not more than 8-fluid ounces capacity each, resistant to lading, packed in strong outside containers, and cushioned with absorbent material in sufficient quantity to completely absorb liquid contents in the event of breakage, are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, rail express, or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements.

(c) When hydrochloric acid contains oils or solvents it must not be shipped in containers or tank cars lined with rubber.

§ 73.264 *Hydrofluoric acid.* (a) Hydrofluoric acid must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside containers of India rubber, ceresine, lead, or other hydrofluoric acid resistant material. These containers are authorized only for strengths of acid for which they are adequate, but in no case may the strength of acid exceed 65 percent.

(2) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with inside containers of India rubber, lead, polyethylene, or other hydrofluoric acid resistant plastic not over one pound capacity each. These containers are authorized only for strength of acid for which they are adequate, but in no case shall the strength of acid exceed 65 percent.

(3) Spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter). Wooden barrels or kegs with inside containers of India rubber, ceresine, or lead. Lead containers are authorized for acid not over 65 percent strength.

(4) Spec. 28 (§ 78.8 of this chapter). Metal-jacketed lead carboys. Authorized for acid not over 65 percent strength.

(5) Spec. 1B (§ 78.2 of this chapter). Boxed lead carboys. Authorized for acid not over 65 percent strength.

(6) Spec. 5H (§ 78.87 of this chapter). Lead-lined metal barrels or drums not over 55 gallons each. Authorized for acid not over 65 percent strength.

(7) Spec. 5A (§ 78.81 of this chapter). Unlined metal barrels or drums which have been subjected to adequate passification or neutralization process (see Note 1). Authorized only for acid of not less than 60 percent and not more than 80 percent strength and all containers must be filled to not over 80 percent of capacity at 68° F. If containers are washed out with water, they must be repassified before reshipment. (See Notes 1, 2, 3, and 4.)

NOTE 1: Each metal container, before being put into service, must be passified by an efficient method.

NOTE 2: Containers not exceeding 55 gallons capacity each are authorized for carload, truckload, less-than-carload, and less-than-truckload shipment. Containers exceeding 55 gallons capacity each are authorized for carload or truckload shipments only but they must be loaded by consignor and unloaded by consignee.

NOTE 3: For less-than-carload or less-than-truckload shipments, containers must be of metal at least as heavy as 14 gauge United States standard for not over 20 gallons capacity each or 12 gauge for not over 55 gallons capacity each. Each container must be subjected to at least one of the following tests before shipment: By interior pressure of at least 15 pounds per square inch before filling or by holding for inspection for at least 24 hours after filling. In either case, each container must be vented prior to shipment.

NOTE 4: Because of the present emergency and until further order of the Commission, containers of not over 55-gallons capacity each, of 14-gauge metal, are authorized, provided test requirements of Note 3 are maintained and provided containers are retired from service after showing a 15 percent loss of tare weight.

(8) Spec. 103A, 104A, 105A, or ARA–IV–A.[1] (§§ 78.266, 78.270, 78.271 to 78.274 of this chapter). Unlined metal tank cars which have been subjected to adequate passification or neutralization process. (See note 1 to paragraph (a) (7) of this section.) Authorized only for acid of 60 to 80 percent strength. If tanks are washed out with water they must be repassified before reshipment.

NOTE 1: Because of the present emergency and until further order of the Commission, tank cars authorized under paragraph (a) (8) of this section may be used to transport hydrofluoric acid stronger than 80 percent but not exceeding 89 percent, provided each car is equipped with suitable inlet and outlet valves with protective housings in accordance with the appropriate tank car specification. On spec. 103A (see § 78.266 of this chapter) cars, safety vent must be provided with frangible disc of material impervious to the lading which will hold a pressure of 30 pounds per square inch for a period of at least one hour but will rupture within eight hours. On all cars equipped with safety valves, a frangible disc of material impervious to the lading must be interposed between the lading and the valve seat. All tanks must be stenciled on both sides immediately above the specification mark "Hydrofluoric acid over 80 percent and not over 89 percent strength only"; use of cars to be limited to movements between Cornwells Heights, Pa., and Philadelphia, Pa., or Cornwells Heights, Pa., and North Claymont, Del.

(9) Spec. 43A (§ 78.18 of this chapter). Rubber drums. Authorized only for acid not over 65 percent strength. Any such container showing evidence of damage must be tested to 20 pounds hydrostatic pressure, without leakage, before using.

(10) Spec. 5D (§ 78.84 of this chapter). Lined metal barrels or drums. Authorized only for acid not over 62 percent strength. Any barrel or drum that shows evidence of damage must be tested before shipment for defects in lining in the manner prescribed in § 78.84–15 (a) of this chapter. Lining materials must meet the test prescribed in Notes 1, 2, and 3 below.

NOTE 1: Performance test. Test panels of linings for drums in hydrofluoric acid service must be subjected to a test in 62 percent hydrofluoric acid for a period of not less than 90 days. At the end of such period there must be no signs of deterioration of such lining material from chemical attack as evidenced by changes in its physical characteristics, and no signs of permeation of hydrofluoric acid through the sample as evidenced by blistering from the metal insert.

NOTE 2: Method of test. The test panel should be at least 2 inches by 6 inches with a steel insert completely covered by lining material. Test panels should be immersed in 62 percent hydrofluoric acid so that 50 percent of the panel is in contact with liquid and 50 percent in contact with vapor. Temperature of test to be maintained at 130° F. for the entire 90 days.

NOTE 3: Drums may be lined with material at least as thick as the sample material tested.

(11) Spec. 103B (§ 78.267 of this chapter). Tank cars, rubber-lined tanks. Authorized only for acid not over 40 percent strength.

(12) Spec. 10A (§ 78.155 of this chapter). Asphaltum-lined wooden barrels. Authorized only for acid not over 30 percent strength.

(13) Spec. 108 or 108A (§§ 78.278 or 78.279 of this chapter). Wooden tanks. Authorized only for acid not over 30 percent strength. All tanks must be lined with asphaltum or other suitable material which will remain in a plastic condition and not be subjected to destruction by the lading.

(14) Spec. MC 310 (§ 78.330 of this chapter). Tank motor vehicles.

(b) Hydrofluoric acid, anhydrous (hydrogen fluoride) must be shipped in specification containers as follows:

(1) Spec. 3,[1] 3A, 3B, 3C, 3E, 4, 4A, 25,[1] or 38,[1] also spec. 4B or 4C if not brazed. (§§ 78.36, 78.38, 78.40, 78.42, 78.48, 78.49, also 78.50 or 78.52 of this chapter.) Cylinders. Filling density must not exceed 85 percent of the pounds water weight capacity of the cylinder.

[1] Use of existing tank cars or cylinders authorized, but new construction not authorized.

(2) Spec. 105A300, 105A300–W, 105,[1] 105A500, 105A500–W, or ARA–V[1]. (§§ 78.271, 78.286, 78.273, or 78.288 of this chapter.) Tank cars equipped with special valves and appurtenances approved for this particular service. Filling density must not exceed 90 percent of the pounds water weight capacity of the tank.

(3) Spec. MC 310 (§ 78.330 of this chapter). Tank motor vehicles.

(4) Because of the present emergency and until further order of the Commission, samples of anhydrous hydrofluoric acid for laboratory examination are authorized for transportation by rail freight, rail express, or highway, when packed in aluminum cylinders, net capacity not exceeding 100 c. c., tested hydrostatically to 500 pounds per square inch and retested quinquennially, and shipped in strong wooden boxes. The cylinders must be cushioned so as to give proper protection to their valves. Filling density must not exceed 80 percent of the water-weight capacity of the cylinder.

(c) Containers must not be entirely filled. Unless otherwise provided in this part, sufficient outage (vacant space) must be allowed so that the liquid portion will not completely fill the container at 130° F. in order to prevent leakage or distortion of containers due to the expansion of the contents from increase in temperature during transit.

§ 73.265 *Hydrofluosilicic acid.* (a) Hydrofluosilicic acid must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside containers of India rubber, ceresine, or other material of equal efficiency resistant to hydrofluosilicic acid.

(2) Spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter). Wooden barrels or kegs with inside containers of India rubber or ceresine.

(3) Spec. 10A (§ 78.155 of this chapter). Wooden barrels or kegs lined with asphaltum or other material of equal efficiency resistant to hydrofluosilicic acid.

(4) Spec. 108 or 108A (§§ 78.278 or 78.279 of this chapter). Wooden tanks. Tanks must be lined with asphaltum or other suitable material which will remain in a plastic condition and not be subject to destruction by the lading.

(b) Hydrofluosilicic acid of not exceeding 40 percent strength may also be shipped when packed in specification containers as follows:

(1) Spec. 5D (§ 78.84 of this chapter). Rubber-lined metal barrels or drums. Any barrel or drum that shows evidence of damage must be tested before shipment for defect in lining in the manner prescribed in spec. 5D (§ 78.84 of this chapter).

(2) Spec. 43A (§ 78.18 of this chapter). Rubber drums. Any drum showing evidence of damage must be tested to 20 pounds hydrostatic pressure, without leakage, before using.

(3) Spec. 103B (§ 78.267 of this chapter). Tank cars, rubber-lined tanks.

(c) Hydrofluosilicic acid containing no free hydrofluoric acid or other ingredient that will attack glass, may also be shipped when packed in specification containers as follows:

(1) Spec. 1A, 1C, or 1D (§§ 78.1, 78.3, or 78.4 of this chapter). Carboys, boxed or in kegs, for which the use of rubber stoppers and gaskets is also authorized.

(2) Spec. 1X (§ 78.5 of this chapter). Boxed carboys of 5 to 6 gallons capacity; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side by rail freight in carload lots only and by motor vehicle in truckload lots only.

(3) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside glass containers, not over 1 gallon each, with rubber or ground-in glass stoppers properly secured.

(4) The vacant space in containers of these acids must be sufficient so that when raised to a uniform temperature of 130° F. the vapor pressure shall not exceed 6 pounds per square inch.

§ 73.266 *Hydrogen peroxide solution in water.* (a) Hydrogen peroxide solution in water containing over 52 percent hydrogen peroxide by weight must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185 or 78.190 of this chapter). Wooden boxes with inside containers consisting of glass bottles not over 1 quart capacity each; bottles must have vented closure and must be packed in a metal container vented at bottom packed in another metal container vented at top; cushioning material shall be used between glass bottle and inner container and between inner and outer metal containers; cushioning material shall be vermiculite or equivalent in an amount at least 10 times the volume of the solution shipped and shall be wet with at least 10 percent water by volume to which has been added a stabilizing agent.

(2) Spec. 42D (§ 78.109 of this chapter). Aluminum drums with vented closure in top head; not over 30 gallons capacity; side openings not permitted. Closure must be sealed to prevent removal in transit and top head plainly marked "KEEP THIS END UP" or "KEEP PLUG UP TO PREVENT SPILLAGE". For shipments other than carload or truckload lots loaded by consignor and unloaded by consignee drums must be of design and venting arrangement approved by the Bureau of Explosives.

(b) Hydrogen peroxide solution in water containing not over 52 percent hydrogen peroxide by weight may also be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass or earthenware inside containers of not more than 1 gallon capacity each. Inside containers must be well cushioned. All material used for cushioning must be incombustible mineral matter, such as whiting, mineral wool, infusorial earth, asbestos, or sifted ashes. Cushioning of inside containers in outside wooden boxes by means of elastic packing, such as wooden strips or large corks fastened securely in position, is authorized if the completed package will pass the swing test prescribed for boxed carboys in spec. 1A (§ 78.1 of this chapter).

(2) Spec. 34B (§ 78.12 of this chapter). Aluminum carboys.

(3) Spec. 42D (§ 78.109 of this chapter). Aluminum drums with vented closure in top head; not over 55 gallons capacity. Closure must be sealed to prevent removal in transit and top head plainly marked "KEEP THIS END UP" or "KEEP PLUG UP TO PREVENT SPILLAGE". Aluminum drums of not over 30 gallons capacity already in service for the transportation of this material, manufactured prior to April 24, 1934, and of at least equal strength and efficiency as drums of like capacity authorized under spec. 42D (§ 78.109 of this chapter), may be continued in use until further order of the Commission.

(4) Spec. 42E (§ 78.136 of this chapter). Aluminum drums (single-trip).

(c) Hydrogen peroxide solution in water containing over 8 percent hydrogen peroxide by weight and not exceeding 37 percent may also be packed in specification containers as follows:

(1) Spec. 1A (§ 78.1 of this chapter). Glass carboys. The cushioning must be incombustible mineral material, elastic wooden-strip packing, or large elastic cushions such as corks fastened securely in position. The use of hay, excelsior, ground cork, or similar material, whether treated or untreated, is prohibited. The carboy stoppers must be vented so as to prevent accumulation of internal pressure; use of cork gasket impregnated with paraffin is authorized.

(2) Spec. 1X (§ 78.5 of this chapter). Boxed carboys of 5 to 6 gallons capacity; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side by rail freight in carload lots only and by motor vehicle in truckload lots only.

(3) Spec. 1D (§ 78.4 of this chapter). Boxed glass carboys of not over 6.5 gallons nominal capacity. Means shall be provided so that accumulated pressure in bottle shall not exceed 10 pounds per square inch gauge at 130° F., or shall vent at a pressure not to exceed 10 pounds per square inch gauge. The cushioning must be incombustible mineral material, elastic wood-strip packing, or large elastic cushions such as corks fastened securely in position. The use of hay, excelsior, ground cork, or similar material, whether treated or untreated, is prohibited.

[1] Use of existing tank cars authorized, but new construction not authorized.

(d) Hydrogen peroxide solution in water containing over 8 percent hydrogen peroxide by weight and not exceeding 10 percent may also be packed in specification containers as follows:

(1) Spec. 10A (§ 78.155 of this chapter). Wooden barrels, paraffined-lined.

(e) Hydrogen peroxide solution in water not exceeding 52 percent hydrogen peroxide by weight not subject to Parts 71–78 of this chapter when shipped in tank cars or tank motor vehicles.

(f) Hydrogen peroxide solution in water exceeding 52 percent hydrogen peroxide by weight may also be shipped in tank cars or tank motor vehicles subject to Parts 71–78 of this chapter provided that such shipments are for ultimate use by the Departments of the Army, Navy, and Air Force of the United States Government. Tank cars and tank motor vehicles must be of design and venting arrangement approved by the Bureau of Explosives.

§ 73.267 *Mixed acid (nitric and sulfuric acid) (nitrating acid).* (a) Mixed acid (nitric and sulfuric acid) (nitrating acid), when offered for transportation by carriers by rail freight, highway, or water must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside glass bottles not over 7 pounds capacity each, individually inclosed in tightly closed metal cans and cushioned therein with incombustible mineral material.

(2) Spec. 5A (§ 78.81 of this chapter). Metal barrels or drums. (See paragraph (b) of this section.)

(3) Spec. 103A (§ 78.266 of this chapter). Tank cars. (See paragraph (b) of this section.)

(4) Spec. 1A or 1C (§§ 78.1 or 78.3 of this chapter). Carboys in boxes or kegs. Authorized only for mixed nitric and sulfuric acid containing not over 17 percent nitric acid and containing at least 33 percent water. Straight-sided carboys must be used; cushioning must be incombustible mineral material, elastic wooden-strip packing, or large elastic cushions, such as cork, fastened securely in position. The use of hay, excelsior, ground cork, or similar material, whether treated or untreated, is prohibited.

(5) Spec. 1X (§ 78.5 of this chapter). Boxed carboys of 5 to 6 gallons capacity; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side by rail freight in carload lots only and by motor vehicle in truckload lots only.

(6) Spec. 1D (§ 78.4 of this chapter). Boxed glass carboys of not over 6.5 gallons nominal capacity; authorized only for mixed nitric and sulfuric acid, containing not over 17 percent nitric acid and containing at least 33 percent water; means shall be provided so that accumulated pressure in bottle shall not exceed 10 pounds per square inch gauge at 103° F., or shall vent at a pressure not to exceed 10 pounds per square inch gauge. Cushioning must be incombustible mineral material, elastic wooden-strip packing, or large elastic cushions such as cork, fastened securely in position. The use of hay, excelsior, ground cork, or similar material, whether treated or untreated, is prohibited.

(7) Spec. MC 310 (§ 78.330 of this chapter). Tank motor vehicles. (See paragraph (b) of this section.)

(8) Spec. 60 (§ 78.255 of this chapter). Portable tanks. (See paragraph (b) of this section.)

(b) Mixtures of sulfuric acid and nitric acid (nitrating acid), shipped in tank cars, cargo tanks, tank trucks, or metal barrels or drums, shall contain not less than 10 percent sulfuric acid. These mixtures may contain:

(1) Up to 10 percent water with not less than 10 percent sulfuric acid.

(2) Up to 15 percent water with not less than 15 percent sulfuric acid.

(3) Up to 20 percent water with not less than 20 percent sulfuric acid.

(4) Up to 38 percent water with not less than 62 percent sulfuric acid.

(c) Mixed acid (nitric and sulfuric acid) (nitrating acid), when offered for transportation by rail express must be packed in specification containers as follows (also authorized for transportation by carriers by rail freight, highway, or water):

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside glass bottles with glass stoppers ground to fit, and these stoppers must be held in place by plaster of Paris covered by strong cloth securely tied. Glass bottles having necks with molded screw threads, must be closed by threaded-type acid-resistant plastic caps. Caps must be equipped with an elastic composition cushion and with glass, porcelain or similar liner which must be impervious to the acid. Such caps, when secured in place by at least one complete continuous thread, must be capable of preventing any leakage of the liquid.

(2) Or glass bottles having necks with molded screw threads must be closed by threaded-type acid-resistant caps. Caps must be lined with a resilient liner which must be impervious to the acid. Such caps, when secured in place by at least one complete continuous thread, must be capable of preventing any leakage of the acid.

(3) Each bottle must be placed in a tightly closed metal container and well cushioned therein on all sides with incombustible mineral packing material, such as whiting, mineral wool, infusorial earth (kieselguhr), asbestos, sifted ashes, or powdered china clay, etc. The metal container must be packed in the outside container, and well cushioned by incombustible mineral packing material as herein described.

(4) Not more than 3½ pounds (1¼ quarts) of mixed acid may be shipped in one outside package.

§ 73.268 *Nitric Acid.* (a) Nitric acid in any quantity must not be packed with any other article.

(b) Nitric acid in any concentration which does not contain significant quantities of sulfuric acid or hydrochloric acid as impurities, when offered for transportation by carriers by rail freight, highway, or water must be packed in specification containers as follows:

(1) Spec. 103C (§ 78.268 of this chapter). Tank cars.

(2) The use of special aluminum alloy tank cars [1] for test service is also provided for by I. C. C. authority in docket 3666 dated November 14, 1939, June 7, 1940, and August 19, 1941, for the shipment of 95 percent or greater nitric acid. (See appendix D to supart I of part 78 of this chapter).

(3) Spec. MC 310 (§ 78.330 of this chapter). Tank motor vehicles.

(4) Spec. 5C (§ 78.83 of this chapter). Metal barrels or drums. Authorized for concentrations of nitric acid as limited by § 78.83–3 (c) of this chapter. Containers weighing less than 85 percent of their original marked weight are not authorized. Spec. 5C (§ 78.83 of this chapter), drums already in service for transportation of this material, manufactured prior to October 1, 1949, may be continued in service within the above limitations until further order of the Commission.

(c) Nitric acid of 80 percent or greater concentration which does not contain significant quantities of sulfuric acid or hydrochloric acid as impurities, when offered for transportation by carriers by rail freight, highway, or water must be packed in specification containers as follows:

(1) Spec. 42B or 5X (§§ 78.107, or 78.91 of this chapter); also 42,[1] if made and marked prior to October 1, 1930. Aluminum drums, or aluminum-lined steel drums.

(d) Nitric acid of 90 percent or greater concentration, when offered for transportation by carriers by rail freight, highway, or water must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, 19A, 11A, or 11B (§§ 78.168, 78.169, 78.170, 78.185, 78.190, 78.160, or 78.161 of this chapter). Wooden boxes, barrels and kegs with inside containers which must be glass bottles not over 5 pints capacity each, individually inclosed in tightly closed metal cans and cushioned therein with sufficient incombustible mineral material. (See paragraphs (g) and (h) of this section.)

(e) Nitric acid of concentration of less than 90 percent, when offered for transportation by rail freight, highway, or water must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, 19A, 11A, or 11B (§§ 78.168, 78.169, 78.170, 78.185, 78.190, 78.160, or 78.161 of this chapter). Wooden boxes, barrels and kegs with inside containers which must be glass bottles not over 5 pints capacity each. (See paragraphs (g) and (h) of this section.)

(f) Nitric acid of concentration of 72 percent or less, when offered for transportation by rail freight, highway, or water must be packed in specification containers as follows:

[1] Use of existing tank cars or drums authorized, but new construction not authorized.

(1) Spec. 1A or 1C (§ 78.1 or 78.3 of this chapter). Straight sided carboys in boxes or kegs.

(2) Spec. 1X (§ 78.5 of this chapter). Boxed carboys of 5 to 6 gallons capacity; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side by rail freight in carload lots only and by motor vehicle in truckload lots only.

(3) Spec. 1D (§ 78.4 of this chapter). Boxed glass carboys of not over 6.5 gallons nominal capacity. Means shall be provided so that accumulated pressure in bottle shall not exceed 10 pounds per square inch gauge at 130° F., or shall vent at a pressure not to exceed 10 pounds per square inch gauge.

(4) Cushioning for carboys must be incombustible mineral material, elastic wooden strips, natural cork blocks or rubber blocks. Other materials may be used if approved by the Bureau of Explosives. The use of hay, excelsior, loose ground cork, or similar materials, whether treated or untreated, is prohibited.

(g) Closures for bottles. Glass stoppers ground to fit and held in place by plaster of Paris covered by a strong cloth securely tied; or:

(1) Threaded-type acid-resistant caps with gasket or lining impervious to the acid and sufficiently resilient, or cushioned, to give an acidproof closure; at least 1 complete continuous thread is required to be engaged when bottle is closed for shipment.

(h) Cushioning inside containers. Inside containers must be well cushioned. All material for cushioning must be incombustible mineral material, such as whiting, mineral wool, infusorial earth, asbestos, sifted ashes, etc. The use of hay, excelsior, ground cork, or similar material, whether treated or untreated, is prohibited. Where the cushioning material is very fine or powdery, separate partitions for the individual inside containers shall be provided to prevent the bottles from shifting and coming in contact with each other, and the box must be tight to prevent sifting of cushioning material.

(1) Cushioning of inside containers in outside specification wooden boxes by means of elastic packings, such as wooden strips or large corks fastened securely in position, is authorized if the completed package will pass the swing test prescribed for boxed carboys, in spec. 1A (§ 78.1 of this chapter).

(i) Nitric acid of any concentration, when offered for transportation by rail express, must be packed in specification containers as follows (also authorized for transportation by carriers by rail freight, highway, or water).

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside glass bottles with glass stoppers ground to fit, and these stoppers must be held in place by plaster of Paris covered by strong cloth securely tied. Glass bottles having necks with molded screw threads, must be closed by threaded type acid-resistant plastic caps. Caps must be equipped with an elastic composition cushion and with glass porcelain or similar liner which must be impervious to the acid. Such caps, when secured in place by at least one complete continuous thread, must be capable of preventing any leakage of the acid.

(2) Or glass bottles having necks with molded screw threads must be closed by thread-type acid-resistant caps. Caps must be lined with a resilient liner which must be impervious to the acid. Such caps, when secured in place by at least one complete continuous thread, must be capable of preventing any leakage of the acid.

(3) Each bottle must be placed in a tightly closed metal container, and well cushioned therein on all sides with incombustible mineral packing material, such as whiting, mineral wool, infusorial earth (kieselguhr), asbestos, sifted ashes, or powdered china clay, etc. The metal container must be packed in outside containers, and well cushioned by incombustible mineral packing material as described in this section.

(4) Not more than 5 pints of nitric acid shall be shipped in one outside package.

§ 73.269 *Perchloric acid.* (a) Perchloric acid in excess of 72 percent must not be shipped. When not exceeding 72 percent strength must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass inside containers consisting of glass bottles not over 7 pounds capacity each cushioned with incombustible mineral material in amount sufficient to absorb the acid.

(2) Spec. 1A, 1C, or 1D (§§ 78.1, 78.3, or 78.4 of this chapter). Carboys, boxed or in kegs.

(3) Spec. 1X (§ 78.5 of this chapter). Boxed carboys of 5 to 6 gallons capacity; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to shipside by rail freight in carload lots only and by motor vehicle in truckload lots only.

(b) Cushioning for carboys must be incombustible mineral material, elastic wooden strips, natural cork blocks or rubber blocks. Other materials may be used if approved by the Bureau of Explosives. The use of hay, excelsior, loose ground cork, or similar materials, whether treated or untreated, is prohibited.

(c) Perchloric acid in any quantity must not be packed with any other article.

(d) Closures for bottles. Required as follows:

(1) Glass stoppers ground to fit and held in place by plaster of Paris covered by a strong cloth securely tied.

(2) Threaded-type acid-resistant caps with a gasket or lining impervious to the acid and sufficiently resilient, or cushioned, to give an acid-proof closure; at least one complete continuous thread is required to be engaged when bottle is closed for shipment.

(e) Inside containers must be well cushioned. All material for cushioning must be incombustible mineral material, such as whiting, mineral wool, infusorial earth (kieselguhr), asbestos, sifted ashes, or powdered china clay, etc. The use of hay, excelsior, ground cork, or similar material, either treated or untreated, is prohibited. Where the cushioning material is very fine or powdery, separate partitions for the individual inside containers should be provided to prevent the bottles from shifting and coming in contact with each other, and the box must be tight to prevent sifting of cushioning material.

(1) Cushioning of inside containers in outside wooden boxes by means of elastic packings, such as wooden strips or large corks fastened securely in position, is authorized if the completed package will pass the swing test prescribed for boxed carboys, in spec. 1A (§ 78.1 of this chapter).

§ 73.270 *Phosphorus tribromide.* (a) Phosphorus tribromide must be packed in specification containers as follows:

(1) Spec. 5H (§ 78.87 of this chapter), Lead-lined metal barrels or drums.

(2) Spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter). Wooden barrels or kegs with glass or earthenware inside containers not over 2 gallons each; the glass or earthenware containers must be cushioned in the outside containers by means of incombustible elastic packing material of such nature that a mixture of the liquid and the packing material will not cause fires or heating.

(3) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass or earthenware inside containers not over 1 gallon each, except that inside containers up to 3 gallons each are authorized when only one is packed in an outside container.

(4) Spec. 28 (§ 78.8 of this chapter). Metal-jacketed lead carboys.

§ 73.271 *Phosphorus oxychloride, phosphorus trichloride, and thiophosphoryl chloride.* (a) Phosphorus oxychloride, phosphorus trichloride and thiophosphoryl chloride must be packed in specification containers as follows:

(1) Spec. 5H (§ 78.87 of this chapter). Lead-lined metal barrels or drums.

(2) Spec. 5K (§ 78.88 of this chapter). Nickel drums.

(3) Spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter). Wooden barrels or kegs with glass or earthenware inside containers not over 2 gallons each; the glass or earthenware containers must be cushioned in the outside containers by means of incombustible elastic packing material of such nature that a mixture of the liquid and the packing material will not cause fires or heating.

(4) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass or earthenware inside containers not over 1 gallon each, except that inside containers up to 3 gallons each are au-

thorized when only one is packed in an outside container.

(5) Spec. 28 (§78.8 of this chapter). Metal-jacketed lead carboys.

(6) Spec. 60 (§ 78.255 of this chapter). Portable tanks when tanks are lead-lined.

(7) Spec. 103A or 103A–W (§§ 78.266 or 78.281 of this chapter). Tank cars, when the tanks of these cars are lead-lined or the tanks are made of solid nickel at least 99 percent pure and all cast metal parts of the tank in contact with the lading have a minimum nickel content of approximately 96.7 percent.

(8) Spec. MC310 (§ 78.330 of this chapter). Tank motor vehicles when tanks are lead-lined.

(b) Phosphorus trichloride may also be shipped in metal barrels or drums, spec. 5A (§ 78.81 of this chapter).

§ 73.272 *Sulfuric acid.* (a) Sulfuric acid (oleum, oil of vitriol, etc.) must be packed in specification containers as follows:

(b) Sulfuric acid solutions of not over 25 percent concentrations, in inside containers of not more than 8 ounces capacity each, resistant to the lading, packed in strong outside containers and cushioned with absorbent material in sufficient quantity to completely absorb liquid contents in event of breakage, are exempt from specification packaging, marking and labeling requirements for transportation by rail freight, rail express or highway. When for transportation by carrier by water they are exempt from specification packaging and labeling requirements and marking, other than name of contents.

(c) Sulfuric acid of any concentration:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass or earthenware inside containers, not over one gallon capacity each, except that such containers up to three gallons capacity may be used when only one such container is packed in each outside wooden box.

(2) Spec. 31 (§ 78.15 of this chapter). Jugs in tubs.

(3) Spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter). Wooden barrels or kegs with glass or earthenware inside containers not over 2 gallons capacity each.

(4) Spec. 1X (§ 78.5 of this chapter). Boxed carboys of 5 to 6 gallons capacity; single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side by rail freight in carload lots only and by motor vehicle in truckload lots only.

(d) For sulfuric acid of concentrations not less than 100 percent and not more than 115 percent (approximate):

(1) Spec. 5C (§ 78.83 of this chapter). Metal barrels or drums of Type 304, 316, or 347 stainless steel or other types of stainless steel of equivalent corrosion resistance and physical properties.

(e) For sulfuric acid of concentrations not to exceed 100.5 percent:

(1) Spec. 1A or 1C (§ 78.1 or 78.3 of this chapter). Carboys in boxes or kegs.

(2) Spec. 1D (§ 78.4 of this chapter). Boxed glass carboys of not over 6.5 gallons nominal capacity.

(f) For sulfuric acid of concentrations not to exceed 93.2 percent (approximately 1.835 specific gravity) (66° Baume):

(1) Spec. 5H (§ 78.87 of this chapter). Metal barrels or drums.

(g) For sulfuric acid of concentrations 77.5 percent (approximately 1.7019 specific gravity) (59.8° Baume) or greater concentrations with or without an inhibitor, provided such acid has a corrosive effect on steel measured at 100° F. no greater than 66° Baume commercial sulfuric acid:

(1) Spec. 5A (§ 78.81 of this chapter). Metal barrels or drums.

(2) Spec. 17F (§ 78.117 of this chapter). Metal barrels or drums (single-trip only). Drums equipped with vented closures of an experimental type approved by the Bureau of Explosives are also authorized for export shipments.

(h) For sulfuric acid of concentrations 65.25 percent (approximately 1.559 specific gravity) (52° Baume) or greater concentrations, provided the corrosive effect on steel measured at 100° F. is not greater than that of 52° Baume commercial sulfuric acid:

(1) Spec. 60 (§ 78.255 of this chapter). Portable tank.

(2) Spec. MC 310 (§ 78.330 of this chapter). Tank motor vehicle.

(3) Spec. 103A or 103A–W (§ 78.266 or 78.281 of this chapter). Tank cars.

(i) For sulfuric acid of concentrations not to exceed 51 percent (approximately 1.408 specific gravity) (42° Baume):

(1) Spec. 5D (§ 78.84 of this chapter). Rubber-lined metal drums.

(2) Spec. 60 (§ 78.255 of this chapter). Portable tanks (rubber-lined).

(3) Spec. MC 310 (§ 78.330 of this chapter). Tank motor vehicles (rubber-lined).

(4) Spec. 103B or 103B–W (§ 78.267 or 78.282 of this chapter). Tank cars.

(j) Gaskets must be in a plastic condition when applied to carboys in boxes, barrels or kegs containing water-white sulfuric acid (electrolyte grade) of concentrations 77.5 percent (approximately 1.7019 specific gravity) (59.8° Baume).

(k) Soft rubber gaskets are authorized on carboys in boxes, barrels or kegs containing sulfuric acid of not over 51 percent concentrations (approximately 1.408 specific gravity) (42° Baume).

(l) Because of the present emergency and until further order of the Commission, sulfuric acid may be offered in transportation by carriers by water in conformity with Regulations for Explosives or Other Dangerous Articles on Board Vessels, 46 CFR 146.23–10, issued by the Commandant of the Coast Guard.

§ 73.273 *Sulfur trioxide, stabilized.* (a) Sulfur trioxide, stabilized, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass or earthenware inside containers not over 1 gallon each.

(2) Spec. 5A or 5C (§§ 78.81 or 78.83 of this chapter). Metal barrels or drums, not over 55 gallons capacity each.

(3) Spec. 17F (§78.117 of this chapter). Metal drums (single-trip).

(4) ICC 103A or 103A–W (§§ 78.266 or 78.281 of this chapter). Tank cars. Authorized only for stabilized sulfur trioxide. Cars equipped with interior heater coils not permitted.

§ 73.274 *Fluosulfonic acid.* (a) Fluosulfonic acid must be packed in containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside containers which must be not over 1 gallon each, except that inside containers up to 3 gallons are authorized when only one is packed in each outside container, as prescribed in Notes 1 and 2 to this section.

NOTE 1: Pyrex glass bottles, authorized only for material containing an excess of sulfur trioxide, with Pyrex glass stoppers ground to fit and held in place by plaster of Paris covered by strong cloth securely tied; each bottle must be placed in a metal container, well cushioned therein with incombustible absorbent materials such as mineral wool, infusorial earth (kieselguhr), asbestos, etc.;

NOTE 2: Or steel containers, 14 gauge steel throughout, welded heads and side seams, equipped with ¾ inch welded flange and plug. Threads for plug must be 8 or less per inch. Each drum must be tested for leakage with 15 pounds hydrostatic pressure.

(2) Spec. 5A (§ 78.81 of this chapter). Metal barrels or drums not over 55 gallons capacity each.

(3) Spec. 103A (§ 78.266 of this chapter). Tank cars.

§ 73.275 *Difluorophosphoric acid, anhydrous, monofluorophosphoric acid, anhydrous, hexafluorophosphoric acid, and mixtures thereof.* (a) Difluorophosphoric acid, anhydrous, monofluorophosphoric acid, anhydrous, hexafluorophosphoric acid, and mixtures thereof must be packed in specification containers as follows:

(1) Spec. 15A, 12B, or 21A (§ 78.168, 78.205, or 78.222 of this chapter). Wooden boxes, fiberboard boxes, or fiber drums with inside containers which must consist of polystyrene or polyethylene bottles not over 2 pounds capacity each, closed by means of threaded acid-resistant caps with a gasket or lining impervious to the acid and sufficiently resilient, or cushioned, to provide an acid-proof closure; caps must have at least one complete continuous thread and be wired or sealed to the bottle to prevent turning of cap after bottle is closed for shipment.

(2) Spec. 42B, 42C, or 42D (§ 78.107, 78.103, or 73.109 of this chapter). Aluminum drums not over 55 gallons capacity.

(b) Monofluorophosphoric acid, anhydrous, may also be packed in specification containers, 15A (§ 78.168 of this chapter). Wooden boxes with inside containers which must consist of glass bottles containing not more than 4 ounces of material, closed by means of threaded-type acid-resistant caps with a gasket or lining impervious to the acid and sufficiently resilient, or cushioned, to

give an acid-proof closure; caps must have at least one complete continuous thread and be wired to the bottle to prevent turning of cap when bottle is closed for shipment; or in glass bottles containing over 4 ounces but not over 5 pounds of material, with glass stoppers ground to fit and securely held in place by means of hard drying wax placed over and around the stopper.

(c) Inside containers must be packed so they cannot change position in the outside container while in transit and must be surrounded by an absorbent cushioning material of suitable chemical and physical characteristics and in sufficient quantity to completely absorb liquid contents in the event of breakage.

§ 73.276 *Anhydrous hydrazine and hydrazine solution.* (a) Anhydrous hydrazine and hydrazine solution, containing 50 percent or less of water must be packed in specification containers as follows:

(1) Spec. 1D (§ 78.4 of this chapter). Boxed glass carboys.

(2) Spec. 15A, 15B, or 15C (§§ 78.168, 78.169, or 78.170 of this chapter). Wooden boxes with inside containers which must consist of glass bottles not exceeding 1-gallon capacity each, cushioned by means of vermiculite within tin cans which shall be tightly closed.

(3) Spec. 5, 5A, 5C, 5G, or 17E (§§ 78.80, 78.81, 78.83, 78.86, or 78.116 of this chapter). Metal drums which shall be of type 304 or 347 stainless steel.

§ 73.277 *Hypochlorite solutions.* (a) Hypochlorite solutions containing more than 7 percent available chlorine by weight must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, or 12B (§§ 78.168, 78.169, 78.170, or 78.205 of this chapter). Wooden or fiberboard boxes with glass or earthenware inside containers of not more than 1 gallon capacity each. Packages must not weigh over 65 pounds gross nor contain more than 4 such inside containers if their capacity is greater than 5 pints each.

(2) Spec. 1A, 1C, or 1D (§§ 78.1, 78.3, or 78.4 of this chapter). Carboys in boxes or kegs.

(b) Closures for inside containers and carboys must be vented and must be of a material resistant to the lading and capable of preventing leakage of liquid contents.

(c) Containers of 5 gallons capacity and over, of a type in service for transportation of this material prior to September 1, 1948, and of a design and venting arrangement approved by the Bureau of Explosives, may be continued in use until further order of the Commission.

(d) Glass or earthenware containers of not more than 4-fluid ounces capacity each, packed in strong outside containers, and cushioned with absorbent material in sufficient quantity to completely absorb liquid contents in the event of breakage, are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, rail express, or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements.

(e) Shipments by tank motor vehicle are exempt from Parts 71–78 of this chapter.

§ 73.278 *Nitrohydrochloric acid.* (a) Nitrohydrochloric acid, which is a mixture of nitric acid not over 1.42 specific gravity and hydrochloric acid not over 1.19 specific gravity in the approximate proportions of one part nitric acid and three parts hydrochloric acid, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass inside containers of not over 5 pints capacity each, individually inclosed in tightly closed metal cans and cushioned therein with sufficient incombustible mineral material.

(b) Nitrohydrochloric acid diluted, is a solution of nitrohydrochloric acid as described in paragraph (a) of this section, which has been diluted to not less than five times the volume of water and must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass inside containers of not over 5 pints capacity each, individually inclosed in tightly closed metal cans and cushioned therein with sufficient incombustible mineral material.

(2) Spec. 1A or 1D (§§ 78.1 or 78.4 of this chapter). Carboys, glass, boxed, capacity not over 5 gallons for spec. 1A (§ 78.1 of this chapter), and 6.5 gallons for spec. 1D (§ 78.4 of this chapter).

§ 73.279 *Anisoyl chloride.* (a) Anisoyl chloride must be packed in specification containers as follows:

(1) Spec. 5C (§ 78.83 of this chapter). Metal barrels or drums.

(2) Spec. 5G (§ 78.86 of this chapter). Metal barrels or drums with flanges for closures welded in place.

(b) Inside containers of not more than 8-fluid ounces capacity each, resistant to lading, packed in strong outside containers, and cushioned with absorbent material in sufficient quantity to completely absorb liquid contents in the event of breakage, are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, rail express, or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements.

§ 73.280 *Amyl trichlorosilane, butyl trichlorosilane, diethyl dichlorosilane, diphenyl dichlorosilane, ethyl phenyl dichlorosilane, hexyl trichlorosilane, octyl trichlorosilane, phenyl trichlorosilane, and propyl trichlorosilane.* (a) Amyl trichlorosilane, butyl trichlorosilane, diethyl dichlorosilane, diphenyl dichlorosilane, ethyl phenyl dichlorosilane, hexyl trichlorosilane, octyl trichlorosilane, phenyl trichlorosilane, and propyl trichlorosilane must be packed in specification containers as follows:

(1) Spec. 15A or 16B (§§ 78.168 or 78.186 of this chapter). Wooden boxes with glass inside containers not over 1 gallon capacity each securely closed and cushioned with incombustible absorbent material.

(2) Spec. 17H or 37D (§§ 78.118 or 78.125 of this chapter). Metal drums (single-trip) with glass inside containers not over 1 gallon capacity each securely closed and cushioned with incombustible absorbent material.

(3) Spec. 5A (§ 78.81 of this chapter). Metal drums not over 55 gallons capacity.

(4) Spec. 5F (§ 78.85 of this chapter). Metal drums not over 11 gallons capacity.

(5) Spec. 5, 5B, 5C, and 17E single-trip (§§ 78.80, 78.82, 78.83 and 78.116 of this chapter). Metal drums. These containers not authorized for shipments by rail express.

(6) Specification cylinders as prescribed for any compressed gas, except acetylene.

§ 73.281 *α-Bromotoluene (benzyl bromide).* (a) α-Bromotoluene (benzyl bromide) must be packed in specification containers as follows:

(1) Spec. 15A, 15B, or 15C (§§ 78.168, 78.169, or 78.170 of this chapter). Wooden boxes, with inside containers which must be glass bottles, not over 5 pints capacity each, closed by means of screw caps which are resistant to action of the contents; bottles must be packed in metal cans having slip-on or friction closure; cans must be cushioned in outside boxes with incombustible material.

§ 73.282 *Carbopropoxide stabilized.* (a) Carbopropoxide stabilized must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass or earthenware inside containers of not over 2 gallons capacity each which must be maintained at a temperature below 75° F. Shipments are authorized for transportation by carrier by motor vehicle only.

§ 73.283 *Bromine trifluoride.* (a) Bromine trifluoride must be packed in specification containers as follows:

(1) Spec. 3A1800, 3E1800, 3B240, or 4B240 (§§ 78.36, 78.42, 78.38, or 78.50 of this chapter). Cylinders.

§ 73.284 *Bromine pentafluoride.* (a) Bromine pentafluoride, when offered for transportation by carriers by rail freight, highway, or water, must be packed in specification containers as follows:

(1) Spec. 3E1800 or 4B240 (§§ 78.42 or 78.50 of this chapter). Cylinders not over 120 pounds water capacity (nominal), filled to not over 210 percent of water capacity. Cylinders must be plugged and fitted with valve protection caps. Spec. 3E1800 (§ 78.42 of this chapter) cylinders must be packed in strong outside wooden boxes and contain not more than one pound of bromine pentafluoride.

(b) Bromine pentafluoride, when offered for transportation by rail express must be packed in specification containers as follows:

(1) Spec. 3E1800 or 4B240 (§§78.42 or 78.50 of this chapter). Cylinders containing not more than one pound of bromine pentafluoride. Cylinders must be plugged and fitted with valve protection caps and must be packed in strong outside wooden boxes.

§ 73.285 *Chlorine trifluoride.* (a) Chlorine trifluoride must be packed in specification containers as follows:

(1) Spec. 3A480, 3E1800, 3B240, or 4B240 (§§ 78.36, 78.42, 78.38, or 78.50 of this chapter). Cylinders.

§ 73.286 *Chemical kits.* (a) Chemical kits, except as otherwise provided in Parts 71–78 of this chapter, must be packed, marked and labeled as prescribed by this part for the specific acids or corrosive liquids contained therein.

(b) Chemical kits containing acids in inside containers not exceeding 6 fluid ounces capacity each and complying with all of the following requirements, are exempt from specification packing, marking, other than name of contents, and labeling requirements for transportation by rail freight, rail express, highway or water:

(1) The kit must not contain any of the items named in § 73.244 (c) of this part.

(2) The kit must be a strong wooden or metal container, or must be packed in a strong wooden or metal container.

(3) The acids or corrosive liquids must be cushioned with sufficient absorbent cushioning material to completely absorb the contents of the individual containers, and must be protected from injury by other materials in the kit.

(4) The contents of the kit must be of such nature and/or so packed that there will be no possibility of the mixture of contents causing dangerous evolution of heat or gas.

§ 73.287 *Chromic acid solution.* (a) Chromic acid solution must be packed in specification containers as follows:

(1) In containers prescribed in § 73.245 of this part.

(2) Spec. 17E or 17H (§§ 78.116 or 78.118 of this chapter). Metal drums (single-trip), not over 5 gallons capacity.

(3) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with one inside glass container of capacity not over 4 fluid ounces, packed in a wax-lined cylindrical fiber carton with metal ends; bottle must have ground glass stopper securely held in position by a piece of cloth tied with wire and dipped in paraffin; space between bottle and the inner surface of the fiber cylinder must be filled with closely packed asbestos in sufficient quantity to completely absorb contents of bottle in the event of breakage. Use of this container will be permitted because of the present emergency and until further order of the Commission.

§ 73.288 *Allyl chloroformate, benzyl chloroformate, ethyl chloroformate, and methyl chloroformate.* (a) Allyl chloroformate, benzyl chloroformate, ethyl chlorofomate, and methyl chloroformate must be packed in specification containers as follows:

(1) Spec. 15A, 15B, or 15C (§§ 78.168, 78.169, or 78.170 of this chapter). Wooden boxes with glass inside containers not over 1 pint each, cushioned with incombustible mineral material.

(2) Spec. 1A (§ 78.1 of this chapter). Boxed carboys. Glass bottles having nominal capacity of 3 gallons also authorized when packed and tested in accordance with requirements of spec. 1A (§ 78.1 of this chapter); necks must be protected during shipment.

(b) Allyl chloroformate may, in addition, be packed in specification 5H (§ 78.87 of this chapter) lead-lined metal drums not over 55 gallons capacity.

§ 73.289 *Formic acid.* (a) Formic acid must be packed in specification containers as follows:

(1) In containers prescribed in § 73.245 of this part, except spec. 5A (§ 78.81 of this chapter). Metal barrels or drums.

(2) Spec. 103C–W (§ 78.283 of this chapter). Tank cars stenciled "FOR FORMIC ACID ONLY".

(3) Spec. 10A (§ 78.155 of this chapter). Wooden barrels or kegs, lined with latex rubber.

(4) Spec. MC 310 (§ 78.330 of this chapter). Tank motor vehicles, marked "For Formic Acid, Only".

(5) Spec. 5C (§ 78.83 of this chapter). Metal barrels or drums.

(6) Spec. 5G (§ 78.86 of this chapter). Metal barrels or drums with flanges for closures welded in place.

(7) Spec. 1D (§ 78.4 of this chapter). Boxed glass carboys of not over 6.5 gallons nominal capacity. Means shall be provided so that accumulated total pressure in bottles shall not exceed 10 pounds per square inch gauge at 130° F., or shall vent at a pressure not to exceed 10 pounds per square inch gauge.

(8) Spec. 17H (§ 78.118 of this chapter). Metal drums (single-trip) equipped with bag type liners of material and construction approved by the Bureau of Explosives. Each drum must have two diametrically opposite vent holes ¼ inch diameter in the side wall at each end in close proximity to the top curl and bottom chime. Interior of welded side seam must be covered or otherwise treated to provide a non-abrasive surface.

(9) Spec. 60 (§ 78.255 of this chapter). Portable tanks, marked "For Formic Acid, Only".

(10) Spec. 1EX (§ 78.6 of this chapter). Carboys in plywood drums. Authorized only for export shipments.

§ 73.290 *Mixtures of hydrofluoric and sulfuric acid.* (a) Mixtures of hydrofluoric acid and sulfuric acid, containing not more than 80 percent by weight and not less than 70 percent by weight of hydrofluoric acid and sulfuric acid combined, with the hydrofluoric acid content not less than 25 percent by weight in any case, must be packed in specification containers as follows:

(1) Specification 5A (§ 78.81 of this chapter). Unlined metal barrels or drums which have been subjected to an adequate passification or neutralization process (see note 1). Containers must be filled to not over 80 percent of capacity at 68° F. If containers are washed out with water, they must be repassified before shipment.

NOTE 1: Each metal container, before being being put into this service, must be passified by the following or an equally efficient method: By filling drum to 90 percent of capacity with hydrofluoric acid of 58 percent strength and allowing drum to stand 48 hours at a temperature of 80° F., and then 7 hours at 140° F., the internal pressure maintained at atmospheric pressure by means of a ventilated bung.

(2) Containers not exceeding 55 gallons capacity each are authorized for carload, truckload, less-than-carload, and less-than-truckload shipment. Containers exceeding 55 gallons capacity each are authorized for carload or truckload shipments only but they must be loaded by consignor and unloaded by consignee.

(3) For less-than-carload or less-than-truckload shipments, containers must be of metal at least as heavy as 14 gauge United States standard for not over 20 gallons capacity each or 12 gauge for not over 55 gallons capacity each. Each container must be subjected to at least one of the following tests before shipment: By interior pressure of at least 15 pounds per square inch before filling or by holding for inspection for at least 24 hours after filling. In either case, each container must be vented prior to shipment.

§ 73.291 *Flame retardant compound, liquid.* (a) Flame retardant compound, liquid, must be packed in specification containers as follows:

(1) Spec. 1A, 1B, or 1C (§§ 78.1, 78.2, or 78.3 of this chapter). Carboys in boxes or kegs which must be closed, and when reused must be reconditioned and tested, as provided in the specification.

(2) Spec. 1D (§ 78.4 of this chapter). Boxed glass carboys of not over 6.5 gallons nominal capacity which must be closed, and when reused must be reconditioned and tested, as provided in the specification; means shall be provided so that accmumulated pressure in bottle shall not exceed 10 pounds per square inch gauge at 130° F., or shall vent at a pressure not to exceed 10 pounds per square inch gauge.

(3) Spec. 1X (§78.5 of this chapter). Boxed carboys of 5 to 6 gallons capacity, single-trip for export only. For shipment by common carriers by water to noncontiguous territories or possessions of the United States and foreign countries; shipments from inland points in the United States which are consigned to such destinations are authorized to be transported to ship side by rail freight in carload lots only and by motor vehicle in truckload lots only.

(4) Spec. 10A (§ 78.155 of this chapter). Wooden barrels or kegs, lined with asphalt or rubber.

(5) Spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter). Wooden barrels or kegs with inside containers which must be glass or earthenware, not over 2 gallons each.

(6) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside containers which must be glass or earthenware, not over 1 gallon each, except that inside containers up to 3 gallons are authorized when only one is packed in each outside container.

(7) Spec. 28 (§78.8 of this chapter). Metal-jacketed lead carboys.

(8) Spec. 103B, 103B–W, 108, or 108A (§§ 78.267, 78.282, 78.278, or 78.279 of this chapter). Tank cars.

SUBPART F—COMPRESSED GASES; DEFINITION AND PREPARATION

§ 73.300 *Compressed gases; definition.* (a) A compressed gas for the purposes of Parts 71–78 of this chapter is defined as any material or mixture having in the container either an absolute pressure exceeding 40 pounds per square inch at 70° F., or an absolute pressure exceeding 104 pounds per square inch at 130° F., or both; or any liquid flammable material having a Reid (Note 1.) vapor pressure exceeding 40 pounds per square inch absolute at 100° F. (See § 73.326 for gases defined and classified as poisonous).

(b) Any compressed gas, as defined in paragraph (a) of this section shall be classified as a flammable compressed gas if either a mixture of 13 percent or less (by volume) with air forms a flammable mixture (Note 2), or the flammability range (Note 2) with air is greater than 12 percent regardless of the lower limit.

NOTE 1: American Society for Testing Materials Method of Test for Vapor Pressure of Petroleum Products (D–323).

NOTE 2: These limits shall be determined at atmospheric temperature and pressure. The method of sampling and the test procedure shall be acceptable to the Bureau of Explosives. The flammability range is defined as the difference between the minimum and maximum percentage by volume of the material in mixture with air that forms a flammable mixture.

§ 73.301 *General requirements*—(a) *Gases capable of combining chemically.* Cylinders, drums, tanks, tank motor vehicles, tank cars, and other containers must not contain gases capable of combining chemically.

(b) *Odorization.* All liquefied petroleum gas in a tank motor vehicle shall be effectively odorized by an approved agent of such character as to indicate positively, by a distinctive odor, the presence of gas down to a concentration in air of not over one-fifth the lower limit of combustibility: *Provided, however,* That odorization is not required if harmful in the use or further processing of the liquefied petroleum gas, or if odorization will serve no useful purpose as a warning agent in such use or further processing.

(1) The lower limits of combustibility of the more commonly used liquefied petroleum gases are: Propane, 2.15 percent; Butane, 1.55 percent. These figures represent volumetric percentages of gas-air mixtures in each case.

(c) *Foreign cylinders.* Charged cylinders made in foreign countries must not be offered for transportation in domestic traffic until they have been tested in this country and proper reports rendered as required by the specifications that apply.

(d) *Ownership.* Cylinders containing compressed gas must not be shipped unless they were charged by or with the consent of the owner of the cylinders.

(e) *Retest.* Cylinders for which prescribed periodic retests have become due must not be charged and shipped until such retests have been properly made.

(f) *Manifolding containers in transportation.* No means of interconnecting such as manifolding of individual containers may be employed for the transportation of compressed gases, except as hereinafter authorized. Containers so manifolded shall be supported and held together as a unit by structurally adequate means.

(1) Manifolding is authorized for containers of the following gases, provided, that each container is individually equipped with approved safety devices as required by § 73.34 (f) of this part: Air; Argon; Carbon Dioxide; Helium; Nitrogen; Nitrous Oxide; Oxygen.

(2) Manifolding is authorized for containers of the following gases, provided individual containers are equipped with approved safety devices as required by § 73.34 (f) of this part and further provided that each container is equipped with individual shut-off valve, or valves, which shall be tightly closed while in transit. Manifold branch lines to these individual shut-off valves shall be sufficiently flexible to prevent injury to the valves which otherwise might result from the use of rigid branch lines. When a temperature measuring device is used on a cylinder, the manifold shut-off valve shall be deemed the equivalent of the individual shut-off valve: hydrogen; hydrocarbon gases (nonliquefied); methane.

(3) Manifolding is authorized for containers of the following gases, provided individual containers are equipped with approved safety devices as required by § 73.34 (f) of this part, and further provided that each container is equipped with individual shut-off valve, or valves, which shall be tightly closed while in transit, and that each such container must be separately charged and means shall be provided to insure that no interchange of container contents can occur during transportation. Manifold branch lines to individual shut-off valves shall be sufficiently flexible to prevent injury to the valves which otherwise might result from the use of rigid branch lines: ethane; ethylene; propylene; liquefied petroleum gases; liquefied hydrocarbon gases.

(4) Manifolding is authorized for containers of acetylene, provided that each container is individually equipped with approved safety devices as required by § 73.34 (f) of this part, and further provided that each container is equipped with an individual shut-off valve, or valves, which shall be tightly closed while in transit. Manifold branch lines to these individual shut-off valves shall be sufficiently flexible to prevent injury to the valves which otherwise might result from the use of rigid branch lines. All manifolded containers shall be transported in a vertical position. For the checking of tare weights or for replacement of solvent the container shall be removed from the manifold. This subparagraph is not intended to prohibit the charging of the acetylene cylinders while manifolded.

(g) *Service pressure.* The service pressure for which a cylinder is designed is hereby defined as that which is marked on the cylinder. For example, for cylinders marked ICC–3A1800 (§ 78.36 of this chapter) the service pressure is 1,800 pounds per square inch gauge.

(1) For cylinders which are not marked to show service pressure, the authorized service pressures are as follows:

I. C. C. specification marking:	*Authorized service pressure (pounds per square inch gauge)*
ICC–3	1,800
ICC–3E	1,800
ICC–4	300
ICC–8	250
ICC–25	300
ICC–33	480
ICC–38	250
ICC–9	200
ICC–40	200

(2) For cylinders made prior to the effective date of specifications, the service pressure is hereby defined as being the same as for the same type of cylinder made in accordance with the current specifications.

(h) *Weight and pressure check; verification of content.* Except as noted in paragraph (h) (1) of this section, the amount of liquefied gas charged into cylinders or drums must be determined by weight and this weight must also be checked, after disconnecting from the charging line, by the use of proper scales. The pressure of nonliquefied gas and gas in solution must be checked daily on a representative cylinder after it has cooled to a settled temperature.

(1) Cylinders with a water capacity of 200 pounds or more and for use with a liquefied petroleum gas with a specific gravity at 60° F. of 0.504 or greater may have their contents determined by using a fixed length dip tube gauging device. The length of the dip tube shall be such that when a liquefied petroleum gas with a specific volume of 0.03051 cu. ft./lb. at a temperature of 40° F. is charged into the cylinder it just reaches the bottom of the tube. The weight of this liquid shall not exceed 42 percent of the water capacity of the cylinder, which must be stamped thereon. The length of the dip tube, expressed in inches carried out to one decimal place and prefixed with the letters DT, shall be stamped on the cylinder and on the exterior of removable type dip tube; for the purpose of this requirement the marked length shall be expressed as the distance measured along the axis of a straight tube from the top of the boss through which the tube is inserted to the proper level of the liquid in the cylinder. The length of each dip tube shall be checked when installed by weighing each cylinder after filling except when installed in groups of substantially identical cylinders in which case one of each 25 cylinders shall be weighed. The quantity of liquefied gas in each container must be checked by means of the dip tube after disconnecting from the charging line. The outlet from the dip tube shall be not larger than a No. 54 drill size orifice. A container representative of each day's filling at each charging plant shall have its contents checked by weighing after disconnecting from the charging line.

(i) *Valve protection.* Cylinders containing flammable, corrosive, or noxious gases (hydrogen, pintsch gas, coal gas, chlorine, sulfur dioxide, etc.), must have their valves protected by metal caps securely attached to the cylinders and of

sufficient strength to protect the valves from injury during trar it: *Provided,* That these caps will not be required (1) if the cylinder are boxed or crated so as to give a proper protection to the valves; (2) if the valves are so recessed into the cylinders or otherwise protected so that they will not be subjected to a blow if the cylinder is dropped on a flat surface; (3) if, for cylinders containing nonliquefied gas under pressure not exceeding 300 pounds per square inch at 70° F., the valves are strong enough to avoid injury during transit; (4) if the cylinders are loaded in cars or motor vehicles by the consignor and to be unloaded by the consignee, are loaded compactly in an upright position, and are securely braced.

§ 73.302 *Exemptions for compressed gases.* (a) Compressed gases, except poisonous gases as defined by § 73.326 (a) of this part are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, rail express, or highway, but when for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements, as follows:

(1) In cylinders or tubes not exceeding 2-inch outside diameter, and of not more than 4-fluid-ounce capacity.

(2) Metal containers not over 1 quart capacity charged to not over 170 pounds per square inch at 70° F., or containers not over 30 gallons capacity charged to not over 75 pounds per square inch at 70° F., filled with nondangerous material to not over 90 percent capacity at 70° F. and then charged with nonflammable, nonliquefied gas. Each container must be tested before shipment to three times the gas pressure at 70° F., and, when refilled and reshipped, must be retested at this pressure before each shipment.

(3) Inside nonrefillable metal containers charged with a solution of materials and compressed gas or gases, which is nonpoisonous and nonflammable and of capacity not to exceed 30 cubic inches (16.6 fluid ounces). Pressure in the container not to exceed 55 pounds per square inch absolute at 70° F., and the liquid content of the material and gas must not completely fill the container at 130° F. Each completed container filled for shipment must have been heated until content reached a minimum temperature of 130° F., without evidence of leakage, distortion or other defect.

(4) Carbonated beverages.

(5) Foodstuffs, soaps, or cosmetics, in metal cans with soluble or emulsified compressed gas, provided the pressure in the container does not exceed 105 pounds per square inch absolute at 70° F. or 140 pounds per square inch absolute at 130° F. The metal container must be capable of withstanding without bursting a pressure of two times the pressure of contents at 70° F. or one and one-half times the pressure of the contents at 130° F., whichever is greater.

§ 73.303 *Compressed gases.* (a) Compressed gases must be in metal cylinders unless otherwise specifically provided.

§ 73.304 *Filling limits.* (a) The liquid portion, if any, of the gas must not completely fill the cylinder or drum at 130° F.

NOTE 1: Maximum filling densities are permitted by § 73.308 of this part for certain liquefied compressed gases having critical temperatures below 130° F. that result in the container being liquid full below the critical temperature, but because of compressibility of the liquids, the maximum pressure requirements of paragraph (e) of this section are met up to and including 130° F.

(b) For mixtures, the liquid portion of the gas plus any additional liquid or solid must not completely fill the container at 130° F.

(c) The pressure in the cylinder at 70° F. must not exceed the service pressure for which the container is designed (see § 73.301 (g) of this part), except as provided in paragraph (d) of this section.

NOTE 1: Because of the present emergency and until further order of the Commission, the requirements of paragraph (d) of this section are waived and and ICC-3A (§ 78.36 of this chapter) and 3AA (§ 78.37 of this chapter) cylinders may be charged with compressed gases, other than liquefied or dissolved gases, to a pressure 10 percent in excess of their marked service pressures.

(d) Spec. 3A and 3AA cylinders (§§ 78.36 and 78.37 of this chapter) may be charged with compressed gases, other than liquefied, dissolved, poisonous, or flammable gases, to a pressure 10 percent in excess of their marked service pressure, *Provided:*

(1) That such cylinders are equipped with frangible disc safety devices (without fusible metal backing) having a bursting pressure not exceeding the minimum prescribed test pressure.

(2) That the elastic expansion shall have been determined at the time of the last test or retest by the water jacket method.

(3) That either the average wall stress (see Note 1 of this subparagraph) or the maximum wall stress (see Note 2 of this subparagraph) shall not exceed the wall stress limitation shown in the following table:

Type of steel	Average wall stress limitation	Maximum wall stress limitation
Plain carbon steels over 0.35 carbon and medium manganese steels	53,000	58,000
Steels of analysis and heat-treatment specified in spec. 3AA	67,000	73,000
Plain carbon steels less than 0.35 carbon made prior to 1920	45,000	48,000

NOTE 1: The average wall stress shall be computed from the elastic expansion data using the following formula:

$$S = \frac{1.7EE}{KV} - 0.4P$$

where

S = wall stress, pounds per square inch
EE = elastic expansion (total less permanent) in cubic centimeters
K = factor x 10^{-7} experimentally determined for the particular type of cylinder being tested
V = internal volume in cubic centimeters (1 cubic inch = 16.387 cubic centimeters)
P = test pressure, pounds per square inch

Formula derived from formula of Note 2 and the following:

$$EE = PKV \times \frac{D^2}{D^2 - d^2}$$

NOTE 2: The maximum wall stress shall be computed from the formula:

$$S = P\frac{(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where

S = wall stress, pounds per square inch
P = test pressure, pounds per square inch
D = outside diameter, inches
$d = D - 2t$, where t = minimum wall thickness determined by a suitable method

(4) That an external and internal visual examination made at the time of test or retest shows the cylinder to be free from excessive corrosion, pitting, or dangerous defects.

(5) That a plus sign (+) be added following the test date marking on the cylinder.

(e) The pressure in the cylinder at 130° F. must not exceed one and one-fourth times the service pressure for which the container is designed, except in the case of acetylene, nitrous oxide, and liquefied carbon dioxide (see § 73.301 (g) of this part).

NOTE 1: When a cylinder is charged in accordance with paragraph (d) of this section, the pressure in the cylinder at 130° F. must not exceed one and one-fourth times the filling pressure authorized therein.

§ 73.305 *Compressed gas mixtures.* (a) Compressed gas and other material (mixtures of), offered for transportation, when not in violation of § 73.301 (a) and (b) of this part, must be shipped as required for compressed gas, except as follows:

(1) Mixtures containing any poisonous article, class C, in such proportion that the mixture would be classed as a poisonous article under § 73.381 (a) of this part, may be shipped in cylinders as authorized for such poisonous article.

(2) Mixtures containing any poisonous article, class A, in such proportion that the mixture would be classed as a poisonous article under § 73.326 (a) of this part, must be shipped in cylinders as authorized for such poisonous article.

§ 73.306 *Liquefied gases, except gas in solution or poisonous gas.* (a) Liquefied gases, except gas in solution or poisonous gas, for which charging requirements are not definitely prescribed in §§ 73.303 or 73.312 of this part, must be shipped, subject to §§ 73.301 (a), (b), (c), (d), (e), (h), 73.303 (a), 73.304, 73.305, and 73.308 Note 12 of this part, in cylinders made under specification containers as follows:

(1) Spec. 3,[1] 3A, 3B, 3E, 4, 4A, 4B, 4BA (§§ 78.36, 78.38, 78.42, 78.48, 78.49, 78.50, and 78.51 of this chapter), 25,[1] 26,[1] or 38,[1] also Spec. 9 or 40 (§§ 78.63 or 78.66 of this chapter), except that mixtures containing carbon bisulfide (disulfide),

[1] Use of existing cylinders authorized, but new construction not authorized.

ethyl chloride, ethylene oxide, nickel carbonyl, spirits of nitroglycerin, zinc ethyl, or poisonous articles, class A, B, or C, as defined by this part are not permitted unless otherwise prescribed in this part. (See §§ 73.34 and 73.301 (g) of this part.)

(b) Mixtures containing compressed gas or gases including insecticides which mixtures are nonpoisonous and nonflammable under this part, must be shipped in cylinders as prescribed in paragraph (a) of this section.

(1) Spec. 2P (§ 78.33 of this chapter). Inside metal containers in strong wooden or fiber boxes of such design as to protect valves from injury or accidental functioning under conditions incident to transportation. Pressure in the container must not exceed 75 pounds per square inch absolute at 70° F. Each completed metal container filled for shipment must be heated until content reaches a minimum temperature of 130° F., without evidence of leakage, distortion or other defect. Each outside shipping container must be plainly marked "Inside containers comply with prescribed specifications".

(c) Refrigerant gases which are nonpoisonous and nonflammable under this part, must be shipped in cylinders as prescribed in § 73.308 of this part or subparagraph (a) (1) of this section, or as follows:

(1) Spec. 2P (§ 78.33 of this chapter). Inside metal containers equipped with safety devices of a type approved by the Bureau of Explosives and packed in strong wooden or fiber boxes of such design as to protect valves from injury or accidental functioning under conditions incident to transportation. Pressure in the container must not exceed 85 pounds per square inch absolute at 70° F. Each completed metal container filled for shipment must be heated until content reaches a minimum temperature of 130° F., without evidence of leakage, distortion or other defect. Each outside shipping container must be plainly marked "Inside containers comply with prescribed specifications".

§ 73.307 *Nonliquefied gases, except gas in solution or poisonous gas.* (a) Nonliquefied gases, except gas in solution or poisonous gas, for which charging requirements are not definitely prescribed in § 73.308 of this part, must be shipped, subject to §§ 73.301 (a), (b), (c), (d), (e), (h), 73.303 (a), 73.304, 73.305, and 73.308 Note 12 of this part, in any type of cylinder made under specifications as follows:

(1) Spec. 3,[1] 3A, 3B, 3C, 3D, 3E, 4, 4A, 4B, 4BA, 4C (§§ 78.36, 78.38, 78.40, 78.41, 78.42, 78.48, 78.49, 78.50, 78.51, or 78.52 of this chapter), 7,[1] 25,[1] 26,[1] 33,[1] or 38.[1] (See §§ 73.34 and 73.301 (g) of this part.)

§ 73.308 *Compressed gases in cylinders.* (a) The following restrictions must be complied with for the gases named:

Kind of gas	Maximum permitted filling density (see Note 12) (percent)	Cylinders (see Note 11) marked as shown in this column must be used except as provided in note 1 and § 73.34 (a) to (c) of this part
Anhydrous ammonia. (See Note 9.)	54	ICC-4; ICC-3A480; ICC-3A480X; ICC-4A480; ICC-3
Carbon dioxide—nitrous oxide mixtures	68	ICC-3A1800; ICC-3
Chlorine. (See Note 6.)	125	ICC-3A480; ICC-25; ICC-3.
Cyclopropane	55	ICC-3A225; ICC-3B225; ICC-4A225; ICC-4B225; ICC-4BA225; ICC-7-300; ICC-3; ICC-3E1800.
Dichlorodifluoromethane	119	ICC-3A225; ICC-3B225; ICC-4A225; ICC-4B225; ICC-4BA225; ICC-9.
Dichlorodifluoromethane and difluoroethane mixture (constant boiling mixture).	100	ICC-3A240; ICC-3B240; ICC-4A240; ICC-4B240; ICC-4BA240; ICC-9.
Difluoroethane	79	ICC-3A150; ICC-3B150; ICC-4B150; ICC-4BA225.
Difluoromonochloroethane	100	ICC-3A150; ICC-3B150; ICC-4B150; ICC-4BA225.
Dimethylamine, anhydrous	59	ICC-3A150; ICC-3B150; ICC-4B150; ICC-4BA225.
Ethane	35.8	ICC-3A1800; ICC-3.
Ethane	36.8	ICC-3A2000.
Ethylene	31.0	ICC-3A1800; ICC-3.
Ethylene	32.5	ICC-3A2000.
Hydrogen sulfide	68	ICC-3A480; ICC-3B480; ICC-4A480; ICC-4B480; ICC-4BA480; ICC-26-480.
Insecticide, liquefied gas. (See Note 8.)	§ 73.304 (a) and (b) of this part.	ICC-3A300; ICC-3B300; ICC-4B300; ICC-4BA300; ICC-9; ICC-40.
Liquefied carbon dioxide. (See Notes 3 and 5.)	68	ICC-3A1800; ICC-3.
Liquefied nonflammable gases, liquids other than those classified as flammable, corrosive, or poisonous and mixtures or solutions thereof, charged with nitrogen, carbon dioxide, or air. (See Note 10.)	§ 73.304 (a) and (b) of this part and the pressure in the container must not at 130° F. exceed 5/4 the marked service pressure of the container.	ICC-3A300; ICC-4B300; ICC-4B A300 ICC-4D300.
Methyl chloride. (See Note 4)	84	ICC-3A225; ICC-3B225; ICC-4A225; ICC-4B225; ICC-4BA225; ICC-3; ICC-4; ICC-25; ICC-26-300; ICC-38.
Methyl mercaptan	80	ICC-3A240; ICC-3B240; ICC-4B240; ICC-4BA240.
Monochlorodifluoromethane	105	ICC-3A240; ICC-3B240; ICC-4B240; ICC-4BA240.
Monochlorotrifluoromethane	100	ICC-3A1800; ICC-3.
Monomethylamine, anhydrous	60	ICC-3A150; ICC-3B150; ICC-4B150; ICC-4BA225.
Nitrosyl chloride	110	ICC-3BN400 only.
Nitrous oxide. (See Note 2)	68	ICC-3A1800; ICC-3.
Propylene	44	ICC-3A300; ICC-3B300; ICC-4A300; ICC-4B300; ICC-4BA300; ICC-3; ICC-4; ICC-25; ICC-26-300; ICC-38
Sulfur dioxide	125	ICC-3A225; ICC-3B225; ICC-4A225; ICC-4B225; ICC-4BA225; ICC-3; ICC-4; ICC-25; ICC-26-150; ICC-38.
Sulfur hexafluoride	110	ICC-3A1800; ICC-3.
Tetrafluoroethylene, inhibited	90	ICC-3A1200; ICC-3E1800.
Trifluorocholoroethylene	115	ICC-3A300; ICC-3B300; ICC-4A300; ICC-4B300; ICC-4BA300.
Trimethylamine, anhydrous	57	ICC-3A150; ICC-3B150; ICC-4B150; ICC-4BA225.
Vinyl chloride, inhibited. (See Note 7).	84	ICC-4B300, without brazed seams; ICC-4BA300, without brazed seams; ICC-3A300; ICC-25.
Vinyl methyl ether, inhibited. (See Note 7.)	68	ICC-4B300, without brazed seams; ICC-4BA300, without brazed seams; ICC-3A300; ICC-3B300; ICC-25.

NOTE 1: Cylinders complying with spec. 3E (§ 78.42 of this chapter) are also authorized for all gases named in this table for which steel cylinders are authorized except where ICC–3A2000 (§ 78.36 of this chapter) cylinders are specified.

NOTE 2: Filling density for nitrous oxide may be 75 percent in cylinders made previous to February 1, 1917, of less than 12-pound water capacity, and if known to have passed a test pressure of not less than 3,500 pounds per square inch.

NOTE 3: The charge in carbon dioxide cylinders must not exceed 68 percent by weight of the water capacity of the cylinder. Cylinders rated for 75 pounds or for 100 pounds carbon dioxide capacity are the only cylinders authorized for shipment of more than 50 pounds of carbon dioxide except that cylinders of sizes not over 9 1/16 inches o. d. by 51 inches (approx.), charged with mixtures of carbon dioxide containing at least 6 percent by weight of other gas or liquid, are exempt from the foregoing part of this sentence.

NOTE 4: Cylinders ICC–3A150, ICC–3B150, ICC–4A150, and ICC–4B150 (§§ 78.36, 78.38, 78.49, and 78.50 of this chapter) manufactured prior to December 7, 1936, are also authorized.

NOTE 5: Mining devices consisting of a cylinder containing carbon dioxide with a heating element, are authorized for shipment under the following conditions: Cylinders shall be of steel, have a calculated bursting pressure of at least 39,000 pounds per square inch, be fitted with a frangible disc that will operate at not over 57 percent of that pressure, be able to withstand a drop of 10 feet so as to strike crosswise on a steel rail while under internal pressure of at least 3,000 pounds per square inch, and be charged with not over 6 pounds of carbon dioxide gas at a filling density of not over 85 percent. (See Note 12 of this section); the cylinders are exempted from specification requirements other than the foregoing; the device must be shipped in strong boxes, described as liquefied carbon dioxide gas ("mining device"), and marked, labeled, and certified as prescribed for liquefied carbon dioxide.

NOTE 6: Cylinders purchased after October 1, 1944, for the transportation of chlorine must contain no aperture other than that provided in the neck of the cylinder for attachment of a valve equipped with an approved safety device. Cylinders purchased after November 1, 1935, and charged with chlorine must not contain over 150 pounds of gas.

NOTE 7: All parts of valve and safety devices in contact with contents of cylinders must be of a metal or other material, suitably treated if necessary, which will not cause formation of any acetylides.

[1] Use of existing cylinders authorized, but new construction not authorized.

NOTE 8: Cylinders of 86 cubic inches capacity or less must be packed in strong outside containers. (See § 73.25 of this part).

NOTE 9: Cylinders marked ICC–3A480X (§ 78.43 of this chapter) are authorized for service trial, reports of which, showing the number in service, the method of transportation used, the number of trips and average length of trip, and the condition of the cylinders, must be made annually by the owner to the Bureau of Explosives.

NOTE 10: Containers must be equipped with approved safety devices and 4D (§ 78.53 of this chapter) spheres must be packed in strong boxes or crates. (See § 73.25 of this part).

NOTE 11: Specs. 3,[1] 25,[1] 26,[1] 33,[1] and 38[1] are now obsolete but cylinders made thereunder may be continued in service.

NOTE 12: The "filling density" is hereby defined as the percent ratio of the weight of gas in a container to the weight of water that the container will hold.

§ 73.309 *Acetylene gas.* (a) Acetylene gas must be shipped in cylinders, spec. 8 or 8AL (§§ 78.59 or 78.60 of this chapter). The cylinders must be completely filled with a porous material that has been tested with satisfactory results by the Bureau of Explosives, and this material must be charged with a suitable solvent.

(1) The specific gravity of the solvent in acetylene cylinders must be 0.796 or over at 15.5° C., 59.9° F. The amount of solvent must not cause the tare weight of the cylinder to exceed its marked tare weight. The tare weight includes the weight of the cylinder proper, porous filling, valve, and solvent, but without removable cap.

(2) The amount of solvent at 70° F. for a cylinder having a shell water capacity exceeding 20 pounds (nominal) shall be determined from the following table:

Percent porosity of filler:	*Maximum acetone solvent percent shell capacity by volume*
90 to 92	43.4
83 to 90	40.0
80 to 83	38.6
75 to 80	36.2
70 to 75	33.8
65 to 70	31.4

(3) The amount of solvent at 70° F. for a cylinder having a shell water capacity of 20 pounds or less (nominal) shall be determined from the following table:

Percent porosity of filler:	*Maximum acetone solvent percent shell capacity by volume*
90 to 92	41.8
83 to 90	38.5
80 to 83	37.1
75 to 80	34.8
70 to 75	32.5
65 to 70	30.2

NOTE 1: The amount of acetone specified in paragraph (a) (2) and (3) of this section must not be exceeded in the filling of cylinders manufactured prior to the effective date of this acetoning schedule.

(b) The pressure in cylinders containing acetylene gas must not exceed 250 pounds per square inch at 70° F., and in case the cylinders are marked for a lower allowable charging pressure at 70° F., then that pressure must not be exceeded.

(c) Cylinders containing acetylene gas must not be shipped unless they were charged by or with the consent of the owner, and by a person, firm, or company having possession of complete information as to the nature of the porous filling, the kind and quantity of solvent in the cylinders, and the meaning of such markings on the cylinders as are prescribed by the Commission's regulations and specifications applying to containers for the transportation of acetylene gas.

§ 73.310 *Fire extinguishers and component parts thereof.* (a) Fire extinguishers and component parts thereof containing nonliquefied gas for the purpose of expelling fire extinguishing contents, when shipped under the following conditions are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, rail express, or highway, but when for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements:

(1) Must be shipped as inside containers.

(2) The container under stored pressure shall have an internal volume not exceeding 1,100 cubic inches.

(3) The pressure in the container shall not exceed 200 pounds per square inch at 70° F.

(4) The contents shall be nonflammable as covered in §§ 73.115 and 73.150 of this part; nonpoisonous as covered in § 73.325 (a), class A, B, or C of this part; and not corrosive as defined in § 73.240 of this part.

(5) Each container must be tested before shipment to at least three times the pressure in the container at 70° F. when charged and not less than 120 pounds per square inch, and before refilling and reshipping must be retested at this pressure before each shipment. The container shall show no leakage or damage when subjected to this pressure.

§ 73.311 *Fluorine.* (a) Fluorine must be shipped in metal cylinders complying with spec. 3A2000 or 3BN400 (§§ 78.36 or 78.39 of this chapter), equipped with valve protection caps and subject to § 73.34 (f) (4) of this part; cylinders must not be charged to over 400 pounds per square inch, gauge, at 70° F.; cylinders must not contain over 6 pounds of gas.

§ 73.312 *Liquefied petroleum gas.* (a) Liquefied petroleum gas must be charged into specification containers as follows:

(1) Spec. 3,[1] 3A, 3B, 3E, 4, 4B, 4BA (§§ 78.36, 78.38, 78.42, 78.48, 78.50, 78.51 of this chapter), 4B240X[1] (see appendix A to subpart C of Part 78 of this chapter), 4B240FLW or 9 (§§ 78.54 or 78.63 of this chapter), 25,[1] 26,[1] or 38.[1] Cylinders authorized under § 73.34 (a) to (e) of this part may be used.

NOTE 1: Because of the present emergency and until further order of the Commission, non-ICC specification containers used for liquefied petroleum gases prior to June 15, 1943, under laws, rules, or regulations of the States in which they are located, and so long as they are maintained in safe transportation condition, are authorized for use in the transportation of those gases by common, contract, or private carrier by motor vehicle, in intrastate commerce only, within those States. All other requirements of the Commission for such transportation must be complied with. This authority does not apply to cargo tanks of tank motor vehicles.

NOTE 2: Because of the present emergency and until further order of the Commission, cylinders marked as complying with I. C. C. Spec. 4B240FLW (§ 78.54 of this chapter) bearing manufacturer's symbol WCO and serial numbers 47A–1 to 47A–59200, inclusive, varying from the specification requirements as to physical properties of steel, are authorized for the transportation of liquefied petroleum gases.

(2) Spec. 3C or 4C (§§ 78.40 or 78.52 of this chapter). Cylinders are authorized when capacity of cylinders does not exceed 3,881 cu. in. (16 gallons with 5 percent tolerance), for liquefied petroleum gas with gas pressure not over 145 pounds per square inch, gauge, at 130° F.

(3) Spec. 7.[1] Cylinders when made prior to October 1, 1930, are authorized when capacity of cylinder does not exceed 3,881 cu. in. (16 gallons with 5 percent tolerance), for liquefied petroleum gas with gas pressure not over 70 pounds per square inch at 70° F., nor over 145 pounds per square inch at 130° F.

(4) Spec. 7.[1] Cylinders made prior to October 1, 1930, and lawfully marked ICC–7–150, are authorized for the shipment of liquefied petroleum gas, subject to § 73.304 of this part, provided they have been satisfactorily retested, by water jacketed test, as prescribed in § 73.34 (j) and (k) of this part.

(5) Spec. 5 (§ 78.80 of this chapter). Metal drums made prior to October 1, 1930, of 11 gallons capacity and made of steel at least 16 gauge United States standard, are authorized for gas pressure not over 23 pounds per square inch at 70° F., nor over 70 pounds per square inch at 130° F.

(6) Spec. 5F (§ 78.85 of this chapter). Metal drums. Authorized for gas pressure not over 28 pounds per square inch at 70° F., nor over 86 pounds per square inch at 130° F.

(b) Filling density limited as follows:

Minimum specific gravity of the liquid material at 60° F.	Maximum filling density in percent of the water-weight capacity of the container	Minimum specific gravity of the liquid material at 60° F.	Maximum filling density in percent of the water-weight capacity of the container
0.271–0.289	26	0.504–0.510	42
0.290–0.306	27	0.511–0.519	43
0.307–0.322	28	0.520–0.527	44
0.323–0.338	29	0.528–0.536	45
0.339–0.354	30	0.537–0.544	46
0.355–0.371	31	0.545–0.552	47
0.372–0.398	32	0.553–0.560	48
0.399–0.425	33	0.561–0.568	49
0.426–0.440	34	0.569–0.576	50
0.441–0.452	35	0.577–0.584	51
0.453–0.462	36	0.585–0.592	52
0.463–0.472	37	0.593–0.600	53
0.473–0.480	38	0.601–0.608	54
0.481–0.488	39	0.609–0.617	55
0.489–0.495	40	0.618–0.626	56
0.496–0.503	41	0.627–0.634	57

(c) Subject to § 73.304 (d) of this part, any filling density percentage prescribed in this section is authorized to be increased by 2 for liquefied petroleum gas in spec. 26[1] or 3[1] cylinders or in spec. 3A (§ 78.36 of this chapter) marked for 1,800 pounds, or higher, service pressure.

§ 73.313 *Refrigerating machines.* (a) Refrigerating machines of the self-contained type containing not over 50 pounds of gas in each pressure vessel and containing not more than two charged pressure vessels, refrigerating machines

[1] Use of existing cylinders authorized, but new construction not authorized.

of the remote-control type consisting of separate units shipped separately and each containing not over 25 pounds weight of gas, or other similar apparatus assembled for shipment containing not over 15 pounds weight of gas or liquid for their operation, when shipped under the following conditions are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, rail express, or highway, but when for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements.

(1) All parts subject to gas pressure during shipment must be tested during manufacture by interior pressure and must show no leakage or indication of failure under the test; for liquefied gas the test pressure must be 4 times and for nonliquefied gas it must be 5/3 times the gas pressure at 70° F.

(2) The liquid portion of the gas, if any, must not completely fill the container at 130° F.

(3) The amount of gas, if liquefied, must not exceed the filling densities prescribed in §§ 73.308 or 73.312 of this part.

(4) Any unit of a refrigerating machine of the self-contained type containing more than one pressure vessel charged with 50 pounds of gas as authorized in this section shall have each such pressure vessel equipped with a safety device meeting the requirements of the American Standard Safety Code for Mechanical Refrigeration (ASA–B9) and individual shut-off valve or valves which shall be closed while in transportation. Such pressure vessels shall be manufactured and inspected in accordance with Section VIII of the American Society of Mechanical Engineers Code, 1949 or 1950 Edition.

§ 73.314 *Compressed gases in tank cars.* (a) Compressed gases must not be shipped in tank cars except as provided in paragraphs (b) to (g) of this section, § 73.432 of this part, and in the following table:

Kind of gas	Maximum permitted filling density, Note 1	Required type of tank car, Note 2
	Percent	
Anhydrous ammonia	50	ICC-106A500, Note 12.
	57	ICC-105A300.
Argon	Note 5	ICC-107A.
Butadiene (pressure not exceeding 75 pounds per square inch at 105° F.)	Note 3	ICC-104A, Note 9.
Chlorine	125	ICC-106A500, Note 12.
	125	ICC-105A300, Note 8.
Crude nitrogen fertilizer solution	Note 6	ICC-106A500.
		ICC-105A300.
Dichlorodifluoromethane	119	ICC-106A500, Note 12.
	125	ICC-105A300.
Dichlorodifluoromethane and difluoroethane mixture (constant boiling mixture).	100	ICC-106A500, Note 12.
	105	ICC-105A300.
Difluoroethane	79	ICC-106A500, Note 12.
Difluoromonochloroethane	100	ICC-106A500, Note 12.
Dimethylamine, anhydrous	59	ICC-106A500.
	62	ICC-105A300.
Dimethyl ether	59	ICC-106A500.
	62	ICC-105A300.
Dispersant gas, n. o. s	Note 16	ICC-106A500, Note 12.
Fertilizer ammoniating solution containing free ammonia	Note 6	ICC-106A500.
		ICC-105A300.
Helium	Note 5	ICC-107A.
Hydrogen	Note 5	ICC-107A, Note 7.
Hydrogen sulfide	68	ICC-106A800, Notes 12 and 13.
Liquefied carbon dioxide	Note 10	ICC-105A500, ICC-105A600, Note 11.
Liquefied hydrocarbon gas	Note 6	Notes 5 and 9.
Liquefied petroleum gas (pressure not exceeding 75 pounds per square inch at 105° F.).	Note 3	ICC-104A, Note 9.
Liquefied petroleum gas (pressure not exceeding 225 pounds per square inch at 105° F.).	Note 3	ICC-105A300, Notes 5 and 9.
Liquefied petroleum gas (pressure not exceeding 300 pounds per square inch at 105° F.).	Note 3	ICC-105A400, Notes 5 and 9.
Liquefied petroleum gas (pressure not exceeding 375 pounds per square inch at 105° F.).	Note 3	ICC-105A500, Notes 5 and 9.
Liquefied petroleum gas (pressure not exceeding 375 pounds per square inch at 130° F.).	Note 4	ICC-106A500.
Liquefied petroleum gas (pressure not exceeding 450 pounds per square inch at 105° F.).	Note 3	ICC-105A600, Notes 5 and 9.
Methyl chloride	84	ICC-106A500, Note 12.
		ICC-105A300.
Methyl mercaptan	80	ICC-106A500, Note 13.
Monochlorodifluoromethane	105	ICC-106A500, Note 12.
	110	ICC-105A300.
Monochlorotetrafluoroethane	125	ICC-106A500, Note 12.
Monomethylamine, anhydrous	60	ICC-106A500.
	62	ICC-105A300.
Nitrogen	Note 5	ICC-107A.
Nitrosyl chloride	124	ICC-105A300-W, Note 15.
Oxygen	Note 5	ICC-107A.
Sulfur dioxide	125	ICC-106A500, Note 12.
	125	ICC-105A300.
Trimethylamine, anhydrous	57	ICC-106A500.
	59	ICC-105A300.
Vinyl chloride, inhibited (see Note 14)	84	ICC-106A500, Note 12.
	87	ICC-105A300.

NOTE 1: The filling density for liquefied gases is hereby defined as the percent ratio of the weight of gas in the tank to the weight of water that the tank will hold. For determining the water capacity of the tank in pounds, the weight of a gallon (231 cubic inches) of water at 60° F. in air shall be 8.32828 pounds.

NOTE 2: When tank cars marked ICC-105A300 (§ 78.271 of this chapter) are prescribed, tank cars marked ICC-105A400, 105A500, and 105A600 (§§ 78.272, 78.273, and 78.274 of this chapter) may also be used; when ICC-104A (§ 78.270 of this chapter) tank cars are prescribed, tank cars marked ICC-105A300, 105A400, 105A500, and 105A600 (§§ 78.271, 78.272, 78.273, 78.274 of this chapter) may also be used; and when ICC-106A500 (§ 78.275 of this chapter) tank cars are prescribed, tank cars marked ICC-106A800 (§ 78.276 of this chapter) may also be used.

NOTE 3: (a) Maximum permitted filling density in tank cars transporting liquefied petroleum gas or butadiene of specific gravity shown, taken at 60 degrees Fahrenheit.

Specific gravity	Filling density	Specific gravity	Filling density
0.500	45.500	0.568	53.600
0.501	45.600	0.569	53.700
0.502	45.700	0.570	53.800
0.503	45.800	0.571	53.900
0.504	45.900	0.572	54.000
0.505	46.000	0.573	54.125
0.506	46.125	0.574	54.250
0.507	46.250	0.575	54.375
0.508	46.375	0.576	54.500
0.509	46.500	0.577	54.600
0.510	46.750	0.578	54.700
0.511	47.000	0.579	54.800
0.512	47.125	0.580	54.900
0.513	47.250	0.581	55.000
0.514	47.375	0.582	55.100
0.515	47.500	0.583	55.200
0.516	47.625	0.584	55.300
0.517	47.750	0.585	55.400
0.518	47.875	0.586	55.500
0.519	48.000	0.587	55.625
0.520	48.125	0.588	55.750
0.521	48.250	0.589	55.875
0.522	48.375	0.590	56.000
0.523	48.500	0.591	56.090
0.524	48.600	0.592	56.180
0.525	48.700	0.593	56.270
0.526	48.800	0.594	56.360
0.527	48.900	0.595	56.450
0.528	49.000	0.596	56.540
0.529	49.125	0.597	56.630
0.530	49.250	0.598	56.720
0.531	49.375	0.599	56.810
0.532	49.500	0.600	56.900
0.533	49.625	0.601	56.990
0.534	49.750	0.602	57.080
0.535	49.875	0.603	57.170
0.536	50.000	0.604	57.260
0.537	50.100	0.605	57.350
0.538	50.200	0.606	57.440
0.539	50.300	0.607	57.530
0.540	50.400	0.608	57.620
0.541	50.500	0.609	57.710
0.542	50.625	0.610	57.800
0.543	50.750	0.611	57.890
0.544	50.875	0.612	57.980
0.545	51.000	0.613	58.070
0.546	51.100	0.614	58.160
0.547	51.200	0.615	58.250
0.548	51.300	0.616	58.340
0.549	51.400	0.617	58.430
0.550	51.500	0.618	58.520
0.551	51.625	0.619	58.610
0.552	51.750	0.620	58.700
0.553	51.875	0.621	58.790
0.554	52.000	0.622	58.880
0.555	52.125	0.623	58.970
0.556	52.250	0.624	59.060
0.557	52.375	0.625	59.150
0.558	52.500	0.626	59.240
0.559	52.625	0.627	59.330
0.560	52.750	0.628	59.420
0.561	52.875	0.629	59.510
0.562	53.000	0.630	59.600
0.563	53.100	0.631	59.690
0.564	53.200	0.632	59.780
0.565	53.300	0.633	59.870
0.566	53.400	0.634	59.960
0.567	53.500	0.635	60.050

(b) Because of the present emergency and until further order of the Commission, and only for shipments made during the months of November to March, inclusive, the following filling densities may be used in lieu of those specified in the table in paragraph (a) of Note 3:

Specific gravity	Filling density	Specific gravity	Filling density
0.500	47.40	0.525	50.14
0.501	47.51	0.526	50.25
0.502	47.62	0.527	50.36
0.503	47.73	0.528	50.47
0.504	47.84	0.529	50.58
0.505	47.95	0.530	50.69
0.506	48.06	0.531	50.79
0.507	48.17	0.532	50.90
0.508	48.28	0.533	51.01
0.509	48.39	0.534	51.12
0.510	48.51	0.535	51.23
0.511	48.61	0.536	51.34
0.512	48.72	0.537	51.45
0.513	48.83	0.538	51.56
0.514	48.94	0.539	51.67
0.515	49.05	0.540	51.78
0.516	49.16	0.541	51.88
0.517	49.27	0.542	51.99
0.518	49.38	0.543	52.09
0.519	49.49	0.544	52.20
0.520	49.60	0.545	52.31
0.521	49.70	0.546	52.41
0.522	49.81	0.547	52.52
0.523	49.92	0.548	52.62
0.524	50.03	0.519	52.73

Specific gravity	Filling density	Specific gravity	Filling density
0.550	52.84	0.593	57.34
0.551	52.94	0.594	57.44
0.552	53.05	0.595	57.53
0.553	53.16	0.596	57.63
0.554	53.26	0.597	57.72
0.555	53.37	0.598	57.82
0.556	53.48	0.599	57.91
0.557	53.58	0.600	58.01
0.558	53.69	0.601	58.10
0.559	53.80	0.602	58.20
0.560	53.91	0.603	58.29
0.561	54.01	0.604	58.39
0.562	54.12	0.605	58.49
0.563	54.22	0.606	58.58
0.564	54.33	0.607	58.68
0.565	54.43	0.608	58.77
0.566	54.54	0.609	58.87
0.567	54.64	0.610	58.97
0.568	54.75	0.611	59.06
0.569	54.85	0.612	59.16
0.570	54.96	0.613	59.26
0.571	55.06	0.614	59.35
0.572	55.17	0.615	59.45
0.573	55.27	0.616	59.55
0.574	55.38	0.617	59.64
0.575	55.48	0.618	59.74
0.576	55.59	0.619	59.84
0.577	55.69	0.620	59.94
0.578	55.80	0.621	60.03
0.579	55.90	0.622	60.13
0.580	56.01	0.623	60.23
0.581	56.11	0.624	60.32
0.582	56.22	0.625	60.42
0.583	56.32	0.626	60.52
0.584	56.43	0.627	60.61
0.585	56.53	0.628	60.71
0.586	56.64	0.629	60.81
0.587	56.74	0.630	60.91
0.588	56.85	0.631	61.00
0.589	56.95	0.632	61.10
0.590	57.06	0.633	61.19
0.591	57.15	0.634	61.29
0.592	57.25	0.635	61.39

NOTE 4: See § 73.312 (b) of this part.

NOTE 5: See § 73.314 (b) of this part.

NOTE 6: See § 73.314 (c) of this part.

NOTE 7: Before any ICC–107A (§ 78.277 of this chapter) tank car may be used for shipments of hydrogen the following requirements must be complied with. Each tank must be equipped with one or more safety devices of approved type and discharge area, the discharge outlet of each safety device must be connected to a manifold having an unobstructed discharge area of at least one and one-half times the total discharge area of the safety devices connected to the manifold; all manifolds must be connected to a single common header having an unobstructed discharge outlet pointing upward and extending above top of the car; the header and the header outlet must each have an unobstructed discharge area at least equal to the total discharge area of the manifolds connected to the header; the header outlet must be equipped with an approved ignition device which will instantly ignite any hydrogen discharged through the safety devices.

NOTE 8: For tank cars of other than ICC 106A type (§§ 78.275 or 78.276 of this chapter), used for shipping chlorine, tests prescribed in § 78.281–15 of this chapter must be made at intervals of 2 years or less and interior pipes of liquid discharge valves must be equipped with check valves of approved design. Because of the present emergency and unless further ordered by the Commission, the current two-year period for tests, as amended September 7, 1944, is extended to three years for tank cars used for shipping chlorine and operated under reporting marks SHPX Nos. 3320 to 3399, inclusive, and CWSX Nos. 16000 to 16037, inclusive, on which these tests are now overdue or pending. This addition also amends § 78.281–15 of this chapter and paragraph (g) of § 73.31 of this part.

NOTE 9: For tank cars of other than ICC 106A type (§§ 78.275 or 78.276 of this chapter), used for shipping liquefied hydrocarbon or liquefied petroleum gas, interior pipes of liquid and gas discharge valves must be equipped with check valves of approved design.

NOTE 10: The liquid portion of the gas at 0° F. must not completely fill the tank.

NOTE 11: Before an ICC–105A500 or 105A600 (§ 78.273 or 78.274 of this chapter) tank car may be used for the transportation of liquefied carbon dioxide, the following requirements must be met: Tank must be lagged with an approved insulation material of a thickness so that the thermal conductance is not more than 0.03 B. t. u. per square foot, per degree F. differential in temperature per hour. Tank must be equipped with one safety valve of approved design set to open at a pressure not exceeding three-fourths of the test pressure of the tank and one frangible disc device of approved design set to function at a pressure less than the test pressure of the tank. The discharge capacity of each of these safety devices must be sufficient to prevent building up of pressure in tank in excess of three-fourths of the test pressure of the tank. Tank must be equipped with two pressure-regulating valves of approved design, one set to open at three-fifths of the test pressure of the tank and one set to open at two-thirds of the test pressure of the tank. Each regulating valve and safety device must have its final discharge piped to the outside of the dome.

NOTE 12: Tanks complying with specification 106A500 (§ 78.275 of this chapter), containing chlorine, anhydrous ammonia, sulfur dioxide, methyl chloride, dichlorodifluoromethane, monochlorodifluoromethane, monochlorotetrafluoroethane, vinyl chloride, inhibited, difluoroethane, difluoromonochloroethane, dispersant gas, n. o. s., or dichlorodifluoromethane and difluoroethane mixture (constant boiling mixture), or tanks complying with specification 106A800 (§ 78.276 of this chapter), containing hydrogen sulfide, may be transported on trucks or semitrailers only, when securely chocked or clamped thereon to prevent shifting, and provided adequate facilities are present for handling tanks where transfer in transit is necessary. See § 74.560 of this chapter, for rail freight-motor vehicle shipments.

NOTE 13: Container shall not be equipped with safety devices of any description and valves must be protected by supplemental gastight closures approved by the Bureau of Explosives.

NOTE 14: All parts of valves and safety devices in contact with contents of tank must be of a metal or other material suitably treated if necessary, which will not cause formation of any acetylides.

NOTE 15: Before an ICC–105A300–W (§ 78.286 of this chapter) tank car may be used for the transportation of nitrosyl chloride, the following requirements must be met: Tanks must be made of or clad with a metal not subject to rapid deterioration by the lading; all appurtenances, such as manhole covers, venting, loading and discharge valves, safety valves, check valves, and eduction pipes, must be made of metal not subject to rapid deterioration by the lading; cork must be used as an insulating material.

NOTE 16: See paragraphs (b) and (c) of this section.

(b) The gas pressure at 105° F. in any lagged tank of tank cars of specs. 104A, 105A300, 105A400, 105A500, and 105A600 (§§ 78.270, 78.271, 78.272, 78.273, and 78.274 of this chapter), and at 130° F. in any unlagged tank of tank cars of specs. 106A500 and 106A800 (§§ 78.275 and 78.276 of this chapter) must not exceed three-fourths times the prescribed retest pressure of the tank. The gas pressure at 130° F. in any unlagged tank of tank cars of the 107A (§ 78.277 of this chapter) series must not exceed seven-tenths of the marked test pressure of the tank.

NOTE 1: Because of the present emergency and until further order of the Commission, ICC–107A (§ 78.277 of this chapter) tanks may be charged with helium to a pressure 10 percent in excess of the marked maximum gas pressure at 130° F. of each tank.

(c) The liquid portion of the gas at 105° F. must not completely fill a lagged tank nor at 130° F. completely fill an unlagged tank.

(d) The amount of liquefied gas charged into each tank may be determined either, first, by weight, and this weight must be checked after disconnecting the charging line, by the use of proper scales, or second, the weight of liquefied petroleum gas, dimethylamine, monomethylamine, and trimethylamine may be calculated using the outage tables supplied by the tank car owners and the specific gravities as determined at the plant, and this computation must be checked by determination of specific gravity of product after loading. Carriers may verify calculated weights by use of proper scales.

(e) Tank cars containing compressed gases must not be shipped unless they were loaded by or with the consent of the owner thereof; and must not be loaded with any gas which combines chemically with the gas previously loaded therein, until all residue has been removed and interior of tank thoroughly cleaned. For cars of the ICC106A (§§ 78.275 and 78.276 of this chapter) type, the tanks must be placed in position and attached to the car structure by the shipper.

(f) Tank cars made in foreign countries must not be used in domestic traffic until they have been tested in this country and proper reports rendered as required by the specifications that apply.

(g) The maximum quantity of any liquefied gas, except crude nitrogen fertilizer solution, fertilizer ammoniating solution containing free ammonia, methyl chloride, and vinyl chloride, inhibited, loaded into tanks mounted on one car structure must not exceed 60,000 pounds. *Provided*, That for single-unit tank car tanks having water weight capacities not less than 86,240 pounds nor over 90,640 pounds, lagged with 4 inches of corkboard, equipped with one or more safety valves set to open at a pressure of 225 pounds per square inch, the total discharge capacity of which must be sufficient to prevent building up of pressure in the tank in excess of 225 pounds per square inch, mounted on one car structure, tank jackets stenciled ICC–105A300 (§ 78.271 of this chapter) if tanks are forge-welded and ICC–105A300W (§ 78.286 of this chapter) if tanks are fusion-welded, and in all other respects constructed and maintained in full compliance with I. C. C. shipping container specification 105A500 or 105A-500W (§§ 78.273 or 78.288 of this chapter), the quantity of liquefied chlorine gas or liquefied sulfur dioxide gas loaded into such tanks must be at least 107,800 pounds and not more than 110,000 pounds. (See Appendix D to Subpart I of Part 78 of this chapter.)

§ 73.315 *Compressed gases in cargo tanks and portable tank containers.* (a) Cargo tanks and portable tank containers must not contain gases capable of combining chemically.

(1) Compressed gases must not be shipped in cargo tanks or portable tank containers except as provided in this sec-

tion and §§ 73.32 and 73.33 of this part, and in the following table (for marking requirements see §§ 73.401 (a) (1) and 77.823 (d) of this chapter):

Kind of gas	Maximum permitted filling density		Specification container required	
	Percent by weight (see Note 1)	Percent by volume (see par. (f) of this section)	Type (see Note 2)	Minimum design working pressure (psig)
Anhydrous ammonia	56	82 See Note 5	ICC-51, MC-330	265.
Carbon dioxide	See par. (e) of this section.	95	ICC-51, MC-330	200; see Note 3.
Liquefied petroleum gas	See par. (b) of this section.	See par. (b) of this section.	ICC-51, MC-330	See subpar. (b) (1) of this section.
Nitrous oxide	See par. (c) of this section.	95	ICC-51, MC-330	200; see Note 3.
Sulfur dioxide (tanks not over 1,200 gallons water capacity).	125	87.5	ICC-51, MC-330	150; see Note 4.
Sulfur dioxide (tanks over 1,200 gallons water capacity).	125	87.5	ICC-51, MC-330	125; see Note 4.
Sulfur dioxide (optional portable tank 1,000-2,000 pounds water capacity, fusible plug).	125	See Note 6	ICC-51	225.

NOTE 1: Maximum filling density for liquefied gases is hereby defined as the percent ratio of the weight of gas in the tank to the weight of water that the tank will hold. For determining the water capacity of the tank in pounds, the weight of a gallon (231 cubic inches) of water at 60° F. in air shall be 8.32828 pounds.

NOTE 2: See §§ 73.32 and 73.33 of this part for authority to use containers made prior to May 15, 1950.

NOTE 3: If cargo tanks and portable tank containers for carbon dioxide and nitrous oxide are designed to comply with the "Rules for Containers for Gases and Liquids at Temperatures of Minus 20 Degrees Fahrenheit and Below" of the A. S. M. E. Code, the design working pressure may be reduced to 100 psig or the controlled pressure, whichever is greater.

NOTE 4: A corrosion factor shall be applied in the design of tanks for sulfur dioxide.

NOTE 5: Unlagged cargo tanks and portable tank containers for liquid anhydrous ammonia may be filled to 87.5 percent by volume provided the temperature of the anhydrous ammonia being loaded into such tanks is determined to be not lower than 30° F. or provided the filling of such tanks is stopped at the first indication of frost or ice formation on the outside surface of the tank and is not resumed until such frost or ice has disappeared.

NOTE 6: Tanks equipped with fusible plugs must be filled by weight.

(b) Maximum permitted filling densities for cargo tanks and portable tank containers for transportation of liquefied petroleum gases are as follows:

Maximum specific gravity of the liquid material at 60° F.	Maximum permitted filling density in percent of the water-weight capacity of the tanks		Maximum permitted filling density by volume
	1200 gallons or less	Over 1200 gallons	
	Percent	*Percent*	
0.473–0.480	38	41	See Note 1.
0.481–0.488	39	42	
0.489–0.495	40	43	
0.496–0.503	41	44	
0.504–0.510	42	45	
0.511–0.519	43	46	
0.520–0.527	44	47	
0.528–0.536	45	48	
0.537–0.544	46	49	
0.545–0.552	47	50	
0.553–0.560	48	51	
0.561–0.568	49	52	
0.569–0.576	50	53	
0.577–0.584	51	54	
0.585–0.592	52	55	
0.593–0.600	53	56	
0.601–0.608	54	57	
0.609–0.617	55	58	
0.618–0.626	56	59	
0.627–0.634	57	60	

NOTE 1: Same filling density as permitted by weight, except when using fixed length dip tube or other fixed maximum liquid level indicators (paragraph (f) of this section), in which case the maximum permitted filling density shall not exceed 97 percent of the maximum permitted filling density by weight contained in the table.

(1) The design working pressure of cargo tanks and portable tank containers for liquefied petroleum gases shall be in accordance with the following classification:

Maximum vapor pressure of liquefied petroleum gas at 115° F. which may be placed in tank (psig)	Minimum design working pressure (psig)
125	125
187	187
250	250
Over 250 see Note 1 to subpar. (b) (1) of this section.	

NOTE 1: Gases with vapor pressure exceeding 250 psig shall be placed in tanks with design working pressure increased above 250 psig by increments of 62.5 psig.

(c) The loading of liquefied gases into cargo tanks and portable tank containers shall be determined by weight or by suitable liquid level gauging device. In either case the liquid portion of the gas shall not fill the tank at 105° F. if the tank be lagged, nor at 115° F. if the tank be unlagged, except that this requirement shall be waived for the shipment of carbon dioxide and nitrous oxide in tanks (which are required to be equipped with suitable pressure controlling devices) which may be charged to a level corresponding to 95 percent of the volumetric capacity of the tank.

(d) If the loading of cargo tanks and portable tank containers with liquefied gases is to be determined by weight, the gross weight shall be checked after the filling line is disconnected in each instance. The gross weight shall be calculated from the tank capacity and tare weight set forth on the metal plate required by the specification, and the maximum filling density permitted for the material being loaded into the tank as set forth in the table, paragraph (a) (1) of this section.

(e) If the loading of cargo tanks and portable tank containers with liquefied gases is to be determined by adjustable liquid level device, each tank and each compartment thereof shall have a thermometer well, so that the internal liquid temperature can easily be determined, and the amount of liquid in the tank shall be corrected to a 60° F. basis. Liquid levels shall not exceed a level corresponding to the maximum filling density permitted for the material being loaded into the tank as set forth in the table in paragraph (a) (1) of this section.

(f) When the loading of cargo tanks and portable tank containers with liquefied gases is determined only by fixed length dip tube or other fixed maximum liquid level indicator, the device shall be arranged to function at a level not to exceed the maximum permitted volume prescribed by the table, paragraph (a) (1) of this section. Loading shall be stopped when the device functions.

(g) Containers, the liquid level of which has been determined by means of a fixed length dip tube gauging device, shall not be acceptable for stowage as cargo on vessels in commerce subject to the jurisdiction of the United States Coast Guard. Nothing contained in this rule shall be so construed as to prohibit the transportation on car floats or car ferries of motor vehicles laden with containers nor cargo tanks the liquid level of either of which has been determined by means of fixed length dip tube devices.

(h) Each cargo tank and portable tank container, except tanks filled by weight, shall be equipped with one or more of the following gauging devices which indicate accurately the maximum permitted liquid level: (Additional gauging devices may be installed but may not be used as primary controls for filling of cargo tanks and portable tank containers. Gauge glasses shall not be permitted to be installed on any cargo tank or portable tank container).

Kind of gas	Permitted gauging device
Anhydrous ammonia	Rotary tube; fixed length dip tube.
Carbon dioxide	Rotary tube; adjustable slip tube; fixed length dip tube.
Liquefied petroleum gases	Do.
Nitrous oxide	Do.
Sulfur dioxide	Fixed length dip tube.

(1) The design pressure of the liquid level gauging devices shall be at least equal to the design working pressure of the tank.

(2) All liquid level gauging devices, except on tanks provided with fixed maximum level in indicators, shall be legibly and permanently marked in increments of not more than 20 Fahrenheit degrees to indicate the maximum

levels to which the tank may be filled with liquid at temperatures above 20° F. except that gauging devices on tanks for carbon dioxide and nitrous oxide may be marked in increments of not more than 25 psig. In the event that it is impracticable to put these markings on the gauging device, this information shall be marked on a suitable plate affixed to the tank in a location adjacent to the gauging device.

(3) Liquid level gauging devices which are so constructed that the outward flow of tank contents exceeds that passed by a No. 54 drill size opening, shall be equipped with excess-flow valves. Exception: Not required on gauging devices when used on tanks in carbon dioxide service.

(4) A fixed-length dip tube gauging device, when used, shall consist of a dip pipe of small diameter equipped with a valve at the outer end, and extending into the tank to a specified fixed length. On horizontally mounted cylindrical tanks the fixed length to which the tube extends into the tank shall be such that the device will function to indicate when the liquid at a point equidistant from the heads of the tank in a vertical plane containing the longitudinal axis of the tank, reaches the maximum level permitted by this section except that on tanks for liquefied petroleum gases the device should be set to function when the liquid reaches the maximum level at 40° F. when charged in accordance with the authorized filling density. On spherical tanks and on vertically mounted cylindrical tanks the fixed length to which the tube extends into the tank shall be such that the device will function to indicate when the liquid at a point on the vertical axis of the tank in its normal position reaches the maximum level permitted by this section except that on tanks for liquefied petroleum gases the device should be set to function when the liquid reaches the maximum level at 40° F. when charged in accordance with the authorized filling density.

(i) Each tank shall be provided with one or more safety devices which, unless otherwise specified, shall be safety relief valves of the spring-loaded type and they shall be arranged to discharge upward and unobstructed to the outside of the protective housing in such a manner as to prevent any impingement of escaping gas upon the tank.

(1) Safety relief valves on any tank shall be set to start to discharge at a pressure not in excess of the design working pressure of the tank and shall have a total relieving capacity sufficient to prevent a maximum pressure in the tank of more than 120 percent of the design working pressure, using the heat input as determined by Fetterly's formula.[1] The required relieving capacity of safety relief valves for lagged tanks shall be based upon the heat input to a bare tank, unless insulation is covered by a sheet metal jacket of not less than 16 gauge nominal thickness.

(2) The start-to-discharge pressure of safety relief valves shall be not less than the values given in the following table:

Kind of gas	Minimum start-to-discharge pressure (psig)
Anhydrous ammonia	265.
Carbon dioxide	See paragraph (i) (1) of this section.
Liquefied petroleum gas	90 percent of the design working pressure of tank.
Nitrous oxide	See paragraph (i) (1) of this section.
Sulfur dioxide:	
Up to 1,200 gal. water capacity tank.	120.
Over 1,200 gal. water capacity tank.	110.

(3) Each safety relief valve shall be plainly and permanently marked with the pressure in psig at which it is set to discharge, with the actual rate of discharge of the device in cubic feet per minute of the gas at 60° F. and atmospheric pressure, and with the manufacturer's name and catalog number. The rated discharge capacity of the device shall be determined at a pressure of 120 percent of the design working pressure of the tank.

(4) Connections to safety relief valves shall be of sufficient size to provide the required rate of discharge through the safety relief valves.

(5) Safety relief valves shall be arranged so that the possibility of tampering will be minimized; and if the pressure setting or adjustment is external the safety relief valves shall be provided with suitable means for sealing the adjustment.

(6) No shut-off valves shall be installed between the safety relief valves and the tank except, in cases where two or more safety relief valves are installed on the same tank, a shut-off valve may be used where the arrangement of the shut-off valve or valves is such as always to afford full required capacity flow through at least one safety relief valve.

(7) Safety relief valves shall have direct communication with the vapor space of the tank.

(8) Any portion of liquid piping or hose which at any time may be closed at each end must be provided with a safety relief valve to prevent excessive hydrostatic pressure. This safety relief valve must not have an intervening shut-off valve installed.

(9) Restrictions as specified in Notes 1, 2, and 3 to this subparagraph also apply to safety devices on tanks for carbon dioxide and/or nitrous oxide.

NOTE 1: The maximum operating pressure in the tank shall be regulated by the use of one or more pressure controlling devices, which devices shall not be in lieu of the safety relief valve required in paragraph (1) of this section.

NOTE 2: All safety devices shall be so installed and located that the cooling effect of the contents will not prevent the effective operation of the device.

NOTE 3: In addition to safety relief valves required by paragraph (1) of this section each tank for carbon dioxide may be equipped with one or more frangible disc devices of suitable design set to function at a pressure not exceeding two times the design working pressure of the tank.

(10) Subject to conditions of subparagraph (a) (1) of this section for sulfur dioxide optional portable tank 1,000–2,000 pounds water capacity—225 psig, one or more fusible plugs approved by the Bureau of Explosives may be used in lieu of safety relief valves of the spring-loaded type. The fusible plug or plugs shall have total relieving capacity as determined by the use of Fetterly's formula sufficient to prevent a pressure rise in the tank of more than 120 percent of the design working pressure. If the tank is over thirty inches long, both ends must have the total specified safety discharge area.

(j) Storage containers for liquefied petroleum gas for permanent installation on consumer premises may be shipped by private motor carrier only under the following conditions:

(1) The containers shall comply with the construction requirements of one of the following pressure vessel codes and shall be marked to indicate compliance as specified in the code:

The 1950 Edition of the Unfired Pressure Vessel Code of the A. S. M. E., no revisions.
The 1949 Edition of the Unfired Pressure Vessel Code of the A. S. M. E.
The 1943 Edition of the joint Unfired Pressure Vessel Code of the A. P. I. and A. S. M. E.

(2) Each container shall be equipped with safety devices in compliance with the requirements for safety devices on aboveground containers as specified in the National Board of Fire Underwriters Pamphlet No. 58 "Standards for the Design, Installation and Construction of Containers and Pertinent Equipment for the Storage and Handling of Liquefied Petroleum Gases.", 1949 Edition.

(3) The containers shall be so braced or otherwise secured on the vehicle as to prevent relative motion while in transit. Valves or other fittings shall be adequately protected against injury during transportation. (See § 77.834 (g) of this chapter.)

(4) Except as provided in subparagraph (j) (5) of this paragraph, containers shall not be shipped when charged with liquefied petroleum gas to more than 5 percent of their water capacity.

(5) Storage containers of less than 1042 pounds water capacity (125 gallons) may be shipped when charged with liquefied petroleum gas in compliance with I. C. C. filling density.

SUBPART G—POISONOUS ARTICLES—DEFINITION AND PREPARATION

§ 73.325 *Classes of poisonous articles.* (a) Poisonous articles for the purpose of Parts 71–78 of this chapter are divided into four classes according to degree of hazard in transportation.

(1) Extremely dangerous poison—class A.

(2) Less dangerous poison—class B.

(3) Tear gases or irritating substances—class C.

(4) Radioactive materials—class D.

§ 73.326 *Extremely dangerous poisons—class A—poison gas label; definition.* (a) For the purpose of Parts 71–78 of this chapter extremely dangerous poisons, class A, are poisonous gases or liquids of such nature that a very small amount of the gas, or vapor of the liquid, mixed with air is dangerous to life. This class includes the following:

[1] Copies of Fetterly's formula may be obtained from the Bureau of Explosives.

(1) Chlorpicrin.
(2) Cyanogen.
(3) Cyanogen chloride containing less than 0.9 percent water.
(4) Diphosgene.
(5) Ethyldichlorarsine.
(6) Hydrocyanic acid (see Note 1 of this paragraph).
(7) Lewisite.
(8) Methyldichlorarsine.
(9) Mustard gas.
(10) Nitrogen peroxide (tetroxide).
(11) Phenylcarbylamine chloride.
(12) Phosgene (diphosgene).

NOTE 1: Diluted solutions of hydrocyanic acid of not exceeding 5 percent strength are classed as poisonous articles, class B (see § 73.343 of this part).

(b) Poisonous gases or liquids, class A, as defined in paragraph (a) of this section, except as provided in §§ 73.329 (d) and 73.331 of this part, must not be offered for transportation by rail express.

§ 73.327 *Packing.* (a) Cylinders used must comply with the provisions of §§ 73.34 and 73.301 (g) of this part.

(b) Closing and cushioning. All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed, or in any case when necessary to prevent breakage or leakage.

(c) No class A poisons in cargo tanks. No "extremely dangerous poison, class A," may be loaded into or transported in any cargo tank.

(d) It shall not be permissible to transport class A poison if there be any interconnecting means of any character between the containers.

§ 73.328 *Poisonous gases and liquids not specifically provided for.* (a) Poisonous gases and liquids, as defined in § 73.326, other than those for which special requirements are prescribed, must be packed in specification containers as follows:

(1) Spec. 33[1] or 3D (§ 78.41 of this chapter). Metal cylinders of not over 125 pounds water capacity (nominal). Gaskets if used between the protection cap and neck of cylinder must be renewed for each shipment even though they may appear to be in good condition. Cylinders not fitted with valve protection extension ring must be packed in wooden boxes complying as to construction, marking, and labeling, with the requirements of § 73.25 of this part.

§ 73.329 *Chlorpicrin and bromacetone.* (a) Chlorpicrin and bromacetone, when offered for transportation by carriers by rail freight, highway, or water must be packed in specification containers as follows:

(1) As prescribed in § 73.328 of this part.

(2) Spec. 15A, 15B, 15C, or 16A (§§ 78.168, 78.169, 78.170, or 78.185 of this chapter). Wooden boxes with inside glass bottles or tubes in hermetically sealed metal cans in corrugated fiberboard cartons, spec. 2C (§ 78.22 of this chapter). Bottles must contain not over 1 pound of liquid each, must be filled to not over 95 percent capacity, must be tightly and securely closed, and must be cushioned in cans with at least ½ inch of absorbent material. Cans must be made of metal at least 32 gauge United States standard. Total amount of liquid in outside box must not exceed 24 pounds.

(b) Chlorpicrin may also be packed in specification containers as follows:

(1) Spec. 12B (§ 78.205 of this chapter). One-piece corrugated fiberboard boxes at least 200-pound test with inside glass bottles or tubes in hermetically sealed metal cans in individual unsealed one-piece corrugated fiberboard boxes spec. 12B (§ 78.205 of this chapter) at least 200-pound test. Bottles must contain not over 1 pound of liquid each, must be filled to not over 95 percent capacity, must be tightly and securely closed and must be cushioned in cans with at least ½ inch of absorbent material. Cans must be made of metal at least 32 gauge United States standard. Total amount of liquid in outside box must not exceed 12 pounds.

(2) Spec. 12B (§ 78.205 of this chapter). One-piece corrugated fiberboard boxes at least 200-pound test with not more than one inside glass bottle or tube in a hermetically sealed metal can. Bottles must contain not over 1 pound of liquid, must be filled to not over 95 percent capacity, must be tightly and securely closed and must be cushioned in cans with at least ½ inch of absorbent material. Cans must be made of metal at least 32 gauge United States standard.

(c) Chlorpicrin or mixtures of chlorpicrin with nonpoisonous liquid, in addition to containers prescribed in paragraphs (a) and (b) of this section, when offered for transportation by carriers by rail freight, highway, or water may be shipped in specification containers as follows:

(1) Spec. 3,[1] 3A, 3B, 3C, 3E, 4A, 4B, 4C, (§§ 78.36, 78.38, 78.40, 78.42, 78.49, 78.50, 78.52 of this chapter), 7,[1] 25,[1] or 26[1] not over 250 pounds water capacity (nominal). Valves or other closing devices must be protected, to prevent injury in transit, by screw-on metal caps or by packing the cylinders in strong boxes or crates. Cylinders less than 18 inches in length or less than 5 inches in diameter must be packed in boxes or crates (see § 73.25 of this part).

(2) Spec. 5A (§ 78.81 of this chapter). Metal drums of not exceeding 33 gallons capacity with welded seams.

NOTE 1: Because of the present emergency and until further order of the Commission, drums not exceeding 55 gallons capacity with welded seams are authorized for mixtures containing not over 15 percent by volume of chlorpicrin.

(d) Chlorpicrin when offered for transportation by rail express must be packed in specification containers as follows (also authorized for transportation by carriers by rail freight, highway, or water):

(1) Spec. 15A, 15B, 15C, or 16A (§§ 78.168, 78.169, 78.170, or 78.185 of this chapter). Wooden boxes with inside glass bottles or tubes, in hermetically sealed metal cans in corrugated fiberboard cartons, spec. 2C (§ 78.22 of this chapter). Bottles must contain not over 1 pound of liquid each, must be filled to not over 95 percent capacity, must be tightly and securely closed and must be cushioned in cans with at least ½ inch of absorbent material. Cans must be made of metal at least 32 gauge United States standard. Total amount of liquid in outside box must not exceed 24 pounds.

(2) Spec. 15A (§ 78.168 of this chapter). Wooden boxes, metal-strapped, with chlorpicrin absorbed in an efficient absorbing material packed in hermetically sealed metal cans not exceeding 1 quart capacity each.

(3) Spec. 12B (§ 78.205 of this chapter). One-piece corrugated fiberboard boxes at least 200-pound test with inside glass bottles or tubes, in hermetically sealed metal cans in individual unsealed one-piece corrugated fiberboard boxes, Spec. 12B (§ 78.205 of this chapter) at least 200-pound test. Bottles must contain not over 1 pound of liquid each, must be filled to not over 95 percent capacity, must be tightly and securely closed and must be cushioned in cans with at least ½ inch of absorbent material. Cans must be made of metal at least 32 gauge United States standard. Total amount of liquid in outside box must not exceed 12 pounds.

(4) Spec. 12B (§ 78.205 of this chapter). One-piece corrugated fiberboard boxes at least 200-pound test with not more than one inside glass bottle or tube in a hermetically sealed metal can. Bottles must contain not over 1 pound of liquid, must be filled to not over 95 percent capacity, must be tightly and securely closed and must be cushioned in cans with at least ½ inch of absorbent material. Cans must be made of metal at least 32 gauge United States standard.

§ 73.330 *Chemical ammunition.* (a) Projectiles, shells, bombs, and grenades containing poisonous gases or liquids, class A, § 73.326 of this part, but not equipped or packed with ignition elements, bursting charges, detonating fuzes, or explosive components, may only be shipped by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government. Shipments must be packed and marked as required by their regulations, and packages must be labeled with the "Poison Gas" label and marked "NON-EXPLOSIVE" and with the name of the contents. (See §§ 73.53 (r) and 73.59 of this part for explosive chemical ammunition.)

(b) Chemical ammunition containing poisonous liquids or gases, class A, must not be offered for transportation by rail express.

§ 73.331 *Gas identification sets.* (a) Gas identification sets containing poisonous liquids and gases, class A, and poisonous articles, class C, and chlorine when offered for transportation by carriers by rail freight, rail express, highway, or water must be packed in spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes, under the following conditions:

(1) Gas identification sets containing poisonous liquids and gases, class A, and poisonous articles, class C, may be shipped in amounts not exceeding 5 mils, if a liquid, or 5 grams, if a solid, when

[1] Use of existing cylinders authorized, but new construction not authorized.

mixed with or absorbed in activated charcoal or silica gel, or other absorbent medium, and packed in strong glass bottles of not less than 4-fluid-ounces capacity. The poisonous gases, class A, and chlorine may be shipped if the gas itself is absorbed in activated charcoal or silica gel, or other absorbent medium, this material to be filled into 4-ounce bottles as above; each bottle as herein specified must be surrounded with appropriate absorbent cushioning material, and inclosed in a hermetically sealed metal can; each can must be surrounded on all sides by at least 1 inch of dry, fine sawdust or wood pulp; the cans must be packed in an outside wooden box, spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter); the bottles must be closed with ground-in glass stoppers securely fastened; the cushioning material around the bottle must be at least 1 inch thick; the cans must be made from metal of thickness not less than 30 gauge, United States standard; and there must be not more than a total of 100 grams or mils, or a combination of both, in each outside wooden box.

(b) Gas identification sets containing poisonous liquids or gases, class A and class C, when offered for transportation by carriers by rail freight, rail express, highway, or water must be packed for shipment as follows:

(1) The liquids or liquefied gases in hermetically sealed glass tubes containing not to exceed 40 cubic centimeters each; each tube securely cushioned and packed in an individual mailing tube with screw-thread metal cover; not more than 12 of such mailing tubes, cushioned with corrugated fiberboard, packed in a closed fiberboard container; and not to exceed 4 such fiberboard containers, containing an aggregate of not to exceed 48 glass tubes, cushioned and packed in an outside steel cylinder of not less than 0.145-inch wall thickness, which is closed by a plate, bolted to a flange, welded to cylinder wall. Suitable gasket shall be placed between flange and head plate, and closure shall be such as to prevent leakage of any gas.

§ 73.332 *Hydrocyanic acid, liquid (prussic acid) and hydrocyanic acid liquefied.* (a) Hydrocyanic acid, liquid (prussic acid) and hydrocyanic acid liquefied, must be packed in specification containers as follows:

(1) Metal drums of not over 20 gallons capacity constructed of not less than 20 gauge bodies with welded side seams and not less than 18 gauge heads double seamed or welded to bodies. Sheets for bodies and heads shall be low carbon open hearth or electric steel, or monel. Openings over 2.3 inches diameter not permitted. Flanges shall be welded, or riveted and soldered, or pressed in and soldered, to drums. Closures to be of the threaded plug or cap type and to be gas tight but may be equipped with suitable venting device. SHIPMENTS ARE AUTHORIZED FOR INTRASTATE TRANSPORTATION BY PRIVATE AND QUALIFIED CONTRACT CARRIERS BY MOTOR VEHICLE ONLY.

(2) As prescribed in § 73.328 of this part.

(3) Spec. 3A480 (§ 78.36 of this chapter). Metal cylinders of not over 125 pounds water capacity (nominal), minimum wall thickness 0.147 inch, and in no case shall the wall stress exceed 24,000 pounds per square inch when calculated by the formula in § 78.36–10 (b) of this chapter; valve protection cap must be used and be at least 3/16 inch thick, gastight, with 3/16 inch faced seat for gasket and with United States standard form thread; the cap must be capable of preventing injury or distortion of the valve when it is subjected to an impact caused by allowing cylinder, prepared as for shipment, to fall from an upright position with side of cap striking a solid steel object projecting not more than 6 inches above floor level.

(b) Cylinders must be charged with not more than 0.6 pound of liquid for 1-pound water capacity of cylinder. Each filled cylinder must be tested for leakage before shipment and must show absolutely no leakage; this test must consist in passing over the closure of the cylinder, without the protection cap attached, a piece of Guignard's sodium picrate paper to detect any escape of hydrocyanic acid from the cylinder. Other equally efficient test methods may also be used in lieu of the picrate paper.

(c) Liquid hydrocyanic acid completely absorbed in inert material may also be shipped in specification containers as follows:

(1) Spec. 15A (§ 78.168 of this chapter). Wooden boxes with inside containers consisting of metal cans, spec. 2N (§ 78.32 of this chapter), not over 14 pounds water capacity each. The liquid contents of each can must not exceed 0.33 pound of liquid for 1-pound water capacity of the can. Each can containing 4 ounces or more of liquid must be fitted with fiber caps not less than 0.08 inch thick flanged about 1 inch and fitting snugly over each end of the can. Each can must be tested for leakage after being filled and again after being maintained at ordinary room temperature for a period of at least three weeks. Each can must have its outer surface protected against rust by the use of enamel or lacquer, or each can must be completely wrapped in waterproof paper.

(2) The box lining must consist of not more than two pieces of waterproof paper, one piece completely surrounding the contents and running lengthwise of the box, and the other piece completely surrounding the contents and running crosswise of the box. In each instance, the wrapping must overlap at least 4 inches.

§ 73.333 *Phosgene or diphosgene.* (a) Phosgene or diphosgene must be packed in specification containers as follows:

(1) As prescribed in § 73.328 of this part; filling density (see § 73.308, Note 12 of this part) must not exceed 125 percent and a cylinder must not contain more than 150 pounds of phosgene.

(b) Each filled cylinder must be tested for leakage before shipment and must show absolutely no leakage; this test must consist in immersing the cylinder and valve, without the protection cap attached, in a bath of water at a temperature of approximately 150° F. for at least thirty minutes, during which time frequent examinations must be made to note any escape of gas. The valve of the cylinder must not be loosened after this test and before shipment.

§ 73.334 *Hexaethyl tetraphosphate, parathion, and tetraethyl pyrophosphate mixtures.* (a) Hexaethyl tetraphosphate, parathion, and tetraethyl pyrophosphate mixtures with compressed gas, containing not more than 10 percent by weight of hexaethyl tetraphosphate, parathion, or tetraethyl pyrophosphate must be packed in specification containers as follows:

(1) Spec. 3A300, 3B300, 4A300, 4B240, or 4BA240 (§§ 78.36, 78.38, 78.49, 78.50, or 78.51 of this chapter). Metal cylinders, charged with not more than 5 pounds of the mixture and to a maximum filling density of 80 percent of the water capacity. Cylinders must not be equipped with eduction tubes or fusible plugs. Valves must be of a type acceptable to the Bureau of Explosives.

(b) Cylinders must be packed in strong wooden boxes with valves or other closing devices protected from injury, with not more than twelve cylinders in one outside wooden box. A single-trip outside fiberboard box may be used when not more than four such cylinders are to be shipped in one outside container. Valves must be adequately protected. Box and valve protection must be of strength sufficient to protect all parts of inside containers and valves from deformation or breakage resulting from a drop of at least six feet onto a concrete floor, impacting at the weakest point.

§ 73.335 *Police grenades.* (a) Police grenades containing poisonous gases or liquids, class A, must be packed in specification containers as follows:

(1) Spec. 15A, 15B, or 15C (§§ 78.168, 78.169, or 78.170 of this chapter). Metal-strapped wooden boxes. Each grenade must be individually inclosed in a corrugated fiberboard carton, spec. 2C (§ 78.22 of this chapter), and when so packed must be able to withstand without leakage a drop of 5 feet on concrete. Grenades must consist of copper shell containing securely closed glass bottles or tubes containing not over 50 cubic centimeters of poisonous material. Each outside container may contain not over 24 grenades and weigh not over 75 pounds gross.

(b) Pending approval by the Commission of regulations classifying the numerous devices within the general descriptions of this section, and providing appropriate restrictions to be observed in the transportation thereof, no shipment of packages containing articles under this section shall be made until samples thereof have been examined by the Bureau of Explosives or by other competent testing laboratory in the presence of representative of the Bureau of Explosives, and the shipment is shown to possess such resistance to shocks of transportation and protection against leakage of contents as are afforded by standard types of packages described in Part 78 of this chapter, and the packages are labeled or marked to show compliance with this part.

§ 73.336 *Nitrogen dioxide, liquid (nitrogen peroxide, tetroxide).* (a) Nitrogen dioxide, liquid (nitrogen peroxide, tetroxide), must be packed in specification containers as follows:

(1) As prescribed in § 73.328 of this part.

(2) Spec. 3A480 (§ 78.36 of this chapter) or 25.[1] Metal cylinders with valve removed; valve opening to be closed by means of a solid metal plug with tapered thread properly luted to prevent leakage; valve protection cap must be used and be at least 3/16 inch thick, gastight, with 3/16 inch faced seat for gasket and with United States standard form thread. Use of this container will be permitted because of the present emergency and until further order of the Commission.

(3) Spec. 106A500 (§ 78.275 of this chapter). Tank cars. Each container must be equipped with valve protection caps, gastight, which must be approved by the Bureau of Explosives; containers must not be equipped with safety devices of any type; containers must be filled so that they will not be liquid full at 130° F.

§ 73.343 *Less dangerous poisons, class B, liquid or solid, poison label; definition.* (a) For the purpose of Parts 71–78 of this chapter and except as otherwise provided in this part class B poisons are substances, liquids or solids (including pastes and semi-solids), other than classes, A, C, or D poisons which are known to be so toxic to man as to afford a hazard to health during transportation, or which, in the absence of adequate data on human toxicity, are presumed to be toxic to man because they fall within any one of the following categories when tested on laboratory animals:

(1) *Oral toxicity.* Those which produce death within 48 hours in half or more than half of a group of 10 or more white laboratory rats weighing 200 to 300 grams at a single dose of 50 milligrams or less per kilogram of body weight, when administered orally.

(2) *Toxicity on inhalation.* Those which produce death within 48 hours in half or more than half of a group of 10 or more white laboratory rats weighing 200 to 300 grams, when inhaled continuously for a period of one hour or less at a concentration of 2 milligrams or less per liter of vapor, mist, or dust, provided such concentration is likely to be encountered by man when the chemical product is used in any reasonable foreseeable manner.

(3) *Toxicity by skin absorption.* Those which produce death within 48 hours in half or more than half of a group of 10 or more rabbits tested at a dosage of 200 milligrams or less per kilogram body weight, when administered by continuous contact with the bare skin for 24 hours or less.

(b) The foregoing categories shall not apply if the physical characteristics or the probable hazards to humans as shown by experience indicate that the substances will not cause serious sickness or death. Neither the display of danger or warning labels pertaining to use nor the toxicity tests set forth above shall prejudice or prohibit the exemption of any substances from the provisions of Parts 71–78 of this chapter.

§ 73.344 *Packing for class B poisons, liquid.* (a) Closing and cushioning. All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed, or in any case when necessary to prevent breakage or leakage.

(b) *Outage.* Outage for containers of liquid poison for transportation by carriers by rail freight, rail express, highway, or water must be as follows:

(1) Containers must not be entirely filled. Sufficient interior space must be left vacant to prevent leakage or distortion of containers due to the expansion of the contents from increase of temperature during transit.

(2) The proper vacant space (outage) in a tank car or other shipping container depends on the coefficient of expansion of the liquid and the maximum increase of temperature to which it will be subjected in transit. Outage must be calculated to the total capacity of the container.

(3) Liquid poison must not be loaded into domes of tank cars.

(4) In tank cars, outage must be calculated to percentage of the total capacity of the tank, i. e., shell and dome capacity combined. If the dome of the tank car does not provide sufficient outage, then vacant space must be left in the shell to make up the required outage.

(5) The outage for tank cars must not be less than 1 percent.

(6) No cargo tank or compartment thereof used for the transportation of any liquid poison shall be completely filled; sufficient space shall be left vacant in every case to prevent leakage from or distortion of any such cargo tank by expansion of the contents due to rise in temperature in transit, and such free space (outage) shall be sufficient in every case so that such cargo tank shall not become entirely filled with the liquid at 130° F.

§ 73.345 *Exemptions for poisonous liquids, class B.* (a) Poisonous liquids, class B, as defined in § 73.343 of this part, except those as enumerated in paragraph (b) of this section, in tightly closed inside containers, securely cushioned when necessary to prevent breakage and packed as follows, are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, rail express, or highway, but when for transportation by carrier by water are exempt from specification packaging, marking other than name of contents, and labeling requirements:

(1) In glass or earthenware containers not over 1 quart capacity each, or in metal containers not over 1 gallon capacity each, packed in strong outside wooden boxes or barrels.

(2) In glass or earthenware containers not over 1 pint capacity each, or in metal containers not over 1 quart capacity each, packed in strong outside fiberboard boxes.

(b) The following articles in any quantity are not exempt from any of the provisions of this part:

(1) Aniline oil.
(2) Hydrocyanic acid solutions.
(3) Methyl bromide.
(4) Motor fuel anti-knock compound.
(5) Phenyldichlorarsine.
(6) Tetraethyl lead.

§ 73.346 *Poisonous liquids not specifically provided for.* (a) Poisonous liquids as defined in § 73.343 of this part, other than those for which special requirements are prescribed, must be packed in specification containers as follows:

(1) Spec. 5, 5A, or 5B (§§78.80, 78.81, or 78.82 of this chapter). Metal barrels or drums, with openings not exceeding 2.3 inches in diameter.

(2) Spec. 17C or 17E (§ 78.115 or 78.116 of this chapter). Metal drums (single-trip containers), with openings not exceeding 2.3 inches in diameter.

(3) Spec. 37D (§ 78.125 of this chapter). Metal drums (single-trip containers), welded side seams, openings not over 2.3 inches in diameter, capacity not over 10 gallons:

(4) Spec. 37E (§ 78.126 of this chapter). Metal drums, single-trip containers, with welded side seams, not over 5 gallons; authorized for pastes only.

(5) Spec. 10A, 10B, or 10C (§§ 78.155, 78.156, or 78.157 of this chapter). Wooden barrels or kegs.

(6) Spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter). Wooden barrels or kegs with glass or earthenware inside containers, not over 1 gallon capacity each, or with metal inside containers not over 2 gallons capacity each.

(7) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with glass or earthenware inside containers not over 1 quart capacity each, or with metal inside containers not over 1 gallon capacity each. Packages containing glass or earthenware containers must not weigh over 65 pounds gross.

(8) Spec. 12D (§ 78.207 of this chapter). Fiberboard boxes with inside container which must be glass or earthenware not over one gallon each; authorized for not more than 75 pounds gross weight; not to contain more than 4 such inside containers if their capacity is greater than 5 pints each. Use of this container will be permitted because of the present emergency and until further order of the Commission.

(9) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass or earthenware inside containers not over 1 gallon capacity each, except that inside containers up to 3 gallons are authorized when only one is packed in each outside container; or with metal inside containers, not over 10 gallons capacity each.

(10) Spec. 103 or 103A (§§ 78.265 or 78.266 of this chapter). Tank cars.

(11) Cylinders as prescribed for any compressed gas, except acetylene, are also authorized.

(12) Spec. MC 300, MC 301, MC 302, or MC 303 (§§ 78.321, 78.322, 78.323 or 78.324 of this chapter). Tank motor vehicles.

(13) Spec. 1A (§ 78.1 of this chapter). Boxed glass carboys with capacity not over 5 gallons. Must be closed, and when reused must be reconditioned and tested, as provided in the specification.

[1] Use of existing cylinders authorized, but new construction not authorized.

Use of this container will be permitted because of the present emergency and until further order of the Commission.

§ 73.347 *Aniline oil.* (a) Aniline oil must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with metal inside containers not over 10 gallons capacity each, or glass bottles not over 1 pound capacity each. Not more than 25 of these bottles shall be packed in any outside container.

NOTE 1: Because of the present emergency and until further order of the Commission glass bottles not over 5 pounds capacity each and not more than 6 of these bottles packed in one outside container are authorized.

(2) Spec. 103 or 103A (§§ 78.265 or 78.266 of this chapter). Tank cars.

(3) Spec. MC 300, MC 301, MC 302, or MC 303 (§§ 78.321, 78.322, 78.323, or 78.324 of this chapter). Tank motor vehicles.

(4) Spec. 5, 5A, or 5B (§§ 78.80, 78.81, or 78.82 of this chapter). Metal barrels or drums. Net weight in 110 gallon drums must not exceed 915 pounds.

(5) Spec. 17C (§ 78.115 of this chapter). Metal drums (single-trip).

(6) Spec. 17E (§ 78.116 of this chapter). Metal drums (single-trip) not over 5 gallons capacity each.

(b) Openings in metal barrels or drums must not exceed 2.3 inches in diameter.

(1) Gaskets not less than one-eighth inch thick must be used at bung and filling holes. Gaskets must be made of hard fiber impregnated with glycerin, metal-covered cork, impregnated asbestos sheets, or metal-covered asbestos.

(c) Filled drums must be so placed that bungs will be subjected to hydrostatic head of oil contained therein for a period of not less than 12 hours.

(1) The exterior of filled drums must be carefully examined for evidence of aniline oil, any traces of which must be removed by washing off with water or, preferably, weak acetic acid. The space between rolling hoops immediately around the bung should be painted to aid in the detection of leaks at this point.

(d) All returnable drums must bear the following notice, "PREVENT DAMAGE TO FOODSTUFFS OR OTHER FREIGHT. DRAIN THIS DRUM THOROUGHLY. TIGHTEN BUNGS, WITH GASKET, SECURELY IN PLACE BEFORE RETURNING. USE NEW GASKETS WHEN NECESSARY. ANILINE OIL STAINS ON THE OUTSIDE OF DRUMS SHOULD BE WASHED OFF WITH WATER OR, PREFERABLY, WEAK ACETIC ACID", shellacked to head of drum near the consignee's name and address.

§ 73.348 *Arsenic acid.* (a) Arsenic acid must be packed in specification containers as follows:

(1) As prescribed in § 73.346 of this part. When shipped in metal barrels or drums, or tank motor vehicles or tank cars, without lead lining, the arsenic acid must contain not over 0.05 percent nitric acid.

(2) Spec. 1A, 1C, or 1D (§§ 78.1, 78.3, or 78.4 of this chapter). Glass carboys in boxes or kegs which must be closed, and when reused must be reconditioned and tested, as provided in the specification.

§ 73.349 *Carbolic acid (phenol) liquid.* (a) Carbolic acid (phenol) liquid (liquid tar acid containing over 50 percent benzo-phenol), must be packed in specification containers as follows:

(1) As prescribed in § 73.346 of this part.

(2) Specification 1A, 1C, or 1D (§§ 78.1, 78.3, or 78.4 of this chapter). Glass carboys in boxes or kegs, which must be closed, and when reused must be reconditioned and tested, as provided in the specification.

§ 73.350 *Chemical ammunition.* (a) Chemical ammunition consisting of projectiles, shells, bombs, grenades and other containers filled with gases, liquids, or chemicals, class B, poison, without ignition elements, bursting charges, detonating fuzes, or other explosive components, must be packed for shipment in strong outside wooden or metal boxes. Boxes must be marked with name of contents and labeled as prescribed by this part for gases, liquids, or chemicals contained therein.

(b) Chemical ammunition, when shipped as such, must not be equipped or packed with explosive or ignition elements. (See §§ 73.53 (r) and 73.59 of this part for explosive chemical ammunition.)

§ 73.351 *Hydrocyanic acid solutions.* (a) Hydrocyanic acid solutions must be in glass bottles not over 1 pound capacity each for solutions of not over 5 percent strength and not over 5 pounds capacity each for solutions of not over 2 percent strength, and must be packed in specification containers as follows:

(1) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes.

(2) Spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter). Wooden barrels or kegs.

§ 73.352 *Liquid sodium or potassium cyanide.* (a) Liquid sodium or potassium cyanide must be packed in specification containers as follows:

(1) Spec. 5, 5A, or 5B (§§ 78.80, 78.81, or 78.82 of this chapter). Metal barrels or drums without galvanizing inside, with openings not exceeding 2.3 inches in diameter.

(2) Spec. 17E or 37D (§§ 78.116 or 78.125 of this chapter) (single-trip). Metal drums with welded side seams, with openings not exceeding 2.3 inches in diameter.

(3) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with inside glass or earthenware containers not over 1 gallon capacity each, or inside metal containers not over 10 gallons capacity each, and without galvanizing.

(4) Spec. 103 or 103A (§§ 78.265 or 78.266 of this chapter). Tank cars.

(5) Spec. MC 300, MC 301, MC 302, or MC 303 (§§ 78.321, 78.322, 78.323, or 78.324 of this chapter). Tank motor vehicles.

§ 73.353 *Methyl bromide.* (a) Methyl bromide must be packed in specification containers as follows:

(1) Spec. 5A (§ 78.81 of this chapter). Metal drums not exceeding 30 gallons capacity or metal drums of bilge type not exceeding 33 gallons capacity and with openings not exceeding 2.3 inches in diameter. Use of these containers will be permitted because of the present emergency and until further order of the Commission.

(2) Spec. 15A, 15B, 15C, 16A, 19A, or 12B (§§ 78.168, 78.169, 78.170, 78.185, 78.190, or 78.205 of this chapter). Wooden, wire-bound wooden, or fiberboard boxes, with inside metal cans containing not over 1 pound each; outage required so cans shall not become liquidfull at 130° F. Cans must be made with body of at least 90-pound tin plate, with concave or pressure ends at least 107-pound tin plate, with all seams soldered or lined to prevent leakage, and with strength to withstand at least 130 pounds interior pressure without leakage.

(3) Spec. 3A300, 3B300, 3E1800, or 4B300 (§§ 78.36, 78.38, 78.42, or 78.50 of this chapter). Metal cylinders of not over 125 pounds water capacity (nominal). Valves or other closing devices must be protected, to prevent injury in transit, by screw-on metal caps or by packing the cylinders in strong boxes or crates. Cylinders less than 18 inches in length or less than 5 inches in diameter must be packed in boxes or crates. (See § 73.25 of this part).

NOTE 1: Because of the present emergency and until further order of the Commission, metal cylinders under this subparagraph, of not over 254 pounds water capacity (nominal), are authorized.

(4) Spec. 4D300 (§ 78.53 of this chapter). Metal spheres for aircraft use only, must be equipped with approved safety devices and must be packed in strong boxes or crates (see § 73.25 of this part).

(5) Spec. 104A or 106A500 (§§ 78.270 or 78.275 of this chapter). Tank cars.

(b) Outage must be sufficient to prevent tank car from becoming entirely filled with liquid at the following temperature: Spec. 104A (§ 78.270 of this chapter), at 105° F., spec. 106A500 (§ 78.275 of this chapter), at 130° F.

(c) Outage must be sufficient to prevent cylinders or spheres from becoming entirely filled with liquid at 130° F. and when the vacant space (outage) is charged with nitrogen, carbon dioxide, or air the pressure in the cylinder or sphere at 130° F. must not exceed 5/4 the marked service pressure of the cylinder or sphere.

§ 73.354 *Motor fuel antiknock compound or tetraethyl lead.* (a) Motor fuel antiknock compound or tetraethyl lead must be packed in specification containers as follows:

(1) Spec. 15A (§ 78.168 of this chapter). Wooden boxes with inside glass or earthenware containers of not over 1 pint capacity each, or metal cans, inclosed in hermetically sealed (soldered) metal cans, spec. 2A (§ 78.20 of this chapter).

(2) Spec. 5 or 5A (§§ 78.80 or 78.81 of this chapter). Metal barrels or drums, with openings not exceeding 2.3 inches in diameter.

(3) Cylinders as prescribed for any compressed gas, except acetylene.

(4) Spec. 105A300 (§ 78.271 of this chapter). Tank cars. Stenciled on

both sides of the tanks, "For Motor Fuel Antiknock Compound Only".

(5) Spec. MC 300, MC 301, MC 302, or MC 303 (§§ 78.321, 78.322, 78.323, or 78.324 of this chapter). Tank motor vehicles.

(b) Outage must be sufficient to prevent any container from becoming entirely filled with liquid at 130° F.

(c) Tank cars or tank motor vehicles are not authorized for tetraethyl lead.

§ 73.355 *Phenyldichlorarsine.* (a) Phenyldichlorarsine must be packed in specification containers as follows:

(1) Spec. 5A (§ 78.81 of this chapter), Metal barrels or drums, made of not less than 12 gauge steel, and limited to 30 gallons capacity, with openings not exceeding 2.3 inches in diameter. Each metal barrel or drum must be tested, before each filling to 20 pounds hydrostatic test.

§ 73.363 *Packing for class B poisons, solid.* (a) Closing and cushioning. All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed, or in any case when necessary to prevent breakage or leakage.

(b) Testing inside containers. All inside containers, except those made of glass, must be able to pass a test by dropping, after filling, from a height of 4 feet to solid concrete without rupture or sifting of contents, except that for bags with contents weighing 25 pounds, a drop test of 2 feet is required.

§ 73.364 *Exemptions for poisonous solids, class B.* (a) Poisonous solids, class B, except cyanides, other than as specified in § 73.370 (b) of this part, in tightly closed inside containers, securely cushioned when necessary to prevent breakage and packed as follows, are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, rail express, or highway, but when for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements:

(1) In inside glass, earthenware, or composition bottles or jars, or metal containers, or lock-corner sliding-lid wooden boxes, of not over 5 pounds capacity each, or chipboard, pasteboard, or fiber cartons, cans, or boxes, of not over 1 pound capacity each, packed in outside wooden or fiberboard boxes, or wooden barrels or kegs. Net weight of contents of outside container, not over 100 pounds.

(2) In inside chipboard, pasteboard, or fiber cartons, cans, or boxes, of not over 5 pounds capacity each, packed in outside fiberboard or wooden boxes. Not more than 5 of these cartons shall be packed in any outside container.

§ 73.365 *Poisonous solids not specifically provided for.* (a) Poisonous solids, as defined in § 73.343 of this part, other than those for which special requirements are prescribed, must be packed in specification containers as follows:

(1) Spec. 5, 5A, 5B, 6A, 6B, or 6C (§§ 78.80, 78.81, 78.82, 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(2) Spec. 17E, 17H, or 37D (§§ 78.116, 78,118, or 78.125 of this chapter). Metal drums (single-trip). Gross weight not over 300 pounds (see Note 1). For materials fused solid in the drum a gross weight of 880 pounds is authorized.

NOTE 1: Because of the present emergency and until further order of the Commission, the gross weight limit may be increased to not over 375 pounds.

(3) Spec. 37H (§ 78.129 of this chapter). Metal drums (single-trip). Net weight not over 200 pounds each.

(4) Spec. 10A, 10B, or 10C (§§ 78.155, 78.156, or 78.157 of this chapter). Wooden barrels or kegs lined with creped-paper bag, spec. 2J (§ 78.28 of this chapter). Liner may be omitted if material is not pulverized or liable to sift.

NOTE 1: Because of the present emergency and until further order of the Commission, wooden whiskey barrels, with char removed and properly recoopered, which comply with all the provisions of spec. 10B, are also authorized. Marking is required on the head of each container, by the reconditioner, by hot branding iron, as follows:

ICC–10B.

Name or symbol (letters) of reconditioner; this must be registered with the Bureau of Explosives and located just above, below, or following the mark ICC–10B.

Size of markings (minimum): ¾-inch high.

(5) Spec. 11A (§ 78.160 of this chapter). Wooden barrels or kegs, tongued and grooved, net weight of contents not over 115 pounds each.

(6) Spec. 12B or 12C (§§ 78.205 or 78.206 of this chapter). Fiberboard boxes, with inside containers which must be metal cans not over 25 pounds capacity each; glass bottles not over 1 gallon capacity each; fiber cans or boxes, spec. 2G (§ 78.26 of this chapter); sliding-top wooden boxes, lined to prevent sifting, not over 25 pounds capacity each; or paper bags, spec. 2D (§ 78.23 of this chapter). Packages containing glass or earthenware containers must not weigh over 65 pounds gross nor contain more than 4 inside containers of over 5 pints capacity each. Outside containers must be not over 5,000 cubic inches capacity nor contain over 50 pounds net weight each, except as provided in § 78.205–23 of this chapter.

TEST: The completed package prepared as for shipping must be capable of standing a drop of 4 feet to solid concrete without breakage of the container or any sifting of contents.

(7) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with securely closed inside fiberboard or chipboard boxes not over 6 pounds net weight each. Interior containers must be at least .028 inches thick for those not over 2½ pounds net weight each and at least .034 inches thick for others. Outside packages must contain not over 36 pounds net weight of material each.

TEST: The individual interior containers as well as the completed package prepared as for shipping must be capable of standing a drop of 4 feet to solid concrete without breakage of the container or any sifting of contents.

(8) Spec. 15A (§ 78.168 of this chapter). Wooden boxes, with inside containers which must be securely closed paper bags, placed within a waterproof duplex bag, spec. 2J (§ 78.28 of this chapter). Net weight of material in one outside box, not over 100 pounds.

(9) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes, with inside containers which must be metal cans not over 25 pounds capacity each; glass or earthenware containers not over 1 gallon capacity each; except that inside containers of not over 5 gallons each and containing not over 25 pounds net weight are authorized when only one inside container is packed in each outside container. Fiber cans or boxes, spec. 2G (§ 78.26 of this chapter), or sliding-top wooden boxes, lined to prevent sifting, not over 25 pounds capacity each. Net weight of material in outside container, not over 100 pounds each.

(10) Spec. 18B (§78.193 of this chapter). Wooden kits lined as prescribed by spec. 2K. (§ 78.29 of this chapter.) Net weight not over 30 pounds each.

(11) Spec. 21A (§ 78.222 of this chapter). Fiber drums. Net weight not over 115 pounds each.

NOTE 1: Because of the present emergency and until further order of the Commission, use is permitted of spec. 21A (§ 78.222 of this chapter) fiber drums, that will withstand two drops from height of 4 feet in same spot or one 6-foot drop, in place of drop test as provided in specification 21A. Maximum loaded capacity 225 pounds net.

(12) Spec. 22A (§ 78.196 of this chapter). Plywood drums. Net weight not over 115 pounds each.

(13) Spec. 103 or 103A (§§ 78.265 or 78.266 of this chapter). Tank cars.

(14) Spec. 21B (§ 78.223 of this chapter). Fiber drums.

§ 73.366 *Arsenic (arsenic trioxide) or arsenic acid (solid).* (a) Arsenic (arsenic trioxide) or arsenic acid (solid) must be packed in specification containers as follows:

(1) As prescribed in § 73.365 of this part.

(2) Spec. 10A, 10B, or 10C (§§ 78.155, 78.156, or 78.157 of this chapter). Wooden barrels or kegs with tongued-and-grooved staves; a 4½-inch metal bung in the head is permitted; lining not required.

(3) Spec. 37E (§ 78.126 of this chapter). Metal drums not over 100 pounds each.

(b) Import shipments of arsenic (arsenic trioxide) may also be shipped when packed as follows:

(1) Inclosed in strong waterproofed cloth containers, securely sewn and closed so as to provide a sift-proof package, and then packed in strong, tight, metal-strapped wooden boxes constructed of material not less than three-fourths inch thick throughout.

(2) In strong and tight metal drums inclosed in a strong outside wooden barrel.

§ 73.367 *Arsenical compounds n. o. s., arsenate of lead, calcium arsenate, Paris green, and arsenical mixtures.* (a) Arsenical compounds n. o. s., arsenate of lead, calcium arsenate, Paris green, and arsenical mixtures must be packed in specification containers as follows:

(1) As prescribed in § 73.365 of this part.

NOTE 1: Because of the present emergency and until further order of the Commission, wooden hoops as specified in § 78.160–6 of this chapter may be used in lieu of steel hoops required by specification 10B (§ 78.156 of this chapter).

(2) Spec. 36A or 36B (§§ 78.230 or 78.233 of this chapter). Triplex bags. Authorized only for arsenical insecticides and fungicides containing 10.0 percent or less or arsenic trioxide.

(3) Spec. 44B (§ 78.236 of this chapter). Multiwall paper bags with inside paper bags, spec. 2D (§ 78.23 of this chapter). Net weight not over 50 pounds each.

(4) Spec. 44C, (§ 78.237 of this chapter). Multiwall paper bags. For carload and truckload shipments only. Net weight not over 50 pounds each.

(5) Spec. 44D (§ 78.238 of this chapter). Multiwall paper bags. For less-than-carload and less-than-truckload shipments. Net weight not over 50 pounds each.

(b) Arsenical compounds n. o. s. containing not more than 6 percent arsenic of which not more than 0.25 percent is water soluble must be packed in specification containers as follows:

(1) As prescribed in paragraph (a) (1), (2), or (3) of this section.

(2) Spec. 44B (§ 78.236 of this chapter). Paper bags with two added inside thicknesses of No. 1 Kraft paper, one sheet having a Mullen test of 50 and the other sheet having a Mullen test of 40. Net weight not over 50 pounds each.

§ 73.368 *Arsenical dust, arsenical flue dust, and other poisonous noncombustible by-product dusts.* (a) Arsenical dust, arsenical flue dust, and other poisonous noncombustible by-product dusts from metal recovery operations not subject to dangerous spontaneous heating, and arsenic trioxide, or sodium arsenate, when delivery is made to plants with private sidings, only, may, in addition to containers prescribed in § 73.367 of this part, be shipped in sift-proof, self-clearing, hopper or bottom outlet steel cars or in sift-proof all steel flat bottom gondola cars with fixed sides and ends equipped with water-proof and dust-proof wooden or steel covers well secured in place for all openings, or in sift-proof box cars of all steel construction only when said cars are assigned exclusively to this service. See § 74.566 (b) of this chapter for cleaning cars. Such cars, when exclusively in this service, are not subject to the requirements of § 74.566 (b) of this chapter.

(b) Arsenical dust and arsenic trioxide may be shipped in bulk in motor vehicles with steel, sift-proof, self-clearing hopper-type or dump-type bodies, with waterproof and dust-proof covers, well secured in place.

§ 73.369 *Carbolic acid (phenol), not liquid.* (a) Carbolic acid (phenol), not liquid, must be packed in specification containers as follows:

(1) Spec. 5, 5A, 5B, 6A, 6B, or 6C (§§ 78.80, 78.81, 78.82, 78.97, 78.98, 78.99 of this chapter). Metal barrels or drums.

(2) Spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter). Wooden barrels or kegs with securely closed inside drums of metal not thinner than No. 26 gauge, the space between drum and barrel or keg being filled with sawdust or rice hulls.

(3) Spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter). Wooden barrels or kegs with glass or earthenware inside containers, not over 1 gallon capacity each, or with metal inside containers not over 2 gallons capacity each.

(4) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with inside containers which must be metal cans not over 25 pounds capacity each.

(5) Spec. 12B (§ 78.205 of this chapter). Fiberboard boxes with glass or earthenware inside containers not over 1 quart capacity each, or with metal inside containers not over 1 gallon capacity each. Packages containing glass or earthenware containers must not weigh over 65 pounds gross.

(6) Spec. 12D (§ 78.207 of this chapter). Fiberboard boxes with inside containers which must be: Glass or earthenware not over 1 gallon each; authorized for not more than 75 pounds gross weight; not to contain more than 4 such inside containers if their capacity is greater than 5 pints each. Use of this container will be permitted because of the present emergency and until further order of the Commission.

(7) Spec. 15A, 15B, 15C, 16A, or 19A (§§ 78.168, 78.169, 78.170, 78.185, or 78.190 of this chapter). Wooden boxes with glass or earthenware inside containers not over 1 gallon capacity each, except that inside containers up to 3 gallons are authorized when only one is packed in each outside container; or with metal inside containers, not over 10 gallons capacity each.

(8) Spec. 15A, 15B, or 15C (§§ 78.168, 78.169, or 78.170 of this chapter). Wooden boxes with metal inside containers, Spec. 2F (§ 78.25 of this chapter), not over 250 pounds total capacity each.

(9) Spec. 17E, 17H, or 37D (§§78.116, 78.118, or 78.125 of this chapter). Metal drums (single-trip). Net weight not over 475 pounds.

(10) Spec. 37G (§ 78.128 of this chapter). Metal drums securely cushioned with sawdust or rice hulls in outside wooden barrels, net weight of contents not over 250 pounds. Outside containers must be marked as prescribed in § 73.25 of this part.

(11) Spec. 37H (§ 78.129 of this chapter). Metal drums (single-trip). Net weight not over 200 pounds each.

(12) Spec. 42B or 42C (§§ 78.107 or 78.108 of this chapter). Aluminum drums.

(13) Spec. 103, 103W, 103A, or 103A–W (§§ 78.265, 78.280, 78.266, or 78.281 of this chapter). Tank cars.

(14) Spec. MC 300, MC 301, MC302, or MC303 (§§ 78.321, 78.322, 78.323, or 78.324 of this chapter). Tank motor vehicles.

§ 73.370 *Cyanides, or cyanide mixtures.* (a) Cyanides, or cyanide mixtures, if containing the cyanogen equivalent of 10 percent or more of potassium cyanide, must be packed in specification containers as follows (see par. (b) of this section for exemptions):

(1) Spec. 15A, 15B, or 15C (§§ 78.168, 78.169, or 78.170 of this chapter). Wooden boxes with metal inside containers, spec. 2F (§ 78.25 of this chapter), not over 25 pounds capacity each; or hermetically sealed (soldered) metal lining, spec. 2F (§ 78.25 of this chapter) or in glass bottles not over 5 pounds capacity each.

(2) Spec. 11A or 11B (§§ 78.160 or 78.161 of this chapter). Wooden barrels with metal inside containers, spec. 2F (§ 78.25 of this chapter) not over 25 pounds capacity each; or hermetically sealed (soldered), metal lining, spec. 2F (§ 78.25 of this chapter).

(3) Spec. 12B or 12C (§§ 78.205 or 78.206 of this chapter). Fiberboard boxes with metal inside containers, spec. 2F (§ 78.25 of this chapter) not over 25 pounds capacity each.

(4) Spec. 5, 5A, 5B, 6A, 6B, or 6C (§§ 78.80, 78.81, 78.82, 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(5) Spec. 37H (§ 78.129 of this chapter). Metal drums (single-trip container), watertight; must be hermetically sealed when used for *calcium cyanide.*

(6) Bulk in watertight metal cars or in watertight container car metal containers.

(7) Spec. 37D (§ 78.125 of this chapter). Metal drums (single-trip), with welded side seams; all seams and closure must be watertight; maximum net weight not over 100 pounds.

(8) Spec. 45B (§ 78.240 of this chapter). Bags, cloth, and paper, lined. Authorized only for sodium cyanides of globular or pellet form, diameter not less than ¾ inch. Net weight not over 100 pounds.

(9) Bulk in watertight metal-bodied covered motor vehicles.

(10) Spec. 21A (§ 78.222 of this chapter). Fiber drums which must be lined or coated, or otherwise treated so as to prevent the entrance of moisture in quantities sufficient to create a hazardous condition in transportation; drums to withstand two drops from height of 4 feet in same spot or one 6-foot drop, in place of drop test as provided in spec. 21A (§ 78.222 of this chapter); maximum loaded capacity 225 pounds net. Use of this container will be permitted because of the present emergency and until further order of the Commission.

(11) Spec. 21B (§ 78.223 of this chapter). Fiber drums.

(b) *Cyanides; exemptions.* Cyanides when packed and described as follows are exempt from specification packaging and labeling requirements:

(1) Cyanides, or cyanide mixtures, in tightly closed glass, earthenware, or metal inside containers, not over one pound each, securely cushioned when necessary to prevent breakage, and packed in outside wooden or fiberboard boxes, or in wooden barrels. Net weight of cyanides or cyanide mixtures in any outside container, not over 25 pounds.

(2) Cyanide mixtures in tightly closed glass, earthenware, or metal inside containers, securely cushioned when necessary to prevent breakage, and packed in outside wooden or fiberboard boxes or in wooden barrels. Net weight of cyanide mixtures in any outside container, not over 5 pounds.

(3) Cyanides of copper, zinc, lead and silver.

§ 73.371 *Dinitrobenzol.* (a) Dinitrobenzol must be packed in specification containers as follows:

(1) As prescribed in § 73.365 of this part.

(2) Spec. 11A (§ 78.160 of this chapter). Wooden barrels, gross weight 300 pounds; must be shipped in carload or truckload shipments only and must not be offered for transportation by carriers by rail express or water.

§ 73.372 *Mercury bichloride.* (a) Mercury bichloride must be packed in specification containers as follows:

(1) As prescribed in § 73.365 of this part.

(2) Spec. 15A (§ 78.168 of this chapter). Wooden boxes with inside containers consisting of strong paper bags in tightly closed inside wooden boxes.

§ 73.373 *Paranitraniline.* (a) Paranitraniline must be packed in specification containers as follows:

(1) As prescribed in § 73.365 of this part.

(2) Spec. 11A (§ 78.160 of this chapter). Wooden barrels, gross weight 385 pounds; must be shipped in carload or truckload shipments only, and must not be offered for transportation by carriers by rail express or water.

(3) Spec. 21A (§ 78.222 of this chapter). Fiber drums, gross weight 400 pounds; side walls must be of at least 10-ply construction having strength not less than 1,200 pounds Mullen or Cady test; in addition to tests prescribed by § 78.222–4 (a) of this chapter, a drum must withstand two drops from a height of 6 feet to solid concrete, the first drop to be made diagonally on bottom chime and the second drop diagonally on the top chime; when heads are made of wood, the grain of the wood must run parallel to concrete surface.

§ 73.374 *Nitrochlorbenzene, meta or para.* (a) Nitrochlorbenzene, meta or para, must be packed in specification containers as follows:

(1) As prescribed in § 73.365 of this part.

(2) Spec. 21A (§ 78.222 of this chapter). Fiber drums, authorized only for nitrochlorbenzene, para, flaked, gross weight 400 pounds; side walls must be of at least 10-ply construction having strength not less than 1,200 pounds Mullen or Cady test; in addition to tests prescribed by § 78.222–4 (a) of this chapter, a drum must withstand two drops from a height of 6 feet to solid concrete, the first drop to be made diagonally on bottom chime and the second drop diagonally on the top chime; when heads are made of wood, the grain of the wood must run parallel to concrete surface.

§ 73.375 *Sodium azide.* (a) Sodium azide must be packed in specification containers as follows:

(1) Spec. 15A (§ 78.168 of this chapter). Wooden boxes, with inside containers which must be securely closed paper bags, placed within a waterproof duplex bag, spec. 2J (§ 78.28 of this chapter). Net weight of material in one outside box, not over 100 pounds.

NOTE 1: Because of the present emergency and until further order of the Commission, uncreped bags may be used.

§ 73.376 *Perchloro - methyl - mercaptan.* (a) Perchloro-methyl-mercaptan in any quantity must not be packed with any other article. When offered for transportation by carriers by rail freight, highway, or water must be packed in specification containers as follows:

(1) Spec. 11A or 11B. (§§ 78.160 or 78.161 of this chapter.) Wooden barrels or kegs, with inside containers which must be glass bottles not over 2 quarts capacity each, individually enclosed in tightly closed metal cans and cushioned therein with incombustible material. Net weight not over 100 pounds in one outside container.

(2) Spec. 15A, 15B, 15C, or 16A. (§§ 78.168, 78.169, 78.170, or 78.185 of this chapter.) Wooden boxes, with inside containers which must be glass bottles not over 2 quarts capacity each, individually enclosed in tightly closed metal cans and cushioned therein with incombustible material. Net weight not over 100 pounds in one outside container.

§ 73.381 *Tear gas or irritating substances class C-Tear Gas Label; definition.* (a) For the purpose of Parts 71–78 of this chapter tear gases are liquid or solid substances which upon contact with fire or when exposed to air give off dangerous or intensely irritating fumes, such as brombenzylcyanide, chloracetophenone, diphenylaminechlorarsine, and diphenylchlorarsine, but not including any poisonous article, class A.

(b) All containers must be tightly and securely closed. Inside containers must be cushioned as prescribed, or in any case when necessary to prevent breakage or leakage.

(c) It shall not be permissible to transport class C poisons if there be any interconnecting means of any character between the containers.

§ 73.382 *Tear gas or irritating substances, class C, not specifically provided for.* (a) Tear gas or irritating substances, class C, as defined in § 73.381 (a) of this part for which special packing is not prescribed, must be packed in specification containers as follows:

(1) Spec. 5, 5A, or 5B (§§ 78.80, 78.81, or 78.82 of this chapter), metal barrels or drums; or spec. 17C (§ 78.115 of this chapter), metal drums (single-trip) not over 5 gallons capacity each.

(2) Spec. 6A, 6B, or 6C (§§ 78.97, 78.98, or 78.99 of this chapter). Metal barrels or drums.

(3) Spec. 15A or 15B (§§ 78.168 or 78.169 of this chapter). Wooden boxes with inside metal containers of not over 1 liquid gallon (10 pounds) capacity each. Not over 8 liquid gallons (80 pounds) of material may be packed in any outside container.

(4) Cylinders as prescribed for any compressed gas, except acetylene, are also authorized for use. These cylinders must be qualified, maintained, and filled in accordance with §§ 73.34 and 73.301 (g) of this part, if used for material with pressure exceeding 25 pounds per square inch at 70° F., they must also be retested as required by § 73.34 of this part.

(b) No class C poisons in cargo tanks. No "tear gases or irritating substances, class C" may be loaded into or transported in any cargo tank.

§ 73.383 *Chemical ammunition.* (a) Chemical ammunition consisting of projectiles, shells, bombs, and other containers, except grenades, filled with gases, liquids, or chemicals class C without ignition elements, bursting charges, detonating fuzes, or other explosive components, must be packed for shipment in strong outside wooden or metal boxes. Boxes must be marked with name of contents and labeled as prescribed by this part for the gases, liquids, or chemicals contained therein.

(b) Chemical ammunition, when shipped as such, must not be equipped or packed with explosive or ignition elements (see §§ 73.53 (r) and 73.59 of this part for explosive chemical ammunition).

§ 73.384 *Monochloracetone, stabilized.* (a) Monochloracetone, stabilized, must be packed in specification containers as follows:

(1) Spec. 5, 5A, or 17C (§§ 78.80, 78.81, or 78.115 of this chapter). Metal barrels or drums not over 5 gallons capacity each.

(2) Spec. 15A, 15B, 15C, or 16A (§§ 78.168, 78.169, 78.170, or 78.185 of this chapter). Wooden boxes with inside glass bottles or tubes in hermetically sealed metal cans in corrugated fiberboard cartons, spec. 2C (§ 78.22 of this chapter). Bottles must contain not over 1 pound of liquid each, must be filled to not over 95 percent capacity, must be tightly and securely closed, and must be cushioned in cans with at least ½ inch of absorbent material. Cans must be made of metal at least 32 gauge United States standard. Total amount of liquid in outside box must not exceed 24 pounds.

§ 73.385 *Tear gas grenades, tear gas candles, or similar devices.* (a) Tear gas grenades, tear gas candles, or similar devices containing lachrymatory (tear producing) substances, for civil or military use must be packed in specification containers as follows (see § 73.101 (d) and (e) of this part for packing tear gas cartridges):

(1) Spec. 15A, 15B, or 15C (§ 78.168, 78.169, or 78.170 of this chapter). Metal-strapped wooden boxes. Functioning elements not assembled in grenades or devices must be in a separate compartment of these boxes, or in inside or separate outside boxes, spec. 15A, 15B, or 15C (§§ 78.168, 78.169, or 78.170 of this chapter), and must be so packed and cushioned that they may not come in contact with each other or with the walls of boxes during transportation. Not more than 24 grenades and 24 functioning devices shall be packed in one outside container and the gross weight of the package must not exceed 75 pounds.

(2) Spec. 37D (§ 78.125 of this chapter). Metal drum. Functioning elements must be packed in separate compartment. Not more than 24 grenades and 24 functioning devices shall be packed in one outside container and the gross weight of the container must not exceed 75 pounds.

(b) These articles must not be assembled with or packed in the same compartment with mechanically or manually operated firing, igniting, bursting, or

other functioning elements, unless of a type or design approved by the Bureau of Explosives.

(c) Pending approval by the Commission of regulations classifying the numerous devices within the general descriptions of this section, and providing appropriate restrictions to be observed in the transportation thereof, no shipment of packages containing articles under this section shall be made until samples thereof have been examined by the Bureau of Explosives or by other competent testing laboratory in the presence of representative of the Bureau of Explosives, and the shipment is shown to possess such resistance to shocks of transportation and protection against leakage of contents as are afforded by standard types of packages described in Part 78 of this chapter, and the packages are labeled or marked to show compliance with this part.

NOTE 1: Grenades or other similar devices may be shipped completely assembled when shipments are made by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government, provided the functioning element is so packed that it cannot accidentally function. The outside containers must be metal-strapped wooden boxes, spec. 15A, 15B, or 15C (§§ 78.168, 78.169, or 78.170 of this chapter).

§ 73.391 *Radioactive materials class D Poison—Radioactive materials label; definition.* (a) For the purpose of Parts 71–78 of this chapter, radioactive material is any material or combination of materials that spontaneously emits ionizing radiation. For the purpose of Parts 71–78 of this chapter, radioactive materials are divided into three groups according to the type of rays emitted at any time during transportation, as follows:

(1) *Group I.* Radioactive materials that emit gamma rays only or both gamma and electrically charged corpuscular rays.

(2) *Group II.* Radioactive materials that emit neutrons and either or both the types of radiation characteristic of Group I materials.

(3) *Group III.* Radioactive Materials that emit electrically charged corpuscular rays only, i. e., alpha or beta, etc., or any other that is so shielded that the gamma radiation at the surface of the package does not exceed 10 milliroentgens for 24 hours at any time during transportation.

(b) Radioactive materials must not be offered for transportation by rail freight except as specifically provided in § 73.392 of this part, or except by special arrangements and under conditions approved by the Bureau of Explosives.

(c) Not more than 2,000 millicuries of radium, polonium, or other members of the radium family of elements, and not more than that amount of any other radioactive substance which disintegrates at the rate of 100,000 million (10^{11}) atoms per second may be packed in one outside container for shipment by rail express, except by special arrangements and under conditions approved by the Bureau of Explosives.

NOTE 1: For purposes of Parts 71–78 of this chapter one millicurie is that amount of any radioactive material which distintegrates at the rate of 37 million atoms per second.

§ 73.392 *Exemptions for radioactive materials.* (a) Radioactive materials are exempt from prescribed packaging, marking and labeling requirements provided they fulfill all of the following conditions:

(1) The package must be such that there can be no leakage of radioactive material under conditions normally incident to transportation.

(2) The package must contain not more than 0.1 millicuries of radium, or polonium, or that amount of strontium 89, strontium 90, or barium 140 which disintegrates at a rate of more than 5 million atoms per second; or that amount of any other radioactive substance which disintegrates at a rate of more than 50 million atoms per second.

(3) The package must be such that no significant alpha, beta, or neutron radiation is omitted from the exterior of the package and the gamma radiation at any surface of the package must be less than 10 milliroentgens for 24 hours.

(b) Manufactured articles other than liquids such as instrument or clock dials of which radioactive materials are a component part, and luminous compounds, when securely packed in strong outside containers are exempt from specification packaging, marking, and labeling requirements provided the gamma radiation at any surface of the package is less than 10 milliroentgens in 24 hours.

(c) Radioactive materials such as ores, residues, etc., of low activity packed in strong tight containers are exempt from specification packaging and labeling requirements for shipment in carload lots by rail freight provided the gamma radiation or equivalent will not exceed 10 milliroentgens per hour at a distance of 12 feet from any surface of the car and that the gamma radiation or equivalent will not exceed 10 milliroentgens per hour at a distance of 5 feet from either end surface of the car. There must be no loose radioactive material in the car, and the shipment must be braced so as to prevent leakage or shift of lading under conditions normally incident to transportation. The car must be placarded by the shipper as provided in §§ 74.541 (b), and 74.553 of this chapter. Shipments must be loaded by consignor and unloaded by consignee.

§ 73.393 *Packing and shielding.* (a) Radioactive materials that present special hazards due to their tendency to remain fixed in the human body for long periods of time (i. e., radium, plutonium, and radioactive strontium, etc.) must, in addition to the packing hereinafter prescribed, be packed in inside metal containers specification 2R (§ 78.34 of this chapter), or other container approved by the Bureau of Explosives.

(b) All radioactive materials must be so packed and shielded that the degree of fogging of undeveloped film under conditions normally incident to transportation (24 hours at 15 feet from the package) will not exceed that produced by 11.5 milliroentgens of penetrating gamma rays of radium filtered by ½ inch of lead.

(c) The design and preparation of the package must be such that there will be no significant radioactive surface contamination of any part of the container.

(d) The smallest dimension of any outside shipping container for radioactive materials must be not less than 4 inches.

(e) All outside shipping containers must be of such design that the gamma radiation will not exceed 200 milliroentgens per hour or equivalent at any point of readily accessible surface. Containers must be equipped with handles and protective devices when necessary in order to satisfy this requirement.

(f) The outside shipping container for any radioactive material unless specifically exempt by § 73.392 of this part must be a wooden box specification 15A or 15B (§§ 78.168 or 78.169 of this chapter), fiber drum specification 21A (§ 78.222 of this chapter), or a fiberboard box specification 12B (§ 78.205 of this chapter), except that equally efficient containers may be used when approved by the Bureau of Explosives.

(g) Radioactive materials Group I, liquid, solid, or gaseous, must be packed in suitable inside containers completely surrounded by a shield of lead or other suitable material of such thickness that at any time during transportation the gamma radiation at one meter (39.3 inches) from any point on the radioactive source will not exceed 10 milliroentgens per hour. The shield must be so designed that it will not open or break under conditions incident to transportation. The minimum shielding must be sufficient to prevent the escape of any primary corpuscular radiation to the exterior of the outside shipping container.

(h) Radioactive materials Group II, liquid, solid, or gaseous, must be packed in suitable inside containers completely shielded so that at any time during transportation the radiation measured at right angles to any point on the long axis of the shipping container will not exceed the limits specified in subparagraphs (1) to (4) of this paragraph. The shielding must be designed so as to maintain its efficiency under conditions normally incident to transportation and must provide personnel protection against fast or slow neutrons and all other ionizing radiation originating in the radioactive materials or any part of the aggregate constituting the complete package.

(1) Gamma radiation of 10 mrhm.

(2) Electrically charged corpuscular radiation which is the physical equivalent (see note 1 of this paragraph) of 10 mrhm. of gamma radiation.

(3) Neutron radiation which is the physical equivalent (see Note 1 of this paragraph) of 2 mrhm. of gamma radiation.

(4) If more than one of the types of radiation named in subparagraphs (1), (2), and/or (3) of this paragraph is present the radiation of each type must be reduced by shielding so that the total does not exceed the equivalent of subparagraphs (1), (2), or (3) of this paragraph.

NOTE 1: For purposes of Parts 71–78 of this chapter the "physical equivalent" of a roentgen is that amount of radiation that would be absorbed in tissue to the extent of 83 ergs per gram (mrhm. is an abbreviation for milliroentgens per hour at 1 meter (39.3 inches)).

(i) Liquid radioactive materials Groups I, II, or III must, in addition, be packed in tight glass, earthenware, or other suitable inside containers. The inside containers must be surrounded on all sides and within the shield by an absorbent material sufficient to absorb the entire liquid contents and of such nature that its efficiency will not be impaired by chemical reaction with the contents. If the container is packed in a metal container specification 2R (§ 78.34 of this chapter) or other container approved by the Bureau of Explosives, the absorbent cushioning is not required.

(j) Radioactive materials Group III, liquid, solid or gaseous, must be packed in suitable inside containers completely wrapped and/or shielded with such material as will prevent the escape of primary corpuscular radiation to the exterior of the shipping container, and secondary radiation at the surface of the container must not exceed 10 milliroentgens per 24 hours, at any time during transportation.

(k) In determining compliance with requirements of paragraphs (e), (g), (h), and (j) of this section measurements of radiation must be made with a Landsverk-Wollan Electrometer Model L–100 or equally efficient standardized meter.

§ 73.394 *Radioactive materials labels.* (a) Each outside container of radioactive material Group I or II, unless exempt by § 73.392 of this part, must be labeled with a properly executed label as described in § 73.414 (a) of this part.

(b) Each outside container of radioactive material Group III must unless exempt by § 73.392 of this part, be labeled with a properly executed label as described in § 73.414 (b) of this part.

Subpart H—Marking and Labeling Explosives and Other Dangerous Articles

Note. The markings prescribed for containers should be as near together as possible.

§ 73.400 *Explosives.* (a) Each package containing explosives must be marked with its proper shipping name as shown in § 72.5 of this chapter and such other marking as prescribed for the explosive in the shipment.

(b) Packages containing explosives must show on top the marking "THIS SIDE UP" when required by § 73.60 (e) (1) and §§ 73.63 (f) and 73.65 (i) of this part.

(c) Each package of explosives must show the name and address of the consignee except in carloads and truckloads or less-than-truckloads when handled by a motor vehicle not requiring transfer from one motor carrier to another. When offered for transportation by carrier by water each package must show the name or mark of the consignor and/or consignee.

(d) Each package of chemical ammunition, explosive, containing poisonous gases, solids or liquids, class A, class B or class C must also have securely attached to it labels prescribed by § 73.409 (a) (1), (a) (2), or (a) (3) of this part.

(1) Carload or truckload shipments of chemical ammunition, explosive, containing poisonous gases, solids or liquids, class A, class B, or class C offered for transportation by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government are exempt from labeling requirements when shipments are loaded or unloaded by the shipper or his duly authorized agent and such shipments are accompanied by qualified personnel supplied with equipment to repair leaks or other container failure which will permit escape of contents.

(e) Each shipment of samples of explosives when offered for transportation by carriers by rail express or water must bear the label prescribed by § 73.411 of this part and each shipment of special fireworks in addition to the marking prescribed by § 73.91 (i) of this part when offered for transportation by carriers by rail express or water must bear the label prescribed by § 73.410 of this part.

(f) Each shipment of smokeless powder for small arms and each shipment of smokeless powder for cannon when offered for transportation by carriers by rail express must bear the label prescribed by § 73.412 of this part.

(g) Each package of explosives must be marked with the I. C. C. specification number as prescribed by the specification, if an I. C. C. specification container is required.

§ 73.401 *Dangerous articles.* (a) Packages containing flammable liquids, flammable solids, oxidizing materials, corrosive liquids, compressed gases, and poisons, as defined in this part must be marked, unless exempted, with the proper shipping name as shown in the commodity list (see § 72.5 of this chapter). For tank cars this marking must appear either on the placards or commodity cards.

(1) Every portable tank used for the transportation of any dangerous article shall be conspicuously and legibly marked on a background of sharply contrasting color with a sign or lettering on the tank with words as appropriate "CORROSIVE LIQUID", "COMPRESSED GAS", or "FLAMMABLE COMPRESSED GAS" and with the proper shipping name as shown in the commodity list (see § 72.5 of this chapter); the height of all required lettering shall be at least 2 inches or 1/10 the diameter of the tank, whichever is the greater; every portable tank container shall be marked with the owner's name; in addition to the markings hereinbefore required, there may be marked on any portable tank container the trademark appropriate to the commodity being transported therein: *Provided, however,* That no such marking shall be of such size and character as to render inconspicuous the required markings. No markings either required or permitted under the terms of this subparagraph shall be in lieu of any other marking or markings required by the Commission.

(b) Each package of dangerous articles must show the name and address of the consignee except in carloads and truckloads or less-than-truckloads when handled by a motor vehicle not requiring transfer from one motor carrier to another.

(c) Packages containing flammable liquids in inside containers of one quart capacity or larger, or corrosive liquids, acids, alkaline caustic liquids, and liquid oxidizing materials in inside containers regardless of capacity, unless specifically exempted, must be packed with filling holes up, and except for carboys not completely boxed, the outside container must be plainly marked "THIS SIDE UP" on the cover or top to indicate the position of the inside containers. This requirement does not apply to materials in inside metal cans of the nonrefillable type with spun-in head and base and having no replaceable cap or other closing device.

(d) Each package must show the specification marking as required if a specification container is prescribed.

(e) Additional shipping information not inconsistent with Parts 71–78 of this chapter may be shown on a container if so desired but no such label or marking shall be of a design, or form, or size, as may be confused with the marking required by Parts 71–78 of this chapter.

§ 73.402 *Labeling dangerous articles.* (a) Each package containing any dangerous article as defined by Parts 71–78 of this chapter must be conspicuously labeled by the shipper as follows, except as otherwise provided:

(1) "Red label" as described in § 73.405 of this part on containers of flammable liquids, except when exempted from the regulations by § 73.118 of this part.

(2) "Yellow label" as described in § 73.406 of this part on containers of flammable solids and oxidizing materials, except when exempted from the regulations by § 73.153 and § 73.183 of this part.

(3) "White label" as described in § 73.407 (a) (1), (2) and (3) of this part on containers of acids, alkaline caustic liquids or corrosive liquids, except when exempted from regulations by § 73.244 of this part.

(4) "Red label" as described in § 73.408 (a) (1) of this part on containers of flammable compressed gases, except when exempted from the regulations by § 73.302 of this part.

(5) "Green label" as described in § 73.408 (a) (2) of this part on containers of nonflammable compressed gases, except when exempted from the regulations by § 73.302 of this part.

(6) "Poison gas" label as described in § 73.409 (a) (1) of this part on containers of class A poisons.

(7) "Poison" label as described in § 73.409 (a) (2) of this part on containers of class B poison liquids or solids, except when exempted from the regulations by § 73.345 and § 73.364 of this part.

(8) "Radioactive Materials" label as described in § 73.414 (a) of this part on containers of class D poisons, Group I and II except when exempted by § 73.392 of this part.

(9) "Radioactive Materials" label as described in § 73.414 (b) of this part on containers of class D poisons, Group III, except when exempted by § 73.392 of this part.

(10) "Tear gas" label as described in § 73.409 (a) (3) of this part on containers of poisons, class C.

(11) "Bung label" as described in § 73.119 (i) of this part on metal barrels or drums containing flammable liquids with vapor pressure exceeding 16 pounds per square inch absolute.

(12) "Empty label" as described in § 73.413 of this part must be applied to containers which have been emptied and on which the old label has not been removed, obliterated, or destroyed. It must be so placed on the container as to completely cover the old label.

(b) Labels when applied to packages offered for transportation by rail express, rail baggage, or other forms of transportation for which a certified shipping order, bill of lading, or other shipping paper is not required, must show shipper's name in printing, stamping, or writing underneath the certificate printed thereon.

(c) Labels and marking name of contents are not required on carload or truckload quantities of dangerous articles, except class A, class C, or class D poisons, by rail freight, rail express, or highway, when such shipments are unloaded by the consignee or his duly authorized agent from the car or motor vehicle in which originally loaded.

(1) Carload or truckload shipments of class A, class B, class C, or class D poisons offered for transportation by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government are exempt from labeling requirements when shipments are loaded or unloaded by the shipper or his duly authorized agent and such shipments are accompanied by qualified personnel supplied with equipment to repair leaks or other container failure which will permit escape of contents.

(d) Except on class A, class C, or class D poisons, labels are not required on less-than-truckload shipments by motor vehicle by public highway when the articles are readily identifiable by reason of type of container or when the container is plainly marked to indicate its contents and;

(1) When the shipment is transported from origin to destination without transfer between vehicles and;

(2) When the shipper or its employees are in direct control or perform the loading, transporting and unloading.

(e) When it is known that subsequent shipments of these packages may be made by consignees in less-than-carload or less-than-truckload quantities, or in carload or truckload quantities to a point where they may be handled by other than the original consignee, the original shipper should attach labels to the packages as would be required for less-than-carload or less-than-truckload shipments.

§ 73.403 *Labels for mixed packing.* (a) Use red label only when red and other labels are prescribed.

(b) Use white acid (alkaline caustic liquid or corrosive liquid) label only when white acid (alkaline caustic liquid or corrosive liquid) and yellow or poison labels are prescribed.

(c) Use yellow label only when yellow and poison labels are prescribed.

§ 73.404 *Labels.* (a) Shippers must furnish and attach the labels prescribed for their packages. Labels should be applied to that part of the package bearing consignee's name and address.

(b) Labels must not be applied to packages containing articles which are not subject to Parts 71–78 of this chapter or are exempted therefrom.

(c) Shippers must not use labels which by their size, shape, and color, may readily be confused with the standard caution labels prescribed in this part.

(d) Labels must conform to standards as to size, printing, and color, and samples will be furnished, on request, by the Bureau of Explosives.

(e) A combination diamond-shaped label-tag of proper size and color, bearing on one side the shipping information and on the reverse side the wording prescribed in this part, will be permitted.

(f) As certification of compliance with regulations is also required by other Government agencies, and to avoid multiplicity of certifications, there may be added to the certificate on labels "and the Commandant of the Coast Guard", or "and the Civil Air Regulations", or "and the Post Office Department", as is necessary.

(g) The carriers's name and stationery form number, or the shipper's name and address, may be printed on the labels, in type not larger than 10 point, if placed within the black-line border and in the upper or lower corner of the diamond.

(h) Labels remaining on hand and which were authorized by regulations in effect on December 31, 1950, may be used until present stocks are exhausted.

§ 73.405 *Flammable liquids label.* (a) Labels for flammable liquids must be of diamond shape, bright red in color, and with each side 4 inches long. Printing must be in black letters inside of a black-line border measuring 3½ inches on each side and as shown in this section.

RED LABEL FOR FLAMMABLE LIQUIDS

(Reduced size)

(Black printing on red)

§ 73.406 *Flammable solids and oxidizing materials label.* (a) Labels for flammable solids and oxidizing materials must be of diamond shape, bright yellow in color, and with each side 4 inches long. Printing must be in black letters inside of a black-line border measuring 3½ inches on each side and as shown in this section.

YELLOW LABEL FOR FLAMMABLE SOLIDS AND OXIDIZING MATERIALS

(Reduced size)

(Black printing on yellow)

§ 73.407 *Acids, corrosive liquids, and alkaline caustic liquids labels.* (a) Labels for corrosive liquids, acids and alkaline caustic liquids must be of diamond shape, white in color, and with each side 4 inches long. Printing must be in black letters inside of a black-line border measuring 3½ inches on each side and as shown in this section.

(1) White label for acids:

(Reduced size)

(Black printing on white)

(2) White label for corrosive liquids.

(Reduced size)

(Black printing on white)

(3) White label for alkaline caustic liquids.

(Reduced size)

(Black printing on white)

§ 73.408 *Compressed gas labels.* (a) Labels for compressed gases must be of diamond shape, bright red in color for flammable gases and bright green for nonflammable gases, and with each side 4 inches long. Printing must be in black letters inside of a black-line border measuring 3½ inches on each side and as shown in this section.

(1) Red label for flammable gases.

(Reduced size)

(Black printing on red)

(2) Green label for nonflammable gases.

(Reduced size)

(Black printing on green)

§ 73.409 *Poisonous articles and tear gas labels.* (a) Labels for poisonous articles and tear gases must be of diamond shape, white in color, and with each side 4 inches long. Printing must be in red letters inside of a red-line border measuring 3½ inches on each side and as shown in this section.

(1) Poison gas label.

(Reduced size)

(Red printing on white)

(2) Poison label.

(Reduced size)

(Red printing on white)

(3) Tear gas label.

(Reduced size)

(Red printing on white)

§ 73.410 *Special fireworks label.* (a) Labels for special fireworks must be square measuring 4 inches on each side and bright red in color. Printing must be in black letters inside of a black-line border measuring 3½ inches on each side as shown in this section.

RED LABEL FOR SPECIAL FIREWORKS

(Reduced size)

(Black printing on red)

§ 73.411 *Explosives samples for laboratory examination label.* (a) Labels for samples of explosives for laboratory examination must be square measuring 4 inches on each side and bright red in color. Printing must be in black letters inside of a black-line border measuring 3½ inches on each side and as shown in this section.

RED LABEL FOR SAMPLES OF EXPLOSIVES

(Reduced size)

(Black printing on red)

§ 73.412 *Smokeless powder for small arms and for cannon labels for express shipment.* (a) Labels for smokeless powder for small arms and labels for smokeless powder for cannon must be square measuring 4 inches on each side and bright red in color. Printing must be in black letters inside of a black-line border measuring 3½ inches on each side and as shown in this section.

(1) Red label for smokeless powder for small arms for express shipment.

(Reduced size)

(Black printing on red)

Smokeless Powder for Small Arms
For Express Shipment

HANDLE CAREFULLY
KEEP FIRE AWAY

This is to certify that the contents of this package are properly described by name and are packed and marked and are in proper condition for transportation according to the Regulations prescribed by the Interstate Commerce Commission.

(Shipper's name)

(2) Red label for smokeless powder for cannon for express shipment.

(Reduced size)

(Black printing on red)

Smokeless Powder for Cannon
For Express Shipment

HANDLE CAREFULLY
KEEP FIRE AWAY

This is to certify that the contents of this package are properly described by name and are packed and marked and are in proper condition for transportation according to the Regulations prescribed by the Interstate Commerce Commission.

(Shipper's name)

§ 73.413 *Empty container label.* (a) Labels for empty containers must be not less than 6 inches on each side, white in color, and printed in letters not less than 1 inch high in black ink and as shown in this section.

WHITE LABEL FOR EMPTY CONTAINERS

(Reduced size)

(Black printing on white)

6 inches

EMPTY

6 inches

§ 73.414 *Radioactive materials labels.* (a) Labels for radioactive materials (class D poisons) Group I and Group II must be of diamond shape, white in color, and with each side 4 inches long. Printing must be in red letters inside of a red-line border measuring 3½ inches on each side, as shown in this section.

LABEL FOR RADIOACTIVE MATERIALS GROUP I OR II

(Reduced size)

(Red printing on white)

This label must be duly executed by the shipper.

(b) Labels for radioactive materials (class D poisons) Group III must be of diamond shape, white in color, and with each side 4 inches long. Printing must be in blue letters inside of a blue-line border measuring 3½ inches on each side, and as shown in this section.

LABEL FOR RADIOACTIVE MATERIALS GROUP III

(Reduced size)

(Blue printing on white)

SUBPART I—SHIPPING INSTRUCTIONS

§ 73.425 *"Order-Notify," "C. O. D.," and "Stop-off" shipments.* (a) Except on through bills of lading to a foreign country, shipments of explosives, class A and blasting caps in any quantity must not be offered for transportation by carriers by rail freight or rail express when consigned "to order notify" or "C. O. D.". Shippers must not consign these shipments to themselves at points where they have not a resident representative.

(b) Explosives, class A must not be offered for transportation by carriers by rail freight or rail express subject to "stop-off" privileges en route for partial loading or unloading.

§ 73.426 *Cars fumigated with flammable liquids or toxic or poisonous liquids or gases.* (a) Delivery to carrier of cars fumigated with flammable liquid is prohibited until 48 hours have elapsed after fumigation.

(b) Cars or the lading thereof which have been fumigated with poisonous or toxic liquid or gas, such as chlorpicrin, hydrocyanic acid, methyl bromide, etc., must be placarded on each door or near thereto with placard reading as follows:

(Reduced size)

(Red lettering on white cardboard)

10 inches

8 inches

DANGER

This car has been

FUMIGATED

with

(Name of poisonous liquid or gas)

BEFORE UNLOADING, open both doors and DO NOT ENTER until car is free of gas.

§ 73.427 *Shipping order and bill of lading description.* (a) The shipper when offering for transportation by carriers by rail freight, rail express, highway, or water any class A, class B, or class C explosive, flammable liquid, flammable solid, oxidizing material, corrosive liquid, compressed gas, or poison, as defined by this part, must describe such article in the shipping order, bill of lading or other shipping paper by the shipping name used in § 72.5 of this chapter (see commodity list) and may add a further description not inconsistent therewith. Abbreviations must not be used. For shipments of blasting caps the shipper must, in addition, show the number of caps in the shipment.

NOTE 1: In commodity list (§ 72.5 of this chapter) shipping names are shown in roman, not *italics*.

§ 73.428 *Label or placard notation.* (a) The shipping order, bill of lading or other shipping paper must also show thereon in connection with the entry of the article as prescribed in § 73.427 of this part, the color or kind of label applied, and for cars containing such articles loaded by the shipper, requiring placards the kind of placard applied to the car.

§ 73.429 *Receipts; rail express shipments.* (a) A receipt upon the form prescribed by the originating rail express carrier must be issued to the shipper for each express shipment of explosives or other dangerous articles accepted for transportation. Before a receipt is issued, the shipper must apply the label prescribed in this part to each package containing any article requiring a label under Parts 71–78 of this chapter.

(b) Each receipt must show the proper and definite name of commodity, as listed in § 72.5 of this chapter, and the color of the label applied to the package if any is required.

§ 73.430 *Certificate.* (a) The shipper offering for transportation by carriers by rail freight, highway, water, or air, any class A or class B explosive and blasting caps or electric blasting caps in any quantity, and any flammable liquid, flammable solid, oxidizing material, corrosive liquid, compressed gas, or poison,

requiring labels, or carloads requiring placards, as prescribed by Parts 71–78 of this chapter, must show on the shipping order, bill of lading, or other shipping paper, in the lower left-hand corner, the following certificate over the written or stamped facsimile signature of the shipper or his duly authorized agent:

This is to certify that the above named articles are properly described, and are packed and marked and are in proper condition for transportation according to the regulations prescribed by the Interstate Commerce Commission.

(b) For the relief of shippers from multiplicity of certifications required for packages which may move by various means of transportation, shipments may be certified for rail, motor vehicle, water, or air transportation by adding to the certificate required on the shipping document "and the Commandant of the Coast Guard", or "and the Civil Air Regulations", as the case may be.

§ 73.431 *Switching ticket.* (a) When the initial movement is a switching operation, the switching order, switching receipt or switching ticket, and copies thereof, prepared by the shipper, must bear the placard indorsement and the shipper's certificate prescribed by §§ 73.430 and 74.584 (a) and (b) of this chapter.

§ 73.432 *Tank car shipments.* (a) Tank cars containing flammable liquids having a flash point of 80° F. or below, except liquid road asphalt or tar, must not be offered for shipment unless originally consigned or subsequently reconsigned to parties having private-siding (see Note 1 of this section) or railroad-siding facilities equipped for piping the liquid from tank cars to permanent storage tanks of sufficient capacity to receive contents of car.

(b) A tank car containing any compressed gas must not be offered for transportation unless the car is consigned for delivery (see paragraph (c) of this section) and unloading on a private track (see Note 1 of this section), except that where no private track is available, delivery and unloading on carrier tracks is permitted provided the following conditions are complied with:

(1) Any tank car of ICC–106A type (see §§ 78.275 and 78.276 of this chapter) may be offered for transportation and the loaded unit tanks may be removed from car frame on carrier tracks, provided the shipper has obtained from the delivering carrier and filed with originating carrier, written permission (see Note 2 of this section) for such removal. The consignee must furnish adequately safe mechanical hoist, obtained from the carrier if desirable, by which the tanks shall be lifted from the car and deposited directly upon vehicles furnished by the consignee for immediate removal from carrier property or tanks must be lifted by adequately safe mechanical hoist from car directly to vessels for further transportation.

(c) Any tank car of other than ICC–106A type (see §§ 78.275 and 78.276 of this chapter), containing liquefied hydrocarbon or liquefied petroleum gas, and having interior pipes of liquid and gas discharge valves equipped with check valves, may be consigned for delivery and unloading on carrier tracks, if the lading is piped directly from the car to permanent storage tanks of sufficient capacity to receive the entire contents of the car. Such cars may also be consigned for storage on a private track or on a carrier track when designated by the carrier for such storage.

(d) For cars of the ICC–106A type (see §§ 78.275, and 78.276 of this chapter), the tanks must be placed in position and attached to the car structure by the shipper.

(e) Flammable liquids must not be loaded into tank cars on carriers' property from tank trucks, wagons or drums.

NOTE 1: For this purpose, a private track is a track outside of carrier's right-of-way, yard, and terminals, and of which the carrier does not own either the rails, ties, roadbed or right-of-way; or a track or portion of a track which is devoted to the purpose of its user, either by lease or written agreement; in which case the lease or written agreement will be considered as equivalent to ownership.

NOTE 2: Carriers should give permission for the unloading of these containers on carrier tracks only where no private siding is available within reasonable trucking distance of final destination. The danger involved is the release of chlorine gas due to accidental injury to container in handling. The exposure to this danger decreases directly with the isolation of the unloading point.

PART 74—REGULATIONS APPLYING PARTICULARLY TO CARRIERS BY RAIL FREIGHT

Sec.

SUBPART A—LOADING, UNLOADING, PLACARDING AND HANDLING CARS; LOADING PACKAGES INTO CARS

SUBPART B—LOADING AND STORAGE CHART OF EXPLOSIVES AND OTHER DANGEROUS ARTICLES

SUBPART C—PLACARDS ON CARS

SUBPART D—UNLOADING FROM CARS

SUBPART E—HANDLING BY CARRIERS BY RAIL FREIGHT

AUTHORITY: §§ 74.500 to 74.600 issued under sec. 204, 49 Stat. 546, as amended, sec. 835, 62 Stat. 739, 49 U. S. C. 304, 18 U. S. C., Sup., 835.

§ 74.500 *Purpose of the regulations in Parts 71–78 of this chapter.* (a) To promote the uniform enforcement of law and to minimize the dangers to life and property incident to the transportation of explosives and other dangerous articles by rail freight carriers engaged in interstate or foreign commerce, Parts 71–78 of this chapter are prescribed to define these articles for transportation purposes and to state the precautions that must be observed by the carrier in handling them while in transit. It is the duty of each such carrier to make the prescribed regulations effective and to thoroughly instruct employes in relation thereto.

§ 74.501 *Acceptable articles.* (a) Explosives, including samples of explosives and explosive articles not exceeding 5 pounds net weight and other dangerous articles may be accepted and transported, provided they are in proper condition and are certified, for transportation by rail, highway, or water. Articles must be loaded, stayed, and handled in transit according to regulations

applying to service or services used. Methods of manufacture, packing, and storage, in so far as they affect safety in transportation, must be open to inspection by a duly authorized representative of the initial carrier or by the Bureau of Explosives. Shipments that do not comply with Parts 71–78 of this chapter must not be accepted for transportation or transported.

§ 74.502 *Forbidden explosives.* (a) The acceptance of the following articles for transportation by common carrier by rail freight, is forbidden:

(1) Diazodinitrophenol, dry.

(2) Dynamite, except gelatin dynamite, containing over 60 percent of liquid explosive ingredient.

(3) Dynamite having an unsatisfactory absorbent, or one that permits leakage of a liquid explosive ingredient under any conditions liable to exist during transportation or storage.

(4) Explosive compositions that ignite spontaneously or undergo marked decomposition when subjected for 48 consecutive hours to a temperature of 75° C. (167° F.).

(5) Explosives containing an ammonium salt and a chlorate.

(6) Explosives condemned by the Bureau of Explosives (except properly packaged samples for laboratory examinations).

(7) Explosives not packed, marked, described, and certified, in accordance with Parts 71–78 of this chapter.

(8) New explosives (except samples for laboratory examinations) until approved for transportation by the Bureau of Explosives.

(9) Condemned or leaking dynamite must not be repacked and offered for shipment unless the repacking is done by a competent person in the presence of, or with the written consent of, an inspector, or with the written authority of the chief inspector, of the Bureau of Explosives.

(10) Leaking or damaged packages of explosives must not be accepted for transportation or transported by rail. Should any package of high explosives when offered for shipment show excessive dampness or be moldy or show outward signs of any oily stain or other indication that absorption of the liquid part of the explosive is not perfect, or that the amount of the liquid part is greater than the absorbent can carry, the package must be refused in every instance. The shipper must substantiate any claim that a stain is due to contact with material other than the liquid explosive ingredient of an explosive. In case of doubt the package must be rejected.

(11) Firecrackers, flash crackers, or salutes, the explosive contents of which exceed 12 grains each in weight.

(12) Fireworks that combine an explosive and a detonator or blasting cap.

(13) Fireworks containing an ammonium salt and a chlorate.

(14) Fireworks containing yellow or white phosphorus.

(15) Fireworks or fireworks compositions that ignite spontaneously or undergo marked decomposition when subjected for 48 consecutive hours to a temperature of 75° C. (167° F.),

(16) Fireworks properly condemned by the Bureau of Explosives, except properly repacked samples for laboratory examinations.

(17) Toy caps containing more than an average of twenty-five hundredths of a grain of explosive composition per cap.

(18) Toy torpedoes the maximum outside dimension of which exceeds ⅞ inch, or toy torpedoes containing a mixture of potassium chlorate, black antimony and sulfur with an average weight of explosive composition in each torpedo exceeding four grains.

(19) Toy torpedoes containing a cap composed of a mixture of red phosphorus and potassium chlorate exceeding an average of one-half (0.5) grain per cap.

(20) Fulminate of mercury, dry.

(21) Guanyl nitrosamino guanylidene hydrazine, dry.

(22) Lead azide, dry.

(23) Lead styphnate (lead trinitroresorcinate), dry.

(24) Nitroglycerin, liquid.

(25) Nitro mannite, dry.

(26) Nitrosoguanidine, dry.

(27) Pentaerythrite tetranitrate, dry.

(28) Tetrazene (guanyl nitrosamino guanyl tetrazene), dry.

§ 74.503 *"Order-Notify", "C. O. D.", and "Stop-off" shipments.* (a) Except on through bills of lading to a foreign country, shipments of explosives, class A, and blasting caps in any quantity must not be accepted for transportation or transported by carrier by rail freight when consigned "to order notify" or "C. O. D.". Shippers must not consign these shipments to themselves at points where they have not a resident representative.

(b) Explosives, class A, must not be accepted for transportation or transported by carrier by rail freight subject to "stop-off" privileges en route for partial loading or unloading.

§ 74.504 *Carriers' material and supplies.* (a) Parts 71–78 of this chapter apply also to shipments of carriers' material and supplies moving by rail.

§ 74.505 *Canadian shipments.* (a) Explosives and other dangerous articles as defined in Parts 71–78 of this chapter, which are packed, marked, labeled, and loaded, in conformity with the regulations of the Board of Transport Commissioners for Canada, may be accepted and carried by carriers from point of entry in the United States to their destination in the United States or through the United States en route to a point in Canada.

§ 74.506 *Emergency shipments.* (a) For the protection of the public against fire, explosion, or other, or further hazard with respect to shipments of explosives or other dangerous articles offered for transportation or in transit by any carrier by railroad, such carrier shall make immediate report to the Bureau of Explosives, 30 Vesey Street, New York, N. Y., for handling, any of the following emergency matters coming to their attention:

(1) Instances of packages of explosives or other dangerous articles discovered in transit not properly prepared for transportation in accordance with applicable regulation in Parts 71–78 of this chapter.

(2) Railroad wrecks or accidents involving damage to containers of explosives or other dangerous articles to such a degree as to necessitate repacking of the articles.

(3) Other like emergencies in which any carrier by railroad is or is likely to become involved, or may offer aid at its command.

(b) This section shall in no respect excuse either shipper or carrier by railroad for failure to exercise due care to prevent any departure from any regulation prescribed in Parts 71–78 of this chapter.

§ 74.507 *Labels.* (See §§ 73.405 to 73.414 of this chapter for description of labels.) (a) Carriers must keep on hand an adequate supply of labels. Lost or detached labels must be replaced from information given on revenue or other waybill, manifest, memo or other shipping paper.

(b) The carrier's name and stationery form number may be printed on the labels, in type not larger than 10 point, if placed within the black-line border and in the upper or lower corner of the diamond.

§ 74.508 *Violations and accidents to be reported.* (a) Serious violations of Parts 71–78 of this chapter (such as defective packing, improper staying, or rough treatment of car), and accidents, fires or explosions, and leaking or broken containers occurring in connection with the transportation or storage on carrier's property of explosives or other dangerous articles, must be reported promptly by the rail carrier to the Bureau of Explosives.

(b) The Bureau of Explosives, upon receipt of reports from carriers should promptly report to the shipper full particulars covering all cases of defective packing, improper staying, leaking and broken shipping containers and rough treatment of cars resulting in leakage or damage to shipping containers or staying.

§ 74.509 *Quantity limitations.* (a) When quantity limitations are specified in Parts 71–78 of this chapter by United States liquid measure or by avoirdupois weight it is authorized that quantities measured by the metric system may be substituted, up to but not exceeding 1 gallon for liquid and 10 pounds for solids, on the basis of 1 liter per quart specified and 500 grams per pound specified.

SUBPART A—LOADING, UNLOADING, PLACARDING AND HANDLING CARS; LOADING PACKAGES INTO CARS

§ 74.525 *Loading packages of explosives in cars, selection, preparation, inspection of car and certificate.* (a) Certified cars: For the transportation of smokeless powder for small arms in quantity exceeding 50 pounds net weight and all explosives, class A, except blasting caps and electric blasting caps not exceeding 1,000 caps, only closed cars, certified and placarded "Explosives", may be used.

(b) Certified cars must be inspected inside and outside and must conform to the following specifications:

(1) Closed cars of not less than 80,000 pounds capacity, with steel underframes and friction draft gear, must be used when available, except that on narrow-gage and other railroads, explosives may be transported in cars of less than that capacity, provided the available cars of greatest capacity and strength are used for this purpose.

(2) Must be equipped with air brakes and hand brakes in condition for service.

(3) Must have no loose boards or cracks in the roof, sides, or ends, through which sparks may enter, or unprotected decayed spots liable to hold sparks and start a fire.

(4) The roof of the car must be carefully inspected from the outside for decayed spots or broken boards, especially under or near the running board, and such spots must be covered or repaired to prevent their holding fire from sparks. A car with a roof generally decayed, even if tight, must not be used.

(5) The doors must shut so closely that no sparks can get in at the joints, and, when necessary, they must be stripped. The stripping for doors should be on the inside and be fastened to the door frames where it will form a shoulder against which the closed doors are pressed by means of wedges or cleats in door shoes or keepers. The openings under the doors should be similarly closed. The hasp fastenings must be examined with doors closed and fastened, and the doors must be cleated when necessary to prevent doors shifting. When the car is opened for any cause, wedges or cleats must be replaced before car containing explosives is permitted to proceed.

(6) The journal boxes and trucks must be carefully examined and put in such condition as to reduce to a minimum the danger of hotboxes or other failure necessitating the setting out of the car before reaching destination. The lids or covers of journal boxes must be in place.

(7) The car must be carefully swept out before it is loaded. For less-than-carload shipments the space in which the packages are to be loaded must be carefully swept.

(8) Holes in the floor or lining must be repaired and special care taken to have no projecting nails or bolts or exposed pieces of metal which may work loose or produce holes in packages of explosives during transit. Protruding nails in the floor or lining which have worked loose must be drawn, and if necessary for the purpose of fastening the floor or lining, new nails must be driven through other parts thereof.

(9) When packages of explosives are to be loaded over exposed draft bolts or king bolts, these bolts must have pieces of sound wood with beveled ends spiked to the floor over them (or empty wooden boxes of the same character as those used for the explosive may be used for this purpose) to prevent possibility of the bolts causing damage to the packages of explosives. Metal floor plates must be completely covered with wood, plywood, or fiber or composition sheets of adequate thickness and strength to prevent contact of the floor plates with the packages of explosives under conditions incident to transportation.

(10) Cars equipped with automobile loading devices must not be used unless the loading device is securely attached to the roof of car with fastenings supplementing those already provided and so fixed that it cannot fall.

(11) The carrier must have the car examined by a competent employe to see that it is properly prepared, and must have a "Car Certificate" signed in triplicate upon the prescribed form (see paragraph (c) (2) and (3) of this section) before permitting the car to be loaded.

(12) A car must not be loaded with any explosives, class A, or smokeless powder for small arms in quantity exceeding 50 pounds net weight, until it shall have been thoroughly inspected by a competent employee of the carrier who shall certify as to its proper condition under this section and shall sign certificate No. 1 prescribed in paragraph (c) (2) and (3) of this section.

(c) After a certified car as prescribed in this section has been furnished by the carrier, the shipper or his authorized employe must, before commencing the loading of any such car, inspect the interior thereof and after loading, certify to the proper condition as specified in paragraph (b) of this section by signing certificate No. 2 of the car certificate prescribed by subparagraphs (2) and (3) of this paragraph.

(1) For all shipments loaded by the shipper, a competent employee of the carrier must inspect the finished load and certify to its compliance with this part before the car shall be accepted for transportation; and certificate No. 2 as prescribed by subparagraphs (2) and (3) of this paragraph shall be signed before the car is permitted to go forward. When a car is loaded by the carrier, certificate No. 2 must be signed only by the representative of the carrier.

(2) The certificates as prescribed in subparagraph (3) of this paragraph must not be signed by the carrier's or shipper's representative unless the condition of any car covered thereby meets the requirements of this part.

(3) Car Certificate. The following certificate, printed on strong tag board measuring 7 by 7 inches, or 6 by 8 inches, must be duly executed in triplicate by the carrier, and by the shipper, if he loads the shipment; the original must be filed by the carrier at the forwarding station on a separate file; and the other two must be attached, one to each outer side of car to the fixed placard board or to the side of wooden car between car initials and the car door.

----------Railroad

CAR CERTIFICATE

No. 1 ---------- Station, ---------- 19---

I hereby certify that I have this day personally examined -------- car No. --------; and that the roof, sides, and ends have no loose boards, holes, or cracks, or unprotected decayed spots liable to hold sparks and start a fire; that the kingbolts and draft bolts are properly protected and that there are no uncovered pieces of metal or nails projecting from the floor or sides of the car which might injure packages of explosives; also that the floor is in good condition and has this day been cleanly swept before the car was loaded; that I have examined all the axle boxes and that they are properly covered, packed, and oiled, and that the air brakes and hand brakes are in condition for service.

Railway employee inspecting car.

No. 2 ---------- Station, ----------19---

I hereby certify that I have this day personally examined the above car; that the floor is in good condition and has been cleanly swept and that the roof, sides, and ends have no loose boards, holes, cracks, or unprotected decayed spots liable to hold sparks and start a fire; that the kingbolts and draft bolts are protected, and that there are no uncovered pieces of metal or nails projecting from the floor or sides of the car which might injure packages of explosives; that the explosives in this car have been loaded and stayed and that the car has been placarded according to the regulations for the transportation of explosives prescribed by the Interstate Commerce Commission; that the doors fit or have been stripped so that sparks cannot get in at the joints or bottom.

Shipper.

Railway employee inspecting loading and staying.

NOTE 1: Both certificates must be signed; certificate No. 1 by the representative of the carrier. For all shipments loaded by the shipper he or his authorized agent must sign certificate No. 2, and the representative of the carrier must certify as to loading and staying and general conditions. When the car is not loaded by shipper, certificate No. 2 must be signed only by the representative of the carrier. A shipper must decline to use a car not in proper condition.

§ 74.526 *Loading explosives into cars.* (a) Except as provided in this section, boxes of class A explosives named in §§ 73.53 to 73.87 of this chapter not including ammunition for cannon with projectiles, explosive projectiles, explosive mines and explosive bombs, when loaded in the car, must rest on their bottoms. They may be loaded crosswise or lengthwise of the car, but not so that the ends of wooden boxes will bear against the sides of fiberboard boxes, or so that the end of any box will cause a high pressure on a small area of another box.

(b) Shipments of explosive bombs, unfuzed explosive projectiles, and large containers of incendiary bombs weighing 500 pounds or more, each, may be loaded in stock cars or in gondola cars (flat bottom) when adequately braced. When necessary, wooden boxed bombs must be protected against accidental ignition.

(c) Boxes of high explosives, low explosives, or black powder, packed in long cartridges, bags, or siftproof liners, and containing no liquid explosive ingredient, may be loaded on their sides or ends, but not so that the end of a box will cause a high pressure on a small area of another box.

(d) Explosives for which a certified and placarded car is prescribed (see § 74.525 (a) of this part) must not be loaded higher than the permanent car lining unless additional lining is provided as high as the lading.

(e) When the lading of a car consists of or includes any explosives, the weight

of the lading should be distributed so that it will be equalized on each side of the car and over the trucks.

(f) Explosives packed in metal kegs, except when boxed, must be loaded on their sides with ends towards ends of the car; packages of explosives must not be placed in the space opposite the doors unless the doorways are boarded on the inside as high as the lading. (This does not apply to palletized packages provided they are braced so that they cannot fall or slide into the doorways during transit.)

(g) Wooden or fiber kegs, barrels, or drums, may be loaded on their sides or ends, as will best suit the conditions.

(h) Packages containing any of the explosives for the transportation of which a certified and placarded car is prescribed (see § 74.525 of this part) and blasting caps or electric blasting caps in any quantity, must be stayed (blocked and braced) by the one who loads the car, so as to prevent change of position by the ordinary shocks incident to transportation. Special care must be used to prevent such packages from falling to the floor or from having anything fall on them or slide against them during transit. (See note 1.)

NOTE 1: For recommended methods of blocking and bracing, see Bureau of Explosives' Pamphlets 6 and 6A.

(i) To prevent delays to local freight trains, when there are shipments of explosives for different destinations loaded in a "peddler car" or "way car", the shipments for each destination must be stayed separately.

(j) Forwarding and transfer stations for explosives must be provided with the necessary materials for staying.

(k) Shippers must furnish the material for staying packages of explosives loaded by them.

(l) Explosives, class A, must not be loaded into cars equipped with lighted heaters.

(m) Blasting caps or electric blasting caps in quantity not exceeding 1,000 caps may be loaded in any closed car which is in good condition, without car certificates or placards.

(n) Container cars must not be used for smokeless powder for small arms in quantity exceeding 50 pounds net weight, class A explosives, or blasting caps in any quantity.

§ 74.527 *Forbidden mixed loading and storage.* (a) Explosives, class A, smokeless powder for small arms in quantity exceeding 50 pounds net weight and initiating or priming explosives must not be transported in the same car with, nor be stored on railway property near, any of the dangerous articles other than explosives for which red, yellow, green, or white (acid or corrosive liquid) labels are prescribed in Parts 71–78 of this chapter, nor with charged electric storage batteries.

(b) Explosives must not be loaded together nor with other dangerous articles, except as provided in the loading and storage chart (see § 74.538 of this part).

(c) Explosives which under Parts 71–78 of this chapter require certified cars placarded "Explosives" (see § 74.525 (a) of this part), blasting caps in any quantity, and acids or corrosive liquids in carboys, must not be carried in trucks, truck bodies, or trailers, on flat cars.

§ 74.528 *Protect explosives from injury.* (a) In a car containing explosives, all other freight must be so loaded, and if necessary so braced and stayed, as to prevent injury to packages of explosives during transit. When practicable, explosives should be loaded so as to avoid transfer at stations.

§ 74.529 *Cars for class B explosives.* (a) Explosives, class B, must not be loaded into cars equipped with lighted heaters.

(b) Shipments of class B explosives (see §§ 73.88 to 73.94 of this chapter) must be loaded in a closed car which is in good condition, into which sparks cannot enter, and with roof not in danger of taking fire through unprotected decayed wood. Class B explosives, except special fireworks, must not be transported in container cars. These cars do not require the car certificate but must have attached to both sides and both ends the "DANGEROUS" placard prescribed by § 74.552 of this part, and the doors if not tight must be stripped to prevent the entrance of sparks.

§ 74.530 *Cars for class C, explosives.* (a) Explosives, class C, may be loaded into any closed car in good condition. With the exception of blasting caps and electric blasting caps, explosives, class C, may be loaded into any container car in good condition. No placards or car certificates are required.

§ 74.531 *Lights.* (a) When necessary to use lights while handling explosives, it is recommended that where practicable incandescent electric lights be provided.

§ 74.532 *Loading other dangerous articles into cars.* (a) Shipments must be properly loaded in closed cars, except as otherwise provided in Parts 71–78 of this chapter, and cars placarded as prescribed, when accepted by carriers.

(1) Shippers must furnish the material for staying packages of other dangerous articles loaded by them.

(b) Flammable liquids (red label) and flammable gases (red label) must not be loaded into cars equipped with lighted heaters.

(c) Packages protected by labels or carload lots exempted from labels (see § 73.402 (c) and (d) of this chapter) must be so loaded that they cannot fall to the car floor and in such manner that other freight cannot fall onto or slide against them. Packages bearing marking "This Side Up" must be so loaded. Dangerous articles for which red, yellow, green, or white (acid, alkaline caustic liquid, or corrosive liquid) labels are prescribed herein, must not be loaded in the same car with explosives named in §§ 73.53 to 73.87 of this chapter. (See loading and storage chart, § 74.538 of this part. Packages protected by yellow labels must not be loaded in the same end of a car with packages protected by "Acid", "Alkaline Caustic Liquid", or "Corrosive Liquid" labels.

(d) Metal barrels or drums containing flammable liquids and cylinders containing compressed gases may be loaded on steel gondola or flatcars or into stock cars, but must not be loaded into hopper bottom cars.

NOTE 1. See Bureau of Explosives Pamphlet No. 6 for recommended methods of blocking and bracing these articles in cars. See loading and storage chart (§ 74.538 of this part) before loading labeled articles together or with explosives named in §§ 73.53 to 73.87 of this chapter.

(e) Empty cylinders, barrels, kegs, or drums, previously used for the shipment of any dangerous article, as defined in Part 73 of this chapter, must have all openings including removable heads, filling and vent holes properly closed before being offered for transportation.

(1) They may be loaded in open or stock cars when desired. Cars should not be placarded but lighted open-flame lanterns or other open-flame lights should be kept away.

(f) Carboys previously used for the shipment of corrosive liquids when presented to carriers for transportation in carload or less-than-carload shipments as "empty" carboys, must be thoroughly (completely) drained. Whenever practicable they should not be loaded with valuable or perishable freight.

(g) Matches: Carload lots of strike-anywhere (friction) matches must be loaded as compactly as possible to avoid motion within the car, especially lengthwise of the car. Protruding nails, metal band anchors or other projections on sidewalls, ends, door posts, studding, or car floors liable to puncture packages must be removed or adequately covered to prevent damage to containers of matches. Car doorways should be boarded on the inside to keep packages from contact with the doors, and the inside lining of the car should be supplemented when necessary by strips nailed to the car and close enough together to keep the boxes from being jammed against the studding and broken by high pressures on small areas. The strongest dimension of the box should be loaded lengthwise of the car.

(1) When packages are loaded over or near exposed draft bolts or kingbolts, the bolts should be covered by boards not less than 1 inch thick or by empty wooden boxes of proper size, and the ends of these boards should be beveled to prevent the end of a box resting against the end of the board and being crushed by it. Partial layers of boxes should be interlocked with the lower layers. The cars used should be made secure against the entrance of sparks or rain and should be the strongest cars available. Under no condition should any car be loaded with more than 48,000 pounds gross weight of strike-anywhere matches.

(2) Carload lots of strike-anywhere matches handled subject to stop-off privileges must be loaded in accordance with paragraph (g) and (g) (1) of this section and when necessary the load must be rearranged and/or blocked and braced by each consignee before forwarding.

(3) Less-than-carload lots of "strike-anywhere" matches should be carefully loaded so that they cannot fall to the car floor and so that other packages of freight cannot fall on or injure them.

Whenever practicable the packages of matches should be placed to facilitate ready removal from the car in case of fire. A smoking box of matches should not be broken open; the fire will cease of itself if air can be kept from it.

(4) Carload or less-than-carload lots of "strike-anywhere" matches which have been damaged by fire, or by water in extinguishing a fire, in transit or on carrier's property, must be reloaded in properly prepared cars, and braced or blocked before being forwarded to destination, to freight claim department or claim adjusters, or to original shipper or other parties for salvage. Great care should be taken to examine and repair damaged outside packages before reloading into car. All loose matches should first be destroyed. Individual interior boxes and paper-wrapped cartons or packages, should then be carefully placed in tight outside packages complying, as nearly as circumstances will permit, with container specifications; but under no condition shall the outside package be of less strength than required by specification 15A or 12C (§§ 78.168 or 78.206 of this chapter), nor of greater capacity than authorized. Charred cases must not be used. Boards used in repairing wooden cases must be so nailed that they will not allow any interior boxes, cartons, or packages to fall out. In the event that the individual boxes or paper-wrapped packages do not fit snugly in the outside package, the vacant spaces should be filled tightly with dry and clean cotton waste, or elastic wads of dry newspapers or dry waste paper.

(h) Corrosive liquids: Carboys of acids or other corrosive liquids must not be loaded into container cars. They must be so blocked, braced or stayed that they cannot change position during transit when being handled with reasonable care. Carboys of nitric acid must not be loaded into box cars more than two tiers high, except that completely boxed carboys, specification 1D (§ 78.4 of this chapter), may be loaded three tiers high. Car doors may be cleated in an open position if desired. Whenever practicable, flat or stock cars should be used for loading carboys of acids.

(1) When less-than-carload shipments are loaded with other freight, the carboys must be placed near the doorway and must have wooden strips not less than 2 inches in height nailed to the car floor about 8 inches from the bracing. These strips must be arranged so that the liquid from a broken carboy will drain toward the doorway and outside the car. The space between the strips and the floor braces or blocking used for staying the carboy boxes must be covered with at least 1 inch thickness of clean and dry sand or earth, not sawdust or other combustible material.

(2) Nitric acid, when loaded in the same car with other acids or other corrosive liquids in carboys, must be separated from the other carboys. A 2 by 6 inch plank, set on edge, should be nailed across the car floor at least 12 inches from the nitric acid carboys, and the space between the plank and the carboys of nitric acid should be filled with sand, sifted ashes, or other incombustible absorbent material.

(3) Charged electric storage batteries for shipment must be completely protected so that short circuits will be prevented and must not be loaded or stored with explosives.

(4) Shipments of electric storage batteries (wet), and electrolyte packed as required by § 73.258 of this chapter, must be so blocked and braced that they cannot change position during transit when cars are handled with reasonable care; and must be so loaded that other freight cannot fall onto or slide against them. They may be loaded on gondola or flat cars, but must not be loaded into hopper bottom cars.

(i) Compressed gases in cylinders: Cylinders containing compressed gases must be loaded on their sides except when packed in boxes or crates, or when placed in suitable permanent racks in cars, or when securely braced.

(1) Cylinders containing compressed gases may be loaded into steel gondola or flat cars or into stock cars, but must not be loaded into hopper bottom cars.

(j) Radioactive ores, residues, and similar material: Shipments of radioactive ores, residues, or similar material as provided in § 73.392 of this chapter, must be so loaded as to avoid spillage and scattering of loose material.

(1) The amount of radioactive material loaded in a car must be limited as provided in § 73.392 of this chapter.

(2) No persons shall remain in a car containing radioactive material unnecessarily and the shipper must furnish the carrier with such information and equipment as is necessary for the protection of the carrier's employes.

(3) Any loose radioactive material must be removed from the car and placed in a closed container in a segregated location and held for instructions from the shipper or the Bureau of Explosives.

(k) Ammonium nitrate, ammonium nitrate fertilizer, calcium nitrate, and guanidine nitrate: Ammonium nitrate, ammonium nitrate fertilizer, calcium nitrate, and guanidine nitrate in bags must be loaded in all wood box cars, or wooden box cars with steel roofs, or steel box cars with wooden floors. Only clean cars must be used and must be free of any projections that would injure bags.

(l) Poison gas; class A, by rail freight: Poison gases, class A, may be shipped by, for, or to, the Departments of the Army, Navy, or Air Force of the United States Government, when loaded and handled as follows:

(1) In metal drums, specification ICC 5A (§ 78.81 of this chapter) or WD 5A,[1] in box cars, gondola cars, or stock cars (flat bottom) in carload lots.

(2) In tanks, specification ICC 106A (§§ 78.275 or 78.276 of this chapter), mounted on or secured to multi-unit cars or gondola cars (flat bottom) in carload lots only.

(3) In bombs, in box cars or gondola cars (flat bottom) in carload lots only.

(4) In projectiles or ammunition for cannon with gas filled projectiles in box cars in carload or less-than-carload lots.

(5) Gas handlers. Each shipment of one or more carloads, as described in subparagraph (1) of this paragraph, shall be accompanied by a crew of qualified gas handlers, supplied with equipment to handle leaks or other container failure, which will permit the escape of gas. Gas handlers will remain with the shipment during the entire time that it is in the custody of the carrier. Gas handlers will, in the event of leakage or escape of gas, make repairs and perform decontamination, if necessary. If they need assistance they will advise the carrier's representative as to the nearest Chemical Warfare Service Depot and aid required.

(6) Loading and bracing in cars. Drums must be loaded in cars having level floors. Cars equipped with metal corrugated ends or cars having bowed ends must be supplied with end wall bulkheads constructed in accordance with requirements for center gates. (See Sketch 1, Bureau of Explosives Pamphlet No. 6.)

(7) Drums must be loaded not more than one tier (layer) high and with filling holes up. They must be loaded as closely together as possible both crosswise and lengthwise and so blocked and braced as to maintain their relative positions during transit.

(8) Drums with filling holes in heads must be loaded on their bottoms. They may be loaded in rows, lengthwise of the car and any space between the sides of car and the nearest row of drums must be "filled in" with wooden boards or lumber nailed to sides of car sufficient in length and width to contact both hoops of drums, or, drums may be loaded across car in staggered stacks of which the number of drums in alternate stacks is reduced by one drum. All drums in stacks following the first stack loaded in end of car must be placed tightly into the angle of space formed by the sidewalls of the drum in the preceding stack. Any space between the sides of car and the drums in stacks having the greater number of drums, must be "filled in" with wooden boards or lumber nailed to sides of car sufficient in length and width to contact both hoops of drums.

(9) Drums with filling holes in sides must be loaded on their sides with filling holes up. They must be loaded lengthwise of the car in rows and any space between sides of car and the nearest row of drums must be "filled in" with wooden boards or lumber nailed to sides of car sufficient in length and width to contact both hoops of drums.

(10) Drums must be loaded in box car from ends of car toward space between car doors, and there braced by center gates and wedges. (See Sketch 1, Bureau of Explosives Pamphlet No. 6.)

(11) Doorways of box cars must be protected by one of the methods prescribed in Sketch 1, Bureau of Explosives Pamphlet No. 6A.

(12) Tanks must be securely mounted on cars especially provided for them or on gondola cars prepared with substantial wooden frames and blocks.

(13) Bombs, projectiles, and cannon ammunition must be loaded, blocked and braced as shown in Bureau of Explosives Pamphlet 6A. When shipments are loaded in gondola cars they must be securely blocked and braced and not loaded higher than the sides of the car.

[1] War Department specification container.

SUBPART B—LOADING AND STORAGE CHART OF EXPLOSIVES AND OTHER DANGEROUS ARTICLES

§ 74.538 *Loading and storage chart of explosives and other dangerous articles.* (a) Explosives or other dangerous articles must not be loaded, transported, or stored together, except as provided in the Loading and Storage Chart of Explosives and Other Dangerous Articles shown in this section.

The following table shows the explosives and other dangerous articles which must not be loaded or stored together.

The letter X at an intersection of horizontal and vertical columns shows that these articles must not be loaded or stored together, for example: Detonating fuzes, boosters (explosive) g horizontal column must not be loaded or stored with high explosives b vertical column.

		a	b	c	d	e	f	g	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Low explosives or black powder	High explosives, and smokeless powder for small arms in quantity exceeding 50 pounds net weight	Initiating or priming explosives, wet: Diazodinitrophenol, fulminate of mercury, guanyl nitrosamino guanylidene hydrazine, lead azide, lead styphnate, nitro mannite, nitrosoguanidine, pentaerythrite tetranitrate, tetrazeno	Blasting caps, with or without safety fuse (including electric blasting caps), detonating primers	Ammunition for cannon with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles or shell, ammunition for small arms with explosive bullets, or ammunition for small arms with explosive projectiles, or rocket ammunition with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles or illuminating projectiles [a]	Explosive projectiles, bombs, torpedoes, or mines, rifle or hand grenades (explosive), jet thrust units (jato), class A [a]	Detonating fuzes, boosters (explosive)	Ammunition for cannon with empty, inert-loaded or solid projectiles, or rocket ammunition with empty projectiles, inert-loaded or solid projectiles or without projectiles	Smokeless powder for cannon, or not exceeding 50 pounds net weight of smokeless powder for small arms, or jet thrust units (jato), class B	Fireworks, special	Small arms ammunition	Primers for cannon or small arms, empty cartridge bags—black powder igniters, empty cartridge cases, primed, empty grenades, primed, combination primers or percussion caps, toy caps, explosive cable cutters, explosive rivets	Percussion fuzes, tracer fuzes or tracers	Time or combination fuzes	Cordeau detonant fuse, safety squibs, fuse lighters, fuse igniters, delay electric igniters, electric squibs or instantaneous fuse	Fireworks, common	Flammable liquids or compressed flammable gases, red label	Flammable solids or oxidizing materials, yellow label	Acids or corrosive liquids, white label	Compressed nonflammable gases, green label	Poisonous gases or liquids, in cylinders, projectiles or bombs, poison gas label	Radioactive materials (class D poisons)
CLASS A EXPLOSIVES																							
Low explosives or black powder	a			X							X						X	X	X	X	X	X	X
High explosives, and smokeless powder for small arms in quantity exceeding 50 pounds net weight	b			X				X			X						X	X	X	X	X	X	X
Initiating or priming explosives, wet: Diazodinitrophenol, fulminate of mercury, guanyl nitrosamino guanylidene hydrazine, lead azide, lead styphnate, nitro mannite, nitrosoguanidine, pentaerythrite tetranitrate, tetrazene	c	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Blasting caps, with or without safety fuse (including electric blasting caps), detonating primers	d			X		X	X				[b] X						[b] X	[b] X	[b] X	[b] X	[b] X	X	X
Ammunition for cannon with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles or shell, ammunition for small arms with explosive bullets, or ammunition for small arms with explosive projectiles, or rocket ammunition with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles or illuminating projectiles. [c]	e			X	X			X			X						X	X	X	X	X	X	X
Explosive projectiles, bombs, torpedoes, or mines, rifle or hand grenades (explosive), jet thrust units (jato), class A. [c]	f			X	X			X			X						X	X	X	X	X	X	X
Detonating fuzes, boosters (explosive)	g		X	X		X	X				X						X	X	X	X	X	X	X
CLASS B EXPLOSIVES																							
Ammunition for cannon with empty, inert-loaded or solid projectiles, or without projectiles, or rocket ammunition with empty projectiles, inert-loaded or solid projectiles or without projectiles	1			X																[b] X		X	
Smokeless powder for cannon, or not exceeding 50 pounds net weight of smokeless powder for small arms, or jet thrust units (jato), class B	2			X							-									[b] X		X	
Fireworks, special	3	X	X	X	[b] X	X	X	X														X	
CLASS C EXPLOSIVES																							
Small arms ammunition	4			X																			
Primers for cannon or small arms, empty cartridge bags-black powder igniters, empty cartridge cases, primed, empty grenades, primed, combination primers or percussion caps, toy caps, explosive cable cutters, explosive rivets	5			X																			

See footnotes at end of table.

The following table shows the explosives and other dangerous articles which must not be loaded or stored together.

The letter X at an intersection of horizontal and vertical columns shows that these articles must not be loaded or stored together, for example: Detonating fuzes, boosters (explosive) g horizontal column must not be loaded or stored with high explosives b vertical column.

		Low explosives or black powder	High explosives, and smokeless powder for small arms in quantity exceeding 50 pounds net weight	Initiating or priming explosives, wet: Diazodinitrophenol, fulminate of mercury, guanyl nitrosamino guanylidene hydrazine, lead azide, lead styphnate, nitro mannite, nitrosoguanidine, pentaerythrito tetranitrate, tetrazene	Blasting caps, with or without safety fuse (including electric blasting caps), detonating primers	Ammunition for cannon with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles or shell, ammunition for small arms with explosive bullets, or ammunition for small arms with explosive projectiles, or rocket ammunition with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles or illuminating projectiles [a]	Explosive projectiles, bombs, torpedoes, or mines, rifle or hand grenades (explosive), jet thrust units (jato), class A [c]	Detonating fuzes, boosters (explosive)	Ammunition for cannon with empty, inert-loaded or solid projectiles, or without projectiles, or rocket ammunition with empty projectiles, inert-loaded or solid projectiles or without projectiles	Smokeless powder for cannon, or not exceeding 50 pounds net weight of smokeless powder for small arms, or jet thrust units (jato), class B	Fireworks, special	Small arms ammunition	Primers for cannon or small arms, empty cartridge bags—black powder igniters, empty cartridge cases, primed, empty grenades, primed, combination primers or percussion caps, toy caps, explosive cable cutters, explosive rivets	Percussion fuzes, tracer fuzes or tracers	Time or combination fuzes	Cordeau detonant fuse, safety squibs, fuse lighters, fuse igniters, delay electric igniters, electric squibs or instantaneous fuse	Fireworks, common	Flammable liquids or compressed flammable gases, red label	Flammable solids or oxidizing materials, yellow label	Acids or corrosive liquids, white label	Compressed nonflammable gases, green label	Poisonous gases or liquids, in cylinders, projectiles or bombs, poison gas label	Radioactive materials (class D poisons)
		a	b	c	d	e	f	g	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLASS C EXPLOSIVES—continued																							
Percussion fuzes, tracer fuzes or tracers	6			X																			
Time or combination fuzes	7			X																			
Cordeau detonant fuse, safety squibs, fuse lighters, fuse igniters, delay electric igniters, electric squibs or instantaneous fuse	8			X										[d]									
Fireworks, common	9	X	X	X	[e] X	X	X	X														X	
OTHER DANGEROUS ARTICLES																							
Flammable liquids or compressed flammable gases, red label	10	X	X	X	[e] X	X	X	X														X	
Flammable solids or oxidizing materials, yellow label	11	X	X	X	[e] X	X	X	X												[b] X		X	
Acids or corrosive liquids, white label	12	X	X	X	[e] X	X	X	X	[b] X	[b] X									[b] X			X	
Compressed nonflammable gases, green label	13	X	X	X	[e] X	X	X	X															
Poisonous gases or liquids, in cylinders, projectiles or bombs, poison gas label	14	X	X	X	X	X	X	X	X	X	X						X	X	X	X			
Radioactive materials (class D poisons)	15	X	X	X	X	X	X	X															

[a] Blasting caps or electric blasting caps in quantities not exceeding 1,000 caps may also be loaded and transported with all articles named except those in columns c, e, and f.

[b] Unless loaded in opposite ends of car, acids or other corrosive liquids, white label, must not be loaded with yellow label articles, ammunition for cannon with or without projectiles, or smokeless powder.

[c] Explosives, class A, and explosives, class B, must not be loaded or stored with chemical ammunition containing incendiary charges either with or without bursting charges. Chemical ammunition of the same classification containing incendiary charges may be loaded and stored together.

NOTE 1: Charged electric storage batteries must not be loaded in the same car nor stored with any class A explosive.

NOTE 2: Cyanides or cyanide mixtures must not be loaded or stored with acids or corrosive liquids.

NOTE 3: Gas identification sets may be loaded and transported with all articles named except those in column c.

SUBPART C—PLACARDS ON CARS

§ 74.540 *"Explosives" placards.* (a) Explosives placards as prescribed in § 74.550 of this part must be applied to certified cars containing explosives, class A, specified in §§ 73.53 to 73.87 of this chapter, and smokeless powder for small arms in quantity exceeding 50 pounds, net weight. Placards must show in the spaces provided station name and date.

NOTE 1: For cars requiring the poison gas placard see § 74.542.

§ 74.541 *"Dangerous" placards; or "Dangerous—class D poison" placards.* (a) "DANGEROUS" placard, as prescribed by § 74.552 of this part must be applied to cars, and container cars, as follows:

(1) Cars containing one or more packages bearing red, yellow, white acid, or corrosive liquid caution labels, or white "poison" labels, as prescribed by §§ 73.405 to 73.408 and 73.409 (a) (2) of this chapter, or without labels as authorized in § 73.402 (c) and (d) of this chapter.

(2) Cars containing flammable solids, oxidizing materials or poisonous solids, class B, in bulk.

(3) Tank cars containing flammable liquids, flammable solids or oxidizing materials, acids or corrosive liquids, poisonous liquids or solids, class B, compressed flammable gases, compressed nonflammable gases.

(4) Cars containing shipments of explosives, class B. See § 74.540 for placarding cars containing shipments of smokeless powder for small arms in quantity exceeding 50 pounds net weight.

NOTE 1: For cars also requiring the poison gas placard see § 74.542.

(5) When explosives, class A, or smokeless powder for small arms, in quantity exceeding 50 pounds net weight, are loaded in the same car with explosives, class B, or poisonous solids or liquids, class B, only the "Explosives" placard is required.

(b) "Dangerous—Class D poison" placards, as prescribed in § 74.553, must be applied to cars containing shipments of class D poisons as provided in §§ 73.391 and 73.392 of this chapter.

§ 74.542 *"Poison gas" placards.* (a) "Poison gas" placards as prescribed by § 74.551 of this part must be applied to cars as follows:

(1) Cars containing one or more packages or articles bearing the "Poison gas" label.

(2) Cars containing ammunition for cannon with toxic gas projectiles, or projectiles, bombs, or other containers

loaded with toxic gas requiring the "Poison gas" label.

NOTE 1: The poison gas placard must be applied to cars in addition to any other placards required.

§ 74.543 *Placarding cars; passenger trains.* (a) When a freight, baggage, or express car containing freight shipments of explosives, class B, or freight shipments of dangerous articles other than explosives requiring labels as prescribed by Part 73 of this chapter (not including class A poison gases or liquids), is hauled in a passenger train and such car or cars are not occupied by an employe of the carrier, proper placards must be applied to the car as required by this part.

§ 74.544 *Placards not required.* (a) Placards are not required for:

(1) Cars containing explosives, class C.

(2) Cars, other than tank cars, containing nonflammable compressed gas (green label).

(3) Cars containing class C poisons (tear gas label).

(4) Cars loaded with electric storage batteries containing electrolyte or corrosive battery fluid in carload lots.

§ 74.545 *Commodity name on carloads.* (a) Placards for carloads of class B explosives and other dangerous articles must show thereon, in the space provided, the proper name of the commodity as prescribed by § 72.5 of this chapter, or the commodity name must be shown on tag board cards measuring approximately 5 by 8 inches securely attached to each side of the car.

§ 74.546 *Placards must be standard.* (a) Placards must conform to standards as prescribed. Samples will be furnished by the Bureau of Explosives on request.

(b) Tag-board placards must be printed on strong tag board, designated commercially as No. 2 tag board, and weighing 150 pounds per ream, of sheets 24 by 36 inches, and having a resistance of not less than 60 pounds per square inch, Mullen test.

(c) Paper placards must be printed on strong white paper.

(d) Placards or car cards which by their shape, coloring, or printing may be readily confused with the standard placards prescribed in this part must not be used.

(e) Carrier's or shipper's name and stationery form number may be printed on placards in type not larger than 10 point, but must be printed thereon separate from any placard wording.

(f) When the tag board placards bear wording prescribed in § 74.552 (a) of this part, and provided the wording prescribed by § 74.563 (c) of this part appears on the reverse side thereof, the words "removed or" may be omitted or the word "removed" changed to "reversed", as the case may be.

(g) Placards remaining on hand and which were authorized by regulations in effect on December 31, 1950, may be used until present stocks are exhausted.

§ 74.547 *Carriers supply of placards.* (a) Carriers must keep on hand an adequate supply of all necessary placards for placarding cars loaded by them and for the replacement of missing placards on loaded cars while in transit.

§ 74.548 *Placarded cars.* (a) Shippers must have applied placards to cars loaded by them when cars are acceptable for transportation. (See § 74.549 of this part for method of application.)

§ 74.549 *Application of placards.* (a) Placards must be securely applied one to each end and each side of car, as follows:

(1) By tacking tag-board placards to each end and each side of cars, or to placard boards of suitable size provided for the purpose.

(2) Placards applied to the sides of closed or open top cars containing explosives or other dangerous articles must be attached to the fixed placard board or to the side of the wooden car between car initials and number and the car door.

(3) Tacks when used must have heads at least ¼ inch across. At least 5 tacks must be used, one at each corner and one in the center of the placard, or when stapling devices are used the staples should be made of flat metal of not less than 19 gauge, and the space between the legs of the staples should be at least ⅜ inch and length of staples not less than ¼ inch. At least 9 staples must be used, one at each corner, one along edge between each corner, and one in center. Tacks, nails, staples, or other devices used in previous application of placards must be removed when their presence interferes with proper application of placards.

(4) By insertion of tag-board placards in suitable placard holders affixed to cars.

(5) Paper placards must be securely pasted to metal placard boards provided for the purpose. Grease or other substances, which interfere with secure application, must be removed from metal surfaces before pasting on placards.

(b) Placards applied to cars must have the printing in horizontal position.

(c) "Explosives" placards and car certificates must be placed alongside of each other.

NOTE 1: Because of the present emergency and until further order of the Commission, gondola cars used for the shipments of bombs or poison gas, may be placarded on both sides and both ends of car.

(d) Placards applied to sides of tank cars must be placed as near the middle as possible. Side placard boards applied to tank cars near end of tank may be used until replaced by boards located near middle of tank, in accordance with requirements effective November 1, 1927.

(e) Placard holders must be so constructed as not to obstruct the wording, change the shape of the placard, or reduce the exposed surface of the placard more than three-eighths of an inch on each side.

NOTE 1: Permanent metal holders designed to provide for secure attachment, easy application, removal, or reversal of placards prescribed in these regulations are required on all new tank cars, on new underframes to which tanks are applied, and on all tank cars receiving general repairs.

(f) Placards must be applied to both sides and both ends of a container car on which a container or containers loaded with special fireworks, or with dangerous articles requiring labels, are placed; or placards must be applied to both ends of such a car and to both sides of a container loaded with such articles.

(g) Metal reversible placards, bearing on one side the "Dangerous" placard wording as prescribed in § 74.552 of this part and on the reverse side the "Dangerous—Empty" placard wording as prescribed in § 74.563 of this part may be used in lieu of placard holders prescribed in Note 1 to § 74.549 (e) of this part. The wording on these placards must be kept distinct as to colors and clearly legible.

§ 74.550 *Explosives, class A placard.* (a) The "Explosives" placard must be of rectangular shape, measuring 11 by 14 inches, and must bear the wording as shown in the following cut; the printing must be in red and black as follows:

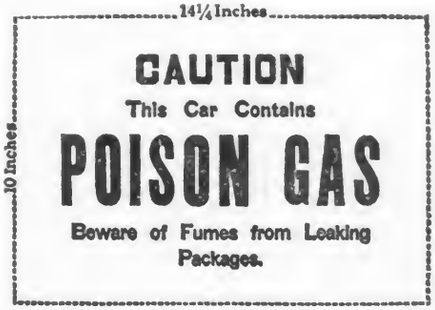
EXPLOSIVES PLACARD

(Reduced size)

§ 74.551 *Poison gas placard.* (a) The "Poison gas" placard must be of rectangular shape, measuring 10 by 14¼ inches, and must bear the wording as shown in the following cut; the printing must be in red as follows:

POISON GAS PLACARD

(Reduced size)



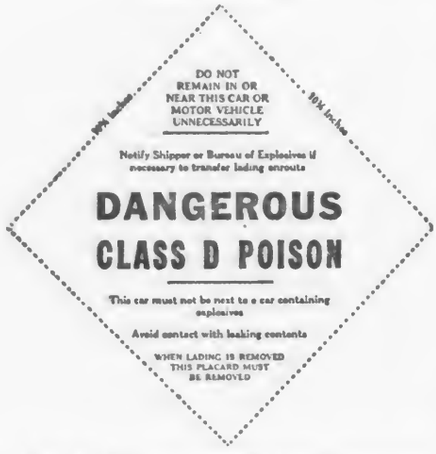
§ 74.552 *Dangerous placard.* (a) The "Dangerous" placard must be of diamond shape, measuring 10¾ inches on each side, and must bear the wording as shown in the following cut; the word "Dangerous" must be in red, and the lettering in black, as follows:

DANGEROUS PLACARD
(Reduced size)

(b) The reverse side of such placards may bear the wording as prescribed for the "Dangerous-Empty" placard. (See § 74.563 of this part.)

§ 74.553 *Dangerous—Class D poison placard.* (a) The "Dangerous—Class D Poison" placard for class D poisons, must be of diamond shape measuring 10¾ inches on each side, and must bear the wording in red letters as shown in the following cut:

DANGEROUS PLACARD FOR CLASS D POISONS
(Reduced size)



§ 74.554 *Unauthorized use of placards.* (a) Placards prescribed by this part must not be applied to cars containing articles not subject to Parts 71–78 of this chapter or specifically exempted therefrom.

SUBPART D—UNLOADING FROM CARS

§ 74.560 *Tank car delivery.* (a) Tank cars containing flammable liquids having a flash point of 80° F. or below, except liquid road asphalt or tar, must not be delivered, unless originally consigned or subsequently reconsigned to parties having private-siding (see Note 1) or railroad-siding facilities equipped for piping the liquid from tank cars to permanent storage tanks of sufficient capacity to receive contents of car.

(b) No tank car containing compressed gas may be unloaded unless the car is consigned for delivery and unloading on a private track (see Note 1 to subparagraph (2) of this paragraph), except that where no private track is available, delivery and unloading on carrier tracks is permitted provided the following conditions are complied with:

(1) Any tank car of ICC–106A type (see §§ 78.275 and 78.276 of this chapter) may be delivered and the loaded unit tanks may be removed from car frame on carrier tracks, if, before car is accepted for transportation, the shipper has obtained from the delivering carrier and filed with originating carrier, written permission (see Note 2 to subparagraph (2) of this paragraph) for such removal. The consignee must furnish adequately safe mechanical hoist, obtained from the carrier if desirable, by which the tanks are lifted from the car and deposited directly upon vehicles furnished by the consignee for immediate removal from carrier property or tanks must be lifted by adequately safe mechanical hoist from car directly to vessels for further transportation.

(2) Any tank car of other than ICC–106A type (see §§ 78.275 and 78.276 of this chapter), containing liquefied hydrocarbon or liquefied petroleum gas, and having interior pipes of liquid and gas discharge valves equipped with check valves, may be delivered and unloaded on carrier tracks, if the lading is piped directly from car to permanent storage tanks of sufficient capacity to receive entire contents of car.

NOTE 1: For this purpose, a private track is a track outside of carrier's right-of-way, yard and terminals, and of which the carrier does not own either the rails, ties, roadbed or right-of-way; or a track or portion of a track which is devoted to the purpose of its user, either by lease or written agreement, in which case the lease or written agreement will be considered as equivalent to ownership.

NOTE 2: Carriers should give permission for the unloading of these containers on carrier tracks only where no private siding is available within reasonable trucking distance of final destination. The danger involved is the release of chlorine gas due to accidental injury to container in handling. The exposure to this danger decreases directly with the isolation of the unloading point.

§ 74.561 *Tank car unloading.* (a) In unloading tank cars the following rules must be observed (see also § 74.560 of this part for compressed gases):

(1) Unloading operations should be performed only by reliable persons properly instructed and made responsible for careful compliance with this part.

(2) Brakes must be set and wheels blocked on all cars being unloaded.

(3) Caution signs must be so placed on the track or car as to give necessary warning to persons approaching car from open end or ends of siding and must be left up until after car is unloaded and disconnected from discharge connection. Signs must be of metal or other suitable material, at least 12 by 15 inches in size and bear the words, "STOP—Tank Car Connected", or "STOP—Men at Work", the word "STOP" being in letters at least 4 inches high and the other words in letters at least 2 inches high. The letters must be white on a blue background.

(4) Before manhole cover or outlet valve cap is removed, tank car must be relieved of all interior pressure by cooling tank with water or venting tank by raising safety valve or opening vent on dome at short intervals. If venting to relieve pressure will cause a dangerous amount of vapor to collect outside the car, venting and unloading must be deferred until pressure is reduced by allowing the car to stand overnight or otherwise cooling the contents. These precautions are not necessary when car is equipped with a manhole cover which hinges inward or with an inner manhole cover which does not have to be removed to unload the car, and when pressure is relieved by piping vapor into a condenser or storage tank.

(b) After pressure is released, seal should be broken and manhole cover removed as follows:

(1) *Screw type.* Cover must be loosened by placing bar between manhole cover lug and knob. After two complete turns, so that vent openings are exposed, the operation must be stopped, and if there is any sound of escaping vapor, the cover must be again screwed down tightly and interior pressure relieved as prescribed in paragraph (a) (4) of this section, before again attempting to remove the cover.

(2) *Hinged and bolted type.* All nuts must be unscrewed one complete turn, after which same precautions as prescribed for screw type cover must be observed.

(3) *Interior type.* All dirt and cinders must be carefully removed from around cover before yoke is unscrewed.

(c) When car is unloaded through bottom outlet valve, manhole cover must be adjusted as follows:

(1) *Screw type.* Manhole cover must be put in place, but not entirely screwed down, in order that air may enter tank through vent holes in threaded flange of cover.

(2) *Hinged and bolted type.* A small wooden block should be placed under one edge of cover.

(3) *Interior type.* Screw must be tightened up in yoke so that cover will be brought up within one-half inch of closed position.

(d) When unloading through bottom outlet of cars equipped with interior manhole type of covers, and in all cases where unloading is done through the manhole (unless special covers are used, provided with safety-vent opening and tight connection for discharge outlet), the manhole must be protected against entrance of sparks or other sources of ignition of vapor by asbestos or metal covers or by being covered and surrounded with wet burlap. Burlap must be kept damp by replacement or the application of water as needed.

(e) Seals or other substances must not be thrown into the tank. Also care must be taken to avoid spilling any of the contents over car or tank.

(f) Valve rod handle or control in dome must be operated a few times to see that outlet valve in bottom of tank is on its seat before valve cap is removed.

(g) Valve cap, or reducer when large outlet is to be used, must be removed with suitable wrench after set screws are loosened and a pail is placed in position to catch any liquid that may be in outlet chamber. If valve cap or reducer does not unscrew easily, it must be tapped lightly with mallet or wooden block in an upward direction. If leak-

age shows upon starting the removal, cap or reducer must not be entirely unscrewed, but sufficient threads must be left engaged and sufficient time allowed to permit escape of any accumulation of liquid in the outlet chamber. If leakage stops or initial rate of leakage diminishes materially, cap or reducer may be entirely removed. If initial rate of leakage continues, further efforts must be made to seat the outlet valve, see paragraph (f) of this section. If this fails, the cap or reducer must be screwed up tight and tank must be unloaded through the dome. If upon removal of the outlet cap the outlet chamber is found to be blocked with frozen liquid or any other matter, replace cap immediately and make careful examination to determine that outlet casting has not been cracked. If the obstruction is not frozen liquid, the car must be unloaded through the dome. If the obstruction is frozen liquid and no crack has been found in the outlet casting, the car may, if circumstances require it, be unloaded from the bottom as follows:

(1) Remove cap and attach unloading connections immediately. Then, before opening the valve inside the tank car, apply steam to outside of outlet casting or wrap casting with burlap or other rags and apply hot water to melt the frozen liquid. In any event, top unloading is considered safer than bottom unloading.

(h) Unloading connections must be securely attached to unloading pipes on dome or to bottom discharge outlets before discharge valves are opened.

(i) Tank cars must not be allowed to stand with unloading connections attached after unloading is completed, and throughout the entire period of unloading, or while car is connected to unloading device, the car must be attended by the unloader.

(j) If necessary to discontinue unloading a tank car for any reason, all unloading connections must be disconnected. All valves must first be tightly closed, and the closures of all other openings securely applied.

(k) As soon as a tank car is completely unloaded, all valves must be made tight, the unloading connections must be removed and all other closures made tight, except that heater coil inlet and outlet pipes must be left open for drainage. The manhole cover must be applied by the use of a bar or wrench, the outlet valves reducer and outlet valve cap by the use of a wrench having a handle at least 36 inches long, and the outlet valve cap plug, end plug, and all other closures of openings and of their protective housings by the use of a suitable tool.

(l) Railroad defect cards must not be removed.

(m) Ground around connections must be covered with fresh, dry sand or dirt, if oil or gasoline has been spilled previously.

(n) All tools and implements used in connection with unloading should be kept free from oil, dirt, and grit.

§ 74.562 *Removal of placards and car certificate after unloading.* (a) When lading requiring placards or car certificates is removed from cars other than tank cars, placards and car certificates must be removed by the party unloading the car.

(b) After tank car is unloaded, the party unloading the car must remove all shipping cards and "Dangerous" placards from car, or may replace or cover the placards with the "Dangerous—Empty" placards prescribed in § 74.563 of this part, or reverse the reversible metal placards so as to exhibit the "Dangerous—Empty" wording, and must promptly notify the railroad agent that car is empty.

§ 74.563 *"Dangerous—Empty" placard.* (a) "Dangerous—Empty" placards must measure 10¾ inches on each side. The printing must be as shown in the cut in this section, in black on strong white paper, or on tag board designated commercially as No. 2 tag board, and weighing 150 pounds per ream of sheets 24 inches by 36 inches, and having a resistance of not less than 60 pounds per square inch, Mullen test.

(b) The reverse side of such placards may bear the wording as prescribed for the "Dangerous" placard. (See § 74.552 of this part.)

(c) Paper placards must be securely pasted over the "Dangerous" placards pasted on metal placard boards provided for the purpose. Tag board placards must be securely tacked to wooden boards or inserted in holders provided for the purpose.

"DANGEROUS—EMPTY" PLACARD

(Reduced size)

NOTE 1: The words *"Keep lights and fires away"* and *"Flammable or poisonous vapor"* may be omitted from placards attached to tank cars which previously contained alkaline corrosive liquids or corrosive liquids which do not react with the metal wall or lining of the tank to form a flammable or poisonous gas.

§ 74.564 *Removal and disposition of explosives and other dangerous articles at destination*—(a) *Delivery at nonagency stations.* Shipments of explosives must not be unloaded at nonagency stations unless the consignee is there to receive them or unless properly locked and secure storage facilities are provided at that point for their protection.

(1) If delivery cannot be so made, shipment must be taken to next or nearest agency station for delivery.

(b) *Delivery at agency stations.* Carrier must require consignee to remove shipments of explosives and other dangerous articles from carrier's property within 48 hours after notice of arrival has been sent or given. Sundays and holidays are not included. If not so removed, carrier must immediately dispose of the shipments as follows:

(1) Class A explosives, by storage at the expense of the owner or by return to the shipper if reasonably safe storage is not available; by sale; when necessary to safety, by destruction under supervision of a competent person.

(2) Explosives and other dangerous articles, except class A explosives, in carload and less-than-carload lots as prescribed in subparagraphs (3) and (4) of this paragraph.

(3) Carload shipments: By storage on carrier's property; by storage on other than carrier's property, if safe storage on carrier's propety is not available; by sale at expiration of 15 calendar days after notice of arrival has been sent or given to consignee, provided consignor has been notified of nondelivery at expiration of 48-hour period and orders for disposition have not been received.

(4) Less-than-carload shipments: By return to shipper if notice of nondelivery was requested and given consignor as prescribed by carrier's tariff, and orders for return to shipper have been received; by storage on carrier's property; by storage on other than carrier's property, if safe storage on carrier's property is not available; by sale at expiration of 15 calendar days after notice of arrival has been sent or given to consignee, provided consignor has been notified of nondelivery at expiration of 48-hour period and orders for disposition have not been received.

§ 74.565 *Violations and accidents to be reported.* (a) Consignees must report promptly to the Bureau of Explosives all instances of improper staying and broken, leaking, or defective containers of explosives or other dangerous articles in shipments received by them.

(b) The Bureau of Explosives, upon receipt of reports from consignees, should promptly report to the shipper full particulars covering all cases of defective packing, improper staying leaking and/or broken shipping containers and rough treatment of cars resulting in leakage or damage to shipping containers or staying.

§ 74.566 *Cleaning cars.* (a) Cars which have contained arsenic, arsenate or lead, sodium arsenate, calcium arsenate, Paris green, calcium cyanide, potassium cyanide, sodium cyanide, or other poisonous articles, which show any evidence of leakage from packages, must be thoroughly cleaned after unloading before cars are again placed in service.

(b) After unloading poisons from steel hopper cars, cars must be thoroughly flushed out with water.

(c) All loose powder or other explosive or any other dangerous article which has leaked from packages must be carefully removed from car and other railroad property.

(d) Any car which has contained radioactive material must be thoroughly cleaned by the consignee in such a manner as to remove all radioactive material from the car, and a certificate to this

effect must be furnished the local agent of the railway company before the car is released to the carrier.

§ 74.567 *Flammable vapors.* (a) A box car or container car placarded "Dangerous", or known to contain flammable liquids, gases, or vapors must not be entered with a lighted open-flame lantern, torch, or other fire, until both car doors have been opened and sufficient time allowed for ventilation and escape of any vapors. The presence of these vapors will generally be indicated by characteristic odors. When leakage is continuous, ventilation will not remove the danger. The leaking package should be located and removed, using electric lights or waiting for daylight.

SUBPART E—HANDLING BY CARRIERS BY RAIL FREIGHT

§ 74.575 *Restrictions.* (a) When local conditions make the acceptance, transportation, or delivery of explosives or other dangerous articles unusually hazardous, local restrictions may be imposed by the carrier.

(b) All carriers must report to the Bureau of Explosives for publication full information as to restrictions which may be imposed against the acceptance, delivery, or transportation of explosives or other dangerous articles, over any portion of their lines.

§ 74.576 *Intermediate shippers and carriers.* (a) Forwarding companies must have on file shipper's certified bill of lading or shipping order, and know that packages delivered to carrier for transportation comply with Parts 71–78 of this chapter.

§ 74.577 *Shipping days for explosives.* (a) When practicable at any point, regular days should be assigned for receiving from shippers less-than-carload lots of explosives, class A, as shown in Part 73 of this chapter.

(b) To enable the carrier to provide proper cars at stations where less-than-carload shipments of explosives, class A, are accepted for loading by the carrier, the shipper must give to the carrier not less than 24 hours' notice of his intention to offer such shipments, and state their destinations. When a regular day to receive all explosives shipments offered at such a station has been appointed, this notice may be waived by the carrier, but the explosives shipments must be delivered on such days in time to permit proper inspection, billing, and loading on that day.

§ 74.578 *Flammable vapors.* (a) A box car or container car placarded "Dangerous," or known to contain flammable liquids, must not be entered with a lighted open-flame lantern, torch, or other fire, until both car doors have been opened and sufficient time allowed for ventilation and escape of any vapors. The presence of these vapors will generally be indicated by characteristic odors. When leakage is continuous, ventilation will not remove the danger. The leaking package should be located and removed, using electric lights or waiting for daylight.

§ 74.579 *Cars fumigated with flammable liquids or toxic or poisonous liquids or gases.* (a) Delivery to carrier or transportation of cars fumigated with flammable liquid is prohibited until 48 hours have elapsed after fumigation.

(b) Cars or the lading thereof which have been fumigated with poisonous or toxic liquid or gas, such as chlorpicrin, hydrocyanic acid, methyl bromide, etc., must be placarded on each door or near thereto with placard reading as follows:

(Reduced size)

(Red lettering on white cardboard)

10 INCHES

8 INCHES

DANGER

This car has been

FUMIGATED

with

(Name of poisonous liquid or gas)

BEFORE UNLOADING, open both doors and DO NOT ENTER until car is free of gas

§ 74.580 *Violations must be corrected.* (a) All violations discovered must be corrected before forwarding shipments of explosives.

§ 74.581 *Routing shipments.* (a) Before any shipment of explosives, class A, as named in §§ 73.53 to 73.87 of this chapter, destined to a point beyond the the lines of the initial carrier, is accepted from a shipper, the initial carrier must ascertain that the shipment can go forward by the route designated, and to avoid delays en route the initial carrier must be in possession of full rate information, before forwarding the shipment.

§ 74.582 *Movement to be expedited.* (a) Carriers must forward shipments of explosives and other dangerous articles promptly and within 48 hours after acceptance at originating point or receipt at any yard, transfer station or interchange point except that where biweekly or weekly service only is performed, shipments of explosives and other dangerous articles must be forwarded on the first available train.

(b) No tank car loaded with flammable liquid or compressed flammable gas shall be received and held at any point, subject to forwarding orders, so as to defeat the purpose of this section or of § 74.560 of this part.

§ 74.583 *Examination of shipping order and packages.* (a) Carriers must examine shipping order and determine that proper certificate is given and that packages are not broken or leaking when offered for transportation.

§ 74.584 *Waybills, switching orders, or other billing.* (a) The revenue waybill, astray waybill, switching order or any other billing issued in lieu thereof, prepared from the shipping order or other shipping paper, or shipping orders used as waybills, must describe the article by shipping name as prescribed in § 72.5 of this chapter and must show label notations for less-than-carload shipments or placard notations for carload shipment for dangerous articles other than explosives and placard indorsements as follows:

	Label notation to follow entry of the article on the billing	Placard notation to follow entry of the article on the billing	Placard endorsement must be ⅜" high and appear on the billing near the space provided for the car number
For high explosives initiating explosives and low explosives, class A, and smokeless powder for small arms in quantity exceeding 50 pounds net weight.	None	None	"Explosives."
For explosive chemical ammunition containing class A, poison gas.	Poison gas label	"Polson Gas Placard".	"Explosives" and "Poison gas".
For explosives, class B, except smokeless powder for small arms in quantity exceeding 50 pounds net weight.	None	None	"Dangerous".
For explosives, class C	None	None	None.
For flammable liquids	Red label	"Dangerous Placard"	"Dangerous".
For flammable solids and oxidizing materials.	Yellow label	"Dangerous Placard"	"Dangerous".
For corrosive liquids	White label	"Dangerous Placard"	"Dangerous".
For compressed nonflammable gases in containers other than tank cars.	Green label	None	None.
For compressed nonflammable gases in tank cars.	None	"Dangerous Placard"	"Dangerous".
For compressed flammable gases	Red label	"Dangerous Placard"	"Dangerous".
For poison gases or liquids, class A	Poison gas label	"Poison Gas Placard"	"Poison Gas".
For poisonous liquids or solids, class B	Poison label	"Dangerous Placard"	"Dangerous".
For tear gases, class C	Tear gas label	None	None.
For radioactive materials, class D poison	Radioactive materials label.	"Dangerous Class D Poison Placard".	"Dangerous".

(b) Billing prepared from the shipping order or other shipping paper covering shipments of blasting caps, must, in addition, show the number of blasting caps in the shipment.

(c) Waybills, manifests, or memorandums for shipments offered for transportation by carrier by water must show the label notations as prescribed in this section.

(d) Abbreviations must not be used on shipping orders or billing for explosives or other dangerous articles.

(e) When the initial movement is a switching operation, the switching order, switching receipt or switching ticket, and copies thereof, prepared by the shipper, or by the carrier under the shipper's written authority, must bear the placard indorsement and the shipper's certificate prescribed by § 73.430 of this chapter and paragraph (a) of this section; for other switching movement, the switching ticket prepared by a railway employee must show the kind of placard required.

(f) The car ticket, card waybill, running slip, envelope containing waybills,

or any other billing for any loaded car which under these regulations should bear "Explosive", "Dangerous", "Dangerous—Class D poison", or "Poison Gas" placards must have plainly stamped, or plainly written on the face of such billing; near the car number, in letters not less than three-eighths of an inch high, the words 'Explosive", "Dangerous", or "Poison Gas"; and for container cars must also show which of the containers loaded thereon contain dangerous articles.

(g) For tank cars not loaded, the billing must show the word "Empty".

(h) At stations where explosives are loaded into a properly certified and placarded car received with other shipments of explosives, or when shipments of explosives are transferred or reloaded, or carload shipments are reconsigned, a record must be kept of the car, originating point, carrier's name and date of car certificate.

§ 74.585 *Nonagency shipments.* (a) If shipments of explosives are accepted at nonagency stations, provisions must be made for the proper certification and placarded car received with other shipments, and loading and staying of packages in cars.

§ 74.586 *Handling explosives and other dangerous articles.* (a) In handling packages of explosives at stations and in transferring them to and from cars, the greatest care must be taken, and shocks or falls liable to injure the containers must be avoided. Where an inclined chute is employed, such chute shall be constructed of 1-inch planed boards, with side guards 4 inches high extending 3 inches above top face of bottom of chute and, throughout its length, fastened with brass screws. D-shaped wooden strips or runners, not more than 6 inches apart and running lengthwise of chute, must be fastened to the upper surface of the bottom board by means of glue and wooden pegs extending through the bottom board and runners. Chutes must be occasionally wiped down with waste moistened with machine oil when dynamite packages are being handled.

(b) A stuffed mattress, 4 feet wide by 6 feet long and not less than 4 inches thick, or a heavy jute or hemp mat of like dimensions, must be placed under the discharging end of the chute.

(c) Careful men must be chosen to handle explosives, the platform and the shoes of the men must be as free as possible from grit, and all possible precautions must be taken against fire.

(d) Unauthorized persons must not have access to explosives and other dangerous articles at any time while such articles are in the custody of the carrier.

(e) Explosives and other dangerous articles must be kept in a safe place while being held for delivery or loading.

(f) In handling packages containing dangerous articles other than explosives at stations, and to and from cars, care must be taken to prevent their falling or being broken. Heavy packages should be trucked, rolled, or moved by use of skids or other satisfactory devices and must not be dropped from trucks, platforms, or cars. Planks for rolling trucks from platforms to cars should have beveled ends.

(g) Acid or other corrosive-liquid carboys should be handled so as not to spill the contents. "Empty" carboys, so called, should be handled with necks up, and with sufficient care to prevent burns to clothing or person from leaking acid or other corrosive liquid.

§ 74.587 *Lights.* (a) When necessary to use lights while handling explosives, it is recommended that where practicable incandescent electric lights be provided.

§ 74.588 *Disposition of damaged or astray shipments.* (a) Packages of explosives found injured or broken in transit may be recoopered when this is evidently practicable and not dangerous. A broken box of high explosives that can not be recoopered should be reinforced by stout wrapping paper and twine, placed in another strong box and surrounded by dry, fine sawdust or dry and clean cotton waste or elastic wads made from dry newspapers. A ruptured can or keg should be sealed with tape and should be inclosed in a grain bag of good quality and boxed. Injured packages thus protected and properly marked may be forwarded. The box and waybill should be marked to indicate that it has been repacked.

(b) Particles of explosive compositions from damaged containers possibly may be strewn on car floors or freight, and due care should be exercised in repacking such containers that no sparks may be produced by contact of metal or other hard surfaces, or otherwise. Water will prevent the explosion of practically all explosive substances except dynamite, and in such cases car floors should be thoroughly swept, and washed with a plentiful supply of water. Use of iron-wheel trucks, metal hammers or other metal tools that may produce sparks, should be avoided. This restriction does not apply to metal tools made of brass, bronze or copper.

(c) Unless they are leaking, or in a manifestly insecure condition, packages of dangerous articles other than explosives in transit must be forwarded to destination and report made of any violation observed. Leaking packages must not be forwarded until repaired or reconditioned.

(d) Packages of explosives showing evidence of leakage of liquid ingredients must (1) be returned immediately to shipper, if at point of shipment; or (2) disposed of to a person who is competent and willing to remove them from railway property, if leakage is discovered while in transit; or (3) removed immediately by consignee, if shipment is at destination.

(e) When disposition cannot be made as above, the leaking boxes must be packed in other boxes large enough to permit inclosure, and the leaking boxes must be surrounded by at least 2 inches of dry, fine sawdust or dry and clean cotton waste, and be stored in station magazine or other safe place until arrival of an inspector of the Bureau of Explosives, or other authorized person, to superintend the destruction or disposition of the condemned material.

(f) An astray shipment of explosives must be forwarded immediately to its destination if known, or returned to the shipper by the most practicable route, provided a careful inspection shows the packages to be in proper condition for safe transportation.

(g) When a package in an astray shipment is not in proper condition for safe transportation (see paragraphs (a), (d), and (e) of this section), or when name and address of consignee or shipper are unknown, disposition must be made as prescribed by paragraphs (d) and (e) of this section.

(h) An astray package of dangerous articles other than explosives of known destination and in proper condition for safe transportation, must be forwarded immediately on an "astray bill", showing proper label notation and placard indorsement, as prescribed by § 74.584 (a) to (f) of this part. When necessary to replace a label and doubt exists as to the kind, the red label should be used.

§ 74.589 *Handling cars; definitions.* (1) "Person" means any individual, partnership, corporation, association, joint stock company, business trust or other organized group of persons, or any trustee, receiver, assignee, or personal representative, and includes any department or agency of the United States, any State, the District of Columbia, or any other political, governmental or legal entity;

(2) "Railroad" means any person engaged in transportation as a common carrier by rail and includes its agents or employees;

(3) "Engine" means any locomotive, propelled by any form of energy, used by a railroad;

(4) "Freight car" means any vehicle used for the transportation of property by rail;

(5) "Passenger car" means any vehicle used for the transportation of passengers by rail;

(6) "Combination car" means any vehicle used for the transportation of both property and passengers by rail;

(7) "Occupied caboose" means any vehicle used by railroad employees, caretakers, or others authorized to ride therein;

(8) "A train" is one or more engines coupled together with or without cars displaying markers;

(9) "Freight train" means one or more engines coupled with one or more freight cars, displaying markers;

(10) "Passenger train" means one or more engines coupled with one or more passenger cars carrying passengers, displaying markers;

(11) "Mixed train" means one or more engines coupled with one or more freight cars and passenger cars carrying passengers, displaying markers;

(12) "Placarded car" shall be construed to embrace also any car which under this part is required to be placarded;

(13) "Pickup and/or setoff service" shall be construed to mean trains in service that pick up and/or set off one or more cars at three or more stations en route; trains having cars from which less-than-carload freight is loaded or

unloaded en route; or trains regularly scheduled to perform pickup and/or setoff service which on some days make less than three stops.

(a) *Placards on cars.* A car requiring car certificates and "Explosives", or "Dangerous", "Dangerous—Class D Poison", or "Poison Gas" placards under the provisions of this part shall not be transported unless such freight car is at all times placarded and certificated as required by this part of this chapter. Placards and car certificates lost in transit shall be replaced at next inspection point and those not required must be removed.

(1) At points where trains are inspected, cars placarded "Explosives" and adjacent cars shall be inspected; such cars shall continue in movement only when inspection shows them to be in condition for safe transportation.

(b) *Switching cars containing explosives or poison gas.* A car placarded "Explosives" or placarded "Poison Gas" shall not be cut off while in motion. No car moving under its own momentum shall be allowed to strike any car placarded "Explosives", or placarded "Poison Gas". No freight car placarded "Explosives" or placarded "Poison Gas" shall be coupled into with more force than is necessary to complete the coupling.

(1) When transporting a car placarded "Explosives" in terminals, yards, side tracks, or sidings, such cars shall be separated from the engine by at least one nonplacarded car.

(2) Closed cars placarded "Explosives" shall have doors closed before they are moved.

(c) *Switching of cars containing dangerous articles.* In switching operations where use of hand brakes is necessary, a placarded loaded tank car, or a draft which includes a placarded loaded tank car shall not be cut off until the preceding car or cars clear the ladder track and the draft containing the placarded loaded tank car, or a placarded loaded tank car shall in turn clear the ladder before another car is allowed to follow.

(1) In switching operations where hand brakes are used, it shall be determined by trial that a car placarded "Dangerous" or that a car occupied by a rider in a draft containing a car placarded "Dangerous" has its hand brakes in proper working condition before it is cut off.

(d) *Placement of freight cars containing explosives in yards, on sidings, or sidetracks.* Cars placarded "Explosives" shall be so placed that they will be safe from all probable danger of fire. Freight cars placarded "Explosives" shall not be placed under bridges or overhead highway crossings, nor in or alongside of passenger sheds or stations except for loading or unloading purposes.

(e) *Notice to crews of cars containing explosives in freight trains or mixed trains.* At all terminals or other places where trains are made up by crews other than road crew accompanying the outbound movement of cars, the railroad shall execute a consecutively numbered notice showing the location in the freight train or mixed train of every car placarded "Explosives". A copy of such notice shall be delivered to the train and engine crew and a copy thereof showing delivery to the train and engine crew shall be kept on file by the railroad at each point where such notice is given. At points other than terminals where train or engine crews are changed, the notice shall be transferred from crew to crew.

(f) *Position in freight train or mixed train of cars containing explosives.* In a freight train or a mixed train either standing or during transportation thereof, a car placarded "Explosives" shall, when length of train permits, be placed not nearer than the sixteenth car from both the engine or occupied caboose, except:

(1) When the length of freight train or mixed train will not permit it to be so placed, it shall be placed near the middle of the train.

(2) When transported in a freight train made up in "blocks" or classifications, a car placarded "Explosives" shall be placed near the middle of the "block" or classification in which moving, but not nearer than the sixth car from both the engine or occupied caboose.

(3) When transported in a freight train or a mixed train performing pickup and/or setoff service, it shall be placed not nearer than the second car from both the engine or occupied caboose, except as provided in paragraph (k) of this section.

(g) *Separating cars placarded "Explosives" from other cars in trains.* In a freight train or a mixed train either standing or during transportation thereof, a car placarded "Explosives" must not be handled next to:

(1) Occupied passenger car, other than car occupied by gas handlers or military personnel accompanying shipments.

(2) Occupied combination car, other than car occupied by gas handlers or military personnel accompanying shipments.

(3) Any car placarded "Dangerous".

(4) Engine.

(5) Any car placarded "Poison Gas".

(6) Wooden underframe car (except on narrow gauge railroads).

(7) Loaded flat car.

(8) Open-top car when any of the lading extends or protrudes above or beyond the ends or sides thereof.

(9) Car equipped with automatic refrigeration of the gas-burning type.

(10) Car containing lighted heaters, stoves, or lanterns.

(11) Car loaded with live animals or fowl, occupied by an attendant.

(12) Occupied caboose, except as provided in paragraph (k) of this section.

(h) *Position in train of loaded placarded tank car.* In a freight train or a mixed train, except a train consisting entirely of placarded loaded tank cars and as provided in paragraph (i) of this section, a placarded loaded tank car shall when the length of the train permits, be not nearer than the sixth car from the engine, occupied caboose or passenger car.

(1) When the length of the freight train or mixed train will not permit it to be so placed, it shall be not nearer than the second car from the engine, occupied caboose or passenger car.

(2) When transported in a freight train engaged in "pickup" or "setoff" service, a placarded loaded tank car shall be not nearer than the second car from both engine or occupied caboose.

(i) *Separating loaded tank cars placarded "Dangerous" from other cars in trains.* In a freight train or mixed train either standing or during transportation thereof, a placarded loaded tank car must not be handled next to:

(1) Occupied passenger car, other than gas handlers accompanying shipment.

(2) Occupied combination car, other than gas handlers accompanying shipment.

(3) Any car placarded "Explosives".

(4) Engine, (except when train consists only of placarded loaded tank cars).

(5) Any car placarded "Poison Gas".

(6) Wooden under-frame car (except on narrow gauge railroads).

(7) Loaded flat cars.

(8) Open-top car when any of the lading extends or protrudes above or beyond the ends or sides thereof.

(9) Car equipped with automatic refrigeration of the gas-burning type.

(10) Car containing lighted heaters, stoves, or lanterns.

(11) Car loaded with live animals or fowl, occupied by an attendant.

(12) Occupied caboose, (except when train consists only of placarded loaded tank cars).

(j) *Position in freight train or mixed train of cars placarded "Poison Gas" or containing poison liquids, class A.* In a freight train or mixed train either standing or during transportation thereof, a car placarded "Poison Gas" or containing poison liquids, class A, shall not be next to other freight cars placarded "Explosives" or cars placarded "Dangerous".

(k) *Position in freight train or mixed train of cars placarded "Explosives" and "Poison Gas" or containing poison liquids when accompanied by cars carrying gas handling crews.* A car placarded "Poison Gas" or containing poison liquids class A in drums, tanks or bombs, or a car placarded both "Explosives" and "Poison Gas" shall at all times be next to and ahead of the car occupied by the gas handling crews, when accompanying such car.

(1) A car or cars placarded "Explosives" shall be next to and ahead of a car occupied by guards accompanying such car, except that when the car occupied by guards is equipped with a heater it shall be the fourth car behind the car or cars placarded "Explosives".

(l) *Cars containing explosives or poison gas and tank cars placarded "Dangerous" in passenger or mixed trains.* Cars containing explosives, class A, poison gases or liquids, class A, and tank cars requiring "Dangerous" placards shall not be transported in a passenger train. Such cars may be transported in mixed trains but only at such times and between such points that freight train service is not in operation.

(1) Cars containing explosives, class A, poison gases or liquids, class A, and tank cars placarded "Dangerous" shall not be transported next to occupied

cabooses or cars carrying passengers in mixed trains, except as provided in paragraph (k) of this section.

(2) When a car containing explosives, class B, or dangerous articles other than explosives requiring labels (not includin class A poison gases or liquids) is moved in a mixed train and such car is not occupied by an employee of the carrier, placards must be applied to the car as required by this part.

(m) *Position in train of cars containing class D poison.* In a freight train or mixed train either standing or during transportation thereof, a car placarded "Dangerous—Class D Poison" must not be handled next to cars placarded "Explosives" or next to carload shipments of undeveloped film.

§ 74.590 *Record of change of seals of cars of explosives to be made.* (a) When a car seal is changed on a car placarded "Explosives" while en route or before delivery to a consignee, a record must be made showing the following information which shall be shown on or attached to waybill or other form of memorandum which shall accompany car to destination.

Railroad ---------- Place ---------- Date ----------

Car initials ---------- Car number ----------

Number or description of seal broken ----------

Number or description of seal used to reseal car ----------

Reasons for opening car ----------

Conditions of load ----------

Name and occupation of person opening car ----------

§ 74.591 *Car magazines.* (a) When specially authorized by the carrier, class A explosives in quantity not exceeding 150 pounds may be carried in construction or repair cars when the packages of explosives are placed in a "magazine" box made of sound lumber not less than 1 inch thick, covered on the exterior with metal, and provided with strong handles. This box must be plainly stenciled on the top, sides, and ends, in letters not less than 2 inches high, "EXPLOSIVES—DANGEROUS—HANDLE CAREFULLY". The box must be provided with strong hinges and with a lock for keeping it securely closed. Vacant space in the box must be filled with a cushioning material such as sawdust or excelsior, and the box must be properly stayed to prevent movement within the car. The car, when not occupied by a responsible employe, must be placarded "EXPLOSIVES".

§ 74.592 *Cotton fires.* (a) When fire occurs in a shipment of cotton in transit at a point where it cannot be reconditioned, and where arrangements cannot be made with the originating line to sell it, all burnt cotton in the shipment must be stored under observation in as safe a place as practicable for not less than 10 days, and without further evidence of fire, before forwarding. The billing must be changed to read "Burnt Cotton", and the material must be forwarded as a dangerous article. (See § 73.159 of this chapter).

§ 74.593 *Charcoal fires.* (a) When fire occurs in charcoal in transit, water should not be used if it is practicable to locate and remove the material on fire, since wet charcoal is much more liable to ignite spontaneously, and the fire cannot be stopped permanently by the use of water. If fire occurs in ground charcoal or screenings, any material which has become wet in extinguishing fire must be removed from the car, and not reshipped; the remainder of the charcoal must be held under observation in a dry place for at least five days before forwarding.

§ 74.594 *Leaking tank cars.* (a) Action in any particular case will depend upon existing conditions, and good judgment will be necessary to avoid disastrous fires on the one hand and useless sacrifice of valuable property on the other.

(b) Volatile, flammable, and combustible liquids, or flammable liquefied gases, such as gasoline, naphtha, petroleum oils, or liquefied petroleum gas, in large quantity and spread over a large surface, will form vapors that will ignite at a considerable distance, depending on the kind and quantity of liquid and the direction and force of the wind. Many of the liquids, regarded as safe to carry under ordinary conditions and transported in tank cars without the "Dangerous" placard, should still be treated as dangerous in handling a wreck.

(c) When tank cars are leaking, all lights or fires near them should be extinguished or removed until it is determined that contents are not flammable or combustible. Incandescent electric lights, or portable electric flash-lights should be used when available.

(d) Lanterns necessarily used for signaling should be kept on the side from which the wind is blowing and at as high an elevation as can be obtained. The vapors will go with the wind but not against it. The ash pan and fire box of a locomotive or steam derrick are sources of danger, especially when wind is blowing across the wrecked or leaking tank car toward them. Wrecks involving tank cars should in no case be approached with lighted pipes, cigars, or cigarettes, and all spectators should be kept away.

(e) Effort should be made to prevent the spread of liquid leakage over a large surface by collecting it in any available vessels or draining it into a hole or depression at a safe distance from the track. When necessary, trenches should be dug for this purpose.

(f) It is not safe to drain flammable or combustile liquids in large quantities into a sewer, since vapors may thus be carried to distant points and there ignited. Care should be exercised also not to permit these liquids to drain into streams of water which may be used by irrigation plants or for watering stock. Dry earth over spilled liquid will decrease the rate of evaporation and the danger. A stream of these liquids on the ground should be dammed and dry earth thrown on the liquid as it collects.

(g) Sudden shocks or jars that might produce sparks or friction should be avoided. When possible, the wrecked cars should be jacked carefully into position after removing other cars and freight that might be injured by fire. Only as a last resort, to meet an emergency, should a wrecked car be moved by dragging, and when this is done all persons should be kept at a safe distance. (See § 74.600 of this part.)

(h) No unnecessary attempt should be made to transport a damaged tank car from which flammable or combustible liquid is leaking. Safety in short movements may be secured by attaching a receptacle under small leaks to prevent spread of these liquids over tracks. Tracks at intervals in rear of a moving car should be covered with fresh earth to prevent fire overtaking the car. Engines should be kept away; also spectators who may be smoking. If damaged car is derailed, and not in a position to obstruct or endanger traffic, leaks should be stopped as far as possible, and the car should be left under guard until another tank car or sufficient receptacles can be provided for the transfer of the liquid, which should be transferred by pumping when practicable.

(i) Highly volatile products cannot be transferred in the usual way by a vacuum pump. The pump can only be used when placed so that liquid flows to it from the tank by gravity.

(j) Whenever the leaking condition of a tank car is such that tranfer of lading has been necessary, the car must be stenciled on both sides, in letters three inches in size, adjacent to the car number, "LEAKY TANK. DO NOT LOAD UNTIL REPAIRED", and indicate and mark at the location of the leak with the symbol "X", and the owner must be immediately notified by wire, such notification to indicate definitely location of leak. Stenciling must not be removed until the tank is repaired.

(k) Even a tank that is not leaking is liable to be ruptured by the use of slings, and slipping of chain slings may produce sparks. Saving of the contents of the tank is not as important as the prevention of fire.

(l) An empty or partially empty tank car, with or without placards, is very liable to contain explosive gases, and open flame lights must not be brought near it. (See § 74.595 of this part).

§ 74.595 *Examination of empty tank cars.* (a) Lighted lanterns. Many fatal accidents have resulted from using lanterns or lighted matches to examine the interior of empty tank cars or in using hot rivets to repair unsteamed tank cars, which may contain flammable vapors even when the previous lading was not of flash point below 80° F. Only incandescent electric lights should be used for this examination. Fumes in any empty tank car should be considered as injurious to a person entering it. In no case should an empty tank be entered before it has been cleaned by steaming, without wearing a respirator, hose mask type only, and without having another person stationed at the manhole with a rope attached to the person entering the tank. Hobnailed shoes and metal tools are liable to create sparks

and should not be used inside an empty tank.

§ 74.596 *Inspection of tank cars.* (a) Loaded tank cars must be inspected by the carrier before acceptance at the originating points and when received in interchange to see that they are not leaking and that the air and hand brakes, journal boxes and trucks are in proper condition for service.

(b) Empty tank cars tendered for movement or when received in interchange must have manhole covers, outlet valve reducers, outlet valve caps, outlet valve cap plugs, end plugs, and plugs or caps of other openings securely in their proper places; except that heater coil inlet and outlet pipes must be left open for drainage.

(c) Safety valves on tank cars must not be tested while these cars are loaded. Whenever test of safety valves or tank is due on a loaded car while in transit, unless the car is leaking or in a manifestly insecure condition, it must be forwarded to destination, carded on each side with a card exhibiting the following notice:

Safety valves } Overdue for test.
Tank }
Moving under I. C. C. § 74.596 (c).

(1) Prompt reports of such movements, showing initials and numbers of cars, must be made by the railroad carding the cars to the Bureau of Explosives, 30 Vesey Street, New York City.

§ 74.597 *Leaking packages of acid or poisons.* (a) Whenever a car bearing the "Dangerous" placard is discovered in transit with packages in leaking condition, all unnecessary movement of the car must cease and at the first opportunity an examination must be made of the lading, and if practicable any broken or leaking packages of nitric or mixed acids should be removed promptly to prevent fire. Any acid or other corrosive liquid remaining on the car floor or on surrounding packages should be washed away with a plentiful supply of water, or if not available, cleaned up with a liberal application of sand or earth. Care should be exercised to prevent inhalation of gases liberated through the application of water; when employes are injured by acid or other corrosive liquid, the liquid should be washed off immediately by a liberal application of water.

(b) Cars which have contained arsenic, arsenate of lead, sodium arsenate, calcium arsenate, Paris green, calcium cyanide, potassium cyanide, sodium cyanide, or other poisonous articles, which show any evidence of leakage from packages, must be thoroughly cleaned after unloading before cars are again placed in service.

(c) Leakage of dangerous articles is often accompanied by odors characteristic of the articles, and all available opportunities for noting such odors must be utilized in order that the source of leakage may be discovered and the leakage stopped, or the leaking package removed from the car, or the contents of tank cars transferred. If artificial light is necessary, only electric lights should be used. Leaking tank cars containing compressed gases should be switched to a location distant from habitation and highways and proper action taken for transferring contents under competent supervision.

(d) Cars containing leaking packages or leaking tank cars must be protected against ignition of liquid or vapors by flame of inspector's lanterns or torches, by burning fusees, by switch-lights, by switch-thawing flames, by fires on side of track, by hot coals from locomotives, or otherwise. All unnecessary movement of a car discovered in transit in leaking condition must cease until the unsafe condition is remedied.

(e) *Radioactive materials—Poison class D.* In event of breakage of container, wreck, fire, or unusual delay involving cars placarded "Dangerous-Class D Poison" as prescribed in § 74.541 (b) of this part, the car and any loose radioactive material must be isolated as far as possible from danger of human contact and no persons must be allowed to remain close to the car or contents needlessly until qualified persons are available to supervise handling. The shipper and the Bureau of Explosives should be notified immediately.

(1) Cars, buildings, areas, or equipment in which class D poisons have been spilled must not be again placed in service or occupied until decontaminated by qualified persons.

§ 74.598 *Inspection of cars at interchange.* (a) Cars containing explosives requiring explosives placards (see § 74.525 (a)), which are offered by connecting lines must be carefully inspected by the receiving line on the outside, including the roof; and, if practicable, the lading must also be inspected. These cars must not be forwarded until all discovered violations have been corrected.

(b) If the car shows evidence of, or if there is any reason to suspect that it has received rough treatment, the lading must be inspected and placed in proper condition before the car is permitted to proceed. When interchange occurs and inspection is necessary after daylight hours, electric flash lights should be provided. Naked lights must not be used.

(c) Shipments of explosives and other dangerous articles offered by connecting lines must comply with Parts 71–78 of this chapter, and the revenue waybill, freight bill, manifest of lading, card waybill, switching order, transfer slip ticket, or other billing, must bear label notation and placard indorsement prescribed by § 74.584 of this part.

(d) Cars containing packages of dangerous articles other than explosives should not be offered in interchange if packages are in leaking condition. If small leaks have developed in movement of tank cars to interchange, and where short movements are necessary to make delivery for unloading by consignee, and this movement may be safely made, the precautions prescribed by § 74.594 of this part, must be observed.

§ 74.599 *Handling by electric railways and motor cars.* (a) Explosives, class A, as specified in §§ 73.53 to 73.87 of this chapter, must not be transported in any self-propelled car operated by electric or other motive power, if such car is carrying passengers.

(b) Dangerous articles other than explosives, and class B, and class C, explosives when transported in self-propelled motor cars, must be carried in a compartment of such cars in which there shall be no electrically operated apparatus, or electric circuits, other than circuits in conduits properly installed.

(c) When the motor car is used as a freight or baggage car and not as a passenger car, not more than 500 pounds net of explosives, or not exceeding 5,000 blasting caps or electric blasting caps, may be transported. The explosives must be placed in a "magazine" box made of sound lumber not less than 1 inch thick, covered on the exterior with metal, and provided with strong handles. This box must be plainly stenciled on the top, sides, and ends, in letters not less than 2 inches high, "EXPLOSIVES—DANGEROUS—HANDLE CAREFULLY". The box must be provided with strong hinges and with a lock for keeping it securely closed. Vacant space in the box must be filled with a cushioning material such as sawdust or excelsior, and the box must be properly stayed to prevent movement within the car.

(d) Explosives may be transported in a trailer or other closed car and must be securely blocked, braced and stayed so as to prevent movement during transit, and other freight must not be permitted to fall on or slide against such shipments.

(e) Trailer cars or other cars not occupied by a representative of the carrier must bear the standard placards as prescribed in this part.

(f) Explosives and other dangerous articles must not be loaded and transported together, except as permitted by the loading and storage chart, § 74.538 of this part.

(g) All the requirements of Parts 71 to 78 of this chapter as to packing, marking, labeling, description, certification and waybilling, must be complied with for all shipments of explosives or other dangerous articles transported by electric railways or other self-propelled motor car lines engaged in interstate or foreign commerce.

§ 74.600 *In case of a wreck.* (a) Details involving the handling of explosives and other dangerous articles in the event of a wreck may be found in Bureau of Explosives Pamphlet No. 22 covering "Recommended practice for handling collisions and derailments involving explosives, gasoline and other dangerous articles".

(b) Whenever a car placarded "Explosives" is involved in an accident or wreck it must be opened and contents examined, and whenever opened for any purpose inspection must be made of the packages of explosives as soon as practicable without unnecessary disturbance of lading, to see that they are properly loaded and stayed and in good condition. Upon the discovery of leaking or broken packages they must be carefully removed to a safe place. Loose powder or other explosives must be swept up and carefully removed. If the floor is wet with nitroglycerin the car is unsafe to use, and a representative of the Bureau of Explosives should be immediately called

to superintend the thorough mopping and washing of the floor with a warm, saturated solution of concentrated lye or sodium carbonate. If necessary, the car must be placed on an isolated siding and proper notice given.

PART 75—REGULATIONS APPLYING TO CARRIERS BY RAIL EXPRESS

Sec.

AUTHORITY: §§ 75.650 to 75.660 issued under sec. 204, 49 Stat. 546, as amended, sec. 835, 62 Stat. 739; 49 U. S. C. 304, 18 U. S. C., Sup., 835.

§ 75.650 *Purpose of regulations in Parts 71–78 of this chapter.* (a) To promote the uniform enforcement of law and to minimizing the dangers to life and property incident to the transportation of explosives and other dangerous articles, by rail express carriers engaged in interstate or foreign commerce, Parts 71–78 of this chapter are prescribed to define these articles for rail express transportation purposes, and to state the precautions that must be observed by the carrier in handling them while in transit. It is the duty of each such carrier to make the prescribed regulations effective and to thoroughly instruct employees in relation thereto.

§ 75.651 *Acceptable articles.* (a) Explosives and other dangerous articles, except such as will not be accepted, may be offered for transportation to rail express carriers engaged in interstate or foreign commerce and transported, provided they are in proper condition for transportation and are certified that the regulations in Parts 71–78 of this chapter have been complied with, and provided their method of manufacture, packing, and storage, so far as they affect safe transportation, are open to inspection by a duly authorized representative of the initial carrier or of the Bureau of Explosives. Shipments that do not comply with Parts 71–78 of this chapter must not be accepted for transportation or transported.

§ 75.652 *Application* (a) Parts 71–78 of this chapter apply to all shipments of explosives and other dangerous articles as defined in Part 73 of this chapter including carriers' material and supplies.

§ 75.653 *Labels.* (a) Labels prescribed by the Commission's regulations, Part 73 of this chapter, must be applied to rail express shipments, unless exempt from Parts 71–78 of this chapter, and in addition the shipper must certify to compliance with the regulations by writing, stamping, or printing his name underneath the certificate printed thereon.

(b) Carriers must keep on hand an adequate supply of labels. Lost or detached labels must be replaced from information given on the waybill or from information on the package.

§ 75.654 *Receipts.* (a) A receipt upon the form prescribed by the originating rail express carrier must be issued to the shipper for each express shipment of explosives or other dangerous articles accepted for transportation. Before a receipt is issued, the shipper must apply the label prescribed in Part 73 of this chapter to each package containing any article requiring a label under Parts 71–78 of this chapter.

(b) Each receipt must show the proper and definite name of commodity, as listed in § 72.5 of this chapter, and the color of the label applied to the package if any is required.

§ 75.655 *Protection of packages.* (a) In handling packages containing explosives or other dangerous articles, care must be taken to prevent them from falling or from being broken. They must not be thrown, dropped, or rolled. Packages bearing the marking "This Side UP" as required by Part 73 of this chapter must be so handled and loaded.

(b) Packages protected by labels must be so loaded that they cannot fall to the car floor and in such manner that other freight cannot fall onto or slide against them.

(c) Unless sealed cars are equipped with a suitable guard or screen to prevent the lading coming in contact with hot steam pipes, or heat exits used in electrically-heated equipment, packages containing explosives or other dangerous articles must not be transported in them.

(d) Shipments of explosives or other dangerous articles, except poisons and nonflammable compressed gases, when transported in passenger carrying trains, should be loaded in the car occupied by an express employee or in connecting cars to which an express employee has access through end doors, and in a place that will permit their ready removal in case of fire. They must not be loaded in cars or stored in stations near steam pipes or other sources of heat. No placards are required on such cars when occupied by an express employee. Shipments bearing poison label, when practicable, should be loaded in sealed cars; when loaded in cars occupied by messenger, care should be taken to prevent any contents sifting or leaking from containers.

(e) When an express or baggage car containing any package requiring a label prescribed by Part 73 of this chapter is not occupied by an express employee, or is not a connecting car to which an express employee has access through an end door, and the car is handled in a passenger, mixed, or freight train, the proper placards must be attached thereto as required by Part 74 of this chapter for the transportation of such articles by rail freight.

(f) Packages containing dangerous articles, as defined by Part 73 of this chapter, that are loaded in sealed cars for express movement from the point of origin, must be loaded in a place that will permit of their ready removal in case of fire, wreck, or unloading, and near the car door, if possible.

(g) Not to exceed 10 gas identification sets may be transported in any car at any time.

(h) It is important to prevent contact of contents of packages bearing either yellow or white corrosive liquid labels with combustible substances, such as sawdust, shavings, or sweepings, that may be present in express cars. The space should be swept or cleaned.

(i) Unless they are leaking, or in a manifestly insecure condition, packages of dangerous articles other than explosives in transit must be forwarded to destination and report made of any violation observed. Leaking packages must be reconditioned or repaired promptly and forwarded to destination.

(j) A container of radioactive material bearing red label must not be placed in cars, depots or other places closer than 3 feet to an area which may be continuously occupied by passengers, employees, or shipments of animals. When more than one such container is present, the distance from occupied areas must be computed from the table in subparagraph (2) of this paragraph by adding the number of units shown on labels on the containers.

(1) In a combination car carrying passengers and/or express shipments, a container of radioactive material must not be placed closer than 3 feet to the dividing partition. For more than one such container the distance must be computed by method described in subparagraph (2) of this paragraph.

(2) A container of radioactive material, red label, must not be placed closer than 15 feet to any package containing undeveloped film. If more than one such container is present, the distance must be computed from the table in this subparagraph by adding the number of units shown on the labels on the packages.

TABLE

Total number of units	Minimum distance in feet to nearest undeveloped film	Distance in feet to area that may be continuously occupied by passengers or employes	Distance in feet from dividing partition of a combination car
1 to 10	15	3	3
11 to 20	20	4	4
21 to 30	25	5	5
31 to 40	30	6	6

NOTE 1: The distance in the table must be measured from the nearest point of the radioactive container or containers.

NOTE 2: 1 unit equals 1 milliroentgen per hour at 1 meter for hard gamma radiation or the amount of radiation which has the same effect on film as 1 mrhm. of hard gamma rays of radium filtered by ½ inch of lead.

(3) Not more than 40 units of radioactive material (red label) shall be transported in any car or stored in a depot at one time.

(4) All containers of radioactive material (red label) must be carried by the handles when handles are provided.

(5) Radioactive materials (class D poisons) must not be loaded in the same car with samples of explosives.

(6) If for any reason, a package containing radioactive material (red label) would otherwise remain in the same building for a period longer than 24

hours, it must be moved to a different location after each 24 hours.

(7) In case of fire, wreck, breakage or unusual delay involving any shipment of radioactive material the package or material should be segregated as far as possible from human contact. The shipper and the Bureau of Explosives should be immediately notified. In case of breakage of a package containing radioactive material and when it appears likely that the inside container may have been damaged, great care must be exercised to prevent contact with, inhalation or any other means of the radioactive material entering the body.

§ 75.656 *Removal at destination.* (a) Shipments of explosives and other dangerous articles as defined by Part 73 of this chapter which cannot be delivered within 48 hours after arrival at destination, Sundays and holidays not included, or shipments which are refused by the consignee, must be promptly disposed of (1) by return to the shipper, if in proper shipping condition, or (2) by storage, provided a suitable storage place for such articles is available off the carrier's property, or (3) by sale, or (4) when necessary to safety, by destruction; *Provided*, That charged electric batteries may be held for 30 days after arrival at destination, pending delivery or disposition.

§ 75.657 *Waybills.* (a) The waybill or delivery sheet when used as a waybill, or other billing issued in lieu thereof, and the transfer sheet, or interchange record used for transferring such shipments to a connecting carrier, must properly describe the articles by name as shown in § 72.5 of this chapter and show color of label applied.

§ 75.658 *Connecting line shipments.* (a) Shipments of dangerous articles offered by connecting express or other transportation lines must comply with Parts 71–78 of this chapter.

§ 75.659 *Astray shipments.* (a) Any astray shipment of dangerous articles must be forwarded promptly to destination, if known, provided a careful inspection shows the package to be in proper condition for safe transportation. If the package is not labeled and the exact nature of the contents is unknown, the red label must be applied.

§ 75.660 *Violations and accidents or fires must be reported.* (a) Violations and accidents or fires must be reported promptly by the express carrier to the Bureau of Explosives, 30 Vesey Street, New York 7, N. Y., as follows:

(1) Serious violations of Parts 71–78 of this chapter.

(2) Facts relating to leaking or broken containers.

(3) Accidents or fires in connection with the transportation or storage on express or railway property of explosives or other dangerous articles.

PART 76—REGULATIONS APPLYING TO RAIL CARRIERS IN BAGGAGE SERVICE

Sec.

AUTHORITY: §§ 76.700 to 76.707 issued under sec. 204, 49 Stat. 546, as amended, sec. 835, 62 Stat. 739; 49 U. S. C. 304, 18 U. S. C., Sup., 835.

§ 76.700 *Purpose of regulations in Parts 71–78 of this chapter.* (a) To provide for the safe transportation of dangerous articles in rail baggage service on passenger-carrying trains of carriers engaged in interstate or foreign commerce, the following regulations are prescribed to define these articles for rail baggage transportation purposes, and to state the precautions that must be observed by the carrier in handling them while in transit.

§ 76.701 *Application.* (a) Parts 71–78 of this chapter apply to all shipments in rail baggage service of dangerous articles as prescribed in this part. Shipments of explosives, other than those authorized for transportation by rail express, or dangerous articles, except as provided in this part, must not be accepted for transportation in rail baggage service. The Commission will make provision as occasion and safety may require for dangerous articles other than those described in this part. Carriers engaged in interstate or foreign commerce must make the regulations in this part effective and must provide for the thorough instruction of their employees.

NOTE 1: Explosives or other dangerous articles, consisting of carrier's materials and supplies such as are acceptable for rail express transportation, may be transported in baggage cars when packed, marked, and labeled as prescribed by regulations for rail express shipments in Part 75 of this chapter.

§ 76.702 *Dangerous articles.* (a) No dangerous article described by Parts 71–78 of this chapter shall be accepted for transportation or transported in rail baggage service except as provided for in § 76.703 of this part and which must be packed, marked and labeled as required by Part 73 of this chapter.

§ 76.703 *Acceptable articles.* (a) The following articles may be transported in rail baggage service under this part:

(b) Compressed gases:

Dichlorodifluoromethane.	Green gas label.	In cylinders not exceeding 12 by 51 inches, and with pressure not exceeding 300 pounds at 70° F.
Hydrogen	Red gas label.	
Oxygen	Green gas label.	
Anhydrous ammonia.	Green gas label.	In cylinders not exceeding 4½ by 22 inches.
Chlorine	Green gas label.	
Ethylene	Red gas label.	
Liquefied carbon dioxide.	Green gas label.	
Liquefied petroleum.	Red gas label.	
Methyl chloride	Red gas label.	
Nitrous oxide	Green gas label.	
Oxygen	Green gas label.	
Sulfur dioxide	Green gas label.	

(1) Compressed gases must be shipped in metal cylinders complying with specifications and regulations as prescribed for freight shipments.

(c) Motion-picture films, yellow label. In containers as prescribed by paragraphs (e) to (g) of this section.

(d) Mine-rescue equipment. Cylinders of compressed gas for mine rescue or medical work may be shipped when packed with other equipment pertaining to such work; cylinders not over 4½ by 22 inches may be shipped when packed in traveling bags, suitcases, trunks, or other suitable outside containers. When so packed, the prescribed label must be placed on each outside container.

(e) Flammable motion-picture films must be packed in sparkproof metal cases or trunks complying with spec. 32A, 32B, or 32C (§§ 78.146, 78.147, or 78.148 of this chapter). Not more than 12,000 feet of standard width (1⅜ inches wide), 12 reels of approximately 1,000 feet each, or equivalent thereof, or more than 3 reels of stereoscopic film (2½ inches wide and approximately 1,500 feet each), may be packed in one such outside container; or as follows:

(1) In outside wooden boxes, spec. 15A, 15B, 15C, or 16A (§§ 78.168, 78.169, 78.170, or 78.185 of this chapter), provided each reel is placed in a tightly closed inside metal container. The gross weight of such a package must not exceed 80 pounds. Boxes must be equipped with handles, and covers securely fastened by metal hasp and staple with a strong lock or other efficient device.

(f) When slow-burning (nonflammable) motion-picture films are packed in the same outside containers with flammable motion-picture films, the outside packages must bear the yellow label, and the total contents of the outside container must not exceed the quantity or gross weight permitted for flammable films. (See paragraph (e) of this section.)

(g) Packages of motion-picture films with advertising matter attached to the outside container must not be offered or accepted for transportation. Shippers desiring to include advertising matter with their shipments of motion-picture films must place the advertising matter inside the outside box containing the films.

§ 76.704 *Labels.* (a) All packages containing samples of explosives for laboratory examination, special fireworks and other dangerous articles for which labels are prescribed by Part 73 of this chapter, must be conspicuously labeled by the shipper. Labels should be applied when practicable to that part of the package bearing the consignee's name and address, or baggage check. The shipper must certify to compliance with Parts 71–78 of this chapter by writing, stamping, or printing his name underneath the certificate printed thereon. Shippers must furnish and attach labels prescribed for their shipments.

(b) Carriers must keep on hand an adequate supply of labels. Lost or detached labels must be replaced.

§ 76.705 *Placards.* (a) Placards ordinarily used to indicate the presence in cars of flammable articles will not be required on baggage cars in charge of a railroad employee and moving in passenger trains, or on electric or gasoline motor cars in charge of an employee of the carrier, and which are run independently of cars carrying passengers. (See § 74.543 of this chapter for placarding of cars not occupied by carrier's employee.)

§ 76.706 *Handling of packages.* (a) In handling packages containing dangerous articles, care must be taken to prevent them from falling or from being

broken. They must not be thrown, dropped, or rolled.

(b) Packages containing dangerous articles when transported in baggage service in passenger-carrying trains must be loaded in the car occupied by a railway employee, and in a place that will permit their ready removal in case of fire. They must not be loaded in cars nor stored in stations near steam pipes or other sources of heat.

(c) The originating carrier, when a shipment is offered to it that is known to contain dangerous articles as defined by Parts 71–78 of this chapter, must see that the packages are marked and labeled as prescribed in Part 73 of this chapter.

(d) Shipments of dangerous articles offered by connecting transportation lines must comply with the regulations in Parts 71–78 of this chapter.

(e) An astray shipment of dangerous articles or a shipment made in violation of Parts 71–78 of this chapter without the knowledge of the carrier, must be forwarded promptly to destination, if known, provided a careful inspection shows the package to be in proper condition for safe transportation.

(f) Unauthorized persons must not be allowed to have access to dangerous articles in transit at any time while such articles are in the custody of the carrier.

§ 76.707 *Reporting violations and accidents or fires.* (a) Serious violations of the regulations in Parts 71–78 of this chapter, facts relating to leaking or broken containers, and accidents or fires in connection with the transportation or storage on railway property of explosives or other dangerous articles, must be reported promptly by the rail carrier in baggage service to the Bureau of Explosives, 30 Vesey Street, New York, N. Y.

PART 77—REGULATIONS APPLYING TO SHIPMENTS MADE BY WAY OF COMMON AND CONTRACT CARRIER BY PUBLIC HIGHWAY

SUBPART A—GENERAL INFORMATION AND REGULATIONS

SUBPART B—LOADING AND UNLOADING

SUBPART C—LOADING AND STORAGE CHART OF EXPLOSIVES AND OTHER DANGEROUS ARTICLES

SUBPART D—VEHICLES AND SHIPMENTS IN TRANSIT; ACCIDENTS

SUBPART E—REGULATIONS APPLYING TO EXPLOSIVES OR OTHER DANGEROUS ARTICLES ON MOTOR VEHICLES CARRYING PASSENGERS FOR HIRE

AUTHORITY: §§ 77.800 to 77.870 issued under sec. 204, 49 Stat. 546, as amended, sec. 835, 62 Stat. 739; 49 U. S. C. 304, 18 U. S. C., Sup., 835.

[Prescribed under authority of the Transportation of Explosives Act of March 4, 1921, 41 Stat. 1444, 1445, for regulations applying to common carriers by motor vehicle, and under authority of the Interstate Commerce Act, Part II, sec. 204 (a) (2), for regulations applying to contract carriers by motor vehicle.]

NOTE 1: Because of the present emergency and until further order of the Commission, the following regulations shall apply to transportation of flammable liquids by private carriers of property in interstate or foreign commerce:

All regulations heretofore applying to common or contract carriers by motor vehicle shall apply to such private carriers, except:

Cargo tanks of tank motor vehicles constructed previous to June 15, 1943, may be continued in service if maintained in safe operating condition and sufficiently frequent inspections are maintained to determine compliance with all requirements as specified in this Note.

Any defect or deficiency, due to accident or otherwise, that is likely to cause serious hazard must be corrected before any such tank is continued in or returned to service; see, however, § 77.856 of this part.

Requirements applying to tests of tanks, and provisions for markers thereon except that indicating the flammable nature of the cargo, are waived.

Outages for shipments shall be those provided for by Part 73 of this chapter, except that filling of tanks to outage markers already incorporated in tanks, having due regard for safety in the transportation of the flammable liquids, need not be changed.

Section 77.815 of this part, labels, and § 77.819 of this part, certification of packages, need not be complied with by such private carriers, except as to packages transferred from one carrier to another.

SUBPART A—GENERAL INFORMATION AND REGULATIONS

§ 77.800 *Purpose of regulations in Parts 71–78 of this chapter.* (a) To promote the uniform enforcement of law and to minimize the dangers to life and property incident to the transportation of explosives and other dangerous articles, by common and contract carriers, by motor vehicle engaged in interstate or foreign commerce, the regulations in Parts 71–78 of this chapter are prescribed to define these articles for motor vehicle transportation purposes, and to state the precautions that must be observed by the carrier in handling them while in transit. It is the duty of each such carrier to make the prescribed regulations effective and to thoroughly instruct employees in relation thereto.

§ 77.801 *Scope of regulations in Parts 71–78 of this chapter.* (a) Explosives and other dangerous articles, except such as may not be accepted and transported under Parts 71–78 of this chapter, may be accepted and transported by common and contract carriers by motor vehicle engaged in interstate or foreign commerce, provided they are in proper condition for transportation and are certified as being in compliance with Parts 71–78 of this chapter, and provided the method of manufacture, packing, and storage, so far as they affect safety in transportation, are open to inspection by a duly authorized representative of the initial carrier or of the Bureau of Explosives. Shipments that do not comply with Parts 71–78 of this chapter must not be accepted for transportation or transported.

§ 77.802 *Application of regulations in Parts 71-78 of this chapter.* (a) Parts 71–78 of this chapter apply to all common and contract carriers by motor vehicle transporting explosives and/or other dangerous articles as defined by Interstate Commerce Commission "Regulations for Transportation of Explosives and Other Dangerous Articles by Land and Water in Rail Freight, Express and Baggage Services and by Motor Vehicle (Highway) and Water". When shipments are accepted by motor vehicle for further transportation by rail express (see also paragraph (c) of this section), rail baggage (see also paragraph (d) of this section), rail freight or by water on board vessel, they must, in addition to Parts 71–78 of this chapter, comply with the applicable regulations for the service by which they are to be transported.

(b) The regulations prescribed by the Commandant of the Coast Guard governing the transportation of "Explosives or Other Dangerous Articles on Board Vessels" also include combustible liquids and hazardous articles.

(c) The fifth column of the Commodity List, § 72.5 of this chapter, indicates the maximum quantity of an article that may be accepted for transportation by rail express or that the article is not acceptable for transportation by rail express.

(d) The mark ϕ preceding an article in the Commodity List, § 72.5 of this chapter, indicates that the article may be accepted for rail baggage transportation. All articles not so marked are not acceptable for rail baggage transportation.

§ 77.803 *Import shipments by domestic carriers by motor vehicles.* (a) Import shipments of explosives and other

dangerous articles offered in the United States in original packages for transportation by carriers by motor vehicle must comply with all requirements of Parts 71–78 of this chapter. The importer must furnish with the order to the foreign shipper, and also to the forwarding agent at the port of entry, full and complete information as to the packing, marking, labeling, and other requirements, as prescribed in Parts 71–78 of this chapter. The forwarding agent must file with the initial carrier in the United States a properly certified shipping order or other shipping paper as prescribed in Parts 71–78 of this chapter.

(b) Import shipments transferred in port areas by motor vehicle: Parts 71–78 of this chapter do not apply to such transportation by motor vehicle as may be necessary to effect transfer of import shipments from place of discharge to other places within the same port area or delivery to a water carrier within the same port area (including contiguous harbors); further transportation of such import shipments by connecting water carrier shall be subject to the regulations prescribed by the Commandant of the Coast Guard.

§ 77.804 *Export shipments by domestic carriers by motor vehicle.* (a) Explosives and other dangerous articles authorized to be exported from the United States when packed, marked, labeled, and described, in accordance with rules and regulations in force at destination ports, must not be offered to any common or contract carrier by motor vehicle for domestic transportation unless in full accordance with Parts 71–78 of this chapter.

(b) Export shipments transferred in port areas by motor vehicle: Parts 71–78 of this chapter do not apply to such transportation by motor vehicle as may be necessary to effect transfer of export shipments from place of shipment to other places within the same port area or delivery to a water carrier within the same port area (including contiguous harbors); further transportation of such export shipments by connecting water carrier shall be subject to the regulations prescribed by the Commandant of the Coast Guard.

§ 77.805 *Canadian shipments.* (a) Explosives or other dangerous articles which are packed, marked, labeled, and loaded, in conformity with the regulations of the Board of Transport Commissioners for Canada, may be accepted and carried by carriers from point of entry in the United States to their destination in the United States or through the United States en route to a point in Canada.

§ 77.806 *United States Government shipments.* (a) Shipments of explosives or other dangerous articles offered by or consigned to the Departments of the Army, Navy, and Air Force of the United States Government must be packed, including limitations of weight, in accordance with Interstate Commerce Commission regulations for the transportation of explosives and other dangerous articles (Parts 71–78 of this chapter) or as required by their regulations.

§ 77.807 *Emergency shipments.* (a) For the protection of the public against fire, explosion, or other or further hazard, with respect to shipments of explosives or other dangerous articles offered for transportation or in transit by any common or contract carrier by motor vehicle, such carrier shall make immediate report to the Bureau of Explosives, 30 Vesey Street, New York, N. Y., for handling, any of the following emergency matters coming to their attention (see also §§ 77.853 to 77.870 of this part for handling shipments in transit):

(1) Instances of packages of explosives or other dangerous articles discovered in transit not properly prepared for transportation in accordance with applicable regulations in Parts 71–78 of this chapter.

(2) Motor carrier accidents involving damage to container of explosives or other dangerous articles to such a degree as to necessitate repacking of the articles.

(3) Other like emergencies in which any common or contract carrier by motor vehicle is or is likely to become involved, or may offer aid at its command.

(4) This section shall in no respect excuse either shipper or carrier by motor vehicle for failure to exercise due care to prevent any departure from any regulation prescribed in Parts 71–78 of this chapter.

§ 77.808 *Connecting carrier shipments.* (a) Shipments of explosives or other dangerous articles offered by connecting transportation lines must comply with Parts 71–78 of this chapter.

§ 77.809 *Carrier's material and supplies.* (a) The regulations in Parts 71–78 of this chapter apply to all shipments of explosives and other dangerous articles, including carrier's material and supplies.

§ 77.810 *Vehicular tunnels.* (a) Nothing contained in Parts 71–78 of this chapter shall be so construed as to nullify or supersede regulations established and published under authority of State statute or municipal ordinance regarding the kind, character, or quantity of any explosive or other dangerous article permitted by such regulations to be transported through any urban vehicular tunnel used for mass transportation.

§ 77.811 *Astray shipments.* (a) Any astray shipment of dangerous articles other than explosives must be forwarded promptly to destination, if known, provided a careful inspection shows the package to be in proper condition for safe transportation. If the package is not labeled and the exact nature of the contents is unknown, the red label must be applied.

§ 77.812 *Containers required.* (a) Containers required for explosives and other dangerous articles are prescribed in Part 73 of this chapter, Regulations Applying to Shippers.

§ 77.813 *Inefficient containers.* (a) The results of experience gained by examination of broken or leaking containers must be recorded by the Bureau of Explosives to the end that further use of any particular kind of container shown by experience to be inefficient, may be prohibited by the Commission.

§ 77.814 *Accidents to be reported.* (a) Fires or explosions occurring in connection with the transportation, or storage on carrier's property, of explosives or other dangerous articles, and leaking, broken, or seriously damaged containers, must be reported promptly by the highway carrier to the Commission. These reports are required to the end that further use of containers shown by experience to be inefficient may be prohibited by the Commission:

No. 3666

Report to

BUREAU OF SERVICE

INTERSTATE COMMERCE COMMISSION

WASHINGTON, D. C.

FIRES, EXPLOSIONS, AND LEAKING, BROKEN, OR SERIOUSLY DAMAGED CONTAINERS

[that can be attributed in whole or in part to the transportation or storage of explosives or other dangerous articles]

Submitted by _____
(Name of carrier—corporate or business name)

_____, 19____
(Date)

Address _____ _____
(Street and number) (City-town)

_____
(State)

Common carrier, I. C. C. certificate No. _____
Contract carrier, I. C. C. permit No. _____
Date of accident or discovery of damage _____; place _____
Commodity and quantity _____; quantity destroyed _____
What marking or placards were on motor vehicle? _____
If a tank motor vehicle, what sign or other marking to indicate contents?_____

Show package markings:
- Name of contents _____; I. C. C. Spec. No. _____
- Label _____
- Serial Nos. _____; Code Nos. _____
- If carboy, show box maker's name _____ and whether straight sided _____ or balloon shaped_____.

Name and address of shipper _____
Name and address of consignee _____
T. L. or L. T. L. shipment _____

RESULTS OF ACCIDENT

[State whether in transportation or storage]

Number of persons injured ____; killed _____
Property loss:

Reporting-carrier's vehicle	$_____
Other vehicles	_____
Reporting-carrier's cargo	_____
Other cargoes	_____
Other property (describe)	_____
Total loss	_____

Give all essential facts and details of handling (use additional sheet if necessary), stating: (1) Part of package damaged or leaking, and what was done to stop leak, (2) rate of leakage, (3) probable cause of fire, explosion, or leaking, broken, or seriously damaged container, (4) distance between source of ignition and point of leakage of flammable liquid or vapor, (5) description of package, packing or cushioning material, and method of loading and bracing in vehicle, (6) for tank motor vehicle, speed of vehicle, condition of highway, degree and elevation of curve, if any, (7) any defective condition of vehicle likely to contribute directly to accident, and (8) specification number, type, or

other identifying description of tank, and date built, if shown.

Is this accident also being reported to the Commission on Form BMC-50? ----------
(Yes or no)

This report is required by § 77.814 of regulations in Docket 3666.
Information furnished on this form will not be open to public inspection.

(Signed) ----------

§ 77.815 *Labels.* (See § 73.405 to § 73.414 of this chapter for description of labels.) (a) Labels prescribed by the Commission's regulations, Part 73 of this chapter, must have been applied to shipments, unless exempt from Parts 71–78 of this chapter, and in addition the shipper must have certified to compliance with the regulations by writing, stamping, or printing his name underneath the certificate printed thereon or on the shipping papers.

(b) Labels and marking name of contents are not required on truckload quantities of dangerous articles, except class A, class C, or class D poisons, when such shipments are unloaded by the consignee or his duly authorized agent from the motor vehicle in which originally loaded.

(1) Truckload shipments of chemical ammunition, explosive, containing poisonous gases, solids or liquids, class A, class B or class C, or poisons class A, class B, class C or class D offered for transportation by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government are exempt from labeling requirements when shipments are loaded or unloaded by the shipper or his duly authorized agent and such shipments are accompanied by qualified personnel supplied with equipment to repair leaks or other container failure which will permit escape of contents.

(c) Except on class A, class C, or class D poisons, labels are not required on less-than-truckload shipments by motor vehicle by public highway when the articles are readily identifiable by reason of type of container or when the container is plainly marked to indicate its contents and;

(1) When the shipment is transported from origin to destination without transfer between vehicles and;

(2) When the shipper or its employes are in direct control or perform the loading, transporting and unloading.

(d) When it is known that subsequent shipments of these packages in less-than-truckload quantities will probably be made by the consignee, labels should be attached to the packages as would be required for less-than-truckload shipments.

(e) Carriers must keep on hand an adequate supply of labels. Lost or detached labels must be replaced from information given on waybill, manifest, memorandum, or other shipping paper.

(f) Samples will be furnished, on request, by the Bureau of Explosives, 30 Vesey Street, New York, N. Y.

(g) The carrier's name and stationery form number may be printed on the labels, in type not larger than 10 point, if placed within the red or black-line border and in the upper or lower corner of the diamond.

(h) Additional shipping information not inconsistent with Parts 71–78 of this chapter may be shown by the shipper on a container of dangerous articles other than explosives if so desired, but no label or marking may be of a design, or form, or size, as may be confused with the label or marking required by Part 73 of this chapter.

§ 77.816 *Marking on containers.* (a) Each package of explosives or other dangerous articles must show the name and address of the consignee. Whenever the transportation of any explosive or other dangerous article is to be exclusively by motor vehicle between points between which the articles are not to be transferred from one motor carrier to another, in either truckload or less-than-truckload lots, the individual packages need not be marked with the consignee's name and address.

§ 77.817 *Shipping papers.* (a) Every driver of a motor vehicle transporting explosives or other dangerous articles shall have in his possession a manifest, memorandum receipt, bill of lading, shipping order, shipping paper, or other memorandum setting forth the following information for each class of such article being transported: The shipping name, the total quantity by weight, volume, or otherwise as appropriate of each kind of explosive or other dangerous article, and the prescribed label when required for the outside container of such article.

§ 77.818 *Receipts.* (a) A receipt upon the form prescribed by the originating express carrier must be issued to the shipper for each express shipment of explosives or other dangerous articles accepted for transportation. Before a receipt is issued, the shipper must apply the label prescribed in Part 73 to each package containing any article requiring a label under Parts 71–78 of this chapter.

(b) Each receipt must show the proper and definite name of commodity, as listed in § 72.5 of this chapter, and the color of the label applied to the package if any is required.

§ 77.819 *Certificate.* (a) Except as provided in this section, no motor carrier may accept for transportation or transport any class A or class B explosives, blasting caps or electric blasting caps in any quantity, or any dangerous articles requiring label as prescribed by Part 73 of this chapter, unless it be certified to him by the shipper's name inserted in the certificate on the label or by the following certificate over the written or stamped facsimile signature of the shipper or his duly authorized agent in the lower left-hand corner of the manifest, memorandum receipt, bill of lading, shipping order, shipping paper, or other memorandum:

This is to certify that the above named articles are properly described, and are packed and marked and are in proper condition for transportation according to the regulations prescribed by the Interstate Commerce Commission.

(b) For the relief of shippers from multiplicity of certifications required for packages which may move by various means of transportation, shipments may be certified for rail, motor vehicle, water, or air transportation by adding to the certificate required on the shipping document "and the Commandant of the Coast Guard", or "and the Civil Air Regulations", as the case may be.

§ 77.820 *Waybills, manifests, etc.* (a) The waybill, manifest, dispatch, memorandum receipt, bill of lading, transfer sheet, or interchange record, when prepared for shipments and used for transferring such shipments to a connecting carrier, must properly describe the articles by name as shown in § 72.5 of this chapter, and show color of label applied.

§ 77.821 *Explosives or other dangerous articles forbidden or limited for transportation*—(a) *Nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, forbidden to common carriers.* Liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, except as defined in § 73.53 (e) of this chapter, may not be accepted for transportation or be transported by any common carrier by motor vehicle.

(b) *Rejection of leaking containers of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate.* Any individual container used for the transportation of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, or any boot used therewith, found in such a condition as to permit leakage, shall be discarded and shall not thereafter be repaired for further use.

(c) *Explosives or other dangerous articles forbidden or limited for transportation.* No motor carrier may accept for transportation or transport any explosive or other dangerous article listed in Commodity List (§ 72.5 of this chapter), as "forbidden" for transportation by all motor carriers; nor, if there be any prohibition or limitation regarding the transportation of any particular explosive or other dangerous article by a particular kind of motor carrier, may any such article be accepted for transportation or be transported by that kind of carrier, except as indicated in this part. (See § 77.870 of this part.)

(d) *Leaking or damaged packages of high explosive must not be accepted for transportation or transported.* Should any package of high explosive when offered for shipment show excessive dampness or be moldy or show outward signs of any oily stain or other indication that absorption of the liquid part of the explosive is not perfect, or that the amount of the liquid part is greater than the absorbent can carry, the package must be refused in every instance. The shipper must substantiate any claim that a stain is due to contact with material other than the liquid explosive ingredient of the explosive. In case of doubt the package must be rejected.

(e) *Condemned or leaking dynamite; repacking.* Condemned or leaking dynamite must not be repacked and offered for shipment unless the repacking is done by a competent person in the presence of or with the written consent of an inspector, or with the written authority of the chief inspector, of the Bureau of Explosives.

§ 77.822 *Acceptable articles.* (a) Any motor carrier may accept for transportation or transport any acceptable ex-

plosive or other dangerous articles listed in the Commodity List, § 72.5 of this chapter: *Provided, however,* That no provision of this section shall be so construed as to permit the acceptance or transportation of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, other than as defined in § 73.53 (e) of this chapter, by any common carrier.

(b) *Liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate.* Liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, other than as defined in § 73.53 (e) of this chapter, may be transported only by motor carriers other than common carriers in containers complying with specification MC200 (§ 78.315 of this chapter). No form of trailer may be attached.

§ 77.823 *Marking on motor vehicles and trailers other than tank motor vehicles.* (a) Every motor vehicle transporting any quantity of explosives, class A, poison gas, class A, or radioactive material, poison class D requiring red radioactive materials label; and every motor vehicle transporting 2,500 pounds gross weight or more of explosives, class B, flammable liquids, flammable solids or oxidizing materials, corrosive liquids, compressed gas, class B poisons, and tear gas, or 5,000 pounds gross weight or more of two or more articles of these groups shall be marked or placarded on each side and rear with a placard or lettering in letters not less than 3 inches high on a contrasting background as follows:

(1) Explosives, class A	EXPLOSIVES
(2) Explosives, class B	DANGEROUS
(3) Flammable liquid	DANGEROUS
(4) Flammable solid	DANGEROUS
(5) Oxidizing material	DANGEROUS
(6) Corrosive liquid	DANGEROUS
(7) Compressed gas	COMPRESSED GAS
(8) Poison gas, class A	POISON GAS
(9) Tear gas	DANGEROUS
(10) Poisons, class B	DANGEROUS
(11) Dangerous, class D poison	DANGEROUS—RADIOACTIVE MATERIAL

(b) *Tank motor vehicles.* Every tank motor 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 3 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 trade-mark, when and only when such name or mark plainly indicates the flammable nature of the cargo.

(c) *Tank motor vehicles.* Every tank motor vehicle used for the transportation of any corrosive 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 3 inches high on a background of sharply contrasting color, optionally, as follows:

(1) The common name of the corrosive liquid being transported.

(2) A sign or lettering on the motor vehicle, with the word "ACID", or, when transporting corrosive liquids other than acids, the words "CORROSIVE LIQUID".

(d) *Tank motor vehicles.* Every cargo tank used for the transportation of any compressed gas, regardless of the quantity being transported, or whether loaded or empty, shall be conspicuously and legibly marked on each side and the rear thereof on a background of sharply contrasting color with a sign or lettering on the tank with words as appropriate "COMPRESSED GAS", or "FLAMMABLE COMPRESSED GAS" in letters at least 6 inches high; and in letters at least 2 inches high with the commonly accepted name, such as "ANHYDROUS AMMONIA", "CARBON DIOXIDE", "LIQUEFIED PETROLEUM GAS", "NITROUS OXIDE", or "SULPHUR DIOXIDE".

(1) Every cargo tank shall be marked with the name of the motor carrier who owns the vehicle of which such tank forms a part; or, if the operator of the vehicle is not the owner, the name of the owner thereof.

(2) In addition to the markings hereinbefore required, there may be marked on any cargo tank the trademark appropriate to the commodity being transported therein; *Provided, however,* That no such marking shall be of such size and character as to render inconspicuous the required markings.

(3) No markings either required or permitted under the terms of this paragraph shall be in lieu of any other marking or markings required by the Commission.

(e) *Tank motor vehicles.* Every tank motor vehicle used for the transportation of any less dangerous poison, class B, 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 3 inches high, on a background of a sharply contrasting color, optionally, as follows:

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

(2) With the common name of the Class B poison being transported.

(f) *Removal of signs or lettering.* Every sign or lettering required by paragraph (a) of this section shall be removed from or covered on any motor vehicle to which it is attached or affixed when such motor vehicle is not transporting the article for which the sign is appropriate, except that no such sign or lettering is required to be removed or covered when such motor vehicle is used exclusively in the transportation of any article for which the sign or lettering is appropriate.

(g) *Only one marking required.* Whenever any motor vehicle is transporting more than one class of dangerous article for which signs or placards are required to be lettered on or affixed to any such motor vehicle, no more than one kind of sign, lettering, or placard need be displayed. The sign, lettering, or placard used shall be the one which, in the judgment of the motor carrier, designates the most dangerous article being transported.

SUBPART B—LOADING AND UNLOADING

NOTE: For prohibited loading and storage of explosives and other dangerous articles, see § 77.848 of this part.

§ 77.834 *General requirements.*—(a) *Containers secured in vehicle.* Any tank, barrel, drum, or cylinder, not designed to be permanently attached to a motor vehicle, containing any flammable liquid, compressed gas, corrosive liquid, or poisonous article, shall be reasonably secured against movement within the motor vehicle by which it is being transported.

(b) *No explosives or other dangerous articles on pole trailers.* No explosive or other dangerous article may be loaded into or on or transported in or on any pole trailer.

(c) *No smoking while loading or unloading.* Smoking on or about any motor vehicle while loading or unloading any explosive, flammable liquid, flammable solid, oxidizing material, or flammable compressed gas is forbidden.

(d) *Keep fire away, loading and unloading.* Extreme care shall be taken in the loading or unloading of any explosive, flammable liquid, flammable solid, oxidizing material, or flammable compressed gas into or from any motor vehicle to keep fire away and to prevent persons in the vicinity from smoking, lighting matches, or carrying any flame or lighted cigar, pipe, or cigarette.

(e) *Handbrake set while loading and unloading.* No explosive or other dangerous article shall be loaded into or on, or unloaded from, any motor vehicle unless the handbrake be securely set and all other reasonable precautions be taken to prevent motion of the motor vehicle during such loading or unloading process.

(f) *Use of tools, loading and unloading.* No tools which are likely to damage the effectiveness of the closure of any package or other container, or likely adversely to affect such package or container, shall be used for the loading or unloading of any explosive or other dangerous article.

(g) *Prevent relative motion between containers.* Containers of flammable liquids, flammable solids, oxidizing materials, corrosive liquids, acids, compressed gases, and poisonous liquids or gases, must be so braced as to prevent relative motion thereof while in transit. Containers having valves or other fittings must be so loaded that there will be the minimum likelihood of damage thereto during transportation.

(h) *Precautions concerning containers in transit; fueling road units.* Reasonable care should be taken to prevent undue rise in temperature of containers and their contents during transit. There must be no tampering with such container or the contents thereof nor any discharge of the contents of any container between point of origin and point of billed destination. Discharge of contents of any container, other than a cargo tank, must not be made prior to removal from the motor vehicle. Nothing contained in this paragraph shall be so construed as to prohibit the fueling of machinery or vehicles used in road construction or maintenance.

(i) *Tank motor vehicles attended, loading and unloading.* Under no circumstances shall a tank motor vehicle be left unattended during the loading or unloading process. For the purpose of this part, the delivery hose, when attached to the motor vehicle, shall be deemed a part thereof.

(j) *Prohibited loading combinations.* In any single driven motor vehicle or in any single unit of a combination of motor vehicles, explosives and other dangerous articles shall not be loaded together if prohibited by loading and storage chart, § 77.848 of this part. This section shall not be so construed as to forbid the carrying of materials essential to safe operation of motor vehicles (see Motor Carrier Safety Regulations, Part 193 of this chapter).

(k) *Access to mixed ladings.* Flammable solids, oxidizing materials, or corrosive liquids, when transported on a motor vehicle with other lading not otherwise forbidden, shall be so loaded as to provide ready access thereto for shifting or removal.

§ 77.835 *Explosives.* (See also § 77.834 (a) to (k) of this part)—(a) *Engine stopped.* No explosive shall be loaded into or on or be unloaded from any motor vehicle with the engine running.

(b) *Care in loading, unloading, or other handling of explosives.* No bale hooks or other metal tools shall be used for the loading, unloading, or other handling of explosives, nor shall any package or other container of explosives, except barrels or kegs, be rolled. No packages of explosives shall be thrown or dropped during process of loading or unloading or handling of explosives. Special care shall be exercised to the end that packages or other containers containing explosives shall not catch fire from sparks or hot gases from the exhaust tailpipe.

(c) *Explosives on trucks or semitrailers; no other trailer.* Any explosive other than liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, except as defined in § 73.53 (e) of this chapter, and forbidden explosives may be loaded into and transported on any truck or any semitrailer attached to a tractor, to which no form of trailer may be attached when so loaded.

(d) *Explosives on trucks and full trailers.* Any explosives other than liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, except as defined in § 73.53 (e) of this chapter, and forbidden explosives, may be loaded into and transported on any truck and a full trailer attached thereto provided that there shall be no more than one truck and one trailer comprising the combination.

(e) *No sharp projections inside body of vehicles.* No motor vehicle transporting any kind of explosive shall have on the interior of the body in which the explosives are contained, any inwardly projecting bolts, screws, nails, or other inwardly projecting parts likely to produce damage to any package or container of explosives during the loading or unloading process or in transit.

(f) *Explosives vehicles, floors tight and lined.* Motor vehicles used exclusively for the transportation of explosives shall have tight floors and lining such as wood or other nonsparking material which shall cover any projections or metal which may come into contact with packages of explosives.

(g) *Blasting caps and/or electric blasting caps in same vehicle with other explosives.* Blasting caps and/or electric blasting caps, without limitation as to quantity except as limited in paragraph (m) of this section may be transported in the same motor vehicle with high explosives, as follows: The blasting caps and electric blasting caps must be packed in authorized I. C. C. specification outside shipping containers, or in prescribed inside I. C. C. packages in an outside box made of 1 inch lumber lined with suitable padding material not less than ½ inch thick or a box made of not less than 12 gauge sheet metal lined with plywood or other suitable material not less than ⅜ inch thick so that no metal is exposed. Hinged cover and fastening device are required on boxes. These boxes must be loaded in motor vehicle so that contents or box will be immediately accessible for removal. Blasting caps or electric blasting caps, when not packed in containers referred to above in this paragraph, must be transported in containers as prescribed in spec. MC201 (§ 78.318 of this chapter). See paragraph (m) of this section for shipment of blasting caps with liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate. Explosive projectiles with detonating fuzes assembled in place must not be transported unless shipped by, for, or to the Departments of the Army, Navy, and Air Force of the United States Government, or unless of a type approved by the Bureau of Explosives.

(h) *Lading within body or covered, tailgate closed.* Except as provided in paragraphs (g), (k), and (m) of this section, dealing with the transportation of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, other than as defined in § 73.53 (e) of this chapter, all of that portion of the lading of any motor vehicle which consists of explosives shall be contained entirely with the body of the motor vehicle, and if such motor vehicle has a tailboard or tailgate, it shall be closed and secured in place during such transportation. Every motor vehicle transporting explosives must either have a closed body or have the body thereof covered with a tarpaulin, and in either event care must be taken to protect the load from moisture and sparks.

(i) *Explosives to be protected against damage by other lading.* No motor vehicle transporting any explosive may transport as a part of its load any metal or other articles or materials likely to damage such explosive or any package in which it is contained, unless the different parts of such load be so segregated or secured in place in or on the motor vehicle and separated by bulkheads or other suitable means as to prevent such damage.

(j) *Transfer of explosives en route.* No class A or class B explosive shall be transferred from one container to another, or from one motor vehicle to another vehicle, or from another vehicle to a motor vehicle, on any public highway, street, or road, except in case of emergency. In such cases flares (pot torches), fusees, red electric lanterns, or flags shall be set out in the manner prescribed for disabled or stopped motor vehicles in Motor Carrier Safety Regulations (Part 193 of this chapter). In any event, all practicable means, in addition to those hereinbefore prescribed, shall be taken to protect and warn other users of the highway against the hazard involved in any such transfer or against the hazard occasioned by the emergency making such transfer necessary.

(k) *Loading requirements for liquid nitroglycerin, desensitized liquid nitroglycerin, or diethylene glycol dinitrate.* Liquid nitroglycerin, desensitized liquid nitroglycerin, or diethylene glycol dinitrate, other than as defined in § 73.53 (e) of this chapter, may be accepted for transportation and transported only by motor carriers other than common carriers if it be loaded into or on a truck having the type of body specified in spec. MC200 (§ 78.315 of this chapter). No liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate may be loaded directly above any other explosive, or in any quantity in excess of 900 quarts on one motor vehicle or 10 quarts in any one individual container. Additional quantities of explosives, other than nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, excepting any type of blasting or percussion cap or other detonating device, may be carried on such motor vehicle in a closed or covered bed or body which shall be firmly bolted or fastened above the lid of the compartment containing the nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate. In no case shall the net load be more than 7,500 pounds. (See paragraph (m) of this section and spec. MC201 (§ 78.318 of this chapter).)

(l) *Separation of tools and supplies for preparing charges.* Motor vehicles transporting liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, may also transport the tools and supplies necessary for preparing and firing charges thereof: *Provided,* That such tools and supplies be properly secured in place so as to prevent their coming in contact with the body above specified.

(m) *Caps or other explosives.* Any explosives, including desensitized liquid explosives as defined in § 73.53 (e) of this chapter, other than liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, transported on any motor vehicle transporting liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, shall be segregated; each kind from every other kind, and from tools or other supplies. Any percussion caps, detonators, blasting caps, or electric blasting caps, shall be carried either in a cloth container having individual pockets for each such cap, or by at least equally safe means. No greater number of any such caps shall be carried in the manner de-

scribed than is necessary for use on any particular trip.

§ 77.836 *Nonexplosive material.* (a) No restrictions are prescribed in Parts 71–78 of this chapter for the packing, handling, and transportation of material relating to ammunition for cannon, but containing no explosive or other dangerous article, such as cartridge cases, "dummy" or "drill" cartridges, etc., sand-loaded projectiles, sand-loaded bombs, empty projectiles, empty mines, empty bombs, solid projectiles, or empty torpedoes. Rotating bands should be protected against deformation by method of packing or loading.

§ 77.837 *Flammable liquids.* (See also § 77.834 (a) to (k) of this part)—(a) *Engine stopped.* Unless the engine of the motor vehicle is to be used for the operation of a pump, no flammable liquid shall be loaded into or on or unloaded from any other motor vehicle than a tank motor vehicle with the engine running; and in any event care should be exercised to prevent ignition of the vapors from any such liquid.

(b) *Bonding or grounding containers prior to and during transfers.* For containers which are not in metallic contact with each other, either metallic bonds or ground conductors shall be provided for the neutralization of possible static charges prior to and during transfers of flammable liquids between such containers. Such bonding shall be made by first connecting an electric conductor to the container to be filled and subsequently connecting the conductor to the container from which the liquid is to come, and not in any other order. To provide against ignition of vapors by discharge of static electricity, the latter connection shall be made at a point well removed from the opening from which the flammable liquid is to be discharged.

§ 77.838 *Flammable solids and oxidizing materials.* (See also § 77.834 (a) to (k) of this part.) (a) *Lading within body or covered; tailgate closed; pick-up and delivery.* All of that portion of the lading of any motor vehicle transporting flammable solids or oxidizing materials shall be contained entirely within the body of the motor vehicle and shall be covered by such body, by tarpaulins, or other suitable means, and if such motor vehicle has a tailboard or tailgate, it shall be closed and secured in place during such transportation: *Provided, however,* That the provisions of this paragraph need not apply to "pick-up and delivery" motor vehicles when such motor vehicles are used in no other transportation than in and about cities, towns, or villages.

(b) *Articles to be kept dry.* Special care shall be taken in the loading of any motor vehicle with flammable solids or oxidizing materials which are likely to become hazardous to transport when wet, to keep them from being wetted during the loading process and to keep them dry during transit. Special care shall also be taken in the loading of any motor vehicle with flammable solids or oxidizing materials, which are likely to become more hazardous to transport by wetting, to keep them from being wetted during the loading process and to keep them dry during transit. Examples of such dangerous materials are charcoal screenings, ground, crushed, or pulverized charcoal, and lump charcoal.

(c) *Lading ventilation, precautions against spontaneous combustion.* Whenever a motor carrier has knowledge concerning the hazards of spontaneous combustion or heating of any article to be loaded on a motor vehicle, such article shall be so loaded as to afford sufficient ventilation of the load to provide reasonable assurance against fire from this cause; and in such a case the motor vehicle shall be unloaded as soon as practicable after reaching its destination. Charcoal screenings, or ground, crushed, granulated, or pulverized charcoal, in bags, shall be so loaded that the bags are laid horizontally in the motor vehicle, and so piled that there will be spaces for effective air circulation, which spaces shall not be less than 4 inches wide; and air spaces shall be maintained between rows of bags. Bags shall not be piled closer than 6 inches from the top of any motor vehicle with a closed body.

(d) *Loose or baled nitrate of soda bags.* Loose or baled unwashed, empty bags, having contained nitrate of soda, may be transported in truckload lots only in motor vehicles, and such motor vehicles must have closed or covered bodies lined with paper; such shipments are required to be loaded by the shipper and to be unloaded by the consignee.

(e) *Staying or blocking of packages of matches.* Special care shall be exercised in the loading of packages containing "strike-anywhere" matches to prevent the shifting or jamming of any such package during transit. To this end, the packages shall be compactly loaded with the strongest dimensions of each box or other container loaded lengthwise of the motor vehicle.

(1) *Smooth vehicle interior for matches.* Unless strike-anywhere matches are contained in wooden outside boxes, special care shall be taken to provide that the inside surfaces of any motor vehicle into which such matches are to be loaded and with which surfaces the containers might come in contact, shall be smooth, without protrusions of any sort, such as bolts, nuts, sharp edges, or corners, etc., and there shall be provided for this purpose smooth wooden inner linings, if the interior of the motor vehicle is not otherwise smooth in accordance with this requirement.

(2) *Matches not loaded next to red label articles.* Matches of whatever character shall not be loaded next to packages protected by the red caution label.

(f) *Ammonium nitrate, ammonium nitrate fertilizer, or guanidine nitrate.* Ammonium nitrate, ammonium nitrate fertilizer, or guanidine nitrate in bags in closed or open type motor vehicles which must be swept clean and free of any projections capable of injuring bags. All-metal vehicles of the closed type must not be used. When transported in open type motor vehicles the lading shall be suitably covered.

§ 77.839 *Corrosive liquids.* (See also § 77.834 (a) to (k) of this part.) (a) *Nitric acid.* In addition to the requirements set forth in paragraph (b) of this section, no carboy or other container of nitric acid shall be loaded above any container containing any other kind of material. The loading of carboys or other containers of nitric acid shall be limited to two tiers high.

(b) *Carboys and frangible containers.* In general, individual carboys and frangible containers of acids or other corrosive liquids, including charged electric storage batteries, shall, when loaded by hand, be individually loaded into and unloaded from any motor vehicle in which they are to be, or have been, transported. All reasonable precautions shall be taken to prevent, by all practicable means, the dropping of any such containers or batteries containing corrosive liquids. No such container or battery shall be loaded into a motor vehicle having an uneven floor surface. It shall be permissible to load on or transport in any motor vehicle any authorized carboys or frangible shipping containers, containing acids or other corrosive liquids, more than one tier high above any floor only if such carboys or other containers are boxed or crated, or are in barrels or kegs, as required by Parts 71–78 of this chapter, and only if such containers are so stacked that the weight of each tier above the first is entirely supported by the boxes, crates, barrels, kegs, or other authorized means of enclosing the carboys or frangible containers. Only so many tiers as may adequately be so supported without danger of crushing or breaking, shall be permitted. Means shall be provided to prevent by all practicable means, in all cases, the shifting of containers or batteries during transit. Nothing contained in this section shall be so construed as to prevent the use of cleats or other retaining means for the purpose of preventing shifting of containers or batteries. For the purposes of this section a false floor or platform, secured against relative motion within the body of the motor vehicle, shall be deemed to be a floor. (For recommendations for handling leaking or broken packages, see § 77.858 (a) of this part.)

(c) *Storage batteries.* In addition to the requirements set forth in paragraph (b) of this section, all storage batteries containing any electrolyte shall be so loaded, if loaded with other lading, that all such batteries will be protected against other lading falling onto or against them; and adequate means shall be provided in all cases for the protection and insulation of battery terminals against short circuits.

§ 77.840 *Compressed gases.* (See also § 77.834 (a) to (k) of this part.) (a) *Floors or platforms essentially flat.* Cylinders containing compressed gases shall not be loaded onto any part of the floor or platform of any motor vehicle which is not essentially flat; cylinders containing compressed gases may be loaded onto any motor vehicle not having a floor or platform only if such motor vehicle be equipped with suitable racks having adequate means for securing such cylinders in place therein. Nothing contained in this section shall be so construed as to prohibit the loading of such cylinders on

any motor vehicle having a floor or platform and racks as hereinbefore described.

(1) *Cylinders, horizontal.* Cylinders containing compressed gases shall be loaded in a horizontal position unless packed in boxes or crates of such dimensions as to prevent their overturning, or unless loaded into racks securely attached to the motor vehicle, or unless so securely lashed in an upright position as to prevent their overturning.

(b) Portable tank containers containing compressed gases shall be loaded on motor vehicles only as follows:

(1) Onto a flat floor or platform of a motor vehicle.

(2) Onto a suitable frame of a motor vehicle.

(3) In either such case, such containers shall be safely and securely blocked or held down to prevent movement relative to each other or to the supporting structure when in transit, particularly during sudden starts and stops and changes of direction of the vehicle.

(4) Requirements of subparagraphs (1) and (2) of this paragraph shall not be construed as prohibiting stacking of containers, provided the provisions of subparagraph (3) of this paragraph are fully complied with.

(c) Tanks complying with specification 106A500 (§ 78.275 of this chapter), containing chlorine, anhydrous ammonia, sulfur dioxide, methyl chloride, dichlorodifluoromethane, monochlorodifluoromethane, monochlorotetrafluoroethane, vinyl chloride, inhibited, difluoroethane, difluoromonochloroethane, dispersant gas, n. o. s., or dichlorodifluoromethane and difluoroethane mixture (constant boiling mixture), or tanks complying with specification 106A800 (§ 78.276 of this chapter), containing hydrogen sulfide, may be transported on trucks or semitrailers only, when securely chocked or clamped thereon to prevent shifting, and provided adequate facilities are present for handling tanks where transfer in transit is necessary. See § 74.560 (b) (1) of this chapter, for rail freight-motor vehicle shipments.

(d) *Engine to be stopped in tank motor vehicles, except for transfer pump.* No flammable compressed gas shall be loaded into or on or unloaded from any tank motor vehicle with the engine running unless the engine is used for the operation of the transfer pump of the vehicle. Unless the delivery hose is equipped with a shut-off valve at its discharge end, the engine of the motor vehicle shall be stopped at the finish of such loading or unloading operation while the filling or discharge connections are disconnected.

§ 77.841 *Poisons.* (See also § 77.834 (a) to (k) of this part). (a) *Arsenical compounds in bulk.* Care shall be exercised in the loading and unloading of "arsenical dust", "arsenic trioxide", and "sodium arsenate", allowable to be loaded into sift-proof, steel hopper-type or dump-type motor-vehicle bodies equipped with water-proof, dust-proof covers well secured in place on all openings, to accomplish such loading with the minimum spread of such compounds into the atmosphere by all means that are practicable; and no such loading or unloading shall be done near or adjacent to any place where there are or are likely to be, during the loading or unloading process, assemblages of persons other than those engaged in the loading or unloading process, or upon any public highway or in any public place.

(b) *No class A or class C poisons in cargo tanks.* No dangerous poison, class A, or any tear gas or irritating substance, class C, may be loaded into or transported in any cargo tank.

(c) *Class A or class C poisons.* It shall not be permissible to transport class A or class C poisons if there be any interconnecting means of any character between the containers.

(d) *Radioactive material.* A container of radioactive material bearing radioactive material, red label, must not be placed in vehicles, terminals, or other places closer than 3 feet to an area which may be continuously occupied by passengers, employees, or shipments of animals. When more than one such container is present, the distance from occupied areas must be computed from the table in subparagraph (1) of this paragraph by adding the number of units shown on labels on the containers.

(1) A container of radioactive material, red label, must not be placed closer than 15 feet to any package containing undeveloped film. If more than one such container is present the distance must be computed from the table in this subparagraph by adding the number of units shown on the labels on the packages.

TABLE

Total number of units	Minimum distance in feet to nearest undeveloped film	Distance in feet to area that may be continuously occupied by passengers or employes for periods:	
		Up to 8 hours	Exceeding 8 hours
1 to 10	15	3	5
11 to 20	20	4	7
21 to 30	25	5	9
31 to 40	30	6	10

NOTE 1. The distance in the table must be measured from the nearest point of the radioactive container or containers.

NOTE 2. 1 unit equals 1 milliroentgen per hour at 1 meter for hard gamma radiation or the amount of radiation which has the same effect on film as 1 mrhm. of hard gamma rays of radium filtered by ½ inch of lead.

(2) Not more than 40 units of radioactive material, red label, shall be transported in any vehicle or stored in a terminal at one time. Packages must be so blocked or braced in vehicles as to prevent any shift of lading under conditions normally incident to transportation.

(3) All containers of radioactive material, red label, must be carried by the handles when handles are provided.

(4) Radioactive materials (class D poisons) must not be loaded in the same vehicle with Class A explosives.

(5) If for any reason, a package containing radioactive materials, red label, would otherwise remain in the same building for a period longer than 24 hours, it must be moved to a different location after each 24 hours.

SUBPART C—LOADING AND STORAGE CHART OF EXPLOSIVES AND OTHER DANGEROUS ARTICLES

§ 77.848 *Loading and storage chart of explosives and other dangerous articles.* (a) Explosives or other dangerous articles must not be loaded, transported or stored together, except as provided in the Loading and Storage Chart of Explosives and Other Dangerous Articles shown in this section.

The following table shows the explosives and other dangerous articles which must not be loaded or stored together.
The letter X at an intersection of horizontal and vertical columns shows that these articles must not be loaded or stored together, for example: detonating fuzes, boosters (explosive) g horizontal column must not be loaded or stored with high explosives b vertical column

		a	b	c	d	e	f	g	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Low explosives or black powder	High explosives, and smokeless powder for small arms in quantity exceeding 50 pounds net weight	Initiating or priming explosives, wet: Diazodinitrophenol, fulminate of mercury, guanyl nitrosamino guanylidene hydrazine, lead azide, lead styphnate, nitro mannite, nitrosoguanidine, pentaerythrite tetranitrate, tetrazene	Blasting caps, with or without safety fuse (including electric blasting caps), detonating primers	Ammunition for cannon with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles or shell, ammunition for small arms with explosive bullets, or ammunition for small arms with explosive projectiles, or rocket ammunition with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles or illuminating projectiles.[a]	Explosive projectiles, bombs, torpedoes, or mines, rifle or hand grenades (explosive), jet thrust units (jato), class A.[a]	Detonating fuzes, boosters (explosive)	Ammunition for cannon with empty, inert-loaded or solid projectiles, or without projectiles, or rocket ammunition with empty projectiles, inert-loaded or solid projectiles or without projectiles	Smokeless powder for cannon, or not exceeding 50 pounds net weight of smokeless powder for small arms, or jet thrust units (jato), class B	Fireworks, special	Small arms ammunition	Primers for cannon or small arms, empty cartridge bags-black powder igniters, empty cartridge cases, primed, empty grenades, primed, combination primers or percussion caps, toy caps, explosive cable cutters, explosive rivets	Percussion fuzes, tracer fuzes or tracers	Time or combination fuze	Cordeau detonant fuse, safety squibs, fuse lighters, fuse igniters, delay electric igniters, electric squibs or instantaneous fuse	Fireworks, common	Flammable liquids or compressed flammable gases, red label	Flammable solids or oxidizing materials, yellow label	Acids or corrosive liquids, white label	Compressed nonflammable gases, green label	Poisonous gases or liquids, in cylinders, projectiles or bombs, poison gas label	Radioactive materials (class D poisons)
CLASS A EXPLOSIVES																							
Low explosives or black powder	a			X							X						X	X	X	X	X	X	X
High explosives, and smokeless powder for small arms in quantity exceeding 50 pounds net weight	b			X				X			X						X	X	X	X	X	X	X
Initiating or priming explosives, wet: Diazodinitrophenol, fulminate of mereury, guanyl nitrosamino guanylidene hydrazine, lead azide, lead styphnate, nitro mannite, nitrosoguanidine, pentaerythrite tetranitrate, tetrazene	c	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Blasting caps, with or without safety fuse (including electric blasting caps), detonating primers	d			X		X	X				[a] X						[a] X	[a] X	[a] X	[a] X	[a] X	X	X
Ammunition for cannon with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles or shell, ammunition for small arms with explosive bullets, or ammunition for small arms with explosive projectiles, or rocket ammunition with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles or illuminating projectiles.[a]	e			X	X			X			X						X	X	X	X	X	X	X
Explosive projectiles, bombs, torpedoes, or mines, rifle or hand grenades (explosive), jet thrust units (jato), class A.[a]	f			X	X			X			X						X	X	X	X	X	X	X
Detonating fuzes, boosters (explosive)	g		X	X		X	X				X						X	X	X	X	X	X	X
CLASS B EXPLOSIVES																							
Ammunition for cannon with empty, inert-loaded or solid projectiles, or without projectiles, or rocket ammunition with empty projectiles, inert-loaded or solid projectiles or without projectiles	1			X																[b] X		X	
Smokeless powder for cannon, or not exceeding 50 pounds net weight of smokeless powder for small arms, or jet thrust units (jato), class B	2			X																[b] X		X	
Fireworks, special	3	X	X	X	[a] X	X	X	X														X	
CLASS C EXPLOSIVES																							
Small arms ammunition	4			X																			
Primers for cannon or small arms, empty cartridge bags-black powder igniters, empty cartridge cases, primed, empty grenades, primed, combination primers or percussion caps, toy caps, explosive cable cutters, explosive rivets	5			X																			
Percussion fuzes, tracer fuzes or tracers	6			X																			
Time or combination fuzes	7			X																			
Cordeau detonant fuse, safety squibs, fuse lighters, fuse igniters, delay electric igniters, electric squibs or instantaneous fuse	8			X																			
Fireworks, common	9	X	X	X	[a] X	X	X	X														X	

See footnotes at end of table.

The following table shows the explosives and other dangerous articles which must not be loaded or stored together.
The letter X at an intersection of horizontal and vertical columns shows that these articles must not be loaded or stored together, for example: detonating fuzes, boosters (explosive) g horizontal column must not be loaded or stored with high explosives b vertical column

		Low explosives or black powder	High explosives, and smokeless powder for small arms in quantity exceeding 50 pounds net weight	Initiating or priming explosives, wet: Diazodinitrophenol, fulminate of mercury, guanyl nitrosamino guanylidene hydrazine, lead azide, lead styphnate, nitro mannite, nitrosoguanidine, pentaerythrite tetranitrate, tetrazene	Blasting caps, with or without safety fuse (including electric blasting caps), detonating primers	Ammunition for cannon with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles, illuminating projectiles or shell, ammunition for small arms with explosive bullets, or ammunition for small arms with explosive projectiles, or rocket ammunition with explosive projectiles, gas projectiles, smoke projectiles, incendiary projectiles or illuminating projectiles.[c]	Explosive projectiles, bombs, torpedoes, or mines, rifle or hand grenades (explosive), jet thrust units (jato), class A.[c]	Detonating fuzes, boosters (explosive)	Ammunition for cannon with empty, inert-loaded or solid projectiles, or without projectiles, or rocket ammunition with empty projectiles, inert-loaded or solid projectiles or without projectiles	Smokeless powder for cannon, or not exceeding 50 pounds net weight of smokeless powder for small arms, or jet thrust units (jato), class B	Fireworks, special	Small arms ammunition	Primers for cannon or small arms, empty cartridge bags-black powder igniters, empty cartridge cases, primed, empty grenades, primed, combination primers or percussion caps, toy caps, explosive cable cutters, explosive rivets	Percussion fuzes, tracer fuzes or tracers	Time or combination fuzes	Cordeau detonant fuse, safety squibs, fuse lighters, fuse igniters, delay electric igniters, electric squibs or instantaneous fuse	Fireworks, common	Flammable liquids or compressed flammable gases, red label	Flammable solids or oxidizing materials, yellow label	Acids or corrosive liquids, white label	Compressed nonflammable gases, green label	Poisonous gases or liquids, in cylinders, projectiles or bombs, poison gas label	Radioactive materials (class D poisons)
		a	b	c	d	e	f	g	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
OTHER DANGEROUS ARTICLES																							
Flammable liquids or compressed flammable gases, red label	10	X	X	X	[a] X	X	X	X	----	----	----	----	----	----	----	----	----	----	----	----	----	X	----
Flammable solids or oxidizing materials, yellow label	11	X	X	X	[a] X	X	X	X	----	----	----	----	----	----	----	----	----	----	----	[b] X	----	X	----
Acids or corrosive liquids, white label	12	X	X	X	[a] X	X	X	X	[b] X	[b] X	----	----	----	----	----	----	----	----	[b] X	----	----	X	----
Compressed nonflammable gases, green label	13	X	X	X	[a] X	X	X	X	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Poisonous gases or liquids, in cylinders, projectiles or bombs, poison gas label	14	X	X	X	X	X	X	X	X	X	X	----	----	----	----	----	X	X	X	X	----	----	----
Radioactive materials (class D poisons)	15	X	X	X	X	X	X	X	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

[a] Blasting caps or electric blasting caps in quantities not exceeding 1,000 caps may also be loaded and transported with all articles named except those in columns c, e, and f. Blasting caps and/or electric blasting caps, without limitations as to quantity, may be transported in the same motor vehicle with high explosives or nitroglycerin, desensitized nitroglycerin, or diethylene glycol dinitrate, in conformity with § 77.824 of this part.

[b] Acids or other corrosive liquids, white label, must not be loaded above or adjacent to flammable solids or oxidizing materials, yellow label, ammunition for cannon with or without projectiles, or smokeless powder.

[c] Explosives, class A, and explosives, class B, must not be loaded or stored with chemical ammunition containing incendiary charges either with or without bursting charges. Chemical ammunition of the same classification containing incendiary charges may be loaded and stored together.

NOTE 1: Charged electric storage batteries must not be loaded in the same vehicle with explosives, class A.

NOTE 2: Cyanides or cyanide mixtures must not be loaded or stored with acids or corrosive liquids.

NOTE 3: Gas identification sets may be loaded and transported with all articles named except those in column e.

SUBPART D—VEHICLES AND SHIPMENT IN TRANSIT; ACCIDENTS

NOTE: See § 77.807 of this part for emergency shipments.

§ 77.853 *Transportation and delivery of shipments*—(a) *No unnecessary delay in movement of shipments.* All shipments of explosives or other dangerous articles shall be transported without unnecessary delay, from and including the time of commencement of the loading of the cargo until its final discharge at destination.

(b) *Delivery at destination.* Shipments of explosives and other dangerous articles which are refused by the consignees, or which can not be delivered within 48 hours after arrival at destination, must be promptly disposed of (1) by return to the shipper, if in proper shipping condition, or (2) by storage, provided a suitable storage place for such articles is available, or (3) by sale, or (4) when necessary to safety, by destruction: *Provided,* That charged electric batteries may be held for 30 days after arrival at destination, pending delivery or disposition.

(c) *Delivery to authorized person, or magazine.* Every shipment of dangerous explosives by motor vehicle shall be delivered only to someone authorized to receive it, except such explosives shipments as are placed in magazines which are immediately thereafter locked.

§ 77.854 *Disabled vehicles and broken or leaking packages; repairs.* (See also Forbidden articles, § 77.821 of this part).

(a) *Care of lading, explosives or other dangerous articles.* In the event of disablement of a motor vehicle transporting any explosives or other dangerous article, special care shall be taken to guard the vehicle and its load or to take such steps as may be necessary to provide against hazard. Special effort shall be made to remove the motor vehicle to a place where the hazards of the materials being transported may be provided against. See §§ 193.23 and 193.24 of this chapter, for signals required to be displayed on the highway.

(b) *Disposition of containers found broken or leaking in transit.* When leaks occur in packages or containers during the course of transportation, subsequent to initial loading, disposition of such package or container shall be made by the safest practical means afforded under paragraphs (c), (d), and (e) of this section.

(c) *Repairing packages.* Packages may be repaired when safe and practicable, such repairing to be in accordance with the best and safest practice known and available.

(d) *Transportation of repaired packages.* Any package repaired in accordance with the requirements of paragraph (c) of this section, except as provided in §§ 77.855 (c), 77.856 (c) and 77.858 (b) of this part, may be transported to the nearest place at which it may safely be disposed of only in compliance with the following requirements:

(1) The package must be safe for transportation.

(2) The repair of the package must be adequate to prevent contamination of or hazardous admixture with other lading transported on the same motor vehicle therewith.

(3) If the carrier is not himself the shipper, the consignee's name and address must be plainly marked on the repaired package.

(e) *Disposition of unsafe broken packages.* In the event any leaking package or container cannot be safely and adequately repaired for transportation or transported, it shall be stored pending proper disposition in the safest and most expeditious manner possible.

(f) *Disabled vehicles; other dangerous articles.* Whenever any motor vehicle transporting flammable liquids, flammable solids, oxidizing materials, corrosive liquids, compressed gases, or poisons, is disabled upon the traveled

portion of any highway, or a shoulder next thereto, the following requirements shall be complied with during the period of such stop:

(1) For motor vehicles other than cargo tanks, flares (pot torches), fusees, red electric lanterns, red emergency reflectors, and red flags shall be displayed as required under §§ 193.23 and 193.24 of this chapter.

(2) For cargo tank motor vehicles used for the transportation of flammable liquids or flammable compressed gases, whether loaded or empty, red electric lanterns, red emergency reflectors and red flags shall be displayed as required in §§ 193.23 (b), (d), and 193.24 of this chapter.

(g) *Repairs to disabled vehicles.* No repairs shall be made on any motor vehicle containing explosives or other dangerous articles except in case such repairs may be made without hazard; nor shall any such loaded motor vehicle be repaired in a closed garage.

77.855 *Accidents; explosives*—(a) *Vehicle disabled; warning of nearby persons; removal of explosives.* In the event of an accident involving any motor vehicle transporting any explosives, every available means shall be employed to prevent individuals, other than those employed in the protection of persons or property or in the removal of hazards or wreckage, from congregating in the vicinity; such means shall also be employed to prevent smoking, to keep flame away, and to safeguard against the aggravation of the hazard present, and to warn other users of the highway. In the event that any motor vehicle laden with or carrying dangerous explosives is entangled with another or with any other object or structure, following an accident, no attempt shall be made to disentangle either vehicle, or the laden vehicle from the object or structure, until the lading, together with any fragments thereof, be removed to a place at least 200 feet from the vehicle (and preferably 200 feet from any habitation). In the event of fire, involving a motor vehicle laden with any explosive, every practicable effort shall be made to give warning of danger of explosion to habitants in the vicinity and to other users of the highway.

(b) *Disposition of spilled or leaking explosives.* In the event of any accident involving any motor vehicle transporting any explosive in which packages are broken, all unbroken packages and as much of any broken packages as possible shall be carefully gathered and removed to a place of safety, in order to prevent fire or explosion. In clearing any wreck in which a motor vehicle containing any explosive is involved, care shall be exercised not to produce sparks with tools or by other means in moving of or working about the wreckage, so as to avoid as far as possible fires or explosions.

(c) *Explosives packages in transit capable of repair.* Any package of explosives found injured or broken in transit may be repaired or recoopered when this is evidently practicable and not dangerous. When a box that contains any explosive is so damaged that it cannot be repaired it should be reinforced by stout wrapping paper and twine, placed in another strong box, and surrounded by dry, fine sawdust, or dry and clean cotton waste, or elastic wads made from dry newspapers. The box cover should then be securely attached. A ruptured can or keg should be inclosed in a grain bag of good quality, and boxed. Injured packages thus protected, and properly marked with name of contents and consignee's name and address, may be carried to destination: *Provided, however,* That the motor carrier, if himself the shipper, need not mark his own name and address on the package.

(d) *Liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate.* When any liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate has been spilled on any portion of any motor vehicle it shall be washed with a suitable neutralizing agent until all of any such spillage shall have become completely neutralized.

NOTE 1: Liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate may be destroyed by use of a solution composed of:

60 percent commercial sodium sulfide	1 ounce.
Denatured alcohol	7½ fluid ounces.
Acetone	2 fluid ounces.
Water	3 fluid ounces.

(e) *Explosives other than liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate.* When particles of any explosive composition other than liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate have escaped from a damaged container to the floor of the body of the carrier's motor vehicle, the floor shall be thoroughly swept and any absorbed portion removed.

(f) *Unrepairable explosives packages.* When any package of explosives in transit is found to be leaking or damaged and cannot be recoopered, it may not be transported beyond the minimum distance necessary to reach a place where the explosive may be disposed of with safety, except as provided in § 77.854 (e) and paragraph (c) of this section.

§ 77.856 *Accidents; flammable liquids*—(a) *Accident to vehicle; warnings; no sparks or flame.* In the event of an accident involving any motor vehicle transporting any flammable liquid every available means shall be employed to prevent individuals, other than those employed in the protection of persons or property or in the removal of hazards or wreckage, from congregating in the vicinity; such means shall also be employed to prevent smoking, to keep fires or flame away, to safeguard against the hazard present, and to warn other users of the highway. (See also § 77.814 of this part.)

(b) Prevent leakage from spreading. Whenever any flammable liquid is escaping from a container, all practical means shall be taken to prevent such liquid from spreading over a wide area, from flowing into sewers and streams, and from becoming ignited.

(c) *Disposition of contents of cargo tank when unsafe to continue.* In the event of a leak in a cargo tank of such a character as to make further transportation unsafe, the leaking vehicle should be removed from the traveled portion of the highway; and every available means employed for the safe disposal of the leaking liquid by preventing, so far as practicable, its spread over a wide area, such as by digging trenches to drain to a hole or depression in the ground, diverting the liquid away from streams or sewers if possible, or catching the liquid in containers if practicable. Smoking and the lighting of cigarettes, cigars, or pipes in the vicinity is prohibited, and fires or flames in the vicinity of the leaking cargo tank must be extinguished.

(d) *Transfer of flammable liquids en route.* No flammable liquid shall be transferred from one container to another, or from one motor vehicle to another vehicle, or from another vehicle to a motor vehicle, on any public highway, street, or road, except in case of emergency. In such cases red electric lanterns, red emergency reflectors, or red flags shall be set out in the manner prescribed for disabled or stopped motor vehicles in Motor Carrier Safety Regulations (Part 193 of this chapter). In any event, all practicable means, in addition to those hereinbefore prescribed, shall be taken to protect and warn other users of the highway against the hazard involved in any such transfer, or against the hazard occasioned by the emergency making such transfer necessary. Nothing contained in this rule shall be so construed as to prohibit the fueling of machinery or vehicles used in road construction and maintenance.

(e) *Transportation of leaking cargo tanks.* A leaking cargo tank may only be transported the minimum distance necessary to reach a place where the contents of the tank or compartment may be disposed of with safety. Every available means must be utilized to prevent the leakage or spillage of the liquid upon the highway.

§ 77.857 *Accidents, flammable solids and oxidizing materials*—(a) *Dangerous articles spilled; warning of nearby persons.* In the event of any accident involving any motor vehicle in which any flammable solid or oxidizing material may have become spilled, every practicable and available means shall be taken to warn all approaching persons of the hazard of fire.

(b) *Prevent spread of fire where possible.* Care shall be exercised in the event of damage to packages of flammable solids or oxidizing materials which either have been or may be on fire, to limit the spread of the fire.

(c) *Disposition of spilled or leaking materials.* In the event of any accident involving any motor vehicle transporting any flammable solid or oxidizing material in which packages are broken, as much as possible of any broken packages shall be carefully gathered and removed to a place of safety, and if the removal of unbroken packages from the motor vehicle would decrease the hazard of fire or other hazard, they shall be removed. The handling of any such materials not contained in packages shall

be such as to promote the greatest safety to other users of the highway.

(d) *Reloading of damaged packages of matches; repairs.* In the event of damage to matches or packages of matches by fire or by water in extinguishing a fire in transit, they shall be reloaded in accordance with the applicable requirements for the packing and loading of matches. Great care shall be taken, however, first to examine and repair any damage to outside containers before reloading, and all loose matches shall be destroyed. Smoking boxes of matches shall not be opened in the vicinity of the remainder of the lading. Such boxes shall be destroyed at a safe distance from the motor vehicle, preferably by burning, and shall not be left, either smoking or burning.

§ 77.858 *Accidents; corrosive liquids*—(a) *Accident to vehicle; other lading damaged; vehicle washed.* In the event of any accident involving any motor vehicle transporting corrosive liquids in which has been involved the breakage, spillage, or leakage of containers of such liquids, care shall be exercised in the handling of any other lading which may have become damaged thereby so as to minimize the hazard in handling such damaged lading during the unloading process; and the interior of any other parts of the motor vehicle upon which the corrosive liquid may have become spilled shall be thoroughly washed with water as soon after the unloading process as feasible and prior, in any event, to the subsequent reloading of the motor vehicle. (See also § 77.814 of this part.)

(b) *Leaking cargo tanks.* In the event of leakage of liquid from any cargo tank or any compartment thereof used for the transportation of corrosive liquids, which develops or is discovered subsequent to the commencement of transportation, any one of the following means, or any means in addition to those herein prescribed, equally or more effective, shall be employed to minimize further hazard:

(1) Further to transport the cargo tank only the minimum distance to reach a place where the contents of the tank or compartment which is leaking may be disposed of with safety, meanwhile employing every available means to prevent the spillage or leaking of any liquid on the highway.

(2) In the event the leak is of such a character as to make further transportation of the cargo tank unsafe, to draw off the traveled portion of the highway, and to employ every available means for the safe disposal of the leaking liquid by preventing, so far as practicable, its spread over a wide area, as by absorbing by means of the use of noncombustible absorbent material, such as fine ashes, sand, earth, etc., or by any other practicable means; by digging trenches to drain to a hole or depression in the ground; by diverting the liquid away from streams or sewers if possible; or by catching the liquid in containers if practicable. So far as practicable, every available means shall be employed to prevent the congregation of spectators and to prevent them from coming in contact with the liquid or its fumes. All available means shall be taken to prevent injury or damage to other users of the highway, or to livestock or farm animals, which might be occasioned by the unloading of the corrosive liquid.

§ 77.859 *Accidents; compressed gases.*—(a) *Accident to vehicle; warnings; keep fire away.* In the event of an accident involving any motor vehicle transporting any compressed gas, the release of which would constitute a hazard to other users of the highway, due care shall be taken that only persons employed in the removal of hazards or wreckage shall be allowed in proximity to the motor vehicle, and the shipper should be notified. In such cases, every practicable and available means shall be taken to warn all approaching persons of the danger involved and to caution them against the use of matches or flame-producing devices, if the gas is flammable.

(b) *Transfer of flammable gas en route; no flame or sparks.* No flammable compressed gas shall be transferred from one container to another, or from one tank motor vehicle to another tank vehicle, or from another tank vehicle to a tank motor vehicle, on any public highway, street, or road, except in case of emergency. In such cases every precaution shall be taken to prevent the escape of gas. Red electric lanterns, red emergency reflectors, or red flags shall be set out in the manner prescribed in Motor Carrier Safety Regulations (Part 193 of this chapter). All cargo tanks involved in such transfer shall be grounded. The transfer shall be made only during daylight, unless the emergency occurs at night or extends into hours of darkness and the hazard would be increased by waiting until daylight. In any such event, all practicable means, in addition to those hereinbefore prescribed, shall be taken to protect and warn other users of the highway against the hazard involved in any such transfer, or against the hazard occasioned by the emergency making such transfer necessary. Every precaution shall be taken to prevent the ignition of any flammable compressed gas from any source; and when it is possible to prevent the congregation of persons not directly concerned with the emergency, this shall be done. Every practicable precaution shall be taken to keep flames or fire away from the scene of the emergency and to prevent smoking or the lighting of pipes, cigars, or cigarettes. Similarly, special care shall be exercised in the operation of any engine, whether of the motor vehicles involved or any other, and where the operation of any such engine would be likely to produce ignition of the flammable compressed gas, the transfer shall be accomplished by other means, if possible. Nothing contained in this section shall be so construed as to prohibit the fueling of machinery or vehicles used in road construction and maintenance.

§ 77.860 *Accidents; poisons*—(a) *Accident to vehicle; warnings; no sparks or flame.* In the event of an accident involving any motor vehicle transporting any poison which is flammable, noxious, or toxic, every available means shall be employed in the protection of persons or property or in the removal of hazards or wreckage, from congregating in the vicinity; such means shall also be employed to prevent smoking, to keep flame away, to safeguard against the aggravation of the hazard present, and to warn other users of the highway. Care shall also be taken to prevent any poison, whether flammable or nonflammable, from contaminating streams or flowing or being spilled into sewers, and poison in powdered form from being scattered by wind. (See also § 77.814 of this part.)

(b) *Leaking cargo tanks.* In the event of leakage of liquid from any cargo tank or any compartment thereof used for the transportation of any poison which is also flammable, or which would come also within the definition of a flammable liquid, or of any gas or combination of gas and liquid, or any poison which would come within the definition of a compressed gas, the requirements shall be the same as those set forth for flammable liquids and compressed gases. In addition, all possible care shall be taken to warn bystanders or other users of the highway against the hazard of inhaling vapors or coming in contact with the poison.

(c) *Radioactive materials; poison D.* In case of accident to vehicle resulting in breakage of, or unusual delay to any shipment of radioactive material the package or material should be segregated as far as possible from human contact. The shipper and the Bureau of Explosives should be immediately notified. In case of breakage of a package containing radioactive material and when it appears likely that the inside container may have been damaged, great care must be exercised to prevent contact with or inhalation of radioactive material by any person.

Subpart E—Regulations Applying to Explosives or Other Dangerous Articles on Motor Vehicles Carrying Passengers for Hire

§ 77.870 *Regulations for passenger carrying vehicles.*—(a) *Vehicles transporting passengers and property.* In addition to the regulations in Parts 71 to 78 of this chapter the following requirements shall apply to vehicles transporting passengers and property.

(b) *No explosives or other dangerous articles on passenger-carrying vehicles, exceptions.* No explosives or other dangerous articles except small-arms ammunition, emergency shipments of drugs, chemicals and hospital supplies, and the accompanying munitions of war of the Departments of the Army, Navy, and Air Force of the United States Government, are authorized by Parts 71–78 of this chapter to be transported on motor vehicles carrying passengers for hire where other practicable means of transportation is available.

(c) *Explosives in passenger-carrying space forbidden.* No explosive, except small-arms ammunition, may be carried in the passenger-carrying space of any motor vehicle transporting passengers for hire.

(d) *Explosives and other dangerous articles on passenger-carrying vehicles; quantity.* Where no other practicable

means of transportation is available the following articles in the quantities as shown may be transported in motor vehicles carrying passengers for hire in a space other than that provided for passengers: Not to exceed 100 pounds gross weight of any or all of the kinds of explosives permitted to be transported by rail express or rail baggage services, may be transported on a motor vehicle transporting passengers: *Provided, however,* That samples of explosives for laboratory examination, not exceeding a net weight of one-half pound each, and not exceeding 20 samples or not to exceed a total of 100 blasting caps at one time in a single motor vehicle, may be transported in a motor vehicle transporting passengers. (See § 72.5 of this chapter.)

(e) *Articles other than explosives on passenger-carrying vehicles.* The gross weight of any given class of dangerous article other than explosives shall not exceed 100 pounds, and the aggregate weight of all such other dangerous articles shall not exceed 500 pounds. This provision does not apply to nontoxic, nonflammable refrigerants, when such refrigerant is for servicing operations of a motor carrier on whose motor vehicles the refrigerant is used. A cylinder secured against movement while in transit and not exceeding 250 pounds gross weight may be transported.

(f) *Poisons on passenger-carrying vehicles.* No motor carrier may transport any extremely dangerous poison, class A, any tear gas or irritating substance, class C, any less dangerous poison, class B, which is a liquid, or any paranitraniline, in any amount, in or on any bus while engaged in the transportation of passengers; or any less dangerous poison, class B, which is other than a liquid, in any amount exceeding an aggregate of 100 pounds gross weight in or on any such bus.

(g) *Radioactive materials on passenger-carrying vehicles.* No motor carrier may transport any radioactive material, poison, class D, requiring red or blue radioactive material label under these regulations in or on any bus while engaged in the transportation of passengers except where no other practicable means of transportation is available. Packages of radioactive materials must be handled and placed in the vehicle in accordance with the requirements of § 77.841 (d) of this part.

PART 78—SHIPPING CONTAINER SPECIFICATIONS

SUBPART A—SPECIFICATIONS FOR CARBOYS, JUGS IN TUBS, AND RUBBER DRUMS

Sec.

78.1 Specification 1A; boxed carboys. (Glass, earthenware, clay, or stoneware.)
78.2 Specification 1B; boxed lead carboys.
78.3 Specification 1C; carboys in kegs. (Glass, earthenware, clay or stoneware.)
78.4 Specification 1D; boxed glass carboys.
78.5 Specification 1X; boxed carboys 5 to 6 gallons, for export only. (Glass, earthenware, clay, or stoneware.) Single-trip container.
78.6 Specification 1EX; glass carboys in plywood drums for export only.
78.8 Specification 28; metal-jacketed lead carboy.
78.9 Specification 28A; metal-jacketed lead carboy.
78.12 Specification 34B; aluminum carboys.
78.15 Specification 31; jugs in tubs.
78.18 Specification 43A; rubber drums.

SUBPART B—SPECIFICATIONS FOR INSIDE CONTAINERS, AND LININGS

Sec.

78.20 Specification 2A; inside containers—metal cans, pails and kits.
78.22 Specification 2C; inside containers—corrugated fiberboard cartons.
78.23 Specification 2D; inside containers—duplex paper bags.
78.25 Specification 2F; inside metal containers and liners.
78.26 Specification 2G; inside containers—fiber cans and boxes.
78.28 Specification 2J; inside containers—waterproof paper bags for linings.
78.29 Specification 2K; inside containers—paper bags for lining.
78.30 Specification 2L; lining for boxes.
78.31 Specification 2M; waterproofed paper lining.
78.32 Specification 2N; inside containers—metal cans.
78.33 Specification 2P; inside metal containers.
78.34 Specification 2R; inside containers—metal tubes.

SUBPART C—SPECIFICATIONS FOR CYLINDERS

78.36 Specification 3A; seamless steel cylinders.
78.37 Specification 3AA; seamless steel cylinders, made of definitely prescribed steels.
78.38 Specification 3B; seamless steel cylinders.
78.39 Specification 3BN; seamless nickel cylinders.
78.40 Specification 3C; seamless steel cylinders.
78.41 Specification 3D; seamless steel cylinders.
78.42 Specification 3E; seamless steel cylinders.
78.43 Specification 3A480X; experimental type seamless steel cylinders.
78.48 Specification 4; forge welded steel cylinders.
78.49 Specification 4A; forge welded steel cylinders.
78.50 Specification 4B; welded and brazed steel cylinders.
78.51 Specification 4BA; welded or brazed steel cylinders made of definitely prescribed steels.
78.52 Specification 4C; welded and brazed steel cylinders.
78.53 Specification 4D; inside containers—welded steel for aircraft use.
78.54 Specification 4B240–FLW; welded or welded and brazed cylinders with fusion-welded longitudinal seam.
78.55 Specification 4B–ET; welded and brazed cylinders made from electric resistance welded tubing.
78.59 Specification 8; steel cylinders with approved porous filling for acetylene.
78.60 Specification 8AL; steel cylinders with approved porous filling for acetylene.
78.63 Specification 9; inside containers—seamless or welded or brazed steel cylinders.
78.66 Specification 40; inside containers—non-refillable seamless or welded or brazed steel cylinders.

APPENDIX A—Special orders.

SUBPART D—SPECIFICATIONS FOR METAL BARRELS, DRUMS, KEGS, CASES, TRUNKS AND BOXES

Sec.

78.80 Specification 5; steel barrels or drums.
78.81 Specification 5A; steel barrels or drums.
78.82 Specification 5B; steel barrels or drums.
78.83 Specification 5C; steel barrels or drums.
78.84 Specification 5D; steel barrels or drums—lined.
78.85 Specification 5F; steel drums.
78.86 Specification 5G; steel barrels or drums.
78.87 Specification 5H; steel barrels or drums—lead lined.
78.88 Specification 5K; nickel barrels or drums.
78.89 Specification 5L; steel barrels or drums.
78.90 Specification 5M; monel drums.
78.91 Specification 5X; steel drums—aluminum lined.
78.92 Specification 5P; lagged steel drums.
78.97 Specification 6A; steel barrels or drums.
78.98 Specification 6B; steel barrels or drums.
78.99 Specification 6C; steel barrels or drums.
78.100 Specification 6J; steel barrels and drums.
78.101 Specification 6K; steel barrels or drums.
78.107 Specification 42B; aluminum drums.
78.108 Specification 42C; aluminum barrels or drums.
78.109 Specification 42D; aluminum drums.
78.115 Specification 17C; steel drums. Single-trip container.
78.116 Specification 17E; steel drums. Single-trip container.
78.117 Specification 17F; steel drums. Single-trip container.
78.118 Specification 17H; steel drums. Single-trip container.
78.119 Specification 17X; steel barrels or drums. Single-trip container.
78.125 Specification 37D; steel drums. Single-trip container.
78.126 Specification 37E; steel drums, Single-trip container.
78.127 Specification 37F; steel drums. Single-trip container.
78.128 Specification 37G; steel drums. Single-trip container.
78.129 Specification 37H; steel drums. Single-trip container.
78.130 Specification 37K; steel drums. Single-trip container.
78.136 Specification 42E; aluminum drums. Single-trip container.
78.140 Specification 13; metal kegs.
78.141 Specification 13A; metal drums.
78.146 Specification 32A; metal cases—riveted or lock seamed.
78.147 Specification 32B; metal cases—welded or riveted.
78.148 Specification 32C; metal trunks.
78.149 Specification 32D; metal boxes for old and worn-out motion-picture film no longer exhibitable.

SUBPART E—SPECIFICATIONS FOR WOODEN BARRELS, KEGS, BOXES, KITS, AND DRUMS

78.155 Specification 10A; wooden barrels and kegs (tight).
78.156 Specification 10B; wooden barrels and kegs (tight).
78.157 Specification 10C; wooden barrels and kegs (tight).
78.160 Specification 11A; wooden barrels and kegs (slack).
78.161 Specification 11B; wooden barrels and kegs (slack).

AUTHORITY: §§ 78.1 to 78.336 issued under sec. 204, 49 Stat. 546, as amended, sec. 835, 62 Stat. 739; 49 U. S. C. 304, 18 U. S. C., Sup., 835.

SUBPART A—SPECIFICATIONS FOR CARBOYS, JUGS IN TUBS, AND RUBBER DRUMS

§ 78.1 *Specification 1A; boxed carboys.* Glass, earthenware, clay, or stoneware.

§ 78.1–1 *Compliance.* (a) Required in all details.

§ 78.1–2 *Reuse of packages.* (a) Parts of outside container and cushioning must be replaced when broken, decayed, or inefficient in any way.

(b) Carboys with lip cracked or badly chipped not authorized; gasket seat must be even. Packages must be capable of passing tests prescribed in § 78.1–9.

§ 78.1–3 *Closing devices required.* (a) As follows except when otherwise authorized in the packing regulations:

(1) Acidproof stoppers or other devices, with gaskets, securely fastened; closures to be vented or sufficiently porous to vent off pressure; gaskets to be of ¼" asbestos-rope or other resilient material equivalent in efficiency; gaskets cut from asbestos board not authorized.

(2) Glass stoppers ground to fit and securely fastened.

(3) Cork or other efficient device; authorized only when contents are not corrosive.

§ 78.1–4 *Capacity and marking of carboy.* (a) Containers 5 to 13 gallons are classed as carboys. Must be permanently marked to indicate maker and year of manufacture; mark of maker to be registered with the Bureau of Explosives.

§ 78.1–5 *Glass carboys.* (a) Thoroughly annealed; top of lip smooth and even; must contain at least 20 pounds of glass for 12-gallon carboys and 21 pounds for 13-gallon carboys. Glass in side walls should be well distributed and at least 1/16" thick. Defective carboys not authorized.

§ 78.1–6 *Earthenware, clay, or stoneware carboys.* (a) Of acidproof material.

§ 78.1–7 *Outside containers.* (a) Wooden boxes completely enclosing body of carboy or wooden boxes completely enclosing body and neck of carboy, with 4 vertical corner posts, two cleats for shoes and two carrying cleats. (See paragraph (e) of this section).

(b) Lumber to be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

(c) Assemble sides and ends with grain of wood horizontal and nail as specified. Nail bottom to sides and ends; fasten

top by any efficient means. Cleats for shoes to be along edges of bottom parallel to carrying cleats. (See paragraph (e) of this section).

(d) Parts and dimension as follows:

Carboy capacity, not over	Minimum dimensions			Nails—Sides and bottom	
	Thickness—Sides, top, bottom, and ends	[1] Vertical corner posts	[1] Carrying cleats and shoes	[2] Size, not less than	[3] Spacing, average not over
Gallons	*Inch*	*Inches*	*Inches*	*Penny*	*Inches*
5 to 6	5/8	5/8 x 2 1/2	5/8 x 1 7/8	7	2 1/4
				6	2
7 to 13	25/32	25/32 x 3 1/8	25/32 x 2 11/32	9	2 3/4
				8	2 1/2

[1] Other dimensions with equal cross section acceptable.
[2] Screws of equal efficiency authorized.
[3] Spacing 6 inches acceptable along edge grain of bottoms.

(c) In place of bottom cleats, the following is authorized: 2 angle irons at least 1 1/4" x 1 1/4" x 1/16", applied across grain of bottom boards from corner to corner, supported by acid resistant metal corner supports securely fastened to sides and ends at each bottom corner so as to raise bottom boards of box at least 3/4" above bottom of corner supports; nailing along end grain of bottom boards not required.

(f) Special box. Must comply with this specification except as follows: Bottom of box must be nailed to 4 nailing cleats which form part of the sides and ends of box. Top of box must be reinforced by 2 cleats of 1/2-inch lumber 4 inches wide, extending the entire width of the top at right angles to the sides of the boards forming the top; a vacant space of 1 inch between outside edge of top and cleat should be allowed for nailing top to box; parts and dimensions must be as follows:

Carboy capacity, not over (gallons)	Minimum dimensions					Nails, sides, and bottom	
	Thickness of sides, top, and ends	Thickness of bottom	Thickness and width of bottom nailing cleats	Carrying cleats and shoes	Triangular vertical corner posts	Size not less than [1]	Spacing average not over [2]
	Inch	*Inches*	*Inches*	*Inches*	*Inches*	*Penny*	*Inches*
5 to 13	1/2	25/32	25/32 by 2 1/2	25/32 by 2 1/2	2 1/2 by 2 1/2 (short sides).	8	2 1/2
						10	2 3/4

[1] Screws of equal efficiency authorized.
[2] Spacing 6 inches acceptable along edge grain of bottoms.

§ 78.1–8 *Marking of outside container.* (a) On each container with letters and figures at least 3/4" high applied by hot branding iron or black printing ink with high pressure dies as follows:

(1) ICC—1A. This mark shall be understood to certify that the complete package complies with all specification requirements.

(2) Name or symbol (letters) of company setting up the package, or other party assuming responsibility for its compliance with specification requirements; this must be registered with the Bureau of Explosives and located just above or below the mark specified in paragraph (a) (1) of this section.

§ 78.1–9 *Tests*—(a) *Apparatus.* Standard required. Detail prints can be obtained from Bureau of Explosives, 30 Vesey Street, New York 7, N. Y.

(b) *Method.* Fill with water to lower edge of neck; swing 55" measured from wall to nearest bottom edge of basket:

(1) Side shock; test at least 10 carboys.

(2) Bottom shock; test at least 5 carboys.

(c) *Acceptable results.* 90 percent of carboys must not break under side shock; same for bottom shock.

(d) *When required.* By each manufacturing and each filling plant; during each 6 months of each year, one series each year to be witnessed by representative of Bureau of Explosives; separate tests required for:

(1) New packages (those with new outside container).

(2) Used packages.

(3) Packages with carboys differing over 2 gallons.

(4) Packages differing in kind of cushioning.

(e) *Exception.* Tests not required by plant which fills and ships for one shipment only packages obtained from another plant where required tests are made.

(f) *Reports.* Required to be made to Bureau of Explosives on form as follows:

REPORT OF TESTS OF CARBOYS

(As required by I. C. C. Regulations and Specifications)

(Place) _____
(Date) _____
Test made for _____
_____
(Give name and address of plant for which tests were made)

Description of package	Results					
	Number of test	55-inch swing		Number of test	55-inch swing	
		Side	Bottom		Side	Bottom
Capacity	1			13		
Condition [1]	2			14		
	3			15		
Type of inside container [2]	4			16		
	5			17		
Cushioning [3]	6			18		
	7			19		
Diameter of bottle	8			20		
	9			21		
Size of outside container (inside)	10			22		
	11			23		
	12			24		

[1] State whether outside container is new or used.
[2] State whether glass, earthenware; etc.
[3] State whether hay, mineral wool, ground cork, excelsior, wood strips ..... type, cork pads ..... type, etc.

Specification mark is _____
Identification symbol is _____
Remarks _____
_____
_____
(Signature) _____
(Per) _____

§ 78.1–10 *Approval of veneer, plywood, and laminated wood boxes.* (a) Boxes of veneer, plywood, laminated wood, or any combination thereof, which comply with §§ 78.1–1 to 78–1–10 (except § 78.1–7 (a), (c), and (d), are approved provided:

(1) Outside containers shall completely enclose body of carboy or body and neck of carboy.

(2) That complete inner packing and box specifications have been filed with and approved by the Bureau of Explosives.

(3) That these boxed carboys pass the regular tests prescribed in § 78.1–9.

(4) That boxed carboys after a minimum service period of 6 months pass the tests prescribed in § 78.1–9.

(5) That a detailed report of tests prescribed under paragraph (a) (4) of this section has been filed with and accepted as satisfactory by the Bureau of Explosives.

§ 78.2 *Specification 1B; boxed lead carboys.*

§ 78.2–1 *Compliance.* (a) Required in all details.

§ 78.2–2 *Reuse of packages.* (a) Parts of outside container and cushioning must be replaced when broken, decayed, or inefficient in any way.

(b) Test, see § 78.2–7, required before each shipment.

§ 78.2–3 *Closing.* (a) By stoppers securely fastened.

§ 78.2–4 *Capacity, marking, and manufacture of carboy*—(a) *Capacity and marking of carboy.* Containers 5 to 13 gallons are classed as carboys. Must be permanently marked to indicate maker and year of manufacture; mark of maker to be registered with the Bureau of Explosives.

(b) *Manufacture of carboy.* Of pure-chemical or pure-electrolytic virgin lead; side and bottom sheets 8 pounds and top sheets 10 pounds per square foot minimum; all seams burned.

§ 78.2–5 *Outside containers.* (a) Wooden box, completely enclosing body of carboy, with 4 vertical corner posts, 2 cleats for shoes, and 2 carrying cleats. Corner posts not required when ends are twice the specified thickness.

(b) Lumber to be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

(c) Assemble sides and ends with grain of wood horizontal and nail as specified. Nail bottom to sides and ends; fasten top by any efficient means. Cleats for shoes to be along edges of bottom parallel to carrying cleats. (See paragraph (e) of this section.)

(d) Parts and dimensions as follows:

Carboy capacity, not over	Minimum dimensions			Nails—Sides and bottom	
	Thickness—Sides, top, bottom, and ends	[1] Vertical corner posts	[1] Carrying cleats and shoes	[2] Size, not less than	[3] Spacing, average not over
Gallons	*Inches*	*Inches*	*Inches*	*Penny*	*Inches*
5 to 6	5/8	5/8 x 2 1/2	5/8 x 1 7/8	7	2 1/4
				6	2
7 to 13	25/32	25/32 x 3 1/8	25/32 x 2 11/32	9	2 3/4
				8	2 1/2

[1] Other dimensions with equal cross section acceptable.
[2] Screws of equal efficiency authorized.
[3] Spacing 6 inches acceptable along edge grain of bottoms.

(e) In place of bottom cleats, the following is authorized: 2 angle irons at least 1¼" x 1¼" x 1/16", applied across grain of bottom boards from corner to corner, supported by acid resistant metal corner supports securely fastened to sides and ends at each bottom corner so as to raise bottom boards of box at least ¾" above bottom of corner supports; nailing along end grain of bottom boards not required..

§ 78.2–6 *Marking of outside container.* (a) On each container with letters and figures at least ¾" high applied by hot branding iron or black printing ink with high pressure dies as follows:

(1) ICC–1B. This mark shall be understood to certify that the complete package complies with all specification requirements.

(2) Name or symbol (letters) of company setting up the package, or other party assuming responsibility for its compliance with specification requirements; this must be registered with the Bureau of Explosives and located just above or below the mark specified in paragraph (a) (1) of this section.

§ 78.2–7 *Tests.* (a) To 5 pounds per square inch internal pressure without leakage; required before each shipment.

§ 78.2–8 *Approval of veneer, plywood and laminated wood boxes.* (a) Boxes of veneer, plywood, laminated wood, or any combination thereof, which comply with §§ 78.2–1 to 78.2–8 except § 78.2–5 (a), (c), and (d) are approved provided:

(1) Outside containers shall completely enclose body of carboy or body and neck of carboy.

(2) That complete inner packing and box specifications have been filed with and approved by the Bureau of Explosives..

(3) That these boxed carboys pass the regular tests prescribed in § 78.2–7.

(4) That boxed carboys after a minimum service period of 6 months pass the tests prescribed in § 78.2–7.

(5) That a detailed report of tests prescribed under paragraph (a) (4) of this section has been filed with and accepted as satisfactory by the Bureau of Explosives.

§ 78.3 *Specification 1C; carboys in kegs.* Glass, earthenware, clay or stoneware.

§ 78.3–1 *Compliance.* (a) Required in all details.

§ 78.3–2 *Reuse of packages.* (a) Parts of outside container and cushioning must be replaced when broken, decayed, or inefficient in any way.

(b) Carboys with lip cracked or badly chipped not authorized; gasket seat must be even. Packages must be capable of passing tests prescribed in § 78.3–9.

§ 78.3–3 *Closing devices required.* (a) As follows except when otherwise authorized in the packing regulations:

(1) Acidproof stoppers or other devices, with gaskets, securely fastened; closures to be vented or sufficiently porous to vent off pressure; gaskets to be of ¼" asbestos-rope or other resilient material equivalent in efficiency; gaskets cut from asbestos board not authorized.

(2) Glass stoppers ground to fit and securely fastened.

(3) Cork or other efficient device; authorized only when contents are not corrosive.

§ 78.3–4 *Capacity and marking of carboy.* (a) Containers 5 to 13 gallons are classed as carboys. Must be permanently marked to indicate maker and year of manufacture; mark of maker to be registered with the Bureau of Explosives.

§ 78.3–5 *Glass carboys.* (a) Thoroughly annealed; top of lip smooth and even; must contain at least 20 pounds of glass for 12-gallon carboys and 21 pounds for 13-gallon carboys. Glass in side walls should be well distributed and at least 1/16" thick. Defective carboys not authorized.

§ 78.3–6 *Earthenware, clay, or stoneware carboys.* (a) Earthenware, clay, or stoneware carboys of acidproof material.

§ 78.3–7 *Manufacture of kegs.* (a) Manufacture of kegs as follows:

(1) *Staves and headings.* To be of white oak, chestnut oak, red oak, black cherry, or Douglas fir; quarter sawed with the grain, from straight-grained timber, so no annual ring shall slope over half the thickness of stave or head; thoroughly kiln dried, moisture content 7 percent to 11 percent; free from rotten sap, checks, pitch pockets, cat faces, and other defects that show through on both sides.

(2) *Hoops.* To be of cooperage-grade hoop steel.

(b) Staves: To be sawed evenly and circular; croze center to be within 1⅛" of end of stave; stave end to have ⅛" free from bevel.

(1) *Heading.* Of uniform thickness and properly circled; planed on outside and properly jointed and glued, or doweled and flagged; dowel diameter not over 5/12 thickness of head.

(c) The keg: Stave joints reasonably flush on outside.

(d) Parts required and dimensions. As follows:

(1) Staves, when finished on outside:

Capacity of container, not over	Maximum			Minimum	
	Length	Width	Bilge circle	Staves	Thickness
Gallons	*Inches*	*Inches*	*Inches*	*Number*	*Inch*
30	30	5	74	16	5/8
15	24	4 1/2	54	14	9/16
10	22	4 1/4	50	12	1/2
5	18	4	40	10	1/2

Foregoing thicknesses are of staves finished on one side. One-sixteenth inch must be added for unfinished staves.
Foregoing maximum lengths are authorized to be increased 6 percent or less, provided the thickness of stave is increased at least one-sixteenth inch for each increase of 1 inch in length or fraction thereof.

(2) Heading, after planing:

Capacity of container, not over	Maximum		Minimum	
	Pieces	Diameter	Thickness	Width
Gallons	*Number*	*Inches*	*Inch*	*Inches*
30	6	18	5/8	2 1/2
15	5	14	5/16	2
10	5	13	1/2	2
5	4	11	1/2	2

(3) Hoops, number and size:

Capacity of container, not over (gallons)	Minimum number of hoops	Minimum size of hoops (inches in width and Birmingham gauge)							
		Head		First quarter		Second quarter		Bilge	
		Inch	Gauge	Inch	Gauge	Inch	Gauge	Inch	Gauge
30	6	1 1/2	18	1 1/4	19	-----	-----	1 1/2	18
15	6	1 1/4	19	1 1/8	19	-----	-----	1 1/4	19
10	6	1 1/8	19	1	19	-----	-----	1 1/8	19
5	6	1	19	1	19	-----	-----	1	19

§ 78.3–8 *Marking of outside container.* (a) On each container with letters and figures at least ¾" high applied near the bilge by hot branding iron or black printing ink with high pressure dies as follows:

(1) ICC–1C. This mark shall be understood to certify that the complete package complies with all specification requirements.

(2) Name or symbol (letters) of company setting up the package, or other party assuming responsibility for its compliance with specification requirements; this must be registered with the Bureau of Explosives and located just above or below the mark specified in paragraph (a) (1) of this section.

§ 78.3–9 *Tests*—(a) *Apparatus.* Standard required. Detail prints can be obtained from Bureau of Explosives, 30 Vesey Street, New York 7, N. Y.

(b) *Method.* Fill with water to lower edge of neck; swing 55" measured from wall to nearest bottom edge of basket:

(1) Side shock; test at least 10 carboys.

(2) Bottom shock; test at least 5 carboys.

(c) *Acceptable results.* 90 percent of carboys must not break under side shock; same for bottom shock.

(d) *When required.* By each manufacturing and each filling plant; during

each 6 months of each year, one series each year to be witnessed by representative of Bureau of Explosives; separate tests required for:

(1) New packages (those with new outside container).

(2) Used packages.

(3) Packages with carboys differing over 2 gallons.

(4) Packages differing in kind of cushioning.

(e) *Exception.* Tests not required by plant which fills and ships for one shipment only packages obtained from another plant where required tests are made.

(f) *Reports.* Required to be made to Bureau of Explosives on form as follows:

REPORTS OF TESTS OF CARBOYS

(As required by I. C. C. Regulations and Specifications)

(Place) _____
(Date) _____
Test made for _____
_____
(Give name and address of plant for which tests were made)

Description of package	Results					
	No. of test	55-inch swing		No. of test	55-inch swing	
		Side	Bottom		Side	Bottom
Capacity	1			13		
Condition [1]	2			14		
	3			15		
Type of inside container [2]	4			16		
	5			17		
Cushioning [3]	6			18		
	7			19		
Diameter of bottle	8			20		
	9			21		
Size of outside container (inside).	10			22		
	11			23		
	12			24		

Specification mark is _____
Identification symbol is _____
Remarks _____
_____
_____
(Signature) _____
(Per) _____

[1] State whether outside container is new or used.
[2] State whether glass, earthenware; etc.
[3] State whether hay, mineral wool, ground cork, excelsior, wood strips ____ type, cork pads ____ type, etc.

§ 78.4 *Specification 1D; boxed glass carboys.*

§ 78.4–1 *Compliance.* (a) Required in all details.

§ 78.4–2 *Reuse of packages.* (a) Parts of outside container and cushioning must be replaced when broken, decayed, or inefficient in any way.

(b) Carboys with lip cracked or badly chipped not authorized; gasket seat must be even. Packages must be capable of passing tests prescribed in § 78.4–8.

§ 78.4–3 *Closure.* (a) Threaded screw cap which shall be constructed of a suitable plastic or other material resistant to lading.

(b) Gasket or lining for cap must be used and shall be resistant to lading and;

§ 78.4–4 *Capacity and marking of carboy*—(a) *Capacity.* 6.5 United States gallons nominal capacity, 7.0 United States gallons overflow, tolerance plus or minus 10 fluid ounces.

(b) *Marking.* Each carboy bottle must be permanently marked in bottom as follows:

(1) Must be liquid tight or;

(2) Must be liquid tight up to venting pressure when such venting is prescribed for the material which is to be shipped.

(c) At least one complete continuous thread must be engaged with gasket in place.

Maker's mark (to be registered with Bureau of Explosives) Year of Manufacture
ICC–1D

§ 78.4–5 *Glass carboy bottle.* (a) Must be machine-blown, thoroughly and properly annealed, with screw thread finish having at least one continuous thread to accommodate closure; top of lip smooth and even; must contain 14 pounds of glass, tolerance minus 8 ounces plus 16 ounces. Minimum thickness to be .075 inch. Defective carboys not authorized.

§ 78.4–6 *Outside containers.* (a) Wooden boxes completely enclosing body and neck of carboy, with 4 vertical corner posts, two cleats for shoes and two carrying cleats. An opening not exceeding 3 inches in width may be provided directly above the neck of bottle, if the top of the box is made up of not more than two pieces of lumber of $\frac{25}{32}$ inch thickness. Bottom board of the two ends of the box must be constructed of lumber at least one inch thick, must be flush with the carrying cleats and be at least $2\frac{3}{4}$ inches in width. Cleats or other fasteners used to secure cover must not extend beyond carrying cleats.

(b) Lumber to be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

(c) Assemble sides and ends with grain of wood horizontal and nail as specified. Nail bottom to sides and ends; fasten top by any efficient means. Cleats for shoes to be along edges of bottom parallel to carrying cleats and at right angle to the direction of bottom board or boards.

(d) Parts and dimensions as follows:

Carboy capacity, nominal not over (gallons)	Minimum dimensions			[4] Nails—Sides and bottom	
	[1] Thickness—Sides, top, bottom, and ends	[2] Vertical corner posts	[3] Carrying cleats and shoes	Size	[5] Spacing, average
6.5	*Inch* ½	*Square inches* 2.0	*Inches* ½x2¾	*Penny* 6	*Inches* 2

[1] Except as prescribed or permitted under § 78.4–6 (a).
[2] Cross sectional area.
[3] Other dimensions with equal cross section acceptable. In lieu of separate carrying cleats, side board, at point where cleat should be located, may be constructed of lumber not less than one inch thick so that overhang will be at least ½ inch.
[4] Screws of equal efficiency authorized.
[5] Spacing 6 inches acceptable along edge grain of bottoms.

§ 78.4–7 *Marking of outside container.* (a) On each container with letters and figures at least ¾" high applied by hot branding iron or black printing ink with high pressure dies as follows:

(1) ICC–1D. This mark shall be understood to certify that the complete package complies with all specification requirements.

(2) Name or symbol (letters) of company setting up the package, or other party assuming responsibility for its compliance with specification requirements; this must be registered with the Bureau of Explosives and located just above or below the mark specified in paragraph (a) (1) of this section.

§ 78.4–8 *Tests*—(a) *Apparatus.* Standard required. Detail prints can be obtained from Bureau of Explosives, 30 Vesey Street, New York 7, N. Y.

(b) *Method.* Fill with water to lower edge of neck; swing 55" measured from wall to nearest bottom edge of basket:

(1) Side shock; test at least 10 carboys.

(2) Bottom shock, test at least 5 carboys.

(c) *Acceptable results.* 90 percent of carboys must not break under side shock; same for bottom shock.

(d) *When required.* By each manufacturing and each filling plant; during each 6 months of each year, one series each year to be witnessed by representative of Bureau of Explosives; separate tests required for:

(1) New packages (those with new outside container).

(2) Used packages.

(3) Packages differing in kind of cushioning.

(e) *Exception.* Tests not required by plant which fills and ships for one shipment only packages obtained from another plant where required tests are made.

(f) *Reports.* Required to be made to Bureau of Explosives on form as follows:

REPORT OF TESTS OF CARBOYS

(As required by I. C. C. Regulations and Specifications)

(Place) _____
(Date) _____
Test made for _____
_____
(Give name and address of plant for which tests were made)

Description of package	Results					
	No. of test	55-inch swing		No. of test	55-inch swing	
		Side	Bottom		Side	Bottom
Capacity	1			13		
Condition [1]	2			14		
	3			15		
Type of inside container [2]	4			16		
	5			17		
Cushioning [3]	6			18		
	7			19		
Diameter of bottle	8			20		
	9			21		
Size of outside container (inside).	10			22		
	11			23		
	12			24		

[1] State whether outside container is new or used.
[2] State whether glass, earthenware; etc.
[3] State whether hay, mineral wool, ground cork, excelsior, wood strips ____ type, cork pads ____ type, etc.

Specification mark is .....
Identification symbol is .....
Remarks .....
.....
.....
(Signature) .....
(Per) .....

(g) *Internal pressure test.* Bottles shall be capable of withstanding a sustained internal pressure of 20 p. s. i. gauge for a 15-day period. Bottle manufacturer shall demonstrate to Bureau of Explosives that bottles of a proposed design will meet this test prior to start of production.

(h) *Hydrostatic pressure test.* One bottle selected at random from each 200 produced on each mold shall be subjected to an instantaneous hydrostatic pressure test to bursting. Pressure at which bottle bursts must not be less than 40 p. s. i. gauge. If bottle so tested fails at a pressure less than 40 p. s. i., 12 additional samples must be selected from the same lot of 200 bottles and tested in the same manner. All 12 samples must pass required test otherwise entire lot shall be rejected.

§ 78.5 *Specification 1X; boxed carboys, 5 to 6 gallon, for export only.* Glass, earthenware, clay, or stoneware. Single-trip container.

§ 78.5–1 *Compliance.* (a) Required in all details.

§ 78.5–2 *Closing devices required.* (a) As follows except when otherwise authorized in the packing regulations:

(1) For carboys: Acidproof stoppers or other devices, with gaskets, securely fastened; closure to be vented or sufficiently porous to vent off pressure; gaskets to be of ¼ inch asbestos-rope or other resilient material equivalent in efficiency; gaskets cut from asbestos board not authorized.

(2) For box: Two flat metal nailless straps, at least ⅝ inch by 0.020 inch, encircling top, sides, and bottom and securely sealed are required.

§ 78.5–3 *Capacity and marking of carboy.* (a) Containers must be 5 to 6 gallon size and permanently marked to indicate maker and year of manufacture.

§ 78.5–4 *Glass carboys.* (a) Thoroughly annealed; top of lip smooth and even. Glass in side walls should be well distributed and at least 1/16 inch thick. Defective carboys not authorized.

§ 78.5–5 *Earthenware, clay, or stoneware carboys.* (a) Earthenware, clay, or stoneware carboys of acidproof material.

§ 78.5–6 *Outside containers.* (a) Wooden boxes completely enclosing body and neck of carboy, with 4 vertical corner posts. Top may consist of cap fitting snugly inside body of box and resting on corner posts.

(b) Lumber to be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

(c) Assemble sides and ends with grain of wood horizontal and nail as specified; nail bottom to ends; fasten top by any efficient means.

(d) *Parts and dimensions.* Sides, top, and bottom at least ½ inch thick; vertical corner posts at least 2.25 square inches cross section; nails at least 6-penny at 2-inch intervals or 5-penny at 1¾-inch intervals.

§ 78.5–7 *Marking of outside container.* (a) On each container with letters and figures at least ¾ inch high applied by hot branding iron or black printing ink with high pressure dies as follows:

(1) ICC–1X. This mark shall be understood to certify that the complete package complies with all specification requirements.

(2) Name or symbol (letters) of company setting up the package, or other party assuming responsibility for its compliance with specification requirements; this must be registered with the Bureau of Explosives and located just above or below the mark specified in paragraph (a) (1) of this section.

§ 78.5–8 *Marking.* (a) Each outside container must also be plainly marked "FOR EXPORT ONLY, NOT RETURNABLE" and the top must be marked "THIS SIDE UP".

§ 78.5–9 *Tests*—(a) *Apparatus.* Standard required. Detail prints can be obtained from Bureau of Explosives, 30 Vesey Street, New York 7, N. Y.

(b) *Method.* Fill with water to lower edge of neck; swing 55" measured from wall to nearest bottom edge of basket:

(1) Side shock; test at least 10 carboys.

(2) Bottom shock; test at least 5 carboys.

(c) *Acceptable results.* 90 percent of carboys must not break under side shock; same for bottom shock.

(d) *When required.* By each manufacturing and each filling plant; during each 6 months of each year, one series each year to be witnessed by representative of Bureau of Explosives; separate tests required for:

(1) New packages (those with new outside container).

(2) Used packages.

(3) Packages differing in kind of cushioning.

(e) *Exception.* Tests not required by plant which fills and ships for one shipment only packages obtained from another plant where required tests are made.

(f) *Reports.* Required to be made to Bureau of Explosives on form as follows:

REPORT OF TESTS OF CARBOYS

(As required by I. C. C. Regulations and Specifications)

(Place) .....
(Date) .....
Test made for .....
.....
(Give name and address of plant for which tests were made)

Description of package	Results					
	No. of test	55-inch swing		No. of test	55-inch swing	
		Side	Bottom		Side	Bottom
Capacity	1			13		
Condition [1]	2			14		
	3			15		
Type of inside container [2]	4			16		
	5			17		
Cushioning [3]	6			18		
	7			19		
Diameter of bottle	8			20		
	9			21		
Size of outside container (inside).	10			22		
	11			23		
	12			24		

Specification mark is .....
Identification symbol is .....
Remarks .....
.....
.....
(Signature) .....
(Per) .....

[1] State whether outside container is new or used.
[2] State whether glass, earthenware; etc.
[3] State whether hay, mineral wool, ground cork, excelsior, wood strips ____ type, cork pads ____ type, etc.

§ 78.6 *Specification 1EX; glass carboys in plywood drums for export only.*

§ 78.6–1 *Compliance.* (a) Required in all details.

§ 78.6–2 *Lumber.* (a) To be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

§ 78.6–3 *Closing devices required.* (a) As follows except when otherwise authorized in the packing regulations:

(1) Acidproof stoppers or other devices, with gaskets, securely fastened; closures to be vented or sufficiently porous to vent off pressure; gaskets to be of ¼ inch asbestos-rope or other resilient material equivalent in efficiency; gaskets cut from asbestos board not authorized.

§ 78.6–4 *Capacity and marking of carboy.* (a) Containers must be 5 to 6½ gallons capacity and permanently marked to indicate maker and year of manufacture.

§ 78.6–5 *Glass carboys.* (a) Thoroughly annealed; top of lip smooth and even. Glass in side walls should be well distributed and at least 1/16 inch thick. Defective carboys not authorized.

§ 78.6–6 *Outside containers.* (a) Plywood drums completely enclosing body and neck of carboy and constructed as follows:

(1) *Body shell.* To be of two plies of hardwood veneer, each not less than 1/12 inch in thickness, firmly glued together, with the grain of the outside ply parallel and the inner ply vertical to the heads. The body shall be butt-jointed and shall be fastened on the outside with a 28-gauge steel strip, not less than 1½ inches in width. 17-gauge staples shall be driven on each side of the joint, spaced not more than 1½ inches apart and clinched on inside of the body.

(2) *Heads.* Top and bottom heads shall be of three ply hardwood veneer, each ply not less than 1/12 inch in thickness, all firmly glued together, with the grain of each outer ply at right angles to the grain of the center ply. Each head shall be circled to fit snugly inside of the body. Interior heads shall be of the same construction.

(3) *Hoops.* To be of hardwood veneer, not less than 1¾ inches wide by ⅛ inch thick. Hoops shall be fastened to the body by 17-gauge staples on not less than 3 inch centers and shall be overlapped not less than 3 inches.

(4) *Head liners.* When plywood cushioning is used the inner lining strips which support the plywood cushion shall be of hardwood veneer not less than ⅛ inch in thickness and ⅝ inch in width and shall butt or slightly gap. All other head lining strips shall be made of hardwood veneer not less than ⅛ inch in thickness and ⅝ inch in width and shall overlap not less than 3 inches. The bottom head liner and the inside liner strips for the false head and support of the top head shall be fastened by 17-gauge staples on not less than 3 inch centers. The staples shall be driven through the outer hoop and body and clinched on the inside of the veneer strips; except that the strips holding the false head shall have staples only through the body shell and liner. The top liner which forms the final closure shall be fastened to the body by 14-gauge staples driven through the head liner and body into the outer hoop on not less than 4 inch centers.

(5) *Battens.* A ⅝ inch by 2 inch batten shall be applied to top and bottom and shall be secured at each end by two nails driven through the hoops and shell.

§ 78.6–7 *Approval.* (a) The complete inner packing and drum specification must be filed with and approved by the Bureau of Explosives.

§ 78.6–8 *Marking of outside container for compliance with specification.* (a) On each container with letters and figures at least ¾ inch high applied by hot branding iron or black printing ink with high pressure dies as follows:

(1) ICC–1EX. This mark shall be understood to certify that the complete package complies with all specification requirements.

(2) Name or symbol (letters) of company setting up the package, or other party assuming responsibility for its compliance with specification requirements; this must be registered with the Bureau of Explosives and located just above or below the mark specified in paragraph (a) (1) of this section.

§ 78.6–9 *Marking of outside container for export and handling.* (a) Each outside container must also be plainly marked "FOR EXPORT ONLY, NOT RETURNABLE" and the top must be marked "THIS SIDE UP".

§ 78.6–10 *Tests*—(a) *Apparatus.* Standard required. Detail prints can be obtained from Bureau of Explosives, 30 Vesey Street, New York 7, N. Y.

(b) *Method.* Fill with water to lower edge of neck; swing 55" measured from wall to nearest bottom edge of basket:

(1) Side shock; test at least 10 carboys.

(2) Bottom shock; test at least 5 carboys.

(c) *Acceptable results.* 90 percent of carboys must not break under side shock; same for bottom shock.

(d) *When required.* By each manufacturing and each filling plant; during each 6 months of each year, one series each year to be witnessed by representative of Bureau of Explosives; separate tests required for:

(1) New packages (those with new outside containers).

(2) Used packages.

(3) Packages differing in kind of cushioning.

(e) *Exception.* Tests not required by plant which fills and ships, for one shipment only, packages obtained from another plant where required tests are made.

(f) *Reports.* Required to be made to Bureau of Explosives on form as follows:

REPORT OF TESTS OF CARBOYS

(As required by I. C. C. Regulations and Specifications)

(Place) _____
(Date) _____
Test made for _____
_____
(Give name and address of plant for which tests were made)

Description of package	Results					
	No. of test	55-inch swing: Side	55-inch swing: Bottom	No. of test	55-inch swing: Side	55-inch swing: Bottom
Capacity	1			13		
Condition [1]	2			14		
	3			15		
Type of inside container [2]	4			16		
	5			17		
Cushioning [3]	6			18		
	7			19		
Diameter of bottle	8			20		
	9			21		
Size of outside container (inside)	10			22		
	11			23		
	12			24		

Specification mark is _____
Identification symbol is _____
Remarks _____
_____
_____
(Signature) _____
(Per) _____

[1] State whether outside container is new or used.
[2] State whether glass, earthenware; etc.
[3] State whether hay, mineral wool, ground cork, excelsior, wood strips ____ type, cork pads ____ type, etc.

§ 78.8 *Specification 28; metal-jacketed lead carboys.*

§ 78.8–1 *Compliance.* (a) Required in all details.

§ 78.8–2 *Size.* (a) Not over 15 gallons (nominal).

§ 78.8–3 *Test.* (a) By 5 pounds internal pressure, without leakage, before each shipment.

§ 78.8–4 *Parts required and dimensions.* (a) As in §§ 78.8–5 to 78.8–8.

§ 78.8–5 *Carboy closing device.* (a) To consist of follower-ring with stud bolts, plate-gasket, and cap as shown in § 78.8–8.

(b) Follower-ring to be 1½" wide with machined top face, inner edges rounded off to about ¼" radius, and fitted with 4 stud bolts, fastened to prevent turning, for 2" neck and 6 bolts for larger necks.

(c) Neck of carboy to be flanged over to edge of follower-ring and may be swedged out under it; inside diameter of neck not over 4".

§ 78.8–6 *Outside container.* (a) Welding authorized in place of rivets shown; body rivets, if used, to be countersunk on inside.

(b) Bayonet fastenings, or other efficient method, authorized to secure top to body in place of bolts shown.

(c) Two adequate lifting handles required on body.

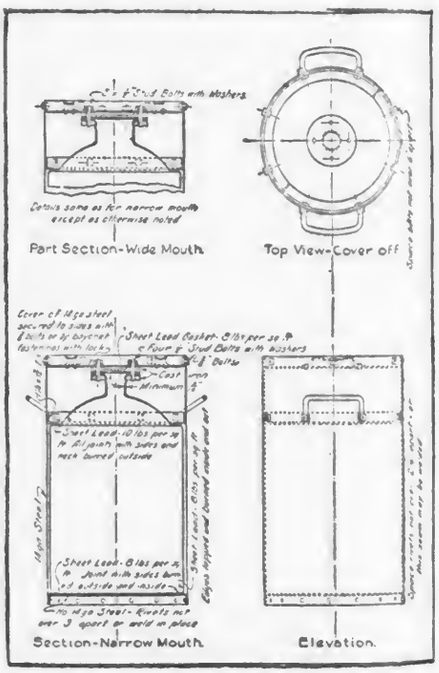
(d) Projections above level of top edge of body not authorized.

§ 78.8–7 *Marking on each outside container.* (a) By embossing on top with raised marks ¾" high as follows (stamping authorized if clearly legible):

(1) ICC–28. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

§ 78.8–8 *Shipping container specification No. 28.*



§ 78.9 *Specification 28A; metal-jacketed lead carboys.*

§ 78.9–1 *Compliance.* (a) Required in all details.

§ 78.9–2 *Size.* (a) Not over 15 gallons (nominal).

§ 78.9–3 *Test.* (a) By 5 pounds internal pressure, without leakage, before each shipment.

§ 78.9–4 *Parts required and dimensions.* (a) As in §§ 78.9–5 to 78.9–8.

§ 78.9–5 *Carboy closing device.* (a) To consist of follower-ring with stud bolts, plate-gasket, and cap as shown.

(b) Follower-ring to be 1½" wide with machined top face, inner edges rounded off to about ¼" radius, and fitted with 4 stud bolts, fastened to prevent turning, for 2" neck and 6 bolts for larger necks.

(c) Neck of carboy to be flanged over to edge of follower-ring and may be swedged out under it; inside diameter of neck not over 8".

§ 78.9–6 *Outside container.* (a) Welding authorized in place of rivets shown; body rivets, if used, to be countersunk on inside.

(b) Bayonet fastenings, or other efficient method, authorized to secure top to body in place of bolts shown.

(c) Two adequate lifting handles required on body.

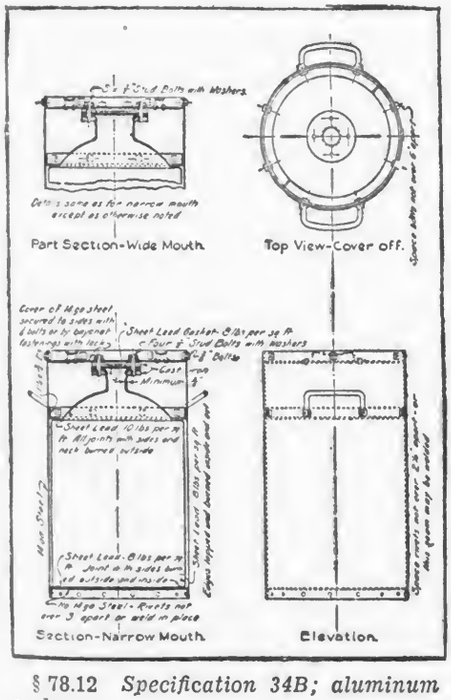
(d) Projections above level of top edge of body not authorized.

§ 78.9–7 *Marking on each outside container.* (a) By embossing on top with raised marks ¾" high as follows (stamping authorized if clearly legible):

(1) ICC–28A. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

§ 78.9–8 *Shipping container specification No. 28A.*



§ 78.12 *Specification 34B; aluminum carboys.*

§ 78.12–1 *Compliance.* (a) Required in all details.

§ 78.12–2 *Rated capacity.* (a) As marked, see § 78.12–9: 5 to 15 gallons; actual capacity shall be rated capacity plus at least 2 percent.

§ 78.12–3 *Composition.* (a) Body and heads of aluminum at least 99 percent pure, or an aluminum base alloy of equivalent corrosion resistance and physical properties.

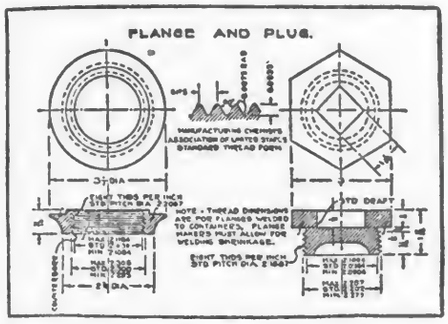
§ 78.12–4 *Outage.* (a) Two percent of rated capacity, plus a maximum tolerance of 1 quart.

§ 78.12–5 *Seams.* (a) Welded, including attachment of handles and other devices. Circumferential seams at least 3" from bottom.

§ 78.12–6 *Parts and dimensions.* (a) Thickness of material at least 0.110"; handles required.

§ 78.12–7 *Closures.* (a) Adequate to prevent leakage; openings over 2.3" not authorized; suitable gaskets required.

(b) When threaded plugs, or caps, are used, they must be close fitting with gasket surfaces which bear squarely on each other when without gasket; they must have not over 8 threads per inch, with 5 complete threads engaged when gasket is in place, or not over 4 threads per inch, with 2 complete threads similarly engaged. Thread form must conform with the following drawing:



§ 78.12–8 *Projections.* (a) Closing devices and other parts must be able to withstand tests prescribed in § 78.12–11.

§ 78.12–9 *Marking on each container.* (a) On top by stamping with pressure dies, by embossing with raised marks, or plate attached by welding, as follows:

(1) ICC–34B. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

(3) Gauge of metal, Brown and Sharpe, in thinnest part; rated capacity in gallons; year of manufacture (for example, 7–30–50).

§ 78.12–10 *Size of marking.* (a) Size of marking (minimum):—½" high.

§ 78.12–11 *Type tests.* (a) Samples, taken at random and closed as for use, shall withstand prescribed tests without leakage except that leakage through closure shall not constitute failure. Tests to be made by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike on bottom edge or circumferential seam.

(2) Hydrostatic pressure test of 40 pounds per square inch sustained for 5 minutes.

§ 78.12–12 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior pressure of at least 10 pounds per square inch. Leakers shall be rejected or repaired and retested.

§ 78.15 *Specification 31; jugs in tubs.*

§ 78.15–1 *Compliance.* (a) Required in all details.

§ 78.15–2 *Jugs.* (a) Of acid-resisting material; capacity not over 2 gallons; only 1 jug in each tub.

§ 78.15–3 *Size of tub.* (a) Sufficient to allow 1½" space around jug except at top where ½" space is acceptable.

§ 78.15–4 *Material for tub.* (a) Of sound wood; 7/16" staves; 7/16" top and bottom; at least 5 wooden hoops ⅞" x ⅛" (approx.) or 3 metal hoops with rolled edge at least ¾" x 29 gauge United States standard.

§ 78.15–5 *Construction.* (a) Staves to be set up evenly; bottom hoop to be fastened with at least seven 4-penny nails driven through hoop, through staves, and into bottom of tub; other hoops to be securely fastened in place.

§ 78.15–6 *Cushioning.* (a) To be tightly packed with adequate cushioning material.

§ 78.15–7 *Marking.* (a) On each container with letters and figures at least ½" high in rectangle as follows:

ICC–31

(b) This mark shall be understood to certify that the package complies with all specification requirements.

§ 78.15–8 *Closing for shipment.* (a) Jug to be closed by rubber stoppers, or other closure equally acid-resistant; cork stoppers not authorized. Top of tub to be secured in place by at least four substantial metal strips, at least 7/16" x 3½" nailed to side and top of tub.

§ 78.18 *Specification 43A; rubber drums.*

§ 78.18–1 *Compliance.* (a) Required in all details.

§ 78.18–2 *Rated capacity.* (a) As marked, see § 78.18–8. Actual capacity shall be rated capacity plus at least 2 percent.

§ 78.18–3 *Body and heads.* (a) Of at least two laminations; inside lamination of synthetic rubber, or of pale crepe rubber compounded with paraffin or otherwise treated, such as to be capable of withstanding the action of hydrofluoric acid, up to 65 percent hydrofluoric acid maximum, for 30 days without any substantial deterioration; other laminations of cotton fiber and rubber.

§ 78.18–4 *Rolling hoops.* (a) Tough rubber free from cotton or other fiber.

§ 78.18–5 *The drum.* (a) Body, heads, lining, rolling hoops, and filling hole flange to be all vulcanized together at one operation. No cements, adhe-

sives or secondary vulcanization authorized.

§ 78.18–6 *Parts and dimensions.* (a) Parts and dimensions as follows:

[1] Rated capacity (U. S. wine gallons)	Minimum weight (pounds)	Minimum thickness		Rolling hoops			
				Chime (quarter round)		Body (half round)	
		Body (inch)	Heads (inch)	Width (inches)	Depth (inch)	Width (inches)	Depth (inch)
5	18	3/8	1/2	1 3/4	3/4	------	------
13	30	5/8	1/2	2	1	2	1
30	65	9/16	1 1/16	2 9/16	1	2 1/4	1

[1] Other capacities not authorized.

§ 78.18–7 *Closures.* (a) To be such as to prevent spillage or leakage in transit and must be approved by the Bureau of Explosives.

§ 78.18–8 *Marking on each container.* (a) Marking on top head plainly and permanently as follows:

(1) ICC–43A; this mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

(3) Rated gallonage and year of manufacture (for example, 5–50).

§ 78.18–9 *Type tests.* (a) Samples, taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on top chime. Also a 4-foot drop to strike directly on closing device. Parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 40 pounds per square inch sustained for 5 minutes, using drums which have passed the drop test; side walls must not expand beyond chime hoops.

§ 78.18–10 *Material test.* (a) Samples from side wall and end must have breaking strength at least 1,200 pounds per square inch.

SUBPART B—SPECIFICATIONS FOR INSIDE CONTAINERS, AND LININGS

§ 78.20 *Specification 2A; inside containers, metal cans, pails and kits.*

§ 78.20–1 *Capacity, thickness of metal, test, and closure*—(a) *Capacity.* Not over 10 gallons.

(b) *Thickness of metal.* At least 28-gauge, United States standard (commercial 135-pound tin plate), for cans over 1-gallon capacity; smaller cans of metal of adequate thickness.

(c) *Test.* By interior pressure on each completed can, without leakage.

(d) *Closure.* Air-tight and leakproof.

§ 78.22 *Specification 2C; inside containers, corrugated fiberboard cartons.*

§ 78.22–1 *Construction.* (a) To be of double-wall board, 275-pound strength, or 2 thicknesses of double-faced board, 175-pound strength, Mullen or Cady test; slides or linings to be 1-piece with joint cloth-taped.

§ 78.22–2 *Outside container.* (a) Outside container must be lined throughout with, and cartons separated by, double-wall corrugated fiberboard of 275-pound strength, Mullen or Cady test.

§ 78.23 *Specification 2D; inside containers, duplex paper bags.*

§ 78.23–1 *Construction.* (a) Bags to be at least 2 thicknesses of No. 1 Kraft bag-paper, or equivalent, and as follows: [1]

Maximum weight of contents (pounds)	Minimum [1] weight (per 480 sheets 24" x 36") and strength			
	One sheet		Other sheet	
	Weight [1] (pounds)	Strength, Mullen test	Weight [1] (pounds)	Strength Mullen test
2	30	30	30	30
6	50	50	40	40
12	60	60	50	50
25	70	70	60	60

[1] Weight 15 percent less authorized for rope paper containing 35 percent or more of manila rope fiber.

§ 78.23–2 *Test.* (a) Bags, filled and closed as for shipment, must be able to withstand drop of 4 feet onto concrete without rupture or sifting, except that 2-foot drop is acceptable for bags to contain 25 pounds.

§ 78.25 *Specification 2F; inside metal containers and liners.*

§ 78.25–1 *Construction.* (a) Containers over 1-gallon capacity and all lining must be at least 30 gauge, United States standard (commercial 107-pound tin plate) and sealed leakproof.

§ 78.26 *Specification 2G; inside containers, fiber cans and boxes.*

§ 78.26–1 *Capacity, and thickness of metal and fiber.* (a) Capacity not over 6 pounds, net. Metal tops, bottoms, and connections of suitable thickness are authorized. Minimum fiber thickness as follows:

(1) Up to 1/4-pound size: 0.021".

(2) Up to 1-pound size: 0.026".

(3) Up to 3-pound size: 0.036".

(4) Up to 6-pound size: 0.050", provided that 0.036" fiber heads with 130-pound strength [2] are authorized; or, 0.228" with 175-pound strength; [2] or, 0.036" with 90-pound strength,[2] provided each container is wrapped with No. 1 Kraft paper of 60-pound base weight pasted thereon.

§ 78.28 *Specification 2J; inside containers, waterproof paper bags for linings.*

[1] 5-ply paper, of 60-pound No. 1 kraft, also authorized for 25-pounds weight of contents.

[2] Mullen or Cady test.

§ 78.28–1 *Material* (a) Two sheets of paper cemented together and creped to afford 25 percent stretch; paper to be No. 1 Kraft, 30 pounds per ream (480 sheets, 24" x 36") before creping; total weight 90 pounds per ream.

NOTE 1: Because of the present emergency and until further order of the Commission, a ream may consist of 500 sheets.

§ 78.28–2 *Test.* (a) Material folded into cones and filled with water to depth of 2" at 70° F. must not show water on outside within 24 hours.

§ 78.28–3 *Construction.* (a) Form to fit the outside container without stretching; seams and closures to afford a siftproof bag.

§ 78.29 *Specification 2K; inside containers, paper bags for linings.*

§ 78.29–1 *Paper and construction*—(a) *Paper.* No. 1 Kraft, creped; at least 45 pounds per ream (480 sheets, 24" x 36") before creping.

NOTE 1: Because of the present emergency and until further order of the Commission, a ream may consist of 500 sheets.

(b) *Construction.* Form to fit the outside container without stretching; seams and closure to afford a siftproof bag.

§ 78.30 *Specification 2L; lining for boxes.*

§ 78.30–1 *Box lining.* (a) Box lining must be of strong paraffined paper, or other suitable material, without joints or other openings at the bottom or at sides of box, and shall fully protect contents in contact with top of box.

(b) Tensile strength of material must be at least 35 pounds with the grain and 17 pounds across grain, tested by direct pull on strips measuring 3" by 1". Average results of three or more tests with the grain and three or more across grain shall be used.

(c) Material shall be impervious to water and nitroglycerin at 77° F. Test for imperviousness shall consist of folding material into cones, loosely to avoid breakage at creases. Cones tested for nitroglycerin shall be filled to 1" depth; those for water to 2". No leakage of liquid shall occur during 24 hours' exposure.

(d) Material must transmit no oily or greasy stain to unglazed paper. Test shall consist of placing one thickness of material, with two thicknesses of unglazed paper on each side, in an oven at 104° F. for 24 hours, under pressure of a lead disk 1 1/2" thick and of 10 pounds weight resting edgewise on the paper.

(e) Saturating paraffin, when used, shall have melting point of 125° F. or above. Test shall consist of extracting paraffin from 1 ounce or more of material with ether. After evaporation of all ether, paraffin shall be melted and poured upon the surface of water contained in a hemispherical dish approximately 3 3/4" in diameter. Dish shall be three-fourths full of water above melting point of paraffin. Thermometer shall be placed with bulb three-fourths immersed in center of dish. Water and paraffin shall be allowed to cool until paraffin upon the surface of water commences to solidify. Temperature shall then be read and recorded as melting point of paraffin.

§ 78.30–2 *Bag.* (a) Bag complying with requirements of paragraphs (b) (c), and (d) of this section also authorized.

(b) Material must be: 2 sheets of No. 1 sulphate Kraft paper joined by asphaltum or equivalent; outer sheet at least 60 pounds and inner sheet at least 30 pounds per ream (480 sheets, 24" x 36"); inner sheet coated with wax, or equivalent, with melting point at least 125° F.; compliance with § 78.30–1 (b) and (c) required.

NOTE 1: Because of the present emergency and until further order of the Commission, a ream may consist of 500 sheets.

(c) Seams must be pasted with adhesive not affected by nitroglycerin.

(d) Completed bag must be formed to fit outside container without undue strain and must be impervious to seepage of nitroglycerin.

§ 78.31 *Specification 2M; waterproofed paper lining.*

§ 78.31–1 *Waterproofed paper.* (a) Waterproofed paper for box lining must be strong, folded or constructed without joints or openings at sides, bottoms, or ends, and shall fully protect contents at top of box.

§ 78.32 *Specification 2N; inside containers, metal cans.*

§ 78.32–1 *Size.* (a) Not over 14-pounds water capacity (388 cubic inches).

§ 78.32–2 *Material.* (a) Tin plate, good quality, as follows:

Maximum diameter of can	Minimum thickness of metal (inch)	
	In body	In heads
4 $^{7}/_{16}$ inches	0.01134 (1C–107 pound tin plate).	0.01305 (1XL–128 pound tin plate).
6 $^{11}/_{16}$ inches	0.01134 (1C–107 pound tin plate).	0.01485 (2XL–148 pound tin plate).

NOTE 1: Because of the present emergency and until further order of the Commission, the minimum thickness of metal in heads may be 1XL–107-pound tin plate for cans of not over 4 $^{7}/_{16}$ inch diameter and 1XL–135-pound tin plate for cans of not over 6 $^{11}/_{16}$ inches diameter, provided side seams are soldered and heads are attached to body by full double seams internally soldered.

§ 78.32–3 *Manufacture.* (a) Seams soldered or full double seam. Outside surface rustproofed by lacquer or equivalent.

§ 78.32–4 *Test.* (a) When closed as for shipment, must be capable of standing 40-pound interior pressure without leakage.

§ 78 33 *Specification 2P; inside metal containers.*

§ 78.33–1 *Compliance.* (a) Required in all details.

§ 78.33–2 *Type and size.* (a) Single-trip inside containers. Must be seamless, or with seams, welded, soldered, brazed, double seamed, or swedged.

(b) The maximum capacity of containers in this class shall not exceed 30 cubic inches (16.6 fluid ounces). The maximum inside diameter shall not exceed 3 inches.

§ 78.33–3 *Inspection.* (a) By competent inspector.

§ 78.33–4 *Duties of inspector.* (a) To inspect material and completed containers and witness tests, and to reject defective materials or containers.

§ 78.33–5 *Material.* (a) Uniform quality steel plate such as black plate, electro-tin plate, hot dipped tin plate, tern plate or other commercially accepted can making plate; or non-ferrous metal of uniform drawing quality.

(b) Material with seams, cracks, laminations or other injurious defects not authorized.

§ 78.33–6 *Manufacture.* (a) By appliances and methods that will assure uniformity of completed containers; dirt and scale to be removed as necessary; no defect acceptable that is likely to weaken the finished container appreciably; reasonably smooth and uniform surface finish required.

(b) Seams when used must be as follows:

(1) Circumferential seams: By welding, swedging, brazing, soldering, or double seaming.

(2) Side seams: By welding, brazing or soldering. Side seams not authorized on aluminum containers.

(c) Ends: The ends shall be of pressure design (not flat).

§ 78.33–7 *Wall thickness.* (a) The minimum wall for any container shall be 0.009 inch.

§ 78.33–8 *Tests.* (a) One out of each lot of 5,000 containers or less, successively produced per day, shall be pressure tested to not less than 180 pounds per square inch gauge with no bulging of either end. The container tested shall be complete with ends assembled.

(b) One out of each lot of 5,000 containers or less, successively produced per day, shall be pressure tested to destruction and must not burst below 210 pounds per square inch gauge pressure. The container tested shall be complete with ends assembled.

(c) Each such 5,000 containers or less, successively produced per day, shall constitute a lot and if the test container shall fail, the lot shall be rejected or ten additional may be selected at random and subjected to the test under which failure occurred. These containers shall be complete with ends assembled. Should any of the ten containers thus tested fail, the entire lot must be rejected. All containers constituting a lot shall be of like material, size, design, construction, finish and quality.

§ 78.33–9 *Marking.* (a) On each container by printing, lithographing, embossing, or stamping manufacturer's name or symbol. If symbol is used it must be registered with the Bureau of Explosives.

§ 78.34 *Specification 2R; inside containers, metal tubes.*

§ 78.34–1 *Size.* (a) Outside diameter of the tube must not exceed 3 inches and length must not exceed 8 inches exclusive of flanges, or handling, or fastening devices.

§ 78.34–2 *Manufacture.* (a) Stainless steel, malleable iron, or brass having a wall thickness of not less than $^{3}/_{32}$ inch for diameter up to 2 inches and not less than $^{1}/_{8}$ inch for diameter up to three inches. The ends of the tube must be fitted with screw type closures except that one end of the tube may be permanently closed by a welded or brazed plate. Welded or brazed side seams are authorized.

§ 78.34–3 *Welding and brazing.* (a) Must be done in a workmanlike manner and must be free from defects.

§ 78.34–4 *Closing devices.* (a) Must be of screw type. Number of threads per inch must be not less than United States standard pipe threads. Caps or plugs are authorized.

SUBPART C—SPECIFICATIONS FOR CYLINDERS

§ 78.36 *Specification 3A; seamless steel cylinders.*

§ 78.36–1 *Compliance.* (a) Required in all details.

§ 78.36–2 *Type, size and service pressure*—(a) *Type and size.* Seamless; not over 1,000 pounds water capacity (nominal).

(b) *Service pressure.*[1] At least 150 pounds per square inch.

§ 78.36–3 *Inspection by whom and where.* (a) By competent and disinterested inspector acceptable to the Bureau of Explosives; chemical analyses and tests, as specified, to be made within limits of the United States. This requirement is necessary because of the present emergency and until further order of the Commission.

§ 78.36–4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided,* That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 78.36–22) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.36–5 *Steel.* (a) Open-hearth or electric steel of uniform quality. Content percent for the following not over:

[1] The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, ICC–3A2000 indicates the service pressure as 2,000 pounds per square inch.

Carbon, 0.55; phosphorus, 0.045; sulphur, 0.050.

§ 78.36–6 *Identification of material.* (a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 78.36–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.36–8 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no fissure or other defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. If not originally free from such defects, the surface may be machined or otherwise treated to eliminate these defects. The thickness of the bottoms of cylinders welded or formed by spinning is, under no condition, to be less than two times the minimum wall thickness of the cylindrical shell; such bottom thicknesses to be measured within an area bounded by a line representing the points of contact between the cylinder and floor when the cylinder is in a vertical position.

§ 78.36–9 *Welding or brazing.* (a) Welding or brazing for any purpose whatsoever is prohibited except as follows: (1) Welding or brazing is authorized for the attachment of neckrings and footrings which are non-pressure parts, and only to the tops and bottoms of cylinders having a service pressure of 500 pounds per square inch or less. Cylinders, neckrings, and footrings must be made of weldable steel, carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure. (2) As permitted in § 78.36–8 (a).

NOTE 1: Cylinders used solely in anhydrous ammonia service may have a ½ inch diameter bar welded within their concave bottoms in accordance with the foregoing requirements.

§ 78.36–10 *Wall thickness.* (a) For cylinders with service pressure less than 900 pounds the wall stress shall not exceed 24,000 pounds per square inch. Minimum wall 0.100'' for any cylinder over 5'' outside diameter.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where

S = wall stress in pounds per square inch;
P = minimum test pressure prescribed for water jacket test or 450 pounds per square inch whichever is the greater;
D = outside diameter in inches;
d = inside diameter in inches.

§ 78.36–11 *Heat treatment.* (a) The completed cylinders must be uniformly and properly heat-treated prior to tests.

§ 78.36–12 *Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.* (a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 6 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

§ 78.36–13 *Safety devices and protection for valves, safety devices, and other connections, if applied.* (a) Must be as required by the Interstate Commerce Commission's regulations that apply (see §§ 73.34 (f) and 73.301 (i) of this chapter).

§ 78.36–14 *Hydrostatic test.* (a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Each cylinder must be tested to at least 5/3 times service pressure.

§ 78.36–15 *Flattening test.* (a) Between knife edges, wedge shaped, 60° angle, rounded to ½'' radius; test 1 cylinder,[1] taken at random out of each lot of 200 or less, after hydrostatic test.

§ 78.36–16 *Physical test.* (a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1[1] cylinder taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches; provided, that gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over ¾₁₆-inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within 1 inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–42.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

§ 78.36–17 *Acceptable results for physical and flattening tests.* (a) Either of the following:

(1) Elongation at least 40 percent for 2-inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

(2) Elongation at least 20 percent for 2-inch gauge length or 10 percent in other cases; yield strength not over 73 percent of tensile strength; flattening required, without cracking, to 6 times wall thickness.

§ 78.36–18 *Leakage test.* (a) All spun cylinders and plugged cylinders (see Notes 1 and 2) must be tested for leakage by gas or air pressure after the bottom has been cleaned and is free from all moisture. Pressure, approximately the same as but no less than service pressure, must be applied to one side of the finished bottom over an area of at least 1/16 of the total area of the bottom but not less than ¾ inch in diameter, including the closure, for at least 1 minute, during which time the other side of the bottom exposed to pressure must be covered with water and closely examined for indications of leakage. Leakers must be rejected. (See Note 1 to § 78.36–19.)

NOTE 1: A spun cylinder is one in which an end closure in the finished cylinder has been welded by the spinning process.

NOTE 2: A plugged cylinder is one in which a permanent closure in the bottom of a finished cylinder has been effected by a plug.

NOTE 3: As a safety precaution, if the manufacturer elects to make this test before the hydrostatic test, he should design his apparatus so that the pressure is applied to the smallest area practicable, around the point of closure, and so as to use the smallest possible volume of air or gas.

§ 78.36–19 *Rejected cylinders.* (a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding or spinning is not authorized.

[1] For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

NOTE 1: Spun cylinders rejected under the provisions of § 78.36-18 may be removed from the spun cylinder category by drilling to remove defective material, tapping and plugging.

§ 78.36-20 *Marking.* (a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck as follows:

(1) ICC-3A followed by the service pressure (for example, ICC-3A1800, etc.).

(2) A serial [1] number and an identifying symbol (letters); location [2] of number to be just below the ICC mark; location [2] of symbol to be just below the number. The symbol and numbers must be those of purchaser, user, or maker. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

(3) Inspector's official mark near serial number; date of test (such as 5-50 for May 1950), so placed that dates of subsequent tests can be easily added; and word "SPUN" or "PLUG" near ICC mark when an end closure in the finished cylinder has been welded by the spinning process, or effected by plugging.

§ 78.36-21 *Size of marks.* (a) At least ¼" high if space permits.

§ 78.36-22 *Inspector's report.* (a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Gas Cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long.
Marks stamped into the shoulder of the cylinder are:
Specification ICC— _____
Serial numbers _____ to _____ inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____

These cylinders were made by process of _____

The _____ permitted in (neckrings—footrings) § 78.36-9 were attached by process of _____ (welding—brazing)

The material used was identified by the following _____ (heat-purchase order) numbers _____

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____ (were—were not) marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. ICC-3A were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 3A except as follows:

Exceptions: _____

(Signed) _____
Inspector.

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company.
For _____ Company.

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____

(Signed) _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) _____

(Place) _____
(Date) _____

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Serial numbers of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Tare weight (pounds) [2]	Volumetric capacity

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

[2] Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 per cent.

(Signed) _____

[1] Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 60 cubic inches.

[2] Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

Example:

ICC—3A1800
1234
XY

§ 78.37 *Specification 3AA; seamless steel cylinders, made of definitely prescribed steels.*

§ 78.37–1 *Compliance.* (a) Required in all details.

§ 78.37–2 *Type, size and service pressure*—(a) *Type and size.* Seamless; not over 1,000 pounds water capacity (nominal).

(b) *Service pressure.*[1] At least 150 pounds per square inch.

§ 78.37–3 *Inspection by whom and where.* (a) By competent and disinterested inspector acceptable to the Bureau of Explosives; chemical analyses and tests, as specified, to be made within limits of the United States. This requirement is necessary because of the present emergency and until further order of the Commission.

§ 78.37–4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided,* That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 78.37–22) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.37–5 *Authorized steel.* (a) Open hearth or electric steel of uniform quality. The following chemical analyses are authorized (see note 1):

Designation	4130X (percent) (see note 2)	NE-8630 (percent) (see note 2)	9115 (percent) (see note 2)	9125 (percent) (see note 2)
Carbon	0.25/0.35	0.28/0.33	0.10/0.20	0.20/0.30.
Manganese	0.40/0.90	0.70/0.90	0.50/0.75	0.50/0.75.
Phosphorus	0.04 max	0.04 max	0.04 max	0.04 max.
Sulphur	0.05 max	0.04 max	0.04 max	0.04 max.
Silicon	0.20/0.35	0.20/0.35	0.60/0.90	0.60/0.90.
Chromium	0.80/1.10	0.40/0.60	0.50/0.65	0.50/0.65.
Molybdenum	0.15/0.25	0.15/0.25		
Zirconium			0.05/0.15	0.05/0.15.
Nickel		0.40/0.70		

Designation	9115X (percent) (see note 2)	9125X (percent) (see note 2)	Intermediate manganese (percent)
Carbon	0.10/0.20	0.20/0.30	0.40.
Manganese	0.50/0.75	0.50/0.75	1.35/1.65.
Phosphorus	0.04 max	0.04 max	0.04 max.
Sulphur	0.04 max	0.04 max	0.05 max.
Silicon	0.60/0.90	0.60/0.90	0.10/0.30.
Chromium	0.50/0.65	0.50/0.65	
Molybdenum	0.10/0.20	0.10/0.20	
Zirconium	0.05/0.15	0.05/0.15	
Nickel			

NOTE 1: A heat of steel made under any of the above specifications, chemical analysis of which is slightly out of the specified range, is acceptable, if satisfactory in all other respects, provided the standard permissible variations from specified chemical ranges and limits published in the American Iron and Steel Institute Products Manual, Section 10, dated June 1945, are not exceeded or are approved by the Bureau of Explosives.

NOTE 2: This designation shall not be restrictive and the commercial steel is limited in analysis as shown in the table.

§ 78.37–6 *Identification of material.* (a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 78.37–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.37–8 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no fissure or other defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. If not originally free from such defects, the surface may be machined or otherwise treated to eliminate these defects. The thickness of the bottoms of cylinders welded or formed by spinning is, under no condition, to be less than two times the minimum wall thickness of the cylindrical shell; such bottom thicknesses to be measured within an area bounded by a line representing the points of contact between the cylinder and floor when the cylinder is in a vertical position.

§ 78.37–9 *Welding or brazing.* (a) Welding or brazing for any purpose whatsoever is prohibited except as follows:

(1) Welding or brazing is authorized for the attachment of neckrings and footrings which are non-pressure parts, and only to the tops and bottoms of cylinders having a service pressure of 500 pounds per square inch or less. Cylinders, neckrings, and footrings must be made of weldable steel, carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure.

(2) As permitted in § 78.37–8.

§ 78.37–10 *Wall thickness.* (a) For cylinders with service pressure less than 900 pounds the wall stress shall not exceed 24,000 pounds per square inch. Minimum wall 0.100" for any cylinder over 5" outside diameter.

(b) For cylinders with service pressure of 900 p. s. i. or more the minimum wall shall be such that the wall stress at the minimum specified test pressure shall not exceed 67 percent of the minimum tensile strength of the steel as determined from the physical tests required in §§ 78.37–16 and 78.37–17 and shall be not over 70,000 p. s. i.

(c) Calculation must be made by the formula:

$$S=\frac{P(1.3D^2+0.4d^2)}{D^2-d^2}$$

where

S = wall stress in pounds per square inch;
P = minimum test pressure prescribed for water jacket test of 450 pounds per square inch whichever is the greater;
D = outside diameter in inches;
d = inside diameter in inches.

§ 78.37–11 *Heat treatment.* (a) The completed cylinders must be uniformly and properly heat treated prior to tests. Heat treatment of cylinders of the authorized analyses shall be as follows:

(1) All cylinders must be oil quenched except as noted in paragraph (a) (5) and (7) of this section.

(2) The steel temperature on quenching shall be that recommended for the steel analysis, but in no case shall exceed 1750° F.

(3) All steels shall be tempered at a temperature most suitable for that steel.

(4) The minimum tempering temperature shall be not less than 1200° F. except as noted in paragraph (a) (6) of this section.

(5) Steel 4130X may be normalized at a temperature of 1650° F. instead of being quenched, and cylinders so normalized need not be tempered.

(6) Intermediate manganese steels may be tempered at temperatures not less than 1150° F., and after heat treating, each cylinder must be submitted to a magnetic test to detect the presence of quenching cracks. Cracked cylinders shall be rejected and destroyed.

(7) Steels coming under this specification may be quenched in molten salt bath maintained at a temperature not less than 375° F.

§ 78.37–12 *Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.* (a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 6 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

[1] The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, ICC–3AA2000 indicates the service pressure as 2,000 pounds per square inch.

§ 78.37–13 *Safety devices and protection for valves, safety devices, and other connections, if applied.* (a) Must be as required by the Interstate Commerce Commission's regulations that apply (see §§ 73.34 (f) and 73.301 (i) of this chapter).

§ 78.37–14 *Hydrostatic test.* (a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Each cylinder must be tested to at least 5/3 times service pressure.

§ 78.37–15 *Flattening test.* (a) Between knife edges, wedge shaped, 60° angle, rounded to ½" radius; test 1 cylinder[1] taken at random out of each lot of 200 or less, after hydrostatic test.

§ 78.37–16 *Physical test.* (a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1[1] cylinder taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches: *Provided*, That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16 inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–42.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

§ 78.37–17 *Physical and flattening tests.* (a) Acceptable results for physical and flattening tests; elongation at least 20 percent for 2" gauge length or at least 10 percent in other cases; flattening required without cracking to 6 times wall thickness.

§ 78.37–18 *Leakage test.* (a) All spun cylinders and plugged cylinders (See Notes 1 and 2) must be tested for leakage by gas or air pressure after the bottom has been cleaned and is free from all moisture. Pressure, approximately the same as but no less than service pressure, must be applied to one side of the finished bottom over an area of at least 1/16 of the total area of the bottom but not less than ¾ inch in diameter, including the closure, for at least one minute, during which time the other side of the bottom exposed to pressure must be covered with water and closely examined for indications of leakage. Leakers must be rejected. (See Note 1 to § 78.37–19.)

NOTE 1: A spun cylinder is one in which an end closure in the finished cylinder has been welded by the spinning process.

NOTE 2: A plugged cylinder is one in which a permanent closure in the bottom of a finished cylinder has been effected by a plug.

NOTE 3: As a safety precaution, if the manufacturer elects to make this test before the hydrostatic test, he should design his apparatus so that the pressure is applied to the smallest area practicable, around the point of closure, and so as to use the smallest possible volume of air or gas.

§ 78.37–19 *Rejected cylinders.* (a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding or spinning is not authorized.

NOTE 1: Spun cylinders rejected under the provisions of § 78.37–18 may be removed from the spun cylinder category by drilling to remove defective material, tapping and plugging.

§ 78.37–20 *Marking.* (a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck as follows:

(1) ICC–3AA followed by the service pressure (for example, ICC–3AA1800, etc.).

(2) A serial[1] number and an identifying symbol (letters); location[2] of number to be just below the ICC mark; location[2] of symbol to be just below the number. The symbol and numbers must be those of purchaser, user, or maker. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

(3) Inspector's official mark near serial number; date of test (such as 5–50 for May 1950, so placed that dates of subsequent tests can be easily added; and word "SPUN" or "PLUG" near ICC mark when an end closure in the finished cylinder has been welded by the spinning process, or effected by plugging.

§ 78.37–21 *Size of marks.* (a) At least ¼" high if space permits.

§ 78.37–22 *Inspector's report.* (a) Required to be clear, legible, and in the following form:

(Place) _____
(Date) _____

Gas Cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long

Marks stamped into the shoulder of the cylinder are:
Specification ICC _____
Serial numbers _____ to _____ inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____
These cylinders were made by process of _____

The cylinders were heat treated by the process of _____
The _____ permitted in § 78.37–9 were attached by process of _____
(neckrings—footrings) (welding—brazing)

The material used was identified by the following _____ numbers _____
(heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____ marked on the material.
(were—were not)

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

[1] For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

[1] Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 60 cubic inches.

[2] Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

Example: ICC–3AA1800
1234
XY

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. ICC–3AA were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 3AA except as follows:

Exceptions: _____

_____

_____

(Signed) _____
Inspector.

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

NOTE. Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis								
				C	P	S	Si	Mn	Ni	Cr	Mo	Zr

The analyses were made by _____

(Signed) _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company.
For _____ Company.

Test No.	Cylinders represented by test (serial Nos.)	Yield strength at 0.2 percent offset (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) _____

(Place) _____
(Date) _____

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Tare weight (pounds) [2]	Volumetric capacity

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

[2] Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

(Signed) _____

§ 78.38 *Specification 3B; seamless steel cylinders.*

§ 78.38–1 *Compliance.* (a) Required in all details.

§ 78.38–2 *Type, size, and service pressure*—(a) *Type and size.* Seamless; not over 1,000 pounds water capacity (nominal).

(b) *Service pressure.*[1] At least 150 to not over 500 pounds per square inch.

[1] The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, ICC–3B300 indicates the service pressure as 300 pounds per square inch.

§ 78.38–3 *Inspection by whom and where.* (a) By competent inspector; chemical analyses and tests, as specified, to be made within limits of the United States. Interested inspectors are authorized.

§ 78.38–4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided*, That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 78.38–22) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.38–5 *Steel.* (a) Open-hearth or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.55; phosphorus, 0.045; sulphur, 0.050.

§ 78.38–6 *Identification of material.* (a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 78.38–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.38–8 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no fissure or other defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. If not originally free from such defects, the surface may be machined or otherwise treated to eliminate these defects. The thickness of the bottoms of cylinders welded or formed by spinning is, under no condition, to be less than two times the minimum wall thickness of the cylindrical shell; such bottom thicknesses to be measured within an area bounded by a line representing the points of contact between the cylinder and floor when the cylinder is in a vertical position.

§ 78.38–9 *Welding or brazing.* (a) Welding or brazing for any purpose whatsoever is prohibited except as follows:

(1) Welding or brazing is authorized for the attachment of neckrings and footrings which are non-pressure parts,

and only to the tops and bottoms of cylinders having a service pressure of 500 pounds per square inch or less. Cylinders, neckrings, and footrings must be made of weldable steel, carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure.

(2) As permitted in § 78.38–8.

§ 78.38–10 *Wall thickness.* (a) The wall stress shall not exceed 24,000 pounds per square inch. Minimum wall 0.090" for any cylinder over 5" outside diameter.

(b) Calculation must be made by the formula:

$$S=\frac{P(1.3D^2+0.4d^2)}{D^2-d^2}$$

where

S=wall stress in pounds per square inch;
P=minimum test pressure prescribed for water jacket test or 450 pounds per square inch whichever is the greater;
D=outside diameter in inches;
d=inside diameter in inches.

§ 78.38–11 *Heat treatment.* (a) The completed cylinders must be uniformly and properly heat-treated prior to tests.

§ 78.38–12 *Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.* (a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 6 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

§ 78.38–13 *Safety devices and protection for valves, safety devices, and other connections, if applied.* (a) Must be as required by the Interstate Commerce Commission's regulations that apply (see §§ 73.34 (f) and 73.301 (i) of this chapter).

§ 78.38–14 *Hydrostatic test.* (a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Cylinders must be tested as follows:

(1) Each cylinder; to at least 2 times service pressure.

(2) Or, 1 cylinder out of each lot of 200 or less; to at least 3 times service pressure. Others must be examined under pressure of 2 times service pressure and show no defect.

§ 78.38–15 *Flattening test.* (a) Between knife edges, wedge shaped, 60° angle, rounded to ½" radius; test 1 cylinder [1] taken at random out of each lot of 200 or less, after hydrostatic test.

§ 78.38–16 *Physical test.* (a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1 [1] cylinder taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches: *Provided,* That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16 inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–42.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

§ 78.38–17 *Acceptable results for physical and flattening tests.* (a) Either of the following:

(1) Elongation at least 40 percent for 2-inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

(2) Elongation at least 20 percent for 2-inch gauge length or 10 percent in other cases; yield strength not over 73 percent of tensile strength; flattening required, without cracking, to 6 times wall thickness.

§ 78.38–18 *Leakage test.* (a) All spun cylinders and plugged cylinders (see Notes 1 and 2) must be tested for leakage by gas or air pressure after the bottom has been cleaned and is free from all moisture. Pressure, approximately the same as but no less than service pressure, must be applied to one side of the finished bottom over an area of at least 1/16 of the total area of the bottom but not less than ¾ inch in diameter, including the closure, for at least one minute, during which time the other side of the bottom exposed to pressure must be covered with water and closely examined for indications of leakage. Leakers must be rejected. (See Note 1 to § 78.38–19.)

NOTE 1: A spun cylinder is one in which an end closure in the finished cylinder has been welded by the spinning process.

NOTE 2: A plugged cylinder is one in which a permanent closure in the bottom of a finished cylinder has been effected by a plug.

NOTE 3: As a safety precaution, if the manufacturer elects to make this test before the hydrostatic test, he should design his apparatus so that the pressure is applied to the smallest area practicable, around the point of closure, and so as to use the smallest possible volume of air or gas.

§ 78.38–19 *Rejected cylinders.* (a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding or spinning is not authorized.

NOTE 1: Spun cylinders rejected under the provisions of § 78.38–18 may be removed from the spun cylinder category by drilling to remove defective material, tapping and plugging.

§ 78.38–20 *Marking.* (a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck as follows:

(1) ICC–3B followed by the service pressure (for example, ICC–3B300, etc.).

(2) A serial [1] number and an identifying symbol (letters); location [2] of number to be just below the ICC mark; location [2] of symbol to be just below the number. The symbol and numbers must be those of purchaser, user, or maker. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

(3) Inspector's official mark near serial number; date of test (such as 5–50

[1] For lots of 30 or less physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

[1] Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 60 cubic inches.

[2] Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

Example:

ICC–3B300
1234
XY

for May 1950), so placed that dates of subsequent tests can be easily added; and word *"SPUN"* or *"PLUG"* near ICC mark when an end closure in the finished cylinder has been welded by the spinning process, or effected by plugging.

§ 78.38–21 *Size of marks.* (a) At least ¼" high if space permits

§ 78.38–22 *Inspector's report.* (a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Gas cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long.
Marks stamped into the shoulder of the cylinder are:
Specification ICC– _____
Serials numbers _____ to _____ inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____

These cylinders were made by process of _____

The _____ permitted
(neckrings—footrings)
in § 78.38–9 were attached by process of _____
(welding—brazing)

The material used was identified by the following _____ numbers
(heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____
(were—were not)
marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. ICC–3B were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 3B except as follows:
Exceptions _____

(Signed) _____
Inspector

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____

(Signed) _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) _____

(Place) _____
(Date) _____

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Serial numbers of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Tare weight (pounds) [2]	Volumetric capacity [3]

NOTE: When specifications require test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of _____ pounds per square inch and showed no defect."

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

[2] Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

[3] Report approximate maximum and minimum volumetric capacity for the lot.

(Signed) _____

§ 78.39 *Specification 3BN; Seamless nickel cylinders.*

§ 78.39–1 *Compliance.* (a) Required in all details.

§ 78.39–2 *Type, size and service pressure*—(a) *Type and size.* Seamless; not over 125 pounds water capacity (nominal).

(b) *Service pressure.*[1] At least 150 to not over 500 pounds per square inch.

[1] The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, ICC–3BN400 indicates the service pressure as 400 pounds per square inch.

§ 78.39–3 *Inspection by whom and where.* (a) By competent inspector; chemical analyses and tests, as specified, to be made within limits of the United States. Interested inspectors are authorized.

§ 78.39–4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided,* That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable

when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests, verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 78.39–21) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.39–5 *Nickel.* (a) At least 99.0 percent pure nickel plus cobalt.

§ 78.39–6 *Identification of material.* (a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 78.39–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.39–8 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Cylinders closed in by spinnfng process not authorized.

§ 78.39–9 *Welding or brazing.* (a) Welding or brazing for any purpose whatsoever is prohibited except that welding is authorized for the attachment of neckrings and footrings which are nonpressure parts, and only to the tops and bottoms of cylinders. Neckrings and footrings must be of weldable material, carbon content of which must not exceed 0.25 percent Nickel welding rod must be used.

§ 78.39–10 *Wall thickness.* (a) The wall stress shall not exceed 15,000 pounds per square inch. Minimum wall 0.100" for any cylinder over 5" outside diameter.

(b) Calculation must be made by the formula:

$$S=\frac{P(1.3D^2+0.4d^2)}{D^2-d^2}$$

where

S = wall stress in pounds per square inch;
P = minimum test pressure prescribed for water jacket test or 450 pounds per square inch whichever is the greater;
D = outside diameter in inches;
d = inside diameter in inches.

§ 78.39–11 *Heat treatment.* (a) The completed cylinders must be uniformly and properly heat-treated prior to tests.

§ 78.39–12 *Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.* (a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 6 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

§ 78.39–13 *Safety devices and protection for valves, safety devices, and other connections, if applied.* (a) Must be as required by the Interstate Commerce Commission's regulations that apply (see §§ 73.34 (f) and 73.301 (i) of this chapter).

§ 78.39–14 *Hydrostatic test.* (a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Each cylinder must be tested to at least 2 times service pressure.

§ 78.39–15 *Flattening test.* (a) Between knife edges, wedge shaped, 60° angle, rounded to ½" radius; test 1 cylinder [1] taken at random out of each lot of 200 or less, after hydrostatic test.

§ 78.39–16 *Physical test.* (a) To determine yield strength, tensile strength, elongation, and reduction of area of material: Required on 2 specimens cut from 1 [1] cylinder taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches: *Provided,* That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16 inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

[1] For lots of 30 or less physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–42.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

§ 78.39–17 *Acceptable results for physical and flattening tests.* (a) Either of the following:

(1) Elongation at least 40 percent for 2" gauge length or at least 20 percent in other cases; yield point not over 50 percent of tensile strength; flattening test not required.

(2) Elongation at least 20 percent for 2" gauge length or 10 percent in other cases; yield point not over 50 percent of tensile strength; flattening required, without cracking, to 6 times wall thickness.

§ 78.39–18 *Rejected cylinders.* (a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding not authorized.

§ 78.39–19 *Marking.* (a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck as follows:

(1) ICC–3BN followed by service pressure (for example ICC–3BN400, etc.).

(2) A serial [1] number and an identifying symbol (letters); location [2] of number to be just below the ICC mark; location [2] of symbol to be just below the number. The symbol and numbers must be those of purchaser, user, or maker. The symbol must be registered with the

[1] Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter.

[2] Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

Example:

ICC—3BN400
1234
XY

Bureau of Explosives; duplications unauthorized.

(3) Inspector's official mark, near serial number; date of test (such as 5-50 for May 1950), so placed that dates of subsequent tests can be easily added.

§ 78.39-20 *Size of marks.* (a) At least ¼" high if space permits.

§ 78.39-21 *Inspector's report.* (a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Gas cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long.
Marks stamped into the shoulder of the cylinder are:
Specification ICC—_____
Serial numbers _____ to _____ inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____

These cylinders were made by process of _____

The _____ permitted in (neckrings—footrings) § 78.39-9 were attached by process of _____ (welding-brazing)

The material used was identified by the following _____ numbers (heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____ (were—were not) marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was ____ inch. The outside diameter was determined by a close approximation to be ____ inches. The wall stress was calculated to be ____ pounds per square inch under an internal pressure of ____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. ICC-3BN were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 3BN except as follows:

Exceptions _____

(Signed) _____, Inspector.

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company.
For _____ Company.

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____
(Signed) _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) _____

(Place) _____
(Date) _____

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Tare weight (pounds) [2]	Volumetric capacity

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

[2] Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

(Signed) _____

§ 78.40 *Specification 3C; seamless steel cylinders.*

§ 78.40-1 *Compliance.* (a) Required in all details.

§ 78.40-2 *Type, size, and service pressure*—(a) *Type and size.* Seamless; not over 1,000 pounds water capacity (nominal).

(b) *Service pressure.*[1] At least 90 to not over 300 pounds per square inch.

[1] The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, ICC-3C300 indicates the service pressure as 300 pounds per square inch.

§ 78.40-3 *Inspection by whom and where.* (a) By competent inspector; chemical analyses and tests, as specified, to be made within limits of the United States. Interested inspectors are authorized.

§ 78.40-4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided,* That a certificate from the manufacturer

thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 78.40–22) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.40–5 *Steel.* (a) Open-hearth or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.55; phosphorus, 0.045; sulphur, 0.050.

§ 78.40–6 *Identification of material.* (a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 78.40–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.40–8 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no fissure or other defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. If not originally free from such defects, the surface may be machined or otherwise treated to eliminate these defects. The thickness of the bottoms of cylinders welded or formed by spinning is, under no condition, to be less than two times the minimum wall thickness of the cylindrical shell; such bottom thicknesses to be measured within an area bounded by a line representing the points of contact between the cylinder and floor when the cylinder is in a vertical position.

§ 78.40–9 *Welding or brazing.* (a) Welding or brazing for any purpose whatsoever is prohibited except as follows:

(1) Welding or brazing is authorized for the attachment of neckrings and footrings which are non-pressure parts, and only to the tops and bottoms of cylinders having a service pressure of 500 pounds per square inch or less. Cylinders, neckrings, and footrings must be made of weldable steel, carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure.

(2) As permitted in § 78.40–8.

§ 78.40–10 *Wall thickness.* (a) The wall stress shall not exceed 24,000 pounds per square inch. Minimum wall 0.090" for any cylinder over 5" outside diameter.

(b) Calculation must be made by the formula:

$$S=\frac{P(1.3D^2+0.4d^2}{D^2-d^2}$$

where

S = wall stress in pounds per square inch;
P = minimum test pressure prescribed for water jacket test or 450 pounds per square inch whichever is the greater;
D = outside diameter in inches;
d = inside diameter in inches.

§ 78.40–11 *Heat treatment.* (a) The completed cylinders must be uniformly and properly heat-treated prior to tests.

§ 78.40–12 *Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.* (a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 6 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

§ 78.40–13 *Safety devices and protection for valves, safety devices, and other connections, if applied.* (a) Must be as required by the Interstate Commerce Commission's regulations that apply (see §§ 73.34 (f) and 73.301 (i) of this chapter).

§ 78.40–14 *Hydrostatic test.* (a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Cylinders must be tested as follows: 1 cylinder out of each lot of 200 or less; to at least 3 times service pressure. Others must be examined under pressure of 2 times service pressure and show no defect. If tested cylinder fails, each cylinder in the lot may be tested; those passing are acceptable.

§ 78.40–15 *Flattening test.* (a) Between knife edges, wedge shaped, 60° angle, rounded to ½" radius; test 1 cylinder [1] taken at random out of each lot of 200 or less, after hydrostatic test.

§ 78.40–16 *Physical test.* (a) *To determine yield strength, tensile strength, elongation, and reduction of area of material.* Required on 2 specimens cut from 1 [1] cylinder taken at random out of each lot of 200 or less.

(b) Specimens must be gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches; *Provided*, That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16 inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–42.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

§ 78.40–17 *Acceptable results for physical and flattening tests.* (a) Either of the following:

(1) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

(2) Elongation at least 20 percent for 2 inch gauge length or 10 percent in other cases; yield strength not over 73 percent of tensile strength; flattening required, without cracking, to 6 times wall thickness.

§ 78.40–18 *Leakage test.* (a) All spun cylinders and plugged cylinders (see Notes 1 and 2) must be tested for leakage by gas or air pressure after the bottom

[1] For lots of 30 or less physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

has been cleaned and is free from all moisture. Pressure, approximately the same as but no less than service pressure, must be applied to one side of the finished bottom over an area of at least 1/16 of the total area of the bottom but not less than 3/4 inch in diameter, including the closure, for at least one minute, during which time the other side of the bottom exposed to pressure must be covered with water and closely examined for indications of leakage. Leakers must be rejected. (See Note 1 § 78.40–19.)

NOTE 1: A spun cylinder is one in which an end closure in the finished cylinder has been welded by the spinning process.

NOTE 2: A plugged cylinder is one in which a permanent closure in the bottom of a finished cylinder has been effected by a plug.

NOTE 3: As a safety precaution, if the manufacturer elects to make this test before the hydrostatic test, he should design his apparatus so that the pressure is applied to the smallest area practicable, around the point of closure, and so as to use the smallest possible volume of air or gas.

§ 78.40–19 *Rejected cylinders.* (a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding or spinning is not authorized.

NOTE 1: Spun cylinders rejected under the provisions of § 78.40–18 may be removed from the spun cylinder category by drilling to remove defective material, tapping and plugging.

§ 78.40–20 *Marking.* (a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck as follows:

(1) ICC–3C followed by the service pressure (for example ICC–3C300, etc.).

(2) A serial [1] number and an identifying symbol (letters); location [2] of number to be just below the ICC mark; location [2] of symbol to be just below the number. The symbol and numbers must be those of purchaser, user, or maker. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

(3) Inspector's official mark near serial number; date of test (such as 5–50 for May 1950), so placed that dates of subsequent tests can be easily added; and word *"SPUN"* or *"PLUG"* near ICC mark when an end closure in the finished cylinder has been welded by the spinning process, or effected by plugging.

[1] Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 60 cubic inches.

[2] Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

Example:

ICC–3C300
1234
XY

§ 78.40–21 *Size of marks.* (a) At least 1/4" high if space permits.

§ 78.40–22 *Inspector's report.* (a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Gas cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long.
Marks stamped into the shoulder of the cylinder are:
Specification ICC— _____
Serial numbers _____ to ____ inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____

These cylinders were made by process of _____

The _____ permitted in (neckrings—footrings) § 78.40–9 were attached by process of _____ (welding—brazing)

The material used was identified by the following _____ (heat-purchase order) numbers _____.

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____ (were—were not) marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. ICC–3C were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 3C except as follows:

Exceptions: _____

(Signed) _____
Inspector.

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____

(Signed) _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) _____

(Place) .....
(Date) .....

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered ..... to ..... inclusive.
Size ..... inches outside diameter by ..... inches long.
Made by ..... Company
For ..... Company

Serial numbers of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Tare weight (pounds) [2]	Volumetric capacity [3]

NOTE: When specifications require test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of ..... pounds per square inch and showed no defect."

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

[2] Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

[3] Report approximate maximum and minimum volumetric capacity for the lot.

(Signed) .....

§ 78.41 *Specification 3D; seamless steel cylinders.*

§ 78.41–1 *Compliance.* (a) Required in all details.

§ 78.41–2 *Type, size, and service pressure*—(a) *Type and size.* Seamless; not over 125 pounds water capacity (nominal); closing of bottom ends by spinning or swedging not authorized.

(b) *Service pressure.*[1] Must be 480 pounds per square inch.

§ 78.41–3 *Inspection by whom and where.* (a) By competent and disinterested inspector acceptable to the Bureau of Explosives; chemical analyses and tests, as specified, to be made within limits of the United States. This requirement is necessary because of the present emergency and until further order of the Commission.

§ 78.41–4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided,* That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted. Inspection of valves and protection caps is required.

(d) Render complete report (§ 78.41–21) to purchaser, cylinder maker, and the Bureau of Explosives.

[1] The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, ICC–3D480 indicates the service pressure as 480 pounds per square inch.

§ 78.41–5 *Steel.* (a) Open-hearth or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.55; phosphorus, 0.045; sulphur, 0.050.

§ 78.41–6 *Identification of material.* (a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 78.41–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.41–8 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required.

(b) Extension ring: Top end of cylinder over 5" outside diameter must be fitted with section of tubing shrunk on, not welded to cylinder, and extending at least 4" below shoulder and above neck; thickness of ring as prescribed for cylinder wall; drain holes required.

(c) Valve and protection cap of metal substantially noncorrodible.

(d) Valve body and other parts subject to gas pressure when closed to be of forged, drawn, or extruded metal. Plug instead of valve is authorized.

(e) Protection cap must be at least 3/16" thick, gas tight, with 3/16" faced seat for gasket, and with United States standard form thread; it must not project beyond extension ring.

(f) Assembly of valves to cylinder: Selective method required so that at least 1 thread is left disengaged when screwed home. Efficient luting material required. Assembly by shippers is permitted without supervision by inspector.

§ 78.41–9 *Welding or brazing.* (a) Welding or brazing is authorized, but only for the sealing of neckrings which must be threaded on the external neck of cylinders of not over 500 cubic inches capacity. Cylinders and neckrings must be weldable steel, the carbon content of which must not exceed 0.25 percent except that the use of 4130X steel is authorized. The weld free from moisture must be tested with gas or air at not less than 800 pounds per square inch.

§ 78.41–10 *Wall thickness.* (a) The wall stress shall not exceed 16,000 pounds per square inch. Minimum wall 0.100" for any cylinder over 5" outside diameter.

(b) Calculation must be made by the formula:

$$S=\frac{P(1.3D^2+0.4d^2)}{D^2-d^2}$$

where

S = wall stress in pounds per square inch;
P = 800 pounds per square inch;
D = outside diameter in inches;
d = inside diameter in inches.

§ 78.41–11 *Heat treatment.* (a) The completed cylinders must be uniformly and properly heat-treated prior to tests.

§ 78.41–12 *Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.* (a) Threads required to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

§ 78.41–13 *Safety devices and protection for valves, safety devices, and other connections, if applied.* (a) Must be as required by the Interstate Commerce Commission's regulations that apply (see §§ 73.34 (f) and 73.301 (i) of this chapter).

§ 78.41–14 *Hydrostatic test.* (a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Each cylinder must be tested to at least 5/3 times service pressure.

§ 78.41–15 *Flattening test.* (a) Between knife edges, wedge shaped, 60° angle, rounded to 1/2" radius; test 1 cylinder [1] taken at random out of each lot of 200 or less, after hydrostatic test.

§ 78.41–16 *Physical test.* (a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1 [1] cylinder taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1 1/2 inches; or, gauge length 2 inches with width not over 1 1/2 inches; provided, that gauge

[1] For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16 inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–42.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed 1/8 inch per minute during yield strength determination.

§ 78.41–17 *Acceptable results for physical and flattening tests.* (a) Either of the following:

(1) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

(2) Elongation at least 20 percent for 2 inch gauge length or 10 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test is required, without cracking, to 4 times wall thickness.

§ 78.41–18 *Rejected cylinders.* (a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding is not authorized.

§ 78.41–19 *Marking.* (a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck, and also on extension ring, as follows:

(1) ICC–3D480

(2) A serial [1] number and an identifying symbol (letters); location [2] of number to be just below the ICC mark; location [2] of symbol to be just below the number. The symbol and numbers must be those of purchaser, user, or maker. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

(3) Inspector's official mark near serial number; date of test (such as 5–50 for May 1950), so placed that dates of subsequent tests can be easily added.

§ 78.41–20 *Size of marks.* (a) At least 1/4" high if space permits.

§ 78.41–21 *Inspector's report.* (a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Gas cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long
Marks stamped into the shoulder of the cylinder are:
Specification ICC– _____
Serial numbers _____ to _____ inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____

These cylinders were made by process of _____

The neckrings _____ permitted in § 78.41–9 were attached by process of _____
(welding—brazing)

The material used was identified by the following _____ numbers _____
(heat-purchase order)

The material used was verified as to chemical anaylsis and record thereof is attached hereto. The heat numbers _____
(were—were not)
marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was ____ inch. The outside diameter was determined by a close approximation to be ____ inches. The wall stress was calculated to be ____ pounds per square inch under an internal pressure of ____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. ICC–3D were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 3D except as follows:

Exceptions _____

(Signed) _____
Inspector.

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____

(Signed) _____

[1] Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter.

[2] Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

Example:

ICC–3D480
1234
XY

(Place) .....
(Date) .....

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered ..... to ..... inclusive.
Size ..... inches outside diameter by ..... inches long.
Made by ..... Company
For ..... Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) .....

(Place) .....
(Date) .....

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered ..... to ..... inclusive.
Size ..... inches outside diameter by ..... inches long.
Made by ..... Company
For ..... Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters)[1]	Permanent expansion (cubic centimeters)[1]	Percent ratio of permanent expansion to total expansion[1]	Tare weight (pounds)[2]	Volumetric capacity

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.
[2] Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

(Signed) .....

§ 78.42 *Specification 3E; seamless steel cylinders.*

§ 78.42–1 *Compliance.* (a) Required in all details.

§ 78.42–2 *Type, size, and service pressure*—(a) *Type and size.* Seamless. Must have outside diameter less than 2", length less than 2 feet.

(b) *Service pressure.*[1] Must be 1,800 pounds per square inch.

§ 78.42–3 *Inspection by whom and where.* (a) By competent inspector; chemical analyses and tests, as specified, to be made within limits of the United States. Interested inspectors are authorized.

§ 78.42–4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of steel by analysis or by obtaining certified analysis: *Provided,* That check analysis of samples taken from one cylinder out of each lot of 200 or less is acceptable.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 78.42–15) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.42–5 *Steel.* (a) Open-hearth or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.55; phosphorus, 0.045; sulphur, 0.050.

§ 78.42–6 *Identification of steel.* (a) Required; any suitable method.

§ 78.42–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.42–8 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. The thickness of the spun bottom is, under no condition, to be less than two times the minimum wall thickness of the cylindrical shell; such bottom thickness to be measured within an area bounded by a line representing the points of contact between the cylinder and floor when the cylinder is in a vertical position.

§ 78.42–9 *Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.* (a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 4 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

§ 78.42–10 *Safety devices and protection for valves, safety devices, and other connections, if applied.* (a) Must be as required by the Interstate Commerce Commission's regulations that apply (see §§ 73.34 (f) and 73.301 (i) of this chapter).

§ 78.42–11 *Hydrostatic test.* (a) Cylinders must be tested as follows:

(1) One cylinder out of each lot of 500 or less to be subjected to hydrostatic pressure of 6,000 pounds per square inch or higher.

(2) The cylinder referred to in subparagraph (1) of this paragraph shall burst at a pressure higher than 6,000 pounds per square inch without fragmenting or otherwise showing lack of ductility, or shall hold a pressure of 12,000 pounds per square inch for 30 seconds without bursting, in which case it shall be subjected to a flattening test without cracking to six times wall thickness between knife edges, wedge shaped, 60 degree angle, rounded out to ½ inch radius.

NOTE 1: Inspector's report shall be suitably changed to show results of latter alternate and flattening test.

(3) Other cylinders must be examined under pressure of at least 3,000 pounds per square inch and not to exceed 3,600 pounds per square inch and show no defect. The pressure must be maintained for at least 30 seconds and sufficiently longer to insure complete examination.

§ 78.42–12 *Leakage test.* (a) All spun cylinders and plugged cylinders (See Notes 1 and 2) must be tested for leakage by gas or air pressure after the bottom has been cleaned and is free from all moisture. Pressure, approximately the same as but no less than service pressure, must be applied to one side of the finished bottom over an area of at least 1/16 of the total area of the bottom but not less than ¾ inch in diameter, including the closure, for at least one minute, during which time the other side of the bottom exposed to pressure must be covered with water and closely examined for indications of leakage. Leakers must be rejected. (See Note 1 to § 78.42–13).

NOTE 1: A spun cylinder is one in which an end closure in the finished cylinder has been welded by the spinning process.

NOTE 2: A plugged cylinder is one in which a permanent closure in the bottom of a finished cylinder has been effected by a plug.

NOTE 3: As a safety precaution, if the manufacturer elects to make this test before the hydrostatic test, he should design his apparatus so that the pressure is applied to the smallest area practicable, around the point of closure, and so as to use the smallest possible volume of air or gas.

§ 78.42–13 *Rejected cylinders.* (a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must

[1] The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, ICC–3E1800 indicates the service pressure as 1,800 pounds per square inch.

pass all prescribed tests. Repair by welding or spinning is not authorized.

NOTE 1: Spun cylinders rejected under the provisions of § 78.42–12 may be removed from the spun cylinder category by drilling to remove defective material, tapping and plugging.

§ 78.42–14 *Marking.* (a) Marking on each cylinder by stamping plainly and permanently as follows:

(1) ICC–3E1800.

(2) An identifying symbol (letters); location to be just following or below the ICC mark. The symbol must be that of purchaser, user or maker. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

Example:

ICC–3E1800
XY

(3) Date of test (such as 5–50 for May 1950).

§ 78.42–15 *Inspector's report.* (a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Steel gas cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long
Marks stamped into the shoulder of the cylinder are:
Specification ICC—3E1800
Serial numbers _____ to _____ inclusive (if numbered).
Identifying symbol (registered) _____
Test date _____

These cylinders were made by process of _____

The steel used was identified by the following _____ numbers _____ (heat-purchase order)

The steel used was verified as to chemical analysis and record thereof is attached hereto.

All material, such as plates, billets, and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The tare weight per cylinder without valve is _____ (approx.). The volumetric capacity per cylinder is _____ (approx.).

Each and every cylinder was properly tapped with a taper thread; the threads were inspected and found to be clean-cut, of proper length, and correct as to gauge.

One finished cylinder out of each lot of 500 or less was taken at random and burst by interior pressure with the following results:

Date of test	Pressure at which cylinder ruptured

Each and every cylinder with bottom closed in by spinning was subjected to an interior gas pressure of at least 1,800 pounds per square inch and showed no leakage.

Each and every cylinder was subjected to an interior pressure of at least 3,000 pounds per square inch and showed no defect.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 3E except as follows:

Exceptions _____

(Signed) _____
(Inspector)

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF STEEL FOR CYLINDERS

Number _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Test No.	Heat No.	Check analysis No.	Cylinders represented Serial Nos.	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____

(Signed) _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) _____

(Place) _____
(Date) _____

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Serial numbers of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Tare weight (pounds) [2]	Volumetric capacity

NOTE: When specifications require test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of _____ pounds per square inch and showed no defect."

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

[2] Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

(Signed) _____

§ 78.43 *Specification 3A480X; experimental type seamless steel cylinders.*

§ 78.43–1 *Compliance.* (a) Required in all details.

§ 78.43–2 *Type, size, and service pressure*—(a) *Type and size.* Seamless, special type having not more than 278 pounds nominal water capacity, authorized for trial service. Authority for construction and use of these cylinders must be procured in writing from the Bureau of Explosives, 30 Vesey Street, New York 7, New York.

(b) *Service pressure.*[1] 480 pounds per square inch.

§ 78.43–3 *Inspection by whom and where.* (a) By competent and disinterested inspector acceptable to the Bureau of Explosives; chemical analyses and tests, as specified, to be made within limits of the United States. This requirement is necessary because of the present emergency and until further order of the Commission.

§ 78.43–4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided,* That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 78.43–22) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.43–5 *Steel.* (a) Open-hearth or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.40; phosphorus, 0.045; sulphur, 0.50.

§ 78.43–6 *Identification of material.* (a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 78.43–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.43–8 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no fissure or other defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. If not originally free from such defects, the surface may be machined or otherwise treated to eliminate these defects. The thickness of the bottoms of cylinders welded or formed by spinning is, under no condition, to be less than two times the minimum wall thickness of the cylindrical shell; such bottom thicknesses to be measured within an area bounded by a line representing the points of contact between the cylinder and floor when the cylinder is in a vertical position.

[1] The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, ICC–3A480X indicates the service pressure as 480 pounds per square inch.

§ 78.43–9 *Neckrings and footrings.* (a) Neckrings must be attached by peening. Footrings must be shrunk on, not welded to cylinders, provided that footrings may be welded to cylinders when the carbon content of the steel in each is 0.25 percent or less.

NOTE 1: Cylinders used solely in anhydrous ammonia service may have a ½ inch diameter bar welded within their concave bottoms in accordance with the foregoing requirements.

§ 78.43–10 *Wall thickness.* (a) Minimum wall 0.100" for any cylinder over 5" outside diameter. Wall stress shall not exceed 40,000 pounds per square inch.

(b) Calculation must be made by the formula:

$$S=\frac{P(1.3D^2+0.4d^2)}{D^2-d^2}$$

where

S = wall stress in pounds per square inch;
P = 800 pounds per square inch;
D = Outside diameter in inches.
d = inside diameter in inches.

§ 78.43–11 *Heat treatment* (a) The completed cylinders must be uniformly and properly heat-treated prior to tests.

§ 78.43–12 *Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.* (a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 6 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

§ 78.43–13 *Safety devices and protection for valves, safety devices, and other connections, if applied.* (a) Devices must be as required by the Interstate Commerce Commission's regulations that apply (see §§ 73.34 (f) and 73.301 (i) of this chapter).

§ 78.43–14 *Hydrostatic test.* (a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Each cylinder must be tested to at least 5/3 times service pressure.

§ 78.43–15 *Flattening test.* (a) Between knife edges, wedge shaped, 60° angle, rounded to ½" radius; test 1 cylinder[2] taken at random out of each lot of 200 or less, after hydrostatic test.

§ 78.43–16 *Physical test.* (a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1[2] cylinder taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches: *Provided,* That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16 inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–42.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed 1/8 inch per minute during yield strength determination.

§ 78.43–17 *Acceptable results for physical and flattening tests.* (a) Either of the following:

(1) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

(2) Elongation at least 20 percent for 2 inch gauge length or 10 percent in other cases; yield strength not over 73 percent of tensile strength; flattening

[2] For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

required, without cracking, to 6 times wall thickness.

§ 78.43–18 *Leakage test.* (a) All spun cylinders and plugged cylinders (see Notes 1 and 2) must be tested for leakage by gas or air pressure after the bottom has been cleaned and is free from all moisture. Pressure, approximately the same as but no less than service pressure, must be applied to one side of the finished bottom over an area of at least $^1/_{16}$ of the total area of the bottom but not less than ¾ inch in diameter, including the closure, for at least one minute, during which time the other side of the bottom exposed to pressure must be covered with water and closely examined for indications of leakage. Leakers must be rejected. (See Note 1 to § 78.43–19.)

NOTE 1: A spun cylinder is one in which an end closure in the finished cylinder has been welded by the spinning process.

NOTE 2: A plugged cylinder is one in which a permanent closure in the bottom of a finished cylinder has been effected by a plug.

NOTE 3: As a safety precaution, if the manufacturer elects to make this test before the hydrostatic test, he should design his apparatus so that the pressure is applied to the smallest area practicable, around the point of closure, and so as to use the smallest possible volume of air or gas.

§ 78.43–19 *Rejected cylinders.* (a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding or spinning is not authorized.

NOTE 1: Spun cylinders rejected under the provisions of § 78.43–18 may be removed from the spun cylinder category by drilling to remove defective material, tapping and plugging.

§ 78.43–20 *Marking.* (a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck as follows:

(1) ICC–3A480X.

(2) A serial number and an identifying symbol (letters); location[1] of number to be just below the ICC mark; location[1] of symbol to be just below the number. The symbol and numbers must be those of purchaser, user, or maker. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

(3) Inspector's official mark near serial number; date of test (such as 5–50 for May 1950), so placed that dates of subsequent tests can be easily added; and word "SPUN" or "PLUG" near ICC mark when an end closure in the finished cylinder has been welded by the spinning process, or effected by plugging.

§ 78.43–21 *Size of marks.* (a) At least ¼ inch high if space permits.

§ 78.43–22 *Inspector's report.* (a) Required to be clear, legible, and in following form:

[1] Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

Example:

ICC–3A480X
1234
XY

(Place) _____
(Date) _____

Gas cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long.
Marks stamped into the shoulder of the cylinder are:
Specification ICC– _____
Serial numbers _____ to _____ inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____

These cylinders were made by process of _____

The footrings _____ welded
(were—were not)
as permitted in § 78.43–9.

The material used was identified by the following _____ numbers
(heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____
(were—were not)
marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. ICC–3A480X were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 3A480X except as follows:

Exceptions: _____

(Signed) _____
Inspector.

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____

(Signed) _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) _____

(Place) .....
(Date) .....

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered ..... to ..... inclusive.
Size ..... inches outside diameter by ..... inches long.
Made by ..... Company
For ..... Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Tare weight (pounds) [2]	Volumetric capacity

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinderby the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.
[2] Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

(Signed) .....

§ 78.48 *Specification 4; forge welded steel cylinders.*

§ 78.48–1 *Compliance.* (a) Required in all details.

§ 78.48–2 *Type, size, and service pressure.*—(a) *Type and size.* Must be welded type; forge lap-welded seams required; not over 1,000 pounds water capacity (nominal).

(b) *Service pressure.* Must be 300 pounds per square inch.

§ 78.48–3 *Inspection by whom and where.* (a) By competent and disinterested inspector acceptable to the Bureau of Explosives; chemical analyses and tests, as specified, to be made within limits of the United States. This requirement is necessary because of the present emergency and until further order of the Commission.

§ 78.48–4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided,* That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 78.48–21) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.48–5 *Steel.* (a) Open-hearth or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.25; phosphorus, 0.045; sulphur, 0.050: *Provided,* That Bessemer steel with phosphorus not over 0.11 percent is authorized when carbon content is 0.20 percent or less.

§ 78.48–6 *Identification of material.* (a) Required; any suitable method.

§ 78.48–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.48–8 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no fissure or other defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Cylinders closed in by spinning process not authorized.

§ 78.48–9 *Brazing or welding.* (a) The attachment to the tops and bottoms only of cylinders by welding or brazing of neckrings, footrings, handles, bosses, pads, and valve protection rings is authorized: *Provided,* That such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure.

§ 78.48–10 *Wall thickness.* (a) The wall stress shall not exceed 18,000 pounds per square inch. Minimum wall 0.100" for any cylinder over 5" outside diameter.

(b) Calculation must be made by the formula:

$$S = \frac{P\ (1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where
S = wall stress in pounds per square inch;
P = 700 pounds per square inch;
D = outside diameter in inches;
d = inside diameter in inches.

§ 78.48–11 *Heat treatment.* (a) The completed cylinders must be uniformly and properly heat treated. Heat treatment after tests is authorized.

§ 78.48–12 *Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.* (a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads required; to be of length not less than as specified for American Standard taper pipe threads.

§ 78.48–13 *Safety devices and protection for valves, safety devices, and other connections, if applied.* (a) Must be as required by the Interstate Commerce Commission's regulations that apply (see §§ 73.34 (f) and 73.301 (i) of this chapter).

§ 78.48–14 *Hydrostatic test.* (a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Each cylinder must be tested to pressure of at least 700 pounds per square inch.

§ 78.48–15 *Flattening test.* (a) Between knife edges, wedge shaped, 60° angle, rounded to ½" radius; test 1 cylinder [1] taken at random out of each lot of 200 or less, after hydrostatic test.

§ 78.48–16 *Physical test.* (a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1 [1] cylinder, or part thereof heat-treated as required, taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches: *Provided,* That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over $\frac{3}{16}$ inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–42.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to

[1] For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

§ 78.48–17 *Acceptable results for physical and flattening tests.* (a) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

Exception: Flattening test is required, without cracking, to 6 times wall thickness when cylinders are made of lap-welded pipe; in such case rings (crop ends) cut from each end of pipe must be tested with weld 45° or less from point of greatest stress; if a ring fails, another from the same end of pipe may be tested.

§ 78.48–18 *Rejected cylinders.* (a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding is authorized.

§ 78.48–19 *Marking.* (a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck, provided that cylinders not less than 0.090" thick may be stamped on the side wall adjacent to the top head, as follows:

(1) ICC–4.

(2) A serial [1] number and an identifying symbol (letters); location [2] of number to be just below the ICC mark; location [2] of symbol to be just below the serial number. The symbol and numbers must be those of purchaser, user, or maker. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

(3) Inspector's official mark near serial number; date of test (such as 5–50 for May 1950), so placed that dates of subsequent tests can be easily added.

[1] Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter.

[2] Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

Example:

ICC–4
1234
XY

§ 78.48–20 *Size of marks.* (a) At least ¼" high if space permits.

§ 78.48–21 *Inspector's report.* (a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Gas cylinders

Manufactured by _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long.
Marks stamped into the shoulder of the cylinder are:
Specification ICC– _____
Serial numbers _____ to _____ inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____

These cylinders were made by process of _____

The _____ permitted (neckrings, footrings, etc) in § 78.48–9 were attached by process of _____ (welding—brazing)

The material used was identified by the following _____ (heat-purchase order) numbers _____

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____ (were—were not) marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. ICC–4 were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 4 except as follows:

Exceptions _____

(Signed) _____
Inspector.

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____

(Signed) _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) _____

(Place) .....
(Date) .....

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered ..... to ..... inclusive.
Size ..... inches outside diameter by ..... inches long.
Made by ..... Company
For ..... Company

Serial numbers of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Tare weight (pounds) [2]	Volumetric capacity [3]

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.
[2] Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.
[3] Volumetric capacity on 2 percent of the cylinders is acceptable.

(Signed) .....

§ 78.49 *Specification 4A; forge welded steel cylinders.*

§ 78.49–1 *Compliance.* (a) Required in all details.

§ 78.49–2 *Type, size, and service pressure*—(a) *Type and size.* Must be welded type; forge lap-welded seams required; not over 1,000 pounds water capacity (nominal).

(b) *Service pressure.*[1] At least 150 to not over 500 pounds per square inch.

§ 78.49–3 *Inspection by whom and where.* (a) By competent and disinterested inspector acceptable to the Bureau of Explosives; chemical analyses and tests, as specified, to be made within limits of the United States. This requirement is necessary because of the present emergency and until further order of the Commission.

§ 78.49–4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided,* That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 78.49–21) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.49–5 *Steel.* (a) Open-hearth or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.25; phosphorus, 0.045; sulphur, 0.050.

§ 78.49–6 *Identification of material.* (a) Required; any suitable method.

§ 78.49–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.49–8 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no fissure or other defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Cylinders closed in by spinning process not authorized.

§ 78.49–9 *Welding or brazing.* (a) The attachment to the tops and bottoms only of cylinders by welding or brazing of neckrings, footrings, handles, bosses, pads, and valve protection rings is authorized provided that such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure.

§ 78.49–10 *Wall thickness.* (a) The wall stress shall not exceed 18,000 pounds per square inch for cylinders with longitudinal side seam nor 24,000 pounds per square inch for cylinders without such seam. Minimum wall 0.100" for any cylinder over 5" outside diameter.

(b) Calculation must be made by the formula:

$$S=\frac{P(1.3D^2+0.4d^2)}{D^2-d^2}$$

where
S = wall stress in pounds per square inch;
P = minimum test pressure prescribed for water jacket test or 450 pounds per square inch whichever is the greater;
D = outside diameter in inches;
d = inside diameter in inches.

§ 78.49–11 *Heat treatment.* (a) Body and heads formed by drawing or pressing must be uniformly and properly heat treated prior to tests.

§ 78.49–12 *Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.* (a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 6 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

§ 78.49–13 *Safety devices and protection for valves, safety devices, and other connections, if applied.* (a) Devices must be as required by the Interstate Commerce Commission's regulations that apply (see §§ 73.34 (f) and 73.301 (i) of this chapter).

§ 78.49–14 *Hydrostatic test.* (a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Each cylinder must be tested to at least $\frac{5}{3}$ times service pressure.

§ 78.49–15 *Flattening test.* (a) Between knife edges, wedge shaped, 60° angle, rounded to ½" radius; test 1 cylinder[1] taken at random out of each lot of 200 or less, after hydrostatic test.

§ 78.49–16 *Physical test.* (a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1[1] cylinder, or part thereof heat-treated as required, taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches: *Provided,* That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over $\frac{3}{16}$ inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens.

[1] The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, ICC–4A300 indicates the service pressure as 300 pounds per square inch.

[1] For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–42.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

§ 78.49–17 *Acceptable results for physical and flattening tests.* (a) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

Exception: Flattening test is required, without cracking, to 6 times wall thickness when cylinders are made of lap-welded pipe; in such case rings (crop ends) cut from each end of pipe must be tested with weld 45° or less from point of greatest stress; if a ring fails, another from the same end of pipe may be tested.

§ 78.49–18 *Rejected cylinders.* (a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding is authorized.

§ 78.49–19 *Marking.* (a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck, provided that cylinders not less than 0.090" thick may be stamped on the side wall adjacent to the top head, as follows:

(1) ICC–4A followed by the service pressure (for example, ICC–4A300, etc.)

(2) A serial [1] number and an identifying symbol (letters); location [2] of number to be just below the ICC mark; location [2] of symbol to be just below the number. The symbol and numbers must be those of purchaser, user, or maker. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

(3) Inspector's official mark near serial number; date of test (such as 5–50 for May 1950), so placed that dates of subsequent tests can be easily added.

§ 78.49–20 *Size of marks.* (a) At least ¼" high if space permits.

§ 78.49–21 *Inspector's report.* (a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Gas cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long
Marks stamped into the shoulder of the cylinder are:
Specification ICC– _____
Serial numbers _____ to _____ inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____

These cylinders were made by process of _____
_____
_____

The _____ permitted in
(neckrings, footrings, etc.)

§ 78.49–9 were attached by process of _____
_____
(welding—brazing)

The material used was identified by the following _____ numbers _____
(heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____
(were—were not)
marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was ____ inch. The outside diameter was determined by a close approximation to be ____ inches. The wall stress was calculated to be ____ pounds per square inch under an internal pressure of ____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. ICC–4A were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 4A except as follows:

Exceptions _____
_____
_____

(Signed) _____
Inspector.

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____
(Signed) _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) _____

[1] Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 60 cubic inches.

[2] Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

Example:

ICC–4A300
1234
XY

(Place)_____
(Date)_____

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Tare weight (pounds) [2]	Volumetric capacity

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.
[2] Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

(Signed)_____

§ 78.50 *Specification 4B; welded and brazed steel cylinders.*

§ 78.50–1 *Compliance.* (a) Required in all details.

§ 78.50–2 *Type, size, and service pressure*—(a) *Type and size.* Must be welded or brazed type; longitudinal seams must be forge lap-welded or brazed; not over 1,000 pounds water capacity (nominal). Cylinders closed in by spinnnig process not authorized.

(b) *Service pressure.*[1] At least 150 to not over 500 pounds per square inch.

§ 78.50–3 *Inspection by whom and where.* (a) By competent inspector; chemical analyses and tests, as specified, to be made within limits of the United States. Interested inspectors are authorized.

§ 78.50–4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided,* That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 78.50–21) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.50–5 *Steel.* (a) Open-hearth or electric steel of uniform quality. Content precent for the following not over: Carbon, 0.25; phosphorus, 0.045; sulphur, 0.050.

§ 78.50–6 *Identification of material.* (a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 78.50–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.50–8 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Exposed bottom welds on cylinders over 18" long must be protected by footrings. Seams must be made as follows:

(1) Circumferential seams: By welding or by brazing. Heads attached by brazing must have a driving fit with the shell, unless the shell is crimped, swedged, or curled over the skirt or flange of the head, and be thoroughly brazed until complete penetration by the brazing material of the brazed joint is secured. Depth of brazing from end of shell must be at least four times the thickness of shell metal.

(2) Longitudinal seams in shells: By forged lap welding, by copper brazing, by copper alloy brazing, or by silver alloy brazing. Copper alloy composition must be: Copper, 95 percent minimum; Silicon, 1.5 percent to 3.85 percent; Manganese, 0.25 percent to 1.10 percent. The melting point of the silver alloy brazing material must be in excess of 1000° F. When brazed, the plate edge must be lapped at least eight times the thickness of plate, laps being held in position, substantially metal to metal, by riveting or electric spot-welding; brazing must be done by using a suitable flux and by placing brazing material on one side of seam and applying heat until this material shows uniformly along the seam of the other side.

§ 78.50–9 *Welding or brazing.* (a) The attachment to the tops and bottoms only of cylinders by welding or brazing of neckrings, footrings, handles, bosses, pads, and valve protection rings is authorized: *Provided,* That such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure.

§ 78.50–10 *Wall thickness.* (a) For outside diameters over 5" the minimum wall thickness shall be 0.090 inch. In any case the minimum wall thickness shall be such that calculated wall stress at minimum test pressure (§ 78.50–14 (d)) shall not exceed the following values:

(1) 24,000 pounds per square inch for cylinders without longitudinal seam;

(2) 22,800 pounds per square inch for cylinders having copper brazed or silver alloy brazed longitudinal seam;

(3) 18,000 pounds per square inch for cylinders having forged lapped welded longitudinal seam.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where
S = wall stress in pounds per square inch;
P = minimum test pressure prescribed for water jacket test or 450 pounds per square inch whichever is the greater;
D = outside diameter in inches;
d = inside diameter in inches.

§ 78.50–11 *Heat treatment.* (a) Body and heads formed by drawing or pressing must be uniformly and properly heat treated prior to tests.

§ 78.50–12 *Opening in cylinders.* (a) Each opening in cylinders, except those for safety devices, must be provided with a fitting, boss, or pad, securely attached to cylinder by brazing or by welding or by threads. Fitting, boss, or pad must be of steel suitable for the method of attachment employed, and which need not be identified or verified as to analysis, except that if attachment is by welding, carbon content must not exceed 0.25 percent. If threads are used, they must comply with the following:

(1) Threads must be clean cut, even, without checks, and tapped to gauge.

(2) Taper threads to be of length not less than as specified for American Standard taper pipe threads.

(3) Straight threads, having at least 4 engaged threads, to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

(b) Closure of fitting, boss, or pad must be adequate to prevent leakage.

§ 78.50–13 *Safety devices and protection for valves, safety devices, and other connections, if applied.* (a) Must be as required by the Interstate Commerce Commission's regulations that apply (see §§ 73.34 (f) and 73.301 (i) of this chapter).

§ 78.50–14 *Hydrostatic test.* (a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

[1] The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder: for example, ICC–4B300 indicates the service pressure as 300 pounds per square inch.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Cylinders must be tested as follows:

(1) Each cylinder; to at least 2 times service pressure.

(2) Or, 1 cylinder out of each lot of 200 or less; to at least 3 times service pressure. Others must be examined under pressure of 2 times service pressure and show no defect.

§ 78.50–15 *Flattening test.* (a) Between knife edges, wedge shaped, 60° angle, rounded to ½" radius; test 1 cylinder [1] taken at random out of each lot of 200 or less, after hydrostatic test.

§ 78.50–16 *Physical test.* (a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1 [1] cylinder, or part thereof heat-treated as required, taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches; provided, that gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16 inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–42.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

§ 78.50–17 *Acceptable results for physical and flattening tests.* (a) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

Exception: Flattening test is required, without cracking, to 6 times wall thickness when cylinders are made of lap-welded pipe; in such case rings (crop ends) cut from each end of pipe must be tested with weld 45° or less from point of greatest stress; if a ring fails, another from the same end of pipe may be tested.

§ 78.50–18 *Rejected cylinders.* (a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair of brazed seams by brazing and welded seams by welding is authorized.

§ 78.50–19 *Marking.* (a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, neck or valve protection collar which is permanently attached to the cylinders and forming an integral part thereof, provided that cylinders not less than 0.090 inches thick may be stamped on the side wall adjacent to top head, as follows:

(1) ICC–4B followed by the service pressure (for example, ICC–4B300, etc.).

(2) A serial [1] number and an identifying symbol (letters); location [2] of number to be just below the ICC mark; location [3] of symbol to be just below the serial number. The symbol and numbers must be those of purchaser, user, or maker. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

(3) Inspector's official mark, near serial number; date of test (such as 5–50 for May 1950), so placed that date of subsequent test can be easily added.

§ 78.50–20 *Size of marks.* (a) At least ¼" high if space permits.

§ 78.50–21 *Inspector's report.* (a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Gas cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long.
Marks stamped into the shoulder of the cylinder are:
Specification ICC– _____
Serial numbers _____ to _____ inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____

These cylinders were made by process of _____

The _____ permitted in
(neckrings, footrings, etc)
§ 78.50–9 were attached by process of _____
(welding—brazing)

The material used was identified by the following _____ numbers
(heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____
(were—were not)
marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was ____ inch. The outside diameter was determined by a close approximation to be ____ inches. The wall stress was calculated to be ____ pounds per square inch under an internal pressure of ____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. ICC–4B were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 4B except as follows:

Exceptions: _____

(Signed) _____
Inspector.

[1] For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

[1] Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 60 cubic inches.

[2] Symbol in front of or following the number with ample space between or symbol and serial number stamped into welded or brazed-on valve spud directly above the ICC specification mark located on head of cylinder are also authorized. Other variations in location authorized only when necessitated by lack of space.

Example:

ICC–4B300
1234
XY

(Place) .....
(Date) .....

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered ..... to ..... inclusive.
Size ..... inches outside diameter by ..... inches long.
Made by ..... Company
For ..... Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by .....
(Signed) .....

(Place) .....
(Date) .....

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered ..... to ..... inclusive.
Size ..... inches outside diameter by ..... inches long.
Made by ..... Company
For ..... Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) .....

(Place) .....
(Date) .....

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered ..... to ..... inclusive.
Size ..... inches outside diameter by ..... inches long.
Made by ..... Company
For ..... Company

Serial numbers of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Tare weight (pounds) [2]	Volumetric capacity [3]

NOTE: When specifications require test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of ..... pounds per square inch and showed no defect."

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.
[2] Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.
[3] Report approximate maximum and minimum volumetric capacity for the lot.

(Signed) .....

§ 78.51 *Specification 4BA; welded or brazed steel cylinders made of definitely prescribed steels.*

§ 78.51–1 *Compliance.* (a) Required in all details.

§ 78.51–2 *Type size, and service pressure.* (a) Must be welded or brazed type; not over 1000 pounds water capacity (nominal); service pressure at least 225 and not over 500 pounds per square inch gauge. Closures welded by the spinning process not permitted.

§ 78.51–3 *Inspection by whom and where.* (a) By competent inspector; chemical analyses and tests, as specified, to be made within limits of the United States. Interested inspectors are authorized.

§ 78.51–4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements of this specification. For cylinders made by the billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided,* That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with specification requirements including: markings; condition of inside; tests; threads; heat treatment. Obtain samples for all tests, and check chemical analyses, witness all tests; report volumetric capacity, tare weight (see report form), and minimum thickness of wall noted.

(d) Render complete report (§ 78.51–21) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.51–5 *Steel.* (a) Designations and limiting chemical compositions of steels authorized by this specification shall be as shown in § 78.51–20, Table I.

§ 78.51–6 *Identification of material.* (a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with the heat number.

§ 78.51–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.51–8 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Exposed bottom welds on cylinders over 18 inches long must be protected by footrings. Seams must be made as follows: Minimum thickness of heads and bottoms shall be not less than 90 percent of the required thickness of the side wall.

(b) *Circumferential seams.* By welding or by brazing. Heads attached by brazing must have a driving fit with the shell, unless the shell is crimped, swedged, or curled over the skirt or flange of the head, and must be thoroughly brazed until complete penetration by the brazing material of the brazed joint is secured. Depth of brazing from end of shell must be at least four times the thickness of shell metal.

(c) Longitudinal seams in shells: By copper brazing or copper alloy brazing. Copper alloy composition must be: Copper 95 percent minimum, Silicon 1.5 percent to 3.85 percent, Manganese 0.25 percent to 1.10 percent. The plate edge must be lapped at least eight times the thickness of plate, laps being held in position, substantially metal to metal, by riveting or by electric spot-welding. Brazing must be done by using a suitable flux and by placing brazing material on one side of seam and applying heat until this material shows uniformly along the seam of the other side.

(1) Strength of longitudinal seam: Copper brazed longitudinal seam must have strength at least 3/2 times the strength of the steel wall.

§ 78.51–9 *Welding and brazing.* (a) The attachment to the tops and bottoms

only of cylinders by welding or brazing of neckrings, footrings, handles, bosses, pads, and valve protection rings is authorized provided that such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure.

§ 78.51–10 *Wall thickness.* (a) For outside diameters over 5" the minimum wall thickness shall be 0.078". In any case the minimum wall thickness shall be such that the calculated wall stress at minimum test pressure (§ 78.51–14) shall not exceed the lesser value of any of the following:

(1) The value shown in table I, § 78.51–20, for the particular material under consideration;

(2) One-half of the minimum tensile strength of the material determined as required in § 78.51–15;

(3) 35,000 pounds per square inch.

(4) Further provided that wall stress for cylinders having copper brazed longitudinal seams must not exceed 95 percent of any of the above values. Measured wall thickness shall not include galvanizing or other protective coating.

(b) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where

S = wall stress in pounds per square inch;
P = minimum test pressure prescribed for water jacket test;
D = outside diameter in inches;
d = inside diameter in inches.

(c) Cylinders with wall thickness less than 0.100", the ratio of tangential length to outside diameter shall not exceed 3.5.

§ 78.51–11 *Heat treatment.* (a) Each cylinder must be uniformly and properly heat treated prior to test by the applicable method shown in § 78.51–20, Table 1. Heat treatment must be accomplished after all forming and welding operations, except that when brazed joints are used, heat treatment must follow any forming and welding operations, but may be done before, during or after the brazing operations.

(b) Heat treatment is not required after welding or brazing weldable low carbon parts to attachments of similar material which have been previously welded or brazed to the top or bottom of cylinders and properly heat treated, provided such subsequent welding or brazing does not produce a temperature in excess of 400° F. in any part of the top or bottom material.

§ 78.51–12 *Openings in cylinders.* (a) All openings must be in the heads or bases.

(b) Each opening in cylinders, except those for safety devices, must be provided with a fitting, boss, or pad, securely attached to cylinder by brazing, by welding, or by threads. If threads are used they must comply with the following:

(1) Threads must be clean-cut, even, without checks and cut to gauge.

(2) Taper threads to be of length not less than as specified for American Standard taper pipe threads.

(3) Straight threads, having at least 4 engaged threads, to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

(c) Closure of fitting, boss, or pad must be adequate to prevent leakage.

§ 78.51–13 *Safety devices and protection for valves, safety devices, and other connections, if applied.* (a) Devices must be as required by the Interstate Commerce Commission's Regulations that apply. (See §§ 73.34 (f) and 73.301 (i) of this chapter.)

§ 78.51–14 *Hydrostatic test.* (a) By water jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat treatment and previous to the official test must not exceed 90 percent of the test pressure.

(c) Permanent volumetric expansion must not exceed 10 percent of the total volumetric expansion at test pressure.

(d) Cylinders must be tested as follows:

(1) Each cylinder; to at least 2 times service pressure.

(2) Or, 1 cylinder out of each lot of 200 or less; to at least 3 times service pressure. Others must be examined under pressure of 2 times service pressure and show no defect.

§ 78.51–15 *Physical test.* (a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from one cylinder having passed the hydrostatic test, or part thereof heat-treated as required, taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches, provided, that gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16 inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–46.

(2) In using the "extension under load" method, the total strain (or "extension under load"), corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain reference shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

§ 78.51–16 *Elongation.* (a) Physical test specimens must show at least 40 percent for 2-inch gauge length or at least 20 percent in other cases, except that these elongation percentages may be reduced numerically by 2 for 2-inch specimens, and by 1 in other cases, for each 7,500 pounds per square inch increment of tensile strength above 50,000 pounds per square inch to a maximum of four such increments.

§ 78.51–17 *Tests*—(a) *Weld test.* (Does not apply to brazed seams.)

(b) *Reduced section tensile test.* A specimen shall be cut from the cylinder used for the physical tests specified in § 78.51–15. Specimen shall be taken across the seam, edges shall be parallel for a distance of approximately 2 inches on either side of the weld. The specimen must be fractured in tension. The breaking stress calculated on the parent metal area must be at least equal to two (2) times the stress calculated under § 78.51–10 (b). Should this specimen fail to meet the requirements, specimen may be taken from two additional cylinders from the same lot and tested. If either of the latter specimens fails to meet requirements, the entire lot represented shall be rejected.

(c) *Guided bend test.* A bend test specimen shall be cut from the cylinder used for the physical tests specified in § 78.51–15. Specimen shall be taken across the seam, shall be 1½ inches wide, edges shall be parallel and rounded with a file, and back-up strip, if used, shall be removed by machining. The specimen shall be bent to refusal in the guided bend test jig illustrated in § 78.51–22. The root of the weld (inside surface of the cylinder), shall be located away from the ram of the jig. No specimen shall show a crack or other open defect exceeding ⅛ inch in any direction upon completion of the test. Should this specimen fail to meet the requirements, specimens may be taken from each of two additional cylinders from the same lot and tested. If either of the latter

specimens fails to meet requirements, the entire lot represented shall be rejected.

(d) *Alternate guided-bend test.* An alternate guided-bend test jig, as illustrated in § 78.51-23 (a) and (b), may be used for testing the soundness of fillet welded lap joints and joggle butt joints. The test specimen shall be bent across the weld as illustrated in sketch A or B for fillet welded lap joints and as illustrated in sketch C or D for joggle butt joints. The specimen shall be bent until the elongation at the outer surface, adjacent to the root of the weld, between the lightly scribed gauge lines—a to b, shall be at least 20 percent; except that this percentage may be reduced for steels having a tensile strength in excess of 50,000 pounds per square inch, as provided in § 78.51-16. No tested specimen shall show a crack, or other defect, as specified in § 78.51-17 (b). The gauge lines shall be lightly scribed before bending. The amount of elongation may be conveniently determined with a Brinell microscope or any other suitable method may be employed.

§ 78.51-18 *Rejected cylinders.* (a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair of brazed seams by brazing and welded seams by welding is authorized.

§ 78.51-19 *Marking.* (a) Marking on each cylinder stamped as follows:

(1) ICC-4BA followed by the service pressure (for example, ICC-4BA240, etc.).

(2) A serial number and an identifying symbol, both to be of the purchaser, user, or maker. The symbol must be registered with the Bureau of Explosives. Duplications unauthorized. Lot numbers in place of serial numbers authorized for cylinders not over 2 inches outside diameter or for cylinders with volumetric capacity not exceeding 60 cubic inches.

(3) Inspector's official mark.

(4) Date of test (such as 4-50 for April 50).

(5) Additional markings are permitted.

(b) Sequence of marks. Number shall be just below the ICC marking; identifying symbol shall be just below the number; inspector's official mark shall be near the serial number. Date of test shall be so placed that dates of subsequent test can easily be added. Symbol in front of or following the number, with space between, or symbol and serial number stamped into welded or brazed-on valve spud directly above the ICC mark located on head of cylinder are also authorized. Other variations in sequence of marks authorized only when necessitated by lack of space.

(c) Location of markings. Markings may be stamped plainly and permanently in the following locations on the cylinder:

(1) On shoulders and top heads not less than 0.087 inch thick.

(2) On side wall adjacent to top head for side walls not less than 0.090 inch thick.

(3) On neck, valve boss, valve protection sleeve, or similar part permanently attached to top end of cylinder.

(4) On a plate attached to the top of the cylinder or permanent part thereof; sufficient space must be left on the plate to provide for stamping at least six retest dates; the plate must be at least 1/16 inch thick and must be attached by welding, or by brazing at a temperature of at least 1100° F, throughout all edges of the plate.

(5) Variations in location of markings authorized only when neccesitated by lack of space.

(d) Size of marks. Space permitting, at least 1/4 inch high.

§ 78.51-20 *Authorized steel.* (a) Open hearth or electric steel of uniform quality. The following chemical analyses are authorized. (See footnote 1):

TABLE I—AUTHORIZED MATERIALS

Designation	Chemical analysis—limits in percent				
	1315 [2 4]	HIS [2 4]	MAY [2 4]	NAX [2 4]	COR [2 4]
Carbon	0.10/0.20	0.12 max.	0.12 max.	0.20 max.	0.12 max.
Manganese	1.10/1.65	0.50/0.90	0.50/1.00	0.45/0.75	0.20/0.50.
Phosphorus	0.045 max.	0.05/0.12	0.05/0.12	0.045 max.	0.07/0.15.
Sulphur	0.05 max.	0.05 max.	0.05 max.	0.05 max.	0.05 max.
Silicon	0.15/0.35	0.15 max.	0.10/0.50	0.50/0.90	0.25/0.75
Chromium			0.40/1.00	0.45/0.70	0.50/1.25.
Molybdenum		0.08/0.18			
Zirconium				0.05/0.25	
Nickel		0.45/0.75	0.25/0.75		0.65 max.
Copper	0.40 max.	0.95/1.30	0.50/0.70		0.25/0.55.
Aluminum		0.12/0.27			
Heat treatment authorized	[3]	[3]	[3]	[3]	[3]
Maximum stress	35,000	35,000	35,000	35,000	35,000.

Designation	SCX [2 4]	4017 [2 4]	OTY [2 4 5]	RDT [2 4 5 6]
Carbon	0.20 max.	0.13/0.20	0.15 max.	0.12 max.
Manganese	0.60/1.00	0.75/1.10	0.90/1.40	0.50/1.00.
Phosphorus	0.045 max.	0.04 max.	0.090/0.135	0.040 max.
Sulphur	0.045 max.	0.04 max.	0.04 max.	0.050 max.
Silicon	0.15/0.30	0.25/0.35	0.10 max.	
Chromium	0.15/0.50.			
Molybdenum	0.15/0.35	0.25/0.35		0.10/0.30.
Zirconium				
Nickel				0.50/1.20.
Copper	0.20/0.50		0.30/0.70	0.50/1.00.
Aluminum				
Heat treatment authorized maximum	[3]	[3]	[3]	[3]
Stress	35,000	35,000	35,000	35,000.

[1] A heat of steel made under any of the above specifications, chemical analysis of which is slightly out of the specified range, is acceptable, if satisfactory in all other respects, provided the standard permissible variations from specified chemical ranges and limits published in the American Iron and Steel Institute Products Manual, section 10 dated June 1945, are not exceeded or are approved by the Bureau of Explosives.
[2] This designation shall not be restrictive and the commercial steel is limited in analysis as shown in the table.
[3] Any suitable heat treatment in excess of 1,100° F., except that liquid quenching is not permitted.
[4] Addition of other elements to obtain alloying effect is not authorized.
[5] Grain size 6 or finer according to A. S. T. M. Spec. E 19-46.
[6] Only fully killed steel authorized.

§ 78.51-21 *Inspector's report.* (a) Required to be clear, legible and in following form:

(Place) _____
(Date) _____

Steel gas cylinders

Manufactured for _____
Location at _____
Manufactured by _____
Location at _____
Consigned to _____
Location at _____
Quantity ____ Size ____ inches outside diameter by ____ inches long
Marks stamped into the _____
(Location of marking)
of the cylinder are:
Specification ICC-_____
Serial numbers _____ to _____ inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks _____
_____
_____

These cylinders were made by process of _____

The material used was type ____ authorized in table I of Spec. No. 4BA.

The material used was identified by the following _____ numbers
(heat-purchase order)

_____

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____
(were—were not)
marked on the material.

All material was inspected and all that was accepted was found free from seams, cracks, laminations and other injurious defects.

The compliance of cylinders with specification requirements was verified including markings, condition of inside, tests, threads, etc. All cylinders with defects which might prove injurious were rejected. The processes of manufacture and heat treatment were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be ____ inches. The wall stress was calculated to be ____ pounds per square inch under an internal pressure of ____ pounds per square inch.

Hydrostratic tests, tensile tests of material, and other tests as prescribed in specification No. ICC-4BA ____ were made in the presence of the inspector and all cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

Each cylinder _____ been equipped
(has-has not)
with safety devices as follows: _____

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 4BA except as follows:

Exceptions _____
_____
_____
(Manufacturer's name)

Signed _____
Inspector

By _____

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF STEEL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company.
For _____ Company.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis										
				C	P	S	Si	Mn	Ni	Cr	Mo	Cu	Al	Zr

Steel was manufactured by _____ Company. The originals of the certified mill test reports are in the files of the manufacturer.

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Chemical analyses were made by _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in inches)	Reduction of area (percent)	Weld tensile test	Weld bend test

(Signed) _____

(Place) _____
(Date) _____

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Tare weight (pounds) [2]	Volumetric capacity [3]

NOTE: When specifications require test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of _____ pounds per square inch and showed no defect."

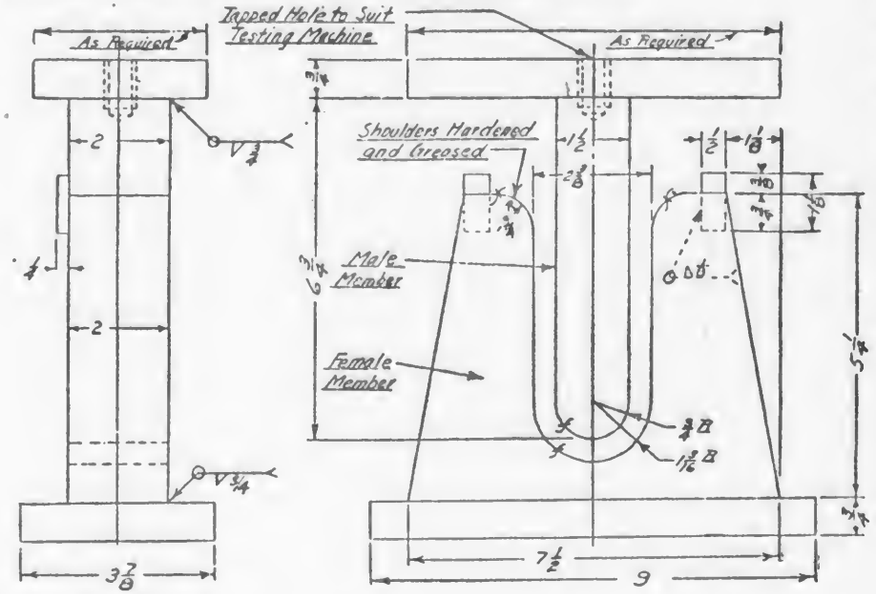
[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

[2] Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

[3] Report approximate maximum and minimum volumetric capacity for the lot.

(Signed) _____

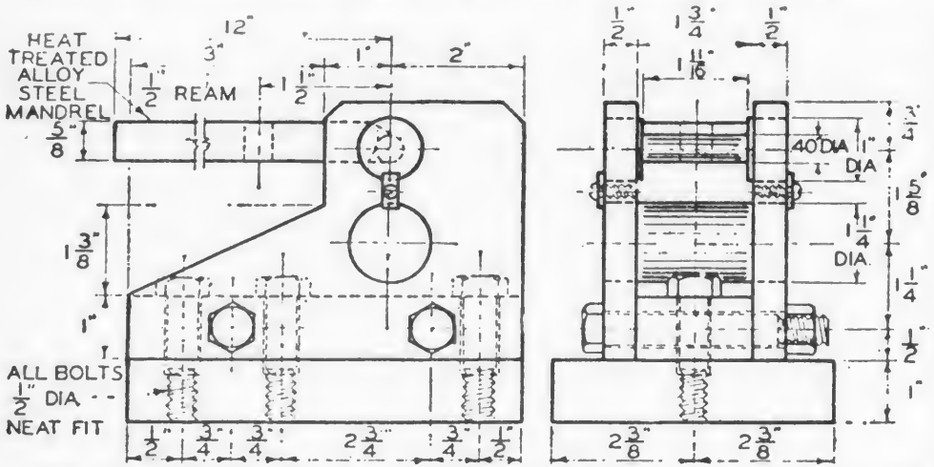
§ 78.51–22 *Guided bend test jig.* (a) Dimensions as follows:



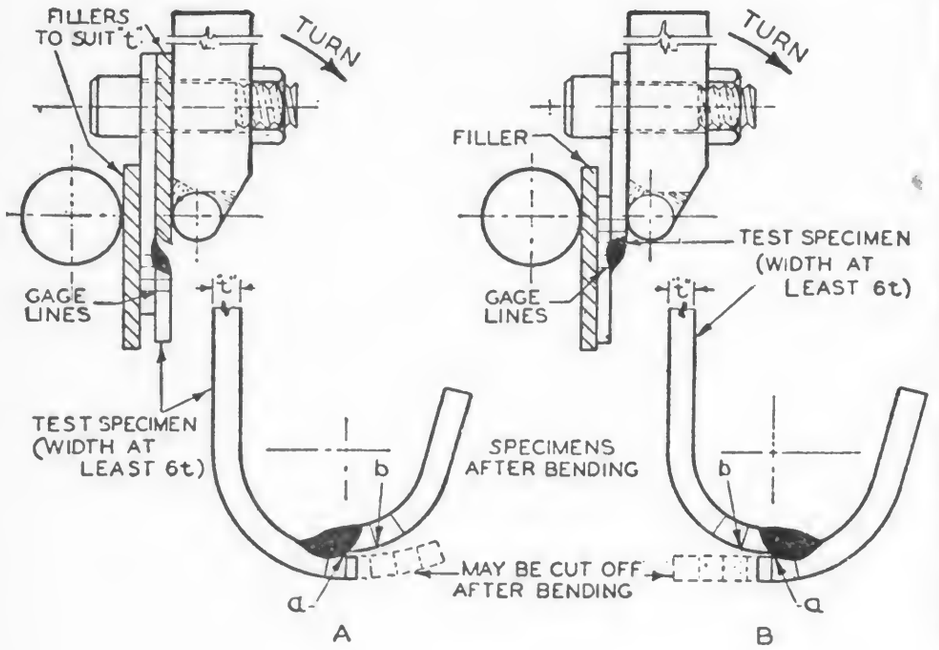
Jig Complies with A.S.M.E. Code for Unfired Pressure Vessels, 1940 Edition

NOTE: Dimensions shown for die and plunger are for ⅜" thick material only. The following dimensions shall be used for other thicknesses. Thickness of plunger member = 4 × thickness of test specimen. Radius of plunger member = 2 × thickness of test specimen. Width of opening, die member = 6 × thickness of test specimen + ⅛". Radius of die member = 3 × thickness of test specimen + 1/16".

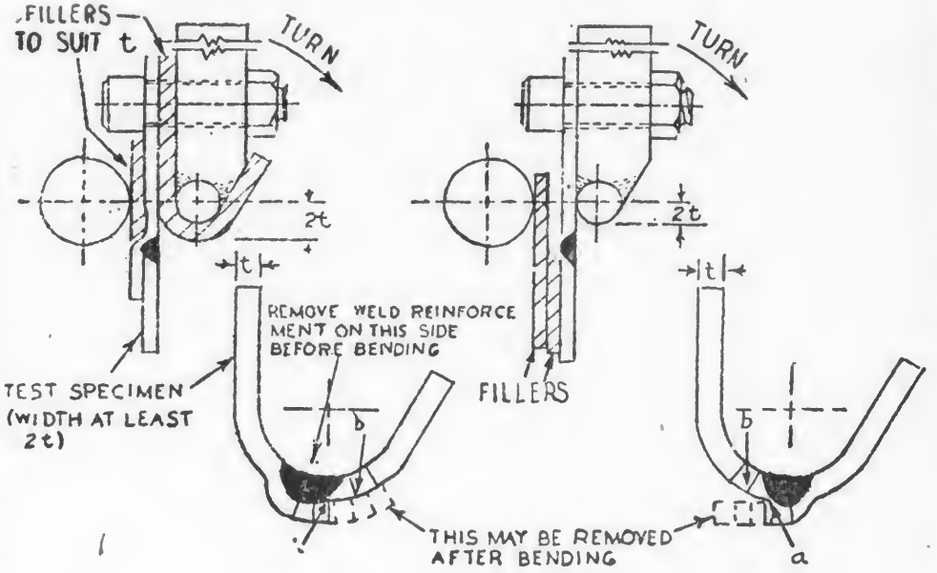
§ 78.51–23 *Alternate guided bend test jig.* (a) Dimensions as follows:



NOTE: Dimensions shown are suitable for bending lap-weld specimens of 0.05" to 0.133" material thickness. A piece of 2" pipe may be slipped over the mandrel for turning. For any specimen thickness, fillers of appropriate thickness shall be added to one or both sides of the specimen as shown to obtain the required elongation.



(b) *Alternate guided bend test jig.* Dimensions as follows:



§ 78.52 *Specification 4C; welded and brazed steel cylinders.*

§ 78.52–1 *Compliance.* (a) Required in all details.

§ 78.52–2 *Type, size, and service pressure*—(a) *Type and size.* Must be welded or brazed type; longitudinal seams must be forge lap-welded or brazed; not over 1,000 pounds water capacity (nominal). Cylinders closed in by spinning process not authorized.

(b) *Service pressure.*[1] At least 90 to not over 300 pounds per square inch.

§ 78.52–3 *Inspection by whom and where.* (a) By competent inspector; chemical analyses and tests, as specified, to be made within limits of the United States. Interested inspectors are authorized.

[1] The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, ICC–4C300 indicates the service pressure as 300 pounds per square inch.

§ 78.52–4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided,* That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 78.52–21) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.52–5 *Steel.* (a) Open-hearth or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.25; phosphorus, 0.045; sulphur, 0.050.

§ 78.52–6 *Identification of material.* (a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 78.52–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.52–8 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Exposed bottom welds on cylinders over 18" long must be protected by foot rings. Seams must be made as follows:

(1) *Circumferential seams.* By welding or by brazing. Heads attached by brazing must have a driving fit with the shell, unless the shell is crimped, swedged, or curled over the skirt or flange of the head, and be thoroughly brazed until complete penetration by the brazing material of the brazed joint is secured. Depth of brazing from end of shell must be at least four times the thickness of shell metal.

(2) *Longitudinal seams in shells.* By forged lap welding or by copper brazing. When brazed, the plate edge must be lapped at least eight times the thickness of plate, laps being held in position, substantially metal to metal, by riveting or electric spot welding; brazing must be done by placing flux and brazing material on one side of seam and applying heat until this material shows uniformly along the seam on the other side.

§ 78.52–9 *Welding or brazing.* (a) The attachment to the tops and bottoms only of cylinders by welding or brazing of neckrings, footrings, handles, bosses, pads, and valve protection rings is authorized provided that such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent except in the case of 4130X steel which may be used with proper welding procedure.

§ 78.52–10 *Wall thickness.* (a) The wall stress shall not exceed 18,000 pounds per square inch for cylinders with longitudinal side seam nor 24,000 pounds per square inch for cylinders without such seam: *Provided,* That a wall stress of not over 22,800 pounds per square inch is authorized for cylinders with copper brazed side seam having strength at least 3/2 times the strength of the steel wall. Minimum wall 0.090 inch for any cylinder over 5" outside diameter.

(b) Calculation must be made by the formula:

$$S=\frac{P(1.3D^2+0.4d^2)}{D^2-d^2}$$

where

S = wall stress in pounds per square inch;
P = test pressure prescribed for water jacket test or 348 pounds per square inch whichever is the greater;
D = outside diameter in inches;
d = inside diameter in inches.

§ 78.52–11 *Heat treatment.* (a) Body and heads formed by drawing or pressing must be uniformly and properly heat treated prior to tests.

§ 78.52–12 *Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.* (a) Threads required to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 6 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinders; gaskets required, adequate to prevent leakage.

§ 78.52–13 *Safety devices and protection for valves, safety devices, and other connections, if applied.* (a) Must be as required by the Interstate Commerce Commission's regulations that apply (see §§ 73.34 (f) and 73.301 (i) of this chapter).

§ 78.52–14 *Hydrostatic test.* (a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Cylinders must be tested as follows: 1 cylinder out of each lot of 200 or less; to 3 times service pressure. Others must be examined under pressure of 2 times service pressure and show no defect. If tested cylinder fails, each cylinder in the lot may be tested; those passing are acceptable.

§ 78.52–15 *Flattening test.* (a) Between knife edges, wedge shaped, 60° angle, rounded to ½" radius; test 1 cylinder [1] taken at random out of each lot of 200 or less, after hydrostatic test.

§ 78.52–16 *Physical test.* (a) Required on 2 specimens cut from 1 [1] cylinder, or part thereof heat treated as required, taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches; provided, that gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16 inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straigthened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–42.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under approximate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

§ 78.52–17 *Acceptable results for physical and flattening tests.* (a) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

Exception: Flattening test is required, without cracking, to 6 times wall thickness when cylinders are made of lap-welded pipe; in such case rings (crop ends) cut from each end of pipe must be tested with weld 45° or less from point of greatest stress; if a ring fails, another from the same end of pipe may be tested.

§ 78.52–18 *Rejected cylinders.* (a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair of brazed seams by brazing and welded seams by welding is authorized.

[1] For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to the same heat treatment as the finished cylinder.

§ 78.52-19 *Marking.* (a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck, provided that cylinders not less than 0.090" thick may be stamped on the side wall adjacent to the top head, as follows:

(1) ICC-4C followed by the service pressure (for example, ICC-4C300, etc.).

(2) A serial [1] number and an identifying symbol (letters); location [2] of number to be just below the ICC mark; location [2] of symbol to be just below the number. The symbol and numbers must be those of purchaser, user, or maker. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

(3) Inspector's official mark near serial number; date of test (such as 5-50 for May 1950), so placed that dates of subsequent tests can be easily added.

§ 78.52-20 *Size of marks.* (a) At least ¼" high if space permits.

§ 78.52-21 *Inspector's report.* (a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Gas cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long
Marks stamped into the shoulder of the cylinder are:
Specification ICC- _____
Serial numbers _____ to _____ inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____

These cylinders were made by process of _____

The _____ permitted
(neckrings, footrings, etc.)
in § 78.52-9 were attached by process of _____
(welding—brazing)

The material used was identified by the following _____ numbers
(heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____
(were—were not)
marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. ICC-4C were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 4C except as follows:

Exceptions _____

(Signed) _____
Inspector.

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading, "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____

(Signed) _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) _____

(Place) _____
(Date) _____

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Tare weight (pounds) [2]	Volumetric capacity [3]

NOTE: When specifications require test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of _____ pounds per square inch and showed no defect."

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

[2] Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

[3] Report approximate maximum and minimum volumetric capacity for the lot.

(Signed) _____

[1] Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 60 cubic inches.

[2] Symbol in front of or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

Example: ICC--4C300
1234
XY

§ 78.53 *Specification 4D; inside containers, welded steel for aircraft use.*

§ 78.53–1 *Compliance.* (a) Required in all details.

§ 78.53–2 *Type, size, and service pressure*—(a) *Type and size.* Welded steel spheres (two seamless hemispheres) or circumferentially welded cylinders (two seamless drawn shells) not over 1100 cubic inches capacity. Cylinders closed in by spinning process not authorized.

(b) *Service pressure.*[1] At least 300 to not over 500 pounds per square inch.

§ 78 53–3 *Inspection by whom and where.* (a) By competent inspector of the manufacturer, or a disinterested inspection agency; chemical analyses and tests, as specified, to be made within the limits of the United States.

§ 78.53–4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided*, That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 78.53–20) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.53–5 *Steel.* (a) Open-hearth or electric steel of uniform and weldable quality. Content percent for the following not over: Carbon, 0.25; phosphorus, 0.045; sulfur, 0.050, except that the following steels commercially known as 4130X, Type 304, 321, and 347 stainless steels may be used with proper welding procedure and complying with the following analyses:

41 30X	*Percent*
Carbon	0.25/0.35
Manganese	0.40/0.60
Phosphorus	0.04 max.
Sulfur	0.05 max.
Silicon	0.20/0.35
Chromium	0.80/1.10
Molybdenum	0.15/0.25
Zirconium	
Nickel	

[1] The "service pressure" limits the use of the container. It is shown by marks on container; for example ICC–4D300 indicates the service pressure as 300 pounds per square inch.

	Stainless steels		
	304 (percent)	321 (percent)	347 (percent)
Carbon (maximum)	0.08	0.08	0.08
Manganese (maximum)	2.00	2.00	2.00
Phosphorus (maximum)	.030	.030	.030
Sulfur (maximum)	.030	.030	.030
Silicon (maximum)	.75	.75	.75
Nickel	8.0/11.0	9.0/13.0	9.0/13.0
Chromium	18.0/20.0	17.0/20.0	17.0/20.0
Molybdenum			
Titanium		[1]	
Columbium			[2]

[1] Titanium shall be not less than 5×C and not more than 0.60 percent.

[2] Columbium shall be not less than 10×C and not more than 1.0 percent.

§ 78.53–6 *Identification of material.* (a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 78.53–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.53–8 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished container appreciably; reasonably smooth and uniform surface finish required.

§ 78.53–9 *Wall thickness.* (a) The wall stress at minimum test pressure shall not exceed 24,000 pounds per square inch, except where steels commercially known as 4130X, Type 304, 321, and 347 stainless steels are used, stress at test pressure shall not exceed 37,000 pounds per square inch. Minimum wall 0.040 inch for any diameter container.

(b) Calculation for a sphere must be made by the formula:

$$S=\frac{PD}{4tE}$$

where

S = wall stress in pounds per square inch;
P = test pressure prescribed for water jacket test, i. e., at least two times service pressure, in pounds per square inch;
D = outside diameter in inches;
t = minimum wall thickness in inches;
E = 0.85 (provides 85 percent weld efficiency factor).

(c) Calculation for a *cylinder* must be made by the formula:

$$S=\frac{P(1.3D^2+0.4d^2)}{D^2-d^2}$$

where

S = wall stress in pounds per square inch;
P = test pressure prescribed for water jacket test, i. e., at least two times service pressure, in pounds per square inch;
D = outside diameter in inches;
d = inside diameter in inches.

§ 78.53–10 *Heat treatment.* (a) The completed cylinders must be uniformly and properly heat-treated prior to tests.

§ 78.53–11 *Openings in container.* (a) Each opening in container, except those for safety devices, must be provided with a fitting, boss, or pad, securely attached to container by brazing or by welding or by threads. If threads are used, they must comply with the following:

(1) Threads must be clean cut, even, without checks, and tapped to gauge.

(2) Taper threads to be of length not less than as specified for American Standard taper pipe threads.

(3) Straight threads, having at least 4 engaged threads, to have tight fit and calculated shear strength at least 10 times the test pressure of the container; gaskets required, adequate to prevent leakage.

(b) Closure of fitting, boss, or pad must be adequate to prevent leakage.

§ 78.53–12 *Safety devices and protection for valves, safety devices, and other connections, if applied.* (a) Devices must be as required by the Interstate Commerce Commission's regulations that apply (see §§ 73.34 (f) and 73.301 (i) of this chapter).

§ 78.53–13 *Hydrostatic test.* (a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Containers must be tested as follows:

(1) Each container to at least 2 times service pressure, or

(2) One container out of each lot of 200 or less to at least 3 times service pressure. Others must be examined under pressure of 2 times service pressure and show no defects.

§ 78.53–14 *Flattening test for spheres and cylinders*—(a) *Flattening test for spheres.* Between parallel steel plates on a press with welded seam at right angles to the plates; test one sphere taken at random out of each lot of 200 or less after hydrostatic test. Any projecting appurtenances may be cut off (by mechanical means only) prior to crushing.

(b) *Flattening test for cylinders.* Between knife edges, wedge shaped, 60° angle, rounded to ½ inch radius; test one cylinder[1] taken at random out of each lot of 200 or less, after hydrostatic test.

§ 78.53–15 *Physical test and specimens for spheres and cylinders*—(a) *Physical test for spheres.* Required on 2 specimens cut from flat representative sample plate of the same heat taken at random from the steel used to produce

[1] For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to the same heat-treatment as the finished cylinder.

the sphere. This flat steel from which the 2 specimens are to be cut must receive the same heat-treatment as the spheres themselves. Sample plates to be taken for each lot of 200 or less spheres.

(b) *Specimens for spheres.* Specimens must be gauge length 2 inches with width not over 1½ inches; provided, that gauge length at least 24 times thickness with width not over 6 times thickness is authorized when wall of sphere is not over 3/16 inch thick.

(c) *Physical test for cylinders.* Required on 2 specimens cut from 1 [1] cylinder taken at random out of each lot of 200 or less.

(d) *Specimens for cylinders.* Specimens must be gauge length 8 inches with width not over 1½ inches; or gauge length 2 inches with width not over 1½ inches; provided, that gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16 inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within 1 inch of each end of the reduced section. Heating of specimen for any purpose is not authorized.

(e) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–42.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

§ 78.53–16 *Acceptable results for physical and flattening tests.* (a) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

(b) Elongation at least 20 percent for 2 inch gauge length or 10 percent in other cases; flattening required to 50 percent of the original outside diameter without cracking.

§ 78.53–17 *Rejected cylinders.* (a) Reheat-treatment authorized; subsequent thereto, acceptable containers must pass all prescribed tests. Repair of welded seams by welding prior to reheat-treatment authorized.

§ 78.53–18 *Marking.* (a) Marking on each container by stamping plainly and permanently only where the metal is at least 0.09 inch thick, or on a metal nameplate permanently secured to the container by means other than soft solder, or by means that would not reduce the wall thickness, as follows:

(1) ICC–4D followed by the service pressure (for example, ICC–4D300, etc.).

(2) A serial [1] number and an identifying symbol (letters); location of number to be just below the ICC mark; location [2] of symbol to be just below the number. The symbol and numbers must be those of purchaser, user, or maker. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

(3) Inspector's official mark, near serial number; date of test (such as 8–50 for August 1950), so placed that dates of subsequent tests can be easily added.

§ 78.53–19 *Size of marks.* (a) Of sufficient size to be legible.

§ 78.53–20 *Inspector's report.* (a) Required to be clear, legible, and in the following form:

(Place) _____
(Date) _____

Gas _____
(spheres-cylinders)

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size ____ inches outside diameter by ____ inches long.
Marks stamped into the _____
_____
(Shoulder-metal plate, § 78.53–18)
Specification ICC–_____
Serial numbers ____ to ____, inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____

These containers were made by process of
_____
_____

The material used was identified by the following _____ numbers
(heat-purchase order)
_____

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____
(were—were not)
marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each container was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the container. The processes of manufacture and heat treatment of containers were supervised and found to be efficient and satisfactory.

The container walls were measured and the minimum thickness noted was ____ inch. The outside diameter was determined by a close approximation to be ____ inches. The wall stress was calculated to be ____ pounds per square inch under an internal pressure of ____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. ICC–4D were made in the presence of the inspector and all material and containers accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these containers proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 4D except as follows:

Exceptions: _____
_____
_____

(Signed) _____
Inspector.

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CONTAINERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading, "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Containers represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____
(Signed) _____

[1] For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to the same heat-treatment as the finished cylinder.

[1] Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 60 cubic inches.

[2] Symbol in front or following the number with ample space between is also authorized. Other variation in location authorized only when necessitated by lack of space.

Example: ICC–4D300
1234
XY

(Place) .....
(Date) .....

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CONTAINERS

Numbered ..... to ..... inclusive.
Size ..... inches outside diameter by ..... inches long.
Made by ..... Company
For ..... Company

Test No.	Containers represented by test (serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) .....

(Place) .....
(Date) .....

RECORD OF HYDROSTATIC TESTS ON CONTAINERS

Numbered ..... to ..... inclusive.
Size ..... inches outside diameter by ..... inches long.
Made by ..... Company
For ..... Company

Serial Nos. of containers tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Tare weight (pounds) [2]	Volumetric capacity

NOTE: When specifications require test for only 1 out of each lot of 200 or less containers, the check on the others must be indicated by a notation hereon reading, "Each container was subjected to a pressure of ..... pounds per square inch and showed no defect."

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the container by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

[2] Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

(Signed) .....

§ 78.54 *Specification 4B240–FLW; welded or welded and brazed cylinders with fusion-welded longitudinal seam.*

§ 78.54–1 *Compliance.* (a) Required in all details.

§ 78.54–2 *Type, size, and service pressure.*—(a) *Type and size.* Must be welded or brazed type with longitudinal fusion-welded seam. 240 pounds nominal water capacity. Cylinders closed in by spinning process not authorized.

(b) *Service pressure.*[1] 240 pounds per square inch.

§ 78.54–3 *Inspection by whom and where.* (a) By competent and disinterested inspector acceptable to the Bureau of Explosives; chemical analyses and tests, as specified, to be made within limits of the United States. This requirement is necessary because of the present emergency and until further order of the Commission.

§ 78.54–4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided,* That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 78.54–22) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.54–5 *Steel.* (a) Steel shall be plain carbon steel of American Society for Testing Materials firebox quality with carbon content not in excess of 0.25 percent.

§ 78.54–6 *Identification of material.* (a) Required; any suitable method.

§ 78.54–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.54–8 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Exposed bottom welds on cylinders over 18" long must be protected by foot rings. Seams must be made as follows:

(1) Circumferential seams by welding or by brazing: Heads attached by brazing must have a driving fit with the shell, unless the shell is crimped, swedged, or curled over the skirt or flange of the head, and be thoroughly brazed until complete penetration by the brazing material of the brazed joint is secured. Depth of brazing from end of shell must be at least four times the thickness of shell metal.

(2) Longitudinal fusion-welded seam shall be of the double-welded butt type. Filler metal may be added from one side when and if means are provided for accomplishing complete penetration and reinforcement on both sides of the joint. Welding procedure and welding operators shall be qualified for the manufacture of pressure vessels in accordance with paragraph U-69 of the Rules for Construction of Unfired Pressure Vessels, Section VIII of the American Society of Mechanical Engineers Boiler Construction Code, 1943 Edition including Addenda to 1946 Edition.

§ 78.54–9 *Welding or brazing.* (a) The attachment to the tops and bottoms only of cylinders by welding or brazing of neckrings, footrings, handles, bosses, pads, and valve protection rings is authorized provided that such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent.

§ 78.54–10 *Wall thickness.* (a) For outside diameters over 5 inches the minimum wall thickness shall be 0.090 inch. In any case the minimum wall thickness shall be such that calculated wall stress at 480 pounds per square inch shall not exceed 18,000 pounds per square inch.

(b) Calculation must be made by the formula:

$$S=\frac{P(1.3D^2+0.4d^2)}{D^2-d^2}$$

where

S = wall stress in pounds per square inch;
P = 480 pounds per square inch;
D = outside diameter in inches;
d = inside diameter in inches.

§ 78.54–11 *Heat treatment.* (a) Each cylinder shall be thermally stress-relieved after all initial welding and seam repair welding operations have been completed and prior to the hydrostatic test.

§ 78.54–12 *Openings in cylinders.* (a) Each opening in cylinders, except those for safety devices, must be provided with a fitting, boss, or pad, securely attached to cylinder by brazing or by welding or by threads. Fitting, boss, or pad must be of steel suitable for the method of attachment employed, and which need not be identified or verified as to analysis, except that if attachment is by welding, carbon content must not exceed 0.25 percent. If threads are used, they must comply with the following:

(1) Threads must be clean cut, even, without checks, and tapped to gauge.

(2) Taper threads to be of length not less than as specified for American Standard taper pipe threads.

(3) Straight threads, having at least 4 engaged threads, to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder;

[1] The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, ICC 4B240–FLW.

gaskets required, adequate to prevent leakage.

(b) Closure of fitting, boss, or pad must be adequate to prevent leakage.

§ 78.54–13 *Safety devices and protection for valves, safety devices, and other connections, if applied.* (a) Devices must be as required by the Interstate Commerce Commission's regulations that apply (see §§ 73.34 (f) and 73.301 (i) of this chapter).

§ 78.54–14 *Hydrostatic test.* (a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Each cylinder shall be subjected to the hydrostatic test and test pressure shall be at least two and two thirds times the service pressure. Following this test, each cylinder shall be subjected to a dry air-pressure test of two times the service pressure. The cylinder shall be thoroughly dry before air test is applied, and during test welded seams shall be examined for leaks, either by submerging the cylinders in liquid, or by painting all welded seams with a solution suitable for the detection of leaks.

(e) One finished cylinder out of each lot, which appears to the inspector to be the least likely to meet the test, shall be selected by the inspector from each lot of 200 or less successively produced and shall be hydrostatically tested to destruction and shall not burst at a pressure less than six times the service pressure.

§ 78.54–15 *Physical test.* (a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1[1] cylinder, or part thereof heat-treated as required, taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches; provided, that gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16 inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–42.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

§ 78.54–16 *Acceptable results for physical tests.* (a) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test not required.

§ 78.54–17 *Weld tests.* (a) A bend test specimen shall be cut from the cylinder used for the physical tests specified in § 78.54–15. Specimen shall be taken across the seam, shall be 1½ inches wide, edges shall be parallel and rounded with a file, and back-up strip, if used, shall be removed by machining. The specimen shall be bent to refusal in the guided bend test jig shown in the drawing in § 78.54–23. The root of the weld (inside surface of the cylinder) shall be located away from the ram of the jig. No specimen shall show a crack exceeding ⅛ inch in any direction upon completion of the test. Should this specimen fail to meet the requirements, two additional specimens from the same cylinder shall be tested, and if either of these fails to meet the requirements, the entire lot represented shall be rejected.

(b) In addition to the guided bend test, a reduced section tension test shall be made transverse to the weld and meet the requirements of paragraph Q–109 of section IX of the American Society of Mechanical Engineers Boiler Construction Code, 1943 Edition including Addenda to 1946 Edition. Should this specimen fail to meet the requirements, two additional specimens from the same cylinder shall be tested, and if either of these fails to meet the requirements, the entire lot represented shall be rejected.

§ 78.54–18 *Radiographic examination.* (a) One finished longitudinal seam shall be selected at random from each lot of 100 or less successively produced and be radiographically examined throughout its length in accordance with subparagraph (h) of paragraph U–68 of the American Society of Mechanical Engineers' Unfired Pressure Vessel Code. Should the radiographs fail to meet the requirements two additional seams of the same lot shall be examined, and if either of these fails to meet the requirements the entire lot shall be rejected.

§ 78.54–19 *Rejected cylinders.* (a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair of brazed seams by brazing and welded seams by welding is authorized.

§ 78.54–20 *Marking.* (a) Marking required on each cylinder by stamping plainly and permanently on shoulder, top head, or neck as follows:

(1) ICC–4B240–FLW.

(2) A serial number and an identifying symbol (letters); location[1] of number to be just below the ICC mark; location[1] of symbol to be just below the number. The symbol and numbers must be those of the purchaser, user, or maker. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

(3) Inspector's official mark near serial number, date of test (such as 12–50 for December 1950), so placed that dates of subsequent test can be easily added.

§ 78.54–21 *Size of marks.* (a) At least ¼" high if space permits.

§ 78.54–22 *Inspector's report.* (a) Required to be clear, legible, and in following form:

[1] For lots of 30 or less, physical tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

[1] Symbol in front of or following the number with ample space between or symbol and serial number stamped into welded or brazed-on valve spud directly above the ICC specification mark located on head of cylinder are also authorized. Other variations in location authorized only when necessitated by lack of space.

Example:

ICC–4B240–FLW
1234
XY

(Place) _____
(Date) _____

Gas cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size ____ inches outside diameter by ____ inches long.
Marks stamped into the shoulder of the cylinder are:
Specification ICC– _____
Serial numbers ____ to ____ inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____

These cylinders were made by process of _____

The _____ permitted
(neckrings, footrings, etc.)
in § 78.54–9 were attached by process of _____
(welding—brazing)

The material used was identified by the following _____ numbers
(heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____ marked on the material.
(were—were not)

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was ____ inch. The outside diameter was determined by a close approximation to be ____ inches. The wall stress was calculated to be ____ pounds per square inch under an internal pressure of ____ pounds per square inch.

Hydrostatic tests, tensile tests of material, and other tests, as prescribed in specification No. ICC–4B240FLW were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 4B240FLW except as follows:
Exceptions: _____

(Signed) _____
Inspector.

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading, "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____

(Signed) _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)

(Signed) _____

(Place) _____
(Date) _____

RECORD OF WELD AND BURST TESTS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (serial Nos.)	Root bend test acceptable (yes or no)	Transverse test acceptable (yes or no)	Radiographic examination acceptable (yes or no)	Burst test (pounds per square inch)

Radiographic technique employed consisted of _____

(Signed) _____

(Place) _____
(Date) _____

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

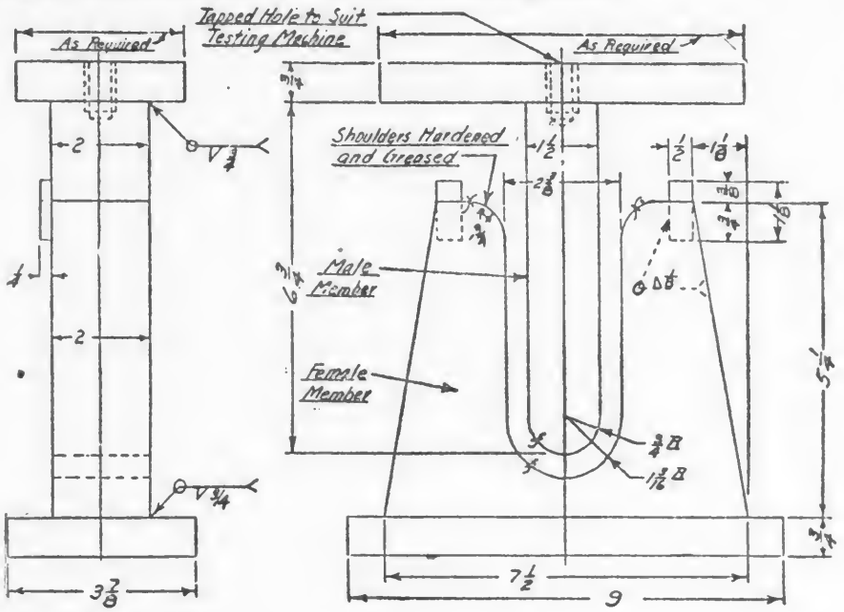
Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Tare weight (pounds) [2]	Volumetric capacity [3]

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.
[2] Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.
[3] Report approximate maximum and minimum volumetric capacity for the lot.

(Signed) _____

§ 78.54–23 *Guided bend test jig.* (a) Dimensions as follows:



Jig Complies with A.S.M.E. Code for Unfired Pressure Vessels. 1940 Edition

NOTE: Dimensions shown for die and plunger are for 3/8" thick material only. The following dimensions shall be used for other thicknesses. Thickness of plunger member = 4 × thickness of test specimen. Radius of plunger member = 2 × thickness of test specimen. Width of opening, die member = 6 × thickness of test specimen + 1/8". Radius of die member = 3 × thickness of test specimen + 1/16".

§ 78.55 *Specification 4B–ET; welded and brazed cylinders made from electric resistance welded tubing.*

§ 78.55–1 *Compliance.* (a) Required in all details.

§ 78.55–2 *Type, spinning process, size and service pressure*—(a) *Type.* Cylinders must be of brazed type made from electric resistance welded tubing which has been certified by the tubing manufacturer that each length of tubing has been pressure tested to a fiber stress of 24,000 pounds per square inch, as calculated by the formula—

$$P=\frac{24000(D^2-d^2)}{(1.3D^2+0.4d^2)}$$

where P is the pressure required for pressure testing of tubing by the tubing manufacturer. Pressure shall be maintained for not less than 30 seconds. Lengths that leak must be rejected. No repairs permitted.

(b) *Spinning process.* Cylinders closed in by spinning process authorized.

(c) *Size.* The maximum water capacity of this type shall not exceed 12 pounds or 333 cubic inches. The maximum outside diameter of the shell shall be five inches and maximum length of shell 17.5 inches.

(d) *Service pressure.*[1] At least 240 to not over 500 pounds per square inch.

§ 78.55–3 *Inspection by whom and where.* (a) By competent inspector; chemical analyses and tests, as specified, to be made within limits of the United States. Interested inspectors are authorized.

[1] The "service pressure" limits the use of the cylinder. It is shown by marks on cylinder; for example, ICC–4B300ET.

§ 78.55–4 *Duties of inspector.* Inspector shall: (a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after nick and cold break.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: *Provided,* That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity and tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 78.55–22) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.55–5 *Steel.* (a) Open hearth or electric steel of uniform quality. Plain carbon steel content percent for the following not over: carbon, 0.25; phosphorus, 0.045; sulfur, 0.050. The addition of other elements for alloying effect is prohibited.

§ 78.55–6 *Identification of material.* (a) Required; any suitable method.

§ 78.55–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.55–8 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Heads may be attached to shells by lap brazing or may be formed integrally. The thickness of the bottom of cylinders welded or formed by spinning is, under no condition, to be less than two times the minimum wall thickness of the cylindrical shell; such bottom thicknesses to be measured within an area bounded by a line representing the points of contact between the cylinder and floor when the cylinder is in a vertical position. Seams must be made as follows:

(b) Circumferential seams: By brazing only. Heads attached to shells by the lap brazing method shall overlap not less than four times wall thickness. Brazing material shall have a melting point of not less than 1000° F. Heads must have a driving fit with the shell unless the shell is crimped, swedged, or curled over the skirt or flange of the head and be thoroughly brazed until complete penetration of the joint by the brazing material is secured. Brazed joints may be repaired by brazing.

(c) Longitudinal seams in shell: Electric resistance welded joints only. No repairs to longitudinal joints permitted.

§ 78.55–9 *Welding or brazing.* (a) The attachment to the tops and bottoms only of cylinders by welding or brazing of neckrings, footrings, handles, bosses, pads, and valve protection rings is authorized provided that such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent.

§ 78.55–10 *Wall thickness.* (a) The wall stress at two times service pressure shall not exceed 18,000 pounds per square inch. Minimum thickness shall be 0.044 inch.

(b) Calculation must be made by the formula:

$$S=\frac{P(1.3D^2+0.4d^2)}{D^2-d^2}$$

where
S = wall stress in pounds per square inch;
P = 2 times service pressure;
D = outside diameter in inches;
d = inside diameter in inches.

§ 78.55–11 *Heat treatment.* (a) Heads formed by drawing or pressing must be uniformly and properly heat treated prior to tests.

(b) Cylinders with integral formed heads or bases must be subjected to a normalizing operation. Normalizing and brazing operations may be combined, provided the operation is carried out at a temperature in excess of the upper critical temperature of the steel.

§ 78.55–12 *Openings in cylinders.* (a) Each opening in cylinders, except those for safety devices, must be provided with a fitting, boss, or pad, securely attached to cylinder by brazing or by welding or by threads. Fitting, boss, or pad must be of steel suitable for the method of attachment employed, and which need not be identified or verified as to analysis, except that if attachment is by welding, carbon content must not exceed

0.25 percent. If threads are used, they must comply with the following:

(1) Threads must be clean cut, even, without checks, and tapped to gauge.

(2) Taper threads to be of length not less than as specified for American Standard taper pipe threads.

(3) Straight threads, having at least 4 engaged threads, to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

(b) Closure of fitting, boss, or pad must be adequate to prevent leakage.

§ 78.55–13 *Safety devices and protection for valves, safety devices, and other connections, if applied.* (a) Devices must be as required by the Interstate Commerce Commission's regulations that apply (see §§ 73.34 (f) and 73.301 (i) of this chapter).

§ 78.55–14 *Hydrostatic test.* (a) By water-jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 percent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 percent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) Cylinders must be tested as follows:

(1) Each cylinder; to at least 2 times service pressure.

(2) Or, 1 cylinder out of each lot of 200 or less; to at least 3 times service pressure. Others must be examined under pressure of 2 times service pressure and show no defect.

(e) Each 1000 cylinders or less successively produced each day shall constitute a lot. One cylinder shall be selected from each lot and hydrostatically tested to destruction. If this cylinder bursts below five times the service pressure, then two additional cylinders must be selected and subjected to this test. If either of these cylinders fails by bursting below five times the service pressure, then the entire lot must be rejected. All cylinders constituting a lot shall be of identical size, construction, heat-treatment, finish, and quality.

§ 78.55–15 *Flattening test.* (a) Between knife edges, wedge shaped, 60° angle, rounded to ½" radius; test 1 cylinder taken at random out of each lot of 200 or less, after hydrostatic test.

§ 78.55–16 *Physical test.* (a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1 cylinder, or part thereof heat-treated as required, taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1½ inches; or, gauge length 2 inches with width not over 1½ inches; provided, that gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16 inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–42.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

§ 78.55–17 *Acceptable results for physical and flattening tests.* (a) Elongation at least 40 percent for 2 inch gauge length or at least 20 percent in other cases; yield strength not over 73 percent of tensile strength; flattening test required, without cracking, to six times wall thickness with weld 90° from direction of applied load. Two rings cut from the ends of length of pipe used in production of a lot may be used for flattening test provided the rings accompany the lot which they represent in all thermal processing operations. At least one of the rings must pass the flattening test.

§ 78.55–18 *Leakage test.* (a) All spun cylinders and plugged cylinders (see Notes 1 and 2) must be tested for leakage by gas or air pressure after the bottom has been cleaned and is free from all moisture. Pressure, approximately the same as but no less than service pressure, must be applied to one side of the finished bottom over an area of at least 1/16 of the total area of the bottom but not less than ¾" in diameter, including the closure, for at least 1 minute, during which time the other side of the bottom exposed to pressure must be covered with water and closely examined for indications of leakage. Leakers must be rejected. (See § 78.55–19 (a) (1).)

NOTE 1: A spun cylinder is one in which an end closure in the finished cylinder has been welded by the spinning process.

NOTE 2: A plugged cylinder is one in which a permanent closure in the bottom of a finished cylinder has been effected by a plug.

NOTE 3: As a safety precaution, if the manufacturer elects to make this test before the hydrostatic test, he should design his apparatus so that the pressure is applied to the smallest area practicable, around the point of closure, and so as to use the smallest possible volume of air or gas.

§ 78.55–19 *Rejected cylinders*—(a) *Repairs authorized.* Leakers must be rejected, except that:

(1) Spun cylinders rejected under the provisions of § 78.55–18 may be removed from the spun cylinder category by drilling to remove defective material, tapping, and plugging.

(2) Brazed joints may be rebrazed.

(3) Subsequent to the operations noted above in subparagraphs (1) and (2) of this paragraph, acceptable cylinders must pass all prescribed tests.

§ 78.55–20 *Marking.* (a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, neck or valve protection collar which is permanently attached to the cylinders and forming an integral part thereof, provided that cylinders not less than 0.090 inches thick may be stamped on the side wall adjacent to top head, as follows:

(1) ICC–4B followed by the service pressure and the letters ET (for example, ICC–4B240ET, etc.).

(2) A serial [1] number and an identifying symbol (letters); location [2] of number to be just below the ICC mark; location [2] of symbol to be just below the serial number. The symbol and numbers must be those of purchaser, user, or maker. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

(3) Inspector's official mark, near serial number; date of test (such as 5–50 for May 1950), so placed that date of subsequent test can be easily added; and

[1] Lot numbers, not over 500 cylinders in each lot, authorized for cylinders not over 2 inches outside diameter and for cylinders over 2 inches outside diameter when the volumetric capacity does not exceed 60 cubic inches.

[2] Symbol in front of or following the number with ample space between or symbol and serial number stamped into welded or brazed-on valve spud directly above the ICC specification mark located on head of cylinder are also authorized. Other variations in location authorized only when necessitated by lack of space.

Example:

ICC–4B240ET
1234
XY

word "SPUN" or "PLUG" near ICC mark when an end closure in the finished cylinder has been welded by the spinning process or effected by plugging.

§ 78.55–21 *Size of marks.* (a) At least ¼" high if space permits.

§ 78.55–22 *Inspector's report.* (a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Gas cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long.
Marks stamped into the shoulder of the cylinder are:
Specification ICC- _____
Serial numbers _____ to _____ inclusive.
Inspector's mark _____
Identifying symbol (registered) _____
Test date _____
Tare weights (yes or no) _____
Other marks (if any) _____

These cylinders were made by process of _____

The _____ permitted in (neckrings, footrings, etc.) § 78.55–9 were attached by process of _____ (welding—brazing)

The material used was identified by the following _____ numbers _____ (heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____ (were—were not) marked on the material.

All material, such as plates, billets and electric resistance welded tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was ____ inch. The outside diameter was determined by a close approximation to be ____ inches. The wall stress was calculated to be ____ pounds per square inch under an internal pressure of ____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. ICC–4B–ET were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

A certificate of test on the electric resistance tubing has been obtained from the tubing manufacturer. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. ICC–4B–ET except as follows:

Exceptions _____

(Signed) _____
Inspector.

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____
(Signed) _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches).	Reduction of area (percent)	Flattening test	Bursting test (pounds per square inch)

(Place) _____
(Date) _____

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long
Made by _____ Company
For _____ Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Tare weight (pounds) [2]	Volumetric capacity [3]

NOTE: When specifications require test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of _____ pounds per square inch and showed no defect."

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

[2] Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 percent.

[3] Report approximate maximum and minimum volumetric capacity for the lot.

(Signed) _____

§ 78.59 *Specification 8; steel cylinders with approved porous filling for acetylene.*

§ 78.59–1 *Compliance.* (a) Required in all details.

§ 78.59–2 *Type and service pressure—* (a) *Type.* Seamless except that the following is authorized: Longitudinal seam if forge lap welded; attachment of heads by welding or by brazing by dipping process; welded circumferential body seam if cylinder has no longitudinal seam.

(b) *Service pressure.*[1] 250 pounds per square inch.

§ 78.59–3 *Inspection by whom and where.* (a) By competent and disinterested inspectors except that for cylinders made in the United States of America interested inspectors are also authorized; chemical analyses and tests, as specified, to be made within limits of the United States.

[1] Service pressure limits the use of the cylinder to 250 pounds per square inch at 70° F.

(b) *Duties of shell inspector:*

(1) Inspect all material and reject any not complying with requirements; for cylinders made by billet piercing process, billets to be inspected after nick and cold break.

(2) Require certified chemical analyses of steel used, signed by manufacturer thereof; also verify by check analyses of samples taken from each heat or from 1 out of each lot of 200 or less plates, shells, or tubes used.

(3) Verify compliance of cylinder shells with all shell requirements; inspect inside before closing in both ends; verify heat treatment as proper; obtain all samples for all tests and for check analyses; witness all tests; verify threads by gauge; report volumetric capacity and minimum thickness of wall noted.

(4) Prepare report on manufacture of steel shells in form prescribed in § 78.59–20 (a). Furnish one copy to manufacturer, one copy to Bureau of Explosives, and three copies to the company that is to complete the cylinders.

(c) Duties of inspector of completed cylinders: Determine porosity of filling and tare weights; verify compliance of marking with prescribed requirements; obtain necessary copies of steel shell reports prescribed in paragraph (b) of this section; render complete reports, as prescribed in § 78.59–20 to the purchaser, to the Bureau of Explosives, and to the company that has completed the manufacture of the cylinders.

§ 78.59–4 *Steel.* (a) Open-hearth or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.25; phosphorus, 0.045; sulphur, 0.050.

NOTE 1: Because of the present emergency and until further order of the Commission, the use of steel commercially known as 4130X is authorized for the fabrication of cylinders with dip-brazed bottoms and with spuds for fittings in ends of cylinders attached by brazing.

§ 78.59–5 *Identification of steel.* (a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 78.59–6 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.59–7 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required.

§ 78.59–8 *Exposed bottom welds.* (a) Exposed bottom welds on cylinders over 10" long must be protected by foot rings.

§ 78.59–9 *Heat treatment.* (a) The completed cylinders, or body and heads thereof completed up to point of assembly, must be uniformly heat treated prior to tests.

§ 78.59–10 *Openings.* (a) Standard taper pipe threads required; length not less than as specified for American Standard pipe threads; tapped to gauge; clean cut, even, and without checks.

§ 78.59–11 *Safety devices and protection for valves, safety devices, and other connections.* (a) If applied must be as required by the Interstate Commerce Commission's regulations that apply. (See §§ 73.34 (f) and 73.301 (i) of this chapter.)

§ 78.59–12 *Hydrostatic test.* (a) By water jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat treatment and previous to the official test must not exceed 90 percent of the test pressure nor be within 100 pounds thereof.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) One cylinder out of each lot of 200 or less must be hydrostatically tested to at least 750 pounds per square inch. Cylinders not so tested must be examined under pressure of between 500 and 600 pounds per square inch and show no defect. If hydrostatically tested cylinder fails, each cylinder in the lot may be hydrostatically tested and those passing are acceptable.

§ 78.59–13 *Leakage test.* (a) By interior air or gas pressure not less than the service pressure; leakers must be rejected. Required only for cylinders with bottoms closed in by spinning.

§ 78.59–14 *Physical test.* (a) Required on 2 specimens cut longitudinally from 1 cylinder or part thereof taken at random out of each lot of 200 or less, after heat treatment.

(b) Specimens must be: Gauge length 8" with width not over 1½"; or, gauge length 2" with width not over 1½": *Provided*, That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16" thick.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–42.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

(d) Yield strength shall not exceed 73 percent of tensile strength. Elongation must be at least 40 percent in 2 inch or 20 percent in other cases.

§ 73.59–15 *Rejected cylinders.* (a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding is authorized.

§ 78.59–16 *Porous filling.* (a) Cylinders must be completely filled with an approved porous material, uniform in quality, thoroughly dry, free from voids, and of such structure as to make impossible any disintegration or sagging when wet with solvent. Filling material must have been tested with satisfactory results under supervision of the Bureau of Explosives.

(b) Porosity of filling to be 80 percent or less except that filling with a porosity in excess of 80 percent but not in excess of 92 percent, may be used when tested with satisfactory results under the supervision of the Bureau of Explosives. When the porous mass has a porosity in excess of 80 percent but not in excess of 83 percent, the pores shall be uniform and shall not be visible at a magnification of 200 diameters. When the porous mass has a porosity in excess of 83 percent but not in excess of 92 percent, the pores shall be uniform and shall not be visible at a magnification of 500 diameters. A cylinder taken at random from a lot of 200 or less must be tested for porosity providing the porsity of each cylinder is not known. Should test cylinders fail, test of each cylinder of the lot is authorized, cylinders passing the test to be acceptable.

(c) For filling that is molded and dried before insertion in cylinders, porosity test may be made on sample block taken at random from material to be used.

(d) The porosity of the filling material shall be determined; the amount of solvent at 70° F. for a cylinder:

(1) Having shell volumetric capacity above 20 pounds water capacity (nominal), shall not exceed the following:

Percent porosity of filler:	*Maximum acetone solvent percent shell capacity by volume*
90 to 92	43.4
83 to 90	40.0
80 to 83	38.6
75 to 80	36.2
70 to 75	33.8
65 to 70	31 4

(2) Having volumetric capacity of 20 pounds or less water capacity (nominal), shall not exceed the following:

Percent porosity of filler:	*Maximum acetone solvent percent shell capacity by volume*
90 to 92	41.8
83 to 90	38.5
80 to 83	37.1
75 to 80	34.8
70 to 75	32.5
65 to 70	30.2

§ 78.59–17 *Tare weight.* (a) Tare weight referred to in §§ 78.59–1 to 78.59–21 shall be the combined weight of cylinder proper, porous filling, valve, and solvent, but without removable cap.

§ 78.59–18 *Marking.* (a) Marking on each cylinder by stamping plainly and permanently on or near the shoulder, top head, neck or valve protection collar which is permanently attached to the cylinder and forming an integral part thereof, as follows:

(1) ICC–8.

(2) A serial number and an identifying symbol (letters) grouped [1] above or below the ICC mark. The symbol and numbers must be those of purchaser, user, or maker. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

(3) Date of test (such as 5–50 for May 1950), so placed that dates of subsequent tests can be easily added.

(4) Tare weight of cylinder in pounds and ounces.

(5) Cylinders, not completed, when delivered must each be marked for identification of each lot of 200 or less.

§ 78.59–19 *Size of marks.* (a) At least ⅛" high for cylinders less than 4" inside diameter and at least ¼" high for larger cylinders.

§ 78.59–20 *Inspector's report.* (a) Report to cover manufacture of acetylene shells; required to be clear, legible, and in the following form:

(Place) _____
(Date) _____

Acetylene shells

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long.
Marks stamped into the shoulder of the cylinder are:
Lot number _____
Other marks (if any) _____

These cylinders were made by process of _____

The material used was identified by the following _____ numbers
(heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____
(were—were not)
marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. ICC–8 were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 8 except as follows:

Exceptions _____

(Signed) _____
Inspector.

[1] Variation in location authorized only when necessitated by lack of space.

Example:

ICC–8
1234
XY

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis						
				C	P	S	Si	Mn	Ni	Cr

The analyses were made by _____

(Signed) _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Flattening test

(Signed) _____

(Place) _____
(Date) _____

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent Expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Volumetric capacity [2]

NOTE: When specification requires test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of _____ pounds per square inch and showed no defect."

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

[2] Report approximate maximum and minimum volumetric capacity for the lot.

(Signed) _____

(b) Inspector's report to cover completed manufacture of acetylene cylinders; required to be clear and legible and in the following form:

(Place) _____
(Date) _____

Final Report: For completed steel cylinders with approved porous filling for acetylene.

Manufactured for _____
Location at _____
Steel shells manufactured by _____
Location at _____
Cylinders completed by _____
Location at _____
Consigned to _____
Location at _____
Quantity _____
Size ____ inches outside diameter by ____ inches long.
Marks are stamped into _____ as follows:
(show location)
Specification ICC–8.
Serial numbers _____ to _____ inclusive.
Identifying symbol (registered) _____
Inspector's mark (if applied) _____
Test date _____
Other marks (if any) _____

Application of prescribed marks, as reported above, and location thereof were verified.

Each cylinder was filled with porous filling material consisting of _____ in the form of _____

The porosity of the filling is between _____ and _____ percent as determined by tests made by the _____ company whose report has been found satisfactory and is on file.

The tare weight of each cylinder was determined and a record thereof is attached hereto.

Each cylinder has been equipped with safety devices _____

A certified report of manufacture and test of the steel shells is attached hereto.

I hereby certify that, subject to the acceptability of the reports covering the steel shells, all of these cylinders proved satisfactory in every way and comply with the requirements of the Interstate Commerce Commission specification No. 8.

Signed _____
(Inspector)

§ 78.59–21 *Additional type.* (a) For seamless cylinders, contracted for by the United States Navy or United States Coast Guard, made of steel commercially known as 4130X the prescribed limitations of carbon content, yield point, and elongation of steel are hereby waived provided the cylinders otherwise comply with §§ 78.59–1 to 78.59–20 and the following conditions:

(b) The following chemical analysis is authorized. (See Note 1.)

Designation:	*4130X (percent)*
Carbon	0.25/0.35
Manganese	0.40/0.90
Phosphorus	0.04 max.
Sulphur	0.05 max.
Silicon	0.20/0.35
Chromium	0.80/1.10
Molybdenum	0.15/0.25
Zirconium	
Nickel	

NOTE 1: A heat of steel made under this specification, chemical analysis of which is slightly out of the specified range, is acceptable, if satisfactory in all other respects, provided the standard permissible variations from specified chemical ranges and limits published in the American Iron and Steel Institute Products Manual, section 10, dated June 1945, are not exceeded.

(c) Minimum wall thickness must be such that the wall stress under interior pressure of 1,000 pounds per square inch will not exceed 18,000 pounds per square inch when calculated by the formula:

$$S=\frac{P(1.3D^2+0.4d^2)}{D^2-d^2}$$

where
S = wall stress in pounds per square inch;
P = 1,000 pounds per square inch;
D = outside diameter in inches;
d = inside diameter in inches.

(d) The elongation of the steel must be at least 20 percent in 2 inches.

(e) The test pressure under § 78.59–12 of this specification must be at least 1,000 pounds per square inch.

(f) Flattening test: Between knife edges, wedge shaped, 60° angle, rounded to ½ inch radius; test 1 cylinder [1] taken at random out of each lot of 200 or less, after hydrostatic test. The cylinders must pass test without cracking to 6 times wall thickness.

(g) Reports of manufacture and tests of the cylinder shells must include the following additional information: Chemical analysis data on manganese, chromium, molybdenum, and other alloy materials present, if any; definite statement as to the heat-treatment used.

§ 78.60 *Specification 8AL; steel cylinders with approved porous filling for acetylene.*

§ 78.60–1 *Compliance.* (a) Required in all details.

§ 78.60–2 *Type and service pressure.* (a) *Type.* Seamless except that the following is authorized: Attachment of heads by welding or by brazing by dipping process; welded circumferential body seam. Longitudinal seams not authorized.

(b) *Service pressure.* [2] 250 pounds per square inch.

§ 78.60–3 *Inspection by whom and where.* (a) By competent and disinterested inspectors except that for cylinders made in the United States of America interested inspectors are also authorized; chemical analyses and tests, as specified, to be made within limits of the United States.

(b) Duties of shell inspector. Inspect all material and reject any not complying with requirements; for cylinders made by billet piercing process, billets to be inspected after nick and cold break.

(1) Require certified chemical analyses of steel used, signed by manufacturer thereof; also verify by check analyses of samples taken from each heat or from 1 out of each lot of 200 or less plates, shells, or tubes used.

(2) Verify compliance of cylinder shells with all shell requirements; inspect inside before closing in both ends; verify heat treatment as proper; obtain all samples for all tests and for check analyses; witness all tests; verify threads by gauge; report volumetric capacity and minimum thickness of wall noted.

(3) Report percentage of each specified alloying element in the steel. Prepare report on manufacture of steel shells in form prescribed in § 78.60–24 (a). Furnish one copy to manufacturer, one copy to Bureau of Explosives, and three copies to the company that is to complete the cylinders.

(c) Duties of inspector of completed cylinders. Determine porosity of filling and tare weights; verify compliance of marking with prescribed requirements; obtain necessary copies of steel shell reports prescribed in paragraph (b) of this section; render complete reports, as prescribed in § 78.60–24, to the purchaser, to the Bureau of Explosives, and to the company that has completed the manufacture of the cylinders.

§ 78.60–4 *Authorized steel.* (a) Open hearth or electric steel of uniform quality. The following chemical analyses are authorized. See footnote 1 of table.

TABLE I—AUTHORIZED MATERIALS

Designation	Chemical analysis—Limits in percent				
	1315 [3] [4]	HIS [3] [4]	MAY [3] [4]	NAX [3] [4]	COR [3] [4]
Carbon	0.10/0.20	0.12 max.	0.12 max.	0.20 max.	0.12 max.
Manganese	1.10/1.65	0.50/0.90	0.50/1.00	0.45/0.75	0.20/0.50.
Phosphorus	0.045 max.	0.05/0.12	0.08/0.12	0.045 max.	0.07/0.15.
Sulphur	0.05 max.	0.05 max.	0.05 max.	0.05 max.	0.05 max.
Silicon	0.15/0.35	0.15 max.	0.10/0.50	0.50/0.90	0.25/0.75.
Chromium			0.40/1.00	0.45/0.70	0.50/1.25.
Molybdenum		0.08/0.18			
Zirconium				0.05/0.25	
Nickel		0.45/0.75	0.25/0.75		0.65 max.
Copper	0.40 max.	0.95/1.30	0.50/0.70		0.25/0.55.
Aluminum		0.12/0.27			
Heat treatment authorized	(5)	(5)	(5)	(5)	(4)
Maximum stress	35,000	35,000	35,000	35,000	35,000.

See footnotes at end of table.

[1] For lots of 30 or less, physical and flattening tests are authorized to be made on a ring at least 8 inches long cut from each cylinder and subjected to same heat treatment as the finished cylinder.

[2] Service pressure limits the use of the cylinder to 250 pounds per square inch at 70° F.

TABLE I—AUTHORIZED MATERIALS—Continued

Designation	Chemical analysis—Limits in percent			
	SCX [3] [4]	4017 [3] [4]	OTY [3] [4]	RDT [3] [4] [6]
Carbon	0.20 max.	0.13/0.20	0.15 max.	0.12 max.
Manganese	0.60/1.00	0.75/1.10	0.90/1.40	0.50/1.00.
Phosphorus	0.045 max.	0.040 max.	0.090/0.135	0.040 max.
Sulphur	0.045 max.	0.040 max.	0.040 max.	0.050 max.
Silicon	0.15/0.30	0.25/0.35	0.10 max.	
Chromium	0.15/0.50			
Molybdenum	0.15./0.35	0.25/0.35		0.10/0.30.
Zirconium				
Nickel				0.50/1.20.
Copper	0.20/0.50		0.30/0.70	0.50/1.00.
Aluminum				
Heat treatment authorized	(5)	(5)	(5)	(5)
Maximum stress	35,000	35,000	35,000	35,000.

[1] A heat of steel made under any of the above specifications, chemical analysis of which is slightly out of the specified range, is acceptable, if satisfactory in all other respects, provided the standard permissible variations from specified chemical ranges and limits published in the American Iron and Steel Institute Products Manual, section 10, dated June 1945, are not exceeded or are approved by the Bureau of Explosives.
[2] This designation shall not be restrictive and the commercial steel is limited in analysis as shown in the table.
[3] Any suitable heat treatment in excess of 1100° F., except that liquid quenching is not permitted.
[4] Addition of other elements to obtain alloying effect is not authorized.
[5] Grain size 6 or finer according to A. S. T. M. Spec. E 19–46.
[6] Only fully killed steel authorized.

§ 78.60–5 *Identification of steel.* (a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

§ 78.60–6 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.60–7 *Manufacture.* (a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required.

§ 78.60–8 *Foot rings.* (a) Exposed bottom welds on cylinders over 18" long must be protected by footrings.

§ 78.60–9 *Welding or brazing.* (a) The attachment to the tops or bottoms only of cylinders by welding or brazing of neckrings, footrings, handles, bosses, pads, and valve protecting rings is authorized provided that such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which must not exceed 0.25 percent.

(b) Heat treatment is not required after welding or brazing weldable low carbon parts to attachments, specified in paragraph (a) of this section, of similar material which have been previously welded or brazed to the top or bottom of cylinders and properly heat treated, provided such subsequent welding or brazing does not produce a temperature in excess of 400° F. in any part of the top or bottom material.

§ 78.60–10 *Wall thickness; wall stress.* (a) The calculated wall stress at 750 pounds per square inch shall not exceed 35,000 pounds per square inch, or one-half of the minimum ultimate strength of the steel as determined in § 78.60–16, whichever value is the smaller. Measured wall thickness shall not include galvanizing or other protective coating.

(1) Calculation of wall stress must be made by the formula:

$$S=\frac{P(1.3D^2+0.4d^2)}{D^2-d^2}$$

where

S = wall stress in pounds per square inch;
P = 750 pounds per square inch (minimum test pressure);
D = outside diameter in inches;
d = inside diameter in inches.

Either D or d must be calculated from the relation $D=d+2t$, where t = minimum wall thickness.

(2) Cylinders with wall thickness less than 0.100 inch, the ratio of straight side wall length to outside diameter shall not exceed 3.5.

(3) For cylinders having outside diameter over 5 inches, the minimum wall thickness shall be 0.087 inch.

§ 78.60–11 *Heat-treatment.* (a) Each cylinder must be uniformly and properly heat treated, prior to tests, by any suitable method in excess of 1100° F. Heat treatment must be accomplished after all forming and welding operations, except that when brazed joints are used, heat treatment must follow any forming and welding operations but may be done before, during, or after the brazing operations. Liquid quenching not authorized.

§ 78.60–12 *Openings.* (a) Standard taper pipe threads required; length not less than as specified for American Standard pipe threads; tapped to gauge; clean cut, even, and without checks.

§ 78.60–13 *Safety devices and protection for valves, safety devices, and other connections.* (a) If applied must be as required by the Interstate Commerce Commission's regulations that apply. (See §§ 73.34 (f) and 73.301 (i) of this chapter.)

§ 78.60–14 *Hydrostatic test.* (a) By water jacket, or other suitable method, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to occuracy either of 1 percent or 0.1 cubic centimeter.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat treatment and previous to the official test must not exceed 90 percent of the test pressure nor be within 100 pounds thereof.

(c) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

(d) One cylinder out of each lot of 200 or less must be hydrostatically tested to at least 750 pounds per square inch. Cylinders not so tested must be examined under pressure of between 500 and 600 pounds per square inch and show no defect. If hydrostatically tested cylinder fails, each cylinder in the lot may be hydrostatically tested and those passing are acceptable.

§ 78.60–15 *Leakage test.* (a) By interior air or gas pressure not less than the service pressure; leakers must be rejected. Required only for cylinders with bottoms closed in by spinning.

§ 78.60–16 *Physical test.* (a) Required on 2 specimens cut longitudinally from 1 cylinder or part thereof taken at random out of each lot of 200 or less, after heat treatment.

(b) Specimens must be: Gauge length 8" with width not over 1½"; or, gauge length 2" with width not over 1½": *Provided,* That gauge length at least 24 times thickness with width not over 6 times thickness is authorized when cylinder wall is not over 3/16" thick.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8–42.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined from the 0.2 offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed ⅛ inch per minute during yield strength determination.

§ 78.60–17 *Elongation.* (a) Physical test specimens must show at least 40 percent for 2 inch gauge length or at least 20 percent in other cases, except that these elongation percentages may be reduced numerically by 2 for 2 inch specimens and 1 in other cases for each 7,500 pounds per square inch increment of tensile strength above 50,000 pounds per square inch to a maximum of four such increments.

§ 78.60–18 *Weld tests.* (a) Specimens taken across the circumferentially welded seam must be cut from one cylinder taken at random from each lot of 200 or less cylinders after heat treatment and must pass satisfactorily the following tests:

(1) *Tensile test.* One specimen for tensile test without preparation other than finishing the edges parallel for a distance of approximately 2 inches on each side of the circumferential welded seam must be fractured in tension. The breaking stress calculated on the parent metal area must be at least equal to two (2) times the stress as calculated under the requirement of § 78.60–10 (a) (1) of this specification. Should this specimen fail to meet the requirements, one specimen may be taken from each of two additional cylinders from the same lot and tested. If either of these two specimens fails to meet the requirements, the entire lot represented shall be rejected.

(2) *Guided bend test.* One bend test specimen shall be cut from the cylinder used for the tensile test required in subparagraph (1) of this paragraph. Specimen shall be taken across the circumferential welded seam, shall be 1½ inches wide; edges shall be parallel and rounded with a file and "back-up" strip, if used, shall be removed by machining. The specimen shall be bent to refusal in the guided bend test jig illustrated in § 78.60–25. The root of the weld (inside surface of the cylinder), shall be located away from the ram of the jig. No specimen shall show a crack or other opening exceeding ⅛ inch in any direction upon completion of the test. Should this specimen fail to meet the requirements, one specimen from each of two additional cylinders may be taken from the same lot and tested. If either of the latter two specimens fail to meet the requirements, the entire lot shall be rejected.

(3) *Alternate guided-bend test.* An alternate guided-bend test jig, as illustrated in § 78.60–26, may be used for testing the soundness of fillet welded lap joints. The test specimen shall be bent across the weld as illustrated in sketch A or B until the elongation at the outer surface, adjacent to the root of the weld, between the lightly scribed gauge lines—a to b, shall be at least 20 percent; except that this percentage may be reduced for steels having a tensile strength in excess of 50,000 pounds per square inch, as provided in § 78.60–7 (a). No tested specimen shall show a crack, or other defect, as specified in subparagraph (2) of this section. The gauge lines shall be lightly scribed before bending. The amount of elongation (sketches A and B) may be conveniently determined with a Brinell microscope, or any other suitable method may be employed.

§ 78.60–19 *Rejected cylinders.* (a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding is authorized.

§ 78.60–20 *Porous filling.* (a) Cylinders must be completely filled with an approved porous material, uniform in quality, thoroughly dry, free from voids, and of such structure as to make impossible any disintegration or sagging when wet with solvent. Filling material must have been tested with satisfactory results under supervision of the Bureau of Explosives.

(b) Porosity of filling to be 80 percent or less except that filling with a porosity in excess of 80 percent but not in excess of 92 percent, may be used when tested with satisfactory results under the supervision of the Bureau of Explosives. When the porous mass has a porosity in excess of 80 percent but not in excess of 83 percent, the pores shall be uniform and shall not be visible at a magnification of 200 diameters. When the porous mass has a porosity in excess of 83 percent but not in excess of 92 percent, the pores shall be uniform and shall not be visible at a magnification of 500 diameters. A cylinder taken at random from a lot of 200 or less must be tested for porosity providing the porosity of each cylinder is not known. Should test cylinders fail, test of each cylinder of the lot is authorized, cylinders passing the test to be acceptable.

(c) For filling that is molded and dried before insertion in cylinders, porosity test may be made on sample block taken at random from material to be used.

(d) The porosity of the filling material shall be determined; the amount of solvent at 70° F. for a cylinder:

(1) Having shell volumetric capacity above 20 pounds water capacity (nominal), shall not exceed the following:

Percent porosity of filler:	*Maximum acetone solvent percent shell capacity by volume*
90 to 92	43.4
83 to 90	40.0
80 to 83	38.6
75 to 80	36.2
70 to 75	33.8
65 to 70	31.4

(2) Having volumetric capacity of 20 pounds or less water capacity (nominal), shall not exceed the following:

Percent porosity of filler:	*Maximum acetone solvent percent shell capacity by volume*
90 to 92	41.8
83 to 90	38.5
80 to 83	37.1
75 to 80	34.8
70 to 75	32.5
65 to 70	30.2

§ 78.60–21 *Tare weight.* (a) Tare weight here referred to shall be the combined weight of cylinder proper, porous filling, valve, and solvent, but without removable cap.

§ 78.60–22 *Marking.* (a) Marking on each cylinder as follows:

(1) ICC–8AL.

(2) A serial number and an indentifying symbol (letters) grouped [1] above or below the ICC mark. The symbol and numbers must be those of purchaser or user. The symbol must be registered with the Bureau of Explosives; duplications unauthorized.

(3) Date of test (such as 5–50 for May 1950) so placed that dates of subsequent tests can be easily added.

(4) Tare weight of cylinder in pounds and ounces.

(5) Cylinders, not completed, when delivered must each be marked for identification of each lot of 200 or less.

(b) Markings shall be stamped plainly and permanently in locations in accordance with the following:

(1) On shoulders and top heads not less than 0.087 inch thick, or

(2) On neck, valve boss, valve protection sleeve, or similar part permanently attached to the top end of cylinder, or

(3) On a plate of ferrous material attached to the top of the cylinder or permanent part thereof; the plate must be at least 1/16 inch thick, and must be attached by welding, or by brazing at a temperature of at least 1,100° F. throughout all edges of the plate. Sufficient space must be left on the plate to provide for stamping at least four (4) retest dates.

§ 78.60–23 *Size of marks.* (a) At least ⅛" high for cylinders less than 4" inside diameter and at least ¼" high for larger cylinders.

§ 78.60–24 *Inspector's report.* (a) Report to cover manufacture of acetylene shells; required to be clear, legible, and in the following form:

(Place) _____
(Date) _____

Acetylene shells

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size ____ inches outside diameter by ____ inches long.
Marks stamped into the shoulder of the cylinder are:
Lot number _____
Other marks (if any) _____

These cylinders were made by process of _____
_____
_____
The _____ permitted in
(neckrings, footrings, etc.)
§ 78.60–9 were attached by process of _____
_____
(welding—brazing)

The material used was identified by the following _____ numbers _____
(heat-purchase order)

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____
(were—were not)
marked on the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured and the minimum thickness noted was ____ inch. The outside diameter was determined by a close approximation to be ____ inches. The wall stress was calculated to be ____ pounds

[1] Variation in location authorized only when necessitated by lack of space.
Example:

ICC–8AL
1234
XY

per square inch under an internal pressure of ____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in specification No. ICC–8AL were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 8AL except as follows:

Exceptions: _____

_____

_____

(Signed) _____

Inspector.

(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF STEEL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Test No.	Heat No.	Check analysis No.	Cylinders represented (serial Nos.)	Chemical analysis										
				C	P	S	Si	Mn	Ni	Cr	Mo	Cu	Al	Zr

Steel was manufactured by _____ Company.
The originals of the certified mill test reports are in the files of the manufacturer.

NOTE: Any omission of analysis by heats, if authorized, must be accounted for by notation hereon reading, "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

The analyses were made by _____

(Signed) _____

(Place) _____
(Date) _____

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Test No.	Cylinders represented by test (serial Nos.)	Yield strength (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Weld tensile test	Weld bend test

(Signed) _____

(Place) _____
(Date) _____

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Serial Nos. of cylinders tested arranged numerically	Actual test pressure (pounds per square inch)	Total expansion (cubic centimeters) [1]	Permanent expansion (cubic centimeters) [1]	Percent ratio of permanent expansion to total expansion [1]	Volumetric capacity [2]

NOTE: When specification requires test for only 1 out of each lot of 200 or less cylinders, the check on the others must be indicated by a notation hereon reading, "Each cylinder was subjected to a pressure of _____ pounds per square inch and showed no defect."

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

[2] Report approximate maximum and minimum volumetric capacity for the lot.

(Signed) _____

(b) Inspector's report to cover completed manufacture of acetylene cylinders; required to be clear and legible and in the following form:

(Place) _____
(Date) _____

Final Report: For completed steel cylinders with approved porous filling for acetylene.

Manufactured for _____
Location at _____
Steel shells manufactured by _____
Location at _____
Cylinders completed by _____
Location at _____
Consigned to _____
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long.
Marks are stamped into _____
(show location)
as follows:
Specification ICC–8AL
Serial numbers _____ to _____ inclusive.
Identifying symbol (registered) _____
Inspector's mark (if applied) _____
Test date _____
Other marks (if any) _____

Application of prescribed marks, as reported above, and location thereof were verified.

Each cylinder was filled with porous filling material consisting of _____ in the form of _____

The porosity of the filling is between ____ and _____ percent as determined by tests made by the _____ company whose report has been found satisfactory and is on file.

The tare weight of each cylinder was determined and a record thereof is attached hereto.

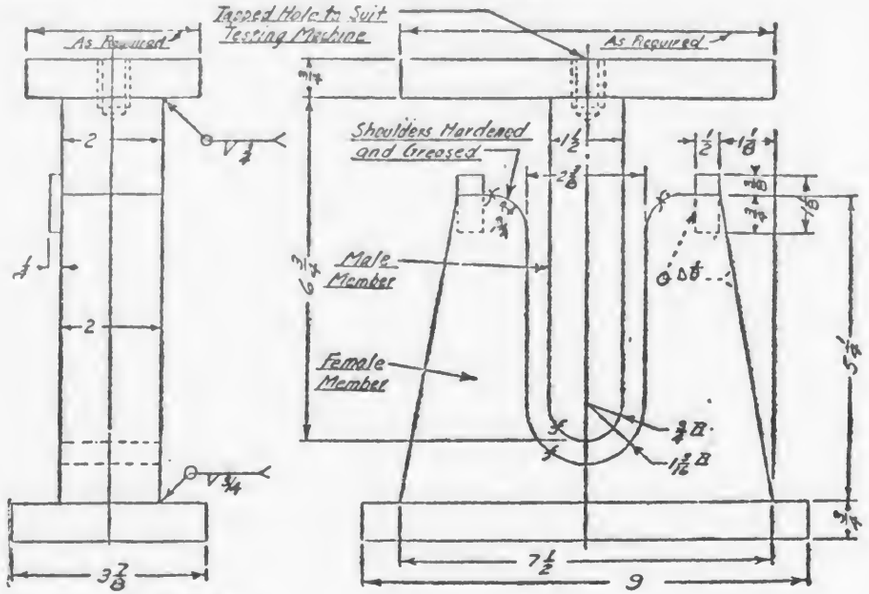
Each cylinder has been equipped with safety devices _____

A certified report of manufacture and test of the steel shells is attached hereto.

I hereby certify that, subject to the acceptability of the reports covering the steel shells, all of these cylinders proved satisfactory in every way and comply with the requirements of the Interstate Commerce Commission specification No. 8AL.

Signed _____
(Inspector)

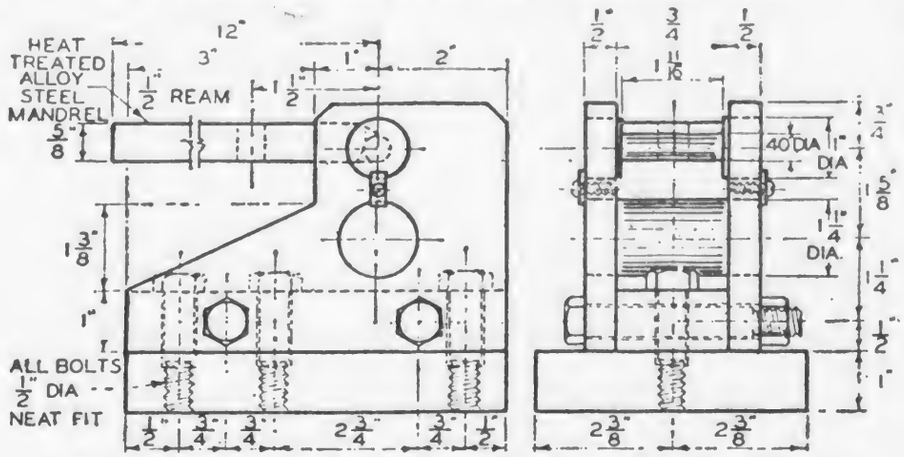
§ 78.60–25 *Guided bend test jig.* (a) Dimensions as follows:



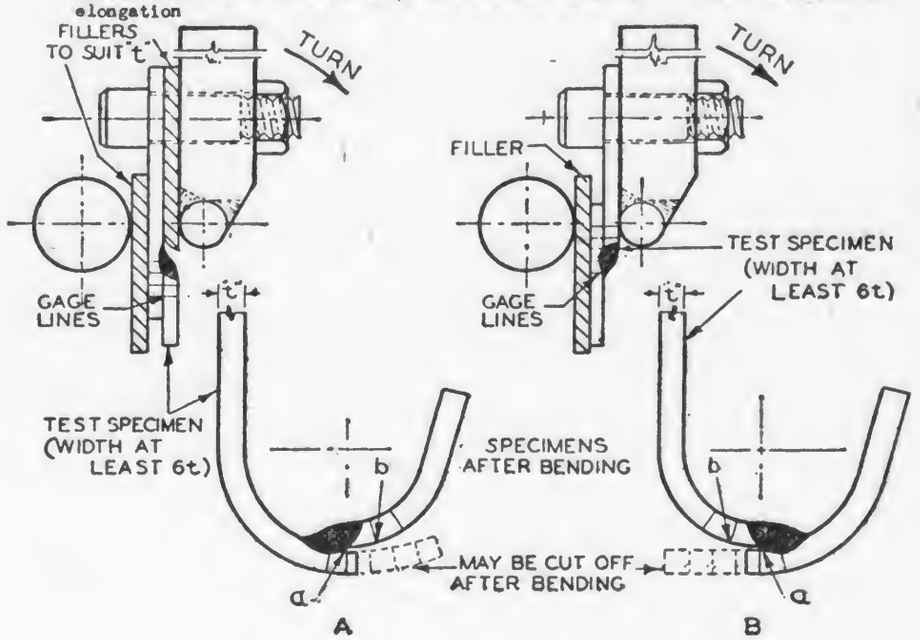
Jig Complies with A.S.M.E. Code for Unfired Pressure Vessels, 1940 Edition

NOTE: Dimensions shown for die and plunger are for ⅜" thick material only. The following dimensions shall be used for other thicknesses. Thickness of plunger member = 4 × thickness of test specimen. Radius of plunger member = 2 × thickness of test specimen. Width of opening, die member = 6 × thickness of test specimen + ⅛". Radius of die member = 3 × thickness of test specimen + 1/16".

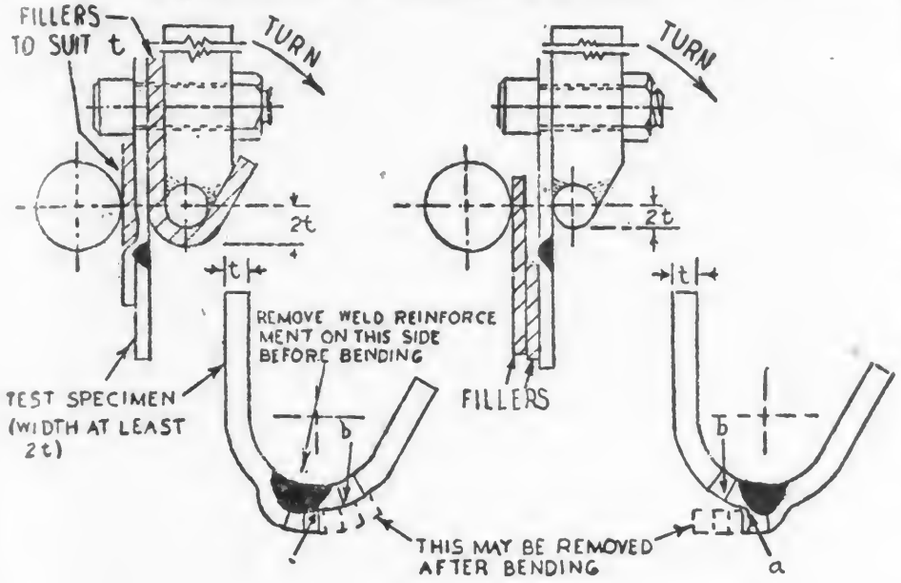
§ 78.60–26 *Alternate guided bend test jig.* (a) Dimensions as follows:



Dimensions shown are suitable for bending lap-weld specimens of .05" to .133" material thickness. A piece of 2" pipe may be slipped over the mandrel for turning. For any specimen thickness, fillers of appropriate thickness shall be added to one or both sides of the specimen as shown to obtain the required elongation



(b) *Alternate guided bend test jig.* Dimensions as follows:



C D

§ 78.63 *Specification 9; Inside containers, seamless or welded or brazed steel cylinders.*

§ 78.63–1 *Compliance.* (a) Required in all details.

§ 78.63–2 *Type, size, and service pressure*—(a) *Type and size.* Must be seamless, welded, or brazed (brazing material must have a melting point of not less than 1,000° F.). The maximum water capacity of containers in this class shall not exceed 86 cubic inches. Longitudinal seams are prohibited, except that containers constructed from longitudinally welded steel tubing are authorized: *Provided,* That certification is made by the tubing manufacturer that the tubing has been pressure tested to a fiber stress of 24,000 pounds per square inch as calculated by the formula

$$P=\frac{24000\ (D^2-d^2)}{(1.3D^2+0.4d^2)}$$

where

P is the pressure required for pressure testing of tubing by the tubing manufacturer.

(b) *Service pressure.* Service pressure must be 200 pounds per square inch.

§ 78.63–3 *Inspection by whom and where.* (a) By competent inspector; chemical analyses and tests, as specified, to be made within limits of the United States. Interested inspectors are authorized.

§ 78.63–4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements.

(b) Verify compliance with the requirements of § 78.63–5 of this specification by submitting copy of certified chemical analysis obtained from the steel manufacturer for each heat of steel (ladle analysis acceptable); or if such evidence is lacking, then a sample from each coil or sheet must be analyzed and results submitted.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; select samples for all tests and for check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity (see report form) and minimum thickness of wall noted.

(d) Render complete report (see § 78.63–19) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.63–5 *Steel.* (a) Open-hearth or electric steel of uniform quality. Content percent for the following not over: Carbon, 0.150; phosphorus, 0.045; sulphur, 0.055.

§ 78.63–6 *Identification of material.* (a) Required; any suitable method.

§ 78.63–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.63–8 *Manufacture.* (a) By proper appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Seams must be made as follows:

(1) Circumferential seams. Except as provided in subparagraph (2) of this paragraph by welding or by brazing. Heads attached by brazing must have a driving fit with the shell, unless the shell is crimped, swedged, or curled over the skirt or flange of the head, and be thoroughly brazed until complete penetration by the brazing material of the brazed joint is secured. Depth of brazing from end of shell must be at least four times the thickness of shell metal.

(2) A container made of two hemispherical heads, each having an integral tangential cylindrical skirt portion assembled so that the two cylindrical skirt portions telescope one within the other is authorized but must meet the following additional requirements for the skirt portions; one be a driving fit within the other; they be of equal length and telescoped for their full length; the length of the overlap be not less than 8 nor more than 10 times the thickness of the thinner of the two skirts; the overlapping joint be brazed (not welded) so as to get complete penetration for the full length of the joint.

§ 78.63–9 *Wall thickness.* (a) The wall stress at 600 pounds per square inch shall not exceed 24,000 pounds per square inch, except that for longitudinally welded steel tubing the stress shall not exceed 20,400 pounds per square inch. The minimum wall for any cylinder shall be 0.040 inch. For the container authorized in § 78.63–8 (a) (2) the wall thickness of the cylinder shall be taken as the sum of the thickness of the two skirts (without allowance for the brazing material between).

(b) Calculation must be made by the formula:

$$S=\frac{600\ (1.3D^2+0.4d^2)}{D^2-d^2}$$

where

S = wall stress in pounds per square inch;
D = outside diameter in inches;
d = inside diameter in inches.

(c) Calculation for thickness of hemispherical heads of containers authorized in § 78.63–8 (a) (2) must be made by the formula:

$$S=\frac{600D}{4tC}$$

where

t = thickness in inches;
C = 0.85 (design factor);
S and D have same significance as in paragraph (b) of this section. The minimum thickness of head or skirt shall be 0.040 inch. The thickness of the skirt shall be not less than the thickness of the head.

§ 78.63–10 *Heat treatment.* (a) Body and heads must be uniformly and properly heat treated prior to tests.

§ 78.63–11 *Openings in cylinders.* (a) Each opening in cylinders, except those for safety devices, must be provided with a fitting, boss, or pad, securely attached to cylinder by brazing or by welding or by threads. If threads are used, they must comply with the following:

(1) Threads must be clean cut, even, without checks, and tapped to gauge.

(2) Taper threads to be of length not less than as specified for American Standard taper pipe threads.

(3) Straight threads, having at least 4 engaged threads, to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

(b) Closure of fitting, boss, or pad must be adequate to prevent leakage.

§ 78.63–12 *Safety devices.* (a) Devices must be as required by the Interstate Commerce Commission's regulations that apply. (See §§ 73.34 (f) and 73.301 (i) of this chapter.)

§ 78.63–13 *Pressure tests.* (a) Each cylinder produced shall be tested at an internal pressure [1] of at least 400 pounds per square inch and not exceeding 600

[1] Warning: Where air or gas pressure is used for testing, means designed to protect personnel is recommended.

pounds per square inch, held for at least 30 seconds, and shall show no leak or other defects when inspected by suitable means.

(b) One out of each 1,000 cylinders or less successively produced shall be hydrostatically tested to destruction and must not burst below 1,200 pounds per square inch. Each such 1,000 cylinders or less successively produced shall constitute a lot and if the test cylinder shall fail, then the entire lot must be rejected. All cylinders constituting a lot shall be of identical size, design, construction, heat treatment, finish and quality.

§ 78.63–14 *Flattening test.* (a) Between knife edges, wedge shaped, 60° angle, rounded to ½ inch radius; test 1 cylinder taken at random out of each lot of 1,000 or less, after pressure test. This flattening test is required and the test cylinder shall not have cracked when the outer surfaces of the walls are apart not more than a distance of 6 times the thickness of such walls.

§ 78.63–15 *Rejected cylinders.* (a) Reheat treatment authorized for lots failing to meet the requirements of § 78.63–14; such lots of cylinders after this treatment must pass all prescribed tests.

§ 78.63–16 *Repair of brazed and welded seams.* (a) Only repair of brazed seams by brazing and welded seams by welding is authorized, provided such cylinders are retested and pass the tests prescribed in § 78.63–13.

§ 78.63–17 *Marking.* (a) Marking on each cylinder, by embossing plainly and permanently on valve end of cylinder before heat-treatment the marks ICC–9 and registered symbol of manufacturer.

(1) Other marks as prescribed in subparagraph (3) of this paragraph must be shown on a permanently attached name plate or by printing or decalcomania, provided that such markings are waterproofed and adherent and not easily impaired when subjected to water immersion and weathering under service conditions, or are coated with a water-insoluble transparent lacquer; except that, cylinders having brazed lapped circumferential seam may, after having been tested in accordance with §§ 78.63–13 and 78.63–14 of this specification, have marks permanently stamped into metal of this seam, provided that such marks do not exceed (0.015") fifteen thousandths of an inch in depth.

(2) Such marks must be maintained in a legible condition and if at any time the cylinder is returned for refilling and such marks are illegible, then the cylinder must not be returned to service until it has been retested as prescribed in § 78.63–13 (a) and new test date applied.

(3) Inspector's official mark; lot number; date of test (such as 5–50 for May 1950), so placed that dates of subsequent tests can be easily added.

§ 78.63–18 *Size of embossed marks.* (a) At least ¼ inch high.

§ 78.63–19 *Inspector's reports.* (a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Steel gas cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size _____ inches outside diameter by _____ inches long
Identification marks on cylinder are:
Specification ICC–9.
Lot number _____
Identifying symbols (registered) _____
Test date _____
These cylinders were made by process of _____

_____

The steel used was identified by heat or analysis numbers as shown on the "Record of Chemical Analysis of Steel for Cylinders" attached hereto.

The steel used was verified as to chemical analysis and record thereof is attached hereto.

All material was inspected and each cylinder was inspected both before and after closing; all accepted material and cylinders were found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment were supervised and found to be efficient and satisfactory.

A test cylinder of each lot was measured and had a minimum wall thickness and volumetric capacity as shown in table below.

Date of test	Lot No.	Number in lot	Minimum wall thickness (inches)	Volumetric capacity (cubic inches)

Each and every cylinder was properly tapped; the threads were inspected and found to be clean cut, of proper length, and correct as to gauge.

One finished cylinder out of each lot was taken at random and burst by interior hydrostatic pressure with the following results:

Date of test	Lot No.	Pressure at which cylinder ruptured (pounds per square inch)

Each and every cylinder was subjected to an interior pressure of ___ pounds per square inch and showed no leak or other defect.

Hydrostatic tests, pressure tests, flattening tests, and other tests, as perscribed in specification No. ICC–9 were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with requirements of Interstate Commerce Commission's specification No. 9 except as follows:

Exceptions: _____

_____

_____

(Signed) _____
Inspector.

RECORD OF CHEMICAL ANALYSIS OF STEEL FOR CYLINDERS

Size ____ inches outside diameter by _____ inches long.
Made by _____ Company
For _____ Company

Lot No.	Number in lot	Heat No.	Check analysis No.	Chemical analysis		
				C	P	S

The analyses were made by _____
(Signed) _____
Inspector.

§ 78.66 *Specification 40; inside containers, non-refillable seamless or welded or brazed steel cylinders.*

§ 78.66–1 *Compliance.* (a) Required in all details.

§ 78.66–2 *Type, size, and service pressure*—(a) *Type and size.* Must be seamless, welded, or brazed (brazing material must have a melting point of not less than 1000° F.). The maximum water capacity of cylinders in this class shall not exceed 1.44 pounds or 40 cubic inches. Longitudinal seams are prohibited, except that containers constructed from longitudinally welded steel tubing are authorized provided that certification is made by the tubing manufacturer that the tubing has been pressure tested to a fiber stress of 24,000 pounds per square inch as calculated by the formula:

$$P = \frac{24000\ (D^2 - d^2)}{(1.3D^2 + 0.4d^2)}$$

where

P is the pressure required for pressure testing of tubing by the tubing manufacturer.

(b) *Service pressure.* Service pressure must be 200 pounds per square inch.

§ 78.66–3 *Inspection by whom and where.* (a) By competent inspector of the manufacturer; or a disinterested inspection agency, chemical analysis and tests, as specified, to be made within limits of the United States.

§ 78.66–4 *Duties of inspector.* (a) Inspect all material and reject any not complying with requirements.

(b) Verify compliance with the requirements of § 78.66–5 of this specification by submitting copy of certified chemical analysis obtained from the steel manufacturer for each heat of steel (ladle analysis acceptable); or if such evidence is lacking, then a sample from each coil or sheet must be analyzed and results submitted.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; select samples for all tests and for check chemical analyses; witness all tests; verify threads by gauge; report volumetric capacity (see report form) and minimum thickness of wall noted.

(d) Render complete report (§ 78.66–19) to purchaser, cylinder maker, and the Bureau of Explosives.

§ 78.66–5 *Steel.* (a) Open-hearth or electric steel of uniform quality. Con-

tent percent for the following not over: Carbon, 0.150; phosphorus, 0.045; sulphur, 0.055.

§ 78.66–6 *Identification of material.* (a) Required; any suitable method.

§ 78.66–7 *Defects.* (a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

§ 78.66–8 *Manufacture.* (a) By proper appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. Seams must be as follows:

(1) Circumferential seams. Except as provided in subparagraph (2) of this paragraph by welding or by brazing. Heads attached by brazing must have a driving fit with the shell, unless the shell is crimped, swedged, or curled over the skirt or flange of the head, and be thoroughly brazed until complete penetration by the brazing material of the brazed joint is secured. Depth of brazing from end of shell must be at least four times the thickness of shell metal.

(2) A container of two hemispherical heads, each having an integral tangential cylindrical skirt portion assembled so that the two cylindrical skirt portions telescope one within the other is authorized but must meet the following additional requirements for the skirt portions; one be a driving fit within the other; they be of equal length and telescoped for their full length; the length of the overlap be not less than 8 nor more than 10 times the thickness of the thinner of the two skirts; the overlapping joint be brazed (not welded) so as to get complete penetration for the full length of the joint.

§ 78.66–9 *Wall thickness.* (a) The wall stress at 600 pounds per square inch shall not exceed 24,000 pounds per square inch, except that for longitudinally welded steel tubing the stress shall not exceed 20,400 pounds per square inch. The minimum wall for any cylinder shall be 0.032 inch. For the container authorized in § 78.66–8 (a) (2) the wall thickness of the cylinder shall be taken as the sum of the thicknesses of the two skirts (without allowance for the brazing material between).

(b) Calculation must be made by the formula:

$$S=\frac{600\ (1.3D^2+0.4d^2)}{D^2-d^2}$$

where

S = wall stress in pounds per square inch;
D = outside diameter in inches;
d = inside diameter in inches.

(c) Calculation for thickness of hemispherical heads of containers authorized in § 78.66–8 (a) (2) must be made by the formula:

$$S=\frac{600D}{4tC}$$

where

t = thickness in inches;
C = 0.85 (design factor);
S and D have same significance as in paragraph (b) of this section. The minimum thickness of the head or skirt shall be 0.032 inch. The thickness of the skirt shall not be less than the [illegible] of the head.

No [illegible]—52

§ 78.66–10 *Heat treatment.* (a) Body and heads must be uniformly and properly heat treated prior to tests.

§ 78.66–11 *Openings in cylinders.* (a) Each opening in cylinder, except those for safety devices, must be provided with a fitting, boss, or pad, securely attached to cylinder by brazing or by welding or by threads. If threads are used, they must comply with the following:

(1) Threads must be clean cut, even, without checks, and tapped to gauge.

(2) Taper threads to be of length not less than as specified for American Standard taper pipe threads.

(3) Straight threads, having at least 4 engaged threads, to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder; gaskets required, adequate to prevent leakage.

(b) Closure of fitting, boss, or pad, must be adequate to prevent leakage.

§ 78.66–12 *Safety devices.* (a) Devices must be as required by the Interstate Commerce Commission's regulations that apply. (See §§ 73.34 (f) and 73.301 (i) of this chapter.)

§ 78.66–13 *Pressure tests.* (a) Each cylinder produced shall be tested at an internal pressure [1] of at least 200 pounds per square inch and not exceeding 600 pounds per square inch, held for at least 30 seconds, and shall show no leak or other defect when inspected by suitable means.

(b) One out of each 3,000 cylinders or less successively produced per day shall be hydrostatically tested to destruction and must not burst below 1,200 pounds per square inch. Each such 3,000 cylinders or less successively produced per day shall constitute a lot and if the test cylinder shall fail, then the entire lot must be rejected. All cylinders constituting a lot shall be of identical size, design, construction, heat treatment, finish and quality.

§ 78.66–14 *Flattening test.* (a) Between knife edges, wedge shaped, 60° angle, rounded to ½ inch radius; test 1 cylinder taken at random out of each lot of 3,000 or less successively produced per day, after pressure test. This flattening test is required and the test cylinder shall not have cracked when the outer surfaces of the walls are apart not more than a distance of 6 times the thickness of such walls.

§ 78.66–15 *Rejected cylinders.* (a) Reheat treatment authorized for lots failing to meet the requirements of § 78.66–14; such lots of cylinders after this treatment must pass all prescribed tests.

§ 78.66–16 *Repair of brazed and welded seams.* (a) Only repair of brazed seams by brazing and welded seams by welding is authorized, provided such cylinders are retested and pass the tests prescribed in § 78.66–13 (a).

§ 78.66–17 *Marking.* (a) Marking on each cylinder by embossing plainly and permanently on valve end of cylinder before heat-treatment, the marks ICC–40 and registered symbol of manufacture.

(1) Other marks as prescribed in subparagraph (2) of this paragraph, must be shown on a permanently attached name plate or by printing or decalcomania, provided that such markings are waterproofed and adherent and not easily impaired when subject to water immersion and weathering under service conditions, or are coated over with a water-insoluble transparent lacquer; except that cylinders having brazed lapped circumferential seam may, after having been tested in accordance with §§ 78.66–13 and 78.66–14 of this specification, have marks permanently stamped into metal of this seam, provided that such marks do not exceed 0.015" in depth.

(2) Inspector's official mark; lot number; date of test (such as 5–50 for May 1950); the words "Illegal to refill and transport".

§ 78.66–18 *Size of embossed marks.* (a) At least ¼ inch high.

§ 78.66–19 *Inspector's reports.* (a) Required to be clear, legible, and in following form:

(Place) _____
(Date) _____

Steel Gas Cylinders

Manufactured for _____ Company
Location at _____
Manufactured by _____ Company
Location at _____
Consigned to _____ Company
Location at _____
Quantity _____
Size ____ inches outside diameter by ____ inches long.
Identification marks embossed on cylinders are:
Specification ICC–40.
Identifying symbols (registered) _____
Other marks on cylinder are:
Inspector's official mark _____
Lot number _____
Test date _____
Illegal to refill and transport _____
These cylinders were made by process of
_____
_____
_____

The steel used was identified by heat or analysis numbers as shown on the "Record of Chemical Analysis of Steel for cylinders" attached hereto.

The steel used was verified as to chemical analysis and record thereof is attached hereto.

All material was inspected and each cylinder was inspected both before and after closing; all accepted material and cylinders were found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment were supervised and found to be efficient and satisfactory.

A test cylinder of each lot was measured and had a minimum wall thickness and volumetric capacity as shown in table below:

Date of test	Lot No.	Number in lot	Minimum wall thickness (inches)	Volumetric capacity (cubic inches or pounds of water)

[1] Warning: Where air or gas pressure is used for testing, means designed to protect personnel is recommended.

Such threads as were used were inspected and found to be clean cut, of proper length, and correct as to gauge.

One finished cylinder out of each lot was taken at random and burst by interior hydrostatic pressure with the following results:

Date of test	Lot No.	Pressure at which cylinder ruptured (pounds per square inch)

Each and every cylinder was subjected to an interior pressure of 200-pounds per square inch and showed no leak or other defect.

Hydrostatic tests, pressure tests, flattening tests, and other tests, as prescribed in Specification No. ICC–40 were made in the presence of the inspector and all material and cylinders were found to be in compliance with the requirements of that specification.

I hereby certify that all of these cylinders proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission's specification No. 40 except as follows:

Exceptions: _____

_____

_____

(Signed) _____

Inspector.

RECORD OF CHEMICAL ANALYSIS OF STEEL FOR CYLINDERS

Size _____ inches outside diameter by _____ inches long.

Made by _____ Company

For _____ Company

Lot No.	Number in lot	Heat No.	Check analysis No.	Chemical analysis		
				C	P	S

The analyses were made by _____

(Signed) _____

Inspector.

APPENDIX A—SPECIAL ORDERS (USE OF EXISTING CONTAINERS AUTHORIZED, BUT NEW CONSTRUCTION NOT AUTHORIZED)

Order approved December 28, 1939, in No. 3666, authorizing trial transportation of commercial butane (liquefied petroleum gas) on freight vessels in portable fusion-welded tanks of special design, between ports of the United States and points located in Puerto Rico and Virgin Islands, amended by order August 16, 1940, also order March 29, 1940, authorizing trial transportation of commercial butane (liquefied petroleum gas) in such tanks to Cristobal and Balboa, Canal Zone, and Colon and Panama City, Republic of Panama. Pertinent sections of regulations amended accordingly. Stowage canceled by regulations of Secretary of Commerce effective April 9, 1941. Authority noted in § 73.32 (d) of this chapter, covers tanks as follows:

Specification for design, construction, and use of portable tank container for trial service in the transportation of butane on deck in the open freight vessels of common carriers by water engaged in interstate or foreign commerce.

1. *Application.* (a) This specification applies to containers for transportation of butane on freight vessels only.

(b) When reference is made to "gas" in this specification it refers to "butane" in either liquid or gaseous state. The terms "tanks" and "containers" are used interchangeably.

2. *Design, working pressure, and classification of containers.* (a) Containers shall be designed and classified as follows:

Container type	For gases with vapor pressure not to exceed lbs. per sq. in., gauge, at 100° F.	Minimum design pressure of containers by—			
		A. S. M. E. Code, safety factor 5		A.P.I.–A.S.M.E. Code, safety factor 4	
		Lb.	*gauge*	*Lb.*	*gauge*
No. 125	*125	125		156	
No. 150	*150	150		187	
No. 175	*175	175		219	
No. 200	*200	200		250	

*In no event may vapor pressure of butane filled into any tank exceed 80 pounds per square inch at 100° F.

(b) The shell or head thickness of any container shall not be less than 3/16 inch.

3. *Construction and tests of all containers and markings on containers* (a) Containers shall be constructed in accordance with the Unfired Pressure Vessel Code of the American Society of Mechanical Engineers, or in accordance with the API-ASME Code; except that compliance with the following shall not be required; paragraphs U-2 to U-10, inclusive, and U-19 of the aforesaid ASME Code; paragraphs W-601 to W-606 inclusive, and section (1) and appendix to section (1) of the aforesaid API-ASME Code.

(1) All fusion-welding under this specification shall be equal in quality, strength and continuing efficiency, and the method used in certifying fabricators shall insure equally efficient welding to that prescribed by the Commission in order dated November 13, 1935 (213 ICC 207), and exhibit containing specifications presented in that proceeding, for tank-car tanks to be used in the transportation of liquefied petroleum gas.

(b) All containers shall be tested at the time of manufacture in accordance with the requirements of the rules or code under which the vessels are manufactured.

(c) The water capacity shall be such that the total weight of any container, including contents and accessories, shall not exceed 8,000 pounds.

(d) A name plate shall be securely attached to each container, located adjacent to filling connections and in such manner as to be readily visible, and bearing the following information:

(1) Name and address of the assembler of the container and container accessories.

(2) The wording "This container shall not contain butane having a vapor pressure in excess of 80 pounds per square inch at 100 degrees F."

(3) Markings in increments of 20° F., indicating the maximum levels beyond which the container shall not be filled with liquid at temperatures between 20° F. and 130° F., except on containers provided with fixed maximum-level indicators, or replaceable containers which are gauged by weighing. This marking may be on the gauging device.

(e) Each container shall be permanently marked in accordance with the requirements of the code under which it was constructed, or with the stamp of the National Board of Boiler and Pressure Vessel Inspectors, and in addition shall have the following markings:

(1) The water capacity of the container in pounds or gallons, U. S. Standard.

(2) The working pressure in pounds per square inch for which the container is designed.

(3) The wall thickness of the shell and heads.

(f) All container inlets and outlets, except safety relief valves and gauging devices, shall be labeled to designate whether they communicate with vapor or liquid space.

(g) Each container must be subjected, at least once every five years, to the original hydrostatic and hammer test required by the code under which it was manufactured. A container must be condemned if it fails to pass such test. Each tank passing the test must be marked with the date (month and year) plainly and permanently stamped on the tank or name plate. For example: 1–29 for January 1929. Dates of previous tests must not be obliterated.

(h) All prescribed markings on tanks must be kept legible.

(i) Containers exposed to action of fire must not again be placed in service until they have been subjected to proper heat treatment, and retest as provided in section 8 (g).

4. *Filling pipe and discharge pipes.* (a) The discharge outlet shall be provided with a suitable automatic excess flow valve.

(b) Filling connections shall be provided with approved automatic valves to prevent back flow in case the filling connection is broken.

(c) All other connections to containers, except safety relief connections, shall be equipped with approved automatic excess flow valves. All excess flow and back pressure check valves shall be located inside of the container, or at a point outside where the line enters the container. In the latter case, installation shall be made in such manner that any undue strain beyond the excess flow or back pressure check valve will cause breakage on the discharge end of the excess flow or back pressure check valve, and not between container and such valve. Gauging devices which do not involve the flow of liquid, or which are so constructed that outward flow of container contents shall not exceed that passed by a No. 54 drill size, need not be equipped with excess flow valves.

NOTE 1: An excess flow valve is a valve so designed that it will automatically close and shut off the gas or liquid flow in case:

(1) The flow through the valve exceeds predetermined flow, which flow must be less than the pipe line capacity to and from such excess flow valve.

(2) The pressure on the inlet side of excess flow valve exceeds by a certain designed number of pounds per square inch the pressure in pounds on the outlet of such valve.

(d) All connections to containers except gauging device connections (see sec. 6 (a) hereof) and safety relief connections shall be provided with shut-off valves located as close to the container as practicable.

5. *Safety devices.* (a) Every container shall be provided with one or more safety relief valves of spring loaded or equivalent type arranged to afford free vent to the outer air and with discharge area sufficient to prevent the building up of pressure in excess of 120 percent of the maximum permitted setting of the relief valve on the container, and in accordance with the provisions of Appendix "A–1".

(b) Safety relief valves shall be set to start to discharge, with relation to the design working pressure of the container, as follows:

Container	Minimum	Maximum
	Percent	*Percent*
A. S. M. E.	100	125
A. P. I.—A. S. M. E.	80	100

(c) Safety relief valves shall be so arranged that tampering will be minimized and, if pressure setting or adjustment is external, the relief valves shall be provided with suitable means for sealing the adjustment mechanism. No shut-off valve shall be installed between the safety relief valve and the container.

(d) Each safety valve shall be plainly and permanently marked as follows:

(1) With the pressure in pounds per square inch, gauge, at which the valve is set to start to discharge and the actual free discharge area in square inches of the valve at its full open position; for example, 200–24.

6. *Gauging devices.* (a) Each container may be loaded by the weighing method, or by accurately determining liquid levels,

with compensation for temperature and for vapor above the liquid in which case it shall be equipped with an accurate liquid level gauging device of approved design, for example, a rotary tube, slip tube, automatic outage tank, magnetic, or fixed tube device, the latter consisting of a dip pipe of small size equipped with a valve at the outer end, and so arranged that the maximum liquid level to which the container may be filled is not in excess of the maximum permitted under the filling density table in Sec. 10 (a), but based on an initial liquid temperature of not to exceed 40° F.

(1) Gauging devices of the rotary tube, fixed tube, slip tube, and magnetic type may be used without installation of an excess flow valve, provided the bleed valve opening is not larger than a #54 drill size. If tanks are to be filled according to liquid level, each tank should have a thermometer well so that the internal liquid temperature can be easily determined and the amount of liquid and vapor in the tank corrected to a 60° F. basis.

(b) Gauging devices shall have a design working pressure of at least 250 lbs. per sq. in., gauge.

(c) Gauge glasses of the column type are prohibited.

7. *Fittings and accessories.* (a) All valves and connections shall be of a type approved as herein provided, suitable for use with liquefied petroleum gas and designed for not less than the maximum pressure to which they may be subjected.

(b) Valve seat material, packing gaskets, etc., shall be of such quality as not to be adversely affected by liquefied petroleum gases.

8. *Protection of valves, fittings, and accessories.* (a) Each container shall have all valves, fittings, accessories, safety devices, gauging devices, and the like suitably protected against mechanical damage by rings, covers, boxes, or hoods, rigidly attached to the containers. Such attachments shall comply with the provisions of the Code of rules under which the containers are constructed, and shall be designed (with a minimum factor of safety of four) to withstand loading in any direction equal to two times the weight of the container and attachments when filled to the maximum permissible loaded weight.

9. *Mountings for containers.* (a) Horizontal containers shall be designed and built with supports attached. The type of support popularly known as "skids" will be deemed to comply with this requirement.

(b) Containers may be permanently attached to the supports or may be removable, provided proper anchorage is assured to prevent jarring loose, slipping, or rotating of containers.

(c) Containers shall be secured in place on the supports by fastenings, designed (with a factor of safety of four) to withstand loadings in any direction equal to four times the filled weight of the container. Brackets, cradles, lifting lugs, or other attachments intended to carry loadings shall be in accordance with the Code under which the containers are constructed and shall be attached by the container manufacturer before testing.

(d) Lifting lugs, designed (with a safety factor of four) to withstand loadings in any direction equal to four times the filled weight of the container, shall be provided on the container or container support in a manner suitable for attaching lifting gear and hold-down devices.

10. *Filling densities.* (a) The "filling density" is defined as the percent ratio of the weight of the gas in a container to the weight of water the container will hold at 60° F. The filling density of containers shall not exceed the ratios following:

Specific gravity at 60° F.:	*Maximum permitted percent filling density*
0.369–0.398	82
0.399–0.425	83
0.426–0.440	84
0.441–0.452	85
0.453–0.462	86
0.463–0.472	87
0.473–0.480	88
0.481–0.488	89
0.489–0.495	40
0.496–0.503	41
0.504–0.510	42
0.511–0.519	43
0.520–0.527	44
0.528–0.536	45
0.537–0.544	46
0.545–0.552	47
0.553–0.560	48
0.561–0.568	49
0.569–0.576	50
0.577–0.584	51
0.585–0.592	52
0.593–0.600	53
0.601–0.608	54
0.609–0.617	55
0.618–0.620	56
0.627–0.634	57

(b) The liquid portion of the gas in a container shall not completely fill the container at 130° F.

11. *Odorizing the gas.* (a) In order that the danger of escaping combustible gas may be minimized and to facilitate the quick detection of gas leaks, butane transported in these containers shall be effectively odorized by an approved agent of such character as to positively indicate the presence of gas, down to concentrations in air of not over one-fifth the lower limit of combustibility, by a distinctive odor.

NOTE 1: The lower limit of combustibility of butane is 1.55. This figure represents volumetric percentage of a gas-air mixture.

12. *Painting and marking.* (a) Containers shall be painted a light heat-reflecting color and the paint shall be renewed as often as necessary to thoroughly protect all metal surfaces.

(b) Each container shall be plainly and conspicuously marked in red letters not less than four inches high with the words "FLAMMABLE GAS—KEEP FIRE AND LIGHTS AWAY."

(c) Each container shall be plainly and conspicuously marked "This Side Up" or "This End Up," as required.

APPENDIX A–1—REQUIRED SIZES OF SAFETY VALVES FOR BUTANE GAS TANKS AS CLASSIFIED UNDER SECTION 2

NOTE: D=outside diameter of tank in feet and fractions thereof; U=over-all length of tank in feet and fractions thereof.

	Type 80-lb. min.	Type 100-lb. min.	Minimum required safety valve actual free discharge area (sq. ins.)*			
			Type 125-lb. min.	Type 150-lb. min.	Type 175-lb. min.	Type 200-lb. min.
Where ($D \times U$) does not exceed 10	0.32	0.27	0.22	0.19	0.18	0.16
Is greater than 10 but not more than 15	.46	.38	.30	.25	.24	.21
Is greater than 15 but not more than 20	.60	.50	.42	.36	.33	.29
Is greater than 20 but not more than 40	1.25	1.03	.84	.71	.64	.57
Is greater than 40 but not more than 60	1.90	1.57	1.25	1.06	.94	.83
Is greater than 60 but not more than 80	2.50	2.06	1.68	1.43	1.25	1.10

*In no event may vapor pressure of butane filled into any tank exceed 80 pounds per square inch at 100° F.

Order approved March 29, 1940, in No. 3666, authorizing trial transportation of commercial butane (liquefied petroleum gas) on freight vessels in portable fusion-welded tanks of special design to Cristobal and Balboa, Canal Zone, and Colon and Panama City, Republic of Panama, amending order December 28, 1939, for trial transportation of commercial butane between ports of the United States and points located in Puerto Rico and Virgin Islands. Pertinent sections of regulations amended accordingly. Authority noted in § 73.32 (d) of this chapter. Stowage canceled by regulations of Secretary of Commerce effective April 9, 1941.

Order approved December 18, 1941, in No. 3666, authorizing trial transportation of liquefied petroleum gas in 5,000 cylinders of additional-type alloy steel construction. Pertinent sections of regulations amended accordingly. Authority noted in § 73.312 (a) (1) of this chapter covering specification 4B–240X cylinders, as follows:

SPECIFICATION 4B ALLOY STEEL CYLINDERS

22. *Additional type.* Cylinders without longitudinal welded seam when made for service pressure at least 150 pounds to not over 500 pounds per square inch are authorized when complying with this specification with exceptions and additional requirements as follows:

(a) Exceptions. (1) Yield point not over 75 percent of tensile strength is acceptable.

(2) Wall thickness is acceptable, subject to the additional requirement specified in par. 22 (b) (1), as follows:

Inside diameter of cylinders (ins.)	Minimum thickness* (in.)	Inside diameter of cylinders (ins.)	Minimum thickness* (in.)
13 or less	0.078	Over 14½ to 15	0.087
Over 13 to 14	.081	Over 15 to 16	.092
Over 14 to 14½	.084	Over 16	.100

*Excluding galvanizing or other protective coating.

(3) Elongation percentages as prescribed in § 78.50–17 (a) may be reduced by 2 percent for 2-inch specimens, and 1 percent in other cases, for each 7,500 pounds per square inch increment of tensile strength above 50,000 pounds per square inch up to the maximum of 80,000 pounds per square inch.

(b) *Additional requirements.* (1) Wall stress at test pressure, as calculated under § 78.50–10 (b), must not exceed 50 percent of the minimum tensile strength of the steel.

(2) Ratio of length of cylinder to its diameter must not exceed 3.5 when wall thickness is less than 0.10 inch.

(3) Each cylinder, except when brazed throughout, must be thermally stress relieved after all welding operations have been completed and prior to the hydrostatic test.

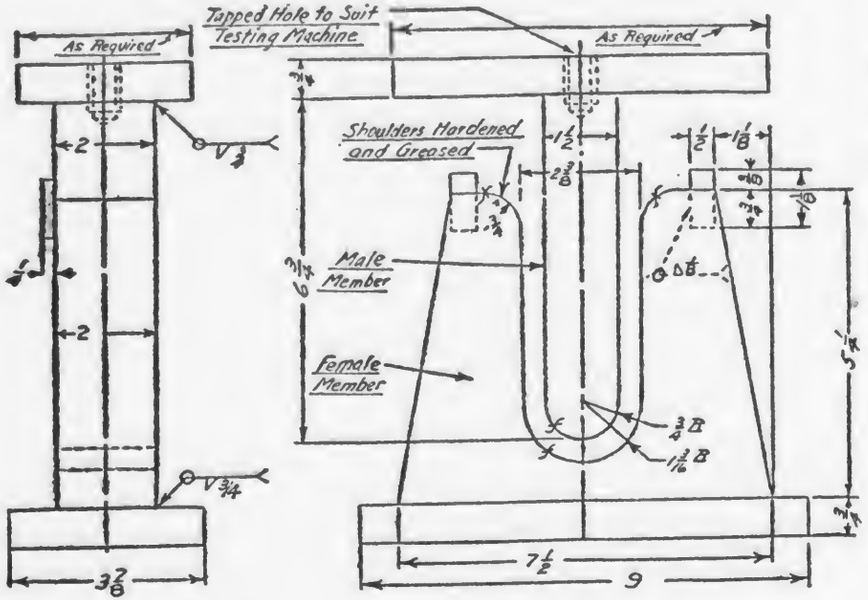
(4) Weld test specimens must be cut from one cylinder taken at random from each lot of 200 or less cylinders after stress relieving as prescribed and must pass satisfactorily the following tests:

(a) *Tensile test.* Without preparation other than finishing the edges parallel for a distance of approximately 2 inches on each side of the weld, the specimen must be frac-

tured in a tensile test; the unit breaking load must be at least equal to the minimum unit breaking load in the tensile tests made under the requirements of § 78.50–16.

(b) *Guided bent test.* A specimen 1½ inches wide, on which the edges have been machined parallel and rounded with a file, but without other preparation, shall be bent to refusal in the guided bent jig shown in drawing as an appendix attachment made part hereof. The root of the weld (inside surface of cylinder) shall be located away from the ram of the jig. Any specimen which shows a crack exceeding ⅛ inch in any direction upon completion of the test shall be considered unsatisfactory.

APPENDIX



Jig Complies with A.S.M.E. Code for Unfired Pressure Vessels. 1940 Edition

Guided Bend Test Jig

(5) All markings must be applied on a plate of ferrous material attached to the top end of the cylinder or permanent part thereof; sufficient space must be left on the plate to provide for stamping at least six retest dates; the plate must not be attached to the side wall of the cylinders; the plate must be at least 1/16 inch thick and it must be attached by welding, or by brazing at a temperature of at least 1400° F., throughout all edges of the plate; provided, that marks may be stamped into the metal of the valve boss or valve protecting sleeve or similar part permanently attached to the top end of the cylinder; provided further, that marks other than those prescribed in par. 19 may be stamped into the foot ring. Stamping of letters, figures or other marks into the metal of the cylinder for any purpose whatever, except as above authorized, is expressly prohibited.

(6) Reports of manufacture shall include percentage of each alloying element in the steel and shall state that the cylinders are made under the provisions of par. 22 of this specification.

(7) Carbon content of steel must not exceed 0.20 percent.

(c) Marking requirements of § 78.50–19 (a) (2) of specification No. 4 must be complied with. The marking of cylinders must be as follows:

L. C. C.—4 B—240 X

SUBPART D—SPECIFICATIONS FOR METAL BARRELS, DRUMS, KEGS, CASES, TRUNKS AND BOXES

§ 78.80 *Specification 5; steel barrels or drums.* Removable head containers which will pass all required tests are authorized.

§ 78.80–1 *Compliance.* (a) Required in all details.

§ 78.80–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.80–11 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.80–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.80–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½
19	1.750	3½
20	1.500	3½
22	1.250	3½

§ 78.80–5 *Seams.* (a) Body seams welded.

§ 78.80–6 *Chime reinforcement.* (a) Containers over 25 gallons capacity, with flanged head secured to body, to have chime reinforcement adequate for its protection.

§ 78.80–7 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
		Body sheet	Head sheet	Type [1]	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
5	Straight side	22	22	None		
10	do	20	20	do		
33	do	14	14	do		
33	do	18	18	U	16	
55	do	16	16	U	14	
110	do	14	14	U	12	
33	do	18	18	I-bar	¾ x 1¼	1.25
55	do	16	16	do	¾ x 1¼	1.25
110	do	14	14	do	¾ x 1¼	1.25
33	do	16	16	[2]		
55	do	14	14	[2]		
33	Bilge	14	16	None		
55	do	13	14	do		

[1] Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.
[2] Rolled or swedged in.

§ 78.80–8 *Rolling hoops.* (a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 78.80–9 *Closures.* (a) Adequate to prevent leakage; gaskets required.

(b) Closing part (plug, cap, plate, etc., see Note 1.) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 3 or more complete threads; two drainage holes of not over

5/16-inch diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 3 threads when screwed home with gasket in place.

§ 78.80–10 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.80–11 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–5. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

§ 78.80–12 *Size of markings.* (a) Size of markings (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 78.80–13 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 40 pounds per square inch sustained for 5 minutes.

§ 78.80–14 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested. Removable head containers not required to be tested with heads in place except that samples taken at random and closed as for use, of each type and size, must be tested at start of production and repeated every four months. Samples so tested must be retained until further tests are made.

§ 78.81 *Specification 5A; steel barrels or drums.* Removable head containers not authorized.

§ 78.81–1 *Compliance.* (a) Required in all details.

§ 78.81–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.81–11 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.81–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.81–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5

§ 78.81–5 *Seams.* (a) Body seams welded.

(b) Head and chime seams welded or double-seamed.

(c) Flanges for closures welded in place.

§ 78.81–6 *Chime reinforcement.* (a) Containers over 25 gallons capacity, with flanged head secured to body, to have chime reinforcement adequate for its protection.

§ 78.81–7 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
		Body sheet	Head sheet	Type[1]	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
10	Straight side	16	16	None		
30	do	16	16	I-bar	¾ x 1¼	1.25
55	do	14	14	do	1"x 1½	1.60
110	do	12	12	do	1 x 1½	1.60
30	Bilge	14	16	None		
55	do	13	14	do		

[1] Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.

§ 78.81–8 *Rolling hoops.* (a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or welding of the rolling hoops directly to the body of the drum in any manner is not permitted.

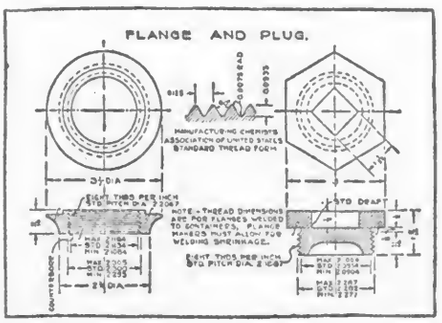
§ 78.81–9 *Closures.* (a) Adequate to prevent leakage; gasket required. Closure must be of screw-thread type or fastened by screw-thread device. Unthreaded cap is authorized for containers of 12 gallons or less if cap is provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 5 or more complete threads; two drainage holes of not over 5/16" diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 5 threads when screwed home with gasket in place.

(d) Openings over 2.3" diameter not permitted. Threads for plug or cap must be 8 or less per inch when over ¾" standard pipe size; thread diameters and thread form must conform with the following drawing; other details shown on the drawing are recommended.



§ 78.81–10 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.81–11 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–5A. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

§ 78.81–12 *Size of markings.* (a) Size of markings (minimum): ½" high for

33-gallon or less, ¾" for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 78.81–13 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 80 pounds per square inch sustained for 5 minutes.

§ 78.81–14 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested.

§ 78.82 *Specification 5B; steel barrels or drums.* Removable head containers which will pass all required tests are authorized.

§ 78.82–1 *Compliance.* (a) Required in all details.

§ 78.82–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.82–11 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.82–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.82–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½
19	1.750	3½
20	1.500	3½
22	1.250	3½
24	1.000	2½

§ 78.82–5 *Seams.* (a) Body seams welded.

§ 78.82–6 *Chime reinforcement.* (a) Containers over 25 gallons capacity, with flanged head secured to body, to have chime reinforcement adequate for its protection.

§ 78.82–7 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
		Body sheet	Head sheet	Type[1]	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
5	Straight side	24	24	None		
10	do	22	22	do		
15	do	20	20	(2)		
33	do	18	18	(2)		
55	do	16	16	(2)		
110	do	13	14	(2)		
33	Bilge	16	16	None		
55	do	14	14	do		

[1] Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.
[2] Rolled or swedged in hoops.

§ 78.82–8 *Rolling hoops.* (a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 78.82–9 *Closures.* (a) Adequate to prevent leakage; gaskets required.

(b) Closing part (plug, cap, plate, etc., see note 1.) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided without side sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 3 or more complete threads; two drainage holes of not over 5/16" diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 3 threads when screwed home with gasket in place. Threaded bung closures consisting of any type other than welded flanges and plugs, must be of a type approved by the Bureau of Explosives for use, after submission of proof as to efficiency.

§ 78.82–10 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.82–11 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–5B. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14–55–50). When gauge of metal in body differs from that in the head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

§ 78.82–12 *Size of markings.* (a) Size of markings (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 78.82–13 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 40 pounds per square inch sustained for 5 minutes.

§ 78.82–14 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested. Removable head containers not required to be tested with heads in place except that samples taken at random and closed as for use, of each type and size, must be tested at start of production and repeated every four months. Samples so tested must be retained until further tests are made.

§ 78.83 *Specification 5C; steel barrels or drums.* Removable head containers not authorized.

§ 78.83–1 *Compliance.* (a) Required in all details.

§ 78.83–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.83–11 (a)

(3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.83–3 *Composition.* (a) Steel must be, except for rolling hoops and chime reinforcement, as follows:

(b) All sheet metal, welding rod, closing devices, and samples taken from the welded portion of the finished container must be of Type 304, 18 chrome 8 nickel alloy with 0.08 percent carbon maximum, 18–20 percent chromium, 8–11 percent nickel, or other types of stainless steel of equivalent corrosion resistance and physical properties.

(c) Type 304 or other grades of equivalent corrosion resistant steels in the as-welded condition are permissible for nitric acid concentrations up to and including 78 percent. For all concentrations of nitric acid the following are permissible:

(1) Type 304 heat-treated (quenches from 1900° F.), or

(2) Stabilized Type 347 in the as-welded condition, or

(3) Stabilized Type 347 stress-relieved (1550°–1650° F.), or

(4) Stabilized Type 347 heat-treated (quenches from 1900° F.), or

(5) Other grades of equivalent corrosion resistance.

(d) All parts of any completed container exposed to lading must comply with the standard 65 percent boiling nitric acid test in that the limit of inches per month penetration in accordance with corrosion test as used in American Society of Testing Materials Committee A–10 1933 collaboration testing program, shall be 0.0015 inch, this figure to be an average of five 48-hour tests.

§ 78.83–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½
19	1.750	3½
20	1.500	3½

§ 78.83–5 *Seams.* (a) Body seams welded.

(b) Head and chime seams welded or double-seamed.

(c) Flanges for closures welded in place.

§ 78.83–6 *Chime reinforcement.* (a) Containers of 10 gallons capacity or over, with flanged head secured to body, to have chime reinforcement adequate for its protection.

§ 78.83–7 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
		Body sheet	Head sheet	Type[1]	Minimum Size (gauge or inch)	Minimum Weight (pounds per foot)
15	Straight side	20	20	None		
30	do	18	18	I-bar	¾ x 1¼	1.25
55	do	16	16	do	1 x 1½	1.60
110	do	14	14	do	1 x 1½	1.60
15	Bilge	16	16	None		
30	do	14	16	do		
55	do	13	14	do		

[1] Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.

§ 78.83–8 *Rolling hoops.* (a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

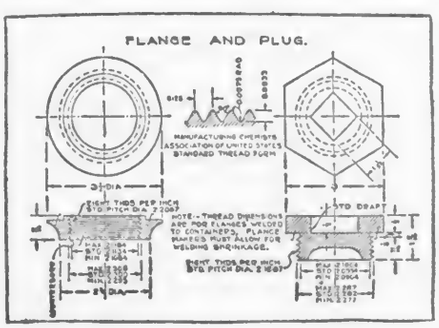
§ 78.83–9 *Closures.* (a) Adequate to prevent leakage; gaskets required. Closure must be of screw-thread type or fastened by screw-thread device. Unthreaded cap is authorized for containers of 12 gallons or less if cap is provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closures with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 5 or more complete threads; two drainage holes of not over 5/16-inch diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 5 threads when screwed home with gasket in place. Except that for containers not over 15 gallons marked capacity the seat (flanges, etc.) for plug or cap may have at least 3 complete threads and plug or cap sufficient length of thread to engage 3 threads when screwed home with gasket in place.

(d) Openings over 2.3 inch diameter not permitted. For containers over 15 gallons marked capacity, threads for plug or cap must be 8 or less per inch when over ¾ inch standard pipe size; thread diameters and thread form must conform to the following drawing; other details on drawings are recommended.



§ 78.83–10 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.83–11 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–5C, the type of steel used in body and head sheets as identified by American Iron and Steel Institute type number, and, in addition, the letters HT following steel designation on containers subjected to stress relieving or heat treatment during manufacture (for example, ICC–5C–304 or ICC–5C–304HT as applicable). These marks shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives. Also, by embossing or stamping, tare weight in pounds (for example TW121).

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

§ 78.83–12 *Size of markings.* (a) Size of markings (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 78.83–13 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 80 pounds per square inch sustained for 5 minutes.

§ 78.83–14 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested.

§ 78.84 *Specification 5D; steel barrels or drums, lined.* Removable head containers which will pass all required tests are authorized.

§ 78.84–1 *Compliance.* (a) Required in all details.

§ 78.84–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.84–11 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity, actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.84–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.84–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5

§ 78.84–5 *Lining.* (a) To be applied so as to adhere securely to metal throughout; to be tough and pliable. Hard rubber authorized to line closing devices.

§ 78.84–6 *Chime reinforcement.* (a) Containers over 25 gallons capacity, with flanged head secured to body, to have chime reinforcement adequate for its protection.

§ 78.84–7 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
		Body sheet	Head sheet	Type [1]	Minimum size (gauge or inch)	Minimum weight (pounds per foot)
10	Straight side	16	16	None		
30	do	16	16	I-bar	¾ x 1¾	1.25
55	do	14	14	do	1 x 1½	1.60
110	do	12	12	do	1 x 1½	1.60
30	Bilge	14	16	None		
55	do	13	14	do		

[1] Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.

§ 78.84–8 *Rolling hoops.* (a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 78.84–9 *Closures.* (a) Adequate to prevent leakage; gaskets required.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 5 or more complete threads; two drainage holes of not over 5/16" diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 5 threads when screwed home with gasket in place.

(d) Closure must be of screw-thread type or fastened by screw-thread device.

§ 78.84–10 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.84–11 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–5D. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

§ 78.84–12 *Size of markings.* (a) Size of markings (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 78.84–13 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 80 pounds per square inch sustained for 5 minutes.

§ 78.84–14 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested. Removable head containers not required to be tested with heads in place except that samples taken at random and closed as for use, of each type and size, must be tested at start of production and repeated every four months. Samples so tested must be retained until further tests are made.

§ 78.84–15 *Additional test.* (a) On each container, by 110-volt electrical circuit between inside and outside of container filled with suitable electrolyte; a milliammeter must show zero reading. The milliammeter test is required when retesting containers which show evidence of damage. A spark coil test is permitted on each container during manufacture, in lieu of the milliammeter test described above.

§ 78.85 *Specification 5F; steel drums.* Removable head containers not authorized.

§ 78.85–1 *Compliance.* (a) Required in all details.

§ 78.85–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.85–10 (a) (3): Not over 11 gallons.

§ 78.85–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.85–4 *Weight of sheets.* (a) Not less than 2.97 pounds per square foot.

§ 78.85–5 *Seams.* (a) Body seams welded or brazed.

(b) Head and chime seams welded or brazed.

(c) Flanges for closures welded or brazed in place.

§ 78.85–6 *Chime reinforcement.* (a) Container to have chime reinforcement adequate for its protection.

§ 78.85–7 *Parts and dimensions.* (a) Body and heads at least No. 14 gauge United States standard.

§ 78.85–8 *Closures required.* (a) Of screw-thread type and adequate to prevent leakage in transit. Openings over 2.3" diameter not permitted. Threads for connections (valve, bung, etc.) to be American Standard taper pipe threads, tapped to gauge, and clean cut to insure tight joints.

§ 78.85–9 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.85–10 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–5F. This mark shall be understood to certify that the container complies with all specification requirements. Serial number and name or symbol (letters) of company or person for whose use the containers are made are also required.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

§ 78.85–11 *Size of markings.* (a) Size of markings (minimum): ½" high.

§ 78.85–12 *Type tests.* (a) Samples, taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 125 pounds per square inch sustained for 5 minutes.

§ 78.85–13 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 100 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested.

§ 78.86 *Specification 5G; steel barrels or drums.* Removable head containers not authorized.

§ 78.86–1 *Compliance.* (a) Required in all details.

§ 78.86–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.86–11 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.86–3 *Composition.* (a) Steel must be, except for rolling hoops and chime reinforcement, an austenitic 18 and 8 chrome nickel alloy with carbon content not over 0.08 percent.

§ 78.86–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Per cent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½
19	1.750	3½
20	1.500	3½
22	1.250	3½

§ 78.86–5 *Seams.* (a) Body seams welded.

(b) Head and chime seams welded or double-seamed.

§ 78.86–6 *Chime reinforcement.* (a) Containers over 25 gallons capacity, with flanged head secured to body, to have chime reinforcement adequate for its protection.

§ 78.86–7 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
		Body sheet	Head sheet	Type [1]	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
5	Straight side	22	22	None		
10	do	20	20	do		
33	do	14	14	do		
33	do	18	18	U	16	
55	do	16	16	U	14	
110	do	14	14	U	12	
33	do	18	18	I-bar	¾ x 1¼	1.25
55	do	16	16	do	¾ x 1¼	1.25
110	do	14	14	do	¾ x 1¼	1.25
33	do	16	16	[2]		
55	do	14	14	[2]		
33	Bilge	14	16	None		
55	do	13	14	do		

[1] Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.
[2] Rolled or swedged in.

§ 78.86–8 *Rolling hoops.* (a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 78.86–9 *Closures.* (a) Adequate to prevent leakage; gasket required. Closure must be of screw-thread type or fastened by screw-thread device. Unthreaded cap is authorized for containers of 12 gallons or less if cap is provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

(b) Closing part (plug, cap, plate, etc. see Note 1) must be of metal as thick as prescribed for head of container; this is not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 5 or more complete threads; two drainage holes of not over 5/16" diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 5 threads when screwed home with gasket in place.

(d) Openings over 2.3" diameter not permitted. Threads for plug or cap must be 8 or less per inch when over ¾" standard pipe size.

§ 78.86–10 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.86–11 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–5G. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

§ 78.86–12 *Size of markings.* (a) Size of markings (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not

over 55 gallons, and 1" for over 55 gallons.

§ 78.86–13 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 40 pounds per square inch sustained for 5 minutes.

§ 78.86–14 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested.

§ 78.87 *Specification 5H; steel barrels or drums, lead lined.* Removable head containers not authorized.

§ 78.87–1 *Compliance.* (a) Required in all details.

§ 78.87–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.87–11 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity, actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.87–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.87–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5

§ 78.87–5 *Seams.* (a) Body seams welded.

(b) Head and chime seams or double-seamed.

(c) Flanges for closures welded in place.

§ 78.87–6 *Chime reinforcement.* (a) Containers with flanged head secured to body to have chime reinforcement adequate for its protection.

§ 78.87–7 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
		Body sheet	Head sheet	Type [1]	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
10	Straight side	16	16	None		
80	do	16	16	I-bar	¾ x 1¼	1.25
55	do	14	14	do	1 x 1½	1.60
110	do	12	12	do	1 x 1½	1.60
30	Bilge	14	16	None		
55	do	13	14	do		

[1] Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.

(b) Lining required: Of lead, at least 3/32" thick, completely bonded to the steel.

§ 78.87–8 *Rolling hoops.* (a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 78.87–9 *Closures.* (a) Adequate to prevent leakage; gaskets required. Closure must be of screw-thread type or fastened by screw-thread device. Unthreaded cap is authorized for containers of 12 gallons or less if cap is provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 5 or more complete threads; two drainage holes of not over 5/16" diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 5 threads when screwed home with gasket in place.

(d) Openings over 2.3" diameter not permitted. Threads for plug or cap must be 8 or less per inch when over ¾" standard pipe size.

§ 78.87–10 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.87–11 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–5H. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

§ 78.87–12 *Size of markings.* (a) Size of marking (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 78.87–13 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 80 pounds per square inch sustained for 5 minutes.

(3) Periodic drop tests will not be required after initial drop tests at start of manufacture, on containers of a construction in excess of minimum specification requirements approved by the Bureau of Explosives. Changes in construction (drum, lining, or closures) must also be approved by the Bureau of Explosives for use, after submission of proof as to efficiency, to continue this exemption.

§ 78.87–14 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested.

§ 78.88 *Specification 5K; nickel barrels or drums.* Removable head containers not authorized.

§ 78.88–1 *Compliance.* (a) Required in all details.

§ 78.88–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.88–10 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.88–3 *Composition.* (a) Material must be, except for rolling hoops and chime reinforcements, nickel at least 99.0 percent pure.

§ 78.88–4 *Seams.* (a) Body seams welded.

(b) Head and chime seams welded or double-seamed.

(c) Flanges for closures welded in place.

§ 78.88–5 *Chime reinforcement.* (a) Containers over 25 gallons capacity, with flanged head secured to body, to have chime reinforcement adequate for its protection.

§ 78.88–6 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
		Body sheet	Head sheet	Type [1]	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
10	Straight side	16	16	None		
30	do	16	16	I-bar	¾ x 1¼	1.25
55	do	14	14	do	1 x 1½	1.60
110	do	12	12	do	1 x 1½	1.60
30	Bilge	14	16	None		
55	do	13	14	do		

[1] Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.

§ 78.88–7 *Rolling hoops.* (a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

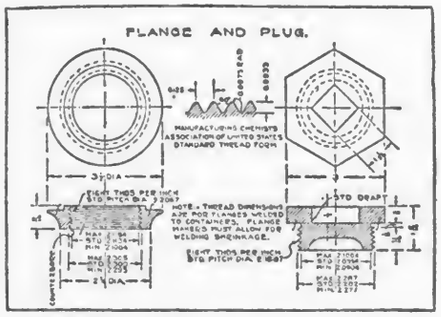
§ 78.88–8 *Closures.* (a) Adequate to prevent leakage; gaskets required. Closure must be of screw-thread type or fastened by screw-thread device. Unthreaded cap is authorized for containers of 12 gallons or less if cap is provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

(b) Closing part (plug, cap, plate, etc. see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 5 or more complete threads; two drainage holes of not over 5/16" diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 5 threads when screwed home with gasket in place.

(d) Openings over 2.3" diameter not permitted. Threads for plug or cap must be 8 or less per inch when over ¾" standard pipe size; thread diameters and thread form must conform with the following drawing; other details shown on the drawing are recommended.



§ 78.88–9 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.88–10 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–5K. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

§ 78.88–11 *Size of markings.* (a) Size of markings (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 78.88–12 *Type tests.* (a) Samples, taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every 12 months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 80 pounds per square inch sustained for 5 minutes.

§ 78.88–13 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested.

§ 78.89 *Specification 5L; steel barrels or drums.* Removable head containers not authorized.

§ 78.89–1 *Compliance.* (a) Required in all details.

§ 78.89–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.89–9 (a) (3). Actual capacity shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart.

§ 78 89–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.89–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½
19	1.750	3½
20	1.500	3½

§ 78.89–5 *Seams.* (a) Body seams welded.

(b) Head and chime seams welded or double-seamed.

(c) Flanged spout for filling and emptying container welded in place or attached in a manner approved by Bureau of Explosives.

§ 78.89–6 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
		Body sheet	Head sheet	Type	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
5	Rectangular	20	20	None		

§ 78.89–7 *Closures.* (a) Adequate to prevent leakage; gaskets required.

(b) Closing part must be of sufficient strength to withstand the drop test prescribed in § 78.89–11 (a) (1).

(c) Closure must be of screw-thread type or fastened by screw-thread device.

(d) Openings over 2.5 inches diameter not permitted.

§ 78.89–8 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.89–9 *Markings.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–5L. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacturer (for example, 20–5–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 20/18–5–50 for body 20 gauge and head 18 gauge).

§ 78.89–10 *Size of markings.* (a) Size of markings (minimum): ½" high.

§ 78.89–11 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 15 pounds per square inch sustained for 5 minutes.

§ 78.89–12 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 5 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested.

§ 78.90 *Specification 5M; monel drums.* Removable head containers not authorized.

§ 78.90–1 *Compliance.* (a) Required in all details.

§ 78.90–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.90–10 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.90–3 *Composition.* (a) Material must be, except for rolling hoops and chime reinforcements, monel.

§ 78.90–4 *Seams.* (a) Body seams welded.

(b) Head and chime seams welded or double-seamed.

(c) Flanges for closures welded in place.

§ 78.90–5 *Chime reinforcement.* (a) Containers to have chime reinforcement adequate for its protection.

§ 78.90–6 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
		Body sheet	Head sheet	Type [1]	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
10	Straight side	14	14	None		
55	do	14	14	I-bar	1 x 1½	1.60

[1] Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.

§ 78.90–7 *Rolling hoops.* (a) Separate hoops if used, to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 78.90–8 *Closures.* (a) Adequate to prevent leakage; gaskets required.

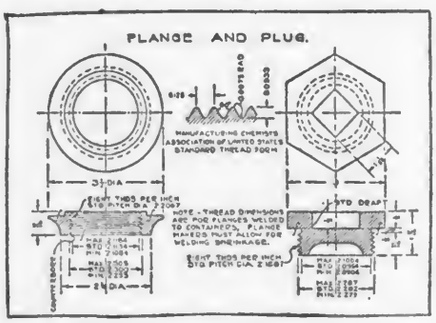
(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 5 or more complete threads; two drainage holes of not over 5/16" diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 5 threads when screwed home with gasket in place.

(d) Closure must be of screw-thread type or fastened by screw-thread device.

(e) Openings over 2.3" diameter not permitted. Threads for plug or cap must be 8 or less per inch when over ¾" standard pipe size; thread diameters and thread form must conform with the following drawing; other details shown on the drawing are recommended.



§ 78.90–9 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.90–10 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–5M. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14–55–50).

§ 78.90–11 *Size of markings.* (a) Size of markings (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not over 55 gallons.

§ 78.90–12 *Type tests.* (a) Samples, taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type

and size by each company starting production and to be repeated every 12 months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 80 pounds per square inch sustained for 5 minutes.

§ 78.90–13 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested.

§ 78.91 *Specification 5X; steel drums, aluminum lined.* Removable head containers not authorized.

§ 78.91–1 *Compliance.* (a) Required in all details.

§ 78.91–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.91–11 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.91–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.91–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5

§ 78.91–5 *Seams.* (a) Body seams welded.

(b) Head and chime seams welded or double-seamed.

(c) Flanges for closures welded in place.

§ 78.91–6 *Chime reinforcement.* (a) Containers over 25 gallons capacity, with flanged head secured to body, to have chime reinforcement adequate for its protection.

§ 78.91–7 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
		Body sheet	Head sheet	Type[1]	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
10	Straight side	16	16	None		
30	do	16	16	I-bar	¾ x 1¼	1.25
55	do	14	14	do	1 x 1½	1.60
110	do	12	12	do	1 x 1½	1.60
30	Bilge	14	16	None		
55	do	13	14	do		

[1] Rolling hoops of pliable solid rubber or other suitable material are also authorized when approved as to type and construction by the Bureau of Explosives.

(b) *Lining.* Required; of aluminum 99 percent pure; thickness 0.12"; all seams welded. It shall have reasonably good fit in outside drum and be arranged so that extensive movement therein will be prevented.

§ 78.91–8 *Rolling hoops.* (a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 78.91–9 *Closures.* (a) Adequate to prevent leakage; shall be located between rolling hoops; aluminum plate gasket, at least 0.10 inch thick, is required. Closure must be of screw-thread type or fastened by screw-thread device. Unthreaded cap is authorized for containers of 12 gallons or less if cap is provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or or cap, must have 5 or more complete threads; two 5/16" drainage holes are allowed. Plug, or cap, must have sufficient length of thread to engage 5 threads when screwed home without gasket. Threaded cap closures, 3 full threads engaged are also authorized.

(d) Openings over 2.3" diameter not permitted. Threads for plug or cap must be 8 or less per inch when over ¾" standard pipe size.

§ 78.91–10 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.91–11 *Marking* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–5X. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

§ 78.91–12 *Size of markings.* (a) Size of marking (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 78.91–13 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 80 pounds per square inch sustained for 5 minutes.

§ 78.91–14 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested.

§ 78.92 *Specification 5P; lagged steel drums.* Removable head containers not authorized.

§ 78.92–1 *Compliance.* (a) Required in all details.

§ 78.92–2 *Rated capacity.* (a) Rated capacity not over 61 gallons, see § 78.92–12 (a) (3). Actual capacity shall be not less than rated capacity plus two percent nor greater than rated capacity plus two percent plus one and one-half gallons.

§ 78.92–3 *Composition.* (a) Sheets for body and heads of inside container to be low carbon, open hearth or electric steel. Sheets for body and heads of outside shell may be of any weldable steel suitable for the purpose.

§ 78.92–4 *Weight of sheets.* (a) Average draft weight of gauges not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
14	3.125	5

§ 78.92–5 *Construction.* (a) Container shall consist of a straight sided inside steel drum which must be lagged with a suitable fire-resistant lagging material of such insulating properties and thickness that the drum charged with the commodity to be shipped will not rupture in a fire when it is equipped with safety devices as required by § 78.92–9. The entire insulation must be covered with a metal shell so constructed that moisture cannot come in contact with lagging.

(b) Brazing is not permitted.

(c) All seams of drum and shell must be fusion welded.

(d) Flanges or bosses for closures in the inner container must be fusion welded in place to the inside drum and the metal shell.

(e) Means for testing inside drum for leaks must be provided in outside shell.

§ 78.92–6 *Parts and dimensions.* (a) Parts and dimensions as follows:

(1) Minimum thickness of body and head sheets for inside drum must be #14 United States Standard gauge.

(2) Minimum thickness of body sheets for outside shell must be #12 United States Standard gauge.

(3) Minimum thickness of head sheets for outside shell must be #14 United States Standard gauge.

§ 78.92–7 *Rolling hoops.* (a) Rolling hoops are required and these may be rolled or swedged in the outside shell or consist of separate hoops having a tight fit on shell and securely held in place.

§ 78.92–8 *Closures.* (a) All closures must be of screw-thread type adequate to prevent leakage and be of a material which will not react dangerously in contact with the commodity.

(b) All openings in inside drums must be located in the top head.

(c) Openings over 2.3 inches screw thread size not permitted.

(d) Plugs, caps, or other fittings must have sufficient length of thread to engage 5 threads when screwed home with gasket in place.

(e) Gaskets which are not affected by lading are required for closures having straight threads.

§ 78.92–9 *Safety devices.* (a) Each container must be provided with safety devices approved as to type and location by the Bureau of Explosives and found to prevent the bursting of the normally charged container when it is placed in a fire.

§ 78.92–10 *Closure protection.* (a) Construction must be such as to afford adequate protection to valves and safety devices.

§ 78.92–11 *Defective containers.* (a) Leaks and other defects to be repaired only by processes used in constructing container.

§ 78.92–12 *Marking.* (a) Marking on each container by embossing with raised marks or by steel stamping on top head of outside shell or on a permanently attached head protective ring, as follows:

(1) ICC–5P. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with and its use approved by the Bureau of Explosives.

(3) Minimum gauge of metal of inner container, rated capacity in gallons and year of manufacture must be indicated in the order named (for example, 14–61–50).

(4) Size of markings (minimum): ½ inch high for stamping, 1 inch high for embossing.

§ 78.92–13 *Tests.* (a) Sample drums, taken at random and closed as for use, shall withstand prescribed tests without leakage, one test to be made of each design and size of drum by each company before starting production as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet on to solid concrete so as to strike diagonally on chime (foot ring), or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker.

(2) Hydrostatic pressure test of 100 pounds per square inch sustained for five minutes. This test shall be applied to the finished inner container before lagging material and outer shell are assembled.

(3) Samples last tested to be retained until further tests are made.

§ 78.92–14 *Leakage test.* (a) Each container shall be tested with seams under water or covered with soapsuds or other suitable material by interior air pressure of at least 75 pounds per square inch. Leakage test shall be applied to finished inner container before lagging or outer shell are assembled. Leakers shall be rejected or repaired and retested.

§ 78.97 *Specification 6A; steel barrels or drums.* Removable head containers which will pass all required tests are authorized.

§ 78.97–1 *Compliance.* (a) Required in all details.

§ 78.97–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.97–9 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.97–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.97–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5

§ 78.97–5 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity (gallons)	Authorized gross weight (pounds)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
			Body sheet	Head sheet	Type	Minimum	
						Size (gauge or inch)	Weight (pounds per foot)
5 to 10	160	Straight side.	16	16	None		
5 to 30	480	...do	14	14	I-bar	¾ x 1¼	1.25
5 to 55	880	...do	12	12	...do	1 x 1½	1.60
5 to 33	480	Bilge	13	14	None		
5 to 55	880	...do	12	12	...do		

§ 78.97–6 *Rolling hoops.* (a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 78.97–7 *Closures.* (a) Adequate to prevent leakage; gaskets required. Closures must be of screw-thread type or secured by positive fastening.

(b) Closing part (plug, cap, plate, etc., see note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

§ 78.97–8 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.97–9 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC—6A***; stars to be replaced by the authorized gross weight (for example, ICC—6A880, etc.). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

§ 78.97–10 *Size of markings.* (a) Size of markings (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not over 55 gallons.

§ 78.97–11 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 30 pounds per square inch sustained for 5 minutes. Leakage through closure shall not constitute failure.

§ 78.97–12 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested. Removable head containers not required to be tested with heads in place except that samples taken at random and closed as for use, of each type and size, must be tested at start of production and repeated every four months. Samples so tested must be retained until further tests are made.

§ 78.98 *Specification 6B; steel barrels or drums.* Removable head containers which will pass all required tests are authorized.

§ 78.98–1 *Compliance.* (a) Required in all details.

§ 78.98–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.98–9 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity, actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.98–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.98–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½

§ 78.98–5 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity (gallons)	Authorized gross weight (pounds)	Type of Container	Minimum Thickness in the black (gauge, United States standard)		Rolling hoops		
			Body Sheet	Head Sheet	Type	Minimum	
						Size (gauge or inch)	Weight (pounds per foot)
5 to 10	160	Straight side	18	18	None		
5 to 30	480	do	16	16	U [1]	14	
5 to 55	880	do	14	14	U	12	
5 to 30	480	do	16	16	I-bar [1]	¾ x 1¼	1.25
5 to 55	880	do	14	14	do	¾ x 1¼	1.25
5 to 110	1,760	do	12	12	do	1 x 1½	1.60
5 to 33	480	Bilge	15	16	None		
5 to 55	880	do	13	14	do		

[1] Rolled or swedged in hoops permitted.

§ 78.98–6 *Rolling hoops.* (a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 78.98–7 *Closures.* (a) Adequate to prevent leakage; gaskets required. Closures must be of screw-thread type or secured by positive fastening.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

§ 78.98–8 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.98–9 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–6B***; stars to be replaced by the authorized gross weight (for example, ICC–6B880, etc.). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example, 14/12–55–50 for body 14 gauge and head 12 gauge).

§ 78.98–10 *Size of markings.* (a) Size of markings (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 78.98–11 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 30 pounds per square inch sustained for 5 minutes. Leakage through closure shall not constitute failure.

§ 78.98–12 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representatives of Bureau of Explosives. Leakers shall be rejected or repaired and retested. Removable head containers not required to be tested with heads in place except that samples taken at random

and closed as for use, of each type and size, must be tested at start of production and repeated every four months. Samples so tested must be retained until further tests are made.

§ 78.99 *Specification 6C; steel barrels or drums.* Removable head containers which will pass all required tests are authorized.

§ 78.99–1 *Compliance.* (a) Required in all details.

§ 78.99–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.99–9 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.99–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.99–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½
19	1.750	3½
20	1.500	3½
22	1.250	3½

§ 78.99–5 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity (gallons)	Authorized gross weight (pounds)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
			Body sheet	Head sheet	Type	Minimum	
						Size (gauge or inch)	Weight (pounds per foot)
5	80	Straight side	22	22	None		
5 to 10	160	do	20	20	do		
5 to 30	480	do	18	18	U	16	
5 to 55	880	do	16	16	U	14	
5 to 110	1,760	do	14	14	U	12	
5 to 30	480	do	18	18	I-bar	¾ x 1¼	1.25
5 to 55	880	do	16	16	do	¾ x 1¼	1.25
5 to 110	1,760	do	14	14	do	1 x 1½	1.60
5 to 33	480	Bilge	16	18	None		
5 to 55	880	do	15	16	do		

§ 78.99–6 *Rolling hoops.* (a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 78.99–7 *Closures.* (a) Adequate to prevent leakage; gaskets required. Closures must be of screw-thread type or secured by positive fastening.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

§ 78.99–8 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.99–9 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–6C***; stars to be replaced by the authorized gross weight (for example, ICC–6C880, etc.). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge.

§ 78.99–10 *Size of markings.* (a) Size of markings (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not over 55 gallons, and 1" for over 55 gallons.

§ 78.99–11 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 30 pounds per square inch sustained for 5 minutes. Leakage through closure shall not constitute failure.

§ 78.99–12 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested. Removable head containers not required to be tested with heads in place except that samples taken at random and closed as for use, of each type and size, must be tested at start of production and repeated every four months. Samples so tested must be retained until further tests are made.

§ 78.100 *Specification 6J; steel barrels and drums.* Removable head containers which will pass all required tests are authorized.

§ 78.100–1 *Compliance.* (a) Required in all details.

§ 78.100–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.100–9 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.100–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.100–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½
19	1.750	3½

§ 78.100–5 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity (gallons)	Authorized gross weight (pounds)	Type of Container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
			Body Sheet	Head Sheet	Type	Minimum	
						Size (gauge or inch)	Weight (pounds per foot)
5 to 30	260	Straight side	19	19	(1)		
5 to 55	480	do	18	18	(1)		
5 to 55	880	do	16	16	U	14	
5 to 55	880	do	16	16	I-bar	¾ x 1¼	1.25
5 to 33	480	Bilge	16	18	None		
5 to 55	880	do	15	16	do		

[1] Rolled or swedged in hoops.

§ 78.100–6 *Rolling hoops.* (a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 78.100–7 *Closures.* (a) Adequate to prevent leakage; gaskets required. Closures must be of screw-thread type or secured by positive fastening.

(b) Closing part (plug, cap, plate, etc. see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

§ 78.100–8 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.100–9 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–6J***; stars to be replaced by the authorized gross weight (for example, ICC–6J880, etc.). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

§ 78.100–10 *Size of markings.* (a) Size of markings (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not over 55 gallons.

§ 78.100–11 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

§ 78.101 *Specification 6K; steel barrels or drums.* Removable head containers which will pass all required tests are authorized.

§ 78.101–1 *Compliance.* (a) Required in all details.

§ 78.101–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.101–9 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.101–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.101–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½

§ 78.101–5 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Authorized gross weight (pounds)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
			Body sheet	Head sheet	Type	Minimum	
						Size (gauge or inch)	Weight (pounds per foot)
55	480	Straight side	18	18	(1)		

[1] Rolled or swedged in hoops.

§ 78.101–6 *Rolling hoops.* (a) Separate hoops to have tight fit on shell and be firmly secured in place. Beading under rolling hoops or spot welding not permitted.

§ 78.101–7 *Closures.* (a) Adequate to prevent leakage; gaskets required. Closures must be of screw-thread type or secured by positive fastening.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

§ 78.101–8 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.101–9 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–6K480. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 18–55–50).

§ 78.101–10 *Size of markings.* (a) Size of markings (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not over 55 gallons.

§ 78.101–11 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime, or when without chime seam, to strike on other circumferential seam; also additional drop

test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 15 pounds per square inch sustained for 5 minutes. Leakage through closure shall not constitute failure.

§ 78.101–12 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 7 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested. Removable head containers not required to be tested with heads in place except that samples taken at random and closed as for use, of each type and size, must be tested at start of production and repeated every four months. Samples so tested must be retained until further tests are made.

§ 78.107 *Specification 42B; aluminum drums.*

§ 78.107–1 *Compliance.* (a) Required in all details.

§ 78.107–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.107–9 (a) (3). Not less than 5 gallons; actual capacity shall be rated capacity plus at least 2 percent.

§ 78.107–3 *Composition.* (a) Body and heads of aluminum at least 99 percent pure, or an aluminum base alloy of equivalent corrosion resistance and physical properties.

§ 78.107–4 *Outage.* (a) Two percent of rated capacity, plus a maximum tolerance of 1 quart.

§ 78.107–5 *Seams.* (a) Welded, including attachment of flanges for closures and other devices. Circumferential seams at least 3" from top of chime; chime seams not permitted.

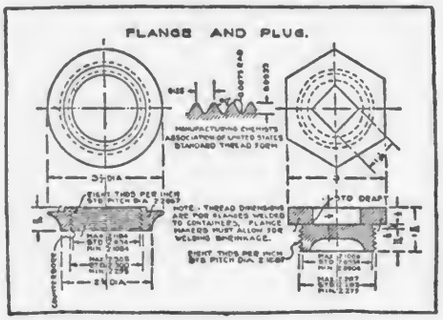
§ 78.107–6 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Minimum thickness of material (inch)	Rolling hoops required, type authorized, and minimum dimensions	
		I-bar, size (inch)	U-type, aluminum, thickness (inch)
10	0.110	¾ x 1¼	0.139
30	.154	¾ x 1¼	.193
55	.187	¾ x 1¼	.234
110	.230	1 x 1½	----------

(b) Rolling hoops must be firmly secured in place and not over 19" apart; beading under hoops not permitted.

§ 78.107–7 *Closures.* (a) Of screw-thread type or secured by screw-thread device; openings over 2.3" not authorized; suitable gaskets required.

(b) Threaded plugs, or caps, and flanges must be close fitting with gasket surfaces which bear squarely on each other when without gasket; they must have not over 8 threads per inch, with 5 complete threads engaged when gasket is in place, or not over 4 threads per inch, with 2 complete threads similarly engaged; two 5/16 inch drainage holes are authorized in flange. Thread form must conform to that shown by drawing below or be of a form that shall provide an equally efficient closure.



§ 78.107–8 *Projections.* (a) Closing devices and other parts must not project beyond chime or rolling hoops.

§ 78.107–9 *Marking.* (a) Marking on each container on top head by stamping with pressure dies, by embossing with raised marks, or plate attached by welding, as follows:

(1) ICC–42B. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

(3) Gauge of metal, Brown and Sharpe, in thinnest part; rated capacity in gallons; year of manufacture (for example, 7–30–50).

§ 78.107–10 *Size of marking.* (a) Size of marking (minimum): ½" high for 30-gallon and smaller containers, ¾" for over 30 and not over 55 gallons, and 1" for over 55 gallons.

§ 78.107–11 *Type tests.* (a) Samples, taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional test on any other parts which might be considered weaker than the chime.

(2) Hydrostatic pressure test of 60 pounds per square inch sustained for 5 minutes.

§ 78.107–12 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested.

§ 78.108 *Specification 42C; aluminum barrels or drums.*

§ 78.108–1 *Compliance.* (a) Required in all details.

§ 78.108–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.108–9 (a) (3). Not less than 5 gallons; actual capacity shall be rated capacity plus at least 2 percent.

§ 78.108–3 *Composition.* (a) Body and heads of aluminum at least 99 percent pure, or an aluminum base alloy of equivalent corrosion resistance and physical properties.

§ 78.108–4 *Outage.* (a) Two percent of rated capacity, plus a maximum tolerance of 1 quart.

§ 78.108–5 *Seams.* (a) Welded, including attachment of flanges for closures and other devices. Circumferential seams at least 3" from top of chime; chime seams not permitted.

§ 78.108–6 *Parts and dimensions.* (a) Parts and dimensions as follows:

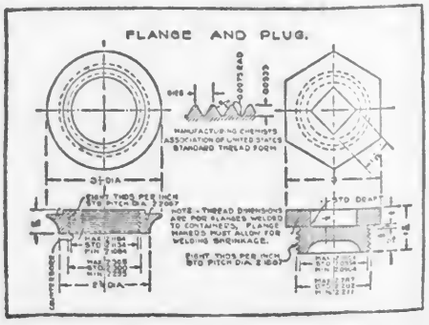
Marked capacity not over (gallons)	Type of container	Minimum thickness of material (inch)	Rolling hoops required, type authorized, and minimum dimensions	
			I-bar, size (inches)	U-type, aluminum, thickness (inch)
10	Straight side.	0.093	¾ x 1¼	0.116
30	do	.129	¾ x 1¼	.161
55	do	.155	¾ x 1¼	.194
110	do	.192	1 x 1½	----------
15	Bilge	.110	Expanded from shell.[1]	
30	do	.150	Do.	
55	do	.180	Do.	

[1] Only required when side openings are used.

(b) Rolling hoops must be firmly secured in place and not over 19" apart; beading under hoops not permitted.

§ 78.108–7 *Closures.* (a) Of screw-thread type or secured by screw-thread device; openings over 2.3" not authorized; suitable gaskets required.

(b) Threaded plugs, or caps, and flanges must be close fitting with gasket surfaces which bear squarely on each other when without gasket; they must have not over 8 threads per inch, with 5 complete threads engaged when gasket is in place, or not over 4 threads per inch, with 2 complete threads similarly engaged; two 5/16 inch drainage holes are authorized in flange. Thread form must conform to that shown by drawing below or be of a form that shall provide an equally efficient closure.



§ 78.108–8 *Projections.* (a) Closing devices and other parts must not project beyond chime or rolling hoops.

§ 78.108–9 *Marking.* (a) Marking on each container on top head, by stamping with pressure dies, by embossing with raised marks, or plate attached by welding, as follows:

(1) ICC–42C. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

(3) Gauge of metal, Brown and Sharpe, in thinnest part; rated capacity in gallons; year of manufacture (for example, 7–30–50).

§ 78.108–10 *Size of marking.* (a) Size of marking (minimum): ½" high for 30-gallon and smaller containers, ¾" for over 30 and not over 55 gallons, and 1" for over 55 gallons.

§ 78.108–11 *Type tests.* (a) Samples, taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional test on any other parts which might be considered weaker than the chime.

(2) Hydrostatic pressure test of 60 pounds per square inch sustained for 5 minutes.

§ 78.108–12 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested.

§ 78.109 *Specification 42D; aluminum drums.*

§ 78.109–1 *Compliance.* (a) Required in all details.

§ 78.109–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.109–9 (a) (3). Not less than 5 gallons; actual capacity shall be rated capacity plus at least 2 percent.

§ 78.109–3 *Composition.* (a) Body and heads of aluminum at least 99 percent pure, or an aluminum base alloy of equivalent corrosion resistance and physical properties.

§ 78.109–4 *Outage.* (a) Two percent of rated capacity, plus a maximum tolerance of 1 quart.

§ 78.109–5 *Seams.* (a) Welded, including attachment of flanges for closures and other devices. Circumferential seams at least 3" from top of chime; chime seams not permitted.

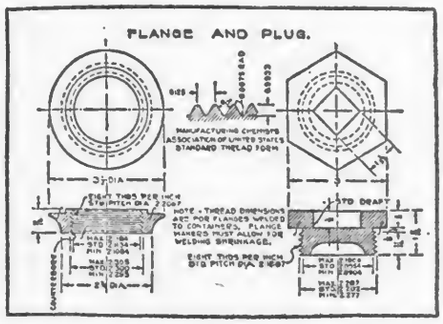
§ 78.109–6. *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Minimum thickness of material (inch)	Rolling hoops required, type authorized, and minimum dimensions	
		I-bar, size (inch)	U-type, aluminum, thickness (inch)
10	0.093	¾ x 1¼	0.092
30	.102	¾ x 1¼	.128
55	.123	¾ x 1¼	.154
110	.154	1 x 1½	

(b) Rolling hoops must be firmly secured in place and not over 19" apart; beading under hoops not permitted.

§ 78.109–7 *Closures.* (a) Of screw-thread type or secured by screw-thread device; openings over 2.3" not authorized; suitable gaskets required. Vented closing devices of type approved by the Bureau of Explosives are authorized when specified by the purchaser.

(b) Threaded plugs, or caps, and flanges must be close fitting with gasket surfaces which bear squarely on each other when without gasket; they must have not over 8 threads per inch, with 5 complete threads engaged when gasket is in place, or not over 4 threads per inch, with 2 complete threads similarly engaged; two 5/16 inch drainage holes are authorized in flange. Thread form must conform to that shown by drawing below or be of a form that shall provide an equally efficient closure.



§ 78.109–8 *Projections.* (a) Closing devices and other parts must not project beyond chime or rolling hoops.

§ 78.109–9 *Marking.* (a) Marking on each container on top head, by stamping with pressure dies, by embossing with raised marks, or plate attached by welding, as follows:

(1) ICC–42D. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

(3) Gauge of metal, Brown and Sharpe, in thinnest part; rated capacity in gallons; year of manufacture (for example, 7–30–50).

§ 78.109–10 *Size of marking.* (a) Size of marking (minimum): ½" high for 30-gallon and smaller containers, ¾" for over 30 and not over 55 gallons, and 1" for over 55 gallons.

§ 78.109–11 *Type tests.* (a) Samples, taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional test on any other parts which might be considered weaker than the chime.

(2) Hydrostatic pressure test of 40 pounds per square inch sustained for 5 minutes.

§ 78.109–12 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 10 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested.

§ 78.115 *Specification 17C; steel drums.* Single trip container. Removable head containers which will pass all required tests are authorized.

§ 78.115–1 *Compliance.* (a) Required in all details.

§ 78.115–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.115–10 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.115–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.115–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½
19	1.750	3½
20	1.500	3½
22	1.250	3½

§ 78.115–5 *Seams.* (a) Body seams welded.

§ 78.115–6 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
		Body sheet	Head sheet	Type	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
5	Straight side	22	22	None		
10	do	20	20	do		
30	do	18	18	(1)		
55	do	16	16	(1)		

[1] Rolled or swedged in hoops.

§ 78.115–7 *Convex heads.* (a) Convex (crowned) heads, not extending beyond level of chime, required for drums of 25 gallons capacity or over; minimum convexity 5/8" for capacity 25 to 35 gallons, inclusive, and 3/4" for larger drums.

§ 78.115–8 *Closures.* (a) Adequate to prevent leakage; gaskets required.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 3 or more complete threads; two drainage holes of not over 5/16 inch diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 3 threads when screwed home with gasket in place. Threaded closures having fewer threads are authorized for containers having a capacity of 12 gallons or less when such closures are approved by the Bureau of Explosives upon proof of satisfactory tests.

§ 78.115–9 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.115–10 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–17C. This mark shall be understood to certify that the container complies with all specification requirements. The letters STC; located just below or above the ICC mark to indicate "single trip container".

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 14–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

§ 78.115–11 *Size of markings.* (a) Size of markings (minimum): 1/2" high for 33 gallons or less, 3/4" for over 33 and not over 55 gallons.

§ 78.115–12 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 40 pounds per square inch sustained for 5 minutes.

§ 78.115–13 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soap suds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representatives of Bureau of Explosives. Leakers shall be rejected or repaired and retested. Removable head containers not required to be tested with heads in place except that samples taken at random and closed as for use, of each type and size, must be tested at start of production and repeated every four months. Samples so tested must be retained until further tests are made.

§ 78.116 *Specification 17E; steel drums.* Single trip container. Removable head containers not authorized.

§ 78.116–1 *Compliance.* (a) Required in all details.

§ 78.116–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.116–10 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.116–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.116–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½
19	1.750	3½
20	1.500	3½
22	1.250	3½
24	1.000	2½

§ 78.116–5 *Seams.* (a) Body seams welded.

§ 78.116–6 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
		Body sheet	Head sheet	Type	Minimum	
					Size (gauge or inch)	Weight (pounds per foot)
5	Straight side	24	24	None		
10	do	22	22	do		
30	do	[2] 19	[2] 19	(1)		
55	do	[2] 18	18	(1)		

[1] Rolled or swedged in hoops.
[2] 20 gauge authorized.

§ 78.116–7 *Convex heads.* (a) Convex (crowned) heads, not extending beyond level of chime, required for drums of 25 gallons capacity or over; minimum convexity 5/8" for capacity 25 to 35 gallons, inclusive, and 3/4" for larger drums. Convexity of 3/8" authorized for drums made of 18 gauge material throughout.

§ 78.116–8 *Closures.* (a) Adequate to prevent leakage; gaskets required.

(b) Closing part (plug, cap, plate, etc. see Note 1) must be of metal as thick as prescribed for head of container: *Provided,* That thinner metal closures or closures of other material are authorized for containers of 12 gallons capacity or less when opening to be closed is not over 2.3" diameter and closures, except threaded metal closures, are fitted with outside sealing devices which cannot be removed without destroying the closure or sealing device. Closures of a material other than metal must be of a type approved by the Bureau

of Explosives for use, after satisfactory proof of efficiency.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 3 or more complete threads; two drainage holes of not over 5/16 inch diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 3 threads when screwed home with gasket in place. *Provided,* That for containers having a capacity of 12 gallons and less the seat (flange, etc.) for plug, or cap, must have two or more complete threads and plug, or cap, must have sufficient length of thread to engage two threads when screwed home with gasket in place.

§ 78.116–9 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.116–10 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–17E. This mark shall be understood to certify that the container complies with all specification requirements. The letters STC; located just below or above the ICC mark to indicate "single trip container".

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 12–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

§ 78.116–11 *Size of markings.* (a) Size of markings (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not over 55 gallons.

§ 78.116–12 *Type tests.* (a) Samples taken at random closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 15 pounds per square inch sustained for 5 minutes.

§ 78.116–13 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 7 pounds per square inch for containers over 12 gallons capacity and at least 5 pounds for others. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested.

§ 78.117 *Specification 17F; steel drums.* Single trip container. Removable head containers not authorized.

§ 78.117–1 *Compliance.* (a) Required in all details.

§ 78.117–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.117–11 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.117–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel. Steel to be as high as practicable in tensile strength, having no loose oxide or scale.

§ 78.117–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5

§ 78.117–5 *Seams.* (a) Body seams welded.

(b) Head and chime seams welded or double-seamed.

(c) Flanges for closures welded in place.

§ 78.117–6 *Chime reinforcement.* (a) Chime reinforcement required and to be not less than 11 gauge.

§ 78.117–7 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the black (gauge, United States standard)		Rolling hoops		
		Body sheet	Head sheet	Type	Minimum Size	Minimum Weight
55	Straight side	16	16	(1)		

[1] Rolled or swedged-in hoops. Use of I-bar hoops authorized.

§ 78.117–8 *Rolling hoops and convex heads.* (a) Rolling hoops to be expanded. Alternate use of I-bar hoops authorized. Extra corrugations between hoops and chimes required.

(b) Convex heads. Convex (crowned) heads; minimum convexity to be ¾ inch, with minimum chime height of 1¼ inches.

§ 78.117–9 *Closures.* (a) Adequate to prevent leakage; gaskets required.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3 inches in diameter. If unthreaded cap is used it must be provided with outside sealing devices which cannot be removed without destroying the cap or sealing device.

NOTE 1: This does not apply to cap seal over a closure which complies with all requirements.

(c) Closure must be of screw-thread type or fastened by screw-thread device.

(d) One opening not over 2.3 inches and one opening not over ¾ inch allowed; both openings to be welded in one head only. Threads to be standard pipe thread of 11 threads per inch for the larger opening and 14 threads per inch for the ¾-inch opening.

§ 78.117–10 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.117–11 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–17F. This mark shall be understood to certify that the container complies with all specification requirements. The letters STC, located just below or above the ICC mark, to indicate "single trip container".

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 12–55–50).

§ 78.117–12 *Size of markings.* (a) Size of markings (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not over 55 gallons.

§ 78.117–13 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting be-

yond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 80 pounds per square inch sustained for 5 minutes.

§ 78.117–14 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 15 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested.

§ 77.118 *Specification 17H; steel drums.* Single trip container. Removable head containers which will pass all required tests are authorized.

§ 78.118–1 *Compliance.* (a) Required in all details.

§ 78.118–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.118–10 (a) (3). Actual capacity of straight-sided containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon; actual capacity of bilge-type containers must be not less than rated capacity, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.118–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.118–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½
19	1.750	3½
20	1.500	3½
22	1.250	3½
24	1.000	2½

§ 78.118–5 *Seams.* (a) Body seams welded.

§ 78.118–6 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Type of container	Minimum thickness in the black (gauge, United States standard)			Rolling hoops		
		Body sheet	Bottom head sheet	Removable head sheet	Type	Minimum	
						Size (gauge or inch)	Weight (pounds per foot)
5	Straight side	24	24	20	None		
30	do	18	18	[3]18	[1]		
55	do	18	18	[3]14	[2]		

[1] Rolled or swedged in hoops.
[2] Each drum must have three rolled or swedged in hoops, one to be placed in the body near the top curl.
[3] 16 gauge authorized provided there are one or more corrugations in the cover near the periphery.

§ 78.118–7 *Convex heads.* (a) Convex (crowned) heads, not extending beyond level of chime, required for drums of 25 gallons capacity or over; minimum convexity of ⅜ inch required.

§ 78.118–8 *Closures.* (a) Adequate to prevent leakage; gaskets required.

(b) Drums over 5 gallons capacity must be closed by means of 12 gauge bolted ring with drop forged lugs, one of which is threaded, and having ⅜ inch bolt and nut for drums not over 30 gallons capacity and ⅝ inch bolt and nut for drums over 30 gallons capacity. Five gallon drums must be of lug type closure with cover having at least 16 lugs. Equally efficient types of closures are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 3 or more complete threads; two drainage holes of not over 5/16 inch diameter are allowed. Plug, or cap, must have sufficient length of thread to engage 3 threads when screwed home with gasket in place. Provided, that for containers having a capacity of 12 gallons and less the seat (flange, etc.) for plug, or cap, must have two or more complete threads and plug, or cap, must have sufficient length of thread to engage two threads when screwed home with gasket in place.

§ 78.118–9 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.118–10 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–17H. This mark shall be understood to certify that the container complies with all specification requirements. The letters STC, located just below or above the ICC mark to indicate "single trip container".

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 12–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

§ 78.118–11 *Size of markings.* (a) Size of markings (minimum): ½" high for 33-gallon or less, ¾" for over 33 and not over 55 gallons.

§ 78.118–12 *Type tests.* (a) Samples taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 4 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 15 pounds per square inch sustained for 5 minutes.

§ 78.118–13 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 7 pounds per square inch for containers over 12 gallons capacity and at least 5 pounds for others. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested. Containers not required to be tested with heads in place except that samples taken at random and closed as for use, of each type and size, must be tested at start of production and repeated every four months. Samples so tested must be retained until further tests are made.

§ 78.119 *Specification 17X; steel barrels or drums.* Single trip container. Removable head containers not authorized.

§ 78.119–1 *Compliance.* (a) Required in all details.

§ 78.119–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.119–10 (a) (3). Actual capacity of containers shall be not less than rated (marked) capacity plus 2 percent, nor greater than rated capacity plus 2 percent, plus 1 quart, except that for containers over 30 gallons marked capacity actual capacity shall be not less than rated capacity plus 2 percent, nor greater than rated capacity plus 2 percent plus 1 gallon.

§ 78.119–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.119–4 *Weight of sheets.* (a) Average draft weight not less than as follows:

Gauge, United States Standard No.	18	19
Standard weight per sq. ft. (pounds)	2.00	1.75
Authorized tolerances (percent)	3½	3½

§ 78.119–5 *Seams.* (a) Body seams welded.

(b) Head and chime seams welded or double-seamed.

§ 78.119–6 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons).	30	55.
Type of container	Straight side	Straight side.
Minimum thickness in the black. (Gauge United States Standard).	Body sheet: 19.	Body sheet: 18.
	Head sheet: 19.	Head sheet: 18.
Type of rolling hoops.	Rolled or swedged in hoops.	Rolled or swedged in hoops.

§ 78.119–7 *Flat or convexed heads.* (a) When heads are convexed (crowned) they shall not extend within ¼ inch of the chime level; maximum convexity $1\frac{3}{32}$ inch for 55-gallon drums.

§ 78.119–8 *Closures.* (a) Adequate to prevent leakage; gaskets required. Closure must be of screw-thread type or fastened by screw-thread device.

(b) Closing part (plug, cap, plate, etc., see Note 1) must be of metal as thick as prescribed for head of container; this not required for containers of 12 gallons or less when the opening to be closed is not over 2.3" diameter and the closing part is constructed, or fitted with sealing device, so that it cannot be removed without destroying it or the sealing device.

NOTE 1: This does not apply to a cap seal over a closure when closure complies with all requirements.

(c) For closure with threaded plug or cap, the seat (flange, etc.) for plug, or cap, must have 3 or more complete threads; two drainage holes of not over $\frac{5}{16}$" diameter are allowed only in flanges having at least 5 threads. Plug, or cap, must have sufficient length of thread to engage 3 threads when screwed home with gasket in place.

§ 78.119–9 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing containers, not to be soldered.

§ 78.119–10 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–17X. This mark shall be understood to certify that the container complies with all specification requirements. The letters STC located just below or above the ICC mark to indicate "single trip container".

(2) Name or symbol of maker.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 18–55–50).

(4) Steel barrels or drums manufactured prior to March 31, 1941, which are in compliance with this specification except as to marking may be accepted as permitted by § 73.22 of this chapter without necessity of having the marking embossed on the head in raised letters. This shipping paper shall, however, certify that the drum is in compliance.

§ 78.119–11 *Size of markings.* (a) Size of markings (minimum): ¾ inch high.

§ 78.119–12 *Type tests.* (a) Samples, taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping filled with water to 98 percent capacity from height of 4 feet onto solid concrete, so as to strike diagonally on chime seam; also additional drop test on any other parts which might be considered weaker than the chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

(2) Hydrostatic pressure test of 15 pounds per square inch sustained for 5 minutes.

§ 78.119–13 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 7 pounds per square inch. Equally efficient means of testing are authorized upon demonstration and proof of satisfactory tests to representative of Bureau of Explosives. Leakers shall be rejected or repaired and retested.

§ 78.125 *Specification 37D; steel drums.* Single trip container. Removable head containers which will pass all required tests are authorized.

§ 78.125–1 *Compliance.* (a) Required in all details.

§ 78.125–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.125–8 (a) (3). Actual capacity not less than rated (marked) capacity plus 2 percent, not greater than rated capacity plus 2 percent plus 1 quart.

§ 78.125–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.125–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½
19	1.750	3½
20	1.500	3½
22	1.250	3½
24	1.000	2½

§ 78.125–5 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity (gallons)	Authorized gross weight (pounds)	Type of container	Welded side seam required	Minimum thickness in the black (gauge, United States standard)	
				Body sheet	Head sheet
3 to 55	80	Straight side	No	24	24
	160	do	No	22	22
	300	do	No	20	20
	425	do	No	19	19
	480	do	Yes	19	19
	880	do	Yes	18	18

§ 78.125–6 *Closure required.* (a) Adequate to prevent leakage; gaskets required when necessary; to be of screw-thread type or secured by positive fastening.

§ 78.125–7 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.125–8 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–37D***; stars to be replaced by the authorized gross weight (for example, ICC–37D880, etc.). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 18–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

(4) The letters STC; located just above or below the ICC mark to indicate "single trip container".

§ 78.125–9 *Size of markings.* (a) Size of markings (minimum): ½" high for 30-gallon or less, ¾" for over 30 gallons.

§ 78.125–10 *Type test.* (a) Samples, taken at random and closed as for use, shall withstand prescribed test without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Sample last tested to be retained until further tests are made. The type test is as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

§ 78.126 *Specification 37E; steel drums.* Single trip container. Re-

movable head containers which will pass all required tests are authorized.

§ 78.126–1 *Compliance.* (a) Required in all details.

§ 78.126–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.126–8 (a) (3). Actual capacity not less than rated (marked) capacity plus 2 percent, not greater than rated capacity plus 2 percent plus 1 quart.

§ 78.126–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.126–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½
19	1.750	3½
20	1.500	3½
22	1.250	3½
24	1.000	2½
26	.750	2½

§ 78.126–5 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity (gallons)	Authorized gross weight (pounds)	Type of container	Welded side seam required	Minimum thickness in the black (gauge, United States standard)	
				Body sheet	Head sheet
3 to 55	80	Straight side	No	26	26
	160	do	No	25	25
	220	do	No	24	24
	425	do	No	22	22
	480	do	Yes	22	22
	880	do	Yes	20	20

§ 78.126–6 *Closure required.* (a) Adequate to prevent leakage; gaskets required when necessary; to be of screw-thread type or secured by positive fastening.

§ 78.126–7 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.126–8 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–37E***; stars to be replaced by the authorized gross weight (for example, ICC–37E880, etc.). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 18–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

(4) The letters STC; located just above or below the ICC mark to indicate "single trip container."

§ 78.126–9 *Size of markings.* (a) Size of markings (minimum): ½" high for 30-gallon or less, ¾" for over 30 gallons.

§ 78.126–10 *Type test.* (a) Samples, taken at random and closed as for use, shall withstand prescribed test without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Sample last tested to be retained until further tests are made. The type test is as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

§ 78.127 *Specification 37F; steel drums.* Single trip container. Removable head containers which will pass all required tests are authorized.

§ 78.127–1 *Compliance.* (a) Required in all details.

§ 78.127–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.127–8 (a) (3). Actual capacity not less than rated (marked) capacity plus 2 percent not greater than rated capacity plus 2 percent plus 1 quart.

§ 78.127–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.127–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½
19	1.750	3½
20	1.500	3½
22	1.250	3½
24	1.000	2½
26	.750	2½

§ 78.127–5 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity (gallons)	Authorized gross weight (pounds)	Type of container	Welded side seam required	Minimum thickness in the black (gauge, United States standard)	
				Body sheet	Head sheet
5 to 55	80	Straight side	No	26	26
5 to 55	160	do	No	26	26
5 to 55 [1]	275	do	No	24	24
5 to 55	425	do	No	24	24
5 to 55	480	do	Yes	24	24
5 to 55	880	do	Yes	22	22

[1] Because of the present emergency and until further order of the Commission.

§ 78.127–6 *Closure required.* (a) Adequate to prevent leakage; gaskets required when necessary; to be of screw-thread type or secured by positive fastening.

§ 78.127–7 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.127–8 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC—37F***; stars to be replaced by the authorized gross weight (for example, ICC–37F880, etc.). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 18–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

(4) The letters STC; located just above or below the ICC mark to indicate "single trip container".

§ 78.127–9 *Size of markings.* (a) Size of markings (minimum): ½" high for 30-gallon or less, ¾" for over 30 gallons.

§ 78.127–10 *Type test.* (a) Samples, taken at random and closed as for use, shall withstand prescribed test without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Sample last tested to be retained until further tests are made. The type test is as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

§ 78.128 *Specification 37G; steel drums.* Single trip container. Re-

movable head containers which will pass all required tests are authorized.

§ 78.128–1 *Compliance.* (a) Required in all details.

§ 78.128–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.128–8 (a) (3). Actual capacity not less than rated (marked) capacity plus 2 percent, not greater than rated capacity plus 2 percent plus 1 quart.

§ 78.128–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.128–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½
19	1.750	3½
20	1.500	3½
22	1.250	3½
24	1.000	2½
26	.750	2½
28	.625	2½

§ 78.128–5 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity (gallons)	Authorized gross weight (pounds)	Type of container	Welded side seam required	Minimum thickness in the black (gauge, United States standard)	
				Body sheet	Head sheet
5 to 55	80	Straight side	No	28	28
	160	do	No	28	28
	325	do	No	26	26
	425	do	No	24	24
	480	do	Yes	26	26
	880	do	Yes	24	24

§ 78.128–6 *Closure required.* (a) Adequate to prevent leakage; gaskets required when necessary; to be of screw-thread type or secured by positive fastening.

§ 78.128–7 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.128–8 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–37G***; stars to be replaced by the authorized gross weight (for example, ICC–37G880, etc.). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 18–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

(4) The letters STC; located just above or below the ICC mark to indicate "single trip container".

§ 78.128–9 *Size of markings.* (a) Size of markings (minimum): ½" high for 30-gallons or less, ¾" for over 30 gallons.

§ 78.128–10 *Type test.* (a) Samples, taken at random and closed as for use, shall withstand prescribed test without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Sample last tested to be retained until further tests are made. The type test is as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

§ 78.129 *Specification 37H; steel drums.* Single trip container. Removable head containers which will pass all required tests are authorized.

§ 78.129–1 *Compliance.* (a) Required in all details.

§ 78.129–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.129–8 (a) (3). Actual capacity not less than rated (marked) capacity plus 2 percent, not greater than rated capacity plus 2 percent plus 1 quart.

§ 78.129–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.129–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½
19	1.750	3½
20	1.500	3½
22	1.250	3½
24	1.000	2½
26	.750	2½
28	.625	2½

§ 78.129–5 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity (gallons)	Authorized gross weight (pounds)	Type of container	Minimum thickness in the black (gauge, United States standard)	
			Body sheet	Head sheet
5 to 10	45	Straight side.	28	28
5 to 35	145	do	26	26
5 to 30	245	do	24	24
5 to 55	245	do	22	22

(b) Side seams and chimes must be welded or of Gordon or other equally efficient lock type.

(c) Drums of 26 gauge head and body sheets with lap-welded body seams are also authorized for sizes 5 to 40 gallons with maximum authorized gross weight of 220 pounds.

§ 78.129–6 *Closure required.* (a) Adequate to prevent leakage; gasket required when necessary; to be of screw-thread type or secured by positive fastening. Filling opening over 9-inch diameter unauthorized, except when consisting of full removable head. Dust-proof closure required. If closing device can not be opened and closed without reducing efficiency, container must, when specified on purchase order, be provided with supplementary opening for sampling at least 2 inches in diameter with closing device such that it can be opened and closed without reduction of efficiency.

§ 78.129–7 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.129–8 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–37H***; stars to be replaced by the authorized gross weight (for example, ICC–37H245, etc.). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 18–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

(4) The letters STC; located just above or below the ICC mark to indicate "single trip container".

§ 78.129–9 *Size of markings.* (a) Size of markings (minimum): ½" high for 30-gallon or less, ¾" for over 30 gallons.

§ 78.129–10 *Type test.* (a) Samples, taken at random and closed as for use, shall withstand prescribed test without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Sample last tested to be re-

tained until further tests are made. The type test is as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

§ 78.130 *Specification 37K; steel drums.* Single trip container. Removable head containers which will pass all required tests are authorized.

§ 78.130–1 *Compliance.* (a) Required in all details.

§ 78.130–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.130–8 (a) (3). Actual capacity not less than rated (marked) capacity plus 2 percent, not greater than rated capacity plus 2 percent plus 1 quart.

§ 78.130–3 *Composition.* (a) Sheets for body and heads to be low carbon, open hearth or electric steel.

§ 78.130–4 *Weight of sheets.* (a) Average draft weight for any gauge not less than as follows:

Gauge, United States standard (No.)	Standard weight per square foot	Authorized tolerances
	Pounds	*Percent*
12	4.375	5
13	3.750	5
14	3.125	5
15	2.8125	5
16	2.500	5
18	2.000	3½
19	1.750	3½
20	1.500	3½
22	1.250	3½

§ 78.130–5 *Parts and dimensions.* (a) Parts and dimensions as follows:

Marked capacity not over (gallons)	Authorized gross weight (pounds)	Type of container	Welded side seam required	Minimum thickness in the black (gauge, United States standard)	
				Body sheet	Head sheet
55	275	Straight side	Yes	22	22

§ 78.130–6 *Closure required.* (a) Adequate to prevent leakage; to be of bolted ring or lever lock ring types only; sponge rubber gaskets required; flowed-in gaskets not permitted.

§ 78.130–7 *Defective containers.* (a) Leaks and other defects to be repaired by method used in constructing container, not by soldering.

§ 78.130–8 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–37K275. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be recorded with the Bureau of Explosives.

(3) Gauge of metal in thinnest part, rated capacity in gallons, and year of manufacture (for example, 18–55–50). When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first (for example 14/12–55–50 for body 14 gauge and head 12 gauge).

(4) The letters STC; located just above or below the ICC mark to indicate "single trip container".

§ 78.130–9 *Size of markings.* (a) Size of markings (minimum): ½" high for 30-gallon or less, ¾" for over 30 gallons.

§ 78.130–10 *Type test.* (a) Samples, taken at random and closed as for use, shall withstand prescribed test without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Sample last tested to be retained until further tests are made. The type test is as follows:

(1) Test by dropping, filled with dry, finely powdered material to the authorized gross weight, from height of 4 feet onto solid concrete so as to strike diagonally on top chime. Closing devices and other parts projecting beyond chime or rolling hoops must also be capable of withstanding this test.

§ 78.136 *Specification 42E; aluminum drums.* Single-trip container.

§ 78.136–1 *Compliance.* (a) Required in all details.

§ 78.136–2 *Rated capacity.* (a) Rated capacity as marked, see § 78.136–9 (a) (3), 55 gallons; actual capacity shall be rated capacity plus at least 2 percent.

§ 78.136–3 *Composition.* (a) Body and heads of aluminum alloy 52S. Plastic closure plugs authorized if suitably resistant to action of lading.

§ 78.136–4 *Outage.* (a) Two percent of rated capacity, plus a maximum tolerance of 1 quart.

§ 78.136–5 *Seams.* (a) Welded, including attachment of flanges for closures and other devices. Circumferential seams at least 3" from top of chime; chime seams not permitted.

§ 78.136–6 *Parts and dimensions.* (a) To be of 14 Brown and Sharpe gauge (0.064").

(b) Rolled or swedged in rolling hoops required.

§ 78.136–7 *Closures.* (a) Of screw-thread type or secured by screw-thread device; openings over 2.3 inches not authorized; suitable gaskets required; head openings only permitted. Vented closing devices of type approved by the Bureau of Explosives are authorized when specified by the purchaser.

(b) Threaded plugs, or caps, and flanges must be close fitting with gasket surfaces which bear squarely on each other when without gasket; they must have not over 12 threads per inch, with at least 3 threads engaged when gasket is in place; two 5/16-inch drainage holes are authorized in flange.

§ 78.136–8 *Head rings.* (a) Must be of 14 Brown and Sharpe gauge (0.064") tack-welded to each head.

§ 78.136–9 *Marking.* (a) Marking on each container on top head, by stamping with pressure dies, by embossing with raised marks, or plate attached by welding, as follows:

(1) ICC–42E. This mark shall be understood to certify that the container complies with all specification requirements. The letters STC; located just below or above the ICC mark to indicate "single-trip container".

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

(3) Gauge of metal, Brown and Sharpe, in thinnest part; rated capacity in gallons; year of manufacture (for example, 7–30–50).

§ 78.136–10 *Size of marking.* (a) Size of marking (minimum): 1 inch high.

§ 78.136–11 *Type tests.* (a) Samples, taken at random and closed as for use, shall withstand prescribed tests without leakage. Tests to be made of each type and size by each company starting production and to be repeated every four months. Samples last tested to be retained until further tests are made. The type tests are as follows:

(1) Test by dropping, filled with water to 98 percent capacity, from height of 6 feet onto solid concrete so as to strike diagonally on chime, or when without chime seam, to strike on other circumferential seam; also additional test on any other parts which might be considered weaker than the chime.

(2) Hydrostatic pressure test of 60 pounds per square inch sustained for 5 minutes.

§ 78.136–12 *Leakage test.* (a) Each container shall be tested, with seams under water or covered with soapsuds or heavy oil, by interior air pressure of at least 10 pounds per square inch. Leakers shall be rejected or repaired and retested.

§ 78.140 *Specification 13; metal kegs.*

§ 78.140–1 *Compliance.* (a) Required in all details.

§ 78.140–2 *Composition.* (a) To be open-hearth or electric steel, box annealed dead soft; carbon not over 0.14 percent.

§ 78.140–3 *Parts and dimensions.* (a) Parts and dimensions as follows:

	Gross weight of kegs and contents			
	Not over 15 pounds	Not over 30 pounds [1]	Over 30 pounds but not over 75 pounds	Over 75 pounds but not over 150 pounds
Thickness of material:				
Body	30 gauge	28 gauge	24 gauge	24 gauge.
Head	do	do	28 gauge	28 gauge.
Width of lap for side seam	5/16 inch	7/16 inch	7/16 inch	½ inch.
Number of corrugations in each end of body	3	3	5	7.
Minimum depths of corrugations	1/16 inch	3/32 inch	3/32 inch	3/32 inch.
Width of laps on body and head seams	5/16 inch	3/16 inch	3/16 inch	5/16 inch.
Width of laps on head for head seams	5/16 inch	3/8 inch	3/8 inch	3/4 inch.
Head seams	Double lap	Double lap	Double lap	Single lap.

[1] Smokeless powder 32 pounds gross.

NOTE: Dimensions of materials specified are minimum requirements. Gauge specified is for commercial plate, United States standard. Corrugations not required in body of kegs for gross weights not over 7 pounds.

§ 78.140–4 *Seams.* (a) For gross weight over 75 pounds, all seams welded, brazed, soldered, or riveted; rivets at not over 5" centers.

§ 78.140–5 *Closures*—(a) *Slide type.* Metal holder, for slide, securely fastened to head; washer of suitable material 0.025" thick; metal drop with depression to fit into bunghole and hold washer in place; metal slide to cover the foregoing. Positive fastening required between slide and slide holder to prevent leakage in transit; friction fastening not authorized.

(b) *Cap or plug type.* Metal holder, for cap or plug, securely fastened to head; metal cap or plug, with gasket when necessary to prevent sifting. Positive fastening required between cap, or plug, and holder to prevent leakage in transit; friction fastening not authorized.

§ 78.140–6 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–13. This mark shall be understood to certify that the container complies with all specification requirements.

§ 78.140–7 *Size of markings.* (a) Size of markings (minimum): 5/16" high.

§ 78.140–8 *Type test.* (a) Keg filled with fine, dry sand in weight equal to that of shipment must be capable of withstanding, without leakage, 4 successive drops of 4 feet on the head onto solid concrete. Tests to be made of each type and size by each company manufacturing this type of container and to be repeated every six months while in production. If production is discontinued and is resumed, this requirement will also apply if prescribed tests have not been made within the previous six-month period. Samples last tested to be retained until further tests are made.

§ 78.140–9 *Filling with contents*—(a) *Lining.* Cloth bag lining required for gross weight over 32 pounds; neck of bag to be securely tied.

§ 78.140–10 *Additional keg*—(a) *Stove-pipe keg.* Authorized only for shipments loaded by shipper and to be unloaded by consignee and for gross weight of 30 pounds. Must comply with all requirements, except § 78.140–5, and also with the following:

(1) Length to be about 4 times diameter; cap (slip cover) to have snug fit over body with 3" overlap.

(2) Contents to be enclosed in double paper tubes, with pasted seams, not over 2½" diameter and made of tough manila paper weighing at least 50 pounds per 480 sheets 24" x 36"; outside tube to be waxed. Ends of tubes to be folded and tucked between folds of tube to prevent leakage.

NOTE 1: Because of the present emergency and until further order of the Commission, a ream may consist of 500 sheets.

§ 78.141 *Specification 13A; metal drums.*

§ 78.141–1 *Compliance.* (a) Required in all details.

§ 78.141–2 *Type.* (a) Straight sided; authorized only for material cast solid and with filling end head applied after material is loaded and closed in the manner prescribed in § 78.141–6. No other openings permitted.

§ 78.141–3 *Composition.* (a) To be low carbon, open-hearth or electric steel.

§ 78.141–4 *Heads and body*—(a) *Heads.* To be not less than 28 gauge United States standard.

(b) *Body.* To be not less than 28 gauge United States standard.

§ 78.141–5 *Seams.* (a) Must be welded.

§ 78.141–6 *Heads.* (a) To be attached by means of double lapped-seam.

§ 78.141–7 *Marking.* (a) Marking on each container by embossing on head with raised marks as follows:

(1) ICC–13A. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Size of markings (minimum): 5/16 inch high.

§ 78.141–8 *Type tests.* (a) Drum filled and closed as for shipment must be capable of withstanding, without rupture, 4 successive drops of 4 feet on the head onto solid concrete.

(b) Drum must be capable of withstanding hydrostatic pressure test of 30 pounds per square inch, sustained for 5 minutes.

(c) Tests to be made of each type and size by each company manufacturing this type of container and to be repeated every six months while in production. If production is discontinued and is resumed, this requirement will also apply if prescribed tests have not been made within the previous six-month period. Samples last tested to be retained until further tests are made.

§ 78.146 *Specification 32A; metal cases, riveted or lock-seamed.*

§ 78.146–1 *Compliance.* (a) Required in all details.

§ 78.146–2 *Gauge standards.* (a) United States standard for sheet metal; American or Brown and Sharpe for wire.

§ 78.146–3 *Covers.* (a) To have at least 1" lap on body and to fit with clearance not over 1/32"; lapped corners to be welded.

§ 78.146–4 *Edge protection.* (a) Open edges of body must be turned or rolled inward; front open edge of cover must be turned or rolled outward. Not required for material at least 20-gauge thick or for "trailer" cases.

§ 78.146–5 *Bottom protection.* (a) Face on which case will ordinarily rest must be reinforced with continuous angle straps, or be fitted with trunk corners, or be double thickness along edges. Not required for cases of at least 20-gauge metal or of not over 1 reel capacity or for "trailer" cases.

§ 78.146–6 *Hinges.* (a) To be of continuous loop type with loops of steel wire at least 7-gauge, welded; hinge straps at least 18-gauge securely welded or riveted.

§ 78.146–7 *Carrying handles.* (a) Any type of adequate strength.

§ 78.146–8 *Closing devices.* (a) To be of sufficient strength and efficiency to prevent injury or unfastening in tests (§ 78.146–14) or in transit.

§ 78.146–9 *Rivets.* (a) At least 5/32" diameter; length to furnish efficient heads; split rivets not authorized except for attachment of lining.

§ 78.146–10 *Rivet reinforcement.* (a) Hinges, fastening devices, and handles, when riveted in place, must have additional inside reinforcement of steel, at least as thick as in case, through which rivets must pass. Not required when case is made of at least 20-gauge material throughout.

§ 78.146–11 *Lining.* (a) Required throughout; to be hard-surfaced fiberboard at least 0.125" thick and with strength of 800 pounds, Mullen or Cady test, or wooden lining at least 0.25" thick.

§ 78.146–12 *Metal partitions.* (a) Metal partitions (when used) to be as thick as body of case, permanently fastened to the case, and lined the same as the case.

§ 78.146–13 *Protective coating.* (a) Steel cases must be of galvanized material or protected from corrosion by paint, lacquer, or other adequate coating.

§ 78.146–14 *Type tests.* (a) Cases completely filled as for shipment must be capable of withstanding 4 successive drops onto solid concrete from a height

of 6 feet without rupture of case or permanent damage to or unfastening of closing device. Tests to be made by dropping on cover, seam, or any corner.

§ 78.146–15 *Marking.* (a) Marking on each container by the maker with plain and permanent marks at least ½" high as follows:

(1) ICC—32A. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

§ 78.146–16 *Cases with capacity (approx.) not over 9,000 feet of 1⅜" film.* (a) Compliance with §§ 78.146–1 to 78.146–15 required. Seams to be lockseams or riveted. Material to be steel, at least 20-gauge. 2 hinges, 1 fastening device, and 1 carrying handle required.

§ 78.146–17 *Cases with capacity (approx.) not over 8,000 feet of 1⅜" film or 4,500 feet of 2½" film.* (a) Construction as in § 78.146–16, except: 22-gauge material authorized; 1 hinge authorized for single-reel cases.

§ 78.146–18 *Cases with capacity not over 1 reel of 10" diameter.* (a) Construction as in § 78–146–16, except: 24-gauge material and 1 hinge authorized.

§ 78.146–19 *Cases with capacity not over 500 feet of film, "Trailer Cases".* (a) Construction as in § 78.146–16, except: 26-gauge material and 1 hinge of any type authorized.

§ 78.147 *Specification 32B; metal cases, welded or riveted.*

§ 78.147–1 *Compliance.* (a) Required in all details.

§ 78.147–2 *Gauge standards.* (a) United States standard for sheet metal; American or Brown and Sharpe for wire.

§ 78.147–3 *Covers.* (a) To have at least 1" lap on body and to fit with clearance not over 1/32"; lapped corners to be welded.

§ 78.147–4 *Edge protection.* (a) Open edges of body must be turned or rolled inward; front open edge of cover must be turned or rolled outward. Not required for material at least 20-gauge thick or for "trailer" cases.

§ 78.147–5 *Bottom protection.* (a) Face on which case will ordinarily rest must be reinforced with continuous angle straps, or be fitted with trunk corners, or be double thickness along edges. Not required for cases of at least 20-gauge metal or of not over 1 reel capacity or for "trailer" cases.

§ 78.147–6 *Hinges.* (a) To be of continuous loop type with loops of steel wire at least 7-gauge, welded; hinge straps at least 18-gauge securely welded or riveted.

§ 78.147–7 *Carrying handles.* (a) Any type of adequate strength.

§ 78.147–8 *Closing devices.* (a) To be of sufficient strength and efficiency to prevent injury or unfastening in tests (§ 78.147–14) or in transit.

§ 78.147–9 *Rivets.* (a) At least 5/32" diameter: length to furnish efficient heads; split rivets not authorized except for attachment of lining.

§ 78.147–10 *Rivet reinforcement.* (a) Hinges, fastening devices, and handles, when riveted in place, must have additional inside reinforcement of steel, at least as thick as in case, through which rivets must pass. Not required when case is made of at least 20-gauge material throughout.

§ 78.147–11 *Lining.* (a) Required throughout; to be hard-surfaced fiberboard at least 0.125" thick and with strength of 800 pounds, Mullen or Cady test, or wooden lining at least 0.25" thick.

§ 78.147–12 *Metal partitions.* (a) Metal partitions (when used) to be as thick as body of case, permanently fastened to the case, and lined the same as the case.

§ 78.147–13 *Protective coating.* (a) Steel cases must be of galvanized material or protected from corrosion by paint, lacquer, or other adequate coating.

§ 78.147–14 *Type tests.* (a) Cases completely filled as for shipment must be capable of withstanding 4 successive drops onto solid concrete from a height of 6 feet without rupture of case or permanent damage to or unfastening of closing device. Tests to be made by dropping on cover, seam, or any corner.

§ 78.147–15 *Marking.* (a) Marking on each container by the maker with plain and permanent marks at least ½" high as follows:

(1) ICC—32B. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

§ 78.147–16 *Cases with capacity (approximate) not over 12,000 feet of 1⅜" film or 6,000 feet of 2½" film.* (a) Compliance with §§ 78.147–1 to 78.147–15 required. Seams to be welded or riveted. Material to be steel, or aluminum-manganese alloy, at least 18-gauge. 2 hinges, 2 fastening devices spaced as for hinges, and 2 carrying handles required.

§ 78.147–17 *Cases with capacity (approximate) not over 9,000 feet of 1⅜" film.* (a) Compliance with §§ 78.147–1 to 78.147–16, except: 1 fastening device and 1 carrying handle authorized.

§ 78.147–18 *Cases with capacity (approximate) not over 8,000 feet of 1⅜" film or 4,500 feet of 2½" film.* (a) Construction as in § 78.147–16, except: 20-gauge material, 1 fastening device, and 1 carrying handle authorized; 1 hinge authorized for single-reel cases. Detachable covers (no hinges) with ¾" lap on body and efficiency to prevent displacement in tests, are authorized. Trailer cases, capacity not over 500 feet of film, no handle required. Cover lap not less than full one-half inch.

§ 78.148 *Specification 32C; metal trunks.*

§ 78.148–1 *Design.* (a) To be designed to contain film in film-reel cans and projecting apparatus only; other articles not authorized therein.

§ 78.148–2 *Strength.* (a) To be of strength and efficiency to carry contents in ordinary handling without damage to trunk or contents.

§ 78.148–3 *Compartments.* (a) Separate compartments required for each reel of film and for projecting apparatus; each compartment to be constructed so that, in closing, it will have no cracks or openings.

§ 78.148–4 *Compartment linings.* (a) Each film compartment to be made of, or lined throughout with, sheet metal; this metal to be protected against contact with film-reel can by a substantial interlining of fiberboard or equivalent.

§ 78.148–5 *Marking.* (a) Marking on each container by the maker with plain and permanent marks at least ½" high applied on 2" by 4" metal plate securely riveted to top of cover of trunk as follows:

(1) ICC—32C. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

§ 78.149 *Specification 32D; metal boxes for old and worn-out motion-picture film no longer exhibitable.*

§ 78.149–1 *Compliance.* (a) Required in all details.

§ 78.149–2 *Gauge standards.* (a) United States standard for sheet metal; American or Brown and Sharpe for wire.

§ 78.149–3 *Material.* (a) Material to be steel; body and bottom at least 16-gauge; cover at least 18-gauge.

§ 78.149–4 *Joints and seams.* (a) All joints and seams to be welded or riveted.

§ 78.149–5 *Cover.* (a) Cover must be tight-fitting, to prevent entrance of sparks, with provision for secure fastening to be locked or sealed.

§ 78.149–6 *Type tests.* (a) Cases completely filled as for shipment must be capable of withstanding 4 successive drops onto solid concrete from a height of 4 feet without rupture of case or permanent damage to or unfastening of closing device. Tests to be made by dropping on cover, seam, or any corner.

§ 78.149–7 *Marking.* (a) Marking on each container by the maker with plain and permanent marks at least ½" high as follows:

(1) ICC–32D. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the

Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

SUBPART E—SPECIFICATIONS FOR WOODEN BARRELS, KEGS, BOXES, KITS, AND DRUMS

§ 78.155 *Specification 10A; wooden barrels and kegs (tight).*

§ 78.155–1 *Compliance* (a) Required in all details.

§ 78.155–2 *Staves and heading.* (a) To be of white oak, chestnut oak, red oak, black cherry, Douglas fir, beech, sweet birch, yellow birch, sugar (hard) maple, or Scandinavian pine; quarter sawed with the grain, from straight-grained timber, so no annual ring shall slope over half the thickness of stave or head; thoroughly kiln dried, moisture content 7 percent to 11 percent; free from rotten sap, checks, pitch pockets, cat faces, seed and worm holes in excess of 15 in one container, and other defects that show through on both sides.

§ 78.155–3 *Hoops.* (a) Hoops to be of cooperage-grade hoop steel.

§ 78.155–4 *Staves.* (a) Staves to be sawed evenly and circular; croze center to be within 1⅛" of end of stave; stave end to have ⅛" free from bevel.

§ 78.155–5 *Heading.* (a) Heading of uniform thickness and properly circled; planed on outside and properly jointed and glued, or doweled and flagged; dowel diameter not over 5/12 thickness of head.

§ 78.155–6 *The barrel.* (a) Stave joints reasonably flush on outside. Lathing is forbidden.

(b) Worm and seed holes to be plugged; over 15 not authorized in one container.

§ 78.155–7 *Parts required and dimensions.* (a) Parts required and dimensions as follows (10 percent excess capacity authorized):

(1) Staves, when finished on outside:

Capacity of container, not over	Maximum			Minimum	
	Length	Width	Bilge circle	Staves	Thickness
Gallons	*Inches*	*Inches*	*Inches*	*Number*	*Inch*
50	34	6	84	19	¾
30	30	5	74	16	5/8
15	24	4½	54	14	9/16
10	22	4¼	50	12	½
5	18	4	40	10	½

Foregoing thicknesses are of staves finished on one side. One-sixteenth inch must be added for unfinished staves.
Foregoing maximum lengths are authorized to be increased 6 percent or less, provided the thickness of stave is increased at least one-sixteenth inch for each increase of 1 inch in length or fraction thereof.

(2) Heading, after planing:

Capacity of container, not over	Maximum		Minimum	
	Pieces	Diameter	Thickness	Width
Gallons	*Number*	*Inches*	*Inch*	*Inches*
50	6	21	1	2½
30	6	18	1 1/16	2½
15	5	14	1 1/16	2
10	5	13	5/8	2
5	4	11	5/8	2

(3) Hoops, number and size:

Capacity of container, not over (gallons)	Minimum number of hoops	Minimum size of hoops (inches in width and Birmingham gauge)							
		Head		1st quarter		2d quarter		Bilge	
		Inch	Gauge	Inch	Gauge	Inch	Gauge	Inch	Gauge
50	8	1¾	[1] 16	1½	18	1½	18	1¾	17
30	6	1½	17	1½	19	-----	-----	1½	18
15	6	1¼	18	1⅛	19	-----	-----	1¼	19
10	6	1⅛	19	1	19	-----	-----	1⅛	19
5	6	1⅛	19	1	19	-----	-----	1	19

[1] Because of the present emergency and until further order of the Commission, head hoops of 17 gauge are authorized.

§ 78.155–8 *Closures.* (a) To be such as to prevent leakage in transit. Bung holes in staves must be not over 2" diameter.

§ 78.155–9 *Lining.* (a) To be as prescribed in Part 73 of this chapter or otherwise appropriate for the contents.

§ 78.155–10 *Type test.* (a) Sample container at least 2 days old shall not increase more than 10 percent on diameter of head when all hoops above bilge are removed.

§ 78.155–11 *Leakage test.* (a) Required for each lined container; by pressure at time of sizing or air pressure of at least 5 pounds per square inch; leakers to be repaired and retested.

§ 78.155–12 *Marking.* (a) Marking on each container by the maker. By hot branding iron on head as follows:

(1) ICC–10A. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

(3) Date of manufacture (for example, 7–50 for July 1950) located near the maker's mark.

NOTE 1: Because of the present emergency and until further order of the Commission, date of manufacture may be omitted.

§ 78.155–13 *Size of markings.* (a) Size of markings (minimum): ¾" high for over 30-gallon size, ½" for others.

§ 78.156 *Specification 10B; wooden barrels and kegs (tight).*

§ 78.156–1 *Compliance.* (a) Required in all details.

§ 78.156–2 *Staves and heading.* (a) To be of white oak, chestnut oak, red oak, black cherry, Douglas fir, beech, sweet birch, yellow birch, sugar (hard) maple, or Scandinavian pine; quarter sawed with the grain, from straight-grained timber, so no annual ring shall slope over half the thickness of stave or head; thoroughly kiln dried, moisture content 7 percent to 11 percent; free from rotten sap, checks, pitch pockets, cat faces, seed and worm holes in excess of 15 in one container, and other defects that show through on both sides.

§ 78.156–3 *Hoops.* (a) To be of cooperage-grade hoop steel.

§ 78.156–4 *Staves.* (a) Staves to be sawed evenly and circular; croze center to be within 1⅛" of end of stave; stave end to have ⅛" free from bevel.

§ 78.156–5 *Heading.* (a) Heading of uniform thickness and properly circled; planed on outside and properly jointed and glued, or doweled and flagged; dowel diameter not over 5/12 thickness of head.

§ 78.156–6 *The barrel.* (a) Stave joints reasonably flush on outside. Lathing is forbidden.

(b) Worm and seed holes to be plugged; over 15 not authorized in one container.

§ 78.156–7 *Parts required and dimensions.* (a) Parts required and dimensions as follows (10 percent excess capacity authorized):

(1) Staves, when finished on outside:

Capacity of container, not over	Maximum			Minimum	
	Length	Width	Bilge Circle	Staves	Thickness
Gallons	*Inches*	*Inches*	*Inches*	*Number*	*Inch*
50	34	6	84	19	1 1/16
30	30	5	74	16	5/8
15	24	4½	54	14	9/16
10	22	4¼	50	12	½
5	18	4	40	10	½

Foregoing thicknesses are of staves finished on one side. One-sixteenth inch must be added for unfinished staves.
Foregoing maximum lengths are authorized to be increased 6 percent or less, provided the thickness of stave is increased at least one-sixteenth inch for each increase of 1 inch in length or fraction thereof.

(2) Heading, after planing:

Capacity of container, not over	Maximum		Minimum	
	Pieces	Diameter	Thickness	Width
Gallons	*Number*	*Inches*	*Inch*	*Inches*
50	6	21	¾	2½
30	6	18	5/8	2½
15	5	14	9/16	2
10	5	13	½	2
5	4	11	½	2

NOTE 1: Because of the present emergency and until further order of the Commission, for barrels of not over 50 gallons capacity, maximum number of pieces may be 7 provided they have a minimum thickness of ⅞ inch.

(3) Hoops, number and size:

Capacity of container, not over (gallons)	Minimum number of hoops	Minimum size of hoops (inches in width and Birmingham gauge)							
		Head		First quarter		Second quarter		Bilge	
		Inch	Gauge	Inch	Gauge	Inch	Gauge	Inch	Gauge
50	[1] 8	[2] 1¾	[2] 17	1½	18	1½	18	[3] 1¾	[3] 17
30	6	1½	18	1¼	19	-----	-----	1½	18
15	6	1¼	19	1⅛	19	-----	-----	1¼	19
10	6	1⅛	19	1	19	-----	-----	1⅛	19
5	[2] 6	1	19	1	19	-----	-----	1	19

[1] Because of the present emergency and until further order of the Commission, the minimum number of hoops is authorized to be reduced to 6 by eliminating second quarter hoops.
[2] Because of the present emergency and until further order of the Commission, the minimum number of hoops is authorized to be reduced to 4 by eliminating first quarter hoops if head and bilge hoops of 1¾ inch by 17 gauge are used.
[3] 2 inch by 18 gauge hoops are also authorized.

§ 78.156–8 *Closures.* (a) To be such as to prevent leakage in transit. Bung holes in staves must be not over 2" diameter.

§ 78.156–9 *Lining.* (a) To be as prescribed in Part 73 of this chapter or otherwise appropriate for the contents.

§ 78.156–10 *Type test.* (a) Sample container at least 2 days old shall not increase more than 10 percent on diameter of head when all hoops above bilge are removed.

§ 78.156–11 *Leakage test.* (a) Required for each lined container; by pressure at time of sizing or air pressure of at least 5 pounds per square inch; leakers to be repaired and retested.

§ 78.156–12 *Marking.* (a) Marking on each container by the maker. By hot branding iron on head as follows:

(1) ICC–10B. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

(3) Date of manufacture (for example, 7—50 for July 1950) located near the maker's mark.

NOTE 1: Because of the present emergency and until further order of the Commission, date of manufacture may be omitted.

§ 78.156–13 *Size of markings.* (a) Size of markings (minimum): ¾" high for over 30-gallon size, ½" for others.

§ 78.157 *Specification 10C; wooden barrels and kegs (tight).*

§ 78.157–1 *Compliance.* (a) Required in all details.

§ 78.157–2 *Staves and heading.* (a) To be of white oak, chestnut oak, red oak, black cherry, Douglas fir, beech, sweet birch, yellow birch, sugar (hard) maple, or Scandinavian pine; quarter sawed with the grain, from straight-grained timber, so no annual ring shall slope over half the thickness of stave or head; thoroughly kiln dried, moisture content 7 percent to 11 percent; free from rotten sap, checks, pitch pockets, cat faces, seed and worm holes in excess of 15 in one container, and other defects that show through on both sides.

§ 78.157–3 *Hoops.* (a) To be of cooperage-grade hoop steel.

§ 78.157–4 *Staves.* (a) Staves to be sawed evenly and circular; croze center to be within 1⅛" of end of stave; stave end to have ⅛" free from bevel.

§ 78.157–5 *Heading.* (a) Heading of uniform thickness and properly circled; planed on outside and properly jointed and glued, or doweled and flagged; dowel diameter not over 5/12 thickness of head.

§ 78.157–6 *The barrel.* (a) Stave joints reasonably flush on outside. Lathing is forbidden.

(b) Worm and seed holes to be plugged; over 15 not authorized in one container.

§ 78.157–7 *Parts required and dimensions.* (a) Parts required and dimensions as follows (10 percent excess capacity authorized):

(1) Staves, when finished on outside:

Capacity of container, not over	Maximum			Minimum	
	Length	Width	Bilge circle	Staves	Thickness
Gallons	*Inches*	*Inches*	*Inches*	*Number*	*Inch*
50	34	6	84	19	1 1/16
30	30	5	74	16	⅝
15	24	4½	54	14	9/16
10	22	4¼	50	12	½
5	18	4	40	10	½

Foregoing thicknesses are of staves finished on one side. One-sixteenth inch must be added for unfinished staves. Foregoing maximum lengths are authorized to be increased 6 percent or less, provided the thickness of stave is increased at least one-sixteenth inch for each increase of 1 inch in length or fraction thereof.

(2) Heading after planing:

Capacity of container, not over	Maximum		Minimum	
	Pieces	Diameter	Thickness	Width
Gallons	*Number*	*Inches*	*Inch*	*Inches*
50	6	21	¾	2½
30	6	18	⅝	2½
15	5	14	9/16	2
10	5	13	½	2
5	4	11	½	2

NOTE 1: Because of the present emergency and until further order of the Commission, for barrels of not over 50 gallons capacity, maximum number of pieces may be 7 provided they have a minimum thickness of ⅞ inch.

(3) Hoops, number and size:

Capacity of container, not over (gallons)	Minimum number of hoops	Minimum size of hoops (inches in width and Birmingham gauge)							
		Head		1st quarter		2d quarter		Bilge	
		Inch	Gauge	Inch	Gauge	Inch	Gauge	Inch	Gauge
50	6	1¾	17	1½	18	-----	-----	1¾	17
30	6	1½	18	1¼	19	-----	-----	1½	18
15	6	1¼	19	1⅛	19	-----	-----	1¼	19
10	6	1⅛	19	1	19	-----	-----	1⅛	19
5	6	1	19	1	19	-----	-----	1	19

§ 78.157–8 *Closures.* (a) To be such as to prevent leakage in transit. Bung holes in staves must be not over 2" diameter.

§ 78.157–9 *Lining.* (a) To be as prescribed in Part 73 of this chapter or otherwise appropriate for the contents.

§ 78.157–10 *Type test.* (a) Sample container at least 2 days old shall not increase more than 10 percent on diameter of head when all hoops above bilge are removed.

§ 78.157–11 *Leakage test.* (a) Required for each lined container; by pressure at time of sizing or air pressure of at least 5 pounds per square inch; leakers to be repaired and retested.

§ 78.157–12 *Marking.* (a) Marking on each container by the maker. By hot branding iron on head as follows:

(1) ICC–10C. This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

(3) Date of manufacture (for example, 7–50 for July, 1950) located near the maker's mark.

NOTE 1: Because of the present emergency and until further order of the Commission, date of manufacture may be omitted.

§ 78.157–13 *Size of markings.* (a) Size of markings (minimum): ¾" high for over 30-gallon size, ½" for others.

§ 78.160 *Specification 11A; wooden barrels and kegs (slack).*

§ 78.160–1 *Compliance.* (a) Required in all details.

§ 78.160–2 *Classification of woods.* (a) As follows:

GROUP A

Oak.	Sycamore.
Beech.	Hackberry.
Maple.	Birch.
Elm.	Douglas fir.
Red Gum.	White ash.

GROUP B

Cottonwood.	Pine.
Basswood.	Chestnut.
Tupelo gum.	Willow.

NOTE 1: Because of the present emergency and until further order of the Commission, cottonwood and poplar are authorized to be included in Group A woods.

§ 78.160–3 *Staves.* (a) Staves of Group A woods, No. 1 grade, kiln dried; of uniform thickness, well equalized, circled, and jointed; minimum thickness 5 staves to 1⅞"; maximum width 5½".

(b) To be tongued and grooved.

§ 78.160–4 *Heading.* (a) Heading to be No. 1 grade, kiln dried, uniform thickness, turned true to size, dressed on one side, and jointed and glued.

§ 78.160–5 *Metal hoops.* (a) Hoops of cooperage-grade hoop steel with one edge beaded or rolled.

§ 78.160–6 *Wooden hoops.* (a) No. 1 grade coiled elm at least 9/32" x 5/32" x 1⅜"; ends joined by 1 staple and 2 additional nails or staples clinched on the inside or by 4 nails or 3 staples clinched on the inside.

§ 78.160–7 *Parts and dimensions.* (a) Parts and dimensions as follows:

Authorized net weight (pounds)	Heading				Staves	Metal hoops [4]	
	Diameter not over [3] (inch)	Thickness at least, Wood group A (inch)	Thickness at least, Wood group B (inch)	Number of pieces not over	Length not over [3] (inch)	Width (inch) by Birmingham wire gauge (minimum), Head	Width (inch) by Birmingham wire gauge (minimum), Quarter [2] and bilge
350	16	½	½	3	28½	1⅝ x 23	1⅜ x 23
450	16	½	⅝	3	28½	1⅝ x 23	1⅜ x 23
600	16	⅝	⅝	3	28½	1⅝ x 23	1⅜ x 23
350	17	½	½	4	30	1⅝ x 23	1⅜ x 23
450	17	½	⅝	4	30	1⅝ x 23	1⅜ x 23
600	17	⅝	⅝	4	30	1⅝ x 23	1⅜ x 23
350	19	½	½	5	34	1⅝ x 22	1⅜ x 23
450	19	½	⅝	5	34	1⅝ x 22	1⅜ x 23
600	19	⅝	⅝	5	34	1⅝ x 22	1⅜ x 23
350	21	½	½	5	34	1⅝ x 21 or 2 x 22	1⅜ x 23
450	[1] 21	½	⅝	5	34	1⅝ x 21 or 2 x 22	1⅜ x 23
600	[1] 21	⅝	⅝	5	34	1⅝ x 21 or 2 x 22	1⅜ x 23

[1] Head battens required; at least ½" x 3½"; ends rounded to fit chime; securely nailed to heads.
[2] Quarter hoops not required for 350 pounds authorized net weight.
[3] Tolerance of ⅛" authorized.
[4] Wooden hoops authorized: 8 for 350 pounds net; 10 for 450 pounds net; 12 for 600 pounds net.

§ 78.160–8 *Head liners.* (a) Required as provided in § 78.160–13.

§ 78.160–9 *Marking.* (a) Marking on each container to be applied by the maker on top head as follows:

(1) ICC–11A; followed by the authorized gross weight (authorized net weight plus tare weight; for example, ICC–11A475, etc.). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

§ 78.160–10 *Size of marking.* (a) Size of marking (minimum): ¾" high for head diameter over 17"; ½" high for others.

§ 78.160–11 *Heads.* (a) To fit well in croze and be secured by nails or staples at 8" spacing through hoops into heads.

§ 78.160–12 *Head battens (when required by § 78.160–7).* (a) To be fastened at each end by ½" metal strapping nailed over chime and under hoops.

§ 78.160–13 *Head liners.* (a) To extend across grain, circle at least ½ of circumference, and be nailed or stapled at 5" intervals. Required for containers with wooden hoops when net weight of contents is to exceed 250 pounds.

§ 78.160–14 *Quarter and bilge hoops.* (a) To be redriven and fastened by 4 fasteners for each hoop; puncture fastening at 8" intervals authorized for metal hoops.

§ 78.161 *Specification 11B; wooden barrels and kegs (slack).*

§ 78.161–1 *Compliance.* (a) Required in all details.

§ 78.161–2 *Classification of woods.* (a) as follows:

GROUP A

Oak.	
Beech.	Hackberry.
Maple.	Birch.
Elm.	Douglas fir.
Red Gum.	White ash.
Sycamore.	

GROUP B

Cottonwood.	Pine.
Basswood.	Chestnut.
Tupelo gum.	Willow.

NOTE 1: Because of the present emergency and until further order of the Commission, cottonwood and popular are authorized to be included in Group A woods.

§ 78.161–3 *Staves.* (a) Staves of Group A woods, No. 1 grade, kiln dried; of uniform thickness, well equalized, circled, and jointed; minimum thickness 5 staves to 1⅞"; maximum width 5½". Group B woods authorized for 24" or shorter staves.

§ 78.161–4 *Heading.* (a) Heading to be No. 1 grade, kiln dried, uniform thickness, turned true to size, dressed on one side, and jointed.

§ 78.161–5 *Metal hoops.* (a) Hoops of cooperage-grade hoop steel with one edge beaded or rolled.

§ 78.161–6 *Wooden hoops.* (a) No. 1 grade coiled elm at least 9/32" x 5/32" x 1⅜"; ends joined by 1 staple and 2 additional nails or staples clinched on the inside or by 4 nails or 3 staples clinched on the inside.

§ 78.161–7 *Parts and dimensions.* (a) Parts and dimensions as follows:

Authorized net weight (pounds)	Heading				Staves	Metal hoops [4]	
	Diameter not over [3] (inches)	Thickness at least, Wood group A (inch)	Thickness at least, Wood group B (inch)	Number of pieces not over	Length not over [3] (inches)	Width (inch) by Birmingham wire gauge (minimum), Head	Width (inch) by Birmingham wire gauge (minimum), Quarter [2] and bilge
350	16	½	½	3	28½	1⅝ x 23	1⅜ x 23
450	16	½	⅝	3	28½	1⅝ x 23	1⅜ x 23
600	16	⅝	⅝	3	28½	1⅝ x 23	1⅜ x 23
350	17	½	½	4	30	1⅝ x 23	1⅜ x 23
450	17	½	⅝	4	30	1⅝ x 23	1⅜ x 23
600	17	⅝	⅝	4	30	1⅝ x 23	1⅜ x 23
350	19	½	½	5	34	1⅝ x 22	1⅜ x 23
450	19	½	⅝	5	34	1⅝ x 22	1⅜ x 23
600	19	⅝	⅝	5	34	1⅝ x 22	1⅜ x 23
350	21	½	½	5	34	1⅝ x 21 or 2 x 22	1⅜ x 23
450	[1] 21	½	⅝	5	34	1⅝ x 21 or 2 x 22	1⅜ x 23
600	[1] 21	⅝	⅝	5	34	1⅝ x 21 or 2 x 22	1⅜ x 23

[1] Head battens required; at least ½" x 3½"; ends rounded to fit chime; securely nailed to heads.
[2] Quarter hoops not required for 350 pounds authorized net weight.
[3] Tolerance of ⅛" authorized.
[4] Wooden hoops authorized: 8 for 350 pounds net; 10 for 450 pounds net; 12 for 600 pounds net.

§ 78.161–8 *Head liners.* (a) Required as provided in § 78.161–13.

§ 78.161–9 *Marking.* (a) Marking on each container to be applied by the maker on top head as follows:

(1) ICC–11B; followed by the authorized gross weight (authorized net weight plus tare weight; for example, ICC–11B370, etc.). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

§ 78.161–10 *Size of marking.* (a) Size of marking (minimum): ¾" high for head diameter over 17"; ½" high for others.

§ 78.161–11 *Heads.* (a) Heads to fit well in croze and be secured by nails or staples at 8" spacing through hoops into heads.

§ 78.161–12 *Head battens (when required by § 78.161–7).* (a) To be fastened at each end by ½" metal strapping nailed over chime and under hoops.

§ 78.161–13 *Head liners.* (a) To extend across grain, circle at least ½ of circumference, and be nailed or stapled at 5" intervals. Required for containers with wooden hoops when net weight of contents is to exceed 250 pounds.

§ 78.161–14 *Quarter and bilge hoops.* (a) To be redriven and fastened by 4 fasteners for each hoop; puncture fastening at 8" intervals authorized for metal hoops.

§ 78.165 *Specification 14; wooden boxes nailed.*

§ 78.165–1 *Compliance.* (a) Required in all details.

§ 78.165–2 *Lumber.* (a) White pine or wood of at least equal strength, well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength. Grain of wood in cleats must not cross cleat within ½ its length.

§ 78.165–3 *Nails.* (a) Cement coated, except as otherwise authorized, or screws of equal efficiency.

§ 78.165–4 *Ends, sides, tops, and bottoms.* (a) Ends, sides, tops, and bottoms, as follows:

(1) Parts of 1-piece.

(2) Parts Linderman-joint glued.

(3) Parts tongued, grooved, and glued.

(4) Parts butt-joint glued, provided the joined surfaces are planed before gluing so as to assure full contact. After immersion in water for 24 hours at 70° F, the part must not fail at the joint when it is broken.

(b) Tongued, grooved and glued joints in uncleated ends must also be fastened with corrugated fasteners not over 8" apart, within 3" of each end of joint and having penetration 4/5 thickness of end.

§ 78.165–5 *Cleated ends.* (a) Double cleated, 2 vertical and 2 horizontal.

Nails staggered at 2" intervals and clinched; cement coating not required.

§ 78.165–6 *Sides, tops, and bottoms.* (a) Of size to extend out over cleats, if any.

Authorized gross weight (maximum) (pounds)	Type of box	Thickness of lumber (minimum)				Nails (minimum size)	
		Ends	Sides	Tops and bottoms	Cleats	Into ends or cleats	Into sides
		Inches	*Inch*	*Inch*	*Inches*	*Penny*	*Penny*
35	Lock [1] Corner	7/16	7/16	5/16		5d	5d
65	Lock [1] Corner	½	½	3/8		5d	5d
75	Plain Nailed	7/8	½	½		7d	5d
75	Double Cleat	3/8	3/8	3/8	½ x 1½	5d	
140	Plain Nail	1⅛	5/8	5/8		8d	7d
140	Lock [1] Corner	5/8	5/8	5/8		7d	7d
140	Double Cleat	¾	5/8	5/8	¾ x 1⅞	7d	7d

[1] Or dovetail.

§ 78.165–7 *Lock and dovetail corners.* (a) Glued.

§ 78.165–8 *Parts and dimensions.* (a) Parts and dimensions as follows:

§ 78.165–9 *Joints in sides and ends.* (a) Staggered; except for ends cleated as prescribed.

§ 78.165–10 *Tops and bottoms.* (a) Must fit evenly on frame of box.

§ 78.165–11 *Cleated boxes.* (a) Sides, top, and bottom must be secured to ends by nails driven into cleats, not into end boards.

§ 78.165–12 *Nails in each nailing edge (minimum number).* (a) At least equal to length of edge in inches divided by 2; when number of nails is at least equal to length of edge divided by 1¾, 4d nails are authorized where 5d nails are prescribed.

Exception: Eight inch spacing authorized for nailing tops and bottoms to sides.

NOTE 1: Because of the present emergency and until further order of the Commission, the following exception is authorized for nailing tops to boxes: When 7d and 8d nails are required by § 78.165–8, 6d nails are authorized if number of nails used is at least equal to length of end edge divided by 1¾ and length of side edge divided by 6.

§ 78.165–13 *Marking.* (a) Marking on each box with letters and figures at least ½" high in rectangle as follows:

ICC–14

(1) This mark shall be understood to certify that box complies with all specification requirements.

§ 78.168 *Specification 15A; wooden boxes, nailed.*

§ 78.168–1 *Compliance.* (a) Required in all details.

§ 78.168–2 *Closed [1] box.* (a) Parts and pieces to be in close contact.

§ 78.168–3 *Ends.* (a) One-piece, or equivalent (see § 78.168–5), or cleated as prescribed; joints tongued, grooved, and glued.

§ 78.168–4 *Sides, top, and bottom.* (a) Joints tongued, grooved, and glued, or one-piece equivalent.

[1] Openings for filling device of inside container authorized if device is properly protected.

§ 78.168–5 *One-piece equivalents.* (a) Parts are considered equivalent to one-piece as follows:

(1) Parts Linderman-joint glued.

(2) Parts at least ½" thick, tongued and grooved and glued, with 2 or more corrugated fasteners on each joint.

(3) Parts butt-joint glued, provided the joined surfaces are planed before gluing, so as to assure full contact. After immersion in water for 24 hours at 70° F. the part must not fail at the joint when it is broken.

(b) Corrugated fasteners (as prescribed for one-piece equivalents): 1" wide; penetration 4/5 thickness of part; within 3" of end of joint and not over 8" apart; for 3 or more, drive alternately into opposite sides of part.

§ 78.168–6 *Gluing efficiency.* (a) Shall be determined for boxes for gross weight of 150 pounds or less. When filled with sand and sawdust to marked gross weight, the boxes must be able to withstand 8 drops of 12", one on each corner, onto solid concrete without exposure of contents.

§ 78.168–7 *Lumber.* (a) To be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength. Grain of wood in cleats must not cross cleat within ½ its length.

§ 78.168–8 *Nails.* (a) Cement coated, unless otherwise authorized herein, of size specified for "sinkers" and "coolers" as generally known to the trade.

§ 78.168–9 *Grouping of principal woods.* (a) Grouping as follows:

GROUP 1

White pine.	Willow.
Norway pine.	Noble fir.
Aspen (popple).	Magnolia.
Spruce.	Buckeye.
Western (yellow) pine.	White fir.
	Cedar.
Cottonwood.	Redwood.
Balsam fir.	Butternut.
Yellow poplar.	Cucumber.
Chestnut.	Alpine fir.
Sugar pine.	Lodgepole pine.
Cypress.	Jack pine.
Basswood.	

GROUP 2

Southern yellow pine.	Douglas fir.
Hemlock.	Larch (tamarack).
North Carolina pine.	

GROUP 3

White elm.	Black gum.
Red gum.	Black ash.
Sycamore.	Tupelo.
Pumpkin ash.	Maple—soft or silver.

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	Hickory.
Hackberry.	White ash.

§ 78.168–10 *Width of pieces.* (a) At least 2½".

§ 78.168–11 *Width of cleats.* (a) Twice the prescribed thickness plus ¾".

§ 78.168–12 *Thickness of lumber.* (a) Nailed boxes not cleated (Style 1). Authorized gross weight not over 100 pounds, see Note 1. Sides as in Table 1; top and bottom as in Table 1A; ends as in Table 5.

(b) Glued-lock-corner boxes (Style 6). Authorized gross weight not over 150 pounds. Sides as in Table 3; top and bottom as in Table 1A; ends as in Table 3A. Or, sides as in Table 2; top and bottom as in Table 1A; end as in Table 4.

(c) Single-cleated boxes (Style 4 or 5). Authorized gross weight not over 200 pounds, see Note 2. Sides as in Table 1; top and bottom as in Table 1A; ends and cleats as in Table 3A.

(d) Double-cleated boxes (Style 2, 2½, or 3). Authorized gross weight not over 500 pounds, see Note 3. Sides as in Table 1; top and bottom as in Table 1A; end and cleats as in Table 2A. Or, sides as in Table 1; top and bottom as in Table 1A; cleats as in Table 3B; ends not thinner than thickest side or top.

NOTE 1: When group II woods are used the gross weight may be increased to 110 pounds.

NOTE 2: When group II woods are used the gross weight may be increased to 220 pounds.

NOTE 3: When group II woods are used the gross weight may be increased to 550 pounds.

(e) Tables are as follows (dimensions of materials finished or resawed):

TABLE 1

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inch*	*Inch*	*Inch*	*Inch*
15	5/16	5/16	5/16	5/16	5/16	5/16
25	5/16	5/16	5/16	5/16	5/16	5/16
35	5/16	5/16	5/16	5/16	5/16	5/16
45	11/32	11/32	11/32	11/32	11/32	11/32
55	3/8	11/32	11/32	11/32	11/32	11/32
65	3/8	3/8	11/32	11/32	11/32	11/32
75	7/16	3/8	3/8	11/32	11/32	11/32
85	7/16	7/16	3/8	3/8	11/32	11/32
100	½	7/16	7/16	3/8	3/8	11/32
125	9/16	½	½	7/16	3/8	3/8
150	5/8	9/16	9/16	½	7/16	3/8
175	5/8	5/8	9/16	½	½	7/16
200	11/16	5/8	5/8	9/16	½	7/16
250	25/32	¾	11/16	5/8	9/16	½
300	13/16	13/16	¾	11/16	5/8	9/16
350	15/16	7/8	13/16	¾	13/16	5/8
400	1	15/16	7/8	13/16	¾	13/16
500	1⅛	1 1/16	1	15/16	7/8	¾

TABLE 1A

Width of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inch*	*Inch*	*Inch*	*Inch*
15	5/16	5/16	5/16	5/16	5/16	5/16
25	5/16	5/16	5/16	5/16	5/16	5/16
35	5/16	5/16	5/16	5/16	5/16	5/16
45	11/32	11/32	11/32	11/32	11/32	11/32
55	3/8	11/32	11/32	11/32	11/32	11/32
65	3/8	3/8	11/32	11/32	11/32	11/32
75	7/16	3/8	3/8	11/32	11/32	11/32
85	7/16	7/16	3/8	3/8	11/32	11/32
100	1/2	7/16	7/16	3/8	3/8	11/32
125	9/16	1/2	1/2	7/16	3/8	3/8
150	5/8	9/16	9/16	1/2	7/16	3/8
175	5/8	5/8	9/16	1/2	1/2	7/16
200	11/16	5/8	5/8	9/16	1/2	7/16
250	25/32	3/4	11/16	5/8	9/16	1/2
300	13/16	13/16	3/4	11/16	5/8	9/16
350	15/16	7/8	13/16	3/4	11/16	5/8
400	1	15/16	7/8	13/16	3/4	11/16
500	1 1/8	1 1/16	1	15/16	7/8	3/4

TABLE 2

Depth of box (inches)	Not over 8"	Not over 9"	No over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inch*	*Inch*
15	11/32	11/32	11/32	11/32	11/32	11/32
25	11/32	11/32	11/32	11/32	11/32	11/32
35	3/8	11/32	11/32	11/32	11/32	11/32
45	7/16	3/8	3/8	11/32	11/32	11/32
55	1/2	7/16	3/8	3/8	11/32	11/32
65	1/2	1/2	7/16	3/8	3/8	11/32
75	9/16	1/2	1/2	7/16	3/8	3/8
85	9/16	9/16	1/2	7/16	7/16	3/8
100	5/8	9/16	9/16	1/2	7/16	7/16
125	11/16	5/8	5/8	9/16	1/2	7/16
150	3/4	11/16	11/16	5/8	9/16	1/2
175	13/16	3/4	11/16	11/16	5/8	9/16
200	7/8	13/16	3/4	3/4	11/16	5/8
250	1	15/16	7/8	13/16	3/4	5/8
300	1 1/16	1	15/16	7/8	25/32	11/16
350	1 1/8	1 1/16	1	15/16	7/8	3/4
400	1 3/16	1 1/8	1 1/16	1	15/16	13/16
500	------	------	1 1/8	1 1/16	1	7/8

TABLE 2A

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inch*	*Inch*
15	11/32	11/32	11/32	11/32	11/32	11/32
25	7/16	7/16	7/16	7/16	7/16	7/16
35	7/16	7/16	7/16	7/16	7/16	7/16
45	7/16	7/16	7/16	7/16	7/16	7/16
55	1/2	7/16	7/16	7/16	7/16	7/16
65	1/2	1/2	7/16	7/16	7/16	7/16
75	9/16	1/2	1/2	7/16	7/16	7/16
85	9/16	9/16	1/2	7/16	7/16	7/16
100	5/8	9/16	9/16	1/2	7/16	7/16
125	13/16	5/8	5/8	9/16	1/2	7/16
150	3/4	11/16	11/16	5/8	9/16	1/2
175	13/16	3/4	11/16	11/16	5/8	9/16
200	7/8	13/16	3/4	3/4	11/16	5/8
250	1	15/16	7/8	13/16	3/4	5/8
300	1 1/16	1	15/16	7/8	25/32	11/16
350	1 1/8	1 1/16	1	15/16	7/8	3/4
400	1 3/16	1 1/8	1 1/16	1	15/16	13/16
500	------	------	1 1/8	1 1/16	1	7/8

TABLE 3

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
15	5/16	5/16	5/16	5/16	5/16	5/16
25	3/8	11/32	11/32	11/32	11/32	11/32
35	7/16	7/16	3/8	11/32	11/32	11/32
45	1/2	1/2	7/16	7/16	3/8	11/32
55	9/16	1/2	1/2	7/16	7/16	3/8
65	9/16	9/16	9/16	1/2	7/16	7/16
75	5/8	5/8	9/16	1/2	1/2	7/16
85	11/16	11/16	5/8	9/16	1/2	1/2
100	3/4	11/16	11/16	5/8	9/16	1/2
125	13/16	3/4	3/4	11/16	5/8	9/16
150	15/16	7/8	13/16	3/4	11/16	5/8
175	1	15/16	7/8	13/16	3/4	11/16
200	1 1/16	1	15/16	7/8	25/32	11/16
250	1 1/8	1 1/16	1	15/16	7/8	25/32
300	1 5/16	1 3/16	1 1/8	1 1/16	15/16	7/8
350	------	1 5/16	1 1/4	1 1/8	1	15/16
400	------	------	------	1 1/4	1 1/8	1
500	------	------	------	------	1 1/4	1 1/8

TABLE 3A

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
15	11/32	11/32	11/32	11/32	11/32	11/32
25	7/16	7/16	7/16	7/16	7/16	7/16
35	7/16	7/16	7/16	7/16	7/16	7/16
45	1/2	1/2	7/16	7/16	7/16	7/16
55	9/16	1/2	1/2	7/16	7/16	7/16
65	9/16	9/16	9/16	1/2	7/16	7/16
75	5/8	5/8	9/16	1/2	1/2	7/16
85	11/16	11/16	5/8	9/16	1/2	1/2
100	3/4	11/16	11/16	5/8	9/16	1/2
125	13/16	3/4	3/4	11/16	5/8	9/16
150	15/16	7/8	13/16	3/4	11/16	5/8
175	1	15/16	7/8	13/16	3/4	11/16
200	1 1/16	1	15/16	7/8	25/32	11/16
250	1 1/8	1 1/16	1	15/16	7/8	25/32
300	1 5/16	1 3/16	1 1/8	1 1/16	15/16	7/8
350	------	1 5/16	1 1/4	1 1/8	1	15/16
400	------	------	------	1 1/4	1 1/8	1
500	------	------	------	------	1 1/4	1 1/8

TABLE 3B

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
15	7/16	7/16	7/16	7/16	7/16	7/16
25	7/16	7/16	7/16	7/16	7/16	7/16
35	7/16	7/16	7/16	7/16	7/16	7/16
45	1/2	1/2	7/16	7/16	7/16	7/16
55	9/16	1/2	1/2	7/16	7/16	7/16
65	9/16	9/16	9/16	1/2	7/16	7/16
75	5/8	5/8	9/16	1/2	1/2	7/16
85	11/16	11/16	5/8	9/16	1/2	1/2
100	3/4	11/16	11/16	5/8	9/16	1/2
125	13/16	3/4	3/4	11/16	5/8	9/16
150	15/16	7/8	13/16	3/4	11/16	5/8
175	1	15/16	7/8	13/16	3/4	11/16
200	1 1/16	1	15/16	7/8	25/32	11/16
250	1 1/8	1 1/16	1	15/16	7/8	25/32
300	1 5/16	1 3/16	1 1/8	1 1/16	15/16	7/8
350	------	1 5/16	1 1/4	1 1/8	1	15/16
400	------	------	------	1 1/4	1 1/8	1
500	------	------	------	------	1 1/4	1 1/8

TABLE 4

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inch	*Inch*	*Inch*	*Inch*	*Inch*	*Inch*
15	7/16	7/16	7/16	7/16	7/16	7/16
25	7/16	7/16	7/16	7/16	7/16	7/16
35	1/2	1/2	7/16	7/16	7/16	7/16
45	9/16	9/16	1/2	1/2	7/16	7/16
55	5/8	9/16	9/16	1/2	1/2	7/16
65	11/16	5/8	5/8	9/16	1/2	1/2
75	3/4	11/16	5/8	5/8	9/16	1/2
85	25/32	3/4	13/16	5/8	5/8	9/16
100	7/8	13/16	3/4	11/16	5/8	9/16
125	15/16	7/8	13/16	3/4	11/16	5/8
150	1	15/16	15/16	7/8	13/16	11/16

TABLE 5

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inch	*Inch*	*Inch*	*Inch*	*Inch*	*Inch*
15	1/2	1/2	1/2	1/2	1/2	1/2
25	1/2	1/2	1/2	1/2	1/2	1/2
35	5/8	9/16	1/2	1/2	1/2	1/2
45	11/16	5/8	9/16	1/2	1/2	1/2
55	3/4	13/16	5/8	5/8	9/16	1/2
65	13/16	3/4	11/16	5/8	5/8	9/16
75	7/8	13/16	3/4	11/16	5/8	9/16
85	15/16	7/8	13/16	3/4	11/16	5/8
100	1	15/16	7/8	13/16	3/4	11/16

§ 78.168–13 *Reduced thicknesses.* (a) Reduction in thicknesses is authorized as in paragraphs (a) to (d) of this section except that reduced thicknesses must be not less than:

(1) Sides, top, and bottom: Minimum 5/16" for boxes up to 35 pounds authorized gross weight and 3/8" above that weight.

(2) Ends and cleats: Minimum 7/16".

(b) Sides of one-piece or equivalent: 12½ percent.

(c) Any part or cleat of Group 3 or 4 wood: 20 percent.

(d) Sides, top, and bottom when to be strapped as per § 78.168–19 (b): 20 percent for 1 strap; 35 percent for 2 straps.

CONVERSION TABLE

Specified thickness (inches)	Reduced thickness corresponding to percent reduction		
	12½	20	35
9/32	1/4	1/4	1/4
5/16	9/32	1/4	1/4
11/32	5/16	9/32	1/4
3/8	5/16	5/16	1/4
7/16	3/8	11/32	9/32
1/2	7/16	3/8	5/16
9/16	1/2	7/16	3/8
5/8	9/16	1/2	7/16
11/16	5/8	9/16	7/16
3/4	5/8	5/8	1/2
25/32	11/16	5/8	1/2
13/16	11/16	5/8	1/2
7/8	3/4	11/16	9/16
15/16	13/16	3/4	5/8
1	7/8	13/16	9/16
1 1/16	15/16	7/8	11/16
1 1/8	1	15/16	3/4
1 3/16	1 1/16	1	25/32
1 1/4	1 1/8	1 1/16	13/16
1 5/16	1 1/8	1 1/16	7/8

§ 78.168–14 *Assembly.* (a) By nailing; screws, hinges and hasp, or other device of equal efficiency are authorized; nails should be driven flush.

§ 78.168–15 *Nails and nailing.* (a) Cement coated nails of size and with spacing detailed in §§ 78.168–16 and 78.168–17.

(b) At cleated edges drive at least 40 percent of nails into cleats.

(c) Nails fastening cleats to be staggered and clinch ⅛"; uncoated nails authorized.

(d) Nailing tops and bottoms to sides permitted but not required.

§ 78.168–16 *Nails; kind and dimensions.* (a) Cement [2] coated of gauge and length as for "sinkers" and "coolers" as generally known to the trade; size [3] in "penny" as follows:

Species of wood holding points of nails	Thickness of material holding points of nails (inches)										
	⅜ or less	7/16	½	9/16	⅝	11/16	¾	25/32	13/16	⅞	15/16 or more
Group 1	4	5	5	6	7	7	8	8	8	9	10
Group 2	4	4	5	5	6	6	7	7	7	8	9
Group 3	3	4	4	5	5	6	6	7	7	7	8
Group 4	3	3	4	4	4	5	5	6	6	7	7

§ 78.168–17 *Nail spacing.*[1] (a) Nail spacing as follows:

Nails (size)	Maximum spacing when driven into end and cleats	
	Side grain	End grains
	Inches	*Inches*
Threepenny	1¼	1
Fourpenny	1½	1¼
Fivepenny	1¾	1½
Sixpenny	2	1¾
Sevenpenny	2¼	2
Eightpenny	2½	2¼
Ninepenny	2¾	2½
Tenpenny	3	2½

§ 78.168–18 *Marking.* (a) Marking on each box with letters and figures at least ½" high in rectangle as follows:

ICC–15A***

(1) The stars must be replaced by authorized gross weight (for example, ICC–15A100, etc.). This mark shall be understood to certify that box complies with all specification requirements.

(b) The words "ONE STRAP", or "TWO STRAPS", etc., when straps are required (see § 78.168–13 (d)); this to be placed above or below the rectangle.

(c) Marks may also be applied as follows:

ICC–15A

NO STRAP XXX LBS.
ONE STRAP XXX LBS.
TWO STRAPS XXX LBS.

(1) The "X's" must be replaced by authorized gross weights as authorized for the strapping conditions.

§ 78.168–19 *Closing for shipment.* (a) Box to be securely closed. Nails, if used, to be as prescribed in §§ 78.168–16 and 78.168–17.

(b) Metal straps, as specified by marks on box, must encircle sides, top, and bottom as follows:

(1) One nailless strap: At center of box.

(2) Two or more nailless straps: Outer two about ⅛ of box length from ends and other equally spaced between.

(3) Nailed straps: At ends of sides, top, and bottom; use same size nails as for closing and space not over twice as far apart.

(4) Size of flat straps must be as follows:

Authorized gross weight (pounds)	Cross-section size when number of straps is—		
	1	2	3
	Inch	*Inch*	*Inch*
50	½ x 0.020	⅜ x 0.015	----------
100	⅝ x 0.020	½ x 0.018	----------
200	¾ x 0.023	⅝ x 0.020	½ x 0.018
300	----------	⅝ x 0.023	½ x 0.020
400	----------	¾ x 0.020	½ x 0.023
500	----------	¾ x 0.023	⅝ x 0.023

(5) Wires, Washburn and Moen gauge, authorized as follows:

Authorized gross weight (pounds)	Gauge of wires when number of straps is—		
	1	2	3
50	12	14	----------
100	11	12	----------
200	9	11	12
300	----------	10	11
400	----------	10	11
500	----------	9	10

§ 78.169 *Specification 15B; wooden boxes, nailed.*

§ 78.169–1 *Compliance.* (a) Required in all details.

§ 78.169–2 *Closed*[4] *box.* (a) Parts and pieces to be in close contact.

§ 78.169–3 *Ends.* (a) One-piece, or equivalent (see § 78.169–5); or cleated as prescribed with joints tongued and grooved.

§ 78.169–4 *Sides, top, and bottom.* (a) Joints tongued, grooved, and glued, or one-piece equivalent.

§ 78.169–5 *One-piece equivalents.* (a) Parts are considered equivalent to one-piece as follows:

(1) Parts Linderman-joint glued.

(2) Parts at least ½" thick, tongued and grooved and glued, with 2 or more corrugated fasteners on each joint.

(3) Parts at least ½" thick, tongued and grooved and fastened with 3 or more corrugated fasteners on each joint.

(4) Parts butt-joint glued, provided the joined surfaces are planed before gluing, so as to assure full contact. After immersion in water for 24 hours at 70° F. the part must not fail at the joint when it is broken.

(b) Corrugated fasteners (as prescribed for one-piece equivalents): 1" wide; penetration 4/5 thickness of part; within 3" of end of joint and not over 8" apart; for 3 or more, drive alternately into opposite sides of part.

§ 78.169–6 *Gluing efficiency.* (a) Shall be determined for boxes for gross weight of 150 pounds or less. When filled with sand and sawdust to marked gross weight, the boxes must be able to withstand 8 drops of 12", one on each corner, onto solid concrete without exposure of contents.

§ 78.169–7 *Lumber.* (a) To be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing and other defects that would materially lessen the strength. Grain of wood in cleats must not cross cleat within ½ its length.

§ 78.169–8 *Nails.* (a) Cement coated, unless otherwise authorized herein, of size specified for "sinkers" and "coolers" as generally known to the trade.

§ 78.169–9 *Grouping of principal woods.* (a) Grouping as follows:

GROUP 1

White pine.	Willow.
Norway pine.	Noble fir.
Aspen (popple).	Magnolia.
Spruce.	Buckeye.
Western (yellow) pine.	White fir.
	Cedar.
Cottonwood.	Redwood.
Balsam fir.	Butternut.
Yellow poplar.	Cucumber.
Chestnut.	Alpine fir.
Sugar pine.	Lodgepole pine.
Cypress.	Jack pine.
Basswood.	

GROUP 2

Southern yellow pine.	Douglas fir.
Hemlock.	Larch (tamarack).
North Carolina pine.	

GROUP 3

White elm.	Black gum.
Red gum.	Black ash.
Sycamore.	Tupelo.
Pumpkin ash.	Maple—soft or silver.

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	Hickory.
Hackberry.	White ash.

§ 78.169–10 *Width of pieces* (a) At least 2½".

§ 78.169–11 *Width of cleats.* (a) Twice the prescribed thickness plus ¾".

[1] To determine number of nails, divide length of nailing edge by spacing; fractions greater than ½ are considered as whole numbers.

[2] Uncoated nails authorized when increased 25 percent in number.

[3] Nails 1-penny smaller authorized when spaced as for 2-penny smaller. Nails 2-penny smaller authorized, but not less than 3-penny, when thickness of material nailed through does not exceed ½ of thickness of material holding points of nails.

[4] Openings for filling device of inside container authorized if device is properly protected.

§ 78.169–12 *Thickness of lumber.* (a) Nailed boxes not cleated (Style 1). Authorized gross weight not over 100 pounds, see Note 1. Sides as in Table 1; top and bottom as in Table 1A; ends as in Table 5.

(b) Glued-lock-corner boxes (Style 6): Authorized gross weight not over 150 pounds. Sides as in Table 3; top and bottom as in Table 1A; ends as in Table 3A. Or, sides as in Table 2; top and bottom as in Table 1A; ends as in Table 4.

(c) Single-cleated boxes (Style 4 or 5): Authorized gross weight not over 200 pounds, see Note 2. Sides as in Table 1; top and bottom as in Table 1A; ends and cleats as in Table 3A.

(d) Double-cleated boxes (Style 2, 2½, or 3): Authorized gross weight not over 500 pounds, see Note 3. Sides as in Table 1; top and bottom as in Table 1A; end and cleats as in Table 2A. Or, sides as in Table 1; top and bottom as in Table 1A; cleats as in Table 3B; ends not thinner than thickest side or top.

NOTE 1: When group II woods are used the gross weight may be increased to 110 pounds.

NOTE 2: When group II woods are used the gross weight may be increased to 220 pounds.

NOTE 3: When group II woods are used the gross weight may be increased to 550 pounds.

(e) Tables are as follows (dimensions of materials finished or resawed).

TABLE 1

Depth of box (inches)	Not over 8″	Not over 9″	Not over 10″	Not over 12″	Not over 14″	Over 14″
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inch*	*Inch*	*Inch*	*Inch*
15	5/16	5/16	5/16	5/16	5/16	5/16
25	5/16	5/16	5/16	5/16	5/16	5/16
35	5/16	5/16	5/16	5/16	5/16	5/16
45	11/32	11/32	11/32	11/32	11/32	11/32
55	3/8	11/32	11/32	11/32	11/32	11/32
65	3/8	3/8	11/32	11/32	11/32	11/32
75	7/16	3/8	3/8	11/32	11/32	11/32
85	7/16	7/16	3/8	3/8	11/32	11/32
100	1/2	7/16	7/16	3/8	3/8	11/32
125	9/16	1/2	1/2	7/16	3/8	3/8
150	5/8	9/16	9/16	1/2	7/16	3/8
175	5/8	5/8	9/16	1/2	1/2	7/16
200	11/16	5/8	5/8	9/16	1/2	7/16
250	25/32	3/4	11/16	5/8	9/16	1/2
300	13/16	13/16	3/4	11/16	5/8	9/16
350	15/16	7/8	13/16	3/4	11/16	5/8
400	1	15/16	7/8	13/16	3/4	11/16
500	1 1/8	1 1/16	1	15/16	7/8	3/4

TABLE 1A

Width of box (inches)	Not over 8″	Not over 9″	Not over 10″	Not over 12″	Not over 14″	Over 14″
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inch*	*Inch*	*Inch*	*Inch*
15	5/16	5/16	5/16	5/16	5/16	5/16
25	5/16	5/16	5/16	5/16	5/16	5/16
35	5/16	5/16	5/16	5/16	5/16	5/16
45	11/32	11/32	11/32	11/32	11/32	11/32
55	3/8	11/32	11/32	11/32	11/32	11/32
65	3/8	3/8	11/32	11/32	11/32	11/32
75	7/16	3/8	3/8	11/32	11/32	11/32
85	7/16	7/16	3/8	3/8	11/32	11/32
100	1/2	7/16	7/16	3/8	3/8	11/32
125	9/16	1/2	1/2	7/16	3/8	3/8
150	5/8	9/16	9/16	1/2	7/16	3/8
175	5/8	5/8	9/16	1/2	1/2	7/16
200	11/16	5/8	5/8	9/16	1/2	7/16
250	25/32	3/4	11/16	5/8	9/16	1/2
300	13/16	13/16	3/4	11/16	5/8	9/16
350	15/16	7/8	13/16	3/4	11/16	5/8
400	1	15/16	7/8	13/16	3/4	11/16
500	1 1/8	1 1/16	1	15/16	7/8	3/4

TABLE 2

Depth of box (inches)	Not over 8″	Not over 9″	Not over 10″	Not over 12″	Not over 14″	Over 14″
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inch*	*Inch*
15	11/32	11/32	11/32	11/32	11/32	11/32
25	11/32	11/32	11/32	11/32	11/32	11/32
35	3/8	11/32	11/32	11/32	11/32	11/32
45	7/16	3/8	3/8	11/32	11/32	11/32
55	1/2	7/16	3/8	3/8	11/32	11/32
65	1/2	1/2	7/16	3/8	3/8	11/32
75	9/16	1/2	1/2	7/16	3/8	3/8
85	9/16	9/16	1/2	7/16	7/16	3/8
100	5/8	9/16	9/16	1/2	7/16	7/16
125	11/16	5/8	5/8	9/16	1/2	7/16
150	3/4	11/16	11/16	5/8	9/16	1/2
175	13/16	3/4	11/16	11/16	5/8	9/16
200	7/8	13/16	3/4	3/4	11/16	5/8
250	1	15/16	7/8	13/16	3/4	5/8
300	1 1/16	1	15/16	7/8	25/32	11/16
350	1 1/8	1 1/16	1	15/16	7/8	3/4
400	1 13/16	1 1/8	1 1/16	1	15/16	13/16
500	------	------	1 1/8	1 1/16	1	7/8

TABLE 2A

Smallest dimension of end	Not over 8″	Not over 9″	Not over 10″	Not over 12″	Not over 14″	Over 14″
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inch*	*Inch*
15	11/32	11/32	11/32	11/32	11/32	11/32
25	7/16	7/16	7/16	7/16	7/16	7/16
35	7/16	7/16	7/16	7/16	7/16	7/16
45	7/16	7/16	7/16	7/16	7/16	7/16
55	1/2	7/16	7/16	7/16	7/16	7/16
65	1/2	1/2	7/16	7/16	7/16	7/16
75	9/16	1/2	1/2	7/16	7/16	7/16
85	9/16	9/16	1/2	7/16	7/16	7/16
100	5/8	9/16	9/16	1/2	7/16	7/16
125	11/16	5/8	5/8	9/16	1/2	7/16
150	3/4	11/16	11/16	5/8	9/16	1/2
175	13/16	3/4	11/16	11/16	5/8	9/16
200	7/8	13/16	3/4	3/4	11/16	5/8
250	1	15/16	7/8	13/16	3/4	5/8
300	1 1/16	1	15/16	7/8	25/32	11/16
350	1 1/8	1 1/16	1	15/16	7/8	3/4
400	1 13/16	1 1/8	1 1/16	1	15/16	13/16
500	------	------	1 1/8	1 1/16	1	7/8

TABLE 3

Depth of box (inches)	Not over 8″	Not over 9″	Not over 10″	Not over 12″	Not over 14″	Over 14″
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
15	5/16	5/16	5/16	5/16	5/16	5/16
25	3/8	11/32	11/32	11/32	11/32	11/32
35	7/16	7/16	3/8	11/32	11/32	11/32
45	1/2	1/2	7/16	7/16	3/8	11/32
55	9/16	1/2	1/2	7/16	7/16	3/8
65	9/16	9/16	9/16	1/2	7/16	7/16
75	5/8	5/8	9/16	1/2	1/2	7/16
85	11/16	11/16	5/8	9/16	1/2	1/2
100	3/4	11/16	11/16	5/8	9/16	1/2
125	13/16	3/4	3/4	11/16	5/8	9/16
150	15/16	7/8	13/16	3/4	11/16	5/8
175	1	15/16	7/8	13/16	3/4	11/16
200	1 1/16	1	15/16	7/8	25/32	11/16
250	1 1/8	1 1/16	1	15/16	7/8	25/32
300	1 5/16	1 3/16	1 1/8	1 1/16	15/16	7/8
350	------	1 5/16	1 1/4	1 1/8	1	1 1/16
400	------	------	------	1 1/4	1 1/8	1
500	------	------	------	------	1 1/4	1 1/8

TABLE 3A

Smallest dimension of end	Not over 8″	Not over 9″	Not over 10″	Not over 12″	Not over 14″	Over 14″
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
15	11/32	11/32	11/32	11/32	11/32	11/32
25	7/16	7/16	7/16	7/16	7/16	7/16
35	7/16	7/16	7/16	7/16	7/16	7/16
45	1/2	1/2	7/16	7/16	7/16	7/16
55	9/16	1/2	1/2	7/16	7/16	7/16
65	9/16	9/16	9/16	1/2	7/16	7/16
75	5/8	5/8	9/16	1/2	1/2	7/16
85	11/16	11/16	5/8	9/16	1/2	1/2
100	3/4	11/16	11/16	5/8	9/16	1/2
125	13/16	3/4	3/4	11/16	5/8	9/16
150	15/16	7/8	13/16	3/4	11/16	5/8
175	1	15/16	7/8	13/16	3/4	11/16
200	1 1/16	1	15/16	7/8	25/32	11/16
250	1 1/8	1 1/16	1	15/16	7/8	25/32
300	1 5/16	1 3/16	1 1/8	1 1/16	15/16	7/8
350	------	1 5/16	1 1/4	1 1/8	1	1 1/16
400	------	------	------	1 1/4	1 1/8	1
500	------	------	------	------	1 1/4	1 1/8

TABLE 3B

Smallest dimension of end	Not over 8″	Not over 9″	Not over 10″	Not over 12″	Not over 14″	Over 14″
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
15	7/16	7/16	7/16	7/16	7/16	7/16
25	7/16	7/16	7/16	7/16	7/16	7/16
35	7/16	7/16	7/16	7/16	7/16	7/16
45	1/2	1/2	7/16	7/16	7/16	7/16
55	9/16	1/2	1/2	7/16	7/16	7/16
65	9/16	9/16	9/16	1/2	7/16	7/16
75	5/8	5/8	9/16	1/2	1/2	7/16
85	11/16	11/16	5/8	9/16	1/2	1/2
100	3/4	11/16	11/16	5/8	9/16	1/2
125	13/16	3/4	3/4	11/16	5/8	9/16
150	15/16	7/8	13/16	3/4	11/16	5/8
175	1	15/16	7/8	13/16	3/4	11/16
200	1 1/16	1	15/16	7/8	25/32	11/16
250	1 1/8	1 1/16	1	15/16	7/8	25/32
300	1 5/16	1 3/16	1 1/8	1 1/16	15/16	7/8
350	------	1 5/16	1 1/4	1 1/8	1	1 1/16
400	------	------	------	1 1/4	1 1/8	1
500	------	------	------	------	1 1/4	1 1/8

TABLE 4

Smallest dimension of end	Not over 8″	Not over 9″	Not over 10″	Not over 12″	Not over 14″	Over 14″
Authorized gross weight (pounds)	Minimum thickness of part					
	Inch	*Inch*	*Inch*	*Inch*	*Inch*	*Inch*
15	7/16	7/16	7/16	7/16	7/16	7/16
25	7/16	7/16	7/16	7/16	7/16	7/16
35	1/2	1/2	7/16	7/16	7/16	7/16
45	9/16	9/16	1/2	1/2	7/16	7/16
55	5/8	9/16	9/16	1/2	1/2	7/16
65	11/16	5/8	5/8	9/16	1/2	1/2
75	3/4	11/16	5/8	5/8	9/16	1/2
85	25/32	3/4	11/16	5/8	5/8	9/16
100	7/8	13/16	3/4	11/16	5/8	9/16
125	15/16	7/8	13/16	3/4	11/16	5/8
150	1	15/16	15/16	7/8	13/16	11/16

TABLE 5

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inch	*Inch*	*Inch*	*Inch*	*Inch*	*Inch*
15	½	½	½	½	½	½
25	½	½	½	½	½	½
35	5/8	9/16	½	½	½	½
45	11/16	5/8	9/16	9/16	½	½
55	¾	11/16	5/8	5/8	9/16	½
65	13/16	¾	11/16	5/8	5/8	9/16
75	7/8	13/16	¾	11/16	5/8	9/16
85	15/16	7/8	13/16	¾	11/16	5/8
100	1	15/16	7/8	13/16	¾	11/16

§ 78.169–13 *Reduced thicknesses.* (a) Reduction in thicknesses is authorized as in paragraphs (a) to (d) of this section except that reduced thicknesses must be not less than:

(1) Sides, top, and bottom: Minimum 7/16" for boxes up to 35 pounds authorized gross weight and 3/8" above that weight.

(2) Ends and cleats: Minimum 7/16".

(b) Sides of one-piece or equivalent: 12½ percent.

(c) Any part or cleat of Group 3 or 4 wood: 20 percent.

(d) Sides, top, and bottom when to be strapped as per § 78.169–19 (b): 20 percent for 1 strap; 35 percent for 2 straps.

CONVERSION TABLE

Specified thickness (inches)	Reduced thickness corresponding to percent reduction		
	12½	20	35
9/32	¼	¼	¼
5/16	9/32	¼	¼
11/32	5/16	9/32	¼
3/8	5/16	5/16	¼
7/16	3/8	11/32	9/32
½	7/16	3/8	5/16
9/16	½	7/16	3/8
5/8	9/16	½	7/16
11/16	5/8	9/16	7/16
¾	5/8	5/8	½
25/32	11/16	5/8	½
13/16	11/16	5/8	½
7/8	¾	11/16	9/16
15/16	13/16	¾	5/8
1	7/8	13/16	5/8
1 1/16	15/16	7/8	11/16
1 1/8	1	7/8	¾
1 3/16	1 1/16	15/16	25/32
1 ¼	1 1/8	1	13/16
1 5/16	1 1/8	1 1/16	7/8

§ 78.169–14 *Assembly.* (a) By nailing; screws, hinges and hasp, or other device of equal efficiency are authorized; nails should be driven flush.

§ 78.169–15 *Nails and nailing.* (a) Cement coated nails of size and with spacing detailed in §§ 78.169–16 and 78.169–17.

(b) At cleated edges drive at least 40 percent of nails into cleats.

(c) Nails fastening cleats to be staggered and clinch 1/8"; uncoated nails authorized.

(d) Nailing tops and bottoms to sides permitted but not required.

§ 78.169–16 *Nails; kind and dimensions.* (a) Cement [1] coated of gauge and length as for "sinkers" and "coolers" as generally known to the trade; size [2] in "penny" as follows:

Species of wood holding points of nails	Thickness of material holding points of nails (inches)										
	3/8 or less	7/16	½	9/16	5/8	11/16	¾	25/32	13/16	7/8	15/16 or more
Group 1	4	5	5	6	7	7	8	8	8	9	10
Group 2	4	4	5	5	6	6	7	7	7	8	9
Group 3	3	4	4	5	5	6	6	7	7	7	8
Group 4	3	3	4	4	4	5	5	6	6	7	7

§ 78.169–17 *Nail spacing.* [3] (a) Nail spacing as follows:

Nails (size)	Maximum spacing when driven into end and cleats	
	Side grain	End grains
	Inches	*Inches*
Threepenny	1¼	1
Fourpenny	1½	1¼
Fivepenny	1¾	1½
Sixpenny	2	1¾
Sevenpenny	2¼	2
Eightpenny	2½	2¼
Ninepenny	2¾	2½
Tenpenny	3	2½

§ 78.169–18 *Marking.* (a) Marking on each box with letters and figures at least ½" high in rectangle as follows:

ICC–15B***

(1) The stars must be replaced by authorized gross weight (for example, ICC–15B125, etc.). This mark shall be understood to certify that box complies with all specification requirements.

(b) The words "ONE STRAP", or "TWO STRAPS", etc., when straps are required (see § 78.169–13 (d)); this to be placed above or below the rectangle.

(c) Marks may also be applied as follows:

ICC–15B

NO STRAP XXX LBS.
ONE STRAP XXX LBS.
TWO STRAPS XXX LBS.

(1) The "X's" must be replaced by authorized gross weights as authorized for the strapping conditions.

§ 78.169–19 *Closing for shipment.* (a) Box to be securely closed. Nails, if used, to be as prescribed in §§ 78.169–16 and 78.169–17.

(b) Metal straps, as specified by marks on box, must encircle sides, top, and bottom as follows:

(1) One nailless strap: At center of box.

(2) Two or more nailless straps: Outer two about 1/6 of box length from ends and other equally spaced between.

(3) Nailed straps: At ends of sides, top, and bottom; use same size nails as for closing and space not over twice as far apart.

(4) Size of flat straps must be as follows:

Authorized gross weight (pounds)	Cross-section size when number of straps is—		
	1	2	3
	Inch	*Inch*	*Inch*
50	½ x 0.020	3/8 x 0.015	----------
100	5/8 x 0.020	½ x 0.018	----------
200	¾ x 0.023	5/8 x 0.020	½ x 0.018
300	----------	5/8 x 0.023	½ x 0.020
400	----------	¾ x 0.020	½ x 0.023
500	----------	¾ x 0.023	5/8 x 0.023

(5) Wires, Washburn and Moen gauge, authorized as follows:

Authorized gross weight (pounds)	Gauge of wires when number of straps is—		
	1	2	3
50	12	14	----------
100	11	12	----------
200	9	11	12
300	----------	10	11
400	----------	10	11
500	----------	9	10

§ 78.170 *Specification 15C; wooden boxes, nailed.*

§ 78.170–1 *Compliance.* (a) Required in all details.

§ 78.170–2 *Closed box.* [4] (a) Parts and pieces to be in close contact.

§ 78.170–3 *Ends.* (a) One-piece, or equivalent (see § 78.170–4); or cleated as prescribed.

§ 78.170–4 *One-piece equivalents.* (a) Parts are considered equivalent to one-piece as follows:

(1) Parts Linderman-joint glued.

(2) Parts at least ½" thick, tongued and grooved and glued, with 2 or more corrugated fasteners on each joint.

(3) Parts at least ½" thick fastened with 3 or more corrugated fasteners on each joint.

(4) Parts butt-joint glued, provided the joined surfaces are planed before

[1] Uncoated nails authorized when increased 25 percent in number.

[2] Nails 1-penny smaller authorized when spaced as for 2-penny smaller. Nails 2-penny smaller authorized, but not less than 3-penny, when thickness of material nailed through does not exceed ½ of thickness of material holding points of nails.

[3] To determine number of nails, divide length of nailing edge by spacing; fractions greater than ½ are considered as whole numbers.

[4] Openings for filling device of inside container authorized if device is properly protected.

gluing, so as to assure full contact. After immersion in water for 24 hours at 70° F. the part must not fail at the joint when it is broken.

(b) Corrugated fasteners (as prescribed for one-piece equivalents): 1" wide; penetration ⅘ thickness of part; within 3" of end of joint and not over 8" apart; for 3 or more, drive alternately into opposite sides of part.

§ 78.170–5 *Gluing efficiency.* (a) Shall be determined for boxes for gross weight of 150 pounds or less. When filled with sand and sawdust to marked gross weight, the boxes must be able to withstand 8 drops of 12", one on each corner, onto solid concrete without exposure of contents.

§ 78.170–6 *Lumber.* (a) To be well seasoned, commercially dry, and free from decay, loose knots that would interfere with nailing, and other defects that would materially lessen the strength. Grain of wood in cleats must not cross cleat within ½ its length.

§ 78.170–7 *Nails.* (a) Cement coated, unless otherwise authorized herein, of size specified for "sinkers" and "coolers" as generally known to the trade.

§ 78.170–8 *Grouping of principal woods.* (a) Grouping as follows:

GROUP 1

White pine.	Willow.
Norway pine.	Noble fir.
Aspen (popple).	Magnolia.
Spruce	Buckeye.
Western (yellow) pine.	White fir.
	Cedar.
Cottonwood.	Redwood.
Balsam fir.	Butternut.
Yellow poplar.	Cucumber.
Chestnut.	Alpine fir.
Sugar pine.	Lodgepole pine.
Cypress.	Jack pine.
Basswood.	

GROUP 2

Southern yellow pine.	Douglas fir.
Hemlock.	Larch (tamarack).
North Carolina pine.	

GROUP 3

White elm.	Black gum.
Red gum.	Black ash.
Sycamore.	Tupelo.
Pumpkin ash.	Maple—soft or silver.

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	Hickory.
Hackberry.	White ash.

§ 78.170–9 *Width of pieces.* (a) At least 2½".

§ 78.170–10 *Width of cleats.* (a) Twice the prescribed thickness plus ¾".

§ 78.170–11 *Thickness of lumber.* (a) Nailed boxes not cleated (Style 1): Authorized gross weight not over 100 pounds, see Note 1. Sides as in Table 1; top and bottom as in Table 1A; ends as in Table 5.

(b) Glued-lock-corner boxes (Style 6): Authorized gross weight not over 150 pounds. Sides as in Table 3; top and bottom as in Table 1A; ends as in Table 3A. Or, sides as in Table 2; top and bottom as in Table 1A; ends as in Table 4.

(c) Single-cleated boxes (Style 4 or 5): Authorized gross weight not over 200 pounds, see Note 2. Sides as in Table 1; top and bottom as in Table 1A; ends and cleats as in Table 3A.

(d) Double-cleated boxes (Style 2, 2½, or 3): Authorized gross weight not over 500 pounds, see Note 3. Sides as in Table 1; top and bottom as in Table 1A; end and cleats as in Table 2A. Or, sides as in Table 1; top and bottom as in Table 1A; cleats as in Table 3B; ends not thinner than thickest side or top.

NOTE 1: When group II woods are used the gross weight may be increased to 110 pounds.

NOTE 2: When group II woods are used the gross weight may be increased to 220 pounds.

NOTE 3: When group II woods are used the gross weight may be increased to 550 pounds.

(e) Tables are as follows (dimensions of materials finished or resawed):

TABLE 1

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inch*	*Inch*	*Inch*	*Inch*
15	¼	¼	¼	¼	¼	¼
25	¼	¼	¼	¼	¼	¼
35	5/16	9/32	9/32	¼	¼	¼
45	11/32	5/16	5/16	9/32	¼	¼
55	3/8	11/32	11/32	5/16	9/32	¼
65	3/8	3/8	11/32	5/16	5/16	9/32
75	7/16	3/8	3/8	11/32	11/32	9/32
85	7/16	7/16	3/8	3/8	11/32	5/16
100	½	7/16	7/16	3/8	3/8	11/32
125	9/16	½	½	7/16	3/8	3/8
150	5/8	9/16	9/16	½	7/16	3/8
175	5/8	5/8	9/16	½	½	7/16
200	11/16	5/8	5/8	9/16	½	7/16
250	25/32	¾	11/16	5/8	9/16	½
300	13/16	13/16	¾	11/16	5/8	9/16
350	15/16	⅞	13/16	¾	11/16	5/8
400	1	15/16	⅞	13/16	¾	11/16
500	1⅛	1 1/16	1	15/16	⅞	¾

TABLE 1A

Width of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inch*	*Inch*	*Inch*	*Inch*
15	¼	¼	¼	¼	¼	¼
25	¼	¼	¼	¼	¼	¼
35	5/16	9/32	9/32	¼	¼	¼
45	11/32	5/16	5/16	9/32	¼	¼
55	3/8	11/32	11/32	5/16	9/32	¼
65	3/8	3/8	11/32	5/16	5/16	9/32
75	7/16	3/8	3/8	11/32	11/32	9/32
85	7/16	7/16	3/8	3/8	11/32	5/16
100	½	7/16	7/16	3/8	3/8	11/32
125	9/16	½	½	7/16	3/8	3/8
150	5/8	9/16	9/16	½	7/16	3/8
175	5/8	5/8	9/16	½	½	7/16
200	11/16	5/8	5/8	9/16	½	7/16
250	25/32	¾	11/16	5/8	9/16	½
300	13/16	13/16	¾	11/16	5/8	9/16
350	15/16	⅞	13/16	¾	11/16	5/8
400	1	1 1/16	⅞	13/16	¾	11/16
500	1⅛	1 1/16	1	1 1/16	⅞	¾

TABLE 2

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inch*	*Inch*
15	11/32	11/32	5/16	9/32	¼	¼
25	11/32	11/32	5/16	9/32	¼	¼
35	3/8	11/32	5/16	5/16	9/32	¼
45	7/16	3/8	3/8	11/32	5/16	9/32
55	½	7/16	3/8	3/8	11/32	5/16
65	½	½	7/16	3/8	3/8	11/32
75	9/16	½	½	7/16	3/8	3/8
85	9/16	9/16	½	7/16	7/16	3/8
100	5/8	9/16	9/16	½	7/16	7/16
125	11/16	5/8	5/8	9/16	½	7/16
150	¾	11/16	11/16	5/8	9/16	½
175	13/16	¾	11/16	11/16	5/8	9/16
200	⅞	13/16	¾	¾	11/16	5/8
250	1	15/16	⅞	13/16	¾	5/8
300	1 1/16	1	15/16	⅞	25/32	11/16
350	1⅛	1 1/16	1	15/16	⅞	¾
400	1 3/16	1⅛	1 1/16	1	15/16	13/16
500	------	------	1⅛	1 1/16	1	⅞

TABLE 2A

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inch*	*Inch*
15	11/32	11/32	11/32	11/32	11/32	11/32
25	7/16	7/16	7/16	7/16	7/16	7/16
35	7/16	7/16	7/16	7/16	7/16	7/16
45	7/16	7/16	7/16	7/16	7/16	7/16
55	½	7/16	7/16	7/16	7/16	7/16
65	½	½	7/16	7/16	7/16	7/16
75	9/16	½	½	7/16	7/16	7/16
85	9/16	9/16	½	7/16	7/16	7/16
100	5/8	9/16	9/16	½	7/16	7/16
125	11/16	5/8	5/8	9/16	½	7/16
150	¾	11/16	11/16	5/8	9/16	½
175	13/16	¾	11/16	11/16	5/8	9/16
200	⅞	13/16	¾	¾	11/16	5/8
250	1	15/16	⅞	13/16	¾	5/8
300	1 1/16	1	15/16	⅞	25/32	11/16
350	1⅛	1 1/16	1	15/16	⅞	¾
400	1 3/16	1⅛	1 1/16	1	15/16	13/16
500	------	------	1⅛	1 1/16	1	⅞

TABLE 3

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
15	9/32	9/32	¼	¼	¼	¼
25	5/16	11/32	5/16	9/32	¼	¼
35	7/16	7/16	3/8	11/32	11/32	9/32
45	½	½	7/16	7/16	3/8	11/32
55	9/16	½	½	7/16	7/16	3/8
65	9/16	9/16	9/16	½	7/16	7/16
75	5/8	9/16	9/16	½	½	7/16
85	11/16	11/16	5/8	9/16	½	½
100	¾	11/16	11/16	5/8	9/16	½
125	13/16	¾	¾	11/16	5/8	9/16
150	15/16	⅞	13/16	¾	11/16	5/8
175	1	15/16	⅞	13/16	¾	11/16
200	1 1/16	1	15/16	⅞	25/32	11/16
250	1⅛	1 1/16	1	15/16	⅞	25/32
300	1 5/16	1 3/16	1⅛	1 1/16	15/16	⅞
350	------	1 3/16	1¼	1⅛	1	15/16
400	------	------	------	1¼	1⅛	1
500	------	------	------	------	1¼	1⅛

TABLE 3A

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
15	11/32	11/32	11/32	11/32	11/32	11/32
25	7/16	7/16	7/16	7/16	7/16	7/16
35	7/16	7/16	7/16	7/16	7/16	7/16
45	1/2	1/2	7/16	7/16	7/16	7/16
55	9/16	1/2	1/2	7/16	7/16	7/16
65	9/16	9/16	9/16	1/2	7/16	7/16
75	5/8	5/8	9/16	1/2	1/2	7/16
85	13/16	13/16	5/8	9/16	1/2	1/2
100	3/4	13/16	13/16	5/8	9/16	1/2
125	13/16	3/4	3/4	13/16	5/8	9/16
150	15/16	7/8	13/16	3/4	13/16	5/8
175	1	15/16	7/8	13/16	3/4	13/16
200	1 1/16	1	15/16	7/8	25/32	13/16
250	1 1/8	1 1/16	1	15/16	7/8	25/32
300	1 3/16	1 3/16	1 1/8	1 1/16	15/16	7/8
350	------	1 5/16	1 1/4	1 1/8	1	15/16
400	------	------	------	1 1/4	1 1/8	1
500	------	------	------	------	1 1/4	1 1/8

TABLE 3B

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
15	7/16	7/16	7/16	7/16	7/16	7/16
25	7/16	7/16	7/16	7/16	7/16	7/16
35	7/16	7/16	7/16	7/16	7/16	7/16
45	1/2	1/2	7/16	7/16	7/16	7/16
55	9/16	1/2	1/2	7/16	7/16	7/16
65	9/16	9/16	9/16	1/2	7/16	7/16
75	5/8	5/8	9/16	1/2	1/2	7/16
85	13/16	13/16	5/8	9/16	1/2	1/2
100	3/4	13/16	13/16	5/8	9/16	1/2
125	13/16	3/4	3/4	13/16	5/8	9/16
150	15/16	7/8	13/16	3/4	13/16	5/8
175	1	15/16	7/8	13/16	3/4	13/16
200	1 1/16	1	15/16	7/8	25/32	13/16
250	1 1/8	1 1/16	1	15/16	7/8	25/32
300	1 3/16	1 3/16	1 1/8	1 1/16	15/16	7/8
350	------	1 5/16	1 1/4	1 1/8	1	15/16
400	------	------	------	1 1/4	1 1/8	1
500	------	------	------	------	1 1/4	1 1/8

TABLE 4

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inch	*Inch*	*Inch*	*Inch*	*Inch*	*Inch*
15	7/16	7/16	7/16	7/16	7/16	7/16
25	7/16	7/16	7/16	7/16	7/16	7/16
35	1/2	1/2	7/16	7/16	7/16	7/16
45	9/16	9/16	1/2	1/2	7/16	7/16
55	5/8	9/16	9/16	1/2	1/2	7/16
65	13/16	5/8	5/8	9/16	1/2	1/2
75	3/4	13/16	5/8	5/8	9/16	1/2
85	25/32	3/4	13/16	5/8	5/8	9/16
100	7/8	13/16	3/4	13/16	5/8	9/16
125	15/16	7/8	13/16	3/4	13/16	5/8
150	1	15/16	15/16	7/8	13/16	13/16

TABLE 5

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inch	*Inch*	*Inch*	*Inch*	*Inch*	*Inch*
15	1/2	1/2	1/2	1/2	1/2	1/2
25	1/2	1/2	1/2	1/2	1/2	1/2
35	5/8	9/16	1/2	1/2	1/2	1/2
45	13/16	5/8	9/16	9/16	1/2	1/2
55	3/4	13/16	5/8	5/8	9/16	1/2
65	13/16	3/4	13/16	5/8	5/8	9/16
75	7/8	13/16	3/4	13/16	5/8	9/16
85	15/16	7/8	13/16	3/4	13/16	5/8
100	1	15/16	7/8	13/16	3/4	13/16

§ 78.170–12 *Reduced thicknesses.* (a) Reduction in thickness is authorized as in paragraphs (a) to (d) of this section except that reduced thicknesses must be not less than:

(1) Sides, top, and bottom: Minimum 1/4" for boxes up to 150 pounds authorized gross weight and 3/8" above that weight.

(2) Ends and cleats: Minimum 7/16".

(b) Sides of one-piece or equivalent: 12½ percent.

(c) Any part or cleat of Group 3 or 4 wood: 20 percent.

(d) Sides, top, and bottom when to be strapped as per § 78.170–18 (b): 20 percent for 1 strap; 35 percent for 2 straps.

CONVERSION TABLE

Specified thickness (inches)	Reduced thickness corresponding to percent reduction		
	12½	20	35
9/32	1/4	1/4	1/4
5/16	9/32	1/4	1/4
11/32	5/16	9/32	1/4
3/8	5/16	5/16	1/4
7/16	3/8	11/32	9/32
1/2	7/16	3/8	5/16
9/16	1/2	7/16	3/8
5/8	9/16	1/2	7/16
13/16	5/8	9/16	7/16
3/4	5/8	5/8	1/2
25/32	13/16	5/8	1/2
13/16	13/16	5/8	1/2
7/8	3/4	13/16	9/16
15/16	13/16	3/4	5/8
1	7/8	13/16	5/8
1 1/16	15/16	7/8	13/16
1 1/8	1	7/8	3/4
1 3/16	1 1/16	15/16	25/32
1 1/4	1 1/8	1	13/16
1 5/16	1 1/8	1 1/16	7/8

§ 78.170–13 *Assembly.* (a) By nailing; screws, hinges and hasp, or other device of equal efficiency are authorized; nails should be driven flush.

§ 78.170–14 *Nails and nailing.* (a) Cement coated nails of size and with spacing detailed in §§ 78.170–15 and 78.–170–16.

(b) At cleated edges drive at least 40 percent of nails into cleats.

(c) Nails fastening cleats to be staggered and clinch 1/8"; uncoated nails authorized.

(d) Nailing tops and bottoms to sides permitted but not required.

§ 78.170–15 *Nails; kind and dimensions.* (a) Cement [1] coated of gauge and length as for "sinkers" and "coolers" as generally known to the trade; size [2] in "penny" as follows:

Species of wood holding points of nails	Thickness of material holding points of nails (inches)										
	3/8 or less	7/16	1/2	9/16	5/8	13/16	3/4	25/32	13/16	7/8	15/16 or more
Group 1	4	5	5	6	7	7	8	8	8	9	10
Group 2	4	4	5	5	6	6	7	7	7	8	9
Group 3	3	4	4	5	5	6	6	7	7	7	8
Group 4	3	3	4	4	4	5	5	6	6	7	7

§ 78.170–16 *Nail spacing.* [3] (a) Nail spacing as follows:

Nails (size)	Maximum spacing when driven into end and cleats	
	Side grain	End grains
	Inches	*Inches*
Threepenny	1 1/4	1
Fourpenny	1 1/2	1 1/4
Fivepenny	1 3/4	1 1/2
Sixpenny	2	1 3/4
Sevenpenny	2 1/4	2
Eightpenny	2 1/2	2 1/4
Ninepenny	2 3/4	2 1/2
Tenpenny	3	2 1/2

§ 78.170–17 *Marking.* (a) Marking on each box with letters and figures at least 1/2" high in rectangle as follows:

ICC–15C***

(1) The stars must be replaced by authorized gross weight (for example, ICC-15C100, etc.). This mark shall be understood to certify that box complies with all specification requirements.

(b) The words "ONE STRAP", or "TWO STRAPS", etc., when straps are required (see § 78.170–12 (d); this to be placed above or below the rectangle.

(c) Marks may also be applied as follows:

ICC–15C

NO STRAP XXX LBS.
ONE STRAP XXX LBS.
TWO STRAPS XXX LBS.

(1) The "X's" must be replaced by authorized gross weights as authorized for the strapping conditions.

[1] Uncoated nails authorized when increased 25 percent in number.

[2] Nails 1-penny smaller authorized when spaced as for 2-penny smaller. Nails 2-penny smaller authorized, but not less than 3-penny, when thickness of material nailed through does not exceed 1/2 of thickness of material holding points of nails.

[3] To determine number of nails, divide length of nailing edge by spacing; fractions greater than 1/2 are considered as whole numbers.

§ 78.170–18 *Closing for shipment.* (a) Box to be securely closed. Nails, if used, to be as prescribed in §§ 78.170–15 and 78.170–16.

(b) Metal straps, as specified by marks on box, must encircle sides, top, and bottom as follows:

(1) One nailless strap: At center of box.

(2) Two or more nailless straps: Outer two about ⅛ of box length from ends and other equally spaced between.

(3) Nailed straps: At ends of sides, top, and bottom; use same size nails as for closing and space not over twice as far apart.

(4) Size of flat straps must be as follows:

Authorized gross weight (pounds)	Cross-section size when number of straps is—		
	1	2	3
	Inch	*Inch*	*Inch*
50	½ x 0.020	⅜ x 0.015	
100	⅝ x 0.020	½ x 0.018	
200	¾ x 0.023	⅝ x 0.020	½ x 0.018
300		⅝ x 0.023	½ x 0.020
400		¾ x 0.020	½ x 0.023
500		¾ x 0.023	⅝ x 0.023

(5) Wires, Washburn and Moen gauge, authorized as follows:

Authorized gross weight (pounds)	Gauge of wires when number of straps is—		
	1	2	3
50	12	14	
100	11	12	
200	9	11	12
300		10	11
400		10	11
500		9	10

§ 78.171 *Specification 15D; wooden boxes, nailed.*

§ 78.171–1 *Compliance.* (a) Required in all details.

§ 78.171–2 *Spaces between boards.* (a) Space 4" wide authorized except that bottom pieces must be in close contact with each other and with sides and ends.

§ 78.171–3 *Ends.* (a) One-piece, or equivalent (see § 78.171–5); or cleated as prescribed.

§ 78.171–4 *Handles.* (a) Containers may be provided with suitable handles at discretion of shipper. Handles must be of dimensions specified herein, consisting of horizontal strips or cleats extending across top of each side or each end; handles which do not project 3 inches beyond the vertical edges of the container must be mounted to leave at least 7/16 inch open space between handle and box, or be at least ¾ inch thick, or be of cross section at least equal to cleats required for single-cleated boxes of corresponding size and gross weight. Extension of cleats or side boards is acceptable for projecting handles.

Authorized gross weight, maximum (pounds):	*Handles, minimum cross section (inches)*
100	½ x 1¾
150	½ x 2¾
200	⅝ x 2½
300	⅝ x 3½
400	13/16 x 3½

§ 78.171–5 *One-piece equivalents.* (a) Parts are considered equivalent to one-piece as follows:

(1) Parts Linderman-joint glued.

(2) Parts at least ½" thick, tongued and grooved and glued, with 2 or more corrugated fasteners on each joint.

(3) Parts at least ½" thick fastened with 3 or more corrugated fasteners on each joint.

(4) Parts butt-joint glued, provided the joined surfaces are planed before gluing, so as to assure full contact. After immersion in water for 24 hours at 70° F. the part must not fail at the joint when it is broken.

(b) Corrugated fasteners (as prescribed for one-piece equivalents). 1" wide; penetration ⅘ thickness of part; within 3" of end of joint and not over 8" apart; for 3 or more, drive alternately into opposite sides of part.

§ 78.171–6 *Gluing efficiency.* (a) Shall be determined for boxes for gross weight of 150 pounds or less. When filled with sand and sawdust to marked gross weight, the boxes must be able to withstand 8 drops of 12", one on each corner, onto solid concrete without exposure of contents.

§ 78.171–7 *Lumber.* (a) To be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength. Grain of wood in cleats must not cross cleat within ½ its length.

§ 78.171–8 *Nails.* (a) Cement coated, unless otherwise authorized herein, of size specified for "sinkers" and "coolers" as generally known to the trade.

§ 78.171–9 *Grouping of principal woods.* (a) Grouping as follows:

GROUP 1

White pine.	Willow.
Norway pine.	Noble fir.
Aspen (popple).	Magnolia.
Spruce.	Buckeye.
Western (yellow) pine.	White fir.
	Cedar.
Cottonwood.	Redwood.
Balsam fir.	Butternut.
Yellow poplar.	Cucumber.
Chestnut.	Alpine fir.
Sugar pine.	Lodgepole pine.
Cypress.	Jack pine.
Basswood.	

GROUP 2

Southern yellow pine.	Douglas fir.
Hemlock.	Larch (tamarack).
North Carolina pine.	

GROUP 3

White elm.	Black gum.
Red gum.	Black ash.
Sycamore.	Tupelo.
Pumpkin ash.	Maple—soft or silver.

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	Hickory.
Hackberry.	White ash.

§ 78.171–10 *Width of pieces.* (a) At least 2½".

§ 78.171–11 *Width of cleats.* (a) Twice the prescribed thickness plus ¾".

§ 78.171–12 *Thickness of lumber.* (a) Nailed boxes not cleated (Style 1): Authorized gross weight not over 100 pounds, see Note 1. Sides as in Table 1; top and bottom as in Table 1A; ends as in Table 5.

(b) Glued-lock-corner boxes (Style 6): Authorized gross weight not over 150 pounds. Sides as in Table 3; top and bottom as in Table 1A; ends as in Table 3A. Or, sides as in Table 2; top and bottom as in Table 1A; ends as in Table 4.

(c) Single-cleated boxes (Style 4 or 5): Authorized gross weight not over 200 pounds for boxes with vertical cleats nor over 400 pounds for boxes with horizontal cleats. Sides as in Table 1; top and bottom as in Table 1A; ends and cleats as in Table 3A.

(d) Double-cleated boxes (Style 2, 2½, or 3): Authorized gross weight not over 500 pounds. Sides as in Table 1; top and bottom as in Table 1A; ends and cleats as in Table 2A. Or, sides as in Table 1; top and bottom as in Table 1A, cleats as in Table 3B; ends not thinner than thinnest side or top.

Exception: For containers consisting of an inner wooden crate of at least ½" thickness throughout, with or without top, and an outside double cleated box without the openings permitted by § 78.171–2, the thickness of all parts of the outside box may be reduced to not less than ¾".

(e) Tables are as follows (dimensions of materials finished or resawed):

TABLE 1

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inch*	*Inch*	*Inch*	*Inch*
15	5/16	5/16	5/16	5/16	5/16	5/16
25	5/16	5/16	5/16	5/16	5/16	5/16
35	5/16	5/16	5/16	5/16	5/16	5/16
45	11/32	11/32	11/32	11/32	11/32	11/32
55	3/8	11/32	11/32	11/32	11/32	11/32
65	3/8	3/8	11/32	11/32	11/32	11/32
75	7/16	3/8	3/8	11/32	11/32	11/32
85	7/16	7/16	3/8	3/8	11/32	11/32
100	½	7/16	7/16	3/8	3/8	11/32
125	9/16	½	½	7/16	3/8	3/8
150	5/8	9/16	9/16	½	7/16	3/8
175	5/8	5/8	9/16	½	½	7/16
200	11/16	5/8	5/8	9/16	½	½
250	25/32	¾	11/16	5/8	9/16	½
300	13/16	13/16	¾	11/16	5/8	9/16
350	15/16	7/8	13/16	¾	11/16	5/8
400	1	15/16	7/8	13/16	¾	11/16
500	1⅛	1 1/16	1	15/16	7/8	¾

TABLE 1A

Width of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inch*	*Inch*	*Inch*	*Inch*
15	5/16	5/16	5/16	5/16	5/16	5/16
25	5/16	5/16	5/16	5/16	5/16	5/16
35	5/16	5/16	5/16	5/16	5/16	5/16
45	11/32	11/32	11/32	11/32	11/32	11/32
55	3/8	11/32	11/32	11/32	11/32	11/32
65	3/8	3/8	11/32	11/32	11/32	11/32
75	7/16	3/8	3/8	11/32	11/32	11/32
85	7/16	7/16	3/8	3/8	11/32	11/32
100	½	7/16	7/16	3/8	3/8	11/32
125	9/16	½	½	7/16	3/8	3/8
150	5/8	9/16	9/16	½	7/16	3/8
175	5/8	5/8	9/16	½	½	7/16
200	11/16	5/8	5/8	9/16	½	7/16
250	25/32	¾	11/16	5/8	9/16	½
300	13/16	13/16	¾	11/16	5/8	9/16
350	15/16	7/8	13/16	¾	11/16	5/8
400	1	15/16	7/8	13/16	¾	11/16
500	1⅛	1 1/16	1	15/16	7/8	¾

TABLE 2

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inch*	*Inch*
15	11/32	11/32	11/32	11/32	11/32	11/32
25	11/32	11/32	11/32	11/32	11/32	11/32
35	3/8	11/32	11/32	11/32	11/32	11/32
45	7/16	3/8	3/8	11/32	11/32	11/32
55	1/2	7/16	7/16	3/8	11/32	11/32
65	1/2	1/2	7/16	3/8	3/8	11/32
75	9/16	1/2	1/2	7/16	3/8	3/8
85	9/16	9/16	1/2	7/16	7/16	3/8
100	5/8	9/16	9/16	1/2	7/16	7/16
125	11/16	5/8	5/8	9/16	1/2	7/16
150	3/4	11/16	11/16	5/8	9/16	1/2
175	13/16	3/4	11/16	11/16	5/8	9/16
200	7/8	13/16	3/4	3/4	11/16	5/8
250	1	15/16	7/8	13/16	3/4	5/8
300	1 1/16	1	15/16	7/8	25/32	11/16
350	1 1/8	1 1/16	1	15/16	7/8	3/4
400	1 3/16	1 1/8	1 1/16	1	15/16	13/16
500	------	------	1 1/8	1 1/16	1	7/8

TABLE 2A

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inch*	*Inch*
15	11/32	11/32	11/32	11/32	11/32	11/32
25	7/16	7/16	7/16	7/16	7/16	7/16
35	7/16	7/16	7/16	7/16	7/16	7/16
45	7/16	7/16	7/16	7/16	7/16	7/16
55	1/2	7/16	7/16	7/16	7/16	7/16
65	1/2	1/2	7/16	7/16	7/16	7/16
75	9/16	1/2	1/2	7/16	7/16	7/16
85	9/16	9/16	1/2	7/16	7/16	7/16
100	5/8	9/16	9/16	1/2	7/16	7/16
125	11/16	5/8	5/8	9/16	1/2	7/16
150	3/4	11/16	11/16	5/8	9/16	1/2
175	13/16	3/4	11/16	11/16	5/8	9/16
200	7/8	13/16	3/4	3/4	11/16	5/8
250	1	15/16	7/8	13/16	3/4	5/8
300	1 1/16	1	15/16	7/8	25/32	11/16
350	1 1/8	1 1/16	1	15/16	7/8	3/4
400	1 3/16	1 1/8	1 1/16	1	15/16	13/16
500	------	------	1 1/8	1 1/16	1	7/8

TABLE 3

Depth of box (inches)	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
15	5/16	5/16	5/16	5/16	5/16	5/16
25	3/8	11/32	11/32	11/32	11/32	11/32
35	7/16	7/16	3/8	11/32	11/32	11/32
45	1/2	1/2	7/16	7/16	3/8	11/32
55	9/16	1/2	1/2	7/16	7/16	3/8
65	9/16	9/16	9/16	1/2	7/16	7/16
75	5/8	5/8	9/16	1/2	1/2	7/16
85	11/16	11/16	5/8	9/16	1/2	1/2
100	3/4	11/16	11/16	5/8	9/16	1/2
125	13/16	3/4	3/4	11/16	5/8	9/16
150	15/16	7/8	13/16	3/4	11/16	5/8
175	1	15/16	7/8	13/16	3/4	11/16
200	1 1/16	1	15/16	7/8	25/32	11/16
250	1 1/8	1 1/16	1	15/16	7/8	25/32
300	1 5/16	1 3/16	1 1/8	1 1/16	15/16	7/8
350	------	1 5/16	1 1/4	1 1/8	1	15/16
400	------	------	------	1 1/4	1 1/8	1
500	------	------	------	------	1 1/4	1 1/8

TABLE 3A

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
15	11/32	11/32	11/32	11/32	11/32	11/32
25	7/16	7/16	7/16	7/16	7/16	7/16
35	7/16	7/16	7/16	7/16	7/16	7/16
45	1/2	1/2	7/16	7/16	7/16	7/16
55	9/16	1/2	1/2	7/16	7/16	7/16
65	9/16	9/16	9/16	1/2	7/16	7/16
75	5/8	5/8	9/16	1/2	1/2	7/16
85	11/16	11/16	5/8	9/16	1/2	1/2
100	3/4	11/16	11/16	5/8	9/16	1/2
125	13/16	3/4	3/4	11/16	5/8	9/16
150	15/16	7/8	13/16	3/4	11/16	5/8
175	1	15/16	7/8	13/16	3/4	11/16
200	1 1/16	1	15/16	7/8	25/32	11/16
250	1 1/8	1 1/16	1	15/16	7/8	25/32
300	1 5/16	1 3/16	1 1/8	1 1/16	15/16	7/8
350	------	1 5/16	1 1/4	1 1/8	1	15/16
400	------	------	------	1 1/4	1 1/8	1
500	------	------	------	------	1 1/4	1 1/8

TABLE 3B

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
15	7/16	7/16	7/16	7/16	7/16	7/16
25	7/16	7/16	7/16	7/16	7/16	7/16
35	7/16	7/16	7/16	7/16	7/16	7/16
45	1/2	1/2	7/16	7/16	7/16	7/16
55	9/16	1/2	1/2	7/16	7/16	7/16
65	9/16	9/16	9/16	1/2	7/16	7/16
75	5/8	5/8	9/16	1/2	1/2	7/16
85	11/16	11/16	5/8	9/16	1/2	1/2
100	3/4	11/16	11/16	5/8	9/16	1/2
125	13/16	3/4	3/4	11/16	5/8	9/16
150	15/16	7/8	13/16	3/4	11/16	5/8
175	1	15/16	7/8	13/16	3/4	11/16
200	1 1/16	1	15/16	7/8	25/32	11/16
250	1 1/8	1 1/16	1	15/16	7/8	25/32
300	1 5/16	1 3/16	1 1/8	1 1/16	15/16	7/8
350	------	1 5/16	1 1/4	1 1/8	1	15/16
400	------	------	------	1 1/4	1 1/8	1
500	------	------	------	------	1 1/4	1 1/8

TABLE 4

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inch	*Inch*	*Inch*	*Inch*	*Inch*	*Inch*
15	7/16	7/16	7/16	7/16	7/16	7/16
25	7/16	7/16	7/16	7/16	7/16	7/16
35	1/2	1/2	7/16	7/16	7/16	7/16
45	9/16	9/16	1/2	1/2	7/16	7/16
55	5/8	9/16	9/16	1/2	1/2	7/16
65	11/16	5/8	5/8	9/16	1/2	1/2
75	3/4	11/16	5/8	5/8	9/16	1/2
85	25/32	3/4	11/16	5/8	5/8	9/16
100	7/8	13/16	3/4	11/16	5/8	9/16
125	15/16	7/8	13/16	3/4	11/16	5/8
150	1	15/16	13/16	7/8	13/16	11/16

TABLE 5

Smallest dimension of end	Not over 8"	Not over 9"	Not over 10"	Not over 12"	Not over 14"	Over 14"
Authorized gross weight (pounds)	Minimum thickness of part					
	Inch	*Inch*	*Inch*	*Inch*	*Inch*	*Inch*
15	1/2	1/2	1/2	1/2	1/2	1/2
25	1/2	1/2	1/2	1/2	1/2	1/2
35	5/8	9/16	1/2	1/2	1/2	1/2
45	11/16	5/8	9/16	9/16	1/2	1/2
55	3/4	11/16	5/8	5/8	9/16	1/2
65	13/16	3/4	11/16	5/8	5/8	9/16
75	7/8	13/16	3/4	11/16	5/8	9/16
85	15/16	7/8	13/16	3/4	11/16	5/8
100	1	15/16	7/8	13/16	3/4	11/16

§ 78.171–13 Reduced thicknesses. (a) Reduction in thicknesses is authorized as in paragraphs (a) to (d) of this section except that reduced thicknesses must be not less than:

(1) Sides, top, and bottom: Minimum 5/16" for boxes up to 35 pounds authorized gross weight and 3/8" above that weight.

(2) Ends and cleats: Minimum 7/16".

(b) Sides of one-piece or equivalent: 12½ percent. In battery boxes reinforced with separate pieces in the form of extension handles, not extension of side boards or cleats, having cross section at least equal to cleats required for single-cleated boxes of corresponding size and gross weight, 20 percent in sides or ends so reinforced.

(c) Any part or cleat of Group 3 or 4 wood: 20 percent.

(d) Sides, top, and bottom when to be strapped as per § 78.171–18 (b): 20 percent for 1 strap; 35 percent for 2 straps.

CONVERSION TABLE

Specified thickness (inches)	Reduced thickness corresponding to percent reduction		
	12½	20	35
9/32	1/4	1/4	1/4
5/16	9/32	1/4	1/4
11/32	5/16	9/32	1/4
3/8	5/16	5/16	1/4
7/16	3/8	11/32	9/32
1/2	7/16	3/8	5/16
9/16	1/2	7/16	3/8
5/8	9/16	1/2	7/16
11/16	5/8	9/16	7/16
3/4	5/8	5/8	1/2
25/32	11/16	5/8	1/2
13/16	11/16	5/8	1/2
7/8	3/4	11/16	9/16
15/16	13/16	3/4	5/8
1	7/8	13/16	5/8
1 1/16	15/16	7/8	11/16
1 1/8	1	7/8	3/4
1 3/16	1 1/16	15/16	25/32
1 1/4	1 1/8	1	13/16
1 5/16	1 1/8	1 1/16	7/8

§ 78.171–14 *Nails and nailing.* (a) Cement coated nails of size and with spacing detailed in §§ 78.171–15 and 78.171–16.

(b) At cleated edges drive at least 40 percent of nails into cleats.

(c) Nails fastening cleats to be staggered and clinch ⅛''; uncoated nails authorized.

(d) Nailing tops and bottoms to sides permitted but not required.

§ 78.171–15 *Nails; kind and dimensions.* (a) Cement [1] coated of gauge and length as for "sinkers" and "coolers" as generally known to the trade; size [2] in "penny" as follows:

Species of wood holding points of nails	Thickness of material holding points of nails (inches)										
	⅜ or less	7/16	½	9/16	⅝	11/16	¾	25/32	13/16	⅞	15/16 or more
Group 1	4	5	5	6	7	7	8	8	8	9	10
Group 2	4	4	5	5	6	6	7	7	7	8	9
Group 3	3	4	4	5	5	6	6	7	7	7	8
Group 4	3	3	4	4	4	5	5	6	6	7	7

§ 78.171–16 *Nail spacing.* [3] (a) Nail spacing as follows:

Nails (size)	Maximum spacing when driven into end and cleats	
	Side grain	End grains
	Inches	*Inches*
Threepenny	1¼	1
Fourpenny	1½	1¼
Fivepenny	1⅝	1½
Sixpenny	2	1¾
Sevenpenny	2¼	2
Eightpenny	2½	2¼
Ninepenny	2¾	2½
Tenpenny	3	2½

§ 78.171–17 *Marking.* (a) Marking on each box with letters and figures at least ½'' high in rectangle as follows:

ICC–15D ***

(1) The stars must be replaced by authorized gross weight (for example, ICC–15D125, etc.) This mark shall be understood to certify that box complies with all specification requirements.

(b) The words "ONE STRAP", or "TWO STRAPS", etc., when straps are required (see § 78.171–13 (d)); this to be placed above or below the rectangle.

(c) Marks may also be applied as follows:

ICC–15D

NO STRAP XXX LBS.
ONE STRAP XXX LBS.
TWO STRAPS XXX LBS.

(1) The "X's" must be replaced by authorized gross weights as authorized for the strapping conditions.

§ 78.171–18 *Closing for shipment.* (a) Box to be securely closed. Nails, if used, to be as prescribed in §§ 78.171–15 and 78.171–16.

(b) Metal straps, as specified by marks on box, must encircle sides, top, and bottom as follows:

(1) One nailless strap: At center of box.

(2) Two or more nailless straps: Outer two about ⅛ of box length from ends and other equally spaced between.

(3) Nailed straps: At ends of sides, top, and bottom; use same size nails as for closing and space not over twice as far apart.

(4) Size of flat straps must be as follows:

Authorized gross weight (pounds)	Cross-section size when number of straps is—		
	1	2	3
	Inch	*Inch*	*Inch*
50	½ x 0.020	¾ x 0.015	
100	⅝ x 0.020	½ x 0.018	
200	¾ x 0.023	⅝ x 0.020	½ x 0.018
300		⅝ x 0.023	½ x 0.020
400		¾ x 0.020	½ x 0.023
500		¾ x 0.023	⅝ x 0.023

(5) Wires, Washburn and Moen gauge, authorized as follows:

Authorized gross weight (pounds)	Gauge of wires when number of straps is—		
	1	2	3
50	12	14	
100	11	12	
200	9	11	12
300		10	11
400		10	11
500		9	10

§ 78.171–19 *Boxes for shipment of wet electric storage batteries.* (a) Boxes over 500 pounds gross weight are authorized for shipments of wet electric storage batteries when the batteries are contained in a rigid cradle or box, or are securely fastened together so as to form a single unit, and not more than one such cradle, box, or unit is packed in the outside container. Skids required: runners to be at least 2 inches by 4 inches commercial thickness, minimum of three, except that two runners are authorized when width of case does not exceed 24 inches; or two runners may be used, minimum of 4 inches by 4 inches commercial thickness, when case does not exceed 36 inches in width. Runners to be beveled at ends to facilitate use of rollers. Bottom boards, minimum of 1 inch commercial thickness, to be nailed across runners; bracing of parts and thickness of lumber to be sufficient to protect contents in transit.

§ 78.176 *Specification 15L; wooden boxes with inside containers for desensitized liquid explosives.*

§ 78.176–1 *Compliance.* (a) Required in all details.

§ 78.176–2 *Size and capacity.* (a) Each outside wooden container shall contain not more than one inside metal container having a capacity not to exceed 10 quarts.

§ 78.176–3 *Outside containers.* (a) Wooden boxes cleated as prescribed. Parts must be in close contact and completely enclose inside containers. Lumber must be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with assembly, or other defects that materially lessen the strength.

(b) Assembly: Use brass screws throughout. Assemble sides and ends with grain of wood vertical. Fasten bottom securely with edges flush with sides and ends of box. Cleats must extend around entire perimeter of box. Apply top and bottom cleats horizontally. Bottom cleats must be flush with bottom surface of the box. Top cleats must extend above top of box to provide a ¾-inch recess for cover projections (see § 78.176–5). Cover must be flush with outside surface of top cleats and must be cleated on the outside at all edges. Cleats may be mitered but must butt at all corners.

(c) Parts and dimensions as follows:

Minimum dimensions			
Thickness, sides, top, bottom, and ends	Top cleats	Bottom cleats	Cover cleats
⅝''	⅝'' x 3½''	⅝'' x 2¾''	¾'' x 2''

§ 78.176–4 *Inside containers.* (a) Inside containers must be as follows:

(1) *Metal containers.* Double seamed, of copper weighing not less than 16 ounces per square foot, or other nonsparking material of equivalent strength. All seams must be closed by welding, brazing, or soldering so as to be tight against leakage. Handles must be fastened to top of container and be of copper weighing not less than 48 ounces per square foot, or other nonsparking material of equivalent strength. Each side of the container must be strengthened vertically by at least three equally spaced indented crimps. Each container must have two pouring spouts in the top securely closed by rubber stoppers.

(2) *Rubber liners.* Each inside metal container must be inserted in a two-piece rubber liner or boot, consisting of a cover and body, into which it must fit snugly and which in turn shall fit snugly the outside wooden container. This liner must be watertight and of such size as to fully protect the inside container. Sides of liner must be at least ¼ inch in thickness and bottom at least ½ inch in thickness. Top edge of boot must be flanged to fit the recess provided by the top cleats on the outside wooden container and such flange must be at least ⅜ inch thick exclusive of any channels or indentations necessary to effect satisfactory closure because of projections on cover. Cover must be not less than ½ inch in thickness including projections for securing rubber stoppers in metal containers, and must have a formed molding around its entire perim-

[1] Uncoated nails authorized when increased 25 percent in number.

[2] Nails 1-penny smaller authorized when spaced as for 2-penny smaller. Nails 2-penny smaller authorized, but not less than 3-penny, when thickness of material nailed through does not exceed ½ of thickness of material holding points of nails.

[3] To determine number of nails, divide length of nailing edge by spacing; fractions greater than ½ are considered as whole numbers.

eter to match and tightly fit channels or indentations in the body flange.

(b) Tests. Each inside metal and rubber container must be adequately tested and inspected during manufacture to insure against leakage.

§ 78.176–5 *Closure.* (a) Top of rubber liner must be firmly fastened to wooden cover of outside container so as to fit securely into ¾ inch recess provided by top cleats on box. Top of liner must have projections on the inside which bear directly on rubber stoppers of metal containers to secure them in place. When closure is effected the liner must provide a positive seal against interior leakage. Cover of wooden outside container must be securely fastened to body of container by means of trunk clasps affixed to each face of the box. The trunk clasps must be recessed into cover and top cleats to furnish a smooth bearing surface on all faces of the box.

§ 78.176–6 *Marking.* (a) Marking on each box with letters and figures at least ½-inch high in rectangle as follows:

(1) This mark shall be understood to certify that box complies with all specification requirements.

§ 78.181 *Specification 15X; wooden boxes for two five-gallon cans.*

§ 78.181–1 *Compliance.* (a) Required in all details.

§ 78.181–2 *Closed box.* (a) Parts and pieces to be in close contact.

§ 78.181–3 *Ends* (a) To be of group I, II, or III wood not over 2-piece.

§ 78.181–4 *Sides, top and bottom.* (a) To be of Group I, II, or III wood, not over 3-piece.

§ 78.181–5 *Two-piece ends and corrugated fasteners*—(a) *Two-piece ends.* Joints must be fastened with at least 3 corrugated fasteners.

(b) *Corrugated fasteners.* To be 1" wide and with penetration of ½ inch.

§ 78.181–6 *Lumber.* (a) To be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

§ 78.181–7 *Groupings of principal woods.* (a) Grouping as follows:

GROUP I

White pine.	Willow.
Norway pine.	Noble fir.
Aspen (popple).	Magnolia.
Spruce.	Buckeye.
Western (yellow) pine.	White fir.
	Cedar.
Cottonwood.	Redwood.
Balsam fir.	Butternut.
Yellow poplar.	Cucumber.
Chestnut.	Alpine fir.
Sugar pine.	Lodgepole pine.
Cypress.	Jackpine.
Basswood.	

GROUP II

Southern yellow pine.	North Carolina pine.
Larch (tamarack).	Douglas fir.
Hemlock.	

GROUP III

White elm.	Black gum.
Red gum.	Black ash.
Sycamore.	Tupelo.
Pumpkin ash.	Maple, soft or silver.

§ 78.181–8 *Width of pieces.* (a) At least 2" for sides, top and bottom if in two pieces, or 2⅜" for tops and bottoms and at least 4" for sides if in three pieces.

§ 78.181–9 *Thickness of lumber.* (a) Thickness as follows:

(1) Ends: Thickness to be not less than ¾" for Group I or II lumber and 1 1/16" for Group III lumber.

(2) Sides, top and bottom: Thickness to be not less than ⅜".

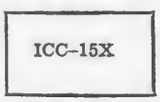
§ 78.181–10 *Assembly.* (a) By nailing with either bright or cement-coated nails, size and spacing as follows:

(1) Top to each end: 5 nails (1½" by 12½ gauge).

(2) Bottom to each end: 6 nails (1¾" by 12 gauge).

(3) Sides to each end: 6 nails (1½" by 12½ gauge).

§ 78.181–11 *Marking.* (a) Marking on each box in letters and figures at least ½" high in a rectangle as follows:



(1) This mark shall be understood to certify that box complies with all specification requirements.

§ 78.181–12 *Inside can.* (a) Size: Approximate dimensions 9⅜ x 9⅜ x 13 15/16 inches.

(b) Approximate capacity: 1,188 cu. in.

(c) Top: Embossed.
Seams: Crimped and soldered.
Closure: Airtight and leakproof.
Handles: Wire.

(d) Bottom: Embossed.
Seams: Crimped and soldered.

(e) Body: Paneled on 4 sides.
Two seams: Clinched and soldered

(f) Material: IC (107 lb.) tin or terneplate.

(g) Average weight: 2 pounds 8 ounces.

(h) Marking: No specification marking required.

§ 78.185 *Specification 16A; wooden boxes, wirebound.*

§ 78.185–1 *Compliance.* (a) Required in all details. Authorized tolerances. Cleats, battens, and handles, minus 1/32"; single thickness veneer, minus 5 percent; resawn boards, 1/64" below specified thickness for boards up to 7/32" thick and 1/32" below specified thickness for boards ¼" or more thick.

§ 78.185–2 *Lumber.* (a) Well seasoned and commercially dry; free from decay, objectionable knots, slanting shakes, sharp cross grain, and other defects that materially lessen the strength. Grain of wood in cleats and battens must not cross piece within its length.

§ 78.185–3 *Wires.* (a) Of annealed steel, or other metal of equal strength, Washburn and Moen sizes.

§ 78.185–4 *Staples.* (a) Wire size, Washburn and Moen.

§ 78.185–5 *Grouping of principal woods.* (a) Grouping as follows:

GROUP 1

White pine.	Noble fir.
Norway pine.	Willow.
Aspen (popple).	Magnolia.
Spruce.	Buckeye.
Western yellow pine.	White fir.
	Cedar.
Cottonwood.	Redwood.
Yellow poplar.	Butternut.
Balsam fir.	Alpine fir.
Chestnut.	Cucumber.
Sugar pine.	Lodgepole pine.
Cypress.	Jack pine.
Basswood.	

GROUP 2

Southern yellow pine.	Douglas fir.
	Larch (tamarack).
Hemlock.	
North Carolina pine.	

GROUP 3

White elm.	Black gum.
Red gum.	Tupelo.
Sycamore.	Maple—soft or silver.
Pumpkin ash.	
Black ash.	

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	White ash.
Hackberry.	Hickory.

§ 78.185–6 *Closed box.* (a) Parts and pieces with edges in close contact to give completely closed box.

§ 78.185–7 *Top, sides, and bottom.* (a) Each cleated at both ends; intermediate rows of cleats authorized.

§ 78.185–8 *Cleats.* (a) Ends mitered or with mortise and tenon joints.

§ 78.185–9 *Ends.* (a) Battened when prescribed. Wired ends authorized provided wires run cross grain and terminate in loops with ends of wire driven through end board and clinched. Grain of wood perpendicular to sides except for wired ends.

§ 78.185–10 *Wires.* (a) One wire over each row of cleats; intermediate wires as prescribed.

§ 78.185–11 *Stapling.* (a) Staples for wires over cleats driven through boards into cleats and anchored; others through boards and clinched.

§ 78.185–12 *Thickness of boards (sides, tops, bottoms, and ends).* (a) Thickness as follows except that, for thicknesses prescribed as 3/16" or less, resawn boards must be 1/64" thicker for each resawn surface:

Group of wood	Minimum thickness of boards (inch)						
	1/8 (0.125)	9/64 (0.143)	3/16 (0.167)	3/16 (0.185)	7/32 (0.219)	1/4 (0.250)	5/16 (0.313)
	Authorized gross weight, box and contents (pounds)						
1	25	35	50	75	100	150	200
2	35	50	75	100	150	200	315
3	50	75	100	150	200	315	400
4	75	100	150	200	315	400	

(b) For boxes with 3 or more rows of cleats, boards of the next lower thickness prescribed in the table are acceptable.

§ 78.185–13 *Size of cleats.* (a) At least 13/16" by 13/16" when thickness required for boards exceeds 1/7"; otherwise at least 9/16" by 13/16".

§ 78.185–14. *Binding wires (sides, top, and bottom).* (a) Spacing not over 8".

Exception: When each binding wire is stapled to a row of cleats, 11" spacing is authorized.

(b) Number and size of binding wires as follows:

Number of wires	Minimum gauge of wires, Washburn and Moen				
	16	15	14	13	12
	Authorized gross weight, box and contents (pounds)				
2	35	50	75	100	150
3	50	75	100	150	200
4	75	100	150	200	315
5	100	150	200	315	400
6		200	315	400	
7			400		

§ 78.185–15 *Wires for wired ends.* (a) At least 2 wires on each end, size not less than as specified for binding wires in § 78.185–14, and spaced as follows:

Thickness of end (inch)	Maximum spacing	
	Between wires (inch)	Wires to cleats (inch)
0.125	6	4
.143	6	4
.167	6½	4
.187	6½	4
.219	7	4
.250	7	4
.313	7	4

(b) Ends less than 10 inches deep are authorized with 1 wire provided they are reinforced by 2 strips (liners), at least 1¼" wide and as thick as ends, securely stapled along edges of the end parallel to the wires.

§ 78.185–16 *Staple spacing (approximate) and minimum size.* (a) Staples into cleats 16 gauge, Washburn and Moen, and:

(1) One and one-fourth inches long with 1½" spacing, or 1⅛ long with 1" spacing, when boards are over ¼" thick.

(2) One and one-eighth inches long with 1½" spacing, for boards ¼" thick or less; except that staples ⅞" long with 1½" spacing are authorized when boards are 1/7" thick or less.

(b) Other staples 18 gauge, Washburn and Moen.

§ 78.185–17 *End supporting battens.*[1] (a) End supporting battens at least 1⅛" wide and same thickness as cleats; fastened securely across ends parallel to side cleats; required so that unsupported distance between cleats, battens, and between cleats and battens will be not greater than as follows.

Thickness of ends (inch):	*Maximum spacing (inches)*
0.125	10
0.143	11
0.167	12
0.187	13
0.219	14
0.250	15
0.313	16

§ 78.185–18 *Side cleat battens and wired end supports.*—(a) *Side cleat battens.* At least 13/16" by 13/16"; fastened securely to ends so as to be adjacent to side cleats when box is set up; required, in addition to any other battens, when authorized gross weight exceeds the following:

Group of wood in cleats:	*Authorized gross weight, box and contents, over (pounds)*
1	100
2	150
3	200
4	200

(b) *Wired end supports.* Wired ends, for boxes for authorized gross weight exceeding the foregoing, must be reinforced by 2 strips (liners), at least 1¼" wide and as thick as ends, securely stapled along edges of the end parallel to the wires; side cleat battens not required.

§ 78.185–19 *Marking.* (a) Marking on each box with letters and figures at least ½" high in rectangle as follows:

ICC–16A***

(1) Stars must be replaced by maximum authorized gross weight (for example, ICC–16A150, etc.). This mark shall be understood to certify that box complies with all specification requirements.

(b) Name of maker located just above, below, or following the mark specified in paragraph (a) of this section; symbol (letters) authorized if registered with the Bureau of Explosives.

§ 78.125–20 *Setting up and closing.* (a) Nail or staple unwired ends to side cleats at intervals not over 2½"; fasten wired ends securely by means of loop fasteners.

(b) Twist ends of binding wires or bend loops to give tight closure.

(c) Nail at least 2 nails through side cleats into each side-cleat batten at not over 4" intervals; nail through top and bottom cleats with one 7-penny nail into each end of end-supporting battens.

[1] Not required for wired ends less than 20 inches long.

§ 78.186 *Specification 16B; wooden boxes, wirebound.*

§ 78.186–1 *Compliance.* (a) Required in all details. Authorized tolerances: Cleats, battens, and handles, minus 1/32"; single thickness veneer, minus 5 percent; resawn boards, 1/64" below specified thickness for boards up to 7/32" thick and 1/32" below specified thickness for boards ¼" or more thick.

§ 78.186–2 *Lumber.* (a) Well seasoned and commercially dry; free from decay, objectionable knots, slanting shakes, sharp cross grain, and other defects that materially lessen the strength. Grain of wood in cleats and battens must not cross piece within its length.

§ 78.186–3 *Wires.* (a) Of annealed steel, or other metal of equal strength, Washburn and Moen sizes.

§ 78.186–4 *Staples.* (a) Wire size, Washburn and Moen.

§ 78.186–5 *Grouping of principal woods.* (a) Grouping as follows:

GROUP 1

White pine.	Noble fir.
Norway pine.	Willow.
Aspen (popple).	Magnolia.
Spruce.	Buckeye.
Western yellow pine.	White fir.
Cottonwood.	Cedar.
Yellow poplar.	Redwood.
Balsam fir.	Butternut.
Chestnut.	Alpine fir.
Sugar pine.	Cucumber.
Cypress.	Lodgepole pine.
Basswood.	Jack pine.

GROUP 2

Southern yellow pine.	North Carolina pine.
	Douglas fir.
Hemlock.	Larch (tamarack).

GROUP 3

White elm.	Black ash.
Red gum.	Black gum.
Sycamore.	Tupelo.
Pumpkin ash.	Maple—soft or silver.

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	White ash.
Hackberry.	Hickory.

§ 78.186–6 *Closed box.* (a) Parts and pieces with edges in close contact to give completely closed box except that spaces 1½" are authorized between side boards and between top boards when boards are at least 3½" wide.

(b) Handles: Containers may be provided with suitable handles at discretion of shipper. When used, they must be securely fastened along tops of sides under wires and project 3 inches or be mounted on end cleats; extensions of side boards acceptable; dimensions as follows:

Authorized gross weight not over (pounds):	*Handles[1] minimum cross section (inches)*
150	½ x 2½
200	5/8 x 2½
315	5/8 x 3½
400	13/16 x 3½

[1] Also ridge reinforcing battens when prescribed.

§ 78.186–7 *Top, sides, and bottom.* (a) Each cleated at both ends; intermediate rows of cleats authorized.

§ 78.186–8 *Cleats.* (a) Ends mitered or with mortise and tenon joints.

§ 78.186–9 *Ends.* (a) Battened when prescribed. Wired ends authorized provided wires run cross grain and terminate in loops with ends of wire driven through end board and clinched. Grain of wood perpendicular to sides except for wired ends. Ridge-top containers, authorized as follows:

(1) Ends must be at least 2 times as thick as prescribed in § 78.186–12.

(2) Unsupported distance as prescribed in § 78.186–17 must not exceed 10" in any case.

(3) Ridge over 30" long must be reinforced on the outside, from end to end, by 2 battens with abutting edges and of cross section as prescribed for handles.

(4) Vertical grain unwired ends are authorized.

§ 78.186–10 *Wires.* (a) One wire over each row of cleats; intermediate wires as prescribed.

§ 78.186–11 *Stapling.* (a) Staples for wires over cleats driven through boards into cleats and anchored; others through boards and clinched.

§ 78.186–12 *Thickness of boards (sides, tops, bottoms, and ends).* (a) Thickness as follows except that, for thicknesses prescribed as 3/16" or less, resawn boards must be 1/64" thicker for each resawn surface:

Group of wood	Minimum thickness of boards (inch)						
	1/8 (0.125)	1/7 (0.143)	1/6 (0.167)	3/16 (0.185)	7/32 (0.219)	1/4 (0.250)	5/16 (0.313)
	Authorized gross weight, box and contents (pounds)						
1	25	35	50	75	100	150	200
2	35	50	75	100	150	200	315
3	50	75	100	150	200	315	400
4	75	100	150	200	315	400	----

(b) For boxes with 3 or more rows of cleats, boards of the next lower thickness prescribed in the table are acceptable.

§ 78.186–13 *Size of cleats.* (a) At least 13/16" by 13/16" when thickness required for boards exceeds 1/7"; otherwise at least 9/16" by 13/16".

§ 78.186–14 *Binding wires (sides, top, and bottom).* (a) Spacing not over 8".

Exception: When each binding wire is stapled to a row of cleats, 11" spacing is authorized.

(b) Number and size of binding wires as follows:

Number of wires	Minimum gauge of wires, Washburn and Moen				
	16	15	14	13	12
	Authorized gross weight, box and contents (pounds)				
2	35	50	75	100	150
3	50	75	100	150	200
4	75	100	150	200	315
5	100	150	200	315	400
6	----	200	315	400	----
7	----	----	400	----	----

§ 78.186–15 *Wires for wired ends.* (a) At least 2 wires on each end, size not less than as specified for binding wires in § 78.186–14, and spaced as follows:

Thickness of end (inch)	Maximum spacing	
	Between wires (inch)	Wires to cleats (inch)
0.125	6	4
.143	6	4
.167	6½	4
.187	6½	4
.219	7	4
.250	7	4
.313	7	4

(b) Ends less than 10 inches deep are authorized with 1 wire provided they are reinforced by 2 strips (liners), at least 1¼" wide and as thick as ends, securely stapled along edges of the end parallel to the wires.

§ 78.186–16 *Staple spacing (approximate) and minimum size.* (a) Staples into cleats 16 gauge, Washburn and Moen, and:

(1) One and one-fourth inches long with 1½" spacing, or 1⅛" long with 1" spacing, when boards are over ¼" thick.

(2) One and one-eighth inches long with 1½" spacing, for boards ¼" thick or less; except that staples ⅞" long with 1½" spacing are authorized when boards are 1/7" thick or less.

(b) Other staples 18 gauge, Washburn and Moen.

§ 78.186–17 *End supporting battens*[1] (a) At least 1⅛" wide and same thickness as cleats; fastened securely across ends parallel to side cleats; required so that unsupported distance between cleats, battens, and between cleats and battens will be not greater than as follows:

Thickness of ends (inch):	*Maximum-spacing (inches)*
0.125	10
0.143	11
0.167	12
0.187	13
0.219	14
0.250	15
0.313	16

§ 78.186–18 *Side cleat battens and wired end supports*—(a) *Side cleat battens.* At least 13/16" by 13/16"; fastened securely to ends so as to be adjacent to side cleats when box is set up; required, in addition to any other battens, when authorized gross weight exceeds the following:

Group of wood in cleats:	*Authorized gross weight, box and contents, over (pounds)*
1	100
2	150
3	200
4	200

(b) *Wired end supports.* Wired ends, for boxes for authorized gross weight exceeding the foregoing, must be reinforced by 2 strips (liners), at least 1¼" wide and as thick as ends, securely stapled along edges of the end parallel to the wires; side cleat battens not required.

§ 78.186–19 *Marking.* (a) Marking on each box with letters and figures at least ½" high in rectangle as follows.

ICC–16B***

(1) Stars must be replaced by maximum authorized gross weight (for example, ICC–16B315, etc.). This mark shall be understood to certify that box complies with all specification requirements.

(b) Name of maker located just above, below, or following the mark specified in paragraph (a) of this section; symbol (letters) authorized if registered with the Bureau of Explosives.

§ 78.186–20 *Setting up and closing.* (a) Nail or staple unwired ends to side cleats at intervals not over 2½"; fasten wired ends securely by means of loop fasteners. *Provided,* That ends at least 7/16" thick may be nailed with cement-coated nails through sides, top, and bottom of box into the ends at 3" intervals.

(b) Twist ends of binding wires or bend loops to give tight closure.

(c) Nail at least 2 nails through side cleats into each side-cleat batten at not over 4" intervals; nail through top and bottom cleats with one 7-penny nail into each end of end-supporting battens.

§ 78.186–21 *Special box.* (a) Gross weight not over 500 pounds. Must comply with this specification except as follows: Sides, top, bottom, and ends, to be of group 2 or 3 wood having minimum thickness of ¼" for boxes not over 315 pounds gross weight, 5/16" for boxes not over 400 pounds gross weight, and ⅜" for boxes not over 500 pounds gross weight. Size of end cleats must be at least 13/16" x ⅞" and ends must have horizontal supporting battens at least 1⅜" x 13/16". One batten is required for boxes not over 200 pounds gross weight and three battens for others. Ends must be held in place by one metal strap at least ⅝" x 0.020" completely around the box stapled to the middle end battens. When size of box will not permit the application of all prescribed binding wires during manufacture, the additional binding wires of prescribed number and size, or metal straps of equal number and strength, must be applied after closing. At least three-binding wires must be applied to boxes not over 200 pounds gross weight and at least four to boxes over 200 pounds gross weight

[1] Not required for wired ends less than 20 inches long.

by the box manufacturer. Binding wires for boxes over 400 pounds gross weight must be of size and number prescribed for boxes not over 400 pounds gross weight.

§ 78.190 *Specification 19A; wooden boxes, glued plywood cleated.*

§ 78.190–1 *Compliance.* (a) Required in all details.

§ 78.190–2 *Three-way corners.* (a) Three-way corners (when specified in §§ 78.190–3 to 78.190–13) shall be of type so nailing will be into edge grain of cleats, unless otherwise specified.

§ 78.190–3 *Lumber.* (a) Well seasoned and commercially dry; free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength. Cleats to be free from knots and grain of wood must not cross cleat in less than one-half its length.

(b) To be at least 3-ply, except for cleats; each ply glued in place with grain at right angles to the one next.

§ 78.190–4 *Nails.* (a) Cement coated and of size specified for "sinkers", "coolers", and "3-ply-veneer nails" as generally known to the trade.

§ 78.190–5 *Grouping of principal woods.* (a) Grouping as follows:

GROUP 1

White pine.	Willow.
Norway pine.	Noble fir.
Aspen (popple).	Magnolia.
Spruce.	Buckeye.
Western (yellow) pine.	White fir.
	Cedar.
Cottonwood.	Redwood.
Yellow poplar.	Butternut.
Balsam fir.	Cucumber.
Chestnut.	Alpine fir.
Sugar pine.	Lodgepole pine.
Cypress.	Jack pine.
Basswood.	

GROUP 2

Southern yellow pine.	Douglas fir.
Hemlock.	Larch (tamarack).
North Carolina pine.	

GROUP 3

White elm.	Black ash.
Red gum.	Black gum.
Sycamore.	Tupelo.
Pumpkin ash.	Maple—soft or silver.

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	White ash.
Hackberry.	Hickory.

§ 78.190–6 *Three-way corners.* (a) Three-way corners required; except for authorized gross weight not over 75 pounds

§ 78.190–7 *Cleats required.* (a) Two on each face at opposite edges; others as necessary so that cleats are not over 12" apart. These to extend full length of face.

(b) Others, if necessary, to provide nailing surface at each box edge.

§ 78.190–8 *Parts and dimensions.* (a) Parts and dimensions as follows:

Authorized gross weight	Plywood minimum thickness [1]	Cleats of group 1 or 2 woods [1]		Cleats of group 3 or 4 woods [1]	
		Minimum thickness	Minimum width	Minimum thickness	Minimum width
Pounds	*Inch*	*Inch*	*Inches*	*Inch*	*Inches*
50	3/20	1/2	1 1/2	1/2	1 1/2
75	3/20	9/16	1 11/16	1/2	1 1/2
100	3/16	5/8	1 7/8	1/2	1 1/2
150	3/16	11/16	2 1/16	1/2	1 1/2
200	3/12	3/4	2 1/4	9/16	1 11/16
300	3/12	13/16	2 7/16	5/8	1 7/8
400	3/12	7/8	2 5/8	11/16	2 1/16

[1] Variation authorized of 1/8 prescribed thickness of any part not to exceed 10 percent of its area. Cleats at least 1/2" thick, of cross section equivalent to prescribed cleats are authorized.

§ 78.190–9 *Marking.* (a) Marking on each container with letters and figures at least 1/2" high in rectangle as follows:

ICC–19A***

(1) The stars must be replaced by authorized gross weight (for example, ICC–19A200). This mark shall be understood to certify that box complies with all specification requirements.

(2) Name of maker located just above, below, or following the mark specified in paragraph (a) of this section; symbol (letters) authorized if registered with the Bureau of Explosives.

§ 78.190–10 *Setting up and closing all boxes.* (a) Each edge of each plywood section secured with 3-ply-veneer cement coated nails, or staples, at 3" intervals as follows:

(1) To face of cleat; clinching required; cement coating optional.

(2) To edge of cleat; except when nailing through a cleat in which case nail as in § 78.190–13.

§ 78.190–11 *Boxes with 3-way corners.* (a) Each cleat forming 3-way corner to be nailed with 2 nails at each end into edge of adjoining cleat.

§ 78.190–12 *Boxes without 3-way corners.* (a) Each edge cleat to be nailed to cleat on adjoining face.

§ 78.190–13 *Nails and nailing under §§ 78.190–11 and 78.190–12.* (a) To be cement coated and as follows:

Cleats—thickness (inch)	Nails—cement coated			
	Group 1 or 2 woods		Group 3 or 4 woods	
	Size (penny)	Spacing (inches)	Size (penny)	Spacing (inches)
1/2	5	1 3/4	4	1 1/2
9/16	6	2	5	1 3/4
5/8	6	2	5	1 3/4
11/16	7	2 1/4	6	2
3/4	7	2 1/4	6	2
13/16	8	2 1/2	7	2 1/4
7/8	9	2 3/4	8	2 1/2

§ 78.193 *Specification 18B; wooden kits.*

§ 78.193–1 *Compliance.* (a) Required in all details.

§ 78.193–2 *Tops and bottoms.* (a) Pieces to be glued together.

§ 78.193–3 *Parts required and dimensions.* (a) Parts required and dimensions as follows:

Authorized gross weight (pounds)	Thickness (minimum)		Hoops (minimum)		
	Top and bottom (inch)	Staves (inch)	Number	Width (inch)	Gauge [1]
25	1/2	3/8	3	9/16	23
40	1/2	1/2	3	5/8	23

[1] Birmingham wire gauge (number).

§ 78.193–4 *Middle hoop.* (a) Middle hoop of No. 11 gauge wire authorized.

§ 78.193–5 *Type test.* (a) Sample, filled with dry, finely powdered material to authorized gross weight and closed as for use, shall withstand, without leaking, a drop from height of 4 feet onto solid concrete so as to strike diagonally on top chime.

§ 78.193–6 *Marking.* (a) Marking on each container plainly as follows:

(1) ICC–18B; followed by the authorized gross weight (for example, ICC–18B25). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

§ 78.193–7 *Size of mark.* (a) Size of mark (minimum), 1/2" high.

§ 78.196 *Specification 22A; wooden drums, glued plywood.*

§ 78.196–1 *Compliance.* (a) Required in all details.

§ 78.196–2 *Lumber.* (a) To be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

§ 78.196–3 *Woods required for plywood.* (a) As follows:

GROUP 3

White elm.	Black gum.
Red gum.	Tupelo.
Sycamore.	Maple—soft or silver.
Pumpkin ash.	
Black ash.	

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	White ash.
Hackberry.	Hickory.

§ 78.196–4 *Plywood.* (a) At least 2-ply for body and 3-ply for heads; all plies glued together cross grain.

§ 78.196–5 *Hoops and battens.* (a) Grain of wood must not cross piece within 1/2 of its length. Hoops to be of elm.

Exception: Plywood hoops 0.28" thick are authorized.

§ 78.196–6 *Parts and dimensions.* (a) Parts and dimensions as follows:

Maximum net weights authorized	Thickness (minimum)		Size of hoops (minimum)		Head liners (minimum)
	Body	Heads	Wooden	Metal [2]	
Pounds	*Inch*	*Inch*	*Inch*	*Inch*	*Inch*
33	0.16	3/8	1/8 x 2	0.023 x 1 7/16 [1] .015 x 2 3/8	1/8 x 5/8
55	.18	3/8	1/8 x 2	.023 x 1 7/16 [1] .015 x 2 3/8	1/8 x 5/8
115	.20	3/8	1/8 x 2 1/4	.023 x 1 9/16 [1] .015 x 2 3/8	1/4 x 3/4
200	.28	0.43	1/4 x 3	.028 x 1 9/16	1/4 x 3/4

[1] Authorized only when metal hoop is between body of drum and wooden hoop as described in § 78.196–8.

[2] On drums of not over 10½ gallons capacity having authorized maximum net weights not over 115 pounds, additional outside headliners may be used in lieu of metal hoops provided containers will pass prescribed tests. (See §78.196–14.)

§ 78.196–7 *Body joints.* (a) To be made by steel strip 0.015" x 1½" secured by staples, clinched, at 1⅛" centers, or by other method giving equivalent strength; also to be made siftproof by 2 thicknesses of 3" paper tape 60-pound strength, Mullen or Cady test, or other equivalent protection.

NOTE 1: Because of the present emergency and until further order of the Commission, tape 2½" may be used.

§ 78.196–8 *Hoops.* (a) One wooden and 1 metal required at each chime; wooden hoops secured by staples, clinched, at 3" centers; metal hoops to be outside wooden hoops and secured by punching, or other equivalent method, at 6" centers.

§ 78.196–9 *Head battens.* (a) Required for heads over 15" diameter; ¾" x 3", minimum; ends rounded to fit chime.

§ 78.196–10 *Head liners.* (a) Required inside and outside for full circumference of heads. To be securely fastened by staples or nails, clinched.

§ 78.196–11 *Head lining paper.* (a) Required for each head; 1½" larger than head diameter; of No. 1 Kraft paper 90 pounds per ream (480 sheets 24" x 36") or equivalent.

NOTE 1: Because of the present emergency and until further order of the Commission, a ream may consist of 500 sheets.

§ 78.196–12 *Bung openings.* (a) Bung and bunghole authorized provided head lining paper is glued around hole.

§ 78.196–13 *Insertion of head.* (a) As in § 78.196–16.

§ 78.196–14 *Tests.* (a) Samples of each type and size taken at random, filled with dry, fine powder to the authorized net weight and closed as for use, must be capable of withstanding, without leakage, 2 drops diagonally on either end chime onto solid concrete from height of 4 feet.

§ 78.196–15 *Marking.* (a) Marking on each container by marks ¾" high, as follows:

(1) ICC–22A, followed by authorized gross weight (authorized net weight plus approximate tare weight, for example, ICC–22A115). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

§ 78.196–16 *Closing for shipment—* (a) *Closing heads.* Insert head lining paper, head, and head liner; nail with 15 gauge nails, clinched, at 2" centers through head liner, body and wooden hoop; equivalent stapling authorized. Nail through steel hoop with two 7-penny nails into each end of head batten, if any.

§ 78.196–17 *Bung closures.* (a) Bung closures (if any) must be well driven and secured sufficiently to prevent leakage in transit.

§ 78.197 *Specification 22B; wooden drums, glued plywood.*

§ 78.197–1 *Compliance.* (a) Required in all details.

§ 78.197–2 *Lumber.* (a) To be well seasoned, commercially dry, and free from decay, loose knots, knots that would interfere with nailing, and other defects that would materially lessen the strength.

§ 78.197–3 *Woods required for plywood.* (a) Woods required as follows:

GROUP 3

White elm.	Black ash.
Red gum.	Black gum.
Sycamore.	Tupelo.
Pumpkin ash.	Maple—soft or silver.

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	White ash.
Hackberry.	Hickory.

§ 78.197–4 *Plywood.* (a) At least 2-ply for body and 3-ply for heads; all plies glued together cross grain.

§ 78.197–5 *Hoops and battens.* (a) Grain of wood must not cross piece within ½ of its length. Hoops to be of elm. Exception: Plywood hoops 0.28" thick are authorized.

§ 78.197–6 *Parts and dimensions.* (a) Parts and dimensions as follows:

Maximum net weights authorized	Thickness (minimum)		Size of hoops (minimum)		Head liners (minimum)
	Body	Heads	Wooden	Metal [2]	
Pounds	*Inch*	*Inch*	*Inch*	*Inch*	*Inch*
33	0.16	3/8	1/8 x 2	0.023 x 1 7/16 [1] .015 x 2 3/8	1/8 x 5/8
55	.18	3/8	1/8 x 2	.023 x 1 7/16 [1] .015 x 2 3/8	1/8 x 5/8
115	.20	3/8	1/8 x 2 1/4	.023 x 1 9/16 [1] .015 x 2 3/8	1/4 x 3/4
200	.28	0.43	1/4 x 3	.028 x 1 9/16	1/4 x 3/4

[1] Authorized only when metal hoop is between body of drum and wooden hoop as described in § 78.197–8.

[2] On drums of not over 10½ gallons capacity having authorized maximum net weights not over 115 pounds, additional outside headliners may be used in lieu of metal hoops provided containers will pass prescribed tests. (See § 78.197–13.)

§ 78.197–7 *Body joint.* (a) Joint to be made by steel strip 0.015" x 1½" secured by staples, clinched, at 1⅛" centers, or by other method giving equivalent strength.

§ 78.197–8 *Hoops.* (a) One wooden and 1 metal required at each chime; wooden hoops secured by staples, clinched, at 3" centers; metal hoops to be outside wooden hoops and secured by punching, or other equivalent method, at 6" centers.

§ 78.197–9 *Head battens.* (a) Required for heads over 15" diameter, ¾" x 3", minimum; ends rounded to fit chime.

§ 78.197–10 *Head liners.* (a) Required inside and outside for full circumference of heads. To be securely fastened by staples or nails, clinched. Not required when close fitting inside metal drum is used.

§ 78.197–11 *Bung openings.* (a) Bung and bung hole authorized provided head lining paper is glued around hole.

§ 78.197–12 *Insertion of head.* (a) As in § 78.197–15.

§ 78.197–13 *Tests.* (a) Samples of each type and size taken at random, filled with dry, fine powder to the authorized net weight and closed as for use, must be capable of withstanding, without leakage, 2 drops diagonally on either end chime onto solid concrete from height of 4 feet.

§ 78.197–14 *Marking.* (a) Marking on each container by marks ¾" high, as follows:

(1) ICC–22B, followed by authorized gross weight (authorized net weight plus approximate tare weight, for example, ICC–22B235). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

§ 78.197–15 *Closing for shipment—* (a) *Closing heads.* Insert head lining paper, head, and head liner; nail with 15 gauge nails, clinched, at 2" centers through head liner, body and wooden hoop; equivalent stapling authorized. Nail through steel hoop with two 7-penny nails into each end of head batten, if any.

§ 78.197–16 *Bung closures.* (a) Bung closures (if any) must be well driven and secured sufficiently to prevent leakage in transit.

SUBPART F—SPECIFICATIONS FOR FIBERBOARD BOXES, DRUMS, AND MAILING TUBES

§ 78.205 *Specification 12B;* fiberboard boxes.

§ 78.205–1 *Compliance.* (a) Required in all details.

§ 78.205–2 *Definitions.* (a) Terms such as "200-pound test" mean minimum strength, Mullen or Cady test.

(b) "Joints" are where edges of parts of box, except recessed flanged heads, are connected together in setting up the box. Generally done by box maker.

(c) "Seams" are where edges of parts of box are visible, except joints, when box is closed.

§ 78.205–3 *Classification of board.* (a) Fiberboard is hereby classified by strength [1] of completed board as in first column of the following table; weights specified in the table are the minimums authorized.

Classified strength [1] of completed board	Solid fiberboard—Minimum combined weight of component plies exclusive of adhesives (pounds per 1,000 sq. ft.)	Facings for corrugated fiberboard	
		Double-faced—Minimum combined weight of facings (pounds per 1,000 sq. ft.)	Double-wall—Minimum combined weight of facings including center liner (pounds per 1,000 sq. ft.)
175	149	75	----------
200	190	84	92
275	237	138	110
325	237	138	110
350	283	180	126
375	283	180	180
400	283	180	180
450	283	180	180

[1] Mullen or Cady test (minimum).

§ 78.205–4 *Solid fiberboard.* (a) To be 3-ply or more; both outer plies water resistant.

§ 78.205–5 *Corrugated fiberboard.* (a) Both outer facings water resistant; corrugated sheets must be at least 0.009 inch thick and weigh not less than 26 pounds per 1000 square feet; all parts must be securely glued together throughout all contact areas.

§ 78.205–6 *Stitching staples.* (a) Of steel wire at least $\frac{3}{32}$ x 0.019 inch, or equal cross section, formed into staples about $\frac{7}{16}$ inch wide. Staples of metal other than steel are authorized provided their efficiency is equal to that of steel wire staples specified in this section.

§ 78.205–7 *Tape.* (a) Coated with glue at least equal to No. 1¾ Peter Cooper standard. Cloth tape of strength, across the woof, at least 70 units, Elmendorf test. Sisal tape of 2 sheets of No. 1 Kraft paper, total weight 80 pounds per ream (500 sheets, 24" x 36"); sheets to be combined with asphalt and reinforced by unspun sisal fibers completely embedded in the asphalt and extending across the tape, except as provided in § 78.205–11 (d).

§ 78.205–8 *Test.* (a) Acceptable board must have prescribed strength, Mullen or Cady test, after exposure for at least 3 hours to normal atmospheric conditions (50 to 70 percent relative humidity), under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures, 12 from each side; when all results but 4 show prescribed strength the board is acceptable.

(4) For corrugated fiberboard, double-pop tests may be disregarded.

§ 78.205–9 *Types authorized.* (a) To be of solid or corrugated fiberboard of the following types, or as specifically provided for in §§ 78.205–19 to 78.205–28 of this specification.

(1) Slotted box; three-piece box without recessed ends; three-piece box of solid fiberboard with recessed ends; double-slide box; triple-slide box; telescope box, with sections of equal depth, or with covers, top or bottom or both, with 3 inches overlap. (See § 78.205–14 (d) for boxes with single-flap closures).

§ 78.205–10 *Forming.* (a) Parts must be cut true to size and so creased and slotted as to fit closely into position without cracking, surface breaks, separation of parts outside of crease, or undue binding.

§ 78.205–11 *Joints.* (a) For solid and corrugated fiberboard slotted containers: Lapped 1½" except as in § 78.205–12; stitched at 2½" intervals and within 1" of each end of joint; body joint must be double-stitched (2 parallel stitches) at each end of joint over 18" long.

(b) For corrugated fiberboard slotted containers only: One butt joint taped (See § 78.205–7) is authorized; 3 inch tape required for boxes over 30 pounds authorized gross weight and 2 inch tape for others.

(c) For triple and double slide boxes: Joints of all slides must be taped (See § 78.205–7) or stitched.

(d) For corrugated fiberboard only: One butt joint taped inside and outside with strips of one thickness of sulphate paper not less than 2 inches wide extending entire length of joint and firmly glued to box. For boxes not exceeding 65 pounds gross weight, outside strip of sulphate paper to be of basis weight not less than 60 pounds testing not less than 60 pounds and inside strip of sulphate paper to be of basis weight not less than 40 pounds testing not less than 40 pounds. For boxes exceeding 65 pounds gross weight, outside and inside with strips of sulphate paper which must each be of basis weight not less than 90 pounds testing not less than 90 pounds. Basis weight of paper shown is for 500 sheets, 24 x 36 inches.

§ 78.205–12 *Flanged heads.* (a) Must have 4 flanges, at least 1" long above fillet, on each head. Recessed flanged heads not authorized for boxes of corrugated fiberboard.

§ 78.205–13 *Seams which are to be stitched.* (a) Overlap, if any, required to be at least 1½" except as in § 78.205–12.

§ 78.205–14 *Flap closures.* (a) Fill-in pieces between inner flaps are required when necessary to prevent an opening in a seam.

(b) If to be closed by adhesive, each inner flap must cover at least ⅓ of face; inner flaps must butt or have full overlap, or fill-in pieces must be used; except that fill-in pieces are not required when outer flaps have full overlap. Outer flaps must butt or have full overlap.

(c) In lieu of fill-in pieces between inner flaps which do not butt, the following is authorized when linings are not prescribed in § 78.205–16;

(1) Top and bottom pads the same dimensions as interior of container of solid or corrugated fiberboard at least 125 pound test (Mullen or Cady).

(2) Minimum combined weight of facings for corrugated fiberboard pads must be at least 52 pounds per thousand square feet.

(3) Minimum combined weight of component plies for solid fiberboard pads must be at least 114 pounds per thousand square feet, exclusive of adhesives.

(d) Single-flap closures are authorized for boxes with one dimension not over 2"; each flap must be scored and form one of the small faces of the box and lap at least 5" on one of the largest faces.

§ 78.205–15 *Linings (when prescribed).* (a) Of 1-piece to extend around 4 faces with joint at center of 1 face and with 4 flanges, at least 1½" long, on each end (corners may be mitered) to bend over the other 2 faces; also 2 pads to cover the other 2 faces. Pads may be omitted if closing flaps afford 3 thicknesses throughout face. For boxes with 1 dimension not over 3", one of the widest flanges may be lengthened to cover entire face and lap 6" on the adjoining face and the other flanges and the pads may then be omitted.

§ 78.205–16 *Authorized gross weight and parts required.* (a) Authorized gross weight (when packed) and parts required as follows:

Authorized gross weight (pounds)	Strength of fiberboard (minimum) Mullen or Cady test						
	Solid board			Double-faced corrugated		Double-wall corrugated	
	Box	Lining [2]	Heads [1]	Box	Lining [2]	Box	Lining [2]
15	175	------	[3]	175	------	200	------
30	200	------	275	200	------	200	------
40	275	------	350	275	------	200	------
				200	175		
55	325	------	[3]	325	------	275	------
65	375	------	[3]	375	------	275	------
	275	175	350	275	175		
				200	200		

[1] For recessed heads when used. In other cases same as for box.
[2] As prescribed in § 78.205–15. A complete box is acceptable in place of the lining.
[3] Recessed heads not authorized in any case.

(b) Triple slide boxes authorized for gross weights as follows: Of board at least 175-pound test for 40 pounds; of board at least 200-pound test for 65 pounds.

§ 78.205–17 *Closing for shipment.* (a) Slotted container, by coating with adhesive the entire contact surfaces of closing flaps and fill-in pieces. By coating with adhesive the inner slides of triple slide boxes or double slide boxes. For single-flap closures as authorized for boxes with one dimension not over 2 inches, the flaps must be fastened to the body with adhesive.

(b) Or, by stitching at 2½" intervals along all seams (one 5" space allowed

when necessary to permit use of stitching device).

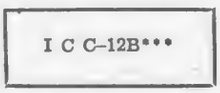
(c) Fiberboard boxes with covers extending over sides but not to bottom, covers resting on walls of box, or telescope boxes of equal depth sections, covers extending to bottom, must be secured by one of the following methods:

(1) By not less than three metal straps, one lengthwise and others at right angles thereto.

(2) When cover extends not less than 3 inches over the walls of the box, by coating with adhesive the entire contact area of the cover.

(d) When metal straps are specified, boxes must be strapped with the required number; size at least ⅝" x 0.015".

§ 78.205–18 *Marking*—(a) *On each container.* Symbol in rectangle as follows:



(1) Stars to be replaced by authorized gross weight (for example, ICC—12B40, etc.). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name and address of plant making the container; symbol (letters) authorized if recorded with the Bureau of Explosives. This mark to be located just above or below the mark specified in paragraph (a) of this section.

(3) When metal straps are prescribed, boxes must be marked "_____ (number) METAL STRAPS REQUIRED" just above or below the mark specified in paragraph (a) (1) of this section.

(4) Size of markings.—At least ½" high.

§ 78.205–19 *Special box; authorized only for contents in 1-gallon rectangular metal cans.* (a) Must comply with this specification except as follows: Must be 1-piece type, of double-wall corrugated fiberboard at least 400-pound test with all three facings at least 135-pound test; to be marked "FOR 1-GAL. RECTANGULAR CANS ONLY" near the I. C. C. specification mark; authorized gross weight 84 pounds.

§ 78.205–20 *Special box; authorized only for pyroxylin in sheets, rods, or tubes.* (a) Must comply with this specification except as follows: Must be of board at least 275-pound test with lining at least 200-pound test, all being double-faced corrugated fiberboard; 3 metal straps required (see §§ 78.205–17 and 78.205–18); authorized gross weight 90 pounds.

§ 78.205–21 *Special box; authorized only for pyroxylin in sheets, rods, or tubes.* (a) Must comply with this specification except as follows: Must be telescope type with wooden frame between the parts that telescope; authorized gross weight 90 pounds.

(b) Frame of group 3 or 4 wood 9/16" thick with lock corners glued.

GROUP 3

White elm.	Black gum.
Red gum.	Black ash.
Sycamore.	Tupelo.
Pumpkin ash.	Maple—soft or silver.

GROUP 4

Hard maple.	Birch.
Beech.	Rock elm.
Oak.	Hickory.
Hackberry.	White ash.

(c) Telescoping parts of double-faced corrugated fiberboard at least 400-pound test with facings at least 180 pounds per thousand square feet; each part of same depth as frame; outer part to have corners overlapped and securely fastened.

(d) Four metal straps required. Glued or stitched closure not required. (See §§ 78.205–17 and 78–205–18.)

§ 78.205–22 *Special box; authorized only for motion-picture film in metal cans or strong cardboard or fiberboard boxes each containing not over 2,000 feet (approx.) of film.* (a) Must comply with this specification except as follows:

(1) *For one inside container.* Must be of board at least 275-pound test for a 2,000-foot film and of board at least 200-pound test for a 1,000-foot film; lining and pads not required; closure by taping with strong paper tape authorized.

(2) *For more than one inside container.* Must be of 1-piece type; authorized gross weight 55 pounds when made of 325-pound test board, 65 pounds when made of 375-pound test board, and 75 pounds when made of 450-pound test board; interior packing required, of fiberboard at least 175-pound test, adequate to support inside containers in center of outside container; lining and top and bottom pads not required.

§ 78.205–23 *Special box; authorized only for poisonous solids, class B, in 1-gallon metal cans.* (a) Must comply with this specification except as follows: Must be 1-piece type, of double-wall corrugated fiberboard at least 400-pound test with all three facings at least 135-pound test; authorized gross weight 84 pounds.

§ 78.205–24 *Special box; authorized only for railway fusees.* (a) Must comply with this specification except as follows: Must be double-faced corrugated fiberboard at least 400-pound test, or solid fiberboard of same strength; lining and pads not required; authorized gross weight 75 pounds. For fusees equipped with spikes, protection as required in § 73.108 (b) (2) of this chapter must be provided.

§ 78.205–25 *Special box; authorized only for wet electric storage batteries of the glass cell type.* (a) Must comply with this specification except as follows: Must be one-piece type of double wall corrugated fiberboard at least 275-pound test; must have linings to extend around 4 faces with joint in center of or at end of one face but at no time may joint of box and joint of liner coincide; lining to be of sufficient height to support vertical scorings of box; lining to be made of double wall corrugated board with minimum test of 275 pounds, top of battery or batteries to be protected by trays or scored sheets of corrugated fiberboard having minimum test of 200 pounds; bottom of batteries to be protected by minimum of one excelsior pad or one double wall corrugated fiberboard pad; when one or more batteries are packed in same carton, batteries must be separated by a minimum of one thickness of double wall corrugated fiberboard minimum test 275 pounds; authorized gross weight 95 pounds.

§ 78.205–26 *Special box; authorized only for one 5-gallon rectangular metal can, spec. 2F (§ 78.25 of this part); gross weight not to exceed 65 pounds.* (a) Must comply with this specification except as follows: Must be 1-piece type of double-wall corrugated fiberboard at least 350-pound test; must have top and bottom pads of double-wall corrugated fiberboard at least 350-pound test, pads to be double-flanged with flanges extending down the inside of carton at least four inches.

§ 78.205–27 *Special box; authorized only for not more than two square inside metal cans each containing not over 200 feet (approx.) motion-picture film; gross weight not to exceed 15 pounds.* (a) Must comply with this specification except as follows: Must be double-slide type, both slides of double-faced corrugated fiberboard at least 200-pound test; closure by taping with strong paper tape authorized.

§ 78.205–28 *Special box; authorized only for wet electric storage batteries of impregnated rubber, asphaltum composition, wooden-battery-box type, or aluminum-case type, having a net weight greater than 75 pounds.* (a) Must comply with this specification except as follows: Must be one-piece type of double wall corrugated fiberboard at least 400-pound test, or solid fiberboard testing at least 400 pounds; boxes may or may not have hand holes provided for in ends of box provided same will not materially weaken box; top of battery to be protected by wood frame, corrugated trays or scored sheets of corrugated fiberboard having minimum test of 200 pounds, top protection must bear evenly on connectors of battery to facilitate stacking of batteries; bottom of batteries to be protected by minimum of one excelsior pad or double wall corrugated fiberboard pad; sides and ends of battery to have minimum of ½-inch cushioning between battery and walls of box, cushioning to be of excelsior pads, corrugated fiberboard or other suitable cushioning material; no more than one battery to be packed per box; authorized gross weight 185 pounds.

§ 78.206 *Specification 12C; fiberboard boxes.*

§ 78.206–1 *Compliance.* (a) Required in all details.

§ 78.206–2 *Definitions.* (a) Terms such as "200-pound test" mean minimum strength, Mullen or Cady test.

(b) "Joints" are where edges of parts of box, except recessed flanged heads, are connected together in setting up the box. Generally done by box maker.

(c) "Seams" are where edges of parts of box are visible, except joints, when box is closed.

§ 78.206–3 *Classification of board.* (a) Fiberboard is hereby classified by strength of completed board as in first

column of the following table; weights specified in the table are the minimums authorized.

Classified strength [1] of completed board	Solid fiberboard—Minimum combined weight of component plies exclusive of adhesives (pounds per 1,000 sq. ft.)	Facings for corrugated fiberboard	
		Double-faced—Minimum combined weight of facings (pounds per 1,000 sq. ft.)	Double-wall—Minimum combined weight of facings including center liner (pounds per 1,000 sq. ft.)
175	149	75	----------
200	190	84	92
275	237	138	110
350	283	180	126

[1] Mullen or Cady test (minimum).

§ 78.206–4 *Solid fiberboard.* (a) To be 3-ply or more; both outer plies water resistant.

§ 78.206–5 *Corrugated fiberboard.* (a) Both outer facings water resistant; corrugated sheets must be at least 0.009 inch thick and weigh not less than 26 pounds per 1000 square feet; all parts must be securely glued together throughout all contact areas.

§ 78.206–6 *Stitching staples.* (a) Of steel wire at least $\frac{3}{32} \times 0.019$ inch, or equal cross section, formed into staples about $\frac{7}{16}$ inch wide. Staples of metal other than steel are authorized provided their efficiency is equal to that of steel wire staples specified in this section.

§ 78.206–7 *Tape.* (a) Coated with glue at least equal to No. 1¾ Peter Cooper standard. Cloth tape of strength, across woof, at least 70 units, Elmendorf test. Sisal tape of 2 sheets of No. 1 Kraft paper, total weight 80 pounds per ream (500 sheets, 24 × 36 inches); sheets to be combined with asphalt and reinforced by unspun sisal fibers completely embedded in the asphalt and extending across the tape, except as provided in § 78.206–11 (d).

§ 78.206–8 *Test.* (a) Acceptable board must have prescribed strength, Mullen or Cady test, after exposure for at least 3 hours to normal atmospheric conditions (50 to 70 percent relative humidity), under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures, 12 from each side; when all results but 4 show prescribed strength the board is acceptable.

(4) For corrugated fiberboard, double-pop tests may be disregarded.

§ 78.206–9 *Types authorized.* (a) To be of solid or corrugated fiberboard of the following types:

(1) Slotted box; three-piece box without recessed ends; three-piece box of solid fiberboard with recessed ends; double-slide box; triple-slide box; telescope box, with sections of equal depth, or with covers, top or bottom or both, with 3-inch overlap. (See § 78.206–14 (d) for boxes with single-flap closures.)

§ 78.206–10 *Forming.* (a) Parts must be cut true to size and so creased and slotted as to fit closely into position without cracking, surface breaks, separation of parts outside of crease, or undue binding.

§ 78.206–11 *Joints.* (a) For solid and corrugated fiberboard slotted containers: Lapped 1½" except as in § 78.206–12; stitched at 2½" intervals and within 1" of each end of joint; body joint must be double-stitched (2 parallel stitches) at each end of joint over 18" long.

(b) For corrugated fiberboard slotted containers only: One butt joint taped (See § 78.206–7) is authorized; 3 inch tape required for boxes over 30 pounds authorized gross weight and 2 inch tape for others.

(c) For triple and double slide boxes: Joints of all slides must be taped (See § 78.206–7) or stitched.

(d) For corrugated fiberboard only: One butt joint taped inside and outside with strips of one thickness of sulphate paper not less than 2 inches wide extending entire length of joint and firmly glued to box. For boxes not exceeding 65 pounds gross weight, outside strip of sulphate paper to be of basis weight not less than 60 pounds testing not less than 60 pounds and inside strip of sulphate paper to be of basis weight not less than 40 pounds testing not less than 40 pounds. For boxes exceeding 65 pounds gross weight, outside and inside with strips of sulphate paper which must each be of basis weight not less than 90 pounds testing not less than 90 pounds. Basis weight of paper shown is 500 sheets, 24 x 36 inches.

§ 78.206–12 *Flanged heads.* (a) Must have 4 flanges, at least 1" long above fillet, on each head. Recessed flanged heads not authorized for boxes of corrugated fiberboard.

§ 78.206–13 *Seams which are to be stitched.* (a) Overlap, if any, required to be at least 1½" except as in § 78.206–12.

§ 78.206–14 *Flap closures.* (a) Fill-in pieces between inner flaps are required when necessary to prevent an opening in a seam.

(b) If to be closed by adhesive, each inner flap must cover at least ⅓ of face; inner flaps must butt or have full overlap, or fill-in pieces must be used; except that fill-in pieces are not required when outer flaps have full overlap. Outer flaps must butt or have full overlap.

(c) In lieu of fill-in pieces between inner flaps which do not butt, the following is authorized when linings are not prescribed in § 78.206–15:

(1) Top and bottom pads the same dimensions as interior of container of solid or corrugated fiberboard at least 125 pound test (Mullen or Cady).

(2) Minimum combined weight of facings for corrugated fiberboard pads must be at least 52 pounds per thousand square feet.

(3) Minimum combined weight of component plies for solid fiberboard pads must be at least 114 pounds per thousand square feet, exclusive of adhesives.

(d) Single-flap closures are authorized for boxes with one dimension not over 2"; each flap must be scored and form one of the small faces of the box and lap at least 5" on one of the largest faces.

§ 78.206–15 *Linings (when prescribed).* (a) Of 1-piece to extend around 4 faces with joint at center of 1 face and with 4 flanges, at least 1½" long, on each end (corners may be mitered) to bend over the other 2 faces; also 2 pads to cover the other 2 faces. Pads may be omitted if closing flaps afford 3 thicknesses throughout face. For boxes with 1 dimension not over 3", one of the widest flanges may be lengthened to cover entire face and lap 6" on the adjoining face and the other flanges and the pads may then be omitted.

§ 78.206–16 *Authorized gross weight and parts required.* (a) Authorized gross weight (when packed) and parts required as follows:

Authorized gross weight (pounds)	Strength of fiberboard (minimum) Mullen or Cady Test						
	Solid board			Double-faced corrugated		Double-wall corrugated	
	Box	Lining [2]	Heads [1]	Box	Lining [2]	Box	Lining [2]
30	175	------	200	175	------	200	------
40	200	------	275	200	------	200	------
65	275	------	350	{[3] 275 200	------ 175	} 275	------

[1] For recessed heads when used. In other cases same as for box.

[2] As prescribed in § 78.206–15 A complete box is acceptable in place of the lining.

[3] Facings at least 138 pounds per thousand square feet or inner facing at least 42 pounds and outer facing at least 90 pounds per thousand square feet.

(b) Triple slide boxes of double-faced corrugated fiberboard of at least 175-pound test are also authorized for 65 pounds gross weight.

§ 78.206–17 *Closing for shipment.* (a) Slotted container, by coating with adhesive the entire contact surfaces of closing flaps and fill-in pieces. By coating with adhesive the inner slides of triple slide boxes or double slide boxes. For single-flap closures as authorized for boxes with one dimension not over 2 inches, the flaps must be fastened to the body with adhesive.

(b) Or, by stitching at 2½" intervals along all seams (one 5" space allowed when necessary to permit use of stitching device).

(c) Fiberboard boxes with covers extending over sides but not to bottom, covers resting on walls of box, or telescope boxes of equal depth sections, covers extending to bottom, must be secured by one of the following methods:

(1) By not less than three metal straps, one lengthwise and others at right angles thereto.

(2) When cover extends not less than 3 inches over the walls of the box, by coating with adhesive the entire contact area of the cover.

(d) When metal straps are specified, boxes must be strapped with the required number; size at least ⅝ x 0.015".

§ 78.206–18 *Marking.* (a) On each container. Symbol in rectangle as follows:

ICC–12C***

(1) Stars to be replaced by authorized gross weight (for example, ICC–12C65, etc.). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name and address of plant making the container; symbol (letters) authorized if recorded with the Bureau of Explosives. This mark to be located just above or below the mark specified in paragraph (a) of this section.

(3) When metal straps are prescribed, boxes must be marked "_____ (number) METAL STRAPS REQUIRED" just above or below the mark specified in (a) (1) of this section.

(4) Size of markings: At least ½" high.

§ 78.207 *Specification 12D; fiberboard boxes.*

§ 78.207–1 *Compliance.* (a) Required in all details.

§ 78.207–2 *Definitions.* (a) Terms such as "200-pound test" mean minimum strength, Mullen or Cady test.

(b) "Joints" are where edges of parts of box are connected together in setting up the box. Generally done by box maker.

(c) "Seams" are where edges of parts of box are visible, except joints, when box is closed.

§ 78.207–3 *Classification of board.* (a) Fiberboard is hereby classified by strength of completed board as in first column of the following table; weights specified in the table are the minimums authorized.

Classified strength [1] of completed board	Facings for double-wall corrugated fiberboard—Minimum combined weight of facings including center liner (pounds per 1,000 sq. ft.)
275	110
350	126

[1] Mullen or Cady test (minimum).

§ 78.207–4 *Corrugated fiberboard.* (a) Both outer facings water resistant; corrugated sheets at least 0.009" thick and weigh not less than 26 pounds per 1000 square feet; all parts securely glued together throughout all contact areas.

§ 78.207–5 *Stitching staples.* (a) Of steel wire at least 3/32" x 0.019", or equal cross section, formed into staples about 7/16" wide. Staples of metal other than steel are authorized provided their efficiency is equal to that of steel wire staples specified in this section.

§ 78.207–6 *Tape.* (a) Coated with glue at least equal to No. 1¾ Peter Cooper standard. Cloth tape of strength, across the woof, at least 70 units, Elmendorf test. Sisal tape of 2 sheets of No. 1 Kraft paper, total weight 80 pounds per ream (500 sheets, 24" x 36"); sheets to be combined with asphalt and reinforced by unspun sisal fibers completely embedded in the asphalt and extending across the tape, except as provided in § 78.207–10 (d).

§ 78.207–7 *Test.* (a) Acceptable board must have prescribed strength, Mullen or Cady test, after exposure for at least 3 hours to normal atmospheric conditions (50 to 70 percent relative humidity), under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures, 12 from each side, when all results but 4 show prescribed strength the board is acceptable.

(4) Double-pop tests may be disregarded.

§ 78.207–8 *Types authorized.* (a) To be of double-wall corrugated fiberboard of the following types:

(1) Slotted box; three piece box without recessed ends; double-slide box; triple-slide box; telescope box, with sections of equal depth, or with covers, top or bottom or both, with 3 inch overlap.

§ 78.207–9 *Forming.* (a) Parts must be cut true to size and so creased and slotted as to fit closely into position without cracking, surface breaks, separation of parts outside of crease, or undue binding.

§ 78.207–10 *Joints.* (a) For slotted containers: Lapped 1½ inches except as in § 78.207–11; stitched at 2½ inch intervals and within 1 inch of each end of joint; body joint must be double-stitched (2 parallel stitches) at each end of joint over 18 inches long.

(b) For slotted containers only: One butt joint taped (See § 78.207–6) is authorized; 3 inch tape required.

(c) For triple and double slide boxes: Joints of all slides must be taped (See § 78.207–6) or stitched.

(d) One butt joint taped inside and outside with strips of one thickness of sulphate paper not less than 2 inches wide extending entire length of joint and firmly glued to box. For boxes not exceeding 65 pounds gross weight, outside strip of sulphate paper to be of basis weight not less than 60 pounds testing not less than 60 pounds and inside strip of sulphate paper to be of basis weight not less than 40 pounds testing not less than 40 pounds. For boxes exceeding 65 pounds gross weight, outside and inside with strips of sulphate paper which must each be of basis weight not less than 90 pounds testing not less than 90 pounds. Basis weight of paper shown is for 500 sheets, 24 x 36 inches.

§ 78.207–11 *Flanged heads.* (a) Must have 4 flanges, at least 1" long above fillet, on each head. Recessed flanged heads not authorized.

§ 78.207–12 *Seams which are to be stitched.* (a) Overlap, if any, required to be at least 1½" except as in § 78.207–11.

§ 78.207–13 *Flap closures.* (a) Fill-in pieces between inner flaps are required when necessary to prevent an opening in a seam.

(b) If to be closed by adhesive, each inner flap must cover at least ⅓ of face; inner flaps must butt or have full overlap, or fill-in pieces must be used; except that fill-in pieces are not required when outer flaps have full overlap. Outer flaps must butt or have full overlap.

§ 78.207–14 *Linings (when prescribed).* (a) Of 1 piece to extend around 4 faces with joint at center of 1 face and with 4 flanges, at least 1½" long, on each end (corners may be mitered) to bend over the other 2 faces; also 2 pads to cover the other 2 faces. Pads may be omitted if closing flaps afford 3 thicknesses throughout face. For boxes with 1 dimension not over 3", one of the widest flanges may be lengthened to cover entire face and lap 6" on the adjoining face and the other flanges and the pads may then be omitted.

§ 78.207–15 *Authorized gross weight and parts required.* (a) Authorized gross weight (when packed) and parts required as follows:

(1) For authorized gross weight of 25 pounds, box must be constructed of 275-pound test with liners and top and bottom pads of same material;

(2) For authorized gross weight of 75 pounds, inside containers must be packed in boxes of 275-pound test and these packages packed in an outside box of 350-pound test;

§ 78.207–16 *Test for completed package.* (a) The completed packages closed as for shipment must be capable of withstanding a drop of 4 feet to solid concrete without breakage of the inside containers.

§ 78.207–17 *Closing for shipment.* (a) Slotted container, by coating with adhesive the entire contact surfaces of closing flaps and fill-in pieces. By coating with adhesive the inner slides of triple slide boxes or double slide boxes.

(b) Or, by stitching at 2½" intervals along all seams (one 5" space allowed when necessary to permit use of stitching device).

(c) Fiberboard boxes with covers extending over sides but not to bottom, covers resting on walls of box, or telescope boxes of equal depth section, covers extending to bottom, must be secured by one of the following methods:

(1) By not less than three metal straps, one lengthwise and others at right angles thereto.

(2) When cover extends not less than 3 inches over the walls of the box, by coating with adhesive the entire contact area of the cover.

(d) When metal straps are specified, boxes must be strapped with the required number; size at least ⅝" x 0.015".

§ 78.207–18 *Marking.* (a) On each container. Symbol in rectangle as follows:

ICC–12D***

(1) Stars to be replaced by authorized gross weight (for example, ICC–12D65, etc.). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name and address of plant making the container; symbol (letters) authorized if recorded with the Bureau of Explosives. This mark to be located just above or below the mark specified in (a) of this section.

(3) When metal straps are prescribed, boxes must be marked "_____ (number) METAL STRAPS REQUIRED" just above or below the mark specified in paragraph (a) (1) of this section.

(4) Size of markings.—At least ½" high.

§ 78.208 *Specification 12E; fiberboard boxes.*

§ 78.208–1 *Compliance.* (a) Required in all details.

§ 78.208–2 *Definitions.* (a) Terms such as "200-pound test" mean minimum strength, Mullen or Cady test.

(b) "Joints" are where edges of parts of box, except recessed flanged heads, are connected together in setting up the box. Generally done by box maker.

(c) "Seams" are where edges of parts of box are visible, except joints, when box is closed.

§ 78.208–3 *Corrugated fiberboard.* (a) Both outer facings water resistant; corrugated sheets must be at least 0.009 inch thick and weigh not less than 26 pounds per 1000 square feet; all parts must be securely glued together throughout all contact areas.

§ 78.208–4 *Tape.* (a) Coated with glue at least equal to No. 1¾ Peter Cooper standard. Cloth tape of strength, across woof, at least 70 units, Elmendorf test. Sisal tape of 2 sheets of No. 1 Kraft paper, total weight 80 pounds per ream (500 sheets, 24 x 36 inches); sheets to be combined with asphalt and reinforced by unspun sisal fibers completely embedded in the asphalt and extending across the tape.

§ 78.208–5 *Test.* (a) Acceptable board must have prescribed strength, Mullen or Cady test, after exposure for at least 3 hours to normal atmospheric conditions (50 to 70 percent relative humidity), under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures, 12 from each side; when all results but 4 show prescribed strength the board is acceptable.

(4) Double-pop tests may be disregarded.

§ 78.208–6 *Type authorized.* (a) Corrugated fiberboard with one-piece body with separate flanged heads. Box is authorized only for 1 or 2 rectangular metal inside containers of not over 5 gallons capacity each.

§ 78.208–7 *Forming.* (a) Parts must be cut true to size and so creased and slotted as to fit closely into position without cracking, surface breaks, separation of parts outside of crease, or undue binding.

§ 78.208–8 *Joints*—(a) *Body.* Each end of body must have four flanges, creased to bend over outside of body, at least 2½" long beyond crease.

(b) *Butt joint.* One butt joint taped is authorized; 3-inch tape required.

§ 78.208–9 *Flanged heads.* (a) Each head must have four flanges, one on each edge, creased to bend over outside body of the box and then under the body flanges, of length at least 5 inches exclusive of creases.

§ 78.208–10 *Authorized gross weight (when packed) and parts required.* (a) Board for outside container must be corrugated fiberboard at least 400-pound test; minimum combined weight of component plies, exclusive of adhesives, 180 pounds per 1000 square feet; body must be double-wall board; heads may be double-faced board. Authorized gross weight 110 pounds.

§ 78.208–11 *Closing for shipment.* (a) Boxes must be closed by applying heads with head-flanges tucked under body-flanges and then fastening each head in place with a flat steel strap, at least ⅜" x 0.015", extending around the 4 sides of the body and securely sealed.

§ 78.208–12 *Marking.* (a) *On each container.* Symbol in rectangle as follows:

ICC–12E110

(1) This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name and address of plant making the container; symbol (letters) authorized if recorded with the Bureau of Explosives. This mark to be located just above or below the mark specified in paragraph (a) of this section.

(3) When metal straps are prescribed, boxes must be marked "_____(number) METAL STRAPS REQUIRED" just above or below the mark specified in paragraph (a) (1) of this section.

(4) *Size of markings.* At least ½" high.

§ 78.214 *Specification 23F; fiberboard boxes.*

§ 78.214–1 *Compliance.* (a) Required in all details.

§ 78.214–2 *Definitions.* (a) Terms such as "200-pound test" mean minimum strength, Mullen or Cady test.

(b) "Joints" are where edges of parts of box are connected together in setting up the box. Generally done by box maker.

(c) "Seams" are where edges of parts of box are visible, except joints, when box is closed.

§ 78.214–3 *Solid fiberboard.* (a) To be 3-ply or more; both outer plies waterproofed. Each ply at least 0.016".

§ 78.214–4 *Corrugated fiberboard.* (a) Both outer facings water resistant; corrugated sheets at least 0.009" thick, all parts securely glued together throughout all contact areas. Each facing at least 0.016".

§ 78.214–5 *Stitching staples.* (a) Of steel wire, copper-coated or equivalent in nonsparking quality, at least 3/32" x 0.019", or equal cross section, formed into staples about 7/16" wide.

§ 78.214–6 *Tape.* (a) Coated with glue at least equal to No. 1¾ Peter Cooper standard. Cloth tape of strength, across the woof, at least 70 units, Elmendorf test. Sisal tape of 2 sheets of No. 1 Kraft paper, total weight 80 pounds per ream (500 sheets, 24" x 36"); sheets to be combined with asphalt and reinforced by unspun sisal fibers completely embedded in the asphalt and extending across the tape.

§ 78.214–7 *Test.* (a) Acceptable board must have prescribed strength, Mullen or Cady test, under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures, 12 from each side; when all results but 4 show prescribed strength the board is acceptable.

(4) For corrugated fiberboard, double-pop tests may be disregarded.

§ 78.214–8 *Type authorized.* (a) Of solid fiberboard; 1-piece, or 3-piece without recessed heads, fitted with lining tubes except that lining tubes are not required for boxes not exceeding 35 pounds gross weight used for shipment of electric blasting caps packed in accordance with § 73.66 (g) (1). Boxes having handholes are authorized when approved by the Bureau of Explosives.

§ 78.214–9 *Inside packing and size limits.* (a) As prescribed in § 78.214–15.

§ 78.214–10 *Forming.* (a) Parts must be cut true to size and so creased and slotted as to fit closely into position without cracking, surface breaks, separation of parts outside of crease, or undue binding.

§ 78.214–11 *Joints.* (a) Lapped 1½" except as in § 78.214–12; stitched at 2½" intervals and within 1" of each end of joint; double-stitched (2 parallel stitches) at each end of joint over 18" long.

§ 78.214–12 *Flanged heads.* (a) Must have 4 flanges, at least 1" long above fillet, on each head. Recessed flanged heads not authorized.

§ 78.214–13 *Seams which are to be stitched.* (a) Overlap, if any, required to be at least 1½" except as in § 78.214–12.

§ 78.214–14 *Flap closures.* (a) Flaps must butt or have full overlap excepting that inner flaps may overlap ½ inch

when supported across the entire width of the overlap by the lining tubes.

§ 78.214–15 *Authorized gross weight (when packed) and parts required.* (a) Box to be of solid fiberboard, special waterproofed, at least 300-pound test, and weighing at least 250 pounds per thousand square feet. Tubes to be of solid or corrugated fiberboard at least 200-pound test and of 1-piece with adjoining edges stitched or taped.

NOTE 1: Because of the present emergency and until further order of the Commission, the requirements prescribed in § 78.214–15 (a) are modified only to the extent that a board having a minimum thickness of 0.080 inch is not required provided the board weighs at least 283 pounds per thousand square feet.

(b) Authorized gross weight: 65 pounds when two or more lining tubes are used to divide the box into two or more compartments; 65 pounds when one or more lining tubes are used and contents will consist of one cartridge only or of black powder in bags; 35 pounds in all other cases except that boxes having a single solid fiberboard lining tube at least 0.120 inch thick are authorized for 65 pounds gross weight.

§ 78.214–16 *Closing for shipment* (a) By coating with adhesive at least 50 percent of the entire contact surface of the closing flaps.

(b) Or, by stitching at 2½" intervals along all seams (one 5" space allowed when necessary to permit use of stitching device).

§ 78.214–17 *Marking.* (a) On each container. Symbol in rectangle as follows:

ICC–23F***

(1) Stars to be replaced by authorized gross weight (for example, ICC–23F35 or ICC–23F65). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name and address of plant making the container; symbol (letters) authorized if recorded with the Bureau of Explosives. This mark to be located just above or below the mark specified in paragraph (a) of this section.

(3) Size of markings. At least ½" high.

§ 78.214–18 *Special tests*—(a) *By whom and when.* By or for each plant making the boxes; at beginning of manufacture and at 6-month intervals thereafter; on largest size, by weight, above and below 35 pounds gross. Report of results, with all pertinent data, to be maintained on file for 1 year; copy to be filed with Bureau of Explosives.

§ 78.214–19 *Material.* (a) Box material (special waterproofed board) must be 300-pound test board and weigh at least 250 pounds per thousand square feet when commercially dry.

(b) Box material must also have 200-pound test strength and moisture content not over 30 percent as follows:

(1) Immediately after exposure for 3 days to 90 percent humidity at 75° F.

(2) Immediately after it has been in contact with water for 3 hours under 3" head at 75° F.

§ 78.214–20 *Completed containers.* (a) Samples must pass the following immediately after exposure for 2 weeks to 90 percent humidity at 75° F.; loaded containers shall contain dummy contents of shape and weight of the expected contents, and shall be closed in same manner as for shipment:

(1) Three loaded samples to be tested. Each must withstand 200 drops in standard 7-foot revolving test drum with pointed hazard in place, without spilling any contents.

(2) Three loaded samples to be tested. Each must withstand end to end pressure of at least 1,600 pounds without deflection of over 1½".

(3) Three empty samples to be tested. Each must withstand top to bottom pressure of at least 500 pounds without deflection of ½".

§ 78.218 *Specification 23G; special cylindrical fiberboard box for high explosives.*

§ 78.218–1 *Compliance.* (a) Required in all details.

§ 78.218–2 *Definition.* (a) Terms such as "200-pound test" mean minimum strength, Mullen or Cady test.

§ 78.218–3 *Side walls, ends, and interior.* (a) *Side walls.* To be not less than four-ply of continuous fiber sheets convolutely or spirally wound; combined strength to be not less than 300 pounds, dry; combined thickness to be not less than 0.060".

(b) *Ends.* To be of one or more plies of fiberboard sufficiently strong to withstand prescribed tests. Wax or plastic material with fiberboard inserts authorized provided the completed container will withstand the prescribed tests at temperatures from zero to one hundred thirty degrees F.

(c) *Interior* of the container must be lined or so treated as to prevent penetration by the commodity with which the container is filled for shipping.

§ 78.218–4 *Stitching staples.* (a) If used shall be of steel wire, copper-coated or equivalent in non-sparking quality, at least $\frac{3}{32}$" by 0.010" or equivalent cross section, formed into staples approximately $\frac{7}{16}$" wide.

§ 78.218–5 *Tape.* (a) Coated with animal glue at least equal to No. 1¾ Peter Cooper standard or other adhesive equivalent in tensile properties and resistance to deterioration. Cloth tape of strength, across the woof, at least 70 units, Elmendorf test. Sisal tape of 2 sheets of No. 1 Kraft paper, total weight 80 pounds per ream (480 sheets, 24" x 36"); sheets to be combined with asphalt and reinforced by unspun sisal fibers completely embedded in the asphalt and extending across the tape.

§ 78.218–6 *Test of board.* (a) Acceptable board must have prescribed strength, Mullen or Cady test, under test as follows:

(1) Clamp board firmly in machine and turn wheel thereof at constant speed of approximately 2 revolutions per second.

(2) Six punctures required, 3 from each side; all results but one must show prescribed strength.

(3) Board failing may be retested by making 24 punctures, 12 from each side; when all results but 4 show prescribed strength the board is acceptable.

§ 78.218–7 *Type of container authorized.* (a) One cylindrical tube or;

(b) Two cylindrical tubes butted together and taped or glued completely around circumference at joints to make positive closure.

(c) Open ends to be closed in such a manner as to give complete closure which will withstand prescribed tests.

§ 78.218–8 *Approval of specification required.* (a) Specification for each type of container manufactured (under the specification) must be filed with and approved by the Bureau of Explosives. Changes in construction (container and closure) differing from specification thus filed must be approved before authorized for use.

§ 78.218–9 *Authorized size and weight limit.* (a) Maximum authorized outside diameter of container is 12".

(b) Maximum authorized gross weight of container is 65 pounds.

§ 78.218–10 *Marking.* (a) On each container by symbol in rectangle as follows:

ICC–23G***

(1) Stars to be replaced by *authorized gross weight* (for example, ICC–23G40, ICC–23G65, etc.). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in (a) of this section.

(3) Size of markings; at least ½" high.

§ 78.218–11 *Special tests.* (a) *By whom and when.* By or for each plant making the boxes; at beginning of manufacture and at 6-month intervals thereafter; on largest size, by weight, above and below 35 pounds gross. Report of results, with all pertinent data, to be maintained on file for 1 year; copy to be filed with the Bureau of Explosives.

§ 78.218–12 *Material.* (a) Box material must be not less than 300 pound test board when commercially dry.

(b) Box material must also have 200-pound test strength, moisture content not over 30 percent and puncture strength not less than 200 units, as determined by General Electric Puncture Tester using an average obtained from a series of five tests, as follows:

(c) Immediately after exposure for 3 days to 90 percent humidity at 75° F.

§ 78.218–13 *Completed containers.* (a) Samples must pass the following immediately after exposure for 2 weeks to 90 percent humidity at 75° F.; loaded

containers shall contain dummy contents of shape and weight same as expected contents.

(b) Three loaded samples to be tested. Each must withstand end to end pressure of at least 500 pounds without deflection of over 1½"; speed of compression tester to be ½" per minute plus ¼" minus ¼" per minute.

(c) Three loaded samples to be tested. Each must withstand side to side pressure of at least 500 pounds without deflection of over ½ inch; except that for boxes with fluted crimped ends the deflection shall not exceed ¾ inch; speed of compression tested to be ½ inch per minute plus ¼ inch minus ¼ inch per minute.

(d) Three loaded samples to be tested. Each must withstand, without rupture, four 4-foot drops diagonally on the end more likely to cause rupture on impact.

(e) Three loaded samples to be tested. Each must be dropped once, flat on its side, across another similar package lying flat upon the ground with its longitudinal axis at right angles to container dropped. Drops must be made from a height four feet above the topmost point of the container on the ground.

§ 78.222 *Specification 21A; fiber drums.*

§ 78.222–1 *Compliance.* (a) Required in all details.

§ 78.222–2 *Parts and dimensions.* (a) Parts and dimensions (minimum) as follows:

Authorized net weight (pounds)	Side wall, calculated [1] strength [1]	Wooden heads, [2] [3] thickness (inch) [3]	Fiber heads [4] [5]		Maximum gallon capacity	Maximum inside diameter (inches)
			Thickness (inch)	Strength [1]		
56	680	13/16	0.120	590	7½	9
56	680	13/16	.120	650	15	14
56	680	13/16	.170	800	20	18½
115	850	13/16	.170	800	30	18½
115	850	13/16	.220	900	45	23
200	1,100	13/16	.220	900	55	18½
200	1,100	13/16	.260	1,000	55	23

[1] Mullen or Cady test.
[2] Number of laminations times strength of sheet. For walls made with liner, include liner in calculations.
[3] Minimum thickness may be reduced to 25/32" for lumber dressed two sides.
[4] When made of 2 or more discs, the discs must be fastened together with adhesive.
[5] Approved metal heads permitted when authorized (see § 78.222–5).
[6] Joints in head must be Linderman joints, glued.

§ 78.222–3 *Side walls.* (a) To be solid or consist of outer shell with liner; each piece to be made of a continuous fiber sheet, convolutely wound, at least 0.01" thick, the plies being secured together by adhesive.

§ 78.222–4 *Type tests.* (a) Samples taken at random, filled with dry, finely powdered material to authorize net weight, closed as for use, must withstand tests, under supervision of a representative of the Bureau of Explosives, without leakage or serious rupture as follows:

(1) Drum must be able to withstand a drop from height of 4 feet on a solid concrete floor, so as to strike diagonally on its (1) top chime, (2) drum closure, (3) end, or any other weak point. Drums with wood heads to be dropped with grain of wood in cover parallel to concrete surface. No single drum shall be expected to withstand more than one drop.

(2) Compression test by applying weight or pressure not less than 1,000 pounds on the top (cover) of drum.

(3) The tests described above must be made by any company starting production on samples taken at random of each type and size of container and must be repeated every 4 months or less during production; samples last tested must be retained until further tests are made.

§ 78.222–5 *Registration of drum specification.* (a) Specification for each type of drum manufactured (under this specification) shall be filed with the Bureau of Explosives. Changes in construction (drum and closure) differing from specification thus filed must be approved by the Bureau of Explosives before authorized for use.

§ 78.222–6 *Marking.* (a) On each container as follows:

(1) ICC–21A followed by the authorized gross weight (authorized net weight plus approximate tare weight, for example, ICC–21A130). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

§ 78.223 *Specification 21B; fiber drums.*

§ 78.223–1 *Compliance.* (a) Required in all details.

§ 78.223–2 *Sidewalls and ends.* (a) Sidewalls to be convolutely wound of fiber sheets at least 0.01 inch thick, the plies being secured together with adhesive.

(b) Ends to be of two or more discs of fiberboard fastened together with adhesive, or of metal or wood sufficiently strong to withstand prescribed tests.

§ 78.223–3 *Capacity and weight.* (a) Maximum authorized capacity 55 gallons.

(b) Maximum authorized net weight 200 pounds, except as otherwise covered in the regulations.

§ 78.223–4 *Type tests.* (a) Samples taken at random, conditioned at least 24 hours at an approximate temperature of 75° F. and relative humidity of 50 percent, filled with dry, finely powdered material to authorized weight, closed as for use, must withstand the following tests, under supervision of a representative of the Bureau of Explosives, without leakage and without serious rupture. No single drum shall be expected to withstand more than the test prescribed in any one of the following subparagraphs:

(1) *Chime drop.* Drum must be able to withstand two drops from a height of 4 feet on a solid concrete floor, the first drop to be made diagonally on the bottom chime and the second drop diagonally on the top chime. Drums with wood heads to be dropped with grain of wood heads parallel to concrete surface.

(2) *Flat drop.* Drum must be able to withstand two drops from a height of 4 feet onto a 2 inch by 6 inch timber resting on the floor with the 6 inch leg vertical, the drops being made with the drum in a horizontal position at right angles to the timber and so that each drop strikes at a different position near the center of the drum sidewall.

(3) *End compression.* Drum must be able to withstand end to end pressure of 1500 pounds without deflection of over 1½ inches; speed of compression tester to be ½ inch plus or minus ¼ inch per minute.

(b) The tests prescribed above must be made by any company starting production on samples taken at random of each type and diameter of container and must be repeated every 4 months or less during production; samples last tested must be retained until further tests are made.

§ 78.223–5 *Registration of drum specification.* (a) Specification for each type of drum manufactured (under this specification) shall be filed with the Bureau of Explosives. Changes in construction (drum and closure) differing from specifications thus filed must be approved by the Bureau of Explosives before authorized for use.

§ 78.223–6 *Marking.* (a) On each container as follows:

(1) ICC–21B, followed by the authorized gross weight, (authorized net weight, plus approximate tare weight, for example: ICC–21B130). This mark shall be understood to certify that the container complies with all specification requirements.

(2) Name or symbol (letters) of maker; this must be registered with the Bureau of Explosives and located just above, below, or following the mark specified in paragraph (a) (1) of this section.

§ 78.226 *Specification 29; mailing tubes.*

§ 78.226–1 *Compliance.* (a) Required in all details.

§ 78.226–2 *Cushioning.* (a) Inside containers, if any, must fit closely in tube or be properly cushioned.

§ 78.226–3 *Construction.* (a) Of fiber at least ⅛" thick; metal bottom; metal screw-cap top.

§ 78.226–4 *Marking.* (a) On each container by letters and figures as follows: ICC–29; this mark shall be understood to certify that the container complies with all specification requirements.

SUBPART G—SPECIFICATIONS FOR BAGS, CLOTH, BURLAP OR PAPER

§ 78.230 *Specification 36A; lined cloth bags (triplex).*

§ 78.230–1 *Compliance.* (a) Required in all details.

§ 78.230–2 *Capacity.* (a) Not over 100 pounds, net.

§ 78.230–3 *Cloth.* (a) Osnaburg cotton cloth at least 8½ ounces per square yard.

NOTE 1: Because of the present emergency and until further order of the Commission, cloth of 40-inch width, 2.11 yards per pound, may be used, provided creped paper is of two-way stretch construction.

§ 78.230–4 *Paper.* (a) No. 1 Kraft creped. A "ream" as used herein, means 480 sheets 24" x 36" before creping.

NOTE 1: Because of the present emergency and until further order of the Commission, a ream may consist of 500 sheets.

§ 78.230–5 *Assembly.* (a) Either of the following:

(1) *Single bag.* Cloth-lined with 2 sheets of creped paper, each at least 35 pounds per ream, cemented together and to cloth. Combined tensile strength at least 100 pounds, warp and fill.

(2) *Triple bag.* Outer of cloth; intermediate of 2 thicknesses of creped paper, each at least 30 pounds per ream, cemented together with asphalt so as to weigh 90 pounds per ream; inner of creped paper at least 45 pounds per ream.

§ 78.230–6 *Seams.* (a) To be dust-tight.

§ 78.230–7 *Test.* (a) The finished container, filled and closed as for shipment, must be capable of withstanding drop test of 4 feet without sifting.

§ 78.230–8 *Marking.* (a) Marking on each container by marks at least 1" high as follows:

(1) ICC–36A; this mark shall be understood to certify that the container complies with all specification requirements.

(2) Name and address of maker; located above or below the mark specified in (a) (1) of this section; symbol (letters) authorized if registered with the Bureau of Explosives.

§ 78.230–9 *Closing for Shipment.* (a) By double tying with steel wires at least No. 16 Birmingham wire gauge; inner bags, if any, to have edges rolled in before outer bag is tied.

§ 78.233 *Specification 36B; burlap bags, lined.*

§ 78.233–1 *Compliance.* (a) Required in all details.

§ 78.233–2 *Capacity.* (a) Not over 100 pounds, net.

§ 78.233–3 *Burlap.* (a) At least equal in quality and strength to 10-oz., 40" (10/40), Calcutta A and/or B mill grade. Thread count at least 11 per 37/40", porter, and 12 per inch, shot; this to be an average of 6 counts.

§ 78.233–4 *Paper.* (a) No. 1 Kraft, creped; at least 25 pounds per ream (480 sheets, 24" x 36") before creping.

NOTE 1: Because of the present emergency and until further order of the Commission, a ream may consist of 500 sheets.

§ 78.233–5 *Assembly.* (a) Burlap to be lined with 2 sheets of creped paper cemented together and to burlap.

(b) Adhesive between paper sheets to be asphalt, melting point 150° F., at minimum rate of 110 pounds per ream.

(c) Adhesive between paper and burlap to be either:

(1) Curing rubber latex at minimum rate of 40 pounds, dry weight, per ream.

(2) Asphalt, any desirable type, at minimum rate of 110 pounds per ream.

§ 78.233–6 *Stretch of paper lining.* (a) At least equal to that of burlap in direction of warp and fill and equal to 10 percent in diagonal direction.

§ 78.233–7 *Seams.* (a) By cementing or taping to give seam strength at least equal to that of bag material and prevent sifting.

§ 78.233–8 *Test.* (a) The finished container, filled and closed as for shipment, must be capable of withstanding drop test of 4 feet on the butt without sifting or rupture of burlap or liners.

§ 78.233–9 *Marking.* (a) Marking on each container by marks at least 1" high as follows:

(1) ICC–36B; this mark shall be understood to certify that the container complies with all specification requirements.

(2) Name and address of maker; located above or below the mark specified in paragraph (a) (1) of this section; symbol (letters) authorized if registered with the Bureau of Explosives.

§ 78.233–10 *Closing for shipment.* (a) As specified for seams, § 78.233–7; or, by tying with 2 steel wires of at least No. 16 Birmingham wire gauge.

§ 78.236 *Specification 44B; multiwall paper bags.*

§ 78.236–1 *Construction.* (a) Bags must be at least 4 thicknesses of paper; this must be heavy duty shipping sack Kraft paper, or equivalent, with a minimum total basis weight of 200 pounds of paper (500 sheets, 24" x 36"). Outer sheet must be of water-resistant stock and at least 60 pounds basis weight, inner sheets not less than 40 pounds basis weight. Bags to be of "satchel bottom" construction; bottoms to be reinforced with a Kraft paper patch at least 30 pounds basis weight. Other bottoms of equal efficiency are authorized.

(b) Or, bags must be at least 2 thicknesses of paper; this must be heavy duty shipping sack Kraft paper, or equivalent, with a minimum total basis weight of 110 pounds (500 sheets, 24" x 36"), fastened together with waterproof composition reinforced with jute, sisal, cotton, or other yarn or cord imbedded in the composition and criss-crossed at intervals of not over ½", approximately, so as to give approximately the same tensile strength for both width and length. Bags to be of "satchel bottom" construction. Other bottoms of equal efficiency are authorized.

§ 78.236–2 *Mullen or Cady test.* (a) Mullen or Cady test of all Kraft paper used must be not less than 90 percent of basis weight. Laminated sheets of paper are to be considered as one thickness of paper.

§ 78.236–3 *Adhesive.* (a) Moisture resistant adhesive must be used on all seams, joints, and bottom patch, if any.

§ 78.236–4 *Closure.* (a) For 4-ply bags: Inner (fourth) ply to be diamond folded, loose; the third ply to be diamond folded and silicated across all its overlapping folds; the two outer plies to be diamond folded, and cross sealed, front to back and side to side, with gummed tape extending at least 2 inches down sides of bag; sealing tape must be 4" wide, of No. 1 Kraft paper, 90 pounds basis weight (500 sheets, 24" x 36"), or equivalent, and having a strength, Mullen or Cady test, of not less than 90 pounds. Other closures of equal efficiency are authorized.

(b) For all bags: Any closure for the top which is equal in efficiency to that of the bottom, is authorized.

§ 78.236–5 *Tests for shipment.* (a) Bags as prepared for shipment must be able to withstand four 4-foot drops, one on each end and one each on opposite sides, without sifting or rupture.

§ 78.236–6 *Marking.* (a) Marking on each bag with letters and figures at least ½" high in rectangle as follows:

ICC–44B

(1) This mark shall be understood to certify that bag complies with all specification requirements.

(2) Name and address of maker located just above or below the mark specified in paragraph (a) of this section; symbol (letters) authorized if registered with the Bureau of Explosives.

§ 78.237 *Specification 44C; multiwall paper bags.*

§ 78.237–1 *Construction.* (a) Bags must be at least 4 thicknesses of paper; this must be heavy duty shipping sack paper, or equivalent, with a minimum total basis weight of 250 pounds of paper (500 sheets, 24" x 36"). Outer sheet must be of water resistant stock and at least 60 pounds basis weight, inner sheets not less than 40 pounds basis weight. Bags to be of sewn, sift-proof bottom construction. Other bottoms of equal efficiency authorized.

§ 78.237–2 *Mullen or Cady test.* (a) Mullen or Cady test of all Kraft paper used must be not less than 90 percent of basis weight. Laminated sheets of paper are to be considered as one thickness of paper.

§ 78.237–3 *Adhesive.* (a) Moisture resistant adhesive must be used on all seams, joints, and bottom patch, if any.

§ 78.237–4 *Closure.* (a) For all bags: Any closure for the top which is equal in efficiency to that of the bottom, is authorized.

§ 78.237–5 *Tests for shipment.* (a) Bags as prepared for shipment must be able to withstand four 4-foot drops, one on each end and one each on opposite sides, without sifting or rupture.

§ 78.237–6 *Marking.* (a) On each bag with letters and figures at least ½ inch high in rectangle as follows:

ICC–44C

(1) This mark shall be understood to certify that bag complies with all specification requirements.

(2) Name and address of maker located just above or below the mark specified in paragraph (a) of this section; symbol (letters) authorized if registered with the Bureau of Explosives.

§ 78.238 *Specification 44D; multiwall paper bags.*

§ 78.238–1 *Construction.* (a) Bags must be at least 5 thicknesses of paper; this must be heavy duty shipping sack Kraft paper, or equivalent, with a minimum total basis weight of 320 pounds of paper (500 sheets, 24'' x 36''). Outer sheet must be of water resistant stock and at least 70 pounds basis weight, inner sheets not less than 50 pounds basis weight. Bags to be of sewn, sift-proof bottom construction. Other bottoms of equal efficiency authorized.

§ 78.238–2 *Mullen or Cady test.* (a) Mullen or Cady test of all Kraft paper used must be not less than 90 percent of basis weight. Laminated sheets of paper are to be considered as one thickness of paper.

§ 78.238–3 *Adhesive.* (a) Moisture resistant adhesive must be used on all seams, joints, and bottom patch, if any.

§ 78.238–4 *Closure.* (a) For all bags: Any closure for the top which is equal in efficiency to that of the bottom, is authorized.

§ 78.238–5 *Tests for shipment.* (a) Bags as prepared for shipment must be able to withstand four 4-foot drops, one on each end and one each on opposite sides, without sifting or rupture.

§ 78.238–6 *Marking.* (a) On each bag with letters and figures at least ½ inch high in rectangle as follows:

ICC–44D

(1) This mark shall be understood to certify bag complies with all specification requirements.

(2) Name and address of maker located just above or below the mark specified in paragraph (a) of this section; symbol (letters) authorized if registered with the Bureau of Explosives.

§ 78.240 *Specification 45B; bags, cloth and paper, lined.*

§ 78.240–1 *Compliance.* (a) Required in all details.

§ 78.240–2 *Capacity.* (a) Not over 100 pounds net.

§78.240–3 *Assembly.* (a) Bags shall consist of cloth and paper parts all cemented together with curing rubber latex or asphalt, thus making a waterproofed bag as follows:

(1) Inside lining sheet.
(2) Cloth sheet.
(3) Intermediate sheet.
(4) Outside paper sheet.

§ 78.240–4 *Inside lining sheet and intermediate sheet.* (a) Inside lining sheet and intermediate sheet must be regenerated cellulose film at least 0.0012 inch thick or polyvinyl alcohol film at least 0.001 inch thick or other material of equal thickness and equivalent efficiency.

§ 78.240–5 *Cloth sheet.* (a) Cloth sheet must be burlap at least 8-ounce, 40-inch Calcutta A or B mill grade or Osnaburg cotton cloth at least 8½ ounces per square yard.

§ 78.240–6 *Paper.* (a) Paper must be No. 1 Kraft, creped, at least 45 pounds per ream (480 sheets, 24'' by 36'') before creping.

NOTE 1: Because of the present emergency and until further order of the Commission, a ream may consist of 500 sheets.

§ 78.240–7 *Latex and asphalt.* (a) Latex and asphalt must be in sufficient quantity to form a secure bond between the parts of the bags.

§ 78.240–8 *Seams.* (a) Seams must be dust-tight and made by cementing or by sewing and taping with impregnated cloth tape to give seam strength at least equal to that of bag material and prevent sifting.

§ 78.240–9 *Test.* (a) The finished container, filled and closed as for shipment, must be capable of withstanding 2 drop tests of 6 feet on the butt and 2 drop tests of 6 feet on the side without sifting or rupture of burlap or liner.

§ 78.240–10 *Marking.* (a) Marking on each container by marks at least 1 inch high as follows:

(1) ICC–45B; this mark shall be understood to certify that the container complies with all specification requirements.

(2) Name and address of maker; located above or below the mark specified in paragraph (a) (1) of this section; symbol (letters) authorized if registered with the Bureau of Explosives.

§ 78.240–11 *Closing for shipment.* (a) By sewing and taping with impregnated cloth tape to give seam strength at least equal to that of bag material and prevent sifting.

SUBPART H—SPECIFICATIONS FOR PORTABLE TANKS

§ 78.245 *Specification 51; steel portable tanks.*

§ 78.245–1 *Requirements for design and construction.* (a) Tanks shall be of seamless or welded steel construction or combination of both and shall have in excess of 1,000 pounds water capacity. Fusion-welded tanks shall be fully radiographed and stress-relieved. Tanks shall be designed and constructed in accordance with and fulfill the requirements of (1) Par. U-68 or U-200 of Section VIII of the Code for Unfired Pressure Vessels of the American Society of Mechanical Engineers, 1949 Edition; or (2) Section VIII of the Code for Unfired Pressure Vessels of the American Society of Mechanical Engineers, 1950 Edition; or (3) the A. P. I.-A. S. M. E. Code for Unfired Pressure Vessels for Petroleum Liquids and Gases, 1943 Edition (any or all of which hereinafter referred to as "the Code").

(b) Except as noted below, all openings in the tank shall be grouped in one location, either at the top of the tank or at one end of the tank.

Exceptions: (1) The openings for liquid level gauging devices, or for safety devices, may be installed separately at the other location or in the side of the shell; (2) one plugged opening of 2-inch National Pipe Thread or less provided for maintenance purposes may be located elsewhere.

§ 78.245–2 *Material.* (a) All material used for the construction of the tank and appurtenances shall be suitable for use with the commodity to be transported therein.

(b) Material of thickness less than 3/16 inch shall not be used for the shells, heads, and protective housings specified in § 78.245–5.

§ 78.245–3 *Design working pressure.* (a) The design working pressure of a tank authorized under this specification shall be not less than the vapor pressure of the commodity contained therein at 115° F., or as prescribed for a particular commodity by Part 73 of this chapter, except that in no case shall the design working pressure of any container be less than 100 psig nor more than 500 psig. When corrosion factor is prescribed by these regulations, the wall thickness of the tank calculated in accordance with the "Code" (see § 78.245–1 (a)) shall be increased by 20 percent or 0.10 inch, whichever is less.

NOTE 1: The term "design working pressure" as used in this specification is identical to the term "maximum allowable working pressure" as used in the "Code" (see § 78.245–1 (a)).

§ 78.245–4 *Tank mountings.* (a) Tanks shall be designed and fabricated with mountings to provide a secure base in transit. "Skids" or similar devices shall be deemed to comply with this requirement.

(b) All tank mountings such as skids, fastenings, brackets, cradles, lifting lugs, etc., intended to carry loadings shall be permanently secured to tanks in accordance with the requirements under which the tanks are fabricated, and shall be designed with a factor of safety of four, and built to withstand loadings in any direction equal to two times the weight of the tanks and attachments when filled with water.

(c) Lifting lugs or hold-down lugs may be attached to either the tank or tank mountings. If lifting lugs and hold-down lugs are attached directly to the tank, they shall be attached to doubling plates welded to the tank and located at points of support, except that lifting lugs or hold-down lugs with integral bases serving as doubling plates may be welded directly to the tank. Each lifting lug and hold-down lug shall be designed with a factor of safety not less than four to withstand loadings in any direction equal to two times the weight of the tank and attachments when filled with water.

(d) All tank mountings shall be designed so as to prevent the concentration of excessive loads on the tank shell.

§ 78.245–5 *Protection of valves and accessories.* (a) All valves, fittings, accessories, safety devices, gauging devices, and the like shall be adequately protected against mechanical damage by a housing closed with a cover plate.

(b) Protective housing shall comply with the requirements under which the tanks are fabricated with respect to de-

sign and construction, and shall be designed with a minimum factor of safety of four to withstand loadings in any direction equal to two times the weight of the tank and attachments when filled with water.

(c) Requirements concerning types of valves, retesting, and qualification of portable tanks contained in §§ 73.32 and 73.315 of this chapter must be observed

§ 78.245–6 *Name plate.* (a) In addition to the markings required by the "Code" (see § 78.245–1 (a)) under which tanks were constructed, they shall have permanently affixed, on one of the heads of the tank, a metal plate. This plate shall be permanently affixed by means of soldering, brazing, or welding around its complete perimeter. Neither the plate itself nor the means of attachment to the tank shall be subject to destructive attack by the contents of tank. Upon such plate shall be plainly marked by stamping, embossing, or other means of forming letters into or onto the metal of the plate itself the following information in characters at least ⅜ inch high:

Manufacturer's name_____Serial No_____
Owner's serial number_____
I. C. C. specification number_____
Water capacity (pounds)_____
Tare weight (pounds)_____
Design working pressure (psig)_____
Original test date_____
Tank retested at_____(psig) on_____

(b) All tank outlets and inlets, except safety relief valves, shall be marked to designate whether they communicate with vapor or liquid when the tank is filled to the maximum permitted filling density.

§ 78.245–7 *Report.* (a) A copy of the manufacturer's data report required by the "Code" (See § 78.245–1 (a)) under which the tank is fabricated shall be furnished for each new tank to the owner and the Bureau of Explosives. In addition, the manufacturer or owner shall register each tank with the Bureau of Explosives in the following form:

Place _____
Date _____
Portable tank
Manufactured for _____ Company
Location _____
Manufactured by _____ Company
Location _____
Consigned to _____ Company
Location _____
Size _____ feet outside diameter by _____ long.
Marks on tank as prescribed by § 78.245–6 of this specification are as follows:
Manufacturer's name ____ Serial number ___
Owner's serial number _____
I. C. C. Specification _____ Code symbol _____
Date of Manufacture _____
Water capacity (pounds) _____
Tare weight (pounds) _____
Design working pressure (psig) _____
It is hereby certified that this tank is in complete compliance with the requirements of ICC Specification No. 51.
(Signed) _____
Manufacturer or owner

§ 78.255 *Specification 60; steel portable tanks.*

§ 78.255–1 *General requirements.* (a) Tanks shall be constructed in accordance with all requirements of section VIII of the Code for Unfired Pressure Vessels of the American Society of Mechanical Engineers, 1946, Edition, for U-201 fusion-welded unfired pressure vessels.

(b) Tanks shall be of fusion-welded construction, cylindrical in shape, with seamless heads concave to the pressure. Tank shells may be of seamless construction.

(c) Tanks, including all permanent attachments, must be stress relieved as a unit.

(d) Requirements concerning types of valves, retesting, and qualification of portable tanks contained in §§ 73.32 and 73.315 of this chapter must be observed.

§ 78.255–2 *Material.* (a) Material used in the tanks shall be steel of good weldable quality in conformity with requirements of paragraph U–71 of the A. S. M. E. Code, 1946 Edition.

(b) The minimum thickness of metal, exclusive of lining material, for shell and heads of tanks shall be as follows:

Tank capacity:	*Minimum thickness (inch)*
Not more than 1,200 gallons	¼
Over 1,200 to 1,800 gallons	5/16
Over 1,800 gallons	⅜

§ 78.255–3 *Expansion domes.* (a) Expansion domes, if applied, must have a minimum capacity of one percent of the combined capacity of the tank and dome.

§ 78.255–4 *Closures for manholes and domes.* (a) The manhole cover shall be designed to provide a secure closure of the manhole. All covers, not hinged to the tanks, shall be attached to the outside of the dome by at least ⅛ inch chain or its equivalent. Closures shall be made tight against leakage of vapor and liquid by use of gaskets of suitable material.

§ 78.255–5 *Bottom discharge outlets.* (a) Bottom discharge outlets prohibited, except on tanks used for shipments of sludge acid and alkaline corrosive liquids.

(b) If installed, bottom outlets or bottom washout chambers shall be of metal not subject to rapid deterioration by the lading, and each shall be provided with a valve or plug at its upper end and liquid-tight closure at its lower end. Every such valve or plug shall be designed to insure against unseating due to stresses or shocks incident to transportation. Bottom outlets shall be adequately protected against handling damage and outlet equipment must not extend to within less than one inch of the bottom bearing surface of the skids or tank mounting.

§ 78.255–6 *Loading and unloading accessories.* (a) When installed, gauging, loading and air inlet devices, including their valves, shall be provided with adequate means for their secure closure; and means shall also be provided for the closing of pipe connections of valves.

(b) Interior heater coils, if installed, must be of extra heavy pipe and so constructed that breaking off of exterior connections will not cause leakage of tanks.

§ 78.255–7 *Protection of valves and accessories.* (a) All valves, fittings, accessories, safety devices, gauging devices, and the like shall be adequately protected against mechanical damage by a housing closed with a cover plate.

(b) Protective housing shall comply with the requirements under which the tanks are fabricated with respect to design and construction, and shall be designed with a minimum factor of safety of four to withstand loadings in any direction equal to two times the weight of the tank and attachments when filled with water.

§ 78.255–8 *Safety devices.* (a) Safety devices are to be as required, subject to approval of the Bureau of Explosives, by shipping regulations.

§ 78.255–9 *Compartments.* (a) When the interior of the tank is divided into compartments, each compartment shall be designed, constructed and tested as a separate tank. Thickness of shell and compartment heads shall be determined on the basis of total tank capacity.

§ 78.255–10 *Lining.* (a) If a lining is required, the material used for lining the tank shall be homogeneous, nonporous, imperforate when applied, not less elastic than the metal of the tank proper. It shall be of substantially uniform thickness, not less than 1/32 inch thick if metallic, and not less than 1/16 inch thick if nonmetallic, and shall be directly bonded or attached by other equally satisfactory means. Rubber lining shall be not less than 3/16 inch thick. Joints and seams in the lining shall be made by fusing the material together or by other equally satisfactory means. The interior of the tank shall be free from scale, oxidation, moisture and all foreign matter during the lining operation.

§ 78.255–11 *Tank mountings.* (a) Tanks shall be designed and fabricated with mountings to provide a secure base in transit. "Skids" or similar devices shall be deemed to comply with this requirement.

(b) All tank mountings such as skids, fastenings, brackets, cradles, lifting lugs, etc., intended to carry loadings shall be permanently secured to tanks in accordance with the requirements under which the tanks are fabricated, and shall be designed with a factor of safety of four, and built to withstand loadings in any direction equal to two times the weight of the tanks and attachments when filled to the maximum permissible loaded weight.

(c) Lifting lugs or side hold-down lugs shall be provided on the tank mountings in a manner suitable for attaching lifting gear and hold-down devices. Lifting lugs and hold-down lugs welded directly to the tank shall be of the pad-eye type. Doubling plates welded to the tank and located at the points of support shall be deemed to comply with this requirement.

(d) All tank mountings shall be so designed as to prevent the concentration of excessive loads on the tank shell.

§ 78.255–12 *Pressure test.* (a) Each completed portable tank prior to application of lining shall be tested before being put into transportation service by completely filling the tank with water or other liquid having a similar viscosity, the temperature of which shall not exceed 100° F. during the test, and applying a pressure of 60 pounds per square inch gauge. The tank shall be capable of holding the prescribed pressure for at least 10 minutes without leakage, evi-

dence of impending failure, or failure. All closures shall be in place while the test is made and the pressure shall be gauged at the top of the tank. Safety devices and/or vents shall be plugged during this test.

§ 78.255–13 *Repair of tanks.* (a) Tanks failing to meet the test may be repaired and retested, provided that repairs are made in complete compliance with the requirements of this specification.

§ 78.255–14 *Marking.* (a) In addition to marking required by the American Society of Mechanical Engineers Code, every tank shall bear permanent marks at least ⅜ inch high stamped into the metal near the center of one of the tank heads or stamped into a plate permanently attached to the tank by means of brazing or welding or other suitable means as follows:

Manufacturer's name ------ Serial No. ------
ICC specification ----------
Nominal capacity ----------(gallons)
Tare weight ---------- (pounds)
Date of manufacture ----------

§ 78.255–15 *Report.* (a) A copy of the manufacturer's data report required by the *"Code"* (see § 78.255–1 (a)) under which the tank is fabricated shall be furnished for each new tank to the owner and the Bureau of Explosives. In addition, the manufacturer or owner shall register each tank with the Bureau of Explosives in the following form:

Place ----------
Date ----------
Portable tank
Manufactured for ---------- Company
Location ----------
Manufactured by ---------- Company
Location ----------
Consigned to ---------- Company
Location ----------
Size ------ feet outside diameter by ------ long.
Marks on tank as prescribed by § 78.255–14 of this specification are as follows:
Manufacturer's name ----------
Serial number----------
Owner's serial number ----------
ICC specification ----------
ASME Code Symbol (par U–201) ----------
Date of manufacture ----------
Nominal capacity ---------- Gallons
It is hereby certified that this tank is in complete compliance with the requirements of *ICC Specification No. 60.*
(Signed) ----------
Manufacturer or owner

SUBPART I—SPECIFICATIONS FOR TANK CARS

Preface. The following specifications for tanks are minimum requirements. Changes or modifications thereof may be made effective by further orders of the Commission (see § 71.4 of this chapter for General Information of the Commission's regulations). Wherever the word "approved" is used in this subpart, it refers to procedure covered in § 71.5 of this chapter of General Information.

§ 78.257 *General.* (a) All tank cars built on or after the effective date of Parts 71–78 of this chapter must comply with all applicable requirements of the specifications in this subpart.

§ 78.258 A. A. R. *Requirements.* (a) All A. A. R. details, such as underframe, draft gears, brakes, trucks, marking, etc., shall comply with the specifications in this subpart, A. A. R. Standards and A. A. R. "Code of Rules Governing the Condition of and Repairs to Freight and Passenger Cars for the Interchange of Traffic" and I. C. C. requirements as to safety appliances.

(1) All tanks and appurtenances therefor, constructed for use in transporting articles classed as dangerous by regulations of the Interstate Commerce Commission, shall comply with the appropriate Specifications. All car structure details shall comply with A. A. R. Specifications, Standards and Interchange Rules.

(2) Any tank which does not meet the test and retest requirements prescribed therefor shall be prohibited in interchange and must be withdrawn from service.

§ 78.259 *Specification changes.* (a) Specifications previously published are not applicable for cars and tanks mounted thereon built on or after August 1, 1941. Specifications contained in this subpart are for new cars, or tanks therefor, built on or after August 1, 1941.

(b) *Procedure—Applications for approval.* (1) Applications for approval of new or modified designs, specifications or materials for tanks and equipment therefor shall be submitted to the Secretary, Mechanical Division, Association of American Railroads for appropriate committee action.

(2) Applications for approval of designs to be used in constructing cars under the specifications in this subpart, shall be submitted to said Secretary.

(3) Applications will be considered by the Committee on Tank Cars only when made by tank car owners or builders.

(4) All applications, except as noted below, shall be made in 14 sets, including drawings and calculations, folded to approximately 8½ x 11 inches in size for prompt distribution and action.

(5) When cars which are identical in all details are to be built in groups or series, one application shall suffice for such group or series.

(6) Applications shall be made in the form prescribed herein.

(7) When applications are made for approval of designs, etc., where previously approved under appropriate specifications the prescribed form of application shall be used, but drawings, etc., need not be resubmitted. Formerly approved designs may be re-approved by said Secretary for additional cars upon approval of the Committee Chairman, without further committee action.

(8) When applications are made of designs which the Committee desires to have tested, such tests shall be made as directed by the Committee, at applicant's expense. Tests made other than as directed by the Committee will not be accepted.

(9) Applications for approval of designs of multiple unit tank cars shall be submitted to said Secretary, in form prescribed, 14 sets of drawings and calculations of tanks and equipment therefor for the Committee on Tank Cars, and 20 sets of anchorage and car structure parts for the Committee on Car Construction.

(c) In case of alterations of, or additions to, existing tanks and equipment therefor, which change the data on existing Certificate of Construction, Application for Approval shall be submitted and approval received before such cars are placed in service. In case of repairs requiring welding to existing tanks of welded construction, or equipment therefor, application for approval shall be submitted and approval received before such cars are placed in service. Certificate of Construction shall be furnished as prescribed.

(d) *Approvals or rejections.* Approvals or rejections of applications, based on appropriate committee action, shall be issued by said Secretary.

(e) *Certificate of construction.* (1) Before a tank car is placed in service the party assembling the completed car shall furnish to the Bureau of Explosives, to the Secretary, Mechanical Division, Association of American Railroads, and to the car owner, a Certificate of Construction in the form prescribed herein, certifying that the tank, equipment and car complete comply with all the requirements of the specifications therefor.

(2) Where cars which are identical in all details are built in groups or series, one certificate shall suffice for each group or series.

(f) *Application for approval.*

A. A. R. Appl. No. ----------
To Secretary, Mechanical Division, Association of American Railroads. Application is hereby made for approval of designs, materials and ----------[1] of the following:
1. Class per Spec. ------, Number of cars----
2. Initials and numbers----------
3. Commodity for------, Lb. wt. per gal-----
4. Tank, gal. capacity: tank------, dome----
Inside diameter, inches----------
Tank head radii: main-------, knuckle----
Pressure to which to be tested, lb. per sq. in----------
Lagging, kind----------; thermal efficiency, Bureau of Standards----------
Lining, kind----------
5. Safety valves or vents, number----------
To open at pressure per sq. in. of:
Valve No. 1-- Valve No. 2-- Valve No. 3--
6. Car structure----------
Bolster slabbing area, sq. ft----------
Truck capacity---------- lb.
Center of gravity, car complete, loaded (see § 78.263).
Light weight of car complete, lbs----------

Prints from the following drawings are submitted, or have been previously submitted as indicated, applying to these cars:

	Drawing No.	Date of latest revision	Application No. originally approved
7. General arrangement, tank			
8. General arrangement, car body			
9. Reinforced openings			
10. Anchorage, including calculations			
11. Dome or nozzle arrangement			
12. Manhole cover			
13. Protective housing			
14. Venting, loading and discharge valves			
15. Safety valves or vents			
16. Fixtures, heater systems, etc			
17. Gauging devices			
18. Bottom outlet valve			
19. Special commodity stenciling			
20. Dome platform			

21. Applicant ----------
By ----------
Date ----------

[1] Show "construction," "conversion," "alteration," or "welded repairs to tanks of welded construction," whichever applies. If conversion or alteration, show (1) present class, (2) former lading, and (3) date built new on next line.

NOTE 1: This form is composite for all classes of cars. Insert opposite each item the information applying to the class of car or tank applied for. For items 7 to 20, inclusive, insert the word "NONE" opposite items not used on proposed cars or tanks and "NO CHANGE" opposite items not changed on altered or converted cars.

NOTE 2: Applications for approval of new tank car tanks to be mounted on existing car structures, must be accompanied by information to indicate car structure complies with all requirements of current A. A. R. Rules of Interchange and are suitable for continued service.

NOTE 3: For application of approval to make repairs by welding on tank car tanks of welded construction, give data, Items 1 to 6, inclusive, together with application number under which tank car was originally approved. Description of damage to tank, date, place and circumstances of damage together with proposed method of making welded repairs must also be submitted.

(g) *Certificate of construction.*

To Bureau of Explosives; to Car Owners; to Secretary, Mechanical Division, A. A. R.:

It is hereby certified that drawings were submitted for these cars under A. A. R. Application No. _____ and approved by the A. A. R. Committee on Tank Cars under date of _____; that these cars were _____[1] in accordance with specification _____; that materials used conform as to factors of strength, chemical analysis and physical qualities; that workmanship and all car features of construction, equipment, marking, etc., conform to current requirements of I. C. C. Regulations and/or A. A. R. Specifications applying, U. S. Safety Appliances and A. A. R. Standards and Rules of Interchange requirements; and that the data, specifications and drawings are identified as follows:

1. Class per Spec_____, Number of cars___
2. Initials and numbers _____
3. Commodity for _____, Lb. wt. per gal. ____
4. Tank, gals. capacity: tank ___, dome ___
   Inside diameter, inches _____
   Tank head radii: main ____, knuckle ____
   Tested, lbs. per sq. in.: tank _____,
   heater systems _____
   Lagging, kind _____; thermal efficiency, Bureau of Standards _____
   Lining, kind _____
5. Safety valves or vents, number _____
   Opened at pressure per sq. in. of:
   Valve No. 1 _____, Valve No. 2 _____,
   Valve No. 3 _____
6. Car structure.
   Bolster slabbing area, sq. ft. _____
   Truck capacity _____ lb.
   Center of gravity, car complete, loaded (see § 78.263) _____
   Light weight of car complete, lbs. _____

	Drawing No.	Date of Latest Revision
7. General arrangement, tank		
8. General arrangement, car body		
9. Reinforced openings		
10. Anchorage, including calculations		
11. Dome or nozzle arrangement		
12. Manhole cover		
13. Protective housing		
14. Venting, loading and discharge valves		
15. Safety valves or vents		
16. Fixtures, heater systems, etc.		
17. Gauging devices		
18. Bottom outlet valve		
19. Special commodity stenciling		
20. Dome platform		
21. Date cars completed		
22. Builder		
By		
Date		

[1] "Constructed," "converted," "altered," or "welded tanks of these cars were repaired by welding," whichever applies.

NOTE 1: For Certificate of Construction covering repairs by welding on tank car tanks of welded construction, a statement must also be included to the effect that repairs were made in accordance with the method approved under the Application for Approval submitted.

§ 78.260 *Specifications for tank car heater systems*—(a) *Approval of designs.* (1) Application for approval of designs of heater systems for installation in new or existing tanks shall be submitted to said Secretary, and approval by appropriate action obtained before cars with heater systems are placed in service.

(2) For resubmission of designs formerly approved, see § 78.259 (b) (7).

(3) Installations shall be reported on certificates of construction.

§ 78.261 *Interior heater systems*—(a) *Heater pipes and fittings.* (1) When threaded joints are used, pipes shall be not less than two inch "extra strong" lap-welded steel, seamless steel, electric-resistance-welded steel, or wrought iron to current A. A. R. specifications. When the joints are welded, instead of threaded, to give them substantially the same bending strength as the body of the pipes, the thickness of wall may be reduced 20 percent. Joints shall be made by threaded wrought couplings, forged unions, or welding. A minimum number of connections shall be used.

(2) Interior heater systems shall be made of material not affected by the lading. When materials specified in subparagraph (a) (1) of this section are not suitable on account of effect of lading, other approved materials shall be used.

(b) *Return bends.* Cast iron, malleable iron or cast steel return bends shall not be used. Return bends shall be forged or made by bending the pipe. Cast or forged manifolds of approved design are permissible.

(c) *Application to tank.* All piping shall be properly secured to permit necessary expansion and contraction.

(d) *Inlets and outlets.* (1) Inlets and outlets shall be so located in any portion of dome, shell or heads of tanks or steam jacketed outlet as to afford proper self-drainage of the entire system.

(2) Breakage groove required on steam-jacketed outlets.

(3) When ends of steam coils are not attached to manifold or steam jacketed outlet chamber they shall be attached to pads or reinforcements. Pads or reinforcements shall be attached to tank or dome to comply with specifications for type of car involved. Outside pipe connections to steam coils shall not be an integral part of the interior coils and shall be screwed or welded, or both, into outside of pads or reinforcements.

(4) Both inlets and outlets of heater pipes shall be equipped with valve cock, cap or plug. Caps and plugs shall be secured by chain.

(e) *Compartment and multiple-tank cars.* The heater system for each compartment of a compartment tank or each tank of a multiple tank car shall be treated as a separate tank and comply with the requirements contained herein.

(f) *Tests and retests.* (1) When installed, the heater system of each tank shall be tested with hydrostatic pressure and shall be tight at 200 pounds per square inch.

(2) Similar tests shall be made after renewals of any part of heater system.

(3) Each time tanks having heater systems are retested as prescribed in the specifications therefor, the heater system shall also be retested and be tight at a hydrostatic pressure of 200 pounds per square inch.

(g) *Reports.* Reports shall be made on Certificate of Construction when heater systems are installed, including report of initial test. Reports of retests of tanks shall include retests of heater systems.

(h) *Marking.* Tanks having interior heater systems shall be stenciled in accordance with Fig. 1.

§ 78.262 *Exterior heater systems*—(a) *Application to tank.* When exterior heater systems are applied to tanks they shall be secured by bands or other approved method.

(b) *Tests and retests of exterior heater systems.* Not a specification requirement.

§ 78.263 *Car structure.* (a) All car parts must comply with these specifications and A. A. R. Standards as made mandatory by current A. A. R. "Code of Rules Governing the Condition of and Repairs to Freight and Passenger Cars for the Interchange of Traffic" and A. A. R. car design fundamentals.

(b) *Underframe.* (1) Underframe must be of steel which complies with current A. A. R. Specification M-116 for Steel, Structural, Shapes, Plates and Bars.

(2) Rivets must comply with current A. A. R. Specification M-109 for Structural Rivet Steel and Structural Rivets.

(3) Underframe must be equipped with cast steel or forged steel center plates. Malleable iron may be used for other details such as striking plates, draft lugs, side bearings, push-pole pockets, etc. Steel castings must comply with current A. A. R. Specification M-201. Malleable iron castings must comply with current A. A. R. Specification M-402.

(4) Center sills: The center sill construction must meet the following requirements:

Minimum center sill area between points of impact, 30 square inches.

NOTE: A center sill composed of two members, A. A. R. "Z-26" section, total weight 82.4 pounds per foot, having a total area of 24.24 sq. in. is acceptable as an equivalent of the built-up type sill of 30 sq. in. area as specified above.

Ratio of unit stress to end load for center sills, not more than 0.05.

Ratio of unit stress to end load for draft attachments, not more than 0.125.

Length of center or draft sill members between braces must be not more than twenty times the depth of member, measured in the direction in which buckling may take place.

Continuous sills are preferable; sills other than Z-26 to have a cover plate.

Other center sill construction or materials, when approved for tank cars, may be used.

(5) Draft attachments: Per A. A. R. Manual.

(c) *Body bolsters.* Body bolsters must be of steel castings or of the built-up type, thoroughly substantial and sufficient in strength to take at least one-half the total weight of loaded tank car on each side bearing. Provision must be made for jacking under bolsters.

(d) *Draft gear.* A. A. R. certified draft gears.

(e) *Couplers.* A. A. R. Standard.

(f) *Brakes.* A. A. R. Standard, including badge plates.

(g) *Push-pole pockets.* Push-pole pockets optional. If applied, there must be a push-pole pocket at each corner of the car, and where, due to construction of car, push-pole pockets cannot well be placed on corners of underframe, they must be applied to body bolsters.

(h) *Trucks.* A. A. R. Standard.

(i) *Placard holders.* (1) Each tank car must be equipped with four metal placard holders, permanently attached by suitable brackets, located one at each end and each side of car, except cars used exclusively for the transportation of commodities for which the Interstate Commerce Commission Regulations in Parts 71–78 of this chapter do not require placards. Holders must be designed to provide for secure attachment, easy application, removal or reversal of the placards prescribed by the I. C. C. Regulations in Parts 71–78 of this chapter and must be of sufficient size to permit placards to be applied with opposite points of the diamond in vertical or horizontal positions, respectively. Holders applied to sides of cars must be placed as near the middle as possible.

(2) For design of an approved placard holder, see Figure 25. Other approved designs may be used.

(j) *Safety appliances.* Safety appliances shall be in full compliance with United States Safety Appliances, Standard.

(k) *Marking.* See individual specification requirements and Fig. 1.

(l) *Center of gravity.* (1) The center of gravity of the loaded car shall be reported on Certificate of Construction. For determining the center of gravity the weight of lading shall be taken as the difference between the rail load limit and light weight of car.

(2) In computing the center of gravity the following factors shall be used:

Trucks based on an arm of 16.50 inches.
Underframe based on an arm of 33.75 inches.
Tank, including connections, insulation, etc., based on an arm equal to the distance between center of tank and top of rail when loaded (namely, light weight height less ¾ inch).

(m) *Anchorage.* General.

(1) A single-piece anchor is one having two longitudinal members, one half of which is in approximate alignment with each of the two center sills, and secured to the tank bottom as well as to the center sills or to members attached to the center sills.

(2) A multiple-piece anchor is one having more than two longitudinal members, one half of which are in approximate alignment with each of the two center sills, and secured to the tank bottom as well as to the center sills or to members attached to the center sills. When multiple-piece anchorage is used, the minimum requirements prescribed for single-piece anchorage shall be increased by 20 percent.

(3) When the rail load limit of tank car is more than 169,000 pounds but does not exceed 210,000 pounds, all minimum requirements for single-piece anchorage specified herein shall be increased by 25 percent.

(4) When the rail load limit of tank car is over 210,000 pounds all minimum requirements for single-piece anchorage specified herein shall be increased by 50 percent.

(5) For computing rivet areas the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by more than 1/16 inch.

(6) Head block anchorage prohibited.

(n) *Anchors riveted to tank.* The minimum shearing and bearing values of rivets connecting longitudinal anchor plates to tank and underframe shall be as follows:

Where the rail load limit does not exceed 169,000 pounds:
Connection of single piece anchor plates to tank:
Shearing area of rivets, not less than 30 sq. in.
Bearing area of rivets, not less than 24 sq. in.
Connection of single piece anchor plates to underframe:
Shearing area of rivets; not less than 15 sq. in.
Bearing area of rivets, not less than 12 sq. in.

The shearing and bearing areas of rivets securing anchor plates to underframe shall not exceed 70 percent of the shearing and bearing, respectively of those used for connection of anchor plates to tank.

When the anchor riveted to tank is attached to another anchor by means of rivets which in turn is attached to the underframe by means of rivets, both riveted connections must comply with the minimum shearing and bearing requirements, but only one connection (that is, either the connection anchor to anchor or anchor to underframe) need comply with the maximum 70 percent requirement.

(o) *Anchors welded into and forming integral part of bottom sheet.* These anchors must be of "T" shape having top bars of same thickness as bottom sheet and welded into and forming integral parts of bottom sheet of tank. The welds must be of the double-welded butt type.

Where the rail load limit does not exceed 169,000 pounds:
The total minimum longitudinal cross sectional area of both legs of the "T" section anchors through the anchor connection rivet holes must be not less than 30 square inches. The length of anchors welded into and forming part of bottom sheet of tank must not be less than 66 inches.
Connection of single piece anchor plates to underframe:
Shearing area of rivets, not less than 15 square inches.
Bearing area of rivets, not less than 12 square inches.
The shearing area of rivets securing anchor plates to underframe shall not exceed 70 percent of the longitudinal cross sectional area of both legs of the "T" section anchor through the anchor connection rivet holes.
When the anchor welded to tank is attached to another anchor by means of rivets which in turn is attached to the underframe by means of rivets, both riveted connections must comply with the minimum shearing and bearing requirements, but only one connection (that is, either the connection anchor to anchor or anchor to underframe) need comply with the maximum 70 percent requirement.
Tanks equipped with fusion-welded anchors must be stress-relieved as a unit after application of anchor.

(p) Anchors welded to outside of bottom sheet of tank.

Where the rail load limit does not exceed 169,000 pounds.
When longitudinal anchors are welded to outside of bottom sheet of tank by the use of fillet welds with or without plug welds, the following values should be used (see par. A. A. R. 6, of Specification ICC–103W):

Type of joint	*Efficiency (percent)*
Single fillet weld without plug welds	55.0
Single fillet weld with plug welds	65.0

For end welds, the maximum shear stresses shall be 80.0 percent of the tensile strength of the plate used.
For side welds, the maximum shear stresses shall be 60.0 percent of the tensile strength of the plates used.
Plug welds—The maximum load on each plug weld shall be computed for shear by the following formula:

$L = 0.63\ (d - 1/4)^2 \times s$

L = total maximum load in shear on each plug weld in pounds.
d = diameter of the bottom of the hole in which the plug is made in inches.
s = maximum stress in shear in pounds per square inch.
s for shear = 44,000

The total shear value of the attachment of the anchor to the tank must be not less than 1,320,000 pounds.
Connection of single piece anchor plates to underframe:
Shearing area of rivets, not less than 15 square inches.
Bearing area of rivets, not less than 12 square inches.
The shearing values of rivets securing anchor plates to underframe shall not exceed 70 percent of the shearing values of welds used for connection of anchor plates to tank.
When the anchor welded to tank is attached to another anchor by means of rivets which in turn is attached to the underframe by means of rivets, both riveted connections must comply with the minimum shearing and bearing requirements, but only one connection (that is, either the connection anchor to anchor or anchor to underframe) need comply with the maximum 70 percent requirement.
Tanks equipped with fusion-welded anchors must be stress relieved as a unit after application of anchor.

(q) *Tank bands.* (1) Each tank (except multiple unit tanks) shall have at least two bands, one at each bolster or other approved means of equal strength and security. If more than the prescribed two bands are used, their location is optional.

(2) All tank bands shall be in direct contact with outside of main shell.

(3) The sectional area of the tank band shall at no place be less than one square inch. A threaded end 1⅜" or more in diameter, with body consisting of a flat band 2" by ½", or equivalent section, or round iron 1⅛" in diameter, will be accepted as meeting this requirement.

(4) Cars without underframes having tanks securely riveted to body bolsters do not require tank bands.

(r) *Bolster slabbing.* (1) Contact bearing areas shall be as follows:

For cars with 40 ton trucks, not less than 12 sq. ft.

For cars with 50 ton trucks, not less than 15 sq. ft.

For cars with 70 ton trucks, not less than 20 sq. ft.

For cars with 100 ton trucks, not less than 25 sq. ft.

(2) Not less than 50 percent of the above prescribed minimum of number of square feet of bolster slabbing bearing area shall be outside the zone of center sill construction.

§ 78.265 *Specification for tank cars having riveted steel tanks Class ICC–103.* This specification covers Class ICC–103 tank cars having riveted steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)–Procedure.

ICC–1. *Type.* (a) Tanks built under this specification must be cylindrical, with heads dished convex outward, and must have at least one expansion dome with manhole, and such other external projections as are prescribed herein. When the interior of the tank is divided into compartments, each compartment must have two heads dished convex outward, one expansion dome with manhole, and such other external projections as are prescribed herein.

AAR–1. *Lagging.* (a) Not a specification requirement. If applied, the tank shell and dome must be lagged with an approved insulation material of a thickness so that the thermal conductance is not more than 0.225 B. t. u. per square foot, per degree Fahrenheit differential in temperature, per hour.

AAR–1. (b) Before lagging is applied the tank surfaces to be lagged and the inside surface of the metal jacket shall be painted with paint which is not affected by the lading.

AAR–1. (c) The barrel, ends and dome of tank, except seatings of tanks on bolsters and pads of fixtures, shall be lagged with insulating material.

AAR–1. (d) The lagging throughout shall be covered with a metal jacket not less than ⅛ inch in th'ckness.

AAR–1. (e) Openings through lagging shall be flashed around projections to prevent admission of water. Top of dome shall be so constructed that liquids cannot enter between dome wall and outer shell.

ICC–2. *Bursting pressure.* (a) The calculated bursting pressure, based on the lowest tensile strength of the plate and the efficiency of the longitudinal seam, must be at least 300 pounds per square inch.

AAR–2. *Thickness of plates.* (a) The wall thickness in the cylindrical portion of the tank must be calculated by the following formula but in no case shall the wall thickness be less than that specified in par. ICC–4.

$$t = \frac{P \times d}{2S \times E}$$

where

t = thickness in inches of thinnest plate.
P = calculated bursting pressure lb. per sq. in.
d = inside diameter in inches.
S = minimum ultimate tensile strength in lb. per sq. in.
E = efficiency of longitudinal riveted seam. See paragraph ICC–6 (b).

ICC–3. *Material.* (a) All plates for tank and expansion dome must be made of open-hearth boiler plate steel of flange quality. These plates may also be clad with other metals, such as nickel, etc.

ICC–3. (b) All external projections must be made of materials specified hereinafter.

ICC–3. (c) Rivets must be of the same quality as used for steam boilers and other pressure vessels. When clad plates are used, the rivet heads inside the tank must be clad with the same material or rivets may be of the same cladding material, provided rivets have physical properties at least equivalent to rivets prescribed herein.

ICC–3. (d) Tanks made of clad plates must be stenciled "Tank clad with ---------- (naming material)."

AAR–3. (a) All plates used for tank and expansion dome must be of open hearth boiler plate steel of flange quality complying with requirements of current A. A. R. specification M–115, titled Steel, Boiler and Firebox, for Locomotives. These plates may also be clad with other metals, such as nickel, etc.

AAR–3. *Lining.* (b) Not a specification requirement. If applied, must be approved as to material and method of application.

AAR–3. (c) All rivets must be in accordance with current A. A. R. Specification M–110, titled Boiler Rivet Steel and Boiler Rivets. When clad plates are used, the rivet heads inside the tank must be clad with the same material or rivets may be of the same cladding material, provided rivets have physical properties at least equivalent to rivets prescribed herein.

AAR–3. (d) Lined tanks must be stenciled on the tank, or jacket if lagged, in letters at least 2 inches high, immediately above the stenciled mark specified in paragraph ICC–20 (b) "---------- lined tank."
(naming material)

ICC–4. *Thickness and width of plates.* (a) The minimum thickness of plates, including thickness of each plate at rivet seams, must be as follows:

Inside diameter of tanks	Bottom sheets	Shell sheets	Expansion dome sheets	Tank heads	Expansion dome heads [1]	Interior compartment heads
	Inch	*Inch*	*Inch*	*Inch*	*Inch*	*Inch*
60 inches or under	7/16	¾	5/16	½	5/16	3/8
Over 60 to 78 inches	7/16	5/16	5/16	½	5/16	3/8
Over 78 to 96 inches	½	3/8	5/16	½	5/16	3/8
Over 96 to 112 inches	½	7/16	5/16	9/16	5/16	7/16
Over 112 to 122 inches	½	½	5/16	5/8	5/16	½

[1] Expansion dome heads for domes exceeding 70 inches in diameter must have a minimum thickness of 3/8 inch.

ICC–4. (b) The minimum thickness of clad plates, where cladding material has physical properties at least equal to that of the base plate prescribed in paragraph ICC–3 (a), must be as prescribed in the above table. Where the cladding material does not have physical properties at least equal to that of the base plate prescribed in paragraph ICC–3 (a), minimum thickness of base plate must be as prescribed in the above table.

ICC–4. (c) The minimum width of bottom sheet of tank must be 60 inches, measured on the arc, but in all cases the width must be sufficient to bring the entire width of the longitudinal seam, including overlaps, above the cradle.

AAR–4. (a) For extreme diameter, A. A. R. clearance requirements govern.

AAR–4. (b) For tanks built of one piece cylindrical sections, the thickness specified for bottom sheet must apply to the entire cylindrical shell.

AAR–4. (c) For tanks without underframe the minimum thickness of bottom sheet must be not less than ⅝ inch.

AAR–4. (d) When tank is divided into compartments the interior heads must comply with the requirements for interior compartment heads prescribed herein. When capacity of tank is reduced by moving in the exterior head a new exterior head of approved contour not less than ⅜ inch thickness must be applied. When the capacity is reduced by the insertion of a new interior head this head must comply with the requirements for interior compartment heads and the exterior head reapplied. Voids, created by the addition of heads for division into compartments and/or reduction in capacity, must be provided with a tapped drain hole at their lowest point, and a tapped hole at top of tank. The top hole must be closed, and the bottom hole may be closed, with not less than ¾ inch nor more than 1½ inch solid pipe plugs having standard pipe threads.

ICC–5. *Dishing of tank heads.* (a) Tank heads must be of approved contour.

AAR–5. (a) Tank heads must be dished for pressure on concave side and to main inside radius not exceeding 10 feet. The inside knuckle radius must be not less than 3¾ inches except for interior heads of compartment tanks the knuckle radius must be not less than 1½ inches.

ICC–6. *Riveting.* (a) For computing rivet areas the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by more than 1/16 inch. All rivets must be driven hot.

NOTE: ICC–6 (a) *Exception.* Tank heads must meet all applicable requirements of these specifications except that heads may be made of two plates joined by fusion welding.

ICC–6. (b) All seams formed in the manufacture of the tank and expansion dome proper and the attachment of the expansion dome to the tank must be double riveted. Dome head, manhole ring, safety valve flange, and bottom outlet nozzle flange must be single or double riveted. Riveted seams and joints must be made metal to metal without interposition of other material, with the exception that the use of two liners not to exceed 1 inch in width and 1/16 inch in thickness, placed at an angle across the longitudinal seams between two rows of rivets near the internal tank heads on compartment cars to prevent the liquid from passing along the longitudinal seams from one compartment to another while cars are being water tested, will be permissible. The efficiency of double-riveted seams must be at least 70 percent of the strength of the thinnest plate specified in paragraph ICC–4. The efficiency of single-riveted seams must be at least 45 percent of the strength of the thinnest plate specified in paragraph ICC–4. Use of rivets less than ⅝ inch nominal diameter not permissible on any part of tank or attachments.

AAR–6. (a) Fusion-welding for joining plates forming tank heads made of two plates in addition to meeting all applicable requirements of this specification must also comply with all applicable requirements of paragraph AAR–6 of Specification ICC–103–W, except that stress relieving is not required if heads are heated to not less than 1,200° F. for pressing. Tank heads made of two plates joined by fusion-welding must be hot pressed and dished for pressure on concave side to radii specified in paragraph AAR–5. (a). The

fusion-welded joint for tank heads made of two plates must be located horizontally.

ICC-7. *Tank mounting.* (a) The manner in which tank is supported on and securely attached to the car structure must be approved.

AAR-7. *Anchorage.* (a) See § 78.263 of this subpart—Car Structure.

AAR-7. *Tank bands.* (b) See § 78.263 of this subpart—Car Structure.

AAR-7. *Bolster slabbing.* (c) See § 78.263 of this subpart—Car Structure.

ICC-8. *Preparation for calking, and calking.* (a) The edges of plates at all riveted seams must be beveled so that the angle of the calking edges will be between 60 and 70 degrees with the flat surface of the plate. The extreme calking edge distance, measured from center line of rivet hole, must be at least one and one-half times the diameter of the hole and not more than that distance plus ¼ inch.

ICC-8. (b) All seams, including those formed by attachment of expansion dome and other external projections, must be calked both inside and outside, except that inside calking of the seam formed by attachment of expansion dome to tank is not required and outside calking of seams formed by attachment of all external projections, except the expansion dome, is not required. Split calking prohibited.

AAR-8. (a) Electric seal welding of inside calking edges only, in whole or in part, using shielded arc type of electrode, is permitted on new or existing equipment, provided the weld bead has a ⅛ inch minimum to 3/16 inch maximum throat thickness. Qualification of welders must comply with requirements of specification ICC-103-W, paragraphs AAR-6 (k-1) to (k-5), inclusive. Welding clad material to edge of clad plates inside of tank is permitted. Other methods of covering edges of clad plates, if approved, may be used.

ICC-9. *Expansion dome.* (a) The expansion dome must have a capacity, measured from the inside top of shell of tank to the inside top of dome or bottom of any vent pipe projecting inside dome, of at least 2 percent of the total capacity of the tank and dome combined, except that when safety valve or safety vent is applied to side of dome, the effective capacity of dome must be measured from top of safety valve or safety vent opening in the side of dome to inside top of shell of tank.

ICC-9. (b) The opening in manhole ring must be at least 16 inches in diameter. The opening in the tank shell within the dome must be at least 29 inches and not more than 30 inches in diameter.

ICC-9. (c) The dome head must be dished convex outward.

AAR-9. (a) The entire dome must be of pressed, forged, or cast steel; if of forged or cast steel, integral attachments permissible. The dome head if separate, must be of pressed, forged, or cast steel; if of forged or cast steel, integral attachments permissible. Dome head, if of pressed steel, must be dished to a radius of not more than 10 feet.

ICC-10. *Closures for manholes.* (a) The manhole cover must be of approved type, and designed to make it practically impossible to remove the cover while the interior of the tank is subjected to pressure.

ICC-10. (b) Manhole rings and covers must be of cast or pressed steel, malleable iron or other malleable metals.

ICC-10. (c) All covers, not hinged to tank, must be attached to outside of the dome head by at least a ⅜-inch chain or its equivalent.

ICC-10. (d) All joints between manhole covers and their seats must be made tight against leakage of vapor and liquid by use of gaskets of suitable material.

AAR-10. (a) Bolted type, bolted and hinged type, or other approved type manhole cover must be used. See figures 5 and 6.

ICC-11. *Gauging, bottom outlet valve operating, venting, loading and discharging, and air inlet devices extending through domes of tanks.* (a) Not specification requirements. When installed, these devices, including their valves, must be protected from accidental injury by being set into a securely covered recess, or by means of a cast or pressed steel or malleable iron housing with cover securely attached. Openings in wall of housing must be equipped with screw plugs or other closures. Drain holes permitted. Discharging siphon pipes must be securely anchored.

AAR-11. (a) These devices must be of approved design.

ICC-12. *Venting, loading and discharging, and air inlet devices.* (a) These devices, when installed, must be closed by efficient valves made of metal not subject to rapid deterioration by the lading. Provision must be made for closing the pipe connections of the valves.

AAR-12. (a) These devices must be of approved design.

ICC-13. *Bottom discharge outlets.* (a) The bottom discharge outlet, when installed, must be made of metal not subject to rapid deterioration by the lading, be of approved construction, and be provided with a valve at its upper end and a liquid-tight closure at its lower end.

ICC-13. (b) The valve operating mechanism and outlet nozzle construction must be such as to insure against unseating of valve due to stresses or shocks incident to transportation.

ICC-13. (c) Tank used for the transportation of poisonous solids, when designed for bottom unloading, must have the openings securely closed against leakage.

AAR-13. (a) Bottom discharge outlet nozzle may be cast, pressed or forged metal.

AAR-13. (b) To provide for the attachment of unloading connections, the bottom of the main portion of the outlet nozzle or some fixed attachment thereto, must have external U. S. F. threads 4 threads to the inch. The liquid-tight closure must have corresponding female threads machined to give proper clearance.

AAR-13. (c) For outlet nozzles that project 6" or more from shell of tank a "V" groove must be cut (not cast) in the upper part of outlet valve nozzle at a point immediately below lowest part of valve to a depth that will leave thickness of nozzle wall at the root of the "V" not over ⅜". In the case of steam jacketed outlet nozzles this groove must be below the steam chamber but above the bottom of center sill construction. Where outlet nozzle is not a single piece, arrangement must be made to provide the equivalent of the breakage groove.

AAR-13. (d) The flange on the outlet nozzle must be of a thickness which will prevent distortion of the valve seat or valve by any change in contour of the shell resulting from expansion of lading, or other causes, and which will insure that accidental breakage of the outlet nozzle will occur at or below the "V" groove.

AAR-13. (e) The valve must have no wings or stem projecting below the "V" groove in the outlet nozzle, unless they are scored or designed to break or bend without unseating valve. The valve and seat must be readily accessible or removable for repairs, including grinding.

AAR-13. (f) The valve operating mechanism must have means for compensating for variation in the vertical diameter of the tank produced by expansion, weight of the liquid contents, or other causes, and should operate from the interior of the tank, but in the event the rod is carried through the dome, leakage must be prevented by packing in stuffing box and cap nut.

AAR-13. (g) In no case must extreme projection of bottom discharge outlet equipment extend to within 12" above top of rail. All bottom discharge outlet reducers and closures and their attachments must be secured to car by at least ⅜" chain or its equivalent, except that outlet closure plugs may be attached by ¼" chain. When the bottom discharge outlet closure is of the combination cap and valve type, the pipe connection to the valve must be closed by a plug or cap.

ICC-14. *Safety valves.* (a) The tank must be equipped with one or more safety valves mounted on expansion dome. Total valve discharge capacity must be sufficient to prevent building up of pressure in the tank in excess of 45 pounds per square inch.

ICC-14. (b) One safety valve must be provided for each tank, or compartment thereof, of 6,650 gallons capacity or less, and two safety valves for each tank, or compartment thereof, of over 6,650 gallons capacity.

ICC-14. (c) Each safety valve must be set to open at a pressure of 25 pounds per square inch. (For tolerance see paragraph ICC-18.)

ICC-14. (d) Tanks used for the transportation of corrosive liquids, flammable solids, oxidizing materials, or poisonous liquids or solids, Class B, need not be equipped with safety valves, but if not so equipped must have one safety vent at least 2 inches inside diameter closed with a frangible disc of lead or other suitable material, of a thickness that will hold a pressure of 30 pounds per square inch for a period of at least one hour but will rupture within eight hours. Means for holding disc in place must be such as to prevent distortion or damage to disc when applied. Safety vent closure must be chained or otherwise fastened to prevent misplacement. An additional sealed vent of approved design, to prevent use of unloading pressures in excess of 45 pounds per square inch may be applied. All tanks equipped with vents must be stenciled "Not for Flammable Liquids."

AAR-14. (a) Safety valve must be of approved design. See figure 2 and paragraph AAR-18 (a). For safety vent, closure of bolted type preferable, see figure 3-A. For screw type safety vent closure, see figure 3.

ICC-15. *Fixtures, reinforcements, and attachments not otherwise specified.* (a) All attachments to tank and dome must be riveted in place and calked to comply with conditions prescribed in paragraphs ICC-6 and ICC-8, or applied by other approved means of at least equal strength and efficiency. Heater systems, when installed, must be so constructed that the breaking off of their external connections will not cause leakage of contents of tanks.

AAR-15. *Heater systems.* (a) See §§ 78.260 to 78.262, inclusive, of this subpart, Heater Systems.

ICC-16. *Plugs for openings.* (a) All plugs must be solid, of good grade cast iron or equivalent, with standard pipe thread, and when in contact with lading must be of a length which will screw at least six threads inside the face of fitting or tank. Plugs when inserted from the outside of tank heads must have the letter "S" at least ⅜ inch in size stamped with steel stamp or cast on the outside surface to indicate the plug is solid. Plugs when inserted from the inside are identified by appearance of the plug on the outside of the tank as being solid—therefore, no mark required.

ICC-17. *Tests of tanks.* (a) Each tank must be tested, before being put into service, by completely filling tank and dome with water, or other liquid having similar viscosity, of a temperature which must not exceed 100° F. during the test, and applying a pressure of 60 pounds per square inch. Tank must hold the prescribed pressure for at least 10 minutes without leakage or evidence of distress. All rivets and closures, except safety valves or safety vents, must be in place while test is made.

ICC-17. *Test of interior heater systems.* (b) Before interior heater systems are placed in service they must be tested with hydrostatic pressure and must be tight at 200 pounds per square inch.

AAR-17. (a) Tanks if lagged, the test of tank must be made before lagging is applied.

ICC-18. *Tests of safety valves.* (a) Each valve must be tested, before being put into service, by attaching to an air line and applying pressure. The valve must not leak below 20 pounds pressure. (See § 73.31 (l), Note 1, of this chapter.) The valve must open at the pressure prescribed in paragraph ICC-14 (c), with a tolerance of plus or minus 3 pounds.

AAR-18. (a) The above referred to note in § 73.31 (l) of this chapter reads in part as follows: "Safety valves now used on tank cars are reported to permit slow leakage of vapor and it appears that material changes in the design and construction of these valves are necessary to make them tight * * * the necessary changes must be made with the least possible delay."

ICC-19. *Retests of tanks, safety valves, and interior heater systems.* (a) Tanks, safety valves, and interior heater systems must be retested, as prescribed for original tests in paragraphs ICC-17 and ICC-18, at intervals of ten years or less after the original test. Tanks must also be retested before being returned to service after any repairs requiring extensive riveting or calking. Interior heater systems must be retested after repairs. Reports must be rendered as prescribed in paragraph ICC-21.

AAR-19. (a) For lagged tanks, if the jacket and lagging are not removed, the tanks must hold the prescribed pressure for at least 20 minutes. A drop in pressure shall be evidence of leakage, and such portion of the jacket and lagging must be removed as may be necessary to locate the leak and make repairs.

ICC-20. *Marking.* (a) Each tank must be marked, thus certifying that the tank complies with all the requirements of this specification. These marks must be as follows:

ICC-20. (b) ICC-103 in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the tank, or jacket if lagged, in letters and figures at least 2 inches high by the party assembling the completed car.

ICC-20. (c) Initials of tank builder and date of original test of tank in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal immediately below the stamped mark specified in paragraph ICC-20 (b).

ICC-20. (d) Initials of company and date of additional tests performed by the party assembling the completed car, in those cases where the tank builder does not complete the fabrication of tank, such as application of riveted anchors, etc., in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal immediately below the stamped marks specified in paragraph ICC-20 (c) by the party assembling the completed car. These marks must also be stenciled on the tank, or jacket if lagged, in letters and figures at least 2 inches high immediately below the stenciled mark specified in paragraph ICC-20 (b) by the party assembling the completed car.

ICC-20. (e) Date on which the tank was last tested, pressure to which tested, place where test was made, and by whom, stenciled on the tank, or jacket if lagged.

ICC-20. (f) Date on which the safety valves were last tested, pressure to which tested, place where test was made, and by whom, stenciled on the tank, or jacket if lagged.

ICC-20. (g) Date on which interior heater systems were last tested, pressure to which tested, place where test was made, and by whom, stenciled on the tank, or jacket if lagged.

ICC-20. (h) Identification mark, illustrated herein, for approved manhole closure must be stenciled on each side of dome or jacket if lagged in line with the ladders and in a color contrasting to color of dome.

ICC-20. (i) When a tank car and its appurtenances are designed and authorized for the transportation of a particular commodity only, the name of that commodity, followed by the word "only", or such other wording as may be required to indicate the limits of usage of the car, must be stenciled on each side of the tank, or jacket if lagged, in letters at least 2 inches high, immediately above the stenciled mark specified in paragraph ICC-20 (b).

AAR-20. (a) For all other markings, see Figure 1.

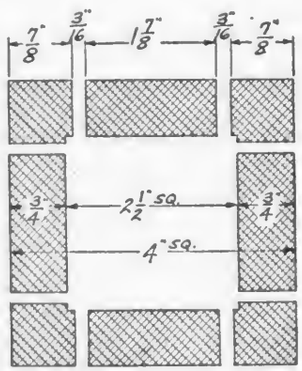
AAR-20. (b) Tanks complying with all requirements of this specification except that heads are made of two plates joined by fusion-welding complying with all requirements of Paragraph AAR-6. (a) are considered as Class ICC-103 and should be so marked.

ICC-21. *Reports.* (a) Before a tank car is placed in service, the party assembling the completed car must furnish to car owner, Bureau of Explosives, and the Secretary, Mechanical Division, Association of American Railroads, a report in approved form certifying that the tank and its equipment comply with all the requirements of this specification. In case of alterations of or additions to tanks or equipment therefor from original design and construction, there must be furnished to the same parties a report in detail of the alterations or additions made to each tank covered by a particular application, showing the initials and number of each tank involved. Reports of retests must be rendered to the Bureau of Explosives and car owner.

AAR-21. *Application for approval.* (a) See § 78.259 (f)—Application for Approval.

AAR-21. *Certificate of construction.* (b) See § 78.259 (g)—Certificate of Construction.

AAR-22. *Car structure.* (a) See § 78.263—Car Structure.



Manhole Closure Identification Mark
(Reduced size)

§ 78.266 *Specification for tank cars having riveted steel tanks, Class ICC-103A.* This specification covers Class ICC-103A tank cars having riveted steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)–Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC-103, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.265 Specification ICC-103):

AAR-4. (c) Car must have underframe.

ICC-6. (b) All seams formed in the manufacture of the tank and expansion dome proper and the attachment of the expansion dome to the tank must be double riveted. Dome head, manhole ring, safety vent flange, and bottom washout nozzle flange must be single or double riveted. Riveted seams and joints must be made metal to metal without interposition of other material with the exception that the use of two liners not to exceed 1 inch in width and 1/16 inch in thickness, placed at an angle across the longitudinal seams between two rows of rivets near the internal tank heads on compartment cars to prevent the liquid from passing along the longitudinal seams from one compartment to another while cars are being water tested, will be permissible. The efficiency of double-riveted seams must be at least 70 percent of the strength of the thinnest plate specified in paragraph ICC-4. The efficiency of single-riveted seams must be at least 45 percent of the strength of the thinnest plate specified in paragraph ICC-4. Use of rivets less than ⅝ inch nominal diameter not permissible on any part of tank or attachments.

ICC-8. (b) All seams, including those formed by attachment of expansion dome and other external projections, must be calked both inside and outside, except that inside calking of the seam formed by attachment of expansion dome to tank, when tank sheet is not cut out to full diameter of dome, is not required and outside calking of seams formed by attachment of all external projections, except the expansion dome, is not required. When the opening in tank shell is cut out to the full diameter of the dome, inside calking of the seam formed by attachment of expansion dome to tank is required. All rivet heads on inside of tank must be calked. Split calking prohibited.

ICC-9. *Expansion dome.* (a) The expansion dome must have a capacity, measured from the inside top of shell of tank to the inside top of dome or bottom of any vent pipe projecting inside dome, of at least 1 percent of the total capacity of the tank and dome combined, except that when safety vent is applied to side of dome, the effective capacity of dome must be measured from top of safety vent opening in the side of dome to inside top of shell of tank.

ICC-9. (b) The opening in manhole ring must be at least 16 inches in diameter. The opening in the tank shell within the dome must be at least 29 inches in diameter, and when the inside diameter of the dome exceeds 29 inches, the opening in the tank shell may be cut out to a diameter sufficiently greater than that of the dome to permit calking of tank shell to the base of the dome. When the inside diameter of the dome exceeds 30 inches and the shell of tank is cut out as provided to permit calking, the tank shell at this point must be adequately reinforced. When the tank shell is not cut out to permit calking and the opening in tank shell does not exceed 30 inches in diameter, no reinforcement is required but the joint between the base of the dome and the tank shell must be sealed on the inside in an approved manner and dome pocket drain holes must be provided with nipples projecting inside the tank at least one inch.

ICC-9. (c) The dome head if of pressed steel must be dished convex outward. The entire dome with attachments, or dome head and manhole ring with attachments, made of cast steel or other malleable metal may be used in place of dished steel plate dome head.

AAR-9. *Tank shell reinforcement at dome opening.* (b) See Figure 23.

ICC-10. *Closures for manholes.* (a) The manhole cover must be of approved type, and designed to provide a secure closure of the manhole.

ICC-10. (c) Requirements of this paragraph optional.

AAR-10. (a) Bolted type, bolted and hinged type, or other approved type manhole cover must be used.

ICC-11. *Gauging, venting, loading and discharging, and air inlet devices extending*

through dome of tanks. (a) These devices when installed must be tightly closed as prescribed in paragraph ICC–12. Protective housings not required, except when the characteristics of the commodity for which the car is authorized are such that these devices must be equipped with valves to provide for the loading and unloading of the contents. Discharging siphon pipes must be securely anchored.

ICC–12. *Gauging, venting, loading and discharging, and air inlet devices.* (a) These devices when installed must be tightly closed with approved caps, plugs, valves, or other fittings. Provision must be made for closing pipe connections of valves. The venting device must be equipped as prescribed in paragraph ICC–14.

ICC–13. *Bottom discharge outlets.* (a) Bottom outlet for discharge of lading prohibited, but tank may be equipped with a bottom washout nozzle of metal not subject to rapid deterioration by the lading, which must be of approved construction complying with the following requirements:

ICC–13. (b) The construction and closure of the bottom washout nozzle must be such that it is liquid tight and should the nozzle be broken, loss of contents will not occur.

ICC–13. (c) The extreme projection of the bottom washout nozzle must be at least 12 inches above the top of rail.

AAR–13. (a) Bottom washout nozzle may be cast, pressed, or forged metal.

AAR–13. (b) The closure of the washout nozzle must be equipped with a ¾ inch solid screw plug. Plug must be secured to car structure or washout chamber by at least a ¼ inch chain.

AAR–13. (c) For bottom washout nozzles that project 6" or more from shell of tank a "V" groove must be cut (not cast) in the upper part of bottom washout nozzle at a point immediately below lowest part of inside closure seat to a depth that will leave thickness of nozzle wall at the root of the "V" not over ⅜". Where bottom washout nozzle is not a single piece, arrangement must be made to provide the equivalent of the breakage groove.

AAR–13. (d) The flange on the bottom washout nozzle must be of a thickness which will prevent distortion of the inside closure seat or closure casting by any change in contour of the shell, resulting from expansion of lading, or other causes, and which will insure that accidental breakage of the washout nozzle will occur at or below the "V" groove.

AAR–13. (e) The closure casting must not project below the "V" groove in the washout nozzle. The closure casting and seat must be readily accessible for repairs, including grinding.

AAR–13. (f) This paragraph does not apply.

AAR–13. (g) This paragraph does not apply.

ICC–14. *Safety vents.* (a) Safety valves prohibited, but a safety vent must be applied. Sulfuric acid, except oleum, mixed acid (nitric and sulfuric acid) (nitrating acid), and other fuming acids, may be transported in Specification ICC–103A tank cars having safety vents equipped with lead discs having ⅛ inch breather holes in the center thereof.

ICC–14. (b) This paragraph does not apply.

ICC–14. (c) This paragraph does not apply.

ICC–14. (d) Each tank or each compartment thereof must be equipped with one safety vent at least 2 inches inside diameter, closed with a frangible disc of lead or other suitable material of a thickness that will hold a pressure of 30 pounds per square inch for a period of at least one hour but will rupture within eight hours. Means for holding disc in place must be such as to prevent distortion or damage to disc when applied. Safety vent closure must be chained or otherwise fastened to prevent misplacement. An additional sealed vent of approved design, to prevent use of unloading pressures in excess of 45 pounds per square inch, may be applied.

AAR–14. (a) Safety vent closure of bolted type preferable, see figure 3–A. For screw type safety vent closure, see Figure 3.

ICC–18. (a) This paragraph does not apply.

AAR–18. (a) This paragraph does not apply.

ICC–19. *Retests of tanks and interior heater systems.* (a) Tanks and interior heater systems must be retested as prescribed for original tests in paragraph ICC–17, except that acid may be used for filling the tank and dome when testing tanks which have not been in service more than 12 years. The first retest of tank and interior heater system must be conducted within four years after the original test, and subsequent retests at four-year intervals up to 12 years or service, thereafter at two-year intervals up to 20 years of service, and annually after 20 years of service. Tanks in service over 12 years must be internally inspected and interior heater systems inspected for defects which would make leakage or failure probable during transit and must be tested with water only. Tanks must also be retested before being returned to service after extensive riveting, caulking, or other repairs. Interior heater systems must be retested after repairs. Reports must be rendered as prescribed in paragraph ICC–21.

ICC–20. (b) ICC–103A in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank. This mark must also be stenciled on the tank, or jacket if lagged, in letters and figures at least 2 inches high.

ICC–20. (f) This paragraph does not apply.

ICC–20. (h) This paragraph does not apply.

AAR–20. (b) Tanks complying with all requirements of this specification except that heads are made of two plates joined by fusion-welding complying with all requirements of paragraph AAR–6 (a) are considered as Class ICC–103A and should be so marked.

§ 78.267 *Specification for tank cars having rubber lined riveted steel tanks Class ICC–103B.* This specification covers Class ICC–103B tank cars having rubber lined riveted steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)–Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC–103, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.265 Specification ICC–103):

ICC–3. *Material.* (a) All plates for tank and expansion dome must be made of open-hearth boiler plate steel of flange quality. All external projections must be made of materials specified hereinafter. Rivets must be of the same quality as used for steam boilers and other pressure vessels.

ICC–3. (b) Each tank, or each compartment thereof, must be lined with acid-resisting rubber, vulcanized or bonded directly or otherwise attached to the metal tank, to provide a nonporous laminated lining. No rubber shall be under tension when applied except that due to conformation over rivet heads. Interior of tank must be free from scale, oxidation, moisture, and all foreign matter during the lining operation.

AAR–3. *Lining.* (b) See paragraphs ICC–3 (b) and ICC–4 (b).

AAR–3. (d) Rubber-lined tanks must be stenciled as prescribed in paragraph ICC–20 (e).

ICC–4. (b) Tank must be lined with rubber at least 5/32 inch thick, except that over all rivets and tank seams the lining must be double thickness. The lining must overlap at least 1½ inches at all edges, which must be straight and be beveled to an angle of approximately 45 degrees. Directly under the dome, vulcanized to the lining on bottom of tank, must be applied a rubber reinforcement pad at least 4½ feet square and at least ½ inch thick, with edges of pad beveled to an angle of approximately 45 degrees. An opening in this pad for sump is permitted.

AAR–4. (c) Car must have underframe.

ICC–6. (b) All seams formed in the manufacture of the tank and expansion dome proper and the attachment of the expansion dome to the tank must be double riveted. Dome head, manhole ring, safety vent flange, and sump flange must be single or double riveted. Riveted seams and joints must be made metal to metal without interposition of other material with the exception that the use of two liners not to exceed 1 inch in width and 1/16 inch in thickness, placed at an angle across the longitudinal seams between two rows of rivets near the internal tank heads on compartment cars to prevent the liquid from passing along the longitudinal seams from one compartment to another while cars are being water tested, will be permissible. The efficiency of double-riveted seams must be at least 70 percent of the strength of the thinnest plate specified in paragraph ICC–4. The efficiency of single-riveted seams must be at least 45 percent of the strength of the thinnest plate specified in paragraph ICC–4. Use of rivets less than ⅝ inch nominal diameter not permissible on any part of tank or attachments. All rivet heads on inside of tank must be of uniform size, button head or similar shape, and the under surface of heads must be driven tight against shell.

ICC–8. (b) All seams, including those formed by attachment of expansion dome and other external projections, must be calked both inside and outside, except that inside calking of the seam formed by attachment of expansion dome to tank, when tank sheet is not cut out to full diameter of dome, is not required and outside calking of seams formed by attachment of all external projections, except the expansion dome, is not required. When the opening in tank shell is cut out to full diameter of dome, inside calking of seam formed by attachment of expansion dome to tank is required. All plates and castings on inside of tank must be calked. All projecting edges of plates, castings, and rivet heads on inside of tank must be rounded and free from fins and other irregular projections. Castings must be free from porosity. Split calking prohibited.

AAR–8. (a) Calk welding not permitted with the exception that applying clad material to edge of clad plates inside of tank is permitted. Other methods of covering edges of clad plates, if approved, may be used.

ICC–9. *Expansion dome.* (a) The expansion dome must have a capacity, measured from the inside top of shell of tank to the inside top of dome or bottom of any vent pipe projecting inside dome, of at least 1 percent of the total capacity of the tank and dome combined, except that when safety vent is applied to side of dome, the effective capacity of dome must be measured from top of safety vent opening in the side of dome to inside top of shell of tank.

ICC–9. (b) The opening in manhole ring, before lining, must be at least 18 inches in diameter. The opening in the tank shell within the dome must be at least 29 inches in diameter, and when the inside diameter of the dome exceeds 29 inches, the opening in the tank shell may be cut out to a diameter sufficiently greater than that of the dome

to permit calking of tank shell to the base of the dome. When the inside diameter of the dome exceeds 30 inches and the shell of tank is cut out as provided to permit calking, the tank shell at this point must be adequately reinforced. When the tank shell is not cut out to permit calking and the opening in tank shell does not exceed 30 inches in diameter, no reinforcement is required. Dome pocket drain holes must be provided with nipples projecting inside the tank at least one inch.

ICC–9. (c) The dome head if of pressed steel must be dished convex outward. The entire dome with attachments, or dome head and manhole ring with attachments, made of cast steel or other malleable metal may be used in place of dished steel plate dome head.

AAR–9. *Tank shell reinforcement at dome opening.* (b) See figure 23.

ICC–10. *Closures for manholes.* (a) The manhole cover must be of approved type, and designed to provide a secure closure of the manhole.

ICC–10. (b) Manhole cover may be made of any suitable metal. The top, bottom, and edge of manhole cover must be covered with rubber as prescribed in paragraph ICC–3 and ICC–4. Through bolt holes may be lined with rubber at least $\frac{1}{8}$ inch in thickness. Cover made of metal not affected by lading need not be rubber covered. All rubber surfaces on outside of tank or fittings must be painted with an age-resisting paint to protect the rubber from light rays.

ICC–10. (c) Requirements of this paragraph optional.

AAR–10. (a) Bolted type, bolted and hinged type, or other approved type manhole cover must be used.

ICC–11. *Gauging, venting, loading and discharging, and air inlet devices extending through dome of tanks.* (a) These devices when installed must be tightly closed in an approved manner. Protective housing not required, except when the characteristics of the commodity for which the car is authorized are such that these devices must be equipped with valves to provide for the loading and unloading of the contents. Discharging siphon pipes must be securely anchored.

ICC–12. *Gauging, venting, loading and discharging, and air inlet devices.* (a) When installed, these devices and their closures must be of metal and have all surfaces covered with rubber as prescribed in paragraphs ICC–3 and ICC–4. These devices when made of metal not affected by the lading need not be rubber covered. Interior pipes of these devices must be supported at their lower end.

ICC–13. *Bottom discharge outlets.* (a) Bottom discharge outlet prohibited, but tank may be equipped with a sump.

ICC–13. (b) This paragraph does not apply.

ICC–13. (c) This paragraph does not apply.

AAR–13. (a) This paragraph does not apply.

AAR–13. (b) This paragraph does not apply.

AAR–13. (c) This paragraph does not apply.

AAR–13. (d) This paragraph does not apply.

AAR–13. (e) This paragraph does not apply.

AAR–13. (f) This paragraph does not apply.

AAR–13. (g) This paragraph does not apply.

ICC–14. *Safety vents.* (a) Safety valves prohibited, but a safety vent must be applied. Except for hydrochloric (muriatic) acid of 22° Baumé strength, and other fuming acids, safety vent of approved design equipped with frangible discs having $\frac{1}{8}$ inch breather hole in the center thereof, or a safety vent of approved design equipped with carbon discs permitting continuous venting, may be used.

ICC–14. (b) This paragraph does not apply.

ICC–14. (c) This paragraph does not apply.

ICC–14. (d) Each tank, or each compartment thereof, must be equipped with one safety vent, lined with rubber of at least $\frac{1}{8}$ inch thickness, having an inside diameter of at least $1\frac{3}{4}$ inches after lining, closed with a frangible disc of lead or other suitable material of a thickness that will hold a pressure of 30 pounds per square inch for a period of at least one hour but will rupture within 8 hours. Means for holding disc in place must be such as to prevent distortion or damage to disc when applied. Safety vent closure must be chained or otherwise fastened to prevent misplacement. An additional sealed vent of approved design, to prevent use of unloading pressures in excess of 45 pounds per square inch, may be applied.

AAR–14. (a) Safety vent closure of bolted type preferable—see figure 3A. For screw type safety vent closure see figure 3.

ICC–15. *Fixtures, reinforcements, and attachments not otherwise specified.* (a) All attachments to tank and dome must be riveted in place and calked to comply with conditions prescribed in paragraphs ICC–6 and ICC–8, or applied by other approved means of at least equal strength and efficiency. Interior heater systems, when installed, must be so constructed that the breaking off of their external connections will not cause leakage of contents of tanks. All surfaces of attachments exposed to the lading must be covered with rubber as prescribed in paragraphs ICC–3 and ICC–4. Attachments made of metal not affected by the lading need not be rubber-covered. Interior heater systems when applied must be made of metal not affected by the lading.

ICC–16. *Plugs for openings.* (a) All plugs must be solid, of good grade cast iron or equivalent, with standard pipe thread, and when in contact with lading must be of a length which will screw at least six threads inside the face of fitting or tank. Plugs must have all surfaces exposed to the lading covered with rubber or be made of metal not affected by lading.

ICC–17. *Tests of tanks.* (a) Each tank must be tested, before rubber lining is applied, by completely filling tank and dome with water, or other liquid having similar viscosity, of a temperature which must not exceed 100° F. during the test, and applying a pressure of 60 pounds per square inch. Tank must hold the prescribed pressure for at least 10 minutes without leakage or evidence of distress. All rivets and closures, except safety vents, must be in place while test is made. After tank is rubber-lined, no further tests are required.

ICC–18. (a) This paragraph does not apply.

AAR–18. (a) This paragraph does not apply.

ICC–19. *Retests of tanks and interior heater systems.* (a) Periodic retests of tanks are not required. Tanks must be retested before rubber lining is renewed. The first retest of interior heater systems must be conducted within four years after the original test, and subsequent retests at four-year intervals up to 12 years of service, thereafter at two-year intervals up to 20 years of service, and annually after 20 years of service. Interior heater systems in service over 12 years must be inspected for defects which would make leakage or failure probable during transit and must be tested with water only. Tanks must also be retested before being returned to service after any repairs requiring riveting or calking of rivets. Interior heater systems must be retested after repairs. Reports must be rendered as prescribed in paragraph ICC–21.

ICC–20. (b) ICC–103B in letters and figures at least $\frac{3}{8}$ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank. This mark must also be stenciled on the tank, or jacket if lagged, in letters and figures at least 2 inches high.

ICC–20. (e) "Rubber-lined tank—pressure test not required," stenciled on tank, or jacket if lagged, instead of record of test of tank.

ICC–20. (f) This paragraph does not apply.

ICC–20. (h) This paragraph does not apply.

AAR–20. (b) Tanks complying with all requirements of this specification except that heads are made of two plates joined by fusion-welding complying with all requirements of paragraph AAR–6 (a) are considered as Class ICC–103B and should be so marked.

ICC–21. *Reports.* (a) Before a tank car is placed in service, the party assembling the completed car must furnish to car owner, Bureau of Explosives, and the Secretary, Mechanical Division, Association of American Railroads, a report in approved form certifying that the tank and its equipment comply with all the requirements of this specification. In case of alterations of or additions to tanks and equipment therefor from original design and construction, a similar report must be rendered to the same parties. Reports of retests must be rendered to the Bureau of Explosives and to car owner.

ICC–21. (b) Before a tank car tank not originally built under this specification is lined with rubber, a report certifying that the tank and its equipment have been brought into compliance with the tank requirements of specification ICC–103B must be furnished by car owner to the party who is to apply the rubber lining. A copy of this report, together with report in approved form certifying that tank has been lined in compliance with all requirements of this specification, must be furnished by party lining the tank to car owner, Bureau of Explosives, and the Secretary, Mechanical Division, Association of American Railroads.

§ 78.268 *Specification for tank cars having riveted alloy steel tanks Class ICC–103C.* This specification covers Class ICC–103C tank cars having riveted alloy steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC–103, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.265 Specification ICC–103):

ICC–3. *Material.* (a) All plates and rivets, and all projections and their closures, must be made of a metal capable of resisting the action of nitric acid as follows:

The maximum corrosion rate in inches penetration per month in the standard boiling 65 percent nitric acid test shall be 0.006 for the straight chromium-bearing stainless steels containing 15 to 18 percent chromium and 0.0015 for any of the chromium nickel alloys of the 18 percent chromium 8 percent nickel type and modified chromium nickel type, this figure to be an average of five 48-hour periods.

ICC–3. (b) This paragraph does not apply.

ICC–3. (c) This paragraph does not apply.

ICC–3. (d) This paragraph does not apply.

AAR–3. (a) All plates, forgings, tubes, valve castings and rivets must be in accordance with AAR Specifications for materials meeting requirements of paragraph ICC–3 (a).

AAR–3. (c) This paragraph does not apply.

ICC–4. (b) This paragraph does not apply.

AAR–4. (c) Car must have underframe.

ICC–6. *Riveting.* (a) For computing rivet areas the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by more than 1/16 inch. All rivets must be driven hot.

ICC–6. (b) All seams formed in the manufacture of the tank and expansion dome proper and the attachment of the expansion dome to the tank must be double riveted. Dome head, manhole ring, safety valve flange, and sump flange must be single or double riveted. Riveted seams and joints must be made metal to metal without interposition of other material with the exception that the use of two liners not to exceed 1 inch in width and 1/16 inch in thickness, placed at an angle across the longitudinal seams between two rows of rivets near the internal tank heads on compartment cars to prevent the liquid from passing along the longitudinal seams from one compartment to another while cars are being water tested, will be permissible. The efficiency of double-riveted seams must be at least 70 percent of the strength of the thinnest plate specified in paragraph ICC–4. The efficiency of single-riveted seams must be at least 45 percent of the strength of the thinnest plate specified in paragraph ICC–4. Use of rivets less than 5/8 inch nominal diameter not permissible on any part of tank or attachments.

AAR–6. (a) This paragraph does not apply.

ICC–8. (b) All seams, including those formed by attachment of expansion dome and other external projections, must be calked both inside and outside. All rivet heads on inside of tank must be calked. Split calking prohibited.

AAR–8. (a) Calk welding not permitted.

ICC–9. *Expansion dome.* (a) The expansion dome must have a capacity, measured from the inside top of shell of tank to the inside top of dome or bottom of any vent pipe projecting inside dome, of at least 1 percent of the total capacity of the tank and dome combined.

ICC–9. (b) The opening in manhole ring must be at least 18 inches in diameter. The opening in the tank shell within the dome must be at least 29 inches in diameter, and when the inside diameter of the dome exceeds 29 inches, the opening in the tank shell may be cut out to a diameter sufficiently greater than that of the dome to permit calking of tank shell to the base of the dome. When the inside diameter of the dome exceeds 30 inches and the shell of tank is cut out as provided to permit calking, the tank shell at this point must be adequately reinforced. When the tank shell is not cut out to permit calking and the opening in tank shell does not exceed 30 inches in diameter, no reinforcement is required but the joint between the base of the dome and the tank shell must be sealed on the inside in an approved manner and dome pocket drain holes must be provided with nipples projecting inside the tank at least one inch.

ICC–9. (c) A dome head and manhole ring in one piece may be used instead of a dished plate dome head.

AAR–9. (a) The entire dome must be of pressed, forged or cast material complying with requirements of paragraph ICC–3 (a). The dome head if separate, must be pressed, forged or cast; if forged or cast, integral attachments permissible. Dome head, if pressed, must be dished to a radius of not more than 10 feet.

AAR–9. *Tank shell reinforcement at dome opening.* (b) See Figure 23.

AAR–9. (c) Design of dome head must be approved.

ICC–10. *Closures for manholes.* (a) The manhole cover must be of approved type, and designed to provide a secure closure of the manhole.

ICC–10. (b) Manhole rings and covers must be made of the metal prescribed in paragraph ICC–3.

ICC–10. (c) Requirements of this paragraph optional.

AAR–10. (a) Bolted type, bolted and hinged type, or other approved type manhole cover must be used.

ICC–11. *Gauging, venting, loading and discharging, and air inlet devices extending through dome of tanks.* (a) These devices when installed must be tightly closed as prescribed in paragraph ICC–12 and be of approved design. Protective housing of approved design covering all these devices must be installed. Discharging siphon pipes must be securely anchored.

ICC–12. *Gauging, venting, loading and discharging, and air inlet devices.* (a) These devices when installed must be tightly closed with approved caps, plugs, valves, or other suitable fittings. Provision must be made for closing pipe connections of valves.

ICC–13. *Bottom discharge outlets.* (a) Bottom discharge outlet prohibited but tank may be equipped with a sump.

ICC–13. (b) This paragraph does not apply.

ICC–13. (c) This paragraph does not apply.

AAR–13. (a) This paragraph does not apply.

AAR–13. (b) This paragraph does not apply.

AAR–13. (c) This paragraph does not apply.

AAR–13. (d) This paragraph does not apply.

AAR–13. (e) This paragraph does not apply.

AAR–13. (f) This paragraph does not apply.

AAR–13. (g) This paragraph does not apply.

ICC–14. *Safety valves.* (a) The tank must be equipped with a safety valve at least 2 inches inside diameter mounted on top of expansion dome.

ICC–14. (b) One safety valve must be provided for each tank.

ICC–14. (c) The safety valve must be set to open at a pressure of 45 pounds per square inch. (For tolerance see paragraph ICC–18.)

ICC–14. (d) This paragraph does not apply.

AAR–14. (a) Safety valves must be of approved design.

ICC–15. *Fixtures, reinforcements, and attachments not otherwise specified.* (a) All attachments to tank and dome must be riveted in place and calked to comply with conditions prescribed in paragraphs ICC–6 and ICC–8.

AAR–15. (a) This paragraph does not apply.

ICC–16. *Plugs for openings.* (a) All plugs must be solid, made of materials prescribed in paragraph ICC–3, with standard pipe thread, and when in contact with lading must be of a length which will screw at least six threads inside the face of fitting or tank. Plugs when inserted from the outside of tank heads must have the letter "S" at least 3/8 inch in size stamped with steel stamp or cast on the outside surface to indicate the plug is solid. Plugs when inserted from the inside are identified by appearance of the plug on the outside of the tank as being solid—therefore, no mark required.

ICC–17. (b) This paragraph does not apply.

ICC–18. *Tests of safety valves.* (a) Valve must be tested before being put into service, by attaching to an air line and applying pressure. The valve must open at the pressure prescribed in paragraph ICC–14 (c), with a tolerance of minus 3 pounds.

AAR–18. (a) This paragraph does not apply.

ICC–19. *Retests of tanks and safety valves.* (a) Tanks and safety valves must be retested as prescribed for original tests in paragraphs ICC–17 and ICC–18, except that acid may be used for filling tank and dome when testing tanks which have not been in service more than 12 years. The first retest must be conducted within four years after the original test, and subsequent retests at four-year intervals up to 12 years of service, thereafter at two-year intervals up to 20 years of service, and annually after 20 years of service. Tanks in service over 12 years must be internally inspected for defects which would make leakage or failure probable during transit and must be tested with water only. Tanks must also be retested before being returned to service after extensive riveting, calking, or other repairs. Reports must be rendered as prescribed in paragraph ICC–21.

ICC–20. (b) ICC–103C in letters and figures at least 3/8 inch high, stamped plainly and permanently into the metal near the center of both outside heads of the tank. This mark must also be stenciled on the tank, or jacket if lagged, in letters and figures at least 2 inches high.

ICC–20. (g) This paragraph does not apply.

ICC–20. (h) This paragraph does not apply.

AAR–20. (b) This paragraph does not apply.

§ 78.269 *Specification for tank cars having lagged riveted steel tanks Class ICC–104.* This specification covers Class ICC–104 tank cars having lagged riveted steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approved by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC–103, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.265 Specification ICC–103):

ICC–1. (b) The tank shell and dome must be lagged with an approved insulation material of a thickness so that the thermal conductance is not more than 0.225 B. t. u. per square foot, per degree Fahrenheit differential in temperature, per hour. The entire insulation must be covered with a metal jacket, efficiently flashed around all openings so as to be weathertight.

AAR–1. (a) See paragraph ICC–1 (b).

ICC–11. *Gauging, bottom outlet valve operating, venting, loading and discharging, and air inlet devices extending through dome of tanks.* (a) Venting and loading and discharging devices of approved design must be installed. Gauging, bottom outlet valve operating and air inlet devices are not specification requirements. These devices when installed, including their valves, must be protected from accidental injury by being set into a securely covered recess, or by means of a cast or pressed steel or malleable iron housing with cover securely attached. Openings in wall of housing must be equipped with screw plugs or other closures. Drain holes permitted. Discharging siphon pipes must be securely anchored.

ICC–14. (e) Tanks used for the transportation of flammable liquids or other commodities having vapor pressures exceeding 27 pounds per square inch, absolute, at 100° F., and not exceeding 40 pounds per square inch, absolute, at 100° F., must have the safety valves set to open at a pressure of 35 pounds per square inch. (For tolerance see par. ICC–18.)

ICC–17. *Tests of tanks.*—(a) Each tank must be tested, before being put into service and before lagging is applied, by completely filling tank and dome with water, or other liquid having similar viscosity, of a tempera-

ture which must not exceed 100° F. during the test, and applying a pressure of 60 pounds per square inch. Tank must hold the prescribed pressure for at least 10 minutes without leakage or evidence of distress. All rivets and closures, except safety valves or safety vents, must be in place while test is made.

AAR–17. (a) See paragraph ICC–17 (a).

ICC–18. (b) Each valve on tank car used for the transportation of flammable liquids or other commodities having vapor pressures exceeding 27 pounds per square inch, absolute, at 100° F., and not exceeding 40 pounds per square inch, absolute, at 100° F., must be tested, before being put into service, by attaching to an air line and applying pressure. The valve must not leak below 28 pounds per square inch, gauge pressure. The valve must open at the pressure prescribed in paragraph ICC–14 (e), with a tolerance of plus or minus 3 pounds.

ICC–19. *Retests of tanks, safety valves, and interior heater systems.* (a) Tanks, safety valves, and interior heater systems must be retested, as prescribed for original tests in paragraphs ICC–17 and ICC–18, at intervals of ten years or less after the original test. Tanks must also be retested before being returned to service after any repairs requiring extensive riveting or calking. If the jacket and lagging are not removed, the tank must hold the prescribed pressure for at least 20 minutes. A drop in pressure shall be evidence of leakage, and such portion of the jacket and lagging must be removed as may be necessary to locate the leak and make repairs. After the repairs have been made, the tank must again be subjected to the prescribed test. Interior heater systems must be retested after repairs. Reports must be rendered as prescribed in paragraph ICC–21.

AAR–19. (a) See paragraph ICC–19 (a).

ICC–20. (b) ICC–104 in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank. This mark must also be stenciled on the jacket, in letters and figures at least 2 inches high.

ICC–20. (j) Tanks equipped with safety valves set to open at a pressure of 35 pounds per square inch, as prescribed by paragraph ICC–14 (e), must be stenciled "For Vapor Pressures Not Exceeding 40 Pounds Per Square Inch Absolute, At 100° F." in letters and figures at least one inch high immediately above the stenciled mark specified in paragraph ICC–20 (b).

AAR–20. (b) Tanks complying with all requirements of this specification except that heads are made of two plates joined by fusion-welding complying with all requirements of paragraph AAR–6 (a) are considered as Class ICC–104 and should be so marked.

§ 78.270 *Specification for tank cars having lagged riveted steel tanks, Class ICC–104A.* This specification covers Class ICC–104A tank cars having lagged riveted steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

ICC–1. *Type.* (a) Tanks built under this specification must be cylindrical with heads dished convex outward. The tank must be provided with a manhole nozzle and cover on top of tank of sufficient diameter to permit access to the interior of the tank and to provide for the proper mounting of venting, loading, unloading, sampling and safety valves, gauging device, thermometer well, and a protective housing on the cover. Other openings in the tank prohibited.

ICC–1. (b) The tank shell and manhole nozzle must be lagged with an approved insulation material of a thickness so that the thermal conductance is not more than 0.075 B. t. u. per square foot, per degree Fahrenheit differential in temperature, per hour. The entire insulation must be covered with a metal jacket, efficiently flashed around all openings so as to be weathertight. When heater systems are attached to exterior of tank, the lagging over each pipe may be reduced in thickness equivalent to one-half that required for shell.

AAR–1. (a) Before lagging is applied the tank surfaces to be lagged and the inside surface of the metal jacket shall be painted with paint which is not affected by the lading.

AAR–1. (b) The barrel, ends and manhole nozzle of tank, except seatings of tanks on bolster and pads of fixtures, shall be lagged with insulating material.

AAR–1. (c) The lagging throughout shall be covered with a metal jacket not less than ⅛ inch in thickness.

AAR–1. (d) Openings through lagging shall be flashed around projections to prevent admission of water. Top of nozzle shall be so constructed that liquids cannot enter between nozzle and jacket.

ICC–2. *Bursting pressure.* (a) The calculated bursting pressure, based on the lowest tensile strength of the plate and the efficiency of the longitudinal seam, must be at least 495 pounds per square inch.

AAR–2. *Thickness of plates.* (a) The wall thickness in the cylindrical portion of the tank must be calculated by the following formula but in no case shall the wall thickness be less than that specified in par. ICC–4.

$$t = \frac{P \times d}{2S \times E}$$

where:

t = thickness in inches of thinnest plate
P = calculated bursting pressure lb. per sq. in.
d = inside diameter in inches
S = minimum ultimate tensile strength in lb. per sq. in.
E = efficiency of longitudinal riveted seam. (See par. ICC–6 (b).)

ICC–3. *Material.* (a) All plates for tank and expansion dome must be made of open-hearth boiler plate steel of flange quality. These plates may also be clad with other metals, such as nickel, etc. All external projections must be made of materials specified hereinafter. Rivets must be of the same quality as used for steam boilers and other pressure vessels. When clad plates are used, the rivet heads inside the tank must be clad with the same material or rivets may be of the same cladding material, provided rivets have physical properties at least equivalent to rivets prescribed herein. Tanks made of clad plates must be stenciled "Tank clad with ---------- (naming material)."

AAR–3. (a) All plates used for tank must be of open-hearth boiler plate steel of flange quality complying with requirements of current A. A. R. Specification M–115, titled Steel, Boiler and Firebox, for Locomotives. These plates may also be clad with other metals, such as nickel, etc.

AAR–3. *Lining.* (b) Not a specification requirement. If applied, must be approved as to material and method of application.

AAR–3. (c) All rivets must be in accordance with current A. A. R. Specification M–110, titled Boiler Rivet Steel and Boiler Rivets. When clad plates are used, the rivet heads inside the tank must be clad with the same material or rivets may be of the same cladding material, provided rivets have physical properties at least equivalent to rivets prescribed herein.

AAR–3. (d) Lined tanks must be stenciled on the jacket in letters at least 2 inches high, immediately above the stenciled mark specified in paragraph ICC–20 (b) "-------- (naming material) lined tank."

ICC–4. *Thickness and width of plates.* (a) The minimum thickness of plates, including thickness of each plate at rivet seams, must be as follows:

Inside diameter of tanks	Bottom sheets	Shell sheets	Tank heads
	Inch	*Inch*	*Inch*
87 inches or under	9/16	9/16	13/16
Over 87 to 96 inches	5/8	5/8	7/8

ICC–4. (b) The minimum thickness of clad plates, where cladding material has physical properties at least equal to that of the base plate prescribed in paragraph ICC–3, must be as prescribed in the above table. Where the cladding material does not have physical properties at least equal to that of the base plate prescribed in paragraph ICC–3, minimum thickness of base plate must be as prescribed in the above table.

ICC–4. (c) The minimum width of bottom sheet of tank must be 60 inches, measured on the arc, but in all cases the width must be sufficient to bring the entire width of the longitudinal seam, including overlaps, above the cradle.

AAR–4. (a) For extreme diameter, A. A. R. clearance requirements govern.

AAR–4. (b) Car must have underframe.

ICC–5. *Dishing of tank heads.* (a) Tank heads must be of approved contour.

AAR–5. (a) Tank heads must be dished for pressure on concave side and to main inside radius not exceeding 10 feet. The inside knuckle radius must be not less than 3¾ inches.

ICC–6. *Riveting.* (a) For computing rivet areas the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by more than 1/16 inch. All rivets must be driven hot.

ICC–6. (b) All seams formed in the manufacture of the tank and the attachment of manhole nozzle to tank must be double-riveted. Riveted seams and joints must be made metal to metal without interposition of other material. The efficiency of the double-riveted seams must be at least 70 percent of the strength of the thinnest plate.

ICC–7. *Tank mounting.* (a) The manner in which tank is supported on and securely attached to the car structure must be approved.

AAR–7. *Anchorage.* (a) See § 78.263 of this subpart—Car Structure.

AAR–7. *Tank bands.* (b) See § 78.263 of this subpart—Car Structure.

AAR–7. *Bolster slabbing.* (c) See § 78.263 of this subpart—Car Structure.

ICC–8. *Preparation for calking and calking.* (a) The edges of plates at all riveted seams must be beveled so that the angle of the calking edges will be between 60 and 70 degrees with the flat surface of the plate. The extreme calking edge distance, measured from center line of rivet hole, must be at least one and one-half times the diameter of the hole and not more than that distance plus ¼ inch.

ICC–8. (b) All seams must be calked inside and outside. Split calking prohibited.

AAR–8. (a) Electric seal welding of inside calking edges only, in whole or in part, using shielded arc type of electrode is permitted on new or existing equipment, provided the weld bead has a ⅛" minimum to 3/16" maximum throat thickness. Qualification of welders must comply with requirements of specification ICC–103–W, paragraphs AAR–6 (k–1) to (k–5), inclusive. Welding clad material to edges of clad plates inside of tank is permitted. Other methods of covering edges of clad plates, if approved, may be used.

ICC–9. *Expansion dome.* (a) Expansion dome prohibited.

ICC–10. *Closures for manholes.* (a) All joints between manhole cover and manhole nozzle, and between manhole cover and valves

or other appurtenances mounted thereon, must be made tight against vapor pressure.

ICC–11. *Manhole nozzle, cover, and protective housing.* (a) Manhole nozzle must be of cast, forged, or pressed steel at least 18 inches inside diameter having approved wall thicknesses and dimensions.

ICC–11. (b) Manhole cover must be of forged or rolled steel at least 2¼ inches thick, machined to approved dimensions. Manhole cover must be attached to manhole nozzle by through or stud bolts not entering tank.

ICC–11. (c) Protective housing of cast or pressed steel must be bolted to manhole cover. Housing must be equipped with a steel cover that can be securely closed. Housing cover on tanks used for the transportation of flammable compressed gases must be provided with an opening equipped with an approved weather-proof covering and having an area at least equal to the total safety valve discharge area. Housing cover must have suitable stop to prevent cover striking loading or unloading connections and be hinged on one side only with approved riveted pin or rod with nuts and cotters. Openings in wall of housing must be equipped with screw plugs or other closures.

ICC–11. (d) The shearing value of the bolts attaching protective housing to manhole cover must not exceed 70 percent of shearing value of bolts attaching manhole cover to manhole nozzle.

AAR–11. (a) For dimensions and tolerances of manhole cover see Figure 8.

ICC–12. *Venting, loading and discharging, gauging and sampling devices.* (a) These devices must be of approved type, made of metal not subject to rapid deterioration by the lading, and must withstand a pressure of 100 pounds per square inch without leakage. The venting, loading and discharging valves must be directly bolted to seatings on manhole cover. Pipe connections of valves must be closed with approved screw plugs chained or otherwise fastened to prevent misplacement. Thermometer well and sampling valve must be installed and closed with screw plugs or valves.

ICC–12. (b) The interior pipes of the liquid and gas discharge valves must be equipped with check valves.

ICC–12. (c) Gauging device, sampling valve, check valves and thermometer well are not specification requirements on tanks used for the transportation of commodities other than those classed as liquefied compressed gases.

ICC–13. *Bottom discharge outlets.* (a) Bottom discharge outlet prohibited.

ICC–14. *Safety valves.* (a) The tank must be equipped with one or more safety valves of approved type, made of metal not subject to rapid deterioration by lading and mounted on manhole cover. The total valve discharge capacity must be sufficient to prevent building up of pressure in tank in excess of 75 pounds per square inch.

ICC–14. (b) The safety valves must be set to open at a pressure of not exceeding 75 pounds per square inch. (For tolerance see par. ICC–18.)

AAR–14. (a) Safety valve must be of approved design. See Appendix "A" for formula for calculating discharge capacity of valve and method of testing sample valve of a particular design to determine its actual discharge capacity which must at least equal the capacity calculated as necessary to prevent building up pressure in the tank in excess of 75 pounds per square inch.

ICC–15. *Fixtures, reinforcements, and attachments, not otherwise specified.* (a) Attachments, other than the tank anchorage and those mounted on manhole nozzle and cover, are prohibited. Heater systems may be applied to exterior of tank by tank bands or other approved method.

ICC–16. *Plugs for openings.* (a) Plugs must be of approved type, with standard pipe thread, and of metal not subject to rapid deterioration by the lading.

ICC–17. *Tests of tanks.* (a) Each tank must be tested, before being put into service, and before lagging is applied, by completely filling tank and dome with water, or other liquid having similar viscosity, of a temperature which must not exceed 100° F. during the test, and applying a pressure of 100 pounds per square inch. Tank must hold the prescribed pressure for at least 10 minutes without leakage or evidence of distress. All rivets and closures, except safety valves, must be in place while test is made.

ICC–17. (b) Tests of exterior heater systems not a specification requirement.

ICC–18. *Tests of safety valves.* (a) Each valve must be tested by air or gas before being put into service. The valve must open at a pressure not exceeding 75 pounds per square inch and be vapor-tight at 60 pounds per square inch, which limiting pressures must not be affected by any auxiliary closure or other combination.

ICC–19. *Retests of tanks and safety valves.* (a) Tanks and safety valves must be retested, as prescribed for original tests in paragraphs ICC–17 and ICC–18, at intervals of five years or less after the original test. Tanks must also be retested before being returned to service after any repairs requiring extensive riveting or calking. If the jacket and lagging are not removed, the tank must hold the prescribed pressure for at least 20 minutes. A drop in pressure shall be evidence of leakage, and such portion of the jacket and lagging must be removed as may be necessary to locate the leak and make repairs. After the repairs have been made, the tank must again be subjected to the prescribed test. Reports must be rendered as prescribed in paragraph ICC–21.

ICC–20. *Marking.* (a) Each tank must be marked, thus certifying that the tank complies with all the requirements of this specification. These marks must be as follows:

ICC–20. (b) ICC–104A in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the jacket in letters and figures at least 2 inches high by the party assembling the completed car.

ICC–20. (c) Initials of tank builder and date of original test of tank in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal immediately below the stamped mark specified in paragraph ICC–20 (b).

ICC–20. (d) Initials of company and date of additional tests performed by the party assembling the completed car, in those cases where the tank builder does not complete the fabrication of tank, such as application of riveted anchors, etc., in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal immediately below the stamped marks specified in paragraph ICC–20 (c) by the party assembling the completed car. These marks must also be stenciled on the jacket in letters and figures at least 2 inches high immediately below the stenciled mark specified in paragraph ICC–20 (b) by the party assembling the completed car.

ICC–20. (e) Date on which the tank was last tested, pressure to which tested, place where test was made, and by whom, stenciled on the jacket.

ICC–20. (f) Date on which the safety valves were last tested, pressure to which tested, place where test was made, and by whom, stencile ' on the jacket.

ICC–20. (g) Water capacity of the tank in pounds stamped plainly and permanently in letters and figures at least ⅜ inch high into the metal of the tank immediately below the marks specified in paragraphs ICC–20 (c) and ICC–20 (d). This mark must also be stenciled on the jacket immediately below the dome platform and either directly behind or within 3 feet of the right or left side of ladder, or ladders if there is a ladder on each side of the tank, in letters and figures at least 2 inches high as follows: Water Capacity, 000,000 Pounds.

ICC–20. (h) When a tank car and its appurtenances are designed and authorized for the transportation of a particular commodity only, the name of that commodity, followed by the word "only," or such other wording as may be required to indicate the limits of usage of the car, must be stenciled on each side of the jacket, in letters at least 2 inches high, immediately above the stenciled mark specified in paragraph ICC–20 (b).

AAR–20. (a) For all other markings, see Figure 1.

AAR–20. (b) For determining water capacity of tanks in pounds, the weight of a gallon (231 cu. in.) of water at 60 degrees F. in air shall be 8.32828 pounds.

ICC–21. *Reports.* (a) Before a tank car is placed in service, the party assembling the completed car must furnish to car owner, Bureau of Explosives, and the Secretary, Mechanical Division, Association of American Railroads, a report in approved form certifying that the tank and its equipment comply with all the requirements of this specification. In case of alterations of or additions to tanks or equipment therefor from original design and construction, there must be furnished to the same parties a report in detail of the alterations or additions made to each tank covered by a particular application, showing the initials and number of each tank involved. Reports of retests must be rendered to the Bureau of Explosives and car owner.

AAR–21. *Application for approval.* (a) See § 78.259 (f) of this subpart—Application for Approval.

AAR–21. *Certificate of construction.* (b) See § 78.259 (g) of this subpart—Certificate of Construction.

AAR–22. *Car structure.* (a) See § 78.263 of this subpart—Car Structure.

§ 78.271 *Specification for tank cars having lagged forged lapwelded steel tanks class ICC–105A300.* This specification covers Class ICC–105A300 tank cars having lagged forged lapwelded steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

ICC–1. *Type.* (a) Tanks built under this specification must be cylindrical, with heads dished convex outward. The tank must be provided with a manhole nozzle and cover on top of the tank of sufficient diameter to permit access to the interior of the tank and to provide for the proper mounting of venting, loading, unloading, sampling and safety valves, gauging device, thermometer well, and a protective housing on the cover. Other openings in the tank prohibited, except those required for testing anchor rivets and their protective coverings.

ICC–2. *Material.* (a) All plates for the tank must be made of open-hearth boiler plate steel of flange quality for forge welding.

AAR–2. (a) All plates for tank must be in accordance with current A. S. T. M. Specification A–89, titled Low Tensile Strength Carbon—Steel Plates of Flange and Firebox Qualities.

AAR–2. (b) All rivets must be in accordance with current A. A. R. Specification M–110, titled Boiler Rivet Steel and Boiler Rivets.

ICC–3. *Thickness of plates.*—(a) The wall thickness must be at least ¾ inch in the cylindrical portion when inside diameter of tank does not exceed 87½ inches. When inside diameter exceeds 87½ inches, the wall

thickness in the cylindrical portion must be calculated by the following formula:

$$\text{Wall thickness in inches} = \frac{300 \times \text{inside diameter in inches}}{35{,}000}$$

ICC–3. (b) Opening in tank for manhole nozzle must be reinforced in an approved manner.

ICC–3. (c) Tank heads must be at least as thick at all points as wall of tank.

AAR–3. (a) The opening in the tank for manhole nozzle must be reinforced. The reinforcement must be obtained by using a manhole nozzle and/or section of shell sheet from which nozzle is flued, of a thickness which will provide the required cross-sectional area as determined by formula shown on figure 15.

ICC–4. *Dishing of tank heads.* (a) Tank heads must be of approved contour.

AAR–4. (a) The tank head shape shall be an ellipsoid of revolution in which the major axis shall equal the diameter of the shell and the minor axis shall be one-half of this.

ICC–5. *Welding.* (a) All seams must be lap-welded by the water gas process, hammered or rolled, or other lap-weld hammered or rolled process which investigation and laboratory tests by the Mechanical Division of the Association of American Railroads have proved will produce equivalent or superior results.

ICC–5. (b) All seams must be stress-relieved after welding.

AAR–5. (a) Stress-relieving must be at a temperature of at least 1100° F. by an approved method.

ICC–6. *Tank mounting.* (a) The manner in which tank is supported on and securely attached to the car structure must be approved.

AAR–6. *Anchorage.* (a) See § 78.263—Car Structure.

AAR–6. *Tank bands.* (b) See §78.263—Car Structure.

AAR–6. *Bolster slabbing.* (c) See §78.263—Car Structure.

AAR–6. (d) Anchor rivets, if used, must have their heads on the inside of the tank shell covered and protected from the lading by a liquid-tight housing of approved design. The lower portion of the housing must be fusion-welded to, and stress relieved with, the center section of the tank shell as a unit. After the rivets have been driven and caulked, the top portion of the housing must be secured to the top of the lower portion by an approved method of welding, which welding need not be stress relieved. A hole must be provided through tank shell, under each housing to permit making air pressure test. Each test hole must be tightly closed after completion of test with an approved plug.

AAR–6. (e) Rivets, if used for attaching anchor, must be driven hot and caulked inside. For computing rivet areas the effective diameter of a driven rivet is the diameter of its reamed hole which hole must in no case exceed nominal diameter of rivet by more than $\frac{1}{16}$ inch. Use of rivets of less than $\frac{5}{8}$ inch nominal diameter prohibited.

ICC–7. *Manhole nozzle, cover, and protective housing.* (a) Manhole nozzle must be of forged or rolled steel at least 18 inches inside diameter having approved wall thicknesses and dimensions.

ICC–7. (b) Manhole cover must be of forged or rolled steel at least 2¼ inches thick machined to approved dimensions. Manhole cover must be attached to manhole nozzle by through or stud bolts not entering tank.

ICC–7. (c) Protective housing of cast or pressed steel must be bolted to manhole cover. Housing must be equipped with a steel cover that can be securely closed. Housing cover on tanks used for the transportation of flammable compressed gases must be provided with an opening equipped with an approved weather-proof covering and having an area at least equal to the total safety valve discharge area. Housing cover must have suitable stop to prevent cover striking loading or unloading connections and be hinged on one side only with an approved riveted pin or rod with nuts and cotters. Openings in wall of housing must be equipped with screw plugs or other closures.

ICC–7. (d) The shearing value of the bolts attaching protective housing to manhole cover must not exceed 70 percent of shearing value of bolts attaching manhole cover to manhole nozzle.

AAR–7. (a) For dimensions and tolerances of manhole cover see Fig. 8.

ICC–8. *Venting, and loading and discharging valves.* (a) These valves must be of approved type, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 300 pounds per square inch without leakage. The valves must be directly bolted to seatings on manhole cover. Pipe connections of the valves must be closed with approved screw plugs chained or otherwise fastened to prevent misplacement.

ICC–8. (b) The interior pipes of the liquid and gas discharge valves, except as prescribed in paragraphs ICC–8 (c) and ICC–8 (d), may be equipped with check valves of an approved design.

ICC–8. (c) Tanks for use in the transportation of chlorine must have the interior pipes of the liquid discharge valves equipped with check valves of an approved design.

ICC–8. (d) Tanks for use in the transportation of liquefied hydrocarbon and liquefied petroleum gases must have the interior pipes of the liquid and gas discharge valves equipped with check valves of an approved design.

ICC–9. *Gauging device, sampling valve and thermometer well.* (a) These fittings are required on tanks used for the transportation of flammable gases. They must be of approved design, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 300 pounds per square inch without leakage. Interior pipes of the gauging device and sampling valve must be equipped with check valves of an approved design. Thermometer well must be closed with screw plug.

ICC–10. *Safety valves.* (a) The tank must be equipped with one or more safety valves of approved type, made of metal not subject to rapid deterioration by lading and mounted on manhole cover. The total valve discharge capacity must be sufficient to prevent building up of pressure in tank in excess of 225 pounds per square inch.

ICC–10. (b) The safety valves must be set to open at a pressure of not exceeding 225 pounds per square inch. (For tolerance see paragraph ICC–14.)

AAR–10. (a) Safety valve must be of approved design. See Appendix "A" for formula for calculating discharge capacity of valve and method of testing sample valve of a particular design to determine its actual discharge capacity which must at least equal the capacity calculated as necessary to prevent building up pressure in the tank in excess of 225 pounds per square inch.

ICC–11. *Fixtures, reinforcements, and attachments not otherwise specified.* (a) Attachments, other than the anchorage and those mounted on manhole nozzle and cover, are prohibited. Heater systems may be applied to exterior of tank by tank bands or other approved method.

AAR–11. *Tests of exterior heater systems.* (a) Not a specification requirement.

ICC–12. *Lagging.* (a) The tank shell and manhole nozzle must be lagged with an approved insulation material of a thickness so that the thermal conductance is not more than .075 B. t. u. per square foot, per degree Fahrenheit differential in temperature, per hour. The entire insulation must be covered with a metal jacket, efficiently flashed around all openings so as to be weather-tight. When heater systems are attached to exterior of tank, the lagging over each pipe may be reduced in thickness equivalent to one-half that required for shell.

ICC–13. *Tests of tanks.* (a) Each tank must be tested, after anchorage is applied and before anchor rivet covers and the tank lagging are applied, by completely filling tank and manhole nozzle with water or other liquid of similar viscosity, having a temperature which must not exceed 100° F. during test, and applying a pressure of 300 pounds per square inch. The tank must hold the prescribed pressure for at least 30 minutes without leakage or distress.

ICC–13. (b) After anchor rivet covers are in place these covers must be tested by applying an air pressure of 100 pounds per square inch through openings in tank shell and must be tight against leakage.

ICC–13. (c) Calking of welded joints to stop leaks developed during the foregoing tests prohibited. Correction of leaks or defects which develop during original construction must be made as prescribed in paragraph ICC–5. Should leaks or defects develop after tank has been placed in service, repairs must be made as provided in § 73.31 (c) of this chapter of the regulations.

ICC–14. *Tests of safety valves.* (a) Each valve must be tested by air or gas before being put into service. The valve must open at a pressure not exceeding 225 pounds per square inch and be vapor-tight at 180 pounds per square inch, which limiting pressures must not be affected by any auxiliary closure or other combination.

ICC–15. *Retests of tanks, anchor rivet covers, and safety valves.* (a) Tanks must be retested to a pressure of 300 pounds per square inch, as prescribed in paragraph ICC–13 (a), except that the anchor rivet covers must not be removed and that the tank lagging and jacket need not be removed unless the pressure in the tank drops during the test period, indicating leakage; anchor rivet covers must be retested to a pressure of 100 pounds per square inch, as prescribed in paragraph ICC–13 (b); and safety valves must be retested to a pressure as prescribed in paragraphs ICC–10 (b) and ICC–14.

ICC–15. (b) All retests must be made, except as prescribed in paragraph ICC–15 (c), at intervals of five years or less. Tanks must also be retested before being returned to service after any repairs requiring welding.

ICC–15. (c) Tanks used for the transportation of chlorine must be retested as prescribed in paragraph ICC–15 (a) at intervals of two years or less.

ICC–15. (d) Report of retests must be rendered as prescribed in paragraph ICC–17.

ICC–16. *Marking.* (a) Each tank must be marked, thus certifying that the tank complies with all the requirements of this specification. These marks must be as follows:

ICC–16. (b) ICC–105A300 in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the jacket in letters and figures at least 2 inches high by the party assembling the completed car.

ICC–16. (c) Initials of tank builder and date of original test of tank in letters and figures at least ⅜ inch high, stamped plainly and permanently into the metal immediately below the stamped mark specified in paragraph ICC–16 (b).

ICC–16. (d) Initials of company and date of additional tests performed by the party assembling the completed car, in those cases where the tank builder does not complete the fabrication of tank, such as application of riveted anchors, etc., in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal immediately below the stamped marks specified in paragraph

ICC–16 (c) by the party assembling the completed car. These marks must also be stenciled on the jacket in letters and figures at least 2 inches high immediately below the stenciled mark specified in paragraph ICC–16 (b) by the party assembling the completed car.

ICC–16. (e) Date on which the tank was last tested, pressure to which tested, place where test was made, and by whom, stenciled on the jacket.

ICC–16. (f) Date on which the safety valves were last tested, pressure to which tested, place where test was made, and by whom, stenciled on the jacket.

ICC–16. (g) Water capacity of the tank in pounds stamped plainly and permanently in letters and figures at least ⅜ inch high into the metal of the tank immediately below the mark specified in paragraphs ICC–16 (c) and ICC–16 (d). This mark must also be stenciled on the jacket immediately below the dome platform either directly behind or within 3 feet of the right or left side of ladder, or ladders if there is a ladder on each side of the tank, in letters and figures at least 2 inches high, as follows: Water Capacity, 000000 Pounds.

ICC–16. (h) When a tank car and its appurtenances are designed and authorized for the transportation of a particular commodity only, the name of that commodity, followed by the word "only", or such other wording as may be required to indicate the limits of usage of the car, must be stenciled on each side of the jacket, in letters at least 2 inches high, immediately above the stenciled mark specified in paragraph ICC–16 (b).

AAR–16. (a) For determining water capacity of tank in pounds, the weight of a gallon (231 cu. in.) of water at 60 degrees F. in air shall be 8.32828 pounds.

AAR–16. (b) For all other markings, see Fig. 1.

ICC–17. *Reports.* (a) Before a tank car is placed in service the party assembling the completed car must furnish to car owner, Bureau of Explosives, and the Secretary, Mechanical Division, Association of American Railroads, a report in approved form certifying that the tank and its equipment comply with all the requirements of this specification. In case of alterations of or additions to tanks or equipment therefor from original design and construction or of repairs, there must be furnished to the same parties a report in detail of the repairs, alterations, or additions made to each tank covered by a particular application, showing the initials and number of each tank involved and stating that heat-treatment called for by the particular type of repair authorized has been performed and that after repairs, alterations, or additions the tests prescribed in paragraph ICC–15 (a) were made, results of hydrostatic tests reported, and tanks marked as prescribed in paragraph ICC–16 (e). Reports of retests must be rendered to the Bureau of Explosives and car owner.

AAR–17. *Application for approval.* (a) See § 78.259 (f)—Application for approval.

AAR–17. *Certificate of construction.* (b) See § 78.259 (g)—Certificate of Construction.

AAR–18. *Car structure.* (a) See § 78.263—Car Structure.

§ 78.272 *Specification for tank cars having lagged forged lapwelded steel tanks Class ICC–105A400.* This specification covers Class ICC–105A400 tank cars having lagged forged lapwelded steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC–105A300, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.271 Specification ICC–105A300):

ICC–3. *Thickness of plates.* (a) The wall thickness must be at least ¾ inch in the cylindrical portion when inside diameter of tank does not exceed 65½ inches. When inside diameter exceeds 65½ inches, the wall thickness in the cylindrical portion must be calculated by the following formula:

$$\text{Wall thickness in inches} = \frac{400 \times \text{inside diameter in inches}}{35{,}000}$$

ICC–8. *Venting, and loading and discharging valves.* (a) These valves must be of approved type, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 400 pounds per square inch without leakage. The valves must be directly bolted to seatings on manhole cover. Pipe connections of the valves must be closed with approved screw plugs chained or otherwise fastened to prevent misplacement.

ICC–9. *Gauging device, sampling valve, and thermometer well.* (a) These fittings are required on tanks used for the transportation of flammable gases. They must be of approved design, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 400 pounds per square inch without leakage. Interior pipes of gauging device and sampling valve must be equipped with check valves of an approved design. Thermometer well must be closed with a screw plug.

ICC–10. *Safety valves.* (a) The tank must be equipped with one or more safety valves of approved type, made of metal not subject to rapid deterioration by lading and mounted on manhole cover. The total valve discharge capacity must be sufficient to prevent building up of pressure in tank in excess of 300 pounds per square inch.

ICC–10. (b) The safety valves must be set to open at a pressure of not exceeding 300 pounds per square inch. (For tolerance see paragraph ICC–14.)

AAR–10. (a) Safety valve must be of approved design. See Appendix "A" for formula for calculating discharge capacity of valve and method of testing sample valve of a particular design to determine its actual discharge capacity which must at least equal the capacity calculated as necessary to prevent building up pressure in the tank in excess of 300 pounds per square inch.

ICC–13. *Tests of tanks.* (a) Each tank must be tested, after anchorage is applied and before anchor rivet covers and the tank lagging are applied, by completely filling tank and manhole nozzle with water or other liquid of similar viscosity, having a temperature which must not exceed 100° F. during test, and applying a pressure of 400 pounds per square inch. The tank must hold the prescribed pressure for at least 30 minutes without leakage or distress.

ICC–14. *Tests of safety valves.* (a) Each valve must be tested by air or gas before being put into service. The valve must open at a pressure not exceeding 300 pounds per square inch and be vapor-tight at 240 pounds per square inch, which limiting pressures must not be affected by any auxiliary closure or other combination.

ICC–15. *Retests of tanks, anchor rivet covers, and safety valves.* (a) Tanks must be retested to a pressure of 400 pounds per square inch, as prescribed in paragraph ICC–13 (a), except that the anchor rivet covers must not be removed and that the tank lagging and jacket need not be removed unless the pressure in the tank drops during the test period, indicating leakage; anchor rivet covers must be retested to a pressure of 100 pounds per square inch, as prescribed in paragraph ICC–13 (b); and safety valves must be retested to a pressure as prescribed in paragraphs ICC–10 (b) and ICC–14.

ICC–16. (b) ICC–105A400 in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the jacket in letters and figures at least 2 inches high by the party assembling the completed car.

§ 78.273 *Specification for tank cars having lagged forged lapwelded steel tanks class ICC–105A500.* This specification covers Class ICC–105A500 tank cars having lagged forged lapwelded steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC–105A300, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.271 Specification ICC–105A300):

ICC–3. *Thickness of plates.* (a) The wall thickness must be at least ¾ inch in the cylindrical portion when inside diameter of tank does not exceed 52½ inches. When inside diameter exceeds 52½ inches, the wall thickness in the cylindrical portion must be calculated by the following formula:

$$\text{Wall thickness in inches} = \frac{500 \times \text{inside diameter in inches}}{35{,}000}$$

ICC–8. *Venting, and loading and discharging valves.* (a) These valves must be of approved type, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 500 pounds per square inch without leakage. The valves must be directly bolted to seatings on manhole cover. Pipe connections of the valves must be closed with approved screw plugs chained or otherwise fastened to prevent misplacement.

ICC–9. *Gauging device, sampling valve, and thermometer well.* (a) These fittings are required on tanks used for the transportation of flammable gases. They must be of approved design, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 500 pounds per square inch without leakage. Interior pipes of gauging device and sampling valve must be equipped with check valves of an approved design. Thermometer well must be closed with screw plug.

ICC–10. *Safety valves.* (a) The tank must be equipped with one or more safety valves of approved type, made of metal not subject to rapid deterioration by lading and mounted on manhole cover. The total valve discharge capacity must be sufficient to prevent building up of pressure in tank in excess of 375 pounds per square inch.

ICC–10. (b) The safety valves must be set to open at a pressure of not exceeding 375 pounds per square inch. (For tolerance see paragraph ICC–14.)

ICC–10. (c) Tanks for use in the transportation of liquefied carbon dioxide must be equipped with one safety valve of approved design set to open at a pressure not exceeding 375 pounds per square inch and one frangible disc device of approved design set to function at a pressure less than the test pressure of the tank. The discharge

capacity of each of these safety devices must be sufficient to prevent building up of pressure in tank in excess of 375 pounds per square inch. Tanks must also be equipped with two pressure-regulating valves of approved design, one set to open at 300 pounds per square inch pressure and one set to open at 333 pounds per square inch pressure. Each pressure-regulating valve and safety device must have its final discharge piped to the outside of the dome.

AAR–10. (a) Safety valve must be of approved design. See Appendix "A" for formula for calculating discharge capacity of valve and method of testing sample valve of a particular design to determine its actual discharge capacity which must at least equal the capacity calculated as necessary to prevent building up pressure in the tank in excess of 375 pounds per square inch.

ICC–12. (b) Tanks for use in the transportation of liquefied carbon dioxide must have tank shell and manhole nozzle lagged with an approved insulation material of a thickness so that the thermal conductance is not more than 0.03 B. t. u. per square foot, per F. differential in temperature per hour. The entire insulation must be covered with a metal jacket, efficiently flashed around all openings so as to be weather tight.

ICC–13. *Tests of tanks.* (a) Each tank must be tested, after anchorage is applied and before anchor rivet covers and the tank lagging are applied, by completely filling tank and manhole nozzle with water or other liquid of similar viscosity, having a temperature which must not exceed 100° F. during test, and applying a pressure of 500 pounds per square inch. The tank must hold the prescribed pressure for at least 30 minutes without leakage or distress.

ICC–14. *Tests of safety valves.* (a) Each valve must be tested by air or gas before being put into service. The valve must open at a pressure not exceeding 375 pounds per square inch and be vapor-tight at 300 pounds per square inch, which limiting pressures must not be affected by any auxiliary closure or other combination.

ICC–15. *Retests of tanks, anchor rivet covers and safety valves.* (a) Tanks must be retested to a pressure of 500 pounds per square inch, as prescribed in paragraph ICC–13 (a), except that the anchor rivet covers must not be removed and that the tank lagging and jacket need not be removed unless the pressure in the tank drops during the test period, indicating leakage; anchor rivet covers must be retested to a pressure of 100 pounds per square inch, as prescribed in paragraph ICC–13 (b); and safety valves must be retested to a pressure as prescribed in paragraphs ICC–10 (b) and ICC–14.

ICC–16. (b) ICC–105A500 in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the jacket in letters and figures at least 2 inches high by the party assembling the completed car.

§ 78.274 *Specification for tank cars having lagged forged lapwelded steel tanks Class ICC–105A600.* This specification covers Class ICC–105A600 tank cars having lagged forged lapwelded steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC–105A300, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.271 Specification ICC–105A300):

ICC–3. *Thickness of plates.* (a) The wall thickness must be at least ¾ inch in the cylindrical portion when inside diameter of tank does not exceed 43½ inches. When inside diameter exceeds 43½ inches, the wall thickness in the cylindrical portion must be calculated by the following formula:

$$\text{Wall thickness in inches} = \frac{600 \times \text{inside diameter in inches}}{35{,}000}$$

ICC–8. *Venting, and loading and discharging valves.* (a) These valves must be of approved type, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 600 pounds per square inch without leakage. The valves must be directly bolted to seatings on manhole cover. Pipe connections of the valves must be closed with approved screw plugs chained or otherwise fastened to prevent misplacement.

ICC–9. *Gauging device, sampling valve, and thermometer well.* (a) These fittings are required on tanks used for the transportation of flammable gases. They must be of approved design, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 600 pounds per square inch without leakage. Interior pipes of gauging device and sampling valve must be equipped with check valves of an approved design. Thermometer well must be closed with screw plug.

ICC–10. *Safety valves.* (a) The tank must be equipped with one or more safety valves of approved type, made of metal not subject to rapid deterioration by lading and mounted on manhole cover. The total valve discharge capacity must be sufficient to prevent building up of pressure in tank in excess of 450 pounds per square inch.

ICC–10. (b) The safety valves must be set to open at a pressure of not exceeding 450 pounds per square inch. (For tolerance see paragraph ICC-14.)

ICC–10. (c) Tanks for use in the transportation of liquefied carbon dioxide must be equipped with one safety valve of approved design set to open at a pressure not exceeding 450 pounds per square inch and one frangible disc device of approved design set to function at a pressure less than the test pressure of the tank. The discharge capacity of each of these safety devices must be sufficient to prevent building up of pressure in tanks in excess of 450 pounds per square inch. Tanks must also be equipped with two pressure-regulating valves of approved design, one set to open at 360 pounds per square inch pressure and one set to open at 400 pounds per square inch pressure. Each pressure-regulating valve and safety device must have its final discharge piped to the outside of the dome.

AAR–10. (a) Safety valve must be of approved design. See Appendix "A" for formula for calculating discharge capacity of valve and method of testing sample valve of a particular design to determine its actual discharge capacity which must at least equal the capacity calculated as necessary to prevent building up pressure in the tank in excess of 450 pounds per square inch.

ICC–12. (b) Tanks for use in the transportation of liquefied carbon dioxide must have tank shell and manhole nozzle lagged with an approved insulation material of a thickness so that the thermal conductance is not more than 0.03 B. t. u. per square foot, per degree F. differential in temperature per hour. The entire insulation must be covered with a metal jacket, efficiently flashed around all openings so as to be weathertight.

ICC–13. *Tests of tanks.* (a) Each tank must be tested, after anchorage is applied and before anchor rivet covers and the tank lagging are applied, by completely filling tank and manhole nozzle with water or other liquid of similar viscosity, having a temperature which must not exceed 100° F. during test, and applying a pressure of 600 pounds per square inch. The tank must hold the prescribed pressure for at least 30 minutes without leakage or distress.

ICC–14. *Test of safety valves.* (a) Each valve must be tested by air or gas before being put into service. The valve must open at a pressure not exceeding 450 pounds per square inch and be vapor-tight at 360 pounds per square inch, which limiting pressures must not be affected by any auxiliary closure or other combination.

ICC–15. *Retests of tanks, anchor rivet covers, and safety valves.* (a) Tanks must be retested to a pressure of 600 pounds per square inch, as prescribed in paragraph ICC–13 (a), except that the anchor rivet covers must not be removed and that the tank lagging and jacket need not be removed unless the pressure in the tank drops during the test period, indicating leakage; anchor rivet covers must be retested to a pressure of 100 pounds per square inch, as prescribed in paragraph ICC–13 (b); and safety valves must be retested to a pressure as prescribed in paragraphs ICC–10 (b) and ICC–14.

ICC–16. (b) ICC–105A600 in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the jacket in letters and figures at least 2 inches high by the party assembling the completed car.

§ 78.275 *Specification for tank cars having forged lapwelded steel tanks class ICC–106A500.* This specification covers Class ICC–106A500 tank cars having forged lapwelded steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

ICC–1. *Type and general requirements.* (a) Tanks built under this specification must be cylindrical, with heads dished convex inward. All openings must be located in the heads. Tanks must be securely attached to car structure in such a manner that they may be removed for filling by the consignor and emptying by the consignee. Each tank must have a capacity of at least 1,600 pounds of water and not more than 2,600 pounds of water.

ICC–1. (b) The tanks must be fabricated by approved methods.

ICC–1. (c) For tanks made in foreign countries, a chemical analysis of material and all tests as specified must be carried out within the limits of the United States under the supervision of a competent and disinterested inspector.

ICC–2. *Material.* (a) All plates for tank must be made of uniform open-hearth steel of good welding quality, free from cracks, laminations, or other defects injurious to the finished tank, and have an elastic limit of not more than 45,000 pounds per square inch and an elongation of at least 20 percent in 8 inches; a test specimen must also bend cold through 180 degrees flat on itself without cracking on the outside of the bent portion; the tensile and bend test specimens must be taken from the finished rolled material, and there must be at least one tensile test and one bend test on specimens from each heat. Chemical analysis must show maximum content percent not greater than as follows: Carbon, 0.20; phosphorus, 0.04; sulphur, 0.05.

ICC–2. (b) All plates must have their heat number and the name or brand of the manufacturer legibly stamped on them at the rolling mill.

ICC–3. *Thickness of plates.* (a) The wall thickness of tanks must be at least $^{13}/_{32}$ inch and must be such that at the test pressure the calculated fiber stress in wall of tank will not be in excess of the following:

Shell wall having longitudinal seams	*Maximum fiber stress pounds per square inch*
Water gas lap-welded	17,500
Fusion welded	15,750

as calculated by the following formula:

$$S=\frac{P\ (1.3\ D^2+0.4\ d^2)}{D^2-d^2}$$

where *P* is interior test pressure in pounds per square inch; *D*, outside diameter in inches; *d*, inside diameter in inches; and *S*, wall stress in pounds per square inch.

ICC–3. (b) Tank heads must be of a thickness sufficient to meet the test requirements of paragraph ICC–11 and to provide for the threading of openings therein as prescribed in paragraph ICC–4 (b).

ICC–4. *Tank heads.* (a) The heads must be hot pressed, flanging and dishing being done in one heat, so as to make a flange at least 4 inches deep and a radius of dish not greater than the diameter of the tank. They must be inserted into the tank shell with flange extending outward and must have a snug driving fit into the shell.

ICC–4. (b) Threads for openings in tank heads for valves and vents must be American Standard taper, tapped to gauge, clean cut, even and without checks to insure tight joints.

ICC–5. *Welding and heat treatment.* (a) All joints and seams other than the longitudinal seam for which alternate requirements are prescribed in paragraph ICC–5 (d) must be made by the water gas lap-weld process, or other lap-weld process which investigation and laboratory tests by the Mechanical Division of the Association of American Railroads have proved will produce equivalent or superior results. All joints and seams other than those provided for in paragraph ICC–5 (d) must be thoroughly hammered or rolled to insure perfect welds. The flanges of the heads must be forge lap-welded to the shell and then crimped inwardly toward the axis line at least 1 inch on the radius. Welding and crimping must be accomplished in one heat.

ICC–5. (b) Each finished tank, before being subjected to the hydrostatic test, must be uniformly and properly heat-treated by heating to a temperature of at least 1,200° F. to remove any undue strains due to processes of manufacture.

ICC–5. (c) Repairs of leaks detected in manufacture or test must be made by the same process as employed in manufacture of tank. Calking, soldering, or similar repairing, prohibited.

ICC–5. (d) Alternate welding procedure. Longitudinal seams may be fusion welded by a process which investigation and laboratory tests by the Mechanical Division of the Association of American Railroads have proved will produce satisfactory results.

AAR–5. (a) Longitudinal seams made by fusion welding must meet all applicable requirements of paragraph AAR–6 (a); AAR–6 (b–1); AAR–6 (b–2); AAR–6 (c) to AAR–6 (m–2), inclusive; and AAR–6 (p) to AAR–6 (s–3), inclusive, of tank car specification ICC–103–W.

ICC–6. *Anchorage.* (a) The manner in which tanks are supported on and securely attached to the car structure must be approved.

ICC–7. *Protective housing and cover.* (a) Valves and other closures of openings in tank heads, except fusible plug vents, must be protected against accidental injury by a detachable cast or pressed steel housing at least $^{3}/_{16}$ inch thick, which must not project beyond the flanged ends of the tank and must be securely fastened to tank head. Housing must be provided with an opening having an area equal to the total safety valve or vent discharge area.

ICC–7. (b) The upper head of tanks mounted vertically on the car structure must be completely covered by a light metal cover designed to exclude moisture, cinders, and other foreign matter, and to be displaced by pressure of gas discharged through safety valves or vents.

ICC–8. *Venting, and loading and discharging valves.* (a) These valves must be of approved type, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 500 pounds per square inch without leakage. The valves must be screwed directly into tank heads or attached to tank heads by other approved methods. Provision must be made for closing the pipe connections of the valves.

ICC–9. *Safety valves and vents.* (a) The tank must be equipped with one or more safety valves or vents of approved type, made of metal not subject to rapid deterioration by the lading and screwed directly into tank heads or attached to tank heads by other approved methods. The total valve or vent discharge capacity must be sufficient to prevent building up of pressure in tank in excess of $^{3}/_{4}$ of the test pressure; when safety vents of the fusible plug type are used, the required discharge capacity must be available in each head.

ICC–9. (b) Tanks mounted vertically on the car structure must have safety valves, or vents of the frangible disc type, which must be located on the upper head.

ICC–9. (c) Safety valves must be set to open and vents of the frangible disc type must function at a pressure of not exceeding 375 pounds per square inch. Vents of the fusible plug type must function at a temperature of not exceeding 175° F. (For tolerance see paragraph ICC–12.)

ICC–9. (d) Tanks must not be equipped with safety valves or vents if prohibited for the service in which tanks are used.

ICC–10. *Fixtures.* (a) Siphon pipes and their couplings on the inside of the tank head and lugs on the outside of the tank head for attaching the valve protection housing may be fusion welded in place, provided they are properly heat-treated in accordance with paragraph ICC–5 (b) at the time the entire tank is heat-treated. All other fixtures and appurtenances, except as provided for in paragraph ICC–6, ICC–7, ICC–8, and ICC–9, are prohibited.

ICC–11. *Tests of tank.* (a) After heat treatment, tanks must be subjected to hydrostatic test in a water jacket, or by other accurate method, operated so as to obtain reliable data. No tank shall have been subjected previously to internal pressure within 100 pounds of the test pressure.

ICC–11. (b) Each tank must be tested to 500 pounds per square inch.

ICC–11. (c) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion of tank. Pressure gauge must permit reading to accuracy of 1 percent. Expansion gauge must permit reading of total expansion to accuracy of 1 percent. Expansion must be recorded in cubic centimeters.

ICC–11. (d) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

ICC–11. (e) Each finished tank must be subjected to interior air pressure test of at least 100 pounds per square inch under conditions favorable to detection of any leakage. No leaks shall appear.

ICC–12. *Tests of safety valves and vents.* (a) Each valve must be tested by air or gas before being put into service and also at intervals as prescribed in paragraph ICC–13. The valve must open at a pressure of not exceeding 375 pounds per square inch and be vapor-tight at 300 pounds per square inch which limiting pressures must not be affected by any auxiliary closure or other combination.

ICC–12. (b) For safety vents of the frangible disc type, a sample of the discs used must burst at a pressure of not exceeding 375 pounds per square inch and be vapor-tight at 300 pounds per square inch.

ICC–12. (c) For safety vents of the fusible plug type, a sample of the fusible plugs used must function at a temperature of not exceeding 175° F. and be vapor-tight at a temperature of 130° F.

ICC–13. *Retests, alterations, and upkeep of tanks, safety valves, and vents.* (a) Each tank must be subjected, at least once every 5 years, to the tests as prescribed in paragraphs ICC–11 (a), (b), (c), and (d). A tank must be condemned when it leaks or when the permanent expansion exceeds 10 percent of the total expansion. Report giving data showing the results of these tests must be rendered by party making tests to the owner of tank and to the Bureau of Explosives, and each tank passing the test must be marked with the date (month and year) plainly and permanently stamped into the metal of one head or chime. For example, 1–50 for January 1950. Dates of previous tests must not be obliterated.

ICC–13. (b) Safety valves must be retested, at least once every 2 years, in the manner prescribed in paragraph ICC–12 (a). Safety vents of the frangible disc and fusible plug types must be inspected after each loaded trip of tank as follows: Remove at least one vent for visual inspection and if it shows signs of deterioration, all the vents on the tank must be removed and inspected and those which do not meet the requirements must be renewed.

ICC–13. (c) All prescribed markings on tanks must be kept legible. Copy of the said markings, in letters and figures of the prescribed size stamped on a brass plate secured to the tank, is authorized. Markings must not be changed except as follows:

(1) By application of additional marks not affecting the test pressure or water capacity; these must not obliterate previously applied marks.

(2) By application of test pressure marks, or alteration of such marks, to indicate a reduced test pressure; authorized only for tanks that have not failed in the 5-year test.

(3) By change of serial numbers or ownership marks, or both; report in sufficient detail so that previous serial number and ownership mark can be determined for each tank, arranged by lot numbers or by consecutive serial numbers, must be filed with the Bureau of Explosives.

ICC–14. *Marking.* (a) Each tank must be plainly and permanently marked, thus certifying that the tank complies with all the requirements of this specification. These marks must be stamped into the metal of one head or chime, in letters and figures at least $^{3}/_{8}$ inch high, as follows:

ICC–14. (b) When longitudinal seam is water gas lap-welded, the mark must be ICC–106A500.

When longitudinal seam is fusion welded, the mark must be ICC–106A500X.

ICC–14. (c) Serial number (immediately below foregoing).

ICC–14. (d) Inspector's official mark (immediately below serial number).

ICC–14. (e) Name, mark (other than a trademark), or initials of company or person for whose use the tanks are being made, which must be recorded with the Bureau of Explosives.

ICC–14. (f) Date of tank test (month and year), such as 1–50 for January, 1950, so placed that dates of subsequent tests may easily be added thereto.

ICC–14. (g) Water capacity—0000 pounds.

AAR–14. (a) For determining water capacity of tank in pounds, the weight of a gallon (231 cu. in.) of water at 60 degrees F. in air shall be 8.32628 pounds.

AAR 14. (b) For all other markings see Fig. 1.

ICC-15. *Inspection and reports.* (a) Purchaser of tanks must provide for inspection by a competent inspector as follows:

(1) The inspector must carefully inspect all plates from which tanks are to be made, and records pertaining thereto, and plates which do not comply with the requirements of this specification must be rejected.

(2) The inspector must secure complete certified records, including chemical analyses and physical tests on samples taken from each heat of steel used in the manufacture of the plate.

(3) The inspector must report capacity in pounds of water and tare weight of each tank and the minimum thickness of tank wall noted.

(4) The inspector must make such inspection as may be necessary to see that all the requirements of this specification are fully complied with, must see that the finished tanks are properly heat-treated, and must witness all air and hydrostatic tests.

(5) The inspector must stamp his official mark on each accepted tank immediately below the serial number, and make certified report (see paragraph ICC-15 (b)) to the builder, to the company or person for whose use the tanks are being made, to the builder of the car structure on which the tanks are to be mounted, if any, to the Bureau of Explosives, and to the Secretary, Mechanical Division, Association of American Railroads.

ICC-15. (b) Inspector's report required herein must be in the following form:

(Place) _____

(Date) _____

STEEL TANKS

It is hereby certified that drawings were submitted for these tanks under A. A. R. Application for Approval No. _____ and approved by the A. A. R. Committee on Tank Cars under date of _____

Built for _____ Company

Location at _____

Built by _____ Company

Location at _____

Consigned to _____ Company

Location at _____

Quantity _____

Size _____ inches outside diameter by _____ inches long.

Marks stamped into the head or chime of the tank are:

Specification ICC _____

Serial numbers _____ to _____ inclusive

Inspector's mark _____

Owner's mark _____

Test date _____

Water capacity (See Record of Hydrostatic Tests)

Tare weights (Yes or No). (See Record of Hydrostatic Tests)

These tanks were made by process of _____

_____

_____

The steel used was identified as indicated by the attached list showing the serial number of each tank, followed by the heat number of the plate, head, and bottom used in the tank.

The steel used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers were stamped into the metal.

All material, such as plates, billets, and seamless tubing, was inspected and each tank was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the tank. The processes of manufacture and heat treatment of tanks were supervised and found to be efficient and satisfactory.

The tank walls were measured and the minimum thickness noted was _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, bend and tensile tests of material, and other tests, as prescribed in this specification were made in the presence of the inspector and all material and tanks accepted were found to be in compliance with the requirements of this specification. Records thereof are attached hereto.

I hereby certify that all of these tanks proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission Specification No. _____.

(Signed) _____,

Inspector.

(Place) _____

(Date) _____

RECORD OF CHEMICAL ANALYSIS OF STEEL FOR TANKS

Numbered _____ to _____ inclusive

Size _____ inches outside diameter by _____ inches long

Made by _____ Company

For _____ Company

Heat No.	Chemical analysis									
	C	P	S	Si	Mn	Ni	Cr			

The analyses were made by

(Signed) _____

(Place) _____

(Date) _____

RECORD OF TENSILE TESTS OF MATERIAL IN TANKS

Numbered _____ to _____ inclusive

Size _____ inches outside diameter by _____ inches long

Made by _____ Company

For _____ Company

Heat No.	Yield point (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (percent in 8 inches)	Reduction of area (percent)	Bend test

(Signed) _____

(Place) _____

(Date) _____

RECORD OF HYDROSTATIC TESTS ON TANKS

Numbered _____ to _____ inclusive

Size _____ inches outside diameter by _____ inches long

Made by _____ Company

For _____ Company

Serial Nos. of tanks tested	Actual test pressure (pounds per square inch)	Total expansion (cc.) [1]	Permanent expansion (cc.) [1]	Percent ratio of permanent expansion to total expansion	Tare weight pounds [2]	Capacity in pounds of water

(Signed) _____

[1] If the tests are made by a method involving the measurement of the amount of liquid forced into the tank by the test pressure then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

[2] Do not include protective housing and cover but state whether with or without valves.

ICC-15. (c) Before a tank built under this specification is placed in service, the builder must furnish to the owner, Bureau of Explosives, and the Secretary, Mechanical Division, Association of American Railroads, a report in proper form certifying that the tank and its equipment comply with all the requirements of this specification including information as to the serial numbers, dates of test, and ownership marks on the tanks.

In the event the owner of the tank instead of the builder elects to furnish the appurtenances such as valve protection caps, loading and unloading valves, and safety valves or vents of the frangible disc or fusible plug type, the owner must furnish to the Bureau of Explosives and to the Secretary, Mechanical Division, Association of American Railroads, a report in proper form certifying that these appurtenances comply with all the requirements of this specification.

In case of alterations of or additions to tanks or equipment therefor from original design and construction or of repairs, there must be furnished to the owner, Bureau of Explosives, and the Secretary, Mechanical Division, Association of American Railroads, a report in detail of the repairs, alterations, or additions made to each tank covered by a particular application, showing the serial number of each tank involved and stating that heat-treatment called for by the particular type of repair authorized has been performed and that after repairs, alterations, or additions the tests prescribed in paragraph ICC-11 were made, results of hydrostatic tests reported, and tanks marked as prescribed in paragraph ICC-13.

Reports of retests must be rendered to the Bureau of Explosives and tank owner.

AAR-15. *Application for approval.* (a) See § 78.259 (f)—Application for Approval.

AAR-15. *Certificate of construction.* (b-1) See paragraph ICC-15 (b) for forms of certificates to be filed covering tanks only.

AAR-15. (b-2) For form of certificate covering Car Structure see § 78.259 (g) of this subpart—Certificate of Construction.

AAR-16. *Car structure.* (a) See § 78.263—Car Structure.

§ 78.276 *Specification for tank cars having forged lapwelded steel tanks Class ICC-106A800.* This specification covers Class ICC-106A800 tank cars having forged lapwelded steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC-106A500, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.275 Specification ICC-106A500).

ICC-8. *Venting, and loading and discharging valves.* (a) These valves must be of approved type, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 800 pounds per square inch without leakage. The valves must be screwed directly into tank heads or attached to tank heads by other approved methods. Provision must be made for closing the pipe connections of the valves.

ICC-9. (c) Safety valves must be set to open and vents of the frangible-disc type must function at a pressure of not exceeding 600 pounds per square inch. Vents of the fusible plug type must function at a temperature of not exceeding 175° F. (For tolerance see paragraph ICC-12.)

ICC-11. (b) Each tank must be tested to 800 pounds per square inch.

ICC–12. *Tests of safety valves and vents.* (a) Each valve must be tested by air or gas before being put into service and also at intervals as prescribed in paragraph ICC–13. The valve must open at a pressure of not exceeding 600 pounds per square inch and be vapor tight at 480 pounds per square inch which limiting pressures must not be affected by any auxiliary closure or other combination.

ICC–12. (b) For safety vents of the frangible disc type, a sample of the discs used must burst at a pressure of not exceeding 600 pounds per square inch and be vapor tight at 480 pounds per square inch.

ICC–14. (b) When longitudinal seam is water gas lap-welded, the mark must be ICC–106A800.

When longitudinal seam is fusion-welded, the mark must be ICC–106A800X.

§ 78.277 *Specifications for tank cars having seamless steel tanks Class ICC–107A****.* This specification covers Class ICC–107A**** tank cars having seamless steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

ICC–1. *Type and general requirements.* (a) Tanks built under this specification must be hollow forged or drawn in one piece. Forged tanks must be machined inside and outside before ends are necked down and, after necking down, the ends must be machined to size on the ends and outside diameter.

ICC–1. (b) Tanks must be fabricated by approved methods.

ICC–1. (c) For tanks made in foreign countries, chemical analysis of material and all tests as specified must be carried out within the limits of the United States under supervision of a competent and disinterested inspector; in addition to which, provisions of paragraph ICC–15 (b) and ICC–15 (c) of this specification must be carried out at the point of manufacture by a recognized inspection bureau with principal office in the United States.

ICC–1. (d) The terms "marked end" and "marked test pressure" used throughout this specification are defined as follows:

"Marked end" is that end of the tank on which marks prescribed in paragraph ICC–14 are stamped.

"Marked test pressure" is that pressure in pounds per square inch which is indicated by the figures substituted for the **** in the marking ICC–107A**** stamped on the marked end of tank.

ICC–1. (e) The gas pressure at 130° F. in the tank must not exceed 7/10 of the marked test pressure of the tank.

ICC–2. *Material.* (a) Tanks must be made from open hearth or electric steel of uniform quality. Material must be free from seams, cracks, laminations, or other defects injurious to finished tank. Forgings and seamless tubing for bodies of tanks must be stamped with heat numbers.

ICC–2. (b) Steel must conform to the following requirements as to chemical composition:

	Carbon steel percent	Alloy steel percent
Carbon.....not over..	0.55	[1] 0.50
Manganese.....do....	.80	[1] 1.65
Phosphorus:		
Acid.....do....	.05	.05
Basic.....do....	.04	.04
Sulphur:		
Acid.....do....	.06	.06
Basic.....do....	.05	.05
Sum of manganese and carbon [1].....not over..	.....	2.10

Steel containing other alloying elements may be used if approved.

For instructions as to the obtaining and checking of chemical analysis, see paragraph ICC–15 (b) 3.

ICC–2. (c) Each necked-down tank must be uniformly and properly heat treated. Heat treatment must consist of annealing or normalizing and drawing. Heat treatment involving the use of liquid quenching medium is prohibited, except under special approval. All scale must be removed from inside and outside of tank to an extent sufficient to allow proper inspection.

ICC–2. (d) Physical tests must be made on two test specimens 0.505 inch in diameter within 2-inch gauge length, taken 180° apart, one from each ring section cut from each end of each forged or drawn tube before necking down, or one from each prolongation at each end of each necked-down tank. These test specimen ring sections or prolongations must be heat treated with the necked-down tank which they represent. The width of the test specimen ring section must be at least its wall thickness. Only when diameters and wall thickness will not permit removal of 0.505 by 2-inch tensile test bar, laid in the transverse direction, may test bar cut in the longitudinal direction be substituted.

ICC–2. (e) Elastic limit, as determined by extensometer, must not exceed 70 percent of tensile strength. Determination shall be made at cross head speed of not more than 0.125 inch per minute with an extensometer reading to 0.0002 inch. The extensometer shall be read at increments of stress not exceeding 5,000 pounds per square inch. The stress at which the strain first exceeds

$$\frac{\text{stress (pounds per square inch)}}{30{,}000{,}000 \text{ (pounds per square inch)}} \text{ plus } 0.005 \text{ (inches per inch)}$$

shall be recorded as the elastic limit.

Elongation must be at least 20 percent and reduction of area at least 35 percent.

NOTE: Upon approval, the ratio of elastic limit to ultimate strength may be raised to permit use of special alloy steels of definite composition that will give equal or better physical properties than steels herein specified.

ICC–3. *Thickness of wall.*—(a) Minimum thickness of wall of each finished tank must be at least one-half inch and also such that at a pressure equal to 7/10 of the marked test pressure of the tank the calculated fiber stress in pounds per square inch at inner wall of tank multiplied by 3.6 will not exceed the tensile strength of any specimen taken from the tank and tested as prescribed in paragraph ICC–2 (d).

ICC–3. (b) Calculations to determine the maximum marked test pressure permitted to be marked on the tank must be made by the formula:

$$P = \frac{10\,S\,(D^2-d^2)}{7\,(D^2+d^2)},$$

where

P = Maximum marked test pressure permitted.

$$S = \frac{U}{3.6}$$

where

U = Tensile strength of that specimen which shows the lower tensile strength of the two specimens taken from the tank and tested as prescribed in paragraph ICC–2 (d).

3.6 = Factor of safety.

$\frac{D^2-d^2}{D^2+d^2}$ = The smaller value obtained for this factor by the operations specified in paragraph ICC–3 (c).

ICC–3. (c) Measure at one end, in a plane perpendicular to the longitudinal axis of the tank and at least 18 inches from that end before necking down—

d = Maximum inside diameter (inches) for the location under consideration; to be determined by direct measurement to an accuracy of 0.05 inch.

t = Maximum thickness of wall for the location under consideration; to be determined by direct measurement to an accuracy of 0.001 inch.

Take $D = d + 2t$.

Calculate the value of $\frac{D^2-d^2}{D^2+d^2}$

Make similar measurements and calculation for a corresponding location at the other end of the tank.

Use the smaller result obtained, from the foregoing, in making calculation prescribed in paragraph ICC–3 (b).

ICC–4. *Necked-down ends of tank.* (a) Each end must be closed by a cover made of forged steel. Covers must be secured to ends of tank by through bolts or studs not entering interior of tank. Covers must be of a thickness sufficient to meet test requirements of paragraph ICC–10 and to compensate for the openings closed by attachments prescribed herein.

It is also provided that each end may be closed by internal threading to accommodate an approved fitting. The internal threads as well as the threads on fittings for these openings shall be clean cut, even, without checks, and tapped to gauge. Taper threads are required and must be of a length not less than as specified for American Standard taper pipe threads. External threading of an approved type shall be permissible on the internal threaded ends.

ICC–4. (b) Loading and discharging valve or valves must be mounted on the cover or threaded into the marked end of tank. Safety devices must be mounted on the cover or threaded into the opposite end of the tank. If fittings are mounted on a cover, they must be of the flanged type.

ICC–4. (c) Joints between covers and ends and between cover and attachments must be of approved form and made tight against vapor or liquid leakage by means of a confined gasket of suitable material.

ICC–5. *Anchorage.* (a) The manner in which tanks are supported on and securely attached to car structure must be approved.

ICC–6. *Protective housing.* (a) Safety devices, and loading and discharging valves on tanks must be protected from accidental injury by approved metal housing, arranged so it may be readily opened to permit inspection and adjustment of safety devices and valves, and securely locked in closed position. Housing must be provided with opening having area equal to twice the total discharge area of safety devices inclosed.

ICC–7. *Loading and discharging valves.* (a) These valves must be of approved type, made of metal not subject to rapid deterioration by lading or in service, and must withstand without leakage a pressure equal to the marked test pressure of tank. Provision must be made for closing service outlet of valves.

ICC–8. *Safety devices.* (a) Tank must be equipped with one or more safety devices of approved type and discharge area, made of metal not subject to rapid deterioration by the lading or in service. Total discharge capacity must be such that, with tank filled with air at pressure equal to 70 percent of the marked test pressure of tank, discharge capacity will be sufficient to reduce air pressure to 30 percent of the marked test pressure within three minutes after safety devices open.

ICC–8. (b) Safety devices must open at pressure not exceeding the marked test pressure of tank and not less than 7/10 of marked test pressure. (For tolerance for safety valves, see paragraph ICC–12 (a).)

ICC–8. (c) Cars used for the transportation of flammable gases must have the safety

devices equipped with an approved ignition device.

ICC–9. *Fixtures.* (a) Attachments, other than those mounted on tank covers or serving as threaded closures for the ends of the tank, are prohibited.

ICC–10. *Tests of tanks.* (a) After heat treatment, tanks must be subjected to hydrostatic tests in a water jacket, or by other accurate method, operated so as to obtain reliable data. No tank shall have been subjected previously to internal pressure greater than 90 percent of the marked test pressure.

ICC–10. (b) Each tank must be tested to a pressure at least equal to the marked test pressure of the tank.

ICC–10. (c) Pressure must be maintained for 30 seconds, and sufficiently longer to insure complete expansion of tank. Pressure gauge must permit reading to accuracy of one percent. Expansion gauge must permit reading of total expansion to accuracy of one percent. Expansion must be recorded in cubic centimeters.

ICC–10. (d) Permanent volumetric expansion must not exceed 10 percent of total volumetric expansion at test pressure.

ICC–11. *Handling of tanks failing in tests.* (a) Tanks rejected for failure in any of the tests prescribed may be reheat treated, and will be acceptable if subsequent to reheat treatment they are subjected to and pass all of the tests.

ICC–12. *Tests of safety devices.* (a) Safety devices of valve type must be tested by air or gas before being put into service and also at intervals as prescribed in paragraph ICC–13 (b). Valve must open at pressure not exceeding the marked test pressure of tank and must be vapor tight at 80 percent of the marked test pressure. These limiting pressures must not be affected by any auxiliary closure or other combination.

ICC–12. (b) For safety devices of frangible disc type, samples of discs used must burst at pressure not exceeding the marked test pressure of tank and not less than 7/10 of marked test pressure. (See also paragraph ICC–13 (b).)

ICC–13. *Retests, alterations, and upkeep of tanks and safety devices.* (a) Each tank must be subjected at least once every five years to test prescribed in paragraphs ICC–10 (a), ICC–10 (b), ICC–10 (c) and ICC–10 (d). A tank must be condemned when it leaks or when permanent expansion exceeds 10 percent of total expansion. Reports giving data showing results of these tests must be rendered by party making tests to owner of tank and to the Bureau of Explosives, and each tank passing test must be marked with date (such as 1–50, for January 1950) plainly and permanently stamped into metal of marked end. Dates of previous tests must not be obliterated.

ICC–13. (b) Tanks used for transportation of flammable gases must have their safety devices of valve type retested at least once every two years in manner prescribed in paragraph ICC–12 (a); when safety devices of frangible disc type are used, one from each car must be tested every two years as prescribed in paragraph ICC–12 (b).

ICC–13. (c) All prescribed markings on tanks must be kept legible. Markings must not be added to or changed, except as follows:

1. By application of additional marks not affecting the marked test pressure or water capacity; these marks must not obliterate prescribed marks previously applied.

2. By application of test pressure marks, or alteration of such marks, to indicate reduced marked test pressure; authorized only for tanks that have not failed in 5-year test.

3. By change of serial numbers or ownership marks, or both, in which case report, in sufficient detail so that previous serial number and ownership mark can be determined for each tank, and arranged by lot numbers or by consecutive serial numbers, must be filed with the Bureau of Explosives.

ICC–14. *Marking.* (a) Each tank must be plainly and permanently marked, thus certifying that tank complies with all requirement of this specification. These marks (Note 1) must be stamped into metal of necked-down section of tank at marked end, in letters and figures at least 3/8 inch high, as follows:

NOTE 1: When these markings are obscured by the anchorage structure or otherwise, they must also be duplicated by stamping into the cover on marked end of tank, or on a brass plate permanently secured to this cover. In either case, the serial number of the tank must also be stamped into the face of the tank end so as to be readily visible when cover bearing markings is removed. Where closure is not effected by a cover, the serial number must be duplicated on the end of the tank so as to be readily visible in the completed assembly while duplication of other markings must be in an approved manner.

ICC–14. (b) ICC–107A****, the **** to be replaced by figures indicating the marked test pressure of the tank. This pressure must not exceed the calculated maximum marked test pressure permitted, as determined by the formula in paragraph ICC–3 (b).

ICC–14. (c) Serial number (immediately below foregoing).

ICC–14. (d) Inspector's official mark (immediately below serial number).

ICC–14. (e) Name, mark (other than a trade-mark), or initials of company or person for whose use tank is being made, which must be recorded with the Bureau of Explosives.

ICC–14. (f) Date (such as 1–50, for January 1950) of tank test, so placed that dates of subsequent tests may easily be added thereto.

ICC–14. (g) Date (such as 1–50 for January 1950) of latest test of safety device of valve type or of frangible disc type, required only when tank is used for transportation of flammable gases. This mark is not required to be stamped into metal of tank provided it is shown on chart as prescribed in Note 2 of paragraph ICC–14 (i).

ICC–14. (h) Water capacity at 60° F.—0000 pounds.

ICC–14. (i) Maximum gas pressure permitted in tank at 130° F. as follows:

Maximum gas pressure
at 130° F. 0000 lb. per sq. in.

NOTE 1: Figures substituted for 0000 must not exceed 7/10 of the marked test pressure of the tank. Charging pressure at temperatures lower than 130° F. must be such that at 130° F. the marked maximum gas pressure will not be exceeded.

NOTE 2: The maximum gas pressure for each tank mounted on the car may also be shown on a chart, as follows, displayed on inside wall of the cab (or housing) which protects marked end of tanks.

(Name of gas for which tanks are being used)

Serial No. of tank	Marked maximum gas pressure at 130° F.[1]	See note [2]	Date of latest safety device test

[1] A single maximum gas pressure at 130° F. may be shown for all tanks on the car provided it does not exceed the lowest marked maximum gas pressure at 130° F. of any tank on the car.

[2] Allowable maximum charging pressures at various temperatures below 130° F. may also be shown on chart if desired.

ICC–14. (j) Name of gas for which tank is being used, stenciled in letters at least two inches high on each tank where they are clearly visible. When the design of the tank is such that this stenciled marking cannot be applied where it is clearly visible to person loading tank, this marking must be stenciled on the cover or on the brass plate on marked end of tank, in letters at least one-half inch high, or shown on the chart prescribed in Note 2 of paragraph ICC–14 (i).

AAR–14. (a) For determining water capacity of tank in pounds, the weight of a gallon (231 cu. in.) of water at 60 degrees F. in air shall be 8.32828 pounds.

AAR–14. (b) For all other markings see figure 1.

ICC–15. *Inspection and reports.* (a) Before a tank car is placed in service, party assembling completed car must furnish to car owner, the Bureau of Explosives, and the Secretary, Mechanical Division, Association of American Railroads, a report in proper form certifying that tanks and their equipment comply with all requirements of this specification and including information as to serial numbers, dates of tests, and ownership marks on tanks mounted on car structure. In case of alterations of or additions to tanks or equipment therefor from original design and construction, there must be furnished to the same parties a report in detail of the alterations or additions made to each tank covered by a particular application, showing the serial number of each tank involved.

ICC–15. (b) Purchaser of tanks must provide for inspection by a competent inspector as follows:

1. Inspector must carefully inspect all material and reject that not complying with paragraph ICC–2.

2. Inspector must stamp his official mark on each forging or seamless tube accepted by him for use in making tanks, and must verify proper application of heat number to such material by occasional inspections at steel manufacturer's plant.

3. Inspector must obtain certified chemical analysis of each heat of material. He must also verify analysis by a check analysis of one sample from top of each ingot after cropping and boring, or after cropping, piercing, and forging. Sample must be taken at mid-wall thickness. For tanks made of seamless tubing, when the foregoing ingot check analysis is not practicable, inspector must verify analysis by check analysis of sample from one section of tubing from each heat of material. Check analysis must include quantitative determinations of all important elements present, in addition to those specified in paragraph ICC–2 (b).

4. Inspector must make inspection of inside surface of tanks before necking down, to insure that no seams, cracks, laminations, or other defects exist.

5. Inspector must fully verify compliance with specification, verify heat treatment of tank as proper; obtain samples for all tests and check chemical analyses; witness all tests; and report minimum thickness of tank wall, maximum inside diameter, and calculated value of D, for each end of each tank as prescribed in paragraph ICC–3 (c).

6. Inspector must stamp his official mark on each accepted tank immediately below serial number, and make certified report (see paragraph ICC–15 (c)) to builder, to company or person for whose use tanks are being made, to builder of car structure on which tanks are to be mounted, to the Bureau of Explosives, and to the Secretary, Mechanical Division, Association of American Railroads.

ICC–15. (c) Inspector's report required herein must be in the following form:

(Place) _____
(Date) _____

STEEL TANKS

It is hereby certified that drawings were submitted for these tanks under A. A. R. Application for Approval No. _____ and approved by the A. A. R. Committee on Tank Cars under date of _____
Built for _____ Company

Location at _____
Built by _____ Company
Location at _____
Consigned to _____
Location at _____
Quantity _____
Length (inches) _____

Marks stamped into tank as required in paragraph ICC–14 are:

ICC–107A****

NOTE: The marked test pressure substituted for the **** on each tank is shown on Record of General Data on Tanks attached hereto.

Serial numbers _____ to _____ inclusive
Inspector's mark _____
Owner's mark _____
Test date _____
Water capacity (see Record of Hydrostatic Tests).
Tare weights (yes or no) (see Record of Hydrostatic Tests).
These tanks were made by process of _____

_____

_____

Steel used was identified as indicated by the attached list showing the serial number of each tank, followed by the heat number.

Steel used was verified as to chemical analysis and record thereof is attached hereto. Heat numbers were stamped into metal.

All material was inspected and each tank was inspected both before and after closing in ends; all material accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to strength of tank. Processes of manufacture and heat treatment of tanks were witnessed and found to be efficient and satisfactory.

Before necking down ends, each tank was measured at each location prescribed in paragraph ICC–3 (c) and minimum wall thickness in inches at each location was recorded; maximum inside diameter in inches at each location was recorded; value of D in inches at each location was calculated and recorded; maximum fiber stress in wall at location showing larger value for

$$\frac{D^2+d^2}{D^2-d^2}$$ was calculated for 7/10

the marked test pressure and recorded. Calculations were made by the formula:

$$S=0.7\,P\,\frac{(D^2+d^2)}{(D^2-d^2)}$$

Hydrostatic tests, tensile tests of material, and other tests, as prescribed in this specification, were made in the presence of the inspector, and all material and tanks accepted were found to be in compliance with the requirements of this specification. Records thereof are attached hereto.

I hereby certify that all of these tanks proved satisfactory in every way and comply with the requirements of Interstate Commerce Commission specification No. 107A****.

(Signed) _____
(Inspector)
(Place) _____
(Date) _____

RECORD OF CHEMICAL ANALYSIS OF STEEL FOR TANKS

Numbered _____ to _____ inclusive
Size _____ inches outside diameter by _____ inches long
Built by _____ Company
For _____ Company

Heat No.	Tanks represented (Serial Nos.)	Chemical analysis							
		C	Mn	P	S	Si	Ni	Cr	Mo

These analyses were made by:
(Signed) _____

(Place) _____
(Date) _____

RECORD OF TENSILE TESTS OF MATERIAL IN TANKS

Numbered _____ to _____ inclusive.
Size _____ inches outside diameter by _____ inches long.
Built by _____ Company.
For _____ Company.

Heat No.	Tanks represented by test (Serial Nos.)	Elastic limit (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (per cent in 2 inches)	Reduction of area (percent)

(Signed) _____

(Place) _____
(Date) _____

RECORD OF HYDROSTATIC TESTS ON TANKS

Numbered _____ to _____ inclusive
Size _____ inches outside diameter by _____ inches long
Built by _____ Company.
For _____ Company.

Serial Nos. of tanks	Actual test pressure (pounds per square inch)	Total expansion (cc.)[1]	Permanent expansion (cc.)[1]	Percent ratio of permanent expansion to total expansion[1]	Tare weight (pounds)[2]	Capacity in pounds of water at 60° F.

(Signed) _____

[1] If tests are made by method involving measurement of amount of liquid forced into tank by test pressure, then the basic data on which calculations are made, such as pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

[2] Do not include protective housing, but state whether with or without valves.

(Place) _____
(Date) _____

RECORD OF GENERAL DATA ON TANKS

Numbered _____ to _____ inclusive
Built by _____ Company
For _____ Company

Serial No. of tank	Date obtained as prescribed in par. ICC-3(c)						$\frac{D^2+d^2}{D^2-d^2}$ Larger value of the factor	(S) Calculated fiber stress in lb. per sq. in. at 7/10 marked test pressure	Marked test pressure in lb. per sq. in. stamped in tank	Minimum tensile strength of material in lb. per sq. in. recorded
	Marked end of tank			Other end of tank						
	(t) Minimum thickness of wall in inches	(d) Maximum inside diameter in inches	(D) Calculated value of D in inches $=d+2t$	(t) Minimum thickness of wall in inches	(d) Maximum inside diameter in inches	(D) Calculated value of D in inches $=d+t$				

(Signed) _____

AAR–15. *Application for approval.* (a) See § 78.259 (f)—Application for Approval.

AAR–15. *Certificate of construction.* (b–1) See paragraph ICC-15 (c) for forms of certificates to be filed covering tanks only.

AAR–15. (b–2) For form of certificate covering car complete with tanks mounted thereon see § 78.259 (g)—Certificate of Construction.

AAR–16. *Car structure.* (a) See § 78.263—Car Structure.

§ 78.278 *Specification for tank cars having lined, coated, or treated wooden-stave metal-hooped tanks Class ICC–108.* This specification covers Class ICC–108 tank cars having lined, coated, or treated wooden-stave metal-hooped tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

ICC–1. *Type.* (a) Tanks built under this specification may be cylindrical, elliptical, or rectangular, with flat heads inserted inside the ends of the tank in rabbets or tied to the end of the tank and to each other by rods on the outside of the tank, and must have at least one filling and discharge opening in the top of the tank which can be securely closed. The tank must have no bottom or side openings, but may be provided with a recess cut in the bottom of the inside of the tank not over 12 inches in diameter and 1 inch deep to form a well or sump to facilitate unloading.

ICC–2. *Bursting strength.* (a) Not specified.

ICC–3. *Material.* (a) All tank staves and heads must be made of a good grade of well-dried tank lumber of a minimum thickness of 3 inches, stock size, as free from shakes and knots as possible. Lumber used for closure of filling and discharge openings and tank covers may be of 2-inch stock size. Tank hoops and tie-rods must be made of suitable metal. Metal reinforcing rings on the heads when required must be made at least one-half inch thick.

ICC–4. *Thickness of material.* (a) Tank hoops and tie-rods must not be less than three-fourths inch in diameter. (See also par. ICC–3.)

ICC–5. *Tank heads.* (a) Tank heads must be made flat, of one or more thicknesses of lumber. Outside heads must be reinforced by flat or angle metal rings at least 3 inches wide and one-half inch thick and having an outside diameter not exceeding by more than twice the thickness of the ring that of the diameter of the outside heads, which must be at least 6 inches larger in diameter than the outside diameter of the tank body. Rings and projection of the heads must be perforated to receive the tie-rods which extend from ring to ring, thus securing the outside heads to the tank. When tanks are mounted vertically on cars, the metal reinforcing rings of the outside heads may be omitted, in

which case the upper end of the tank may be closed with a cover built up with the underside flat and constructed with wooden top battens of at least 4 inches by 6 inches, stock size. The cover must be larger than the tank and have a projection over the side of the tank of at least 3 inches on all sides. The battens holding the cover planking together must extend beyond the tank in order to receive the holding-down bolts which secure the tank to the underframe of the car on which it is mounted. The cover may be provided with one manhole of suitable size to permit access to the interior of the tank. The manhole must be provided with a wooden cover at least 2 inches thick built up in one piece with top battens, and must be securely fastened in place. The manhole cover must be provided with a filling and discharge opening, securely closed.

ICC–6. *Lining, coating, or treatment.* (a) The entire interior of the tank must be lined or coated or treated as follows:

ICC–6. (b) Lined with pure unvulcanized para or plantation stock rubber, free from adulterants or loading, at least one-sixteenth inch in thickness, or other approved rubber compound at least one-sixteenth inch in thickness, cemented directly to the lumber. The joints in the rubber lining must be made by either a butt joint with a cover strip or a lap weld, b t in all cases the joints between rubber and rubber must be made by welding the layers together with a pressure roller. The joints in the rubber lining may also be vulcanized. Rubber cement used for applying the rubber lining must be made of the same stock as the rubber lining, and any coloring pigment used in this cement solution must not react with hydrochloric acid to form a gas.

ICC–6. (c) Coated with asphaltum, coal tar, pitch, or other suitable material which will remain in plastic condition and not be subject to destruction by the lading.

ICC–6. (d) Treated with a material suitable for withstanding the action of the acid.

ICC–7. *Painting.* (a) All outside wooden and metal parts of the tank must be painted with an acid-resisting paint or with hot application of pitch to fill in all crevices.

ICC–8. *Joints.* (a) Joints between outside heads and ends of staves of tank and between filling and discharge openings and their covers must be made tight against leakage by the use of soft-rubber gaskets or by the cementing together of the lining of the tank and the lining of the heads. Joints between the staves may be calked, if necessary, with the same material with which the tank is lined, coated, or treated.

ICC–9. *Plugs for openings.* (a) Filling and discharge openings when not closed with a cover may be closed by a plug tapered to fit the opening, and the top diameter of the plugs must be at least 1 inch larger than the top diameter of openings. Plugs must be securely fastened in position, but need not be pressure tight.

ICC–10. *Test of tanks.* (a) Before a completed tank is placed in service there must be tightly inserted into or attached to the filling opening a pipe of such length that a hydrostatic head of at least 3 feet above the top of the interior of the tank is established by filling the tank and pipe with water having a temperature not exceeding 100° F. Tank must hold the water for not less than 30 minutes without leak or evidence of distress.

ICC–11. *Marking.* (a) Each tank must be marked, thus certifying that the tank complies with all the requirements of this specification. These marks must be as follows:

ICC–11. (b) ICC–108 in letters and figures not less than ⅜ inch high, stamped plainly and permanently into the lumber near the center of one outside head of the tank. This mark must also be stenciled on the tank in letters and figures at least 2 inches high.

ICC–11. (c) Initials of manufacturer and date of original test of tank in letters and figures not less than ⅜ inch high, stamped plainly and permanently into the lumber of the tank immediately below the stamped mark specified in paragraph ICC–11 (b). These initials and date must also be stenciled on the tank in letters and figures at least 2 inches high.

ICC–11. (d) "Rubber-lined tank-pressure test not required," or "Coated tank-pressure test not required," or "Treated tank-pressure test not required," stenciled on the tank immediately below the stenciled mark specified in paragraph ICC–11 (c).

AAR–11. (a) For all other markings, see Figure 1.

ICC–12. *Reports.* (a) Before a tank car is placed in service the party assembling the completed car must furnish to car owner, Bureau of Explosives, and the Secretary, Mechanical Division, Association of American Railroads, a report in approved form certifying that the tank and its equipment comply with all the requirements of this specification. In case of alterations of the tank or equipment therefor from original design, a similar report must be rendered to the same parties.

AAR–12. *Application for approval.* (a) See § 78.259 (f)—Application for Approval.

AAR–12. *Certificate of construction.* (b) See § 78.259 (g)—Certificate of Construction.

AAR–13. *Anchorage.* (a) Must be of approved design.

AAR–14. *Car structure.* (a) See § 78.263—Car Structure.

§ 78.279 *Specification for tank cars having metal-jacketed, coated, wooden-stave metal-hooped tanks, Class ICC–108A.* This specification covers Class ICC–108A tank cars having metal-jacketed, coated, wooden-stave metal-hooped tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC–108, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.278 Specification ICC–108):

ICC–1. *Type.* (a) Tanks built under this specification must be cylindrical, with flat heads inserted inside the ends of the tank in rabbets or tied to the end of the tank and to each other by rods on the outside of the tank, and must have at least one filling and discharge opening in the top of the tank which can be securely closed. The tank must have no bottom or side openings, but may be provided with a recess cut in the bottom of the inside of the tank not over 12 inches in diameter and 1 inch deep to form a well or sump to facilitate unloading.

ICC–1. (b) Tank must be inclosed within a metal jacket. The space between the wooden tank and the metal jacket must be filled with material not subject to destruction by the lading.

ICC–3. (b) Plates for metal jacket may be made of open-hearth boiler-plate steel of flange quality, or ordinary rolled steel. The minimum thickness of plates for the metal jacket, including thickness of each plate at rivet seams, must be as follows:

Diameter of tanks	Bottom sheet	Center shell sheet	Other shell sheets	Dome sheets	Tank heads
Up to 96 inches	Inch ½	Inch ½	Inch ¼	Inch ½	Inch ¼

Rivets may be of the same quality as used for steam boilers and other pressure vessels or of ordinary steel.

AAR–3. (a) All plates used for metal jacket must be of open-hearth boiler plate steel of flange quality complying with requirements of current A. A. R. Specification M–115, titled: Steel, Boiler and Firebox, for Locomotives.

AAR–3. (b) All rivets must be in accordance with current A. A. R. Specification M–110, titled: Boiler Rivet Steel and Boiler Rivets.

ICC–5. (b) The tank heads of the metal jacket must be flat and flanged for riveting on the outside of the tank.

ICC–6. (e) The open spaces between the wooden tank and the metal jacket must be filled with asphaltum, coal tar, pitch, or other suitable material which will remain in plastic condition and not be subject to destruction by the lading.

ICC–11. (b) ICC–108A in letters and figures not less than ⅜ inch high, stamped plainly and permanently into the metal near the center of one head of the jacket. This mark must also be stenciled on the jacket in letters and figures at least 2 inches high.

ICC–11. (c) Initials of manufacturer and date of original test of tank in letters and figures not less than ⅜ inch high, stamped plainly and permanently into the metal of the jacket immediately below the stamped mark specified in paragraph ICC–11 (b). These initials and date must also be stenciled on the jacket in letters and figures at least 2 inches high.

ICC–11. (d) "Coated, wooden-lined tank-pressure test not required," stenciled on the jacket immediately below the stenciled mark specified in paragraph ICC–11 (c).

ICC–13. *Riveting* (a) All seams formed in the manufacture of the jacket and in the attachment of fixtures and connections may be single riveted. Seams must be riveted metal to metal without interposition of other material. The efficiency of the seams, when single riveted, must be at least 45 percent and when double riveted, must be at least 70 percent of the strength of the thinnest plate specified in paragraph ICC–3 (b).

ICC–14. *Calking.* (a) All seams and rivets in the metal jacket must be calked on the outside when necessary to prevent seepage of intermediate filler.

ICC–14. (b) The edges of steel plates at all riveted seams must be prepared for calking so that the angle of the calking edge will be between 60 and 70 degrees with the flat surface of the plate, except that the ends of the bottom sheet, edges of upper sheets at ends of tank, and edges of tank-head flanges must be at right angles to the surface of the plates. The extreme calking edge distance, measured from center line of rivet hole, must be not less than one and one-half times the diameter of the hole and not more than that distance plus one-quarter inch.

§ 78.280 *Specification for tank cars having fusion-welded steel tanks Class ICC–103–W.* This specification covers Class ICC–103–W tank cars having fusion-welded steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

ICC–1. *Type.* (a) Tanks built under this specification must be cylindrical, with heads dished convex outward, and must have at least one expansion dome with manhole, and such other external projections as are prescribed herein. When the interior of the tank is divided into compartments, each compartment must have two heads dished

convex outward, one expansion dome with manhole, and such other external projections as are prescribed herein.

AAR–1. *Lagging.* (a) Not a specification requirement. If applied, the tank shell and dome must be lagged with an approved insulation material of a thickness so that the thermal conductance is not more than 0.225 B. t. u. per square foot, per degree Fahrenheit differential in temperature, per hour.

AAR–1. (b) Before lagging is applied the tank surfaces to be lagged and the inside surface of the metal jacket shall be painted with paint which is not affected by the lading.

AAR–1. (c) The barrel, ends and dome of tank, except seatings of tanks on bolster and pads of fixtures, shall be lagged with insulating material.

AAR–1. (d) The lagging throughout shall be covered with a metal jacket not less than ⅛ inch in thickness.

AAR–1. (e) Openings through lagging shall be flashed around projections to prevent admission of water. Top of dome shall be so constructed that liquids cannot enter between dome wall and outer shell.

ICC–2. *Bursting pressure.* (a) The calculated bursting pressure, based on the lowest tensile strength of the plate and the efficiency of the longitudinal welded joint, must be at least 300 pounds per square inch.

AAR–2. *Thickness of plates.* (a) The wall thickness in the cylindrical portion of the tank must be calculated by the following formula but in no case shall the wall thickness be less than that specified in par. ICC–4.

$$t = \frac{P \times d}{2\ S \times E}$$

where

t = thickness in inches of thinnest plate;
P = calculated bursting pressure lb. per sq. in.;
d = inside diameter in inches;
S = minimum ultimate tensile strength in lb. per sq. in.;
E = efficiency of longitudinal welded joint = 90 percent.

ICC–3. *Material.* (a) All plates for tank and expansion dome must be made of open-hearth boiler-plate steel of flange quality, the carbon content of which shall not exceed 0.30 percent. These plates may also be clad with other metals, such as nickel, etc.

ICC–3. (b) All external projections must be made of materials specified hereinafter.

ICC–3. (c) Rivets, if used, must be of the same quality as used for steam boilers and other pressure vessels. When clad plates are used and attachments are riveted the rivet heads inside the tank must be clad with the same material, or, rivets may be of the same cladding material provided rivets have physical properties at least equivalent to rivets prescribed herein.

ICC–3. (d) Tanks made of clad plates must be stenciled "Tank clad with (naming material)."

AAR–3. (a) All plates used for tank and expansion dome, where expansion dome is required, must be of open hearth boiler plate steel of flange quality complying with requirements of current A. A. R. Specification M–115, titled Steel, Carbon and Carbon-Silicon, Boiler and Firebox, for Locomotives, Stationary Boilers and Other Pressure Vessels or ASTM Standard Specifications A–212 titled High Tensile Strength Carbon-Silicon Steel Plates for Boilers and Other Pressure Vessels, Grade A and Grade B, Flange and Firebox, with the carbon content of the plates used not to exceed 0.30 percent. These plates may also be clad with other metals, such as nickel, etc.

AAR–3. *Lining.* (b) Not a specification requirement. If applied, must be approved as to material and method of application.

AAR–3. (c) All rivets must be in accordance with current A. A. R. Specification M–110, titled Boiler Rivet Steel and Boiler Rivets. When clad plates are used, the rivet heads inside the tank must be clad with the same material or rivets may be of the same cladding material, provided rivets have physical properties at least equivalent to rivets prescribed herein.

AAR–3. (d) Lined tanks must be stenciled on the tank, or jacket if lagged, in letters at least 2 inches high, immediately above the stenciled mark specified in paragraph ICC–20 (b). "----------lined tank." (naming material)

ICC–4. *Thickness and width of plates.* (a) The minimum thickness of plates must be as follows:

Inside diameter of tanks	Bottom sheets	Shell sheets	Expansion dome sheets	Tank heads	Expansion dome heads	Interior compartment heads,
	Inch	*Inch*	*Inch*	*Inch*	*Inch*	*Inch*
60 inches or under	7/16	¼	5/16	½	5/16	5/16
Over 60 to 78 inches	7/16	5/16	5/16	½	5/16	5/16
Over 78 to 96 inches	½	⅜	5/16	½	5/16	⅜
Over 96 to 112 inches	½	7/16	5/16	9/16	5/16	7/16
Over 112 to 122 inches	½	½	5/16	⅝	5/16	½

ICC–4. (b) The minimum thickness of clad plates, where cladding material has physical properties at least equal to that of the base plate prescribed in paragraph ICC–3 (a), must be as prescribed in the above table. Where the cladding material does not have physical properties at least equal to that of the base plate prescribed in paragraph ICC–3 (a), minimum thickness of base plate must be as prescribed in the above table.

ICC–4. (c) The minimum width of bottom sheet of tank must be 60 inches, measured on the arc, but in all cases the width must be sufficient to bring the entire width of the longitudinal welded joint, including welds, above the cradle.

ICC–4. (d) Expansion dome heads for domes exceeding 70 inches in diameter must have a minimum thickness of ⅜ inch.

AAR–4. (a) For extreme diameter A. A. R. clearance requirements govern.

AAR–4. (b) For tanks built of one piece cylindrical sections, the thickness specified for bottom sheet must apply to the entire cylindrical shell.

AAR–4. (c) For tanks without underframe the minimum thickness of bottom sheet must be not less than ⅝ inch.

AAR–4. (d) When tank is divided into compartments the interior head must comply with the requirements for interior compartment heads prescribed herein. When capacity of tank is reduced by moving in the exterior head a new exterior head of approved contour not less than ⅜ inch thickness must be applied. When the capacity is reduced by the insertion of a new interior head this head must comply with the requirements for interior compartment heads and the exterior head reapplied. Voids, created by the addition of heads for division into compartments or reduction in capacity, must be provided with a tapped drain hole at their lowest point, and a tapped hole at top of tank. The top hole must be closed, and the bottom hole may be closed, with not less than ¾ inch nor more than 1½ inch solid pipe plugs having standard pipe threads.

ICC–5. *Dishing of tank heads.* (a) Tank heads must be of approved contour.

AAR–5. (a) Tank heads must be dished for pressure on concave side and to main inside radius not exceeding 10 feet. The inside knuckle radius must be not less than 3¾ inches except for interior heads of compartment tanks the knuckle radius must be not less than 1½ inches.

ICC–6. *Welding.* (a) All joints must be fusion welded by a process which investigation and laboratory tests by the Mechanical Division of the Association of American Railroads have proved will produce satisfactory results.

ICC–6. (b) Manhole ring, safety valve flange, and bottom outlet nozzle flange or other attachments may be riveted or fusion welded. Riveted joints must be made metal to metal without interposition of other material. Rivets, if used, must be driven hot and calked inside. For computing rivet areas the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by more than 1/16 inch. Use of rivets of less than ⅝ inch nominal diameter prohibited. Fusion-welding for securing these attachments in place must be of double-welded butt joint type or double full-fillet lap joint type.

ICC–6. *Calking.* (c) All attachments riveted to the tank must have the rivets and the joints formed by attachments calked on the inside of tank.

AAR–6. *Welding.* (a) Fusion welding to be performed by fabricators certified by Association of American Railroads as qualified to meet the requirements of this specification. All joints must be fabricated by means of fusion welding in accordance with the following requirements:

AAR–6. *Definitions.* (b–1). *Fusion welding.* A process of welding metals in the molten, or molten and vaporous state without the application of mechanical pressure or blows.

AAR–6 (b–2). *Double-welded butt joint.* A joint formed by the fusion of two abutting edges with a filler metal added from both sides of the joint and with reinforcement on both sides. (For permission to remove reinforcements see paragraph AAR–6 (m–1).)

NOTE: A joint with filler metal added from one side only is considered equivalent to a double-welded butt joint when and if means are provided for accomplishing complete penetration and reinforcement on both sides of the joint.

AAR–6 (b–3). *Full-fillet joint.* A fusion weld of approximately triangular cross section the throat of which lies in a plane disposed approximately 45 degrees with respect to the surface of the parts joined, and built up to the full thickness of the plate or nozzle flange that is being joined to a parallel plate, having the throat not less than 0.7 the thickness of the edge of the plate being welded.

AAR–6 (b–4). *Throat.* The minimum thickness of a weld along a straight line passing through the bottom of the cross sectional space provided to contain a fusion weld.

AAR–6 (b–5). *Single full-fillet lap joint.* A single full-fillet lap joint is one in which the overlapped edges of two plates are full-fillet-welded along one edge only.

AAR–6 (b–6). *Double full-fillet lap joint.* A double full-fillet lap joint is one in which the overlapped edges of the plates to be joined are full-fillet-welded at the edge of each plate.

NOTE: When attachments, referred to in paragraph ICC–6 (b) have flanges thicker than the plates to which they are joined, and are secured in place by fillet welds such welds shall be of the double full-fillet lap joint type in which the throat is not less than 0.7 the thickness of the plate to which the attachment is joined.

AAR–6 (b–7). *Plug weld.* A plug weld is one used to join two plates by welding

through a hole in one of them to secure a bond and subsequently filling the hole with weld metal. Plug welds to be used only in conjunction with fillet welds.

AAR–6. *Joint efficiency, maximum.* (c) The efficiencies for computing the value of the various types of fusion-welded joints in tanks constructed in conformity with requirements of this specification shall not exceed the following:

Type of joint	*Efficiency of joint, percent*
Double-welded butt joint	90.0
Full-fillet joint:	
Single full-fillet lap joint without plug welds (see fig. 21)	55.0
Single full-fillet lap joint with plug welds (see fig. 20)	65.0
Double full-fillet lap joint	65.0

NOTE: Strength of fillet welds shall be computed on the throat dimension of the triangular section, using the strength in shear and in conjunction with the stresses given below, multiplied by the joint efficiency given above.

For end welds, the maximum shear stresses shall be 80.0 percent of the tensile strength of the plate used.

For side welds, the maximum shear stresses shall be 60.0 percent of the tensile strength of the plate used.

Plug-weld. The maximum load on each plug weld shall be computed for either shear or tension by the following formula:

$L = 0.63\ (d - \frac{1}{4})^2 \times s$, where

L = total maximum load in shear or tension on each plug weld in lb.

d = diameter of the bottom of the hole in which the plug is made in inches.

s = maximum stress in shear or tension, as the case may be, in lb. per sq. inch:

s for shear = 44,000

s for tension = 55,000

Welding must meet the following test requirements:

AAR–6. *Test plates.* (d–1) A test plate of the dimensions shown in Figure 10 from steel of the same specifications and thickness as the shell plates prepared for welding, may be attached to the shell plate being welded, as in Figure 9, on one end of one longitudinal joint of each tank so that the edges to be welded in the test plate are a continuation of and duplication of the corresponding edges of the longitudinal joint. In this case the weld metal shall be deposited in the test plates continuously with the weld metal deposited in the longitudinal joint. The plates for test samples may be taken from any part of one or more plates of the same lot of material that is used in the fabrication of welded tanks and without reference to the direction of the mill rolling. As an alternate method, a detached test plate may be welded as provided for in AAR–6 (d–2). When more than one welding operator is employed on a tank, the required test plates for the individual tanks shall be made by the welding operator designated by the inspector.

AAR–6. (d–2) When a test plate is welded for the longitudinal joints, none need be furnished for circumferential joints in the same tank, providing the welding process, procedure, and technique are the same.

AAR–6. (d–3) When there are several tanks being welded in succession, or at any one time, the plate thicknesses of which fall within a range of ¼ inch, each 200 feet of longitudinal and circumferential seams may be considered as the equivalent of one tank and only the test plates required by paragraphs AAR–6 (d–1) and AAR–6 (d–2) need be made, provided they are welded in the same way as the joints in question. When the manufacturer is in the regular and continuous production of ICC–103–W, ICC–103A–W, ICC–103B–W, ICC–104–W, ICC–104A–W, ICC–105A300–W, ICC–105A400–W, ICC–105A500–W and ICC–105A600–W tanks, only one test plate need be made for one tank out of twenty (20) of any of these classes, provided a minimum of one (1) test plate per week for any of these classes is made. The test plates shall be so supported that warping due to welding shall not throw the finished test plate out of line by an angle of over 5 degrees.

AAR–6. (d–4) Where the welding has warped the test plates they shall be straightened before being stress relieved. The test plates shall be subjected to the same stress-relieving operation as required by AAR–6 (p). At no time shall the test plates be heated to a temperature higher than that used for stress relieving the tank.

AAR–6. *Test specimens.* (e) The coupons for tension and bend test shall be removed as shown in Figure 10 and be of the dimensions shown in Figures 10 and 11.

AAR–6. *Tension tests.* (f–1) Two types of tension-test specimens are required, one of the joint and the other of the weld metal. The tension specimen of the joint shall be transverse to the welded joint, and shall be the full thickness of the welded plate after the outer and inner surfaces of the weld have been machined to a plane surface flush with the plate.

AAR–6. (f–2) The tensile strength of the joint specimen in Figure 10 shall not be less than the minimum of the specified tensile range of the plate used. (The tension test of the joint specimen as specified herein is intended as a test of the welded joint and not of the plate. If the specimen breaks in the plate and the weld shows no sign of weakness, the test may be accepted as meeting the requirements even though the stress at which failure occurs is less than the minimum of the specified range.)

AAR–6. (f–3) The tension-test specimen of the weld metal shall be taken entirely from the deposited weld metal and shall meet the following requirements:

Tensile strength = at least that of the minimum of the range of the plate which is welded:

Elongation, minimum = 20 percent in 2 inches.

For plate thicknesses less than ⅝ inch, the all-weld-metal tension test may be omitted.

AAR–6. *Bend tests.* (g–1) The bend-test specimen shall be transverse to the welded joint of the full thickness of the plate and shall be of rectangular cross-section with the width 1½ times the thickness of the specimen. The inside and outside surfaces of the weld shall be machined to a plane surface flush with the plate. The edges of this surface shall be rounded to a radius not over 10 percent of the thickness of the plate. The specimen shall be bent cold under free bending conditions until the least elongation measured within or across approximately the entire weld on the outside fibers of the bend-test specimen is 30 percent.

AAR–6. (g–2) When a crack is observed in the convex surface of the specimen between the edges the specimen shall be considered to have failed and the test shall be stopped. Cracks at the corners of the specimen shall not be considered as a failure. The appearance of small defects in the convex surface shall not be considered as a failure if the greatest dimension does not exceed 1/16 inch.

AAR–6. *Specific gravity of weld metal.* (h) No specific gravity test required.

AAR–6. *Retests.* (i–1) Should any of the tests fails to meet the requirements by more than 10 percent, no retests shall be allowed.

AAR–6. (i–2) Should any of the tests fail to meet the requirements by 10 percent or less, retests shall be allowed. A second test plate shall be welded by the same operator who welded the plate which failed to meet the test requirements. The retest shall be made on specimens cut from the second plate.

AAR–6. (i–3) The retests shall comply with the requirements. For either of the tension retests, two specimens shall be cut from the second test plate, and both of these shall meet the requirements.

AAR–6. (i–4) When there is more than one specimen of the same type and when one or more of the group specimens fail to meet the requirements by 10 percent or less, the retest shall be made on an entire group of specimens, which shall meet the requirements.

AAR–6. (i–5) If the percentage of elongation of any tension test specimen is less than that specified and any part of the fracture is more than ¾" from the center of the gauge length of the 2" specimen, or is outside of the middle third of the gauge length of the full-size specimen as indicated by the scribe scratches marked on the specimen before testing, a retest shall be allowed.

AAR–6. *Nondestructive tests.* (j–1) All longitudinal and circumferential welded joints of the tank shell shall be examined throughout their entire length by the X-ray or the gamma-ray method of radiography. When a nozzle, expansion dome or fitting is attached to a tank by a flange or saddle inserted in and butt welded to the shell at the edge of the flange as shown in Figure 22, the weld so made shall be radiographed. Radiographic examination of welds attaching other designs of nozzles, expansion domes or fittings to the tank shell may be omitted.

AAR–6. (j–2) Where excess metal is removed welded joints shall be prepared as follows: The weld reinforcements on both the inside and outside shall be ground, chipped and ground, or suitably machined to remove the irregularities of the weld surface so that it merges smoothly into the plate surface. The finished surface of the reinforcement may have a crown of uniform amount not to exceed approximately 1/16".

AAR–6. (j–3) The films obtained by the use of X-rays shall be known as "exographs," and those obtained by the use of gamma rays as "gammagraphs." Both types of films shall be generally termed "radiographs."

AAR–6. (j–4) The weld shall be radiographed with a technique which will determine quantitatively the size of defects with thicknesses equal to and greater than 2 percent of the thickness of the base metal. To determine whether the radiographic technique employed is detecting defects of a thickness equal to and greater than 2 percent of the thickness of the base metal, suitable thickness gauges or penetrameters shall be placed on the side of the plate nearest the source of radiation and used in the following manner:

AAR–6. (j–4) (1) To determine whether the radiographic technique employed is detecting defects of a thickness equal to and greater than 2 percent of the thickness of the base material, thickness gauges or penetrameters of the type shown in Figure 12 shall be placed on the side of the plate nearest the source of radiation and used as directed.

AAR–6. (j–4) (2) The material of the penetrameter shall be substantially the same as that of the plate under examination.

AAR–6. (j–4) (3) The thickness of the penetrameter shall not be more than 2 percent of the thickness of the plate.

AAR–6. (j–4) (4) There shall be three holes in each penetrameter of diameters equal respectively to two, three, and four times the penetrameter thickness, but in no case less than 1/16". The smallest hole must be distinguishable on the radiograph.

AAR–6. (j–4) (5) Each penetrameter shall carry an identifying number representing, to two significant figures, the minimum thickness of plate for which it may be used.

AAR–6. (j–4) (6) The images of these identifying numbers shall appear clearly on the radiograph.

AAR–6. (j–4) (7) Each penetrameter shall be 1½" long and ½" wide. (See Figure 12.)

AAR–6. (j–5) Two penetrameters shall be used for each exposure, one at each end of the exposed length, parallel and adjacent to

the weld seam with the small holes at the outer ends.

AAR-6. (j-6) The film during exposure shall be as close to the surface of the weld as is practicable. The distance of the film from the surface of the weld on the side opposite the source of radiation shall, if possible, be not greater than 1 inch. With the film not more than 1 inch from the weld surface the minimum distance between the source of radiation and the back of the weld shall be not less than 14 inches.

AAR-6. (j-7) There shall also be a plain indication on each film showing the job number, the shell, or shell section, and seam, as well as the manufacturer's identification, symbol or name.

AAR-6. (j-8) If it is necessary to expose the film at a distance greater than 1 inch from the weld, the following ratio of:

$$\frac{\text{Distance from source of radiation to weld surface toward radiation}}{\text{Distance from weld surface toward radiation to film}}$$

shall be at least 7 to 1. When a grid of the Buckey type is employed to reduce scattered radiation, the above ratio may be reduced to five. These conditions are imposed so as to limit the allowable distortion and magnification of any defects in the welded seam.

AAR-6. (j-9) All radiographs shall be free from excessive mechanical processing defects which would interfere with proper interpretation of the radiograph.

AAR-6. (j-10) Identification markers, the images of which will appear on the film, shall be placed adjacent to the weld and their location accurately and permanently stamped near the weld on the outside surface of the shell, or shell section, so that a defect appearing on the radiograph may be accurately located in the actual weld.

AAR-6. (j-11) The radiographs shall be submitted to the inspector. If the inspector requests, the following data shall be submitted with the radiographs: (1) The thickness of the base metal, (2) the distance of the film from the surface of the weld, (3) the distance of the film from the source of radiation.

AAR-6. (j-12) The acceptability of welds examined by radiography shall be judged by comparing the radiographs with a standard set of radiographs which may be obtained by purchase from Secretary, Mechanical Division, Association of American Railroads. In general the standards of judgment shall be:

(1) Welds in which the radiographs show elongated slag inclusions or cavities shall be unacceptable if the length of any such imperfection is greater than ⅓ T, where T is the thickness of the weld. If the lengths of such imperfections are less than ⅓ T and are separated from each other by at least 6 L of acceptable weld metal, where L is the length of the longest imperfection, the weld shall be judged acceptable if the sum of the lengths of such imperfections is not more than T in a weld length of 12 T.

(2) Welds in which the radiographs show any type of crack or zones of incomplete fusion shall be unacceptable.

(3) Welds in which the radiographs show porosity shall be judged as acceptable or unacceptable by comparison with the standard set of radiographs.

AAR-6. (j-13) A complete set of radiographs for each tank shall be retained for not less than 20 years by the tank builder or by the car owner if he so requests.

AAR-6. *Qualification of welders.* (k-1) The manufacturer shall be responsible for the quality of the welding done by his organization and shall conduct tests of welding operators to determine their ability to produce welds of the required quality.

AAR-6. (k-2) The manufacturer shall satisfy the inspector that all the welding operators employed on a car tank have previously made test plates which comply with the requirements of this specification. Such test plates shall have been made within a period of six months, except that when the welding operator is regularly employed on production work embracing the same process and type of welding the tests may be effective for one year.

AAR-6. (k-3) It is the duty of the inspector to satisfy himself that only welding operators who are proved competent by these test plates are used to weld any car tank and that all welding complies with the requirements of this specification.

AAR-6. (k-4) The inspector has the right at any time to call for and witness the making of welding operator's qualification test plates described in this paragraph by any welding operator, employed in connection with the inspector's contract and to observe the physical tests of the test plates. For such qualification tests the thickness of the test plate shall be approximately the thickness of the plate or parts on which the welding operator is to work.

AAR-6. (k-5) The tests conducted by one manufacturer shall not qualify a welding operator to do work for any other manufacturer.

AAR-6. *Preparation for welding.* (l-1) The plates may be cut to size and shape by machining or shearing, or by flame cutting. If shaped by flame cutting, the edges must be uniform and smooth and must be freed of all loose scale and slag accumulations before welding. The discoloration which may remain on the flame-cut surface is not considered to be detrimental oxidation. The plates or sheets to be joined shall be accurately cut to size and formed. In all cases the forming shall be done by pressure and not by blows, including the edges of the plates forming longitudinal joints of tanks.

AAR-6. (l-2) Particular care should be taken in the layout of joints in which fillet welds are to be used so as to make possible the fusion of the weld metal at the bottom of the fillet. Great care must also be exercised in the deposition of the weld metal so as to secure satisfactory penetration.

AAR-6. (l-3) If the thickness of the flange of a head to be attached to a tank shall by a butt joint exceeds the shell thickness by more than 25 percent (maximum ¼ inch), the flange thickness shall be reduced at the abutting edges either on the inside or the outside, as shown in Figure 13 (b), or on both sides, as shown in Figure 13 (a). Reduction of abutting edges as illustrated in Figure 13 (c) is not permissible.

AAR-6. (l-4) The edges of the plates at the joints shall not have an offset from each other at any point in excess of 25 percent of the thickness of the plate (maximum ⅛ inch).

AAR-6. (l-5) In all cases where plates of unequal thicknesses are abutted, and have offsets exceeding 1/16 inch, the edge of the thicker plate shall be reduced in some manner so that it is approximately the same thickness as the other plate. In longitudinal tank joints the middle lines of the plate thickness shall be in alignment within the fabricating tolerances specified in paragraph AAR-6 (l-4).

AAR-6. (l-6) Bars, jacks, clamps or other appropriate tools may be used to hold the edges to be welded in line. Tack welds may also be used to hold the edges in line, provided these tack welds are removed so that they do not become a part of the joint. The edges of butt joints shall be so held that they will not overlap during welding. Where fillet welds are used, the lapped plates shall fit closely and be kept together during welding.

AAR-6. (l-7) The surfaces of the sheets or plates to be welded shall be cleaned thoroughly of all scale, rust, oil or grease for a distance of not less than ½ inch from the welding edge. Grease or oil may be removed with gasoline, lye, or the equivalent. A steel-wire scratch brush may be used for removing light rust or scale, but for heavy scale, slag, and the like, a grinder, chisel, air hammer, or other suitable tool shall be used to obtain clean and bright metal. When it is necessary to deposit metal over a previously welded surface, any scale or slag therefrom shall be removed by a roughing tool, a chisel, an air chipping hammer, or other suitable means to prevent inclusion of impurities in the weld metal.

AAR-6. (l-8) The dimensions and shape of the edges to be joined shall be such as to allow thorough fusion and complete penetration.

AAR-6. (l-9) For double-welded butt joints the reverse sides shall be chipped, ground, or melted out so as to secure a clean surface of the originally deposited weld prior to the application of the first bead of welding on the second side. Such chipping, grinding, or melting out shall be done in a manner that will insure proper fusion of the weld metal. These requirements are not intended to apply to any process of welding by which proper fusion and penetration are otherwise obtained and no impurities remain at the base of the weld.

AAR-6. (l-10) If the welding is stopped for any reason, extra care shall be taken in re-starting to get full penetration to the bottom of the joint and thorough fusion between the weld metal and the plates, and to the weld metal previously deposited.

AAR-6. *Longitudinal joints.* (m-1) Longitudinal joints shall be of the double-welded butt type and shall be reinforced at the center of the weld on each side of the plate by at least 1/16 inch up to and including ⅝-inch plate, and up to ⅛ inch for heavier plates. The reinforcement may be removed but if not removed shall be built up uniformly from the surface of the plate to a maximum at the center of the weld. Particular attention is called, however, to the importance of the provision that there shall be no valley or groove along the edge of or in the center of the weld, but that the deposited metal must be fused smoothly and uniformly into the plate surface. (If the reinforcement is built up so as to form a ridge with a valley or depression at the edge of the weld next to the plate, the result is a notch which causes concentration of stress and reduces the strength of the joint.) The finish of the welded joint shall be reasonably smooth and free from irregularities, grooves, or depressions. Where a welded butt joint is made the equivalent of a double-welded butt joint (see note in paragraph AAR-6 (b-2) by using a backing up strip and adding filler metal from one side only, the reinforcement shall not be less than 1/16 inch.

AAR-6. (m-2) Where tanks are made up of two or more courses with welded longitudinal joints, the joints of adjacent courses shall be not less than 60 deg. apart.

AAR-6. *Circumferential joints.* (n) Circumferential joints shall be of the double-welded butt type. The details of all of these joints shall conform to the requirements of longitudinal joints given in AAR-6 (m-1).

AAR-6. *Interior compartment heads.* (o) When installed, interior compartment heads shall be secured in place by means of single full-fillet lap joints and, in addition, must be joined to the tank shell by means of plug welds, having a minimum diameter of one (1) inch (see Figure 20). The number of plug welds required for each interior compartment head shall not be less than that given in the following table:

Inside diameter of tanks:	*Minimum number of plug welds*
60 inches or under	16
Over 60 to 78 inches	20
Over 78 to 96 inches	24
Over 96 to 112 inches	28
Over 112 to 122 inches	32

AAR–6. *Stress relieving.* (p) Each tank must be stress relieved by heating uniformly to at least 1100 deg. Fahr. The tank shall be brought slowly up to the specified temperature and held at that temperature for a period of time proportioned on the basis of at least one hour per inch of maximum thickness, minimum one hour, and shall be allowed to cool slowly in a still atmosphere. Welded attachments must be welded in place before tank is stress relieved. Fusion welded anchors, if applied, must be welded in place before tank is stress relieved. The entire tank must be stress relieved by heating the complete tank as a unit.

AAR–6. *Inspection.* (q–1) Purchaser of tanks must provide for inspection by a competent inspector. The manufacturer shall submit the tank for inspection at such stages as may be designated by the inspector.

AAR–6. (q–2) Each tank must also be inspected at the time of the hydrostatic-pressure and hammer tests by the inspector.

AAR–6. (q–3) The manufacturer shall certify that the welding on the tank has been done only by welding operators who have passed the test requirements and that the same material and technique used in making the tests were employed in fabricating the tank.

AAR–6. *Distortion.* (r) The shell of the completed tank shall be circular within a limit of plus or minus one percent of the inside diameter of the tank.

AAR–6. *Repairs during original construction.* (s–1) Pinholes, cracks, or other defects in welded joints shall be repaired only by chipping, machining, or burning out the defect and rewelding. For gas welding the metal around the defects shall be preheated to a dull red for a distance of at least 4" all around. Any preheating means may be used, such as a flange fire, gas or oil burner, or a welding torch. The preheating shall be done slowly so the heat will get well back into the plate and expand it thoroughly. For metallic arc welding preheating or reheating is not required.

AAR–6. (s–2) Tanks shall be stress relieved after any welding repairs have been made.

AAR–6. (s–3) After repairs have been made the tank shall again be tested in the regular way, and if it passes the test the inspector shall accept it. If it does not pass the test the inspector can order supplementary repairs, or, if in his judgment the tank is not suitable for service, he may permanently reject it.

ICC–7. *Stress relieving.* (a) All welding of the tank shell and of attachments welded directly thereto must be stress relieved as a unit.

AAR–7. *Stress relieving.* (a) See paragraph AAR–6 (p).

ICC–8. *Tank mounting.* (a) The manner in which tank is supported on and securely attached to the car structure must be approved.

AAR–8. *Anchorage.* (a) See § 78.263—Car Structure.

AAR–8. (b) Designs of anchorage employing other means of securement to tank than rivets, as described in § 78.263 may be used if approved.

AAR–8. (c) Anchor rivets, if used, may have their heads on the inside of the tank shell covered and protected from the lading by a liquid-tight housing of approved design. The lower portion of the housing must be fusion welded to, and stress-relieved with, the tank shell as a unit. After the rivets have been driven and caulked, the top portion of the housing must be secured to the top of the lower portion by an approved method of welding, which welding need not be stress-relieved. A hole must be provided through tank shell, under each housing to permit making air pressure test. Each test hole must be tightly closed after completion of test with an approved plug.

ICC–9. *Expansion dome.* (a) The expansion dome must have a capacity, measured from the inside top of shell of tank to the inside top of dome or bottom of any vent pipe projecting inside of dome, of at least 2 percent of the total capacity of the tank and dome combined, except that when safety valve or safety vent is applied to side of dome, the effective capacity of dome must be measured from top of safety valve or safety vent opening in the side of dome to inside top of shell of tank.

ICC–9. (b) The opening in manhole ring must be at least 16 inches in diameter. The opening in the tank shell within the dome must be at least 29 inches and not more than 30 inches in diameter.

ICC–9. (c) The dome head must be dished convex outward.

AAR–9. (a) The entire dome must be of pressed, forged, or cast steel; if of forged or cast steel, integral attachments permissible. The dome head if separate, must be of pressed, forged, or cast steel; if of forged or cast steel, integral attachments permissible. Dome head, if of pressed steel, must be dished to a radius of not more than 10 feet.

ICC–10. *Closures for manholes.* (a) The manhole cover must be of approved type and designed to make it practically impossible to remove the cover while the interior of the tank is subjected to pressure.

ICC–10. (b) Manhole covers must be made of cast, forged or pressed steel, malleable iron or other malleable metals. Manhole rings, if riveted to dome of tank, must be made of cast, forged or pressed steel, malleable iron or other malleable metals. Manhole rings, if welded to dome of tank, must be made of cast, forged or pressed metal and be of good weldable quality in conjunction with metal of dome.

ICC–10. (c) All covers not hinged to tank must be attached to outside of the dome head, by at least ⅜ inch chain or its equivalent.

ICC–10. (d) All joints between manhole covers and their seats must be made tight against leakage of vapor and liquid by use of gaskets of suitable material.

AAR–10. (a) Bolted type, bolted and hinged type or other approved type manhole cover must be used. See Figs. 5 and 6.

ICC–11. *Gauging, bottom outlet valve operating, venting, loading and discharging, and air inlet devices extending through domes of tanks.* (a) Not specification requirements. When installed, these devices, including their valves, must be protected from accidental injury by being set into a securely covered recess, or by means of a cast or pressed steel or malleable iron housing with cover securely attached. Housing, if welded to dome of tank, must be made of cast, forged or pressed metal and be of good weldable quality in conjunction with metal of dome. Openings in wall of housing must be equipped with screw plugs or other closures. Drain holes permitted. Discharging siphon pipe must be securely anchored.

AAR–11. (a) These devices must be of approved design.

ICC–12. *Venting, loading and discharging, and air inlet devices.* (a) These devices, when installed, must be closed by efficient valves made of metal not subject to rapid deterioration by the lading. Provision must be made for closing the pipe connections of the valves.

AAR–12. (a) These devices must be of approved design.

ICC–13. *Bottom discharge outlets.* (a) The bottom discharge outlet, when installed, must be made of metal not subject to rapid deterioration by the lading, be of approved construction, and be provided with a valve at its upper end and a liquid-tight closure at its lower end.

ICC–13. (b) The valve operating mechanism and outlet nozzle construction must be such as to insure against unseating of valve due to stresses or shocks incident to transportation.

ICC–13. (c) Tanks used for the transportation of poisonous solids, when designed for bottom unloading, must have the openings securely closed against leakage.

AAR–13. (a) Bottom discharge outlet nozzle may be cast, pressed or forged metal. If outlet nozzle is welded to tank, it must be of cast, forged or pressed metal and be of good weldable quality in conjunction with metal of tank.

AAR–13. (b) To provide for the attachment of standard unloading connections, the bottom of the main portion of the outlet nozzle or some fixed attachment thereto, must have external U. S. F. threads, four threads to the inch. The liquid-tight closure must have corresponding female threads machined to give proper clearance.

AAR–13. (c) For outlet nozzles that project 6" or more from shell of tank a "V" groove must be cut (not cast) in the upper part of outlet valve nozzle at a point immediately below lowest part of valve to a depth that will leave thickness of nozzle wall at the root of the "V" not over ⅜". In the case of steam jacketed outlet nozzles this groove must be below the steam chamber but above the bottom of center sill construction. Where outlet nozzle is not a single piece, arrangement must be made to provide the equivalent of the breakage groove.

AAR–13. (d) The flange on the outlet nozzle must be of a thickness which will prevent distortion of the valve seat or valve by any change in contour of the shell resulting from expansion of lading, or other causes, and which will insure that accidental breakage of the outlet nozzle will occur at or below the "V" groove.

AAR–13. (e) The valve must have no wings or stem projecting below the "V" groove in the outlet nozzle, unless they are scored or designed to break or bend without unseating valve. The valve and seat must be readily accessible or removable for repairs, including grinding.

AAR–13. (f) The valve operating mechanism must have means for compensating for variation in the vertical diameter of the tank produced by expansion, weight of the liquid contents, or other causes, and should operate from the interior of the tank, but in the event the rod is carried through the dome, leakage must be prevented by packing in stuffing box and cap nut.

AAR–13. (g) In no case must extreme projection of bottom discharge outlet equipment extend to within 12" above top of rail. All bottom discharge outlet reducers and closures and their attachments must be secured to car by at least ⅜" chains or its equivalent, except that outlet closure plugs may be attached by ¼" chain. When the bottom discharge outlet closure is of the combination cap and valve type, the pipe connection to the valve must be closed by a plug or cap.

ICC–14. *Safety valves.* (a) The tank must be equipped with one or more safety valves mounted on expansion dome. Total valve discharge capacity must be sufficient to prevent building up of pressure in the tank in excess of 45 pounds per square inch.

ICC–14. (b) One safety valve must be provided for each tank, or compartment thereof, of 6,650 gallons capacity or less, and two safety valves for each tank, or compartment thereof, of over 6,650 gallons capacity.

ICC–14. (c) Each safety valve must be set to open at a pressure of 25 pounds per square inch. (For tolerance see paragraph ICC–18.)

ICC–14. (d) Tanks used for the transportation of corrosive liquids, flammable solids, oxidizing materials, or poisonous liquids or solids, Class B, need not be equipped with safety valves, but if not so equipped must have one safety vent at least 2 inches inside diameter closed with a frangible disc of lead or other suitable material, of a thickness that will hold a pressure of 30 pounds per

square inch for a period of at least one hour but will rupture within eight hours. Means for holding disc in place must be such as to prevent distortion or damage to disc when applied. Safety vent closure must be chained or otherwise fastened to prevent misplacement. An additional sealed vent of approved design, to prevent use of unloading pressures in excess of 45 pounds per square inch, may be applied. All tanks equipped with vents must be stenciled "Not for Flammable Liquids."

AAR-14. (a) Safety valve must be of approved design. See Figure 2 and paragraph AAR-18. For safety vent, closure of bolted type preferable, see Figure 3-A. For screw type safety vent closure, see Figure 3.

AAR-14. (b) Safety valve or safety vent flanges, if welded to dome, must be of cast, forged or pressed metal and be of good weldable quality in conjunction with metal of dome.

ICC-15. *Fixtures, reinforcements, and attachments not otherwise specified.* (a) All attachments to tank and dome must be applied by approved means. When attachments are riveted the edges of plates must be beveled so that the angle of the calking edge will be between 60 and 70 degrees with the flat surface of the attachment. The extreme calking edge distance, measured from center line of rivet hole, must be at least one and one-half times the diameter of the hole and not more than that distance plus ¼ inch. The joints formed by attachment of all riveted external projections must be calked on the inside. Split calking prohibited. Interior heater systems when installed, must be so constructed that the breaking off of their external connections will not cause leakage of contents of tanks.

AAR-15. *Heater systems.* (a) See §§ 78.260 to 78.262, inclusive—Tank Car Heater Systems.

AAR-15. (b) Heater system and plug flanges, if welded to tank or dome, must be of cast, forged or pressed metal and be of good weldable quality in conjunction with metal of tank or dome.

ICC-16. *Plugs for openings.* (a) All plugs must be solid, of good grade cast iron or equivalent, with standard pipe thread, and when in contact with lading must be of a length which will screw at least six threads inside the face of fitting or tank. Plugs when inserted from the outside of tank heads must have the letter "S" at least ⅜ inch in size stamped with steel stamp or cast on the outside surface to indicate the plug is solid. Plugs when inserted from the inside are identified by appearance of the plugs on the outside of the tank as being solid—therefore, no mark required.

ICC-17. *Tests of tanks.* (a) Each tank must be tested, before being put into service, by completely filling tank and dome with water, or other liquid having similar viscosity, of a temperature which must not exceed 100° F. during the test, and applying a pressure of 60 pounds per square inch. Tank must hold the prescribed pressure for at least 10 minutes without leakage or evidence of distress. All rivets and closures, except safety valves or safety vents, must be in place while test is made.

ICC-17. (b) Calking of welded joints to stop leaks developed during the foregoing tests prohibited. Repairs in welded joints must be made as prescribed in paragraph ICC-6 (a).

ICC-17. (c) *Test of interior heater systems.* Before interior heater systems are placed in service they must be tested with hydrostatic pressure and must be tight at 200 pounds per square inch.

AAR-17. *Hammer tests.* (a) The tank shall be subjected to a hydrostatic pressure of 60 pounds per square inch and while subject to this pressure shall be given a thorough hammer or impact test. This impact test shall consist of striking the plate at six-inch intervals on both sides of all butt welded joints and for the full length of all butt welded joints of the tank shell. The weight of the hammer in pounds shall approximately equal the thickness of the thinnest plate of the joint in tenths of an inch, but not to exceed ten pounds. The plates shall be struck with a sharp swinging blow. The edges of the hammer shall be rounded so as to prevent defacing the plate. Following the impact test this pressure must be held for at least 10 minutes.

AAR-17. *Anchor rivet housing test.* (b) After anchor rivet housings, if applied, are in place these housings must be tested by applying an air pressure of 100 pounds per square inch through openings in tank shell and must be tight against leakage.

AAR-17. (c) If tanks are to be lagged, the test of tank must be made before lagging is applied.

ICC-18. *Tests of safety valves.* (a) Each valve must be tested, before being put into service, by attaching to an air line and applying pressure. The valve must not leak below 20 pounds pressure. (See § 73.31 (l) Note 1 of this chapter.) The valve must open at the pressure prescribed in paragraph ICC-14 (c), with a tolerance of plus or minus 3 pounds.

AAR-18. (a) The above referred to note in § 73.31 (l) of this chapter reads in part as follows: "Safety valves now used on tank cars are reported to permit slow leakage of vapor and it appears that material changes in the design and construction of these valves are necessary to make them tight * * * the necessary changes must be made with the least possible delay."

ICC-19. *Retests of tanks, safety valves, and interior heater systems.* (a) Tanks, safety valves, and interior heater systems must be retested, as prescribed for original tests in paragraphs ICC-17 and ICC-18, at intervals of ten years or less after the original test. Tanks must also be retested before being returned to service after any repairs requiring welding, riveting or calking of rivets. Interior heater systems must be retested after repairs. Reports must be rendered as prescribed in paragraph ICC-21.

AAR-19. (a) For lagged tanks, if the jacket and lagging are not removed, the tank must hold the prescribed pressure for at least 20 minutes. A drop in pressure shall be evidence of leakage, and such portion of the jacket and lagging must be removed as may be necessary to locate the leak and make repairs.

AAR-19. (b) Anchor rivet housings, if used, must not be removed during the test period. Anchor rivet housings must be retested to a pressure of 100 pounds per square inch, as prescribed in paragraph AAR-17 (b).

ICC-20. *Marking.* (a) Each tank must be marked, thus certifying that the tank complies with all the requirements of this specification. These marks must be as follows:

ICC-20. (b) ICC-103W in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the tank, or jacket if lagged, in letters and figures at least 2 inches high by the party assembling the completed car.

ICC-20. (c) Initials of tank builder and date of original test of tank in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal immediately below the stamped marks specified in paragraph ICC-20 (b).

ICC-20. (d) Initials of company and date of additional tests performed by the party assembling the completed car, in those cases where the tank builder does not complete the fabrication of tank, such as application of riveted anchors, etc., in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal immediately below the stamped marks specified in paragraph ICC-20 (c) by the party assembling the completed car. These marks must also be stenciled on the tank, or jacket if lagged, in letters and figures at least 2 inches high immediately below the stenciled mark specified in paragraph ICC-20 (b) by the party assembling the completed car.

ICC-20. (e) Date on which the tank was last tested, pressure to which tested, place where test was made, and by whom, stenciled on the tank, or jacket if lagged.

ICC-20. (f) Date on which the safety valves were last tested, pressure to which tested, place where test was made, and by whom, stenciled on the tank, or jacket if lagged.

ICC-20. (g) Date on which interior heater systems were last tested, pressure to which tested, place where test was made, and by whom, stenciled on the tank, or jacket if lagged.

ICC-20. (h) Identification mark, illustrated herein, for approved manhole closure must be stenciled on each side of dome, or jacket if lagged, in line with the ladders and in a color contrasting to color of dome.

ICC-20. (i) When a tank car and its appurtenances are designed and authorized for the transportation of a particular commodity only, the name of that commodity followed by the word "only", or such other wording as may be required to indicate the limits of usage of the car, must be stenciled on each side of the tank, or jacket if lagged, in letters at least 2 inches high, immediately above the stenciled mark specified in paragraph ICC-20 (b).

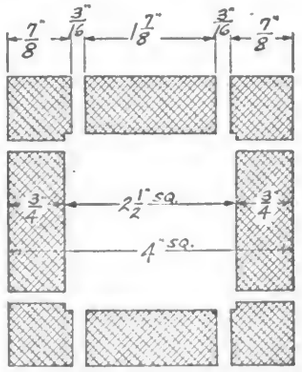
AAR-20. (a) For all other markings, see Figure 1.

ICC-21. *Reports.* (a) Before a tank car is placed in service, the party assembling the completed car must furnish to car owner, Bureau of Explosives, and the Secretary, Mechanical Division, Association of American Railroads, a report in approved form certifying that the tank and its equipment comply with all the requirements of this specification. In case of welded repairs to, alterations of or additions to tanks or equipment therefor from original design and construction, all of which must be approved, there must be furnished to the same parties a report in detail of the welded repairs, alterations or additions made to each tank covered by a particular application, showing the initials and number of each tank involved. Reports of retests must be rendered to the Bureau of Explosives and car owner.

AAR-21. *Application for approval.* (a) See § 78.259 (f)—Application for Approval.

AAR-21. *Certificate of construction.* (b) See § 78.259 (g)—Certificate of Construction.

AAR-22. *Car structure.* (a) See § 78.263—Car Structure.



Manhole Closure Identification Mark
(Reduced size)

§ 78.281 *Specification for tank cars having fusion-welded steel tanks, class ICC-103A-W.* This specification covers Class ICC-103A-W tank cars having fusion-welded steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever

the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of specification ICC–103–W, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.280 Specification ICC–103–W):

ICC–4. (d) This paragraph does not apply.

AAR–4. (c) Car must have underframe.

ICC–6. (b) Manhole rings, safety vent flange, and bottom wash-out nozzle flange or other attachments may be riveted or fusion-welded. Riveted joints must be made metal to metal without interposition of other materials. Rivets, if used, must be driven hot and caiked inside. For computing rivet areas the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by more than 1/16 inch. Use of rivets of less than 5/8 inch nominal diameter prohibited. Fusion-welding for securing these attachments in place must be of the double-welded butt joint type or double-full-fiiiet-iap joint type.

ICC–9. *Expansion dome.* (a) The expansion dome must have a capacity, measured from the inside top of sheii of tank to the inside top of dome or bottom of any vent pipe projecting inside of dome, of at least 1 per cent of the total capacity of the tank and dome combined, except that when safety vent is applied to side of dome, the effective capacity of dome must be measured from top of safety vent opening in the side of dome to inside top of sheil of tank.

ICC–9. (b) The opening in manhole ring must be at least 16 inches in diameter. The opening in the tank shell within the dome must be at least 29 inches in diameter, and when the inside diameter of the dome exceeds 29 inches, the opening in the tank sheil may be cut out to a diameter sufficientiy greater than that of the dome to permit welding of tank shell to the base of the dome. When the inside diameter of the dome exceeds 30 inches and the sheil of tank is cut out as provided to permit welding, the tank shell at this point must be adequateiy reinforced. When the tank shell is not cut out to permit welding and the opening in tank shell does not exceed 30 inches in diameter, no reinforcement is required but the joint between the base of the dome and the tank shell must be sealed on the inside in an approved manner and dome-pocket drain holes must be provided with nipples projecting inside the tank at least one inch.

ICC–9. (c) The dome head if of pressed steel must be dished convex outward. The entire dome with attachments, or dome head and manhoie ring with attachments, made of cast steel or other malleable metal may be used in place of dished steei plate dome head.

AAR–9. *Tank shell reinforcement at dome opening.* (b) See Figure 24.

ICC–10. *Closures for manholes.* (a) The manhoie cover must be of approved type and designed to provide a secure closure of the manhole.

ICC–10. (c) Requirements of this paragraph optional.

AAR–10. (a) Bolted type, boltcd and hinged type, or other approved type manhole cover must be used.

ICC–11. *Gauging, venting, loading and discharging, and air inlet devices extending through domes of tanks.* (a) These devices when installed must be tightiy closed as prescribed in paragraph ICC–12. Protective housing not required, except when the characteristics of the commodity for which the car is authorized are such that these devices must be equipped with valves to provide for the loading and unloading of the contents. Discharging siphon pipe must be securely anchored.

ICC–12. *Gauging, venting, loading and discharging, and air inlet devices.* (a) These devices when installed must be tightly closed with approved caps, plugs, valves, or other fittings. Provision must be made for closing pipe connections of valves. The venting device must be equipped as prescribed in paragraph ICC–14.

ICC–13. *Bottom discharge outlets.* (a) Bottom outlet for discharge of lading prohibited, but tank may be equipped with a bottom wash-out nozzle of metal not subject to rapid deterioration by the lading, which must be of approved construction complying with the following requirements:

ICC–13. (b) The construction and closure of the bottom wash-out nozzle must be such that it is liquid tight and should the nozzle be broken, ioss of contents will not occur.

ICC–13. (c) The extreme projection of the bottom wash-out nozzle must be at least 12 inches above the top of rail.

AAR–13. (a) Bottom wash-out nozzle may be cast, pressed, or forged metal. If welded to tank, it must be of good weldable quality in conjunction with metal in tank.

AAR–13. (b) The closure of the wash-out nozzle must be equipped with a 3/4 inch solid screw plug. Piug must be secured to car structure or washout chamber by at least a 1/4 inch chain.

AAR–13. (c) For bottom wash-out nozzles that project 6 inches or more from shell of tank a "V" groove must be cut (not cast) in the upper part of bottom wash-out nozzle at a point immediately below lowest part of inside closure seat to a depth that will leave thickness of nozzle wall at the root of the "V" not over 3/8 inch. Where bottom wash-out nozzle is not a single piece, arrangement must be made to provide the equivalent of the breakage groove.

AAR–13. (d) The flange on the bottom wash-out nozzle must be of a thickness which will prevent distortion of the inside closure seat or closure casting by any change in contour of the sheli, resulting from expansion of lading, or other causes, and which will insure that accidental breakage of the wash-out nozzle will occur at or below the "V" groove.

AAR–13. (e) The closure casting must not project below the "V" groove in the wash-out nozzle. The closure casting and seat must be readily accessible for repairs, including grinding.

AAR–13. (f) This paragraph does not apply.

AAR–13. (g) This paragraph does not apply.

ICC–14. *Safety vents.* (a) Safety vaives prohibited but a safety vent must be applied. Suifuric acid, except oleum, mixed acid (nitric and suifuric acid) (nitrating acid), and other fuming acids, may be transported in specification ICC 103A–W tank cars having safety vents equipped with lead discs having 1/8" breather holes in the center thereof.

ICC–14. (b) This paragraph does not apply.

ICC–14. (c) This paragraph does not apply.

ICC–14. (d) Each tank or each compartment thereof must be equipped with one safety vent at least 2 inches inside diameter, closed with a frangible disc of lead or other suitable material of a thickness that will hold a pressure of 30 pounds per square inch for a period of at least one hour but will rupture within eight hours. Means for holding disc in place must be such as to prevent distortion or damage to disc when applied. Safety vent closure must be chained or otherwise fastened to prevent misplacement. An additional sealed vent of approved design, to prevent use of unloading pressures in excess of 45 pounds per square inch, may be applied.

AAR–14. (a) Safety vent closure of bolted type preferable, see Figure 3–A. For screw type safety v nt closure, see Figure 3.

AAR–14. (b) Safety vent flanges, if welded to dome, must be of cast, forged, or pressed metal and be of good weldable quality in conjunction with metal of dome.

ICC–15. *Fixtures, reinforcements, and attachments not otherwise specified.* (a) All attachments to tank and dome must be applied by approved means. When attachments are riveted the edges of plates must be beveled so that the angle of the calking edge will be between 60 and 70 degrees with the flat surface of the attachment. The extreme calking edge distance, measured from center line of rivet hole, must be at least one and one-half times the diameter of the hole and not more than that distance plus 1/4 inch. The joints formed by attachment of all riveted external projections must be calked on the inside. All rivet heads on the inside and outside of tank and dome must be calked. Split calking prohibited. Heater systems when installed, must be so constructed that the breaking off of their external connections will not cause leakage of contents of tanks.

ICC–18. (a) This paragraph does not apply.

AAR–18. (a) This paragraph does not apply.

ICC–19. *Retests of tanks and interior heater systems.* (a) Tanks and interior heater systems must be retested as prescribed for original tests in paragraph ICC–17, except that acid may be used for filling the tank and dome when testing tanks which have not been in service more than 12 years. The first retest of tank and interior heater system must be conducted within four years after the original test, and subsequent retests at four-year intervals up to 12 years of service, thereafter at two-year intervals up to 20 years of service, and annually after 20 years of service. Tanks in service over 12 ycars must be internally inspected and interior heater systems inspected for defects which would make leakage or failure probable during transit and must be tested with water only. Tanks must also be retested before being returned to service after any repairs requiring welding, riveting or calking of rivets. Interior heater systems must be retested after repairs. Reports must be rendered as prescribed in paragraph ICC–21.

ICC–20. (b) ICC–103A–W in letters and figures at least 3/4 inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the tank, or jacket if lagged, in letters and figures at least 2 inches high by the party assembling the completed car.

ICC–20. (f) This paragraph does not apply.

ICC–20. (h) This paragraph does not apply.

§ 78.282 *Specification for tank cars having rubber-lined fusion-welded steel tanks, class ICC–103B–W.* This specification covers Class ICC–103B–W tank cars having rubber-lined fusion welded steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC–103–W, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.260 Specification ICC–103–W):

ICC–3. *Material.* (a) All plates for tank and expansion dome must be made of open-hearth boiler-plate steel of flange quality, the carbon content of which shall not exceed 0.30 percent. The lining must be acid-resisting rubber, vulcanized or bonded directly or otherwise attached to the metal tank, to provide a non-porous laminated lining. No rub-

ber shall be under tension when applied except that due to conformation over rivet heads. Interior of tank must be free from scale, oxidation, moisture, and all foreign matter during the lining operation.

ICC-3. (d) This paragraph does not apply.

AAR-3. *Lining.* (b) See paragraphs ICC-3 (a) and ICC-4 (b).

AAR-3. (d) Rubber-lined tanks must be stenciled as prescribed in paragraph ICC-20 (e).

ICC-4. (b) The rubber lining must be at least $\frac{5}{32}$ inch thick except that over all rivets and seams formed by riveted attachments the lining must be double thickness. The lining must overlap at least 1½ inches at all edges, which must be straight and be beveled to an angle of approximately 45 degrees. Directly under the dome, vulcanized to the lining on bottom of tank, must be applied a rubber reinforcement pad at least 4½ feet square and at least ½ inch thick, with edges of pad beveled to an angle of approximately 45 degrees. An opening in this pad for sump is permitted.

ICC-4. (d) This paragraph does not apply.

AAR-4. (c) Car must have underframe.

ICC-6. (b) Manhole ring, safety vent flange, and sump flange or other attachments may be riveted or fusion-welded. Riveted joints must be made metal to metal without interposition of other material. Rivets, if used, must be driven hot and calked inside. For computing rivet areas the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by more than $\frac{1}{16}$ inch. Use of rivets of less than ⅝ inch nominal diameter prohibited. Fusion-welding for securing these attachments in place must be of the double-welded butt joint type or double full-fillet lap joint type. All rivet heads on inside of tank must be button-head or similar shape, of uniform size and the under surface of heads must be driven tight against shell. All plates, castings, and rivet heads on inside of tank must be calked. All projecting edges of plates, castings, and rivet heads on inside of tank must be rounded and free from fins or other irregular projections. Castings must be free from porosity.

ICC-9. *Expansion dome.* (a) The expansion dome must have a capacity, measured from the inside top of shell of tank to the inside top of dome or bottom of any vent pipe projecting inside dome, of at least 1 percent of the total capacity of the tank and dome combined, except that when safety vent is applied to side of dome, the effective capacity of dome must be measured from top of safety vent opening in the side of dome to inside top of shell of tank.

ICC-9. (b) The opening in manhole ring, before lining, must be at least 18 inches in diameter. The opening in the tank shell within the dome must be at least 29 inches in diameter, and when the inside diameter of the dome exeeeds 29 inches, the opening in the tank shell may be cut out to a diameter sufficiently greater than that of the dome to permit welding of tank shell to the base of the dome. When the inside diameter of the dome exceeds 30 inches and the shell of tank is cut out as provided to permit welding, the tank shell at this point must be adequately reinforeed. When the tank shell is not cut out to permit welding and the opening in tank shell does not exceed 30 inches in diameter, no reinforcement is required. Dome pocket drain holes must be provided with nipples projecting inside the tank at least one inch.

ICC-9. (c) The dome head if of pressed steel must be dished convex outward. The entire dome with attachments, or dome head and manhole ring with attachments, made of cast steel or other malleable metal may be used in place of dished steel plate dome head.

AAR-9. *Tank shell reinforcement at dome opening.* (b) See Figure 24.

ICC-10. *Closures for manholes.* (a) The manhole cover must be of approved type and designed to provide a secure closure of the manhole.

ICC-10. (b) Manhole cover may be made of any suitable metal. The top, bottom, and edge of manhole cover must be covered with rubber as prescribed in paragraphs ICC-3 and ICC-4. Through bolt holes may be lined with rubber at least ⅛ inch in thickness. Cover made of metal not affeeted by lading need not be rubber covered. All rubber surfaces on outside of tank or fittings must be painted with an age-resisting paint to protect the rubber from light rays. Manhole rings, if riveted to dome of tank, must be of cast, forged or pressed steel, malleable iron or other malleable metals. Manhole rings, if welded to dome of tank, must be made of east, forged or pressed metal and be of good weldable quality in conjunction with metal of dome.

ICC-10. (e) Requirements of this paragraph optional.

AAR-10. (a) Bolted type, bolted and hinged type, or other approved type manhole cover must be used.

ICC-11. *Gauging, venting, loading and discharging, and air inlet devices extending through domes of tanks.* (a) These devices when installed must be tightly closed in an approved manner. Protective housing not required, except when the characteristics of the commodity for which the car is authorized are such that these devices must be equipped with valves to provide for the loading and unloading of the contents. Discharging siphon pipe must be securely anchored.

ICC-12. *Gauging, venting, loading and discharging, and air inlet devices.* (a) When installed, these devices and their closures must be of metal and have all surfaces eovered with rubber as prescribed in paragraphs ICC-3 and ICC-4. These devices when made of metal not affected by the lading need not be rubber covered. Interior pipes of these devices must be supported at their lower end.

ICC-13. *Bottom discharge outlets.* (a) Bottom discharge outlet prohibited. Bottom sump of cast, pressed, or forged metal is permissible. If used and welded to tank, it must be of cast, pressed, or forged metal and be of good weldable quality in conjunction with metal of tank.

ICC-13. (b) This paragraph does not apply.

ICC-13. (c) This paragraph does not apply.

AAR-13. (a) This paragraph does not apply.

AAR-13. (b) This paragraph does not apply.

AAR-13. (c) This paragraph does not apply.

AAR-13. (d) This paragraph does not apply.

AAR-13. (e) This paragraph does not apply.

AAR-13. (f) This paragraph does not apply.

AAR-13. (g) This paragraph does not apply.

ICC-14. *Safety vents.* (a) Safety valves prohibited, but a safety vent must be applied. Except for hydrochloric (muriatic) acid of 22° Baume strength, and other fuming acids, safety vent of approved design equipped with frangible discs having ⅛ inch breather hole in the center thereof, or a safety vent of approved design equipped with carbon discs permitting continuous venting, may be used.

ICC-14. (b) This paragraph does not apply.

ICC-14. (c) This paragraph does not apply.

ICC-14. (d) Each tank, or each eompartment thereof, must be equipped with one safety vent, lined with rubber of at least ⅛ inch thickness, having an inside diameter of at least 1¾ inches after lining, closed with a frangible disc of lead or other suitable material of a thickness that will hold a pressure of 30 pounds per square inch for a period of at least one hour but will rupture within 8 hours. Means for holding disc in place must be such as to prevent distortion or damage to disc when applied. Safety vent closure must be chained or otherwise fastened to prevent misplacement. An additional sealed vent of approved design, to prevent use of unloading pressures in excess of 45 pounds per square inch, may be applied.

AAR-14. (a) Safety vent closure of bolted type preferable, see Figure 3-A. For screw type safety vent closure, see Figure 3.

AAR-14. (b) Safety vent flanges, if welded to dome, must be of cast, forged, or pressed metal and be of good weldable quality in conjunction with metal of dome.

ICC-15. *Fixtures, reinforcements, and attachments not otherwise specified.*—(a) All attachments to tank and dome must be applied by approved means. When attachments are riveted the edges of plates must be beveled so that the angle of the calking edge will be between 60 and 70 degrees with the flat surface of the attachment. The extreme calking edge distance, measured from center line of rivet hole, must be at least one and one-half times the diameter of the hole and not more than that distance plus ¼ inch. The joints formed by attachment of all riveted external projections must be calked on the inside. Split calking prohibited. Interior heater systems, when installed, must be so eonstructed that the breaking off of their external connections will not cause leakage of contents of tanks. Interior heater systems when applied must be made of metal not affected by the lading. All surfaces of attachments exposed to the lading must be covered with rubber as prescribed in paragraphs ICC-3 and 4. Attachments made of metal not affected by the lading need not be rubber covered.

ICC-16. *Plugs for openings.* (a) All plugs must be solid, of good grade cast iron or equivalent, with standard pipe thread, and when in contact with lading must be of a length which will screw at least six threads inside the face of fitting or tank. Plugs must have all surfaces exposed to the lading covered with rubber or be made of metal not affected by lading.

ICC-17. *Test of tanks.* (a) Each tank must be tested, before rubber lining is applied, by completely filling tank and dome with water, or other liquid having similar viseosity, of a temperature whieh must not exceed 100° F. during the test, and applying a pressure of 60 pounds per square inch. Tank must hold the prescribed pressure for at least 10 minutes without leakage or evidenee of distress. All rivets and closures, except safety vents, must be in place while test is made. After tank is rubber-lined, no further tests are required.

ICC-18. (a) This paragraph does not apply.

AAR-18. (a) This paragraph does not apply.

ICC-19. *Retests of tanks and interior heater systems.* (a) Periodic retests of tanks are not required. Tanks must be retested before rubber lining is renewed. The first retest of interior heater systems must be conduoted within four years after the original test, and subsequent retests at four-year intervals up to 12 years of service, thereafter at two-year intervals up to 20 years of service, and annually after 20 years of servlee. Interior heater systems in service over 12 years must be inspeeted for defeets which would make leakage or failure probable during transit and must be tested with water only. Tanks must also be retested before being returned to servlee after any repairs requiring welding, riveting or ealking of rivets. Interior heater systems must be retested after repairs. Reports must be rendered as prescribed in paragraph ICC-21.

ICC-20. (b) ICC-103B-W in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the tank, or jacket if lagged, in letters and figures at least 2 inches high by the party assembling the completed car.

ICC-20. (e) "Rubber-lined tank—pressure test not required," stenciled on tank, or jacket if lagged, instead of record of test of tank.

ICC-20. (f) This paragraph does not apply.

ICC-20. (h) This paragraph does not apply.

ICC-21. (b) Before a tank car tank not originally built under this specification is lined with rubber, a report certifying that the tank and its equipment have been brought into compliance with the tank requirements of Specification ICC-103B-W must be furnished by car owner to the party who is to apply the rubber lining. A copy of this report, together with report in approved form certifying that tank has been lined in compliance with all requirements of this specification, must be furnished by party lining the tank to car owner, Bureau of Explosives, and the Secretary, Mechanical Division, Association of American Railroads.

§ 78.283 *Specification for tank cars having fusion-welded alloy steel tanks Class ICC-103C-W.* This specification covers Class ICC-103C-W tank cars having fusion welded alloy steel tanks to which have been added AAR details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC-103-W, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.280 Specification ICC-103-W):

ICC-3. *Material.* (a) All plates, and rivets if used, and all projections and their closures, must be made of a metal capable of resisting the action of nitric acid as follows:

The maximum corrosion rate in inches penetration per month in the standard 65 percent boiling nitric acid test shall be 0.006 for the straight chromium-bearing stainless steel containing 15 to 18 percent chromium and 0.0015 for any of the chromium nickel alloys of the 18 percent chromium 8 percent nickel type and modified chromium nickel type, this figure to be an average of five 48-hour periods.

ICC-3. (b) This paragraph does not apply.

ICC-3. (c). This paragraph does not apply.

ICC-3. (d) This paragraph does not apply.

AAR-3. (a) All plates, forgings, tubes, valve castings and rivets must be in accordance with AAR Specifications for materials meeting requirements of paragraph ICC-3 (a).

AAR-3. (c) This paragraph does not apply.

ICC-4. (b) This paragraph does not apply.

ICC-4. (d) This paragraph does not apply.

AAR-4. (c) Car must have underframe.

ICC-6. (b) Manhole ring, safety valve flange, and sump flange or other attachments may be riveted or fusion welded. Riveted joints must be made metal to metal without interposition of any other material. Rivets, if used, must be driven hot and calked inside. For computing rivet areas the effective diameter of a driven rivet is the diameter of its ream hole, which hole must in no case exceed nominal diameter of rivet by more than $\frac{1}{16}$ inch. Use of rivets of less than ⅝ inch nominal diameter prohibited. Fusion-welding for securing these attachments in place must be of the double-welded butt joint type or double full-fillet lap joint type.

AAR-6. *Test plates.* (d-1) Two sets of test plates of the dimensions shown in Fig. 16 from steel of the same specifications and thickness as the shell plates, prepared for welding, may be attached to the shell plate being welded, as in Fig. 9, one set on each end of one longitudinal joint of each tank so that the edges to be welded in the test plates are a continuation of and duplication of the corresponding edges of the longitudinal joint. In this case the weld metal shall be deposited in the test plates continuously with the weld metal deposited in the longitudinal joint. As an alternate method, detached test plates may be welded as provided for in AAR-6 (d-2). The plates for test samples may be taken from any part of one or more plates of the same lot of material that is used in the fabrication of the welded tanks and without reference to the direction of the mill rolling. When more than one welding operator is employed on a car tank, the required test plates for the individual tank shall be made by the welding operator designated by the inspector.

AAR-6. (d-3) When there are several tanks being welded in succession, or at any one time, the plate thicknesses of which fall within a range of ¼ inch, each 200 feet of longitudinal and circumferential seams may be considered as the equivalent of one tank and only the test plates required by paragraphs AAR-6 (d-1) and AAR-6 (d-2) need be made, provided they are welded in the same way as the joints in question. The test plates shall be so supported that warping due to welding shall not throw the finished test plate out of line by an angle of over 5 degrees.

AAR-6. (d-4) Where the welding has warped the test plates they shall be straightened before being annealed. The test plates shall be subjected to the same annealing operation as required by AAR-6 (p). At no time shall the test plates be heated to a temperature higher than that used for annealing the tank.

AAR-6. *Test specimens.* (e) The inspector shall select one of the two welded test plates from which the coupons for tension, corrosion, and bend tests and for specific-gravity determinations shall be removed as shown in Fig. 16 and be of the dimensions shown in Figs. 11 and 16.

AAR-6. (f-2) The tensile strength of the joint specimen in Fig. 16 shall not be less than the minimum of the specified tensile range of the plate used. (The tension test of the joint specimen as specified herein is intended as a test of the welded joint and not of the plate.)

AAR-6. (f-3) The tension-test specimen of the weld metal shall be taken entirely from the deposited weld metal and shall meet the following requirements:

Tensile strength = at least that of the minimum of the range of the plate which is welded:

Elongation, minimum = 15 percent in 2 inches.

For plate thicknesses less than ⅝ inch, the all-weld-metal tension test may be omitted.

AAR-6. *Bend tests.* (g-1) Test specimens from the heat treated and finished plates shall withstand bending cold around a pin, the diameter of which is equal to the thickness of the plate, 180° for specimens taken longitudinally and 120° for transverse specimens, without cracking on the outside of the bent portion.

(g-2) Specimens for longitudinal bend tests shall be taken longitudinally (in direction of rolling) from the long edge of the rolled plate.

(g-3) Specimens for transverse bend tests shall be taken transversely (at right angles to the direction of rolling) from the middle of the ends of the rolled plates.

(g-4) Bend test specimens shall be of the full thickness of the plates and shall be of suitable length and between 1 and 2 inches in width and shall have machined edges.

(g-5) One longitudinal and one transverse bend test shall be taken from each heat treated plate.

(g-6) If the results of the bend tests do not conform to the requirements specified in AAR-6 (g-1), retests may be made. If these also fail to meet the requirements the material shall be rejected.

AAR-6. *Specific gravity of weld metal.* (h) Specimens shall be taken from the weld metal of the joints. The specific-gravity specimens shall, if possible, be 2 inches long and ⅜ inch in diameter, as shown in Fig. 16. The minimum specific gravity shall be not less than 99.0 percent of the alloy plate used.

AAR-6. (i-5) Should the specific gravity obtained on the specific-gravity specimen be less than 98.5 percent, no retest shall be allowed. Should the specific gravity lie between 98.5 percent and 99.0 percent, retest shall be allowed on specimen cut from the second test plate. The retest shall show a specific gravity of not less than 99.0 percent of the alloy plate used.

AAR-6. *Preparation for welding.* (l-1) The plates may be cut to size and shape by machining or shearing. The plates or sheets to be joined shall be accurately cut to size and formed. In all cases the forming shall be done by pressure and not by blows, including the edges of the plates forming longitudinal joints of tanks.

AAR-6. (l-9) For double-welded butt joints the reverse sides shall be chipped or ground, so as to secure a clean surface of the originally deposited weld prior to the application of the first bead of welding on the second side. Such chipping or grinding shall be done in a manner that will insure proper fusion of the weld metal. These requirements are not intended to apply to any process of welding by which proper fusion and penetration are otherwise obtained and no impurities remain at the base of the weld.

AAR-6. *Heat treatment.* (p) Each tank must be heat treated after all welding is completed to remove stresses and at the proper temperature to obtain the corrosion resistance specified in paragraph ICC-3 (a). Welded attachments must be welded in place before tank is heat treated. Fusion welded anchors, if applied, must be welded in place before tank is heat treated. Test plates must be heat treated with and at the same time as the tank. Heat treatment shall be as follows:

A. A. R. Classes S (18 percent Cr., 8 percent Ni.) and M (18 percent Cr., 8 percent Ni.+Mo.)

The tank shall be heated uniformly to a temperature of 1,900° to 2,000° F. for Class S and 1,950° to 2,050° F. for Class M. It shall be held at this temperature for one hour per inch of maximum thickness, but in no case less than one hour, followed by cooling uniformly and as rapidly as possible by quenching in water or by means of a water spray device. Time consumed in cooling from 1,700° to 1,000° F. shall not be more than three minutes. The cooling shall be continued below this temperature.

For A. A. R. Class M only, the following alternative method of heat treatment may be used if agreed to by the purchaser. The tank shall be heated to a temperature of 1,600° F. to 1,650° F. and held sufficiently long to provide freedom from susceptibility to intergranular corrosion, and cooled in a still atmosphere. The holding time generally required for this treatment is at least 72 hours. The purpose of this heat treatment is to place the tank in a state of minimum internal stress as well as to stabilize the steel.

A. A. R. Classes C (18 percent Cr., 8 percent Ni.+Cb.) and T (18 percent Cr., 8 percent Ni.+Ti.)

The tank shall be heated uniformly to 1,550° F. minimum, for Class C and a temperature of 1,550° to 1,650° F. for Class T. It shall be held at the specified temperature for 2 hours per inch of maximum thickness, but in no case less than 2 hours, followed by cooling in still air or in the furnace.

15 to 18 percent Chromium Steel

Tank shall be heated uniformly to a temperature of 1,400° F. minimum to 1,500° F. maximum and held at this temperature for 4 hours minimum plus one hour per inch at maximum thickness over one inch. It shall then be cooled in the furnace at a rate of 50° to 100° F. per hour to a temperature of 1,100° F. before removal from the furnace, and completion of the cooling in air.

Severe hot or cold forming operations, such as pressing or spinning of the tank heads, dome heads, or saddles, must be followed by the specified heat treatment as outlined above for the material used.

AAR-6. *Repairs during original construction.* (s-1) Pinholes, cracks, or other defects in welded joints shall be repaired only by chipping or machining the defect and rewelding.

AAR-6. (s-2) Tanks shall be heat treated, per paragraph AAR-6 (p), after any welding repairs have been made.

ICC-7. *Heat treatment.* (a) All welding of the tank shell and of attachments welded directly thereto must be heat treated as a unit.

AAR-7. *Heat treatment.* (a) See paragraph AAR-6 (p).

ICC-9. *Expansion dome.* (a) The expansion dome must have a capacity, measured from the inside top of shell of tank to the inside top of dome or bottom of any vent pipe projecting inside dome, of at least 1 percent of the total capacity of the tank and dome combined.

ICC-9. (b) The opening in manhole ring must be at least 18 inches in diameter. The opening in the tank shell within the dome must be at least 29 inches in diameter, and when the inside diameter of the dome exceeds 29 inches, the opening in the tank shell may be cut out to a diameter sufficientiy greater than that of the dome to permit welding of tank shell to the base of the dome. When the inside diameter of the dome exceeds 30 inches and the shell of tank is cut out as provided to permit welding, the tank shell at this point must be adequately reinforced. When the tank sheil is not cut out to permit welding and the opening in tank shell does not exceed 30 inches in diameter, no reinforcement is required but the joint between the base of the dome and the tank shell must be sealed on the inside in an approved manner and dome pocket drain holes must be provided with nipples projecting inside the tank at least one inch.

ICC-9. (c) A dome head and manhole ring in one piece may be used instead of a dished plate dome head.

AAR-9. (a) The entire dome must be of pressed, forged or cast material complying with requirements of paragraph ICC-3 (a). The dome head if separate, must be pressed, forged or cast; if forged or cast, integral attachments permissible. Dome head, if pressed, must be dished to a radius of not more than 10 feet.

AAR-9. *Tank shell reinforcement at dome opening.* (b) See figure 24.

AAR-9. (c) Design of dome head must be approved.

ICC-10. *Closures for manhole.* (a) The manhole cover must be of approved type and designed to provide a secure closure of the manhole.

ICC-10. (b) Manhole rings and covers must be made of the metal prescribed in paragraph ICC-3.

ICC-10. (c) Requirements of this paragraph optional.

AAR-10. (a) Bolted type, bolted and hinged type, or other approved type manhole cover must be used.

ICC-11. *Gauging, venting, loading and discharging, and air inlet devices extending through domes of tanks.* (a) These devices when installed must be tightly closed as prescribed in paragraph ICC-12 and be of approved design. Protective housing of approved design covering all these devices must be installed. Discharging siphon pipe must be securely anchored.

ICC-12. *Gauging, venting, loading and discharging, and air inlet devices.* (a) Tnese devices when installed must be tightly closed with approved caps, plugs, valves, or other suitable fittings. Provision must be made for closing pipe connections of valves.

ICC-13. *Bottom discharge outlets.* (a) Bottom discharge outlet prohibited for cars to be used for transportation of corrosive liquids. Bottom sump of cast, pressed, or forged metal is permissible. If used and weided to tank, it must be of cast, pressed, or forged metal and he of good weldable quality in conjunction with metal of tank.

ICC-13. (b) This paragraph does not apply for cars transporting corrosive liquids.

ICC-13. (c) This paragraph does not apply for cars transporting corrosive liquids.

AAR-13. (a) This paragraph does not apply for cars transporting corrosive liquids.

AAR-13. (b) This paragraph does not apply for cars transporting corrosive liquids.

AAR-13. (c) This paragraph does not apply for cars transporting corrosive liquids.

AAR-13. (d) This paragraph does not apply for cars transporting corrosive liquids.

AAR-13. (e) This paragraph does not apply for cars transporting corrosive liquids.

AAR-13. (f) This paragraph does not apply for cars transporting corrosive liquids.

AAR-13. (g) This paragraph does not apply for cars transporting corrosive liquids.

ICC-14. *Safety valves.* (a) The tank must be equipped with a safety valve at least 2 inches inside diameter mounted on top of expansion dome.

ICC-14. (b) One safety valve must be provided for each tank or compartment thereof.

ICC-14. (c) The safety valve must be set to open at a pressure of 45 pounds per square inch. (For tolerance see par. ICC-18.)

ICC-14. (d) This paragraph does not apply.

AAR-14. (a) Safety valve must be of approved design.

AAR-14. (b) Safety valve flanges, if welded to dome, must be of cast, forged or pressed metal and be of good weldable quality in conjunction with metal of dome.

ICC-15. *Fixtures, reinforcements, and attachments not otherwise specified.* (a) All attachments to tank and dome must be applied by approved means. When attachments are riveted the edges of plates must be beveled so that the angle of the calking edge will be between 60 and 70 degrees with the flat surface of the attachment. The extreme calking edge distance, measured from center line of rivet hole, must be at least one and one-half times the diameter of the hole and not more than that distance plus ¼ inch. The joints formed by attachment of all riveted external projections must be calked on the inside. All rivet heads on the inside and outside of tank and dome must be calked. Split calking prohibited. Interior heater systems, when installed, must be so constructed that the breaking off of their external connections will not cause leakage of contents of tanks.

ICC-16. *Plugs for openings.* (a) All plugs must be solid, made of materials prescribed in paragraph ICC-3, with standard pipe thread, and when in contact with lading must be of a length which will screw at least six threads inside the face of fitting or tank. Plugs when inserted from the outside of tank heads must have the letter "S" at least ⅜ inch in size stamped with steel stamp or cast on the outside surface to indicate the plug is solid. Plugs when inserted from the inside are identified by appearance of the plug on the outside of the tank as being solid—therefore, no mark required.

ICC-18. *Tests of safety valves.* (a) Valve must be tested before being put into service, by attaching to an air line and applying pressure. The valve must open at the pressure prescribed in paragraph ICC-14 (c), with a tolerance of minus 3 pounds.

AAR-18. (a) This paragraph does not apply.

ICC-19. *Retests of tanks, safety valves, and interior heater systems.* (a) Tanks, safety valves, and interior heater systems must be retested as prescribed for original tests in paragraphs ICC-17 and ICC-18, except that acid may be used for filiing tank and dome when testing tanks which have not been in service more than 12 years. The first retest must be conducted within four years after the original test, and subsequent retests at four-year intervals up to 12 years of service, thereafter at two-year intervals up to 20 years of service, and annually after 20 years of service. Tanks in service over 12 years must be internally inspected and heater systems inspected for defects which would make leakage or failure probable during transit and must be tested with water only. Tank must also be retested before being returned to service after any repairs requiring welding, riveting, or calking of rivets. Heater systems must be retested after repairs. Reports must be rendered as prescribed in paragraph ICC-21.

ICC-20. (b) ICC-103C-W in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the tank, or jacket if lagged, in letters and figures at least 2 inches high by the party assembling the completed car.

ICC-20. (h) This paragraph does not apply.

§ 78.284 *Specification for tank cars having lagged fusion-welded steel tanks Class ICC-104-W.* This specification covers Class ICC-104-W tank cars having lagged fusion-welded steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC-103-W, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.280 Specification ICC-103-W):

ICC-1. (b) The tank shell and dome must be lagged with an approved insulation material of a thickness so that the thermal conductance is not more than 0.225 B. t. u. per square foot per degree Fahrenheit differential in temperature per hour. The entire insulation must be covered with a metal jacket efficiently flashed around all openings so as to be weathertight.

AAR-1. (a) See paragraph ICC-1 (b).

ICC-11. *Gauging, bottom outlet valve operating, venting, loading and discharging, and air inlet devices extending through domes of tanks.* (a) Venting and loading and discharging devices of approved design must be installed. Gauging, bottom outlet valve operating and air inlet devices are not specification requirements. These devices when installed, including their valves, must be protected from accidental injury by being set into a securely covered recess, or by means of a cast or pressed steel or malleable iron housing with cover securely attached. Openings in wall of housing must be equipped

with screw plugs or other closures. Drain holes permitted. Housing, if welded to dome of tank, must be of cast, forged or pressed metal and be of good weldable quality in conjunction with metal of dome. Discharging siphon pipe must be securely anchored.

ICC–13. (c) This paragraph does not apply.

ICC–14. (e) Tanks used for the transportation of flammable liquids or other commodities having vapor pressure exceeding 27 pounds per square inch, absolute, at 100° F. and not exceeding 40 pounds per square inch, absolute, at 100° F. must have the safety valves set to open at a pressure of 35 pounds per square inch. (For tolerance see paragraph ICC–18.)

ICC–17. *Tests of tanks.* (a) Each tank must be tested, before being put into service and before lagging is applied, by completely filling tank and dome with water, or other liquid having similar viscosity, of a temperature which must not exceed 100° F. during the test, and applying a pressure of 60 pounds per square inch. Tank must hold the prescribed pressure for at least 10 minutes without leakage or evidence of distress. All rivets and closures, except safety valves or safety vents, must be in place while test is made.

AAR–17. (c) See paragraph ICC–17 (a).

ICC–18. (b) Each valve on tank cars used for the transportation of flammable liquids or other commodities having vapor pressures exceeding 27 pounds per square inch, absolute, at 100° F. and not exceeding 40 pounds per square inch, absolute at 100° F. must be tested, before being put into service, by attaching to an air line and applying pressure. The valve must not leak below 28 pounds per square inch gage pressure. The valve must open at the pressure prescribed in paragraph ICC–14 (e), with a tolerance of plus or minus 3 pounds.

ICC–19. *Retests of tanks, safety valves, and interior heater systems.* (a) Tanks, safety valves, and interior heater systems must be retested, as prescribed for original tests in paragraphs ICC–17 and ICC–18, at intervals of ten years or less after the original tests. Tanks must also be retested before being returned to service after any repairs requiring welding, riveting, or calking of rivets. If the jacket and lagging are not removed, the tank must hold the prescribed pressure for at least 20 minutes. A drop in pressure shall be evidence of leakage, and such portion of the jacket and lagging must be removed as may be necessary to locate the leak and make repairs. After the repairs have been made, the tank must again be subjected to the prescribed test. Interior heater systems must be retested after repairs. Reports must be rendered as prescribed in paragraph ICC–21.

AAR–19. (a) See paragraph ICC–19 (a).

ICC–20. (b) ICC–104–W in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the jacket in letters and figures at least 2 inches high by the party assembling the completed car.

ICC–20. (j) Tanks equipped with safety valves set to open at a pressure of 35 pounds per square inch, as prescribed by paragraph ICC–14 (e), must be stenciled "For Vapor Pressures Not Exceeding 40 Pounds per Square Inch Absolute, at 100° F." in letters and figures at least one inch high immediately above the stenciled mark specified in paragraph ICC–20 (b).

§ 78.285 *Specification for tank cars having lagged fusion-welded steel tanks Class ICC–104A–W.* This specification covers Class ICC–104A–W tank cars having lagged fusion-welded steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)–Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC–103–W, except as modified in the following paragraphs (paragraph numbers refer to like number in § 78.280 Specification ICC–103–W):

ICC–1. *Type.* (a) Tanks built under this specification must be cylindrical, with heads dished convex outward. The tank must be provided with a manhole nozzle and cover on top of the tank of sufficient diameter to permit access to the interior of the tank and provide for the proper mounting of venting, loading, unloading, sampling, and safety valves, gauging device, thermometer well, and a protective housing on the cover. Other openings in the tank prohibited, except those required for testing anchor rivets and their protective coverings.

ICC–1. (b) The tank shell and manhole nozzle must be lagged with an approved insulation material of a thickness so that the thermal conductance is not more than 0.075 B. t. u. per square foot, per degree Fahr. differential in temperature per hour. The entire insulation must be covered with a metal jacket, efficiently flashed around all openings so as to be weather tight. When heater systems are attached to exterior of tank, the lagging over each pipe may be reduced in thickness equivalent to one-half that required for shell.

AAR–1. (a) See paragraph ICC–1 (b).

ICC–2. *Bursting pressure.* (a) The calculated bursting pressure, based on the lowest tensile strength of the plate and the efficiency of the longitudinal welded joint must be at least 495 pounds per square inch.

AAR–2. (b) The opening in the tank for manhole nozzle must be reinforced so as to provide the required cross-sectional area as determined by formula shown on Figure 14.

ICC–4. *Thickness and width of plates.* (a) The minimum thickness of plates must be as follows:

Inside diameter of tanks	Bottom sheets	Shell sheets	Tank heads
	Inch	*Inch*	*Inch*
87 inches or under	7/16	7/16	7/16
Over 87 to 96 inches	9/16	9/16	9/16

ICC–4. (d) This paragraph does not apply.

AAR–4. (b) This paragraph does not apply.

AAR–4. (c) Car must have underframe.

AAR–4. (d) This paragraph does not apply.

AAR–5. (a) The tank head shape shall be an ellipsoid of revolution in which the major axis shall equal the diameter of the shell and the minor axis shall be one-half of this.

ICC–6. (b) Manhole nozzle must be of approved design and attached to tank by riveting or fusion-welding. Riveted joints must be made metal to metal without interposition of other material. Rivets, if used, must be driven hot and calked inside. For computing rivet area the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by more than 1/16 inch. Use of rivets of less than ⅝ inch nominal diameter prohibited. Fusion-welding for securing attachments in place must be of the double-welded butt joint type or double full-fillet lap joint type.

ICC–9. *Expansion dome.* (a) Expansion dome prohibited.

ICC–9. (b) This paragraph does not apply.

ICC–9. (c) This paragraph does not apply.

AAR–9. (a) This paragraph does not apply.

ICC–10. *Manhole nozzle, cover and protective housing.* (a) Manhole nozzle must be of cast, forged, or pressed steel at least 18 inches inside diameter having approved wall thicknesses and dimensions.

ICC–10. (b) Manhole cover must be of forged or rolled steel at least 2¼ inches thick, machined to approved dimensions. Manhole cover must be attached to manhole nozzle by through or stud bolts not entering tank.

ICC–10. (c) The shearing value of the bolts attaching protective housing to manhole cover must not exceed 70 percent of shearing value of bolts attaching manhole cover to manhole nozzle.

ICC–10. (d) All joints between manhole cover and manhole nozzle, and between manhole cover and valves or other appurtenances mounted thereon, must be made tight against vapor pressure.

ICC–10. (e) Protective housing of cast or pressed steel must be bolted to manhole cover. Housing must be equipped with a steel cover that can be securely closed. Housing cover on tanks used for the transportation of flammable compressed gases must be provided with an opening equipped with an approved weather-proof covering and having an area at least equal to the total safety valve discharge area. Housing cover must have suitable stop to prevent cover striking loading or unloading connections and be hinged on one side only with approved riveted pin or rod with nuts and cotters. Openings in wall of housing must be equipped with screw plugs or other closures.

AAR–10. *Manhole cover.* (a) For dimensions and tolerances of manhole cover see Figure 8.

ICC–11. *Venting, loading and discharging, gauging and sampling devices.* (a) These devices must be approved type, made of metal not subject to rapid deterioration by the lading, and must withstand a pressure of 100 pounds per square inch without leakage. The venting, and loading and discharging valves must be directly bolted to seatings on manhole cover. Pipe connections of valves must be closed with approved screw plugs chained or otherwise fastened to prevent misplacement. Thermometer well and sampling valve must be installed and closed with screw plugs or valves.

ICC–11. (b) The interior pipes of the liquid and gas discharge valves must be equipped with check valves.

ICC–11. (c) Gauging device, sampling valve, check valves, and thermometer well are not specification requirements on tanks used for the transportation of commodities other than those classed as liquefied compressed gases.

ICC–12. (a) This paragraph does not apply.

ICC–13. *Bottom discharge outlets.* (a) Bottom discharge outlet prohibited.

ICC–13. (b) This paragraph does not apply.

ICC–13. (c) This paragraph does not apply.

AAR–13. (a) This paragraph does not apply.

AAR–13. (b) This paragraph does not apply.

AAR–13. (c) This paragraph does not apply.

AAR–13. (d) This paragraph does not apply.

AAR–13. (e) This paragraph does not apply.

AAR–13. (f) This paragraph does not apply.

AAR–13. (g) This paragraph does not apply.

ICC–14. *Safety valves.* (a) The tank must be equipped with one or more safety valves of approved type, made of metal not subject to rapid deterioration by lading and mounted on manhole cover. The total valve discharge

capacity must be sufficient to prevent building up of pressure in tank in excess of 75 pounds per square inch.

ICC–14. (b) This paragraph does not apply.

ICC–14. (c) The safety valves must be set to open at a pressure of not exceeding 75 pounds per square inch. (For tolerance see paragraph ICC–18.)

ICC–14. (d) This paragraph does not apply.

AAR–14 (a) Safety valve must be of approved design. See Appendix "A" for formula for calculating discharge capacity of valve and method of testing sample valve of a particular design to determine its actual discharge capacity which must at least equal the capacity calculated as necessary to prevent building up pressure in the tank in excess of 75 pounds per square inch.

AAR–14. (b) This paragraph does not apply.

ICC–15. *Fixtures, reinforcements, and attachments, not otherwise specified.* (a) Attachments, other than the anchorage and those mounted on manhole nozzle and cover, are prohibited. Heater systems may be applied to exterior of tank by tank bands or other approved method.

AAR–15. (b) This paragraph does not apply.

ICC–16. *Plugs for openings.* (a) Plugs must be of approved type, with standard pipe thread, and of metal not subject to rapid deterioration by the lading.

ICC–17. *Tests of tanks.*—(a) Each tank must be tested, after anchorage is applied and before the tank lagging is applied, by completely filling tank and manhole nozzle with water or other liquid of similar viscosity, having a temperature which must not exceed 100° F. during test, and applying a pressure of 100 pounds per square inch. The tank must hold the prescribed pressure for at least 10 minutes without leakage or distress. All rivets and closures, except safety valves, must be in place while test is made.

ICC–17. (c) Tests of exterior heater systems not a specification requirement.

AAR–17. *Hammer test.* (a) The tank shall be subjected to a hydrostatic pressure of 100 pounds per square inch and while subject to this pressure shall be given a thorough hammer or impact test. This impact test shall consist of striking the plate at six-inch intervals on both sides of the welded joint and for the full length of all welded joints. The weight of the hammer in pounds shall approximately equal the thickness of the shell in tenths of an inch, but not to exceed ten pounds. The plates shall be struck with a sharp swinging blow. The edges of the hammer shall be rounded so as to prevent defacing the plate. Following the impact test this pressure must be held for at least 10 minutes.

AAR–17. (c) See paragraph ICC–17 (a).

ICC–18. *Tests of safety valves.* (a) Each valve must be tested by air or gas before being put into service. The valve must open at a pressure not exceeding 75 pounds per square inch and be vapor tight at 60 pounds per square inch, which limiting pressures must not be affected by any auxiliary closure or other combination.

AAR–18. (a) This paragraph does not apply.

ICC–19. *Retests of tanks and safety valves.* (a) Tanks must be retested at intervals of 5 years or less to a pressure as prescribed in paragraph ICC–17 (a), except that the tank lagging and jacket need not be removed unless the pressure in the tank drops during the test period, indicating leakage; and safety valves must be retested to a pressure as prescribed in paragraphs ICC–14 (c) and ICC–18. Tanks must be retested before being returned to service after any repairs requiring welding, riveting or calking of rivets. Reports must be rendered as prescribed in paragraph ICC–21.

AAR–19. (a) See paragraph ICC–19 (a).

ICC–20. (b) ICC–104A–W in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the jacket in letters and figures at least 2 inches high by the party assembling the completed car.

ICC–20. (g) This paragraph does not apply.

ICC–20. (h) This paragraph does not apply.

ICC–20. (j) Water capacity of the tank in pounds stamped plainly and permanently in letters and figures at least ⅜ inch high into the metal of the tank immediately below the mark specified in paragraphs ICC–20 (c) and ICC–20 (d). This mark must also be stenciled on the jacket immediately below the dome platform and either directly behind or within 3 feet of the right or left side of ladder, or ladders if there is a ladder on each side of the tank, in letters and figures at least 2 inches high as follows: Water Capacity, 000000 Pounds.

§ 78.286 *Specification for tank cars having lagged fusion-welded steel tanks Class ICC–105A300–W.* This specification covers Class ICC–105A300–W tank cars having lagged fusion-welded steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)–Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC–103–W, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.280 Specification ICC–103–W):

ICC–1. *Type.* (a) Tanks built under this specification must be cylindrical with heads dished convex outward. The tank must be provided with a manhole nozzle and cover on top of the tank of sufficient diameter to permit access to the interior of the tank and to provide for the proper mounting of venting, loading, unloading, sampling and safety valves, gauging device, thermometer well, and a protective housing on the cover. Other openings in the tank prohibited, except those required for testing anchor rivets and their protective coverings.

ICC–1. (b) The tank shell and manhole nozzle must be lagged with an approved insulation material of a thickness so that the thermal conductance is not more than 0.075 B. t. u per sq. ft., per degree Fahr. differential in temperature per hour. The entire insulation must be covered with a metal jacket, efficiently flashed around all openings so as to be weathertight. When heater systems are attached to exterior of tank, the lagging over each pipe may be reduced in thickness equivalent to one-half that required for shell.

AAR–1. (a) See paragraph ICC–1 (b).

ICC–2. *Bursting pressure.* (a) The calculated bursting pressure, based on the lowest tensile strength of the plate and the efficiency of the longitudinal welded joint, must be at least 750 pounds per square inch.

ICC–2. (b) Opening in tank for manhole nozzle must be reinforced in an approved manner.

ICC–2. (c) Tank heads must be at least as thick at all points as wall of tank.

AAR–2. (b) The opening in the tank for manhole nozzle must be reinforced so as to provide the required cross-sectional area as determined by formula shown on Figure 14.

ICC–4. *Thickness and width of plates.* (a) The minimum thickness of plates 1 1/16 inch.

ICC–4. (d) This paragraph does not apply.

AAR–4. (b) This paragraph does not apply.

AAR–4. (c) Car must have underframe.

AAR–4. (d) This paragraph does not apply.

AAR–5. (a) The tank head shape shall be an ellipsoid of revolution in which the major axis shall equal the diameter of the shell and the minor axis shall be one-half of this.

ICC–6. (b) Rivets, if used for attaching anchor, must be driven hot and calked inside. For computing rivet areas the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by more than 1/16 inch. Use of rivets of less than ⅝ inch nominal diameter prohibited.

Anchor rivets must be protected on the inside of tank by an approved design of housing.

ICC–6. (c) This paragraph does not apply.

AAR–8. (c) Anchor rivets, if used, must have their heads on the inside of the tank shell covered and protected from the lading by a liquid-tight housing of approved design. The lower portion of the housing must be fusion-welded to, and stress relieved with, the tank shell as a unit. After the rivets have been driven and calked, the top portion of the housing must be secured to the top of the lower portion by an approved method of welding, which welding need not be stress relieved. A hole must be provided through tank shell, under each housing to permit making air pressure test. Each test hole must be tightly closed after completion of test with an approved plug.

ICC–9. *Expansion dome.* (a) Expansion dome prohibited.

ICC–9. (b) This paragraph does not apply.

ICC–9. (c) This paragraph does not apply.

AAR–9. (a) This paragraph does not apply.

ICC–10. *Manhole nozzle, cover and protective housing.* (a) Manhole nozzle must be of forged or rolled steel at least 18 inches inside diameter having approved wall thicknesses and dimensions.

ICC–10. (b) Manhole cover must be of forged or rolled steel at east 2¼ inches thick machined to approved dimensions. Manhole cover must be attached to manhole nozzle by through or stud bolts not entering tank.

ICC–10. (c) The shearing value of the bolts attaching protective housing to manhole cover must not exceed 70 percent of shearing value of bolts attaching manhole cover to manhole nozzle.

ICC–10. (d) All joints between manhole cover and manhole nozzle, and between manhole cover and valves or other appurtenances mounted thereon, must be made tight against vapor pressure.

ICC–10. (e) Protective housing of cast or pressed steel must be bolted to manhole cover. Housing must be equipped with a steel cover than can be securely closed. Housing cover on tanks used for the transportation of flammable compressed gases must be provided with an opening equipped with an approved weather-proof covering and having an area at least equal to the total safety valve discharge area. Housing cover must have suitable stop to prevent cover striking loading or unloading connections and be hinged on one side only with an approved riveted pin or rod with nuts and cotters. Openings in wall of housing must be equipped with screw plugs or other closures.

AAR–10. *Manhole cover.* (a) For dimensions and tolerance of manhole cover see Figure 8.

ICC–11. *Venting and loading and discharging valves.* (a) These valve must be of approved type, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 300 pounds per

square inch without leakage. The valves must be directly bolted to seatings on manhole cover. Pipe connections of the valves must be closed with approved screw plugs chained or otherwise fastened to prevent misplacement.

ICC–11. (b) The interior pipes of the liquid and gas discharge valves, except as prescribed in paragraphs ICC–11 (d) and ICC–11 (e), may be equipped with check valves of an approved design.

ICC–11. (c) Gauging device, sampling valve, and thermometer well are required on tanks used for the transportation of flammable gases. They must be of approved design, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 300 pounds per square inch without leakage. Interior pipes of the gauging device and sampling valves must be equipped with check valves of an approved design. Thermometer well must be closed with screw plug.

ICC–11. (d) Tanks for use in the transportation of liquefied hydrocarbon and liquefied petroleum gases must have the interior pipes of the liquid and gas discharge valves equipped with check valves of an approved design.

ICC–11. (e) Tanks for use in the transportation of chlorine must have the interior pipes of the liquid discharge valves equipped with check valves of an approved design.

ICC–12. (a) This paragraph does not apply

ICC–13. *Bottom discharge outlets.* (a) Bottom discharge outlet prohibited.

ICC–13. (b) This paragraph does not apply.

ICC–13. (c) This paragraph does not apply.

AAR–13. (a) This paragraph does not apply.

AAR–13. (b) This paragraph does not apply.

AAR–13. (c) This paragraph does not apply.

AAR–13. (d) This paragraph does not apply.

AAR–13. (e) This paragraph does not apply.

AAR–13. (f) This paragraph does not apply.

AAR–13. (g) This paragraph does not apply.

ICC–14. *Safety valves.* (a) The tank must be equipped with one or more safety valves of approved type, made of metal not subject to rapid deterioration by lading and mounted on manhole cover. The total valve-discharge capacity must be sufficient to prevent building up a pressure in tank in excess of 225 pounds per square inch.

ICC–14 (b) This paragraph does not apply.

ICC–14. (c) The safety valves must be set to open at a pressure of not exceeding 225 pounds per square inch. (For tolerance see paragraph ICC–18.)

ICC–14. (d) This paragraph does not apply.

AAR–14. (a) Safety valve must be of approved design. See appendix "A" for formula for calculating discharge capacity of valve and method of testing sample valve of a particular design to determine its actual discharge capacity which must at least equal the capacity calculated as necessary to prevent building up pressure in the tank in excess of 225 pounds per square inch.

AAR–14. (b) This paragraph does not apply.

ICC–15. *Fixtures, reinforcements, and attachments, not otherwise specified.* (a) Attachments, other than the anchorage and those mounted on manhole nozzle and cover, are prohibited. Heater systems may be applied to exterior of tank by tank bands or other approved method.

AAR–15. (b) This paragraph does not apply.

ICC–16. *Plugs for openings.* (a) Plugs must be of approved type, with standard pipe thread, and of metal not subject to rapid deterioration by the lading.

ICC–17. *Tests of Tanks.* (a) Each tank must be tested, after anchorage is applied and before anchor-rivet housings and the tank lagging are applied, by completely filling tank and manhole nozzle with water or other liquid of similar viscosity, having a temperature which must not exceed 100° F. during test, and applying a pressure of 300 pounds per square inch. The tank must hold the prescribed pressure for at least 30 minutes without leakage or distress.

ICC–17. (c) Tests of exterior heater systems not a specification requirement.

ICC–17. (d) After anchor-rivet housings are in place these housings must be tested by applying an air pressure of 100 pounds per square inch through openings in tank shell and must be tight against leakage.

AAR–17. *Hammer test.* (a) The tank shall be subjected to a hydrostatic pressure of 225 pounds per square inch and while subject to this pressure shall be given a thorough hammer or impact test. This impact test shall consist of striking the plate at six-inch intervals on both sides of the welded joint and for the full length of all welded joints. The weight of the hammer in pounds shall approximately equal the thickness of the shell in tenths of an inch, but not to exceed ten pounds. The plates shall be struck with a sharp swinging blow. The edges of the hammer shall be rounded so as to prevent defacing the plate. Following the impact test, each tank must be tested as prescribed in paragraph ICC–17 (a).

AAR–17. (b) See paragraph ICC–17 (d).

AAR–17. (c) See paragraph ICC–17 (a).

ICC–18. *Tests of safety valves.* (a) Each valve must be tested by air or gas before being put into service. The valve must open at a pressure not exceeding 225 pounds per square inch and be vapor-tight at 180 pounds per square inch, which limiting pressures must not be affected by any auxiliary closure or other combination.

AAR–18. (a) This paragraph does not apply.

ICC–19. *Retests of tanks, anchor-rivet housings, and safety valves.* (a) Tanks must be retested at intervals of 5 years or less to a pressure as prescribed in paragraph ICC–17 (a), except that the anchor-rivet housings must not be removed and that the tank lagging and jacket need not be removed unless the pressure in the tank drops during the test period, indicating leakage; anchor-rivet housings must be retested to a pressure as prescribed in paragraph ICC–17 (d); and safety valves must be retested to a pressure as prescribed in paragraphs ICC–14 (c) and ICC–18. Tanks must be retested before being returned to service after any repairs requiring welding. Reports must be rendered as prescribed in paragraph ICC–21.

ICC–19. (b) Tanks used for the transportation of chlorine must be retested as prescribed in paragraph ICC–19 (a) at intervals of two years or less.

AAR–19. (a) See paragraph ICC–19 (a).

AAR–19. (b) See paragraph ICC–19 (a).

ICC–20. (b) ICC–105A300–W in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the jacket in letters and figures at least 2 inches high by the party assembling the completed car.

ICC–20. (g) This paragraph does not apply.

ICC–20. (h) This paragraph does not apply.

ICC–20. (j) Water capacity of the tank in pounds stamped plainly and permanently in letters and figures at least ⅜ inch high into the metal of the tank immediately below the mark specified in paragraphs ICC–20 (c) and ICC–20 (d). This mark must also be stenciled on the jacket immediately below the dome platform and either directly behind or within 3 feet of the right or left side of ladder, or ladders if there is a ladder on each side of the tank, in letters and figures at least 2 inches high as follows: Water Capacity 000000 Pounds.

§ 78.287 *Specification for tank cars having lagged fusion-welded steel tanks, Class ICC–105A400–W.* This specification covers Class ICC–105A400–W tank cars having lagged fusion-welded steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC–103–W, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.280 Specification ICC–103–W):

ICC–1. *Type.* (a) Tanks built under this specification must be cylindrical, with heads dished convex outward. The tank must be provided with a manhole nozzle and cover on top of the tank of sufficient diameter to permit access to the interior of the tank and to provide for the proper mounting of venting, loading, unloading, sampling and safety valves, gauging device, thermometer well, and a protective housing on the cover. Other openings in the tank prohibited, except those required for testing anchor rivets and their protective coverings.

ICC–1. (b) The tank shell and manhole nozzle must be lagged with an approved insulation material of a thickness so that the thermal conductance is not more than 0.075 B. t. u. per square foot, per degree Fahrenheit differential in temperature per hour. The entire insulation must be covered with a metal jacket, efficiently flashed around all openings so as to be weather tight. When heater systems are attached to exterior of tank, the lagging over each pipe may be reduced in thickness equivalent to one-half that required for shell.

AAR–1. (a) See paragraph ICC–1 (b).

ICC–2. *Bursting pressure.* (a) The calculated bursting pressure based on the lowest tensile strength of the plate and the efficiency of the longitudinal welded joint, must be at least 1,000 pounds per square inch.

ICC–2. (b) Opening in tank for manhole nozzle must be reinforced in an approved manner.

ICC–2. (c) Tank heads must be at least as thick at all points as wall of tank.

AAR–2. (b) The opening in the tank for manhole nozzle must be reinforced so as to provide the required cross-sectional area as determined by formula shown on Figure 14.

ICC–4. *Thickness and width of plates.* (a) The minimum thickness of plates $^{11}/_{16}$ inch.

ICC–4. (d) This paragraph does not apply.

AAR–4. (b) This paragraph does not apply.

AAR–4. (c) Car must have underframe.

AAR–4. (d) This paragraph does not apply.

AAR–5. (a) The tank head shape shall be an ellipsoid of revolution in which the major axis shall equal the diameter of the shell and the minor axis shall be one-half of this.

ICC–6. (b) Rivets, if used for attaching anchor, must be driven hot and calked inside. For computing rivet areas the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by

more than 1/16 inch. Use of rivets of less than 5/8 inch nominal diameter prohibited.

Anchor rivets must be protected on the inside of tank by approved design of housing.

ICC–6. (c) This paragraph does not apply.

AAR–8. (c) Anchor rivets, if used, must have their heads on the inside of the tank shell covered and protected from the lading by a liquid-tight housing of approved design. The lower portion of the housing must be fusion-welded to, and stress-relieved with, the tank shell as a unit. After the rivets have been driven and calked, the top portion of the housing must be secured to the top of the lower portion by an approved method of welding, which welding need not be stress-relieved. A hole must be provided through tank shell, under each housing to permit making air-pressure test. Each test hole must be tightly closed after completion of test with an approved plug.

ICC–9. *Expansion dome.* (a) Expansion dome prohibited.

ICC–9. (b) This paragraph does not apply.

ICC–9. (c) This paragraph does not apply.

AAR–9. (a) This paragraph does not apply.

ICC–10. *Manhole nozzle, cover, and protective housing.* (a) Manhole nozzle must be of forged or rolled steel at least 18 inches inside diameter having approved wall thicknesses and dimensions.

ICC–10. (b) Manhole cover must be of forged or rolled steel at least 2¼ inches thick machined to approved dimensions. Manhole cover must be attached to manhole nozzle by through or stud bolts not entering tank.

ICC–10. (c) The shearing value of the bolts attaching protective housing to manhole cover must not exceed 70 percent of shearing value of bolts attaching manhole cover to manhole nozzle.

ICC–10. (d) All joints between manhole cover and manhole nozzle, and between manhole cover and valves or other appurtenances mounted thereon, must be made tight against vapor pressure.

ICC–10. (e) Protective housing of cast or pressed steel must be bolted to manhole cover. Housing must be equipped with a steel cover that can be securely closed. Housing cover on tanks used for the transportation of flammable compressed gases must be provided with an opening equipped with an approved weatherproof covering and having an area at least equal to the total safety valve discharge area. Housing cover must have suitable stop to prevent cover striking loading or unloading connections and be hinged on one side only with an approved riveted pin or rod with nuts and cotters. Openings in wall of housing must be equipped with screw plugs or other closures.

AAR–10. *Manhole cover.* (a) For dimensions and tolerances of manhole cover see Figure 8.

ICC–11. *Venting, and loading and discharging valves.* (a) These valves must be of approved type, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 400 pounds per square inch without leakage. The valves must be directly bolted to seatings on manhole cover. Pipe connections of the valves must be closed with approved screw plugs chained or otherwise fastened to prevent misplacement.

ICC–11. (b) The interior pipes of the liquid and gas discharge valves, except as prescribed in paragraphs ICC–11 (d) and ICC–11 (e), may be equipped with check valves of an approved design.

ICC–11. (c) Gauging device, sampling valve, and thermometer well are required on tanks used for the transportation of flammable gases. They must be of approved design, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 400 pounds per square inch without leakage. Interior pipes of the gauging device and sampling valves must be equipped with check valves of an approved design. Thermometer well must be closed with screw plug.

ICC–11. (d) Tanks for use in the transportation of liquefied hydrocarbon and liquefied petroleum gases must have the interior pipes of the liquid and gas discharge valves equipped with check valves of an approved design.

ICC–11. (e) Tanks for use in the transportation of chlorine must have the interior pipes of the liquid discharge valves equipped with check valves of an approved design.

ICC–12. (a) This paragraph does not apply.

ICC–13. *Bottom discharge outlets.* (a) Bottom discharge outlet prohibited.

ICC–13. (b) This paragraph does not apply.

ICC–13. (c) This paragraph does not apply.

AAR–13. (a) This paragraph does not apply.

AAR–13. (b) This paragraph does not apply.

AAR–13. (c) This paragraph does not apply.

AAR–13. (d) This paragraph does not apply.

AAR–13. (e) This paragraph does not apply.

AAR–13. (f) This paragraph does not apply.

AAR–13. (g) This paragraph does not apply.

ICC–14. *Safety valves.* (a) The tank must be equipped with one or more safety valves of approved type, made of metal not subject to rapid deterioration by lading and mounted on manhole cover. The total valve discharge capacity must be sufficient to prevent building up of pressure in tank in excess of 300 pounds per square inch.

ICC–14. (b) This paragraph does not apply.

ICC–14. (c) The safety valves must be set to open at a pressure of not exceeding 300 pounds per square inch. (For tolerance see paragraph ICC–18.)

ICC–14. (d) This paragraph does not apply.

AAR–14. (a) Safety valve must be of approved design. See Appendix "A" for formula for calculating discharge capacity of valve and method of testing sample valve of a particular design to determine its actual discharge capacity which must at least equal the capacity calculated as necessary to prevent building up pressure in the tank in excess of 300 pounds per square inch.

AAR–14. (b) This paragraph does not apply.

ICC–15. *Fixtures, reinforcements, and attachments, not otherwise specified.* (a) Attachments, other than the anchorage and those mounted on manhole nozzle and cover, are prohibited. Heater systems may be applied to exterior of tank by tank bands or other approved method.

AAR–15. (b) This paragraph does not apply.

ICC–16. *Plugs for openings.* (a) Plugs must be of approved type, with standard pipe thread, and of metal not subject to rapid deterioration by the lading.

ICC–17. *Tests of tanks.* (a) Each tank must be tested, after anchorage is applied and before anchor rivet housings and the tank lagging are applied, by completely filling tank and manhole nozzle with water or other liquid of similar viscosity, having a temperature which must not exceed 100° F. during test, and applying a pressure of 400 pounds per square inch. The tank must hold the prescribed pressure for at least 30 minutes without leakage or distress.

ICC–17. (c) Tests of exterior heater systems not a specification requirement.

ICC–17. (d) After anchor rivet housings are in place these housings must be tested by applying an air pressure of 100 pounds per square inch through openings in tank shell and must be tight against leakage.

AAR–17. *Hammer test.* (a) The tank shall be subjected to a hydrostatic pressure of 300 pounds per square inch and while subject to this pressure shall be given a through hammer or impact test. This impact test shall consist of striking the plate at six-inch intervals on both sides of the welded joint and for the full length of all welded joints. The weight of the hammer in pounds shall approximately equal the thickness of the shell in tenths of an inch, but not to exceed ten pounds. The plates shall be struck with a sharp swinging blow. The edges of the hammer shall be rounded so as to prevent defacing the plate. Following the impact test, each tank must be tested as prescribed in paragraph ICC–17 (a).

AAR–17. (b) See paragraph ICC–17 (d).

AAR–17. (c) See paragraph ICC–17 (a).

ICC–18. *Tests of safety valves.* (a) Each valve must be tested by air or gas before being put into service. The valve must open at a pressure not exceeding 300 pounds per square inch and be vapor-tight at 240 pounds per square inch, which limiting pressures must not be affected by any auxiliary closure or other combination.

AAR–18. (a) This paragraph does not apply.

ICC–19. *Retests of tanks, anchor rivet housings, and safety valves.* (a) Tanks must be retested at intervals of 5 years or less to a pressure as prescribed in paragraph ICC–17 (a), except that the anchor rivet housings must not be removed and that the tank lagging and jacket need not be removed unless the pressure in the tank drops during the test period, indicating leakage; anchor rivet housings must be retested to a pressure as prescribed in paragraph ICC–17 (d); and safety valves must be retested to a pressure as prescribed in paragraph ICC–14 (c) and ICC–18. Tanks must be retested before being returned to service after any repairs requiring welding. Reports must be rendered as prescribed in paragraph ICC–21.

ICC–19. (b) Tanks used for the transportation of chlorine must be retested as prescribed in paragraph ICC–19 (a) at intervals of two years or less.

AAR–19. (a) See paragraph ICC–19 (a).

AAR–19. (b) See paragraph ICC–19 (a).

ICC–20. (b) ICC–105A400–W in letters and figures at least 3/8 inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the jacket in letters and figures at least 2 inches high by the party assembling the completed car.

ICC–20. (g) This paragraph does not apply.

ICC–20. (h) This paragraph does not apply.

ICC–20. (j) Water capacity of the tank in pounds stamped plainly and permanently in letters and figures at least 3/8 inch high into the metal of the tank immediately below the mark specified in paragraphs ICC–20 (c) and ICC–20 (d). This mark must also be stenciled on the jacket immediately below the dome platform and either directly behind or within 3 feet of the right or left side of ladder, or ladders if there is a ladder on each side of the tank, in letters and figures at least 2 inches high as follows: Water Capacity 000000 Pounds.

§ 78.288 *Specification for tank cars having lagged fusion-welded steel tanks Class ICC–105A500–W.* This specification covers Class ICC–105A500–W tank cars having lagged fusion-welded steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC–103–W, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.280 Specification ICC–103–W):

ICC–1. *Type.* (a) Tanks built under this specification must be cylindrical, with heads dished convex outward. The tank must be provided with a manhole nozzle and cover on top of the tank of sufficient diameter to permit access to the interior of the tank and to provide for the proper mounting of

venting, loading, unloading, sampling and safety valves, gauging device, thermometer well, and a protective housing on the cover. Other openings in the tank prohibited, except those required for testing anchor rivets and their protective coverings.

ICC-1. (b) The tank shell and manhole nozzle must be lagged with an approved insulation material of a thickness so that the thermal conductance is not more than 0.075 B. t. u. per square foot, per degree Fahrenheit differential in temperature per hour. The entire insulation must be covered with a metal jacket, efficiently flashed around all openings so as to be weathertight. When heater systems are attached to exterior of tank, the lagging over each pipe may be reduced in thickness equivalent to one-half that required for shell. Tanks for use in transportation of liquefied carbon dioxide must have tank shell and manhole nozzle lagged with an approved insulation material of a thickness so that the thermal conductance is not more than 0.03 B. t. u. per square foot, per degree Fahrenheit differential in temperature per hour. The entire insulation must be covered with a metal jacket, efficiently flashed around all openings so as to be weathertight.

AAR-1. (a) See paragraph ICC-1 (b).

ICC-2. *Bursting pressure.* (a) The calculated bursting pressure based on the lowest tensile strength of the plate and the efficiency of the longitudinal welded joint must be at least 1250 pounds per square inch.

ICC-2. (b) Opening in tank for manhole nozzle must be reinforced in an approved manner.

ICC-2. (c) Tank heads must be at least as thick at all points as wall of tank.

AAR-2. (b) The opening in the tank for manhole nozzle must be reinforced so as to provide the required cross-sectional area as determined by formula shown on Figure 14.

ICC-4. *Thickness and width of plates.* (a) The minimum thickness of plates 11/16 inch.

ICC-4. (d) This paragraph does not apply.

AAR-4. (b) This paragraph does not apply.

AAR-4. (c) Car must have underframe.

AAR-4. (d) This paragraph does not apply.

AAR-5. (a) The tank head shape shall be an ellipsoid of revolution in which the major axis shall equal the diameter of the shell and the minor axis shall be one-half of this.

ICC-6. (b) Rivets, if used for attaching anchor, must be driven hot and calked inside. For computing rivet areas the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by more than 1/16 inch. Use of rivets of less than 5/8 inch nominal diameter prohibited.

Anchor rivets must be protected on the inside of tank by an approved design of housing.

ICC-6. (c) This paragraph does not apply.

AAR-8. (c) Anchor rivets, if used, must have their heads on the inside of the tank shell covered and protected from the lading by a liquid-tight housing of approved design. The lower portion of the housing must be fusion-welded to, and stress-relieved with, the tank shell as a unit. After the rivets have been driven and calked, the top portion of the housing must be secured to the top of the lower portion by an approved method of welding, which welding need not be stress-relieved. A hole must be provided through tank shell, under each housing to permit making air pressure test. Each test hole must be tightly closed after completion of test with an approved plug.

ICC-9. *Expansion dome.* (a) Expansion dome prohibited.

ICC-9. (b) This paragraph does not apply.

ICC-9. (c) This paragraph does not apply.

AAR-9. (a) This paragraph does not apply.

ICC-10. *Manhole nozzle, cover, and protective housing.* (a) Manhole nozzle must be of forged or rolled steel at least 18 inches inside diameter having approved wall thicknesses and dimensions.

ICC-10. (b) Manhole cover must be of forged or rolled steel at least 2¼ inches thick machined to approved dimensions. Manhole cover must be attached to manhole nozzle by through or stud bolts not entering tank.

ICC-10. (c) The shearing value of the bolts attaching protective housing to manhole cover must not exceed 70 percent of shearing value of bolts attaching manhole cover to manhole nozzle.

ICC-10. (d) All joints between manhole cover and manhole nozzle, and between manhole cover and valves or other appurtenances mounted thereon, must be made tight against vapor pressure.

ICC-10. (e) Protective housing of cast or pressed steel must be bolted to manhole cover. Housing must be equipped with a steel cover that can be securely closed. Housing cover on tanks used for the transportation of flammable compressed gases must be provided with an opening equipped with an approved weather-proof covering and having an area at least equal to the total safety valve discharge area. Housing cover must have suitable stop to prevent cover striking loading or unloading connections and be hinged on one side only with an approved riveted pin or rod with nuts and cotters. Openings in wall of housing must be equipped with screw plugs or other closures.

AAR-10. *Manhole cover.* (a) For dimensions and tolerances of manhole cover see Figure 8.

ICC-11. *Venting, and loading and discharging valves.* (a) These valves must be of approved type, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 500 pounds per square inch without leakage. The valves must be directly bolted to seatings on manhole cover. Pipe connections of the valves must be closed with approved screw plugs chained or otherwise fastened to prevent misplacement.

ICC-11. (b) The interior pipes of the liquid and gas discharge valves, except as prescribed in paragraphs ICC-11 (d) and ICC-11 (e), may be equipped with check valves of an approved design.

ICC-11. (c) Gauging device, sampling valve, and thermometer well are required on tanks used for the transportation of flammable gases. They must be of approved design, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 500 pounds per square inch without leakage. Interior pipes of the gauging device and sampling valves must be equipped with check valves of an approved design. Thermometer well must be closed with screw plug.

ICC-11. (d) Tanks for use in the transportation of liquefied hydrocarbon and liquefied petroleum gases must have the interior pipes of the liquid and gas discharge valves equipped with check valves of an approved design.

ICC-11. (c) Tanks for use in the transportation of chlorine must have the interior pipes of the liquid discharge valves equipped with check valves of an approved design.

ICC-12. (a) This paragraph does not apply.

ICC-13. *Bottom discharge outlets.* (a) Bottom discharge outlet prohibited.

ICC-13. (b) This paragraph does not apply.

ICC-13. (c) This paragraph does not apply.

AAR-13. (a) This paragraph does not apply.

AAR-13. (b) This paragraph does not apply.

AAR-13. (c) This paragraph does not apply.

AAR-13. (d) This paragraph does not apply.

AAR-13. (e) This paragraph does not apply.

AAR-13. (f) This paragraph does not apply.

AAR-13. (g) This paragraph does not apply.

ICC-14. *Safety valves.* (a) The tank must be equipped with one or more safety valves of approved type, made of metal not subject to rapid deterioration by lading and mounted on manhole cover. The total valve discharge capacity must be sufficient to prevent building up of pressure in tank in excess of 375 pounds per square inch.

ICC-14. (b) This paragraph does not apply.

ICC-14. (c) The safety valves must be set to open at a pressure of not exceeding 375 pounds per square inch. (For tolerance see paragraph ICC-18.)

ICC-14. (d) This paragraph does not apply.

ICC-14. (e) Tanks for use in the transportation of liquefied carbon dioxide must be equipped with one safety valve of approved design set to open at a pressure not exceeding 375 pounds per square inch and one frangible disc device of approved design set to function at a pressure less than the test pressure of the tank. The discharge capacity of each of these safety devices must be sufficient to prevent building up of pressure in tank in excess of 375 pounds per square inch. Tanks must also be equipped with two pressure-regulating valves of approved design, one set to open at 300 pounds per square inch pressure and one set to open at 333 pounds per square inch pressure. Each pressure-regulating valve and safety device must have its final discharge piped to the outside of the dome.

AAR-14. (a) Safety valve must be of approved design. See Appendix "A" for formula for calculating discharge capacity of valve and method of testing sample valve of a particular design to determine its actual discharge capacity which must at least equal the capacity calculated as necessary to prevent building up pressure in the tank in excess of 375 pounds per square inch.

AAR-14. (b) This paragraph does not apply.

ICC-15. *Fixtures, reinforcements, and attachments, not otherwise specified.* (a) Attachments, other than the anchorage and those mounted on manhole nozzle and cover, are prohibited. Heater systems may be applied to exterior of tank by tank bands or other approved method.

AAR-15. (b) This paragraph does not apply.

ICC-16. *Plugs for openings.* (a) Plugs must be of approved type, with standard pipe thread, and of metal not subject to rapid deterioration by the lading.

ICC-17. *Tests of tanks.* (a) Each tank must be tested, after anchorage is applied and before anchor rivet housings and the tank lagging are applied, by completely filling tank and manhole nozzle with water or other liquid of similar viscosity, having a temperature which must not exceed 100° F. during test, and applying a pressure of 500 pounds per square inch. The tank must hold the prescribed pressure for at least 30 minutes without leakage or distress.

ICC-17. (c) Tests of exterior heater systems not a specification requirement.

ICC-17. (d) After anchor rivet housings are in place these housings must be tested by applying an air pressure of 100 pounds per square inch through openings in tank shell and must be tight against leakage.

AAR-17. *Hammer test.* (a) The tank shall be subjected to a hydrostatic pressure of 375 pounds per square inch and while subject to this pressure shall be given a thorough hammer or impact test. This impact test shall consist of striking the plate at six-inch intervals on both sides of the welded joint and for the full length of all welded joints. The weight of the hammer in pounds shall approximately equal the thickness of the shell in tenths of an inch,

but not to exceed ten pounds. The plates shall be struck with a sharp swinging blow. The edges of the hammer shall be rounded so as to prevent defacing the plate. Following the impact test, each tank must be tested as prescribed in paragraph ICC–17 (a).

AAR–17. (b) See paragraph ICC–17 (d).

AAR–17. (c) See paragraph ICC–17 (a).

ICC–18. *Tests of safety valves.* (a) Each valve must be tested by air or gas before being put into service. The valve must open at a pressure not exceeding 375 pounds per square inch and be vapor-tight at 300 pounds per square inch, which limiting pressures must not be affected by any auxiliary closure or other combination.

AAR–18. (a) This paragraph does not apply.

ICC–19. *Retests of tanks, anchor rivet housings and safety valves.* (a) Tanks must be retested at intervals of 5 years or less to a pressure as prescribed in paragraph ICC–17 (a), except that the anchor rivet housings must not be removed and that the tank lagging and jacket need not be removed unless the pressure in the tank drops during the test period, indicating leakage; anchor rivet housings must be retested to a pressure as prescribed in paragraph ICC–17 (d); and safety valves must be retested to a pressure as prescribed in paragraphs ICC–14 (c) and ICC–18. Tanks must be retested before being returned to service after any repairs requiring welding. Reports of retests must be rendered as pescribed in paragraph ICC–21.

ICC–19. (b) Tanks used for the transportation of chlorine must be retested as prescribed in paragraph ICC–19 (a) at intervals of two years or less.

AAR–19. (a) See paragraph ICC–19 (a).

AAR–19. (b) See paragraph ICC–19 (a).

ICC–20. (b) ICC–105A500–W in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the jacket in letters and figures at least 2 inches high by the party assembling the completed car.

ICC–20. (g) This paragraph does not apply.

ICC–20. (h) This paragraph does not apply.

ICC–20. (j) Water capacity of the tank in pounds stamped plainly and permanently in letters and figures at least ⅜ inch high into the metal of the tank immediately below the mark specified in paragraphs ICC–20 (c) and ICC–20 (d). This mark must also be stenciled on the jacket immediately below the dome platform and either directly behind or within 3 feet of the right or left side of ladder, or ladders if there is a ladder on each side of the tank, in letters and figures at least 2 inches high as follows: Water capacity 000000 pounds.

§ 78.289 *Specification for tank cars having lagged fusion-welded steel tanks Class ICC–105A600–W.* This specification covers Class ICC–105A600–W tank cars having lagged fusion-welded steel tanks to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in this specification it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)–Procedure.

(a) *General requirements.* Tanks built under this specification must comply with all provisions of Specification ICC–103–W, except as modified in the following paragraphs (paragraph numbers refer to like numbers in § 78.280 Specification ICC–103–W):

ICC–1. *Type.* (a) Tanks built under this specification must be cylindrical, with heads dished convex outward. The tank must be provided with a manhole nozzle and cover on top of the tank of sufficient diameter to permit access to the interior of the tank and to provide for the proper mounting of venting, loading, unloading, sampling and safety valves, gauging device, thermometer well, and a protective housing on the cover. Other openings in the tank prohibited, except those required for testing anchor rivets and their protective coverings.

ICC–1. (b) The tank shell and manhole nozzle must be lagged with an approved insulation material of a thickness so that the thermal conductance is not more than 0.075 B. t. u. per sq. ft., per degree F. differential in temperature per hour. The entire insulation must be covered with a metal jacket, efficiently flashed around all openings so as to be weather tight. When heater systems are attached to exterior of tank, the lagging over each pipe may be reduced in thickness equivalent to one-half that required for shell. Tanks for use in transportation of liquefied carbon dioxide must have tank shell and manhole nozzle lagged with an approved insulation material of a thickness so that the thermal conductance is not more than 0.03 B. t. u. per square foot, per degree F. differential in temperature per hour. The entire insulation must be covered with a metal jacket, efficiently flashed around all openings so as to be weather tight.

AAR–1. (a) See paragraph ICC–1 (b).

ICC–2. *Bursting pressure.* (a) The calculated bursting pressure, based on the lowest tensile strength of the plate and the efficiency of the longitudinal welded joint, must be at least 1,500 pounds per square inch.

ICC–2. (b) Opening in tank for manhole nozzle must be reinforced in an approved manner.

ICC–2. (c) Tank heads must be at least as thick at all points as wall of tank.

AAR–2. (b) The opening in the tank for manhole nozzle must be reinforced so as to provide the required cross-sectional area as determined by formula shown on Figure 14.

ICC–4. *Thickness and width of plates.* (a) The minimum thickness of plates $^{11}/_{16}$ inch.

ICC–4. (d) This paragraph does not apply.

AAR–4. (b) This paragraph does not apply.

AAR–4. (c) Car must have underframe.

AAR–4. (d) This paragraph does not apply.

AAR–5. (a) The tank head shape shall be an ellipsoid of revolution in which the major axis shall equal the diameter of the shell and the minor axis shall be one-half of this.

ICC–6. (b) Rivets, if used for attaching anchor, must be driven hot and calked inside. For computing rivet areas the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by more than $^1/_{16}$ inch. Use of rivets of less than ⅝ inch nominal diameter prohibited.

Anchor rivets must be protected on the inside of tank by approved design of housing.

ICC–6. (c) This paragraph does not apply.

AAR–8. (c) Anchor rivets, if used, must have their heads on the inside of the tank shell covered and protected from the lading by a liquid-tight housing of approved design. The lower portion of the housing must be fusion-welded to, and stress-relieved with, the tank shell as a unit. After the rivets have been driven and calked, the top portion of the housing must be secured to the top of the lower portion by an approved method of welding, which welding need not be stress-relieved. A hole must be provided through tank shell, under each housing to permit making air pressure test. Each test hole must be tightly closed after completion of test with an approved plug.

ICC–9. *Expansion dome.* (a) Expansion dome prohibited.

ICC–9. (b) This paragraph does not apply.

ICC–9. (c) This paragraph does not apply.

AAR–9. (a) This paragraph does not apply.

ICC–10. *Manhole nozzle, cover and protective housing.* (a) Manhole nozzle must be of forged or rolled steel at least 18 inches inside diameter having approved wall thicknesses and dimensions.

ICC–10. (b) Manhole cover must be of forged or rolled steel at least 2¼ inches thick machined to approved dimensions. Manhole cover must be attached to manhole nozzle by through or stud bolts not entering tank.

ICC–10. (c) The shearing value of the bolts attaching protective housing to manhole cover must not exceed 70 percent of shearing value of bolts attaching manhole cover to manhole nozzle.

ICC–10. (d) All joints between manhole cover and manhole nozzle, and between manhole cover and valves or other appurtenances mounted thereon, must be made tight against vapor pressure.

ICC–10. (e) Protective housing of cast or pressed steel must be bolted to manhole cover. Housing must be equipped with a steel cover that can be securely closed. Housing cover on tanks used for the transportation of flammable compressed gases must be provided with an opening equipped with an approved weather-proof covering and having an area at least equal to the total safety valve discharge area. Housing cover must have suitable stop to prevent cover striking loading or unloading connections and be hinged on one side only with an approved riveted pin or rod with nuts and cotters. Openings in wall of housing must be equipped with screw plugs or other closures.

AAR–10. *Manhole cover.* (a) For dimensions and tolerances of manhole cover see Figure 8.

ICC–11. *Venting and loading and discharging valves.* (a) These valves must be of approved type, made of metal not subject to rapid deterioration by lading, and must withstand a pressure of 600 pounds per square inch without leakage. The valves must be directly bolted to seating on manhole cover. Pipe connections of the valves must be closed with approved screw plugs chained or otherwise fastened to prevent misplacement.

ICC–11. (b) The interior pipes of the liquid and gas discharge valves, except as prescribed in paragraphs ICC–11 (d) and ICC–11 (e), may be equipped with check valves of an approved design.

ICC–11. (c) Gauging device, sampling valve and thermometer well, are required on tanks used for the transportation of flammable gases. They must be of approved design, made of metal not subject to rapid deterioration by lading. and must withstand a pressure of 600 pounds per square inch without leakage. Interior pipes of the gauging device and sampling valves must be equipped with check valves of an approved design. Thermometer well must be closed with screw plug.

ICC–11. (d) Tanks for use in the transportation of liquefied hydrocarbon and liquefied petroleum gases must have the interior pipes of the liquid and gas discharge valves equipped with check valves of an approved design.

ICC–11. (e) Tanks for use in the transportation of chlorine must have the interior pipes of the liquid discharge valves equipped with check valves of an approved design.

ICC–12. (a) This paragraph does not apply.

ICC–13. *Bottom discharge outlets.* (a) Bottom discharge outlet prohibited.

ICC–13. (b) This paragraph does not apply.

ICC–13. (c) This Paragraph does not apply.

AAR–13. (a) This paragraph does not apply.

AAR–13. (b) This paragraph does not apply.

AAR–13. (c) This paragraph does not apply.

AAR–13. (d) This paragraph does not apply.

AAR–13. (e) This paragraph does not apply.

AAR–13. (f) This paragraph does not apply.

AAR–13. (g) This paragraph does not apply.

ICC–14. *Safety valves.* (a) The tank must be equipped with one or more safety valves of approved type, made of metal not subject to rapid deterioration by lading and mounted on manhole cover. The total valve discharge capacity must be sufficient to prevent building up of pressure in tank in excess of 450 pounds per square inch.

ICC–14. (b) This paragraph does not apply.

ICC–14. (c) The safety valves must be set to open at a pressure of not exceeding 450 pounds per square inch. (For tolerance see paragraph ICC–18.)

ICC–14. (d) This paragraph does not apply.

ICC–14. (e) Tanks for use in the transportation of liquefied carbon dioxide must be equipped with one safety valve of approved design set to open at a pressure not exceeding 450 pounds per square inch and one frangible disc device of approved design set to function at a pressure less than the test pressure of the tank. The discharge capacity of each of these safety devices must be sufficient to prevent building up of pressure in tank in excess of 450 pounds per square inch. Tanks must also be equipped with two pressure-regulating valves of approved design, one set to open at 360 pounds per square inch pressure and one set to open at 400 pounds per square inch pressure. Each pressure-regulating valve and safety device must have its final discharge piped to the outside of the dome.

AAR–14. (a) Safety valve must be of approved design. See Appendix "A" for formula for calculating discharge capacity of valve and method of testing sample valve of a particular design to determine its actual discharge capacity which must at least equal the capacity calculated as necessary to prevent building up pressure in the tank in excess of 450 pounds per square inch.

AAR–14. (b) This paragraph does not apply.

ICC–15. *Fixtures, reinforcements, and attachments, not otherwise specified.* (a) Attachments, other than the anchorage and those mounted on manhole nozzle and cover, are prohibited. Heater systems may be applied to exterior of tank by tank bands or other approved method.

AAR–15. (b) This paragraph does not apply.

ICC–16. *Plugs for openings.* (a) Plugs must be of approved type, with standard pipe thread, and of metal not subject to rapid deterioration by the lading.

ICC–17. *Tests of tanks.* (a) Each tank must be tested, after anchorage is applied, and before anchor rivet housings and the tank lagging are applied, by completely filling tank and manhole nozzle with water or other liquid of similar viscosity, having a temperature which must not exceed 100° F. during test, and applying a pressure of 600 pounds per square inch. The tank must hold the prescribed pressure for at least 30 minutes without leakage or distress.

ICC–17. (c) Tests of exterior heater systems not a specification requirement.

ICC–17. (d) After anchor rivet housings are in place these housings must be tested by applying an air pressure of 100 pounds per square inch through openings in tank shell and must be tight against leakage.

AAR–17. *Hammer tests.* (a) The tank shall be subjected to hydrostatic pressure of 450 pounds per square inch and while subject to this pressure shall be given a thorough hammer or impact test. This impact test shall consist of striking the plate at six-inch intervals on both sides of the welded joint and for the full length of all welded joints. The weight of the hammer in pounds shall approximately equal the thickness of the shell in tenths of an inch, but not to exceed ten pounds. The plates shall be struck with a sharp swinging blow. The edges of the hammer shall be rounded so as to prevent defacing the plate. Following the impact test, each tank must be tested as prescribed in paragraph ICC–17 (a).

AAR–17. (b) See paragraph ICC–17 (d).

AAR–17. (c) See paragraph ICC–17 (a).

ICC–18. *Tests of safety valves.* (a) Each valve must be tested by air or gas before being put into service. The valve must open at a pressure not exceeding 450 pounds per square inch and be vapor-tight at 360 pounds per square inch, which limiting pressures must not be affected by any auxiliary closure or other combination.

AAR–18. (a) This paragraph does not apply.

ICC–19. *Retests of tanks, anchor rivet housings and safety valves.* (a) Tanks must be retested at intervals of 5 years or less to a pressure as prescribed in paragraph ICC–17 (a), except that the anchor rivet housings must not be removed and that the tank lagging and jacket need not be removed unless the pressure in the tank drops during the test period, indicating leakage; anchor rivet housings must be retested to a pressure as prescribed in paragraph ICC–17 (d); and safety valves must be retested to a pressure as prescribed in paragraphs ICC–14 (c) and ICC–18. Tanks must be retested before being returned to service after any repairs requiring welding. Reports must be rendered as prescribed in paragraph ICC–21.

ICC–19. (b) Tanks used for the transportation of chlorine must be retested as prescribed in paragraph ICC–19 (a) at intervals of two years or less.

AAR–19. (a) See paragraph ICC–19 (a).

AAR–19. (b) See paragraph ICC–19 (a).

ICC–20. (b) ICC–105A600–W in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the jacket in letters and figures at least 2 inches high by the party assembling the completed car.

ICC–20. (g) This paragraph does not apply.

ICC–20. (h) This paragraph does not apply.

ICC–20. (j) Water capacity of the tank in pounds stamped plainly and permanently in letters and figures at least ⅜ inch high into the metal of the tank immediately below the mark specified in paragraphs ICC–20 (c) and ICC–20 (d). This mark must also be stenciled on the jacket immediately below the dome platform and either directly behind or within 3 feet of the right or left side of the ladder, or ladders if there is a ladder on each side of the tank, in letters and figures at least 2 inches high as follows: Water Capacity 000000 Pounds.

§ 78.290 *Specifications emergency: USG–A, USG–B, USG–C: Riveted, fusion-welded, or combined riveted and fusion-welded, respectively, steel tanks to be mounted on or to form part of a car; riveted steel tanks class Emergency USG–A; fusion-welded steel tanks class Emergency USG–B; riveted and fusion-welded steel tanks class Emergency USG–C.* These emergency specifications are made effective by orders of the Interstate Commerce Commission dated June 15, 1942, July 14, 1942, December 12, 1942, and April 13, 1943, in order to conserve open-hearth boiler plate steel of flange quality.

These specifications cover tank cars of the above classes to which have been added A. A. R. details which are not inconsistent therewith. Wherever the word "approved" is used in these specifications it means approval by the Association of American Railroads Committee on Tank Cars as prescribed in § 78.259 (b), (c), (d), and (e)—Procedure.

ICC–1. *Type.* (a) Tanks built under these specifications must be cylindrical, with single-compartment barrel section constructed of four longitudinal strip-mill steel plates having a maximum width of 72 inches, with heads dished convex outward, and must have at least one expansion dome with manhole, and such other external projections as are prescribed herein.

ICC–1. (b) Tanks built under these specifications may be of riveted, fusion-welded, or of combined riveted and fusion-welded construction.

AAR–1. *Lagging.* (a) Not a specification requirement. If applied, the tank shell and dome must be lagged with an approved insulation material of a thickness so that the thermal conductance is not more than 0.225 B. t. u. per square foot, per degree Fahrenheit differential in temperature, per hour.

AAR–1. (b) Before lagging is applied the tank surfaces to be lagged and the inside surface of the metal jacket shall be painted with paint which is not affected by the lading.

AAR–1. (c) The barrel, ends and dome of tank, except seatings of tanks on bolsters and pads of fixtures, shall be lagged with insulating material.

AAR–1. (d) The lagging throughout shall be covered with a metal jacket not less than ⅛ inch in thickness.

AAR–1. (e) Openings through lagging shall be flashed around projections to prevent admission of water. Top of dome shall be so constructed that liquids cannot enter between dome wall and outer shell.

ICC–2. *Bursting pressure.* (a) The calculated bursting pressure, based on the lowest tensile strength of the plate and the efficiency of the longitudinal seam, must be at least 240 pounds per square inch when tank is of riveted or of combined riveted and fusion-welded construction, and 280 pounds per square inch when tank is of fusion-welded construction.

ICC–3. *Material.* (a) All plates for tank and expansion dome must be made of steel meeting U. S. Bureau of Ships Ad Interim Specification 48–S–5 (INT) Grade M having minimum tensile strength of 60,000 pounds per square inch.

ICC–3. (b) All external projections must be made of materials specified hereinafter.

ICC–3. (c) Rivets must be of the same quality as used for steam boilers and other pressure vessels.

AAR–3. (a) All rivets must be in accordance with current A. A. R. Specification M–110, titled Rivet Steel and Rivets.

ICC–4. *Thickness and width of plates.* (a) The minimum thickness of plates, including thickness of each plate at seams, must be as follows:

Inside diameter of tanks (inches)	[1] Bottom sheets	Shell sheets	Expansion dome sheets	Tank heads	Expansion dome heads
	Inch	*Inch*	*Inch*	*Inch*	*Inch*
87½ or under	7/16	1/4	1/4	5/16	1/4

[1] Bottom sheet must be adequately reinforced over the bolster slabbing at each end of car in an approved manner.

ICC–4. (b) The minimum width of bottom sheet of tank must be 70 inches, measured on the arc.

AAR–4. (a) Car must have underframe.

ICC–5. *Dishing of tank heads.* (a) Tank heads must be of approved contour.

AAR–5. (a) Tank heads may be made of two plates joined by fusion-welding. Tank heads must be hot pressed and dished for pressure on concave side to main inside radius not exceeding 10 feet. The inside knuckle radius must not be less than 6 inches. For tank heads made of two plates the fusion-welded joint must be located horizontally.

ICC–6. *Riveting.* (a) For computing rivet areas the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by more than 1/16 inch. All rivets must be driven hot.

ICC–6. (b) Riveted seams formed in the manufacture of the tank and expansion dome proper and the attachment of the expansion dome to the tank must be double riveted. Dome head, manhole ring, safety valve flange, and bottom outlet nozzle flange must be single or double riveted. Riveted seams and joints must be made metal to metal without interposition of other material. The efficiency of double-riveted seams must be at least 70 percent of the strength of the thinnest plate specified in paragraph ICC–4. The efficiency of single-riveted seams must be at least 45 percent of the strength of the thinnest plate specified in paragraph ICC–4. Use of rivets less than 5/8 inch nominal diameter not permissible on any part of tank or attachments.

ICC–6. *Welding.* (c) Welded joint formed in the manufacture of the tanks and expansion dome proper must be of double-welded butt-joint type, fusion welded by a process which investigation and laboratory tests by the mechanical division of the Association of American Railroads have proved will produce satisfactory results.

ICC–6. *Manhole ring, safety valve flange, and bottom outlet nozzle.* (d) Manhole ring, safety valve flange, and bottom outlet nozzle flange or other attachments may be riveted or fusion welded. Rivets, if used, must comply with requirements of paragraph ICC–6 (a), 6 (b), 8 (a), and 8 (b). Fusion welding for securing these attachments in place must be of double-welded butt joint type or double full-fillet lap joint type.

AAR–6. *Welding.* (a) Fusion welding to be performed by fabricators certified by Association of American Railroads as qualified to meet the requirements of this specification. Fusion-welded joints must be fabricated in accordance with the following requirements:

AAR–6. *Definitions.* (b–1). Fusion Welding.—A process of welding metals in the molten, or molten and vaporous state without the application of mechanical pressure or blows.

AAR–6. (b–2) *Double welded butt joint.* A joint formed by the fusion of two abutting edges with a filler metal added from both sides of the joint and with reinforcement on both sides. (For permission to remove reinforcements, see paragraph AAR–6 (f–1).)

NOTE: A joint with filler metal added from one side only is considered equivalent to a double-welded butt joint when and if means are provided for accomplishing complete penetration and reinforcement on both sides of the joint.

AAR–6. (b–3) *Full-fillet joint.* A fusion weld of approximately triangular cross section the throat of which lies in a plane disposed approximately 45 degrees with respect to the surface of the parts joined, and built up to the full thickness of the plate or nozzle flange that is being joined to a parallel plate, having the throat not less than 0.7 the thickness of the edge of the plate being welded.

AAR–6. (b–4) *Throat.* The minimum thickness of a weld along a straight line passing through the bottom of the cross sectional space provided to contain a fusion weld.

AAR–6. (b–6) *Double full-fillet lap joint.* A double full-fillet lap joint is one in which the overlapped edges of the plates to be joined are full-fillet-welded at the edge of each plate.

NOTE: When attachments, referred to in paragraph ICC–6 (d) have flanges thicker than the plates to which they are joined, and are secured in place by fillet welds such welds shall be of the double full-fillet lap joint type in which the throat is not less than 0.7 the thickness of the plate to which the attachment is joined.

AAR–6. *Joint efficiency, maximum.* (c) The efficiencies for computing the value of the various types of fusion-welded joints in tanks constructed in conformity with requirements of this specification shall not exceed the following:

Type of joint:	*Efficiency of joint, percent*
Double-welded butt joint	80.0
Double full-fillet lap joint	65.0

AAR–6. *Qualification of welders.* (d–1) The manufacturer shall be responsible for the quality of the welding done by his organization and shall conduct tests of welding operators to determine their ability to produce welds of the required quality.

AAR–6. (d–2) The manufacturer shall satisfy the inspector that all the welding operators employed on a car tank have previously made test plates which comply with the requirements of this specification. Such test plates shall have been made within a period of six months, except that when the welding operator is regularly employed on production work embracing the same process and type of welding the tests may be effective for one year.

AAR–6. (d–3) It is the duty of the inspector to satisfy himself that only welding operators who are proved competent by these test plates are used to weld any car tank and that all welding complies with the requirements of this specification.

AAR–6. (d–4) The inspector has the right at any time to call for and witness the making of welding operator's qualification test plates described in this paragraph by any welding operator, employed in connection with the inspector's contract and to observe the physical tests of the test plates. For such qualification tests the thickness of the test plate shall be approximately the thickness of the plate or parts on which the welding operator is to work.

AAR–6. (d–5) The tests conducted by one manufacturer shall not qualify a welding operator to do work for any other manufacturer.

AAR–6. *Preparation for welding.*—(e–1) The plates may be cut to size and shape by machining or shearing, or by flame cutting. If shaped by flame cutting, the edges must be uniform and smooth and must be freed of all loose scale and slag accumulations before welding. The discoloration which may remain on the flame-cut surface is not considered to be detrimental oxidation. The plates or sheets to be joined shall be accurately cut to size and formed. In all cases the forming shall be done by pressure and not by blows, including the edges of the plates forming longitudinal joints of tanks.

AAR–6. (e–2) Particular care should be taken in the layout of joints in which fillet welds are to be used so as to make possible the fusion of the weld metal at the bottom of the fillet. Great care must also be exercised in the deposition of the weld metal so as to secure satisfactory penetration.

AAR–6. (e–3) If the thickness of the flange of a head to be attached to a tank shell by a butt joint exceeds the shell thickness by more than 25 percent (maximum 1/4 inch) the flange thickness shall be reduced at the abuting edges either on the inside or the outside, as shown in Figure 13 (b), or on both sides, as shown in Figure 13 (a). Reduction of abutting edges as illustrated in Figure 13 (c) is not permissible.

AAR–6. (e–4) The edges of the plates at the joints shall not have an offset from each other at any point in excess of 25 percent of the thickness of the plate (maximum 1/8 inch).

AAR–6. (e–5) In all cases where plates of unequal thicknesses are abutted, and have offsets exceeding 1/16 inch, the edge of the thicker plate shall be reduced in some manner so that it is approximately the same thickness as the other plate. In longitudinal tank joints the middle lines of the plate thickness shall be in alignment, within the fabricating tolerances specified in paragraph AAR–6 (e–4).

AAR–6. (e–6) Bars, jacks, clamps or other appropriate tools may be used to hold the edges to be welded in line. Tack welds may also be used to hold the edges in line, provided these tack welds are removed so that they do not become a part of the joint. The edges of butt joints shall be so held that they will not overlap during welding. Where fillet welds are used, the lapped plates shall fit closely and be kept together during welding.

AAR–6. (e–7) The surfaces of the sheets or plates to be welded shall be cleaned thoroughly of all scale, rust, oil or grease for a distance of not less than 1/2 inch from the welding edge. Grease or oil may be removed with gasoline, lye, or the equivalent. A steel-wire scratch brush may be used for removing light rust or scale, but for heavy scale, slag, and the like, a grinder, chisel, air hammer, or other suitable tool shall be used to obtain clean and bright metal. When it is necessary to deposit metal over a previously welded surface, any scale or slag therefrom shall be removed by a roughing tool, a chisel, an air chipping hammer, or other suitable means to prevent inclusion of impurities in the weld metal.

AAR–6. (e–8) The dimensions and shape of the edges to be joined shall be such as to allow thorough fusion and complete penetration.

AAR–6. (e–9) For double-welded butt joints the reverse sides shall be chipped, ground, or melted out so as to secure a clean surface of the originally deposited weld prior to the application of the first bead of welding on the second side. Such chipping, grinding, or melting out shall be done in a manner that will insure proper fusion of the weld metal. These requirements are not intended to apply to any process of welding by which proper fusion and penetration are otherwise obtained and no impurities remain at the base of the weld.

AAR–6. (e–10) If the welding is stopped for any reason, extra care shall be taken in re-starting to get full penetration to the bottom of the joint and thorough fusion between the weld metal and the plates, and to the weld metal previously deposited.

AAR–6. *Longitudinal joints.* (f–1) Longitudinal joints shall be of the double-welded butt type and shall be reinforced at the center of the weld on each side of the plate by at least 1/16 inch up to and including 5/8-inch plate, and up to 1/8 inch for heavier plates. The reinforcement may be removed but if not removed shall be built up uniformly from the surface of the plate to a maximum at the center of the weld. Particular attention is called, however, to the importance of the provision that there shall be no valley or groove along the edge of or in the center of the weld, but that the deposited metal must be fused smoothly and uniformly into the plate surface. (If the reinforcement is built up so as to form a ridge with a valley or depression at the edge of the weld next to the plate, the result is a notch which causes concentration of stress and reduces the strength of the joint.) The

finish of the welded joint shall be reasonably smooth and free from irregularities, grooves, or depressions. Where a welded butt joint is made the equivalent of a double-welded butt joint (see note in paragraph AAR-6 (b-2)) by using a backing up strip and adding filler metal from one side only, the reinforcement shall not be less than 1/16 inch.

AAR-6. *Circumferential joints.* (g) Circumferential joints shall be of the double-welded butt type. The details of all these joints shall conform to the requirements of longitudinal joints given in AAR-6 (f-1).

AAR-6. *Inspection.* (h-1) Purchaser of tanks must provide for inspection by a competent inspector. The manufacturer shall submit the tank for inspection at such stages as may be designated by the inspector.

AAR-6. (h-2) Each tank must be inspected by the inspector at the time of the hydrostatic-pressure and hammer tests. After completion of the hydrostatic test, the inspector shall examine the tank to determine that all fusion-welding both inside and outside of tank, is free of any defects which would be liable to cause failure in service.

AAR-6. (h-3) The manufacturer shall certify that the welding on the tank has been done only by welding operators who have passed the test requirements and that the same material and technique used in making the tests were employed in fabricating the tank.

AAR-6. *Distortion.* (i) The shell of the completed tank shall be circular within a limit of plus or minus one percent of the inside diameter of the tank.

AAR-6. *Repairs during original construction.* (j-1) Pinholes, cracks, or other defects in welded joints shall be repaired only by chipping, machining, or burning out the defect and reweiding. For gas welding the metal around the defects shall be preheated to a dull red for a distance of at least 4" all around. Any preheating means may be used, such as a flange fire, gas or oil burner, or a welding torch. The preheating shall be done slowly so the heat will get well back into the plate and expand it thoroughly. For metallic arc welding preheating or reheating is not required.

AAR-6. (j-2) After repairs have been made the tank shall again be tested in the regular way, and if it passes the test the inspector shall accept it. If it does not pass the test the inspector can order supplementary repairs, or if in his judgment the tank is not suitable for service, he may permanently reject it.

ICC-7. *Tank mounting.* (a) The manner in which tank is supported on and securely attached to the car structure must be approved.

AAR-7. *Anchorage.* (a) Anchorage must be secured to tank by means of rivets. See § 78.263—Car Structure paragraphs 13 (a) and 13 (b).

AAR-7. *Tank bands.* (b) See § 78.263—Car Structure.

AAR-7. *Bolster slabbing.* (c) See § 78.263—Car Structure.

ICC-8. *Preparation for calking, and calking.* (a) The edges of plates at all riveted seams must be beveled so that the angle of the calking edges will be between 60 and 70 degrees with the flat surface of the plate. The extreme calking edge distance, measured from center line of rivet hole, must be at least one and one-half times the diameter of the hole and not more than that distance plus 1/4 inch.

ICC-8. (b) All riveted seams, including those formed by attachment of expansion dome and other external projections, must be calked both inside and outside, except that inside calking of the seam formed by attachment of expansion dome to tank is not required and outside calking of seams formed by attachment of all external projections, except the expansion dome, is not required. Split calking prohibited.

AAR-8. (a) Calk welding of riveted seams not permitted.

ICC-9. *Expansion dome.* (a) The expansion dome must have a capacity, measured from the inside top of shell of tank to the inside top of dome or bottom of any vent pipe projecting inside dome, of at least 2 percent of the total capacity of the tank and dome combined, except that when safety valve is applied to side of dome, the effective capacity of dome must be measured from top of safety valve opening in the side of dome to inside top of shell of tank.

ICC-9. (b) The opening in manhole ring must be at least 16 inches in diameter. The opening in the tank shell within the dome must be at least 29 inches and not more than 30 inches in diameter.

ICC-9. (c) The dome head must be dished convex outward.

AAR-9. (a) Dome head must be dished to a radius of not more than 10 feet.

ICC-10. *Closures for manholes.* (a) The manhole cover must be of approved type, and designed to make it practically impossible to remove the cover while the interior of the tank is subjected to pressure.

ICC-10. (b) Manhole covers must be made of cast, forged, or pressed steel, malleable iron or other malleable metals. Manhole rings, if riveted to dome of tank, must be made of cast, forged, or pressed steel, malleable iron or other malleable metals. Manhole rings, if welded to dome of tank, must be made of cast, forged, or pressed metal and be of good weldable quality in conjunction with metal of dome.

ICC-10. (c) All covers, not hinged to tank, must be attached to outside of the dome head by at least a 3/8 inch chain or its equivalent.

ICC-10. (d) All joints between manhole covers and their seats must be made tight against leakage of vapor and liquid by use of gaskets of suitable material.

AAR-10. (a) Bolted type, bolted and hinged type, or other approved type manhole cover must be used. See Figures 5 and 6.

ICC-11. *Gauging, bottom outlet valve operating, venting, loading and discharging, and air inlet devices extending through domes of tanks.* (a) Not specification requirements. When installed, these devices, including their valves, must be protected from accidental injury by being set into a securely covered recess, or by means of a cast or pressed steel or malleable iron housing with cover securely attached. Housing, if welded to dome of tank, must be made of cast, forged, or pressed metal and be of good weldable quality in conjunction with metal of dome. Openings in wall of housing must be equipped with screw plugs or other closures. Drain holes permitted. Discharging siphon pipe must be securely anchored.

AAR-11. (a) These devices must be of approved design.

ICC-12. *Venting, loading and discharging, and air inlet devices.* (a) These devices, when installed, must be closed by efficient valves made of metal not subject to rapid deterioration by the lading. Provision must be made for closing the pipe connections of the valves.

AAR-12. (a) These devices must be of approved design.

ICC-13. *Bottom discharge outlets.* (a) The bottom discharge outlet, when installed, must be made of metal not subject to rapid deterioration by the lading, be of approved construction, and be provided with a valve at its upper end and a liquid-tight closure at its lower end.

ICC-13. (b) The valve operating mechanism and outlet nozzle construction must be such as to insure against unseating of valve due to stresses or shocks incident to transportation.

AAR-13. (a) Bottom discharge outlet nozzle may be cast, pressed or forged metal. If outlet nozzle is welded to tank, it must be of cast, forged or pressed metal and be of good weldable quality in conjunction with metal of tank.

AAR-13. (b) To provide for the attachment of unloading connections, the bottom of the main portion of the outlet nozzle or some fixed attachment thereto, must have external U. S. F. threads 4 threads to the inch. The liquid-tight closure must have corresponding female threads machined to give proper clearance.

AAR-13. (c) For outlet nozzles that project 6" or more from shell of tank a "V" groove must be cut (not cast) in the upper part of outlet valve nozzle at a point immediately below lowest part of valve to a depth that will leave thickness of nozzle wall at the root of the "V" not over 3/8". In the case of steam jacketed outlet nozzles this groove must be below the steam chamber but above the bottom of center sill construction. Where outlet nozzle is not a single piece, arrangement must be made to provide the equivalent of the breakage groove.

AAR-13. (d) The flange on the outlet nozzle must be of a thickness which will prevent distortion of the valve seat or valve by any change in contour of the shell resulting from expansion of lading, or other causes, and which will insure that accidental breakage of the outlet nozzle will occur at or below the "V" groove.

AAR-13. (e) The valve must have no wings or stem projecting below the "V" groove in the outlet nozzle, unless they are scored or designed to break or bend without unseating valve. The valve and seat must be readily accessible or removable for repairs, including grinding.

AAR-13. (f) The valve operating mechanism must have means for compensating for variation in the vertical diameter of the tank produced by expansion, weight of the liquid contents, or other causes, and should operate from the interior of the tank, but in the event the rod is carried through the dome, leakage must be prevented by packing in stuffing box and cap nut.

AAR-13. (g) In no case must extreme projection of bottom discharge outlet equipment extend to within 12" above top of rail. All bottom discharge outlet reducers and closures and their attachments must be secured to car by at least 3/8" chain or its equivalent, except that outlet closure plugs may be attached by 1/4" chain. When the bottom discharge outlet closure is of the combination cap and valve type, the pipe connection to the valve must be closed by a plug or cap.

ICC-14. *Safety valves.* (a) The tank must be equipped with two safety valves mounted on expansion dome. Total valve discharge capacity must be sufficient to prevent building up of pressure in the tank in excess of 45 pounds per square inch.

ICC-14. (b) Each safety valve must be set to open at a pressure of 25 pounds per square inch. (For tolerance see paragraph ICC-18.)

AAR-14. (a) Safety valve must be of approved design. See Fig. 2 and paragraph AAR-18 (a).

AAR-14. (b) Safety valve flanges, if welded to dome, must be of cast, forged or pressed metal and be of good weldable quality in conjunction with metal of dome.

ICC-15. *Fixtures, reinforcements, and attachments not otherwise specified.* (a) All attachments to tank and dome must be applied by approved means.

AAR-15. *Heater systems.* (a) See §§ 78.260 to 78.262 inclusive—Heater Systems.

ICC-16. *Plugs for openings.* (a) All plugs must be solid, of good grade cast iron or equivalent, with standard pipe thread, and when in contact with lading must be of a length which will screw at least six threads inside the face of fitting or tank. Plugs when inserted from the outside of tank heads must have the letter "S" at least 3/8 inch in size stamped with steel stamp or cast on the outside surface to indicate the plug is solid. Plugs when inserted from the

inside are identified by appearance of the plug on the outside of the tank as being solid—therefore, no mark required.

ICC–17. *Tests of tanks.* (a) Each tank must be tested, before being put into service, by completely filling tank and dome with water, or other liquid having similar viscosity, of a temperature which must not exceed 100° F. during the test, and applying a pressure of 60 pounds per square inch. Tank must hold the prescribed pressure for at least 10 minutes without leakage or evidence of distress. All rivets and closures, except safety valves, must be in place while test is made.

ICC–17. (b) Calking of fusion-welded joints to stop leaks developed during the foregoing tests prohibited. Repairs to fusion-welded joints must be made as prescribed in paragraph ICC–6 (c).

ICC–17. *Test of interior heater systems.* (c) Before interior heater systems are placed in service they must be tested with hydrostatic pressure and must be tight at 200 pounds per square inch.

AAR–17. *Hammer tests.* (a) When fusion-welding is used for joining plates the tank shall be subjected to a hydrostatic pressure of 60 pounds per square inch and while subject to this pressure shall be given a thorough hammer or impact test. This impact test shall consist of striking the plate at six-inch intervals on both sides of all butt welded joints and for the full length of all butt welded joints of the tank shell. The weight of the hammer in pounds shall approximately equal the thickness of the thinnest plate of the joint in tenths of an inch, but not to exceed ten pounds. The plates shall be struck with a sharp swinging blow. The edges of the hammer shall be rounded so as to prevent defacing the plate. Following the impact test this pressure must be held for at least 10 minutes.

AAR–17. (b) Tanks if lagged, the test of tank must be made before lagging is applied.

ICC–18. *Tests of safety valves.* (a) Each valve must be tested, before being put into service, by attaching to an air line and applying pressure. The valve must not leak below 20 pounds pressure. (See § 73.31 (1) Note 1, of this chapter.) The valve must open at the pressure prescribed in paragraph ICC–14 (c), with a tolerance of plus or minus 3 pounds.

AAR–18. (a) The above referred to note in § 73.31 (1) of this chapter reads in part as follows: "Safety valves now used on tank cars are reported to permit slow leakage of vapor and it appears that material changes in the design and construction of these valves are necessary to make them tight * * * the necessary changes must be made with the least possible delay."

ICC–19. *Retests of tanks and interior heater systems.* (a) Tanks must be retested as prescribed in paragraph ICC–17 (a) before being returned to service after any repairs requiring fusion welding, and after any repairs requiring extensive riveting or calking. Interior heater systems must be retested as prescribed in paragraph ICC–17 (c) before being returned to service after any repairs.

AAR–19. (a) For lagged tanks receiving any repairs requiring fusion-welding or extensive riveting or calking, if the jacket and lagging are not removed, the tanks must hold the prescribed pressure for at least 20 minutes. A drop in pressure shall be evidence of leakage, and such portion of the jacket and lagging must be removed as may be necessary to locate the leak and make repairs.

ICC–20. *Marking.* (a) Each tank must be marked, thus certifying that the tank complies with all the requirements of this specification. These marks must be as follows:

ICC–20. (b) EMERGENCY USG–A, when of riveted construction; EMERGENCY USG–B, when of fusion-welded construction; or EMERGENCY USG–C, when of combined riveted and fusion-welded construction, in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal near the center of both outside heads of the tank by the tank builder. This mark must also be stenciled on the tank in letters and figures at least 2 inches high by the partly assembling the completed car.

ICC–20. (c) Initials of tank builder and date of original test of tank in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal immediately below the stamped mark specified in paragraph ICC–20 (b).

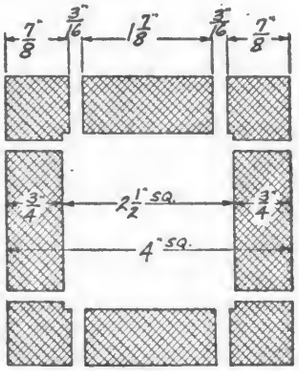
ICC–20. (d) Initials of company and date of additional tests performed by the party assembling the completed car, in those cases where the tank builder does not complete the fabrication of tank, such as application of riveted anchors, etc., in letters and figures at least ⅜ inch high stamped plainly and permanently into the metal immediately below the stamped marks specified in paragraph ICC–20 (c) by the party assembling the completed car. These marks must also be stenciled on the tank in letters and figures at least 2 inches high immediately below the stenciled mark specified in paragraph ICC–20 (b) by the party assembling the completed car.

ICC–20. (e) Date on which the tank was last tested, pressure to which tested, place where test was made, and by whom, stenciled on the tank.

ICC–20. (f) (1) Date on which the safety valves were last tested, pressure to which tested, place where test was made, and by whom, stenciled on the tank.

ICC–20. (f) (2) Date on which interior heater systems were last tested, pressure to which tested, place where test was made, and by whom, stenciled on the tank, or jacket if lagged.

ICC–20. (g) Identification mark, illustrated herein, for approved manhole closure must be stenciled on each side of dome, in line with the ladders and in a color contrasting to color of dome.



Manhole Closure Identification Mark

(Reduced size)

ICC–20. (h) Tanks built under these specifications must be stenciled "For Liquids weighing Not Over 8 Pounds per Gallon With Maximum vapor Pressure of 16 Pounds per Square Inch, Absolute, at 100° F." on each side of the tank, or jacket if lagged, in letters and figures at least 2 inches high, immediately above the stenciled marks specified in paragraph ICC–20 (b).

AAR–20. (a) For all other markings, see Figure 1.

AAR–20. (b) Tanks of riveted construction with the exception of fusion-welding in two-piece heads, with heads joined to tank shell by rivets, are considered Class EMERGENCY USG–A and should be so marked.

ICC–21. *Reports.* (a) Before a tank car is placed in service, the party assembling the completed car must furnish to car owner, Bureau of Explosives, and the Secretary, Mechanical Division, Association of American Railroads, a report in approved form certifying that the tank and its equipment comply with all the requirements of this specification. In case of welded repairs to, alterations of or additions to tanks or equipment therefor from original design and construction, all of which must be approved, there must be furnished to the same parties a report in detail of the welded repairs, alterations or additions made to each tank covered by a particular application, showing the initials and number of each tank involved. Reports of retests must be rendered to the Bureau of Explosives and car owner.

AAR–21. *Application for approval.* (a) See § 78.259 (f)—Application for Approval.

AAR–21. *Certificate of construction.* (b) See § 78.259 (g)—Certificate of Construction.

AAR–22. *Car structure.* (a) See § 78.263—Car Structure.

Appendix A

Method of calculating the diameter and lift of safety valves for use on insulated metal containers and the relief area of safety valves for use on uninsulated unmachined steel containers, in which liquefied gas is charged, the valves to have a discharge capacity sufficient to discharge the contents of the container without exceeding the pressure at which the safety valves are set to open and when the exterior surface of the container is exposed to a temperature of 1200° Fahrenheit.

Safety Valves for Insulated Containers

It will be assumed in the approach to the problem that the exterior surface of the insulation on the container is at a uniform temperature of 1200° Fahr. and the temperature of the contents of the container such that, due to the fire, it will cause an absolute pressure in pounds per square inch the equivalent of that required to open the safety valve.

The pressure relief dimensions of the safety valve are to be such that no pressure in excess of that at which the valve is set to open will be developed in the container during the exposure of the exterior surface of its insulation to a temperature of 1200° Fahr., thus resulting in the complete discharge to the atmosphere of the contents of the container without injury to the container.

To construct the formulae to obtain the safety valve relief dimensions the well-known formula for the weight of steam discharge per hour is used, this formula being:

$W = 110\ PDN$, in which

$$D = \frac{W}{110\ PN}$$

W = the weight of steam discharged per hour through the safety valve.

P = the absolute pressure of the steam in pounds per square inch.

D = the diameter of the safety valve in inches.

N = the left of the safety valve in inches.

The seat of the safety valve in every case in the calculation of the relief dimensions for insulated containers is at an angle of 45°.

For the gases for which adequate safety valves are to be calculated certain properties of those gases in their relation to saturated steam under similar pressure conditions must be known, and, in addition, the rate of transfer of heat in B. t. u. through the exterior insulation and container wall and the surface area in square feet of the exterior wall of the metal container must be known.

If the rate of discharge for steam through a safety valve of certain dimensions is known, then for any gas, if the density at the same pressure as steam is known, the rate of discharge of the gas through the safety valve can be calculated.

The velocity of flow of gases at a given pressure through an orifice of a given area varies inversely as the square root of their densities. Having then the density of steam at a pressure, we can calculate the rate of

discharge for any other gas through the same orifice and at the same pressure.

The discharge pressure through the safety valve of a given area is considered to be constant and the discharge through it to be continuous under the maximum heat flow which would be encountered with a temperature of 1,200° Fahr. at the exterior surface of the insulation of the container. Any temperature less than 1,200 Fahr. but higher than that required to cause the pressure of the gas to open the safety valve will then result in intermittent action of that valve.

The relief dimensions then for the safety valve will be calculated on a basis that they shall be of such dimensions that the valve will discharge sufficient gas under maximum operating conditions to maintain at a predetermined pressure a balance between the heat input into the gas and the heat withdrawal from it, the latter being an effect produced by the latent heat of vaporization of the liquid gas at the pressure at which the valve opens.

The heat insulation in every case considered will consist of a material which it is assumed will not lose more than 50 percent of its heat insulating properties when exposed to a temperature of 1,200 Fahr.

The lift of the safety valve will in every case be considered to be 0.05" for insulated containers, the diameter being the dimension calculated. Any lift greater than 0.05" will result in additional discharge capacity, which would only be called upon in the event of the insulation being removed from a portion of the container. The maximum lift which must be available for this purpose is not less than 0.250", and if the calculated diameter of the valve is not sufficient to obtain an area the equivalent of that found by the following formula

$D \times 3.1416 \times 0.250'' \times$ sine of valve seat angle

then the diameter must be increased an amount sufficient to obtain that area.

The formula used for the calculation of the latent heat of vaporization of the liquid gas is as follows:

$$L = 0.185 \times T\ (V_1 - V_2) \times \frac{dP}{dT}$$

in which

L = the latent heat of vaporization of the liquid gas in B. t. u. per pound weight at pressure P.
T = the absolute temperature in degrees Fahr. at pressure P.
V_1 = the volume of gas (vapor) in cubic feet per pound weight at pressure P.
V_2 = the volume of liquid gas in cubic feet per pound weight at pressure P.
$\frac{dP}{dT}$ = the slope of vapor pressure curve in pounds per square inch per degree Fahr. temperature change at P.
P = the absolute pressure of the gas in pounds per square inch.

Using the various factors referred to in this work and inserting them in their proper places, we then have the formula in the following form to obtain the diameter of the valve with an 0.05" lift.

$$D = \frac{((B \times \pi \times U) + 2E) \times C \times (t_1 - t_2)}{L \times 110 \times P \times N} \sqrt{\left(\frac{W_2}{W_1}\right)},$$

in which

D = the diameter of the safety valve in inches.
B = the diameter of the inside wall of insulation in feet = the outside diameter of metal container.
π = Pi = 3.1416.
U = the length of the container in feet.
E = the area of end of container in square feet; under certain conditions the area of one or both ends may be omitted, depending on the probability of exposure to the temperatures for which the relief dimensions of the valve are calculated.
C = the heat transfer in B. t. u. per square foot per hour per degree Fahr. temperature difference between the temperature at the outside of the insulation and the temperature of the contents of the container when at the pressure at which the safety valve is set to open.
t_1 = the temperature in degrees Fahr. at outside surface of insulation = 1,200 degrees.
t_2 = the temperature in degrees Fahr. of contents of container when at the pressure at which the safety valve is set to open.
W_2 = the density of steam in pounds per cubic foot at pressure P.
W_1 = the density of gas vapor in pounds per cubic foot at pressure P.
N = the lift of the valve in inches = .05.
110 = constant taken from the formula for the weight of steam discharged per hour at pressure P.
P = the absolute pressure in pounds per square inch. $P - 14.7$ = the gauge pressure at which the safety valve is set to open.
L = the latent heat of vaporization of the liquid portion of the gas in B. t. u. per pound weight at the pressure P.

To demonstrate the application of the above formula we will select several liquefied gases for which we will calculate the diameter of the safety valves, each having a lift of 0.05" minimum and not less than 0.250" maximum.

The insulation in every case will be assumed to be corkboard with a thickness of four inches, two inches of which will be considered destroyed by the application of a temperature of 1,200° Fahr. and the remaining two inches will be considered intact and to have a heat transfer of 0.36 B. t. u. per square foot per hour per degree Fahr. temperature difference between 1,200° Fahr. and the temperature of the contents of the container when at the pressure at which the safety valve is set to open.

The gas considered to be in the container will be 40,000 pounds of liquefied petroleum gas having a specific gravity of 0.509 at 60° Fahr. for the liquid portion of the gas.

The metal in the wall will not be considered in the transfer of heat because the rate of heat flow is so much greater through the metal than through the corkboard insulation. The outside diameter and length of the metal container, however, will be used for the purpose of calculating the surface area exposed to the heat. Then,

$B = 7.208$ feet.
$U = 36$ feet.
$E = B^2 \times 0.7854 = 7.208 \times 7.208 \times 0.7854 =$ 40.8056 square feet.
$C = 0.36$.
$t_1 = 1{,}200°$ Fahr.
$t_2 = 120°$ Fahr.
$W_2 = 0.521$.
$P = 239.7$ pounds per square inch absolute.
$N = 0.05''$.
$T = 579.6°$ Fahr.
$V_1 = 0.459$.
$V_2 = 0.03534$.
$W_1 = 2.179$.
$L = 0.185 \times 579.6\ (0.459 - 0.03534) \times 2.8 =$ 127.2 B. t. u. per pound.

Placing the values in their proper places in the formula, it appears as follows:

$$D = \frac{((7.208 \times 3.1416 \times 36) + 2 \times 40.8056) \times 0.36 \times (1200 - 120)}{127.2 \times 110 \times 239.7 \times 0.05}$$

$$\sqrt{\left(\frac{0.521}{2.179}\right)} = \frac{896.794 \times 0.36 \times 1080 \times 0.488}{167694} = \frac{170152.228}{167694} = 1.014''$$

the diameter of a valve with an 0.05" lift, which is calculated to be adequate to discharge 40,000 pounds of liquefied petroleum gas having a specific gravity of 0.509 at 60° Fahr. for the liquid portion of the gas, stored in a metal container 7.208 feet outside diameter by 36 feet long, covered with four inches of corkboard, the whole exterior of which is exposed to a temperature of 1,200° Fahr., the safety valve operating at a gauge pressure of 225 and 239.7 pounds per square inch absolute.

The second example will be for 50,000 pounds of anhydrous ammonia gas, which we will charge into a container having the same dimensions as those used for the liquefied petroleum gas and covered with four inches of corkboard, the whole exterior of which is exposed to a temperature of 1,200° Fahr. Then,

$B = 7.208$ feet.
$U = 36$ feet.
$E = B^2 \times 0.7854 = 7.208 \times 7.208 \times 0.7854 =$ 40.8056 square feet.
$C = 0.36$.
$t_1 = 1{,}200°$ Fahr.
$t_2 = 108°$ Fahr.
$W_2 = 0.521$.
$P = 239.7$ pounds per square inch absolute.
$N = 0.05''$.
$T = 567.6°$ Fahr.
$V_1 = 1.25$.
$V_2 = 0.02781$.
$W_1 = 0.797$.
$L = 0.185 \times 567.6 \times (1.25 - 0.02781) \times 3.6 =$ 462 B. t. u. per pound.

Placing the values in their proper places in the formula, it appears as follows:

$$D = \frac{((7.208 \times 3.1416 \times 36) + 2 \times 40.8056) \times 0.36 \times (1200 - 108)}{462 \times 110 \times 239.7 \times 0.05}$$

$$\sqrt{\left(\frac{0.521}{0.797}\right)} = \frac{896.794 \times 0.36 \times 1092 \times 0.808}{609077} = \frac{284857}{609077} = 0.4677''$$

the diameter of a valve with an 0.05" lift, which is calculated to be adequate to discharge 50,000 pounds of anhydrous ammonia gas which is stored in a metal container 7.208 feet outside diameter by 36 feet long, covered with four inches of corkboard, the whole exterior of which is exposed to a temperature of 1,200° Fahr., the safety valve operating at a gauge pressure of 225 and 239.7 pounds per square inch absolute.

The third example will be for 40,000 pounds of sulphur dioxide gas, which we will charge into a metal container covered with four inches of corkboard, the whole exterior of which is exposed to a temperature of 1,200° Fahr. Then,

$B = 5.17$ feet.
$U = 28.5$ feet.
$E = B^2 \times 0.7854 = 5.17 \times 5.17 \times 0.7854 = 20.994$ square feet.
$C = 0.36$.
$t_1 = 1200°$ F.
$t_2 = 166$ F.
$W_2 = 0.521$.
$P = 239.7$ pounds per square inch absolute.
$N = 0.05''$.
$T = 625.6°$ F.
$V_1 = 0.383$.
$V_2 = 0.013184$.
$W_1 = 2.611$.
$L = 0.185 \times 625.6 \times (0.383 - 0.013184) \times 2.875 = 123$ B. t. u. per pound.

Placing the values in their proper places in the formula, it appears as follows:

$$D=\frac{((5.17\times3.1416\times28.5)+2\times20.994)\times0.36\times(1200-166)}{123\times110\times239.7\times0.05}$$

$$\sqrt{\left(\frac{0.521}{2.611}\right)}=\frac{504.885\times0.36\times1034\times0.447}{162157}=\frac{84008}{162157}=0.518''$$

the diameter of a valve with an 0.05'' lift, which is calculated to be adequate to discharge 40,000 pounds of sulphur dioxide gas, stored in a metal container 5.17 feet outside diameter by 28.5 feet long, covered with four inches of corkboard, the whole exterior of which is exposed to a temperature of 1,200° Fahr., the safety valve operating at a gauge pressure of 225 and 239.7 pounds per square inch absolute.

SAFETY VALVES FOR UNINSULATED UNMACHINED STEEL CONTAINERS

It will be assumed in the approach to the problem that the exterior surface of the container is at a uniform temperature of 1,200° Fahr., and the temperature of the contents of the container such that, due to the fire, it will cause an absolute pressure in pounds per square inch the equivalent of that required to open the safety valve.

The relief area of the safety valve is to be such that no pressure in excess of that at which the valve is set to open will be developed in the container during the exposure of its exterior surface to a temperature of 1,200° Fahr., thus resulting in the complete discharge to the atmosphere of the contents of the container without injury to the container.

The same principles of approach as used for the insulated container will be used for the calculation of the relief areas for uninsulated containers.

In this problem the relief area of the safety valve will be calculated, instead of in terms of diameter with an 0.05'' lift, the formula used for the weight of steam discharged per hour will be used as the base and appears as

$W=50\ PA$, in which

W = the weight of steam discharged per hour.
50 = constant.
P = the absolute pressure of the steam in pounds per square inch. $P-14.7$ = the gauge pressure at which the safety valve is set to open.
A = the area in square inches for a valve having a seat of any angle.

The heat transfer through the steel wall of the container will be calculated from the following formula:

$a=62.5+20t$ equals factor for the wall thickness of the container.
t = the thickness of the container wall in inches.
62.5 = constant.
20 = constant.

$$C=\frac{(t_1-t_3)}{a}$$

where

C = B. t. u. transmitted to contents of container per square foot of container surface per hour per degree Fahr. temperature difference between 1,200° Fahr. and the temperature of the container contents when at the pressure at which the safety valve is set to open.

To obtain the required area of the safety valve to discharge the contents of the container without exceeding the pressure at which the safety valve is set to open, the formula appears as follows:

$$A=\frac{((B\times3.1416\times U)+2E)\times C\times(t_1-t_3)}{L\times P\times50}\sqrt{\left(\frac{W_3}{W_1}\right)}$$

The latent heat of vaporization of the liquid gas is calculated by the same formula used for insulated containers and is

$$L=0.185\times T(V_1-V_2)\times\frac{dP}{dT}$$

To demonstrate the application of the above formulae we will select a liquefied gas having a specific gravity of 0.509 at 60° Fahr. for the liquid portion of the gas.

Then, for a container having an outside diameter of 2.5 feet by 9.33 feet long and a wall thickness of 0.4'' we have

$$a=62.5+(20t)=62.5+8=70.5$$

and $C=\frac{(t_1-t_3)}{a}$ $t_1=1,200°$ Fahr. $t_3=165°$ Fahr.

Then $C=\frac{(1,200-165)}{70.5}=\frac{1035}{70.5}=14.68$ B. t. u.

Then to calculate the required relief area of the valve we have

$B=2.5$ feet.
$U=9.33$ feet.
$E=B^2\times0.7854=2.5\times2.5\times0.7854=4.908$ square feet.
$t_1=1,200°$ Fahr.
$t_3=165°$ Fahr.
$W_3=0.839$ pound per cubic foot.
$P=389.7$ pounds per square inch absolute.
$T=624.6°$ Fahr. absolute.
$V_2=0.0409$ cubic feet per pound.
$V_1=0.220$ cubic feet per pound.
$W_1=4.55$ pounds per cubic foot.

$$L=0.185\times T(V_1-V_2)\times\frac{dP}{dT}=$$

$0.185\times624.6\ (0.220-0.0409\times4.31=89$ B. t. u. per pound.

And,

$$A=\frac{((2.5\times3.1416\times9.33)+2\times4.9)\times14.68\times(1200-165)}{89\times389.7\times50}$$

$$\sqrt{\left(\frac{0.839}{4.55}\right)}=\frac{83\times14.68\times1035\times429}{89\times389.7\times50}=\frac{541005}{1734165}=0.312\text{ sq. in.}$$

the area of a valve which is calculated to be adequate to discharge 1,000 pounds of liquefied petroleum gas having a specific gravity of 0.509 at 60° Fahr. for the liquid portion of the gas, stored in an unmachined steel container 2.5 feet outside diameter by 9.33 feet long, the whole exterior of which is exposed to a temperature of 1200° Fahr., the safety valve opening at 375 pounds per square inch gauge and 389.7 pounds per square inch absolute pressure.

In order to demonstrate the value of the formulae used to calculate the relief dimensions of a safety valve which is installed on an uninsulated container, a fire test was arranged.

The container used for the test had an outside surface area of 83 square feet and was charged with 1,000 pounds by weight of liquefied petroleum gas.

The safety valve was set to open at 375 pounds per square inch gauge pressure.

The relief area of the safety valve was 0.312 square inch. It was intended that the safety valve should open to the full extent of its relief area, and when once opened to that area it should remain open until the contents of the container was discharged without exceeding 375 pounds per square inch gauge pressure.

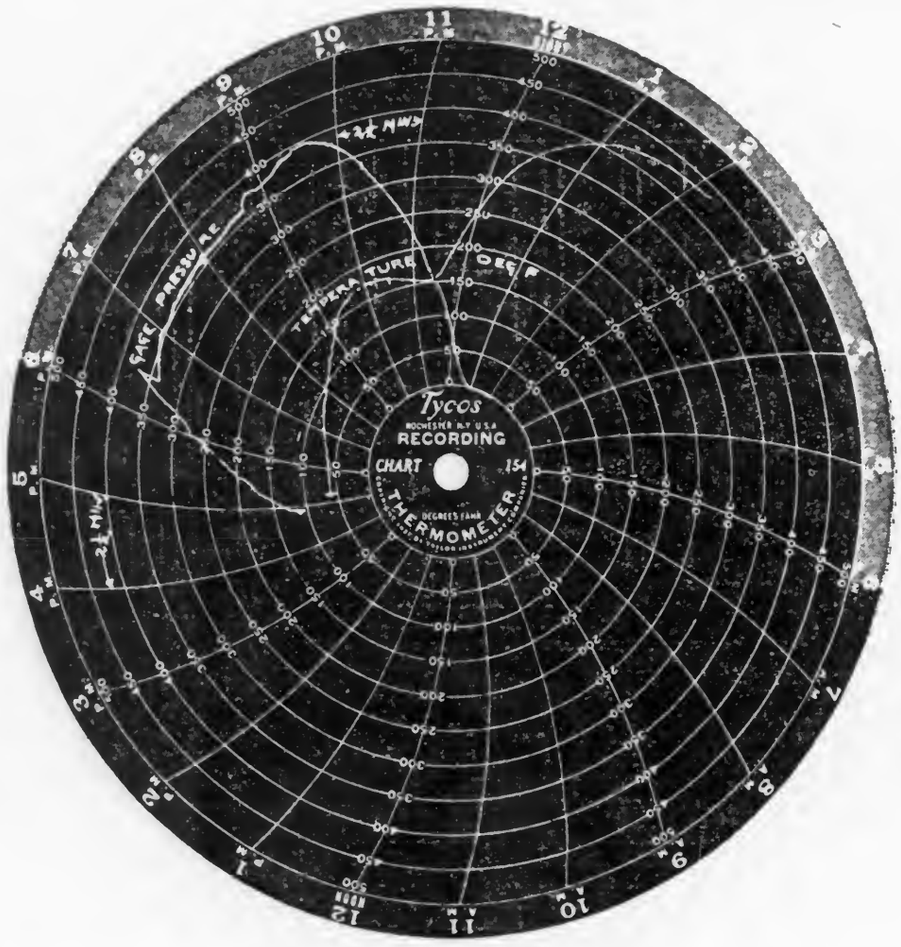
In order to have a fire of some volume and heat intensity, wood saturated with kerosene was placed around the periphery of the container to a depth of four feet and to a height equal to three-fourths of the height of the container and then was ignited.

The temperature and gauge pressure of the contents of the container were recorded by a recording gauge. The chart showing the temperature and pressure during the test is shown in the illustration below.

It will be observed that the approach in every case where the calculation of the relief dimensions of the safety valve is involved was based on the assumption that the temperature of the air at the exterior surface of the container was 1200° Fahr., and the actual fire test which was made indicated that the temperature at the surface under open air conditions was very close to 1200° Fahr.

Should it become necessary under unusual conditions to use a higher temperature than 1200° Fahr. for the temperature of the air at the surface of the container, the formulae can be used in the usual manner, providing, however, that the surface of the container is not subjected to intense blowtorch action. Such a condition will not be met adequately by the formulae discussed herein.

The method of testing a sample safety valve of a particular design to determine its discharge capacity must be approved by the Association of American Railroads Committee on Tank Cars.



APPENDIX B

There follows the second revision, as of March 1, 1936, of the list of dome covers with safety devices, approved by the Committee on Tank Cars, as complying with the requirement contained in § 73.119 (f) (4) of this chapter.

THE FOLLOWING DESIGNS SUBMITTED BY AMERICAN CAR & FOUNDRY CO., 30 CHURCH ST., NEW YORK, N. Y.

Index	Drawing No.	Revised as of—	Type of dome cover	Class of car used on—	Brief description of safety device
1	5577007-C	July 5, 1927	1 external fundamental bolted and hinged type and 1 internal hinged type secured by equalizing yoke.	IV and 104	Internal cover opening inward. External cover provided with shoulders on 2 special hinged bolts located opposite hinge being engaged by lugs on the upper and under side of 2 radial slots.
2	3576768-C	June 18, 1931	Circumference slot with eye bolts.[1]	III and 103	Two diametrically opposite radial slots located sufficiently close to the circumferential slots as to require exact placement of cover before hinged bolts can be dropped and 2 diametrically opposite projections on inner wall of dome ring engaging 2 diametrically opposite projections on dome cover flange. Rib on top of cover necessitates loosening nut sufficient to pass over this rib when cover is rotated.
3	3575904-I	do	Bolted and hinged	III and 103	Shoulders on 2 special hinged bolts located opposite hinge being engaged by lugs on the upper and under side of 2 radial slots
4	3577691-A	Sept. 20, 1929	Circumference slot with eye bolts [1]	IV and 104	2 diametrically opposite radial slots located sufficiently close to the circumferential slots as to require exact placement of cover before hinged bolts can be dropped and 2 diametrically opposite projections on inner wall of dome ring engaging 2 diametrically opposite projections on dome cover flange. Rib on top of cover necessitates loosening nut sufficient to pass over this rib when cover is rotated.
5	3578085-F	Jan. 31, 1931	Bolted and hinged	IV and 104	Same as shown on Drawing No. 3575904-I.
6	3574675-C	Apr. 23, 1931	Screw type with vent holes [1]	III	Unscrewing the cover relieves the internal pressure through vents in the threaded portion of cover, thereby forcing a floating disk upward and actuating 3 equidistant triggers which engage the dome ring, preventing removal of cover until the internal pressure of tank is released.
7	3578086-B	Sept. 3, 1931	Screw type with vent holes [1]	IV	Same as shown on Drawing No. 3574675-C.
8	3584723-A	Apr. 11, 1931	Circumferential slot with eye bolts.[1]	103 III	All circumferential slots have lower lugs which engage shoulders on 2 diametrically opposite special hinged bolts necessitating raising the cover approximately 1/4" before it can be rotated to clear bolts. The slots also have upper lugs which engage nuts if pressure exists.
9	3584782-A	do	do [1]	104	Same as shown on Drawing No. 3584723-A.
10	3584798	Mar. 17, 1931	Bolted and hinged	104 IV	Same as shown on Drawing No. 3575904-I.
11	2579492-B	Nov. 9, 1928	Fundamental bolted type nonhinged.		Washers on dome cover bolts engage ribs on cover at slots, thereby preventing bolts from being disengaged when pressure exists in tank.
12	SK-5-29-31-M-B	Aug. 18, 1931	Radial slot [1]		Combined handle and safety bar riveted to outside face of cover and extending over 2 diametrically opposite hinged bolts which are retained until nuts are run off approximately 5/8", permitting cover to be raised a similar distance before bolts can be dropped.
13	SK-5-29-31-L-B	do	Circumferential slot with studs [1]		Same as shown on Drawing No. SK-5-29-31-M-B.
14	SK-7-24-31-M-B	Sept. 2, 1931	do		Combined handle and safety bar riveted to outside face of cover extending over 2 diameterically opposite studs and having an integral lug which engages nuts, preventing cover from being rotated while interior pressure exists.

[1] Drawings do not indicate this to be Fundamental Type.

THE FOLLOWING DESIGNS SUBMITTED BY AMERICAN CAR & FOUNDRY CO., 30 CHURCH ST., NEW YORK, N. Y.—continued

Index	Drawing No.	Revised as of—	Type of dome cover	Class of car used on—	Brief description of safety device
15	SK-7-17-31-N-A	Sept. 2, 1931	Fundamental bolted and hinged type.		Safety guard riveted to outside face of cover and extending over 2 hinged bolts opposite hinge. The radial slots on cover are further provided with upper ribs which engage washers on bolts, all of which retain the bolts at the guard until nuts are run off approximately 5/8", permitting cover to be raised a similar distance before bolts can be dropped.
16	SK-7-16-31-N-A	do	Fundamental bolted type		Combined handle and safety bar riveted to outside face of cover and extending over 2 diametrically opposite hinged bolts. The radial slots on cover are further provided with upper ribs which engage washers on bolts, all of which retain the bolts at the guard until nuts are run off approximately 5/8", permitting cover to be raised a similar distance before bolts can be dropped.
17	4564495-C	Nov. 13, 1920	1 external insulation cover and 1 internal hinged type, secured by equalizing yoke.[1]		Internal cover opening inward.
18	5563844-A	May 11, 1919	do.[1]		Do.

THE FOLLOWING DESIGNS SUBMITTED BY CANADIAN CAR & FOUNDRY CO., LTD., MONTREAL, P. Q., CANADA

101	C-2249-C	Nov. 4, 1931	Bolted and hinged [1]	103	Shoulders on 2 special bolts located opposite hinge being engaged by lugs on under side of 2 radial slots.
102	C-2250-B	Oct. 21, 1930	do	103	Same as shown on Drawing No. C-2249-C.
103	E-1781-A	Nov. 28, 1929	1 external bolted and hinged type and 1 internal crabbed and hinged type.[1]	104	External cover—shoulders on 2 special bolts located opposite hinge being engaged by lugs on under side of 2 radial slots. Internal cover—opening inward.
104	Z-280-4545	Oct. 24, 1928	Fundamental bolted and hinged type.	III and 103	Washers on dome cover bolts engage ribs on cover at slots, thereby preventing bolts from being disengaged when pressure exists in tank.
105	Z-280-4353-A	Oct. 18, 1928	do	III and 103	Same as shown on Drawing No. Z-280-4515.

THE FOLLOWING DESIGNS SUBMITTED BY GENERAL AMERICAN TANK CAR CORP., CHICAGO, ILL.

201	3-2116 (3-2109 dome cover)	Jan. 28, 1929	Fundamental bolted and hinged type.	103 and 104	Grab handle and safety guard riveted to cover, opposite hinge, engaging 2 bolts and necessitates nuts being run off approximately 5/8" so cover can be raised on equal distance for safety guard to clear bolts as they are dropped.
202	3-1866-B (3-1849 dome cover)	Feb. 19, 1935	do	103	Same as shown on Drawing No. 3-2116.
203	2-2625-D	Oct. 21, 1926	Bolted type [1]	III and IV	3 lugs on cover with engage slots on inside of dome ring.
204	4-2054-A (T-195 and T-203 dome covers)	Sept. 17, 1931	Circumferential slot with studs [1]	III and IV	2 locking devices, lower 1 consisting of 2 diametrically opposite castings held in place by studs which necessitates raising covers approximately 1/2" before same can be rotated and upper 1 consisting of a combined handle and safety bar riveted to outside face of cover and of sufficient length to engage the nuts on 2 diametrically opposite bolts also preventing rotating of cover in raised position should internal pressure exist.
205	2-3953 (5449 and 5471 dome covers)	June 23, 1931	Radial slot [1]	III and IV	2 diametrically opposite combined grab handles and safety guards each engaging 1 bolt and necessitating nuts being run off approximately 5/8" so cover can be raised an equal distance for safety guard to clear bolts as they are dropped.
206	2-2500-D	Jan. 9, 1925	Bolted type [1]	III and IV	Same as shown on Drawing No. 2-2625-D.
207	3-2457	Dec. 21, 1931	Circumferential slot with studs [1]	III and IV	Combined handle and safety guard riveted to outside face of cover and extending to 2 diametrically opposite studs and having an integral lug which engages nuts, preventing cover from being rotated while internal pressure exists.

THE FOLLOWING DESIGNS SUBMITTED BY PETROLEUM IRON WORKS CO. OF OHIO, SHARON, PA.

301	1500	Mar. 15, 1930	Fundamental bolted and hinged type.	103	Grab handle and safety guard riveted to cover, opposite hinge, engaging 2 bolts and necessitates nuts being run off approximately 5/8" so cover can be raised an equal distance to clear bolts as they are dropped.
302	3211-A	Mar. 4, 1927	do	103	Same as shown on Drawing No. 1500.
303	824-C	Apr. 14, 1923	Fundamental bolted type	IV	Washers on dome cover bolts engage ribs on cover at slots, thereby preventing bolts from being disengaged when pressure exists in tank.
304	1504	Mar. 24, 1930	Fundamental bolted and hinged type.	104	Same as shown on Drawing No. 1500.

THE FOLLOWING DESIGNS SUBMITTED BY PRESSED STEEL CAR CO., PITTSBURGH, PA.

401	60130-B	Jan. 23, 1930	Fundamental bolted and hinged type.	103	Washers on dome cover bolts engage ribs on cover at slots, thereby preventing bolts from being disengaged when pressure exists in tank.
402	61950-A	Apr. 21, 1930	do	103	Same as shown on Drawing No. 60130-B.
403	63856-A	Oct. 19, 1931	do	II and III	Do.

THE FOLLOWING DESIGNS SUBMITTED BY STANDARD STEEL CAR CORP., BUTLER, PA.

501	47536-C	May 23, 1923	Internal, crabbed and chained		Internal cover opening inward.

THE FOLLOWING DESIGNS SUBMITTED BY STANDARD TANK CAR CORP, SHARON, PA.

601	10161 (10160-C dome cover)	May 4, 1927	Fundamental bolted and hinged type.	IV Insul. 103	Grab handle and safety guard riveted to cover, opposite hinge, engaging 2 bolts and necessitates nuts being run off approximately 5/8" so cover can be raised an equal distance to clear bolts as they are dropped.
602	10232 (10063-E dome cover)	Nov. 14, 1928	do	103	Same as shown on Drawing No. 10161.
603	10097-A	Jan. 11, 1926	Fundamental bolted type	III and IV	Washers on dome cover bolts engaged ribs on cover at slots, thereby preventing bolts from being disengaged when pressure exists in tank.
604	10066-A	June 8, 1925	do	III and IV	Same as shown on Drawing No. 10097-A.
605	10090	July 21, 1925	do	III and IV	Do.

[1] Drawings do not indicate this to be Fundamental Type.

THE FOLLOWING DESIGNS SUBMITTED BY TIDAL REFINING CO., TULSA, OKLA.

Index	Drawing No.	Revised as of—	Type of dome cover	Class of car used on—	Brief description of safety device
701	TC-130-3	Jan. 8, 1932	Circumferential slot with studs [1]	IV	Combined handle and safety bar riveted to outside face of cover and engaging 2 diametrically opposite studs and having an integral lug which engages nuts, preventing cover from being rotated while interior pressure exists.

THE FOLLOWING DESIGNS SUBMITTED BY UNION TANK CAR CO., 228 NORTH LASALLE ST., CHICAGO, ILL.

801	SK-973-3B	June 1, 1926	1 external insulated bolted radial slot cover and 1 internal crabbed and hinged cover.[1]		Internal cover opening inward.
802	3622-A	Nov. 28, 1928	1 external insulated hasped cover and 1 internal crabbed and chained cover.[1]	IV	Do.
803	3760-D	Apr. 7, 1931	1 external insulated bolted radial slot cover and 1 internal crabbed and hinged cover.[1]	IV	Do.
804	877-C	Mar. 26, 1927	Fundamental bolted type	III and 103	Washers on dome cover bolts engage ribs on cover at slots, thereby preventing bolts from being disengaged when pressure exists in tank.
805	3930 (876-B dome ring) (877-C dome cover) A. A. R. Fundamental Type dome ring and cover with grab iron safety device. (See figs. 5 and 6.)	May 21, 1935	do	III and 103	Washers on dome cover bolts engage ribs on cover at slots, thereby preventing bolts from being disengaged when pressure exists in tank. Dome ring also equipped with one special nonswinging eye-bolt, requiring cover to be raised at this point, automatically venting pressure, if any, and lowering diametrically opposite slot. This permits disengagement of diametrically opposite swinging eye-bolt after which cover is lowered onto seat, raised on opposite side and slid out from under nonswinging eye-bolt.

[1] Drawings do not indicate this to be Fundamental Type.

APPENDIX C

Notes in connection with lettering diagram. New tank cars, and new car structures or new tanks for existing cars, built on or after August 1, 1941 in compliance with specifications contained herein, must be marked as required by the applicable specification and the following Notes. These markings are illustrated by revised figure 1 herein.

When existing cars are repainted and restenciled it is preferable that restenciling be in conformity with requirements of the following Notes as illustrated by revised figure 1 herein.

NOTE 1: Location, sizes, and spacing of letters and numerals to be as shown.

NOTE 2: The reporting marks assigned by the Operating-Transportation Division, Association of American Railroads, should be placed between the horizontal bars and located as shown. If desired, the name, initials, or trademark of owner, or lessee, may be placed on sides of tank, or jacket if lagged, above reporting marks.

NOTE 3: Arrangement of reporting marks, capacity, lightweight, and date should be maintained as shown except that the entire arrangement may be moved slightly, if necessary, to suit construction of car.

NOTE 4: Number of I. C. C. or A. A. R. Specification, preceded by the initials "ICC" or "AAR", applicable to tank must be stenciled on both sides of tank, or jacket if lagged, in letters and figures at least 2" high as shown. The initials of manufacturer and date of original test of tank must also be stenciled in letters and figures at least 2" high on sides of tank, or jacket if lagged, immediately below the specification number. In addition to this stenciling, the letters "ICC" or "AAR" and specification number applicable to tank, initials of manufacturer and date of original test in letters and numerals at least $\frac{3}{8}$" high, must be stamped plainly and permanently into the metal near the center of both outside heads of tank as shown.

NOTE 5: For class of cars requiring water capacity marking, the water capacity of the tank in pounds should be stamped plainly and permanently in letters and figures at least $\frac{3}{8}$" high into the metal of both outside tank heads, immediately below the marking specified in Note 4. This marking must also be stenciled on each side of jacket immediately below the dome platform and either directly behind or within 3 feet of the right or left side of ladder, or ladders if there is a ladder on each side of tank, in letters and numerals at least 2 inches high as follows: Water Capacity 000000 Pounds as shown.

NOTE 6: Car number and initials to be stenciled on underframe center sills, or side sills, and on both truck bolsters.

NOTE 7: When air brakes are cleaned, oiled, tested, and stenciled per Interchange Rule 60, the initials of road doing work and initials of shop or station at which work is done, and date, are to be stenciled in location shown.

NOTE 8: Those lined tanks, which are not required to be retested under these specifications, and wooden tanks must be stenciled to indicate test not required in place of stenciling covering tests of tanks; for example, "RUBBER LINED TANK-PRESSURE TEST NOT REQUIRED", "COATED TANK—PRESSURE TEST NOT REQUIRED", or "TREATED TANK—PRESSURE TEST NOT REQUIRED".

NOTE 9: (a) When tank cars bearing I. C. C. Specification number are designed and authorized for the transportation of a particular commodity only, the name of that commodity, followed by the word "ONLY", or such other wording as may be required to indicate the limits of usage of the car, must be stenciled on each side of the tank, or jacket if lagged, as shown.

(b) A. A. R. Specification tank cars of Classes 201A35, 203, 201A35–W and 203-W must be stenciled to indicate the name of the commodity for which the tank car and its appurtenances are designed and author-

ized, followed by the word "ONLY", or such other wording as may be required to indicate the limits of usage of the car on each side of the tank, or jacket if lagged, as shown.

NOTE 10: (a) All ICC–103, ICC–103W, ICC–104 and ICC–104W tank cars equipped with safety vents must be stencilled "NOT FOR FLAMMABLE LIQUIDS" on side of tank, or jacket if lagged, in location shown.

(b) All ICC–104 and ICC–104W tank cars equipped with safety valves set to open at 35 pounds per square inch, as authorized in Note 3 to § 73.119 (f) (3) of this chapter, must be stencilled "FOR VAPOR PRESSURES NOT EXCEEDING 40 POUNDS PER SQUARE INCH, ABSOLUTE, AT 100° F.," in location shown.

NOTE 11: Cars receiving periodic repacking of journal boxes per Interchange Rule 66 must be stencilled on underframe, or on tank of cars without underframe, as shown, the place (railroad and station), month, day and year.

NOTE 12: (a) When owner desires cars to be marked to provide information with respect to AB brakes, draft gears, couplers, brake beams, wheels, dirt collectors, gallonage of tanks, etc., such marks shall be stencilled on heads of tanks, or jackets if lagged, using 2" or 3" letters and numerals with 2" spacing.

(b) Abbreviations should preferably be used when stencilling information referred to in Note 12 (a); for example, No. 15 BR BM (for Number 15 Brake Beam).

NOTE 13: Where tank, safety valve and heater systems are tested on same date, it will be preferable to use a combination stencilling covering these tests, as shown, but where tank, safety valve and heater systems are tested on different dates, individual stencilling covering these tests may be applied at option of owner.

NOTE 14: Size of journals and A. A. R. should be stencilled on truck where same is not cast integral on side frame.

NOTE 15: Date built new, month and year, must be stencilled as shown, or badge plate applied giving this information. For separate dates built for car structure and tanks see Interchange Rule 3 Section (s).

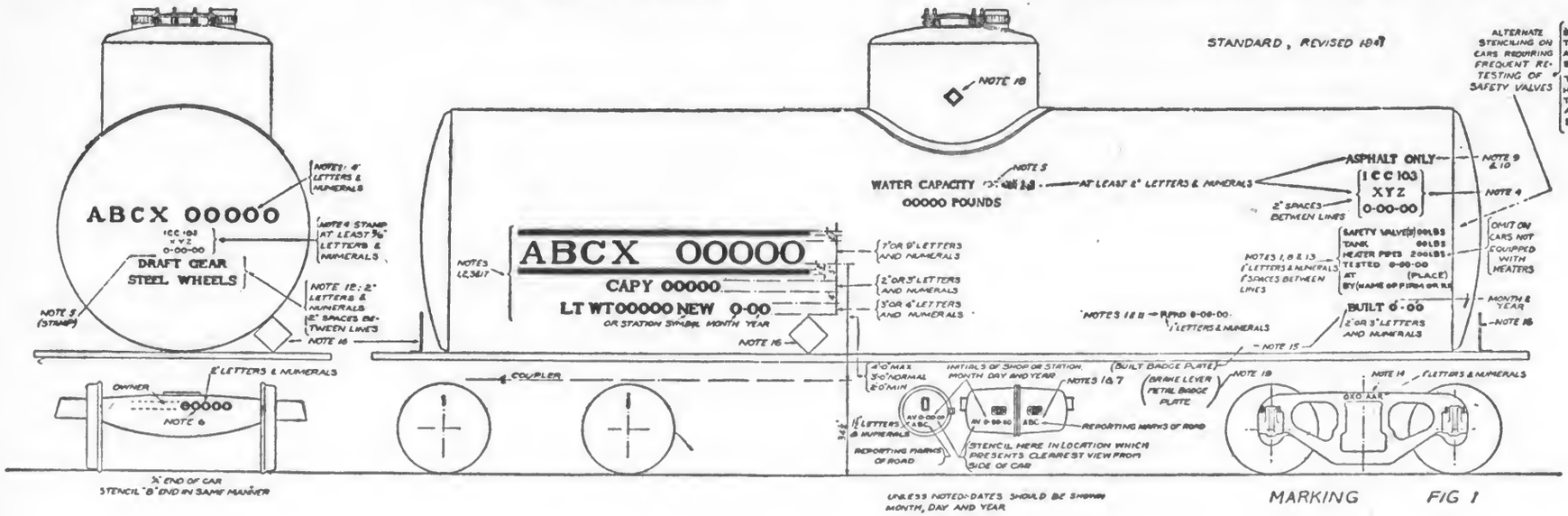
NOTE 16: Metal placard holders must be applied, to both sides as near center of car as possible and to both ends in location shown, to all cars used for the transportation of commodities classified as dangerous by Parts 71–78 of this chapter. See § 78.263 Car Structure, Paragraph 9.

NOTE 17: In no event may the capacity as stencilled on car exceed the load limit based on axle capacity.

NOTE 18: (a) Tank cars Class ICC–103, ICC–103W, ICC–104 and ICC–104W having manhole closures equipped with approved safeguard making removal of closure from manhole opening practically impossible while tank interior is subjected to vapor pressure of lading must be stencilled on each side of dome, or jacket if lagged, in line with the ladders and in a color contrasting to the color of the dome with manhole closure identification mark as shown. For dimensions see I. C. C. paragraph 20 (h) I. C. C. 103 Specifications.

(b) Tank cars of Classes ARA–II, ARA–III, ARA–IV, ICC–103, ICC–103W, ICC–104 and ICC–104W built prior to the effective date of these specifications and now having manhole closures equipped with approved safeguard making removal of closure from manhole opening practically impossible while tank interior is subjected to vapor pressure of lading must be stencilled, as required by § 73.119 (g) of this chapter, on each side of dome, or jacket if lagged, in line with ladders and in a color contrasting to the color of dome with manhole closure identification mark as shown. See § 73.119 (g) of this chapter.

NOTE: 19: Brake lever diagram metal badge plate as shown. See A. A. R. Interchange Rule 3 Section (b).



MARKING FIG 1

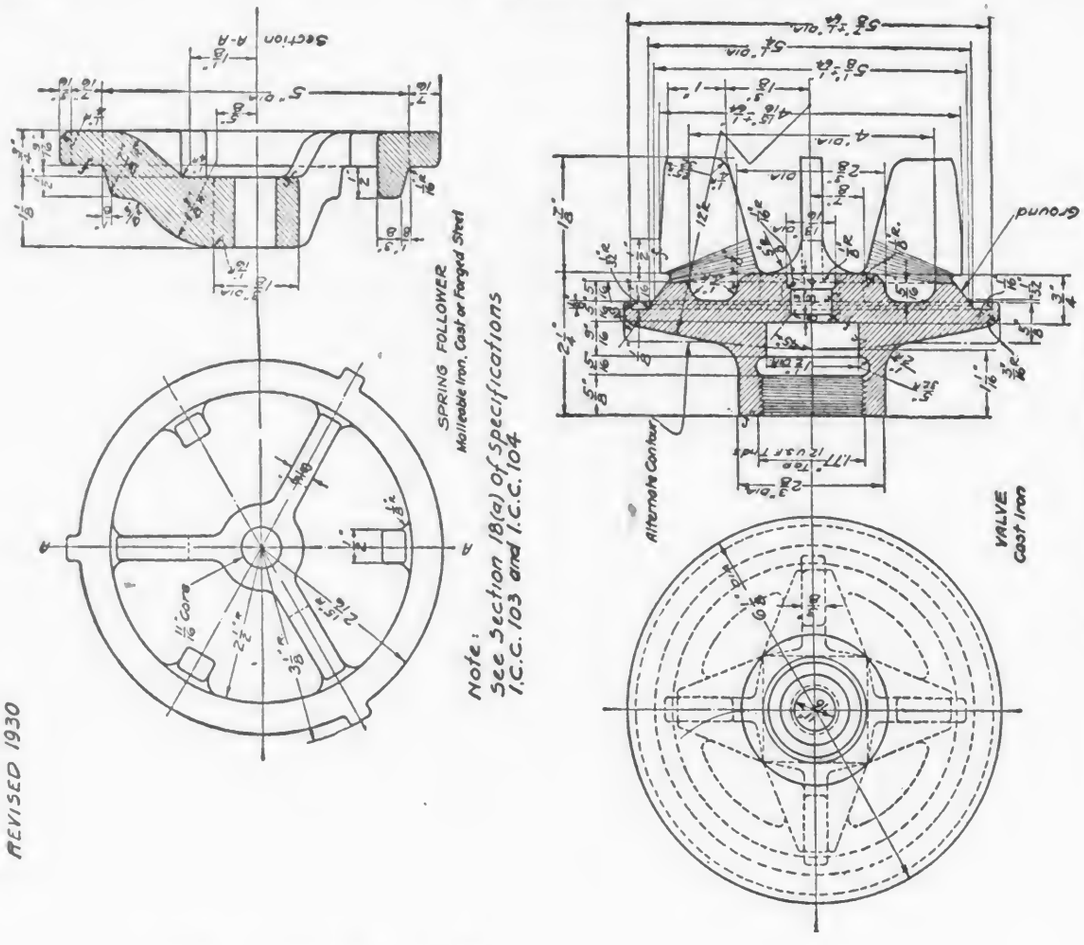


FIGURE 2 continued—Safety valves.

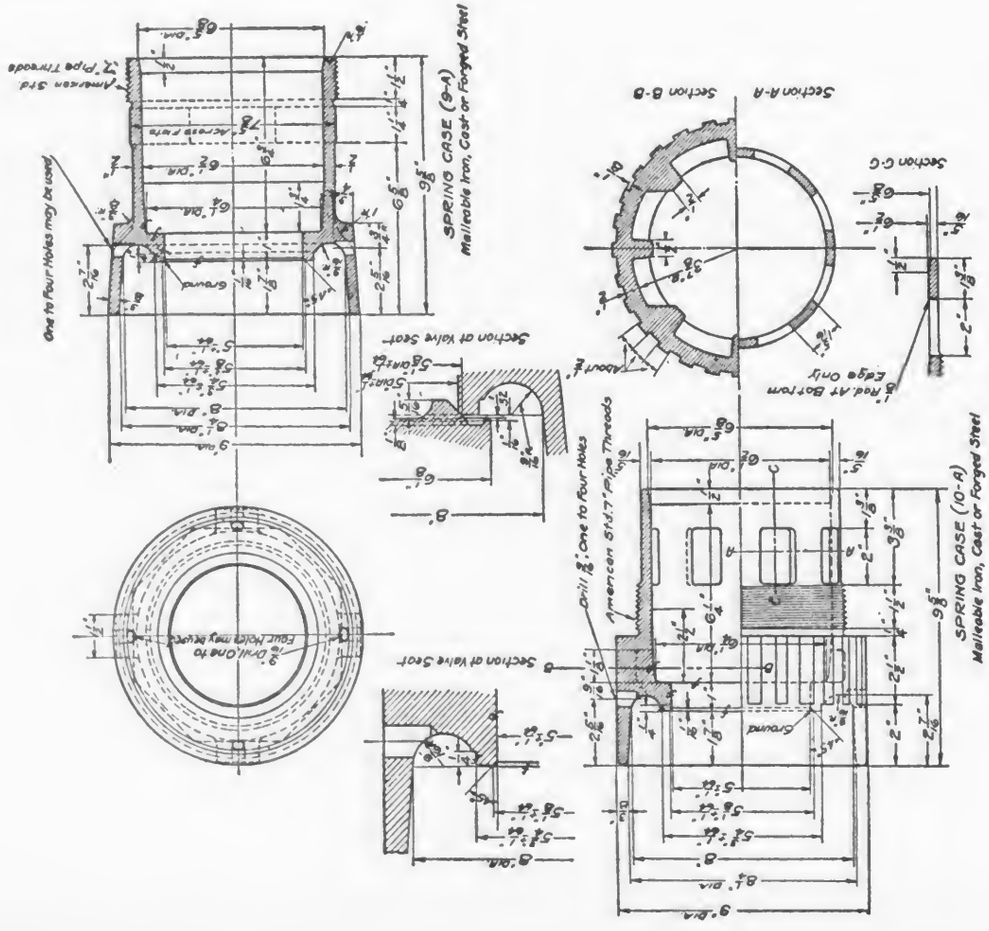


FIGURE 2—Safety valves.

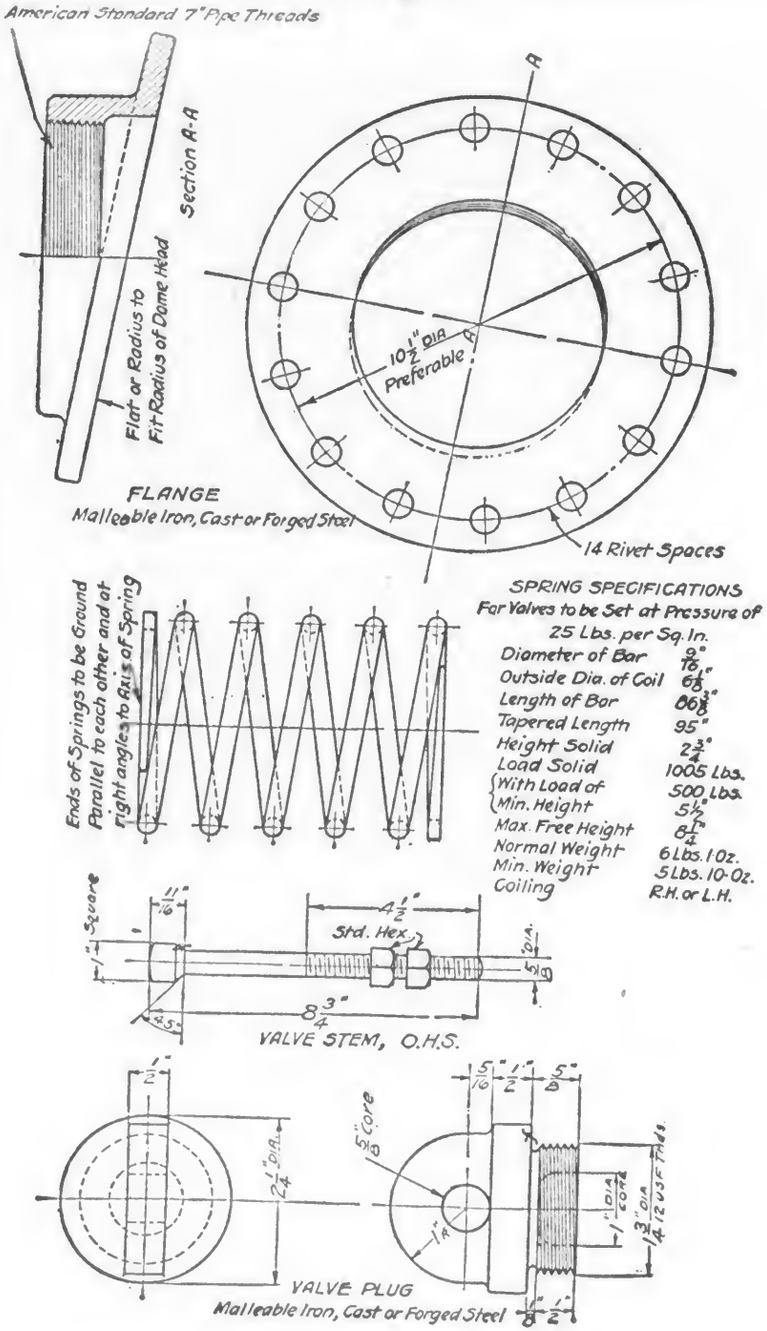


FIGURE 2 continued—Safety valves.

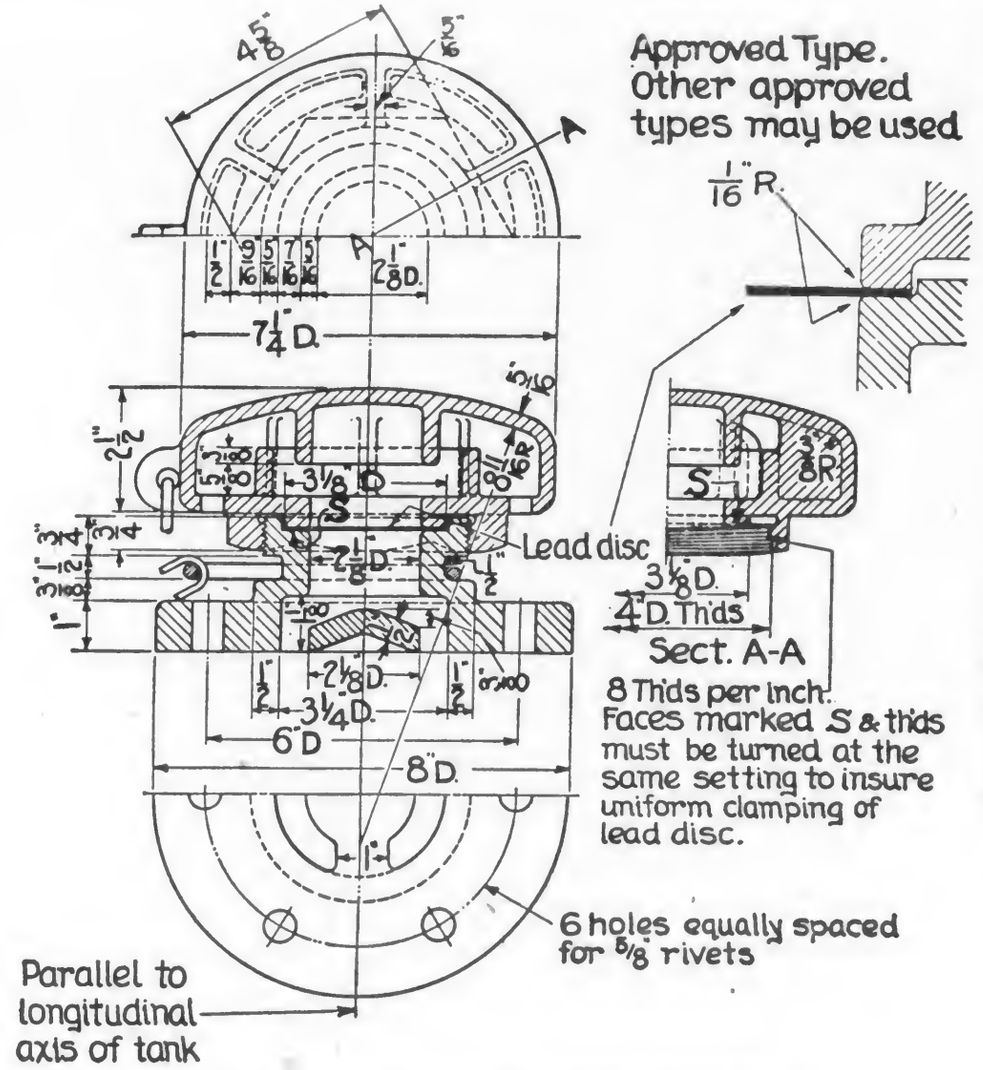


FIGURE 3—2-inch safety vent with frangible diaphragm.

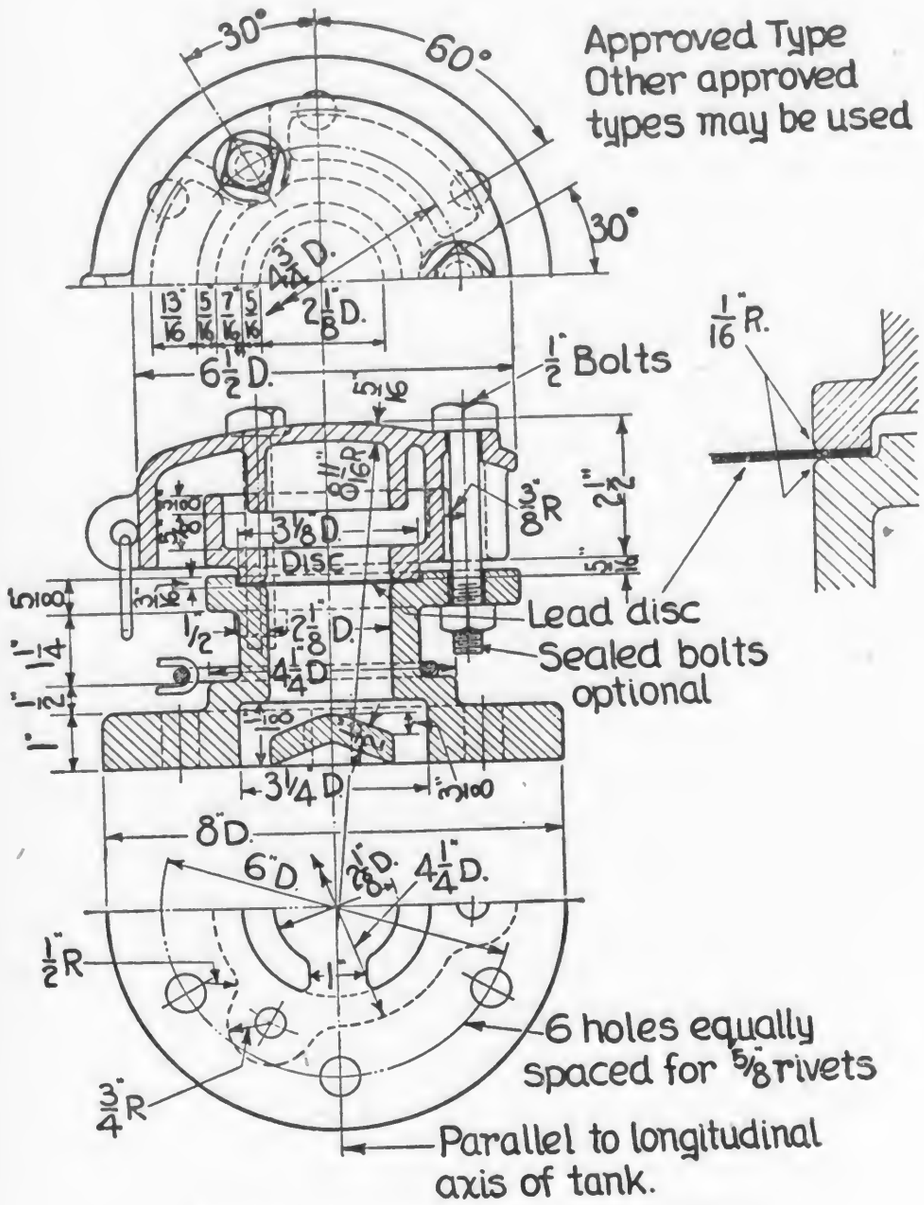


FIGURE 3A—2-inch safety vent with frangible diaphragm.

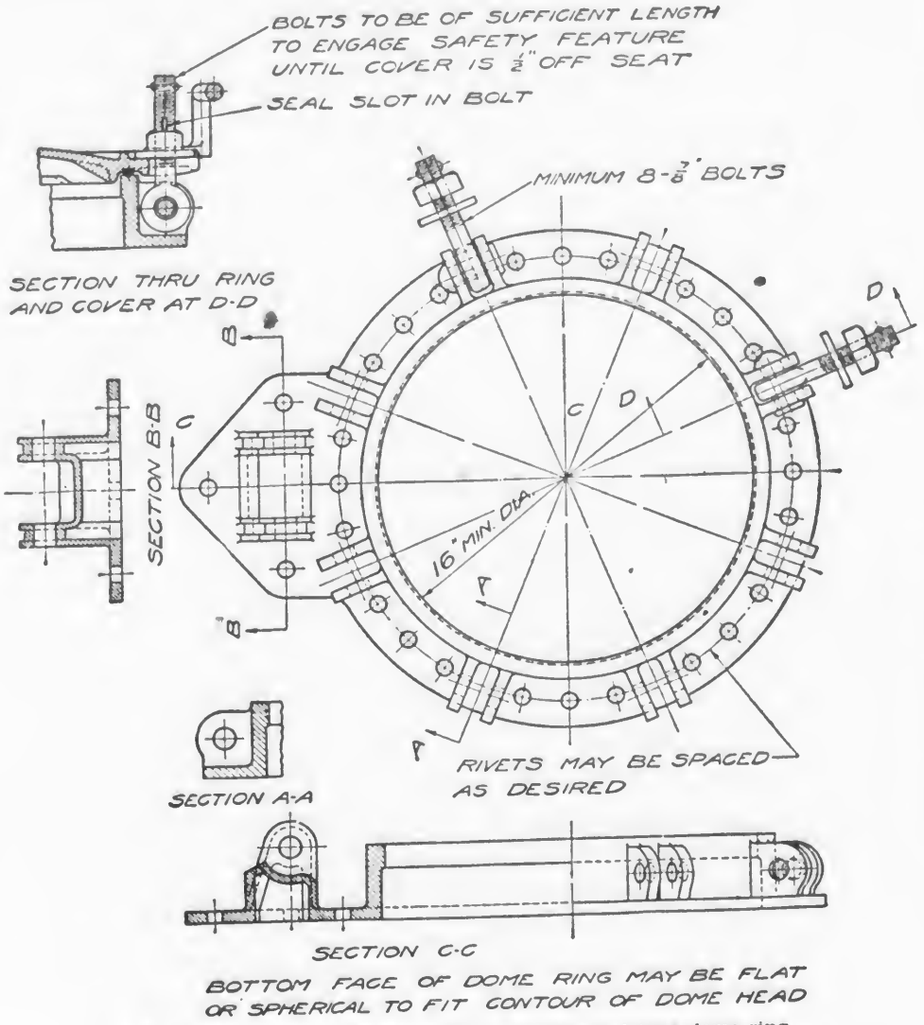


FIGURE 5—(Standard revised 1933)—Fundamental type dome ring.

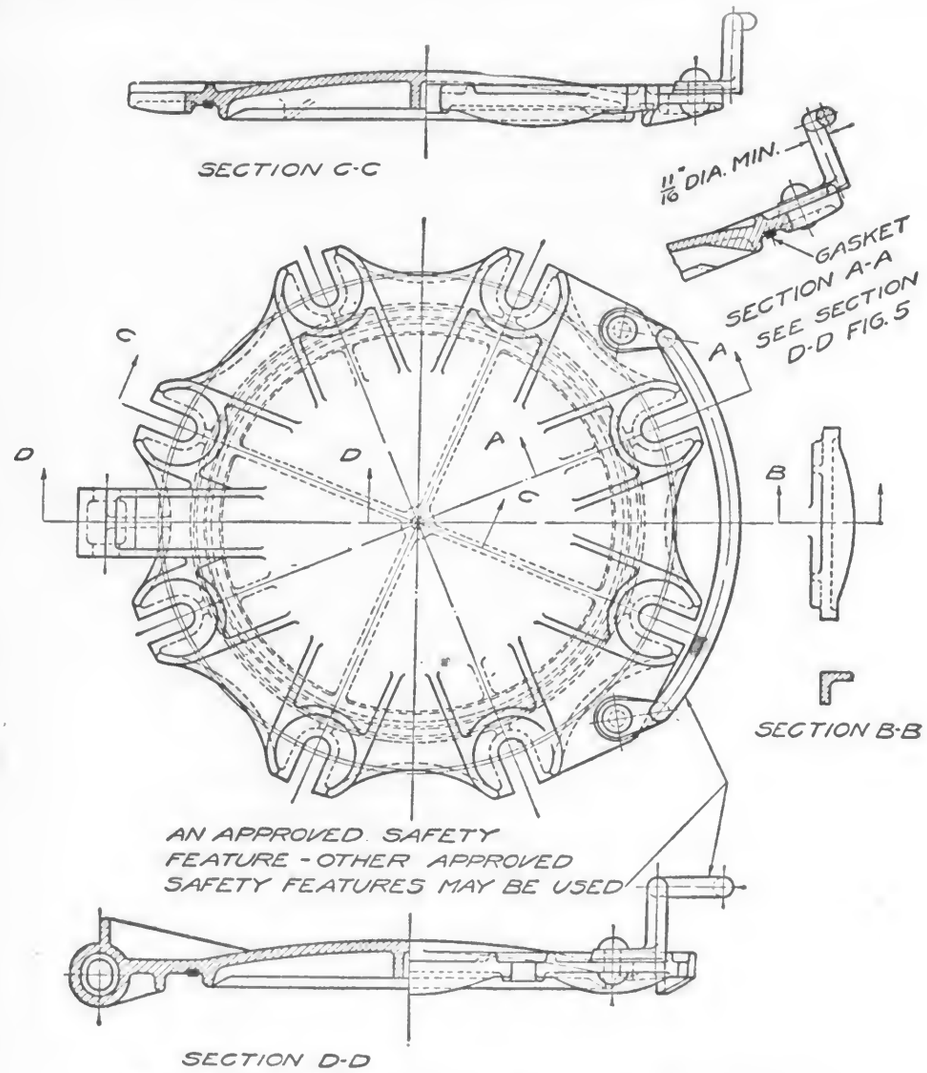
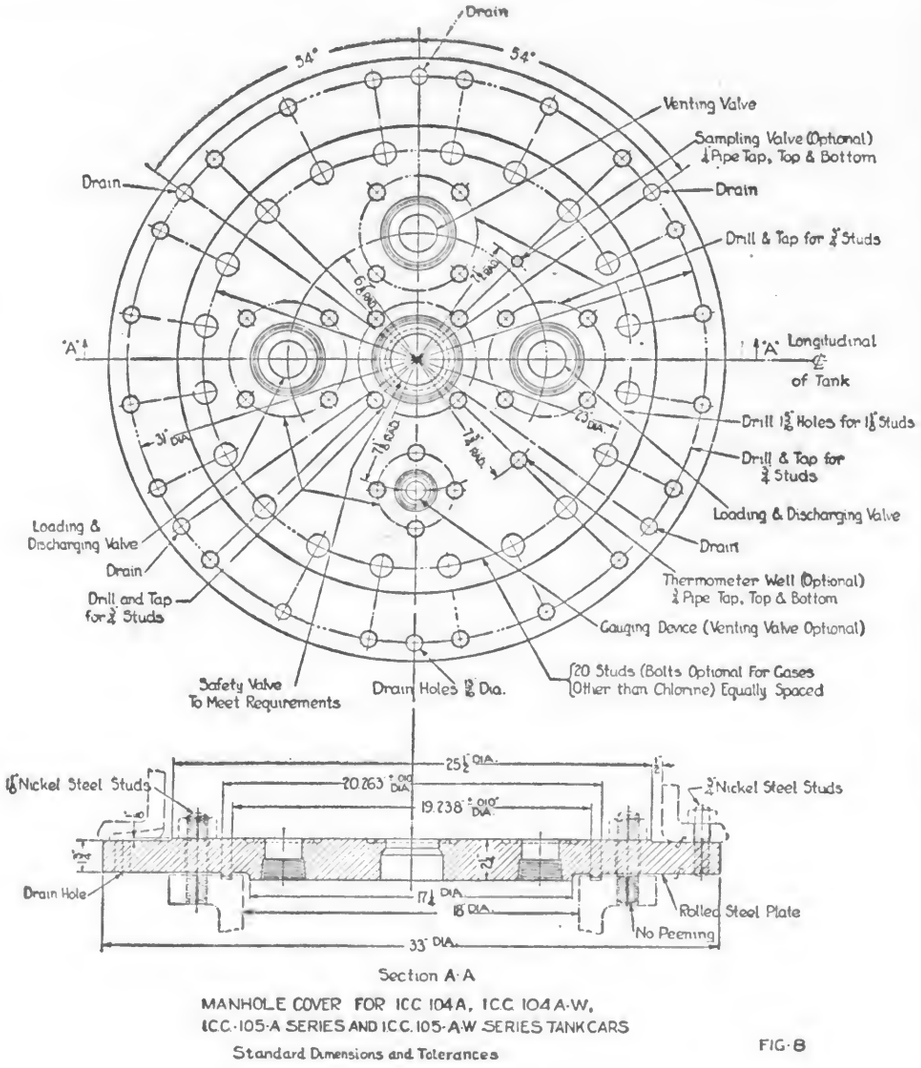


FIGURE 6—(Standard revised 1933)—Fundamental type dome cover.



MANHOLE COVER FOR ICC 104A, ICC 104A-W,
ICC-105-A SERIES AND ICC 105-A-W SERIES TANK CARS
Standard Dimensions and Tolerances

FIG. 8

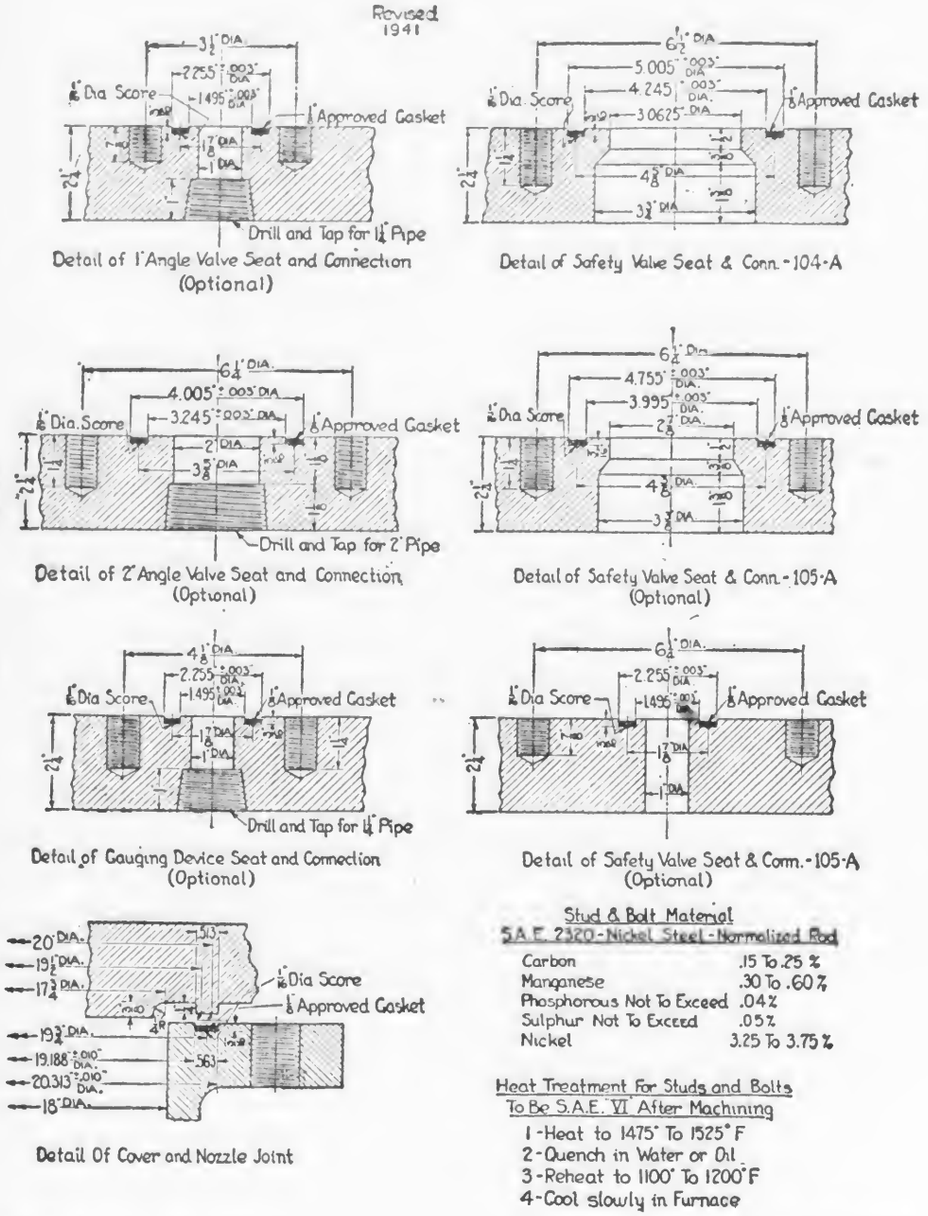


FIGURE 8 continued—(Standard dimensions and tolerances)—Manhole cover for ICC-104-A, ICC-104A-W, ICC-105-A series and ICC-105A-W series tank cars.

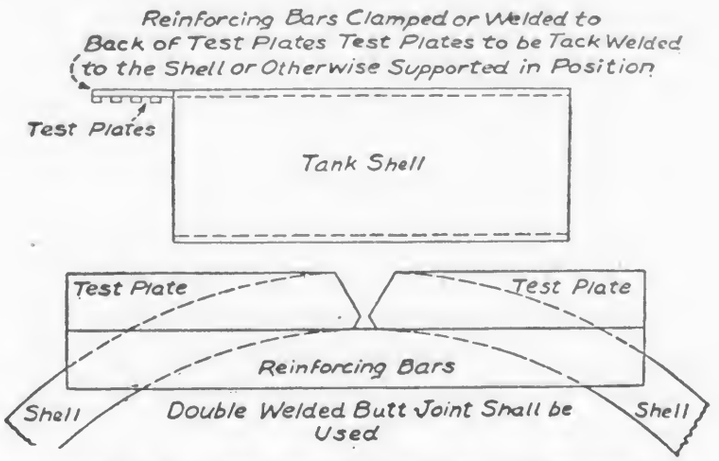


Fig 9 - METHOD OF FORMING LONGITUDINAL TEST PLATES

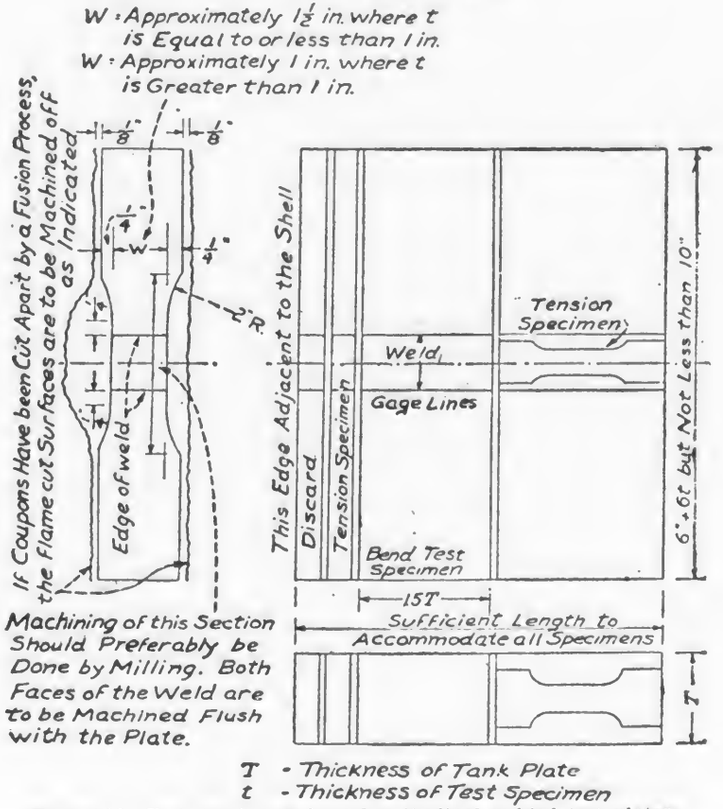


FIGURE 10—Test specimens from longitudinal welded test plates.

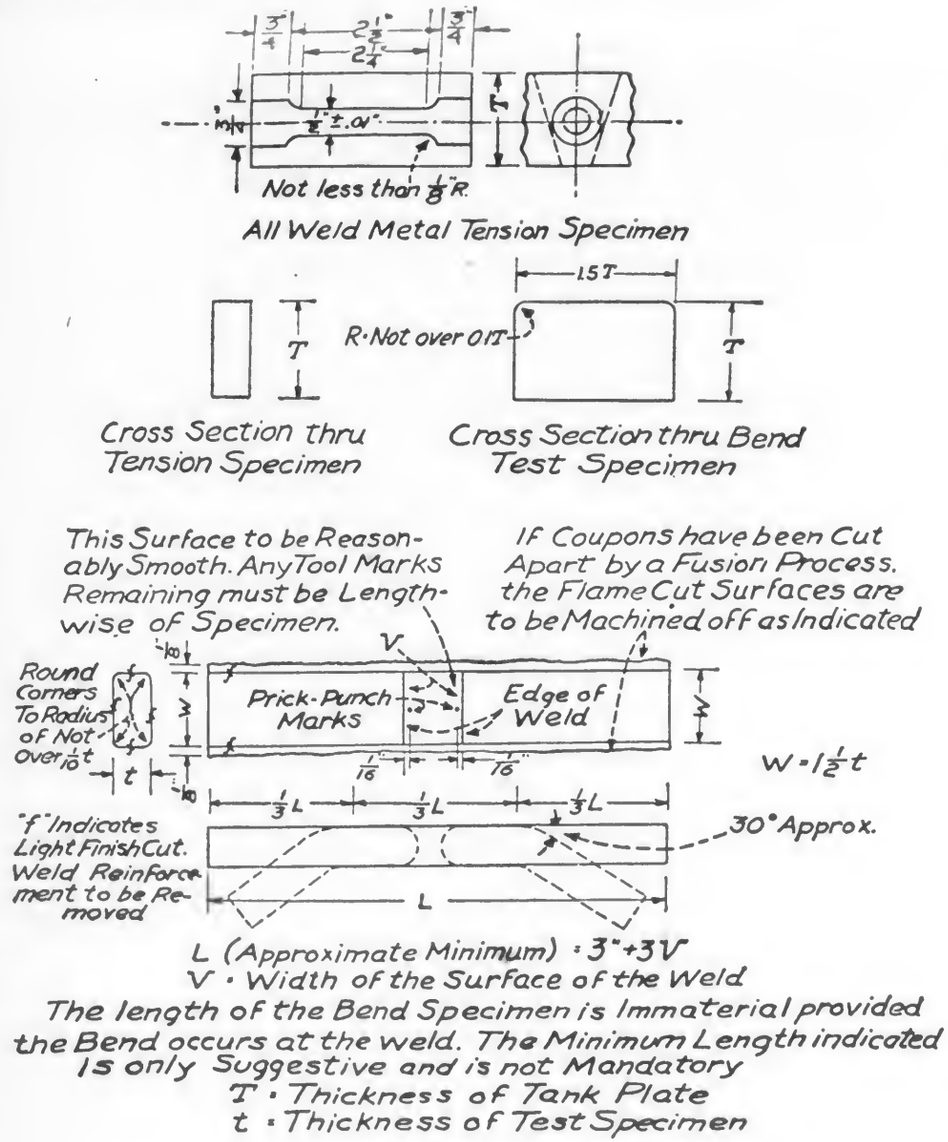
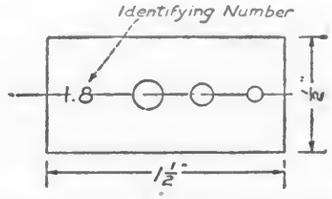
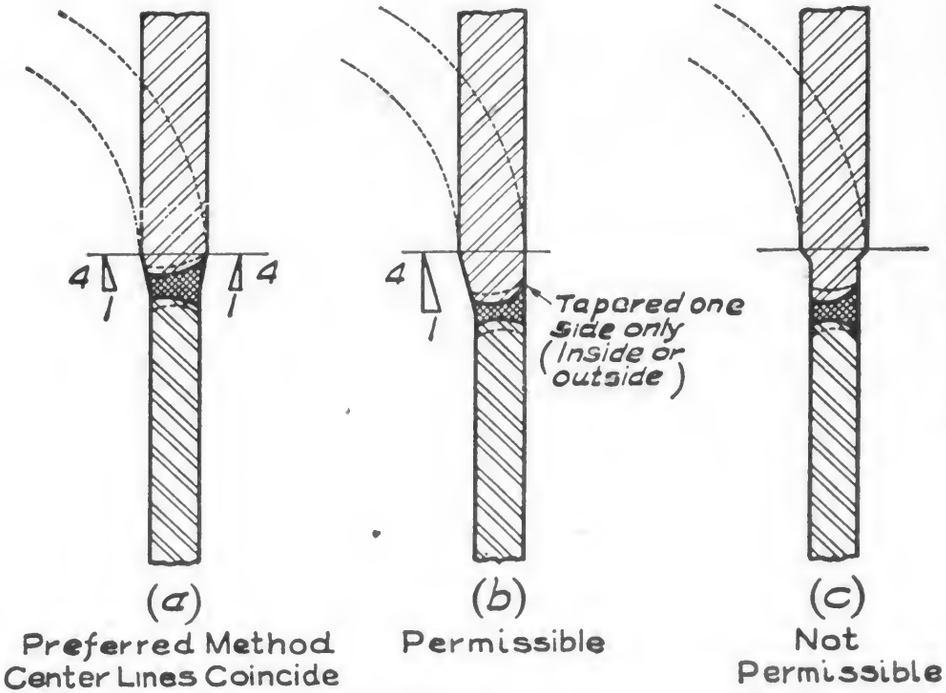


FIGURE 11—Details of test specimens.



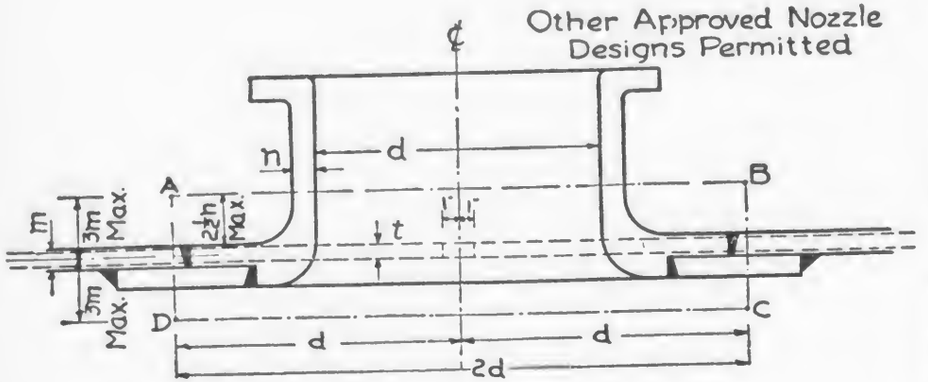
For plates 2½" thick or less. Diameters of holes 2, 3, and 4 times the thickness of Penetrameter but not less than 1/16".

FIGURE 12—Dimensions of penetrameter.



Removal of reinforcement optional (see text).

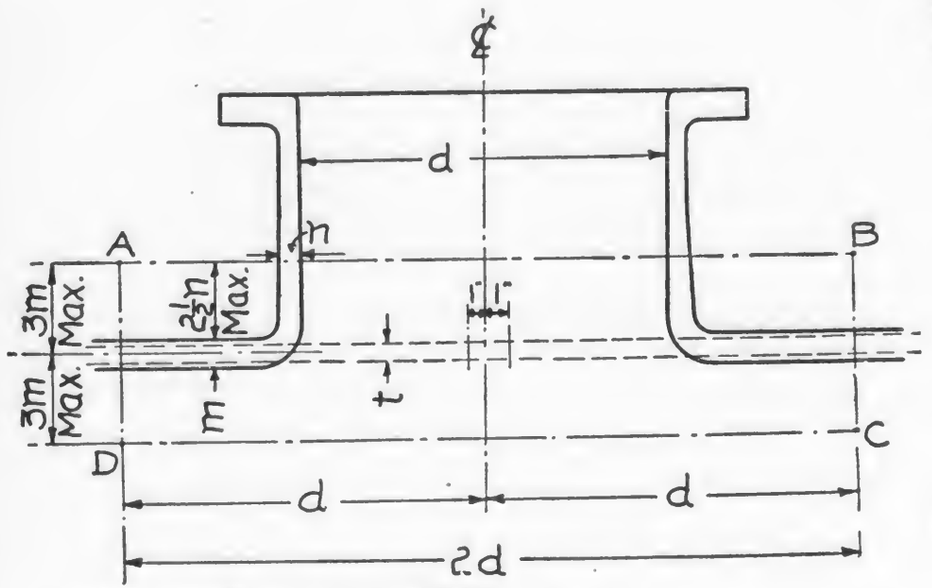
FIGURE 13—Butt welding of plates of unequal thickness.



t = Shell thickness required by specification.
m = Shell thickness around nozzle—actual.
Cross-section area available equals actual area in rectangle *ABCD* =
Cross-section area required equals $2t\ (d-1'')$ =

Excess area =

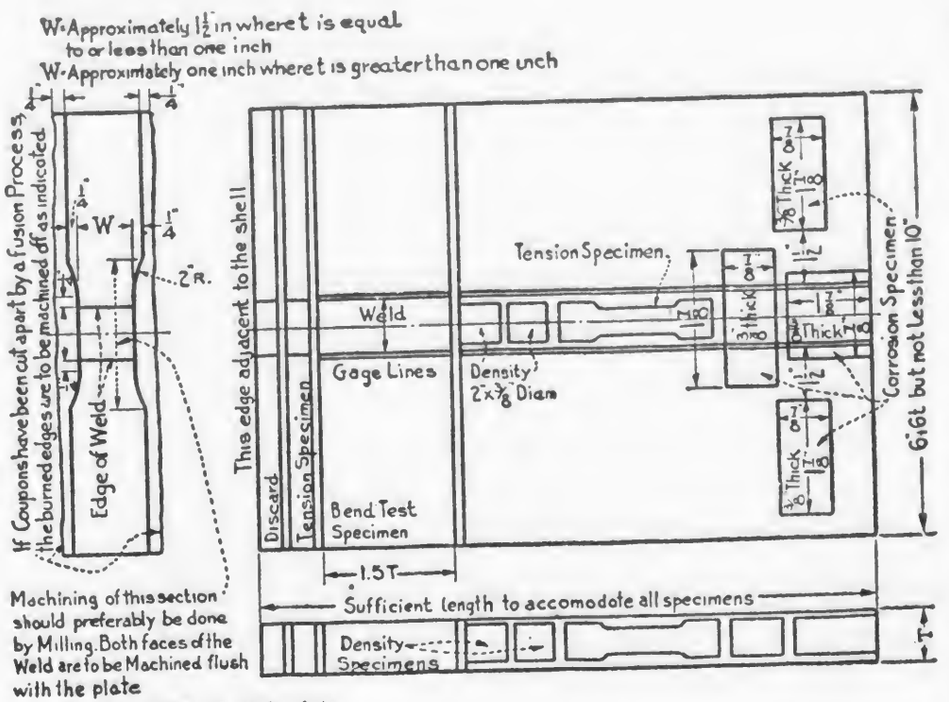
FIGURE 14—Nozzle reinforcement. I. C. C. 104A-W and 105A-W series tanks standard 1941.



t = Shell thickness required by specification.
m = Shell thickness from which nozzle is drawn—actual.
Cross-section area available equals actual area in rectangle *ABCD* =
Cross-section area required equals $2t\ (d-1'')$ =

Excess area =

FIGURE 15—Nozzle reinforcement. I. C. C. 105A series forge welded tanks standard 1941.



T = Thickness of tank plate.
t = Thickness of test specimen.

NOTE: Where T is less than ⅜" the density and corrosion specimens are to be of a diameter or thickness = T.

FIGURE 16—Test specimens from longitudinal welded test plates.

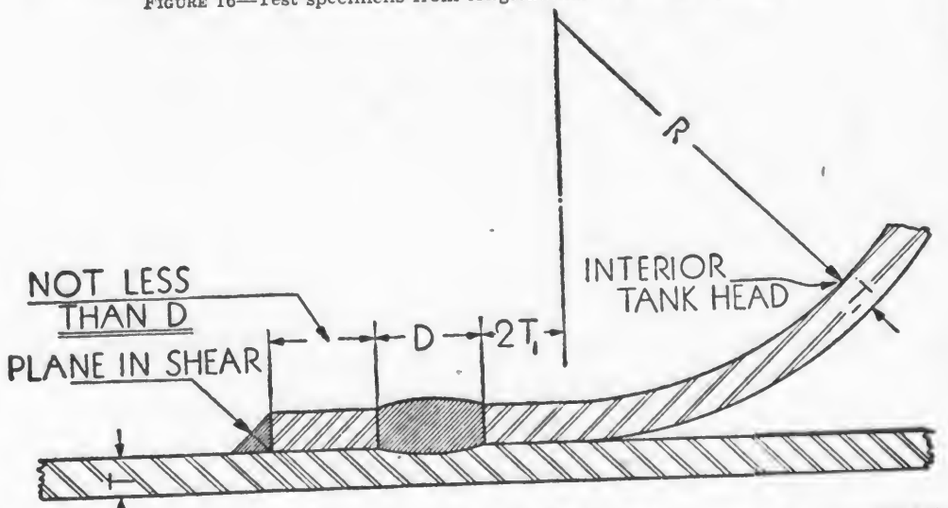


FIGURE 20—Single full-fillet lap joint with plug welds. Interior heads of compartment tank cars.

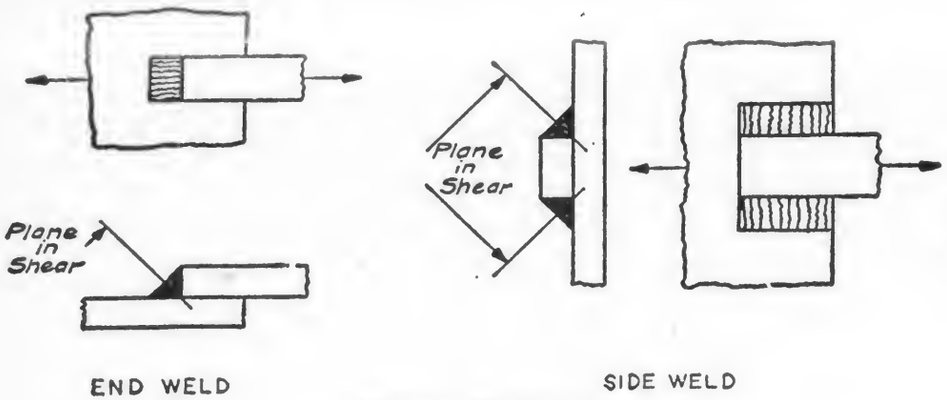


FIGURE 21—Fillet welds.

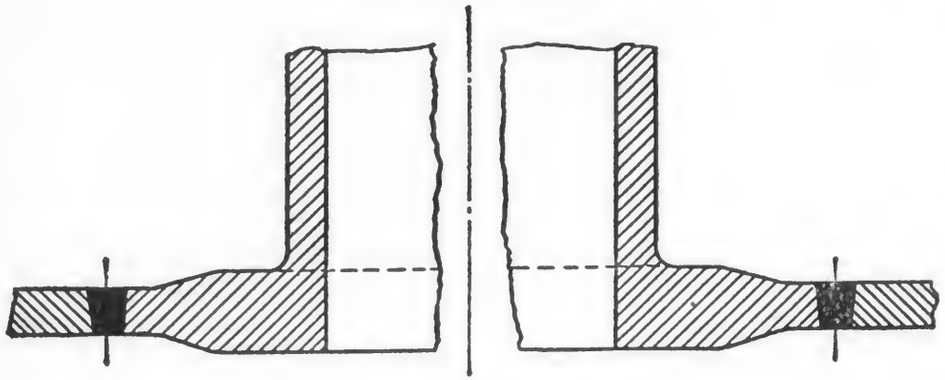
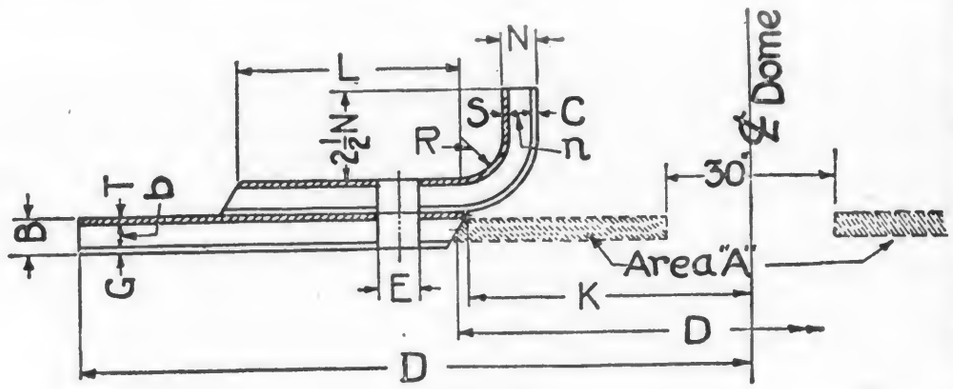


FIGURE 22—Inserted type nozzle or dome.



STANDARD 1941

	Dome	Shell
Specification thickness	n	b
Thickness added for corrosion	C	G
Thickness added for extra strength over spec	S	T

REINFORCEMENT

Added area for strength in dome shell $S[L-E+(2\frac{1}{2}N-R)]+.7854[(R+S)^2-R^2]$ =

Added area for strength in tank shell with no top seam $T[D-(K+E)]$ =

Or Added area for strength in tank shell with top seam $T[D-K]\times.70$ =

Area of reinforcement plate (when req'd.)

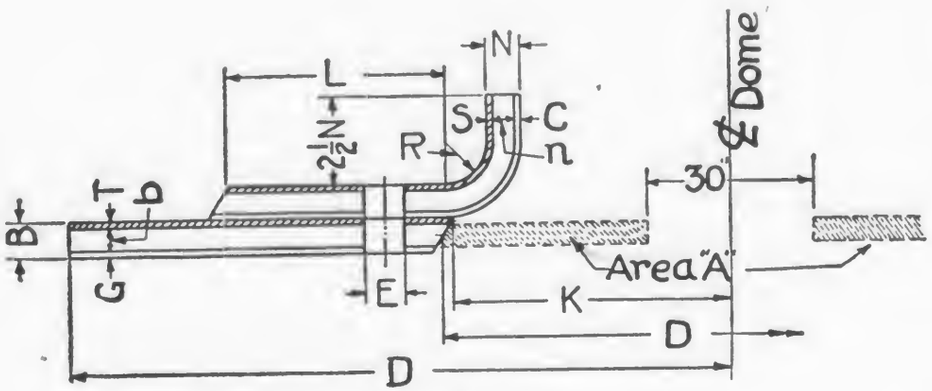
Thickness of plate × width of plate $-E$ =

Total = ×2 =

Additional area req'd. "A" $=(D-30)\times b\times.70$ =

Excess area =

FIGURE 23—Dome reinforcement formula ICC 103A, 103B and 103C tanks.



STANDARD 1941

	Dome	Shell
Specification thickness	n	b
Thickness added for corrosion	C	G
Thickness added for extra strength over spec	S	T

REINFORCEMENT

Added area for strength in dome shell $S[L+(2\frac{1}{2}N-R)]+.7854[(R+S)^2-R^2]$ =

Added area for strength in tank shell with no top seam $=T[D-\frac{1}{2}D]$ =

Or Added area for strength in tank shell with top seam $T[D-\frac{1}{2}D]\times.90$ =

{Area of reinforcement plate (when req'd.)
{Thickness of plate × width of plate = ____ ×2 =

Total =

Additional area req'd. "A" $=(D-30)\times b\times.90$ =

Excess area =

FIGURE 24—Dome reinforcement formula ICC 103A–W, 103B–W and 103C–W tanks.

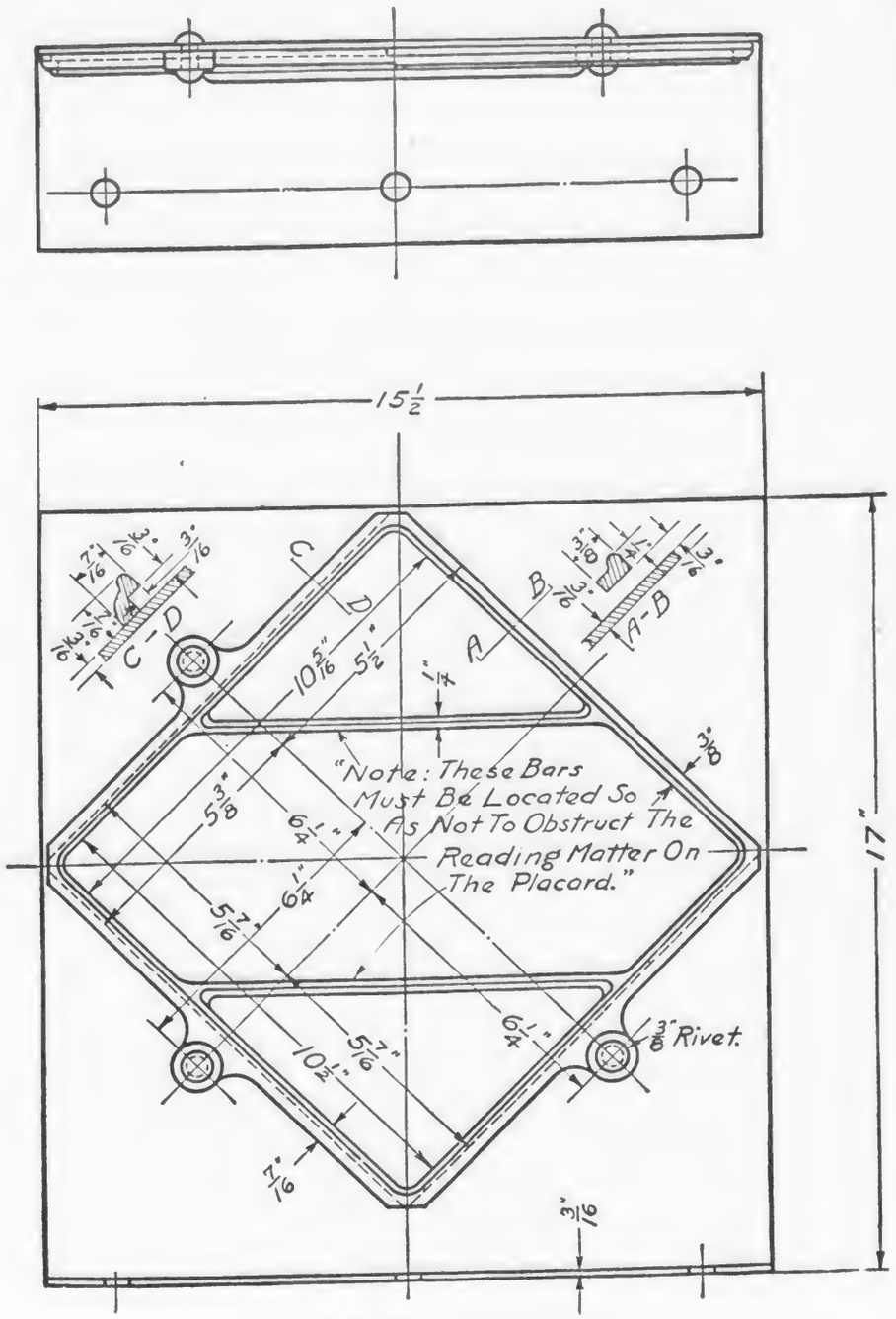


FIGURE 25—Metal holder for placard.

APPENDIX D—SPECIAL ORDERS

Order approved November 5, 1937, in No. 3666, authorizing trial transportation of gasoline in 30 tank cars of riveted aluminum alloy construction, amended by order February 1, 1939, authorizing trial transportation, in 20 additional tank cars, of ethyl acetate, acetone, methanol, and butyraldehyde. Pertinent sections of regulations amended accordingly. Authority noted in § 73.119 (a) (13) of this chapter covers tanks as follows:

SHIPPING CONTAINERS SPECIFICATION 103AL

Riveted Aluminum Alloy, Heat Treated, Tanks To Be Mounted On or To Form Part of a Car

1. *Type.* (a) Tanks built under this specification must be cylindrical, with heads dished convex outward, and must have at least one expansion dome with manhole, and such other external projections as are prescribed herein.

(b) *Lagging.* The tank shell and dome must be lagged with an approved insulation material having a thermal efficiency at least equal to 85 percent carbonate of magnesia 2 inches in thickness.

The entire insulation must be covered with a metal jacket, not less than $\frac{1}{8}$" in thickness, efficiently flashed around all openings so as to be weather-tight.

2. *Bursting pressure.* (a) The calculated bursting pressure, as determined by the following formula, must be at least 300 lbs. per square inch. Castings and attachments must be designed for the same bursting pressure.

(b) Formula for determining bursting pressure:

$$\frac{S \times 2t \times E}{d} = \text{Bursting pressure}$$

S = Ultimate tensile strength in lb. per sq. in.
t = Thickness in inches thinnest plate.
E = Seam efficiency.
d = Inside diameter in inches.

3. *Material.* (a) All plates for tank and expansion dome must be made of aluminum alloy, heat treated, in accordance with Federal Specification No. QQ-A-353, dated 6-6-33, condition "T".

(b) All rivets must be of aluminum alloy having a minimum shearing value when driven in the tank of 33,000 lbs. per sq. in. They must be heated in pyrometrically controlled furnace and be driven hot.

(c) Aluminum alloy castings must conform to proposed Federal specification for aluminum base alloy sand castings QQ-A-363 dated 2-13-37.

(d) Aluminum alloy forgings heat treated, must conform to Federal Specification QQ A-367 effective on the date hereof.

4. *Thickness and widths of plates.* (a) The minimum thickness of plates, including thickness of each plate at rivet seams, must be as follows:

Inside diameter of tanks	Bottom sheets	Shell sheets	Expansion dome sheets	Tank heads	Expansion dome heads
	Inch	*Inch*	*Inch*	*Inch*	*Inch*
Over 78 to 96 inches...	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{5}{16}$	$\frac{1}{2}$	$\frac{5}{16}$

The minimum width of bottom sheet of tank must be 60 inches, measured on the arc, but in all cases the width must be sufficient to bring the entire width of the longitudinal seam, including overlaps, above the cradle.

5. *Dishing of tank heads.* (a) Tank heads must be of approved contour.

6. *Riveting.* (a) For computing rivet areas the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by more than $\frac{1}{16}$ inch. Use of rivets less than $\frac{5}{8}$ inch nominal diameter not permissible on any part of tank or attachments. All rivets must be driven hot.

(b) All seams formed in the manufacture of the tank and expansion dome proper and the attachment of the expansion dome to the tank must be at least double riveted. Dome head, manhole ring, safety valve flange, and bottom outlet chamber flange must be single or double riveted. Riveted seams and joints must be made metal to metal without interposition of other material. The efficiency of multiple riveted seams must be at least 70 percent of the strength of the thinnest plate. The efficiency of single riveted seams must be at least 35 percent of the strength of the thinnest plate.

(c) The manner in which tank is supported on and securely attached to the car structure must be approved.

7. *Preparation for calking.* (a) The edges of plates at all riveted seams must be beveled so that the angle of the calking edges will be between 70 to 80 degrees with the flat surface of the plate. The extreme calking edge distance, measured from center line of rivet hole, must be at least one and one-half times the diameter of the hole and not more than that distance plus $\frac{1}{4}$ inch.

8. *Calking.* (a) All seams, including those formed by attachment of expansion dome and other external projections, must be calked both inside and outside, except that inside calking of the seam formed by attachment of expansion dome to tank is not required and outside calking of seams formed by attachment of all external projections, except the expansion dome is not required. Split calking and calk welding prohibited.

9. *Expansion dome.* (a) The expansion dome must have a capacity, measured from the inside top of shell of tank to the inside top of dome or bottom of any vent pipe projecting inside dome, of at least 2 percent of the total capacity of the tank and dome combined.

(b) The manhole in the dome head must be of sufficient diameter to permit access to the interior of the tank. The opening in tank shell within the dome must be at least 29 inches and not more than 30 inches in diameter.

(c) The dome head must be dished convex outward.

10. *Closures for manholes.* (a) All covers not hinged to tank must be attached to outside of the dome head by at least a $\frac{3}{8}$ inch steel chain or its equivalent.

(b) All joints between manhole covers and their seats must be made tight against vapor pressure, and to secure this a suitable gasket must be used. The manhole cover must be of approved type and design to make it practically impossible to remove the cover while the interior of the tank is subjected to pressure.

(c) Manhole rings and covers must be of cast, forged or pressed aluminum alloy.

11. *Gauging devices, venting and loading and discharge pipes extending through dome of tanks.* (a) Not specification requirements. When installed, these external projections, including their valves, must be protected from accidental injury by being set into a securely covered recess, or by means of cast or pressed steel, malleable iron or aluminum equivalent housing with a cover that can be securely closed. Openings in wall of housing must be equipped with screw plugs or other closures.

12. *Venting, loading, and discharge pipes.* (a) These pipes, when installed, must be closed by efficient valves of metal not subject to rapid deterioration by the lading. Provision must be made for closing the pipe connections of the valves.

13. *Bottom discharge outlets.* (a) The bottom discharge outlet, when applied, must be made of metal not subject to rapid deterioration by the lading, be of approved construction and be provided with a valve at its upper end and a liquid-tight closure at its lower end.

(b) The valve operating mechanism and outlet chamber construction must be such as to insure against unseating of valve due to stresses or shocks incident to tranportation.

14. *Safety valves.* (a) The tank must be equipped with one or more safety valves mounted on expansion dome. Total valve discharge capacity must be sufficient to prevent building up of pressure in the tank in excess of 45 pounds per square inch.

(b) One safety valve must be provided for each tank, or compartment thereof, of 6,650 gallons capacity or less, and two safety valves for each tank, or compartment thereof, of over 6,650 gallons capacity.

(c) Each safety valve must be set to open at a pressure of 25 pounds per square inch. (For tolerance see paragraph 18.)

15. *Fixtures, reinforcements, and other attachments not otherwise specified.* (a) All external attachments to tank must be riveted in place and calked to comply with conditions prescribed in paragraphs 6 and 8, or applied by other approve means of at least equal strength and efficiency.

16. *Plugs for openings.* (a) When plugs are used in the heads or other parts of tanks they must be solid, of aluminum alloy, with standard pipe thread and taper, and of a length which will screw at least 6 threads inside the face of fitting or tank.

17. *Test of tanks.* (a) Each tank must be tested, before being put into service and also at intervals as prescribed in paragraph 19, by completely filling tank and dome with water, or other liquid having similar viscosity, of a temperature which must not exceed 100 degrees F. during the test, and applying a pressure of 60 pounds per square inch. Tank must hold the prescribed pressure for at least 10 minutes without leakage or evidence of distress. All rivets and closures, except safety valves, must be in place while test is made.

18. *Tests of safety valves.* (a) Each valve must be tested, before being put into service and also at intervals as prescribed in paragraph 19, by attaching to an air line and applying pressure. The valve must not leak below 20 pounds pressure. (See § 73.31 (l) Note 1 of this chapter.) The valve must open at the pressure prescribed in paragraph 14 (c) with a tolerance of plus or minus 3 pounds.

19. *Retests of tanks and safety valves.* (a) Tanks and safety valves must be retested as prescribed for original tests in paragraphs 17 and 18, within 10 years after the original test, and thereafter at intervals of five years or less. Tanks must also be retested before being returned to service after any repairs requiring extensive riveting or calking. Reports must be rendered as prescribed in paragraph 21.

20. *Marking.* Each tank must be marked, thus certifying that the tank complies with all the requirements of this specification. These marks must be as follows:

(a) ICC-103-AL in letters and figures at least $\frac{3}{8}$ inch high stamped plainly and permanently into the metal near the center of one outside head of the tank. This mark must also be stenciled on the insulation jacket near the center of one outside head in letters and figures at least 2 inches high.

(b) Initials of manufacturer and date of original test of tank in letters and figures at least $\frac{3}{8}$ inch high, stamped plainly and permanently into the metal of the tank immediately below the stamped mark specified in paragraph 20 (a). These initials and date must also be stenciled on the insulation jacket immediately below the stenciled mark specified in paragraph 20 (a) in letters and figures at least 2 inches high.

(c) Date on which the tank was last tested, pressure to which tested, place where test was made, and by whom, stenciled on the insulation jacket.

(d) Date on which the safety valves were last tested, pressure to which tested, place where test was made and by whom, stenciled on the insulation jacket.

21. *Reports.* (a) Before a tank car is placed in service, the party assembling the completed car must furnish to car owner, Bureau of Explosives, and the Secretary, Mechanical Division, Association of American Railroads, a report in approved form certifying that the tank and its equipment comply with all the requirements of this specification. In case of alterations of the tank or equipment therefor from original design, a similar report must be rendered to the same parties. For the periodic retests of tank and safety valves, other than above mentioned, reports must be rendered to the Bureau of Explosives and to car owner. In addition to the foregoing, owners or operators of cars where construction is authorized herein shall make semi-annual inspections of the tanks and report their condition to the above parties.

A. A. R. REQUIREMENTS

[Appendix to order November 5, 1937]

AAR-5. *Dishing of tank heads.* (a) Tank heads must be dished for pressure on concave side and to main inside radius not exceeding 10 feet. The inside knuckle radius must be not less than 3¾ inches.

AAR-6. *Anchorage.* (a) The minimum shearing and bearing values of rivets connecting longitudinal anchor plates to tank and underframe shall be as follows:

Connection of single piece anchor plates to tank: (A single piece anchor is one having one longitudinal anchor plate on each side of the center sill construction.)

Shearing area of aluminum rivets, not less than 40 square inches.

Bearing area of aluminum rivets, not less than 24 square inches.

Connection of single piece anchor plates to underframe:

Shearing area of steel rivets, not less than 15 square inches.

Bearing area of steel rivets, not less than 12 square inches.

The shearing and bearing values of rivets securing anchor plates to underframe shall not exceed 70 percent of the shearing and bearing values, respectively, of those used for connection of anchor plates to tank. The maximum diameter of a driven aluminum rivet in the anchor must not exceed its nominal diameter plus 1/32 inch. Head block anchorage prohibited.

(b) *Tank bands.* Each tank shall have at least two bands, one at each bolster or other approved means of equal strength and security. If more than the prescribed two bands are used, their location is optional.

All tank bands shall be in direct contact with outside of main shell.

The cross sectional area of the tank band shall at no place be less than the equivalent of one square inch of steel. A threaded end 1⅜ inch or more in diameter, with body consisting of a flat band 2 inch by ½ inch, or equivalent section, or round 1⅛ inch in diameter, will be accepted as meeting this requirement.

(c) *Bolster slabbing.* Contact bearing area shall be not less than 15 square feet.

Not less than 50 percent of the above prescribed minimum of number of square feet of bolster slabbing bearing area shall be outside the zone of center sill construction.

AAR-10. *Closures for manholes.* (a) Approved bolted type or bolted and hinged type, see Figures 5 and 6, AAR specifications, or other approved type must be used.

AAR-13. *Bottom discharge outlets.* (a) To provide for the attachment of standard unloading connections, the bottom of the main portion of the outlet valve chamber or some fixed attachment thereto, must have external U. S. F. threads four threads to the inch. The liquid-tight closure at its lower end must have corresponding female threads machined to give proper clearance.

(b) For outlet chambers that project 6 inches or more from shell of tank a V groove must be cut (not cast) in the upper part of the outlet valve chamber at a point immediately below lowest part of valve to a depth that will leave thickness of chamber wall at the root of the V not over ⅜ inch. Where outlet chamber is not a single piece, arrangement must be made to provide the equivalent of the breakage groove.

(c) The flange on the outlet chamber must be of a thickness which will prevent distortion of the valve seat or valve by any change in contour of the shell resulting from expansion of lading, or other causes, and which will insure that accidental breakage of the outlet chamber will occur at or below the ⅜ groove.

(d) The valve must have no wings or stem projecting below the V groove in the outlet casting, unless they are scored or designed to break or bend without unseating valve. The valve and seat must be readily accessible or removable for repairs, including grinding.

(e) The valve operating mechanism must have means for compensating for variation in the vertical diameter of the tank produced by expansion, weight of the liquid contents, or other causes, and should operate from the interior of the tank.

(f) In no case must extreme projection of bottom discharge outlet equipment extend to within 12" above top of rail. All bottom discharge outlet reducers and closures and their attachments must be secured to car by at least ⅜" steel chain or its equivalent except that outlet closure plugs may be attached by ¼" chain. When the bottom discharge outlet closure is of the combination cap and valve type, the pipe connection to the valve must be closed by a plug or cap.

AAR-14. *Safety valves.* (a) Safety valves must be of approved design. See Figure 2, AAR specifications.

AAR-20. *Marking.* (a) For all other markings see Figure 1, AAR specifications.

AAR-21. *Certificate of construction.* (a) For form of certificate of construction see § 78.259 (g).

AAR-22. *Car structure.* (a) For car structure see § 78.263.

Order approved February 1, 1939, in No. 3666, amending order November 5, 1937, and authorizing trial transportation of ethyl acetate, acetone, methanol, and butyraldehyde, in 20 additional riveted aluminum tank cars, specification 103-AL. Pertinent sections of regulations amended accordingly. Authority noted in § 73.119 (a) (13) of this chapter.

Order approved November 14, 1939, in No. 3666, authorizing trial transportation of 95 percent nitric acid in 4 riveted aluminum alloy tank cars, specification 103C-AL, amended by order Aug. 19, 1941, authorizing trial transportation of same commodity in 5 additional tank cars. Pertinent sections of regulations amended accordingly. Authority noted in § 73.268 (b) (2) of this chapter covers tanks as follows:

SHIPPING CONTAINERS SPECIFICATION 103C-AL

Riveted Aluminum Alloy, Heat Treated, Tanks To Be Mounted on or To Form Part of a Car

1. *Type.* (a) Tanks built under this specification must be cylindrical, with heads dished convex outward, and must have at least one expansion dome with manhole, and such other external projections as are prescribed herein.

(b) *Lagging.* Not a specification requirement. The tank shell and dome must be covered by a steel jacket not less than ¼" thickness, extending upward from running boards and spacer 2" from tank shell thus providing tank shell the protection against external damage.

2. *Bursting pressure.* (a) The calculated bursting pressure, as determined by the following formula, must be at least 300 lbs. per square inch. Castings and attachments must be designed for the same bursting pressure.

(b) Formula for determining bursting pressure:

$$\frac{S \times 2t \times E}{d} = \text{bursting pressure}$$

S = Ultimate tensile strength in lbs. per sq. in.
t = Thickness in inches thinnest plate.
E = Seam efficiency.
d = Inside diameter in inches.

3. *Material.* (a) All plates for tank and expansion dome must be made of aluminum alloy, heat treated, in accordance with Aluminum Co. of America's requirements for 61-ST alloy, having a minimum yield of 35,000 lbs. and a minimum tensile strength of 42,000 lbs. per sq. in.

(b) All rivets must be of aluminum alloy having a minimum shearing value when driven in the tank of 20,000 lbs. per sq. in. They must be heated in pyrometrically controlled furnace and be driven hot.

(c) Aluminum alloy castings must conform to Federal specification for aluminum-base-alloys; sand castings QQ-A-601, dated June 8, 1938, Table I, Class No. 3, heat treatment No. 2, Table III, being Aluminum Co. of America's alloy 356-T6.

(d) Aluminum alloy forgings heat treated, must conform to Aluminum Co. of America's requirements for 61-ST alloy.

4. *Thickness and widths of plates.* (a) The minimum thickness of plates, including thickness of each plate at rivet seams, must be as follows:

Inside diameter of tanks	Bottom sheets	Shell sheets	Expansion dome sheets	Tank heads	Expansion dome heads
	Inch	*Inch*	*Inch*	*Inch*	*Inch*
78 inches	5/16	5/16	5/16	5/16	Cast aluminum alloy 356-T6.

The minimum width of bottom sheet of tank must be 60 inches, measured on the arc, but in all cases the width must be sufficient to bring the entire width of the longitudinal seam, including overlaps, above the cradle.

5. *Dishing of tank heads.* (a) Tank heads must be of approved contour.

6. *Riveting.* (a) For computing rivet areas, the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by more than 1/16 inch. Use of rivets less than ⅝ inch nominal diameter not permissible on any part of tank or attachments. All rivets must be driven hot.

(b) All seams formed in the manufacture of the tank and expansion dome proper and the attachment of the expansion dome to the tank must be at least double riveted. Dome head, manhole ring and sump must be single or double riveted. Riveted seams and joints must be made metal to metal without interposition of other material. The efficiency of multiple riveted seams must be at least 70 percent of the strength of the thinnest plate. The efficiency of single riveted seams must be at least 35 percent of the strength of the thinnest plate.

(c) The manner in which tank is supported on and securely attached to the car structure must be approved.

7. *Preparation for calking.* (a) The edges of plates at all riveted seams must be beveled so that the angle of the calking edges will be between 70 to 80 degrees with the flat surface of the plate. The extreme calking edge distance, measured from the center line of rivet hole, must be at least one and one-half times the diameter of the hole and not more than that distance plus ¼ inch.

8. *Calking.* (a) All seams, including those formed by attachment of expansion dome and

other external projections, must be calked both inside and outside, except that inside calking of the seam formed by attachment of expansion dome to tank is not required when the opening in the tank shell is not cut out to the full diameter of the dome. All rivet heads on inside of tank must be calked. Split calking prohibited.

9. *Expansion dome.* (a) The expansion dome must have a capacity, measured from the inside top of shell of tank to the inside top of dome or bottom of any vent pipe projecting inside dome, of at least 1 percent of the total capacity of the tank and dome combined, and must not exceed 36 inches inside diameter.

(b) The opening in manhole ring must be at least 18 inches in diameter. The opening in the tank shell within the dome must be at least 29 inches in diameter, and when the inside diameter of the dome exceeds 29 inches, the opening in the tank shell may be cut out to a diameter sufficiently greater than that of the dome to permit calking of tank shell to the base of the dome. When the inside diameter of the dome exceeds 30 inches and the shell of tank is cut out as provided to permit calking, the tank shell at this point must be adequately reinforced.

(c) A dome head and manhole ring in one piece may be used instead of a dished plate dome head.

(d) The dome head must be dished convex outward.

10. *Closures for manholes.* (a) The manhole cover must be of approved type and designed to provide a secure closure of the manhole.

(b) Manhole rings and covers must be made of the metal prescribed by paragraph 3.

(c) Manhole ring and cover must be of cast, rolled, forged, or pressed aluminum alloy.

(d) All joints between manhole covers and their seats must be made tight against leakage of vapor and liquid by use of gaskets of suitable material.

11. *Gauging, venting, loading and discharging, and air inlet devices extending through dome of tanks.* (a) These devices when installed must be tightly closed as prescribed in paragraph 12 and be of approved design. Protective housing of approved design covering all these devices must be installed.

12. *Gauging, venting, loading and discharging, and air inlet devices.* (a) These devices when installed must be tightly closed with approved caps, plugs, valves or other suitable fittings. Provision must be made for closing pipe connections of valves.

13. *Bottom discharge outlets.* (a) Bottom discharge outlet is prohibited, but tank may be equipped with a sump.

14. *Safety valves.* (a) The tank must be equipped with a safety valve at least 2 inches inside diameter mounted on top of expansion dome.

(b) One safety valve must be provided for each tank.

(c) The safety valve must be set to open at a pressure of 60 pounds per square inch. (For tolerances see paragraph 18.)

15. *Fixtures, reinforcements and attachments not otherwise specified.* (a) All attachments to tank and dome must be riveted in place and calked to comply with conditions prescribed in paragraphs 6 and 8.

16. *Plugs for openings.* (a) All plugs must be solid, made of materials prescribed in paragraph 3, with standard pipe thread and taper, and when in contact with lading must be of a length which will screw at least six threads inside the face of fitting or tank. Plugs when inserted from the outside of tank heads must have the letter "S" at least $\frac{3}{8}$ inch in size stamped with steel stamp or cast on the outside surface to indicate the plug is solid. Plugs when inserted from the inside are identified by appearance of the plug on the outside of the tank as being solid—therefore, no mark required.

17. *Test of tanks.* (a) Each tank must be tested, before being put into service and also at intervals as prescribed in paragraph 19, by completely filling tank and dome with water, or other liquid having similar viscosity, of a temperature which must not exceed 100 degrees F. during the test, and applying a pressure of 60 pounds per square inch. Tank must hold the prescribed pressure for at least 10 minutes without leakage or evidence of distress. All rivets and closures, except safety valves, must be in place while test is made.

18. *Tests of safety valves.* (a) Valves must be tested before being put into service by attaching to an air line and applying pressure. The valve must open at the pressure prescribed in paragraph 14 (c), with a tolerance of plus or minus 3 pounds.

19. *Retests of tanks and safety valves.* (a) Tanks and safety valves must be retested as prescribed for original tests in paragraphs 17 and 18, except that an acid may be used for filling tank and dome when testing tanks which have not been in service more than 12 years. The first retest must be conducted within four years after the original test, and subsequent retests at four-year intervals up to 12 years of service, thereafter at two year intervals up to 20 years of service, and annually after 20 years of service. Tanks in service over 12 years must be internally inspected for defects which would make leakage or failure probable during transit and must be tested with water only. Tanks must also be retested before being returned to service after extensive riveting, calking or other repairs. Reports must be rendered as prescribed in paragraph 21.

20. *Marking.* Each tank must be marked, thus certifying that the tank complies with all the requirements of this specification. These marks must be as follows:

(a) ICC–103C–AL in letters and figures at least $\frac{3}{8}$ inch high, stamped plainly and permanently into the metal near the center of one outside head of the tank. This mark must also be stenciled on the jacket, in letters and figures at least 2 inches high.

(b) Initials of manufacturer and date of original test of tank in letters and figures at least $\frac{3}{8}$ inch high, stamped plainly and permanently into the metal of the tank immediately below the stamped mark specified in paragraph 20 (a). These initials and date must also be stenciled on the jacket, in letters and figures at least 2 inches high.

(c) Date on which the tank was last tested, pressure to which tested, place where test was made, and by whom, stenciled on the jacket.

(d) Date on which the safety valve was last tested, pressure to which tested, place where test was made, and by whom, stenciled on the jacket.

(e) When a tank car and its appurtenances are designed and authorized for the transportation of a particular commodity only, the name of that commodity followed by the word "only," or such other wording as may be required to indicate the limits of usage of the car, must be stenciled on each side of the tank, in letters at least 2 inches high, immediately above the stenciled mark specified in paragraph 20 (a).

21. *Reports.* (a) Before a tank car is placed in service, the party assembling the completed car must furnish to car owner, Bureau of Explosives, and the Secretary, Mechanical Division, Association of American Railroads, a report in approved form certifying that the tank and its equipment comply with all the requirements of this specification. In case of alterations of the tank or equipment therefor from original design, a similar report must be rendered to the same parties. For the periodic retests of tank and safety valves, other than above mentioned, reports must be rendered to the Bureau of Explosives and to car owner. In addition to the foregoing, owners or operators of cars where construction is authorized herein shall make semi-annual inspection of the tanks and report their condition to the above parties.

A. A. R. REQUIREMENTS

[Appendix to order November 14, 1939]

AAR–5. *Dishing of tank heads.* (a) Tank heads must be dished for pressure on concave side and to main inside radius not exceeding 10 feet. The inside knuckle radius must be not less than $3\frac{3}{4}$ inches.

AAR–6. *Anchorage.* (a) The minimum shearing and bearing values of rivets connecting longitudinal anchor plates to tank and underframe shall be as follows:

Connection of singie piece anchor plates to tank: (A single piece anchor is one having longitudinal anchor plate on each side of the center sill construction.)

Shearing area of aluminum rivets, based on 20,000 minimum shear value, not less than 66 square inches.

Bearing area of aluminum rivets, based on 54,000 minimum bearing value, not less than 43 square inches.

Connection of a singie piece anchor plate to underfr me.

Shearing area of steel rivets, not less than 15 square inches.

Bearing area of steel rivets, using alumimum anchorage plate with minimum bearing value of 54,000, not less than 22 square inches.

The shearing and bearing values of rivets securing anchor plates to underframe shall not exceed 70 percent of the shearing and bearing values, respectively, of those used for connection of anchor plates to tank. The maximum diameter of a driven aluminum rivet in the anchor must not exceed its nominal diameter plus $\frac{1}{32}$ inch. Head block anchorage prohibited.

(b) *Tank bands.* Each tank shall have at least two bands, one at each bolster, or other approved means of equal strength and security. If more than the prescribed two bands are used, their location is optional.

All tank bands shall be in direct contact with outside of main shell.

The cross sectional area of the tank band shall at no place be less than the equivalent of one square inch of steel. A threaded end $1\frac{3}{8}$ inch or more in diameter, with body consisting of a flat band 2 inch by $\frac{1}{2}$ inch, or equivalent section, or round $1\frac{1}{8}$ inch in diameter, will be accepted as meeting this requirement.

(c) *Bolster slabbing.* Contact bearing area shall be not less than 20 square feet.

Not less than 50 percent of the above prescribed minimum of number of square feet of bolster slabbing bearing area shall be outside the zone of center sill construction.

AAR–14. *Safety valves.* (a) Safety valve must be of approved design.

AAR–20. *Marking.* (a) For all other markings see Fig. 1, AAR Specifications.

AAR–21. *Certificate of construction.* (a) For form of certificate of construction see § 78.259 (g).

AAR–22. *Car structure.* (a) For car structure see § 78.263.

Order approved June 7, 1940, in No. 3666, authorizing trial transportation of 95 percent nitric acid in one riveted aluminum alloy tank car, specification 103C–AL. Pertinent sections of regulations amended accordingly. Authority noted in § 73.268 (b) (2) of this chapter covers tanks as follows:

SHIPPING CONTAINER SPECIFICATION 103C–AL

Riveted Aluminum Alloy, Heat Treated, Tanks To Be Mounted on or To Form Part of a Car.

1. *Type.* (a) Tanks built under this specification must be cylindrical, with heads dished convex outward, and must have at least one expansion dome with manhole, and such other external projections as are prescribed herein.

(b) *Lagging.* Not a specification requirement. The tank shell and dome must be covered by a steel jacket not less than ¼-inch thickness, extending upward from running boards and spaced 2 inches from tank shell thus providing tank shell and protection against external damage.

2. *Bursting pressure.* (a) The calculated bursting pressure, as determined by the following formula, must be at least 300 lbs. per square inch. Castings and attachments must be designed for the same bursting pressure.

(b) Formula for determining bursting pressure:

$$\frac{S \times 2t \times E}{d} = \text{bursting pressure}$$

S = Ultimate tensile strength in lbs. per sq. in.
t = Thickness in inches thinnest plate.
E = Seam efficiency.
d = Inside diameter in inches.

3. *Material.* (a) All plates for tank and expansion dome must be made of aluminum alloy, heat treated, in accordance with Aluminum Co. of America's requirements for 61–ST alloy, having a minimum yield of 35,000 lbs. and a minimum tensile of 42,000 lbs. per sq. in.

(b) All rivets must be of aluminum alloy having a minimum shearing value when driven in the tank of 20,000 lbs. per sq. in. They must be heated in pyrometrically controlled furnace and be driven hot.

(c) Aluminum alloy castings must conform to Federal specification for aluminum-base alloys; sand castings QQ–A–601, dated June 8, 1938, Table I, Class No. 3, heat treatment No. 2, Table III, being Aluminum Co. of America's alloy 356–T6.

(d) Aluminum alloy forgings heat treated, must conform to Aluminum Co. of America's requirements for 61–ST alloy.

4. *Thickness and widths of plates.* (a) The minimum thickness of plates, including thickness of each plate at rivet seams, must be as follows:

Inside diameter of tanks	Bottom sheets	Shell sheets	Expansion dome sheets	Tank heads	Expansion dome heads
	Inch	*Inch*	*Inch*	*Inch*	*Inch*
78 inches	5/16	5/8	5/8	5/8	Cast aluminum alloy 356–T6.

The minimum width of bottom sheet of tank must be 60 inches, measured on the arc, but in all cases the width must be sufficient to bring the entire width of the longitudinal seam, including overlaps, above the cradle.

5. *Dishing of tank heads.* (a) Tank heads must be of approved contour.

6. *Riveting.* (a) For computing rivet areas, the effective diameter of a driven rivet is the diameter of its reamed hole, which hole must in no case exceed nominal diameter of rivet by more than 1/16 inch. Use of rivets less than 5/8 inch nominal diameter not permissible on any part of tank or attachments. All rivets must be driven hot.

(b) All seams formed in the manufacture of the tank and expansion dome proper and the attachment of the expansion dome to the tank must be at least double riveted. Dome head, manhole ring and sump must be single or double riveted. Riveted seams and joints must be made metal to metal without interposition of other material. The efficiency of multiple riveted seams must be at least 70 percent of the strength of the thinnest plate. The efficiency of single riveted seams must be at least 35 percent of the strength of the thinnest plate.

(c) The manner in which tank is supported on and securely attached to the car structure must be approved.

7. *Preparation for calking.* (a) The edges of plates at all riveted seams must be beveled so that the angle of the calking edges will be between 70 to 80 degrees with the flat surface of the plate. The extreme calking edge distance, measured from center line of rivet hole, must be at least one and one-half times the diameter of the hole and not more than that distance plus ¼ inch.

8. *Calking.* (a) All seams, including those formed by attachment of expansion dome and other external projections, must be calked both inside and outside, except that inside calking of the seam formed by attachment of expansion dome to tank is not required when the opening in the tank shell is not cut out to the full diameter of the dome. All rivet heads on inside of tank must be calked. Split calking prohibited.

9. *Expansion dome.* (a) The expansion dome must have a capacity, measured from the inside top of shell of tank to the inside top of dome or bottom of any vent pipe projecting inside dome, of at least 1 percent of the total capacity of the tank and dome combined, and must not exceed 36 inches inside diameter.

(b) The opening in manhole ring must be at least 18 inches in diameter. The opening in the tank shell within the dome must be at least 29 inches in diameter, and when the inside diameter of the dome exceeds 29 inches, the opening in the tank shell may be cut out to a diameter sufficiently greater than that of the dome to permit calking of tank shell to the base of the dome. When the inside diameter of the dome exceeds 30 inches and the shell of tank is cut out as provided to permit calking, the tank shell at this point must be adequately reinforced.

(c) A dome head and manhole ring in one piece may be used instead of a dished plate dome head.

(d) The dome head must be dished convex outward.

10. *Closures for manholes.* (a) The manhole cover must be of approved type and designed to provide a secure closure of the manhole.

(b) Manhole rings and covers must be made of the metal prescribed by paragraph 3.

(c) Manhole ring and cover must be of cast, rolled, forged, or pressed aluminum alloy.

(d) All joints between manhole covers and their seats must be made tight against leakage of vapor and liquid by use of gaskets of suitable material.

11. *Gauging, venting, loading and discharging, and air inlet devices extending through dome of tanks.* (a) These devices when installed must be tightly closed as prescribed in paragraph 12 and be of approved design. Protective housing of approved design covering all these devices must be installed.

12. *Gauging, venting, loading and discharging, and air inlet devices.* (a) These devices when installed must be tightly closed with approved caps, plugs, valves, or other suitable fittings. Provision must be made for closing pipe connections of valves.

13. *Bottom discharge outlets.* (a) Bottom discharge outlet is prohibited, but tank may be equipped with a sump.

14. *Safety valves.* (a) The tank must be equipped with a safety valve at least 2 inches inside diameter mounted on top of expansion dome.

(b) One safety valve must be provided for each tank.

(c) The safety valve must be set to open at a pressure of 60 pounds per square inch. (For tolerances see paragraph 18.)

15. *Fixtures, reinforcements and attachments not otherwise specified.* (a) All attachments to tank and dome must be riveted in place and calked to comply with conditions prescribed in paragraphs 6 and 8.

16. *Plugs for openings.* (a) All plugs must be solid, made of materials prescribed in paragraph 3, with standard pipe thread and taper, and when in contact with lading must be of a length which will screw at least six threads inside the face of fitting or tank. Plugs when inserted from the outside of tank heads must have the letter "S" at least 3/8 inch in size stamped with steel stamp or cast on the outside surface to indicate the plug is solid. Plugs when inserted from the inside are identified by appearance of the plug on the outside of the tank as being solid—therefore, no mark required.

17. *Test of tanks.* (a) Each tank must be tested, before being put into service and also at intervals as prescribed in paragraph 19, by completely filling tank and dome with water, or other liquid having similar viscosity, of a temperature which must not exceed 100 degrees F. during the test, and applying a pressure of 60 pounds per square inch. Tank must hold the prescribed pressure for at least 10 minutes without leakage or evidence of distress. All rivets and closures, except safety valves, must be in place while test is made.

18. *Tests of safety valves.* (a) Valve must be tested before being put into service by attaching to an air line and applying pressure. The valve must open at the pressure prescribed in paragraph 14 (c) with a tolerance of plus or minus 3 pounds.

19. *Retests of tanks and safety valves.* (a) Tanks and safety valves must be retested as prescribed for original tests in paragraphs 17 and 18, except that an acid may be used for filling tank and dome when testing tanks which have not been in service more than 12 years. The first retest must be conducted within four years after the original test, and subsequent retests at four-year intervals up to 12 years of service, thereafter at two-year intervals up to 20 years of service, and annually after 20 years of service. Tanks in service over 12 years must be internally inspected for defects which would make leakage or failure probable during transit and must be tested with water only. Tanks must also be retested before being returned to service after extensive riveting, calking, or other repairs. Reports must be rendered as prescribed in paragraph 21.

20. *Marking.* Each tank must be marked, thus certifying that the tank complies with all the requirements of this specification. These marks must be as follows:

(a) ICC–103C–AL in letters and figures at least 3/8 inch high, stamped plainly and permanently into the metal near the center of one outside head of the tank. This mark must also be stenciled on the jacket, in letters and figures at least 2 inches high.

(b) Initials of manufacturer and date of original test of tank in letters and figures at least 3/8 inch high, stamped plainly and permanently into the metal of the tank immediately below the stamped mark specified in paragraph 20 (a). These initials and date must also be stenciled on the jacket, in letters and figures at least 2 inches high.

(c) Date on which the tank was last tested, pressure to which tested, place where test was made, and by whom, stenciled on the jacket.

(d) Date on which the safety valve was last tested, pressure to which tested, place where test was made, and by whom, stenciled on the jacket.

(e) When a tank car and its appurtenances are designed and authorized for the transportation of a particular commodity only, the name of that commodity followed by the word "only", or such other wording as may be required to indicate the limits of usage of the car, must be stenciled on each side of the tank, in letters at least 2 inches high, immediately above the stenciled mark specified in paragraph 20 (a).

21. *Reports.* (a) Before a tank car is placed in service, the party assembling the completed car must furnish to car owner, Bureau of Explosives, and the Secretary, Mechanical Division, Association of American Railroads,

a report in approved form certifying that the tank and its equipment comply with all the requirements of this specification. In case of alterations of the tank or equipment therefor from original design, a similar report must be rendered to the same parties. For the periodic retests of tank and safety valves, other than above mentioned, reports must be rendered to the Bureau of Explosives and to car owner. In addition to the foregoing, owners or operators of cars where construction is authorized herein shall make semiannual inspection of the tanks and report their condition to the above parties.

A. A. R. REQUIREMENTS

[Appendix to order June 7, 1940]

AAR-5. *Dishing of tank heads.* (a) Tank heads must be dished for pressure on concave side and to main inside radius not exceeding 10 feet. The inside knuckle radius must be not less than 3¾ inches.

AAR-6. *Anchorage.* (a) The minimum shearing and bearing values of rivets connecting longitudinal anchor plates to tank and underframe shall be as follows:

Connection of single piece anchor plates to tank: (A single piece anchor is one having longitudinal anchor plate on each side of the center sill construction.)

Shearing area of aluminum rivets, based on 20,000 minimum shear value, not less than 66 square inches.

Bearing area of aluminum rivets, based on 54,000 minimum bearing value, not less than 43 square inches.

Connection of a single piece anchor plate to underframe.

Shearing area of steel rivets, not less than 15 square inches.

Bearing area of steel rivets using aluminum anchorage plate with minimum bearing value of 54,000, not less than 22 square inches.

The shearing and bearing values of rivets securing anchor plates to underframe shall not exceed 70 percent of the shearing and bearing values, respectively, of those used for connection of anchor plates to tank. The maximum diameter of a driven aluminum rivet in the anchor must not exceed its nominal diameter plus 1/32 inch. Head block anchorage prohibited.

(b) *Tank bands.* Each tank shall have at least two bands, one at each bolster, or other approved means of equal strength and security. If more than the prescribed two bands are used, their location is optional.

All tank bands shall be in direct contact with outside of main shell.

The cross sectional area of the tank band shall at no place be less than the equivalent of one square inch of steel. A threaded end 1⅜ inch or more in diameter, with body consisting of a flat band 2 inch by ½ inch, or equivalent section, or round 1⅛ inch in diameter, will be accepted as meeting this requirement.

(c) *Bolster slabbing.* Contact bearing area shall be not less than 20 square feet.

Not less than 50 percent of the above prescribed minimum of number of square feet of bolster slabbing bearing area shall be outside the zone of center sill construction.

AAR-14. *Safety valves.* (a) Safety valve must be of approved design.

AAR-20. *Marking.* (a) For all other markings see fig. 1, AAR Specifications.

AAR-21. *Certificate of construction.* (a) For form of certificate of construction see § 78.259 (g).

AAR-22. *Car structure.* (a) For car structure see § 78.263.

Authority granted August 19, 1941, in No. 3666, for trial transportation of 95 percent nitric acid in 5 riveted aluminum alloy tank cars, specification 103C–AL, amending order November 14, 1939, authorizing trial transportation of same commodity in 4 tank cars. Pertinent sections of regulations amended accordingly. Authority noted in § 73.268 (b) (2) of this chapter.

Order approved December 18, 1941, in No. 3666, authorizing trial transportation of liquid chlorine in single-unit, 55-ton capacity tank cars, specification 105A500. Pertinent sections of regulations amended accordingly. Authority noted in § 73.314 (g) of this chapter.

SUBPART J—SPECIFICATIONS FOR CONTAINERS FOR MOTOR VEHICLE TRANSPORTATION

§ 78.315 *Specification MC 200; containers for liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate.*

§ 78.315–1 *Motor vehicle body.* (a) Every motor vehicle used for the transportation of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, other than desenitized liquid explosives, as defined in § 73.53 (e) of this chapter, shall have a body constructed as set forth below, which body shall have component parts as specified hereinafter.

§ 78.315–2 *Body proper.* (a) The motor-vehicle body proper shall have a hinged cover. Both the body and the cover shall be well and strongly built of wood or other nonsparking material of equal strength, thoroughly waterproofed, having no end or side openings, and lined with copper or other nonsparking sheet metal having all seams made tight against leakage of nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate by welding, brazing, or soldering. No metal of such character as to be capable of producing a spark when struck may be exposed on the inside or the top of the body, nor on the nether side or any edge of the cover, the top of which shall be covered with metal. The body shall be of such dimensions that it will contain only a single tier of individual containers and of such approximate height that the felt pads will securely constrain all inside containers from vertical motion with respect to the body, and shall be securely and firmly attached to the chassis of the motor vehicle. The total load shall not exceed nine hundred (900) quarts liquid measure of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate.

§ 78.315–3 *Cellular construction.* (a) In the motor-vehicle body specified in § 78.315–2 shall be inserted suitable wooden or other nonmetallic, nonsparking cellular construction, the dimensions of each cell of which shall be such that the rubber "boot" or secondary container for the primary container of the nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, both of which are specified hereinafter, shall snugly fit. The cellular construction shall extend from near the top to near the bottom of the full height of each "boot" to be fitted therein, and shall rest upon and be covered by at least one-half (½) inch of felt padding or other material affording equivalent shock-absorbing protection. The cellular construction shall be of such strength as to provide suitable restraint under all conditions of loading to prevent relative motion of inside containers to be inserted or carried therein.

§ 78.315–4 *Inside containers and boots.*—(a) *Inside containers.* Individual containers shall be made of copper or other nonsparking metal of equivalent strength, with all seams closed by welding, brazing or soldering, and shall be tight against leakage of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate. No individual container shall exceed ten (10) quarts (liquid measure) capacity of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate.

(b) *Boots, rubber containers for individual containers.* Each individual container of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate shall be contained in a rubber boot or outer container into which it shall snugly fit, and which, in turn, shall snugly fit into any cell of the cellular construction specified in § 78.315–3. This boot shall be watertight throughout and at least of such volume as to contain all of the liquid content of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate of any inside container inserted in it. It shall be provided with V-shaped grooves at suitable spacings throughout its inside surface, extending from top to bottom in such manner as to prevent the entrapment of air therein upon insertion of the inside container of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate. The inside height of the rubber boot shall approximate the height of the inside container (including stopper) as shipped.

§ 78.318 *Specification MC 201; container for blasting caps, electric blasting caps and percussion caps.*

§ 78.318–1 *Scope.* (a) This specification pertains to a container to be used for the transportation of blasting caps, electric blasting caps, and percussion caps in connection with the transportation of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate, where any or all of such types of caps may be used for the detonation of liquid nitroglycerin, desensitized liquid nitroglycerin or diethylene glycol dinitrate in blasting operations. This specification is not intended to take the place of any shipping or packing requirements of this Commission where the caps in question are themselves articles of commerce.

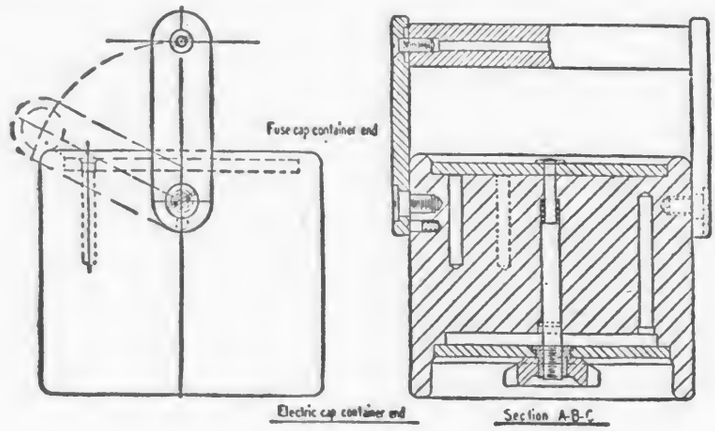
§ 78.318–2 *Container.* (a) Every container for blasting caps, electric blasting caps, and percussion caps coming within the scope of this specification shall be constructed entirely of hard rubber, phenolresinous or other resinous material, or other nonmetallic, nonsparking material, except that metal parts may be used in such locations as not in any event to come in contact with any of the caps. Space shall be provided so that each blasting cap of whatever nature may be inserted in an individual cell in the body of the container, into which each such cap shall snugly fit. There shall be pro-

vided no more than twenty (20) such cellular spaces. Space may be provided into which a plurality of percussion caps may be carried, provided that such space may be closed with a screw cap, and further provided that each or any such space is entirely separate from any space provided for any blasting cap. Each cellular space into which a blasting cap is to be inserted and carried shall be capable of being covered by a rotary cover so arranged as to expose not more than one cell at any time, and capable of rotation to such a place that all cells will be covered at the same time, at which place means shall be provided to lock the cover in place. Means shall be provided to lock in place the cover for the cells provided for the carrying of electric blasting caps. The requirement that not more than one cell be exposed at one time need not apply in the case of electric blasting caps, although spaces for such caps and blasting caps shall be separate. Sufficient annular space shall be provided inside the cover for such electric blasting caps that, when the cover is closed, there will be sufficient space to accommodate the wires customarily attached to such caps. If the material is of such a nature as to require treatment to prevent the absorption of moisture, such treatment shall be applied as shall be necessary in order to provide against the penetration of water by permeation. A suitable carrying handle shall be provided, except for which handle no part of the container may project beyond the exterior of the body.

(b) Exhibited in plates I and II are line drawings of a container for blasting caps, electric blasting caps, and percussion caps, illustrative of the requirements set forth in § 78.318–2 (a). These plates shall not be construed as a part of this specification.

§ 78.321 *Specification MC 300; cargo tanks constructed of mild (open hearth or blue annealed) steel.* To be mounted on and to form part of tank motor vehicles for transportation of flammable liquids, and poisonous liquids, Class B.

§ 78.321–1 *Scope.* (a) This specification is primarily designed to apply to cargo tanks of tank motor vehicles to be used for the transportation of flammable liquids, or poisonous liquids, class B, and, though not mandatory for tanks or for motor vehicles for the transportation of liquids having flash points above eighty degrees Fahrenheit (80° F.), it is recommended that such liquids be transported in tanks and on tank motor vehicles having characteristics equal or superior to the requirements set forth in this specification.



BLASTING CAP CONTAINER

PLATE I

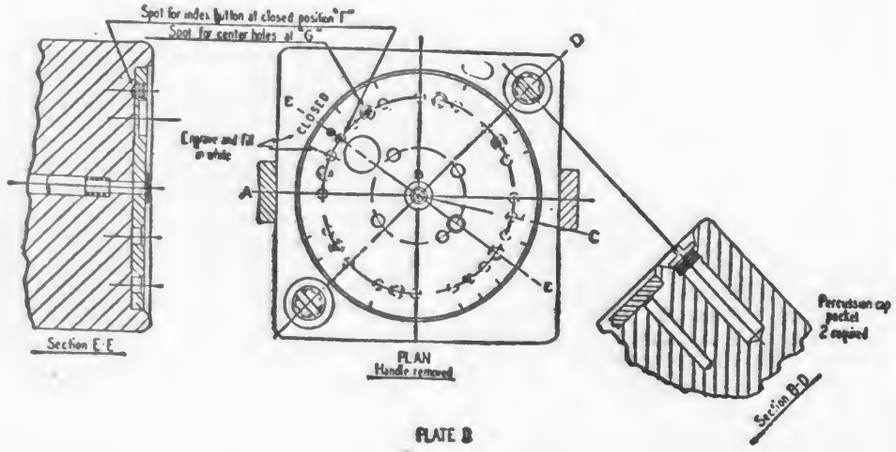


PLATE II

§ 78.321–2 *Existing tank motor vehicles continuing in service*—(a) *Specification tanks of tank motor vehicles.* Tanks of tank motor vehicles used for the transportation of flammable liquids or poisonous liquids which shall have been in service prior to June 15, 1940, may be continued in service provided that they have been designed and constructed in accordance with the requirements of Specification No. 1001, 1937 edition, of the American Petroleum Institute, or in accordance with the requirements of specifications of the National Fire Protection Association, 1929 or 1933 edition.

(b) *Existing nonspecification tanks of tank motor vehicles.* Tanks of tank motor vehicles used for the transportation of flammable liquids or poisonous liquids not meeting the requirements set forth in paragraph (a) of this section, which shall have been in service prior to June 15, 1940, may be continued in service, provided that they fulfill the requirements set forth under §§ 78.321–6 to 78.321–8, and that they be provided with the accessories as specified in §§ 78.321–17, 78.321–18 (a), and 78.321–19 to 78.321–23.

§ 78.321–3 *New tank motor vehicles* (a) Except as provided in § 78.321–4, every new tank of a tank motor vehicle acquired by a motor carrier on or after June 15, 1940, for the transportation of any flammable liquid or poisonous liquid shall comply with the requirements of this specification. A certificate from the manufacturer of the cargo tank, or from a competent testing agency, certifying that each such tank is designed and constructed in accordance with the requirements of the specification shall be procured, and such certificate shall be retained in the files of the carrier during the time that such tank motor vehicle is employed in the transportation of flammable liquids or poisonous liquids by him. In lieu of this certificate, if the motor carrier himself elects to ascertain if any such tank fulfills the requirements of the specification by his own test, he shall similarly retain the test data.

§ 78.321–4 *Novel tanks of tank motor vehicles, special authorization.* (a) The Commission may, upon written request for such authorization by a motor carrier, authorize the use of limited numbers, and for limited times, of new tank motor vehicles which fail to meet the requirements of this specification. In the event of such authorization, the carrier shall furnish those details concerning the design and construction of the tank as seem necessary for the determination of its ability safely to transport flammable liquids or poisonous liquids.

§ 78.321–5. *Marking of cargo tanks*—(a) *Metal identification plate.* On and after January 1, 1941, there shall be on every cargo tank a metal plate located on the right side, near the front, in a place readily accessible for inspection. This plate shall be permanently affixed to the tank by means of soldering, brazing, welding, or other equally suitable means; and upon it shall be marked by stamping, embossing, or other means of forming letters into or on the metal of the plate itself, in the manner illustrated below, at least the information indicated

below. The plate shall not be so painted as to obscure the markings thereon.

Carriers Serial Number [5]

Manufacturer's Name [6]

Date of Manufacture [6]

ICC MC *** [7]

Nominal Tank Cap'y ____ U. S. Gallons

(b) *Test date markings.* The date of the last test or retest required by this specification and the due date of the next required routine test or retest shall be painted on the tank in letters not less than 1¼ inches high, in legible colors, immediately below the metal identification plate specified in paragraph (a) of this section.

(c) *Certification by markings.* The markings specified in paragraphs (a) and (b) of this section shall serve to certify that the information thereby set forth is correct.

§ 78.321–6 *No hazardous repairs on loaded motor vehicles.* (a) None of the repairs required by Part 6 of Motor Carrier Safety Regulations to be made, or any other repairs, shall be performed on any motor vehicle containing any flammable liquid or poisonous liquid, or on a cargo tank, whether empty or loaded, except in such cases that such repair can be made without hazard; nor shall any such loaded motor vehicle be repaired in a closed garage.

§ 78.321–7 *No repair with flame unless gas-free.* (a) No repair of a cargo tank used for the transportation of any flammable liquid or poisonous liquid or any compartment thereof, or of any container for fuel of whatever nature, may be repaired by any method employing a flame, arc, or other means of welding, unless the tank or compartment shall first have been made gas-free.

§ 78.321–8 *Times of retesting of cargo tanks.* Every cargo tank used for the transportation of any flammable liquid or poisonous liquid shall be tested or retested as follows:

(a) *Tank out of service one year or more.* Every cargo tank which has been out of transportation service for a period of one year or more shall not be returned again to or placed in such service until it shall successfully have fulfilled the requirements set forth under § 78.321–9.

(b) *Nonspecification tanks.* Every cargo tank not complying with the requirements of Specification No. 1001, 1937 edition, of the American Petroleum Institute, specifications of the National Fire Protection Association, 1929 or 1933, or this specification, shall be tested at least once in every calendar year and shall successfully fulfill the requirements set forth under § 78.321–9. No two such required tests shall be closer together than 6 months.

(c) *Specification tanks.* Every cargo tank complying with the requirements of Specification No. 1001, 1937 edition, of the American Petroleum Institute, specifications of the National Fire Protection Association, 1929 or 1933, or this specification, shall be tested at least once in every 5-year period. If tested no oftener than once in every 5 years, at least one such test shall be made in the last year of any such 5-year period. The time of reckoning for such testing of such cargo tanks shall be from the time of the last test made in accordance with the requirements set forth under § 78.321–9; and if no such tests have ever been made, such tanks shall be tested within 6 months after June 15, 1940.

(d) *Novel cargo tanks.* Every cargo tank which shall have been authorized by this Commission for transportation of flammable liquids or poisonous liquids under the provisions of § 78.321–4 shall be tested under requirements specifically set forth in the terms of such authorization.

(e) *Testing following accidents.* Every cargo tank capable of suitable repair following any accident in which a tank motor vehicle may have been involved shall be retested in accordance with the requirements set forth under § 78.321–9, if the cargo tank has itself been damaged in a manner likely to affect the safety of operation of the tank motor vehicle, or if the damage to the tank motor vehicle is such as to make the safety of the cargo tank uncertain.

(f) *Special testing required by the Commission.* Upon the showing of probable cause of the necessity for retest, the Commission may, in its discretion, cause any cargo tank to be retested in accordance with the requirements of § 78.321–9 at any time.

§ 78.321–9 *Test for leaks.* (a) Every cargo tank shall be tested by a minimum air or hydrostatic pressure of 3 pounds per square inch gauge applied to each compartment and dome, or to whole tank and dome if it be not divided into compartments. Such pressure shall be maintained for a period of at least 5 minutes, during which, if the test is by air pressure, the entire exterior surface of all of 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. For hydrostatic pressure test, each cargo tank shall be tested by filling each compartment and dome, or whole tank and dome if it be not divided into compartments, with water or other liquid having a similar viscosity, the temperature of which shall not exceed 100° F. during the test, and applying a pressure of 3 pounds per square inch gauge to each compartment and dome, or whole tank and dome if it be not divided into compartments. Hydrostatic pressure, if used, shall be gauged at the top of the tank; and the tank shall be inspected for the issuance of liquid to indicate leaks. All closures shall be in place while test by either method is made. During these tests, operative relief devices shall be clamped, plugged, or otherwise rendered inoperative; such clamps, plugs, and similar devices shall be removed immediately after the test is finished. Any leakage discovered by either of the methods above described, or by any other method, shall be deemed evidence of failure to meet the requirements of this specification. Tanks failing to pass this test shall be suitably repaired, and the above described tests shall be continued until no leaks are discovered, before any cargo tank is put into service.

(b) Every cargo tank to which this specification applies shall be tested by pressures prescribed in paragraph (a) of this section and shall withstand such pressure without undue distortion, evidence of impending failure, or failure. Failure to meet this requirement shall be deemed as sufficient cause for rejection under this specification. If there is undue distortion, or if failure impends or occurs, the cargo tank shall not be returned to service unless a suitable repair is made. The suitability of the repair should be determined by the same method of test.

§ 78.321–10 *Workmanship, general.* (a) Every cargo tank shall be constructed in accordance with the best known and available practices, in addition to the other requirements of this specification.

§ 78.321–11 *Material.* (a) All steel sheets for such cargo tanks shall be of open hearth steel or blue annealed steel meeting the following requirements:

Yield point	25,000 lb. per sq. in.
Ultimate strength	45,000 lb. per sq. in.
Elongation, 2" sample	20 percent

§ 78.321–12 *Thickness of sheets.* (a) The minimum thicknesses of tank sheets shall be as follows:

Aggregate capacity, United States gallons	Shell		Head			
			Flat without reinforcement		Dished, corrugated, or reinforced	
	United States gauge No.	Inch [1]	United States gauge No.	Inch [1]	United States gauge No.	Inch [1]
600 or less	14	0.078	12	0.109	14	0.078
Over 600 to 1,200	12	.109	10	.141	12	.109
Over 1,200:						
(a) Divided into compartments of 600 gallons each or less	12	.109	10	.141	10	.141
(b) Divided into compartments larger than 600 gallons each, or not divided	10	.141	8	.172	8	.172

[1] Approximate.

[5] Carriers are not required to number their tanks serially; any designation regularly used by the carrier to identify the tank may be put in this space.

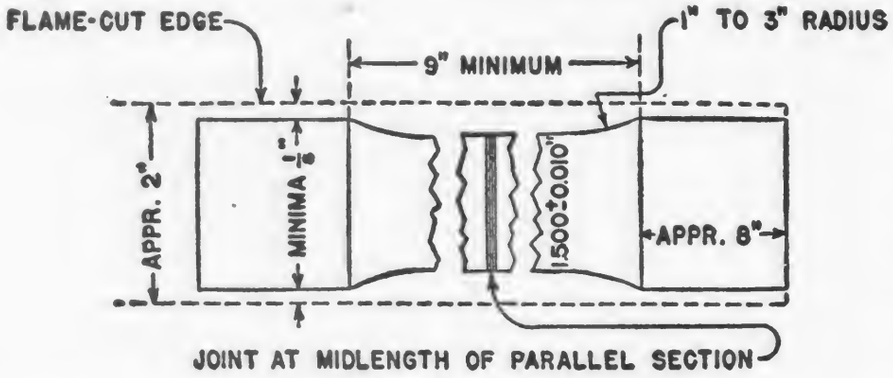
[6] In the event the identity of the tank manufacturer or the date of manufacture is not known and cannot be ascertained, the spaces indicated shall be marked "MAKE UNKNOWN" and/or "DATE OF MANUFACTURE UNKNOWN."

[7] Substitute "A P I SPEC 1001, 1937," or "N F P A SPEC 1929" (or 1933), or "NO SPECIFICATION", or the MC specification applicable, if appropriate.

§ 78.321–13 *Tolerance.* (a) A tolerance of ten percent (10%) shall be allowed for capacities of compartments and tanks.

§ 78.321–14 *Joints*—(a) *Method of joining.* Sheets may be joined by fusion welding, riveting and fusion welding, brazing, or riveting and brazing, at the option of the motor carrier.

(b) *Strength of joints.* The tensile strength of each joint in a tank shall be not less than 85 percent of that of the adjacent metal in the tank. Compliance with this requirement shall be determined by preparing, from materials representative of those to be used in tanks subject to this specification and by the same technique of fabrication, two (2) test specimens conforming to fig. as shown below and testing them to failure in tension. One pair of test specimens may represent all the tanks to be made of the same combination of materials, by the same technique of fabrication, and in the same shop, within six (6) months after the tests on such samples have been completed.



TENSILE SPECIMEN

§ 78.321–15 *Pressure tests.* (a) (The requirements of this paragraph are identical with those set forth in § 78.321–9 (a).)

(b) The requirements of this paragraph are identical with those set forth in § 78.321–9 (b).

§ 78.321–16 *Marking of cargo tanks by metal plates.* (a) Every cargo tank designed and constructed in accordance with this specification shall be marked on a metal plate with the designation "ICC–MC 300" as set forth in § 78.321–5 (a), together with the other markings therein specified. In addition, the test markings shall be painted on the tank in the manner prescribed in § 78.321–5 (b).

§ 78.321–17 *Tank outlets.* (a) Outlet fixtures of tanks shall be substantially made and attached to the tank in such a manner as to prevent breakage at the outlet point.

§ 78.321–18 *Bulkheads or baffles*—(a) *When bulkheads not required.* No bulkhead shall be required in any cargo tank regardless of capacity which is designed for service in which there will never be less than eighty percent (80%) of the capacity volume of the tank while in transportation over the highway and which, in service, is to discharge its entire contents at one unloading point.

(b) *Number, dimensions, and capacities of bulkheads and baffles.* Except as provided in paragraph (a) of this section, every cargo tank shall be divided into compartments and/or provided with baffles as follows:

(1) Every cargo tank larger than fifteen hundred (1,500) gallons shall be divided into compartments, the number of which shall be the result of dividing the capacity of the tank in gallons by twelve hundred (1,200) to the nearest whole number.

(2) Every cargo tank, and every compartment of a cargo tank, over ninety inches (90 in.) 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 baffle nearest it, shall in no case exceed sixty inches (60 in.).

(3) Each bulkhead required by this paragraph shall have adequate strength to sustain without undue stress or any permanent set a horizontal force equal to the weight of so much of the contents of the tank as may come between it and any adjacent bulkhead or tank head, applied as a uniformly distributed load on the surface of the bulkhead or tank head.

(4) Each baffle required by this paragraph shall have at least an area as great as eighty percent (80%) of the cross-sectional area of the tank.

(5) If spaces are provided between compartments, such spaces shall be arranged for venting and for complete drainage at all times.

§ 78.321–19 *Tank vents.* (a) Each tank or tank compartment shall be provided with a vacuum and pressure operated vent with a minimum effective opening of forty-four hundredths of a square inch (0.44 sq. in.), 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 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 two hundred degrees Fahrenheit (200° F.).

§ 78.321–20 *Valve and faucet connections.* (a) All draw-off valves or faucets of tanks and compartments shall have discharge ends threaded, or be otherwise so designed as to insure in every instance a tight connection with the hose extending to the storage fill pipe.

§ 78.321–21 *Emergency discharge control.* (a) Each tank or tank compartment of a bottom-discharge tank shall be equipped with a reliable and effective shut-off valve located inside the shell of the tank or tank compartment in the tank or compartment outlet; and the operating mechanism for such valve or valves shall be provided with a secondary closing mechanism remote from tank filling openings and discharge faucets, for operation in the event of fire or other accident. Such control mechanism shall be provided with a fusible section which will cause the valve to close automatically in case of fire, and the critical temperature for the fusing of such section shall not exceed two hundred degrees Fahrenheit (200° F.).

§ 78.321–22 *Shear section.* (a) There shall be provided betwen each 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 equivalent protection, and leave the shut-off valve seat intact in case of accident to the discharge faucet or piping.

§ 78.321–23 *Protection of valves and faucets.* (a) Draw-off valves and faucets projecting beyond the frame, or if the vehicle be frameless, beyond the shell, at the rear, shall be adequately protected by steel bumpers or other equally effective devices, against collision.

§ 78.321–24 *Overturn protection.* (a) All closures for filling openings shall be protected from damage in the event of overturning of the motor vehicle, by being enclosed within the body of the tank or a dome attached thereto, or by the use of suitable metal guards securely attached to the tank or the frame of the motor vehicle.

§ 78.322 *Specification MC 301; cargo tanks constructed of welded aluminum alloy (grade 3S).* To be mounted on and to form part of tank motor vehicles for transportation of flammable liquids, and poisonous liquids, class B.

§ 78.322–1 *Scope.* (a) This specification is primarily designed to apply to cargo tanks of tank motor vehicles to be used for the transportation of flammable liquids, or poisonous liquids, class B, and, though not mandatory for tanks or for motor vehicles for the transportation of liquids having flash points above eighty degrees Fahrenheit (80° F.), it is recommended that such liquids be transported in tanks and on tank motor vehicles having characteristics equal or superior to the requirements set forth in this specification.

§ 78.322–2 *Existing tank motor vehicles continuing in service*—(a) *Specification tanks of tank motor vehicles.* Tanks of tank motor vehicles used for the transportation of flammable liquids or poisonous liquids which shall have been in service prior to June 15, 1940, may be continued in service provided

that they have been designed and constructed in accordance with the requirements of Specification No. 1001, 1937 edition, of the American Petroleum Institute, or in accordance with the requirements of specifications of the National Fire Protection Association, 1929 or 1933 edition.

(b) *Existing nonspecification tanks of tank motor vehicles.* Tanks of tank motor vehicle used for the transportation of flammable liquids or poisonous liquids not meeting the requirements set forth in paragraph (a) of this section, which shall have been in service prior to June 15, 1940, may be continued in service, provided that they fulfill the requirements set forth under §§ 78.322–6 to 78.322–8, and that they be provided with the accessories as specified in §§ 78.322–17, 78.322–18 (a), and 78.322–19 to 78.322–23.

§ 78.322–3 *New tank motor vehicles.* (a) Except as provided in § 78.322–4 every new tank of a tank motor vehicle acquired by a motor carrier on or after June 15, 1940, for the transportation of any flammable liquid or poisonous liquid shall comply with the requirements of this specification. A certificate from the manufacturer of the cargo tank, or from a competent testing agency, certifying that each such tank is designed and constructed in accordance with the requirements of the specification shall be procured, and such certificate shall be retained in the files of the carrier during the time that such tank motor vehicle is employed in the transportation of flammable liquids or poisonous liquids by him. In lieu of this certificate, if the motor carrier himself elects to ascertain if any such tank fulfills the requirements of the specification by his own test, he shall similarly retain the test data.

§ 78.322–4 *Novel tanks of tank motor vehicles, special authorization.* (a) The Commission may, upon written request for such authorization by a motor carrier, authorize the use of limited numbers, and for limited times, of new tank motor vehicles which fail to meet the requirements of this specification. In the event of such authorization, the carrier shall furnish those details concerning the design and construction of the tank as seem necessary for the determination of its ability safely to transport flammable liquids or poisonous liquids.

§ 78.322–5 *Marking of cargo tanks*—(a) *Metal identification plate.* On and after January 1, 1941, there shall be on every cargo tank a metal plate located on the right side, near the front, in a place readily accessible for inspection. This plate shall be permanently affixed to the tank by means of soldering, brazing, welding, or other equally suitable means; and upon it shall be marked by stamping, embossing, or other means of forming letters into or on the metal of the plate itself, in the manner illustrated below, at least the information indicated below. The plate shall not be so painted as to obscure the markings thereon.

Carrier's Serial Number [5]
Manufacturer's Name [6]
Date of Manufacture [6]
ICC MC*** [7]
Nominal Tank Cap'y _____ U. S. gallons

(b) *Test date markings.* The date of the last test or retest required by this specification and the due date of the next required routine test or retest shall be painted on the tank in letters not less than 1¼ inches high, in legible colors, immediately below the metal identification plate specified in paragraph (a) of this section.

(c) *Certification by markings.* The markings specified in paragraphs (a) and (b) of this section shall serve to certify that the information thereby set forth is correct.

§ 78.322–6 *No hazardous repairs on loaded motor vehicles.* (a) None of the repairs required by Part 6 of Motor Carrier Safety Regulations to be made, or any other repairs, shall be performed on any motor vehicle containing any flammable liquid or poisonous liquid, or on a cargo tank, whether empty or loaded, except in such cases that such repair can be made without hazard; nor shall any such loaded motor vehicle be repaired in a closed garage.

§ 78.322–7 *No repair with flame unless gas-free.* (a) No repair of a cargo tank used for the transportation of any flammable liquid or poisonous liquid or any compartment thereof, or of any container for fuel of whatever nature, may be repaired by any method employing a flame, arc, or other means of welding, unless the tank or compartment shall first have been made gas-free.

§ 78.322–8 *Times of retesting of cargo tanks.* Every cargo tank used for the transportation of any flammable liquid or poisonous liquid shall be tested or retested as follows:

(a) *Tank out of service one year or more.* Every cargo tank which has been out of transportation service for a period of one year or more shall not be returned again to or placed in such service until it shall successfully have fulfilled the requirements set forth under § 78.322–9.

(b) *Nonspecification tanks.* Every cargo tank not complying with the requirements of Specification No. 1001, 1937 edition, of the American Petroleum Institute, specifications of the National Fire Protection Association 1929 or 1933, or this specification, shall be tested at least once in every calendar year and shall succesfully fulfill the requirements set forth under § 78.322–9. No two such required tests shall be closer together than 6 months.

(c) *Specification tanks.* Every cargo tank complying with the requirements of Specification No. 1001, 1937 edition, of the American Petroleum Institute, specifications of the National Fire Protection Association, 1929 or 1933, or this specification, shall be tested at least once in every 5-year period. If tested no oftener than once in every 5 years, at least one such test shall be made in the last year of any such 5-year period. The time of reckoning for such testing of such cargo tanks shall be from the time of the last test made in accordance with the requirements set forth under § 78.322–9; and if no such tests have ever been made, such tanks shall be tested within 6 months after June 15, 1940.

(d) *Novel cargo tanks.* Every cargo tank which shall have been authorized by this Commission for transportation of flammable liquids or poisonous liquids under the provisions of § 78.322–4 shall be tested under requirements specifically set forth in the terms of such authorization.

(e) *Testing following accidents.* Every cargo tank capable of suitable repair following any accident in which a tank motor vehicle may have been involved shall be retested in accordance with the requirements set forth under § 78.322–9, if the cargo tank has itself been damaged in a manner likely to affect the safety of operation of the tank motor vehicle, or if the damage to the tank motor vehicle is such as to make the safety of the cargo tank uncertain.

(f) *Special testing required by the Commission.* Upon the showing of probable cause of the necessity for retest, the Commission may, in its discretion, cause any cargo tank to be retested in accordance with the requirements of § 78.322–9 at any time.

§ 78.322–9 *Test for leaks.* (a) Every cargo tank shall be tested by a minimum air or hydrostatic pressure of 3 pounds per square inch gauge applied to each compartment and dome, or to whole tank and dome if it be not divided into compartments. Such pressure shall be maintained for a period of at least 5 minutes, during which, if the test is by air pressure, the entire exterior surface of all of 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. For hydrostatic pressure test, each cargo tank shall be tested by filling each compartment and dome, or whole tank and dome if it be not divided into compartments, with water or other liquid having a similar viscosity, the temperature of which shall not exceed 100° F. during the test, and applying a pressure of 3 pounds per square inch gauge to each compartment and dome, or whole tank and dome if it be not divided into compartments. Hydrostatic pressure, if used, shall be gauged at the top of the tank; and the tank shall be inspected for the issuance of liquid to indicate leaks. All closures shall be in place while test by either method is made. During these tests, operative relief devices shall be clamped,

[5] Carriers are not required to number their tanks serially; any designation regularly used by the carrier to identify the tank may be put in this space.

[6] In the event the identity of the tank manufacturer or the date of manufacture is not known and cannot be ascertained, the spaces indicated shall be marked "MAKE UNKNOWN" and/or "DATE OF MANUFACTURE UNKNOWN"

[7] Substitute "A P I SPEC 1001, 1937", or "N F P A SPEC 1929" (or 1933), or "NO SPECIFICATION", or the MC specification applicable, if appropriate.

plugged, or otherwise rendered inoperative; such clamps, plugs, and similar devices shall be removed immediately after the test is finished. Any leakage discovered by either of the methods above described, or by any other method, shall be deemed evidence of failure to meet the requirements of this specification. Tanks failing to pass this test shall be suitably repaired, and the above described tests shall be continued until no leaks are discovered, before any cargo tank is put into service.

(b) Every cargo tank to which this specification applies shall be tested by pressures prescribed in paragraph (a) of this section, and shall withstand such pressure without undue distortion, evidence of impending failure, or failure. Failure to meet this requirement shall be deemed as sufficient cause for rejection under this specification. If there is undue distortion, or if failure impends or occurs, the cargo tank shall not be returned to service unless a suitable repair is made. The suitability of the repair should be determined by the same method of test.

§ 78.322–10 *Workmanship, general.* (a) Every cargo tank shall be constructed in accordance with the best known and available practices, in addition to the other requirements of this specification.

§ 78.322–11 *Material.* (a) All sheets for such cargo tanks shall be of aluminum alloy, known as 3 S alloy, meeting the following minimum requirements:

Yield strength	18,000 lb. per sq. in.
Ultimate strength	21,000 lb. per sq. in.
Elongation, 2-inch sample	8 percent.

NOTE: Yield strength is the stress which produces a permanent set of 0.2 percent of the initial gauge length (ASTM E8–36).

§ 78.322–12 *Thickness of sheets.* (a) The minimum thicknesses of tank sheets shall be as follows:

Aggregate capacity, United States gallons	Shell		Head			
			Flat without reinforcement		Dished, corrugated, or reinforced	
	United States gauge No.	Inch [1]	United States gauge No.	Inch [1]	United States gauge No.	Inch [1]
600 or less	12	0.109	9	0.156	12	0.109
Over 600 to 1,200	9	.156	6	.203	9	.156
Over 1,200:						
(a) Divided into compartments of 600 gallons or less	9	.156	6	.203	6	.203
(b) If not divided into compartments, or if divided into compartments of 1,200 or more	6	.203	4	.234	4	.234

[1] Approximate.

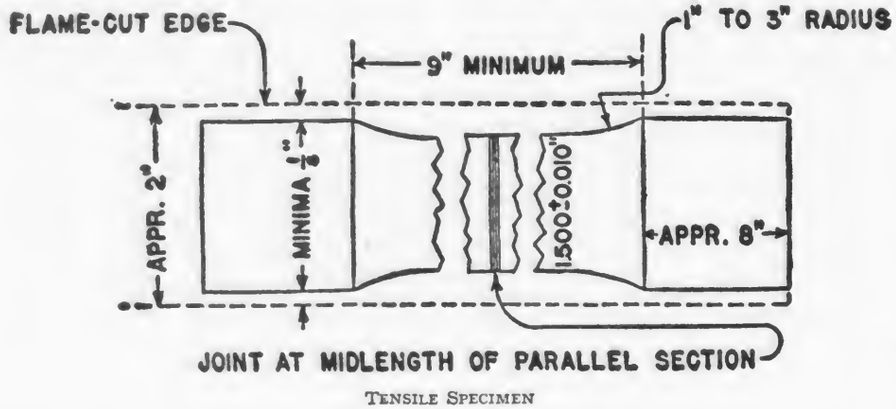
§ 78.322–13 *Tolerance.* (a) A tolerance of ten percent (10%) shall be allowed for capacities of compartments and tanks.

§ 78.322–14 *Joints.* (a) Sheets shall be jointed by fusion welding. The tensile strength of each joint in a tank shall be not less than 15,000 lb. per sq. in. Compliance with this requirement shall be determined by preparing, from materials representative of those to be used in tanks subject to this specification and by the same technique of fabrication, two (2) test specimens conforming to figure as shown below and testing them to failure in tension. One pair of test specimens may represent all the tanks to be made of the same combination of materials, by the same technique of fabrication, and in the same shop, within six (6) months after the tests on such samples have been completed.

§ 78.322–15 *Pressure tests.* (a) (The requirements of this paragraph are identical with those set forth in § 78.322–9 (a).

(b) The requirements of this paragraph are identical with those set forth in § 78.322–9 (b).

§ 78.322–16 *Marking of cargo tanks by metal plates.* (a) Every cargo tank designed and constructed in accordance with this specification shall be marked on a metal plate with the designation "ICC–MC 301" as set forth in § 78.322–5 (a), together with the other markings therein specified. In addition, the test markings shall be painted on the tank in the manner prescribed in § 78.322–5 (b).



TENSILE SPECIMEN

§ 78.322–17 *Tank outlets.* (a) Outlet fixtures of tanks shall be substantially made and attached to the tank in such a manner as to prevent breakage at the outlet point.

§ 78.322–18 *Bulkheads and baffles—* (a) *When bulkheads not required.* No bulkhead shall be required in any cargo tank regardless of capacity which is designed for service in which there will never be less than eighty percent (80%) of the capacity volume of the tank while in transportation over the highway and which, in service, is to discharge its entire contents at one unloading point.

(b) *Number, dimensions, and capacities of bulkheads and baffles.* Except as provided in paragraph (a) of this section, every cargo tank shall be divided into compartments and/or provided with baffles as follows:

(1) Every cargo tank larger than fifteen hundred (1,500) gallons shall be divided into compartments, the number of which shall be the result of dividing the capacity of the tank in gallons by twelve hundred (1,200) to the nearest whole number.

(2) Every cargo tank, and every compartment of a cargo tank, over ninety inches (90 in.) 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 baffle nearest it, shall in no case exceed sixty inches (60 in.).

(3) Each bulkhead required in this paragraph shall have adequate strength to sustain without undue stress or any permanent set a horizontal force equal to the weight of so much of the contents of the tank as may come between it and any adjacent bulkhead or tank head, applied as a uniformly distributed load on the surface of the bulkhead or tank head.

(4) Each baffle required in this paragraph shall have at least an area as great as eighty percent (80%) of the cross-sectional area of the tank.

(5) If spaces are provided between compartments, such spaces shall be arranged for venting and for complete drainage at all times.

§ 78.322–19 *Tank vents.* (a) Each tank or tank compartment shall be provided with a vacuum and pressure operated vent with a minimum effective opening of forty-four hundredths of a square inch (0.44 sq. in.), 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 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 two hundred degrees Fahrenheit (200° F.).

§ 78.322–20 *Valve and faucet connections.* (a) All draw-off valves or faucets of tanks and compartments shall have discharge ends threaded, or be otherwise so designed as to insure in every instance

a tight connection with the hose extending to the storage fill pipe.

§ 78.322-21 *Emergency discharge control.* (a) Each tank or tank compartment of a bottom-discharge tank shall be equipped with a reliable and effective shut-off valve located inside the shell of the tank or tank compartment in the tank or compartment outlet; and the operating mechanism for such valve or valves shall be provided with a secondary closing mechanism remote from tank filling openings and discharge faucets, for operation in the event of fire or other accident. Such control mechanism shall be provided with a fusible section which will cause the valve to close automatically in case of fire, and the critical temperature for the fusing of such section shall not exceed two hundred degrees Fahrenheit (200° F.).

§ 78.322-22 *Shear section.* (a) There shall be provided between each 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 equivalent protection, and leave the shut-off valve seat intact in case of accident to the discharge faucet or piping.

§ 78.322-23 *Protection of valves and faucets.* (a) Draw-off valves and faucets projecting beyond the frame, or if the vehicle be frameless, beyond the shell, at the rear, shall be adequately protected by steel bumpers or other equally effective devices, against collision.

§ 78.322-24 *Overturn protection.* (a) All closures for filling openings shall be protected from damage in the event of overturning of the motor vehicle, by being enclosed within the body of the tank or a dome attached thereto, or by the use of suitable metal guards securely attached to the tank or the frame of the motor vehicle.

§ 78.323 *Specification MC 302; cargo tanks constructed of welded aluminum alloy (Grade 52 S).* To be mounted on and to form part of tank motor vehicles for transportation of flammable liquids, and poisonous liquids, Class B.

§ 78.323-1 *Scope.* (a) This specification is primarily designed to apply to cargo tanks of tank motor vehicles to be used for the transportation of flammable liquids, or poisonous liquids, Class B, and, though not mandatory for tanks or for motor vehicles for the transportation of liquids having flash points above eighty degrees Fahrenheit (80° F.), it is recommended that such liquids be transported in tanks and on tank motor vehicles having characteristics equal or superior to the requirements set forth in this specification.

§ 78.323-2 *Existing tank motor vehicles continuing in service—(a) Specification tanks of tank motor vehicles.* Tanks of tank motor vehicles used for the transportation of flammable liquids or poisonous liquids which shall have been in service prior to June 15, 1940, may be continued in service: *Provided,* That they have been designed and constructed in accordance with the requirements of Specification No. 1001, 1937 edition, of the American Petroleum Institute, or in accordance with the requirements of specifications of the National Fire Protection Association, 1929 or 1933 edition.

(b) *Existing nonspecification tanks of tank motor vehicles.* Tanks of tank motor vehicle used for the transportation of flammable liquids or poisonous liquids not meeting the requirements set forth in paragraph (a) of this section, which shall have been in service prior to June 15, 1940, may be continued in service: *Provided,* That they fulfill the requirements set forth under §§ 78.323-6 to 78.323-8, and that they be provided with the accessories as specified in §§ 78.323-17, 78.323-18 (a) and 78.323-19 to 78.323-23.

§ 78.323-3 *New tank motor vehicles.* (a) Except as provided in § 78.323-4 every new tank of a tank motor vehicle acquired by a motor carrier on or after June 15, 1940, for the transportation of any flammable liquid or poisonous liquid shall comply with the requirements of this specification. A certificate from the manufacturer of the cargo tank, or from a competent testing agency, certifying that each such tank is designed and constructed in accordance with the requirements of the specification shall be procured, and such certificate shall be retained in the files of the carrier during the time that such tank motor vehicle is employed in the transportation of flammable liquids or poisonous liquids by him. In lieu of this certificate, if the motor carrier himself elects to ascertain if any such tank fulfills the requirements of the specification by his own test, he shall similarly retain the test data.

§ 78.323-4 *Novel tanks of tank motor vehicles, special authorization.* (a) The Commission may, upon written request for such authorization by a motor carrier, authorize the use of limited numbers, and for limited times, of new tank motor vehicles which fail to meet the requirements of this specification. In the event of such authorization, the carrier shall furnish those details concerning the design and construction of the tank as seem necessary for the determination of its ability safely to transport flammable liquids or poisonous liquids.

§ 78.323-5 *Marking of cargo tanks—(a) Metal identification plate.* On and after January 1, 1941, there shall be on every cargo tank a metal plate located on the right side, near the front, in a place readily accessible for inspection. This plate shall be permanently affixed to the tank by means of soldering, brazing, welding, or other equally suitable means; and upon it shall be marked by stamping, embossing, or other means of forming letters into or on the metal of the plate itself, in the manner illustrated below, at least the information indicated below. The plate shall not be so painted as to obscure the markings thereon.

Carrier's Serial Number [5]
Manufacturer's Name [6]
Date of Manufacture [6]
IC MC*** [7]
Nominal Tank Cap'y _____ U. S. Gallons

(b) *Test date markings.* The date of the last test or retest required by this specification and the due date of the next required routine test or retest shall be painted on the tank in letters not less than 1¼ inches high, in legible colors, immediately below the metal identification plate specified in paragraph (a) of this section.

(c) *Certification by markings.* The markings specified in paragraphs (a) and (b) of this section shall serve to certify that the information thereby set forth is correct.

§ 78.323-6 *No hazardous repairs on loaded motor vehicles.* (a) None of the repairs required by Part 6 of Motor Carrier Safety Regulations to be made, or any other repairs, shall be performed on any motor vehicle containing any flammable liquid or poisonous liquid, or on a cargo tank, whether empty or loaded, except in such cases that such repair can be made without hazard; nor shall any such loaded motor vehicle be repaired in a closed garage.

§ 78.323-7 *No repair with flame unless gas-free.* (a) No repair of a cargo tank used for the transportation of any flammable liquid or poisonous liquid or any compartment thereof, or of any container for fuel of whatever nature, may be repaired by any method employing a flame, arc, or other means of welding, unless the tank or compartment shall first have been made gas-free.

§ 78.323-8 *Times of retesting of cargo tanks.* Every cargo tank used for the transportation of any flammable liquid or poisonous liquid shall be tested or retested as follows:

(a) *Tank out of service one year or more.* Every cargo tank which has been out of transportation service for a period of one year or more shall not be returned again to or placed in such service until it shall successfully have fulfilled the requirements set forth under § 78.323-9.

(b) *Nonspecification tanks.* Every cargo tank not complying with the requirements of Specification No. 1001, 1937 edition, of the American Petroleum Institute, specifications of the National Fire Protection Association 1929 or 1933, or this specification, shall be tested at least once in every calendar year and shall successfully fulfill the requirements set forth under § 78.323-9. No two such required tests shall be closer together than 6 months.

(c) *Specification tanks.* Every cargo tank complying with the requirements of

[5] Carriers are not required to number their tanks serially; any designation regularly used by the carrier to identify the tank may be put in this space.

[6] In the event the identity of the tank manufacturer or the date of manufacture is not known and cannot be ascertained, the spaces indicated shall be marked "MAKE UNKNOWN" and/or "DATE OF MANUFACTURE UNKNOWN."

[7] Substitute "API SPEC. 1001, 1937," or "NFPA Spec. 1929" (or 1933), or "NO SPECIFICATION," or the MC specification applicable, if appropriate.

Specification No. 1001, 1937 edition of the American Petroleum Institute, specifications of the National Fire Protection Association, 1929 or 1933, or this specification, shall be tested at least once in every 5-year period. If tested no oftener than once in every 5 years, at least one such test shall be made in the last year of any such 5-year period. The time of reckoning for such testing of such cargo tanks shall be from the time of the last test made in accordance with the requirements set forth under § 78.323–9; and if no such tests have ever been made, such tanks shall be tested within 6 months after June 15, 1940.

(d) *Novel cargo tanks.* Every cargo tank which shall have been authorized by this Commission for transportation of flammable liquids or poisonous liquids under the provisions of § 78.323–4 shall be tested under requirements specifically set forth in the terms of such authorization.

(e) *Testing following accidents.* Every cargo tank capable of suitable repair following any accident in which a tank motor vehicle may have been involved shall be retested in accordance with the requirements set forth under § 78.323–9, if the cargo tank has itself been damaged in a manner likely to affect the safety of operation of the tank motor vehicle, or if the damage to the tank motor vehicle is such as to make the safety of the cargo tank uncertain.

(f) *Special testing required by the Commission.* Upon the showing of probable cause of the necessity for retest, the Commission may, in its discretion, cause any cargo tank to be retested in accordance with the requirements of § 78.323–9 at any time.

§ 78.323–9 *Test for leaks.* (a) Every cargo tank shall be tested by a minimum air or hydrostatic pressure of 3 pounds per square inch gauge applied to each compartment and dome, or to whole tank and dome if it be not divided into compartments. Such pressure shall be maintained for a period of at least 5 minutes, during which, if the test is by air pressure, the entire exterior surface of all of 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. For hydrostatic pressure test, each cargo tank shall be tested by filling each compartment and dome, or whole tank and dome if it be not divided into compartments, with water or other liquid having a similar viscosity, the temperature of which shall not exceed 100° F. during the test, and applying a pressure of 3 pounds per square inch gauge to each compartment and dome, or whole tank and dome if it be not divided into compartments. Hydrostatic pressure, if used, shall be gauged at the top of the tank; and the tank shall be inspected for the issuance of liquid to indicate leaks. All closures shall be in place while test by either method is made. During these tests, operative relief devices shall be clamped, plugged, or otherwise rendered inoperative; such clamps, plugs, and similar devices shall be removed immediately after the test is finished. Any leakage discovered by either of the methods above described, or by any other method, shall be deemed evidence of failure to meet the requirements of this specification. Tanks failing to pass this test shall be suitably repaired, and the above described tests shall be continued until no leaks are discovered, before any cargo tank is put into service.

(b) Every cargo tank to which this specification applies shall be tested by pressures prescribed in paragraph (a) of this section, and shall withstand such pressure without undue distortion, evidence of impending failure, or failure. Failure to meet this requirement shall be deemed as sufficient cause for rejection under this specification. If there is undue distortion, or if failure impends or occurs, the cargo tank shall not be returned to service unless a suitable repair is made. The suitability of the repair should be determined by the same method of test.

§ 78.323–10 *Workmanship, general.* (a) Every cargo tank shall be constructed in accordance with the best known and available practices, in addition to the other requirements of this specification.

§ 78.323–11 *Material.* (a) All sheets for such cargo tanks shall be of aluminum alloy, known as 52 S. alloy, meeting the following minimum requirements:

Yield strength	26,000 lb. per sq. in.
Ultimate strength	34,000 lb. per sq. in.
Elongation, 2-inch sample	12 percent.

NOTE: Yield strength is the stress which produces a permanent set of 0.2 percent of the initial gauge length (ASTM E8–36).

§ 78.323–12 *Thickness of sheets.* (a) The minimum thickness of tank sheets shall be as follows:

Aggregate capacity, United States gallons	Shell		Head			
			Flat without reinforcement		Dished, corrugated, or reinforced	
	United States gauge No.	Inch [1]	United States gauge No.	Inch [1]	United States gauge No.	Inch [1]
600 or less	14	0.078	12	0.109	14	0.078
Over 600 to 1,200	12	.109	10	.141	12	.109
Over 1,200:						
(a) Divided into compartments of 600 gallons or less	12	.109	10	.141	10	.141
(b) If not divided into compartments, or if divided into compartments of 1,200 or more	10	.141	8	.172	8	.172

[1] Approximate.

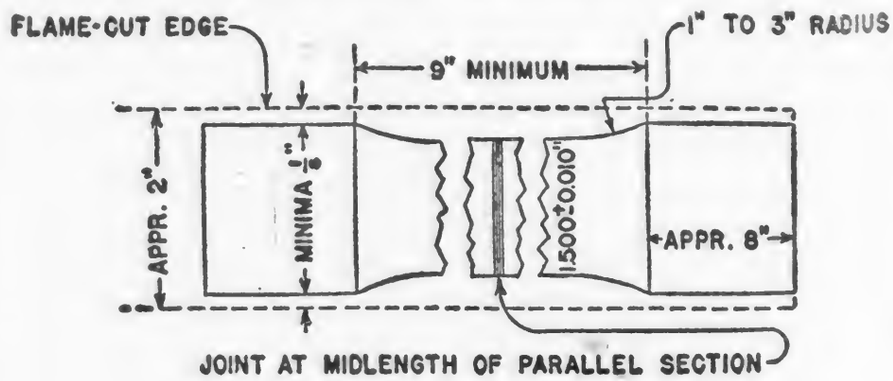
§ 78.323–13 *Tolerance.* (a) A tolerance of ten percent (10%) shall be allowed for capacities of compartments and tanks.

§ 78.323–14 *Joints.* (a) Sheets shall be jointed by fusion welding. The tensile strength of each joint in a tank shall be not less than 15,000 lb. per sq. in. Compliance with this requirement shall be determined by preparing, from materials representative of those to be used in tanks subject to this specification and by the same technique of fabrication, two (2) test specimens conforming to Figure as shown below and testing them to failure in tension. One pair of test specimens may represent all the tanks to be made of the same combination of materials, by the same technique of fabrication, and in the same shop within six (6) months after the tests on such samples have been completed.

§ 78.323–15 *Pressure tests.* (a) The requirements of this paragraph are identical with those set forth in § 78.323–9 (a).

(b) The requirements of this paragraph are identical with those set forth in § 78.323–9 (b).

§ 78.323–16 *Marking of cargo tanks by metal plates.* (a) Every cargo tank



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designed and constructed in accordance with this specification shall be marked on a metal plate with the designation "ICC–MC 302" as set forth in § 78.323–5 (a), together with the other markings therein specified. In addition, the test markings shall be painted on the tank in the manner prescribed in § 78.323–5 (b).

§ 78.323–17 *Tank outlets.* (a) Outlet fixtures of tanks shall be substantially made and attached to the tank in such a manner as to prevent breakage at the outlet point.

§ 78.323–18 *Bulkheads and baffles*—(a) *When bulkheads not required.* No bulkhead shall be required in any cargo tank regardless of capacity which is designed for service in which there will never be less than eighty percent (80%) of the capacity volume of the tank while in transportation over the highway and which, in service, is to discharge its entire contents at one unloading point.

(b) *Number, dimensions, and capacities of bulkheads and baffles.* Except as provided in paragraph (a) of this section, every cargo tank shall be divided into compartments and/or provided with baffles as follows:

(1) Every cargo tank larger than fifteen hundred (1,500) gallons shall be divided into compartments, the number of which shall be the result of dividing the capacity of the tank in gallons by twelve hundred (1,200) to the nearest whole number.

(2) Every cargo tank, and every compartment of a cargo tank, over ninety inches (90 in.) 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 baffle nearest it, shall in no case exceed sixty inches (60 in.).

(3) Each bulkhead required in this paragraph shall have adequate strength to sustain without undue stress or any permanent set a horizontal force equal to the weight of so much of the contents of the tank as may come between it and any adjacent bulkhead or tank head, applied as a uniformly distributed load on the surface of the bulkhead or tank head.

(4) Each baffle required in this paragraph shall have at least an area as great as eighty percent (80%) of the cross-sectional area of the tank.

(5) If spaces are provided between compartments, such spaces shall be arranged for venting and for complete drainage at all times.

§ 78.323–19 *Tank vents.* (a) Each tank or tank compartment shall be provided with a vacuum and pressure operated vent with a minimum effective opening of forty-four hundredths of a square inch (0.44 sq. in.), 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 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 two hundred degrees Fahrenheit (200° F.).

§ 78.323–20 *Value and faucet connections* (a) All draw-off valves or faucets of tanks and compartments shall have discharge ends threaded, or be otherwise so designed as to insure in every instance a tight connection with the hose extending to the storage fill pipe.

§ 78.323–21 *Emergency discharge control.* (a) Each tank or tank compartment of a bottom-discharge tank shall be equipped with a reliable and effective shut-off valve located inside the shell of the tank or tank compartment in the tank or compartment outlet; and the operating mechanism for such valve or valves shall be provided with a secondary closing mechanism remote from tank filling openings and discharge faucets, for operation in the event of fire or other accident. Such control mechanism shall be provided with a fusible section which will cause the valve to close automatically in case of fire, and the critical temperature for the fusing of such section shall not exceed two hundred degrees Fahrenheit (200° F.).

§ 78.323–22 *Shear section.* (a) There shall be provided between each shut-off valve seat and discharge faucet a shear section which will break under strain, unless the discharging piping is so arranged as to afford equivalent protection, and leave the shut-off valve seat intact in case of accident to the discharge faucet or piping.

§ 78.323–23 *Protection of valves and faucets.* (a) Draw-off valves and faucets projecting beyond the frame, or if the vehicle be frameless, beyond the shell, at the rear, shall be adequately protected by steel bumpers or other equally effective devices, against collision.

§ 78.323–24 *Overturn protection.* (a) All closures for filling openings shall be protected from damage in the event of overturning of the motor vehicle, by being enclosed within the body of the tank or a dome attached thereto, or by the use of suitable metal guards securely attached to the tank or the frame of the motor vehicle.

§ 78.324 *Specification MC 303; Cargo tanks constructed of welded ferrous alloy (high-tensile steel).* To be mounted on and to form part of tank motor vehicles for transportation of flammable liquids, and poisonous liquids, class B.

§ 78.324–1 *Scope.* (a) This specification is primarily designed to apply to cargo tanks of tank motor vehicles to be used for the transportation of flammable liquids, or poisonous liquids, class B, and, though not mandatory for tanks or for motor vehicles for the transportation of liquids having flash points above eighty degrees Fahrenheit (80° F.), it is recommended that such liquids be transported in tanks and on tank motor vehicles having characteristics equal or superior to the requirements set forth in this specification.

§ 78.324–2 *Existing tank motor vehicles continuing in service*—(a) *Specification tanks of tank motor vehicles.* Tanks of tank motor vehicles used for the transportation of flammable liquids or poisonous liquids which shall have been in service prior to June 15, 1940, may be continued in service provided that they have been designed and constructed in accordance with the requirements of Specification No. 1001, 1937 edition, of the American Petroleum Institute, or in accordance with the requirements of specifications of the National Fire Protection Association, 1929 or 1933 edition.

(b) *Existing nonspecification tanks of tank motor vehicles.* Tanks of tank motor vehicle used for the transportation of flammable liquids or poisonous liquids not meeting the requirements set forth in paragraph (a) of this section which shall have been in service prior to June 15, 1940, may be continued in service, provided that they fulfill the requirements set forth under §§ 78.324–6 to 78.324–8; and that they be provided with the accessories as specified in §§ 78.324–16, 78.324–17 (a), and 78.324–18 to 78.324–22.

§ 78.324–3 *New tank motor vehicles.* (a) Except as provided in § 78.324–4, every new tank of a tank motor vehicle acquired by a motor carrier on or after June 15, 1940, for the transportation of any flammable liquid or poisonous liquid shall comply with the requirements of this specification. A certificate from the manufacturer of the cargo tank, or from a competent testing agency, certifying that each such tank is designed and constructed in accordance with the requirements of the specification shall be procured, and such certificate shall be retained in the files of the carrier during the time that such tank motor vehicle is employed in the transportation of flammable liquids or poisonous liquids by him. In lieu of this certificate, if the motor carrier himself elects to ascertain if any such tank fulfills the requirements of the specification by his own test, he shall similarly retain the test data.

§ 78.324–4 *Novel tanks of tank motor vehicles, special authorization.* (a) The Commission may, upon written request for such authorization by a motor carrier, authorize the use of limited numbers, and for limited times, of new tank motor vehicles which fail to meet the requirements of this specification. In the event of such authorization, the carrier shall furnish those details concerning the design and construction of the tank as seem necessary for the determination of its ability safely to transport flammable liquids or poisonous liquids.

§ 78.324–5 *Marking of cargo tanks.* (a) *Metal identification plate.* On and after January 1, 1941, there shall be on every cargo tank a metal plate located on the right side, near the front, in a

place readily accessible for inspection. This plate shall be permanently affixed to the tank by means of soldering, brazing, welding, or other equally suitable means; and upon it shall be marked by stamping, embossing, or other means of forming letters into or on the metal of the plate itself, in the manner illustrated below, at least the information indicated below. The plate shall not be so painted as to obscure the markings thereon.

Carrier's serial number.[5]

Manufactuer's name.[6]

Date of manufacture.[6]

I C C MC * * *.[7]

Nominal tank cap'y ---- U. S. gallons.

(b) *Test date markings.* The date of the last test or retest required by this specification and the due date of the next required routine test or retest shall be painted on the tank in letters not less than 1¼ inches high, in legible colors, immediately below the metal identification plate specified in paragraph (a) of this section.

(c) *Certification by markings.* The markings specified in paragraphs (a) and (b) of this section shall serve to certify that the information thereby set forth is correct.

§ 78.324–6 *No hazardous repairs on loaded motor vehicles.* (a) None of the repairs required by Part 6 of Motor Carrier Safety Regulations to be made, or any other repairs, shall be performed on any motor vehicle containing any flammable liquid or poisonous liquid, or on a cargo tank, whether empty or loaded, except in such cases that such repair can be made without hazard; nor shall any such loaded motor vehicle be repaired in a closed garage.

§ 78.324–7 *No repair with flame unless gas-free.* (a) No repair of a cargo tank used for the transportation of any flammable liquid or poisonous liquid or any compartment thereof, or of any container for fuel of whatever nature, may be repaired by any method employing a flame, arc, or other means of welding, unless the tank or compartment shall first have been made gas-free.

§ 78.324–8 *Times of retesting of cargo tanks.* Every cargo tank used for the transportation of any flammable liquid or poisonous liquid shall be tested or retested as follows:

(a) *Tank out of service one year or more.* Every cargo tank which has been out of transportation service for a period of one year or more shall not be returned again to or placed in such service until it shall successfully have fulfilled the requirements set forth under § 78.324–9.

(b) *Nonspecification tanks.* Every cargo tank not complying with the requirements of Specification No. 1001, 1937 edition, of the American Petroleum Institute, specifications of the National Fire Protection Association, 1929 or 1933, or this specification, shall be tested at least once in every calendar year and shall successfully fulfill the requirements set forth under § 78.324–9. No two such required tests shall be closer together than 6 months.

(c) *Specification tanks.* Every cargo tank complying with the requirements of Specification No. 1001, 1937 edition of the American Petroleum Institute, specifications of the National Fire Protection Association, 1929 or 1933, or this specification, shall be tested at least once in every 5-year period. If tested no oftener than once in every 5 years, at least one such test shall be made in the last year of any such 5-year period. The time of reckoning for such testing of such cargo tanks shall be from the time of the last test made in accordance with the requirements set forth under § 78.324–9; and if no such tests have ever been made, such tanks shall be tested within 6 months after June 15, 1940.

(d) *Novel cargo tanks.* Every cargo tank which shall have been authorized by this Commission for transportation of flammable liquids or poisonous liquids under the provisions of § 78.324–4 shall be tested under requirements specifically set forth in the terms of such authorization.

(e) *Testing following accidents.* Every cargo tank capable of suitable repair following any accident in which a tank motor vehicle may have been involved shall be retested in accordance with the requirements set forth under § 78.324–9, if the cargo tank has itself been damaged in a manner likely to affect the safety of operation of the tank motor vehicle, or if the damage to the tank motor vehicle is such as to make the safety of the cargo tank uncertain.

(f) *Special testing required by the Commission.* Upon the showing of probable cause of the necessity for retest, the Commission may, in its discretion, cause any cargo tank to be retested in accordance with the requirements of § 78.324–9 at any time.

§ 78.324–9 *Test for leaks.* (a) Every cargo tank shall be tested by a minimum air or hydrostatic pressure of 3 pounds per square inch gauge applied to each compartment and dome, or to whole tank and dome if it be not divided into compartments. Such pressure shall be maintained for a period of at least 5 minutes, during which, if the test is by air pressure, the entire exterior surface of all of 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. For hydrostatic pressure test, each cargo tank shall be tested by filling each compartment and dome, or whole tank and dome if it be not divided into compartments, with water or other liquid having a similar viscosity, the temperature of which shall not exceed 100° F. during the test, and applying a pressure of 3 pounds per square inch gauge to each compartment and dome, or whole tank and dome if it be not divided into compartments. Hydrostatic pressure, if used, shall be gauged at the top of the tank; and the tank shall be inspected for the issuance of liquid to indicate leaks. All closures shall be in place while test by either method is made. During these tests, operative relief devices shall be clamped, plugged, or otherwise rendered inoperative; such clamps, plugs, and similar dedevices shall be removed immediately after the test is finished. Any leakage discovered by either of the methods above described, or by any other method, shall be deemed evidence of failure to meet the requirements of this specification. Tanks failing to pass this test shall be suitably repaired, and the above described tests shall be continued until no leaks are discovered, before any cargo tank is put into service.

(b) Every cargo tank to which this specification applies shall be tested by pressures prescribed in paragraph (a) of this section and shall withstand such pressure without undue distortion, evidence of impending failure, or failure. Failure to meet this requirement shall be deemed as sufficient cause for rejection under this specification. If there is undue distortion, or if failure impends or occurs, the cargo tank shall not be returned to service unless a suitable repair is made. The suitability of the repair should be determined by the same method of test.

§ 78.324–10 *Workmanship, general.* (a) Every cargo tank shall be constructed in accordance with the best known and available practices, in addition to the other requirements of this specification.

§ 78.324–11 *Material.* (a) All sheets for such cargo tanks shall be of ferrous alloy, commonly known as high-tensile steel, meeting the following minimum requirements:

Yield point	50,000 lb. per sq. in.
Ultimate strength	65,000 lb. per sq. in.
Elongation, 2-inch sample	20 percent.

§ 78.324–12 *Thickness of sheets.* (a) 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; by the distance between successive bulkheads in the case of bulkhead sheets; 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:

[5] Carriers are not required to number their tanks serially; any designation regularly used by the carrier to identify the tank may be put in this space.

[6] In the event the identity of the tank manufacturer or the date of manufacture is not known and cannot be ascertained, the spaces indicated shall be marked "MAKE UNKNOWN" and or "DATE OF MANUFACTURE UNKNOWN".

[7] Substitute "A P I SPEC 1001, 1937", or "N F P A SPEC 1929" (or 1933), or "NO SPECIFICATION", or the MC specification applicable, if appropriate.

TABLE 1—THICKNESS OF HEAD AND BULKHEAD SHEETS

Distances between bulkhead attachments to shell in inches	Volume capacity of tank in gallons per inch of length									
	6 or less		Over 6 to 10		Over 10 to 14		Over 14 to 18		Over 18	
	Bulkheads (dished, corrugated, or reinforced) sheet thickness in United States gauge numbers and number of inches depending upon distances between bulkhead attachments to shell									
	Gauge No.	In. appr.	Gauge No.	In. appr.	Gauge No.	In. appr.	Gauge No.	In. appr.	Gauge No.	In. appr.
30 inches or less	17	0.056	16	0.062	15	0.070	14	0.078	13	0.094
Over 30 inches	16	.062	15	.070	14	.078	13	.094	12	.109
	Bulkheads (flat without reinforcement) sheet thicknesses in United States gauge numbers and number of inches depending upon distances between bulkhead attachments to shell									
30 inches or less	15	0.070	14	0.078	13	0.094	12	0.109	11	0.125
Over 30 inches	14	.078	13	.094	12	.109	11	.125	10	.141

TABLE 2—THICKNESS OF SHELL SHEETS

Distance between bulkheads, baffles, or other shell stiffeners	Volume capacity of tank in gallons per inch of length									
	6 or less		Over 6 to 10		Over 10 to 14		Over 14 to 18		Over 18	
	Shell-sheet thicknesses in United States gauge and number of inches for that portion of the shell rolled to a radius of less than 70 inches, depending on spacing of shell stiffeners									
	Gauge No.	In. app.	Gauge No.	In. app.	Gauge No.	In. app.	Gauge No.	In. app.	Gauge No.	In. app.
20 inches or less	19	0.044	18	0.050	17	0.056	16	0.062	15	0.070
Over 20 inches to 36 inches	18	.050	17	.056	16	.062	15	.070	14	.078
Over 36 inches to 56 inches	17	.056	16	.062	15	.070	14	.078	13	.094
Over 56 inches	16	.062	15	.070	14	.078	13	.094	12	.109
	Shell-sheet thicknesses in United States gauge and number of inches for that portion of the shell rolled to a radius of 70 inches or more but less than 90 inches, depending on spacing of shell stiffeners									
20 inches or less	18	0.050	17	0.056	16	0.062	15	0.070	14	0.078
Over 20 inches to 36 inches	17	.056	16	.062	15	.070	14	.078	13	.094
Over 36 inches to 56 inches	16	.062	15	.070	14	.078	13	.094	12	.109
Over 56 inches	15	.070	14	.078	13	.094	12	.109	11	.125
	Shell-sheet thicknesses in United States gauge and number of inches for that portion of the shell rolled to a radius of 90 inches or more but less than 125 inches, depending on spacing of shell stiffeners									
20 inches or less	17	0.056	16	0.062	15	0.070	14	0.078	13	0.094
Over 20 inches to 36 inches	16	.062	15	.070	14	.078	13	.094	12	.109
Over 36 inches to 56 inches	15	.070	14	.078	13	.094	12	.109	11	.125
Over 56 inches	14	.078	13	.094	12	.109	11	.125	10	.141
	Shell-sheet thicknesses in United States gauge and number of inches for that portion of the shell rolled to a radius of 125 inches or more depending upon spacing of shell stiffeners									
20 inches or less	16	0.062	15	0.070	14	0.078	13	0.094	12	0.109
Over 20 inches to 36 inches	15	.070	14	.078	13	.094	12	.109	11	.125
Over 36 inches to 56 inches	14	.078	13	.094	12	.109	11	.125	10	.141
Over 56 inches	13	.094	12	.109	11	.125	10	.141	9	.156

§ 78.324–13 *Joints*—(a) *Method of joining.* Sheets may be joined by fusion welding, riveting and fusion welding, brazing, or riveting and brazing, at the option of the motor carrier.

(b) *Strength of joints.* The tensile strength of each joint in a tank shall be not less than 85 percent of that of the adjacent metal in the tank. Compliance with this requirement shall be determined by preparing, from materials representative of those to be used in tanks subject to this specification and by the same technique of fabrication, two (2) test specimens conforming to figure as shown below and testing them to failure in tension. One pair of test specimens may represent all the tanks to be made of the same combination of materials, by the same technique of fabrication, and in the same shop, within six (6) months after the tests on such samples have been completed.

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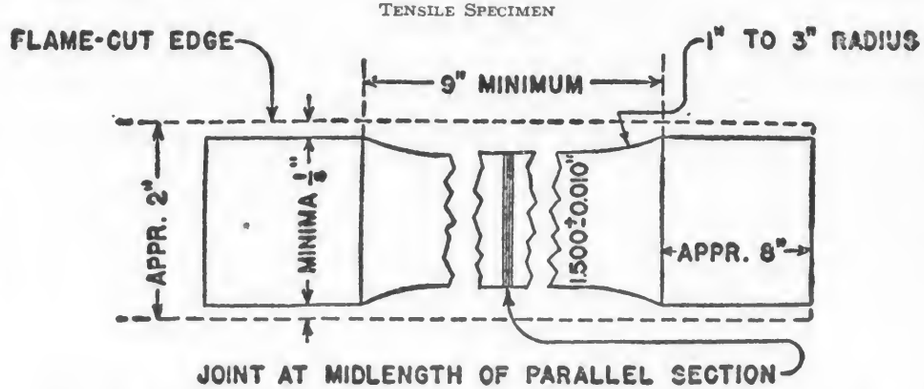

§ 78.324–14 *Pressure test.* (a) The requirements of this section are identical with those set forth in § 78.324–9.

§ 78.324–15 *Marking of cargo tanks by metal plates.* (a) Every cargo tank designed and constructed in accordance with this specification shall be marked on a metal plate with the designation "ICC–MC 303" as set forth in § 78.324–5 (a), together with the other markings therein specified. In addition, the test markings shall be painted on the tank in the manner prescribed in § 78.324–5 (b).

§ 78.324–16 *Tank outlets.* (a) Outlet fixtures of tanks shall be substantially made and attached to the tank in such a manner as to prevent breakage at the outlet point.

§ 78.324–17 *Bulkheads and baffles.*—(a) *When bulkheads not required.* No bulkhead shall be required in any cargo tank regardless of capacity which is designed for service in which there will never be less than eighty percent (80%) of the capacity volume of the tank while in transportation over the highway and which, in service, is to discharge its entire contents at one unloading point.

(b) *Number, dimensions, and capacities of bulkheads and baffles.* Except as provided in paragraph (a) of this section, every cargo tank shall be divided into compartments and/or provided with baffles as follows:

(1) Every cargo tank larger than fifteen hundred (1,500) gallons shall be divided into compartments, the number of which shall be the result of dividing the capacity of the tank in gallons by twelve hundred (1,200) to the nearest whole number.

(2) Every cargo tank, and every compartment of a cargo tank, over ninety inches (90 in.) 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 baffle nearest it, shall in no case exceed sixty inches (60 in.).

(3) Each bulkhead required in this paragraph shall have adequate strength to sustain without undue stress or any permanent set a horizontal force equal to the weight of so much of the contents of the tank as may come between it and any adjacent bulkhead or tank head, applied as a uniformly distributed

load on the surface of the bulkhead or tank head.

(4) Each baffle required in this paragraph shall have at least an area as great as eighty percent (80%) of the cross-sectional area of the tank.

(5) If spaces are provided between compartments, such spaces shall be arranged for venting and for complete drainage at all times .

§ 78.324–18 *Tank vents.* (a) Each tank or tank compartment shall be provided with a vacuum and pressure operated vent with a minimum effective opening of forty-four hundredths of a square inch (0.44 sq. in.), 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 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 two hundred degrees Fahrenheit (200° F.).

§ 78.324–19 *Valve and faucet connections.* (a) All draw-off valves or faucets of tanks and compartments shall have discharge ends threaded, or be otherwise so designed as to insure in every instance a tight connection with the hose extending to the storage fill pipe.

§ 78.324–20 *Emergency discharge control.* (a) Each tank or tank compartment of a bottom-discharge tank shall be equipped with a reliable and effective shut-off valve located inside the shell of the tank or tank compartment in the tank or compartment outlet; and the operating mechanism for such valve or valves shall be provided with a secondary closing mechanism remote from tank filling openings and discharge faucets, for operation in the event of fire or other accident. Such control mechanism shall be provided with a fusible section which will cause the valve to close automatically in case of fire, and the critical temperature for the fusing of such section shall not exceed two hundred degrees Fahrenheit (200° F.).

§ 78.324–21 *Shear section.* (a) There shall be provided between each 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 equivalent protection, and leave the shut-off valve seat intact in case of accident to the discharge faucet or piping.

§ 78.324–22 *Protection of valves and faucets.* (a) Draw-off valves and faucets projecting beyond the frame, or if the vehicle be frameless, beyond the shell, at the rear, shall be adequately protected by steel bumpers or other equally effective devices, against collision.

§ 78.324–23 *Overturn protection.* (a) All closures for filling openings shall be protected from damage in the event of overturning of the motor vehicle, by being enclosed within the body of the tank or a dome attached thereto, or by the use of suitable metal guards securely attached to the tank or the frame of the motor vehicle.

§ 78.324–24 *Tank supports.* (a) The distance from a tank support to the nearest bulkhead, baffle, or other shell stiffener, shall not exceed forty (40) times the thickness of the tank shell at the point of support.

§ 78.330 *Specification MC 310; cargo tanks.* To be mounted on or to form part of tank motor vehicles for the transportation of corrosive liquids.

§ 78.330–1 *Scope.* (a) This specification is primarily designed to apply to cargo tanks of tank motor vehicles to be used for the transportation of corrosive liquids.

§ 78.330–2 *Existing tank motor vehicles continuing in service*—(a) *Specification tank motor vehicles.* Tank motor vehicles used for the transportation of corrosive liquids which shall have been in service prior to June 15, 1940, may be continued in service provided they have been designed and constructed in accordance with the requirements set forth in paragraphs T–117 (a), T–118 (a) and (b), T–120, T–121, T–122, T–123, and T–124, of Regulations for the Transportation of Explosives and Other Dangerous Articles on Public Highways by Motor Truck or Motor Vehicle, approved, adopted, and prescribed by order of this Commission dated November 6, 1934, and vacated on June 15, 1940.

(b) *Existing nonspecification tank motor vehicles.* Tank motor vehicles used for the transportation of corrosive liquids not meeting the requirements set forth in paragraph (a) of this section, which shall have been in service prior to June 15, 1940, may be continued in service provided they fulfill the requirements set forth under § 78.330–6 and are and can be maintained in safe operating condition, but in any event they shall be equipped with at least the accessories as specified in §§ 78.330–15 to 78.330–17, 78.330–18 (b), and 78.330–19.

§ 78.330–3 *New tank motor vehicles.* (a) Except as provided in § 78.330–4, every new tank motor vehicle acquired by a motor carrier on or after June 15, 1940, for the transportation of any corrosive liquid shall comply with the requirements of this specification. A certificate from the manufacturer of the cargo tank, or from a competent testing agency, certifying that each such tank is designed and constructed in accordance with the requirements of this specification, shall be procured, and such certificate shall be retained in the files of the carrier during the time that such tank is employed in the transportation of corrosive liquids by him. In lieu of this certificate, if the motor carrier himself elects to ascertain if any such tank fulfills the requirements of this specification by his own test, he shall similarly retain the test data.

§ 78.330–4 *Novel tank motor vehicles, special authorization.* (a) The Commission may, upon written request for such authorization by a motor carrier, authorize the use of limited numbers, and for limited times, of new tanks which fail to meet the requirements of this specification. In the event of such request for authorization, the carrier shall furnish those details concerning the design and construction of the tank as seem necessary for the determination of its ability safely to transport corrosive liquids.

§ 78.330–5 *Marking of cargo tanks*—(a) *Metal identification plate.* On the right side, near the front, and in a place readily accessible for inspection, there shall be on every cargo tank a metal plate. This plate shall be permanently affixed by means of soldering, brazing, welding, or other suitable means; and upon it shall be marked by stamping, embossing, or other means of forming letters into or on the metal of the plate itself in the manner illustrated below, at least the information indicated below. The plate shall not be so painted as to obscure the markings thereon.

Carrier's Serial Number [11]

Manufacturer's Name [12]

Date of Manufacture [12]

ICC MC 310 [13]

Nominal Cap'y _____ U. S. Gallons

(b) *Test date markings.* The date of the last test or retest required by this specification and the due date of the next required routine test or retest shall be painted on the tank in letters not less than 1¼ inches high, in legible colors, immediately below the metal identification plates specified in paragraph (a) of this section.

(c) *Certification by markings.* The markings specified in paragraphs (a) and (b) of this section shall serve to certify that the information thereby set forth is correct.

§ 78.330–6 *Times of retesting of cargo tanks.* Every cargo tank used for the transportation of any corrosive liquid shall be tested or retested as follows:

(a) *Tanks out of service one year or more.* Every cargo tank which has been out of transportation service for a period of one year or more shall not be returned again to or placed in such service until it shall have successfully fulfilled the requirements set forth under § 78.330–7.

(b) *Nonspecification tanks.* Every cargo tank not complying with the requirements set forth in § 78.330–2 or with the requirements of §§ 78.330–1 to 78.330–7, incl., shall be tested at least once in every calendar year, and shall successfully fulfill the requirements set forth under § 78.330–7. No two such required tests shall be closer together than 6 months.

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[11] Carriers are not required to number their tanks serially; any designation regularly used by the carrier to identify the tanks may be put in this space.

[12] In the event the identity of the tank manufacturer or the date of manufacture is not known and cannot be ascertained, the spaces indicated shall be marked "MAKE UNKNOWN" and/or "DATE OF MANUFACTURE UNKNOWN."

[13] Substitute "ICC SPEC–T–118," or "ICC 7.5–S–1," or "NO SPECIFICATION," as appropriate.

(c) *Specification tanks.* Every cargo tank complying with the requirements set forth in § 78.330–2 (a) or §§ 78.330–1 to 78.330–7 incl. shall be tested at least once in every 5-year period. If tested no oftener than once every 5 years, at least one such test shall be made in the last year of any such 5-year period. The time of reckoning of such testing of such cargo tanks shall be from the time of the last test made in accordance with the requirements set forth under § 78.330–7; and if no such tests have ever been made, such tanks shall be tested within 6 months after June 15, 1940.

(d) *Novel cargo tank.* Every cargo tank which shall have been authorized by this Commission to transport corrosive liquids under the provisions of § 78.330–4 shall be tested under requirements specifically set forth in the terms of such authorization.

(e) *Testing following accidents.* Every cargo tank capable of suitable repair following any accident in which a tank motor vehicle may have been involved shall be retested in accordance with the requirements set forth under § 78.330–7 if the cargo tank has itself been damaged in a manner likely to affect the safety of operation of the motor vehicle, or if the damage to the tank motor vehicle is such as to make the safety of the cargo tank uncertain.

(f) *Special testing required by the Commission.* Upon the showing of probable cause of the necessity for retest, the Commission may, in its discretion, cause any cargo tank to be retested in accordance with the requirements of § 78.330–7 at any time.

§ 78.330–7 *Method of testing*—(a) *Test for leaks; cargo tanks.* Every cargo tank shall be tested by completely filling the tank and dome with water or other liquid having a similar viscosity, the temperature of which shall not exceed 100° F. during the test, and applying a pressure of 1½ times designed working pressure but not less than 10 pounds per square inch gauge. The tank must hold the prescribed pressure for at least 10 minutes without leakage or evidence of distress. All closures shall be in place while test is made, and the pressure shall be gauged at the top of tank.

(b) *Test for distortion or failure.* Every cargo tank shall be tested by the pressures prescribed in paragraph (a) of this section and shall withstand such pressures without undue distortion or other indication of impending failure. If there is undue distortion, or if failure impends or occurs, the cargo tank shall not be returned to service unless a suitable repair is made. The suitability of the repair shall be determined by the same method of test.

§ 78.330–8 *Must comply with A. S. M. E. Code.* (a) Tanks built under this specification shall be designed and constructed in accordance with and fulfill all requirements of section VIII of the Code for Unfired Pressure Vessels of the American Society of Mechanical Engineers, 1940 edition, which is hereinafter referred to as "the Code."

(b) *When divided into compartments.* When the interior of the tank is divided into compartments, each compartment shall be designed, constructed, tested, and retested as a separate tank.

§ 78.330–9 *Material.* (a) As specified in paragraphs U–12, U–13, and U–20 of the A. S. M. E. Code for Unfired Pressure Vessels, 1949 Edition, no revisions. Tanks may be constructed of ferrous materials listed in Table U–2 including the stainless steels or of nickel or nickel alloys as listed in Table U–3 of the Code. Use of other materials listed in Table U–3 may be authorized by the Commission upon submission of satisfactory supporting data.

(b) *Lining.* Except as provided in paragraph (c) of this section, the material used for lining each cargo tank subject to this specification shall be homogeneous, nonporous, imperforate when applied, not less elastic than the metal of the tank proper, and substantially immune to attack by the commodities to be transported therein. It shall be of substantially uniform thickness, not less than $\frac{1}{32}$ inch thick if metallic, and not less than $\frac{1}{16}$ inch thick if nonmetallic, and shall be directly bonded or attached by other equally satisfactory means. Joints and seams in the lining shall be made by fusing the material together, or by other equally satisfactory means. The interior of the tank shall be free from scale, oxidation, moisture, and all foreign matter during the lining operation.

(c) *Conditions under which tanks need not be lined.* Tanks need not be lined as provided in paragraphs (b) of this section, if:

(1) the material of the tank is substantially immune to attack by the materials to be transported therein.

(2) the material of the tank is thick enough to withstand 10 years' normal service without being reduced at any point to less thickness than that specified in § 78.330–10 corresponding to its capacity, or

(3) the chemical reaction between the material of the tank and the commodity to be transported therein is such as to allow the tank to be properly passified or neutralized as set forth elsewhere in this appendix; or

(4) for the transportation of hydrofluoric acid of sixty percent (60%) or higher concentration, they be passified in the following or an equally effective method: By filling the tank to not less than ninety percent (90%) of its capacity with hydrofluoric acid of fifty-eight percent (58%) strength and allowing it to stand at least forty-eight (48) hours at a temperature of eighty degrees Fahrenheit (80° F.), then seven (7) hours at one hundred forty degrees Fahrenheit (140° F.), the internal pressure being maintained at atmospheric pressure the meanwhile.

§ 78.330–10 *Thickness of metal.* (a) The minimum thickness of metal for cargo tanks shall be as follows:

Tank capacity:	*Minimum thickness (inches)*
Not more than 1,200 gallons	¼
Over 1,200 to 1,800 gallons	5/16
Over 1,800 gallons	⅜

§ 78.330–11 *Joints.* (a) All joints and seams formed in the manufacture of any cargo tank shall be made tight by welding, riveting, riveting and welding, brazing, or riveting and brazing, at the option of the motor carrier, subject to the limitation that any of the aforesaid methods are permissible only when any one of them or combination as used in the tank is not subject to adverse action by the nature of the corrosive liquid which is to be transported in such tank.

§ 78.330–12 *Pressure tests*—(a) *Tanks.* Each completed cargo tank shall be tested before being put into transportation service by completely filling the tank and dome with water or other liquid having a similar viscosity, the temperature of which shall not exceed one hundred degrees Fahrenheit (100° F.) during the test, and applying a pressure of one and one-half (1½) times the working pressure of the tank (minimum pressure, ten pounds per square inch (10 lbs./sq. in.) gauge). The tank shall be capable of holding the prescribed pressure for at least ten (10) minutes without leakage, evidence of impending failure, or failure. All closures shall be in place while the test is made, and the pressure shall be gauged at the top of the tank.

§ 78.330–13 *Marking of cargo tanks by metal plates.* (a) Every cargo tank designed and constructed in accordance with this specification shall be marked on a metal plate with the designation "ICC–MC 310" as set forth in § 78.330–5 (a), together with the other markings therein specified. In addition, the test markings shall be painted on the tank in the manner prescribed in § 78.330–5 (b).

§ 78.330–14 *Tank outlets*—(a) *No bottom outlets.* No tanks, except those used for shipments of sludge acid or alkaline corrosive liquids, may have bottom discharge outlets.

(b) *Bottom outlets.* Bottom outlets or bottom wash-out chambers shall be of metal not subject to rapid deterioration by the lading, and each shall be provided with a valve or plug at its upper end and a liquid tight closure at its lower end. Every such valve or plug shall be such as to insure against unseating due to stresses or shocks incident to transportation.

(c) *Bottom wash-out chambers.* Tanks may be equipped with bottom wash-out chambers.

§ 78.330–15 *Venting, gauging, loading, and air inlet devices.* (a) When installed, venting, gauging, loading, and air inlet devices, including their valves, shall be provided with adequate means for their secure closure; and means shall also be provided for the closing of pipe connections of valves.

§ 78.330–16 *Shear section.* (a) There shall be provided between each 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 equivalent protection, and leave the shut-off valve seat intact in case of accident to the discharge faucet or piping.

§ 78.330–17 *Protection of valves.* (a) Draw-off valves and fittings of cargo

tanks projecting beyond the frame, or if the vehicle be frameless, beyond the shell, at the rear, shall be adequately protected by steel bumpers or other equally effective devices, against collision.

§ 78.330–18 *Fixtures, reinforcements, and other attachments not specified.* (a) All external attachments to any cargo tank shall be made of materials specified in "the Code" and constructed and attached as therein specified.

(b) *Heater coils.* Heater coils, when installed, shall be so constructed that the breaking off of their external connections will not cause leakage of contents of tanks.

§ 78.330–19 *Closures for manholes.* (a) The manhole cover shall be designed to provide a secure closure of the manhole. All covers, not hinged to the tanks, shall be attached to the outside of the dome by at least ⅛ inch chain or its equivalent. All joints between manhole covers and their seats shall be made tight against leakage of vapor and liquid by use of gaskets of suitable material not subject to attack by the corrosive liquid to be transported in the tank.

§ 78.336 *Specification MC 330; steel cargo tanks.*

§ 78.336–1 *Requirements for design and construction.* (a) Tanks shall be of seamless or welded steel construction or combination of both and shall be designed and constructed in accordance with and fulfill the requirements of (1) Section VIII of the Code for Unfired Pressure Vessels of the American Society of Mechanical Engineers, 1949 Edition, except that construction under Par. U-70 is not authorized; or (2) Section VIII of the Code for Unfired Pressure Vessels of the American Society of Mechanical Engineers, 1950 Edition; or (3) the A. P. I.-A. S. M. E. Code for Unfired Pressure Vessels for Petroleum Liquids and Gases, 1943 Edition (any or all of which hereinafter referred to as "the Code").

(b) Except as noted below, all openings in the tank shall be grouped in one location, either at the top of the tank or at one end of the tank.

Exceptions: (1) The openings for liquid level gauging devices, or for safety devices, may be installed separately at the other location or in the side of the shell; (2) One plugged opening of 2-inch National Pipe Thread or less provided for maintenance purposes may be located elsewhere; (3) Loading and unloading connections may be located in the bottom of the tank.

§ 78.336–2 *Material.* (a) All material used for the construction of the tank and appurtenances shall be suitable for use with the commodity to be transported therein.

(b) Material of thickness less than 3/16 inch shall not be used for the shell, heads, and protective housings specified in § 78.336–5.

§ 78.336–3 *Design working pressure.* (a) The design working pressure of a tank authorized under this specification shall be not less than the vapor pressure of the commodity contained therein at 115° F., or as prescribed for a particular commodity by Part 73 of this chapter, except that in no case shall the design working pressure of any container be less than 100 psig nor more than 500 psig. When corrosion factor is prescribed by these regulations, the wall thickness of the tank calculated in accordance with the "Code" (see § 78.336–1 (a)) shall be increased by 20 percent or 0.10 inch, whichever is less.

NOTE 1. The term "design working pressure" as used in this specification is identical to the term "Maximum allowable working pressure" as used in the "Code" (see § 78.336–1 (a)).

§ 78.336–4 *Provisions for anchoring tanks to motor vehicles.* (a) Except as provided in paragraph (c) of this section, adequate "hold-down" devices shall be provided which will anchor each tank used as part of any motor vehicle in a suitable and safe manner that will not introduce undue concentration of stresses. These devices shall incorporate turnbuckles or similar positive devices for drawing the tank down tight on the frame of the motor vehicle. Suitable stops or anchors shall be attached to the motor vehicle and the tank to prevent relative movement between them due to stopping, starting, or changes in direction.

(b) The means of attachment of any tank to the cradle, frame, or chassis of a motor vehicle shall be designed with a factor of safety of not less than four, and be built to withstand loadings in any direction equal to two times the weight of the tank and attachments when filled with water.

(c) Whenever any tank motor vehicle is so designed and constructed that the cargo tank constitutes in whole or in part the stress member used in lieu of a frame, then such cargo tanks shall be designed so as successfully and adequately to withstand the stresses thereby imposed in addition to those covered by "the Code" (see § 78.336–1 (a)).

(d) Stops and anchors shall be installed so as to be readily accessible for inspection and maintenance, except that for lagged tanks lagging is permitted to cover such areas.

§ 78.336–5 *Protection of valves and accessories.* (a) All valves, fittings, accessories, safety devices, gauging devices, and the like shall be adequately protected against mechanical damage by a housing closed with a cover plate. Exceptions: (1) Liquid and vapor valves, fittings, and accessories installed in the bottom of the tank shall be adequately protected against mechanical damage, but the housing and cover plate may be omitted. (2) In lieu of a housing closed with a cover plate, tanks used for the transportation of carbon dioxide may have all valves, piping, fittings, accessories, safety devices, gauging devices, and the like installed within the motor vehicle framework, or a suitable collision-resisting subframe, guard or housing.

(b) Protective housing shall comply with the requirements under which the tanks are fabricated with respect to design and construction, and shall be designed with a minimum factor of safety of four to withstand loadings in any direction equal to two times the weight of the tank and attachments when filled with water.

(c) Requirements concerning types of valves, retesting, and qualification of cargo tanks contained in §§ 73.33 and 73.315 of this chapter must be observed.

§ 78.336–6 (a) *Name plate.* In addition to the markings required by the "Code" (See § 78.336–1 (a)) under which tanks were constructed, they shall have permanently affixed, on one of the heads of the tank, a metal plate. This plate shall be permanently affixed by means of soldering, brazing, or welding around its perimeter. Neither the plate itself nor the means of attachment to the tank shall be subject to destructive attack by the contents of tank. On unlagged tanks the plate shall be in a place readily accessible for inspection. On lagged tanks an additional identical plate shall be permanently affixed to the jacket readily accessible for inspection. Upon such plate shall be plainly marked by stamping, embossing, or other means of forming letters into or onto the metal of the plate itself the following information in characters at least ⅜ inch high:

Manufacturer's Name _____ Serial No_____
Owner's Serial Number_____
I. C. C. Specification Number_____
Water capacity (pounds)_____
Tare weight (pounds)_____
Design working pressure (psig)_____
Original test date_____
Tank retested at_____(psig) on_____

(b) All tank outlets and inlets, except safety relief valves, shall be marked to designate whether they communicate with vapor or liquid when the tank is filled to the maximum permitted filling density.

§ 78.336–7 *Report.* (a) A copy of the manufacturer's data report required by the "Code" (See § 78.336–1 (a)) under which the tank is fabricated shall be furnished for each new tank to the owner and the Bureau of Explosives, 30 Vesey St., N. Y., N. Y. In addition, the manufacturer or owner shall register each tank with the Bureau of Explosives in the following form:

Place_____
Date _____

Cargo tank

Manufactured for_____Company
Location_____
Manufactured by_____Company
Location_____
Consigned to_____Company
Location_____
Size_____feet outside diameter by_____long.
Marks on tank as prescribed by § 78.336–6 of this specification are as follows:
Manufacturer's name_____
Serial number_____
Owner's Serial Number_____
I. C. C. specification_____
Code symbol_____
Date of manufacture_____
Water capacity (pounds)_____
Tare weight (pounds)_____
Design working pressure (psig)_____

It is hereby certified that this tank is in complete compliance with the requirements of ICC Specification No_____.

(Signed)_____
Manufacturer or owner.

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