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**Code for the Manufacture,
Transportation, Storage and Use of
EXPLOSIVES and BLASTING AGENTS**

MAY
1962



Sixty Cents

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NATIONAL FIRE PROTECTION ASSOCIATION
International

60 Batterymarch Street, Boston 10, Mass.

National Fire Protection Association

International

The National Fire Protection Association was organized in 1896 to promote the science and improve the methods of fire protection. Its membership includes national and regional societies and associations (list on outside back cover) and twenty thousand individuals, corporations, and organizations. Anyone interested may become a member; the annual dues are \$15.00. Full membership information is available on request.

This is one of a large number of publications on fire safety issued by the Association. All NFPA standards and recommended practices, including this text, are prepared by the technical committees of the NFPA and adopted at an Annual Meeting of the Association. They are intended to prescribe reasonable measures for minimizing losses of life and property by fire.

This text and most other NFPA standards and recommended practices are published in the **National Fire Codes**, a compilation of NFPA's official technical material, issued in seven clothbound volumes. Full information on the availability of these Codes and other NFPA publications can be secured from the Association.

Official NFPA Definitions

SHALL is intended to indicate requirements.

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

APPROVED refers to approval by the authority having jurisdiction.

Units of measurements used here are U. S. standard. 1 U. S. gallon = 0.83 Imperial gallons = 3.785 liters. One foot = 0.3048 meters. One inch = 25.40 millimeters. One pound per square inch = 0.06805 atmospheres = 2.307 feet of water.

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CODE FOR THE MANUFACTURE, TRANSPORTATION, STORAGE, AND USE OF EXPLOSIVES AND BLASTING AGENTS

NFPA No. 495—1962

This Code, prepared by the NFPA Committee on Chemicals and Explosives, was first adopted on July 13, 1959 by the NFPA Board of Directors on authorization of the Annual Meeting of that year. Following reorganization of the committee in 1960, the Sectional Committee on Explosives was assigned responsibility for amendments to this Standard. Amendments were adopted at the 1962 Annual Meeting. The Code supersedes the Suggested Explosives Ordinance for Cities adopted by the Association in 1941, and also the original ordinance adopted by the NFPA in 1912. For amendments adopted in 1962, see page 495-4.

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COMMITTEE ON CHEMICALS AND EXPLOSIVES

Dr. Robert W. Van Dolah, *Chairman*,Explosives Research Laboratory, Bureau of Mines, U. S. Department of the Interior,
4800 Forbes Ave., Pittsburgh 13, Pa.**Chester I. Babcock, † *Secretary*,**

National Fire Protection Assn., 60 Batterymarch St., Boston 10, Mass.

D. R. Abbey, Don Mills, Ont., Canada.
(Personal)**Charles W. Bahme**, Northridge, Calif.
(Personal)**Arthur G. Baker**, Mutual Fire Inspection
Bureau of New England.**W. J. Baker**, Conference of Special Risk Under-
writers.**Mathew M. Braidech**, American Chemical
Society and National Board of Fire Under-
writers.**W. J. Burns**, Munitions Carriers Conference.**John D. Cook**, National Automatic Sprin-
kler and Fire Control Assn.**Dr. Glenn H. Damon**, U. S. Dept. of the
Interior.**Donald A. Diehl**, Compressed Gas Assn.**W. H. Doyle**, Factory Insurance Assn.**R. E. Dufour**, Underwriters' Laboratories,
Inc.**Thomas E. Duke**, Fire Prevention & Engi-
neering Bureau of Texas.**Howard H. Fawcett**, General Electric Co.
(Personal)**Reynold J. Green**, Manufacturing Chem-
ists' Assn., Inc.**Wm. E. Grubert**, Conference of Special Risk
Underwriters.**Wm. G. Hayne**, New York Board of Fire
Underwriters.**Deputy Chief Raymond M. Hill**, Fire
Marshals Assn. of North America.**John Hommes**, Western Actuarial Bureau.**Joseph A. Houghton**, Liberty Mutual Fire
Ins. Co. (Personal)**Garrett B. James, Sr.**, W. H. Markham &
Co. (Personal)**P. E. Johnson**, Factory Mutual Engineering
Division.**R. W. Klefer**, Union Carbide Chemicals Co.
(Personal)**Wm. B. Larkin**, San Diego 6, Calif. (Per-
sonal)**Dr. Richard Y. LeVine**, Olin Mathieson
Chemical Corp. (Personal)**M. W. Marx**, Manufacturing Chemists'
Assn., Inc.**Charles H. Mayhood**, Manufacturing Chem-
ists' Assn., Inc.**F. J. McClain**, Factory Insurance Assn.**W. G. McKenna**, Bureau of Explosives.**Asst. Chief Norman Nordwick**, Fire
Marshals Assn. of North America.**Russell P. Northup**, National Electrical
Manufacturers Assn.**Capt. Harry J. Parker**, National Cargo
Bureau.**Roy Petersen**, American Assn. of Port
Authorities.**S. J. Porter**, Spencer Chemical Co. (Per-
sonal)**H. T. Rittman**, Institute of Makers of
Explosives.**Rudolph Schmidt, Jr.**, Assn. of Casualty
& Surety Cos.**R. H. Scott**, General Electric Co. (Personal)**Eric Shackleton**, Underwriters' Labora-
tories of Canada.**Major Carroll E. Shaw**, Fire Marshals
Assn. of North America.**Charles J. Shukes**, Cook County Inspection
Bureau.**Charles B. Smith**, U. S. Coast Guard.**Herman H. Spaeth**, Pacific Fire Rating
Bureau.**A. W. Strahorn**, Institute of Makers of
Explosives.**Paul T. Truitt**, National Plant Food Insti-
tute.**F. W. Wischmeyer**, Eastman Kodak Co.
(Personal)

ALTERNATE.

Charles Anthony, Compressed Gas Assn. (Alternate to Donald A. Diehl.)

†Non-voting Member

SECTIONAL COMMITTEE ON EXPLOSIVES.

H. T. Rittman, *Chairman*,**W. J. Burns****G. H. Damon****Wm. G. Hayne****Raymond M. Hill****Wm. B. Larkin****W. G. McKenna****S. J. Porter****Carroll E. Shaw****A. W. Strahorn****Robert W. Van Dolah**

FOREWORD

This Code is intended to provide regulations for reasonable safety in the manufacture, storage, transportation, and use of explosives and blasting agents of the type where common usage is incidental to mining, quarrying, road building, harbor improvement, and similar operations, including their usage on farms. It is also intended to cover special industrial devices and in addition the storage and use of explosives and blasting agents in industrial laboratories and laboratories of technical institutions, colleges and universities. The Code may be used as a guide for the preparation of legal regulations. An Appendix contains Suggested Provisions for Municipal Regulations.

The sale and use (public display) of pyrotechnics is not covered by this Code. A "Model State Fireworks Law" is published by the National Fire Protection Association.

Recommended safe practices on a nation-wide scope have many advantages, particularly as to uniform interpretation and proper application at state and city levels. This Code and the Suggested Provisions for Municipal Legal Regulations, contained in Appendix B, are recommended for promoting safety in intrastate and intracity transportation and handling of explosives. Facilities for the handling of explosives incidental to shipment by water should conform with the regulations of the United States Coast Guard. (See Public Law 562 in Appendix A.)

Explosives are acceptable articles of commerce when properly stabilized, packaged, and marked in accordance with the regulations of the Interstate Commerce Commission and when handled with specified care. Appendix A contains a partial list of explosives which are forbidden and unacceptable for transportation by common carriers.

Explosives present a definite hazard when improperly handled or when involved in a fire, collisions, and similar emergencies, especially to personnel of the fire and police departments who may be called upon for assistance, thus making the application of good practices all the more important.

Reasonable and intelligent application of proper enforcement of recognized safe practices can best be effected when the authorities having jurisdiction have readily available authoritative data covering the commodities to be safeguarded. Following is a list of sources of published information and advisory services.

American Association of Port
Authorities
601 Southern Building
Washington, D. C.

Bureau of Explosives
30 Vesey Street
New York 7, N. Y.

U. S. Government Printing Office
Washington 25, D. C.

Institute of Makers of Explosives
250 East 43rd Street
New York 17, N. Y.

Interstate Commerce Commission
Washington 25, D. C.

Manufacturing Chemists' Associa-
tion, Inc.

1825 Connecticut Ave., N.W.
Washington 9, D. C.

Munitions Carriers Conference, Inc.
1424 Sixteenth Street, N.W.
Washington 6, D. C.

National Board of Fire Underwriters
85 John Street
New York 38, N. Y.

National Cargo Bureau, Inc.
99 John Street
New York 38, N. Y.

National Fire Protection Association
60 Batterymarch Street
Boston 10, Mass.

United States Coast Guard
Washington 25, D. C.

AMENDMENTS ADOPTED IN 1962

311. Revised to clarify exclusions from magazine storage requirements and to add fuse lighters, fuse igniters, and safety fuses to the exclusions.

315. Revised to make it clear that authorization must be obtained from the authority having jurisdiction to store more than 50 pounds of explosives in a Class II magazine at a blasting site.

318. Revised to make it clear that the temporary storage distances apply only at blasting sites.

415. Revised so that the road vehicles in which explosives may be transported agree with recently revised vehicle requirements of the ICC.

511. Revised to clarify who may handle explosives.

533. First sentence giving stemming requirements deleted because the stemming procedure required is not followed except in coal mines, where it is required by Federal regulation.

721. Amended to include mobile equipment among the blasting agent mixing facilities that must comply with the American Table of Distances.

723. Sentence dealing with use of ready-mix trucks for blending while in transit on public highways deleted. Prohibition of this practice transferred to 721, which contains restrictions on locations of all blasting agent mixing facilities.

724. Revised to require retesting of blasting agent sensitivity if the packaging method is changed.

724b. Revised to clarify the intent that no liquid fuel with flash point less than that of No. 2 Diesel fuel oil may be used to make a blasting agent.

A46. Reference added.

CHAPTER 1. SCOPE AND DEFINITIONS

11. SCOPE

111. This Code shall apply to the manufacture, keeping, having, storage, sale, transportation, and use of explosives and blasting agents.

112. It shall not apply to the transportation of explosives or blasting agents when under the jurisdiction of and in compliance with the regulations of the Interstate Commerce Commission, the regulations of the United States Coast Guard, and the regulations of the Civil Aeronautical Board and the Board of Transport Commissioners for Canada. It shall, however, apply to state and municipal supervision as to compliance with federal regulations within the jurisdiction of a state or a municipality.

113. It shall not apply to the shipment, transportation and handling of military explosives by the Armed Forces of the United States, State Militia and the Armed Forces of Canada.

114. It shall not apply to the transportation and use of explosives or blasting agents in the normal and emergency operations of federal agencies such as the Bureau of Mines, the Federal Bureau of Investigation, the Secret Service and equivalent Canadian governmental agencies, nor to state or municipal fire and police departments, providing they are acting in their official capacity and in the proper performance of their duties.

115. It shall not apply to the sale and use (public display) of pyrotechnics commonly known as fireworks.*

12. DEFINITIONS

121. In this Code the following words are used as defined below:

APPROVED. The term "approved" shall mean approved by the authority having jurisdiction.

BLASTING AGENT. Shall mean any material or mixture, consisting of a fuel and oxidizer, intended for blasting, not otherwise classified as an explosive and in which none of the ingredients are classified as an explosive, provided that the fin-

* See Appendix A.

ished product, as mixed and packaged for use or shipment, cannot be detonated by means of a No. 8 test blasting cap when unconfined.

NOTE 1: A No. 8 test blasting cap is one containing 2 grams of a mixture of 80% mercury fulminate and 20% potassium chlorate, or a cap of equivalent strength.

NOTE 2: Nitro-Carbo-Nitrate. This term applies to any blasting agent which has been classified as nitro-carbo-nitrate under the Interstate Commerce Commission Regulations, and which is packaged and shipped in compliance with the regulations of the Interstate Commerce Commission.

EXPLOSIVE-ACTUATED POWER TOOLS. Shall mean any tool or special mechanized device or an explosives powered gas-generator system which is actuated by explosive power or which releases and directs work through an explosives propellant or booster charge.

EXPLOSIVES. The term "explosive" or "explosives" shall mean 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 by the Interstate Commerce Commission. The term "explosives" shall include all material which is classified as Class A, Class B and Class C explosives by the Interstate Commerce Commission, and includes, but is not limited to, dynamite, black powder, pellet powders, initiating explosives, blasting caps, electric blasting caps, safety fuse, fuse lighters, fuse igniters, squibs, cordeau detonant fuse, instantaneous fuse, igniter cord, igniters and some special fireworks. (Commercial explosives are those explosives which are intended to be used in commercial or industrial operations.)

NOTE 1: Classification of explosives is described by the Interstate Commerce Commission as follows:

Class A Explosives. Possessing, detonating or otherwise maximum hazard; such as dynamite, nitroglycerin, picric acid, lead azide, fulminate of mercury, black powder, blasting caps, and detonating primers.

Class B Explosives. Possessing flammable hazard, such as propellant explosives (including some smokeless powders), photographic flash powders, and some special fireworks.

Class C Explosives. Includes certain types of manufactured articles which contain Class A or Class B explosives, or both, as components but in restricted quantities.

Forbidden or Not Acceptable Explosives. Shall mean explosives which are forbidden or not acceptable for transportation by common carriers by rail freight, rail express, highway, or water in accordance with the regulations of the Interstate Commerce Commission.

NOTE 2: Certain chemicals and certain fuel materials may have explosive characteristics which are not specifically classified by the Interstate Commerce Commission and are not readily classified for coverage in this Code. Authoritative information should be obtained for such unclassified materials and action commensurate with their hazards, location, isolation and safeguards, should be taken.

HIGHWAY. Shall mean any public street, public alley or public road.

INHABITED BUILDINGS. Shall mean a building or structure regularly used in whole or part as a place of human habitation. The term "inhabited building" shall also mean any church, school, store, railway passenger station, airport terminal for passengers, and any other building or structure where people are accustomed to congregate or assemble, but excluding any building or structure occupied in connection with the manufacture, transportation, storage and use of explosives.

MAGAZINE. Shall mean any building or structure, other than an explosives manufacturing building, approved for the storage of explosives.

MOTOR VEHICLE. Shall mean any self-propelled vehicle, truck, tractor, semi-trailer, or truck-full trailers used for the transportation of freight over public highways.

PYROTECHNICS. Shall mean and include any combustible or explosive compositions or manufactured articles designed and prepared for the purpose of producing audible or visible effects which are commonly referred to as fireworks.

PERSON. Shall mean any individual, firm, co-partnership, corporation, company, association, joint stock association, and including any trustee, receiver, assignee or personal representative thereof.

PUBLIC CONVEYANCE. Shall mean any railroad car, street car, ferry, cab, bus, airplane or other vehicle which is carrying passengers for hire.

RAILWAY. Shall mean any steam, electric, diesel electric or other railroad or railway which carries passengers for hire on the particular line or branch in the vicinity where explosives are stored or where explosives manufacturing buildings are situated.

SINGULAR AND PLURAL. Words used in the singular number shall include the plural and in the plural the singular.

SMALL ARMS AMMUNITION. Shall mean any shotgun, rifle, pistol or revolver cartridge.

SPECIAL INDUSTRIAL EXPLOSIVES DEVICES. Shall mean any explosive power-packs in the form of explosive cartridges or explosive-charged construction devices, which shall include but not be limited to explosive rivets, explosive bolts, explosive charges for driving pins or studs, cartridges for explosive-actuated power tools and other charges of explosives used in special industrial operations including jet tapping in steel furnaces and jet perforation in oil well operations.

SPECIAL INDUSTRIAL HIGH EXPLOSIVES MATERIALS. Shall mean shaped materials and sheet forms and various other extrusions, pellets and packages of high explosives, which include dynamite, TNT,* PETN,* RDX,* and other similar compounds used for high-energy-rate forming, expanding and shaping in metal fabrication, and for dismemberment and quick reduction of scrap metal.

* (Trinitrotoluol, pentaerythritoltetranitrate, cyclotrimethylenetrinitramine)

CHAPTER 2. GENERAL REQUIREMENTS

21. EXPLOSIVES MANUFACTURING

211. The manufacture of any explosive, including small arms ammunition and pyrotechnics, as herein defined, shall be prohibited within (name of city, county, state, or other area) unless such manufacture is authorized by the authority having jurisdiction and is conducted in accordance with recognized safe practices satisfactory to the authority having jurisdiction. This shall not apply to hand loading of small arms ammunition prepared for personal use and not for resale.

212. The manufacture of explosives within (name of city, county, state, or other area) shall be prohibited when such manufacture presents an undue hazard to life and property as determined by the authority having jurisdiction.

22. MISCELLANEOUS PROVISIONS

221. No person shall store, handle, or transport explosives or blasting agents when such storage, handling and transportation of explosives or blasting agents constitutes an undue hazard to life and property.

222. No person shall possess, keep, store, sell, or offer for sale, give away, use, transport, or dispose of in any manner any explosive or blasting agent except upon the approval of the authority having jurisdiction.

223. No person shall use or explode any explosive or blasting agent for purposes other than blasting or demolition operations, except upon the approval of the authority having jurisdiction.

224. No person shall sell or give away any explosive or blasting agent to any unauthorized person.

225. No person shall sell, display or expose for sale any explosive or blasting agent on any highway, street, sidewalk, public way, or public place.

226. Nothing in this Code shall be construed to prohibit the use of explosives in the form prescribed by the official United States Pharmacopeia.

227. Government and industrial laboratories, laboratories of technical institutes, colleges, universities and similar institutions may be permitted to keep, store and use explosives or blasting

agents when confined to the purpose of scientific or technical instruction or research, provided the storage and use of explosives or blasting agents is under experienced and competent supervision and not more than 15 pounds of explosives or blasting agents are kept on hand at any time in such laboratories. When additional quantities of explosives or blasting agents are required, application shall be made for a special ruling by the authority having jurisdiction.

228. The authority having jurisdiction may restrict the quantity of explosives or blasting agents that may be handled at any location within (name of city, county, state, or other area).

CHAPTER 3. STORAGE OF EXPLOSIVES

31. GENERAL PROVISIONS

311. All Class A, Class B, Class C explosives, and special industrial high explosives, and any newly developed and unclassified explosives, shall be kept in magazines which meet the requirements of this chapter. This shall not be construed as applying to the following:

1. Wholesale and retail stocks of small arms ammunition.
2. Special industrial explosive devices when in quantities of less than 500 pounds.
3. Fuse lighters and fuse igniters.
4. Safety fuse (safety fuse does not include cordeau detonant fuse).

312. Blasting caps, electric blasting caps, detonating primers and primed cartridges shall not be stored in the same magazine with other explosives.

313. Ground around magazines shall slope away for drainage. The land surrounding magazines shall be kept clear of brush, dried grass, leaves, and other combustible materials for a distance of at least 25 feet.

314. Magazines as required by this chapter shall be of two classes, namely, Class I magazines, and Class II magazines.

315. Class I magazines shall be required where the quantity of explosives stored is more than 50 pounds. Class II magazines may be used where the quantity of explosives stored is 50 pounds or less, except that the authority having jurisdiction may authorize the use of Class II magazines for the temporary storage at blasting sites of larger quantities of explosives.

316. Class I magazines shall be located away from inhabited buildings, passenger railways and public highways and from other magazines in conformity with the American Table of Distances for Storage of Explosives.*

317. Except as provided in paragraph 318, Class II magazines shall be located in conformity with the American Table of Distances for Storage of Explosives, but may, subject to the approval of the authority having jurisdiction, be permitted in warehouses and in wholesale and retail establishments when located on a floor which has an entrance at outside grade level and the magazine is located not more than 10 feet from such an entrance. Two Class II magazines may be located in the same build-

*See Appendix A.

ing when one is used only for blasting caps in quantities not in excess of 5,000 caps and a distance of 10 feet is maintained between magazines. The location of Class II magazines within a building shall not be changed without the approval of the authority having jurisdiction.

318. When used for temporary storage at a site for blasting operations, Class II magazines shall be located away from neighboring inhabited buildings, railways, highways, and other magazines. A distance of at least one hundred and fifty (150) feet shall be maintained between Class II magazines and the work in progress when the quantity of explosives kept therein is in excess of 25 pounds, and at least 50 feet when the quantity of explosives is 25 pounds, or less. The authority having jurisdiction may require a greater separation between Class II magazines and the work in progress where conditions warrant.

32. CONSTRUCTION OF MAGAZINES — GENERAL

321. Magazines shall be constructed in conformity with the provisions of this chapter, or may be of substantially equivalent construction satisfactory to the authority having jurisdiction.

322. Magazines for the storage of explosives, other than black powder, Class B and Class C explosives shall be bullet-resistant, weather-resistant, fire-resistant, and ventilated sufficiently to protect the explosive in the specific locality. Magazines used only for storage of black powder, Class B and Class C explosives shall be weather-resistant, fire-resistant, and have ventilation. Magazines for storage of blasting and electric blasting caps shall be weather-resistant, fire-resistant, and ventilated.

323. Property upon which Class I magazines are located and property where Class II magazines are located outside of buildings shall be posted with signs reading "Explosives — Keep Off." Such signs shall be located so as to minimize the possibility of a bullet traveling in the direction of the magazine if anyone shoots at the sign.

324. Magazines shall not be provided with artificial heat or lights, except that if artificial lights are necessary an electric safety flashlight or safety lantern shall be used.

33. CONSTRUCTION OF CLASS I MAGAZINES

331. Class I magazines shall be of masonry construction or of wood or of metal construction, or a combination of these types. Thickness of masonry units shall not be less than eight inches. Hollow masonry units used in construction required to be bullet-resistant shall have all hollow spaces filled with weak cement or well tamped sand. Wood constructed walls, required to be bul-

let-resistant, shall have at least a six-inch space between interior and exterior sheathing and the space between sheathing shall be filled with well tamped sand. Metal wall construction, when required to be bullet-resistant, shall be lined with brick at least four inches in thickness or shall have at least a 6-inch sand fill between interior and exterior walls.

332. Floors and roofs of masonry magazines may be of wood construction. Wood floors shall be tongue and grooved lumber having a minimum thickness of one inch.

333. Roofs required to be bullet-resistant shall be protected by a sand tray located at line of eaves and covering the entire area except that necessary for ventilation. Sand in the sand tray shall be maintained at a depth of not less than 4 inches.

334. All wood at the exterior of magazines, including eaves, shall be protected by being covered with black or galvanized steel or aluminum metal of thickness of not less than No. 26 gage. All nails exposed to the interior of magazines shall be well countersunk.

335. Foundations for magazines shall be of substantial construction and arranged to provide good cross ventilation.

336. Magazines shall be ventilated sufficiently to prevent dampness and heating of stored explosives. Ventilating openings shall be screened to prevent the entrance of sparks.

337. Openings to magazines shall be restricted to that necessary for the placement and removal of stocks of explosives. Doors for openings in magazines for Class A Explosives shall be bullet-resistant. Doors for magazines not required to be bullet-resistant shall be designed to prevent unauthorized entrance to the magazine. The authority having jurisdiction may accept doors for openings in magazines when in substantial conformity with the requirements if such construction is considered as sufficiently bullet-resistant.

338. Magazines shall be provided with substantial means for locking; locks shall be provided and magazine doors shall be kept locked, except during the time of placement and removal of stocks of explosives.

339. Provisions shall be made to prevent the piling of stocks of explosives directly against masonry walls, brick lined or sand filled metal walls and single thickness metal walls; such protection, however, shall not interfere with proper ventilation at interior of side and end walls.

34. CONSTRUCTION OF CLASS II MAGAZINES

341. Class II magazines shall be of wood or metal construction, or a combination thereof.

342. Wood magazines of this class shall have sides, bottom and cover constructed of two-inch hardwood boards well braced at corners and protected by being entirely covered with sheet metal of not less than No. 20 gage. All nails exposed to interior of the magazine shall be well countersunk. All metal magazines of this class shall have sides, bottom and cover constructed of sheet metal, and shall be lined with $\frac{3}{8}$ -inch plywood or the equivalent. Edges of metal covers shall overlap sides at least one inch.

343. Covers for both wood and metal constructed magazines of this class shall be provided with substantial strap hinges and shall be provided with substantial means for locking. Covers shall be kept locked except during the placement or removal of explosives.

344. Magazines of this class shall be painted red and shall bear lettering in white, on all sides and top, at least three inches high, "Explosives — Keep Fire Away." Class II magazines when located in warehouses, and in wholesale and retail establishments shall be provided with substantial wheels or casters to facilitate easy removal in the case of fire. Where necessary due to climatic conditions, Class II magazines shall be ventilated.

35. STORAGE WITHIN MAGAZINES

351. Packages of explosives shall be laid flat with top side up. Black powder when stored in magazines with other explosives shall be stored separately. Black powder stored in kegs shall be stored on ends, bungs down, or on side, seams down. Corresponding grades and brands shall be stored together in such a manner that brands and grade marks show. All stocks shall be stored so as to be easily counted and checked. Packages of explosives shall be piled in a stable manner. When any kind of explosive is removed from a magazine for use, the oldest explosive of that particular kind shall always be taken first.

352. Packages of explosives shall not be unpacked or repacked in a magazine nor within 50 feet of a magazine or in close proximity to other explosives. Tools used for opening packages of explosives shall be constructed of non-sparking materials, except that metal slitters may be used for opening fiberboard boxes. A

wood wedge and a fiber, rubber or wood mallet shall be used for opening or closing wood packages of explosives. Opened packages of explosives shall be securely closed before being returned to a magazine.

353. Magazines shall not be used for the storage of any metal tools nor any commodity except explosives, but this restriction shall not apply to the storage of blasting agents and blasting supplies.

354. Magazine floors shall be regularly swept, kept clean, dry, free of grit, paper, empty used packages and rubbish. Brooms and other cleaning utensils shall not have any spark-producing metal parts. Sweepings from floors of magazines shall be properly disposed of. Magazine floors stained with nitroglycerin shall be cleaned according to instructions by the manufacturer.

355. When any explosive has deteriorated to an extent that it is in an unstable or dangerous condition, or if nitroglycerin leaks from any explosive, then the person in possession of such explosive shall immediately report the fact to the authority having jurisdiction and upon his authorization shall proceed to destroy such explosive in accordance with the instructions of the manufacturer. Only experienced persons shall do the work of destroying explosives.

356. When magazines need inside repairs, all explosives shall be removed therefrom and the floors cleaned. In making outside repairs, if there is a possibility of causing sparks or fire the explosives shall be removed from the magazine. Explosives removed from a magazine under repair shall either be placed in another magazine or placed a safe distance from the magazine where they shall be properly guarded and protected until repairs have been completed, when they shall be returned to the magazine.

357. Smoking, matches, open flames, spark producing devices and firearms shall be prohibited inside of or within 50 feet of magazines. Combustible materials shall not be stored within 50 feet of magazines.

358. Magazines shall be in the charge of a competent person at all times who shall be at least 21 years of age, and who shall be held responsible for the enforcement of all safety precautions.

CHAPTER 4. TRANSPORTATION OF EXPLOSIVES

41. GENERAL PROVISIONS

411. In addition to all other applicable requirements set forth in this Code, the transportation of explosives over all highways shall be in accordance with Interstate Commerce Commission regulations. Interstate Commerce Commission regulations and changes lawfully on file and approved by the Interstate Commerce Commission are hereby adopted as a part of this Code.

412. Explosives shall not be transported through any prohibited vehicular tunnel, or subway, or over any prohibited bridge, roadway, or elevated highway.

413. No person shall smoke, carry matches or any other flame-producing device, or carry any firearms or loaded cartridges while in or near a motor vehicle transporting explosives; or drive, load or unload such vehicle in a careless or reckless manner.

414. Explosives shall not be carried or transported in or upon a public conveyance or vehicle carrying passengers for hire.

415. Explosives may be loaded into and transported in the following:

1. Truck
2. Truck with semitrailer
3. Truck with full trailer
4. Truck tractor with semitrailer
5. Truck tractor with semitrailer and full trailer

416. Explosives shall not be transferred from one vehicle to another within the (name of city, county, state, or other area) without informing the fire and police departments thereof. In the event of breakdown or collision the local fire and police departments shall be promptly notified to help safeguard such emergencies. Explosives shall be transferred from the disabled vehicle to another only when proper and qualified supervision is provided.

417. Blasting caps, or electric blasting caps, shall not be transported over the highways on the same vehicles with other explosives, except by permit from the authority having jurisdiction.

42. TRANSPORTATION VEHICLES

421. Vehicles used for transporting explosives shall be strong enough to carry the load without difficulty and be in good me-

chanical condition. If vehicles do not have a closed body, the body shall be covered with a flameproof and moistureproof tarpaulin or other effective protection against moisture and sparks. All vehicles used for the transportation of explosives shall have tight floors and any exposed spark-producing metal on the inside of the body shall be covered with wood or other non-sparking materials to prevent contact with packages of explosives. Packages of explosives shall not be loaded above the sides of an open-body vehicle.

422. Every vehicle used for transporting explosives shall be marked or placarded on both sides, front and rear with the word "Explosives" in letters not less than three inches in height in contrasting colors. In addition to such marking, or placarding, the vehicle may display, in such a manner that it will be readily visible from all directions, a red flag 18 inches x 30 inches, with the word "Explosives" painted, stamped, or sewed thereon in white letters, at least six inches in height.

423. Every motor vehicle used for transporting explosives shall be equipped with one of the following minimum fire extinguishing units:

1. One fifteen-pound carbon dioxide or larger extinguisher;
2. Two five-pound or larger carbon dioxide extinguishers;
3. One ten-pound or larger dry chemical extinguisher;
4. Two four-pound or larger dry chemical extinguishers.

a. Only extinguishers listed or approved by Underwriters' Laboratories, Inc., Factory Mutual Laboratories, the Underwriters' Laboratories of Canada or by some other nationally recognized fire equipment testing laboratory, shall be deemed suitable for use on explosives-carrying vehicles.

b. Extinguishers shall be filled and ready for immediate use and located near the driver's seat. Extinguishers shall be examined periodically by a competent person.

424. A motor vehicle used for transporting explosives shall be given the following inspection to determine that it is in proper condition for safe transportation of explosives:

1. Fire extinguishers shall be filled and in working order.
2. All electrical wiring shall be completely protected and securely fastened to prevent short-circuiting.
3. Chassis, motor, pan and underside of body shall be reasonably clean and free of excess oil and grease.
4. Fuel tank and feed line shall be secure and have no leaks.

5. Brakes, lights, horn, windshield wipers, and steering apparatus shall function properly.
6. Tires shall be checked for proper inflation and defects.
7. The vehicle shall be in proper condition in every other respect and acceptable for handling explosives.

43. OPERATION OF TRANSPORTATION VEHICLES

431. Vehicles transporting explosives shall only be driven by and be in the charge of a driver who is physically fit, careful, capable, reliable, able to read and write the English language, and not addicted to the use, or under the influence of intoxicants or narcotics, and not less than 21 years of age. He shall be familiar with the traffic regulations, state laws, and the provisions of this Code.

432. Except under emergency conditions, no vehicle transporting explosives shall be parked before reaching its destination, even though attended, on any public street adjacent to or in proximity to any bridge, tunnel, dwelling, building, or place where people work, congregate, or assemble.

433. No spark-producing metal, spark-producing metal tools, oils, matches, firearms, electric storage batteries, flammable substances, acids, oxidizing materials, or corrosive compounds shall be carried in the body of any motor truck and/or vehicle transporting explosives, unless the loading of such dangerous articles and the explosives comply with Interstate Commerce Commission regulations.

434. Vehicles transporting explosives shall avoid congested areas and heavy traffic. Where routes through congested areas have been designated by local authorities such routes shall be followed.

435. Delivery shall only be made to authorized persons and into authorized magazines or approved temporary storage or handling areas.

CHAPTER 5. USE OF EXPLOSIVES

51. GENERAL PROVISIONS

511. The handling of explosives may be performed by the person holding a permit to use explosives or by other employees under his direct supervision provided that such employees are at least 21 years of age.

512. While explosives are being handled or used, smoking shall not be permitted and no one near the explosives shall possess matches, open light or other fire or flame. No person shall handle explosives while under the influence of intoxicating liquors, or narcotics.

513. Original containers or Class II magazines shall be used for taking detonators and other explosives from storage magazines to the blasting area.

514. When blasting is done in congested areas or in close proximity to a structure, railway, or highway or any other installation that may be damaged, the blast shall be covered before firing with a mat constructed so that it is capable of preventing fragments from being thrown.

515. Persons authorized to prepare explosive charges or conduct blasting operations shall use every reasonable precaution, including but not limited to warning signals, flags, barricades, or woven wire mats to insure the safety of the general public and workmen.

516. Blasting operations, except by special permission of the authority having jurisdiction, shall be conducted during daylight hours.

517. Whenever blasting is being conducted in the vicinity of gas, electric, water, fire alarm, telephone, telegraph and steam utilities, the blaster shall notify the appropriate representatives of such utilities at least 24 hours in advance of blasting, specifying the location and intended time of such blasting. Verbal notice shall be confirmed with written notice. In an emergency this time limit may be waived by the local authority issuing the original permit.

518. Due precautions shall be taken to prevent accidental discharge of electric blasting caps from current induced by radar, radio transmitters, lightning, adjacent power lines, dust storms,

or other sources of extraneous electricity. These precautions shall include:

1. The suspension of all blasting operations and removal of persons from the blasting area during the approach and progress of an electric storm.
2. The posting of signs warning against the use of mobile radio transmitters on all roads within 350 feet of the blasting operations.
3. Compliance with the latest recommendations of the Institute of Makers of Explosives with regard to blasting in the vicinity of radio transmitters or power lines.

52. STORAGE AT USE SITES

521. Empty boxes and paper and fiber packing materials which have previously contained high explosives shall not be used again for any purpose, but shall be destroyed by burning at an approved isolated location out of doors, and no person shall be nearer than 100 feet after the burning has started.

522. Containers of explosives shall not be opened in any magazine or within 50 feet of any magazine. In opening kegs or wooden cases, no sparking metal tools shall be used; wooden wedges and either wood, fiber or rubber mallets shall be used. Non-sparking metallic slitters may be used for opening fiber-board cases.

523. Explosives or blasting equipment that are obviously deteriorated or damaged shall not be used.

524. No explosives shall be abandoned.

53. LOADING OF EXPLOSIVES (BLASTING)

531. All drill holes shall be sufficiently large to admit freely the insertion of the cartridges of explosives.

532. Tamping shall be done only with wood rods without exposed metal parts, but non-sparking metal connectors may be used for jointed poles. Plastic tamping poles may be used, provided they have been approved by the authority having jurisdiction. Violent tamping shall be avoided.

533. No holes shall be loaded except those to be fired in the next round of blasting. After loading, all remaining explosives shall be immediately returned to an authorized magazine.

534. Drilling shall not be started until all remaining butts of old holes are examined with a wooden stick for unexploded

charges, and if any are found, they shall be refired before work proceeds.

535. No person shall be allowed to deepen drill holes which have contained explosives.

536. After loading for a blast is completed, all excess blasting caps or electric blasting caps and other explosives shall immediately be returned to their separate storage magazines.

54. DISCHARGING EXPLOSIVES

541. Only electric blasting caps shall be used for blasting operations in congested districts, or on highways, or adjacent to highways open to traffic, except where sources of extraneous electricity make such use dangerous.

542. When fuse is used, the blasting cap shall be securely attached to the safety fuse with a standard ring type cap crimper. All primers shall be assembled at least fifty feet from any magazine.

543. Primers shall be made up only as required for each round of blasting.

544. No blasting cap shall be inserted in the explosives without first making a hole in the cartridge for the cap with a wooden punch of proper size or standard cap crimper.

545. Explosives shall not be extracted from a hole that has once been charged or has misfired unless it is impossible to detonate the unexploded charge by insertion of a fresh additional primer.

546. If there are any misfires while using cap and fuse, all persons shall remain away from the charge for at least one hour. If electric blasting caps are used and a misfire occurs, this waiting period may be reduced to thirty minutes. Misfires shall be handled under the direction of the person in charge of the blasting and all wires shall be carefully traced and search made for unexploded charges.

547. Blasters, when testing circuits to charged holes, shall use only blasting galvanometers designed for this purpose.

548. Only the man making leading wire connections in electrical firing shall fire the shot. All connections should be made from bore hole back to the source of firing current, and the leading wires shall remain shorted and not be connected to the blasting machine or other source of current until the charge is to be fired.

55. WARNING REQUIRED

551. Before a blast is fired, a loud warning signal shall be given by the person in charge, who has made certain that all surplus explosives are in a safe place, all persons and vehicles are at a safe distance or under sufficient cover, and that an adequate warning has been given.

CHAPTER 6. EXPLOSIVES AT PIERS, RAILWAY STATIONS AND CARS OR VESSELS NOT OTHERWISE SPECIFIED IN THIS CODE

61. GENERAL PROVISIONS

611. Except in an emergency and with permission of the local authority having jurisdiction, no person shall have or keep explosives in a railway car unless said car and contents and methods of loading are in accordance with the Interstate Commerce Commission Regulations for the Transportation of Explosives.

612. No person shall deliver any explosive to any carrier unless such explosive conforms in all respects, including marking and packing, to the Interstate Commerce Commission Regulations for the Transportation of Explosives.

613. Every railway car containing explosives which has reached its destination, or is stopped in transit so as no longer to be in interstate commerce, shall have attached to both sides and ends of the car, cards with the words "Explosives — Handle Carefully — Keep Fire Away" in red letters at least one and one-half inches high on a white background.

614. Any explosives at a railway facility, truck terminal, pier, wharf, harbor facility, or airport terminal, within the jurisdiction, whether for delivery to a consignee, or forwarded to some other destination, shall be kept in a safe place, isolated as far as practicable and in such manner that they can be easily and quickly removed.

615. Explosives shall not be delivered to or received from any railway station, truck terminal, pier, wharf, harbor facility, or airport terminal within the jurisdiction between the hours of sunset and sunrise, except by special permit from the authority having jurisdiction.

62. NOTIFICATIONS

621. When explosives are brought into the locality under the jurisdiction of this Code, by any means of transportation, for delivery to an intermediate receiver, consignee's agent or consignee, or to be forwarded to some other destination, the carrier performing the shipment shall immediately notify the consignee, fire chief, port authorities, and such other authorities as may be designated, of the arrival of the explosives, and if said con-

signee does not receive and remove the said explosives from the possession of the carrier within 48 hours (Sundays and holidays excluded), after such notification, then the railway, trucking firm, vessel agent, or airline shall remove the said explosives from the jurisdiction or to a properly permitted magazine or make a report to the authority having jurisdiction, who shall see that the said explosives are moved to a place of safety.

622. Any person having been notified, as consignee, of a shipment of explosives being in the hands of any carrier, and within the jurisdiction, shall remove the said explosives within 48 hours, Sundays and holidays excluded, after receiving such notification to some place meeting the requirements of this Code.

63. DESIGNATION OF FACILITIES

631. The local authority having jurisdiction has the authority to and may designate the location for, and limit the quantity of, explosives which may be loaded, unloaded, reloaded, or temporarily retained at any facility within the jurisdiction.

CHAPTER 7. BLASTING AGENTS

71. GENERAL

711. Unless otherwise set forth in this Chapter, blasting agents shall be transported, stored, and used in the same manner as explosives.

72. MIXING OF BLASTING AGENTS

721. Buildings or other facilities used for mixing blasting agents, including mobile equipment, shall be located, with respect to inhabited buildings, passenger railroads and public highways, in accordance with the American Table of Distances.*

a. Any oxidizer stored at a closer distance to the blasting agent storage area than as provided in b. below shall be added to the quantity of blasting agents to calculate the total quantity involved for application of the aforementioned Table.

b. Minimum intra-plant separation distances between mixing units and the oxidizer storage areas and blasting agent storage areas shall be determined by competent persons, and these distances shall be approved by the authority having jurisdiction.

722. Buildings used for the mixing of blasting agents shall conform to the requirements of this Section, unless otherwise specifically approved by the authority having jurisdiction.

a. Buildings should preferably be of noncombustible construction or sheet metal on wood studs.

b. The layout of the mixing building shall be such as to provide physical separation between the finished product storage, and the mixing and packaging operation.

c. Floors in storage areas and in the processing plant should be of concrete. Isolated fuel storage shall be provided to avoid contact between molten oxidizer and fuel in case of fire.

d. The building shall be well ventilated.

e. Heat shall be provided exclusively from a unit outside the building.

723. The design of the mixer should minimize the possibility of frictional heating, compaction, and especially, confinement. Open mixers are preferable to enclosed mixers. Bearings and gears should be protected against the accumulation of oxidizer dust. All surfaces should be accessible for cleaning. Mixing and packaging equipment should be constructed of materials compatible with the fuel-oxidizer composition.

* See Appendix A.

724. The provisions of this Section shall be considered when determining blasting agent compositions. *The sensitivity of the blasting agent shall be determined by means of a No. 8 test blasting cap at regular intervals and after every change in ingredients, composition or packaying, or as may be requested by the authority having jurisdiction.*

a. Oxidizers of small particle size, such as crushed prills or fines, may be more sensitive and hazardous than the ordinary prills and should be handled with greater care.

b. No liquid fuel with flash point lower than that of No. 2 Diesel fuel oil (125° F. minimum or legal) shall be used.

c. Crude oil and crankcase oil should not be used because they may contain light ends that offer increased vapor-explosion hazards or gritty particles that tend to sensitize the resulting blasting agent.

d. If solid fuels are used, they shall be chosen so as to minimize dust-explosion hazard.

e. Metal dusts (aluminum powder, etc.), peroxides, chlorates, or perchlorates shall not be used unless such operations are conducted in a manner approved by the authority having jurisdiction.

f. Unusual compositions shall not be attempted except under the supervision of competent personnel equipped to determine the over-all hazard of the resulting compositions.

725. All electrical switches, controls, motors, and lights, if located in the mixing room, should conform to the requirements of Class II, Division 2 of the National Electrical Code,* otherwise they should be located outside the mixing room. The frame of the mixer and all other equipment that may be used shall be electrically bonded and be provided with a continuous path to the ground.

726. Washdown facilities should be provided. An automatic water-deluge system with adequate capacity is recommended to protect mixers and the finished-explosives storage area in the plant. Floors shall be constructed so as to eliminate open floor drains and piping into which molten materials could flow and be confined in case of fire. The floors and equipment of the mix-

* See Appendix A.

ing and packaging room shall be washed down frequently to prevent accumulation of oxidizers or fuels and other sensitizers. The entire mixing and packaging plant shall be washed down periodically to prevent excessive accumulation of dust.

727. Smoking or open flames shall not be permitted in or within 50 feet of any building or facility used for the mixing of blasting agents.

728. Empty oxidizer bags shall be disposed of daily in a safe manner.

729. Not more than one day's production of blasting agents or the limit determined by the American Table of Distances,* whichever is less, shall be permitted in or near the mixing and packaging plant or area. Larger quantities shall be stored in separate warehouses or magazines.

73. STORAGE OF BLASTING AGENTS AND SUPPLIES

731. Blasting agents and oxidizers used for mixing of blasting agents shall be stored in the manner set forth in this Section.

a. Blasting agents or oxidizers, when stored in conjunction with explosives, shall be stored in the manner set forth in Chapter 3 for explosives. The quantity of blasting agents or oxidizers shall be included when computing the total quantity of explosives for determining distance requirements.

b. Blasting agents, when stored entirely separate from explosives, may be stored in the manner set forth in Chapter 3 or in one-story warehouses (without basements) which shall be:

1. Noncombustible or fire-resistive;
2. Constructed so as to eliminate open floor drains and piping into which molten materials could flow and be confined in case of fire;
3. Weather resistant;
4. Well ventilated; and
5. Equipped with a strong door kept securely locked except when open for business.

c. Semitrailer or full trailer vans used for highway or on-site transportation of the blasting agents are satisfactory for temporarily storing these materials, provided they are located according to the American Table of Distances* with respect to inhabited buildings, passenger railroads and public highways. Trailers should be provided with substantial means for locking,

* See Appendix A.

and the trailer doors shall be kept locked, except during the time of placement and removal of stocks of blasting agents.

732. Warehouses used for the storage of blasting agents separate from explosives shall be located as set forth in this Section.

a. Warehouses used for the storage of blasting agents shall be located in accordance with the provisions of the American Table of Distances* with respect to inhabited buildings, passenger railroads and public highways.

b. If both blasting agents and oxidizers are handled or stored within the distance limitations prescribed through Section 721, the weight of the oxidizer shall be added to the weight of the blasting agent to determine the proper distance for compliance with the American Table of Distances.*

733. Smoking, matches, open flames, spark producing devices and firearms shall be prohibited inside of or within 50 feet of any warehouse used for the storage of blasting agents. Combustible materials shall not be stored within 50 feet of warehouses used for the storage of blasting agents.

734. The interior of warehouses used for the storage of blasting agents shall be kept clean and free from debris and empty containers. Spilled materials shall be cleaned up promptly and safely removed. Combustible materials, flammable liquids, corrosive acids, chlorates, nitrites or similar materials shall not be stored in any warehouse used for blasting agents unless separated therefrom by a fire resistive separation of not less than one hour resistance. The provisions of this Section shall not prohibit the storage of blasting agents together with non-explosive blasting supplies.

735. Piles of oxidizers and warehouses containing oxidizers shall be adequately separated from readily combustible fuels.

736. Caked oxidizers, either in bags or in bulk, shall not be loosened by blasting.

737. Every warehouse used for the storage of blasting agents shall be under the supervision of a competent person who shall be not less than 21 years of age.

738. The local authority having jurisdiction has the authority to and may designate the location for, and limit the quantity of

*See Appendix A.

blasting agents which may be loaded, unloaded, reloaded, or temporarily retained at any facility within the jurisdiction.

74. TRANSPORTATION OF BLASTING AGENTS

741. When blasting agents are transported in the same vehicle with explosives, all of the requirements of Chapter 4 shall be complied with.

742. Vehicles transporting blasting agents shall only be driven by and be in charge of a driver at least twenty-one (21) years of age who is capable, careful, reliable and in possession of a valid motor vehicle operator's license. Such a person shall also be familiar with the State vehicle and traffic laws.

743. No sparking metal, sparking metal tools, oils, matches, firearms, acids or other corrosive liquids shall be carried in the bed or body of any vehicle containing blasting agents.

744. No person shall be permitted to ride upon, drive, load or unload a vehicle containing blasting agents while smoking or under the influence of intoxicants or narcotics.

745. It is prohibited for any person to transport or carry any blasting agents upon any public vehicle carrying passengers for hire.

746. Vehicles transporting blasting agents shall be in safe operating condition at all times.

747. When offering blasting agents for transportation on public highways the packaging, marking and labeling of containers of blasting agents shall comply with the requirements of I.C.C.*

748. Vehicles used for transporting blasting agents on public highways shall be placarded in accordance with I.C.C. regulations.*

75. USE OF BLASTING AGENTS

751. Persons using blasting agents shall comply with all of the applicable provisions of Chapter 5 of this Code.

* See Appendix A.

APPENDIX A. QUANTITY-DISTANCE TABLES, FORBIDDEN EXPLOSIVES, FEDERAL REGULATIONS, REFERENCES

A1. QUANTITY DISTANCE TABLES

A11. American Table of Distances for Storage of Explosives.*

Explosives		Distances in Feet When Storage is Barricaded			
POUNDS OVER	POUNDS NOT OVER	IN- HABITED BUILD- INGS	PAS- SENGER RAIL- WAYS	PUBLIC HIGH- WAYS	SEPA- RATION OF MAGA- ZINES
2	5	70	30	30	6
5	10	90	35	35	8
10	20	110	45	45	10
20	30	125	50	50	11
30	40	140	55	55	12
40	50	150	60	60	14
50	75	170	70	70	15
75	100	190	75	75	16
100	125	200	80	80	18
125	150	215	85	85	19
150	200	235	95	95	21
200	250	255	105	105	23
250	300	270	110	110	24
300	400	295	120	120	27
400	500	320	130	130	29
500	600	340	135	135	31
600	700	355	145	145	32
700	800	375	150	150	33
800	900	390	155	155	35
900	1,000	400	160	160	36
1,000	1,200	425	170	165	39
1,200	1,400	450	180	170	41
1,400	1,600	470	190	175	43
1,600	1,800	490	195	180	44
1,800	2,000	505	205	185	45
2,000	2,500	545	220	190	49
2,500	3,000	580	235	195	52
3,000	4,000	635	255	210	58
4,000	5,000	685	275	225	61
5,000	6,000	730	295	235	65
6,000	7,000	770	310	245	68
7,000	8,000	800	320	250	72

(Continued on Next Page)

* As revised and approved by the Institute of Makers of Explosives, September 30, 1955.

American Table of Distances for Storage of Explosives (Continued)

Explosives		Distances in Feet When Storage is Barricaded			
POUNDS OVER	POUNDS NOT OVER	IN- HABITED BUILD- INGS	PAS- SENGER RAIL- WAYS	PUBLIC HIGH- WAYS	SEPA- RATION OF MAGA- ZINES
8,000	9,000	835	335	255	75
9,000	10,000	865	345	260	78
10,000	12,000	875	370	270	82
12,000	14,000	885	390	275	87
14,000	16,000	900	405	280	90
16,000	18,000	940	420	285	94
18,000	20,000	975	435	290	98
20,000	25,000	1,055	470	315	105
25,000	30,000	1,130	500	340	112
30,000	35,000	1,205	525	360	119
35,000	40,000	1,275	550	380	124
40,000	45,000	1,340	570	400	129
45,000	50,000	1,400	590	420	135
50,000	55,000	1,460	610	440	140
55,000	60,000	1,515	630	455	145
60,000	65,000	1,565	645	470	150
65,000	70,000	1,610	660	485	155
70,000	75,000	1,655	675	500	160
75,000	80,000	1,695	690	510	165
80,000	85,000	1,730	705	520	170
85,000	90,000	1,760	720	530	175
90,000	95,000	1,790	730	540	180
95,000	100,000	1,815	745	545	185
100,000	110,000	1,835	770	550	195
110,000	120,000	1,855	790	555	205
120,000	130,000	1,875	810	560	215
130,000	140,000	1,890	835	565	225
140,000	150,000	1,900	850	570	235
150,000	160,000	1,935	870	580	245
160,000	170,000	1,965	890	590	255
170,000	180,000	1,990	905	600	265
180,000	190,000	2,010	920	605	275
190,000	200,000	2,030	935	610	285
200,000	210,000	2,055	955	620	295
210,000	230,000	2,100	980	635	315
230,000	250,000	2,155	1,010	650	335
250,000	275,000	2,215	1,040	670	360
275,000	300,000	2,275	1,075	690	385

Notes to American Table of Distances for Storage of Explosives

NOTE 1 — “Barricaded” means that a building containing explosives is effectually screened from a magazine, building, railway, or highway, either by a natural barricade, or by an artificial barricade of such height that a straight line from the top of any sidewall of the building containing explosives to the eave line of any magazine, or building, or to a point twelve feet above the center of a railway or highway, will pass through such intervening natural or artificial barricade.

NOTE 2 — “Natural Barricade” means natural features of the ground, such as hills, or timber of sufficient density that the surrounding exposures which require protection cannot be seen from the magazine when the trees are bare of leaves.

NOTE 3 — “Artificial Barricade” means an artificial mound or revetted wall of earth of a minimum thickness of three feet.

NOTE 4 — When a building containing explosives is not barricaded, the distances shown in the Table shall be doubled.

NOTE 5 — When two or more storage magazines are located on the same property, each magazine must comply with the minimum distances specified from inhabited buildings, railways, and highways, and in addition, they should be separated from each other by not less than the distances shown for “Separation of Magazines,” except that the quantity of explosives contained in cap magazines shall govern in regard to the spacing of said cap magazines from magazines containing other explosives. If any two or more magazines are separated from each other by less than the specified “Separation of Magazines” distances, then such two or more magazines, as a group, must be considered as one magazine, and the total quantity of explosives stored in such group must be treated as if stored in a single magazine located on the site of any magazine of the group, and must comply with the minimum of distances specified from other magazines, inhabited buildings, railways, and highways.

NOTE 6 — The permanent storage of more than 300,000 pounds of commercial explosives in one magazine or in a group of magazines which is considered as one magazine is not permitted except by specific approval of the enforcing official.

NOTE 7 — This Table applies only to the manufacture and permanent storage of commercial explosives. It is not applicable to transportation of explosives, or any handling or temporary stor-