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490

STORAGE OF AMMONIUM NITRATE 1975

NATIONAL FIRE PROTECTION ASSOCIATION

470 Atlantic Avenue, Boston, MA 02210

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See Inside Back Cover for Official NFPA Definitions

Code for the
Storage of Ammonium Nitrate

NFPA 490 — 1975

Origin and Development of NFPA 490

NFPA 490 was developed by the Sectional Committee on Storage, Handling and Transportation of Hazardous Chemicals. It was tentatively adopted by the Association in 1963, amended, and again tentatively adopted in 1964. It was officially adopted, after further revisions, in 1965.

NFPA 490 was further amended in 1967, 1969, and 1970. The 1970 edition was completely revised, both editorially and technically, to produce this 1975 edition.

The 1975 edition was officially adopted at the 1975 NFPA Fall Meeting in Pittsburgh, PA on November 19, 1975. The text presented here contains those requirements believed by the Sectional Committee to be essential for the safe storage of Ammonium Nitrate.

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This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.

Interpretation Procedure of the Sectional Committee on Storage, Handling, and Transportation of Hazardous Chemicals

Those desiring an interpretation shall supply the Chairman with five identical copies of a statement in which shall appear specific reference to a single problem, paragraph, or section. Such a statement shall be on the business stationery of the inquirer and shall be duly signed.

When applications involve actual field situations, they shall so state and all parties involved shall be named.

The Interpretations Committee will reserve the prerogative to refuse consideration of any application that refers specifically to proprietary items of equipment or devices. Generally, inquiries should be confined to interpretation of the literal text or the intent thereof.

Requests for interpretations should be addressed to the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

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Foreword

Ammonium Nitrate[1] is a compound containing nitrogen, hydrogen, and oxygen (NH_4NO_3) and is commercially produced by reacting nitric acid with ammonia, evaporating the resultant solution of ammonium nitrate to make a concentrated ammonium nitrate melt which is then spray granulated in a prilling tower, or pelletized or flaked by some other means.

For interstate shipments, the Department of Transportation of the United States classifies ammonium nitrate as an oxidizing material, as it does some other fertilizer products such as sodium nitrate, potassium nitrate and calcium nitrate. Such oxidizing materials can yield oxygen upon decomposition under fire conditions and will, therefore, under proper conditions of mixing, vigorously support combustion if involved in a fire with combustible materials. Ammonium nitrate is capable of undergoing detonation with about half the blast effect of explosives, if heated under confinement that permits high pressure build-up, or is subjected to strong shocks, such as those from an explosive. The sensitivity of ammonium nitrate to detonation increases at elevated temperatures.

Industrial use of ammonium nitrate extends to its use as an ingredient in blasting agents. When a carbonaceous or organic substance such as fuel (or diesel) oil, nut hulls or carbon black is added and admixed with ammonium nitrate, the mixture may become a blasting agent. A blasting agent is defined as being any material or mixture, consisting of a fuel and oxidizer, intended for blasting, not otherwise classed as an explosive and in which none of the ingredients is classified as an explosive, provided that the finished product, as mixed and packaged for use or shipment, cannot be detonated by means of a No. 8 test blasting cap when unconfined. (See *NFPA 495-1973, the Code for the Manufacture, Transportation, Storage, and Use of Explosive Materials.*)

Recent test data on ammonium nitrate are included in the U.S. Bureau of Mines Report of Investigations 6746, Sympathetic Detonation of Ammonium Nitrate and Ammonium Nitrate Fuel Oil; Report of Investigations 6903, Further Studies of Sympathetic Detonation; and Report of Investigations 6773, Explosion Hazards of Ammonium Nitrate Under Fire Exposure. On the basis of these reports a Table of Distances of Ammonium Nitrate and Blasting Agents from Blasting Agents or Explosives has been

[1] The term as used in this publication refers only to solid forms of ammonium nitrate.

developed. The table is included in Appendix A of *NFPA 495-1973, Code for the Manufacture, Transportation, Storage, and Use of Explosive Materials.*

While blasting agents should not be confused with fertilizer products, extreme care should be taken to insure that stored ammonium nitrate does not become sensitized by intimate mixing with carbonaceous, organic or combustible material.

Mixed fertilizers containing less than 60 percent ammonium nitrate are not covered by this Code.

With proper precautions against fire and explosion, ammonium nitrate can be stored safely at the plant, in distributors' warehouses, or on the farm.

Code for the
Storage of Ammonium Nitrate

NFPA No. 490–1975

Chapter 1 Scope and Definitions

1-1 Scope.

1-1.1 Except as provided in 1-1.4, this Code applies to the storage of ammonium nitrate in the form of crystals, flakes, grains or prills including fertilizer grade,[1] dynamite grade, nitrous oxide grade,[2] technical grade and other mixtures containing 60 percent or more ammonium nitrate by weight but does not apply to blasting agents.

1-1.2 It shall not apply to the transportation of ammonium nitrate.

1-1.3 It shall not apply to storage under the jurisdiction of and in compliance with the Regulations of the United States Coast Guard.

1-1.4 The storage of ammonium nitrate and ammonium nitrate mixtures that are more sensitive than allowed by the "Definition and Test Procedures for Ammonium Nitrate Fertilizer"[1] shall not be permitted by this Code except on the specific approval of the authority having jurisdiction.

1-1.5 Nothing in this Code shall apply to the production of ammonium nitrate or to the storage of ammonium nitrate on the premises of the producing plant, provided that no distinct undue hazard to the public is created.

1-2 Definitions.

1-2.1 APPROVED. The term APPROVED shall mean approved by the authority having jurisdiction.

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1 "Definition and Test Procedures for Ammonium Nitrate Fertilizer," available from The Fertilizer Institute, 1015 Eighteenth St., N.W., Washington, D.C. 20036. This definition limits the contents of organic materials, metals, sulfur, etc., in a product that may be classified ammonium nitrate fertilizer.

2 "Standards for Ammonium Nitrate (Nitrous Oxide Grade) including Specifications, Properties, and Recommendations for Packaging, Transportation, Storage, and Use," available from the Compressed Gas Association, Inc., 500 Fifth Ave., New York, N. Y. 10036.

Chapter 2 General Provisions

2-1 Application.

2-1.1 This Code shall apply to all persons, firms, corporations, co-partnerships and associations storing, having or keeping ammonium nitrate, and to the owner or lessee of any building, premises or structure in which ammonium nitrate is stored in quantities of 1,000 pounds or more.

2-2 Restricted Locations.

2-2.1 A permit is required from the authority having jurisdiction for the storage of 1,000 pounds or more of ammonium nitrate.

2-2.2 Not more than 60 tons of ammonium nitrate shall be stored unless the location and storage facility have been approved.

2-2.3 Storage locations shall be subject to approval by the authority having jurisdiction with respect to nearness of residential occupancies, places of public assembly, schools, hospitals, railroads and public highways. Limitations on storable quantities shall be considered with regard to proximity of these exposures and congested commercial or industrial districts.

2-2.4 Approval of large quantity storage shall be subject to due consideration of the fire and explosion[1] hazards, including exposure to toxic vapors from burning or decomposing ammonium nitrate.

2-3 Structures.

2-3.1 Storage buildings shall not have basements unless the basements are open on at least one side. Storage buildings shall not be over one story in height, unless approved for such use.

2-3.2 Storage buildings shall have adequate ventilation or be of a construction that will be self-ventilating in the event of fire.

2-3.3 The wall on the exposed side of a storage building

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[1] Ammonium nitrate is capable of undergoing detonation with the blast effect of about half the quantity of explosives, if heated under confinement that permits high pressure build-up, or if subjected to strong shocks, such as those from an explosive. The sensitivity of ammonium nitrate to detonation is increased by elevated temperatures or by contamination (see Chapter 5).

within 50 feet of a combustible building, forest, piles of combustible materials and similar exposure hazards shall be of fire-resistive construction. In lieu of the fire-resistive wall, other suitable means of exposure protection such as a free standing wall may be used. The roof coverings shall be Class C or better, as defined in *NFPA 203M-1970, Manual on Roof Coverings.*

2-3.4 All flooring in storage and handling areas shall be of noncombustible material or protected against impregnation by ammonium nitrate and shall be without open drains, traps, tunnels, pits or pockets into which any molten ammonium nitrate could flow and be confined in the event of fire.

2-3.5 The continued use of an existing storage building or structure not in strict conformity with this Code may be approved in cases where such continued use will not constitute a hazard to life or adjoining property.

2-3.6 Buildings and structures shall be dry and free from water seepage through the roof, walls and floors.

Chapter 3 Storage of Ammonium Nitrate in Bags, Drums, or Other Containers

3-1 Container.

3-1.1 Bags and containers used for ammonium nitrate must comply with specifications and standards required for use in interstate commerce.

3-1.2 Containers used on the premises in the actual manufacturing or processing need not comply with provisions of 3-1.1.

3-2 Piles.

3-2.1 Containers of ammonium nitrate shall not be accepted for storage when the temperature of the ammonium nitrate exceeds 130°F.

3-2.2 Bags of ammonium nitrate shall not be stored within 30 inches of the storage building walls and partitions.

3-2.3 The height of piles shall not exceed 20 feet. The width of piles shall not exceed 20 feet and the length 50 feet except that where the building is of noncombustible construction or is protected by automatic sprinklers the length of piles shall not be limited. In no case shall the ammonium nitrate be stacked closer than 36 inches below the roof or supporting and spreader beams overhead.

3-2.4 Aisles shall be provided to separate piles by a clear space of not less than 3 feet in width. At least one service or main aisle in the storage area shall be not less than 4 feet in width.

3-2.5 The requirements for pile sizes and aisles, as set forth in 3-2.3 and 3-2.4, may be waived by the authority having jurisdiction where storage facilities are located in remote areas.

Chapter 4 Storage of Bulk Ammonium Nitrate

4-1 Structures.

4-1.1 Bulk storage may be in piles or bins in warehouses, or in separate, bin-type structures.

4-1.2 Warehouses shall have adequate ventilation or be capable of adequate ventilation in case of fire.

4-1.3 Unless constructed of noncombustible material or unless adequate facilities for fighting a roof fire are available, bulk storage structures shall not exceed a height of 40 feet.

4-2 Compartments.

4-2.1 Bins shall be clean and free of materials which may contaminate ammonium nitrate.

4-2.2 Due to the corrosive and reactive properties of ammonium nitrate, and to avoid contamination, galvanized iron, copper, lead and zinc shall not be used in bin construction unless suitably protected. Aluminum bins, and wooden bins protected against impregnation by ammonium nitrate, are permissible.[1]

4-2.3 The warehouse may be subdivided into any desired number of ammonium nitrate storage compartments or bins. The partitions dividing the ammonium nitrate storage from the storage of other products which would contaminate the ammonium nitrate shall be of tight construction.

4-2.4 The ammonium nitrate storage bins or piles shall be clearly identified by signs reading "AMMONIUM NITRATE" with letters at least 2 inches high.

4-3 Piles.

4-3.1 Piles or bins shall be so sized and arranged that all material in the pile is moved out periodically in order to minimize possible caking of the stored ammonium nitrate.

4-3.2 Height or depth of piles shall be limited by the pressure-setting tendency of the product. However, in no case shall the ammonium nitrate be piled higher at any point than 36

[1] Steel or wood can be protected by special coatings such as sodium silicate, or epoxy coatings, or polyvinyl chloride coatings.

inches below the roof or supporting and spreader beams overhead.[1]

4-3.3 Ammonium nitrate shall not be accepted for storage when the temperature of the product exceeds 130°F.

4-3.4 Dynamite, other explosives, and blasting agents shall not be used to break up or loosen caked ammonium nitrate.

[1] Pressure setting is a factor affected by humidity and temperature in the storage space and by pellet quality. Temperature cycles through 90°F. and high atmospheric humidity are undesirable for storage in depth.

Chapter 5 Contaminants

5-1 Separation.

5-1.1 Ammonium nitrate shall be in a separate building or shall be separated by approved type fire walls of not less than one hour fire-resistance rating from storage of organic chemicals, acids or other corrosive materials, materials that may require blasting during processing or handling, compressed flammable gases, flammable and combustible materials or other contaminating substances including **but not limited to** animal fats, baled cotton, baled rags, baled scrap paper, bleaching powder, burlap or cotton bags, caustic soda, coal, coke, charcoal, cork, camphor, excelsior, fibers of any kind, fish oils, fish meal, foam rubber, hay, lubricating oil, linseed oil, or other oxidizable or drying oils, naphthalene, oakum, oiled clothing, oiled paper, oiled textiles, paint, straw, sawdust, wood shavings, or vegetable oils. Walls referred to in this section need extend only to the underside of the roof.

5-1.2 In lieu of separation walls, ammonium nitrate may be separated from the materials referred to in 5-1.1 by a space of at least 30 feet or more as required by the authority having jurisdiction, and if necessary, sills or curbs shall be provided to prevent mixing during fire conditions.

5-1.3 Flammable liquids such as gasoline, kerosine, solvents and light fuel oils shall not be stored on the premises except when such storage conforms to *NFPA 30-1973, Flammable and Combustible Liquids Code,* and when walls and sills or curbs are provided in accordance with 5-1.1 or 5-1.2.

5-1.4 LP-Gas shall not be stored on the premises except when such storage conforms to *NFPA 58-1974, Standard for the Storage and Handling of Liquefied Petroleum Gases.*

5-2 Prohibited Articles.

5-2.1 Sulfur and finely divided metals shall not be stored in the same building with ammonium nitrate except when such storage conforms to *NFPA 495-1973, Code for the Manufacturing, Transportation, Storage, and Use of Explosive Materials.*

5-2.2 Explosives and blasting agents shall not be stored in the same building with ammonium nitrate except on the premises of makers, distributors and user-compounders of explosives or blasting agents.

5-2.2.1 Where explosives or blasting agents are stored in

separate buildings, other than on the premises of makers, distributors, and user-compounders of explosives or blasting agents, they shall be separated from the ammonium nitrate by the distances and/or barricades specified in the Table of Recommended Separation Distances of Ammonium Nitrate and Blasting Agents from Explosives or Blasting Agents,[1] but by not less than 50 feet.

5-2.2.2 Storage and/or operations on the premises of makers, distributors and user-compounders of explosives or blasting agents shall be in conformity with *NFPA 495-1973, Code for the Manufacture, Transportation, Storage, and Use of Explosive Materials.*

[1] Printed in Appendix A of *NFPA 495-1973, Code for the Manufacture, Transportation, Storage, and Use of Explosive Materials.*

Chapter 6 General Precautions

6-1 Electrical Installations.

6-1.1 Electrical installations shall conform to the requirements of *NFPA 70-1975, National Electrical Code,* for ordinary locations. They shall be designed to minimize damage from corrosion.

6-1.2 Electric lamps shall be located or guarded so as to preclude contact with bags or other combustible materials.

6-2 Housekeeping.

6-2.1 Good housekeeping shall be maintained.

6-2.2 Uncontaminated contents of broken bags may be salvaged by placing the damaged bag inside a clean, new slipover bag and closing securely. Other spilled materials and discarded containers shall be promptly gathered and disposed of in a safe manner.

6-3 Sources of Ignition.

6-3.1 Open flames and smoking shall be prohibited in storage buildings but this is not meant to exclude heating units approved by the authority having jurisdiction.

6-4 Signs.

6-4.1 All points of entry to commercial warehouses in which ammonium nitrate is stored shall be properly identified with durable signs meeting the following specifications:

(a) Signs shall have background and letters in contrasting colors.

(b) Signs shall be worded "AMMONIUM NITRATE," with letters at least 2 inches high.

6-5 Vehicles and Lift Trucks.

6-5.1 Internal combustion motor vehicles, lift trucks, and cargo conveyors shall not be permitted to remain unattended in a building where ammonium nitrate is stored unless parked in an area which will prevent the spreading of a fire in event of a vehicle fire.

6-5.2 Fork trucks, tractors, platform lift trucks and other specialized industrial trucks used within the warehouse shall conform to the requirements of at least the GS, LPS, DS or EE designated units set forth in *NFPA 505-1975, Standard for the Use, Maintenance and Operation of Powered Industrial Trucks.*

6-6 Handling Equipment.

6-6.1 Hollow spaces shall be avoided in nitrate handling equipment where nitrate could collect and be confined under sufficiently high pressure to become a source of explosion in the event of fire.[1]

6-7 Lightning.

6-7.1 In areas where lightning storms are prevalent, lightning protection shall be provided. See *NFPA 78-1975, Lightning Protection Code.*

6-8 Control of Access.

6-8.1 Provisions shall be made to prevent unauthorized personnel from entering the ammonium nitrate storage area.

[1] Examples of hollow spaces include hollow conveyor rollers and hollow screw conveyor shafts.

Chapter 7 Fire Protection

7-1 Automatic Sprinklers.

7-1.2 Unless the storage of a greater quantity is approved by the authority having jurisdiction, not more than 2,500 tons of bagged ammonium nitrate shall be stored in a building or structure not equipped with an automatic sprinkler system. When determining whether greater quantities shall be permitted without sprinkler protection, the authority having jurisdiction shall take into consideration exposure of the storage building to built-up areas and possible presence of contaminants in the storage building. Sprinkler protection may be required for the storage of less than 2,500 tons of ammonium nitrate where location of the building or the presence of other stored materials may present a special hazard.

7-1.3 Sprinkler systems shall be of approved type and installed in accordance with *NFPA 13-1975, Standard for the Installation of Sprinkler Systems.*

7-2 Extinguishing Devices.

7-2.1 Suitable fire control devices such as small hose or portable extinguishers shall be provided throughout the warehouse and in the loading and unloading areas. (See *NFPA 10-1975, Standard for the Installation, Maintenance, and Use of Portable Fire Extinguishers* and *NFPA 14-1974, Standard for the Installation of Standpipe and Hose Systems.*)

7-2.2 Water supplies and fire hydrants shall be available in accordance with recognized good practices and as required by the authority having jurisdiction. (See *NFPA 24-1973, Standard for Outside Protection.*)

7-2.3 The requirements for automatic sprinklers, water supplies and fire hydrants set forth in 7-1.2 and 7-2.2 may be waived by the authority having jurisdiction when storage facilities are located in remote areas.

Appendix A Suggested Fire Fighting Procedure

A-1 Should a fire break out in an area where ammonium nitrate is stored, it is important that the mass be kept cool and the burning be promptly extinguished. Apply large volumes of water as quickly as possible. If fires reach massive and uncontrollable proportions, fire fighting personnel should evacuate the area and withdraw to a safe place.

A-2 Provide as much ventilation as possible to the fire area. Rapid dissipation of both the products of decomposition and the heat of reaction is very important.

A-3 Approach the fire from upwind as the vapors from burning ammonium nitrate are very toxic. Self-contained breathing apparatus of types approved by the U.S. Bureau of Mines should be used to protect personnel against gases.

A-4 After extinction of the fire, the loose and contaminated unsalvageable ammonium nitrate should be buried or dumped in water, where permissible. Any residue that cannot be removed by sweeping should be washed away with hoses. Flushing and scrubbing of all areas should be very thorough to insure the dissolving of all residue. Wet empty bags should be removed, permitted to dry out and then burned out of doors.

Appendix B Suggested Provisions For Municipal Legal Regulations

Where this Code is used as the basis for municipal legal regulations, the following provisions are suggested as an aid to enforcement.

B-1 Title.

B-1-1 This ordinance shall be known as "an ordinance regulating the storage, having and keeping of ammonium nitrate in the City of ....," and may be referred to as "The Ammonium Nitrate Storage Ordinance."

NOTE: The title should conform with local law and practice.

B-2 Definitions.

B-2-1 Chief. The Chief of the Fire Department or his authorized representative is hereby designated as "the authority having jurisdiction" wherever that expression appears in the ordinance.

B-2-2 Jurisdiction. "Jurisdiction" whenever used in this ordinance shall mean the City of .....

B-2-3 Permit. The term "Permit," whenever used in this ordinance shall mean the written authority of the ..... issued pursuant to this ordinance to store, have, or keep pure, fertilizer or other grades of ammonium nitrate, and mixtures containing 60 percent or more by weight of ammonium nitrate and which are classified as oxidizing materials (usually by the Department of Transportation) by the authority having jurisdiction.

B-3 Application.

B-3-1 This ordinance shall apply to all persons, firms, corporations, co-partnerships, governmental agencies except Federal, and associations storing, having or keeping ammonium nitrate, and to the owner or lessee of any building or premises in or on which ammonium nitrate is stored or kept.

B-4 Permitted Locations.

B-4-1 The storage of ammonium nitrate in quantities of 1,000 pounds or more is prohibited within the following limits:

NOTE: These limits are to be specified according to local zoning ordinances. They should include all residential, mercantile, and other congested districts.

B-4-2 No permit shall be issued until approval has been