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Standard

for the

Storage, Handling, and Use of PYROXYLIN PLASTICS IN FACTORIES Making Articles Therefrom

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NATIONAL FIRE PROTECTION ASSOCIATION
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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.

Approved Equipment

The National Fire Protection Association does not "approve" individual items of fire protection equipment, materials or services. The suitability of devices and materials for installation under NFPA standards is indicated by the listing of nationally recognized testing laboratories, whose findings are customarily used as a guide to approval by agencies applying these standards. Underwriters' Laboratories, Inc., Underwriters' Laboratories of Canada, the Factory Mutual Laboratories and the American Gas Association (gas equipment) test devices and materials for use in accordance with the appropriate standards, and publish lists which are available on request.

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Pyroxylin Plastics in Factories.

NFPA No. 42 — 1962

The Standard for the Storage, Handling and Use of Pyroxylin Plastics in Factories Making Articles Therefrom was prepared by the Committee on Chemicals and Explosives and presented to the Association in 1920 for tentative adoption. In 1921 the Standard was finally adopted. Minor amendments of the 1922 edition were adopted by the Association in 1928, and in 1934 further revisions were referred to the Board of Directors and approved. In 1936 a few amendments were adopted by the Association.

With reorganization of the Committee in 1960 the Sectional Committee on Explosives was given responsibility for this standard. The 1936 edition, with minor editorial revisions to bring references up to date, and with a new numbering system, was reconfirmed as a current NFPA standard at the 1962 Annual Meeting.

The National Board of Fire Underwriters adopted and published the Standard in 1922, 1928, 1935, 1936, and 1940.

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Synopsis.

This Standard is based on two major premises:

FIRST — That pyroxylin plastic is exceedingly quick-burning and therefore requires immediate application of water, and that a fire in this material is intense and needs large quantities of water; therefore adequate protection requires the installation of automatic sprinklers in all places where the material is stored or handled. These systems must be in excess of the usual installation as to the number of sprinklers, the amount of water available and the general care and maintenance.

SECOND — That to obtain good sprinkler control of fires, lateral transmission of heat in the plastic must be stopped and the heating of a large mass to the point of decomposition prevented. This is feasible in all storage through the installation of tight vertical dividing partitions. Even large total storage is safe for individual rooms if adequately protected and in relatively small masses.

The Standard contemplates construction of such factories, with accompanying storage, in any class of building found acceptable for manufacture by the National Building Code of the National Board of Fire Underwriters.* The Standard requires complete separation of floors, adequate exits, separation of various hazards by fire-resistive partitions, safe heating and liberal fire protection, consisting of automatic sprinklers, fire pails and fire extinguishers, supplemented in some cases by 1½- or 1¼-inch hose.

*See Appendix for availability.

Each plant must provide a standard cabinet, vault or isolated storage building for the storage of the material received by the plant and to be worked upon at that plant. This is classed as raw material regardless of its form and any previous work done upon it. Immediately upon removal from storage, the raw material becomes stock in process and, as such, except when being worked upon, it must be kept in tote-boxes, which are receptacles containing only enough plastic for economic operation, and of a size permitting easy handling. These are limited in the workroom not to exceed 3 per operator and must be kept at least 3 feet apart. Material on workbenches must be separated by low partitions to prevent large accumulations. The Standard provides for cleanliness and requires construction to prevent material from dropping on the floor.

To safeguard large accumulations, special rooms are provided for the storage of tote-boxes and for the storage of finished articles in cartons or otherwise wrapped and packed and for storage of material packed ready for shipment.

In vaults, cabinets, and all other storerooms, in addition to adequate sprinkler protection, averaging one sprinkler to each 20 to 36 square feet, the Standard specifies numerous partitions to prevent a sidewise spread of fire. Provision is also made for adequate ventilation to remove fumes in the storage room and to lessen the probability of these fumes entering the factory building.

It is believed that compliance with this Standard will reasonably safeguard both life and property; radical departure from actual conditions in much of the industry affected will be required, and frequent and rigid inspections by the authority having jurisdiction.

This Standard has been prepared to bring about a reasonable degree of protection and should be considered as establishing the probable minimum of safe requirements. Maximum requirements are not called for in all cases as it is believed that this Standard should be made a basis for municipal ordinances and state laws. Cities adopting this Standard as an ordinance should provide for the enforcement through proper fire department, fire prevention bureau or other properly constituted body, and should make provision for frequent inspections by some of the fire force and should provide for adequate penalties in case the Standard is not lived up to.

Chapter 1. Introduction.

100. Application.

1001. Scope. (a) This standard shall apply to all factories as defined below, manufacturing articles from pyroxylin plastic.

(b) It shall cover the storage, handling and fabrication of pyroxylin plastic, whether in the form of raw material, stock in process of manufacture, unfinished or finished product or scrap, in connection with such factories.

1002. Exceptions. (a) Buildings in which pyroxylin plastics or articles manufactured therefrom are kept, stored or handled, but where no manufacturing is done, except as covered in Section 300 of this standard.

(b) Manufacture of pyroxylin plastic (raw material) from nitrating to storage and shipping of sheets, rods and tubing.

(c) Manufacture, use and storage of cellulose nitrate film.

101. Definitions.

The term PYROXYLIN PLASTIC wherever used in this standard shall be held to mean and include any plastic substance, material or compound, other than cellulose nitrate film as provided for in the Standard for Storage and Handling of Cellulose Nitrate Motion Picture Film, NFPA No. 40,* having soluble cotton or similar cellulose nitrate as a base, including celluloid, fiberloid, pyralin, viscoloid, zylonite and similar products, materials and compounds by whatever name known, when in the form of blocks, slabs, sheets, tubes or fabricated shapes.

The word FACTORY as used herein shall mean only buildings or portions of buildings in which articles are manufactured in whole or in part from pyroxylin plastics.

The term VAULT shall be held to mean a small room of not over 1,500 cubic feet capacity, constructed and protected according to Section 401 of this standard.

The term CABINET shall be held to mean a small metal or fire-resistive enclosure constructed as specified in Section 402 of this standard.

*See Appendix for availability.

The term TOTE-BOX STOREROOM shall be held to mean a specially constructed and protected room, constructed along lines specified in Section 505 of this standard.

The term FINISHED-STOCK STOREROOM shall be held to mean a specially constructed and protected room, constructed along lines specified in Section 701 of this standard.

The term TOTE-BOX shall be held to mean a box constructed as specified in Section 503 of this standard, used for the handling of stock in process or finished stock while in workrooms or tote-box storerooms.

The term RAW MATERIAL wherever used in this standard shall be held to mean and include any pyroxylin plastic when in the form of blocks, slabs, rods, tubes, and other shapes intended to be used for further manufacture.

The term STOCK IN PROCESS or UNFINISHED STOCK wherever used in this standard shall be held to mean and include any stock after it leaves the raw stock storage vault until it is completely finished and ready for storage or shipment.

The term FINISHED STOCK, as used herein, shall be held to mean pyroxylin plastic on which all operations, insofar as each particular factory is concerned, have been completed and which is ready for packing and shipping.

The term LACQUERS, THINNERS, ENAMELS, CEMENTS and DOPE, as used herein, shall be held to mean any liquid which contains a volatile, flammable solvent or thinner used in connection with the fabrication of pyroxylin plastic products.

The term WEIGHT OR POUNDS wherever used in this standard should be held to mean the weight of the pyroxylin plastic and not to include the packing materials, cartons, packing boxes or containers, nor the article or material to which the pyroxylin plastic is secured or attached.

Chapter 2. General.

200. Buildings.

2001. Buildings, other than those excepted in Section 1002, shall conform to the following requirements:

(a) Buildings exceeding three stories in height, if of frame construction, may not be continued in use for factory purposes.

(b) New factory buildings outside the fire limits may be constructed of frame, or existing frame buildings may be adapted for factory purposes, but in no case shall such buildings exceed two stories or 30 feet in height or 5,000 square feet in ground area.

(c) Buildings exceeding five stories in height unless of fire-resistive construction may not be continued in use for factory purposes.

(d) New factory buildings may be of nonfire-resistive construction, or existing nonfire-resistive buildings may be adapted for factory purposes, but in no case shall such buildings exceed four stories or 55 feet in height.

(e) All new and existing buildings shall have all parts of the building used as a factory or for storage equipped with a standard system of automatic sprinklers, and buildings over two stories high used in part as a factory shall have all other parts of the building equipped with a standard system of automatic sprinklers. EXCEPTION: Buildings where other operations of a nonhazardous nature are carried on and the use of pyroxylin plastic is of minor character, need not be sprinklered throughout, but shall have all portions where pyroxylin plastic is being cut or otherwise worked on equipped with sprinklers.

(f) Buildings not of fire-resistive construction shall have floors of double 7/8-inch tongue and groove boards or the equivalent.

(g) All vertical openings between floors, including stairways, elevators, and dumbwaiters, shall be enclosed or otherwise protected in accordance with the National Building Code* recommended by the National Board of Fire Underwriters.

201. Aisle Space and Exits.

2011. All buildings or portions of buildings used in whole or in part for the fabrication of pyroxylin plastics shall be pro-

*See Sections 604.2 and 804 of the 1955 edition. See Appendix for availability.

vided with adequate aisle space and have at least two exits remote from each other.

2012. Exits shall consist of stairways as specified in the National Building Code* recommended by the National Board of Fire Underwriters, or approved horizontal exit. Each exit shall be marked "Exit" in letters not less than six inches high, or by an illuminated sign with letters of the same height.

202. Partitions.

2021. Partitions separating rooms and those otherwise required herein shall be continuous from floor to ceiling and securely anchored to walls, floor, and ceiling. They shall be of reinforced concrete, not less than 3 inches thick, or of metal lath with cement plaster not less than 2½ inches thick, or of solid concrete blocks not less than 2½ inches thick. Block partitions shall be plastered on each side to a thickness of not less than ¼ inch.

2022. In lieu of the foregoing forms of construction, any type of partition construction may be used which will afford one hour protection, as determined by the specifications of standard fire tests for nonbearing partitions.

2023. All openings shall be protected with fire windows or fire doors of approved automatic or self-closing type, suitable for use on openings in corridor and room partitions and conforming in manner of installation to Class "C" of the Standard for the Installation of Fire Doors and Windows, NFPA No. 80.†

203. Heating.

2031. No stove, forge, torch, boiler, furnace, flame or fire and no electric or similar appliance likely to produce an exposed spark, shall be allowed in any room or compartment used for the storage of pyroxylin plastic. Nor shall they be permitted within 20 feet of any pyroxylin plastic in process of manufacture in any workroom.

2032. Artificial heating of building or rooms where pyroxylin plastics are handled or kept may be direct or indirect, but if radiators are within 4 feet of the floor, only low pressure steam, not exceeding five pounds, or hot water will be permitted. For heating vaults only hot water heating system shall be permitted.

*See Article VI of the 1955 edition.
†See Appendix for availability.

2033. Fan and heater for air system shall be in a separate room. See the Standard for the Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying, NFPA No. 91.*

2034. No hot air or other floor registers shall be used, nor shall any wall register be less than 6 inches above the floor.

2035. All radiators, heating coils, pipes or returns that are near the floor or are so located as to permit any combustible material, waste or dirt to come in contact with them shall be guarded with ¼-inch mesh galvanized steel wire cloth, 20 U. S. Gage or its equivalent. The bottom of such guards shall be arranged to lift up for cleaning. The tops shall slope at such an angle as will prevent their use as shelves.

2036. All steam pipes, not protected as specified above and within 6 feet of the floor, and where passing through partitions or racks or near woodwork, shall be covered with asbestos or other approved pipe covering.

204. Lighting and Power.

2041. All wiring and equipment shall conform to the National Electrical Code, NFPA No. 70.*

2042. Only incandescent electric lights shall be permitted. These shall be protected against mechanical injury by substantial wire guards where necessary. In rooms or locations where there are flammable vapors or dusts, compliance with the National Electrical Code provisions covering Class I and Class II hazardous locations may be necessary depending upon the hazard.

2043. The use of portable lights on extension cords in any room in which pyroxylin plastics are handled or stored is prohibited.

2044. Motors or generators having brushes or sliding contacts shall be of the totally enclosed, enclosed-fan-cooled, or enclosed-pipe-ventilated types, or shall be otherwise arranged to minimize the danger from sparks, as provided in the National Electrical Code,* for motors in motion picture studios.

2045. Steam or gas engines shall be located in a room separated from the balance of the plant by fire-resistive partitions, as described in Section 202 of this standard, or shall be located at least 20 feet from material in processes.

*See Appendix for availability.

205. Dry Rooms or Boxes.

2051. Dry rooms or boxes for drying purposes in which heat of higher than ordinary room temperature is required, shall be of noncombustible material and constructed to confine the hazard therein.

2052. Heat shall be low pressure steam, hot water or hot air, with pipes located preferably overhead or at sides. A minimum clearance of 6 inches shall be maintained by proper guards of ¼-inch mesh galvanized steel wire cloth, No. 20 U. S. Gage or its equivalent, so that contents cannot come in contact with steam, hot water or hot air pipes.

2053. Dry rooms or boxes shall have ventilation to outside air. A vent pipe, if necessary, shall be made of not less than No. 20 U. S. Gage metal with lapped seams and riveted joints, run as directly as possible to some safe point outside of building and provided with suitable hood or shield as protection against weather.

2054. Such pipe shall be at least 6 inches from combustible material.

2055. If exhaust system is used fan shall have bronze or equivalent impeller and running rings; also outboard bearings to prevent ignition by spark, friction or otherwise of vapors being drawn through same.

2056. Dry boxes shall be equipped with automatic sprinklers.

2057. Care must be taken to keep dry rooms or boxes free from dust and accumulations of foreign material, and shall be so arranged that they can be readily cleaned.

206. Fire Protection.

2061. Water supply for automatic sprinklers shall be based on the number of sprinklers liable to be affected in any fire section between fire walls or fire-resistive partitions; in any plant it shall be assumed that any one of the following number of sprinklers may be affected, and the condition giving the maximum flow used as a basis:

All sprinklers in a vault.

All the sprinklers in a tote-box storeroom.

Three-fourths of the sprinklers in a finished stock storeroom.

Three-fourths of the sprinklers in a workroom, but not exceeding a total of 36.

All the sprinklers in a section of an isolated storage building.

(a) Supply is to be estimated on 20 gallons a minute per sprinkler for 20 minutes, with a minimum rate of flow of 500 gallons a minute. Such flow shall be with an effective pressure at the top line of sprinklers of not less than 40 pounds. Other details shall be as given in the Standard for the Installation of Sprinkler Systems,* NFPA No. 13.

2062. Special protection consisting of a liberal use of extra sprinklers or manually operated spray systems or other devices may be advisable at certain locations, for example, at lathes, sanders, etc., and hereinafter specified.

2063. A liberal number of water pails shall be provided:

(a) In Workrooms: At least one fire pail to every two persons employed therein.

(b) In Storage and other Sections, except Vaults: At least twenty-four pails for each 5,000 square feet area.

2064. In addition to the above, there shall be at least one small hose connection for each 5,000 square feet area, which shall be equipped with 50 to 75 feet of approved hose, or one or more approved 2½-gallon extinguishers of the type using water, or water solution consisting largely of water (foam not included) to obtain maximum cooling effect.

2065. Around large motors and other electrical equipment where special protection is needed, approved vaporizing liquid, carbon dioxide, or other fire extinguishers suitable for use on Class C fires shall be provided.

NOTE: See Standard for the Installation, Maintenance and Use of Portable Fire Extinguishers, NFPA No. 10.*

2066. Where considerable quantities of pyroxylin plastic are handled or stored, additional protection shall be provided by installing short sections of 1½-inch or 1¼-inch hose with ½-inch or ⅜-inch nozzles convenient to work-benches and similar places, as specified by the authority having jurisdiction.

207. Management.

2071. Every factory or establishment used for the storage or fabrication of articles from pyroxylin plastic must be in charge of a responsible, licensed executive who is familiar with this standard and with the importance of fire prevention and with any local laws or ordinances.

*See Appendix for availability.

2072. The executive must, as a part of his duty, see that this standard is observed and that his employees are instructed as to fire hazards and the proper handling of pyroxylin plastic.

208. Smoking.

2081. Smoking shall be prohibited in any establishment handling, storing or fabricating pyroxylin plastic and conspicuous "No Smoking" signs shall be posted in prominent places.

209. Restrictions.

2091. No building which is situated within 50 feet of the nearest wall of any building occupied as a school, theatre or other place of public amusement or assembly, shall be used for the storage of pyroxylin plastic except in quantities less than 100 pounds, nor the manufacture of articles therefrom where the total quantity exceeds this amount.

2092. Fabricating of pyroxylin plastic articles in any building which is occupied as a tenement house, dwelling, hotel or lodging house shall be prohibited.

Chapter 3. Isolated Storage Buildings.

300. A factory using pyroxylin plastic may provide and use for the bulk storage of this material an isolated storage building provided said building shall conform to the intent of the following provisions:

301. If not protected by a complete system of automatic sprinklers as specified below the building shall be at a distance from combustible material in the open, and from any other building, except (1) a sprinklered building having noncombustible walls and cornice and fully protected wall openings or (2) one having a parapeted blank masonry wall facing the exposure, in accordance with the following table of distances:

Pounds of Pyroxylin Plastic Stored.	Distance in feet to property line, building, or combustible material in the open.
1– 1000	40
1001– 2000	55
2001– 3000	65
3001– 4000	70
4001– 5000	75
5001– 10000	100
10001– 20000	130
20001– 30000	150
30001– 40000	165
40001– 50000	180
50001– 75000	200
75001–100000	225
100001–150000	250
150001–300000	300

302. The building shall not be used for any purpose save the packing, receiving, shipping, and storage of pyroxylin plastic or articles manufactured therefrom and their necessary containers and wrappings. Where storage exceeds 25,000 pounds, packing, receiving and shipping in connection with such storage shall be in a separate room cut off by parapeted wall equivalent in fire resistance to 8 inches of reinforced concrete, with double standard fire doors on opening to the storage section.

3021. Provided that sections separated by blank parapeted walls, equivalent in fire resistance to 8 inches of reinforced concrete, from the section containing pyroxylin plastic may be used for storage of other articles.

303. The building, if located within 100 feet of any other building or combustible material stored in the open, shall have all walls equivalent in fire resistance to 4 inches of concrete, or three-cell 8-inch tile. All openings in such walls shall be protected by shutters or doors equivalent in fire resistance to a two-ply tin-clad fire door or shutter constructed and arranged in accordance with the Standard for the Installation of Fire Doors and Windows, NFPA No. 80.* Skylights shall be protected in such a manner as to prevent radiated heat or flying brands from igniting the contents of the building. Roofs shall be suitably insulated with noncombustible heat insulating materials where necessary to prevent building up a temperature in excess of 100° F in the storage house by heat from the sun's rays.

304. Buildings shall not be such as to exceed a capacity of 100,000 pounds in shipping cases or 50,000 pounds of other material in any one section between blank, parapeted division walls equivalent in fire resistance to 8 inches of reinforced concrete.

305. Adequate vents shall be provided and arranged as specified in Paragraph 4016 of this standard, except that when the building is protected throughout with automatic sprinklers, the vent area need not exceed 100 square inches for each 1,000 pounds storage capacity.

306. If the capacity of any area between division walls of the building, as specified above, exceeds 7,500 pounds, except where storage consists only of material in packing cases, the storage space shall be subdivided into racks and bins separated by partitions equivalent to one of tightly matched ⅞-inch tongue and groove boards, each section to be independently vented or open to aisle space, the partitions to be so arranged as to afford the minimum of obstruction to the distribution by sprinklers if present.

307. If the storage building directly adjoins or communicates with a factory building, it shall be classed as a vault and shall be limited as to size, arrangement and protection as specified for Vaults, Section 401 of this standard.

308. A storage building protected by automatic sprinklers, and having a storage capacity of 1,501 or more cubic feet or 10,001 or more pounds shall have no direct communication with any other building, nor shall it have any wall opening or other opening within 50 feet of any opening in any wall of any building, or

*See Appendix for availability.

of any combustible wall or storage of any combustible material in the open. The walls of a building in the same plane or parallel planes and facing in the same direction as that in which the opening is situated, shall not be considered as coming within the intent of this requirement.

309. Storage buildings not complying as to distances as given in Section 31 of this standard, shall be equipped with an automatic sprinkler system with one automatic sprinkler to each 32 square feet.

310. Storage buildings used for storage of loose scrap shall be equipped with an approved automatic sprinkler system in the ratio of one automatic sprinkler to each 1,000 pounds of storage capacity, unless storage is in tanks or receptacles kept filled with water.

NOTE: It is recommended that scrap not in tight boxes be kept under water.

311. Plans for the building and its protection shall be submitted to the authority having jurisdiction, and all arrangements shall be made subject to the approval of the authority having jurisdiction.

Chapter 4. Storage of Raw Materials in Factories.

400. Storage Methods.

4001. All raw material shall be stored as follows:

(a) Where raw material is received in any building or fire area in excess of 25 pounds, a cabinet or vault constructed as given in this section shall be provided for the storage of the material.

(b) Not more than 1,000 pounds of raw material may be stored in cabinets in any one workroom, but not more than 500 pounds in any one cabinet, nor more than 250 pounds in one compartment.

(c) All raw material in excess of that permitted under (b) above, except stock in process (see Definition 101), must be stored in a vault or vaults.

401. Vaults.

4011. No vault shall exceed 1,500 cubic feet in capacity, nor shall storage space be provided in any vault for more than 10,000 pounds of raw material.

4012. Proximity to boilers, stacks and other sources of heat shall be avoided.

4013. Vault shall be constructed as follows:

(a) Vaults shall be supported by masonry or steel of sufficient strength to carry the load safely. Beams shall rest at both ends on steel girders, iron or steel columns, or walls or piers of masonry. The supports shall afford at least 4 hours' protection as determined by the Standard Methods of Fire Tests of Building Construction and Material, NFPA No. 251.* Hollow tile shall not be used for foundation walls or for walls of other than the top vault where vaults are superimposed.

(b) Floors shall be of fire-resistive material.

(c) Walls shall be of reinforced concrete at least 6 inches in thickness, of brick at least 8 inches in thickness, or hollow tile at least 12 inches in thickness.

(d) Wall shall be so constructed as to be without cracks or holes, permitting escape of gases of combustion into the building.

(e) The roof of vault shall be an independent reinforced concrete roof at least 6 inches thick; in fire-resistive building,

*See Appendix for availability.

where the floor above is equivalent to this, it may serve as the roof if side walls are rigidly tied into it; in construction of this type, a false ceiling, constructed of metal lath and cement plaster 1 inch thick, or the equivalent, and with no openings to the concealed space above, may be used to limit the total interior vault space of 1,500 cubic feet. The vent may extend through this false ceiling and concealed space.

(f) No skylights or windows other than those specified under "Vents" in this section shall be permitted therein.

(g) A fire door shall be provided on each face of the wall on door openings. Doors shall conform as to construction and installation to Class B of the Standard for the Installation of Fire Doors and Windows, NFPA No. 80.* The interior door shall be automatic. The outer door shall be of the swinging type and close into a rabbet, or otherwise be made tight to prevent passage of flame around edges; it shall be self-closing, and if fastened open shall be arranged to close automatically in case of fire originating in or out of vault.

(h) Shelving and racks in vaults shall be of substantial construction throughout and shall be so arranged as to facilitate distribution of water from automatic sprinklers. Shelves shall be constructed with 1-inch space between slats not over 2 inches wide and may be made of iron pipe, rods, channels, angles or of wooden slats. Vertical partitions extending from floor to above the top shelf, shall be provided to divide racks into sections. Means shall be provided to keep the stock or containers on each side of such partitions an inch away from same. Racks, material and doors shall not obstruct any vent openings, and stock shall not be placed higher than 2 feet below sprinkler deflector. Material shall not be stored or kept on the floor, unless in shipping containers approved by the I.C.C. For details of typical arrangement of shelves, slats and automatic sprinklers, see Figures 1 and 2.

(i) Partitions shall be of substantial construction such, for example, as $\frac{7}{8}$-inch matched boards free from cracks and knot holes, or its equivalent in resistance to heat and gases. Materials such as hard cement asbestos board shall be protected against mechanical injury where necessary.

4014. PROTECTION:

(a) Vaults shall be equipped with automatic sprinklers, with

*See Appendix for availability.

a ratio of one sprinkler to each 834 pounds of pyroxylin plastic, or one sprinkler to each 125 cubic feet of total vault space.

(b) A vault which is divided into two or more sections shall have at least one automatic sprinkler in each section.

(c) Sheet metal baffles shall be provided to facilitate operation of sprinklers. When an approved automatic sprinkler system with open heads is permitted by the authority having jurisdiction, the baffles between heads may be omitted.

(d) Arrangement of sprinklers shall be submitted to the authority having jurisdiction for approval in each case.

(e) Sprinkler systems for vaults shall be equipped with a ¾-inch drip line with a ½-inch outlet valve.

(f) Where the design of the building is such that an excessive floor load would result from having the vault filled with water, the vault shall be provided with one or more scuppers, giving an aggregate area equal to 3 square inches for each sprinkler head installed in the vault.

NOTE: A depth of 10 feet of water will result in a floor load of 626 pounds per square foot.

4015. HEAT. (a) Heating, when required to prevent sprinkler pipes freezing, shall be by hot water or low pressure steam with automatic control limiting steam pressure to 10 pounds and the vault temperature to not in excess of 70° F. Radiators shall be placed at the ceiling, over aisle space with wire guards so arranged that no pyroxylin can be placed within 12 inches of such pipes or radiators.

4016. VENTS.

(a) Each vault or compartment of a cabinet shall be separately vented to the outer air.

(b) The vent shall have a minimum effective sectional area in the ratio of 140 square inches for each 1,000 pounds capacity. For a standard vault of 1,500 cubic feet the vent opening shall be 1,400 square inches.

(c) The outlet of each vent shall be above the roof of the building or made to face on a street, court or other clear space remote at least 50 feet to openings. Openings in walls of a building in the same plane or parallel planes and facing in the same direction as that in which the vent is situated shall not be considered as coming within the intent of this requirement.

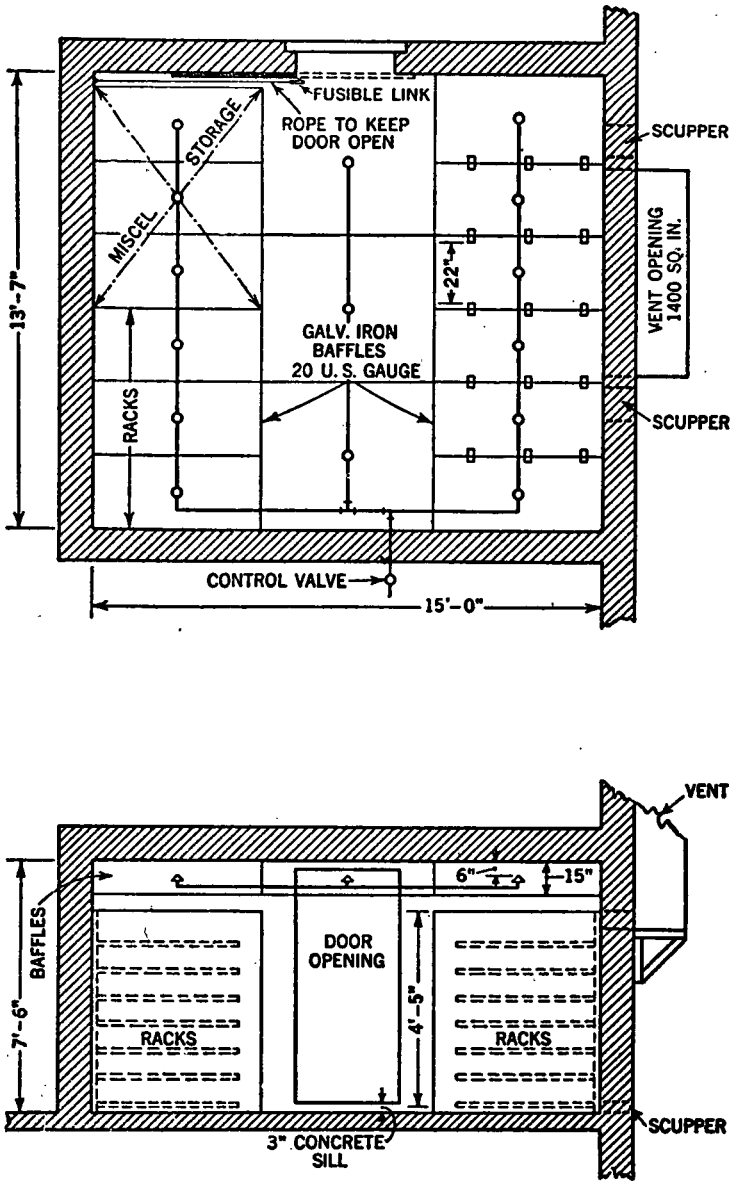


Fig. 1. Raw Stock Storage Vault, Showing General Arrangement of Sprinklers, Racks and Baffles.

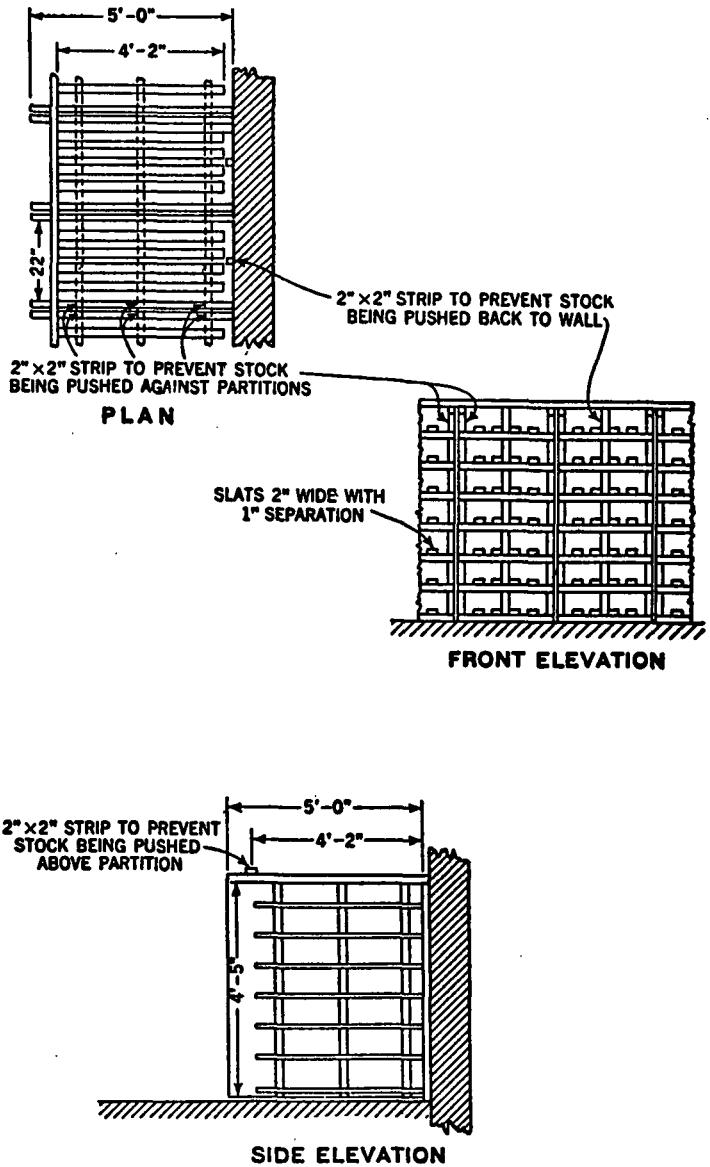


Fig. 2. Details of Storage Racks in Raw Stock Storage Vault.

(d) All interior horizontal or vertical flues shall be of 5 inches reinforced concrete or of a construction equivalent to that of smoke chimneys as specified in the National Building Code recommended by the National Board of Fire Underwriters, except that for 250 pounds or less of raw materials the flue may be of riveted sheet metal of at least No. 18 U. S. Gage covered with 1 inch of approved heat insulation and not nearer than 9 inches to any combustible material.

(e) Exterior metal flues shall be of a construction equivalent to that of smoke stacks.

(f) Each vent opening directly through an exterior wall shall be protected against the weather by a single thickness of glass 1/16-inch thick, painted a dark color, or by other noncombustible fragile material, mounted in a sash arranged to open automatically in case of fire by the use of an approved releasing device placed inside the vault. The total area of the glass shall be taken as the effective sectional area of the vent opening. No pane of glass shall be smaller than 200 square inches. Any other protection equivalent to the above may be accepted in lieu thereof.

(g) A light wire screen, not coarser than ⅛-inch mesh, shall also be placed over each vent, so arranged as not to interfere with the automatic operation of the sash. Bars or a screen designed to prevent burglary, or injury to contents shall not have a mesh of less than 4 inches; shall be located inside of the light wire screen and give a vent opening equal to that called for above.

(h) A permanent guard shall be installed to prevent any of the contents from being forced against the mouth of the vent when the vent opening is 10 inches or less in any dimension.

4017. LIGHTING

(a) All vault lights shall be at the ceiling.

(b) All wiring shall be in metal conduit.

(c) Incandescent electric lights only shall be used. They must have rigid fixtures and be protected by marine type globes.

(d) Lights shall be equipped with keyless sockets and operated by a switch located outside of vault and so arranged as to indicate by means of a pilot light near switch whether the lights in vault are on or off.

402. Cabinets.

4021. No cabinet shall exceed 30 cubic feet capacity.

4022. Cabinets shall be of approved construction.

4023. Cabinets having a capacity in excess of 250 pounds of pyroxylin plastic shall be divided into at least two distinct compartments; each compartment provided with an independent door and vent. The separating partitions should be practically air tight and of substantial construction equivalent to the sides.

NOTE: In general, cabinets should be of a design and so insulated that they will stand at least a five minute fire test on a Standard Time Temperature Control Curve. The racks or drawers must be so arranged that the material immediately adjacent to the partitions does not touch same on either side. Spacers should be provided so as to have such material at least one-half inch away from the partition on either side. Separating partitions may be constructed of three-eighths-inch hard asbestos board or of one-quarter-inch soft asbestos board, enclosed between steel or iron sheets No. 22 U. S. Gage. The exterior sides of cabinet and doors may be composed of one-quarter-inch hard asbestos board carried on a framework of 1¼ by 1¼ by 1⅛-inch angles or may be made of No. 18 U. S. Gage metal, double walled with 1½ inches of air space. The shelves or racks within the cabinet must be of metal and arranged to facilitate distribution of water from sprinklers. Doors to compartments must be so arranged as to remain normally closed, must be kept closed by a three-point latch and must be sufficiently tight to prevent the entrance of flame due to the burning of pyroxylin plastic in an adjoining compartment. Doors on divided cabinets must swing from the center so that they will not expose the contents of one compartment to the other.

4024. For arrangement of vent see Paragraph 4016 of this standard.

4025. Cabinets holding over 50 pounds of pyroxylin plastic shall be equipped with at least one automatic sprinkler. If divided into two or more compartments, they shall have at least one automatic sprinkler in each compartment.

Chapter 5. Manufacturing.

500. Workrooms.

5001. Workrooms may be divided into two classes; namely:

(a) Class A or nonhazardous type — those in which only hand bench work or assembly work is done; also those in which bristling, wet ashing or nonfrictional operations are performed. This shall include work in connection with automobile tops and bodies.

(b) Class B or hazardous type — those not included in Class A; for example, cutting, turning, shaping, beading, sanding, molding, hubbing, artificial softening or heating or the use of mechanical equipment which introduces friction or special hazards and might cause fires.

5002. Separation of Workrooms: (a) Workrooms of both classes shall be separated from each other and from rooms used for other manufacturing or storage purposes by fire-resistive partitions as specified in Section 202 of this standard.

(b) Where both hazardous and nonhazardous operations are performed or carried on in the same room standards governing the hazardous or Class B rooms shall prevail.

501. Tables.

5011. Tables and work benches shall be of substantial construction, arranged to prevent stock from falling from bench to floor, and shall have dividing partitions whenever necessary, as specified in Section 504 of this standard.

5012. Storage or discharge of material under table or work bench is prohibited unless adequately protected with automatic sprinklers installed underneath and spaced not over 4 feet apart. Tables and work benches shall be kept at least 4 inches from any wall, steam or hot water pipe.

502. Classification of Articles.

5021. Class A articles shall be those made from material over one-tenth inch thick and not finely divided during manufacture into teeth, scrollwork or projections.

5022. Class B articles shall be those not coming within the above classification and shall include articles of an individual

weight of one-half ounce or less, regardless of the thickness of material from which they are made.

503. Tote-Boxes.

5031. Tote-boxes shall be substantially constructed and kept in good condition. Covers may be provided, but are not required.

5032. Tote-boxes shall be limited in capacity to the amount required per operator for one-half day's work, and to not over 75 pounds of Class A nor 35 pounds of Class B material or articles and in no case exceed 12,000 cubic inches.

504. Material in Process.

5041. Material in transit may be carried on trucks provided that tote-boxes are not piled upon each other and sheet or other raw material is not piled on tote-boxes. Trucks shall not be left unattended and shall be unloaded promptly. Sheet material may be left in shipping container at blanking or cutting machines, but not in excess of one container to each machine.

5042. Class A or Non-Hazardous Type Workrooms:

(a) During process of manufacture and until packed in shipping cartons or boxes, materials and articles not in finished-stock storeroom or in raw material vault or cabinets shall be kept in tote-boxes in so far as the nature of the work permits.

(b) In no case shall the total quantity in the workroom exceed the capacity of three tote-boxes per 100 square feet of floor space.

(c) Tote-boxes shall in no case be piled one on top of another.

5043. Class B or Hazardous Type Workrooms:

(a) In no case shall operators be stationed closer than 3 feet to each other.

(b) During process of manufacture and until packed in shipping cartons or boxes, materials and articles not in finished-stock storerooms, raw material vaults or cabinets shall be kept in tote-boxes except when on tables, work benches, at machines or being worked upon, as provided below.

(c) The amount of material per operator shall not exceed one-half day's supply and shall be limited to the capacity of three tote-boxes, including material awaiting removal or use.

(d) Material equal to not more than the capacity of one tote-box per operator may be placed upon tables, workbenches or at machines provided tote-boxes, depressions or partitions are arranged to prevent spread of material. Where box, depression or space for material adjoins another or is within 3 feet of another, measured horizontally, a partition constructed of ⅞-inch matched boards or asbestos-cement board or two sheets of metal ½-inch apart, extending 12 inches above top of bench, shall be provided.

(e) In all other cases separation shall be required to prevent accumulation at any one point of an amount exceeding the capacity of one tote-box; such separation to consist of at least 3 feet horizontal distance between boxes. Tote-boxes may be placed under workbenches or tables, provided that automatic sprinklers are installed according to Section 501 of this standard. Unless 3 feet separation, measured horizontally, is maintained, boxes must be separated by solid dividing partitions extending from floor to under side of bench or table with each compartment protected by at least one automatic sprinkler.

505. Storage of Tote-Boxes.

5051. Tote-boxes containing finished or partly finished materials shall be stored as follows, except as permitted in Section 504 of this standard.

5052. Unless stored in cabinets or vaults as specified in Section 401 of this standard, they shall be stored in a special tote-box storeroom separated from other parts of the floor and protected as outlined below:

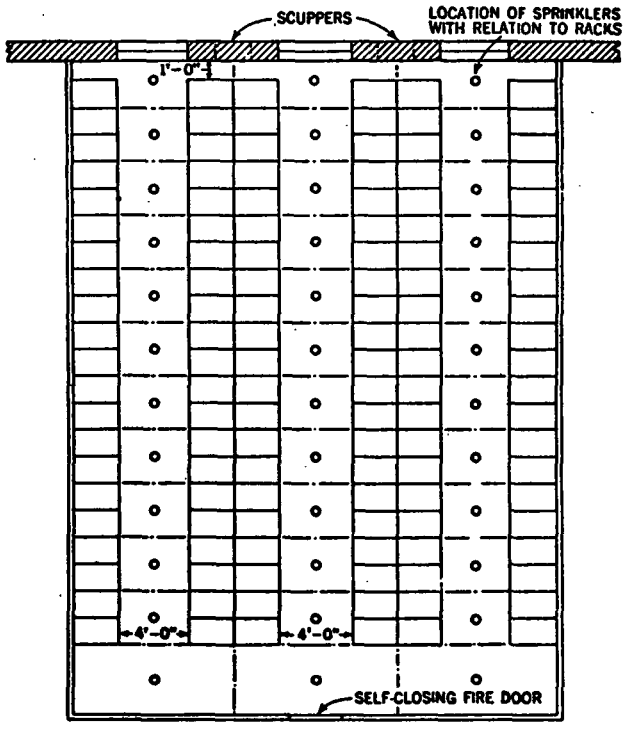
(a) Storeroom shall not exceed 1,000 square feet in area.

(b) Shall be separated from other parts of the floor by walls or partitions as required in Section 202, except that glass is prohibited.

(c) Ceiling of rooms, unless of fire-resistive construction, shall be protected with hard cement plaster at least 1 inch thick.

(d) Storage in this room shall be on shelves divided into vertical sections having solid dividing partitions and back, preferably of noncombustible material or at least ⅞-inch tongue and groove boards or its equivalent in resistance to heat and gases. Front of rack shall be open.

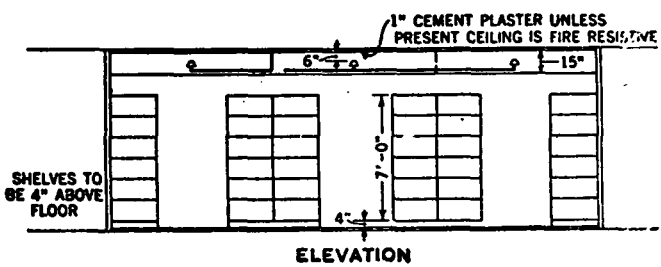
Each section shall be not less than 4 inches or more than 6 inches wider or deeper than one Class A tote-box or two Class B tote-boxes. The distance between shelves shall be at least 2



PLAN

Dimensions of racks, distance between baffles and other dimensions will vary with the size of tote box.

Total area of store room not to exceed 1,000 square feet.



ELEVATION

Fig. 3. Tote-box Storeroom Showing General Arrangement of Racks and Sprinklers.

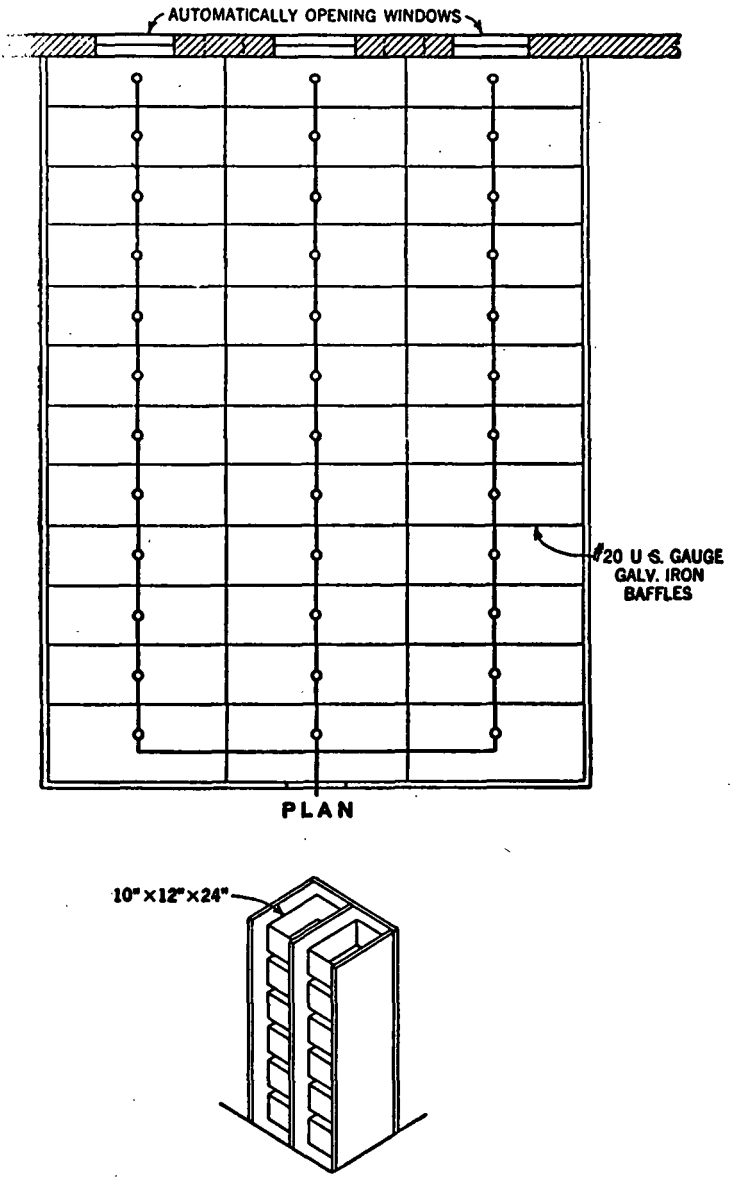


Fig. 4. Tote-Box Storeroom Showing Arrangement of Sprinklers and Baffles and Section of Tote-Box Storage Rack.

inches greater than the depth of the tote-boxes. Shelves shall be constructed of slats not over 2 inches wide, with at least 1 inch separation, and may be made of iron pipe, rods, channels, angles or of wooden slats. Aisle space of at least 4 feet shall be provided. Height of racks is not to be over 8 feet and in no case is stock to be stored higher than 2 feet below sprinkler deflectors.

(e) Sprinkler protection shall be provided, consisting of one sprinkler in center of aisle immediately in front of the dividing partition between each pair of sections, with proper baffles between heads.

(f) Adequate ventilation shall be provided equal to a clear opening of at least ½ square inch per cubic foot of room. Thin glass windows, if unexposed, are acceptable.

(g) Windows or other wall openings in storerooms when exposed by other buildings or structures within 50 feet, or where located above other openings, shall be bricked up or otherwise adequately protected.

506. Softening and Heating.

5061. Softening and heating pyroxylin plastic, when not done by hot water, shall be done on approved steam or electric heaters, dies or tables, having at least 3 inches clearance from all woodwork or combustible material.

5062. Heaters, dies, steam tables and pipes shall be arranged so that no stock except that being worked on will come in contact with same.

5063. Metal receptacle shall be provided in which all combustible pads or coverings used on softening and heating devices shall be kept when not in actual use.

507. Flammable "Lacquers," "Enamels," "Paints," "Thinners," "Cements," and "Dope."

5071. All such material, if kept inside of factory, must be limited to one day's supply unless stored in an approved oil and paint room.

5072. Where main supply is not kept in an oil or paint room, all materials in excess of one day's supply, but not exceeding 10 gallons of compound and 5 gallons of thinner in any one room, shall be stored either in safety cans or in metal boxes.

5073. Metal boxes shall be constructed of sheet iron on angle iron, or a box consisting of a wooden frame covered on interior

and exterior with lock jointed and blind nailed sheet metal, at least No. 32 U. S. Gage, may be used.

5074. Box or enclosure shall be ventilated at top and bottom and whenever practical placed outside of room.

5075. Where allowable, supply of above materials may be stored on a permanent shelf outside of building, securely fastened to wall and not directly in front of a window. The shelf shall be provided with a metal guard rail so that can or cans cannot readily be dislodged by accident.

5076. The use of fire escapes for the storage of flammable liquids and other materials is prohibited by law.

508. Cementing, Dipping, and Spraying.

NOTE: This does not include the use of nonflammable liquids.

5081. Cementing of sheets and other extensive cementing processes where considerable flammable cement is used, also dipping and spraying, shall be done in well ventilated rooms devoted exclusively to such work and separated from the remainder of the building by vapor-tight walls or partitions, constructed in accordance with Section 202.

5082. Spraying operations shall be conducted in accordance with the Standard for Spray Finishing Using Flammable Materials, NFPA No. 33.* Dipping operations shall be conducted in accordance with the Standard for Dip Tanks Containing Flammable or Combustible Liquids, NFPA No. 34.*

509. Shavings, Chips, Turnings, Sawdust, Etc.

5091. Shavings, chips, turnings, sawdust, edgings, trimmings and other materials resulting from manufacturing processes shall be kept thoroughly wet in a metal receptacle until removed from premises and shall be safely disposed of at frequent intervals. Provided that edgings, trimmings and other material remaining from the operation of cutting automobile curtains, or similar materials, may be handled and stored in tote-boxes, as specified for articles in process of manufacture.

5092. Floors, benches and machines shall be kept free from accumulations of this material.

*See Appendix for availability.

5093. Machines producing large amounts of such materials shall be provided with facilities, when necessary, for the discharge of the material as made into the receptacle unless the material is wet as produced and is removed at frequent intervals.

5094. If collector systems are used for the removal of the above materials they shall conform to the Standard for the Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying, NFPA No. 91,* and where necessary, special safeguard shall be provided, such as discharge of stock into water, installation of automatic sprinklers or openhead flushing systems in the piping, and atomizers or waterspray to prevent stock from becoming dry.

5095. A jet of water shall continually play upon saws, cutters and similar machines which are likely to heat the pyroxylin plastic to the ignition point by friction or otherwise when they are in use, except when the use of water will injure the material, in which case special means must be provided for the extinguishment of fire.

*See Appendix for availability.

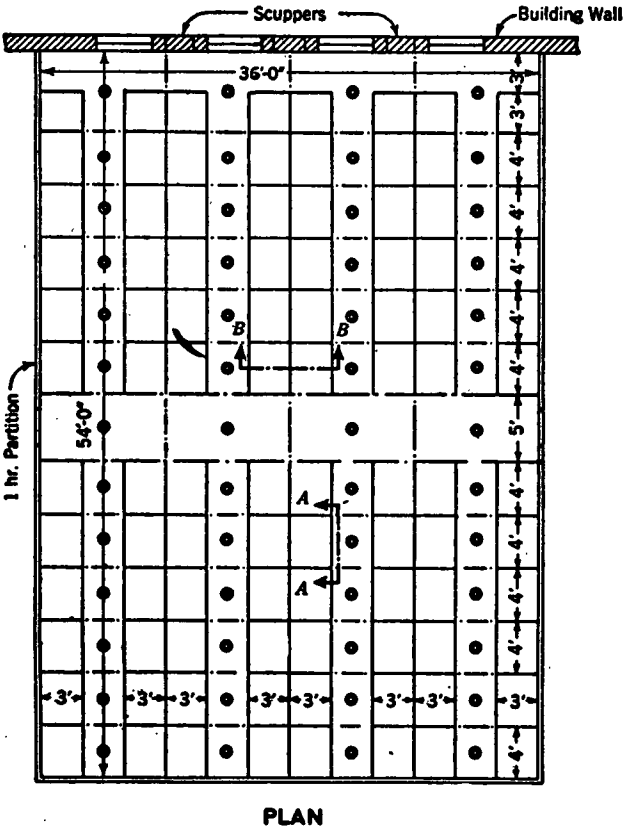


Fig. 5. Stock Storeroom Showing General Arrangement of Racks.