Recommended Safe Practices

for

GENERAL STORAGE

June
1956

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NATIONAL FIRE PROTECTION ASSOCIATION
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National Fire Protection Association

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The National Fire Protection Association was organized in 1896 to promote the science and improve the methods of fire protection and prevention, to obtain and circulate information on these subjects and to secure the cooperation of its members in establishing proper safeguards against loss of life and property by fire. Its membership includes nearly two hundred national and regional societies and associations (list on outside back cover) and more than sixteen thousand individuals, corporations and organizations. Anyone interested may become a member; membership information is available on request.

This pamphlet is one of a large number of publications on fire safety issued by the Association including periodicals, books, posters and other publications; a complete list is available without charge on request. All NFPA standards adopted by the Association are published in six volumes of the **National Fire Codes** which are re-issued annually and which are available on an annual subscription basis. The standards, prepared by the technical committees of the National Fire Protection Association and adopted in the annual meetings of the Association, are intended to prescribe reasonable measures for minimizing losses of life and property by fire. All interests concerned have opportunity through the Association to participate in the development of the standards and to secure impartial consideration of matters affecting them.

NFPA standards are purely advisory as far as the Association is concerned, but are widely used by law enforcing authorities in addition to their general use as guides to fire safety.

Definitions

The official NFPA definitions of shall, should and approved are:

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.

Approved Equipment

The National Fire Protection Association does not "approve" individual items of fire protection equipment, materials or services. The standards are prepared, as far as practicable, in terms of required performance, avoiding specifications of materials, devices or methods so phrased as to preclude obtaining the desired results by other means. The suitability of devices and materials for installation under these standards is indicated by the listings 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 and the Factory Mutual Laboratories test devices and materials for use in accordance with the appropriate standards, and publish lists which are available on request.

General Storage.

NFPA No. 231—1956

This standard was adopted on June 5, 1956 at the annual meeting of the Association and replaces the previous NFPA Standards on General Storage, dated 1946.

The 1956 text is the same as that adopted tentatively at the 1955 Annual Meeting of the Association with the exception of Par. 321. This 1956 edition is, however, a major revision of the previous official standard of the NFPA and incorporates a new section (Part C) on Refrigerated Warehouses.

RECOMMENDED SAFE PRACTICES FOR GENERAL STORAGE.

Contents

Introduction.

1. Purpose.

a. Recommendations contained herein are for the proper handling and safeguarding of storage of types of commodities of moderate combustible hazard. Standards for the storage of non-combustible commodities and those of extra combustible hazard are excluded, as well as storage covered by specific standards.

Specific standards have been prepared on the following subjects. These are published in pamphlet editions by the National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass., and in many cases also by the National Board of Fire Underwriters, 85 John St., New York 38, N. Y. They appear also in the volumes of the National Fire Codes published by the National Fire Protection Association.

No. 30L Flammable Liquids.

No. 40. Cellulose Nitrate Motion Picture Film.

No. 43. Pyroxylin Plastics in Warehouses and Wholesale Jobbing and Retail Stores.

No. 44. Combustible Fibres.

No. 47. Retail Lumber Yards and Lumber Storage Yards.

No. 48. Magnesium.

No. 58. Liquefied Petroleum Gases.

No. 61B. Prevention of Dust Explosions in Terminal Grain Elevators.

No. 61C. Prevention of Dust Explosions in Flour and Feed Mills.

No. 64. Prevention of Dust Ignitions in Country Grain Elevators.

No. 81. Fur Storage, Fumigation and Cleaning.

No. 87. Construction and Protection of Piers and Wharves.

No. 307. Operation of Marine Terminals.

b. Because of the diversity of the materials handled, no fixed recommendations can be provided to cover all conditions. However, principles set forth in this pamphlet will provide a basis for proper protection of commodities in storage whether located in warehouses, other type buildings, or in the open.

Reference for details is made to standards listed following which, except for the last two items, are prepared by committees of the National Fire Protection Association. These include items which are published in separate pamphlet form with the same identifying numbers by the National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass., or by the National Board of Fire Underwriters, 85 John St., New York 38, N. Y., or by the Dominion Board of Insurance Underwriters, St. John St., Montreal or by two or all three of these organizations. They also appear in the volumes of the National Fire Codes published by the National Fire Protection Association. Some standards in the list are prepared under procedures of the American Standards Association, 70 East 40th St., New York 17, N. Y. and for these the ASA number is given.

No. 10. First Aid Fire Appliances.

No. 13. Installation of Sprinkler Systems.

No. 13A. Care and Maintenance of Sprinkler Systems.

No. 14. Installation of Standpipe and Hose Systems.

No. 24. Outside Protection (yard piping, etc.).

No. 27. Organization, Training and Equipment of Private Fire Brigades.

No. 30. Storage of Flammable Liquids.

No. 33. Spray Finishing.

No. 49. Table of Common Hazardous Chemicals.

No. 51. Gas Systems for Welding and Cutting.

No. 58. Liquefied Petroleum Gases.

No. 70. National Electrical Code (ASA C1).

No. 71. Installation, Maintenance and Use of Central Station Protective Signaling Systems for Watchmen, Fire Alarm and Supervisory Service.

No. 72. Installation, Maintenance and Use of Proprietary, Auxiliary, Remote Station and Local Protective Signaling Systems for Watchmen, Fire Alarm and Supervisory Service.

No. 80. Protection of Openings in Walls and Partitions.

No. 82. Incinerators.

No. 82A. Rubbish Handling.

No. 88. Garages.

No. 92. Waterproofing of Floors and Drainage and Installation of Scuppers.

No. 101. Building Exits Code (ASA A9.1).

No. 220. Standard Types of Building Construction.

No. 325. Fire Hazard Properties of Certain Flammable Liquids, Gases and Volatile Solids.

No. 492. Table of Materials Subject to Spontaneous Heating.

No. 505. Operation of Industrial Trucks.

No. 601. The Watchman, Recommended Manual of Instruction and Duties for the Plant Watchman or Guard.

No. 604. Salvaging Operations.

Reference is also made to the following two documents.

Safety Code for Mechanical Refrigeration, ASRE Standard 15R, ASA B 9.1 published by American Society of Refrigeration Engineers, 40 West 40th St., New York, N. Y.

Agent H. A. Campbell's Tariff No. 9 publishing certain Interstate Commerce Regulations, by the Bureau of Explosives of the Association of American Railroads, 30 Vesey St., New York, N. Y.

c. The recommendations in Chapters 1 and 2 are primarily applicable to new buildings and to existing buildings that may be converted to warehouses.

The application to buildings now used as warehouses may require some modification to suit local conditions and should be applied with judgment but without sacrifice of the fundamental principles involved.

2. Responsibility of Management.

a. It is the responsibility of management to take proper consideration of the hazards of the various materials handled. Protective requirements and storage arrangements will vary with the combustibility of the materials and building construction. The management should determine any special precautions that must be followed for the types of material stored. The care, cleanliness and maintenance exercised by management will determine to a large extent the relative fire safety in the storage areas.

b. In addition, consideration must be given to proper storage for materials, in order to prevent the undue concentration of quantities of such materials in a single location subject to one catastrophe. The criterion of the amount of such material that should be stored in a single location is not necessarily dependent upon the dollar value of the commodity but also upon the total supply and availability of the material.

3. Definitions.

a. EXTRA COMBUSTIBLE. Materials which, either by themselves or in combination with their packaging, are highly susceptible to ignition and will contribute to the intensity and rapid spread of fire.

b. MODERATE COMBUSTIBLE. Materials or their packaging, either of which will contribute fuel to fire.

c. NONCOMBUSTIBLE. Materials and their packaging which will neither ignite nor support combustion.

d. The word SHALL is intended to indicate requirements.

e. The words IT IS RECOMMENDED indicate advisory provisions.

f. APPROVED refers to approval by the authority having jurisdiction.

PART A. INDOOR STORAGE.

Chapter 1. Construction.

11. Location.

111. It is recommended that the location of buildings for storage purposes be selected so as to have minimum exposure, ample public or private water supply and hydrants for fire fighting, and accessibility to public fire fighting organizations.

112. Erection of buildings in locations known to be subject to flood is not recommended.

113. Where the quantity of material very difficult to replace promptly is such that it should be separated to minimize the possibility of a catastrophe loss, it is recommended that the material be stored in separate fire areas which are separated by at least 200 feet.

12. Areas.

121. The floor fire area of any floor in a building, for the purpose of these recommended safe practices, means the area inside the exterior enclosure walls or inside a combination of exterior enclosure walls and fire walls.

a. Fire walls, as referred to in these recommended safe practices, are walls of substantial construction with any opening therein protected by fire doors and so designed as to prevent the transmission of fire from one side to the other under conditions of destruction by fire of the contents on one side. Fire walls, to be recognized as such, must extend through and above the roof structure to form a parapet at least three feet high depending on the length of the fire wall and area of the building. The requirements for parapets may be waived on buildings where the roof is of fire-resistive construction in which case it is sufficient to have the fire wall extend to the underside of the roof.

122. In order to reduce the quantity of materials that may be subject to fire, it is recommended that the floor fire areas of storage buildings be kept within reasonable limits. Height, shape and construction of building, including subdivision by standard fire walls are factors affecting requirements for safe floor fire areas. These factors together with type, extent and effectiveness of systems or facilities (public and private) for detection of and protection against fire should be conscientiously weighed in laying out or designing warehouse space.

a. Large undivided areas are undesirable because of the excessive values subject to a single fire and because of the greater

difficulty in fire fighting and salvage operations. Small areas are essential to the effective use of hose streams, where reliance is placed on manual fire protection. A building with numerous accessible exterior openings offers favorable features for fire fighting.

123. Protection of all openings in fire walls shall be of any approved type installed and maintained in accordance with No. 80, Standards for the Protection of Openings in Walls and Partitions. (See Section 542a.)

13. Height.

131. The use of one-story buildings in preference to multi-storied buildings for storage of materials is recommended because greater efficiency of fire fighting and salvage operations are possible in one-story buildings. Multi-storied buildings may be subject to the spread of fire from lower to upper floors and water used on upper floors may cause damage on the lower floors. It is recommended that where buildings over one story must be used, these buildings be of fire-resistive construction with proper protection of vertical openings and suitable provision for drainage of floors.

132. It is recommended that the ceiling heights of storage buildings be held to a minimum dictated by both the nature of the commodity or commodities stored and the material handling system in use, with consideration of the limitations on storage arrangements set forth in Chapter 3, especially Section 322.

14. Protection of Stairways and Shafts.

141. Stairways and other vertical shafts shall be protected in accordance with No. 101, Building Exits Code and shaft doors shall conform to No. 80, Standards for the Protection of Openings in Walls and Partitions.

142. It is recommended that all unnecessary vertical openings in multi-storied buildings be eliminated.

15. Exposure Protection.

151. It is recommended that exposure protection be provided. This may require exterior masonry walls without openings; the protection of exterior openings in masonry walls by fire shutters; the installation of wired glass windows in metal frames; open sprinklers; or a combination of these. It is recommended that wooden cornices and other features that would permit transmission of fire to the storage buildings be protected, as well as window openings.

a. Exposure is the hazard of ignition of a structure or contents from fire in any adjoining building or other exterior source. The extent of the exposure hazard depends upon the size, occupancy, combustibility and distance from the exposing building, together with the protection facilities available.

152. Outside fire shutters or windows designed to protect exposed exterior openings shall be maintained in good condition at all times.

a. Experience shows that after a fire starts, it is seldom possible to close a large number of fire shutters or windows with sufficient promptness to prevent the spread of an exposing fire into the storage buildings.

16. Drainage of Floors.

161. It is recommended that floors be water-proofed and provided with adequate drainage facilities in accordance with the requirements of No. 92, Suggestions on Waterproofing of Floors and Drainage and Installation of Scuppers.

17. Ventilation and Egress for Fire Fighting.

171. It is recommended that large and unbroken roof areas be provided with hatches, skylights, vents or other satisfactory arrangements to ventilate areas properly for fire fighting purposes and that these areas be subdivided by means of heat banking noncombustible curtain boards extending at least 24 inches below the roof.

172. It is recommended that sufficient exterior openings be provided to make all parts of the building readily accessible for fire fighting purposes.

Chapter 2. Protection.

21. Automatic Sprinklers.

211. It is recommended that approved automatic sprinkler systems with adequate water supply be provided in storage buildings. Where an automatic sprinkler system is installed, the installation shall be in accordance with NFPA No. 13, Standards for Installation of Sprinkler Systems.

212. Automatic sprinkler systems shall be provided with proper water-flow alarm devices to provide notification, in case of flow of water from any cause.

213. It is recommended that consideration be given to central station supervisory service, which provides electrical supervision over valves controlling water supplies and other features essential to the operation of the sprinkler system and also provides notification to a central station of the flow of water due to fire or any other cause.

22. First Aid Fire Protection.

221. Extinguishers shall be installed and maintained in accordance with No. 10, Standards for the Installation, Maintenance and Use of First Aid Fire Appliances.

a. Extinguishers shall be of approved type suitable for extinguishing fires in the particular type of commodity stored.

b. First aid fire protection shall be provided for all covered areas so that at least one conveniently accessible extinguishing unit is so located that a person will not have to travel more than 100 feet from any point to reach the nearest unit. Extinguishers shall be placed near doors where they are readily seen and not subject to blocking by stock.

c. Where the climate is such as to involve the danger of freezing, extinguishing equipment located in unheated buildings shall be of a nonfreezing type or shall be placed in suitable heated cabinets.

222. Standpipes and hose systems are recommended for installation in multi-story buildings to protect all interior parts of the building in accordance with No. 14, Standards for the Installation of Standpipe and Hose Systems. Hose outlets for fire department use are recommended where area considerations require this installation.

23. Alarms.

231. When sprinklers or other approved automatic fire extinguishing systems have not been installed, it is recommended that an automatic fire detection system be provided and installed in accordance with No. 72, Standards for the Installation, Maintenance and Use of Proprietary, Auxiliary, Remote Station and Local Protective Signaling Systems for Watchmen, Fire Alarm and Supervisory Service.

232. When supervisory and alarm service is available from operators constantly in attendance at a central station, it is recommended that the automatic fire detection system be in accordance with No. 71, Standards for the Installation, Maintenance and Use of Central Station Protective Signaling Systems for Watchmen, Fire Alarm and Supervisory Service.

233. Provision shall be made for promptly notifying the fire department or private fire brigade in case of fire.

24. Standard Watch Service.

241. It is recommended that standard watch service be provided and be continuously maintained during all nonoperating hours while the property is not otherwise adequately attended.

a. Where an automatic fire alarm system, reporting to a central station, is provided and properly maintained, it may in individual cases, be substituted for watch service.

242. Standard watch service consists of hourly rounds during all nonoperating hours when the plant is not otherwise adequately attended, with rounds recorded on a portable clock or transmitted to a central station. Duties and training shall follow that specified in No. 601, The Watchman. Emphasis is placed on the employment of able-bodied, intelligent and reliable men who are capable of a watchman's responsibilities.

25. Outside Fire Protection.

251. It is recommended that in locations lacking adequate public hydrants, an adequate private water supply and yard hydrant system with suitable hose houses and an ample supply of hose be provided in accordance with No. 24, Standards for Outside Protection.

252. It is recommended that where needed a private fire brigade be formed in accordance with No. 27, Suggestions for the Organization, Training and Equipment of Private Fire Brigades, and properly instructed, utilizing the advice and assistance of the local fire officials and fire protection agencies in organizing, selecting and training of this personnel.

253. Members of the private fire brigade shall be thoroughly instructed and trained and frequently drilled in the use of all fire protection equipment. The importance of giving an immediate alarm and of summoning aid promptly shall be stressed. The brigade should be so organized that men assigned on each shift are given the responsibility of putting into operation fire pumps, private fire trucks and other equipment.

Chapter 3. Storage Arrangement.

31. Material Piling.

311. It is recommended that all materials stored be handled and piled with due regard for the characteristics of the material. Insofar as is practicable, materials of different degrees of combustibility and salvageability shall be separated. (See No. 604, Standards for Salvaging Operations.)

312. It is recommended that the fire hazard characteristics of all materials stored be ascertained and where complete information is lacking, the materials, assumed to be possibly dangerous shall be segregated accordingly. Reference is made to No. 49, Table of Common Hazardous Chemicals; No. 325, Fire Hazard Properties of Certain Flammable Liquids, Gases and Volatile Solids; No. 492, Table of Materials Subject to Spontaneous Heating; Tariff No. 9 publishing certain ICC regulations.

313. Any materials which may be hazardous in combination with each other shall be stored separately.

314. Materials shall be so piled as to minimize the spread of fire internally, to permit convenient access for fire fighting, salvage or removal of portions of material which may constitute a hazard. Neat blocking and piling and good housekeeping shall be maintained at all times.

a. Commodities that are particularly susceptible to water damage shall be on skids, dunnage, pallets or elevated platforms in order to maintain at least four inches clearance from the floor.

b. It is desirable that piling practice be such as to eliminate horizontal flues of excessive length, which would contribute to the spread of fire.

315. It is recommended that the storage of combustible pallets be located where the fire hazard to the stored stock will be at a minimum.

316. Safe floor weight loads shall not be exceeded. For water absorbent materials, normal floor loads must be reduced to take this into account.

319. All storage, even though considered of a temporary nature, shall comply with these safe practices insofar as is practicable.

32. Piling Limitations.

321. Height of piles should be kept as low as practical and volume sufficiently limited so that any fire occurring within the pile can be contained and extinguished by the means available. Factors influencing such consideration include: combustibility and other fire characteristics of the material stored (including packaging), stability, shape and arrangement of piles, frequency and size of aisles and other features of accessibility, barriers including curtain boards or similar methods for retarding spread of fire, fire detection and alarm systems, effective use of hose streams, automatic sprinklers and salvage.

322. Where automatic sprinkler protection is provided, clearance of at least 18 inches shall be maintained under sprinklers. Clearance of up to 36 inches may be required where the nature of the material stored requires greater clearance, or where cases and bales are stored in large tightly packed piles.

323. Where automatic sprinkler protection is not provided and reliance is placed upon hose streams for fire extinguishment, there shall be a clearance of approximately 3 feet between the top of piles and the underside of the lowest beams, girders or other ceiling obstruction which might restrict the play of hose streams over the material.

33. Aisles.

331. It is recommended that main aisles be maintained at reasonable intervals to provide convenient access to all portions of the storage area and that they be not less than 8 feet in width.

332. It is recommended that cross aisles of not less than 4 feet in width be provided for piles up to 10 feet in height or 5 feet in width where piling exceeds 10 feet in height. Where cross aisles are provided, it is recommended that they be located opposite window or door openings in exterior walls as far as practicable.

333. It is recommended that wall aisles at least 12 inches wide be maintained in warehouses used for the storage of materials which may swell or expand with the absorption of water.

334. It is recommended that combustible materials not be stored in contact with fire walls.

Chapter 4. Equipment.

41. Mechanical Handling Equipment.

Power operated industrial trucks shall be of type recommended in Part A of NFPA No. 505, Standards for the Use, Maintenance and Operation of Industrial Trucks, in accordance with the hazards of the location in which they are used.

411. Maintenance and operation of electric, liquid gasoline and liquefied petroleum gas powered industrial trucks shall be in accordance with Parts B and C of NFPA No. 505, Standards for the Use, Maintenance and Operation of Industrial Trucks.

42. Heating and Building Service Equipment.

421. Heating, lighting and service equipment shall be of approved type, installed, maintained and operated in accordance with good practice.

422. Steam lines and other heating equipment shall be so installed or protected that the stored material cannot come in contact with the heating elements.

423. Electrical equipment shall be installed in accordance with the provisions of No. 70, National Electrical Code.

424. Refrigeration systems, if used, shall conform to the recommendations of ASRE No. 15R, Safety Code for Mechanical Refrigeration of the American Society of Refrigeration Engineers.

425. It is recommended that sections of the building occupied as boiler room, engine room or storage garage be cut off from other sections of the buildings.

Chapter 5. Building Maintenance and Operations.

51. Repairing, Refinishing, Packing.

511. It is recommended that where practicable all repairing, refinishing, crating and similar operations, as well as storage of combustible material used in conjunction with crating and packing paints, lacquers, thinners and other finishing materials be restricted to separate cut-off work or storage areas.

512. It is recommended that where practicable automatic sprinklers be installed in crating or packing areas.

513. Metal or metal-lined containers with self-closing or

fusible-link operated covers shall be provided for excelsior or similar packing materials.

514. It is recommended that paint spraying operations be conducted in a cut-off area, and be in accordance with No. 33, Standards for Spray Finishing.

515. Welding and cutting shall be prohibited unless supervised and stock is cleared for adequate distance and flameproofed tarpaulins are provided to catch hot sparks and metal. A close check of the area shall be maintained after completion of welding and cutting operations. Operating procedures shall be in accordance with No. 51, Standards for the Installation and Operation of Gas Systems for Welding and Cutting.

516. It is desirable that commercial trucks and locomotives not be allowed to enter storage areas.

517. It is recommended that fumigation operations comply with No. 574-L, Model Fumigation Ordinance.

518. In connection with storage operations, manufacturing or processing operations with attending hazards of various degrees will very often be found. In all such cases, these operations shall be cut off from the storage areas in a standard manner, and the hazards of the operation shall be safeguarded in accordance with the requirements of the appropriate standards.

52. Waste Disposal.

521. Approved type containers for rubbish and other waste materials shall be provided as required. Containers shall be emptied and contents removed from the premises or otherwise safely disposed of at frequent intervals.

522. It is recommended that incinerators be arranged in accordance with No. 82, Standards for Incinerators and No. 82A, Standards for Rubbish Handling.

53. Smoking.

531. Smoking shall be strictly prohibited in any location where the practice might cause fire.

NOTE: Cooperation of employees is more easily secured when a reasonable policy of control of smoking is adopted, with smoking permitted in specified locations, where there is little hazard, at specified times, under suitable supervision, rather than a complete prohibition which is likely to lead to surreptitious smoking in out of the way places where the hazard is most serious.

54. Building Maintenance.

541. It is recommended that all exterior openings in buildings be maintained tight against the weather. Buildings shall be maintained reasonably secure against the access of unauthorized persons. In general, all openings should be protected against possible entry of sparks and flying brands.

542. Fire walls, fire doors and floors shall be maintained in good repair at all times to restrict the spread of fire from any area where it may originate.

a. It is especially important to provide protection for wall and floor openings, resulting from any construction changes, such as the installation of piping, conveyors or hoists. Suitable protection of conveyor openings is often difficult to accomplish, so it is preferable to design the structure and operations so that such openings are not needed.

543. It is recommended that periodic inspections, preferably weekly, be made of all fire protective equipment, in conjunction with regular inspection of the entire premises. Trustworthy employees, preferably two or more, shall be selected who will alternate in making inspections and conscientiously check over the equipment and record unsatisfactory conditions found on suitable forms. It is desirable that a copy of inspection reports be submitted to someone with authority to correct faulty conditions.

544. The sprinkler system and the water supplies shall be checked and maintained in accordance with No. 13A, Care and Maintenance of Sprinkler Systems. The lack of such care and maintenance may be grounds for classifying the building as unsprinklered.

545. It is recommended that employees assigned to inspection also check such features as general order and neatness, first aid fire appliances, operation of fire doors, waterproof (salvage) covers, electrical equipment and other sources of hazards, such as, dangerous use of cutting and welding equipment and improper storage, use and handling of flammable liquids.

546. It is recommended that a supply of waterproof (salvage) covers be maintained for use during an emergency.

55. Emergency Access.

551. It is recommended that arrangement be made to permit rapid entry into the premises in case of fire or other emergency,

of municipal fire department, police department and other personnel as may be summoned to deal with any emergency without delay by gates, barriers or procedures normally designed for the prevention of unauthorized access.

552. Each storage facility should be considered individually and arrangements made to acquaint the local fire department with advance knowledge of storage conditions, so that in case of fire or other emergency no time will be lost in reaching the seat of the trouble and utilizing fire protection equipment. Frequently plans can be made available that will assist materially.

56. Instruction of Personnel.

561. Employees shall be instructed in location of and trained in the use of available fire protection equipment so that it may be put into operation with the maximum efficiency in case of fire. Employees shall also be instructed in the method of sending an alarm to the fire department.

PART B. OUTDOOR STORAGE.

Chapter 6. Storage and Protection.

61. Foreword.

611. Outdoor storage is recognized as standard practice for certain commodities which, by reason of their bulk, cannot be ordinarily placed in storage buildings.

612. Outdoor storage may be preferable to storage in combustible buildings lacking fire protection, in the case of materials not subject to undue damage or deterioration from exposure to the weather and not particularly susceptible to ignition by sparks or flying brands.

613. Where materials, which normally would be stored in buildings, are stored outdoors in temporary emergencies, it is recommended that special precaution be taken for their safeguard and that they be moved to a storage warehouse as soon as possible.

62. Site.

621. In selecting a site for outdoor storage, preference shall be given to locations having:

a. Adequate municipal fire and police protection.

b. Adequate public water systems with hydrants suitably located for protection of the storage.

c. Adequate all-weather roads for fire department apparatus response.

d. Sufficient clear space from buildings of combustible construction or from other combustible storage which might constitute an exposure hazard.

e. Absence of flood hazard.

f. Adequate clearance space between storage piles and any highways and railroads.

63. Material Piling.

631. It is recommended that materials be stored in unit piles as low in height and small in area as is consistent with good practice for the materials stored. The maximum height will be determined by the base of pile and type of packaging, stability of the pile, under normal as well as fire conditions, combustibility of the material and limit of the effective reach of hose streams.

632. It is recommended that aisles be maintained between individual piles, between piles and buildings and between piles and the boundary line of the storage site. Sufficient driveways, having a width of at least 15 feet, shall be provided to permit the travel of fire equipment to all portions of the storage area. Aisles shall be not less than 10 feet wide to reduce danger of spread of fire from pile to pile and to permit ready access for fire fighting, emergency removal of material or for salvage purposes. Extra combustible materials (see Section 3a) will require wider aisles and roads dependent upon the height of the pile and the degree of combustibility. For extra combustible material, the width of aisles should be equal to the height of the pile but not less than 10 feet.

633. It is recommended that boundary posts with signs designating piling limits be provided to indicate yard area, roadway and aisle limits.

64. Fences.

641. It is recommended that the entire property be surrounded by a fence or other suitable means to prevent access of any unauthorized persons.

642. An adequate number of gates shall be provided in the surrounding fence or other barriers so as to permit ready access of fire apparatus.

65. Buildings.

651. It is recommended that buildings in outside storage yards be located with as much clear space to open yard storage as is practicable but shall be not less than 15 feet from open yard piling unless buildings have blank exterior masonry walls. It is recommended that buildings of wood frame construction or containing hazardous operations be at least 50 feet from the nearest storage pile; and explosion vents, blower outlets, etc., not be directed toward the yard storage.

66. Yard Maintenance and Operations.

661. The entire storage site shall be kept free from accumulation of unnecessary combustible materials. Weeds and grass shall be kept down and regular procedure provided for the periodic clean-up of the entire area.

662. It is desirable that adequate lighting be provided to allow supervision of all parts of the storage area at night.

663. All electrical equipment and installations shall conform to the provisions of No. 70, National Electrical Code.

664. All heating equipment shall conform with established fire prevention standards. Salamanders, braziers, portable heaters or other open fires shall not be used.

665. Smoking shall be strictly prohibited in any location where the practice might cause fire (See Note, Section 531). "No Smoking" signs shall be posted throughout the storage area except in specific locations designated as safe for smoking purposes.

666. Storage and Use of Motor Vehicles Using Gasoline or Liquefied Petroleum Gas as Fuel. It is recommended that vehicles be garaged in a separate detached building. Storage and handling of fuel shall conform with No. 30, Standards or No. 30L, Suggested Ordinance for the Storage, Handling and Use of Flammable Liquids and No. 58, Standards for the Storage and Handling of Liquefied Petroleum Gases. It is recommended that repair operations be conducted outside the yard unless separate masonry walled building is provided. It is recommended that if vehicles are to be greased, repaired, painted or otherwise serviced, such work be conducted in conformance with No. 88, Recommended Good Practice Requirements for Construction and Protection of Garages.

667. Tarpaulins, used for protection of storage against the weather, shall be of approved flameproofed fabric.

668. It is recommended that coal-fired steam locomotives not be allowed to enter the yard where combustible material is stored unless the smoke stack is protected by a spark arrester and the ash pan is protected by screens to prevent hot coals from escaping. Oil-fired steam locomotives and Diesel locomotives from which glowing particles of carbon are emitted from the exhaust stacks shall not be permitted in the yard.

67. Fire Protection.

671. Provisions shall be made by some suitable means for promptly notifying the public fire department or private fire brigade, in case of fire or other emergency.

672. Appropriate first aid fire extinguishing equipment shall be placed at well marked strategic points throughout the storage

area, so that one or more first aid extinguishing units will be quickly available for use at any point. Where the climate is such as to involve the danger of freezing, suitable nonfreezing solutions shall be used.

673. It is recommended that provision be made to permit direction of an adequate number of hose streams on any pile or portion of the storage area that may be involved in fire. It is recommended that unless adequate protection is provided by a municipal fire department, sufficient hose and other equipment be kept on hand at the storage property, suitably housed and provision be made for trained personnel constantly available to put it into operation. It is recommended that monitor nozzles be provided at strategic points where large quantities of highly combustible materials are stored. See No. 24, Standards for Outside Protection.

674. Hydrants and all fire fighting equipment shall be accessible for use at all times. No temporary storage shall be allowed to obstruct access to fire fighting equipment and any accumulation of snow shall be promptly removed.

68. Watch Service.

681. It is recommended that standard watch service be provided and continuously maintained throughout the yard and storage area at all times while the yard is otherwise unoccupied. Duties and training of watchman shall follow that specified in No. 601, The Watchman. It is recommended that there be some suitable means of supervising the watchman's activities to be sure that he makes his required rounds at regular intervals.

682. Attention is directed to the value of strategically placed watch towers in large yards where a watchman, stationed at a point of vantage, can keep the entire property under observation. It is recommended that such watch towers be connected to the fire alarm system so that prompt notification of fire may be given.