NFPA No.

241

SAFEGUARDING

BUILDING CONSTRUCTION AND DEMOLITION OPERATIONS 1968

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Official NFPA Definitions

Adopted Jan. 23, 1964. Where variances to these definitions are found, efforts to eliminate such conflicts are in process.

SHALL is intended to indicate requirements.

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

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*Among the laboratories nationally recognized by the authorities having jurisdiction in the United States and Canada are the Underwriters' Laboratories, Inc., the Factory Mutual Engineering Division, the American Gas Association Laboratories, the Underwriters' Laboratories of Canada, the Canadian Standards Association Testing Laboratories, and the Canadian Gas Association Approvals Division.

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AUTHORITY HAVING JURISDICTION: The organization, office or individual responsible for "approving" equipment, an installation, or a procedure.

Units of Measurements

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. One pound = 453.6 grams.

Standard for

SAFEGUARDING BUILDING CONSTRUCTION AND DEMOLITION OPERATIONS

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This edition, adopted by the National Fire Protection Association Annual Meeting on May 23, 1968, supersedes all previous editions of this Standard. It is a complete revision of the last previous edition issued in 1958.

Work on this subject commenced in 1930 when the NFPA Committee on Construction Operations developed "Recommended Good Practice Requirements for Building Construction Operations." This text was adopted by the National Fire Protection Association with revisions in 1933. In 1942 a tentative revision was submitted and while no offlcial action was taken, the revision was published subsequently for information in the printing of the text in Volume III of the National Fire Codes published by the NFPA.

The NFPA Committee on Building Construction now has jurisdiction over this Standard. A tentative text prepared by that Committee was adopted at the 1957 NFPA Annual Meeting and that text was unanimously approved by the NFPA in 1958.

Committee on Building Construction

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SCOPE: The design, installation and maintenance of building construction features not covered by other NFPA committees. (This committee does not cover building code requirements, exits, protection of openings, vaults, air conditioning, blower systems, etc., which are handled by other committees.)

Standard for

SAFEGUARDING BUILDING CONSTRUCTION AND DEMOLITION OPERATIONS

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Foreword

Fires during construction, major alteration or demolition of buildings are preventable or controllable. The fire potential is usually greater during these operations than in completed buildings. Opportunities for serious fires are present during these operations because of accumulations of combustible materials or debris and the presence of potential sources of ignition.

A study of a number of losses to buildings which were under construction showed that 60 percent of those where the cause could be ascertained originated from these three causes:

(a) Salamanders or portable heating equipment (25 percent)

(b) Cutting and welding operations (20 percent)

(c) Matches and smoking (15 percent)

Early planning and appropriate scheduling of fire preventative measures and fire protective facilities are vitally important in avoiding a major fire in a construction or demolition project. All too often, such fires can be attributed simply to "too little or too late" attention to the threat of fire.

This standard is intended to indicate the measures which, with preplanning, will prevent fire or at least minimize damage when fire occurs. The public fire department and other fire protection authorities should also be consulted for their guidance.

Contracts should specify the fire safety program which is to be observed and establish the owner's right to administration and enforcement, even though the building may otherwise be entirely under the jurisdiction of the builder or the wrecking company. Correction of unnecessary fire hazards should not be subject to delay which frequently accompanies usual contractural negotiations.

Contracts for provision of fire protection facilities should be awarded as early as possible, as there is inherent delay in supplying some fire protection equipment which is specialized and fabricated on order only.

1. Scope

This standard is intended, where applicable, to apply to buildings in the course of erection, major alteration, or demolition.

2. Water Supply

(a) An adequate water supply for fire protection, either temporary or permanent, shall be made available as soon as combustible material accumulates. There shall be no delay in the installation of fire protection equipment.

(b) Where underground water mains are to be provided, they should be installed, completed, and made available for permanent use not later than the time that combustible materials are delivered to the construction site.

3. First-Aid Fire Equipment

(a) Hose and nozzles shall be provided and made ready for use as soon as either the temporary or permanent water supply is available on new construction. Signs designating the location of first aid fire equipment and standpipe connections should be conspicuously displayed. During demolition operations charged hose lines supplied by hydrants or sprinkler riser adapters should be available.

(b) In every building operation wherever a tool house, a storeroom, or other shanty is placed, or a room or space is used for storage, dressing room, or workshop, at least one approved portable extinguisher shall be provided and maintained in an accessible location. At least one approved fire extinguisher shall also be provided on each floor which, in multistory buildings, shall be located in plain sight of the working stairway where the majority of the workmen pass up and down. During demolition portable fire extinguishers should be retained until their removal is necessitated by razing operations. The suitability, distribution and maintenance of extinguishers shall be in accordance with NFPA No. 10, Installation of Portable Fire Extinguishers, and No. 10A, Maintenance and Use of Portable Fire Extinguishers.

4. Access for Fire Fighting

(a) Access for use of heavy fire fighting equipment shall be provided to the immediate job site at the start of construction and maintained until all construction is completed.

(b) Free access from the street to fire hydrants, and to outside

connections for standpipes, sprinklers, or other fire extinguishing equipment, whether permanent or temporary, shall be provided and maintained at all times. Protective pedestrian walkways should not be so constructed as to impede ready access to hydrants. No material or construction shall be placed within ten feet of such hydrants or connections, nor between them and the center line of the street.

(c) During building operations, free access to permanent, temporary, or portable first aid fire equipment shall be maintained at all times.

(d) In all buildings over 50 feet in height, at least one stairway shall be provided in usable condition at all times. This stairway shall be extended upward as each floor is installed in new construction.

(c) Arrangements shall be made so that firemen will have immediate access to the premises when called.

5. Fire Cutoffs.

Fire walls and exit stairways, required for the completed building, should be given construction priority. Fire doors, with automatic closing devices, should be hung on openings as soon as practicable and before any significant quantity of combustible material is introduced.

Conversely for demolition projects, fire cutoffs should be retained as such until razing operations necessitate their removal.

6. Supervision and Watch Service

(a) A capable person having the necessary authority shall be placed in charge of fire protection. His responsibilities shall include maintenance and location of fire protective equipment, general supervision of safeguards and location of salamanders or portable heating equipment, and the establishment and maintenance of safe cutting and welding operations. He should acquaint the watchman with developments during the day and pass along any special instructions on the status of fire protection equipment and emergency procedures.

(b) The buildings should be patrolled at all times when construction operations are not in progress by a competent watchman registering to approved watchman's clock from stations covering all parts of the building.

(c) There should be a fire alarm box near the premises or telephone service to the fire department.

7. Sprinkler Protection

(a) If automatic sprinkler protection is to be provided, the installation should closely follow the construction and be placed in service before or immediately following completion of each story, and before any occupancy is moved into a completed area. Details of installation should be in accordance with NFPA Standard No. 13, Installation of Sprinkler Systems.

(b) During demolition, existing automatic sprinkler installations should be retained in service as long as reasonable by cutting off and capping the system at the floor or area being razed. Operation of sprinkler control valves should be permitted only by properly authorized personnel. Modification of sprinkler systems to permit alterations or additional demolition should be expedited so that the automatic protection may be returned to service as quickly as possible. Sprinkler control valves should be checked daily at close of work to ascertain that protection is in service.

8. Standpipes

In all new buildings in which standpipes are required, or where existing in buildings being altered or demolished, such standpipes shall be maintained in conformity with the progress of building activity in such a manner that they are always ready for fire department use. The standpipes shall be provided with siamese fire department connections on the outside of the building, at the street level, conspicuously marked, and have at least one standard hose outlet at each floor. Pipe sizes, hose valves, hose, water supply, and other details for new construction shall be in accordance with NFPA Standard No. 14, Standpipe and Hose Systems.

9. Cutting and Welding Operations

(a) A permit system shall be used for cutting and welding operations on the job site under the supervision of the construction superintendent or the person in charge of fire protection. This permit system shall be applicable to subcontractors' personnel as well as the contractors. A permit shall not be issued until (1) it has been determined cutting and welding can be safely conducted at the desired location, (2) combustibles have been moved away or safely covered, and (3) a fire watchman with extinguisher is posted for the duration of the work, and for 30 minutes thereafter, to see that sparks or drops of hot metal do not start fires.

(b) All gas operated cutting and welding equipment and operations shall be in accordance with NFPA Standard No. 51, Oxygen-Fuel Gas Systems for Welding and Cutting.

10. Temporary Heating Equipment

(a) The permanent heating equipment for a new building shall be installed and put into operation as soon as practicable. In cold weather demolition operations, the existing building heating facility should be retained to permit sprinklers, hose, and extinguishers to be maintained on lower floors, or within enclosed areas without danger of freezing.

(b) Only steam heaters, approved electric heaters, approved gas and oil fired space heaters, or indirect fired gasoline heaters located outside the building, shall be used.

(c) Chimney or vent connectors, where required from direct fired heaters, shall be maintained at least 18 inches from combustibles.

(d) Oil fired heaters shall comply in design and installation features with NFPA Standard No. 31, Oil Burning Equipment.

(e) Fuel supplies for liquefied petroleum gas fired heaters shall comply with NFPA Standard No. 58, Storage and Handling of Liquefied Petroleum Gases and NFPA Standard No. 54, Gas Appliances and Gas Piping.

(f) Refueling operations for oil burning equipment and liquefied petroleum gas burning equipment shall be safely conducted, removing the heater to a safe location and waiting for it to cool prior to refueling.

(g) Heating devices shall be on a solid base or floor so they are not likely to overturn and they shall be so located that there is a clearance of not less than 6 feet above nor less than 2½ feet on all sides, between such device and unprotected woodwork or combustible material, equipment, or construction.

(h) A capable employee shall be on duty at all times whenever temporary heating equipment is being utilized to supervise the operation and maintenance of the equipment.

11. Smoking

Smoking shall be prohibited at or in the vicinity of hazardous operations or materials.

12. Disposal of Waste

(a) Waste material and rubbish shall not be stored nor allowed to accumulate within the building or in the immediate vicinity, but shall be removed from the premises as rapidly as practicable.

(b) Rubbish shall not be burned on the premises except when permit is first obtained from the local fire department.

(c) If a chute is employed for removal of demolition debris, it should be erected on the outside of the building.

(d) Chimneys, excessive wall areas, or other massive weights should not be collapsed on the upper floors of a building being demolished.

13. Flammable Liquids

(a) Flammable liquids and other hazardous materials such as paints, flammable thinners, gasoline, asphalt and tar should be stored in small detached structures or out in the open and not inside main buildings. Low flash point liquids used within buildings shall be handled only in approved safety cans. Flammable liquid storage should be in accordance with NFPA Standard No. 30, Flammable and Combustible Liquids Code.

(b) Adequate ventilation shall be provided for paint spraying operations and operations involving the application of materials utilizing adhesives containing flammable solvents. Such operations shall be conducted remote from any potential source of ignition.

(c) Asphalt and tar kettles shall be located in a safe place outside of the building or on a noncombustible roof at a point where they avoid danger of ignition of combustible material below. Continuous supervision shall be maintained while kettles are in operation and metal covers shall be provided for all kettles to smother out flames in case of fire.

(d) Used roofing mops shall be stored outside the building and away from other combustible materials.

(e) For demolition projects the following precautions shall be taken:

(1) Drain flammable liquids and combustible oils from tanks and machinery reservoirs in a safe manner, with particular attention to removal of residue and sludge accumulations. Remove from the building immediately.

(2) Tanks and piping, formerly containing flammable liquids are likely to contain flammable vapors and preferably should be removed prior to demolition of the building. If this is not feasible, these hazards should be placarded or otherwise identified for careful removal.

14. Construction Offices and Sheds

(a) Construction offices and sheds for the storage of tools and materials, when located within the building, or on the sidewalk bridging or within 30 feet of the building should be of noncombustible construction or protected with automatic sprinklers. When located 30 feet or more from the building and constructed of combustible materials, it is desirable to separate them into small detached units.

(b) Only safely installed approved heating devices shall be used in construction offices and sheds. Ample clearance shall be provided around stoves and heaters and all chimney and vent connectors to prevent ignition of adjacent combustible materials. Where smoking is permitted, safe receptacles shall be provided for smoking materials.

15. Temporary Enclosures

(a) Only flame resistant tarpaulins or materials of equivalent fire hazard characteristics shall be used.

(b) When used to enclose buildings temporarily, the enclosing material should be fastened securely or guarded by construction so it cannot be blown against heaters by the wind.

16. Scaffolding, Shoring, and Forms

(a) Steel scaffolding, or approved fire retardant treated lumber and planking should be used on both the outside and the inside of the building.

(b) Unnecessary accumulation of combustible forms or form lumber shall be avoided. Those portions of the building where forms are in place should not be used for the storage of combustible building supplies.

17. Electrical Wiring and Equipment

(a) Electrical wiring and equipment for light, heat, or power purposes shall be installed in compliance with the requirements of NFPA No. 70, National Electrical Code.

(b) In demolition projects, electric service should be reduced to a minimum and identified to leave no uncertainty as to which circuits are energized.

18. Construction Equipment

Internal combustion engine powered air compressors, hoists,

derricks, pumps, etc., shall be so located that the exhausts are well away from combustible materials. When the exhausts are piped to outside the building under construction, a clearance of at least 6 inches shall be maintained between such piping and combustible material.

APPENDIX

Buildings under construction, alteration, or demolition are particularly susceptible to fire damage. Construction activities inevitably bring large quantities of combustible materials together with numerous sources of ignition at a time when the building is most vulnerable to a fire as fire protection facilities generally have not been completed and unprotected steel work may exist throughout the structure.

Wooden forms and form supports often constituting sufficient fuel to completely destroy the structure in the early stages of construction give way in the later stages to vast quantities of combustible crating, boxes, cartons, bags, excelsior and straw accompanying the installation of finishing materials and new equipment. Welding and cutting operations, plumbing torches, tar kettles, temporary heating equipment, and wiring all may serve as ignition sources of this combustible accumulation and create a rapidly developing fire situation. Too frequently, automatic sprinkler protection, yard hydrant systems and standpipe and hose facilities have not yet been finished thereby severely hampering fire fighters. The need for proper steps to safeguard these conditions is obvious and conformance with the provisions of this standard will materially assist in reducing the loss potential in structures undergoing construction and alteration or being razed.

Consideration should also be given to several other items associated with the construction work that are not so readily apparent.

Attention should be focused on possible fire exposure hazards created by the construction work. Fire damage may not be confined to the building of origin and may spread to adjacent property. If the fire threat to adjoining or nearby buildings is severe, provision for fire doors, temporary barriers or sprinkler water curtains should be evaluated. For example, construction of a new addition to a hospital may constitute such a life hazard that fire doors or temporary bricking up of existing openings may be definitely indicated. A similar situation may exist when facilities housing a process vital to continued plant production are undergoing expansion.

Windstorm damage, while not necessarily related directly to loss by fire may, in fact, contribute directly to an increase in the fire hazard. Open structures are particularly susceptible to damage from high winds that may cause skewing and misalignment of the structure which may disrupt existing water supplies for fire protection. Not only may water supplies be affected from this cause but they may also freeze in cold weather if temporary doorways or window openings are blown away. Roof construction may also be damaged to the extent that freezing of equipment may occur. Entry of wind into a building may also blow debris, lumber scraps, or tarpaulins against heating devices thereby causing ignition of these materials. Consequently, proper care should be given to eliminating both direct loss from wind and the attendant possibility of resultant fire damage.

In conclusion, buildings in the course of construction have many additional fire hazards not found in completed structures. Fire protection equipment to restrict spread of fire and extinguish it promptly has not yet been installed. Fires are often difficult to approach by the fire department. Every opportunity exists for serious fire loss. Such fires are apt to cause losses far beyond the actual

physical property destroyed, by delaying completion of buildings with consequent loss of revenue. Important business projects, contingent upon occupancy of a structure at a given date, may thus be seriously deranged even by fire causing a relatively small direct loss. These suggested good practice requirements are intended to indicate the measures by which these fires may be prevented or controlled at their outset with a minimum of damage.