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SAFEGUARDING BUILDING CONSTRUCTION AND DEMOLITION OPERATIONS 1980

NATIONAL FIRE PROTECTION ASSOCIATION, INC.
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Standard for

Safeguarding Building Construction and Demolition Operations

NFPA 241-1980

1980 Edition of NFPA 241

This 1980 edition of NFPA 241, *Standard for Safeguarding Building Construction and Demolition Operations*, was prepared by the Committee on Building Construction and was adopted by the National Fire Protection Association, Inc. on November 18, 1980, at its Fall Meeting in San Diego, California. It was released for publication by the Standards Council on December 10, 1980. It has been approved by the American National Standards Institute.

Changes in this 1980 edition are largely editorial. Material formerly included as footnotes has been incorporated in a new appendix.

Origin and Development of NFPA 241

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 official action was taken, the revision was published subsequently for information purposes 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. A complete revision was adopted by the NFPA in 1968 and 1973. An editorial revision was approved in 1975 which brought the standard into conformance with the NFPA Manual of Style. The standard was again substantively reconfirmed in 1980.

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NOTE: Membership on a Committee shall not in and of itself constitute an endorsement of the Association or of any document developed by the Committee on which the member serves.

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates explanatory material on that paragraph in Appendix A.

Information on referenced publications can be found in Appendix C.

Introduction

0-1 Fires during construction, 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 materials or debris and the presence of potential sources of ignition.

A study of a number of losses to buildings which were under construction shows 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 and operation of plumbers' torches (20 percent);

(c) Matches and smoking (15 percent).

0-2 Early planning and appropriate scheduling of fire preventative measures, fire protection facilities, and rapid communication 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.

0-3 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. The importance of pre-fire planning cannot be overemphasized. The unique and dangerous situations which may confront fire fighters during construction or demolition operations dictate that a complete exchange of pertinent information continue from the beginning to the end of operation.

0-4 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 must not be subject to delay which frequently accompanies usual contractural negotiations.

0-5 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.

Chapter 1 Scope

1-1 Scope. This standard shall apply to buildings in the course of erection, alteration, or demolition.

1-2 Definitions.

Approved. Means "acceptable to the authority having jurisdiction."

NOTE: The National Fire Protection Association does not approve, inspect or certify any installations, procedures, equipment or materials nor does it approve or evaluate testing laboratories. In determining the acceptability of installations or procedures, equipment or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization concerned with product evaluations which is in a position to determine compliance with appropriate standards for the current production of listed items.

Shall. Indicates a mandatory requirement.

Should. Indicates a recommendation or that which is advised but not required.

Chapter 2 Temporary Construction and Equipment

2-1 Construction Offices and Sheds.

2-1.1* Construction offices, trailers, sheds and other facilities for the storage of tools and materials, when located within the building, on the sidewalk bridging or within 30 ft (9 m) of the building shall be of noncombustible construction.

2-1.2 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. When temporary heating equipment is used, see Section 3-2.

2-2 Temporary Enclosures.

2-2.1 Only flame resistant tarpaulins or materials of equivalent fire retardant characteristics shall be used.

2-2.2 When used to enclose buildings temporarily, the enclosing material shall be fastened securely or guarded by construction so it cannot be blown against heaters or other sources of ignition by the wind.

2-3* Scaffolding, Shoring, and Forms.

2-3.1 Unnecessary accumulation of combustible forms or form lumber shall be avoided. Those portions of the building where combustible forms are present shall not be used for the storage of other combustible building supplies.

2-3.2* Fire extinguishing equipment shall be provided during forming and stripping. Charged hose lines will meet this requirement.

2-4 Construction Equipment.

2-4.1 Internal combustion engine-powered air compressors, hoist, derricks, pumps, etc., shall be so located that the exhausts discharge well away from combustible materials. When the exhausts are piped to outside the building under construction, a clearance of at least 6 in. (152 mm) shall be maintained between such piping and combustible material.

2-4.2* Internal combustion equipment shall be shut down prior to refueling.

2-4.3 Service areas for construction equipment shall not be located within buildings.

2-4.4 Fuel for internal combustion equipment shall not be stored within the building (*see 3-5.1*).

Chapter 3 Construction Processes and Hazards

3-1 Cutting and Welding Operations.

3-1.1* A permit system shall be used for cutting and welding operations on the job site under the supervision of the person in charge of fire protection. A permit shall not be issued until (1) it has been determined that 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.

3-1.2 All gas-operated cutting and welding equipment and operations shall be in accordance with NFPA 51, *Standard for the Installation and Operation of Oxygen-Fuel Gas Systems for Welding and Cutting*.

3-2 Temporary Heating Equipment.

3-2.1 The permanent heating equipment for a new building shall be installed and put into operation as soon as practicable. In cold weather demolition operations, building heat shall be maintained to permit sprinklers, hose, and extinguishers to be maintained on lower floors, or within enclosed areas without danger of freezing.

3-2.2 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.

3-2.3 Chimney or vent connectors, where required from direct-fired heaters, shall be maintained at least 18 in. (457 mm) from combustibles.

3-2.4 Oil-fired heaters shall comply in design and installation features with NFPA 31, *Standard for the Installation of Oil Burning Equipment*.

3-2.5 Fuel supplies for liquefied petroleum gas-fired heaters shall comply with NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*, and NFPA 54, *National Fuel Gas Code*.

3-2.6 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.

3-2.7 Heating devices shall be situated so they are not likely to overturn and shall otherwise be installed in accordance with their listing, including clearance to combustible material, equipment, or construction.

3-2.8 Temporary heating equipment, when utilized, shall be attended and maintained by competent personnel.

3-3 Smoking.

3-3.1 Smoking shall be prohibited at or in the vicinity of hazardous operations or materials.

3-3.2 Where smoking is permitted, safe receptacles shall be provided for smoking materials.

3-4 Trash Disposal.

3-4.1 Combustible waste material and rubbish shall not be stored or allowed to accumulate within the building or in the immediate vicinity, but shall be removed from the premises as rapidly as practicable.

3-4.2* Rubbish shall not be burned on the premises without first obtaining a permit from the local fire department.

3-5 Flammable Liquids.

3-5.1* Flammable liquid storage shall be in accordance with NFPA 30, *Flammable and Combustible Liquids Code*.

3-5.2 Ventilation shall be provided for operations involving the application of materials containing flammable solvents.

3-5.3 Potential sources of ignition shall be identified and safeguarded whenever such operations are being conducted.

3-5.4 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. Suitable fire extinguishers shall be provided.

3-5.5 Used roofing mops shall be stored away from the building and combustible materials.

3-5.6* For demolition projects the following precaution shall be taken:

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.

Chapter 4 Utilities

4-1 Electrical.

4-1.1 Electrical wiring and equipment for light, heat, or power purposes shall be installed in compliance with the requirements of NFPA 70, *National Electrical Code®*.

4-1.2 In demolition projects, electric service shall be reduced to a minimum and identified to leave no uncertainty as to which circuits are energized.

4-2 Gas. Prior to demolition, gas supplies shall be turned off at a point outside the building and the outlet capped.

Chapter 5 Fire Protection

5-1 Fire Cutoffs.

5-1.1* Fire walls and exit stairways, if required for the completed building, shall be given construction priority. Fire doors with approved closing devices and hardware shall be hung on openings as soon as practicable and before combustible material is introduced. Fire doors, after installation, shall not be obstructed from closing.

5-1.2 For demolition projects, fire cutoffs shall be retained as such until razing operations necessitate their removal.

5-2 Access for Fire Fighting.

5-2.1 A suitable location at the site shall be designated as a command post and provided with plans, emergency information, keys, communication, and equipment, as needed. The person in charge of fire protection shall respond to the location whenever fire occurs.

5-2.2 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.

5-2.3 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 shall not be so constructed as to impede access to hydrants. No material or construction shall interfere with access to hydrants, siamese connections, or fire extinguishing equipment.

5-2.4 During construction or demolition operations, free access to permanent, temporary, or portable first aid fire equipment shall be maintained at all times.

5-2.5* In all buildings over one story 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. This stairway shall be lighted and enclosed if the building exterior walls are in place.

5-2.6 Arrangements shall be made so that firemen will have immediate access to the premises when called.

5-2.7 The local fire authority shall be contacted to establish access ways of sufficient dimension to allow maneuvering of fire equipment.

5-3 Water Supply.

5-3.1* 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.

5-3.2 Where underground water mains are to be provided, they shall be installed, completed, and in service with hydrants or standpipes located as directed by the local fire authority prior to construction work.

5-4 Standpipes.

5-4.1 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.

5-4.2* The standpipes shall be provided with conspicuously marked siamese fire department connections on the outside of the building at the street level and shall have at least one standard hose outlet at each floor.

5-4.3 Pipe size, hose valves, hose, water supply, and other details for new construction shall be in accordance with NFPA 14, *Standard for the Installation of Standpipe and Hose Systems.*

5-4.4 Standpipes shall be securely supported at each alternate floor.

5-4.5* At each floor level, there shall be provided at least one approved hose valve for attaching fire department hose. Valves shall be kept closed at all times during nonfire emergency conditions, and guarded against mechanical injury.

5-4.6 All threads on hose connections shall conform to the local fire department hose thread.

5-4.7 Standpipes shall be carried up with each floor and securely capped at the top. Top hose outlets shall at all times be not more than one floor below the highest forms, staging, and like combustibles.

5-4.8 Temporary standpipes shall remain in service until the permanent standpipe installation is complete.

5-5 Sprinkler Protection.

5-5.1* If automatic sprinkler protection is to be provided, the installation shall be placed in service as soon as possible. Details of installation shall be in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems.*

5-5.2 Where sprinklers are required for safety to life, the building shall not be occupied until the sprinkler installation has been entirely completed and tested such that the protection is not susceptible to frequent impairment attributable to testing and corrections.

Exception: This provision shall not preclude the occupancy of the lower floors of a building, even though the upper floors may be in various stages of construction or protection, providing the following conditions are satisfied:

(a) The sprinkler protection of the lower occupied floors is completed and tested in accordance with the above criteria.

(b) The sprinkler protection of the upper floors will be supplied by entirely seaparate systems and separate control valves such that its absence or incompleteness will in no way impair the sprinkler protection of the occupied lower floors.

5-5.3* When a building equipped with sprinklers by requirement is to be demolished, the sprinkler protection shall be retained in service as long as the condition requiring sprinklers continues to exist.

5-5.4 Operation of sprinkler control valves shall be permitted only by properly authorized personnel and shall be accompanied by notification of duly designated parties. When the sprinkler protection is being regularly turned off and on to facilitate connection of newly completed segments, the sprinkler control valves shall be checked at the end of each work period to ascertain that protection is in service.

5-6 Supervision and Watch Service.

5-6.1* A capable and qualified 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. Where watch service is provided, he shall acquaint the watchman with

developments during the day and pass along any special instructions on the status of fire protection equipment and emergency procedures.

5-6.2 There shall be a readily available public fire alarm box near the premises, telephone service to the responding fire department, or equivalent facilities. Instructions shall be issued to notify the fire department immediately in case of fire. When telephone service is employed, the local fire department number shall be conspicuously posted near each telephone.

5-7 First-Aid Fire Equipment.

5-7.1* 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.

5-7.3 In every building operation, wherever a toolhouse, a storeroom, or other shanty is located in or adjacent to the building under construction, or a room or space within that building is used for storage, dressing room, or workshop, at least one approved extinguisher shall be provided and maintained in an accessible location.

Exception: This requirement may be waived if structures do not exceed 150 sq ft (13.9 m²) floor area or are equipped with automatic sprinklers or other approved protection.

5-7.4 At least one approved fire extinguisher shall also be provided in plain sight on each floor at each usable stairway as soon as combustible material accumulates.

5-7.5* During demolition, suitable fire extinguishers shall be available.

5-7.6 The suitability, distribution, and maintenance of extinguishers shall be in accordance with NFPA 10, *Standard for the Installation of Portable Fire Extinguishers*.

Appendix A

This Appendix is not a part of the requirements of this NFPA document, but is included for information purposes only

A-2-1.1 When located 30 ft (9 m) or more from the building and constructed of combustible materials, it is desirable to subdivide them into small detached units.

A-2-3 Steel scaffolding or approved fire retardant treated lumber and planking should be used on both the outside and the inside of the building.

A-2-3.2 The local fire authority should be contacted regarding adequacy of water supply for hose lines.

A-2-4.2 Suitable fire extinguishers should be provided on manned construction equipment utilizing liquid fuel.

A-3-1.1 Additional fire watchmen should be provided during welding or cutting operations where sparks or molten metal may drop several floors.

If welding operations have been conducted during the previous working period, the oncoming watchman (*see Section 5-6*) should be alterted to check the location where welding was done as a part of his regular rounds. Where watchman service is not provided, use of gas-operated welding or cutting equipment should be discontinued a minimum of one hour before quitting time.

If the structure has a wooden floor, the floor should be wetted down before and after welding or cutting operations are conducted. Adequate precautions must be taken so that wetting down will not introduce a personnel safety hazard.

A-3-4.2 If a chute is employed for removal of demolition debris, it should be erected on the outside of the building.

A-3-5.1 Exterior flammable liquids storage facilities should be provided to prevent fire exposure to the new construction.

A-3-5.6 Tanks and piping formerly containing flammable liquids are likely to contain flammable vapors and 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. Purging with inert materials should be done as early as possible in the

demolition operation in order to minimize the possibility of explosion. Remaining residue or sludge may constitute a fire or explosion hazard.

A-5-1.1 It is recommended that fire doors be closed at the end of each working day.

A-5-2.5 Hoists and elevators provide the only efficient means of transporting hose and other cumbersome fire fighting equipment to upper floors in tall construction or demolition projects. They should be available to the fire department whenever necessary.

A-5-3.1 No minimum water supply is specified due to the wide range of construction types, sites, sizes, etc. However, unless combustibles are essentially nonexistent in the completed structure and occupancy, a minimum of 500 gpm (1893 L/min) should be provided. In most instances the required supply will be higher, and authorities having jurisdiction should be consulted.

A-5-4.2 Threaded plugs should be inserted in fire department hose connections and they should be properly guarded against physical damage.

A-5-4.5 At the highest hose outlet, there should be maintained a substantial box, preferably of metal, in which should be kept a sufficient amount of hose to reach all parts of the floor, appropriate nozzles, spanner wrenches, and hose straps.

A-5-5.1 With good scheduling and contracting, it is possible for the sprinkler installation to progressively and closely follow the building construction. This common good practice provides sprinklered areas for the storage of interior finish materials and building mechanical equipment, much of which may be received in combustible packaging and which cannot be stored outside because of absence of exterior space, weather or security. Even when construction combustibles are not a factor, sprinkler protection would be available for unanticipated early delivery of combustible contents planned for the permanent occupancy. It is not unusual, when needed, to temporarily plug the extremity of a partially installed sprinkler system so that a portion may be placed in automatic service. This is frequently done in multiple-storied buildings to facilitate protection on the lower floors before the upper floors have been built.

A-5-5.3 If the building to be demolished presents a serious fire exposure threat to neighboring property, the existing sprinklers should be retained in service as long as is reasonable by cutting off and capping the system at the floor or area being razed. Modification of the

sprinkler systems to permit alterations or additional demolition should be done under direction of the local fire authority and should be expedited so automatic protection may be restored as quickly as possible.

A-5-6.1 It is recommended that areas and buildings should be patrolled at all times when construction operations are not in progress by a competent watchman registering on an approved watchman's clock from stations covering all parts of the building in accordance with NFPA 601A, *Standard for Guard Operations*.

A-5-7.1 During demolition operations, charged hose lines supplied by hydrants or sprinkler-riser adapters should be available.

A-5-7.5 In addition, 55-gal (208-L) water-filled drums with buckets should be provided on each floor and protected from freezing in winter.

Appendix B

This Appendix is not a part of the requirements of this NFPA document, but is included for information purposes only

Principles of Safeguarding Building Construction and Demolition Operations

B-1 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.

B-2 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, may all 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.

B-3 Consideration should also be given to several other items associated with the construction work that are not so readily apparent.

B-4 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