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NFPA 241

Safeguarding Construction, Alteration, and Demolition Operations 1986



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The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

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NFPA 241

Standard for

Safeguarding Construction, Alteration, and Demolition Operations

1986 Edition

This edition of NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations*, was prepared by the Technical Committee on Construction and Demolition, released by the Correlating Committee on Building Construction, and acted on by the National Fire Protection Association, Inc. at its Fall Meeting held November 18-20, 1985 in Baltimore, Maryland. It was issued by the Standards Council on December 10, 1985, with an effective date of December 30, 1985, and supersedes all previous editions.

The 1986 edition of this standard has been approved by the American National Standards Institute.

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 had jurisdiction over this standard when a tentative text prepared by that Committee was adopted at the 1957 NFPA Annual Meeting. 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.

The 1986 edition represents a complete rewrite. The rewrite represents a comprehensive review by the Technical Committee on Construction and Demolition. When the document was last revised in 1980, it came under the Technical Committee on Building Construction.

The update changes the format in which the safeguards are presented. Chapter 1 through 5 are general in nature and apply to both construction and demolition processes. Chapter 6 presents the specifics associated only with construction processes. Chapter 7 addresses the specifics of demolition. A new Chapter 8 lists mandatory references with which various requirements of the standard require compliance. Nearly 20 NFPA codes and standards are referenced in a mandatory fashion.

The revision expands the treatment of items related to an overall construction and demolition firesafety plan. Definitions have been expanded and added to cover terms with meanings that are unique to this standard. Temporary heating equipment is required to be listed. The section on smoking has been expanded. Trash disposal has been broadened to include housekeeping. Outside chutes, fire cutoffs, and explosives used in demolition have been addressed. Material on temporary standpipes has been included from NFPA 14.

Committee on Building Construction

Correlating Committee

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Donald W. Belles & Assoc. Inc.

Ron Côté, *Secretary*
National Fire Protection Association
(Nonvoting)

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Harold E. Nelson, NBS, Center for Fire Research

Chester W. Schirmer, Schirmer Engineering Corp.
William A. Schmidt, U.S. Veterans Admin.
Richard H. Solomon, Naperville, IL

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Jonas L. Morehart, Nat'l. Institute of Health
Rep. NFPA Safety to Life Committee

Technical Committee on Construction and Demolition

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M & M Protection Consultants

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Thomas C. McNerney, Fire Protection Consultant
R. Benjamin Rietze, Morrison-Knudsen Co.
Hugh O. Strawn, Minnesota Ins. Information Ctr.
Rep. Fire Marshals Assn. of North America

Alternate

Richard G. Kirsop, M & M Protection Consultants
(Alternate to K. A. Kander)

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NFPA 241**Standard for****Safeguarding Construction, Alteration,
and Demolition Operations****1986 Edition**

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 Chapter 8.

Chapter 1 General**1-1 Introduction.**

1-1.1 Fires during construction, alteration, or demolition operations are an ever-present threat. The fire potential is inherently greater during these operations than in the completed structure due to previous occupancy hazard and the presence of large quantities of combustible materials and debris, together with such ignition sources as temporary heating devices, cutting/welding/plumber's torch operations, open fires, and smoking. The threat of arson is also greater during construction and demolition operations due to the availability of combustible materials on-site and the open access.

1-1.2 Fires during construction, alteration, or demolition operations can be eliminated or controlled through the early planning, scheduling, and implementation of fire prevention measures, fire protection systems, rapid communications, and on-site security. An overall construction or demolition firesafety program shall be developed; essential items to be emphasized include:

- (a) Good housekeeping;
- (b) On-site security;
- (c) Installation of new fire protection systems as construction progresses;
- (d) Preservation of existing systems during demolition;
- (e) The organization and training of an on-site fire brigade;
- (f) Rapid communication; and
- (g) Consideration of special hazards resulting from previous occupancies.

1-1.3 A firesafety program shall be included in all construction, alteration, or demolition contracts, and the right of the owner to administer and enforce this program shall be established, even though the building may be entirely under the jurisdiction of the contractor.

1-1.4 This standard presents measures for preventing or minimizing fire damage during construction, alteration, and demolition operations. The public fire department and other fire protection authorities shall also be consulted for guidance. The unique and dangerous situa-

tions confronting fire fighters during such operations require that a complete exchange of pertinent information be established and continued during the life of the project.

1-1.5 General requirements applying to construction and demolition are contained in Chapters 1 through 5; specific requirements for construction activities are found in Chapter 6; and those requirements specific to demolition activities are covered in Chapter 7. Alteration activities may require the use of both the demolition and construction activity requirements as applicable.

1-2 Scope. This standard applies to structures in the course of construction, alteration, or demolition.

1-3 Purpose. This standard is intended to prescribe minimum safeguards for construction, alteration, and demolition operations so as to provide reasonable safety to life and property from fire during such operations. Nothing in this standard is intended to restrict new technologies or alternate arrangements, provided that the level of safety prescribed by the standard is not lowered.

1-4 Definitions.

Approved. 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, such 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.

Authority Having Jurisdiction. The "authority having jurisdiction" is the organization, office, or individual responsible for "approving" equipment, an installation, or a procedure.

NOTE: The phrase "authority having jurisdiction" is used in NFPA documents in a broadmanner since jurisdictions and "approval" agencies vary as do their responsibilities. Where public safety is primary, the "authority having jurisdiction" may be a federal, state, local, or other regional department or individual such as a fire chief, fire marshal, chief of a fire prevention bureau, labor department, health department, building official, electrical inspector or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the "authority having jurisdiction." In many circumstances the property owner or his designated agent assumes the role of the "authority having jurisdiction"; at government installations, the commanding officer or departmental official may be the "authority having jurisdiction."

Hot Work. Operations including cutting, welding, Thermit welding, brazing, soldering, grinding, thermal spraying, thawing pipe, or any other similar situation.

Listed. Equipment or materials included in a list published by an organization acceptable to the "authority having jurisdiction" and concerned with product evalua-

tion, that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specific manner.

NOTE: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The "authority having jurisdiction" should utilize the system employed by the listing organization to identify a listed product.

Protected Structure. For the purposes of this standard, "protected structures" are structures equipped with automatic sprinkler systems or Class I, II, or III wet standpipe or dry standpipe systems for fire department use.

Qualified Agency. Any individual, firm, corporation, or company which either in person or through a representative is regularly engaged in such work, is familiar with all precautions required, and has complied with all the requirements of the authority having jurisdiction.

Roofing Kettle. Any container in excess of 15 gal (56.8 L) capacity used for preheating tar, asphalt, pitch, or similar substances for waterproofing.

Shall. Indicates a mandatory requirement.

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

Single-Ply (Torch Applied) Roofing Systems. Bituminous roofing systems using membranes that are adhered by heating with a torch or other heating apparatus and melting saturated asphalt instead of mopping hot asphalt for adhesion.

Structures. Includes but is not limited to buildings, piers, bridges, and underground installations.

Thermal Spraying. A group of welding or allied processes in which finely divided metallic or nonmetallic materials are deposited in a molten or semimolten condition to form a coating. The coating material may be in the form of powder, ceramic rod, wire, or molten materials.

Thermit Welding. A welding process which produces coalescence of metals by heating them with superheated liquid metal from a chemical reaction between a metal oxide and aluminum, with or without the application of pressure. Filler metal, when used, is obtained from the liquid metal.

Chapter 2 Temporary Construction, Equipment, and Storage

2-1 Temporary Offices and Sheds.

2-1.1* Temporary 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 (9.1 m) of the structure, shall be of noncombustible construction. Detachment between temporary structures, adequate temporary fire protection fixed systems, and/or portable equipment, shall be provided as required by the authority having jurisdiction.

2-1.2 Only safely installed approved heating devices shall be used in temporary 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 as per NFPA 211, *Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances* (connectors and solid fuel); NFPA 54, *National Fuel Gas Code* (fuel gas appliances); and NFPA 31, *Standard for the Installation of Oil Burning Equipment* (liquid fuel appliances). When temporary heating equipment is used, see Section 3-2.

2-2 Temporary Enclosures.

2-2.1 Only noncombustible panels or flame resistant tarpaulins or approved materials of equivalent fire retardant characteristics shall be used. Any other fabrics or plastic films used shall be certified to conform to NFPA 701, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films*.

2-2.2 When used to enclose structures, forming equipment, and similar items, the enclosing material shall be fastened securely or guarded by construction so it cannot be blown by the wind against heaters or other sources of ignition.

2-3 Equipment.

2-3.1 Internal combustion engine-powered air compressors, hoists, derricks, pumps, and similar devices shall be so located that the exhausts discharge well away from combustible materials. When the exhausts are piped to outside the structure under construction, alteration, or demolition, a clearance of at least 9 in. (152 mm) shall be maintained between such piping and combustible material. See NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*.

2-3.2 Internal combustion equipment shall be shut down and allowed to cool to ambient temperatures prior to refueling. (See 5-6.4.)

2-3.3 Service areas for equipment shall not be located within structures under construction, alteration, or demolition.

2-3.4 Fuel for internal combustion equipment shall not be stored within structures under construction, alteration, or demolition except as allowed in Section 3-5.

Chapter 3 Processes and Hazards

3-1 Hot Work Operations.

3-1.1* A permit system shall be used for hot work operations on the job site under the supervision of the fire prevention program manager (*see 5-1.1*). A permit shall not be issued until (1) it has been determined that hot work can be safely conducted at the desired location, (2) combustibles have been moved away or safely covered, (3) the atmosphere is nonflammable, and (4) a fire watch (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. All cracks or openings in floors shall be safely covered or closed.

3-1.2 All gas-operated cutting and welding equipment and operations shall be in accordance with applicable sections of NFPA 51, *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting and Allied Processes*, and NFPA 51B, *Standard for Fire Prevention in Use of Cutting and Welding Processes*.

3-1.3 Thermit Welding.

3-1.3.1* In Thermit welding the mold shall be thoroughly dried before the charge is ignited and provided with a cover.

3-1.3.2* Bulk storage of Thermit welding materials shall be maintained in a detached shed at least 50 ft (15.2 m) from main buildings. The shed shall be maintained dry, posted as a "No Smoking" area, and kept locked.

3-1.3.3 Containers for the starting material shall be tightly closed immediately after each use.

3-1.3.4 The molds shall not be removed until at least 10 to 12 minutes after the weld is made or after sufficient cooling has taken place.

3-1.3.5 There shall be no smoking in areas where Thermit welding material is being used.

3-2 Temporary Heating Equipment.

3-2.1 Temporary heating equipment shall be listed and shall be installed, used, and maintained according to the manufacturer's instructions.

3-2.2 Chimney or vent connectors, where required from direct-fired heaters, shall be maintained at least 18 in. (457 mm) from combustibles and shall be installed in accordance with NFPA 211, *Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances*.

3-2.3 Oil-fired heaters shall comply in design and installation features with NFPA 31, *Standard for the Installation of Oil Burning Equipment*.

3-2.4 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*.

3-2.5* Refueling operations shall be conducted in an approved manner.

3-2.6 Heating devices shall be situated so that they are not likely to overturn and shall otherwise be installed in accordance with their listing, including clearance to combustible material, equipment, or construction.

3-2.7 Temporary heating equipment, when utilized, shall be monitored and maintained by properly trained personnel.

3-3 Smoking.

3-3.1* Smoking shall be prohibited at or in the vicinity of hazardous operations or combustible/flammable materials. "No Smoking" signs shall be posted in these areas.

3-3.2 Smoking shall be permitted only in designated areas. Where smoking is permitted, safe receptacles shall be provided for smoking materials.

3-4 Waste Disposal.

3-4.1* Accumulations of combustible waste material, dust, and debris shall be removed from the structure and its immediate vicinity at the end of each work shift or more frequently as necessary for safe operations.

3-4.2 Rubbish shall not be burned on the premises without first obtaining a permit from the authority having jurisdiction.

3-4.3 Good housekeeping shall be maintained and access shall be kept clear at all times.

3-5 Flammable and Combustible Liquids.

3-5.1 Storage.

3-5.1.1 Storage of flammable and combustible liquids shall be in accordance with NFPA 30, *Flammable and Combustible Liquids Code*, with the following special provision:

Storage of Class I and II liquids shall not exceed 60 gal (227 L).

3-5.1.2 Storage areas shall be kept free of weeds, debris, and combustible materials not necessary to the storage.

3-5.1.3 Open flames and smoking shall not be permitted in flammable and combustible liquids storage areas. Such storage areas shall be appropriately posted as "No Smoking" areas.

3-5.1.4 Marking of Tanks and Containers. Tanks and containers for the storage of flammable and combustible liquids aboveground shall be conspicuously marked with the name of the product they contain and "Flammable - Keep Fire and Flame Away."

3-5.1.5 At least one portable fire extinguisher having a rating of not less than 20-B shall be located not less than 10 ft (3 m) nor more than 50 ft (15.2 m) from any Class I or Class II liquid storage area.

3-5.2 Handling Liquids at Point of Final Use.

3-5.2.1 Class I and II liquids shall be kept in approved safety containers.

3-5.2.2 Means shall be provided to dispose of leakage and spills promptly and safely.

3-5.2.3* Class I liquids shall only be dispensed where there are no open flames or other sources of ignition within the possible path of vapor travel.

3-6 Explosive Materials.

3-6.1 The storage, handling and use of explosive materials shall be in accordance with NFPA 495, *Code for the Manufacture, Transportation, Storage, and Use of Explosive Materials*.

3-6.2 All blasting operations shall be under the direct supervision of someone legally licensed to use explosives and in possession of required permits.

Chapter 4 Utilities

4-1 Electrical.

4-1.1 All construction operation electrical wiring and equipment for light, heat, or power purposes shall be in accordance with pertinent provisions of NFPA 70, *National Electrical Code®*.

4-1.2 Temporary Wiring.

4-1.2.1 Branch Circuits. All branch circuits shall originate in an approved power outlet or panelboard. Conductors shall be permitted within multiconductor cord or cable assemblies or as open conductors. All conductors shall be protected by overcurrent devices at their rated ampacity. Runs of open conductors shall be located where the conductors will not be subject to physical damage, and the conductors shall be fastened at intervals not exceeding 10 ft (3 m). Each branch circuit that supplies receptacles or fixed equipment shall contain a separate equipment grounding conductor when run as open conductors.

4-1.2.2 Lighting.

(a) Temporary lights shall be equipped with guards to prevent accidental contact with the bulb, except that guards are not required when construction of the reflector is such that the bulb is deeply recessed.

(b) Temporary lighting fixtures, such as quartz, which operate at temperatures capable of igniting ordinary combustibles shall be securely fastened so that the possibility of their coming in contact with such materials is precluded.

(c) Temporary lights shall be equipped with heavy-duty electric cords with connections and insulation maintained in safe condition. Temporary lights shall not be suspended by their electric cords unless cords and lights are designed for this means of suspension. Splices shall have insulation equal to that of the cable.

4-1.2.3 Removal. Temporary wiring shall be removed immediately upon completion of construction or purpose for which the wiring was installed.

Chapter 5 Fire Protection

5-1 Owner's Responsibility for Fire Protection.

5-1.1* The owner shall designate a person to be responsible for the fire prevention program and ensuring that it is carried out to completion of the project. This fire prevention program manager shall have the authority to enforce the provisions of this and other applicable fire protection standards.

5-1.2 Where guard service is provided, the manager shall be responsible for the guard service in accordance with NFPA 601, *Standard for Guard Service in Fire Loss Prevention*, and NFPA 601A, *Standard for Guard Operations in Fire Loss Prevention*.

5-1.3 Where there is public fire protection or a private fire brigade, the manager shall be responsible for pre-fire plans being developed with the fire agencies. This plan shall be updated as necessary.

5-1.4 The manager shall be responsible to assure that proper training has been provided for the use of protection equipment.

5-1.5 The manager shall be responsible for the presence of adequate numbers and types of fire protection devices and appliances and for their proper maintenance.

5-1.6 The manager shall be responsible for supervising the permit system for hot work. (*See Section 3-1.*)

5-2 Site Security.

5-2.1* Guard service shall be provided when required by the authority having jurisdiction.

5-2.2* Where guard service is provided, the guard(s) shall be trained in (1) notification procedures to call the fire department and management personnel, (2) knowledge of fire protection equipment, and (3) familiarization with fire hazards. Guards shall be informed of any special status of emergency equipment or hazards. (*See NFPA 601, Standard for Guard Service in Fire Loss Prevention, Chapter 6.*)

5-2.3* Security fences shall be provided when required by the authority having jurisdiction.

5-2.4* Entrances (doors and windows) to the structure under construction, alteration, or demolition shall be secured when required by the authority having jurisdiction.

5-3* Fire Alarm Reporting. 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.

5-4 Access for Fire Fighting.

5-4.1 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.

5-4.2 When access to or within a structure or an area is unduly difficult because of secured openings or where immediate access is necessary for life saving or fire fighting purposes, the authority having jurisdiction may require a key box to be installed in an accessible location. The key box shall be an approved type and shall contain keys to gain necessary access as required by the authority having jurisdiction.

5-4.3 Every building shall be accessible to fire department apparatus by way of access roadways with all-weather driving surface of not less than 20 ft (6.1 m) of unobstructed width, to withstand the live loads of fire apparatus and having a minimum of 13 ft 6 in. (4.1 m) of vertical clearance. Dead-end fire department access roads in excess of 150 ft (45.75 m) length shall be provided with approved provisions for the turning around of fire department apparatus.

Exception: The requirement of this section may be modified when, in the opinion of the fire department, fire fighting or rescue operations would not be impaired.

5-4.4 The required width of access roadways shall not be obstructed in any manner, including parking of vehicles. "No Parking" signs or other appropriate notice, or both, prohibiting obstruction may be required and shall be maintained.

5-4.5 The access roadway shall be extended to within 150 ft (45.75 m) of all portions of the exterior walls of the first story of any building. Where the access roadway cannot be provided, approved fire protection system or systems shall be provided as required and approved by the authority having jurisdiction.

5-4.6 Where a bridge is required to be used as access, it shall be constructed and maintained using design live loading sufficient to carry the imposed loads of the fire apparatus.

5-4.7 Access for use of heavy fire fighting equipment shall be provided to the immediate job site at the start of the project and maintained until completion.

5-4.8 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 and maintained for each floor remaining during demolition. The stairway shall be lighted. During construction the stairway shall be enclosed if the building exterior walls are in place.

5-4.9 Where hoists and elevators provide the only efficient means of transporting hose and other cumbersome fire fighting equipment to upper floors, they shall be available to the fire department whenever necessary.

5-4.10 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.

5-4.11 Free access to permanent, temporary, or portable first-aid fire equipment shall be maintained at all times.

5-5 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 use.

5-6 First-Aid Fire Equipment.

5-6.1 The suitability, distribution, and maintenance of extinguishers shall be in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*.

5-6.2 Wherever a toolhouse, storeroom, or other shanty is located in or adjacent to the building under construction or demolition, 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.

5-6.3 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.

5-6.4 Suitable fire extinguishers shall be provided on manned equipment utilizing liquid fuel.

Chapter 6 Construction Safeguards

6-1 General. The provisions of Chapters 1 through 5 shall be followed, as applicable, for all construction in addition to the specific requirements of this chapter.

6-2* Scaffolding, Shoring, and Forms.

6-2.1 Accumulations of unnecessary combustible forms or form lumber shall be prohibited. Combustible forms or form lumber shall be brought into the structure only when needed. Combustible forms or form lumber shall be removed from the structure as soon as stripping is complete. Those portions of the structure where combustible forms are present shall not be used for the storage of other combustible building materials.

6-2.2* During forming and stripping operations, portable fire extinguishers or charged hose lines shall be pro-

vided to protect adequately the additional combustible loading.

6-3 Construction Material and Equipment Storage.

6-3.1 Temporary storage of equipment to be installed, combustible construction materials, or combustible packing materials shall not be permitted in unprotected structures under construction or alteration unless authorized by the authority having jurisdiction.

6-3.2* Storage shall not be permitted in protected structures until protection is in service.

6-3.3 Yard storage of equipment to be installed or combustible construction materials shall not be stored closer than 30 ft (9.1 m) from the structure under construction or alteration. (See 2-1.1.)

6-4 Roofing Operations.

6-4.1 Asphalt and Tar Kettles.

6-4.1.1 Asphalt and tar kettles shall be located in a safe place outside of the building or on a noncombustible roof at a point so as to avoid danger of ignition of combustible material below.

6-4.1.2 A lid which can be closed by means of gravity shall be provided on all roofing kettles. The tops and covers of all kettles shall be close fitting and constructed of steel having a thickness of not less than 0.075 in. (No. 14 manufacturers' standard gage).

6-4.1.3* Used roofing mops and rags shall be cleaned of excessive asphalt and stored away from the building and combustible materials. Discarded roofing mops and rags shall not be in contact with combustibles.

6-4.1.4 Kettles shall be constantly attended when in operation.

6-4.2 Single-Ply (Torch Applied) Roofing Systems.

6-4.2.1* Single-ply (torch applied) roofing systems shall be installed using extreme caution. Manufacturer's instructions shall be followed in all cases.

6-4.2.2 Caution shall be used when working around roof openings, penetrations, or flashings. Wood nailers and metal flashing shall not be heated with the torch.

6-4.2.3 The torch flame shall not be applied to a combustible substrate for the membrane.

6-4.2.4 Installation of single-ply (torch applied) roofing systems is hot work and shall comply with Section 3-1.

6-4.3* Torches or hot-air guns used to secure plastic roofing membranes shall be used in accordance with manufacturer's recommendations. In order to prevent smoking or ignition of membranes, they shall not be overheated.

6-4.4 Fire Extinguishers for Roofing Operations.

6-4.4.1* There shall be at last one portable fire extinguisher having a rating of not less than 20-B within 30

ft (9.1 m) horizontal travel distance of every roofing kettle at all times while such kettle is in operation.

6-4.4.2* There shall be at least one multipurpose 2-A:20-B:C portable fire extinguisher on the roof being covered or repaired, or other fire protection as determined by the authority having jurisdiction.

6-4.4.3 There shall be at least one multipurpose 2-A:20-B:C portable fire extinguisher within 30 ft (9.1 m) horizontal travel distance of single-ply (torch applied) roofing equipment.

6-4.5 Fuel for Roofing Operations.

6-4.5.1 Fuel containers, burners, and related appurtenances of roofing equipment in which liquefied petroleum gas is used for heating shall comply with all the applicable requirements of NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*.

6-4.5.2 All fuel containers shall be located at least 10 ft (3 m) from the burner flame or at least 2 ft (0.6 m) therefrom when properly insulated from heat or flame.

6-4.5.3 Solid fuel or Class I liquids shall not be used as fuel for roofing kettles.

6-5 Permanent Heating Equipment. The permanent heating equipment for a new building shall be installed and put into operation as soon as practical.

6-6 Utilities.

6-6.1 The provisions of Chapter 4, "Utilities," shall apply in addition to the specific requirements of this section.

6-6.2 Gas.

6-6.2.1 Installation. Installation of gas piping for construction purposes, or modifications to existing gas piping, gas utilization equipment, or accessories shall be performed only by a qualified agency. All such work shall be in accordance with NFPA 54, *National Fuel Gas Code*.

6-6.2.2 Modifications. All modifications to existing gas piping systems shall normally be performed with the gas turned off.

Exception: Hot taps may be made if they are installed by trained and experienced crew utilizing equipment specifically designed for such purpose.

6-7 Fire Cutoffs. Fire walls and exit stairways, if required for the completed building, shall be given construction priority for installation. Fire doors with approved closing devices and hardware shall be installed as soon as is practical and preferably before combustible material is introduced. See NFPA 80, *Standard for Fire Doors and Windows*. Fire doors, after installation, shall not be obstructed from closing.

6-8 Fire Protection During Construction.

6-8.1 The provisions of Chapter 5, "Fire Protection," shall apply in addition to the specific requirements of this section.

6-8.2 Water Supply.

6-8.2.1* 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. (See A-6-2.2.)

6-8.2.2 Where underground water mains and hydrants are to be provided, they shall be installed, completed, and in service prior to construction work.

6-8.3 Sprinkler Protection.

6-8.3.1* 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*.

6-8.3.2 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 separate systems and separate control valves such that its absence or incompleteness will in no way impair the sprinkler protection of the occupied lower floors.*

6-8.3.3 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.

6-8.4 Standpipes.

6-8.4.1 General.

6-8.4.1.1* 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*.

6-8.4.1.2 On permanent Type II and III standpipes, hose and nozzles shall be provided and made ready for use as soon as water supply is available to the standpipe.

Exception: In combined systems where occupant hose will not be required, temporary hose and nozzles shall be provided during construction.*

6-8.4.2 Standpipe Installations in Buildings Under Construction. When required by the authority having

jurisdiction, in buildings under construction, a standpipe system, either temporary or permanent in nature, shall be installed in accordance with the following:

6-8.4.2.1 The standpipes shall be provided with conspicuously marked and readily accessible 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.

6-8.4.2.2 Pipes sizes, hose valves, hose, water supply, and other details for new construction shall be in accordance with this standard.

6-8.4.2.3 Standpipes shall be securely supported and restrained at each alternate floor.

6-8.4.2.4* 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 and guarded against mechanical injury.

6-8.4.2.5 Hose valve(s) shall have external threads having the NH standard thread, for the valve size specified, as specified in NFPA 1963, *Standard for Screw Threads and Gaskets for Fire Hose Connections*.

Exception: Where local fire department connections do not conform to NFPA 1963, the authority having jurisdiction shall designate the connection to be used.

6-8.4.2.6* Standpipes shall be extended 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 similar combustibles.

6-8.4.2.7 Temporary standpipes shall remain in service until the permanent standpipe installation is complete.

Chapter 7 Demolition Safeguards

7-1 General. The provisions of Chapters 1 through 5 shall be followed, as applicable, for all demolition in addition to the specific requirements of this chapter.

7-2 Special Precautions.

7-2.1 The provisions of Section 3-1, "Hot Work Operations," shall apply in addition to the specific requirements of this section.

7-2.2 Special precautions shall be taken when demolition work is done in areas where floors are soaked with oil or other flammable liquid, if dust accumulations are present, or where combustible insulation may be present in floors, walls, or ceilings/roofs where "hot work" is being done. In these situations charged hose lines of adequate number and size shall be provided.

7-2.3* Flammable and combustible liquids shall be drained from tanks and machinery reservoirs in a safe manner and removed from the building immediately. Particular attention shall be paid to removal of residue

and sludge accumulations if hot work operations are involved.

7-3 Temporary Heating Equipment.

7-3.1 The provisions of Section 3-2, "Temporary Heating Equipment," shall apply in addition to the specific requirements of this section.

7-3.2 In cold weather demolition operations, building heat shall be maintained to permit sprinklers, hose, and extinguishers to be operable in areas not in the process of demolition. The minimum temperature at extremities of such areas with wet sprinkler systems shall be 40°F (6°C).

7-4 Smoking.

7-4.1 The provision of Section 3-3, "Smoking," shall apply in addition to the specific requirements of this section.

7-4.2* Smoking shall be prohibited throughout demolition areas.

7-5 Demolition Using Explosives.

7-5.1 The provisions of Section 3-6, "Explosive Materials," shall apply in addition to the specific requirements of this section.

7-5.2* If explosives are used in demolition work (implosion), hose lines [at least two 1½ in (3.8 cm) or one 2½ in. (6.4 cm)] shall be provided in the immediate vicinity of the demolition site during actual detonation. These lines must be of sufficient length to be capable of extinguishing any small fire anywhere on the demolition site after detonation.

7-6 Utilities.

7-6.1 The provisions of Chapter 4, "Utilities," shall apply in addition to the specific requirements of this section.

7-6.2 **Electrical.** Electric service shall be reduced to a minimum and identified to leave no uncertainty as to which circuits are energized.

7-6.3 **Gas.** Prior to demolition, gas supplies shall be turned off and capped at a point outside the building. Gas lines within the building shall be purged after capping unless exempted by the authority having jurisdiction.

7-7* **Fire Cutoffs.** Vertical and horizontal cutoffs shall be retained until razing operations necessitate, as judged by the authority having jurisdiction, their removal. Fire doors shall be closed at the end of each working day.

7-8 Fire Protection During Demolition.

7-8.1 The provisions of Chapter 5, "Fire Protection," shall apply in addition to the specific requirements of this section.

7-8.2* When a building is equipped with sprinklers, the sprinkler protection shall be retained in service as long as the condition requiring sprinklers continues to exist.

7-8.3 Operation of sprinkler control valves shall be permitted only by properly authorized personnel and shall be accompanied by notification of designated parties. When the sprinkler protection is being regularly turned off and on to facilitate removal and capping of segments, the sprinkler control valves shall be checked at the end of each work shift to ascertain that protection is in service.

7-8.4 Standpipes shall be maintained in conformity with the progress of demolition activity in such a manner that they are always ready for fire department use.

7-8.5* Fire extinguishing equipment shall be available subject to the authority having jurisdiction.

Chapter 8 Referenced Publications

8-1 The following documents or portions thereof are referenced within this standard and shall be considered part of the requirements of this document. The edition indicated for each reference is current as of the date of the NFPA issuance of this document. These references are listed separately to facilitate updating to the latest edition by the user.

8-1.1 NFPA Publications. National Fire Protection Association, Batterymarch park, Quincy, MA 02269.

NFPA 10-1984, *Standard for Portable Fire Extinguishers*

NFPA 13-1985, *Standard for the Installation of Sprinkler Systems*

NFPA 14-1986, *Standard for the Installation of Standpipe and Hose Systems*

NFPA 30-1984, *Flammable and Combustible Liquids Code*

NFPA 31-1983, *Standard for the Installation of Oil Burning Equipment*

NFPA 37-1984, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*

NFPA 51-1983, *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting and Allied Processes*

NFPA 51B-1984, *Standard for Fire Prevention in Use of Cutting and Welding Processes*

NFPA 54-1984, *National Fuel Gas Code*

NFPA 58-1986, *Standard for the Storage and Handling of Liquefied Petroleum Gases*

NFPA 70-1984, *National Electrical Code*

NFPA 80-1983, *Standard for Fire Doors and Windows*

NFPA 211-1984, *Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances*

NFPA 495-1985, *Code for the Manufacture, Transportation, Storage, and Use of Explosive Materials*

NFPA 601-1981, *Standard for Guard Service in Fire Loss Prevention*

NFPA 601A-1981, *Standard for Guard Operations in Fire Loss Prevention*

NFPA 701-1977, *Standard Methods of Fire Tests for Flame-Resistant Textiles and Films*

NFPA 1963-1985, *Standard for Screw Threads and Gaskets for Fire Hose Connections*

Appendix A

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

The following notes, bearing the same number as the text of the *Standard for Safeguarding Construction, Alteration, and Demolition Operations* to which they apply, contain useful explanatory material and references.

A-2.1.1 When located 30 ft (9.1 m) or more from the structure and constructed of combustible materials, it is desirable to subdivide temporary support buildings into small detached units to minimize fire loss. Large construction support complexes should be protected with adequate fire protection, e.g., automatic sprinklers, yard hydrants, hose, extinguishers, as required by the authority having jurisdiction.

A-3.1.1 For a sample permit and procedure, see NFPA 51B, *Fire Prevention in the Use of Cutting and Welding Processes*. Additional fire watch 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 5-2.1) should be alerted to check the location where welding was done as part of his/her regular rounds. Where watch service is not provided, use of gas-operated welding or cutting equipment should be discontinued a minimum of one hour before quitting time.

Where practical, work should be moved to a safe location to be welded.

Torches should not be used to cut holes in walls, floors, ceilings, or roofs containing combustible insulation, framing, sheathing, or finished material.

If the structure has a combustible floor, the floor should be wet down, or covered with damp sand or sheet metal 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-3-1.3.1 When the charge for Thermit welding has been ignited, the operator should stand several steps away [at least 10 ft (3 m)] and wear goggles. Burns may occur from the metal splashing, by upsetting the crucible, by breaking the mold, or by allowing the molten metal to come in contact with moisture in the mold, on the floor, or on the ground.

A-3-1.3.2 Where storage near the point of use is necessary, it should be kept at least 10 ft (3 m) away and limited to one day's supply. A listed flammable liquid

cabinet should be used. The area should be kept dry and the cabinet should be locked.

It has been reported that moisture may cause ignition. Ferric oxide and powdered aluminum can be used in a metal cylinder as an incendiary bomb which creates increased concern for keeping storage areas locked.

A-3-2.5 This may necessitate removal of the heater to a safe location and waiting for it to cool prior to refueling.

A-3-3.1 Areas where smoking should be prohibited include, but are not limited to, temporary holding areas for combustible construction materials, storage areas, and areas where oil, gasoline, propane, or flammable material are stored or used.

A-3-4.1 If a chute is employed for removal of debris, it should be erected on the outside of the building. The chute should be of noncombustible construction and the main artery of the chute should be as straight as possible so as to avoid accumulations or clogging within the chute.

A-3-5.2.3 The vapors given off by flammable liquids generally have vapor densities greater than that of air. Therefore, these vapors will tend to collect in low spots and travel at floor level. Being invisible, these vapors are difficult to detect without the aid of proper instruments designed specifically for that purpose.

Proper ventilation is therefore important in the prevention of accidental ignition of these vapors. Proper ventilation can be accomplished by either natural or mechanical means.

A-5-1.1 Make one person responsible for the protection of property from fire. This person should see that the proper procedures for controlling fire hazards are set up and should have full authority to enforce them.

The person should be appointed by the owner. Where an entirely new structure is being constructed, the owner should see that specifications for new buildings contain a clause stating that the "contractor will take all reasonable precautions against fire in accordance with good fire protection engineering practice."

Responsibility for loss prevention rests with the owner. However, loss prevention recommendations are normally accomplished by the contractor. To assure that recommendations are carried out promptly, the owner's assistance may be needed.

A-5-2.1 The requirements for guard service should be based on, but not limited to, the hazards at the site, the size of the risk, the difficulty of fire fighting, the exposure risk, and the physical security of the site.

A-5-2.2 It is recommended that areas in buildings should be patrolled at all times when construction, alteration and demolition operations are not in progress by a competent guard registered on an approved clock from stations covering all parts of the building in accordance with NFPA 601A, *Standard for Guard Operations*. Guards' rounds should include all parts of the buildings and outside areas where there are hazardous equipment or materials. Rounds should be conducted every half

hour for two hours after suspension of work for the day and every day thereafter during night and off days.

A-5-2.3 The requirements for security fencing should be based on, but not limited to, the hazards at the site, the size of the risk, the difficulty of fire fighting, the exposure risk, and the presence of guard service.

A-5-2.4 Securing the openings (doors and windows) to the structure, when possible, would reduce the chance of entry by unauthorized persons. This would reduce the chance of arson or accidental fires. It could, in some instances, eliminate the need for guard service or security fencing. It will also help prevent freezing or wind damage to fire protection equipment and prevent combustible material from being blown against heating devices and igniting.

A-5-3 In large projects and/or tall structures, it is advisable to have an audible device for an evacuation signal in case of fire or other emergency.

A-6-2 Steel scaffolding or approved fire retardant lumber and planking should be used on both the outside and inside of the structure. Construction materials, e.g. forms, shoring, bracing, temporary stairways, platforms, tool boxes, plan boxes, solvents, paints, tarpaulins, and similar items, should be noncombustible, fire retardant "safety" solvent, or high flash point, as the case may require. A concerted effort should be made to attain as high a level of noncombustibility of materials as possible.

A-6-2.2 The authority having jurisdiction should be contacted regarding the adequacy of water suppliers for hose lines.

A-6-3.2 Accepted 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 should 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.

A-6-4.1.3 Many flammable and combustible liquids, including roofing asphalts, combine readily with the oxygen in air and produce heat. When these liquids are present on rags and mops used in roofing operations, the heat can concentrate inside the mass faster than it can be dissipated and result in spontaneous combustion.

Fires in mops can be prevented by "spinning" or cleaning excessive asphalt out of the mop or rag after its work period is finished.

A-6-4.2.1 This is a very hazardous construction process and extreme caution should be exercised during installation. The exposed outer surface of the membrane coil should be heated until a slight sheen develops. The compound should not be overheated. A slight smoke vapor can be seen when the compound is overheated. The flame

from a hand-held torch should be constantly moved from side to side. If a mobile heating apparatus is used it should be kept in constant motion while operating.

A-6-4.3 Some roof membranes such as polyvinyl chloride may require heating, in addition to solvents, in order to form lap joints and/or to secure the membrane to fasteners.

A-6-4.4.1 Additional information regarding the safe use and operation of roofing kettles can be found in NFPA 1, *Fire Prevention Code*, Section 3-6.

A-6-4.4.2 For large roof areas additional protection such as charged hose lines or additional extinguishers may be advisable.

A-6-8.2.1 No minimum water supply is specified due to the wide range of construction types, sites, and sizes. 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-6-8.3.1 With good scheduling and contracting, it is possible for the sprinkler installation to follow progressively and closely the building construction. This is frequently done in multiple buildings to facilitate protection on the lower floors before the upper floors have been built.

A-6-8.4.1.1 Threaded plugs should be inserted in fire department hose connections and they should be properly guarded against physical damage.

A-6-8.4.1.2 Exception: The intent of this provision is to allow the permanent standpipes to be used as temporary standpipes during construction.

A-6-8.4.2.4 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-6-8.4.2.6 Supply of fire hose and nozzles should be ordered in advance so they will be available as soon as standpipes are ready. Hose lines should be connected in areas where construction is in progress.

A-7-2.3 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. For guidance on draining and inerting tanks see NFPA 327, *Standard Procedures for Cleaning or Safeguarding Small Tanks and Containers*, and NFPA 30, *Flammable and Combustible Liquids Code*.

A-7-4.2 Areas where smoking should be prohibited include, but are not limited to, temporary holding areas for combustible construction materials, storage areas, and areas where oil, gasoline, propane, or flammable material are stored or used.

A-7-5.2 If buildings are demolished by explosives, work should be done only by experienced personnel with procedures approved by the authority having jurisdiction.

A-7-7 In situations where adjacent structures will remain, demolition should be started immediately adjacent to the remaining structures, thereby creating a space separation between the remaining structures and the remaining demolition work.

Vertical open shafts in buildings under demolition have been a major factor in the rapid spread of fire throughout the building. Outside chutes should be used where possible so that floor-to-floor integrity can be maintained.

A-7-8.2 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 authority having jurisdiction and should be expedited so

automatic protection may be restored as quickly as possible.

A-7-8.5 During demolition operations, charged hose lines supplied by hydrants or sprinkler-riser adapters should be available.

Appendix B Referenced Publications

B-1 The following documents or portions thereof are referenced within this standard for information purposes only and thus should not be considered part of the requirements of this document. The edition indicated for each reference is current as of the date of the NFPA issuance of this document. These references are listed separately to facilitate updating to the latest edition by the user.

B-1.1 NFPA Publications. National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

NFPA 1-1982, *Fire Prevention Code*

NFPA 327-1982, *Standard Procedures for Cleaning or Safeguarding Small Tanks and Containers*

SUBMITTING PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

**Contact NFPA Standards Administration for final date for receipt of proposals
on a specific document.**

INSTRUCTIONS

**Please use the forms which follow for submitting proposed amendments.
Use a separate form for each proposal.**

1. For each document on which you are proposing amendment indicate:
 - (a) The number and title of the document
 - (b) The specific section or paragraph.
2. Check the box indicating whether or not this proposal recommends new text, revised text, or to delete text.
3. In the space identified as "Proposal" include the wording you propose as new or revised text, or indicate if you wish to delete text.
4. In the space titled "Statement of Problem and Substantiation for Proposal" state the problem which will be resolved by your recommendation and give the specific reason for your proposal including copies of tests, research papers, fire experience, etc. If a statement is more than 200 words in length, the technical committee is authorized to abstract it for the Technical Committee Report.
5. Check the box indicating whether or not this proposal is original material, and if it is not, indicate source.
6. If supplementary material (photographs, diagrams, reports, etc.) is included, you may be required to submit sufficient copies for all members and alternates of the technical committee.

NOTE: The NFPA Regulations Governing Committee Projects in Paragraph 10-10 state: Each proposal shall be submitted to the Council Secretary and shall include:

- (a) identification of the submitter and his affiliation (Committee, organization, company) where appropriate, and
- (b) identification of the document, paragraph of the document to which the proposal is directed, and
- (c) a statement of the problem and substantiation for the proposal, and
- (d) proposed text of proposal, including the wording to be added, revised (and how revised), or deleted.