# NFPA 17 Standard for Dry Chemical Extinguishing Systems 1994 Edition

National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101

## NOTICE

All questions or other communications relating to this document should be sent only to NFPA headquarters, addressed to the attention of the Committee responsible for the document.

For information on the procedures for requesting Technical Committees to issue Formal Interpretations, proposing Tentative Interim Amendments, proposing amendments for Committee consideration, and appeals on matters relating to the content of the document, write to the Secretary, Standards Council, National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

A statement, written or oral, that is not processed in accordance with Section 16 of the Regulations Governing Committee Projects shall not be considered the official position of NFPA or any of its Committees and shall not be considered to be, nor be relied upon as, a Formal Interpretation.

Users of this document should consult applicable federal, state and local laws and regulations. NFPA does not, by the publication of this document, intend to urge action that is not in compliance with applicable laws, and this document may not be construed as doing so.

### Policy Adopted by NFPA Board of Directors on December 3, 1982

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.

---



---

**1. Adoption by Reference**—Public authorities and others are urged to reference this document in laws, ordinances, regulations, administrative orders, or similar instruments. Any deletions, additions, and changes desired by the adopting authority must be noted separately. Those using this method are requested to notify the NFPA (Attention: Secretary, Standards Council) in writing of such use. The term "adoption by reference" means the citing of title and publishing information only.

**2. Adoption by Transcription—A.** Public authorities with lawmaking or rule-making powers only upon written notice to the NFPA (Attention: Secretary, Standards Council), will be granted a royalty-free license to print and republish this document in whole or in part, with changes and additions, if any, noted separately, in laws, ordinances, regulations, administrative orders, or similar instruments having the force of law, provided that: (I) due notice of NFPA's copyright is contained in each law and in each copy thereof; and (2) that such printing and republication is limited to numbers sufficient to satisfy the jurisdiction's lawmaking or rule-making process. **B.** Once this NFPA Code or Standard has been adopted into law, all printings of this document by public authorities with lawmaking or rule-making powers or any other persons desiring to reproduce this document or its contents as adopted by the jurisdiction in whole or in part, in any form, upon written request to NFPA (Attention: Secretary, Standards Council), will be granted a nonexclusive license to print, republish, and vend this document in whole or in part, with changes and additions, if any, noted separately, provided that due notice of NFPA's copyright is contained in each copy. Such license shall be granted only upon agreement to pay NFPA a royalty. This royalty is required to provide funds for the research and development necessary to continue the work of NFPA and its volunteers in continually updating and revising NFPA standards. Under certain circumstances, public authorities with lawmaking or rule-making powers may apply for and may receive a special royalty where the public interest will be served thereby.

**3. Scope of License Grant**—The terms and conditions set forth above do not extend to the index to this document.

(For further explanation, see the Policy Concerning the Adoption, Printing, and Publication of NFPA Documents, which is available upon request from the NFPA.)

---

### Statement on NFPA Procedures

This material has been developed under the published procedures of the National Fire Protection Association, which are designed to assure the appointment of technically competent Committees having balanced representation. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accept any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text.

NFPA has no power or authority to police or enforce compliance with the contents of this document, and any certification of products stating compliance with requirements of this document is made at the peril of the certifier.

99 98 97 96 95 94 5 4 3 2 1 SC-AM-94

**NFPA 17**

**Standard for**

# Dry Chemical Extinguishing Systems

**1994 Edition**

This edition of NFPA 17, *Standard for Dry Chemical Extinguishing Systems*, was prepared by the Technical Committee on Dry and Wet Chemical Extinguishing Systems and acted on by the National Fire Protection Association, Inc., at its Annual Meeting held May 16–18, 1994, in San Francisco, CA. It was issued by the Standards Council on July 14, 1994, with an effective date of August 5, 1994, and supersedes all previous editions.

The 1994 edition of this document has been approved by the American National Standards Institute.

## Origin and Development of NFPA 17

The Dry Chemical Extinguishing Systems Committee was activated in 1952. At that time, there was no dry chemical extinguishing system tested and listed by a testing laboratory, but by late 1954, a system was tested and listed by Underwriters Laboratories Inc. At its meeting in January 1955, the Committee prepared an outline of a standard on dry chemical extinguishing systems and, in the following year, prepared the standard that was tentatively adopted by the National Fire Protection Association on June 7, 1956. Changes to the tentative standard led to approval of the first official NFPA standard on dry chemical extinguishing systems in 1957. Further amendments were made in 1958, 1968, 1969, 1972, 1973, 1975, and 1980. The 1985 edition was a complete revision of the standard. The 1990 edition was a partial revision.

The standard was rewritten for this edition to more clearly state the requirements and to separate the mandatory from the nonmandatory requirements to assist in making the document more usable, enforceable, and adoptable.

# Technical Committee on Dry and Wet Chemical Extinguishing Systems

**Edward D. Leedy,** *Chair*
Industrial Risk Insurers, IL

**John H. Lawlor,** *Secretary*
Keystone Fire Protection Co., PA
Rep. Nat'l Assn. of Fire Equipment Distributors Inc.

**Charles B. Barnett,** Figgie Fire Protection Systems, OH
Rep. Nat'l Fire Sprinkler Assn.
**William M. Carey,** Underwriters Laboratories Inc., IL
**John E. Cribben,** Maryland Casualty Co., MD
Rep. American Insurance Services Group, Inc.
**Jack K. Dick,** Heiser Inc., NY
**Robert H. Hartleben,** Self-Mountaineer Fire & Safety Equip. Co. Inc., WV
**C. Wayne Hubbard,** American Cyanamid Co., NJ
**Robert Kasiski,** Factory Mutual Research Corp., MA
**Joseph N. Knapp,** McDonald's Corp., IL
Rep. Nat'l Restaurant Assn.
**George A. Krabbe,** Automatic Suppression Systems Inc., IL
Rep. Fire Suppression Systems Assn.
**Roland J. Land,** Jardine Insurance Brokers, NY
**Lawrence A. McKenna,** American Tel & Tel Co., NJ
Rep. NFPA Industrial Fire Protection Section
**William D. Shipley,** Ansul Fire Protection, WI
Rep. Fire Equipment Mfrs. Assn., Inc.
**Richard Shiraishi,** Kemper Nat'l Insurance Cos., CA
**Desmond R. Todd,** Levitt-Safety Ltd., Canada
Rep. Fire Equipment Mfrs. Inst. of Canada

**Alternates**

**Salvatore A. Chines,** Industrial Risk Insurers, CT
(Alt. to E. D. Leedy)
**Bruce Christensen,** Ansul Fire Protection, WI
(Alt. to W. D. Shipley)
**Anthony W. Flacco,** Kemper Nat'l Insurance Cos., PA
(Alt. to R. Shiraishi)
**Leo W. Fleury,** Grinnell Corp., RI
(Alt. to C. B . Barnett)
**Norbert W. Makowka,** Nat'l Assn. of Fire Equipment Distributors, IL
(Alt. to J. H. Lawlor)
**Charles F. Willms,** Fire Suppression Systems Assn., NC
(Alt. to G. A. Krabbe)
**Kenneth W. Zastrow,** Underwriters Laboratories Inc., IL
(Alt. to W. M. Carey)

**Nonvoting**

**Walter M. Haessler,** Santa Rosa, CA
(Member Emeritus)

**Mark T. Conroy,** NFPA Staff Liaison

*This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.*

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

**Committee Scope:** This Committee shall have primary responsibility for documents on the design, installation, operation, testing, maintenance, and use of dry and wet chemical extinguishing systems for fire protection.

## Contents

# NFPA 17

## Standard for

# Dry Chemical Extinguishing Systems

## 1994 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 10 and Appendix B.

## Chapter 1 Administration

**1-1* Scope.** This standard includes minimum requirements for dry chemical fire extinguishing systems that discharge dry chemical from fixed nozzles or hand hose lines by means of expellant gas. It contains only the essential requirements and recommendations needed to make the standard workable in the hands of those skilled in this field.

NOTE: Portable dry chemical equipment is covered in NFPA 10, *Standard for Portable Fire Extinguishers.*

**1-2 Purpose.** This standard is prepared for the use and guidance of those charged with the purchasing, designing, installing, testing, inspecting, approving, listing, operating, or maintaining of dry chemical fire extinguishing systems in order that such equipment will function as intended throughout its life. Nothing in this standard is intended to prevent the use of new methods or devices, provided sufficient technical data are submitted to the authority having jurisdiction to demonstrate that the new method or devices are equivalent in quality, effectiveness, durability, and safety to those prescribed by this standard.

**1-2.1** Only those skilled in this field are competent to design and install this equipment. It might be necessary for many of those charged with purchasing, inspecting, testing, approving, operating, and maintaining this equipment to consult an experienced fire protection engineer, competent in this field, in order to discharge their respective duties effectively.

**1-3 Retroactivity Clause.** The provisions of this document are considered necessary to provide a reasonable level of protection from loss of life and property from fire. They reflect situations and the state of the art at the time the standard was issued.

Unless otherwise noted, it is not intended that the provisions of this document be applied to facilities, equipment, structures, or installations that were existing or approved for construction or installation prior to the effective date of this document.

*Exception: In those cases where it is determined by the authority having jurisdiction that the existing situation involves a distinct hazard to life or property, this standard shall apply.*

**1-4 Definitions.** For the purpose of clarification, the following general terms used with special technical meanings in this standard are defined.

**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, 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 that is in a position to determine compliance with appropriate standards for the current production of listed items.

**Authority Having Jurisdiction.** 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 broad manner, 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, or 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 or her 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.

**Automatic Operation.** Operation that does not require any human action.

**Auxiliary Equipment.** Listed equipment used in conjunction with the dry chemical systems, e.g., to shut down power, fuel, or ventilation to the hazard being protected or to initiate signaling devices.

**Branch Duct.** The duct work that contains the exhaust air from a single hood or hazard area.

**Caking.** A phenomenon that occurs when moisture chemically reacts with a dry chemical fire extinguishing agent. This reaction results in materials that, being hydrated by moisture, stick together to form a large agglomerate, or what is more commonly referred to as lumps.

**Calculation and Design.** The process of computing, with the use of equations, graphs, or tables, the system characteristics such as flow rate, pipe size, area, or volume protected by each nozzle, nozzle pressure, and pressure drop. This information is not required for listed preengineered systems, since these systems must be installed in accordance with their pretested limitations described in the manufacturer's installation manual.

**Clearance.** The air distance between dry chemical equipment, including piping and nozzles, and unenclosed or uninsulated live electrical components at other than ground potential.

**Common Duct.** The duct work containing the exhaust air from two or more branch ducts.

**DOT.** The U.S. Department of Transportation, which has jurisdiction over the design and transportation of compressed gas cylinders and cartridges.

**Dry Chemical.** A powder composed of very small particles, usually sodium bicarbonate-, potassium bicarbonate-, or ammonium phosphate-based with added particulate material supplemented by special treatment to provide resistance to packing, resistance to moisture absorption (caking), and the proper flow capabilities.

**Dry Chemical System.** A means of applying dry chemical that can be automatically or manually activated to discharge through a distribution system onto or into the protected hazard. The system includes auxiliary equipment.

**Engineered Systems.** Those requiring individual calculation and design to determine the flow rates, nozzle pressures, pipe size, area, or volume protected by each nozzle, quantities of dry chemical, the number and types of nozzles, and their placement in a specific system.

**Expellant Gas.** The medium used to discharge dry chemical from its container.

**Hand Hose Line System.** A hose and nozzle assembly connected to a supply of dry chemical.

**Inspection.** Inspection is a "quick check" to give reasonable assurance that the extinguishing system is fully charged and operable. This is done by seeing that the system is in place, that it has not been activated or tampered with, and that there is no obvious physical damage or condition to prevent operation.

**Installation and Maintenance Manual.** A pamphlet containing the manufacturer's requirements for the proper design, installation, operation, recharge, inspection, and maintenance of the extinguishing system.

**Listed.** Equipment or materials included in a list published by an organization acceptable to the authority having jurisdiction and concerned with product evaluation 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 specified 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.

**Local Application System.** A supply of dry chemical permanently connected to fixed piping with nozzles arranged to discharge directly onto the fire.

**Lumps.** Agglomerations of dry chemical that do not crumble into particles when dropped from a height of 4 in. (101 mm) onto a hard surface.

**Maintenance.** Maintenance is a thorough check to give maximum assurance that the extinguishing system will operate as intended. It includes a thorough examination and any necessary repair or replacement of system components.

**Manual Operation.** Operation of a system requiring human action.

**Multipurpose Dry Chemical.** Ammonium phosphate-based extinguishing agent that is effective on fires involving both ordinary combustibles, such as wood or paper, and fires involving flammable liquids.

**Owner's Manual.** A pamphlet containing the manufacturer's recommendations for the proper inspection of the extinguishing system.

**Pipe.** Circular conduit for conveying the dry chemical to the discharge nozzle(s). Wherever "pipe" is used in this standard, it shall be understood also to mean "tube."

**Pre-engineered Systems.** Those having predetermined flow rates, nozzle pressures, and quantities of dry chemical. These systems have the specific pipe size, maximum and minimum pipe lengths, flexible hose specifications, number of fittings, and number and types of nozzles prescribed by a testing laboratory. The hazards protected by these systems are specifically limited as to type and size by a testing laboratory, based upon actual fire tests. Limitations on hazards that can be protected by these systems are contained in the manufacturer's listed installation and maintenance manual, which is part of the listing.

**Recharge.** The replacement of the dry chemical and expellant gas.

**Selector Valve.** A device used to direct dry chemical to the hazard being protected.

**Shall.** Indicates a mandatory requirement.

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

**TC.** Transport Canada, which has jurisdiction over design and transportation of compressed gas cylinders and cartridges.

**Total Flooding System.** A supply of dry chemical permanently connected to fixed piping and nozzles that are arranged to discharge dry chemical into an enclosure about the hazard.

**Trained.** One who has undergone the instructions necessary to safely design and install and reliably perform the maintenance and recharge service.

**1-5 Units.** Metric units of measurement in this standard are in accordance with the modernized metric system known as the International System of Units (SI). (*See ASTM E380, Standard for Metric Practice.*)

**1-5.1** If a value for measurement as given in this standard is followed by an equivalent value in other units, the first stated is to be regarded as the requirement. A given equivalent value may be approximate.

**1-5.2** The conversion procedure for the SI units has been to multiply the quantity by the conversion factor and then round the result to the appropriate number of significant digits.

## Chapter 2 Components

**2-1 Detectors.**

**2-1.1** Automatic detectors shall be listed devices that are capable of detecting and indicating heat, flame, smoke, combustible vapors, or an abnormal condition in the hazard that is likely to produce fire.

**2-2 Hand Hose Line and Nozzle Assembly.**

**2-2.1 Hose.** Hose lines on systems shall be coupled to the dry chemical supply and shall incorporate hose listed for this use. Normally, identifying markings on the hose will indicate the acceptability of the hose for this purpose.

**2-2.2 Hose Nozzle.** A hose nozzle shall be so designed that it can be handled by one person and shall incorporate a shutoff device to control the flow of dry chemical.

**2-2.3 Hose Line Storage.** The hose shall be coiled on a hose reel or rack so that it can be readily uncoiled with a minimum of delay. If installed outdoors, it shall be protected against the weather.

**2-3 Nozzles.**

**2-3.1 Discharge Nozzles.** Discharge nozzles shall be listed for their intended use.

**2-3.1.1** Discharge nozzles shall be of adequate strength for use with the expected working pressures.

**2-3.1.2** Discharge nozzles shall be of brass, stainless steel, or other corrosion-resistant materials, or be protected inside and out against corrosion. They shall be made of noncombustible materials and shall withstand the expected fire exposure without deformation.

**2-3.1.3** Discharge nozzles shall be permanently marked for identification.

**2-3.1.4** Discharge nozzles shall be provided with blowoff caps or other suitable devices or materials to prevent the entrance of moisture or other environmental materials into the piping. The protective device shall blow off, open, or blow out upon agent discharge.

**2-4 Operating Devices.**

**2-4.1** Operating devices shall be listed and include releasing mechanisms, alarms, manual actuators, shutoff, and shutoff and auxiliary devices.

**2-4.1.1** All operating devices shall be designed for the service they will encounter and shall not be readily rendered inoperative or susceptible to accidental operation.

**2-4.1.2** Devices shall be marked to indicate their listed minimum and maximum temperature limitations, but all devices shall operate at least from 32°F to 120°F (0°C to 49°C).

**2-4.2 Manual Actuators.**

**2-4.2.1** Manual actuators shall not require a force of more than 40 lb (178 N) nor a movement of more than 14 in. (35.6 mm) to secure operation.

**2-4.2.2** All manual actuators shall be provided with operating instructions. These instructions shall be permitted to include the use of pictographs and shall have lettering at least ¼ in. (6.35 mm) in height. (*See 3-7.1.3.*)

**2-4.2.3** All remote manual operating devices shall be identified as to the hazard they protect.

**2-4.3 Shutoff Devices.**

**2-4.3.1** Shutoff devices shall require manual resetting prior to fuel or power being restored.

**2-4.4 Valves.** All valves shall be listed for the intended use, particularly with regard to flow capacity and operation. Selector valves shall be of the quick-opening type, allowing essential free passage of the dry chemical.

**2-5 Pipe and Fittings.**

**2-5.1 General.** Pipe and fittings shall be of noncombustible material having physical and chemical characteristics such that their integrity under stress can be predicted with reliability. The pipe, fittings, and connection joints shall withstand the maximum expected pressure in the piping system.

**2-5.1.1* Pipe.** Pipe shall be galvanized steel, stainless steel, copper, or brass. Where steel pipe incorporating welded joints or rolled groove fittings is used, a minimum wall thickness of 0.188 in. (5 mm) shall be permitted for maximum system pressures up to 355 psig (2447 kPa) in sizes 4 in. to 8 in. (100 mm to 200 mm). For pipe sizes ⅛ in. to 3 in. (3.2 mm to 76 mm) in welded or rolled groove pipe systems, a minimum wall thickness equivalent to Schedule 10 shall be permitted for maximum system pressures up to 560 psig (3861 kPa). Where steel is joined by threaded fittings or cut grooved couplings, the minimum pipe thickness shall be Schedule 40 for maximum system pressures up to 420 psig (2896 kPa) for pipe sizes 6 in. to 8 in. (150 mm to 200 mm) and 500 psig (3447 kPa) for pipe sizes ⅛ in. to 4 in. (3.2 mm to 100 mm).

*Exception: Black steel pipe may be used in relatively noncorrosive atmospheres.*

**2-5.1.2 Fittings.** Fittings shall be galvanized steel, stainless steel, copper, brass, or galvanized malleable or ductile iron. Pipe fittings shall be compatible with the piping materials and connection method and the system pressure.

*Exception: Black steel pipe may be used in relatively noncorrosive atmospheres.*

**2-5.2** Cast-iron pipe and fittings shall not be used.

**2-5.3*** Flexible piping (hose) shall be used only if specified in the manufacturer's listed installation and maintenance manual.

**2-5.4** Other types of pipe or fittings that have been investigated and listed for this service shall be permitted to be used. The use of such pipe or fittings shall involve careful consideration of the following factors:

(a) Pressure rating
(b) Corrosion (chemical and electrolytic)
(c) Methods of joining
(d) Resistance to fire exposure and rapid temperature changes
(e) Flow characteristics.

**2-6 Dry Chemical.**

**2-6.1*** The type of dry chemical used in the system shall not be changed unless proved to be changeable by a testing laboratory, recommended by the manufacturer of the equipment, and approved by the authority having jurisdiction. Systems are designed on the basis of the flow and extinguishing characteristics of a specific make and type of dry chemical.

**CAUTION:** Types of dry chemical shall not be mixed. Mixtures of certain dry chemicals can generate dangerous pressures and form lumps.

**2-7 Expellant Gas.**

**2-7.1** Carbon dioxide used in expellant gas cartridges shall meet the following specifications:

(a) The vapor phase shall be not less than 99.5 percent carbon dioxide.

(b) The water content of the liquid phase shall not be more than 0.01 percent by weight [-30°F (-34.4°C) dew point].

(c) The oil content shall not be more than 10 ppm by weight.

**2-7.2** Nitrogen used as an expellant gas shall be only standard industrial grade with a dew point of -60°F (-52.2°C) or lower.

**2-8 Wiring.**

**2-8.1 Installation.** Electrical wiring and equipment shall be installed in accordance with NFPA 70, *National Electrical Code®*.

**2-9 Storage Containers.** The dry chemical containers used in these systems shall be designed to meet the requirements of the U.S. Department of Transportation or Transport Canada if used as shipping containers under pressure. If not shipping containers under pressure, they shall be designed, fabricated, inspected, certified, and stamped in accordance with Section VIII of the ASME *Unfired Pressure Vessel Code*; independent inspection and certification is recommended. The design pressure shall be suitable for the maximum pressure developed at 130°F (55°C) or at the maximum controlled temperature limit.

## Chapter 3 System Requirements

**3-1 Use and Limitations.**

**3-1.1* Use.** The types of hazards and equipment that can be protected using dry chemical extinguishing systems include the following:

(a) Flammable or combustible liquids;

**CAUTION:** Extinguishment of flammable liquid fires, especially Class I Liquids (*see NFPA 30, Flammable and Combustible Liquids Code*), can result in a reflash unless all sources of ignition have been removed.

(b) Flammable or combustible gases;

**CAUTION:** Flammable gases present a potential explosion hazard if the flow of gas is not stopped before or during extinguishment.

(c) Combustible solids including plastics, which melt when involved in fire;

(d) Electrical hazards such as oil-filled transformers or circuit breakers;

(e) Textile operations subject to flash surface fires;

(f) Ordinary combustibles such as wood, paper, or cloth;

(g) Restaurant and commercial hoods, ducts, and associated cooking appliance hazards such as deep fat fryers. [*See also Section 3-5 and A-2-6.1(c).*]

**3-1.2 Limitations.** Dry chemical extinguishing systems shall not be considered satisfactory protection for the following:

(a) Chemicals containing their own oxygen supply, such as cellulose nitrate;

(b) Combustible metals such as sodium, potassium, magnesium, titanium, and zirconium;

(c) Deep-seated or burrowing fires in ordinary combustibles where the dry chemical cannot reach the point of combustion.

**3-1.2.1*** Multipurpose dry chemical shall not be used on machinery such as carding equipment in textile operations and delicate electrical equipment because, upon exposure to temperatures in excess of 250°F (121°C) or relative humidity in excess of 50 percent, deposits will be formed that can be corrosive, conductive, and difficult to remove.

**3-1.2.2** Before dry chemical extinguishing equipment is considered for use to protect electronic equipment or delicate electrical relays, the effect of residual deposits of dry chemical on the performance of this equipment shall be evaluated.

**3-2 Multiple Systems Protecting a Common Hazard.**

**3-2.1** Where two or more systems are used to protect a common hazard, they shall be arranged for simultaneous operation. Operation of a single actuator shall cause all systems to operate.

*Exception: See Chapter 7 for pre-engineered systems.*

**3-3 Systems Protecting Two or More Hazards.**

**3-3.1** Where two or more hazards may be simultaneously involved in fire by reason of their proximity, the hazards shall be protected by individual systems installed to operate simultaneously, or by a single system designed to protect all hazards that may be simultaneously involved. Any hazard that will allow fire propagation from one area to another shall constitute a single fire hazard.

**3-4 Dry Chemical Requirements and Distribution.**

**3-4.1* General.** The following factors shall be considered:

(a) Minimum quantity of dry chemical

(b) Minimum flow rate of dry chemical

(c) Nozzle placement limitations including, spacing, distribution, and obstructions.

*Exception No. 1: Pre-engineered systems and hand hose line systems.*

*Exception No. 2: In pre-engineered systems, the factors in 3-4.1(a) through (c) are established for specific volume and other conditions given in the manufacturer's listed installation and maintenance manual. (See Chapter 7 and A-3-4.1.)*

**3-4.2 Compensation for Special Conditions.** Additional quantities of dry chemical and additional nozzles, if necessary, shall be provided to compensate for special condition(s) such as high ventilation rates or prevailing wind conditions that may adversely affect the extinguishing effectiveness of the system.

**3-5 Special Considerations.**

**3-5.1** Where systems protect hazards that are normally heated, such as deep fat fryers, charbroilers, upright broilers, griddles, and ranges in kitchens, or wax tanks, the power or fuel supply to heaters shall be shut off automatically upon actuation of the extinguishing systems.

**3-5.2** Where systems protect hazards that have flowing flammable or combustible fluids or gases, the system shall be provided with automatic means to ensure shutoff of power and fuel valves upon operation of the extinguishing systems.

**3-5.3** Where systems protect hazards that have conveyors moving flammable or combustible materials or commodities, the conveyors shall be automatically shut off upon operation of the extinguishing systems.

**3-5.4** All shutoff systems shall be fail-safe and shall require manual resetting prior to restoration of the operating conditions existing before operation of the extinguishing systems.

**3-5.5** All shutoff devices shall function with the system operation. If the expellant gas is used to pneumatically operate these devices, the gas shall be taken prior to its entry into the dry chemical tank.

**3-6* Personnel Safety.**

**3-6.1 Safety Requirements.** In total flooding and local application systems where there is a possibility that personnel may be exposed to a dry chemical discharge, suitable safeguards shall be provided to ensure prompt evacuation of such locations and also to provide means for prompt rescue of any trapped personnel. Safety items to be considered shall include, but not be limited to, personnel training, warning signs, discharge alarms, predischarge alarms, and respiratory protection.

> **CAUTION: Hazards to Personnel.** The discharge of large amounts of dry chemical can create hazards to personnel such as reduced visibility and temporary breathing difficulty.

**3-6.2 Electrical Clearances.** All system components shall be located to maintain no less than minimum clearances from live electrical parts. The following references shall be considered as the minimum electrical clearance requirements for the installation of dry chemical systems:

(a) ANSI C-2, *National Electrical Safety Code*

(b) NFPA 70, *National Electrical Code*

(c) *Code of Federal Regulations*, Title 29, Part 1910, Subpart S.

**3-6.2.1** Where the design basic insulations level (BIL) is not available, and where nominal voltage is used for the design criteria, the highest minimum clearance specified for this group shall be used.

**3-7* Operation and Control of Systems.**

**3-7.1 Methods of Actuation.** Systems shall be provided with both automatic and manual means of operation.

*Exception: Hand hose line systems shall not require automatic means of operation.*

**3-7.1.1** Operation of any manual actuator shall be all that is required to bring about the full operation of the system. At least one manual actuator shall be provided for each system.

**3-7.1.2** All operating devices shall be designed, located, installed, or protected so that they are not subject to mechanical, environmental, or other conditions that could render them inoperative or cause inadvertent operation of the system.

**3-7.1.3*** At least one manual actuator shall be located no more than 5 ft (1.5 m) above the floor and shall be convenient and easily accessible at all times, including the time of fire.

*Exception: Automatic systems protecting common exhaust ducts only shall not require a remote manual actuator.*

**3-7.1.4** All remote manual actuators shall be identified as to the hazard they protect.

**3-7.1.5** Automatic detection and system actuation shall be in accordance with the manufacturer's listed installation and maintenance manual.

**3-7.2 Supervision.** Supervision of electric- or pneumatic-operated automatic systems shall be provided unless specifically waived by the authority having jurisdiction.

*Exception: Pneumatic actuation piping, hose, and tubing that is not normally pressurized shall not require supervision.*

**3-7.3* Alarms and Indicators.** An alarm or indicator shall be provided to show that the system has operated, that personnel response might be needed, and that the system is in need of recharge.

**3-7.4 Connection to the Alarm System.** The extinguishing system shall be connected to the alarm system, if provided, in accordance with the requirements of NFPA 72, *National Fire Alarm Code*, so that the actuation of the dry chemical system will sound the fire alarm as well as provide the function of the extinguishing system.

**3-8 Dry Chemical and Expellant Gas Supply.**

**3-8.1 Quantity.** The amount of dry chemical in the system shall be at least sufficient for the largest single hazard protected, or for the group of hazards that is to be protected simultaneously.

**3-8.2* Reserve Supply.** Where a dry chemical system protects multiple hazards by means of selector valves, sufficient dry chemical and expellant gas shall be kept on hand for one complete recharge of the system. For single hazard systems, a similar supply shall be kept on hand if the importance of the hazard is such that it cannot be shut down until recharges can be procured.

**3-8.3 Container.** The dry chemical container and expellant gas assemblies shall be located near the hazard or hazards protected, but not where they will be exposed to a fire or explosion in these hazards.

**3-8.3.1** The dry chemical container and expellant gas assemblies shall be located so as not to be subjected to severe weather conditions or to mechanical, chemical, or other damage. Where excessive climatic or mechanical exposures are expected, suitable enclosures or guards shall be provided.

**3-8.3.2*** The dry chemical container and expellant gas assemblies utilizing nitrogen shall be located where the ambient temperature is normally -40°F to 120°F (-40°C to 48.9°C). Assemblies utilizing carbon dioxide shall be located where the ambient temperature is normally 32°F to 120°F (0°C to 48.9°C). If temperatures are outside these limits, the equipment shall be listed for such temperatures, or means shall be provided for maintaining the temperatures within the ambient ranges given.

**3-8.3.3** The dry chemical container and expellant gas assemblies shall be located where they will be accessible for inspection, maintenance, and servicing.

### 3-9 Piping.

**3-9.1* Arrangement and Installation of Pipe and Fittings.** Piping and fittings shall be installed in accordance with good commercial practices.

**3-9.1.1** All piping shall be laid out to produce the desired dry chemical flow rate at the nozzles, and care shall be taken to avoid possible restrictions due to foreign matter, faulty fabrication, or improper installation.

**3-9.1.2** The piping system shall be securely supported and shall not be subject to mechanical, chemical, or other damage. Where explosions are possible, the piping system shall be hung from supports that are least likely to be displaced.

**3-9.1.3** Pipe shall be reamed and cleaned before assembly, and, after assembly, the entire piping system shall be blown out with dry gas before nozzles or discharge devices are installed. Pipe thread compound or tape shall not be used.

*Exception: Pipe thread tape shall be permitted where installed in accordance with the manufacturer's listed installation manual.*

**3-9.1.4** Where the pipe penetrates a duct or hood, the penetration shall have a liquid-tight continuous external weld or shall be sealed by a listed device.

**3-9.2 Pipe Size and Nozzle Determination.** Pipe sizes and nozzles shall be selected, on the basis of calculations, to deliver the required dry chemical flow rate at each nozzle or, for pre-engineered systems, in accordance with the manufacturer's listed installation and maintenance manual.

**3-9.2.1** Equations, or graphs derived therefrom, shall be used to determine the pressure drop in the pipeline in engineered systems. This design information shall be based on tests performed by the manufacturer and shall be confirmed by a testing laboratory. It is not required in pre-engineered systems.

**3-9.2.2** All discharge nozzles shall be designed and subsequently located, installed, or protected so that they are not subject to mechanical, environmental, or other conditions that could render them inoperative.

**3-9.2.3** Discharge nozzles shall be so connected and supported that they will not be readily put out of alignment. Where nozzles are connected directly to flexible hoses, they shall be provided with mounting brackets or fixtures to ensure that they can be aligned properly and that the alignment will be maintained.

## Chapter 4 Total Flooding Systems

**4-1* Uses.** This type of system shall be used only where there is a permanent enclosure about the hazard that is adequate to enable the required concentration to be built up. The total area of unclosable openings shall not exceed 15 percent of the total area of the sides, top, and bottom of the enclosure.

*Exception: This requirement shall not apply to pre-engineered systems.*

**4-1.1** Deep-seated fires involving solids subject to smoldering shall be protected by multipurpose dry chemical systems where the dry chemical can reach all surfaces involved in combustion. Bicarbonate-based dry chemicals shall not be used for protection against this type of fire.

### 4-2 Hazard Specifications.

**4-2.1 Enclosure.** In the design of total flooding systems, the characteristics of the enclosure shall be as specified in 4-2.1.1.

**4-2.1.1** The total area of unclosable openings for which no compensation is provided shall not exceed 1 percent of the total area of the sides, top, and bottom of the enclosure. Unclosable openings having an area in excess of 1 percent and not exceeding 5 percent shall be compensated for by the provision of additional dry chemical. Unclosable openings having an area in excess of 5 percent of the total enclosure area and not exceeding 15 percent shall be screened by local application of additional dry chemical. (*See 4-2.2.6.*)

*Exception: This requirement shall not apply to pre-engineered systems.*

**4-2.2 Leakage and Ventilation.** The leakage of dry chemical from the protected space shall be minimized since the effectiveness of the flooding system depends upon obtaining an extinguishing concentration of dry chemical.

**4-2.2.1** Where possible, openings such as doorways, windows, etc., shall be arranged to close before, or simultaneously with, the start of the dry chemical discharge, or 4-2.2.6 shall be followed.

**4-2.2.2** Where forced-air ventilating systems are involved, they shall be either shut down or closed before, or simultaneously with, the start of the dry chemical discharge, or 4-2.2.6.1 shall be followed.

**4-2.2.3*** The quantity of dry chemical and the flow rate shall be sufficient to create a fire extinguishing concentration in all parts of the enclosure.

**4-2.2.4 Volume Allowances.** In calculating the net volume to be protected, allowance shall be permitted for permanently located structures that materially reduce the volume.

**4-2.2.5 Rate of Application.** In engineered systems, the minimum design rate of application shall be based on the quantity of dry chemical and the maximum time to obtain the design concentration.

**4-2.2.5.1** In engineered systems, the rate of application shall be such that the design concentration in all parts of the enclosure shall be obtained within 30 seconds.

**4-2.2.6** Unclosable openings having areas in excess of 1 percent of the total area of the sides, top, and bottom of the enclosure, and not exceeding 5 percent, shall be compensated for by the use of supplemental dry chemical in the proportion of not less than 0.5 lb/ft$^2$ (2.44 kg/m$^2$) of unenclosed opening, applied through the regular distribution system. Where the unclosable openings have areas exceeding 5 percent of the total of the sides, top, and bottom of the enclosure, and not exceeding 15 percent, compensation shall be furnished by additional dry chemical in the proportion of not less than 1 lb/ft$^2$ (4.88 kg/m$^2$) of unclosed opening, applied simultaneously by local application over the openings.

*Exception: This requirement shall not apply to pre-engineered systems.*

**4-2.2.6.1** For ventilating systems that will not be shut down, supplementary dry chemical shall be added to the protected volume through the regular distribution system. The supplementary dry chemical shall be added at the point or points of air inlet and shall be in proportion to the volume of air removal during the period of dry chemical discharge, calculated as if it were additional volume to be protected.

*Exception: Pre-engineered systems listed for restaurant hood and duct protection shall be permitted for use with or without shutoff of the ventilation system or closure of dampers. (See Chapter 7.)*

## Chapter 5 Local Application Systems

**5-1* Uses.** Local application systems shall be used for the extinguishment of fires in flammable or combustible liquids, gases, and shallow solids, such as paint deposits, where the hazard is not enclosed or where the enclosure does not conform to the requirements for total flooding.

### 5-2 Hazard Specifications.

**5-2.1 Extent of Hazard.** The hazard shall be so isolated from other hazards or combustibles that fire will not spread outside the protected area. The entire hazard shall be protected. The hazard shall include all areas that are or might become coated by combustible or flammable liquids or shallow solid coatings, such as areas subject to spillage, leakage, dripping, splashing, or condensation, and all associated materials or equipment, such as freshly coated stock, drainboards, hoods, ducts, etc., that might extend fire outside or lead fire into the protected area.

NOTE: Protection of the entire hazard may require the combined use of local application and total flooding systems.

**5-2.2 Location.** The design of the system shall consider the location of the hazard, which might be indoors, partly sheltered, or completely outdoors.

**CAUTION:** Consideration shall be given to the effects of wind or other stray air currents on the dry chemical discharge.

**5-2.3** For flammable liquid fires, the nozzles shall be placed tankside or overhead, or a combination of tankside and overhead within the limits of the listing, and located to prevent splashing during discharge.

**5-2.4 Coated Surfaces.** Coated surface areas shall be treated as if they were deep-layer flammable liquid areas (because no distinction has been made in this standard).

**5-2.5 Duration of Discharge.** The minimum effective discharge time shall be determined by the required minimum quantity of dry chemical and the minimum application rate.

*Exception: This requirement shall not apply to pre-engineered systems.*

## Chapter 6 Hand Hose Line Systems

**6-1 Separate Supplies.** Where hand hose lines may be used on a hazard that also is protected by a fixed system, separate dry chemical supplies shall be provided.

*Exception: If a single dry chemical supply is used for both a hand hose line system and a fixed nozzle system, the hazards protected by the two systems shall be separated so that the hand hose lines cannot be simultaneously used on the hazard protected by the fixed nozzle system.*

**6-1.2** Hand hose line systems shall be permitted to supplement fixed nozzle fire protection systems or to supplement portable fire extinguishers for the protection of specific hazards for which dry chemical is a suitable extinguishing agent. These systems shall not be used as a substitute for dry chemical fire extinguishing systems equipped with fixed nozzles except where the hazard cannot be adequately or economically provided with fixed nozzle protection. The decision as to whether hose lines shall be permitted to be used for a particular hazard shall be made by the authority having jurisdiction.

### 6-2 Location, Spacing, and Actuation.

**6-2.1 Location.** Hand hose line stations shall be placed so that they are easily accessible and shall have hose lines long enough to reach the most distant hazard that they are expected to protect. In general, they shall be located so that they are not exposed to the hazard.

**6-2.2 Spacing.** If multiple hose stations are used, they shall be spaced so that any area within the hazard can be covered by one or more hose lines.

**6-2.3 Actuation.** Manual actuation of the dry chemical system shall be possible at each hose line station.

### 6-3 Dry Chemical Requirements.

**6-3.1* Rate and Duration of Discharge.** A hand hose line shall have a sufficient quantity of dry chemical to permit its effective use for a minimum of 30 seconds. The minimum flow rate also shall be sufficient to prevent surging and interrupted discharge. This value for minimum flow rate shall be confirmed by a testing laboratory.

**6-3.2 Simultaneous Use of Hose Lines.** Where simultaneous use of two or more hose lines is possible, a sufficient quantity of dry chemical shall be available to supply the maximum number of nozzles that are likely to be used at any one time for at least 30 seconds and at the appropriate flow rates.

**6-3.3* Operation of Hose Lines.**

**6-3.3.1** The pressurizing valve shall remain in the open position during the entire fire-fighting operation.

**6-3.3.2** The hose lines shall be cleared of dry chemical immediately after use.

**6-4 Training.** All personnel who are likely to use this equipment shall be kept properly trained in its operation and in the fire-fighting techniques applicable to this equipment.

## Chapter 7 Pre-engineered Systems

**7-1* Uses.** Pre-engineered systems shall be installed to protect hazards within the limitations of the listing. Therefore, these systems shall be installed in accordance with the manufacturer's listed installation and maintenance manual. Only system components referenced in the manufacturer's listed installation and maintenance manual or alternative suppliers' components that are listed for use with the specific extinguishing system shall be used.

**7-2 Types of Systems.**

**7-2.1** Pre-engineered dry chemical systems are of the following types:

(a) Local application
(b) Total flooding
(c) Hand hose line
(d) Combination of local application and total flooding.

**7-3 Restaurant Hood, Duct, and Cooking Appliance Systems.**

**7-3.1** Each protected cooking appliance(s), individual hood(s), and branch exhaust duct(s) directly connected to the hood shall be protected by a single system or by systems designed for simultaneous operation.

**7-3.1.1** A fusible link or heat detector shall be provided above each cooking appliance or group of appliances protected by a single nozzle.

*Exception: Cooking appliances located directly below an exhaust duct that have a fusible link or heat detector installed at or within 12 in. (305 mm) of the entrance to the duct.*

**7-3.2** All cooking appliances protected by an extinguishing system shall be provided with an automatic means to ensure the shutdown of fuel or power to the protected appliances upon system actuation.

NOTE: Exhaust fans do not need to be shut down or dampers closed upon system actuation, since the systems have been tested under both zero and high-velocity flow conditions.

**7-3.3** Systems protecting two or more hoods or plenums, or both, that meet the requirements of 3-2.1 shall be installed to ensure the simultaneous operation of all systems protecting the hoods, plenums, or both, and associated cooking appliances located below the hoods.

**7-3.4*** Automatic protection shall be provided for all portions of a common exhaust duct. This shall be accomplished by one of the following methods:

(a)* Simultaneous operation of all cooking appliance, hood, and branch duct systems, one or more of which also protect the common exhaust duct. [*See Figure A-7-3.4(a).*]

Upon operation of these systems, fuel or power to all protected cooking appliances served by the common exhaust duct shall be shut off.

(b)* Simultaneous operation of all systems that protect only the common exhaust duct. [*See Figure A-7-3.4(b).*]

Upon operation of the common exhaust duct systems, the fuel or power to all protected cooking appliances served by the common exhaust duct shall be shut off.

(c)* Independent operation of systems protecting only the common exhaust duct; each system shall protect a portion of the common exhaust duct so that the entire common exhaust duct is protected [*see Figure A-7-3.4(c).*] Each common exhaust duct system shall protect the entire downstream common exhaust duct.

Upon operation of any common duct system, fuel or power to all protected cooking appliances served by that portion of the common exhaust duct shall be shut off.

(d)* Independent operation of cooking appliance, hood, and branch duct systems where one of these systems protects the entire common exhaust duct. [*See Figure A-7-3.4(d).*]

Upon operation of the cooking appliance, hood, and branch duct system that also protects the common exhaust duct, the fuel or power to all protected cooking appliances served by the common exhaust duct shall be shut off.

Upon operation of any system not protecting the common exhaust duct, only the cooking appliances protected by that system shall be shut off, provided these systems have sufficient fire hazard separation so that simultaneous operation of an additional system or systems shall not be required.

(e)* Independent operation of cooking appliance, hood, and branch duct systems, with two or more of these systems also protecting the common exhaust duct. [*See Figure A-7-3.4(e).*]

Upon operation of a cooking appliance, hood, and branch duct system that protects a portion of the common exhaust duct, the fuel or power to all protected cooking appliances served by that portion of the common exhaust duct shall be shut off.

Each common exhaust duct system shall provide protection for the largest common exhaust duct downstream of each system.

Upon operation of a cooking appliance, hood, and branch duct system that does not protect a portion of the common exhaust duct, only the fuel or power to the cooking appliances protected by that system shall be shut off.

Simultaneous operation of another cooking appliance, hood, and branch duct system shall not be required, provided there is sufficient fire hazard separation between hoods and adjacent branch ducts. (*See 3-3.1.*)

(f)* Independent operation of a combination of:

(1) A system that protects only a portion of the common exhaust duct; and

(2) Cooking appliance, hood, and branch duct systems, two or more of which protect the remainder of the common exhaust ducts. [*See Figure A-7-3.4(f).*]

Simultaneous operation of another cooking appliance, hood, and branch duct system shall not be required, provided there is sufficient fire separation between hoods and adjacent branch ducts. (*See 3-3.1.*)

Upon operation of any system, the fuel or power to all protected cooking appliances served by the portion of the common exhaust duct being protected shall be shut off.

**7-3.4.1** A fusible link or heat detector shall be located at each branch duct-to-common duct connection. Actuation of any branch duct-to-common exhaust duct fusible link or heat detector shall actuate the system, protecting that portion of the common duct, and shut off fuel or power to all protected hazards connected to that portion of the common exhaust duct.

**7-3.4.2** The building owner(s) shall be responsible for the protection of a common exhaust duct(s) used by more than one tenant.

The tenant shall be responsible for the protection of a common exhaust duct(s) serving hoods located within the tenant's space and up to the point of connection to the building owner's common exhaust duct. The tenant's common duct shall be considered a branch duct to the building owner's common duct.

### 7-4 Vehicle Fueling Service Station Systems.

**7-4.1** Each hazard protected by two or more systems shall have these systems connected for simultaneous operation.

**7-4.2** The protected area of each hazard shall include the area within the arc scribed by the nozzle end of the hose on each vehicle fuel dispenser.

**CAUTION:** The manufacturer of the system shall be consulted to determine the need for additional coverage under adverse wind conditions.

**7-4.3** Suitable means shall be provided to contain a fuel spill within the protected area.

NOTE: See NFPA 30, *Flammable and Combustible Liquids Code.*

**7-4.4** Equipment shall be provided to shut down all vehicle fuel dispensers simultaneously upon system actuation. In the event of a system discharge, the hazard being protected shall not be returned to service until such time as the system is recharged and operational.

**7-4.5** Automatic detection and actuation of the extinguishing system shall be provided. The manufacturer's listed installation and maintenance manual shall be consulted regarding the type and location of the detectors.

**7-4.6** A remote manual actuator or operating device shall be provided in a conspicuous and accessible location away from the vehicle fuel dispensers and protected area. (*See Section 2-4.*)

**7-4.7** All discharge nozzles shall be located so as to minimize the likelihood of damage or misalignment and within the limitations and constraints of the manufacturer's listed installation and maintenance manual.

### 7-5 Systems for the Protection of Mobile Equipment.

**7-5.1** Only pre-engineered dry chemical systems, including detection systems that have been listed for such use, shall be installed on mobile equipment.

NOTE: For information on mobile surface mining equipment, see NFPA 121, *Standard on Fire Protection for Self-Propelled and Mobile Surface Mining Equipment.*

**7-5.2** Compartments or areas that could be subject to fire shall be protected in accordance with the manufacturer's listed installation and maintenance manual.

**7-5.3** Each protected compartment or area shall be provided with a listed fire detection device specified in the manufacturer's listed installation and maintenance manual to automatically actuate the extinguishing system.

*Exception: Manual actuation only may be provided if acceptable to the authority having jurisdiction.*

**7-5.4** Only the flexible hose and hose fittings specified in the manufacturer's listed installation and maintenance manual shall be used.

**7-5.5** All discharge nozzles shall be located to minimize the likelihood of damage or misalignment and within the limitations and constraints of the manufacturer's listed installation and maintenance manual.

**7-5.6** Location of agent containers, expellant gas cartridges or cylinders, and a manual actuator station(s) shall be appropriate to each application, protected against physical damage, and accessible.

**7-5.7** At least one easily accessible manual actuator or operating device shall be provided for use by the equipment operator.

**7-5.8** An additional manual actuator or operating device shall be located so that it is in the path of egress and operable from ground level.

**7-5.9** If the system is provided with a discharge delay device, both audible and visual alarms shall be provided to warn of the impending system discharge.

**7-5.10** In the event of system discharge, the vehicle being protected shall not be returned to service until such time as the system is recharged and operational.

### 7-6 Hand Hose Line Systems.

**7-6.1** Dry chemical hand hose line systems shall be provided with turrets, skid-mounted hose reels, remote hose reels, or combinations of these.

**7-6.2** The length and size of piping and hose and the type of nozzles shall be within the limitations stated in the manufacturer's listed installation and maintenance manual.

**7-6.3** Differences in elevation between the dry chemical storage tank and each turret or hose reel shall be within the limitations of the manufacturer's listed installation and maintenance manual.

**7-6.4** If multiple cylinders are used to pressurize the dry chemical agent containers, each cylinder shall be provided with a pressure gauge and a manual means of operation.

*Exception No. 1: Slave cylinders without manual actuators shall be permitted if at least two master cylinders with manual actuators are provided.*

*Exception No. 2: Only one manual actuator shall be required to be provided for self-contained skid-mounted systems.*

**7-6.5** Each turret and hose reel shall be provided with a shutoff nozzle or flow control valve.

**7-6.6** An integral method shall be provided to blow out all system piping and hose reels after any use.

**7-6.7** Turret nozzles shall be provided with caps or other suitable devices to prevent moisture or foreign materials from entering the turret or piping.

## Chapter 8 Plans and Acceptance Tests

**8-1 Specifications.** Specifications for dry chemical fire extinguishing systems shall be drawn up with care under the supervision of a competent person and with the advice of the authority having jurisdiction. To ensure a satisfactory system, the provisions of 8-1.1 through 8-1.4 shall be included in the specifications.

**8-1.1** The specifications shall designate the authority having jurisdiction and indicate whether plans shall be required for pre-engineered systems. Plans shall be required for all engineered systems.

**8-1.2** The specifications shall state that the installation shall conform to this standard and meet the approval of the authority having jurisdiction.

**8-1.2.1** The specification shall indicate that only equipment that is specifically listed and compatible for use with the extinguishing system shall be used.

*Exception: Special auxiliary devices acceptable to the system manufacturer and the authority having jurisdiction.*

**8-1.3** The specifications shall include system acceptance tests.

**8-1.4** The specifications shall indicate the hazard to be protected and shall include such information as physical dimensions, combustibles, air-handling equipment, heat sources, etc.

**8-2 Plans.** Where plans are required, the responsibility for their preparation shall be entrusted only to competent persons trained in the design and application of these systems.

**8-2.1** The plans shall be drawn to an indicated scale or be suitably dimensioned and shall be reproducible.

**8-2.2** The plans shall contain sufficient detail to enable the authority having jurisdiction to evaluate the hazard or hazards and to evaluate the effectiveness of the system. The details on the hazards shall include materials involved, the location and arrangement, and the exposure to the hazard.

**8-2.3** The details on the system shall include sufficient information and calculations on the amount of dry chemical; the size, length, and arrangement of connected piping, or piping and hose; and description and location of nozzles so that the adequacy of the system can be determined. Flow rates of nozzles used shall be provided for engineered systems. Information shall be submitted pertaining to the location and function of detection devices, operating devices, auxiliary equipment, and electrical circuitry, if used. Sufficient information shall be indicated to identify properly the apparatus and devices used.

**8-3 Approval of Plans.** Where plans are required, they shall be submitted to the authority having jurisdiction for approval before work starts.

**8-3.1** Where field conditions necessitate any substantial change from the approved plan, the corrected as-installed plans shall be submitted to the authority having jurisdiction for approval.

**8-4 Approval of Installations.** The completed system shall be tested by qualified personnel. The tests shall determine that the system has been properly installed and will function as intended. Only listed equipment and devices shall be used in these systems. (*See Section 7-1.*)

**8-4.1** The installer shall certify that the installation has been made in accordance with the approved plans and the listing of a testing laboratory.

**8-4.2** Acceptance tests shall include a discharge of dry chemical in sufficient amounts to verify that the system is properly installed and functional. The method of verification shall be acceptable to the authority having jurisdiction. Piping shall not be hydrostatically tested. Where pressure testing is required, it shall be by means of a dry gas. The labeling of devices with proper designations and instructions shall be checked.

*Exception: The use of dry chemical for the approval test may be waived by the authority having jurisdiction.*

**8-4.3** After any discharge of dry chemical, all piping and nozzles shall be blown clean using compressed dry air or nitrogen. Care also shall be taken to ensure that the system is properly charged and placed in the normal "set" condition.

**8-5 Manual.** The owner shall be provided with a copy of the manufacturer's listed installation and maintenance manual or listed owner's manual.

## Chapter 9 Inspection, Maintenance, and Recharging

**9-1 General Requirements.**

**9-1.1** Where dry chemical pressure containers are not attached to piping or hand hose lines, the discharge outlet shall be provided with a protective diffusing safety cap to protect personnel from recoil and high-flow discharge in case of accidental actuation. Such protective caps also shall be used on empty pressure containers to protect threads. These caps shall be provided by the manufacturer of the equipment.

**9-1.2 Storage.** Storage of charging supplies of dry chemical shall be in a constantly dry area, and the dry chemical shall be contained in metal drums or other containers that will prevent the entrance of moisture even in small quantities. Prior to the dry chemical chamber being charged, the dry chemical shall be checked carefully to determine that it is in a flowing condition.

**9-1.3*** A trained person who has undergone the instructions necessary to perform the maintenance and recharge service reliably and has the applicable manufacturer's installations and maintenance manual and service bulletins shall service the dry chemical fire extinguishing system at intervals not more than 6 months apart as outlined in Section 9-3.

**9-1.4** All dry chemical extinguishing systems shall be inspected in accordance with the owner's manual and maintained and recharged in accordance with the manufacturer's listed installation and maintenance manual and service bulletins.

**9-1.5 Recharge Agents.**

**9-1.5.1 Quality.** The dry chemical used in the system shall be supplied by the manufacturer of the equipment. The characteristics of the system are dependent upon the composition of the dry chemical and the type of expellant gas, as well as other factors, and, therefore, it is imperative to use the dry chemical provided by the manufacturer of the system and the type of expellant gas specified by the manufacturer of the system.

**9-1.5.1.1** Where carbon dioxide or nitrogen is used as the expellant gas, it shall be of good commercial grade and free of water and other contaminants that might cause container corrosion.

**9-1.6** System access for inspection or maintenance that requires opening panels in fire chases or ducts, or both, shall not be permitted while any appliance(s) or equipment protected by that system is in operation.

**9-2 Owner's Inspection.**

**9-2.1** On a monthly basis, inspection shall be conducted in accordance with the manufacturer's listed installation and maintenance manual or owner's manual. As a minimum, this "quick check" or inspection shall include verification of the following:

(a) The extinguishing system is in its proper location.

(b) The manual actuators are unobstructed.

(c) The tamper indicators and seals are intact.

(d) The maintenance tag or certificate is in place.

(e) No obvious physical damage or condition exists that might prevent operation.

(f) The pressure gauge(s), if provided, is in operable range.

(g) The nozzle blowoff caps are intact and undamaged (where provided).

**9-2.2** If any deficiencies are found, appropriate corrective action shall be taken immediately.

**9-2.3** Personnel making inspections shall keep records for those extinguishing systems that were found to require corrective actions.

**9-2.4** At least monthly, the date the inspection was performed and the initials of the person performing the inspection shall be recorded.

**9-3 Maintenance.**

**9-3.1*** At least semiannually, maintenance shall be conducted in accordance with the manufacturer's listed installation and maintenance manual. As a minimum, such maintenance shall include:

(a) A check to see that the hazard has not changed.

(b) An examination of all detectors, the expellant gas container(s), the agent container(s), releasing devices, piping, hose assemblies, nozzles, alarms, and all auxiliary equipment.

(c)* Verification that the agent distribution piping is not obstructed.

(d) Examination of the dry chemical. If there is evidence of caking, the dry chemical shall be discarded and the system shall be recharged in accordance with the manufacturer's instructions.

*Exception: Dry chemical in stored pressure systems shall not require semiannual examination but shall be examined at least every 6 years.*

(e) Where semiannual maintenance of any dry chemical containers or system components reveals conditions such as, but not limited to, corrosion or pitting in excess of the manufacturer's limits, structural damage or fire damage, or repairs by soldering, welding, or brazing, the affected part(s) shall be replaced or hydrostatically tested in accordance with the recommendations of the manufacturer or the listing agency. The hydrostatic testing of dry chemical containers shall follow the applicable procedures outlined in Section 9-5.

(f) All dry chemical systems shall be tested, which shall include a check of the detection system, alarms, and releasing devices, including manual stations and other associated equipment. A discharge of the dry chemical normally is not part of this test.

(g) Where the maintenance of the system(s) reveals defective parts that could cause an impairment or failure of proper operation of the system(s), the affected parts shall be replaced or repaired in accordance with the manufacturer's recommendations.

(h) The maintenance report, with recommendations, if any, shall be filed with the owner or with the designated party responsible for the system.

**9-3.2*** Fixed temperature-sensing elements of the fusible metal alloy type shall be replaced at least annually from the date of installation. They shall be destroyed when removed.

**9-3.2.1** The year of manufacture and the date of installation of the fixed temperature-sensing element shall be marked on the system inspection tag. The tag shall be signed or initialed by the installer.

**9-3.3** Fixed temperature-sensing elements other than the fusible metal alloy type shall be permitted to remain continuously in service, provided they are inspected and cleaned or replaced if necessary in accordance with the manufacturer's instructions every 12 months or more frequently to ensure proper operation of the system.

**9-4 Recharging.**

**9-4.1** All extinguishing systems shall be recharged after use or as indicated by an inspection or when performing maintenance.

**9-4.2** Systems shall be recharged in accordance with the manufacturer's listed installation and maintenance manual.

**9-5 Hydrostatic Testing.** Hydrostatic testing shall be performed by persons trained in pressure-testing procedures and safeguards and having available suitable testing equipment, facilities, and an appropriate service manual(s). The following parts of dry chemical extinguishing systems shall be subjected to a hydrostatic pressure test at intervals not exceeding 12 years:

(a) Dry chemical containers;

(b) Auxiliary pressure containers; and

(c) Hose assemblies.

*Exception No. 1: Dry chemical containers that are part of extinguishing systems having an agent capacity exceeding 150 lb (68 kg).*

*Exception No. 2: Auxiliary pressure containers not exceeding 2 in. (0.05 m) outside diameter and less than 2 ft (0.6 m) in length.*

*Exception No. 3: Auxiliary pressure containers bearing the DOT "3E" marking.*

NOTE: DOT- or TC-marked cylinders may be required to be subjected to more frequent testing.

**9-5.1** Dry chemical containers, auxiliary pressure containers, and hose assemblies shall be subjected to a hydrostatic test pressure equal to the marked factory test pressure or the test pressure specified in the manufacturer's listed installation and maintenance manual. No leakage, rupture, or movement of hose couplings shall be permitted. The test procedures shall be in accordance with the manufacturer's detailed written hydrostatic test instructions.

*Exception: Containers bearing DOT or TC marking shall be tested or replaced in accordance with the appropriate DOT or TC requirements.*

**9-5.2** Dry chemical agent removed from the containers prior to hydrostatic testing shall be discarded.

**9-5.3** Care shall be taken to ensure that all tested equipment is thoroughly dried prior to reuse.

**9-5.4** To protect the hazard during hydrostatic testing, if there is no connected reserve, alternate protection acceptable to the authority having jurisdiction shall be provided.

## Chapter 10 Referenced Publications

**10-1** 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 the current edition as of the date of the NFPA issuance of this document.

**10-1.1 NFPA Publications.** National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 30, *Flammable and Combustible Liquids Code*, 1993 edition.

NFPA 70, *National Electrical Code*, 1993 edition.

NFPA 72, *National Fire Alarm Code*, 1993 edition.

**10-1.2 Other Publications.**

**10-1.2.1 ANSI Publication.** American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

ANSI C-2, *National Electrical Safety Code*, 1993.

**10-1.2.2 ASME Publication.** American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.

ASME *Unfired Pressure Vessel Code*, 1989.

**10-1.2.3 U.S. Government Publication.** U.S. Government Printing Office, Washington, DC 20402.

*Code of Federal Regulations*, Title 29, Subpart S.

## Appendix A Explanatory Material

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

**A-1-1 Scope.** The dry chemical systems described in this standard are designed to discharge dry chemical from fixed nozzles and piping or from hose lines by means of an expellant gas. The intent of the standard is to present the design considerations applicable to these systems.

Because the flow of dry chemical (solid particles suspended in a gaseous medium) does not follow general hydraulic theories, most of the flow principles have been determined experimentally. The dry chemicals produced by various manufacturers usually are not identical in all characteristics, and each manufacturer designs equipment for use with a specific dry chemical. Therefore, system design principles applicable to the products of one manufacturer are not applicable to the products of another manufacturer. As a result, it is not practical to include system design details as a part of this standard.

It is now generally accepted that the flame extinguishing properties of dry chemicals are due to the interaction of the particles, which stops the chain reaction that takes place in flame combustion. Dry chemicals vary in their flame extinguishing effectiveness. Multipurpose dry chemical owes its effectiveness in extinguishing fires in ordinary combustibles, such as wood and paper, to the formation of a glow-retarding coating over the combustible material. For additional information on dry chemicals and their extinguishing characteristics, see A-2-6.1.

**A-2-5.1.1** Piping and fittings used in systems should be of a type for which the maximum system pressures will not cause material stress greater than the material's yield point when calculated in accordance with ANSI B-31.1, *Power Piping Code*.

**A-2-5.3** The piping for a dry chemical system embodies distinctive features necessitated by the characteristics of the agent. The use of flexible piping or hoses in a dry chemical system introduces a number of factors to be considered that do not normally affect rigid piping. The most important of these is the nature of any changes of direction. The minimum radius of curvature for any flexible hose to be used in a dry chemical system is usually shown in the listing information for a particular system. Other areas of concern that are evaluated in the test for listing are resistance to the effects of vibration, flexure, tension, torsion, temperature, flame, compression, and bending. It is also necessary for the hose to have the strength to contain the dry chemical during discharge and to be made of materials that will be resistant to atmospheric corrosion.

**A-2-6.1 Agent Characteristics.** A dry chemical extinguishing agent is a finely divided powdered material that has been specially treated to be water repellent and capable of being fluidized and free-flowing so that it can be discharged through hose lines and piping when under expellant gas pressure. Dry chemicals currently in use are described briefly as follows:

(a) *Sodium Bicarbonate ($NaHCO_3$)-based Dry Chemical.* This agent consists primarily of sodium bicarbonate and is suitable for use on all types of flammable liquid and gas fires (Class B) and also for fires involving energized electrical equipment (Class C).

It is particularly effective on fires in common cooking oils and fats, since, in combination with these materials, the sodium bicarbonate-based agent reacts to form a type of soap (saponification), which floats on a liquid surface, such as in deep fat fryers, and effectively prevents reignition of the grease.

Sodium bicarbonate-based dry chemical is not generally recommended for the extinguishment of fires in ordinary combustibles (Class A), although it may have a transitory effect in extinguishing surface flaming of such materials.

(b) *Dry Chemicals Based on the Salts of Potassium.* Commercially available agents are essentially potassium bicarbonate ($KHCO_3$), potassium chloride (KCl), and urea-based potassium bicarbonate ($KC_2N_2H_3O_3$). All three agents are suitable for use on all types of flammable liquid and gas fires (Class B) and also for fires involving energized electrical equipment (Class C).

It is generally recognized that salts of potassium are more effective in terms of chemical extinguishment mechanisms than sodium salts in extinguishing Class B fires, except those in deep fat fryers and other cooking equipment.

Dry chemicals based on the salts of potassium are not generally recommended for the extinguishment of fires in ordinary combustibles (Class A), although they may have a transitory effect in extinguishing surface flaming of such materials.

(c) *Multipurpose Dry Chemical.* This agent has as its base monoammonium phosphate ($NH_4H_2PO_4$) and is similar in its effect on Class B and Class C fires to the other dry chemicals. However, it does not possess a saponification characteristic and should therefore not be used on fires in deep fat fryers. Unlike the other dry chemicals, it does have a considerable extinguishing effect on Class A materials. The agent, when heated, decomposes to form a molten residue that will adhere to heated surfaces. On combustible solid surfaces (Class A), this characteristic excludes the oxygen necessary for propagation of the fire.

(d) *Foam-compatible Dry Chemicals.* When or where foam dry chemical systems are used or proposed for the protection of a hazard, the manufacturer should be consulted as to the compatibility of the agents.

**A-3-1.1** Gas fires normally should not be extinguished unless the source of burning gas can be shut off, because an explosive mixture may be formed with air that, if ignited, may cause greater damage than the original fire.

Factors that determine if the gas fire should be extinguished prior to shutting off the gas supply are:

(a) *Accessibility of Gas Shutoff Valves.* Where water hose streams are not available, it may be necessary to extinguish the fire in order to reach the shutoff valves.

(b) *The Proximity of Other Flammable or Combustible Materials.* If ignition of these materials could result in a more hazardous condition, the fire may have to be extinguished prior to gas shutoff.

(c) *Personnel Rescue.* Dry chemical should be applied at flow rates and discharge patterns that will be effective. Gas line flange, line rupture, or impinging fires might need special flow rates and discharge patterns.

**A-3-1.2.1** Dry chemical, when discharged, will drift from the immediate discharge area and settle on surrounding surfaces. Prompt cleanup will minimize possible staining or corrosion of certain materials that may take place in the presence of moisture.

Monoammonium phosphate and potassium chloride are slightly acidic and, in the presence of moisture, can corrode metals such as steel, cast iron, and aluminum.

Potassium bicarbonate, sodium bicarbonate, and urea-based potassium bicarbonate are slightly basic and, in the presence of moisture, can corrode metals such as aluminum, aluminum brass, aluminum bronze, and titanium.

Such corrosion will vary from a dull or tarnished finish to mild surface corrosion. Corrosion should not be of concern when accompanied by prompt cleanup. For the most part, these dry chemical agents can be readily cleaned up by wiping, vacuuming, or washing the exposed materials. Monoammonium phosphate-based agent will need some scraping and washing if the exposed surfaces were hot when the agent was applied.

**A-3-4.1** The limiting specifications for a dry chemical system are a function of the flow characteristics of the particular dry chemical and the equipment used by the manufacturer of the system. Therefore, it is not possible to specify in this standard the exact values for the quantity needed, rate of flow needed, or nozzle distribution. The above considerations are provided in this standard to point out the important features that should be made available to the purchaser, inspector, or other authorities charged with the examination and evaluation of this system. These data should be established by investigation and tests confirmed by a testing laboratory.

**A-3-6 Hazards to Personnel.** Dry chemical fire extinguishing agents are considered nontoxic from a physiological point of view. However, as with any finely divided material, they may produce mild irritation effects, especially when used in an enclosed area. In general, the effects are neither serious nor permanent.

For more specific guidance on individual dry chemical extinguishing agent components and their hazards to personnel (Threshold Limit Values), consult the dry chemical manufacturer.

**A-3-7** See NFPA 72, *National Fire Alarm Code*, for detection, alarm, and control functions for dry chemical extinguishing systems.

**A-3-7.1.3** Common exhaust ducts normally are located in concealed areas such that the need for manual discharge of the system may not be readily apparent. It is recommended that the number and location of remote controls, if any, be given careful consideration.

**A-3-7.3** If only local alarms are provided, consideration should be given to transmitting these alarms to a constantly attended location.

**A-3-8.2 Reserve Supply.** A fully charged reserve unit permanently connected to the system is desirable and may be required by the authority having jurisdiction.

**A-3-8.3.2** Listed systems for use at higher temperatures up to 210°F (99°C) or lower temperatures down to -65°F (-54°C) are available from most system manufacturers, or special systems can be specially designed for extreme temperature(s) conditions.

**A-3-9.1 Dry Chemical Piping.** The following material provides some of the necessary considerations that must be incorporated when piping a mixture of dry chemical and

expellant gas. The flow of the mixture of dry chemical and gas does not strictly follow general hydraulic principles because it is two-phase flow. The flow characteristics are dependent upon the composition and physical characteristics of the type and make of the dry chemical being used, the type of expellant gas being used, and the design of the equipment being used.

Pre-engineered systems do not need calculations for flow rate, pressure drop, and nozzle pressure, since they have been tested for fire extinguishment with minimum and maximum piping limitations, including length of pipe and number and type of elbows, and minimum and maximum temperature limitations. These limitations have been verified by testing laboratories and are published in the manufacturer's installation manual.

Engineered systems are calculated to show that the proper flow rate and nozzle pressure are obtained using the pressure drop occurring in the piping layout. The necessary charts, graphs, and nozzle pattern information must be obtained from the equipment manufacturer and are verified by testing laboratories.

Changes in direction of flow cause separation of expellant gas and dry chemical. To provide proper distribution of dry chemical upon splitting the stream, special attention must be given to the method in which an approach is made to a tee after a change in direction. Certain acceptable methods are shown in Figures A-3-9.1(a) and A-3-9.1(b). Other methods and equipment may be recognized by a testing laboratory in its listings.

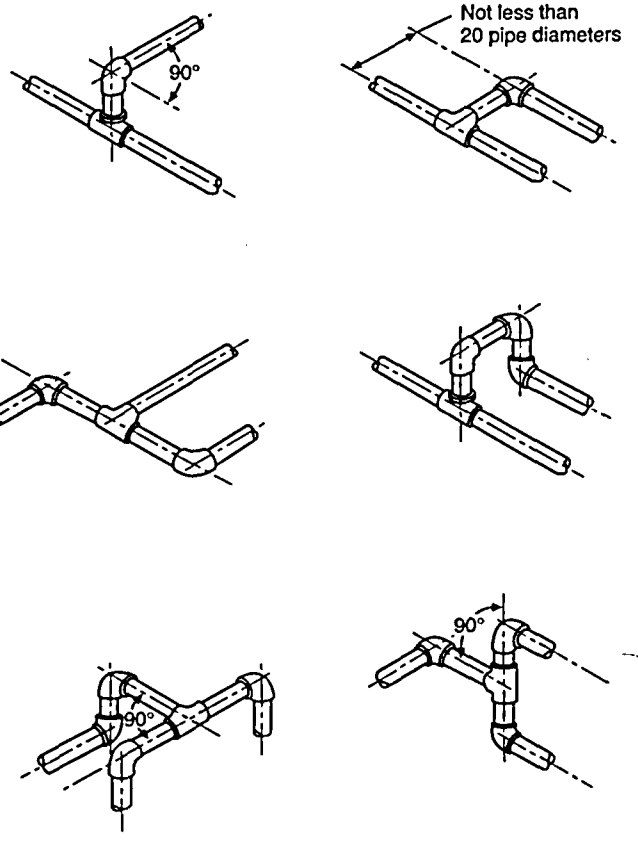



**Figure A-3-9.1(a) Illustrations of acceptable means of piping into a tee in a dry chemical system.**

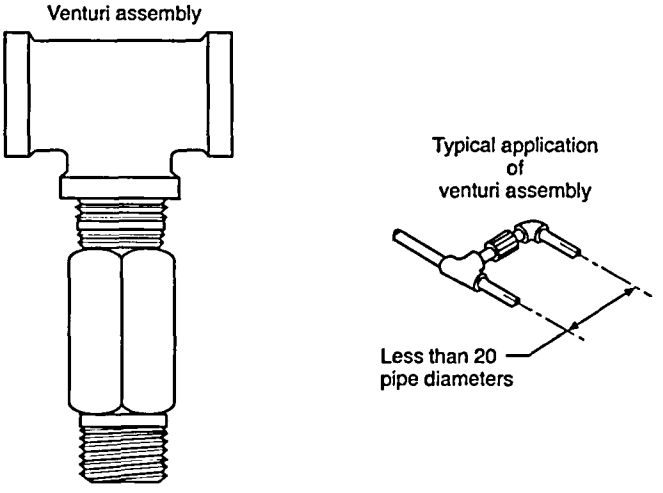



**Figure A-3-9.1(b) Venturi assembly.**

**A-4-1** Consideration should be given to the elimination of probable sources of reignition, because the extinguishing action of a dry chemical flooding system is transient.

**A-4-2.2.3** For fires in ordinary combustibles where multipurpose dry chemical should be used for protection, additional dry chemical applied by local application may be needed in order to protect adequately all exposed surfaces.

**A-5-1** Examples of hazards that may be successfully protected by local application systems include dip tanks, quenching oil tanks, spray booths, oil-filled electrical transformers, vapor vents, deep fat fryers, etc.

**A-6-3.1** An unusually low flow rate will cause the dry chemical to separate from the expellant gas while within the pipe or hose, or both, resulting in uneven flow from the nozzle.

**A-6-3.3** Operation of hand hose line systems depends on manual actuation and manipulation of a discharge nozzle. Speed and simplicity of operation are essential.

**A-7-1 Uses.** Pre-engineered systems may have special limitations, flow rates, and methods of application that differ from the requirements specified in Chapters 1 through 5 of this standard.

**A-7-3.4** One example of each acceptable method is presented in Figures A-7-3.4(a)–(f). These figures are not intended to be all-inclusive.

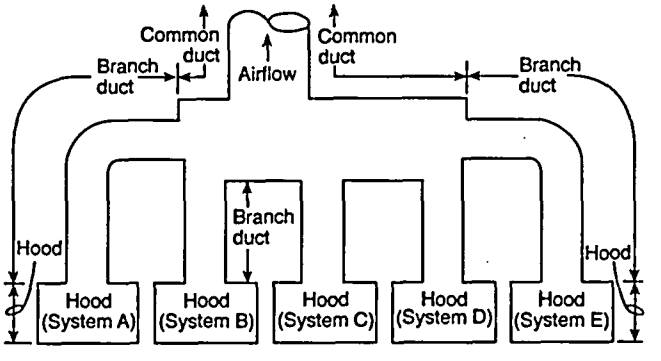



**Figure A-7-3.4(a) Simultaneous operation of all systems.**

**A-7-3.4(a)** Separate cooking appliance, hood, and branch duct systems are interconnected so that they operate simultaneously. One or more of these systems also protect the entire common exhaust duct.

*Scenario*: A fire is detected by System A. System A, protecting cooking appliances, a hood, and a branch duct, is operated. Simultaneously, Systems B, C, D, and E are also operated. All fuel or power to all protected appliances served by the common exhaust duct is shut off.

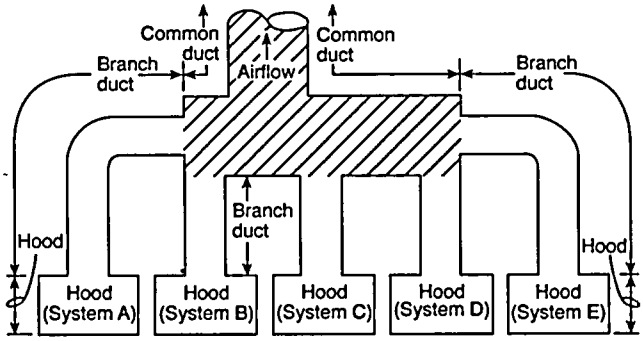



**Figure A-7-3.4(b) Simultaneous operation of all systems that protect only the common exhaust duct.**

**A-7-3.4(b)** Upon operation of the common exhaust duct systems, the fuel or power to all protected appliances served by the common exhaust duct is shut off. The cooking appliance, hood, and branch duct systems provide protection in accordance with 7-3.1, 7-3.2, and 7-3.3.

*Scenario No. 1*: A fire is detected by one of the systems protecting the common exhaust duct. All systems protecting the common exhaust duct are operated simultaneously. Fuel or power to all protected appliances served by the common exhaust duct is shut off.

*Scenario No. 2*: The cooking appliance, hood, and branch duct System A detects a fire. Only System A is operated, and only the fuel or power to the cooking appliances protected by System A is shut off.

**A-7-3.4(c)** Simultaneous operation of another system or systems is not needed, provided there is sufficient fire hazard separation between hoods and adjacent branch ducts. (*See 3-3.1.*)

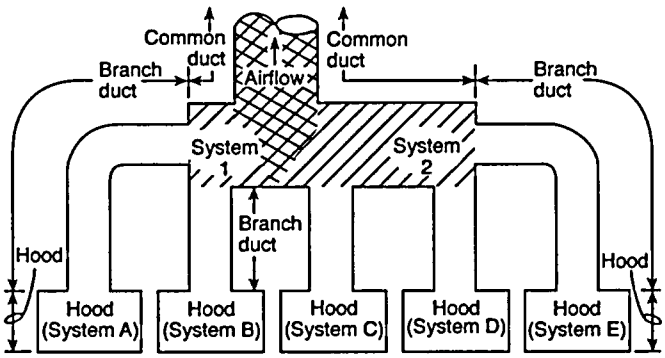


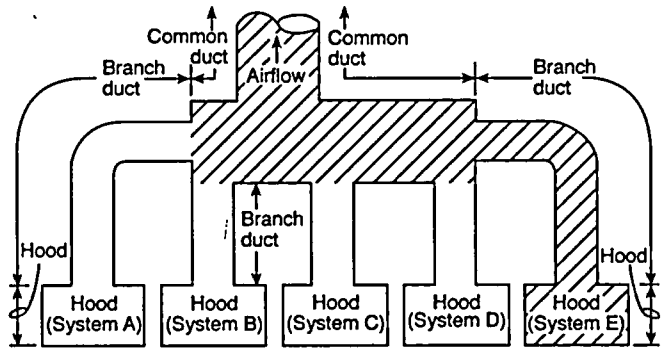

**Figure A-7-3.4(c) Independent operation of systems that protect only the common exhaust duct.**

Each system protects a portion of the common exhaust duct so that the entire common exhaust duct is protected.

Each common exhaust duct system protects a portion of the common exhaust duct and, when operated, shuts off fuel or power to all protected cooking appliances served by that portion of the common exhaust duct.

*Scenario No. 1*: Common duct System 1 detects a fire and operates. Fuel or power to all cooking appliances protected by Systems A and B is shut off. Systems A and B are not operated. Cooking appliances protected by Systems C, D, and E remain in operation.

*Scenario No. 2*: System A, B, C, D, or E detects a fire. Only the system detecting the fire operates, and only the fuel or power to the cooking appliances protected by that system is shut off.




**A-7-3.4(d) Independent operation of cooking appliance, hood, and branch duct systems where one of these systems protects the entire common exhaust duct.**

**A-7-3.4(d)** When the system that also protects the common exhaust duct operates, the fuel or power to all protected cooking appliances served by the common exhaust duct is shut off. If any other system is operated, only the fuel or power to the cooking appliances protected by that system is shut off.

Simultaneous operation of another system or systems is not needed, provided there is sufficient fire hazard separation between hoods and adjacent branch ducts. (*See 3-3.1.*)

*Scenario No. 1*: A fire is detected by System E, which also protects the common exhaust duct. System E operates, and the fuel or power to all cooking appliances served by the common exhaust duct is shut off.

*Scenario No. 2*: A fire is detected by System B. Only System B operates, and only the fuel or power to the cooking appliances protected by System B is shut off.

**A-7-3.4(e)** When a cooking appliance, hood, and branch duct system that also protects a portion of the common duct is operated, the fuel or power to all protected appliances served by that portion of the common exhaust duct is shut off.

When a system is operated that does not protect a portion of the common exhaust duct, only the fuel or power to the cooking appliances protected by that system is shut off.

Simultaneous operation of another system or systems is not needed, provided there is sufficient fire hazard separation between hoods and adjacent branch ducts. (*See 3-3.1.*)

*Scenario No. 1*: System C operates upon detecting a fire. Fuel and power to the cooking appliances protected by System C are shut off. No other systems are affected.

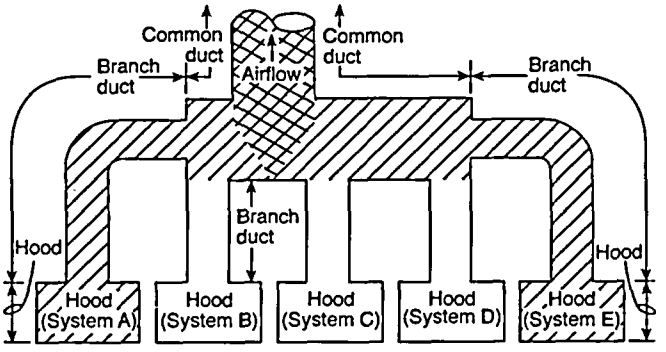



**Figure A-7-3.4(e) Independent operation of cooking appliance, hood, and branch duct systems with two or more of these systems also protecting the common exhaust duct.**

*Scenario No. 2:* System E operates upon detecting a fire. Fuel or power to the cooking appliances served by that portion of the common exhaust duct is shut off; however, Systems C and D are not operated. Cooking appliances protected by Systems A and B are not affected.

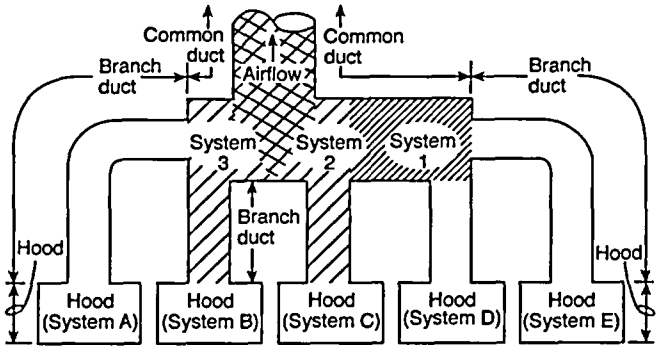



**Figure A-7-3.4(f) Independent operation of (a) a combination of a system that protects only a portion of the common exhaust duct and (b) cooking appliance, hood, and branch duct systems, two or more of which protect the remainder of the common exhaust ducts.**

**A-7-3.4(f)** Simultaneous operation of another cooking appliance, hood, and branch duct system is not needed, provided there is sufficient fire separation between hoods and adjacent branch ducts. (*See 3-3.1.*)

Upon operation of any system, the fuel or power to all protected cooking appliances served by the portion of the common exhaust duct being protected is shut off.

*Scenario No. 1:* A fire is detected by System B or C. If System B operates, the fuel or power to the protected cooking appliances of Systems A and B is shut off. System A is not operated.

If System C operates, only the fuel or power to the appliances protected by System C is shut off.

*Scenario No. 2:* A fire is detected by System D or E. Only that system operates, and only the fuel or power to the cooking appliances protected by that system is shut off.

*Scenario No. 3:* A fire is detected by System 1. Only System 1 operates, and only the fuel or power to the protected appliances served by Systems D and E is shut off. Systems D and E are not operated.

**A-9-1.3** It is recommended that system designers and installers and maintenance personnel be retrained at least every 3 years to be updated with current information on system changes and service bulletins.

**A-9-3.1** Regular service contracts are recommended.

**A-9-3.1(c)** The following methods may be used for verifying that the piping is not obstructed:

(a) Disassembly of all piping;
(b) Purging of piping with nitrogen or dry air;
(c) Conducting a full or partial discharge test;
(d) Other methods recommended by the manufacturer.

**A-9-3.2** The date of manufacture marked on fusible metal alloy sensing elements does not limit when they can be used. These devices have unlimited shelf life. The intent of 9-3.2 is to require replacement of fusible metal alloy sensing elements that have been installed for up to 1 year in environments subjecting them to contaminant-loading, such as grease in restaurant hoods and ducts that could adversely affect their proper operation.

## Appendix B Referenced Publications

**B-1** The following documents or portions thereof are referenced within this standard for informational purposes only and thus are not considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

**B-1.1 NFPA Publications.** National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 10, *Standard for Portable Fire Extinguishers*, 1990 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 1993 edition.

NFPA 72, *National Fire Alarm Code*, 1993 edition.

NFPA 121, *Standard on Fire Protection for Self-Propelled and Mobile Surface Mining Equipment*, 1990 edition.

**B-1.2 Other Publications.**

**B-1.2.1 ANSI Publication.** American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

ANSI B31.1, *Power Piping Code*, 1986.

**B-1.2.2 ASTM Publication.** American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM E380, *Standard for Metric Practice*, 1991.

# Index

# The NFPA Codes and Standards Development Process

Since 1896, one of the primary purposes of the NFPA has been to develop and update the standards covering all areas of fire safety.

**Calls for Proposals**
The code adoption process takes place twice each year and begins with a call for proposals from the public to amend existing codes and standards or to develop the content of new fire safety documents.

**Report on Proposals**
Upon receipt of public proposals, the technical committee members meet to review, consider, and act on the proposals. The public proposals – together with the committee action on each proposal and committee-generated proposals – are published in the NFPA's Report on Proposals (ROP). The ROP is then subject to public review and comment.

**Report on Comments**
These public comments are considered and acted upon by the appropriate technical committees. All public comments – together with the committee action on each comment – are published as the Committee's supplementary report in the NFPA's Report on Comments (ROC).

The committee's report and supplementary report are then presented for adoption and open debate at either of NFPA's semi-annual meetings held throughout the United States and Canada.

**Association Action**
The Association meeting may, subject to review and issuance by the NFPA Standards Council, (a) adopt a report as published, (b) adopt a report as amended, contingent upon subsequent approval by the committee, (c) return a report to committee for further study, and (d) return a portion of a report to committee.

**Standards Council Action**
The Standards Council will make a judgement on whether or not to issue an NFPA document based upon the entire record before the Council, including the vote taken at the Association meeting on the technical committee's report.

**Voting Procedures**
Voting at an NFPA Annual or Fall Meeting is restricted to members of record for 180 days prior to the opening of the first general session of the meeting, except that individuals who join the Association at an Annual or Fall Meeting are entitled to vote at the next Fall or Annual Meeting.

"Members" are defined by Article 3.2 of the Bylaws as individuals, firms, corporations, trade or professional associations, institutes, fire departments, fire brigades, and other public or private agencies desiring to advance the purposes of the Association. Each member shall have one vote in the affairs of the Association. Under Article 4.5 of the Bylaws, the vote of such a member shall be cast by that member individually or by an employee designated in writing by the member of record who has registered for the meeting. Such a designated person shall not be eligible to represent more than one voting privilege on each issue, nor cast more than one vote on each issue.

Any member who wishes to designate an employee to cast that member's vote at an Association meeting in place of that member must provide that employee with written authorization to represent the member at the meeting. The authorization must be on company letterhead signed by the member of record, with the membership number indicated, and the authorization must be recorded with the President of NFPA or his designee before the start of the opening general session of the Meeting. That employee, irrespective of his or her own personal membership status, shall be privileged to cast only one vote on each issue before the Association.